RS/6000 SP

Planning Volume 1, Hardware and Physical Environment

GA22-7280-06

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Note

Before using this information and the product it supports, be sure to read the general information under "Notices" on page xvii.

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This book is a major revision of GA22-7280-05.

This edition applies to Version 3 Release 1 of IBM Parallel System Support Programs for AIX (PSSP), which runs on the IBM RS/6000 SP, and to all subsequent releases and modifications until otherwise indicated in new editions. Significant changes or additions to the text and illustrations are indicated by a vertical line (|) to the left of the change.

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About This Book

This book is an installation site physical planning guide. Its purpose is to help you prepare your site in advance for installation of your IBM RS/6000 Scaleable POWERparallel System (RS/6000 SP). Early planning for your RS/6000 SP installation 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.

Save Your Original Books!

If you receive this book as part of an SP system upgrade, be sure to retain the books that came with your original system. This book emphasizes the latest SP system hardware and might not include some information on previous hardware releases. You can, however, find details on some earlier features in Appendix B, “Withdrawn RS/6000 SP Features” on page 289.

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Hinweis

Dieses Genehmigungsverfahren ist von der Deutschen Bundespost noch nicht veröffentlicht worden.

Getting More Information

This book and other RS/6000 SP hardware and software documentation are available both online and in printed form from the following sources:

- The RS/6000 website at the following URL:

  http://www.rs6000.ibm.com/resource/aix_resource/spbooks

- The Resource Center on the PSSP product media
- Printed documents and CD-ROM versions, which can be ordered from IBM
- IBM internal use Service Information Library (SIL)
- IBM internal use versions available on MKTTOOLS

For more information on these sources and an extensive listing of RS/6000 SP related publications, see “Bibliography” on page 375.

Chapter 1. Introducing the RS/6000 SP System

This chapter is an overview of the IBM RS/6000 Scalable POWERparallel System, also known as the RS/6000 SP. It introduces the processor nodes, model and expansion frames, the standard and optional hardware, and installation site planning. Figure 1 is a conceptual illustration of an RS/6000 SP system.

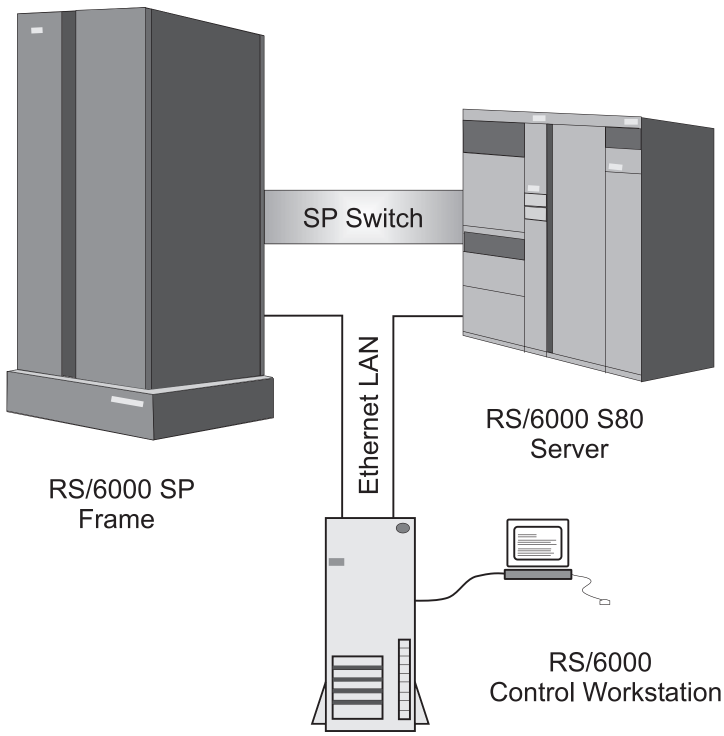


Figure 1. RS/6000 SP System

RS/6000 SP System Overview

The IBM RS/6000 SP is IBM's family of scalable, parallel computing solutions. It provides a state-of-the-art parallel computing system and industry-leading application enablers and applications. The RS/6000 SP runs the AIX operating system along with the Parallel System Support Programs (PSSP) system software on the control workstation and all processor nodes. For complete information on SP system software issues, see *IBM RS/6000 SP: Planning Volume 2, Control Workstation and Software Environment*.

The scalable architecture of the SP system, its high-performance communication, POWER3, POWER2, and PowerPC Architecture give you the power to handle data-intensive, compute-intensive and I/O-intensive jobs with ease. You can execute both serial and parallel applications simultaneously, while managing your system from a single workstation. For scientific and technical applications, the SP system delivers the power and connectivity for rapid turnaround; from structural analysis and seismic modeling to circuit simulation and molecular modeling. Multiple users can run complex queries against very large amounts of data and obtain results interactively. This makes the SP system an ideal solution for database query, online transaction processing, business management, and batch business applications.

The IBM software offerings for the SP system provide an interlocking set of licensed programs designed to address a wide range of system and application needs. The open architecture, based on the AIX operating system (IBM's implementation of UNIX), enables you to easily integrate the SP system into your existing environments. The software architecture is closely tuned to the SP system hardware design for maximum usability and performance.

The SP system family continues the AIX and RS/6000 policy of adherence to open systems standards. Connection to I/O devices, networks of workstations, and mainframe networks is a key element of the SP system offering. Ethernet, HIPPI, SCSI, FDDI, Token-Ring, ATM, SSA, ESCON, BMCA and Fibre Channel 266 and 1 GB interfaces are supported by the SP system.

In addition to the standard network interface cards, the IBM RS/6000 SP system now offers versatile, high speed network connections using extension nodes. Also, the SP system now offers an optional e-business interface using the IBM RS/6000 7017 Enterprise Server as an SP-Attached Server.

Hardware Planning

The basic components of the RS/6000 SP system are:

- Processor nodes (includes SP-Attached Servers)
- Frames with integral power subsystems
- Switches
- Extension nodes
- Control workstations (a high availability option is available)
- Network connectivity adapters
- External disk drives

These components connect to your existing computer network through a local area network (LAN), making the RS/6000 SP system accessible from any network-attached workstation.

Processor Nodes

The IBM RS/6000 SP System is scalable from one to 128 processor nodes. Up to sixteen thin, eight wide, or four high processor nodes can be mounted in a tall frame while a short frame can hold up to eight thin or four wide nodes.

SP systems with more than 128 processor nodes are available on a special order basis; for details, consult your IBM sales representative.

There are four types of RS/6000 SP processor nodes:

- High nodes
- Wide nodes
- Thin nodes
- SP-Attached Servers

Nodes have either a Symmetric MultiProcessor (SMP) configuration or a uniprocessor configuration. SMP-type nodes use Peripheral Component Interconnect (PCI) architecture, while uniprocessor nodes use Micro Channel Architecture (MCA).

See the following chapters for complete details on the available processor nodes:

High Nodes

- Chapter 2, “POWER3 SMP High Node (F/C 2054)” on page 11.

Wide Nodes

- Chapter 3, “POWER3 SMP Wide Node (F/C 2053)” on page 15.
- Chapter 5, “332 MHz SMP Wide Node (F/C 2051)” on page 25.

Thin Nodes

- Chapter 4, “POWER3 SMP Thin Node (F/C 2052)” on page 19.
- Chapter 6, “332 MHz SMP Thin Node (F/C 2050)” on page 29.
- Chapter 7, “160 MHz Uniprocessor Thin Node (F/C 2022)” on page 35.

SP-Attached Servers

An SP-Attached Server is an IBM RS/6000 7017 Enterprise Server configured to operate with the RS/6000 SP System. Enterprise Servers are available as models S70, S7A, and S80. Each is a high-end, PCI based, 64-bit SMP unit that supports concurrent 32-bit and 64-bit applications.

Like a standard SP system processor node, the SP-Attached Server can perform most SP system processing and administration functions. However, unlike a standard SP system processor node, the SP-Attached Server is housed in its own frame. Thus, the SP-Attached Server has both node-like and frame-like characteristics.

For SP system attachment, the Enterprise Server requires the installation of several SP system-specific cables and communications adapters.

For details, see Chapter 8, “SP-Attached Servers (RS/6000 M/T 7017-S70, S7A, and S80)” on page 39.

Extension Nodes

An extension node is a non-standard node that extends the capabilities of the SP system, but that cannot be used in all of the same ways as a standard node.

Note: SP systems with Extension Nodes require PSSP 2.3 software or later.

Dependent Nodes: One type of extension node is a dependent node. A dependent node depends on SP system nodes for certain functions, but implements much of the switch-related protocol that standard nodes use on the SP Switch. Typically, dependent nodes consist of four major components as follows:

1. A physical dependent node - The hardware device requiring SP system processor node support.
2. A dependent node adapter - A communication card mounted in the physical dependent node. This card provides a mechanical interface for the cable connecting the physical dependent node to the SP system.

3. A logical dependent node - Made up of a valid, unused node slot and the corresponding unused SP system switch port. The physical dependent node logically occupies the empty node slot by using the corresponding SP system switch port. The switch port provides a mechanical interface for the cable connecting the SP system to the physical dependent node.
4. A cable - To connect the dependent node adapter with the logical dependent node. It connects the extension node to the SP system.

One specific type of dependent node is the IBM 9077 SP Switch Router. These optional external devices are used for high-speed network connections or system scaling using HIPPI backbones or other communications subsystems such as ATM or 10/100 Ethernet. (See “SP Switch Routers” on page 5.)

Frames

IBM RS/6000 SP system frames contain and provide power for processor nodes, switches, DASD and other hardware. A frame feature code provides an empty frame with its integral power subsystem and line cord; you order nodes and other components using their respective feature codes.

Frames are offered in a list of five options:

- Tall (1.93 m) ***model*** frames
- Tall ***expansion*** frames
- Short (1.25 m) model frames
- Short expansion frames
- SP Switch frames

Frames have locations known as ***drawers*** into which the processor nodes are mounted. Tall frames have eight drawers and short frames have four. Each drawer location is further divided into two ***slots***. A slot has the capacity of one thin node. Wide nodes occupy one full drawer while high nodes fill two drawers.

Complete details on current production frames can be found in the following chapters:

Tall Model and Expansion Frames

Chapter 9, “Tall Frames – 1.93 m (Model 550, F/C 1550, and F/C 2031)” on page 55.

Short Model and Expansion Frames

Chapter 10, “Short Frames – 1.25 m (Model 500 and F/C 1500)” on page 61.

SP Switch Frames

“SP Switch Frames (F/C 2031)” on page 59.

Workgroup Server

The RS/6000 Model T70 Workgroup Server is a limited-configuration, single-phase power system comprising one POWER3 High Node in a medium-height (1.36 m) frame with support for up to four SP Expansion I/O Units. For details, see Chapter 11, “RS/6000 Model T70 Workgroup Server” on page 65.

Control Workstations

When planning your control workstation, you can view it as a server to the SP system applications. The subsystems running on the control workstation are the SP system server applications for the SP system nodes. The nodes are clients of the control workstation server applications. The control workstation server applications provide configuration data, security, hardware monitoring, diagnostics, a single point of control service, and optionally, job scheduling data and a time source.

Since most control workstation planning decisions are based on the ability of the control workstation to handle your software requirements, planning information for this item is covered in *IBM RS/6000 SP: Planning Volume 2, Control Workstation and Software Environment*. Included in that book is the latest list of supported control workstations. Also included are the requirements for a high-availability option (**F/C 1245**), which eliminates the control workstation as a single point of failure.

Control workstation planning information in this book is limited to the following:

- I/O adapter features for both PCI and MCA-type control workstations; see “Control Workstation Interface Adapters” on page 69.
- Service Director; a system monitoring and fault reporting application. For details, see “Service Director” on page 71.

Switches

Switches provide a message-passing network that connect all processor nodes with a minimum of four paths between every pair of nodes. The current production SP series of switches can also be used to connect the SP system with optional external devices.

SP Switch Series

SP Switches are available in both 8-port (**F/C 4008**) and 16-port (**F/C 4011**) configurations. For detailed information, see Chapter 13, “SP Switches (F/C 4011 and F/C 4008)” on page 73.

For planning inter-frame switch cabling, see “Planning for Switch Cabling” on page 101.

SP Switch Routers

The IBM RS/6000 SP Switch Router is a licensed version of the Ascend GRF switched IP router that is enhanced for direct connection to the SP Switch. Network connections through SP Switch Routers are typically faster and have better availability than network connections through SP system nodes.

Connections between the SP system and the SP Switch Router require an SP Switch mounted in the SP system and an SP Switch Router adapter mounted in the router. A switch cable is required to complete the connection between the SP switch and the SP Switch Router adapter. For detailed information on the router, its components, and installation requirements, see Chapter 14, “RS/6000 SP Switch Routers (M/T 9077 04S and 16S)” on page 79.

Network Communications

SP systems have several communication requirements, including the following:

- All SP systems require an SP Ethernet LAN for system administration.
- Switch-configured systems require a frame-to-frame switch cable network.
- SP systems connected to external networks (or with networks between SP system partitions) require additional communication adapters.

The required SP Ethernet LAN that connects all nodes to the control workstation is needed for system administration and is to be used for that purpose exclusively. If you attempt to route non-administrative traffic over the SP Ethernet, and it interferes with administrative traffic, you will have to reroute the non-administrative traffic. Further 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 adapter types that can be used as part of an RS/6000 SP system.

On boot/install server nodes, some adapters are needed to support systems that contain nodes running on different PSSP software release levels. For details, see Chapter 15, “Communication Cabling” on page 93 and *IBM RS/6000 SP: Planning Volume 2, Control Workstation and Software Environment*.

Communication Cabling

Cables are among the most important things you plan for when you set up a communication network.

Cable planning for your SP system communication network includes:

- Placing hardware items on your floor plan (control workstation, processor frames, routers, and servers) so that cables are the correct length to reach all necessary connection points.
- Ensuring that all wiring standards are followed for the cable types you install.
- For switch-configured systems; laying out the frame-to-frame switch cable network and determining the quantity, length, and type of switch cable you need for each switch-equipped frame.

For details on completing these tasks, see Chapter 15, “Communication Cabling” on page 93.

Communication and I/O Adapters

If you plan to connect your entire SP system (or partitions within your SP system) to external networks, you must install communication adapters. If you have an SP system with multiple system partitions, you can enhance system performance by using optional network adapters instead of the SP Switch network for communication between partitions.

Two different communication bus architectures are used in SP systems; Peripheral Component Interconnect (PCI) and Micro Channel Architecture (MCA).

Use of PCI adapters is limited to the following nodes:

- POWER3 SMP Nodes
- 332 MHz SMP Nodes

- SP-Attached Servers

Use of MCA communication adapters is limited to the following nodes:

- 160 MHz Uniprocessor Thin Nodes
- 200 MHz SMP High Nodes (withdrawn from production)
- 135 MHz Uniprocessor Wide Nodes (withdrawn from production)

Planning for Communication I/O Adapters

Planning for I/O adapters involves two high-level tasks:

1. Determining ***which*** adapters to use
2. Determining ***how many*** adapters to use

Determining which adapters to use: Factors for deciding which adapters to use include:

- Performance capability
- What is included with the adapter
- What you must supply for the adapter, including cables if needed
- Software requirements

These details for each PCI-type adapter can be found in Chapter 17, "PCI Communication Adapters" on page 121.

For MCA-type adapters, see Chapter 18, "MCA Communication Adapters" on page 161.

Determining how many adapters to use: Each communication adapter has limitations placed on it including:

- The maximum number allowed per node type
- Performance requirements
- Placement restrictions

This information is shown in tables and lists for each PCI-type adapter in "PCI Bus I/O Adapter Requirements for SMP Nodes" on page 109.

For MCA-type adapters, see "MCA Bus Adapter Requirements for Wide, Thin and High Nodes" on page 118.

Direct Access Storage Devices (DASD)

Direct Access Storage Devices (DASD) can be either of two types as follows:

- Internal (contained within the node)
- External (mounted separately, outside of the node)

Internal DASD

Internal DASD are installed in the node internal DASD bays. If a node does not use an external boot device, it must be configured with internal DASD. In this configuration, a node has both a minimum requirement and a maximum limit for DASD.

For a complete description, see “Internal DASD” on page 221.

External DASD

Previously, external DASD were used only to extend the storage capacity of processor nodes. However, some later nodes can be configured with no internal DASD. Nodes with external DASD only use them also as the source of boot information. In these applications, external DASD are called ***external boot disks***. For a complete description of these features, see “External Boot Disks” on page 226.

For available features to extend node storage, see “External DASD” on page 224.

Installation Site Planning

Electrical Power Planning

Chapter 20, “Power and Electrical Requirements” on page 231 describes power planning issues, such as the electrical subsystem used in SP system frames and the power requirements of individual SP system components. These issues are covered in the following sections:

- “Scalable Electric Power Base Unit (SEPBU)” on page 231 describes the power subsystem.
- “SEPBU Power Requirements” on page 233 provides branch circuit information for each frame configuration.
- “Power Line Cord Specifications for SEPBU-equipped Frames” on page 236 describes the line cords provided with each SP system and lists the plugs and connectors required.
- “Planning for Power Requirements of SP Frames and Features” on page 239 discusses SP system component and auxiliary equipment power requirements.
- “Obtaining Power System Backup Devices” on page 242 provides information on obtaining uninterruptible power supplies and dual line cord static transfer switches that are properly matched with your SP system.
- “Upgrading Power Systems in Early SP Frames” on page 244 describes the equipment supplied in the features for upgrading early SP system power subsystems.

Environmental Planning

Chapter 21, “Environmental Factors” on page 249 covers the following topics:

- “Environmental Specifications of the RS/6000 SP” on page 249 lists temperature and humidity specifications for the SP system.
- “Acoustical Environment of the RS/6000 SP System” on page 250 has a table listing acoustic emissions of nodes and frames.

- “Evaluating Thermal Output” on page 252 describes the procedures you use to calculate air conditioning requirements for your installation.
- “Evaluating Electromagnetic Interference” on page 255.
- “Evaluating Electrostatic Discharge” on page 255.
- “Frame Tie-down Considerations” on page 256 provides drawings showing the tie-down locations on SP system frames.

Floor Planning

In addition to providing weights and dimensions for SP system frames and their shipping containers, Chapter 22, “Floor Plans” on page 259 provides information needed to develop the work space for your SP system. Some of the topics related to this are:

- “Raised Floor Installations” on page 264.
- “Non-Raised Floor Installations” on page 265.
- “Service Clearance Specifications for Frames” on page 267 has tables and illustrations showing the floor space required for SP system frames and the locations of cable openings and leveling casters for each frame type.
- “Multi-Frame System Floor Planning and Illustrations” on page 277 contains tables and illustrations showing floor layouts for a variety of multi-frame SP system installations.
- “RS/6000 SP System Floor Load Analysis” on page 283 contains the formula you use to calculate the actual load placed on your installation site floor.

RS/6000 SP System Upgrades

Many upgrades, conversions, and feature additions are available to enhance SP system performance and capability. Examples of typical upgrades include adding frames to your SP system, installing new higher-performance nodes, and converting MCA-type nodes to PCI nodes. For details, see Appendix A, “SP System Upgrades, Conversions, and Feature Additions” on page 285.

Chapter 2. POWER3 SMP High Node (F/C 2054)

Description

POWER3 SMP High Nodes (**F/C 2054**) use PCI bus architecture and have either two, four, six, or eight 222 MHz 64-bit processors per node. Your IBM RS/6000 SP system must be operating at PSSP 3.1.1 (or later) to use these nodes.

The POWER3 High Node provides additional DASD and PCI adapter capacity by connecting to SP Expansion I/O Units; for details, see “SP Expansion I/O Unit (F/C 2055)” on page 14.

The POWER3 SMP High Node occupies two full drawer locations, thus four nodes can be housed in a tall (1.93 m) frame. POWER3 SMP High Nodes can be placed in the first node slot of a frame without requiring additional nodes.

POWER3 SMP High Nodes require a tall, deep frame (**Model 550** or **F/C 1550**); they are not supported in the withdrawn 2.01 m frame or in the 1.25 m frame.

Note: POWER3 SMP High Nodes are not compatible with High Performance switches (F/C 4010 and F/C 4007).

PCI Bus Description

The POWER3 SMP High Node PCI bus contains one 32-bit and four 64-bit PCI slots for I/O adapters.

Additional PCI adapters can be attached to the bus by using up to six optional SP Expansion I/O Units. Each expansion unit has eight 64-bit PCI adapter slots.

Requirements and Options

F/C 2054 Requirements

POWER3 SMP High Nodes occupy two full node drawers. Up to four POWER3 SMP High Nodes may be installed in one tall/deep frame. Mandatory prerequisites are:

- PSSP 3.1.1 (or later) on the processor node, control workstation, and backup nodes
- Two processors (on one card, mounted in one slot)
- 1 GB of memory
- 9.1 GB of mirrored DASD (with internal booting)

F/C 2054 Options

POWER3 SMP High Node available options include the following:

- Four processor slots allowing a maximum of eight processors per node
- Four memory slots supporting up to 16 GB of memory
- Five PCI slots (four 64-bit and one 32-bit) for communication adapters
- A dedicated Mezzanine Bus (MX) slot for an optional SP Switch MX2 adapter
- Integrated Ethernet with BNC and RJ45 ports:
  - 10Base2 Ethernet (BNC)
  - 10BaseT or 100BaseTX Ethernet (RJ45)
- Support for up to six SP Expansion I/O units (**F/C 2055**)
- Two internal DASD bays supporting up to 18.2 GB of mirrored disk storage
- Integrated Ultra SCSI network
- External nine-pin RS-232 on the planar S2 port (supported only for HACMP serial heartbeat)
  - Node-to-node HACMP cable (**F/C 3124**)
  - Frame-to-frame HACMP cable (**F/C 3125**)

Processor Requirements and Options

POWER3 SMP High Nodes require a minimum of two 222 MHz, PowerPC processors mounted on one card. You can order up to three additional two-processor cards (**F/C 4849**) to configure the node with a total of eight CPUs.

Table 1. Processor Options for POWER3 SMP High Nodes (F/C 2054)

Feature Code	Quantity	Description	Comments
4849	1 - 4	One processor card with two CPUs	1 required

Memory Requirements and Options

POWER3 SMP High Nodes have one to four memory cards, a minimum of one GB (8 x 128 MB DIMMs) and a maximum of 16 GB (16 x 8 x 128 MB DIMMs).

Table 2. Memory features for POWER3 SMP High Nodes (F/C 2054)

Feature Code	Description	Minimum Per Node	Maximum Per Node
4880	Base memory card	1	4
4133	(8) 128 MB DIMMs	1	16

DASD Requirements and Options

POWER3 SMP High Nodes can have one pair of internal DASD attached through an integrated Ultra SCSI network. The POWER3 SMP High Node can have either no internal DASD (with external booting) or from 9.1 GB to a maximum of 18.2 GB of mirrored, internal disk storage.

Additional DASD can be attached to the POWER3 High Node by using up to six SP Expansion I/O units. Each expansion unit has four DASD bays. For details, see “SP Expansion I/O Unit (F/C 2055)” on page 14.

Optional internal DASD are available as follows:

- 9.1 Gigabyte Ultra SCSI disk pair (**F/C 2909**)
- 18.2 Gigabyte Ultra SCSI disk pair (**F/C 2918**)

External storage devices can be accessed through optional Ultra SCSI adapter (**F/C 6207**) and SSA adapter (**F/C 6225**).

Switch and Communication Adapter Requirements and Options

Switch Restrictions

POWER3 SMP High Nodes are not supported with the SP Switch-8, you must use an SP Switch, 16-port (**F/C 4011**).

Note: The POWER3 SMP High Node is not compatible with the older High Performance series of switches. If you install a POWER3 Wide Node into a switch-configured system, it must use only SP Switches.

Switch Adapters

The switch adapter for POWER3 SMP High Nodes does not occupy a PCI slot; it is installed into the Mezzanine (MX) bus. The MX bus connects the I/O planar with the system planar. Placing the switch adapter in the MX bus enables switch traffic to proceed at higher bandwidths and lower latencies.

For switch-configured systems, POWER3 SMP High Nodes require the following switch adapter:

- SP Switch MX2 Adapter (**F/C 4023**); for details, see “Switch Adapters (F/C 4020, 4022, and 4023)” on page 75.

I/O Adapters

The POWER3 SMP High Node has five PCI (Peripheral Component Interconnect) adapter slots. A full line of PCI adapters is offered for these nodes including:

- SCSI-2
- Ethernet
- Token Ring
- FDDI
- ATM
- Async
- Wide Area Network (WAN)

- SSA RAID5
- S/390 ESCON
- Serial HIPPI

For more information about these adapters, see “PCI Bus I/O Adapter Requirements for SMP Nodes” on page 109 and Chapter 17, “PCI Communication Adapters” on page 121.

Note: A 10Base2 or 10BaseT/100BaseTX Ethernet adapter for the SP Ethernet is integrated into the POWER3 High Node and does not occupy a PCI slot.

SP Expansion I/O Unit (F/C 2055)

Each SP Expansion I/O Unit is an extension of the POWER3 SMP High Node, providing eight additional PCI adapter slots and four DASD bays. Up to six expansion units can be connected to each processor node in one to three loops of one or two expansion units in each loop.

Each expansion unit (or pair of units) requires a mounting shelf (**F/C 9935**). This shelf occupies the space of one drawer in a frame. If only a single expansion unit is mounted in the shelf, a filler plate (**F/C 9936**) is required for the other side.

Expansion units can be mounted in the same frame as the node, using 2 m cables (**F/C 3126**), or in separate frames using 15 m cables (**F/C 3127**). These units require a tall, deep frame (**Model 550** or **F/C 1550**); they are not supported in the withdrawn 2.01 m frame or in the 1.25 m frame.

SP Expansion I/O Unit Placement

IBM suggests that SP Expansion I/O Units be mounted in separate frames, so as not to interfere with switch port utilization.

DASD Options

Each SP Expansion I/O Unit has four DASD bays, supporting one or two pairs of DASD.

SCSI and SSA type DASD ***cannot be mixed*** within an expansion unit.

Optional DASD pairs for expansion units are available as follows:

- 9.1 Gigabyte Ultra SCSI disk pair (**F/C 3800**) - requires adapter (**F/C 6206**)
- 18.2 Gigabyte Ultra SCSI disk pair (**F/C 3803**) - requires adapter (**F/C 6206**)
- 9.1 Gigabyte SSA disk pair (**F/C 3802**) - requires adapter (**F/C 6225**)

Note: Empty, unused DASD bay pairs require a filler plate (**F/C 9612**).

Chapter 3. POWER3 SMP Wide Node (F/C 2053)

Description

POWER3 SMP Wide Nodes (F/C 2053) have PCI bus architecture and use either one or two 200 MHz 64-bit processors per node. These nodes are functionally equivalent to an IBM RS/6000 7043-260 workstation. Your IBM RS/6000 SP system must be operating at PSSP 3.1 (or later) to use these nodes.

The POWER3 SMP Wide Node occupies one full drawer, thus eight nodes can be housed in a tall frame. POWER3 SMP Wide Nodes can be placed in the first node slot of a frame without requiring additional nodes.

For electromagnetic compliance, these nodes are housed in an SMP enclosure. This enclosure (F/C 9930) is automatically included when you order a POWER3 SMP Wide Node.

If you plan to mount a POWER3 SMP Wide Node into an older 2.01 m or 1.25 m frame, a power system upgrade is necessary. However; once you have done the power system upgrade, these nodes are fully compatible with all existing SP hardware, except for High Performance switches. For more information on power system upgrades, see “Upgrading Power Systems in Early SP Frames” on page 244.

Note: POWER3 SMP Wide Nodes are not compatible with High Performance switches (F/C 4010 and F/C 4007).

Bus Description

The POWER3 SMP Wide Node PCI bus contains two 32-bit slots and eight 64-bit PCI slots divided into three logical groups. The first slot group (slots I2 and I3) is composed of the two 32-bit slots residing on the CPU side of the POWER3 SMP Wide Node. The second and third group each contain four 64-bit PCI slots (slots I1 through I4 and slots I5 through I8) residing on the I/O side of the node. The I1 slot on the CPU side of the node is reserved for the optional SP Switch MX2 Adapter.

Requirements and Options

F/C 2053 Requirements

This feature code returns one POWER3 SMP Wide Node.

POWER3 SMP Wide Nodes occupy one full node drawer. These nodes are asymmetrically configured for memory, DASD, and adapters. Up to eight POWER3 SMP Wide Nodes may be installed in one tall frame and up to four in a short frame. Mandatory prerequisites are:

- PSSP 3.1 (or later) on the control workstation, backup nodes, and processor node.
- One processor (mounted in one slot)
- 256 MB of memory

- 4.5 GB of mirrored DASD (with internal booting)
- An upgraded power system on older frames (see “Planning for Power Requirements of SP Frames and Features” on page 239 for more information)

F/C 2053 Options

Each POWER3 SMP Wide Node is functionally equivalent to an RS/6000 7043-260 and has:

- Two processor slots allowing a maximum of two processors per node
- Two memory slots supporting up to 4 GB of memory
- Ten PCI slots (two 32-bit and eight 64-bit) for communication adapters
- A dedicated Mezzanine Bus (MX) slot for an optional switch adapter
- Integrated Ethernet with BNC and RJ45 ports
  - only one port may be used at one time
  - 10Base2 Ethernet on BNC
  - 10BaseT Ethernet or 100BaseTX Ethernet on RJ45
- Four DASD bays supporting up to 36.4 GB of mirrored disk storage
- Integrated Ultra SCSI
- Standard service processor
- External nine-pin RS-232 on the planar S2 port (supported only for HACMP serial heartbeat)
  - Node-to-node HACMP cable (**F/C 3124**)
  - Frame-to-frame HACMP cable (**F/C 3125**)

Processor Requirements and Options

SMP Wide Nodes require a minimum of one POWER3 PowerPC processor mounted on one card. However you can order an additional processor card (**F/C 4342**) to configure the node with a total of two CPUs.

Table 3. Processor Options for POWER3 SMP Wide Nodes

Feature Code	Quantity	Description	Comments
4342	1-2	One processor card with one CPU	One required

Memory Requirements and Options

POWER3 SMP Wide Nodes have two memory cards and require a minimum of 256 MB of memory. These nodes will support a maximum of 4 GB of memory. Memory is supplied by 128 MB DIMMs that must be mounted in pairs (256 MB increments). The memory cards are not required to be configured symmetrically. Each card has the capacity to mount 2 GB of DIMMs, with 4 GB addressable per node. Note that with the minimum memory installed (256 MB), the second card will contain no DIMMs. Memory cards and DIMMs are not interchangeable between SMP and non-SMP Wide Nodes. Memory cards are not interchangeable between 332 MHz and POWER3 SMP Wide Nodes.

Table 4. Memory features for POWER3 SMP Wide Nodes (F/C 2053)

Feature Code	Description	Minimum Node Requirement	Maximum Allowed Per Node
4098	Base Memory Card	2	2
4110	One Pair of 128 MB DIMMs (256 MB total)	1 pair	16 pair

Direct Access Storage Device (DASD) Requirements and Options

POWER3 SMP Wide Nodes can have up to four internal DASD attached through an integrated Ultra SCSI network. The POWER3 SMP Wide Node can have either no internal DASD (with external booting) or from 4.5 GB up to a maximum of 36.4 GB of mirrored internal disk storage.

Optional direct access storage devices are available as follows:

- 4.5 Gigabyte Ultra SCSI disk pair (**F/C 2904**)
- 9.1 Gigabyte Ultra SCSI disk pair (**F/C 2909**)
- 18.2 Gigabyte Ultra SCSI disk pair (**F/C 2918**)

Note: This node does not require special cables or adapters to mount internal Ultra DASD. However, the POWER3 SMP Wide Node has an option (**F/C 1241**) which provides an independent SCSI hookup with the following characteristics:

- Eliminates the DASD controller as a single point of failure during mirroring
- Increases disk performance
- Balances disk loading

The F/C 1241 option requires either **F/C 6206** (see "SCSI-2 Ultra/Wide SE PCI Adapter (F/C 6206)" on page 152 for details) or **F/C 6208** (see "SCSI-2 Fast/Wide SE PCI Adapter 4-A (F/C 6208)" on page 321 for details) as a PCI type SCSI adapter.

External storage devices can be accessed through optional Ultra SCSI adapter (**F/C 6207**), SCSI-2 adapter (**F/C 6209**), and SSA adapter (**F/C 6225**).

Switch and Communication Adapter Requirements and Options

Switch Adapters

The switch adapter for POWER3 SMP Wide Nodes does not occupy a PCI slot; it is installed into the Mezzanine (MX) bus. The MX bus connects the I/O planar with the system planar. Placing the switch adapter in the MX bus enables switch traffic to proceed at higher bandwidths and lower latencies.

In switch-configured systems, POWER3 SMP Wide Nodes require the following switch adapter:

- SP Switch MX2 Adapter (**F/C 4023**)

For more information on this adapter, see "Switch Adapters (F/C 4020, 4022, and 4023)" on page 75.

POWER3 SMP Wide Node Switch Restrictions: The POWER3 SMP Wide Node is not compatible with the older High Performance series of switches. If you install a POWER3 Wide Node into a switch-configured system, you must use an SP Switch or an SP Switch-8.

Switch adapters for SMP Wide Nodes are not interchangeable with either the switch adapters used on uniprocessor Wide Nodes or with the SP Switch MX adapter previously used on the 332 MHz SMP nodes.

I/O Adapters

The POWER3 SMP Wide Node has ten PCI (Peripheral Component Interconnect) adapter slots. A full line of PCI adapters is offered for these nodes including:

- SCSI-2
- Ethernet
- Token Ring
- FDDI
- ATM
- Async
- Wide Area Network (WAN)
- SSA RAID5
- S/390 ESCON
- Serial HIPPI

For more information about these adapters, see "PCI Bus I/O Adapter Requirements for SMP Nodes" on page 109 and Chapter 17, "PCI Communication Adapters" on page 121.

Note: A 100BaseTX/10BaseT/10Base2 Ethernet adapter for the SP Ethernet is integrated into the SMP Wide Node and does not use a PCI slot.

Chapter 4. POWER3 SMP Thin Node (F/C 2052)

Description

POWER3 SMP Thin Nodes (F/C 2052) have PCI bus architecture and use either one or two 200 MHz 64-bit processors per node. These nodes are functionally equivalent to an IBM RS/6000 7043-260 workstation. Your IBM RS/6000 SP system must be operating at PSSP 3.1 (or later) to use these nodes.

The POWER3 SMP Thin Node occupies one half drawer and may be installed singly with systems operating at PSSP 3.1 or later. Thus, up to sixteen nodes can be housed in a tall frame. When installed singly, POWER3 SMP Thin Nodes must be placed in the odd numbered node slot (see “Single POWER3 SMP Thin Node Configuration Rules” for details).

For electromagnetic compliance, these nodes are housed in an SMP enclosure. This enclosure (F/C 9930) is automatically included when you order a POWER3 SMP Thin Node. If you have ordered a single SMP Thin Node, a cover plate (F/C 9931) is also included with the SMP Enclosure. The cover plate fills in the enclosure's even numbered node opening.

If you plan to install a POWER3 SMP Thin Node into an older 2.01 m or 1.25 m frame, a power system upgrade is necessary. However; once you have done the power system upgrade, these nodes are fully compatible with all existing SP hardware except for High Performance switches. For more information on power system upgrades, see “Upgrading Power Systems in Early SP Frames” on page 244.

Note: POWER3 SMP Thin Nodes are not compatible with High Performance switches (F/C 4010 and F/C 4007).

Bus Description

The POWER3 SMP Thin Node PCI bus contains two 32-bit slots PCI slots (slots I2 and I3). The I1 slot is reserved for the optional SP Switch MX2 Adapter.

Single POWER3 SMP Thin Node Configuration Rules

Beginning with PSSP 3.1, single POWER3 SMP Thin Nodes and single 332 MHz SMP Thin Nodes are allowed in both tall and short frame configurations provided the following rules are observed:

- Single SMP Thin Nodes must be installed in the odd numbered node position. They are not supported in the even numbered node position.
- Empty node drawers are allowed on tall frames if the frame is either a nonswitched frame or configured with an SP Switch (16-port switch).
- Tall frames configured with the SP Switch-8 (8-port switch) must have all nodes placed in sequential order; no empty drawers are allowed. Thus, the single SMP Thin Node in these frames would be the last node in the configuration.
- Short frame configurations must have all nodes placed in sequential order; no empty drawers are allowed. Thus, the single SMP Thin Node in these frames would be the last node in the configuration.

Notes:

1. These configuration rules apply to both the model frame and any switched or nonswitched expansion frames used in your SP system.
2. A single POWER3 SMP Thin Node and a single 332 MHz SMP Thin Node each occupy one half of a node drawer.
3. Single POWER3 SMP Thin Nodes and single 332 MHz SMP Thin Nodes may be mixed in a Thin Node drawer.
4. If a frame has more than six (6) single thin nodes installed, that frame will have an uneven weight distribution. You must be careful when moving these frames.
5. Uniprocessor thin nodes must be installed in matched pairs and occupy a full node drawer.

Requirements and Options

F/C 2052 Requirements

This feature code returns one POWER3 SMP Thin Node.

POWER3 SMP Thin Nodes occupy one half node drawer. These nodes are asymmetrically configured for memory, DASD, and adapters. Up to sixteen POWER3 SMP Thin Nodes may be installed in one tall frame and up to eight in a short frame. Mandatory prerequisites are:

- PSSP 3.1 (or later) on the control workstation, backup nodes, and processor node
- One processor (mounted in one slot)
- 256 MB of memory
- 4.5 GB of mirrored DASD (with internal booting)
- An upgraded power system on older frames (see “Planning for Power Requirements of SP Frames and Features” on page 239 for more information)

F/C 2052 Options

Each POWER3 SMP Thin Node is functionally equivalent to a RS/6000 7043-260 and has:

- Two processor slots allowing a maximum of two processors per node
- Two memory slots supporting up to 4 GB of memory
- Two (32-bit) PCI slots for communication adapters
- A dedicated Mezzanine Bus (MX) slot for an optional switch adapter
- Integrated Ethernet with BNC and RJ45 ports
  - only one port may be used at one time
  - 10Base2 Ethernet on BNC
  - 10BaseT Ethernet or 100BaseTX Ethernet on RJ45
- Two DASD bays supporting up to 18.2 GB of mirrored disk storage
- Integrated Ultra SCSI

- Standard service processor
- External nine-pin RS-232 on the planar S2 port (supported only for HACMP serial heartbeat)
  - Node-to-node HACMP cable (**F/C 3124**)
  - Frame-to-frame HACMP cable (**F/C 3125**)

Processor Requirements and Options

POWER3 SMP Thin Nodes require a minimum of one POWER3 PowerPC processor mounted on one card. However you can order an additional processor card (**F/C 4342**) to configure the node with a total of two CPUs.

Table 5. Processor Options for POWER3 SMP Thin Nodes

Feature Code	Quantity	Description	Comments
4342	1-2	One processor card with one CPU	One required

Memory Requirements and Options

POWER3 SMP Thin Nodes have two memory cards and require a minimum of 256 MB of memory. These nodes will support a maximum of 4 GB of memory. Memory is supplied by 128 MB DIMMs that must be mounted in pairs (256 MB increments). The memory cards are not required to be configured symmetrically. Each card has the capacity to mount 2 GB of DIMMs, with 4 GB addressable per node. Note that with the minimum memory installed (256 MB), the second card will contain no DIMMs. Memory cards and DIMMs are not interchangeable between SMP and non-SMP Thin Nodes. Memory cards are not interchangeable between 332 MHz and POWER3 SMP Thin Nodes.

Table 6. Memory features for POWER3 SMP Thin Nodes (F/C 2052)

Feature Code	Description	Minimum Node Requirement	Maximum Allowed Per Node
4098	Base Memory Card	2	2
4110	One Pair of 128 MB DIMMs (256 MB total)	1 pair	16 pairs

Direct Access Storage Device (DASD) Requirements and Options

POWER3 SMP Thin Nodes can have up to two internal DASD attached through an integrated Ultra SCSI network.The POWER3 SMP Thin Node can have either no internal DASD (with external booting) or from 4.5 GB up to a maximum of 18.2 GB of mirrored internal disk storage.

Optional internal direct access storage devices are available as follows:

- 4.5 Gigabyte Ultra SCSI disk pair (**F/C 2904**)
- 9.1 Gigabyte Ultra SCSI disk pair (**F/C 2909**)
- 18.2 Gigabyte Ultra SCSI disk pair (**F/C 2918**)

Note: This node does not require special cables or adapters to mount internal Ultra DASD.

External storage devices can be accessed through optional Ultra SCSI adapter (**F/C 6207**), SCSI-2 adapter (**F/C 6209**), and SSA adapter (**F/C 6225**).

Switch and Communication Adapter Requirements and Options

Switch Adapters

The switch adapter for SMP Thin Nodes does not occupy a PCI slot. Instead, the switch adapter for these nodes is installed into the Mezzanine (MX) bus. The MX bus connects the I/O planar with the system planar, placing the switch adapter in the MX bus enables switch traffic to proceed at higher bandwidths and lower latencies.

In switch configured systems, POWER3 SMP Thin Nodes require the following switch adapter:

- SP Switch MX2 Adapter (**F/C 4023**)

For more information on this adapters, see Chapter 13, “SP Switches (F/C 4011 and F/C 4008)” on page 73.

POWER3 SMP Thin Node Switch Restrictions: The POWER3 SMP Thin Node is not compatible with the older High Performance series of switches.

If you install an POWER3 SMP Thin Node into an SP system configured with a switch, that switch must be either an SP switch or an SPS-8 switch.

Switch adapters for POWER3 SMP Thin Nodes are not interchangeable with either the switch adapters used on uniprocessor Thin Nodes or with the SP Switch MX adapter (F/C 4022) used previously on the 332 MHz SMP nodes.

POWER3 SMP Thin Nodes in Expansion Frames

With PSSP 3.1 and single thin nodes, the restriction on using SMP thin nodes in expansion frames has been partially removed. The following applies to single thin nodes only.

Frames with ***single*** POWER3 SMP Thin Nodes installed can be used as non-switched expansion frames. Similarly, if a frame has single thin nodes installed and has a switch with unused switch ports, it can have a non-switched expansion frame attached to the unused switch ports.

If a frame has a node drawer containing a ***pair*** of POWER3 SMP Thin Nodes, the frame cannot be used as an expansion frame and cannot have expansion frames attached.

Notes:

1. Single POWER3 SMP Thin Nodes must be placed in the odd numbered node slot
2. One or more single POWER3 SMP Thin Nodes can be installed in frames with the 16-port SP Switch

Frames with uniprocessor thin nodes or SMP thin node pairs installed require an SP Switch for expansion.

I/O Adapters

The POWER3 SMP Thin Node has two PCI (Peripheral Component Interconnect) adapter slots. A full line of PCI adapters is offered for these nodes including:

- SCSI-2
- Ethernet
- Token Ring
- FDDI
- ATM
- Async
- Wide Area Network (WAN)
- SSA RAID5
- S/390 ESCON

For more information about these adapters, see "PCI Bus I/O Adapter Requirements for SMP Nodes" on page 109 and Chapter 17, "PCI Communication Adapters" on page 121.

Note: A 100BaseTX/10BaseT/10Base2 Ethernet adapter for the SP Ethernet is integrated into the POWER3 SMP Thin Node and does not use a PCI slot.

Chapter 5. 332 MHz SMP Wide Node (F/C 2051)

Description

332 MHz SMP Wide Nodes (F/C 2051) have PCI bus architecture and use either two or four 332 MHz PowerPC processors per node. These nodes are functionally equivalent to an IBM RS/6000 7025-F50 workstation. Your IBM RS/6000 SP system must be operating at PSSP 2.4 (or later) to use these nodes.

The 332 MHz SMP Wide Node occupies one full drawer, therefore eight SMP wide nodes can be housed in a tall frame. SMP wide nodes can be placed in the first node slot of a frame without requiring additional nodes. However, ***uniprocessor*** wide nodes in the first node slot still require an additional filled node drawer in that frame.

For electromagnetic compliance, these nodes are housed in an SMP Enclosure. This enclosure (F/C 9930) is automatically included when you order a 332 MHz SMP Wide Node.

If you are going to mount a 332 MHz SMP Wide Node into an older 2.01 m or 1.25 m frame, a power system upgrade is necessary. However, once you have done the power system upgrade, these nodes are fully compatible with all existing SP hardware except for High Performance switches. For more information on power system upgrades, see “Upgrading Power Systems in Early SP Frames” on page 244.

Note: 332 MHz SMP Wide Nodes are not compatible with High Performance switches (F/C 4010 and F/C 4007).

Bus Description

The 332 MHz SMP Wide Node PCI bus is divided into three logical groups of PCI slots. The first slot group (slots I2 and I3) is composed of the two 32-bit slots residing on the CPU side of the 332 MHz SMP Wide Node while the second and third group reside on the I/O side of the node. Both the second and third group have four PCI slots each. The second group (slots I1 through I4) has three 64-bit slots and a single 32-bit slot. The third group (slots I5 through I8) is made up of the last four 32-bit slots on the I/O side of the node. The third group is a physical extension on the second group. The I1 slot on the CPU side of the node is reserved for the optional SP Switch MX Adapter.

Requirements and Options

F/C 2051 Requirements

This feature code returns one 332 MHz SMP Wide Node.

332 MHz SMP Wide Nodes occupy one full node drawer. These nodes are asymmetrically configured for memory, DASD, and adapters. Up to eight 332 MHz SMP Wide Nodes may be installed in one tall frame and up to four in a short frame. Mandatory prerequisites are:

- PSSP 2.4 (or later) on the control workstation, backup nodes, and processor node
- Two processors (mounted in one slot)
- 256 MB of memory
- 4.5 GB of DASD (with internal booting)
- An upgraded power system on older frames (see “Planning for Power Requirements of SP Frames and Features” on page 239 for more information)

F/C 2051 Options

Each 332 MHz SMP Wide Node is functionally equivalent to an RS/6000 7025-F50 and has:

- Two processor slots allowing a maximum of four processors per node
- Two memory slots supporting up to 3 GB of memory
- Ten PCI slots for communication adapters
- A dedicated Mezzanine Bus (MX) slot for an optional switch adapter
- Integrated 10BaseT/10Base2 Ethernet (only one port may be used at one time)
- Four DASD bays supporting up to 36.4 GB of disk storage
- Integrated SCSI-2 Fast/Wide
- Standard service processor
- External nine-pin RS-232 on the planar S2 port (supported only for HACMP serial heartbeat)
  - Node-to-node HACMP cable (**F/C 3124**)
  - Frame-to-frame HACMP cable (**F/C 3125**)

Processor Requirements and Options

SMP wide nodes require a minimum of two 332 MHz PowerPC processors mounted on one card. However you can order an additional processor card (**F/C 4320**) to configure the node with a total of four CPUs.

Table 7. Processor Options for 332 MHz SMP Nodes

Feature Code	Quantity	Description	Comments
4320	1-2	One processor card with two CPUs	One required

Memory Requirements and Options

332 MHz SMP Wide Nodes have two memory cards and require a minimum of 256 MB of memory. These nodes will support a maximum of 3 GB of memory. Memory is supplied by 128 MB DIMMs that must be mounted in pairs (256 MB increments). The memory cards are not required to be configured symmetrically. Each card has the capacity to mount 2 GBs of DIMMs, however, only 3 GBs are addressable per node. Memory cards and DIMMs are not interchangeable between SMP and non-SMP wide nodes.

Table 8. Memory features for 332 MHz SMP Wide Nodes (F/C 2051)			
Feature Code	**Description**	**Minimum Node Requirement**	**Maximum Allowed Per Node**
4093	Base Memory Card	2	2
4110	One Pair of 128 MB DIMMs (256 MB total)	1 pair	12 pair

Direct Access Storage Device (DASD) Requirements and Options

332 MHz SMP Wide Nodes can have up to four internal DASD attached through an integrated SCSI-2 network. The 332 MHz SMP Wide Node can have either no internal DASD (with external booting) or from 4.5 GB up to a maximum of 36.4 GB of internal disk storage.

Optional direct access storage devices are available as follows:

- 4.5 GB Ultra SCSI disk drive (**F/C 2900**)
- 4.5 GB Ultra SCSI disk drive pair (**F/C 2904**)
- 9.1 GB Ultra SCSI disk drive (**F/C 2908**)
- 9.1 GB Ultra SCSI disk drive pair (**F/C 2909**)
- 18.2 GB Ultra SCSI disk drive pair (**F/C 2918**)

Note: This node does not require special cables or adapters to mount internal DASD. However; the 332 MHz SMP Wide Node has an option (**F/C 1241**) which provides an independent SCSI hookup that accomplishes the following:

- Eliminates the DASD controller as a single point of failure during mirroring.
- Increases disk performance.
- Balances disk loading.

The F/C 1241 option requires either **F/C 6206** (see "SCSI-2 Ultra/Wide SE PCI Adapter (F/C 6206)" on page 152 for details) or **F/C 6208** (see "SCSI-2 Fast/Wide SE PCI Adapter 4-A (F/C 6208)" on page 321 for details) as a PCI type SCSI adapter.

] External storage devices can be accessed through optional Ultra SCSI adapter (**F/C**
] **6207**), SCSI-2 adapter (**F/C 6209**), and SSA adapter (**F/C 6225**).

Switch and Communication Adapter Requirements and Options

Switch Adapters

The switch adapter for SMP wide nodes does not occupy a PCI slot. Instead, the switch adapter for these nodes is installed into the Mezzanine (MX) bus. The MX bus connects the I/O planar with the system planar, placing the switch adapter in the MX bus enables switch traffic to proceed at higher bandwidths and lower latencies.

In switch configured systems, 332 MHz SMP Wide Nodes require the following switch adapter:

- SP Switch MX Adapter (**F/C 4022**)

For more information on this adapter, see Chapter 13, “SP Switches (F/C 4011 and F/C 4008)” on page 73.

332 MHz SMP Wide Node Switch Restrictions: The 332 MHz SMP Wide Node is not compatible with the older High Performance series of switches.

If an SMP wide node is going to be placed into an SP system configured with a switch, that switch must be either an SP Switch or an SP Switch-8.

Switch adapters for SMP wide nodes are not interchangeable with switch adapters used on uniprocessor wide nodes.

I/O Adapters

The 332 MHz SMP Wide Node has ten PCI (Peripheral Component Interconnect) adapter slots. A full line of PCI adapters is offered for these nodes including:

- SCSI-2
- Ethernet
- Token Ring
- FDDI
- ATM
- Async
- Wide Area Network (WAN)
- SSA RAID5
- S/390 ESCON
- Serial HIPPI

For more information about these adapters, see “PCI Bus I/O Adapter Requirements for SMP Nodes” on page 109 and Chapter 17, “PCI Communication Adapters” on page 121.

Note: A 10BaseT/10Base2 Ethernet adapter for the SP Ethernet is integrated into the SMP wide node and does not use a PCI slot.

Chapter 6. 332 MHz SMP Thin Node (F/C 2050)

Description

332 MHz SMP Thin Nodes (F/C 2050) have PCI bus architecture and use either two or four 332 MHz PowerPC processors per node. These nodes are functionally equivalent to an IBM RS/6000 7025-F50 workstation. Your IBM RS/6000 SP system must be operating at PSSP 2.4 (or later) to use these nodes.

The 332 MHz SMP Thin Node occupies one half drawer and may be installed singly with systems operating at PSSP 3.1 or later. Therefore, up to sixteen SMP thin nodes can be housed in a tall frame. When installed singly, 332 MHz SMP Thin Nodes must be placed in the odd numbered node slot (see “Single SMP Thin Node Configuration Rules” for details). Uniprocessor Thin Nodes are still required to be installed in matched pairs which fill the node drawer.

For electromagnetic compliance, these nodes are housed in an SMP Enclosure. This enclosure (F/C 9930) is automatically included when you order a 332 MHz SMP Thin Node. For installations using single SMP thin nodes, a cover plate (F/C 9931) is also included to cover the unused enclosure slot.

If you are going to mount a 332 MHz SMP Thin Node into an older 2.01 m or 1.25 m frame, a power system upgrade is necessary. However, once you have done the power system upgrade, these nodes are fully compatible with all existing SP system hardware except for High Performance switches. For more information on power system upgrades, see “Upgrading Power Systems in Early SP Frames” on page 244.

Note: 332 MHz SMP Thin Nodes are not compatible with High Performance switches (F/C 4010 and F/C 4007).

Bus Description

The 332 MHz SMP Thin Node PCI bus contains two 32-bit slots PCI slots (slots I2 and I3). The I1 slot is reserved for the optional SP Switch MX Adapter.

Single SMP Thin Node Configuration Rules

With PSSP 3.1, single POWER3 SMP Thin Nodes and single 332 MHz. SMP thin nodes are allowed in both tall and short frame configurations provided the following rules are observed:

- Single SMP thin nodes must be installed in the odd numbered node position.
  - Single SMP thin nodes are not supported in the even numbered node position.
- Empty node drawers are allowed on tall frames if the frame is either a nonswitched frame or configured with an SP Switch (16-port switch).
- Tall frames configured with the SP Switch-8 (8-port switch) must have all nodes placed in sequential order, no empty drawers are allowed. Therefore, the single SMP thin node in these frames would be the last node in the configuration.

- Short frame configurations must have all nodes placed in sequential order, no empty drawers are allowed. Therefore, the single SMP thin node in these frames would be the last node in the configuration.

Notes:

1. These configuration rules apply to both the model frame and any switched or nonswitched expansion frames used in your SP system.
2. A single POWER3 SMP Thin Node and a single 332 MHz SMP Thin Node each occupy one half of a node drawer.
3. Single POWER3 SMP Thin Nodes and single 332 MHz SMP Thin Nodes may be mixed in a thin node drawer.
4. If a frame has more than six (6) single SMP thin nodes installed, that frame will have an uneven weight distribution. You must be careful when moving these frames.
5. Uniprocessor Thin Nodes must still be installed in matched pairs and occupy a full node drawer.

Requirements and Options

F/C 2050 Requirements

This feature code returns one 332 MHz SMP Thin Node.

332 MHz SMP Thin Nodes occupy one half of a node drawer. When two SMP thin nodes are placed in one drawer, the nodes may be asymmetrically configured for memory, DASD, processor speed, and adapters. Up to sixteen 332 MHz SMP Thin Nodes may be installed in one tall frame and up to eight in a short frame. Mandatory prerequisites are:

- PSSP 2.4 (or later) on the control workstation, backup nodes, and processor node
- Two processors (mounted in one slot)
- 256 MB of memory
- 4.5 GB of DASD (with internal booting)
- An upgraded power system on older frames (see “Planning for Power Requirements of SP Frames and Features” on page 239 for more information)

F/C 2050 Options

Each 332 MHz SMP Thin Node is functionally equivalent to a RS/6000 7025-F50 and has:

- Two processor slots allowing a maximum of four processors per node
- Two memory slots supporting up to 3 GB of memory
- Two DASD bays supporting up to 18.2 GB of storage
- A dedicated Mezzanine Bus (MX) slot for an optional switch adapter
- Two PCI slots for communication adapters
- Integrated 10BaseT/10Base2 Ethernet (only one port may be used at one time)

- Integrated SCSI-2 Fast/Wide
- Standard service processor
- External nine-pin RS-232 on the planar S2 port (supported only for HACMP serial heartbeat)
  - Node-to-node HACMP cable (**F/C 3124**)
  - Frame-to-frame HACMP cable (**F/C 3125**)

Processor Requirements and Options

SMP thin nodes require a minimum of two 332 MHz PowerPC processors mounted on one card. However, you can order an additional processor card (**F/C 4320**) to configure the node with a total of four CPUs.

Table 9. Processor Options for 332 MHz SMP Nodes

Feature Code	Quantity	Description	Comments
4320	1-2	One processor card with two CPUs	One required

Memory Requirements and Options

332 MHz SMP Thin Nodes have two memory cards and require a minimum of 256 MB of memory. These nodes will support a maximum of 3 GB of memory. Memory is supplied by 128 MB DIMMs that must be mounted in pairs (256 MB increments). The memory cards are not required to be configured symmetrically. Each card has the capacity to mount 2 GB of DIMMs, however, only 3 GB are addressable per node. Memory cards and DIMMs are not interchangeable between SMP and non-SMP thin nodes.

Table 10. Memory features for 332 MHz SMP Thin Nodes (F/C 2050)

Feature Code	Description	Minimum Node Requirement	Maximum Allowed Per Node
4093	Base Memory Card	2	2
4110	One Pair of 128 MB DIMMs (256 MB total)	1 pair	6 pair

Direct Access Storage Device (DASD) Requirements and Options

332 MHz SMP Thin Nodes can have up to two internal DASD attached through an integrated SCSI-2 network. The 332 MHz SMP Thin Node can have either no internal DASD (with external booting) or from 4.5 GB up to a maximum of 18.2 GB of internal disk storage.

Optional direct access storage devices are available as follows:

- 4.5 GB Ultra SCSI disk drive (**F/C 2900**)
- 4.5 GB Ultra SCSI disk drive pair (**F/C 2904**)
- 9.1 GB Ultra SCSI disk drive (**F/C 2908**)
- 9.1 GB Ultra SCSI disk drive pair (**F/C 2909**)

- 18.2 GB Ultra SCSI disk drive pair (**F/C 2918**)

Note: This node does not require special cables or adapters to mount internal DASD.

External storage devices can be accessed through optional Ultra SCSI adapter (**F/C 6207**), SCSI-2 adapter (**F/C 6209**), and SSA adapter (**F/C 6225**).

Switch and Communication Adapter Requirements and Options

Switch Adapters

The switch adapter for SMP thin nodes does not occupy a PCI slot. Instead, the switch adapter for these nodes is installed into the Mezzanine (MX) bus. The MX bus connects the I/O planar with the system planar, placing the switch adapter in the MX bus enables switch traffic to proceed at higher bandwidths and lower latencies.

In switch configured systems, 332 MHz SMP Thin Nodes require the following switch adapter:

- SP Switch MX Adapter (**F/C 4022**)

For more information on this adapter, see Chapter 13, “SP Switches (F/C 4011 and F/C 4008)” on page 73.

332 MHz SMP Thin Node Switch Restrictions: The 332 MHz SMP Thin Node is not compatible with the older High Performance series of switches.

If an SMP thin node is going to be placed into an SP system configured with a switch, that switch must be either an SP switch or an SPS-8 switch.

Switch adapters for SMP thin nodes are not interchangeable with switch adapters used on uniprocessor thin nodes.

SMP Thin Nodes in Expansion Frames

With PSSP 3.1 and single SMP thin nodes, the restriction on using SMP thin nodes in expansion frames has been partially removed. The following applies only to single SMP thin nodes .

Frames with ***single*** SMP thin nodes installed can be used as nonswitched expansion frames. Similarly if a frame has single SMP thin nodes installed and a switch with unused switch ports, it can have a nonswitched expansion frame attached to the unused switch ports.

However, if a frame has a node drawer containing a ***pair*** of SMP thin nodes, the frame cannot be used as an expansion frame and cannot have expansion frames attached.

Notes:

1. Single SMP thin nodes must be placed in the odd numbered node slot
2. One or more single SMP thin nodes may be installed in frames with the 16-port SP Switch

Frames with uniprocessor thin nodes or SMP thin node pairs installed still require an SP switch for expansion.

I/O Adapters

The 332 MHz SMP Thin Node has two PCI (Peripheral Component Interconnect) adapter slots. A full line of PCI adapters is offered for these nodes including:

- SCSI-2
- Ethernet
- Token Ring
- FDDI
- ATM
- Async
- Wide Area Network (WAN)
- SSA RAID5
- S/390 ESCON

For more information about these adapters, see “PCI Bus I/O Adapter Requirements for SMP Nodes” on page 109 and Chapter 17, “PCI Communication Adapters” on page 121.

Note: A 10BaseT/10Base2 Ethernet adapter for the SP Ethernet is integrated into the SMP thin node and does not use a PCI slot.

Chapter 7. 160 MHz Uniprocessor Thin Node (F/C 2022)

Note: 160 MHz Uniprocessor Thin Nodes are withdrawn from marketing as of 12/31/99.

Description

160 MHz uniprocessor thin nodes (F/C 2022) have MCA bus subsystems and contain one IBM RS/6000 160 MHz POWER2 processor per node. 160 MHz uniprocessor thin nodes are functionally equivalent to an IBM RS/6000 7012-397. Your IBM RS/6000 SP system must be operating at PSSP 2.2 (or later) to use these nodes.

Uniprocessor thin nodes are half the width of a wide node and must be installed in ***pairs***. The node pair must be installed in the two slots of a single drawer, and both nodes must have identical configurations. Sixteen uniprocessor thin nodes can be packaged in a tall frame.

Note: Single uniprocessor thin nodes are not supported with PSSP.

Requirements and Options

F/C 2022 Requirements

This feature code returns two 160 MHz uniprocessor thin nodes.

These two nodes require one full drawer (combined). Both nodes in the drawer must be symmetrically configured for memory, DASD, processor speed and adapters. Mandatory prerequisites are:

- PSSP 2.2 or later (consult IBM for possible PTF requirements)
- 64 MB of memory
- 4.5 GB of DASD

F/C 2022 Options

Each 160 MHz uniprocessor thin node is functionally equivalent to a RS/6000 7012-397 and has:

- Four memory slots supporting up to 1 GB of memory
- Two DASD bays supporting up to 18.2 GB of storage
- An optional switch adapter occupying one MCA slot
- Four MCA slots for communication adapters
- Integrated 10BaseT/10Base2 Ethernet (only one port may be used at one time)

Processor Requirements and Options

This uniprocessor thin node has a single 160 MHz Power2 processor. No CPU options exist for this node.

Memory Requirements and Options

160 MHz uniprocessor thin nodes have four memory card slots and can be equipped with the feature codes listed in Table 11. These memory options are configured with type S6.0 memory. Memory cards in these nodes must be symmetrical in size and installed using either a two or four card configuration. The 160 MHz thin node requires a minimum memory size of 64 MB (two 32 MB cards) and has a maximum limit of 1 GB (four 256 MB cards).

Note: For optimal performance, use four card memory configurations (128 MB minimum memory option).

Table 11. Optional Memory Features for Thin Processor Nodes (F/C 2022)

Feature Code	Description	Order Type
4086	32 MB card	Factory or Field
4087	64 MB card	Factory or Field
4088	128 MB card	Factory or Field
4089	256 MB card	Factory or Field

Memory Card Restrictions

Memory cards are not interchangeable between 160 MHz thin nodes and the withdrawn 120 MHz thin nodes.

Memory cards and DIMMs are not interchangeable between SMP and uniprocessor thin nodes.

If you are upgrading older thin nodes to 160 MHz, the memory modules must be replaced with type S6.0 memory.

Direct Access Storage Device (DASD) Requirements and Options

160 MHz thin nodes can have up to two internal SCSI disks attached through an integrated SCSI-2 network. These nodes require a minimum of 4.5 GB of DASD and have a maximum of 18.2 GB of internal disk storage. Also, external storage devices can be accessed through optional SCSI-2 adapters (F/C 2412, F/C 2415, or F/C 2416).

Optional direct access storage devices are available as follows:

F/C 2900 4.5 GB Ultra SCSI disk drive
F/C 2908 9.1 GB Ultra SCSI disk drive

120 MHz thin node upgrades: Withdrawn 120 MHz thin nodes might have 2.2 GB of DASD. If you upgrade a 120 MHz thin node to 160 MHz performance, you can reuse the DASD from the 120 MHz configuration.

Switch and Communication Adapter Requirements and Options

Switch Adapters

In switch configured systems, 160 MHz uniprocessor thin nodes require one of the following switch adapters depending on the type of switch in use:

- SP Switch Adapter (F/C 4020)
  - For more information on this adapter, see Chapter 13, “SP Switches (F/C 4011 and F/C 4008)” on page 73.
- High Performance Switch Adapter (F/C 4018)
  - For more information on this adapter, see “High Performance Switches (F/C 4010 and F/C 4007)” on page 306.

High Performance Switch Alert

The High Performance series of switches (F/C 4010 and F/C 4008) are withdrawn from production.

High Performance Switches are not compatible with:

- SP Switches
- SP Switch Routers
- 332 MHz SMP nodes
- POWER3 SMP nodes
- PSSP 3.1
- SP-attached servers

If you are upgrading your system to include any of these items, you must replace the High Performance Switches with SP Switches.

Uniprocessor Thin Node Switch Restrictions: Switch adapters for uniprocessor thin nodes are not interchangeable with switch adapters used on SMP thin nodes.

Uniprocessor Thin Node Alert

Frames which have uniprocessor thin nodes cannot be used as nonswitched expansion frames. Similarly if a frame has uniprocessor thin nodes and a switch with unused switch ports, it cannot have a nonswitched expansion frame attached to the unused switch ports. Frames having uniprocessor thin nodes installed require an SP switch for expansion.

Communication Adapters

The 160 MHz uniprocessor thin node has four Micro Channel adapter (MCA) slots. If your SP system will be configured to use an SP switch, one of the MCA slots will be occupied by the required SP switch adapter card.

A full line of MCA adapters is offered for these nodes including:

- SCSI-2
- Ethernet

- Token Ring
- FDDI
- HIPPI
- ATM
- WAN Concentrator
- SSA RAID5

For more information about these adapters, see “MCA Bus Adapter Requirements for Wide, Thin and High Nodes” on page 118 and Chapter 18, “MCA Communication Adapters” on page 161.

Note: A 10BaseT/10Base2 Ethernet adapter for the SP Ethernet is integrated into the uniprocessor thin node and does not use a MCA slot.

Chapter 8. SP-Attached Servers (RS/6000 M/T 7017-S70, S7A, and S80)

The SP-Attached Server is an IBM RS/6000 7017 Enterprise Server that is configured to operate with an RS/6000 SP System. This configuration requires the following:

1. Use of an SP-supported Ethernet card for connection to the SP LAN.
2. A custom RS-232 cable, connecting the SP system control workstation to the 7017 SAMI port.
3. A second custom RS-232 cable, connecting the SP system control workstation to the 7017 S1 serial port.
4. For switch-configured systems; the 7017 must have an optional RS/6000 SP System Attachment adapter (**RS/6000 F/C 8396**) installed. This adapter uses an SP Switch cable to connect to a valid switch port on an SP Switch.

With this configuration, the SP-Attached Server enhances the performance of the SP system and provides the scalability needed for e-business applications.

This chapter is divided into the following three sections:

1. "RS/6000 SP-Attached Server (F/C 9122 plus F/C 9123) Overview" describes the Enterprise Server and its system attachment.
2. "RS/6000 SP-Attached Server Installation Requirements" on page 43 describes system and component requirements.
3. "Planning for the RS/6000 SP-Attached Server Network Interface" on page 49 describes the physical connections needed for server attachment.

RS/6000 SP-Attached Server (F/C 9122 plus F/C 9123) Overview

The 7017-S70 Enterprise Server, the 7017-S7A, and the 7017-S80 use RS/6000 feature codes, not RS/6000 SP feature codes. Your IBM sales representative can furnish any feature codes you need to order the options listed in this overview.

The ***RS/6000 SP*** feature codes associated with the SP-Attached Server (**F/C 9122** plus **F/C 9123**) refer to the ***system connections*** that attach the RS/6000 Enterprise Server to your RS/6000 SP system, they do not refer to hardware components. Because the Enterprise Servers are stand-alone devices with cable attachments to the SP system, they have some attributes that appear node-like and others that appear frame-like to the SP system .

F/C 9122 Refers to the node-like attachment between the SP-Attached Server and your SP system

F/C 9123 Refers to the frame-like attachment between the SP-Attached Server and your SP system

The 7017-S70, S7A, and S80 servers appear nearly identical to your SP system and they all use F/C 9122 plus F/C 9123 to attach to the SP system. Your IBM sales representative can help you decide which 7017 Enterprise Server best matches your e-business needs.

System Highlights

The 7017-S70, S7A, and S80 Enterprise Servers have the following system characteristics:

- 64-bit symmetric multiprocessing (SMP)
- Systems configurations with 4, 8, or 12-way PowerPC processors
- Support for concurrent 32- and 64-bit applications
- Reliability from redundant fans; hot-swappable disk drives, power supplies, and fans; and a built-in service processor
- Up to 8 MB ECC L2 cache per processor
- Up to 16 GB of system memory for the S70, up to 32 GB S70 Advanced, and up to 64 GB for the S80
- Up to 56 PCI slots per system
- AIX operating system

Note: Service processors continuously monitor system operations and continue to operate even if the main system is down. Service processors can also be programmed to report potential malfunctions before they occur.

7017 Enterprise Server Description

The 7017 Enterprise Servers excel in online transaction processing (OLTP), Enterprise Resource Planning (ERP), server consolidation, Supply Chain Management, and large database server applications. These servers run both 32- and 64-bit applications concurrently. Most existing 32-bit applications run unaltered due to the binary compatibility of AIX.

7017 Enterprise Servers are packaged in two side-by-side units. The first unit is the Central Electronics Complex (CEC) and the second unit is a standard 19-inch I/O tower. Up to three more I/O towers can be added to a system.

The Central Electronics Complex contains the following:

- 64-bit 125 MHz RS64 I processors (S70 Server), 262 MHz RS64 II (S70 Advanced Server), or 450 MHz RS64 III (S80)
- A high-speed multi-path switch
- A memory controller and system memory
- Two high-speed memory ports with a total collective memory bandwidth of up to 5.6 GB per second
- Standard 512 MB ECC SDRAM memory expands to 16 GB (S70 Server), 32 GB (S70 Advanced Server), or 64 GB (S80)
- A base configuration consisting of a 4-way SMP processor card
- Optional 4-way processor cards that scale your configuration to 8-way or 12-way SMP processing

  Note: The S80 has 6-way cards and scales up to 24-way.
- 4 MB ECC L2 cache memory per 125 MHz processor, 8 MB per 262 MHz and 450 MHz processor

Each I/O tower accommodates up to two I/O drawers (a maximum of four drawers per system) with additional space for storage and communications subsystems.

The base I/O drawer contains the following:

- A high-performance 4.5GB UltraSCSI disk drive
- A 20X (Max) CD-ROM
- A 1.44 MB 3.5-inch diskette drive
- A service processor
- Eleven available PCI slots
- Two available media bays
- Eleven available hot-swappable disk drive bays

Each additional I/O drawer contains the following:

- Fourteen available PCI slots (nine 32-bit and five 64-bit) providing an aggregate data throughput of 500 MB per second to the I/O hub
- Three available media bays
- Twelve available hot-swappable disk drive bays

When all four I/O drawers are installed, the 7017 contains twelve media bays, forty-eight hot-swappable disk drive bays, and fifty-six PCI slots per system.

How the SP System Views the SP-Attached Server

With a few hardware control exceptions, the SP-Attached Server performs the same functions that standard SP processor nodes perform. However, since the SP-Attached Server is mounted in its own frame and not in an SP frame, the SP system cannot view the SP-Attached Server as just another node. Instead, the SP system views the SP-Attached Server as an object with both frame and node characteristics. The node-like features of the SP-Attached Server are driven by F/C 9122 while the frame-like features of this device are driven by F/C 9123.

Because the SP-Attached Server has both frame and node characteristics, it must have both a frame number and a node number. However, since the SP-Attached Server does not have full SP frame characteristics, it cannot be considered as a standard SP expansion frame. Thus, when you assign the frame number to the SP-Attached Server, you must observe two rules as follows:

1. The SP-Attached Server cannot be the first frame in the SP system.
2. The SP-Attached Server cannot be inserted between a switch configured frame and any non-switched expansion frame using that switch.

   As an example, consider that frames one and five of an SP system are switch configured. Frame two is a non-switched expansion frame attached to frame one. Frame six, seven, and eight are non-switched expansion frames attached to frame five.

   In this configuration, an SP-Attached Server could be given frame number three, but that would forbid any future attachment of non-switched expansion frames to the switch in frame one.

If you assigned the SP-Attached Server frame number nine, your system could still be scaled using other switch configured frames and non-switched expansion frames.

The SP-Attached Server can be inserted between two switch-configured frames.

Note: Once the frame number has been assigned, the node number of the server (which is based on the frame number) is automatically generated. The following system defaults are used:

a. The SP-Attached Server is viewed by the system as a single frame containing a single node.

b. The system places the node-like features of the server in the slot one position.

c. Each SP-Attached Server installed in an SP system subtracts one node from the total node count allowed in the system; however, because the SP-Attached Server has frame-like features, it reserves sixteen node numbers that are used in determining the node number of nodes placed after the attached server.

Server Attachment Limits

When you attach a 7017 Enterprise Server to an SP system, certain limitations apply as follows:

1. The first frame in the SP system must be an SP frame containing at least one node.
2. You can attach up to sixteen 7017 Enterprise Servers onto an RS/6000 SP system.
3. Each SP-Attached Server requires one valid, unused node slot in the SP system for switch port assignment.

   An assigned switch port is required in both switch-configured and switchless SP systems. For information on configuring the SP-Attached Servers, see “Assigning a Frame Number” on page 48 and “Assigning a Switch Port Number” on page 48.
4. In some cases, the number of SP-Attached Servers you plan to install can exceed the number of available node slots in an SP frame. In this case, you can take advantage of any valid, unused node slots (and the associated switch ports) that exist in other SP frames in your system.

   As an example, consider a two-frame SP system. The first SP frame contains ten thin nodes and an SP Switch. The second SP frame contains five single SMP thin nodes and another SP Switch. You want to attach eight 7017 Enterprise Servers.

   In this example, you can attach six of the Enterprise Servers to the first frame and two Enterprise Servers to the second SP frame. As an alternative, all eight SP-Attached Servers can be connected to the second SP frame.
5. In some cases, the number of SP-Attached Servers you plan to install can exceed the number of available node slots in your SP system. In this case, you need to add an additional SP frame to your SP system.

   Only the first SP frame is required to have nodes, additional SP frames can be empty.

6. Each SP-Attached Server counts as one node that must be subtracted from the total node count of 128 allowed in an SP system.
7. Each SP-Attached Server also counts as one frame that must be subtracted from the total frame count allowed in an SP system.

RS/6000 SP-Attached Server Installation Requirements

There are several requirements for hardware and software that must be met before you can place the SP-Attached Server into service with your SP system. These requirements are in the following categories:

- System requirements
- Physical requirements
- Switch adapter requirements
- Network media card requirements
- Software requirements

SP-Attached Server SP System Requirements

The following requirements must be met before you can place the SP-Attached Server into service:

1. Your SP system must be operating with a minimum of PSSP 3.1 and AIX 4.3.2.

   Each SP-Attached Server also requires its own PSSP license. See “SP-Attached Server Software Requirements” on page 47 for details and system configuration requirements.
2. Your SP system must be a tall frame system. (Short frames are not compatible with the SP-Attached Server.)
3. The SP-Attached Server must not be the first frame in an SP system.
4. The system can be switched or non-switched.
5. If your SP system is switched, it must use 16-port SP Switches (F/C 4011). (The SP Switch-8 is not compatible with the SP-Attached Server.)

   A special switch adapter must be installed. For details, see “SP-Attached Server Switch Adapter Requirements” on page 45.
6. Three control workstation connections are required as follows:
   a. The SP-LAN connection from the control workstation must use an SP supported Ethernet card mounted in the SP-Attached Server.
   b. A custom RS-232 cable must connect the SP system control workstation to the SP-Attached Server SAMI port.
   c. A second custom RS-232 cable must connect the SP system control workstation to the SP-Attached Server S1 serial port.

   For information on these connections see “Connecting the SP-Attached Server to the Control Workstation” on page 50.
7. To ensure that the entire SP system is at the same electrical potential, the frame-to-frame ground cables provided with your SP system must be connected between the SP system and the SP-Attached Server.

8. Some cables used with your SP-Attached Server have limited lengths. You must keep those lengths, and any required cable drops, in mind when locating your SP-Attached Server in relation to other SP system equipment.

SP-Attached Server Physical Requirements

Physical Dimensions and Weight of the SP-Attached Server

The SP-Attached Server has two modules:

1. The Central Electronics Complex (CEC)
2. The I/O Towers

The CEC contains processors and system memory. I/O towers contain DASD and I/O planars. Each SP-Attached Server consists of one CEC unit and at least one I/O tower. The first I/O tower has ports used to connect the control workstation and up to three additional I/O towers. Table 12 and Table 13 provide information on the physical dimensions and weights of these SP-Attached Server modules.

Table 12. Physical Dimensions of SP-Attached Server

Specification	Central Electronics Complex	I/O Towers
Width	567 mm (22.3 in.)	648 mm (25.5 in.)
Depth	1041 mm (41 in.)	1019 mm (40.1 in.)
Height	1575 mm (62 in.)	1575 mm (62 in.)

Table 13. Weight Specification of SP-Attached Server

Specification	Central Electronics Complex	I/O Towers	I/O Drawer (max. four per tower)
Weight	400 kg (880 lbs.) fully loaded	130 kg (286 lbs.) basic tower	61 kg (135 lbs.) max. wt.

Power Requirements for SP-Attached Servers

If you use the SP-Attached Server as an integral part of your SP system, you must plan for the power requirements of each unit. Table 14 on page 45 provides information on the basic power requirements of the two SP-Attached Server modules.

<table>
<caption>Table 14. Power Specification of SP-Attached Server</caption>
<tr><th>Specification</th><th>Central Electronics Complex</th><th>I/O Towers</th><th>I/O Drawer
(max. four per tower)</th></tr>
<tr><td>Electrical Load</td><td>1887 VA</td><td rowspan="7">Power requirements for each I/O tower are based on the number of I/O drawers installed.</td><td>based on configuration</td></tr>
<tr><td>Voltage Requirement</td><td>200-240 V ac
(50-60 Hz)</td><td>200-240 V ac
(50-60 Hz)</td></tr>
<tr><td>Power Requirement</td><td>1698 W (max.)</td><td>360 W (typ.)
900 W (max.)
(per drawer)</td></tr>
<tr><td>Thermal Load</td><td>5796 BTU/Hr</td><td>1228 BTU/Hr (typ.)
3071 BTU/Hr (max.)
(per drawer)</td></tr>
<tr><td>Power Factor</td><td>0.9</td><td>0.9</td></tr>
<tr><td>Phase Connection</td><td rowspan="2">Depends on local requirements</td><td rowspan="2">Depends on local requirements</td></tr>
<tr><td>Line Cord Termination</td></tr>
<tr><td colspan="4">Note: For complete RS/6000 Machine Type 7017 power planning information, you must refer to: Site and Hardware Planning Information, SA38-0508.</td></tr>
</table>

SP-Attached Server Environmental Specifications

The SP-Attached Server has the following specifications which you need to plan the operating environment:

Maximum Altitude: 2133 m (7000 ft.)

Operating Temperature: 10 to 37.8° C (50 to 100° F)

Non-operating Temperature: 1.0 to 60.0° C (34 to 140° F)

Non-condensing Humidity: 8 to 80%

Wet Bulb Temperature: 23° C (73° F)

Noise Emissions: 7.0 BELs (operating and non-op., LWAD Cat 3C)

SP-Attached Server Switch Adapter Requirements

RS/6000 SP System Attachment Adapter (RS/6000 F/C 8396)

If you install an SP-Attached Server into a system which uses SP Switches, you must install an SP Switch adapter in the SP-Attached Server. However, unlike the SP Switch Router, which can have several router-specific switch adapters installed, the SP-Attached Server must have only one server-specific switch adapter installed for each server system. The adapter you use to connect the SP-Attached Server to the SP Switch is called the RS/6000 SP System Attachment adapter (**RS/6000 F/C 8396**). Because the RS/6000 SP System Attachment adapter is not an SP system adapter, you must order it using an RS/6000 feature code.

The single RS/6000 SP System Attachment adapter you place into each SP-Attached Server requires the following:

1. One valid, unused switch port on the SP Switch; corresponding to a legitimate node slot in your SP configuration.

   A legitimate node slot can be empty, the second half of a wide node, or one of the last three positions of a high node; provided that node slot satisfies the other rules for configuring nodes in an SP system.

   For example, if you have a frame with 16 thin nodes installed, you must not attach an RS/6000 SP System Attachment adapter to that frame until you remove a node and delete its configuration from the system image.

2. One media card slot (slot 10) in the primary (first) I/O tower of SP-Attached Server.

   For other limitations, see "RS/6000 SP System Attachment Adapter Placement Restrictions."

RS/6000 SP System Attachment Adapter Placement Restrictions

The RS/6000 SP System Attachment adapter has the following placement restrictions:

1. The RS/6000 SP System Attachment adapter must be installed in slot 10 of the SP-Attached Server I/O tower.
2. Slot 9 must be left open to ensure the adapter has sufficient bandwidth.
3. Slot 11 must be left open to provide clearance for the switch adapter heat sinks.

Installing an RS/6000 SP System Attachment adapter in existing 7017 Enterprise Servers: If you attach an existing 7017 Enterprise Server to an SP System, you might find a SCSI adapter installed in slot 9 of the server. This SCSI adapter must be relocated. However, the SCSI adapter in slot 9 is typically connected to a boot device and requires special attention ***before*** it is removed.

Boot Device SCSI Adapter Relocation Overview

1. Boot-up the Enterprise Server you are attaching to the SP system.
2. Follow standard AIX procedures to change the boot device:
   a. Change device codes
   b. Change device address
3. Take the Enterprise Server down.
4. Move SCSI card from slot 9 to the new location (remember, slots 9 and 11 must be left open and the SP System Attachment adapter must be placed in slot 10).
   - Place SCSI adapter F/C 6206 and F/C 6208 either in slot 12 or slot 14
   - Place SCSI adapter F/C 6207 and F/C 6209 either in slot 12, slot 13, or slot 14
5. Reboot the server and continue with the SP attachment.

Note: Consult the appropriate documentation for specific installation procedures.

RS/6000 SP System Attachment Adapter Cables

When you order the RS/6000 SP System Attachment adapter, you must also order the following cable:

- A 10 meter switch cable (**F/C 9310**) (connects the RS/6000 SP System Attachment adapter to a valid switch port on the SP Switch).

There are no optional cables for the RS/6000 SP System Attachment adapter.

Note: Although the SP System Attachment adapter is ordered with the Enterprise Server, you must order the 10 m cable (F/C 9310) with the SP system.

SP-Attached Server Network Media Card Requirements

Each network media card requires one media card slot in the SP-Attached Server. All network adapters in the SP-Attached Server use PCI architecture.

PCI Adapter Restriction

Only SP system supported PCI adapters can be used in a 7017 Enterprise Server when it is used as an SP-Attached Server. Thus, if you attach an existing RS/6000 7017 Enterprise Server to an SP system, you must remove any non-SP system supported PCI adapters.

Note: Rules for supported PCI adapters, such as the following, can be found in the RS/6000 7017 Enterprise Server documentation:

- Required adapters (including minimum requirements)
- Maximum quantity of each adapter allowed
- Bus placement restrictions

For a complete listing and detailed specifications of currently supported SP system adapters, see Chapter 17, "PCI Communication Adapters" on page 121. With the exception of the RS/6000 SP System Attachment adapter (which is supported); if an adapter does not appear in the list, it is not supported for the SP-Attached Server. If you plan to use an existing Enterprise Server and any installed adapters do not appear in this list, they must be removed before it can be attached to the SP system.

Note: F/C 2985 and 2987 have placement restrictions when used as the SP-LAN adapter. See "Attaching the SP-LAN Ethernet" on page 51 for more information.

SP-Attached Server Software Requirements

The SP-Attached Server requires an SP system operating with the following software levels:

- PSSP 3.1 (or later)
- AIX 4.3.2 (or later)

Notes:

1. Coexistence features provided by PSSP software permit other nodes in the system to operate at lower software levels. However, if you use an application that has coexistence requirements (such as PE), those requirements must be met.
2. If you attach an ***existing*** Enterprise Server, and that server is connected to an IPv6 network, you must remove the server from the network before making the SP attachment.

Each SP-Attached Server also requires its own PSSP license. PSSP is available in the following formats:

- **F/C 5800** (4 mm tape)
- **F/C 5801** (8 mm tape)
- **F/C 5802** (CD-ROM)

Software Configuration Requirements

The SP-Attached Server requires two software inputs for network configuration:

1. Assigning a frame number
2. Assigning a switch port number

Assigning a Frame Number: SP-Attached Servers are fully integrated into the PSSP software and appear similar to regular processor nodes to the PSSP software. This is in contrast to dependent nodes like the SP Switch Router which are mostly ignored by the PSSP software. Also, unlike the SP Switch Router, the SP-Attached Server must be assigned a frame number.

The SP-Attached Server frame number must be manually configured because the server has frame-like characteristics but does not have a frame supervisor card. When you assign the frame number, observe the following:

1. Do not make the SP-Attached Server the first frame in the SP system.
2. The assigned frame number cannot be a number that comes between the number assigned to a switch-configured frame and the frame numbers assigned to any non-switched expansion frames attached to the switch-configured frame.
3. You can select any frame number up to the maximum number of frames allowed, provided it does not violate the first two points.
4. Specify the hardware protocol (SAMI) for the SP-Attached Server.

For more information on this topic see "How the SP System Views the SP-Attached Server" on page 41.

Assigning a Switch Port Number: Regardless of whether your SP system is switch-configured or switchless, you must assign a switch port number to the SP-Attached Server.

- For a switch-configured SP system, this number can be any valid, unused switch port in the SP system.

  For specific details, see "Connecting the SP-Attached Server to the SP Switch" on page 52.

- For a switchless SP system, an unused node slot is required in the SP frame associated with the SP-Attached Server.

  For specific details, see "Software Configuration in a Switchless System."

Why You Must Assign a Switch Port Number

With a standard SP frame, once the frame number is assigned, the PSSP software generates the node numbers. Also, a configuration algorithm determines the switch port assignment for any non-switched expansion frame attached to the switch-configured frame.

With an SP-Attached Server, the PSSP software generates the node numbers but cannot assign a switch port number, because the software does not see the server as a standard non-switched expansion frame. As a result, you must assign the switch port number.

Software Configuration in a Switchless System: SP-Attached Servers can be installed in a switchless SP system. You install and configure SP-Attached Servers in these systems just as you would in a switch configured system. The only difference occurs in assigning a switch port number to the server. In a switch configured system, the switch port number you assign must be any valid, unused switch port. In a switchless system, you must calculate the switch port number.

This calculation is required even though a switchless system does not have a switch, and the SP-Attached Server does not require an RS/6000 SP System Attachment adapter. In a switchless system, the switch port number is assigned to the SP-Attached Server based on availability of a valid, open node slot in the system.

To determine what switch port you must assign to the SP-Attached Server, use the following formula:

switch_port_number= ((frame_number_of_associated_SP_frame – 1) X 16) + assigned_node_slot_number)

In this formula, the associated SP frame contains the valid, open node slot you are assigning to the SP-Attached Server. Even though the SP-Attached Server is not directly connected with this SP frame, the number of that frame and the number of the open node slot are used to calculate the switch port number.

Planning for the RS/6000 SP-Attached Server Network Interface

There is a maximum number of SP-Attached Servers that can be connected to an SP system. See "Server Attachment Limits" on page 42 for more information.

The SP-Attached Server requires a minimum of four connections with your SP system in order to establish a functional and safe network. If your SP system is configured with an SP Switch, there are five required connections as follows:

1. Three connections with the control workstation:
   a. An Ethernet connection to the SP-LAN for system administration purposes. For cable details, see "Attaching the SP-LAN Ethernet" on page 51.

b. A custom RS-232 cable, connecting the SP system control workstation to the SP-Attached Server SAMI port, using IBM supplied 15 m (49 ft.) cable.

c. A second custom RS-232 cable, connecting the SP system control workstation to the SP-Attached Server S1 serial port, using IBM supplied 15 m (49 ft.) cable.

For details on these connections, see "Connecting the SP-Attached Server to the Control Workstation."

2. The fourth connection is a 10 m (33 ft.) frame-to-frame electrical ground cable.

   The SP-Attached Server must be connected to the SP frames with an IBM supplied grounding cable. This cable is supplied with the SP system when you order F/C 9122 and F/C 9123.

   The frame-to-frame ground is required in addition to the SP-Attached Server electrical ground. The frame-to-frame ground maintains the SP system and the SP-Attached Server at the same electrical potential.

3. The fifth connection is required only if the SP system is switch-configured. In switched systems, the SP-Attached Server must also have an optional RS/6000 SP System Attachment adapter (RS/6000 F/C 8396) installed. This adapter uses a 10 m SP Switch cable to connect to a valid switch port on an SP Switch.

   For details, see "Connecting the SP-Attached Server to the SP Switch" on page 52.

SP-Attached Server Placement Limitations

Placement of the SP-Attached Server is limited by the length of its following supplied cables:

1. The 10 m (33 ft.) frame-to-frame ground cable and RS/6000 SP System Attachment adapter cable
2. The 15 m (49 ft.) RS-232 cables
3. The 15 m (49 ft.) BNC Ethernet cable

Approximately 3 m (10 ft.) of cable is needed for the ***vertical*** portion of the cable runs. Thus, the SP-Attached Server must be no more than 7 m (23 ft.) from the SP frame and no more than 12 m (40 ft.) from the control workstation.

Connecting the SP-Attached Server to the Control Workstation

The SP-Attached Server requires three connections to the control workstation. These connections are:

1. An Ethernet connection to the SP-LAN for system administration purposes.
2. A custom RS-232 cable connecting the SP system control workstation to the SP-Attached Server SAMI port.
3. A second custom RS-232 cable connecting the SP system control workstation to the SP-Attached Server S1 serial port.

Attaching the SP-LAN Ethernet

Two Ethernet adapters are supported for SP-LAN Ethernet communication. These adapters are:

1. 10 MB BNC/RJ-45 Ethernet (**F/C 2985**); ordered with the 7017 Enterprise Server.

   Requires one **F/C 9222** for each SP-Attached Server; ordered with the SP system (configures BNC connection to server); includes a 15 m BNC Ethernet cable.

   For details on this adapter, see “10Base2 and 10BaseT (BNC/RJ-45) Ethernet LAN PCI Adapter (F/C 2985)” on page 144.

2. 10 MB AUI/RJ-45 Ethernet (**F/C 2987**); ordered with the 7017 Enterprise Server.

   Requires one **F/C 9223** for each SP-Attached Server; ordered with the SP system (configures twisted pair connection to server). The customer must supply all twisted pair Ethernet cables.

   For details on this adapter, see “10Base5 and 10BaseT (AUI/RJ-45) Ethernet LAN PCI Adapter (F/C 2987)” on page 146.

SP-LAN Ethernet Connection

The adapter you select (F/C 2985 or F/C 2987) must match the configuration of the SP-LAN on your SP system. These adapters must be placed in the en0 position of the SP-Attached Server (the lowest numbered Ethernet bus slot in the first I/O tower).

Although the 10/100 MB Ethernet adapter (F/C 2968) is an SP supported Ethernet adapter, it is not supported for SP-LAN communication. F/C 2968 can be used in other slots in the SP-Attached Server, but it must not be used in the en0 position.

Ethernet Adapter Restrictions: If you attach an existing 7017 Enterprise Server to an SP System, you must place an SP-LAN Ethernet adapter in the en0 position inside the SP-Attached Server. Because the Ethernet adapter in this slot must be configured for SP communications, any non-SP supported Ethernet adapter that is in this slot must be removed.

Also, even if the Ethernet adapter in en0 is either F/C 2985 or F/C 2987, the adapter must be de-configured and then reconfigured as an SP-LAN Ethernet adapter.

Attaching the RS-232 to the SP-Attached Server

Two RS-232 connections must be made from the control workstation to the SP-Attached Server. These connections go to the following ports on the SP-Attached Server:

1. SAMI port in the control panel on the front of the CEC (uses an IBM-supplied 15 m custom RS-232 cable).
2. S1 serial port on the rear of the primary (first) I/O tower (uses an IBM-supplied 15 m custom RS-232 cable).

Since the SP-Attached Server requires multiple RS-232 connections, you must use a multi-port, asynchronous adapter inside the control workstation. For a listing of the available adapters, RANs, and cables, see “Control Workstation Interface Adapters” on page 69.

Note: The 16-port asynchronous adapter (F/C 2955) used in MCA control workstations is not compatible with the SP-Attached Server.

Configuring Service Director

Service Director is a set of IBM software applications supplied with the SP system and with the 7017 Enterprise Server. Service Director monitors the “health” of these systems (for more information see “Service Director” on page 71).

In a typical Enterprise Server installation, Service Director transmits reports through a modem supplied with the unit. However, when the 7017 Enterprise Server is used as an SP-Attached Server, the modem supplied with the 7017 is not used. In an SP installation, the SP-Attached Server acts like an SP system node and forwards its Service Director messages to the SP system. When the SP system receives messages from the SP-Attached Server, the messages are transmitted through the Service Director modem.

To configure Service Director for the SP-Attached Server you must perform the following:

1. Configure the SP-Attached Server as a Machine Type 7017 in Service Director (must be done manually).
2. Configure Service Director on the SP-Attached Server to forward messages to the SP system (the modem supplied with the 7017 Enterprise Server is not used).
3. Configure Service Director on the SP system to forward messages received from the SP-Attached Server (the Service Director modem on the SP system is attached to the control workstation or other local server).

Connecting the SP-Attached Server to the SP Switch

If your SP system is configured with an SP Switch, the SP-Attached Server requires a connection between the SP Switch and the server. To make this connection your system requires the RS/6000 SP System Attachment adapter (**RS/6000 F/C 8396**). This adapter occupies three media card slots in the SP-Attached Server. For specific details on configuring the RS/6000 SP System Attachment adapter, see “SP-Attached Server Switch Adapter Requirements” on page 45.

Once the adapter is installed in the SP-Attached Server, the 10 m switch cable (**F/C 9310**) must be attached to a valid switch port on the SP Switch. The general steps for choosing a valid SP Switch port are outlined here.

Selecting a Valid Switch Port

In a switch-configured SP system, each SP-Attached Server requires one RS/6000 SP System Attachment adapter. ***Only one switch adapter*** can be used per server. Each of these RS/6000 SP System Attachment adapters requires a valid unused switch port in the SP system. A valid unused switch port is a switch port which meets the rules for configuring frames and switches.

There are two sets of rules for choosing a valid switch port:

1. Rules for selecting a valid switch port associated with an empty node slot.
2. Rules for selecting a valid switch port associated with an unused node slot created by a wide or high node. These node slots are either the second half of a wide node or one of the last three positions of a high node.

For more information, see *IBM RS/6000 SP: Planning Volume 2, Control Workstation and Software Environment*.

Examples of Using an Empty Node Slot Position: As an example, consider the use of an empty node slot position in a single-frame system with a switch and 14 thin nodes located in slots 1 through 14. This system has two unused node slots in position 15 and 16. These two empty node slots have corresponding switch ports which provide valid connections for the RS/6000 SP System Attachment adapter.

For another example, consider a two-frame system with one switch. The first frame is fully populated with eight wide nodes. The second frame has three wide nodes in system node positions 17, 19, and 21. The only valid switch ports in this configuration are those switch ports associated with system node numbers 23, 25, 27, 29, and 31 in the second frame.

For a four-frame system with one switch and fourteen high nodes, there are only two empty node positions. In this example, the first three frames are fully populated with four high nodes in each frame. The last frame has two high nodes and two empty high node slots. Thus, the system has two valid switch ports associated with system node numbers 57 and 61.

For more information, see *IBM RS/6000 SP: Planning Volume 2, Control Workstation and Software Environment*.

Examples of Using Node Slot Positions Within a Wide Node or High Node: As an example, consider a single frame with a switch and eight wide nodes. These wide nodes occupy the odd numbered node slots. Thus, all of the even number slots are said to be unoccupied and would have valid switch ports associated with them. These ports can be used for an RS/6000 SP System Attachment adapter.

For a second example, consider a single-frame system with a switch, twelve thin nodes in slots 1 through 12, and a high node in slot 13. A high node occupies four slots but only uses one switch port. Thus, the only valid switch ports in this configuration are created by the three unused node slots occupied by the high node. In other words, the switch ports are associated with node slots 14, 15, and 16.

For more information, see *IBM RS/6000 SP: Planning Volume 2, Control Workstation and Software Environment*.

Chapter 9. Tall Frames – 1.93 m (Model 550, F/C 1550, and F/C 2031)

Tall Frame Overview

Tall frames are available in three variations:

- Tall ***model*** frames (Model 550)
- Tall ***expansion*** frames (F/C 1550)
- SP Switch frames (F/C 2031)

Frames Withdrawn From Production 4/98

With the introduction of these RS/6000 SP frames, all previous frame feature codes have been withdrawn from production. For details, see “Withdrawn Models and Frames” on page 327.

Previous tall frames were 2.01 m in height; these have been redesigned to 1.93 m. These frames are completely compatible with all existing SP systems. All existing nodes and SP switch types can be directly installed as long as configuration rules are not violated; however, the High Performance switches are withdrawn from production and are not compatible with most current SP system hardware.

As in the older frame designations, the redesigned tall frames have eight drawers and can house up to 16 thin nodes, eight wide nodes, or four high nodes. All node types can be mixed in these frames. They will also accommodate a switch and all power subsystems. All frames are designed for concurrent maintenance; each processor node can be repaired without interrupting operations on other nodes.

In addition to the reduced height, tall frames contain an upgraded SEPBU power subsystem to accommodate the latest SP processor nodes. For information on upgrading existing power supplies, see “Upgrading Power Systems in Early SP Frames” on page 244. This upgrade is required before you can use SMP-type nodes in older frames.

The upgraded SEPBU power subsystem comes equipped with redundant (N+1) power supplies; if one power supply fails, another takes over. These power supplies are self regulating SEPBU units designed for concurrent maintenance; a failed power book can be removed and repaired without interrupting running processes on the nodes.

The SP frame feature codes are simplified by decoupling the imbedded node from the frame offering. Thus, when you order a frame feature, you receive only the frame with its integral SEPBU and power line cord. All nodes, switches, and other auxiliary equipment must be ordered separately.

Note: In order to maintain your entire SP system at the same electrical potential, you must attach a frame-to-frame ground between all frames in your SP system using IBM-supplied cables (P/N 46G5695).

Model 550 Frames

The ***model frame*** is always the first frame in an SP system and it designates the type or model class of your SP system. The base level Model 550 SP system has a tall frame with eight empty node drawers and a 10.5 kW three-phase SEPBU power subsystem.

All processor nodes and optional switches must be purchased separately for these frames. Either one SP Switch or one SP Switch-8 and up to sixteen thin nodes, eight wide nodes, or four high nodes, can be installed in these frames. Other frames that you connect to the model frame are known as ***expansion frames***, (see Figure 2).

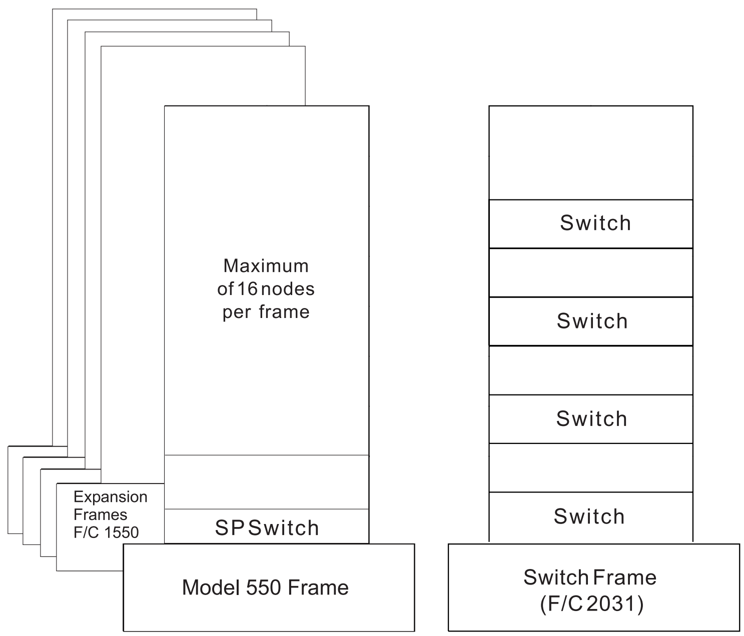


Figure 2. Model 550 System with Frame-Mounted SP Switch, Four Expansion Frames, and an SP Switch Frame with Four Switches

Model 550 SP systems can be developed into several different configurations. Some of these configurations use switches while others do not.

Model 550 Non-Switched Configuration

This configuration consists of 1-64 processor nodes mounted in one required Model 550 frame and in additional tall, non-switched expansion frames (F/C 1550).

Model 550 SP Switch-8 Configuration

This configuration consists of 1-8 processor nodes mounted in one required Model 550 frame equipped with an eight-port SP Switch-8 (F/C 4008). A non-switched expansion frame (F/C 1550) is supported in this configuration only if the model frame is filled before the total node count of eight is reached. In this configuration, each node requires either an SP Switch Adapter (F/C 4020), an SP Switch MX Adapter (F/C 4022), or an SP Switch MX2 Adapter (F/C 4023). Nodes in the non-switched expansion frames share unused switch ports in the model frame.

Model 550 Single-Stage SP Switch Configuration

This configuration consists of 1-80 processor nodes mounted in one required Model 550 frame equipped with a sixteen-port SP Switch (F/C 4011). Depending on the number of nodes in your system, up to four switched expansion frames (four F/C 1550 plus four F/C 4011) can be added to the system.

Single-stage system configurations can also utilize non-switched expansion frames (F/C 1550). Nodes in the non-switched expansion frames share unused switch ports both in the model frame and in the switched expansion frames.

In single-stage switch configurations, all nodes require either an SP Switch Adapter (F/C 4020), an SP Switch MX2 Adapter (F/C 4023), or an SP Switch MX2 Adapter (F/C 4023). No more than 64 of the 80 nodes in these systems can be high nodes.

Model 550 Two-Stage SP Switch Configuration

The standard two-stage switch configuration has 65-128 processor nodes. No more than 64 of the 128 nodes can be high nodes. All nodes in the system must have either an SP Switch Adapter (F/C 4020) or an SP Switch MX2 Adapter (F/C 4023).

These nodes are mounted in one required Model 550 frame equipped with a sixteen-port SP Switch (F/C 4011) and in switched expansion frames (F/C 1550 plus F/C 4011). The SP Switches in these frames form the first switching layer.

This system configuration also requires an SP Switch frame (F/C 2031) which forms the second switch layer. The second stage switches in the SP Switch frame are used for high-performance parallel communication between the SP switches mounted in the model frame and in switched expansion frames. Switch traffic is carried through concurrent data transmissions using the Internet Protocol (IP). See “Switch Overview” on page 73 for more information on the switch.

Two-stage switch system configurations can also utilize non-switched expansion frames (F/C 1550). Nodes in the non-switched expansion frames share unused switch ports in the model frame and in switched expansion frames.

Note: Alternate two-stage switch configurations mounting fewer than 65 nodes or more than 128 nodes are available. Two-stage configurations using less than 65 nodes are simpler to scale up when you add more switches than are single-stage switch configurations. Consult your IBM representative for more information.

Expansion Frames (F/C 1550)

] Used in Model 550, 3BX, 20X, 30X, 40X, and 55H systems, F/C 1550 is a tall
] frame with eight empty node drawers and a SEPBU power supply. All processor
] nodes and optional switches must be purchased separately for these frames. An
] SP Switch and up to sixteen thin nodes, eight wide nodes, or four high nodes can
] be installed in these frames.

F/C 1550 is the base offering for the 1.93 m (75.8 inch) SP expansion frame. These frames are equipped with a 10.5 kW three-phase SEPBU self regulating power subsystem. All 1.93 m frames have eight empty node drawers for separately purchased nodes. Up to sixteen thin nodes, eight wide nodes, or four high nodes can be installed in these frames.

You must populate each expansion frame with optional SP switches and nodes as permitted by system configuration rules. These configuration rules impose limits on the number and location of each type of node and switch that can be included in each system and vary depending on how your SP model frame is configured.

There are two standard configurations for F/C 1550 expansion frames. These are:

1. An expansion frame configured with processor nodes only; known as a ***non-switched expansion frame***.
2. An expansion frame configured with processor nodes and an SP switch; known as a ***switched expansion frame*** .

Non-Switched Expansion Frame Terminology

Non-switched expansion frames were sometimes previously referred to as "logical switch expansion frames."

Both of these terms indicate a shared-switch frame set. The frames of a shared-switch frame set include the first frame (containing the switch) and one or more additional frames which do not contain a switch. The additional frames share the switch of the first frame in the set.

For more information on selecting valid switch ports and configuring shared-switch framesets, refer to *IBM RS/6000 SP: Planning Volume 2, Control Workstation and Software Environment*.

Uniprocessor and SMP Thin Node Pair Alert

Frames which have uniprocessor thin nodes cannot be used as non-switched expansion frames. Similarly if a frame has uniprocessor thin nodes and a switch with unused switch ports, it cannot have a non-switched expansion frame attached to the unused switch ports. Frames having uniprocessor thin nodes require an SP switch for expansion.

SMP thin nodes can, however, be used as single thin nodes. Frames having ***single*** SMP thin nodes ***only*** can be used for expansion and switch sharing. However, if a pair of SMP thin nodes is used, uniprocessor thin node rules apply to expansion and switch sharing.

Using F/C 1550 Non-Switched Expansion Frames

A non-switched expansion frame is defined as a base offering expansion frame equipped with processor nodes only. Some Model 550 SP system configurations can be scaled into larger systems using these frames. These SP system configurations are:

- Configurations using Model 550 frames equipped with processor nodes and a switch.
- Configurations using switch-configured Model 550 frames and F/C 1550 expansion frames equipped with processor nodes and a switch (switched expansion frames).
- Model 550 frames equipped with processor nodes only.

Non-Switched Expansion Frames Used with Frames Containing Processor Nodes and a Switch

Non-switched expansion frames are added to SP frames configured with processor nodes and a switch to take advantage of unused switch ports resulting from certain system configurations. These unused switch ports can be in the model frame or in switched expansion frames. In these cases the switch, which can have ports to attach up to 16 nodes, is not fully utilized.

One example of an under-utilized switch would be a tall frame with eight wide nodes and an SP Switch. In this example, the frame is fully populated yet only eight of the sixteen switch ports are used. In this case, you can add non-switched expansion frames to the switch-configured frame to take advantage of the eight unused switch ports. In these cases, node-to-node data transfers are completed through the switch.

Note: If the switch used in this configuration is an SP Switch-8, the nodes must be placed sequentially in this system configuration. Empty node drawers are not allowed. If the switch is a 16-port SP Switch, nodes can be placed in any order and empty drawers are permissable; however, node-to-node Ethernet BNC jumper cables might be too short if a drawer is left empty.

Non-Switched Expansion Frames Used with Frames Containing Processor Nodes Only

Non-switched expansion frames (configured with processor nodes only) can be added to the Model 550 SP frame to take advantage of unused node slots. In these cases, node-to-node data transfers are completed over the SP LAN.

Using F/C 1550 Switched Expansion Frames

A switched expansion frame is defined as a base offering expansion frame equipped with processor nodes and a switch. These frames are added to SP systems with switch-configured Model 550 frames. Configuration rules permit you to attach up to four switched expansion frames to these model frames. In some system configurations, you can have unused switch ports in either the model frame or the switched expansion frames. Those unused switch ports can be used with non-switched expansion frames to complete your system.

If your SP system uses single-stage switching, you can scale your SP system into a system containing up to 80 nodes. See “Model 550 Single-Stage SP Switch Configuration” on page 57 for more information.

If your SP system uses two-stage switching, you can scale your SP system even larger. In these systems, 128 nodes (or more) are supported. See “Model 550 Two-Stage SP Switch Configuration” on page 57 for more information.

SP Switch Frames (F/C 2031)

An SP Switch Frame (F/C 2031) is a base tall frame with integral SEPBU power supply, equipped with four SP Switches but no processor nodes. The SP Switch Frame is a mandatory prerequisite for systems using more that five SP Switches; it interconnects the switches in model frames and in expansion frames. Note that SP Switch Frames transfer data only within the local SP system.

An SP Switch Frame with four SP Switches supports systems with from 65 to 128 nodes; however, it can also be configured into systems with fewer than 65 nodes to greatly simplify future expansion as more switches are added. For information on the advantages of installing an SP Switch Frame into a smaller system, see “Considerations for Future Switch Expansion” on page 102.

SP Switch Frames can be used in special-order systems which have more than 128 nodes using RPQ 8P2006; for more information, consult your IBM sales representative.

Chapter 10. Short Frames – 1.25 m (Model 500 and F/C 1500)

Short Frame Overview

Short frames are available in two variations:

1. Short ***model*** frames (Model 500)
2. Short ***expansion*** frames (F/C 1500)

> **Frames Withdrawn From Production 4/98**
>
> With the introduction of these RS/6000 SP frames, all previous frame feature codes have been withdrawn from production. For details, see "Withdrawn Models and Frames" on page 327.

All short frames (including previous feature codes) are 1.25 m in height. The short frame SEPBU power subsystem has been redesigned. For information on upgrading existing power supplies, see "Upgrading Power Systems in Early SP Frames" on page 244. This upgrade is required before you can use SMP-type nodes in old style frames.

Even with the redesigned power subsystem, these frames are completely compatible with all existing SP systems. All existing node and SP switch types can be directly installed as long as configuration rules are not violated; however, the High Performance switches are withdrawn from production and are not compatible with some SP system components.

As in the older frames, the redesigned short frame has four drawers and can house up to eight thin nodes, four wide nodes, or two 200 MHz High Nodes (withdrawn from production). Note that POWER3 SMP High Nodes cannot be installed in these frames, due to a depth limitation. Short frames also accommodate an eight port switch and all power subsystems. All node types can be directly installed as long as configuration rules are not violated. All frames are designed for concurrent maintenance; each processor node can be repaired without interrupting operations on other nodes.

Redundant power (F/C 1213) is an option with the redesigned short frame SEPBU. With this option, if one power supply fails, another takes over. These power supplies are self-regulating SEPBU units that have been upgraded to meet the increased power demand of the new SMP-type nodes. SEPBUs with the N+1 feature are also designed for concurrent maintenance; if a power book fails, it can be removed and repaired without interrupting running processes on the nodes.

The SP frame options are simplified by decoupling the imbedded node from the frame offering; when you order a frame feature, all you receive is the frame with a SEPBU and power cord. All nodes, switches, and other auxiliary equipment must be ordered separately.

Note: In order to maintain your entire SP system at the same electrical potential, you must attach a frame-to-frame ground between all frames in your SP system using IBM cables (P/N 46G5695).

Model 500 Frames

The ***model frame*** is always the first frame in an SP system and it designates the type or model class of your SP system. The base level Model 500 SP system has a short frame with four empty node drawers and a 5.0 kW single-phase SEPBU power subsystem.

All processor nodes and the optional switch must be purchased separately for these frames. One SP Switch-8 and up to eight thin nodes, four wide nodes, or two 200 MHz High Nodes (withdrawn from production) can be installed in the Model 500 frame. Other frames that you connect to the model frame are known as ***expansion frames*** (see Figure 3).

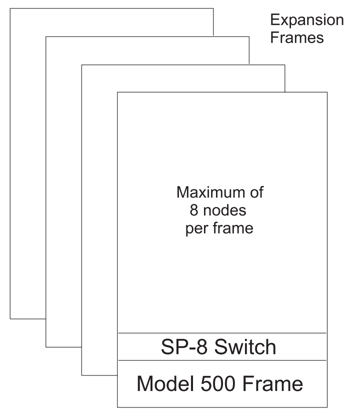


Figure 3. Model 500 System with Optional SP Switch-8 and Three Expansion Frames.

Model 500 SP systems can be developed into two different configurations, either non-switched or switched.

Model 500 Non-Switched Configuration

This configuration consists of 1-8 processor nodes mounted in one required Model 500 frame and up to three additional short, non-switched expansion frames (F/C 1500).

Model 500 Switched Configuration

This configuration consists of 1-8 processor nodes connected through a single eight-port SP Switch-8 (F/C 4008). These nodes are mounted in one required Model 500 frame containing the SP Switch-8 and in up to three additional short, non-switched expansion frames (F/C 1500). In this configuration, each node requires either an SP Switch Adapter (F/C 4020), an SP Switch MX Adapter (F/C 4022), or an SP Switch MX2 Adapter (F/C 4023).

Nodes in the non-switched expansion frames (F/C 1500) share unused switch ports in the model frame. When short frames are used in a switched configuration, only the Model 500 frame can be equipped with a switch. SP switches cannot be mounted in the F/C 1500 frames.

Expansion Frames (F/C 1500)

F/C 1500 is the base offering for the 1.25 m (49 in.) SP expansion frame. These frames are equipped with a 5.0 kW single-phase SEPBU self-regulating power subsystem. All 1.25 m frames have four empty node drawers for separately purchased nodes. Up to eight thin nodes, four wide nodes, or two high nodes can be installed in these frames.

Note: Switches cannot be mounted in F/C 1500 expansion frames.

You must populate each expansion frame with optional nodes as permitted by system configuration rules. These configuration rules impose limits on the number and location of each type of node that can be included in each system and vary depending on how your SP model frame is configured.

F/C 1500 expansion frames can only be configured with processor nodes. Expansion frames that are configured with processor nodes only are known as a ***non-switched expansion frames***.

Using F/C 1500 Non-Switched Expansion Frames

] Model 500, 2AX, 3AX, or 50H SP systems can be fully utilized using F/C 1500
] expansion frames. Model 500 systems have a capacity for up to eight nodes. If you
] fill the model frame before installing all eight nodes, you can install additional nodes
] in the system by using F/C 1500 non-switched expansion frames. The model frame
] can be either of the following:

] - Configured with processor nodes and a switch
] - Configured with processor nodes only

Expansion Frame Terminology

"Non-switched expansion frames" were sometimes previously referred to as "logical switch expansion frames."

Both of these terms indicate a shared-switch frame set. The frames of a shared-switch frame set include the first frame (containing the switch) and one or more additional frames which do not contain a switch. The additional frames share the switch of the first frame in the set.

For more information on selecting valid switch ports and configuring shared-switch frame sets, refer to *IBM RS/6000 SP: Planning Volume 2, Control Workstation and Software Environment*.

Configurations with Processor Nodes and a Switch

Non-switched expansion frames can be added to the Model 500 SP frame configured with processor nodes and an SPS-8 Switch to take advantage of unused switch ports.

One example of an under-utilized switch is a Model 500 frame with four wide nodes and an SP-8 Switch. In this case, the frame is fully populated yet only four of the eight switch ports are used. In this case, you can add non-switched expansion frames to the model frame to take advantage of the four unused switch ports. In these systems, node-to-node data transfers are completed through the switch.

Note: Nodes must be in sequence in this system configuration. Empty node drawers are not allowed.

Configurations with Processor Nodes Only

Non-switched expansion frames can be added to the Model 500 SP frame configured with processor nodes only (no switch) to take advantage of unused node slots. Model 500 systems have a capacity for up to eight nodes. If you fill the model frame by placing two high nodes in that frame, you can install six additional nodes in the system by using F/C 1500 non-switched expansion frames. In these systems node-to-node data transfers are completed over the SP LAN.

Chapter 11. RS/6000 Model T70 Workgroup Server

Model T70 Description

The RS/6000 Model T70 Workgroup Server is a limited-configuration, single-frame offering comprising one POWER3 High Node (**F/C 2054**) installed in a medium-height (1.36 m), deep frame with single-phase 5 KVA power, and support for up to four SP Expansion I/O Units (**F/C 2055**). No switches or expansion frames are supported.

The Model T70 requires a 7043 Model 140 control workstation.

Model T70 Base Configuration

The Model T70 base node configuration is as follows:

- PSSP 3.1.1 (or later) software on the processor node and control workstation
- Two processors (on one card, mounted in one slot)
- 1 GB of memory
- 9.1 GB DASD pair

Model T70 Options

Model T70 available options include the following:

- Up to eight processors on four processor cards
- Up to 16 GB of memory on four memory cards
- Up to five PCI bus adapters in four 64-bit and one 32-bit slots
- Integrated Ethernet with BNC and RJ45 ports:
  - 10Base2 Ethernet (BNC) - Reserved for the T70 LAN
  - 10BaseT or 100BaseTX Ethernet (RJ45)
- Up to 36.4 GB disk storage in two internal DASD bay pairs
- Integrated Ultra SCSI network
- Up to four SP Expansion I/O Units (**F/C 2055**) in the Model T70 frame

  For details on expansion unit capacities, see “SP Expansion I/O Unit (F/C 2055)” on page 14.
- If software preload is requested, you must provide the hostname and IP address for the T70 and control workstation at the time of order entry.

Chapter 12. Control Workstations

The control workstation serves as a point of control for managing, monitoring, and maintaining the RS/6000 SP frames and individual processor nodes. A system administrator can perform these control tasks by logging into the control workstation from any other workstation on the network.

The control workstation also acts as a boot/install server for other servers in the RS/6000 SP system. In addition, it can be set up as an authentication server using Kerberos. It can be the Kerberos primary server, with the master database and administration service, as well as the ticket-granting service. As an alternative, the control workstation can be set up as a Kerberos secondary server, with a backup database, to perform ticket-granting service.

Previously-purchased Workstation Alert

If you intend to use a previously-purchased RS6000 workstation that you have been using for other applications, IBM suggests that you perform the following steps prior to integrating it into your SP system as a control workstation:

1. Ensure that all required hardware configuration prerequisites are met; for details, see *IBM RS/6000 SP: Planning Volume 2, Control Workstation and Software Environment*.
2. Run diagnostics to ensure that the control workstation is functioning properly.

IBM also suggests that you run ***only*** PSSP on your control workstation to ensure optimum performance of your SP system.

Planning for the Control Workstation

Planning for the control workstation requires many hardware and software considerations. Optional features such as High Availability Control Workstations (**F/C 1245**), SP-Attached Servers, and system routers each have different requirements. To take advantage of the latest software enhancements your SP system, along with its control workstation, must be running the latest version of the RS/6000 SP Parallel System Support Programs (PSSP) and of the AIX operating system.

The RS/6000 SP system requires an RS/6000 control workstation with a color monitor. A list of supported control workstations and their requirements and options can be found in *IBM RS/6000 SP: Planning Volume 2, Control Workstation and Software Environment*. There are three different types of control workstations as follows:

- SMP control workstations using PCI adapters
- Uniprocessor control workstations using PCI adapters
- Control workstations using MCA adapters

  These workstations can also have either four or eight-mm tape drives.

Control workstations must be connected to each SP system frame through both an RS-232 cable and an SP Ethernet BNC cable. These 15 meter (49 ft.) cables are supplied with each frame. Thus, the control workstation and SP frames must be no more than 12 m apart, leaving 3 m of cable for the vertical portion of the cable runs. If you need longer vertical runs or if there are under-floor obstructions, you must place the control workstation closer to the frames.

All SP-attached servers must also be connected to the control workstation. However, each SP-attached server requires two RS-232 connections as well as the SP LAN Ethernet connection. See “Planning for the RS/6000 SP-Attached Server Network Interface” on page 49 and “Connecting the SP-Attached Server to the Control Workstation” on page 50 for details.

Note: Most PCI control workstations provide either a 10BaseT or AUI connection for the SP Ethernet LAN. If you are attaching to nodes or SP-attached servers using BNC connections, ensure that you order the appropriate transceiver.

Some newer control workstations, such as the 7025-F50 and 7025-F40, offer a support processor as either a standard or optional feature (**F/C 1001**). The support processor is a standby processor that handles system start-up and some system monitoring functions. When this option is installed with a modem on the **S1** serial port, you can perform remote system restarts on SP systems located in unmanned locations.

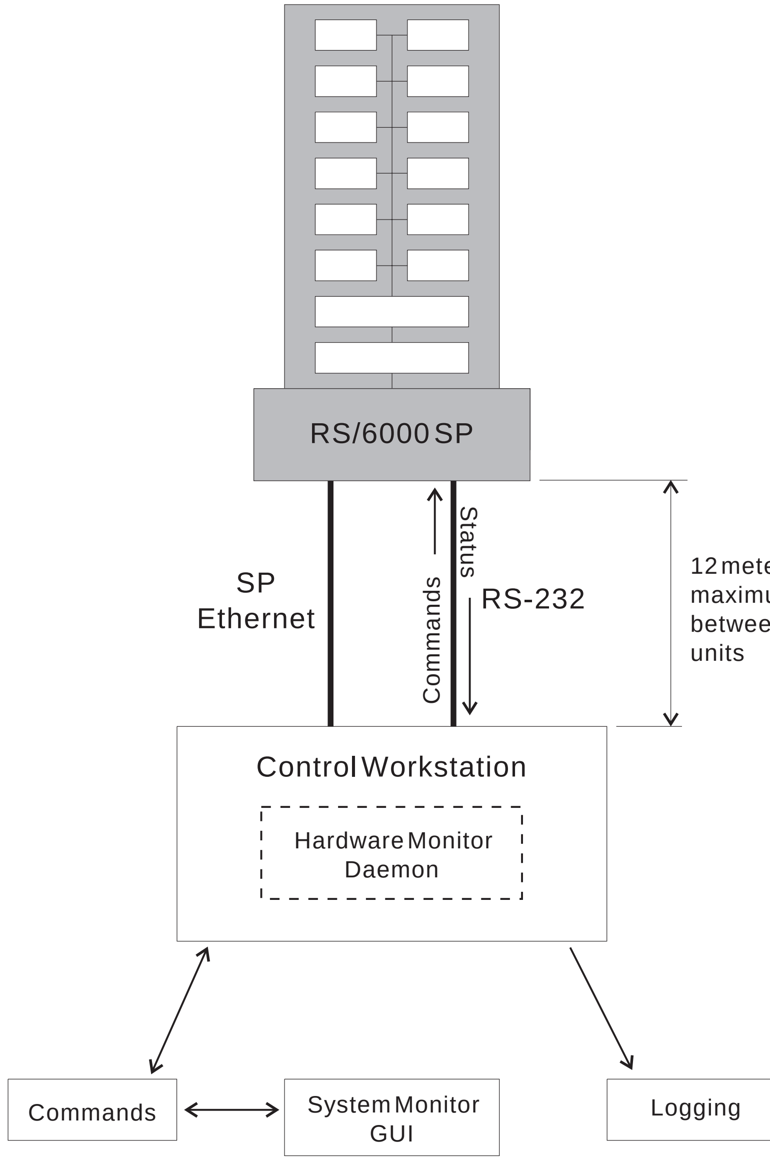


Figure 4. Control Workstation. The customer-supplied control workstation is the point of control for the RS/6000 SP system. The control workstation and all SP processor nodes run both the AIX operating system and the SP system software (PSSP).

Control Workstation Interface Adapters

Several different control workstations are available; each model has different communications adapters offered as standard equipment. Depending on the model of workstation you choose, you might have to add serial and Ethernet adapters to satisfy the needs of your SP system.

Serial Port Adapters

PCI Control Workstations: All new PCI control workstations require a minimum of one additional asynchronous adapter. For additional PCI serial ports, select from the following feature codes:

Note: In addition to the listed PCI bus adapters, the 7024-EXX and 7025-F30 control workstations also support the listed ISA bus adapters. All other PCI control workstations support only PCI bus adapters. PCI adapters offer performance advantages in all PCI control workstations and should be used whenever possible.

8-PORT PCI Adapters:

F/C 2931 8-port asynchronous adapter ISA BUS EIA-232 (withdrawn 12/97)

F/C 2932 8-port asynchronous adapter ISA BUS EIA-232/422A (withdrawn 12/97)

F/C 2943 8-port asynchronous adapter PCI BUS EIA-232/RS-422

128-PORT PCI Adapters

F/C 2933 128-port asynchronous controller ISA bus (withdrawn 12/97)

F/C 2944 128-port asynchronous controller PCI bus

F/C 8130 1.2 MB/sec remote asynchronous node (RAN) 16-port EIA-232 (US)

F/C 8131 128-port asynchronous controller cable, 4.5 m (1.2 MB/sec transfers)

F/C 8132 128-port asynchronous controller cable, 23 cm (1.2 MB/sec transfers)

F/C 8133 RJ-45 to DB-25 converter cable

F/C 8134 World Trade version of F/C 8130

F/C 8136 1.2 MB/sec rack-mountable remote asynchronous node (RAN) 16-port EIA-232

F/C 8137 2.4 MB/sec enhanced remote asynchronous node (RAN) 16-port EIA-232

F/C 8138 2.4 MB/sec enhanced remote asynchronous node (RAN) 16-port RS-422

F/C 2934 Asynchronous terminal/printer cable, EIA-232 (2.4 MB/sec transfers)

F/C 3124 Serial port to serial port cable for drawer-to-drawer connections (2.4 MB/sec transfers)

F/C 3125 Serial port to serial port cable for rack-to-rack connections (2.4 MB/sec transfers)

MCA Control Workstations: For additional **MCA** serial ports, select the following feature codes:

8-PORT MCA Adapters

F/C 2930 8-port asynchronous adapter

F/C 2995 multiport interface cable

16-PORT MCA Adapters

F/C 2955 16-port asynchronous adapter

Note: F/C 2955 is not compatible with the SP-attached server.

F/C 2996 multiport interface cable

128-PORT MCA Adapters

F/C 8128 128-port asynchronous controller

F/C 8130 remote asynchronous node 16-port EIA-232

F/C 8134 World trade version of F/C 8130

Ethernet Adapters

PCI Control Workstations: For additional PCI Ethernet ports, select from the following feature codes:

F/C 2968 IBM 10/100 Mbps Ethernet PCI adapter

F/C 2985 PCI Ethernet BNC/RJ-45 adapter

F/C 2987 PCI Ethernet AUI/RJ-45 adapter

F/C 4224 Ethernet 10Base2 transceiver

MCA Control Workstations: For additional MCA Ethernet adapters, select from the following feature codes:

F/C 2980 Ethernet high performance LAN adapter

F/C 2992 Ethernet twisted pair (TP) adapter

F/C 2993 Ethernet BNC/AUI adapter

F/C 4224 Ethernet 10Base2 transceiver

Service Director

What is Service Director?

Service Director is a set of IBM software applications that monitor the “health” of your SP system. When a system fault is detected, the severity of the fault is analyzed and, if required, Service Director will notify the IBM support center. In addition to notifying the IBM support center, you can also configure Service Director to send an automated E-mail message containing the fault information to your system administrator (requires mail to be active on each node). Upon receiving the fault notification, IBM will automatically dispatch a service engineer (with parts if needed) to correct the problem.

Hardware Requirements

Service Director for the RS/6000 SP requires a local server. Typically, the local server is the control workstation, but it can be any workstation connected to the LAN. The local server must have an available serial port. However, if you are using a control workstation which utilizes a support processor (F/C 1001), the support processor modem must be connected to the S1 serial port. Thus, you cannot use the S1 serial port for Service Director if your control workstation has a support processor installed.

The local host requires the serial port for a modem which transmits fault messages over local telephone lines. All new RS/6000 SP systems include a modem package as part of the ship group. The telecommunication cable plugs and power line cord plugs vary according to the country code used for the SP 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.

  Note: Digital telephone lines cannot be used.

- A telephone extension cable (to connect the modem to the phone jack).

The local host and all nodes in your SP system must have disk space available for installation of the Service Director software. This and other pertinent Service Director planning information can be found in *IBM RS/6000 SP: Planning Volume 2, Control Workstation and Software Environment*.

Specific details for service personnel about installing, operating, and registering Service Director are contained in *Service Director for RS/6000 SP CE Information Guide*.

Chapter 13. SP Switches (F/C 4011 and F/C 4008)

Switch Overview

Switches provide a message-passing network that connects all processor nodes with a minimum of four paths between any pair of nodes. The SP series of switches can also be used to connect the SP system with optional external devices. A switch feature code provides a switch assembly and the required number of switch-to-node cables for your system.

This chapter contains information on the current production SP series of switches:

1. SP Switch, 16-port (**F/C 4011**)
2. SP Switch-8, 8-port (**F/C 4008**)

Note: High Performance series switches are withdrawn from production (for reference information, see “High Performance Switches (F/C 4010 and F/C 4007)” on page 306). You must use the current SP Switches if your SP system is configured with any of the following components:

- POWER3 SMP high nodes - SP Switch (**F/C 4011**) only
- POWER3 SMP wide nodes
- POWER3 SMP thin nodes
- 332 MHz SMP wide nodes
- 332 MHz SMP thin nodes
- SP Switch Routers
- SP-Attached Servers
- PSSP 3.1

Switch Software Considerations

Switch planning involves many issues; node placement, node addressing, and system partitioning are a few that you must consider when planning your switch layout. Make certain that you consult *IBM RS/6000 SP: Planning Volume 2, Control Workstation and Software Environment* for software-related switch planning issues before you finalize your switch plans.

SP Switch (F/C 4011)

The SP Switch provides low-latency, high-bandwidth communication between nodes; supplying a minimum of four paths between any pair of nodes. The SP Switch can be used in conjunction with the SP Switch Router to dramatically increase the speed for TCP/IP, file transfers, remote procedure calls, and relational database functions. The SP Switch offers the following improvements over the earlier High Performance series of switches:

- Higher availability
- Fault isolation

- Concurrent maintenance for nodes
- Improved switch chip bandwidth

The required SP Switch Adapter (F/C 4020), SP Switch MX Adapter (F/C 4022), or SP Switch MX2 Adapter (F/C 4023) connects each SP node to the SP Switch subsystem. One adapter of the required type must be ordered for each node in a switch-configured SP system. If you are using switch expansion frames, the SP Switch subsystem will allow you to scale your SP system up to 128 nodes.

When you order F/C 4011, you receive one 16-port SP Switch and all of the switch-to-node cables you need to connect the switch ports to up to sixteen nodes, both within the switch-equipped frame and in any non-switched expansion frames. You must separately order all switch-to-switch cables that make the connections between switch-equipped frames and to an SP Switch Frame. For details, see "Planning for Switch-to-Switch Cabling" on page 103.

Notes:

1. An SP Switch Router adapter is needed to connect the RS/6000 SP Switch Router to the SP Switch.
2. An RS/6000 SP System Attachment adapter is needed to connect the SP-Attached Server to the SP Switch.

SP Switch-8 (F/C 4008)

Eight port switches are a lower-cost alternative to the full-size sixteen port switches. The 8-port SP Switch-8 (**F/C 4008**) provides switch functions for up to eight processor nodes in Model 500 and Model 550 systems. N+1 internal power for the SP Switch-8 is available using **F/C 1212**.

When you order F/C 4008, you receive one 8-port SP Switch and all of the cables you need to connect the switch ports to up to eight nodes, both within the switch-equipped frame and in any non-switched expansion frames. For details, see "Switch-to-Node Cabling" on page 102.

An SP Switch-8 can be configured in one of two ways:

1. In a Model 500 (1.25 m) frame with up to four F/C 1500 (1.25 m) non-switched expansion frames attached
2. In a Model 550 (1.93 m) frame with F/C 1550 a non-switched expansion frame supporting up to a total of eight nodes

The SP Switch-8 has two active switch chip entry points. Thus, your ability to create system partitions is restricted with this switch. With the maximum of eight nodes attached to the switch, you have two possible system configurations:

- A single partition with up to eight node system
- Two system partitions, with up to four nodes each

For upgrades to greater than eight node support, the SP Switch-8 is replaced by the 16 port SP Switch (**F/C 4011**). The SP Switch uses a similar network topology, proprietary protocol and communication physical layer as the SP Switch-8.

Note: The SP-Attached Server and POWER3 High Nodes cannot be attached to the SP Switch-8.

Switch Adapters (F/C 4020, 4022, and 4023)

If you plan to use a switch in your SP system, you need switch adapters to connect each RS/6000 SP node to the switch subsystem. SP Switches use either the SP Switch Adapter (**F/C 4020**) for MCA-type nodes or the SP Switch MX Adapter (**F/C 4022**) or SP Switch MX2 Adapter (**F/C 4023**) for PCI-type nodes. One switch adapter is needed for each node in the SP system.

Note: High Performance Switch adapters are not compatible with any of the SP Switch adapters; they cannot coexist in the same system configuration.

Table 15. Switch Adapter Features	
Adapter Feature Code	**Description**
4020 *(Note 1, 2)*	SP Switch Adapter For installation as follows: • Optional • Order one adapter per **MCA** type node
4021 (M/T 9077)	SP Switch Router Adapter For installation as follows: • Required for the RS/6000 Switch Router • Multiple adapters allowed in each SP Switch Router
4022 *(Note 1, 2,)*	SP Switch MX Adapter (for 332 MHz SMP nodes) For installation as follows: • one adapter per **PCI** type node
4023 *(Note 1, 2)*	SP Switch MX2 Adapter (for POWER3 SMP nodes) For installation as follows: • Optional • Order one adapter per **PCI** type node
RS/6000 F/C 8396	SP System Attachment Adapter (used in SP-attached servers) For installation as follows: • Required in servers attached to a switch-configured SP system • Only one adapter is allowed per server
Reference information for withdrawn adapters	
4017 *(Note 1, 2, 3)*	HiPS Adapter-1
4018 *(Note 1, 2)*	HiPS Adapter-2

Notes:

1. The HiPS Adapter-1 and Adapter-2 cannot coexist in the same system with any SP Switch adapter.
2. In some thin node configurations, unused switch ports are not available for expansion purposes.
3. F/C 4017 is only available for coexistence with an SP1.

Special Switch Adapters (F/C 4021 and RS/6000 F/C 8396)

Some optional SP system equipment requires special adapters in order to connect to the SP Switch network. These devices include:

- SP Switch Router (**M/T 9077**)
  - Requires one SP Switch Router Adapter (**F/C 4021**) for each SP Switch connection. This adapter is ordered with the SP Switch Router.

  - The SP Switch Router Adapter is placed in the SP Switch Router. The included cable attaches to the SP Switch and uses up one valid node slot on the switch.

  For details, see Chapter 14, “RS/6000 SP Switch Routers (M/T 9077 04S and 16S)” on page 79.

- SP-Attached Server (**M/T 7017**)
  - Requires one RS/6000 SP System Attachment Adapter (**RS/6000 F/C 8396**) ***only if*** the SP-Attached Server is mounted in a switch-configured system. This adapter is ordered with the SP-Attached Server.
  - The RS/6000 SP System Attachment Adapter is placed in the SP-Attached Server and requires a cable to connect with the SP Switch.
    - Requires one valid switch port on the SP Switch
    - The cable is ordered with the SP system
  - SP-Attached Servers do not require this adapter if used in a switchless SP system.
  - This adapter ***is not compatible*** with the SPS-8 switch.
  - Only one adapter is allowed to be installed in each SP-Attached Server.

  For details, see Chapter 8, “SP-Attached Servers (RS/6000 M/T 7017-S70, S7A, and S80)” on page 39.

SP Switch Frame (F/C 2031)

An SP Switch Frame (F/C 2031) is a base tall frame with integral SEPBU power supply, equipped with four SP Switches but no processor nodes. The SP Switch Frame is a mandatory prerequisite for systems using more that five SP Switches; it interconnects the switches in model frames and in expansion frames. Note that SP Switch Frames transfer data only within the local SP system.

An SP Switch Frame with four SP Switches supports systems with from 65 to 128 nodes; however, it can also be configured into systems with fewer than 65 nodes to greatly simplify future expansion as more switches are added. For information on the advantages of installing an SP Switch Frame into a smaller system, see “Considerations for Future Switch Expansion” on page 102.

Consult your IBM sales representative for information on using SP Switch Frames in single-stage systems which have fewer that five switches and also for use in special-order systems which have more than 128 nodes.

Planning Switch Cable Networks

The switch ports in a switch-equipped frame must be connected to all the nodes in that frame as well as to all the nodes in non-switched expansion frames. These switch cables are automatically ordered and shipped with your SP system according to configurator rules. For details, see “Switch-to-Node Cabling” on page 102.

You need to plan for a number of cables that run between each switch-equipped frame in multi-switch systems. For detailed instructions on choosing these cables, refer to “Planning for Switch-to-Switch Cabling” on page 103.

Chapter 14. RS/6000 SP Switch Routers (M/T 9077 04S and 16S)

The IBM 9077 SP Switch Router is one type of dependent node (see "Dependent Nodes" on page 3 for details). It is a licensed version of the Ascend GRF switched IP router that is enhanced for direct connection to the SP Switch.

SP Switch Router Description

A physical dependent node, such as an RS/6000 SP Switch Router (**Machine Type 9077**), can have multiple logical dependent nodes; one for each dependent node adapter it contains. If a dependent node like the SP Switch Router contains more than one dependent node adapter, it can route data between SP systems or system partitions. For the RS/6000 SP Switch Router, this card is the Switch Router Adapter (**F/C 4021**). Data transmission is accomplished by linking the dependent node adapters in the switch router with the logical dependent nodes located in different SP systems or system partitions.

SP Switch Router Requirement

If you plan to attach an SP Switch Router to your SP system, you ***must*** have one valid, unused switch port for each Switch Router Adapter that you install. For details, see "SP Switch Router Adapter Requirements" on page 81.

In addition to the four major dependent node components (listed in "Dependent Nodes" on page 3), the SP Switch Router (a dependent node) has a fifth optional category of components – networking cards – that fit into slots in the SP Switch Router. In the same way that the SP Switch Router Adapter connects the SP Switch Router directly to the SP Switch, these networking cards enable the SP Switch Router to directly connect to an external network.

Both versions of the RS/6000 SP Switch Router can be used with the SP Switch. The Model 04S has four media card slots while the Model 16S has sixteen. Except for the additional traffic capacity of the Model 16S, both units offer similar performance and network availability.

The following networks can be connected to the RS/6000 SP Switch Router using available media cards:

- Ethernet 10/100 Base-T
- FDDI
- ATM OC-3c (single or multimode fiber)
- SONET OC-3c (single or multimode fiber)
- ATM OC-12c (single or multimode fiber)
- HiPPI
- HSSI

  For a complete listing and descriptions of available networking cards, see "Planning for Network Media Cards and Memory Options" on page 88.

Although you can equip an SP node with a variety of network adapters and use the node to make your network connections, the SP Switch Router (with Switch Router Adapter and optional network media cards) offers many advantages when connecting the SP to external networks, as follows:

1. Each media card contains its own IP routing engine (with separate memory) containing a full route table of up to 150,000 routes. Direct access provides much faster lookup times compared to software driven lookups.
2. Media cards route IP packets independently at rates of 60,000 to 130,000 IP packets per second. With independent routing available from each media card, the SP Switch Router gives your SP system excellent scalability characteristics.
3. The SP Switch Router has dynamic network configuration to bypass failed network paths using standard IP protocols.
4. Using multiple Switch Router Adapters in the same SP Switch Router, you can provide high performance connections between system partitions in a single SP system or between multiple SP systems.
5. A single SP system can have more than one SP Switch Router attached to it, further ensuring network availability.
6. Media cards are hot-swappable for uninterrupted SP Switch Router operations.
7. Each SP Switch Router has redundant (N+1), hot-swappable power supplies.

Switch Router Installation Requirements

There are several requirements for hardware and software that must be met before you can place the RS/6000 SP Switch Router into service with your SP system. These requirements are in the following categories:

- SP Switch Router system requirements
- Switch Router physical requirements
- Switch Router Adapter
- Network media cards
- Software

SP Switch Router System Requirements

In addition to the SP Switch Router, the following requirements must be met before you can place the router into service:

1. You must have at least one SP Switch Router Adapter.
2. A VT100-compatible terminal (with an RS-232 cable and null modem) is needed for initial configuration of the SP Switch Router.
3. You need a 10Base-T connection between your SP control workstation and the SP Switch Router. If your control workstation uses 10Base-2 Ethernet, you must also supply a 10Base-T to 10Base-2 bridge.
4. Your SP system ***must*** be equipped with either an SP Switch **(F/C 4011)** or an SP Switch-8 **(F/C 4008)**.
5. You must attach a frame-to-frame ground between the SP Switch Router and the SP system, using the IBM-supplied cable.

SP Switch Router Physical Requirements

Physical Dimensions and Weight of the SP Switch Router

Table 16 provides information on the physical dimensions and weight of SP Switch Routers. The SP Switch Router is available as Machine Type 9077-4S with four adapter slots and as Machine Type 9077-16S with sixteen adapter slots.

Table 16. Physical Dimensions and Weight of SP Switch Router

Specification	**9077-4S**	**9077-16S**
Width	483 mm (19 in.)	483 mm (19 in.)
Depth	483 mm (19 in.)	483 mm (19 in.)
Height	134 mm (5.25 in.)	534 mm (21 in.)
Weight	11.9 kg (26.5 lbs.)	45 kg (100 lbs.)

The SP Switch Router can be mounted in a standard 19-inch equipment rack, such as the 7015-R00. Rails should be used in the rack to support the weight of the 9077-16S.

Note: All rack mounted routers must be installed so that sufficient cooling air can flow around the side of the router.

SP Switch Router Power Requirements

If you use an SP Switch Router as an integral part of your SP system, you must plan for the power requirements of each unit. You can find this information in the “Bibliography” on page 375, in the “RS/6000 SP Switch Router” publications list.

SP Switch Router Adapter Requirements

Each SP Switch Router Adapter **(F/C 4021)** that you place into the SP Switch Router requires the following:

1. One valid, unused switch port on the SP Switch corresponding to a legitimate node slot in your SP configuration.

   A legitimate node slot can be empty, the second half of a wide node, or one of the last three positions of a high node, provided that the node slot satisfies the other rules for configuring nodes in an SP system.

   For example, if you have a frame with 16 thin nodes installed, you cannot attach a Switch Router Adapter to that frame until you remove a node and delete its configuration from the system image.

2. One media card slot in the Switch Router. The RS/6000 SP Switch Router Model 04S has the capacity of a total of four SP Switch Router Adapters and network media cards in any combination. The Model 16S has the capacity of a total of sixteen adapters and network media cards in any combination.

SP Switch Router Network Media Card Requirements

Each network media card requires one media card slot in the RS/6000 SP Switch Router. Keep in mind that the network media cards use the same slots as the SP Switch Router Adapters.

For a complete listing and description of available media cards, see “Planning for Network Media Cards and Memory Options” on page 88.

SP Switch Router Software Requirements

The SP Switch Router requires an SP system operating at PSSP 2.3 (or later), with the appropriate APAR level and AIX 4.2.1 (or later) on the primary and backup nodes for the SP Switch and on the control workstation.

If the SP Switch Router is used in an SP partition where there are nodes operating at lower than the required level of PSSP and AIX, you must apply service updates to the software operating on those nodes.

Planning for the RS/6000 SP Switch Router Network Interface

The RS/6000 SP Switch Router (**Machine Type 9077**) requires a minimum of three connections with your SP system in order to establish a functional and safe network. These connections are as follows:

1. A network connection with the control workstation.

   The SP Switch Router must be connected to the control workstation for system administration purposes. This connection can be either of the following:

   - A direct Ethernet connection between the SP Switch Router and the control workstation.
   - An Ethernet connection from the SP Switch Router to an external network, which then connects to the control workstation.

   See "Connecting the SP Switch Router to the Control Workstation" on page 83 for more information.

2. A connection between an SP Switch Router Adapter and the SP Switch.

   The SP Switch Router transfers information into and out of the processor nodes of your SP system. The link between the SP Switch Router and the SP processor nodes is implemented by the following:

   - An SP Switch Router Adapter (F/C 4021).
   - A switch cable connecting the Switch Router Adapter to a valid switch port on the SP Switch.

   See "Connecting the SP Switch Router to the SP Switch" on page 86 for more information.

3. A frame-to-frame electrical ground.

   The SP Switch Router frame must be connected to the SP frame with a grounding cable. This frame-to-frame ground is required in addition to the SP Switch Router electrical ground. The purpose of the frame-to-frame ground is to maintain the SP and SP Switch Router systems at the same electrical potential.

Both the SP Switch cable and the grounding cable are shipped with each SP Switch Router Adapter. The suggested cable for connecting the SP Switch Router Adapter to the SP Switch is 10 meters long **(F/C 9310)**. An optional 20 meter cable **(F/C 9320)** is also available for the SP Switch connection. A frame-to-frame ground cable the same length as the SP Switch cable is included with both F/C 9310 and F/C 9320 (order using M/T 9077).

The following sections describe how to connect the SP Switch Router to the control workstation and how to connect the SP Switch Router Adapter to a valid SP Switch port.

Connecting the SP Switch Router to the Control Workstation

Although a dependent node such as the SP Switch Router does not function like a processor node, it must be administered by the SP system as if it is a processor node. Thus, the SP Switch Router must be attached to the control workstation. All SP system administrative connections are made to the SP Switch Router using the port on the router control board. From the SP Switch Router control board, the connection to the control workstation is made using one of the following methods:

1. If the control workstation is connected to the SP system through a 10Base-2 (thin coax) network, the SP Switch Router can be connected to the network through a customer supplied 10Base-T to 10Base-2 hub (or bridge) such as the IBM 8222 Ethernet Workgroup Hub. For more information on the IBM 8222, contact your IBM marketing representative.

   All coax and twisted pair Ethernet cables must be supplied by the customer.

2. If the control workstation is connected to the SP system through a twisted pair (TP) Ethernet LAN, the SP Switch Router can be connected to an available port on the Ethernet hub (switch).

   All coax and twisted pair Ethernet cables must be supplied by the customer.

3. The RS/6000 SP Switch Router can also be connected to an additional 10Base-T adapter (such as F/C 2992) that has been installed directly in the control workstation for this purpose. If you decide to use this method, you ***must*** set up a separate Ethernet subnet for the SP Switch Router.

   When using separate 10Base-T adapters for the control workstation connection, in addition to the 10Base-T adapter you must also supply a twisted pair Ethernet cable with a crossed connection appropriate for use between two network interface cards.

4. The SP Switch Router can also be indirectly connected to the control workstation using an external network. In this configuration, the Ethernet connection from the router control board is attached to external network equipment. The external network connection to the control workstation can be one of the following:

   - A separate (non SP-LAN) Ethernet
   - ATM
   - FDDI

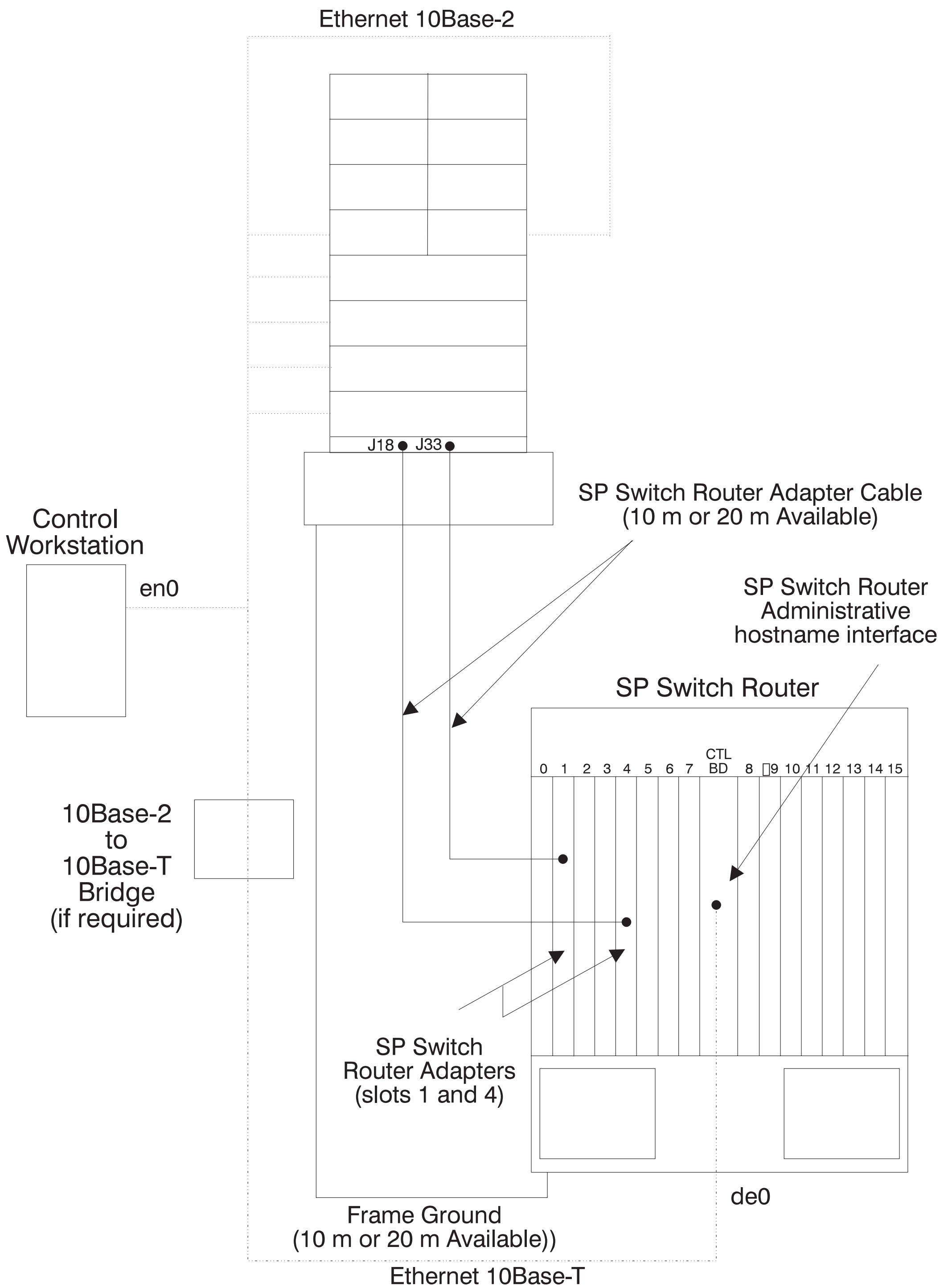


Figure 5. Typical Connections Between the RS/6000 SP Switch Router, the Control Workstation, and the SP Switch

Connecting the SP Switch Router to Multiple SP Systems

If you plan to connect one SP Switch Router to multiple, independent SP Systems, you need the following:

1. One SP Switch Router Adapter for each SP system being connected. For details, see "SP Switch Router Adapter Requirements" on page 81.

2. A Switch Router Adapter cable to connect each of the adapters to an SP Switch located in each of the SP systems. For details, see “Planning for the RS/6000 SP Switch Router Network Interface” on page 82.
3. An Ethernet connection from the SP Switch Router control board to an external network. The router control board Ethernet connection is de0 and uses 10/100BaseT Ethernet.
4. Connections from the external network must attach to the control workstation(s) administering each SP system. The external networks can be one of the following:
   - Other Ethernets
   - ATM
   - FDDI
5. Frame-to-frame grounds are required.

Valid Control Workstation Connections

Other methods can be used to make the connection between the router control board and all control workstations used in the SP systems. Any method providing the ability to ping SP control workstations from the router control board will provide a valid path.

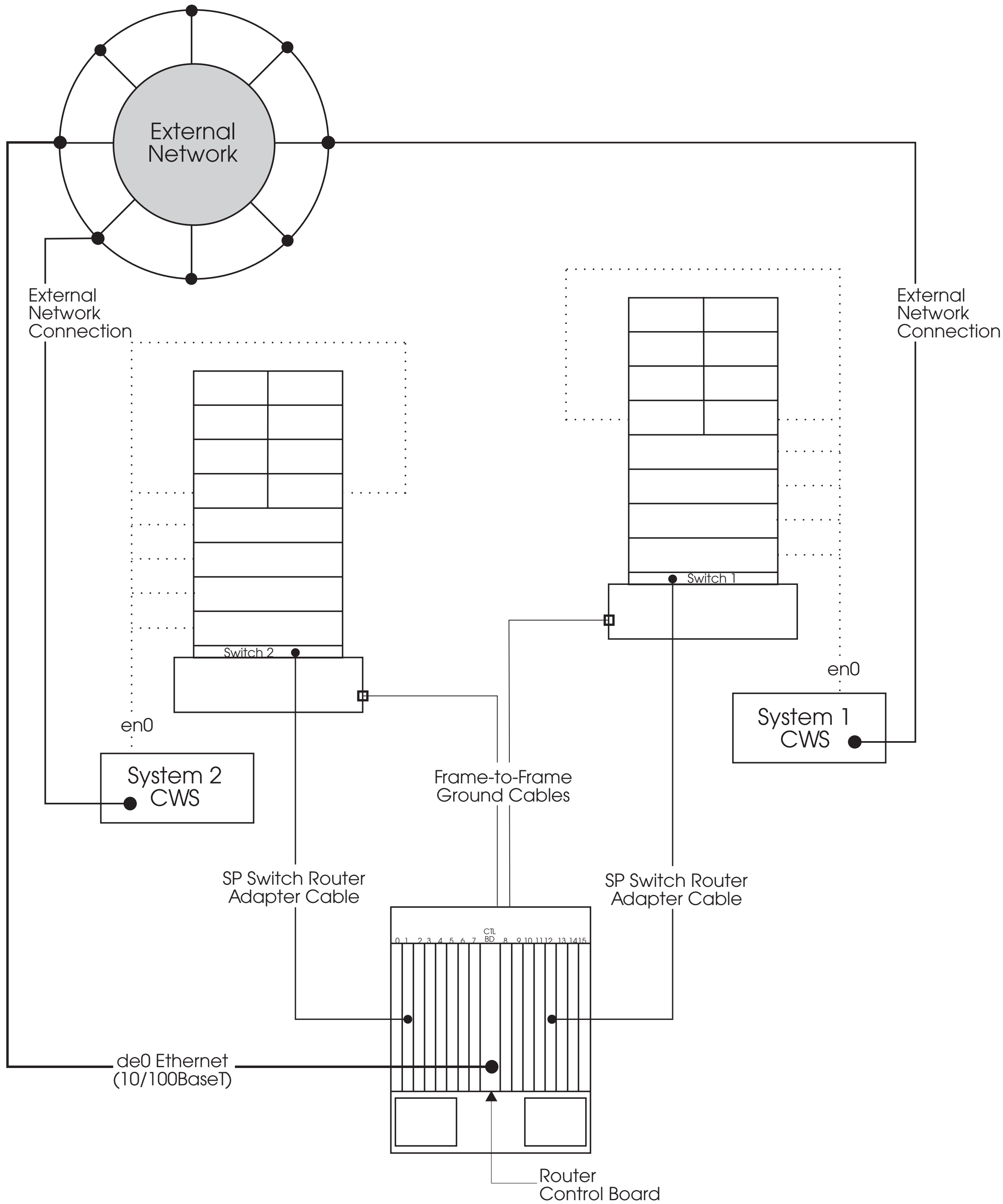


Figure 6. Configuring the RS/6000 SP Switch Router for Communications With Multiple SP Systems

Connecting the SP Switch Router to the SP Switch

In addition to the control workstation Ethernet connection, the RS/6000 SP Switch Router requires a connection between the SP Switch and the SP Switch Router. To make this connection, your system requires the SP Switch Router Adapter (**F/C 4021**). This adapter occupies one media card slot in the attached SP Switch Router.

See the appropriate SP Switch Router documentation (listed in "Bibliography" on page 375) for specific details on connecting the RS/6000 SP Switch Router to your SP system. The general steps required to choose a valid SP Switch port are outlined here.

Selecting a Valid Switch Port

An SP Switch Router Adapter in the SP Switch Router can be attached to an SP Switch to improve throughput of data coming into and going out of the RS/6000 SP system. Each SP Switch Router Adapter in the RS/6000 SP Switch Router requires a valid unused switch port in the SP system. A valid unused switch port is a switch port which meets the rules for configuring frames and switches.

There are two basic sets of rules for choosing a valid switch port:

1. Rules for selecting a valid switch port associated with an empty node slot.
2. Rules for selecting a valid switch port associated with an unused node slot created by a wide or high node. These node slots are either the second half of a wide node or one of the last three positions of a high node.

For more information see *IBM RS/6000 SP: Planning Volume 2, Control Workstation and Software Environment*.

Examples of Using an Empty Node Slot Position: One example of using an empty node slot position would be a single frame system with an SP Switch and 14 thin nodes located in slots 1 through 14. This system has two unused node slots in positions 15 and 16. These two empty node slots have corresponding switch ports which provide valid connections for the SP Switch Router Adapter.

Another example is a two-frame system with one switch. The first frame is fully populated with eight wide nodes. The second frame has three wide nodes in system node positions 17, 19, and 21. The only valid switch ports in this configuration are those switch ports associated with system node numbers 23, 25, 27, 29, and 31 in the second frame.

In a four-frame system with an SP Switch and fourteen high nodes, there are only two empty node positions. In this example, the first three frames are fully populated with four high nodes in each frame. The last frame has two high nodes and two empty high node slots. This means the system has two valid switch ports associated with system node numbers 57 and 61.

For more information, see *IBM RS/6000 SP: Planning Volume 2, Control Workstation and Software Environment*.

Examples of Using Node Slot Positions Within a Wide Node or High Node: The first example is a single frame with an SP Switch and eight wide nodes. These wide nodes occupy the odd numbered node slots. Thus, all of the even number slots are said to be unoccupied and would have valid switch ports associated with them. These ports can be used for an SP Switch Router Adapter.

A second example is a single-frame system with an SP Switch, twelve thin nodes in slots 1 through 12, and a high node in slot 13. A high node occupies four slots but uses only one switch port. Thus, the only valid switch ports in this configuration are created by the three unused node slots occupied by the high node. In other words, the switch ports are associated with node slots 14, 15, and 16.

For more information, see *IBM RS/6000 SP: Planning Volume 2, Control Workstation and Software Environment*.

Planning for Network Media Cards and Memory Options

This section has planning information for the RS/6000 SP Switch Router options. Use these options to connect your SP system to an external network with the SP Switch Router and to increase the memory capacity for routing information.

SP Switch Router memory is used for storing both static and dynamic routing information. Both the 9077-04S and 9077-16S contain standard 128 MB memory.

- For the 9077-04S only, **F/C 1114** provides memory increments of 64 MB, up to a total of 192 MB.
- For both the 9077-04S and 16S, **F/C 1116** provides memory increments of 128 MB, up to a total of 384 MB for the 04S and 512 MB for the 16S.

The features listed in Table 17 are described in detail in this section.

Table 17. SP Switch Router Network Media Cards and Options

SP Feature Code	Description	Notes
1101	ATM OC3, two port SM fiber	
1102	ATM OC3, two port MM fiber	
1103	SONET/IP OC3, one port MM fiber	
1104	SONET/IP OC3, one port SM fiber	
1105	ATM OC12, one port SM fiber	
1106	FDDI, four port MM fiber	
1107	Ethernet 10/100Base-T, eight port	
1108	HIPPI, one port	
1109	HSSI, two port	
1112	Ethernet 10/100Base-T, four port	
1113	Blank faceplate	
1114	64 MB DRAM SIMM Memory option	
1115	ATM OC12, one port MM fiber	
1116	128 MB DRAM SIMM Memory option	
4021	SP Switch Router Adapter	1
9310	SP Switch Router Adapter Cable, 10 meter option (includes 10 m frame-to-frame ground cable, F/C 9311)	
9320	SP Switch Router Adapter Cable, 20 meter option (includes 20 m frame-to-frame ground cable, F/C 9321)	

Notes:

1. Your choice of either F/C 9310 or 9320 is included with each F/C 4021.

ATM OC-3c Two Port Single-mode IP Forwarding Media Card (F/C 1101)

The ATM OC-3c IP Forwarding Media Card is an intelligent, self-contained IP forwarding engine that provides high-performance ATM OC-3c support for the SP Switch Router.

Technical Description: The ATM IP Forwarding Media Card leverages the SP Switch Router to deliver packets at full line speeds. The two full-duplex OC-3c ports use 9/125 micron single-mode optical fiber and provide exceptional configuration flexibility and port density.

ATM OC-3c Two Port Multimode IP Forwarding Media Card (F/C 1102)

The ATM OC-3c IP Forwarding Media Card is an intelligent, self-contained IP forwarding engine that provides high-performance ATM OC-3c support for the SP Switch Router.

Technical Description: The ATM IP Forwarding Media Card leverages the SP Switch Router to deliver packets at full line speeds. The two full-duplex OC-3c ports use 62.5/125 micron multimode optical fiber and provide exceptional configuration flexibility and port density.

SONET/IP OC-3c One Port Multi Mode IP Forwarding Media Card (F/C 1103)

The SONET OC-3c IP Forwarding Media Card is an intelligent, self-contained IP forwarding engine that provides high-performance SONET OC-3c support for the SP Switch Router.

Technical Description: The SONET IP Forwarding Media Card leverages the SP Switch Router to deliver packets at full line speeds. The card provides one SONET OC3c port and uses 62.5/125 micron multimode optical fiber.

SONET/IP OC-3c One Port Single Mode IP Forwarding Media Card (F/C 1104)

The SONET OC-3c IP Forwarding Media Card is an intelligent, self- contained IP forwarding engine that provides high-performance SONET OC-3c support for the SP Switch Router.

Technical Description: The SONET IP Forwarding Media Card leverages the SP Switch Router to deliver packets at full line speeds. The card provides one SONET OC3c port and uses 9/125 micron single-mode optical fiber.

ATM OC-12c One Port Single Mode IP Forwarding Media Card (F/C 1105)

The ATM OC-12c IP Forwarding Media Card is an intelligent, self-contained IP forwarding engine that provides high-performance ATM OC-12c support for the SP Switch Router.

Technical Description: The ATM IP Forwarding Media Card leverages the SP Switch Router to deliver packets at full line speeds. The full-duplex OC-12c port uses 9/125 micron single-mode optical fiber. The card supports up to 1408 Permanent Virtual Circuits of which 1000 can be active at any one time. This adapter does not support Switched Virtual Circuits.

FDDI Four Port IP Forwarding Media Card (F/C 1106)

The FDDI IP Forwarding Media Card is an intelligent, self-contained IP forwarding engine that provides high-performance FDDI support for the SP Switch Router.

Technical Description: The FDDI IP Forwarding Media Card leverages the SP Switch Router to deliver packets at full line speeds. Four 100 megabit/second FDDI ports can be configured as four single attach interfaces, as two dual attach interfaces, or as two single attach and one dual attach interface, providing exceptional flexibility and port density. The ports use 62.5/125 micron multimode optical fiber.

Ethernet 10/100Base-T 8-port IP Forwarding Media Card (F/C 1107)

The 10/100Base-T IP Forwarding Media Card is an intelligent, self-contained IP forwarding engine that provides high-performance Ethernet support for the SP Switch Router.

Technical Description: The 10/100Base-T IP forwarding Media Card leverages the SP Switch Router to deliver packets at full line speeds. The card supports both 10Base-T or 100Base-TX autosensing interfaces to provide exceptional configuration flexibility and port density.

HIPPI One Port IP Forwarding Media Card (F/C 1108)

The HIPPI IP Forwarding Media Card is an intelligent, self-contained IP forwarding engine that provides high-performance HIPPI support for the SP Switch Router.

Technical Description: The HIPPI IP forwarding Media Card leverages the SP Switch Router to deliver packets at full interface speeds.

HSSI Two Port IP Forwarding Media Card (F/C 1109)

Media Card is an intelligent, self-contained IP forwarding engine that provides high-performance HSSI support for the SP Switch Router.

Technical Description: The HSSI IP forwarding Media Card leverages the SP Switch Router to deliver packets at full interface speeds. Two 52 megabit/second, full-duplex HSSI data channels provide exceptional configuration flexibility and port density.

Ethernet 10/100Base-T 4-port IP Forwarding Media Card (F/C 1112)

The 10/100Base-T IP Forwarding Media Card is an intelligent, self-contained IP forwarding engine that provides high-performance Ethernet support for the SP Switch Router.

Technical Description: The 10/100Base-T IP forwarding Media Card leverages the SP Switch Router to deliver packets at full line speeds. The card supports both 10Base-T or 100Base-TX autosensing interfaces to provide exceptional configuration flexibility and port density.

Faceplate (F/C 1113)

F/C 1113 provides a blank faceplate that is needed if a media card is not required or if one is removed from an SP Switch Router.

64 MB DRAM SIMM Memory Option (F/C 1114)

F/C 1114 provides memory in 64 MB increments (2 x 32 MB DRAM).

ATM OC-12c One Port Multi Mode IP Forwarding Media Card (F/C 1115)

The ATM OC-12c IP Forwarding Media Card is an intelligent, self-contained IP forwarding engine that provides high-performance ATM OC-12c support for the SP Switch Router.

Technical Description: The ATM IP Forwarding Media Card leverages the SP Switch Router to deliver packets at full line speeds. The full-duplex OC-12c port uses 62.5/125 micron multimode optical fiber. The card supports up to 1408 Permanent Virtual Circuits of which 1000 can be active at any one time. This adapter does not support Switched Virtual Circuits.

128 MB DRAM SIMM Memory Option (F/C 1116)

F/C 1116 provides memory in 128 MB increments (2 x 64 MB DRAM).

SP Switch Router Adapter (F/C 4021)

The SP Switch Router Adapter is used to connect the SP Switch to an SP Switch Router. You must have one SP Switch Router Adapter for each SP system or SP system partition you are going to connect to the SP Switch Router.

Each F/C 4021 includes your choice of either F/C 9310 or F/C 9320.

Technical Description: The SP Switch Router Adapter provides a high performance, 100 MB/s, full-duplex interface between the SP Switch and the SP Switch Router and is able to sustain IP packet rates of up to 30,000 packets per second in each direction.

When the SP Switch Router Adapter is installed in the RS/6000 SP Switch Router, it allows the SP Switch Router to be used as a networking gateway for the SP.

Each SP Switch Router Adapter requires one available node switch port on the SP Switch.

SP Switch Router - 10 Meter Cable (F/C 9310)

IBM provides a 10 meter cable for connecting each SP Switch Router Adapter to an SP switch.

Each F/C 9310 includes a 10 m frame-to-frame ground cable.

SP Switch Router - 20 Meter Cables (F/C 9320)

This optional 20 meter cable is available for connecting each SP Switch Router Adapter to an SP switch.

Each F/C 9320 includes a 20 m frame-to-frame ground cable.

Chapter 15. Communication Cabling

This chapter describes planning for the cabling connecting the RS/6000 SP system components. When planning for cabling, consider the following to protect inter-frame cables from damage:

- Raised floor installations need under-floor raceways to protect the cable from possible damage.
- Office floor environments need above-floor raceways or protective ramps to protect the cables from possible damage and to ensure safety at your site.

The RS/6000 SP system is connected to your control workstation and file server(s) with the following:

- RS-232 cable (originating at each frame)
- One 50-ohm coaxial Ethernet or Twisted Pair Ethernet link

The RS/6000 SP system can also be connected to external networks using the RS/6000 SP Switch Router and the required SP Switch Router Adapters. The RS/6000 SP Switch Router provides high speed access through a variety of interfaces including:

- FDDI
- HIPPI
- HSSI
- SONET
- ATM
- 10/100 Ethernet

An overview of attaching the RS/6000 SP Switch Router is in "Planning for the RS/6000 SP Switch Router Network Interface" on page 82.

Planning the Location of the Control Workstation Based on Cable Length

RS-232 Cable Provided by IBM

The location of your control workstation depends, in part, on the length of the RS-232 cable that connects it to the RS/6000 SP system. IBM supplies a 15-meter (50-foot) RS-232 cable to link each RS/6000 SP frame to your control workstation. This cable is the communication link between the frame and your control workstation for hardware monitoring and control and system management.

Note: A similar set of cables is provided for each SP-attached server. However, the two RS232 cables provided with the SP-attached server are customized for use with the SP-attached server.

When planning your floor layout, remember to keep the need for cable drops in mind. For that reason, the recommended ***maximum*** distance between the control workstation and each SP frame and any SP-attached server is 12 meters. This leaves a free length of 1.5 meters at each end to reach between the cable tray and the connector.

Planning for Coaxial LAN Cabling

Planning for coaxial LAN cabling includes the following:

- Ethernet LAN and Ethernet cable provided by IBM
- Requirements for coaxial cables.

Ethernet LAN and Ethernet Cable Provided by IBM

IBM supplies an Ethernet LAN and one 15-meter (50-foot) Ethernet cable for each RS/6000 SP frame and each SP-attached server, as well as the required node-to-node cables.

Note: The Ethernet cables provided by IBM are BNC type cables. If the SP system is configured for twisted pair, the customer must supply the cables.

When planning your floor layout, remember to keep in mind the need for cable drops. For that reason, the recommended ***maximum*** distance between the control workstation and each frame is 12 meters. This leaves a free length of 1.5 meters at each end to reach between the cable tray and the connector.

Figure 7 shows the configuration of the Ethernet LAN in a RS/6000 SP frame, the RF shunt, and the 15-meter Ethernet cable.

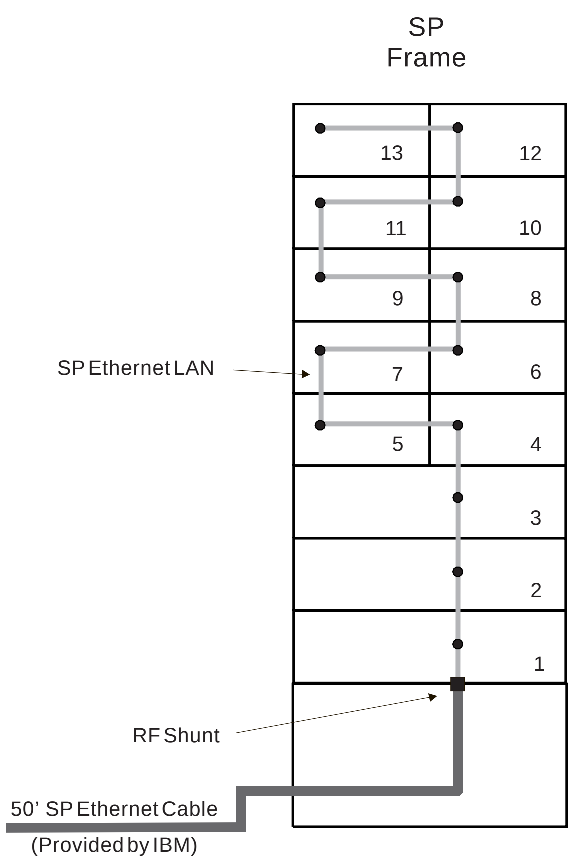


Figure 7. Factory Shipped SP Ethernet LAN, RF Shunt and Ethernet Cable in Rear of SP Frame

RF Shunt

The provided RF shunt (**P/N 46H9751**) is required on each Ethernet BNC exiting an SP frame.

Note: You can reconfigure your SP Ethernet as appropriate for your net-install service. However, SP support is limited to a maximum of 16 Ethernet cables exiting the frame.

Requirements for Coaxial Cables

Coaxial cable types RG-58 A/U or RG-58 C/U meet the parameters specified in Table 18 on page 96.

Cables RG-58 A/U and RG-58 C/U include these characteristics:

- The coaxial cable segment is the sum of all components, not to exceed 30 stations and a total length of 185 meters. The segment is a continuous transmission bus with BNC terminators on two ends, with station drops accomplished through trunk cable connectors.
- The sum of the center conductor, connectors, and shield shall not exceed 10 ohms total per cable segment. The maximum end-to-end propagation delay for a coaxial segment is 950 nanoseconds.

Notes:

1. To comply with Part 15 of the Federal Communications Commission rules (requirements for radio frequency interference from computing devices), use either double-shielded cable or cable with 95 per cent shield coverage.
2. When the RS/6000 SP system is operating, the maximum signal on the coaxial cable is five volts. This complies with the voltage and power limits of Article 725 in the National Electric Code for Class 2 and 3 circuits.
3. Do not use aluminum foil-shielded cable, because of its high electrical resistance and mechanical fragility.

Table 18 on page 96 lists the characteristics of the coaxial-type cable, RG-58, that is suitable for Ethernet cabling at your site.

Table 18. Characteristics of RG-58 Cables Suitable for Coaxial Link	
Category	**Characteristics of Cable (RG-58 A/U, RG-58 C/U)**
Coaxial Segment Components:	
Trunk cable connector	Use a plug-plug-jack BNC 'Y' connector with external insulator. The trunk cable section should contribute no more than 10 milliohms.
Terminator	• **Impedance**: 50 ohms (plus or minus 1 percent.) measured from 0–20 megahertz, with a magnitude of the phase angle of impedance not to exceed 5 degrees • **Power rating**: 0.5 watts or greater
Coaxial Cable Assembly:	
Type	RG-58 A/U or RG-58 C/U
Length	Use minimum cable length section of 0.5 meters to maintain reflections of an acceptable level.
Connectors	Cable section ends to utilize two BNC plug type connectors
Electrical Parameters:	
Characteristic impedance	• Average cable impedance should be 50, plus or minus two ohms. • Periodic variations in impedance along a single piece of cable may be plus or minus three ohm sinusoidal, centered around the average value, with a period of less than two minutes.
Attenuation of 185 meter cable segment	Attenuation should not to exceed 8.5 decibels measured at 10 megahertz, or 6.0 decibels measured at five megahertz.
Velocity of propagation	Minimum velocity required is 0.65c (c= 3.0 x 10**8)
Cable DC loop resistance	Sum of the center conductor resistance, plus the shield resistance measured at 20° Centigrade, not to exceed 50 milliohms per meter.
Coaxial Cable Physical Parameters:	
Mechanical requirements	Stranded, tinned copper with overall diameter of 0.89 millimeter, plus or minus 0.05 millimeter
Dielectric material	Polyethylene 2.95 nominal core
Shielding system	• 95 percent or greater required • Inside diameter to be 2.95 millimeter, plus or minus 0.15 millimeter
Note: Cable used in outdoor cable runs should have the same electrical characteristics as indoor cable.	

Customer Responsibilities for Coaxial Cabling

You have the following responsibilities:

- If your file server is located more than 15 meters from your RS/6000 SP system, obtain and install coaxial link cables that fit your RS/6000 SP configuration.

- Obtain and install BNC connectors.
- Ensure that cables comply with all applicable codes and standards.
- Check that both BNC connectors on a port use coaxial cable of the same impedance.
- Plan for continuous unit-to-unit lengths of cable. Cable splicing is not recommended.
- Provide lightning protection on all outdoor coaxial cables.

Note: Your system installer can provide advice about additional customer-supplied hardware you may need (such as a convertor box) if you plan to use a combination of multiple (thick) and single (thin) coaxial cables.

Connecting Station Protectors

To protect personnel and to prevent damage to your equipment from sudden surges of lightning energy, connect a station protector to the shield at both ends of each coaxial cable that runs out-of-doors.

DANGER

Do not install, maintain, connect, disconnect, or handle either lightning protectors or coaxial cables that connect the protector to the terminal in any way during periods of lightning activity.

Station Protectors Provided by IBM

You can order a station protector kit (**P/N 1830818**) from IBM. An illustration of the station protector kit is shown in Figure 8 on page 98. The kit contains two gas-element station protectors. Each protector can have two coaxial cables connected to it; thus, if you run two cables between the same two points, only one protector kit is required.

An attachment kit (**P/N 1833106**) contains the parts necessary to connect the station protector to each end of a coaxial cable. The kit consists of a bulkhead coupling adapter and a jumper assembly to connect the bulkhead adapter to the station protector.

IBM station protectors are designed for inside installation only. Install the protector inside the building at the point where the cable enters the building. Also, ensure that the protector is as close to a suitable ground as is practical. You must ground the protector.

On all protector installations, allow ready access to elements that must be serviced or replaced. Ensure that the area of the building where the cables enter or leave does not contain combustible material and is not considered a hazardous area.

For information about outdoor cable runs (including lightning protection), see *Installation and Assembly of Coaxial Cable and Accessories for Attachment to IBM Products*, GA27-2805.

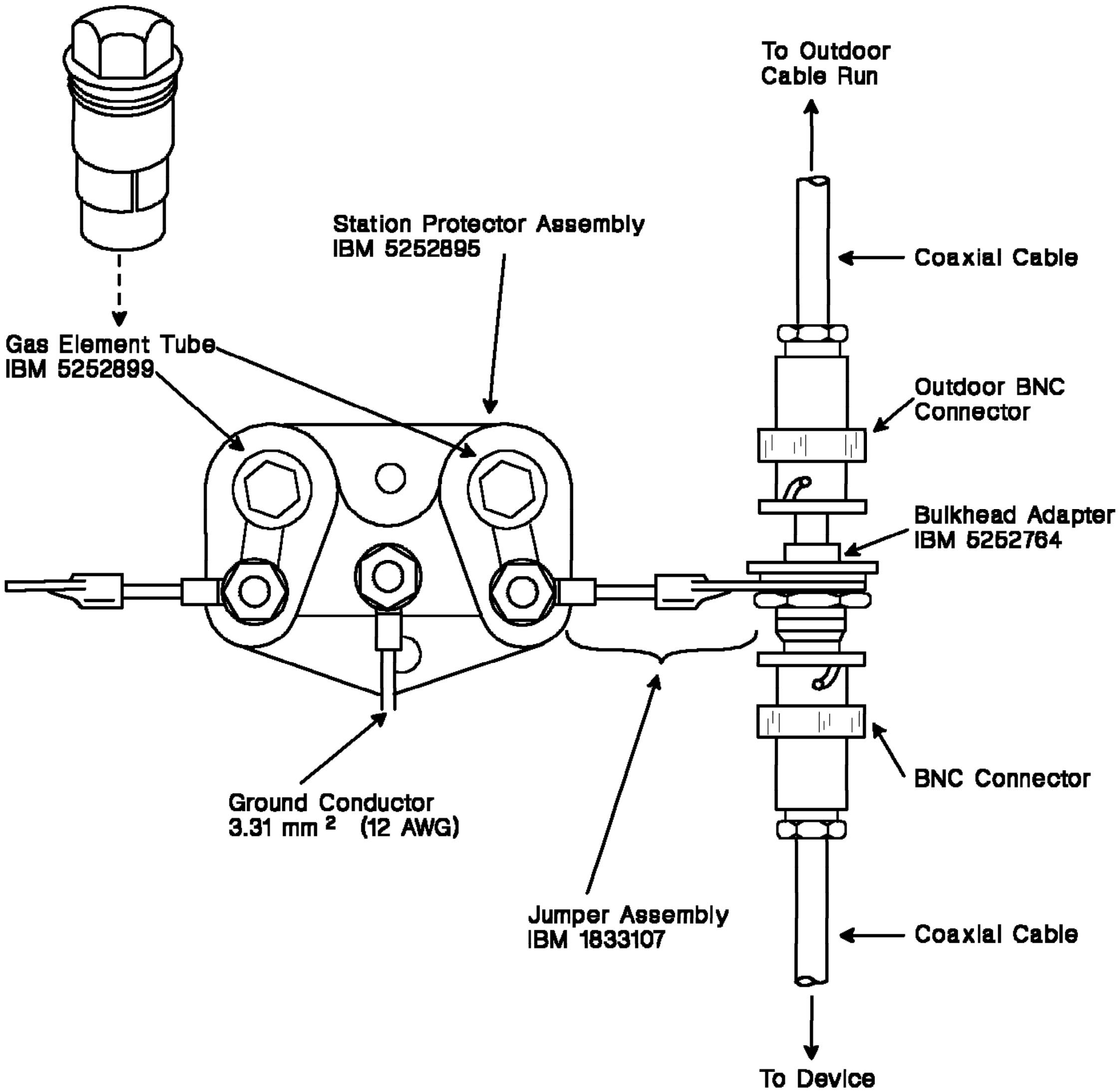


Figure 8. Station Protector and Its Connection to Coaxial Cable

Labeling Coaxial Cables

When installing coaxial cables, attach a label containing the following information to both ends of each cable:

- The device to which the end being labeled is connected.
- The device to which the other end is connected.
- The physical location of the other end of the cable (use an identifier such as a building, floor, column, or other positive location information).
- The length of the cable run.
- The cable tag-out label.

Planning For Cabling Tests

IBM recommends that you test and label coaxial cables that you have ordered before the RS/6000 SP system is installed. Check completion tests on contracts for installation of cabling to ensure that there are no faults, high-resistance connections, or circuit imbalances.

IBM suggests that you check for the following faults:

- Open circuits in individual conductors or shields.
- Short circuits between conductors and shields.
- Grounds on individual conductors or shields.
- Short circuits between the shields of individual cables.

Preparing a Site for Coaxial Cabling

Consider these important points before installing coaxial link cable:

- Cover coupling adapters with shrink tubing to prevent accidental grounding.
- Mount connectors and adapters on shock absorbing material to prevent vibration problems.
- Use non-conductive material for patch panels.

Transmission errors in a coaxial link are often related to the quality of cable, connectors, and adapters used in the installation. A cable or connection fault could cause significant signal distortion.

The level of externally-induced noise in a coaxial link increases with cable length. However, you can minimize externally-induced noise by increasing the space between the coaxial cable and the noise sources.

For more information about the installation of coaxial cable, refer to the *Installation and Assembly of Coaxial Cable and Accessories For Attachment to IBM Products*, GA27-2805.

Routing Indoor Cabling

When planning the layout of your RS/6000 SP, it is important to consider the distance between cables. Unshielded high-power or high-energy sources may require a large separation.

For voltage greater than 440 volts, consult your IBM representative for information on the minimum distances. For voltages up to 440 volts, use the following guidelines for minimum separation distances.

- The minimum distance between coaxial cable and fluorescent, neon, or incandescent lighting fixtures is 127 mm (5 in.).
- The minimum distance between coaxial cable and unshielded power lines or electrical equipment is a function of the power of the equipment.

  Table 19 on page 100 provides guidelines for minimum distances between unshielded coaxial cables and unshielded power line cables for three different usages of separate, grounded, metallic conduits.

Table 19. Separation Distances for Separate Grounded Metallic Conduits	
Power of your equipment	**Minimum distance**
Neither cable in a conduit	
2 kVA or below	130 mm (5 in.)
2 to 5 kVA	300 mm (12 in.)
Over 5 kVA	610 mm (24 in.)
Either cable in a conduit	
2 kVA or below	70 mm (2.5 in.)
2 to 5 kVA	150 mm (6 in.)
Over 5 kVA	300 mm (12 in.)
Both cables in conduits	
2 kVA or below	30 mm (1.2 in.)
2 to 5 kVA	80 mm (3 in.)
Over 5 kVA	150 mm (6 in.)

Note: You can run cable in the same conduit as telephone lines without causing adverse effects.

Planning for Twisted Pair LAN Cabling

This section contains planning information for both SP LAN and external LAN twisted pair Ethernet connections.

Twisted Pair – Customer Responsibility

IBM does not supply twisted pair Ethernet cables or Ethernet hubs. As the customer, you must provide your own cables and hubs.

Requirements for Twisted Pair Ethernet Cabling

Twisted pair Ethernet uses four wires divided into two pairs. Each pair is evenly twisted together over the length of the pair. Twisting the wires improves signal carrying characteristics by canceling out induced signals from external electrical sources. Using twisted pair Ethernet, 10Base-T and 100Base-TX cable lengths of up to 100 meters are possible.

If you use ordinary phone cable in place of Ethernet twisted pair cable, you can experience system problems. Regular phone cable contains parallel wires, resulting in excessive signal cross-talk that triggers CSMA/CD (Carrier Sense Multiple Access/Collision Detection) system responses.

100Base-TX Ethernet

Due to limitations imposed by CSMA/CD on 100Base-TX Ethernet networks, achieving the maximum cable length depends on an accurate network plan. See “Published Ethernet Standards” on page 101 for information sources related to planning 100 MB Ethernet networks.

Your cable segments may be longer or shorter than the nominal length due to the amount of cross-talk and signal attenuation induced in your environment. The actual distance you can extend twisted pair Ethernet is based on a signal loss (or insertion loss) of 11.5 dB. When signal losses exceed this value, the signal is no longer reliable.

Insertion losses consist of the following:

- Signal attenuation in the Ethernet cable
- Signal attenuation in the connectors
- Losses resulting from mismatched components

Wire terminations are done using RJ-45 connectors. However, some SP and control workstation Ethernet adapters require an external transceiver in addition to the RJ-45 jack. You must include all connectors and transceivers when measuring signal attenuation in your system.

Ethernet Cable Routing Practices

The basic cable configuration for twisted pair Ethernet is star wiring. Star wiring completes a network by routing cables from individual machines directly into a central hub. The hub processes incoming signals, makes the required connections, and directs the signal to its intended destination.

The wire used in twisted pair Ethernet networks must meet certain specifications. These are:

- For 10Base-T, wire must be EIA/TIA category 3, 4, or 5 unshielded twisted pair (UTP).
- For 100Base-TX, wire must be EIA/TIA category 5 UTP.
- An Ethernet signal must not pass through more than four hubs enroute from source to destination.

Published Ethernet Standards

The specifications given in EIA/TIA-568 lists other cable and connector standards. EIA/TIA-569 describes standard wiring practices for running Ethernet cables.

EIA/TIA documentation is available from:

Global Engineering – (800) 854-7179

Other Ethernet specifications are covered by IEEE 802.x standards. IEEE documents are available from:

Institute of Electrical and Electronic Engineers – (800) 678-IEEE

Planning for Switch Cabling

If you plan to incorporate SP Switches in your system, you need to plan for a number of cables that run between switches and processor nodes and between each switch and any SP Switch frame in multi-switch systems. This section helps you determine the switch-cable lengths and quantities you need for a new system and for any future expansion.

Note: SP systems with ***up to five*** SP Switches (single-stage switch configuration) do not need a dedicated switch frame; systems with ***more than five*** switches require an SP Switch frame (two-stage configuration).

Switch Software Planning

Switch planning involves many other tasks besides selecting cables. Node placement, node addressing, and system partitioning are just three of the vital issues that you must consider when planning your switch layout. Make certain that you consult *IBM RS/6000 SP: Planning Volume 2, Control Workstation and Software Environment* for software-related switch planning issues before you finalize your switch cabling plans.

Considerations for Future Switch Expansion

An SP Switch Frame is required for systems using more than five switches. However, for future expansion purposes you might want to install a switch frame in a system that would normally require only single-stage switching if you plan to scale up to two-stage configuration at a later date.

As you can see by comparing Figure 9 on page 104 to Figure 10 on page 105, switch cabling is much simpler in a two-stage switch configuration due to the dedicated switch frame. Installing an SP Switch Frame initially greatly simplifies future expansion by eliminating the need to re-cable your switch fabric every time you add another switch.

Consult your IBM sales representative for information on using SP Switch Frames in single-stage systems which have fewer that six switches.

Switch-to-Node Cabling

This section is provided as reference information since you do not need to separately order switch-to-node cabling. These cables are automatically ordered and shipped according to configurator rules.

The switch ports in a switch-equipped frame must be connected to all the nodes in that frame as well as to all the nodes in non-switched expansion frames. As an example, a Model 550 frame containing four high nodes and an SP Switch has twelve unused switch ports; the four nodes within the model frame are connected to four switch ports with four 2-meter cables. The unused ports can be shared by up to twelve additional nodes mounted in non-switched expansion frames. In this case, twelve 10-meter cables are provided to connect these available switch ports to the nodes in the non-switched expansion frames.

Use the following cables to connect switch ports to processor nodes:

- **F/C 9302** – 2-meter switch-to-node cable (for nodes within the switch-equipped frame)
- **F/C 9310** – 10-meter switch-to-node cable (for nodes in non-switched expansion frames)

Planning for Switch-to-Switch Cabling

Use this section to plan for the cable connections between switch-equipped frames in multi-switch SP systems.

The issues that you must consider when planning switch cable connections include:

1. Determining the quantity of cables required
2. Determining the length of required cables
3. Minimizing cable lengths to reduce latency
4. Placing cables to reduce noise from other switch cables and ac sources
5. Making certain that your raised floor is high enough to contain all cables
6. Placing cables so that cooling air flow is unrestricted through raised floor space
7. Labeling and laying cables in an orderly manner, to allow for improved maintenance and reduced risk of mechanical failure
8. Placing cables and frames to allow for system growth

Switch-to-Switch Cable Path Illustrations

This section contains illustrations of typical switch-cable paths between switch-equipped frames. Use them to help in determining the cables that you need for your system. The actual calculations you use to determine cable quantities and lengths are given in the following section.

Switch Cabling Paths for Single-Stage Switch Configurations: In an SP system with single-stage switching, each switch must be connected to every other switch. You must determine the switch-cable lengths and quantities required for each of these connections.

As an example, Figure 9 on page 104 illustrates conceptual floor plans for four different single-stage configurations with from two to five switches. For clarity, only switch-equipped frames are shown; your system might also include non-switched expansion frames.

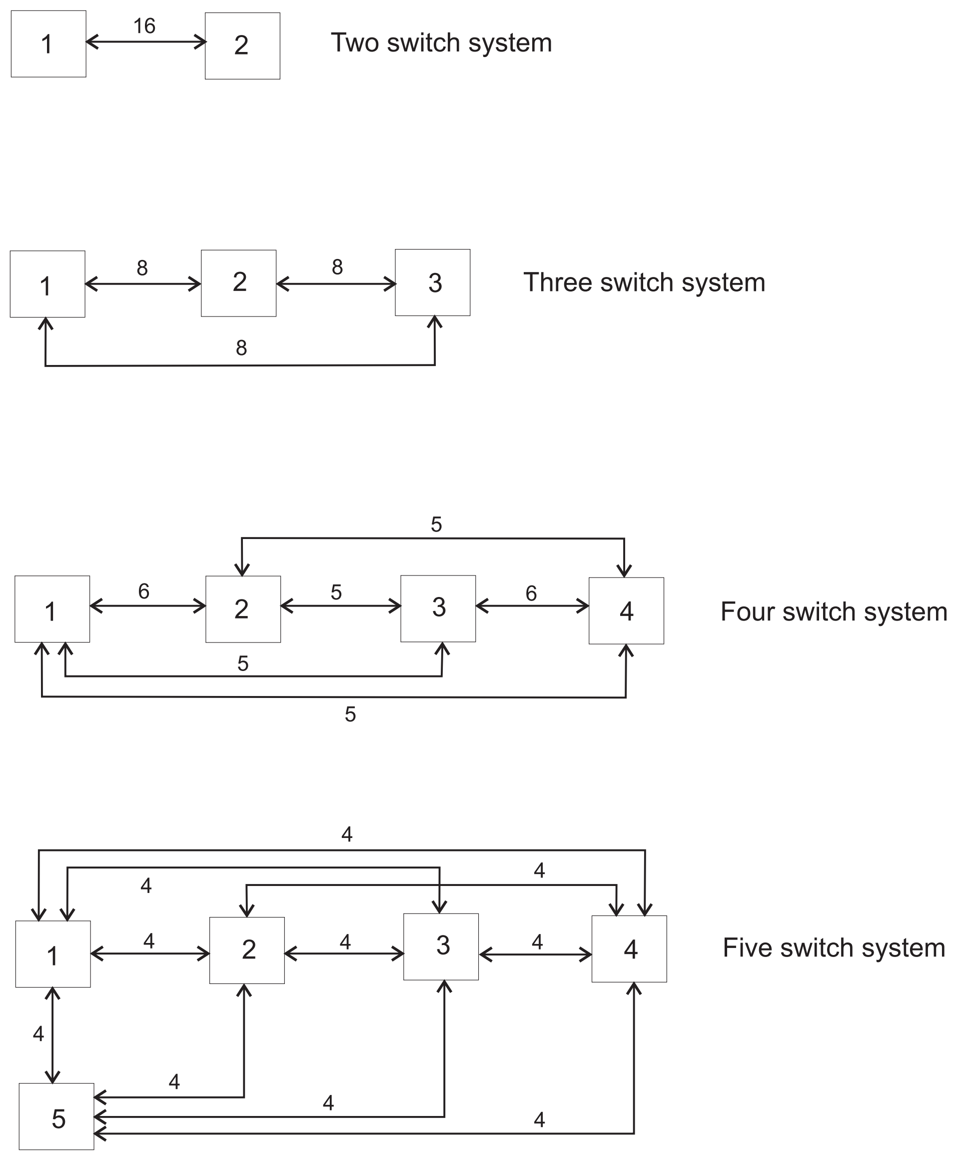


Figure 9. Switch Cable Paths for SP Systems Using Single-Stage Switch Configurations. The numbered squares represent switch-equipped frames and the arrows are the cable sets with the quantity of individual cables in each set as indicated. (Switch-to-node cabling is not shown.)

Switch Cabling Paths for Two-Stage Switch Configurations: The SP Switch frame (**F/C 2031**) is a mandatory prerequisite for all SP systems using more than five switches (two-stage switch configuration). Each switch in a two-stage system connects to the SP Switch frame.

Figure 10 on page 105 illustrates a conceptual cable plan for a two-stage switch configuration. For clarity, only switch-equipped frames are shown; your system might also include non-switched expansion frames.

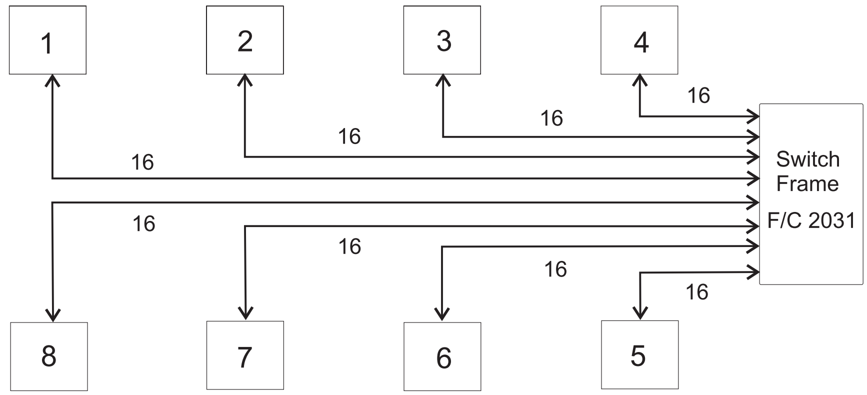


Figure 10. Switch Cable Paths for an SP System Using Two-Stage Switch Configuration. The numbered squares represent switch-equipped frames and the arrows are the cable sets. In systems with an SP Switch frame, all switch cable sets have 16 individual cables as indicated. (Switch-to-node cabling is not shown.)

Determining Switch-to-Switch Cable Quantities

The quantity of switch cables depends on the quantity of switch-equipped frames in the system. Use Table 20 to determine quantities required for standard switch configurations. After determining the quantity and lengths of cables you need, use that information to fill in Table 22 on page 108.

Table 20. Quantities of Switch-to-Switch Cables Required per SP System

Switch Configuration Type	Quantity of Switch-Equipped Frames (excluding SP Switch frame)	Quantity of Cables Between Any Two Switches	Total Quantity of Cables Required	Illustration
Single-Stage	1	N/A	N/A	(not shown)
Single-Stage	2	16	16	Figure 9 on page 104
Single-Stage	3	8	24	Figure 9 on page 104
Single-Stage	4	5 / 6 (See note 1)	32	Figure 9 on page 104
Single-Stage	5	4	40	Figure 9 on page 104
Two-stage configurations requiring SP Switch frames				
Two-Stage	6	16	96	(not shown)
Two-Stage	7	16	112	(not shown)
Two-Stage	8	16	128	Figure 10

Notes:

1. Frames 1 to 2 and Frames 3 to 4 require six cables; all other paths require five.
2. Each cable is approximately 0.5 in. in diameter. IBM recommends that these cables be routed in a customer-supplied raceway or similar protective device to help prevent damage, both in raised and non-raised floor environments.

Determining Switch-to-Switch Cable Lengths

Use the following procedure to calculate the actual length required for each cable connecting switch-equipped frames:

1. First develop your floor plan to determine frame placement (see Chapter 22, “Floor Plans” on page 259).
2. Calculate the cable lengths required between switch-equipped frames using the following formula:

   Cable Length Formula

   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:
     - For systems with single-stage switching, measure the over-the-floor distance from the rear-center of each switch-equipped frame to the rear-center of every other switch-equipped frame.
     - For systems with two-stage switching, measure from the rear-center of each switch-equipped frame to the rear-center of the SP Switch frame (F/C 2031).
   - *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 the 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.)
     - For two-stage switch configurations – 4.8 m (16 ft.)

3. As a check, use Table 21 on page 107 to record the switch-to-switch cable length for each path. Use the following procedure:
   a. Cross out the table cells that do not apply. For example, if you are planning a three-frame system, cross out cells 4 and 5 in each row and column, as well as the column for F/C 2031.
   b. Since cables run directly from the switch-equipped expansion frames to the SP Switch frame in a two-stage switch configuration, cross out all table cells except those under F/C 2031 for systems using this configuration.
   c. For each switch in the left column, record the cable length required to reach the switch in the frames listed to the right.

Table 21. Switch Cable Length Tracking Chart

	To switch in frame number:					
From switch in frame number:	1	2	3	4	5	F/C 2031
1	N/A					
2	N/A	N/A				
3	N/A	N/A	N/A			
4	N/A	N/A	N/A	N/A		
5	N/A	N/A	N/A	N/A	N/A	
6	N/A	N/A	N/A	N/A	N/A	
7	N/A	N/A	N/A	N/A	N/A	
8	N/A	N/A	N/A	N/A	N/A	
For SP systems requiring more than eight switch-equipped frames, contact your IBM sales representative.						

4. After you determine the quantity and lengths of cables you need, use that information to fill in Table 22 on page 108 in "Recording Your Switch-to-Switch Cable Requirements."

Recording Your Switch-to-Switch Cable Requirements

Use the switch cables listed here for switch-to-switch connections between switch-equipped frames. You can choose from the following lengths:

- **F/C 9305**: 5-meter (16 ft.)
- **F/C 9310**: 10-meter (33 ft.)
- **F/C 9315**: 15-meter (49 ft.)
- **F/C 9320**: 20-meter (66 ft.)

It is important that you select the cable size longer than, but as close to, the size you require. Spending the time to calculate the ideal length for each cable enhances your SP system operational efficiency by giving you optimal switch signal performance. Also, with less cable occupying underfloor area, there is improved cooling air flow and better maintenance access.

Use Table 22 on page 108 to record and check the quantity of switch-to-switch cables required for a new system installation. Fill in the quantity of cables needed per length based on your measurements. To check your work, be sure the total quantity of cables calculated in Table 22 on page 108 equals the total quantity of cables listed in Table 20 on page 105 for your size system.

Table 22. Quantity of Switch-to-Switch Cables per Length for a New SP system

	Quantity of Cables				
	5 Meter F/C 9305	**10 Meter** F/C 9310	**15 Meter** F/C 9315	**20 Meter** F/C 9320	**Total Quantity of Cables**
Quantity of cables in a new installation					

Planning Switch Cable Requirements for Future Expansion

Use Table 23 to calculate the quantity of switch cables to order for an expanding system:

1. Fill in the quantity of switch cables in the initial (or existing) system for each cable length.
2. Based on your floor plan for the expanded system, calculate the cable length required between frames. (See "Determining Switch-to-Switch Cable Lengths" on page 106.)
3. Fill in the quantity of switch cables in the expanded system for each cable length (and check against Table 20 on page 105).
4. Calculate the difference between the quantity of cables in the initial system and the quantity in the expanded system.
5. Order the cables required for expansion.

Table 23. Quantity of Switch Cables To Order for an Expanded SP System

	Cable Type			
	5 Meters F/C 9305	**10 Meters F/C 9310**	**15 Meters F/C 9315**	**20 Meters F/C 9320**
Quantity of cables in the expanded system:				
Quantity of cables in the initial system:				
Quantity of cables to be ordered for expansion:				

Chapter 16. Communication Adapter Requirements

This chapter contains information on the quantities of adapters of each type that can be installed in specific node types, suggested PCI adapter quantities and placement, and adapter placement rules and restrictions.

PCI Bus I/O Adapter Requirements for SMP Nodes

If you install the maximum permissible quantity of adapters in the processor nodes, you can achieve ***maximum connectivity*** for the nodes in your system. Use Table 25 on page 111 to determine the maximum quantity of adapters you can use and to determine the resulting power load.

Improved I/O performance, or ***optimum operation***, can usually be realized if you install fewer than the maximum quantity of adapters. For guidelines to help you achieve this improved performance, see “Suggested PCI Adapter Quantities for Optimum Operation” on page 115.

To effectively use the information in this chapter, you need to know the PCI bus and slot naming conventions; for these, see “PCI Bus Group and Slot Descriptions.”

For important installation restrictions for specific adapters, see “PCI Adapter Plugging Rules and Restrictions” on page 113.

PCI Bus Group and Slot Descriptions

This section contains details on PCI bus group and slot naming and labeling conventions for the RS/6000 SP.

PCI Bus Slot Labeling

In both POWER3 and 332 MHz wide nodes, two slots are labeled I2 and two are labeled I3 . They are differentiated in this book as ***I2 and I3 (CPU side)*** and as ***I2 and I3 (I/O side)***.

The CPU side is on the left and the I/O side is on the right, seen as you face the side of the node having the slot labels.

Descriptions of PCI bus group numbering, bus type, slot width and slot speed for POWER3 and 332 MHz SMP nodes are shown in Table 24 on page 110.

Table 24. PCI Bus Descriptions for SMP nodes

Node type	Bus group	Bus type	Slot numbers	Slot width	Slot speed
POWER3 High	0	Primary	I1	32-bit	33 MHz
	0	Primary	I2 and I3	64-bit	33 MHz
	1	Primary	I4 and I5	64-bit	33 MHz
SP Expansion I/O	0-3	Primary	I1 to I8	64-bit	33 MHz
POWER3 Wide	1	Primary	I2 and I3 (CPU side)	32-bit	33 MHz
	2	Primary	I1 to I4 (I/O side)	64-bit	33 MHz
	3	Primary	I5 to I8 (I/O side)	64-bit	33 MHz
POWER3 Thin	1	Primary	I2 and I3	32-bit	33 MHz
332 MHz Wide	1	Primary	I2 and I3 (CPU side)	32-bit	33 MHz
	2	Primary	I1 to I4 (I/O side)	(See Note 1)	33 MHz
	3	Secondary	I5 to I8 (I/O side)	32-bit	33 MHz
332 MHz Thin	1	Primary	I2 and I3	32-bit	33 MHz

Notes:

1. Slot I1 through I3 (I/O side) are 64-bit slots; slot I4 is a 32-bit slot

PCI Adapter Maximum Quantities

The maximum quantities of adapters for POWER3 and 332 MHz SMP Thin and Wide nodes are shown in Table 25 on page 111.

POWER3 High Nodes and SP Expansion I/O Units are shown in Table 26 on page 112.

Quantities suggested for improved performance are shown in “Suggested PCI Adapter Quantities for Optimum Operation” on page 115.

POWER3 and 332 MHz Thin and Wide node

Table 25. Maximum quantities of PCI adapters for SMP thin and wide nodes

Feature Code	PCI Adapter Name	Number of PCI Slots Required	Max. Number Allowed Per Node Wide / Thin	Notes
2732	Serial HIPPI Channel	1	2 / 1	

Feature Code	PCI Adapter Name	Number of PCI Slots Required	Max. Number Allowed Per Node Wide / Thin	Notes
2733	Serial HIPPI Channel	1	2 / 1	
2741	FDDI SK-NET LP SAS	1	4 / 2	1
2742	FDDI SK-NET LP DAS	1	4 / 2	1
2743	FDDI SK-NET UP SAS	1	4 / 2	1
2751	S/390 ESCON	1	2 / 1	
2920	Token Ring Auto Lanstream	1	8 / 2	
2943	RS-422 8-port Async.	1	6 / 2	
2944	WAN RS232 128-port	1	7 / 2	
2947	ARTIC960Hx 4-port selectable	1	6 / 2	
2962	2-port Multiprotocol Adapter	1	6 / 2	
2963	ATM Turboways 155 UTP	1	4 / 2	1
2968	Ethernet 10/100 MB	1	4 / 2	1
2969	Gigabit Ethernet-SX	1	2 / 1	
2985	Ethernet 10 MB BNC	1	8 / 2	
2987	Ethernet 10 MB AUI	1	8 / 2	
2988	ATM 155 MMF	1	4 / 2	1
4959	Token Ring	1	4 / 2	
6205	Dual Channel Ultra2 SCSI	1	2 / 1	
6206	Ultra SCSI SE	1	4 / 2	
6207	Ultra SCSI DE	1	4 / 2	
6208	SCSI-2 F/W SE	1	8 / 2	
6209	SCSI-2 F/W DE	1	8 / 2	
6215	SSA RAID 5	1	6 / 2	
6222	F/W Cache Option	0	(mounts on 6215)	
6225	SSA RAID EL	1	2 / 1	
6235	Fast-Write Cache Option for F/C 6225	0	(mounts on 6225)	
6310	ARTIC960RxD Quad Digital Trunk	1	4 / 2	

Table 25. Maximum quantities of PCI adapters for SMP thin and wide nodes

Notes:

1. Group restrictions apply. For details, see “PCI Adapter Plugging Rules and Restrictions” on page 113.

POWER3 High Node and SP Expansion I/O Unit

The maximum quantities for POWER3 High nodes, SP Expansion I/O Units, and high node/expansion unit combinations are shown in Table 26.

Table 26 (Page 1 of 2). Maximum quantities of PCI adapters for POWER3 High nodes and SP Expansion I/O Units

Feature Code	PCI Adapter Name	Max. Quantity Per POWER3 High node	Max. Quantity Per SP Expansion I/O Unit	Combination Max. Quantity (see Note 1)
2732	Serial HIPPI SW	1	2	2
2733	Serial HIPPI LW	1	2	2
2741	FDDI SK-NET LP SAS	5	8	24
2742	FDDI SK-NET LP DAS	5	8	24
2743	FDDI SK-NET UP SAS	5	8	24
2751	S/390 ESCON	0	4	10
2920	Token Ring Auto Lanstream	5	8	24
2943	RS-422 8-port Async.	5	8	24
2944	WAN RS232 128-port	5	8	24
2947	ARTIC960Hx 4-port selectable	4	8	24
2962	2-port Multiprotocol Adapter	5	8	24
2963	ATM Turboways 155 UTP	3	8	24
2968	Ethernet 10/100 MB	5	8	24
2969	Gigabit Ethernet-SX	1	2	8
2985	Ethernet 10 MB BNC	5	8	24
2987	Ethernet 10 MB AUI	5	8	24
2988	ATM 155 MMF	3	8	24
4959	Token Ring	3	8	24
6205	Dual Channel Ultra2 SCSI	1	2	6
6206	Ultra SCSI SE	3	8	24
6207	Ultra SCSI DE	3	8	24
6215	SSA RAID 5	2	4	24
6222	F/W Cache Option	(mounts on 6215)		
6225	SSA RAID EL	2	2	12
6235	Fast-Write Cache Option	(mounts on 6225)		
6310	ARTIC960RxD Quad Digital Trunk	3	0	3

Feature Code	PCI Adapter Name	Max. Quantity Per POWER3 High node	Max. Quantity Per SP Expansion I/O Unit	Combination Max. Quantity (see Note 1)

Table 26 (Page 2 of 2). Maximum quantities of PCI adapters for POWER3 High nodes and SP Expansion I/O Units

Notes:

1. The combination column shows the maximum quantity of adapters supported for a specific POWER3 High node and six SP Expansion I/O Units connected to that node.

PCI Adapter Plugging Rules and Restrictions

This section lists specific PCI adapter installation rules and restrictions by node type.

POWER3 High Node

- F/C 6206 and 6207 cannot be placed in slot 1 or 2.
- F/C 6215, 6225 must be placed in slot 3 or 5.
- F/C 2947 and 6310 cannot be placed in slot 1.
- F/C 2732, 2733, 2969, 6205 must be placed in slot 5.

SP Expansion I/O Unit

- F/C 2732, 2733 must be placed in slot 1, 3, or 5.
- F/C 6215 must be placed in slot 1, 3, 5, or 7.
- F/C 2969, 6205, 6225 must be placed in slot 1 or 3.
- F/C 2963 and 2988 cannot be placed to the immediate right of F/C 2751.
- F/C 2751 must be placed in slot 1, 3, 5, or 7 in unit 3 or 4, or in slot 5 or 7 in unit 5.

POWER3 Wide Node

- No more than four (in any combination) of F/C 2741, 2742, 2743, 2963, 2968, 2988 can be installed.
- If one F/C 2969 is installed, no more than two (in any combination) of F/C 2741, 2742, 2743, 2963, 2968, 2988 can be installed.
- If two F/C 2969 are installed, none of F/C 2741, 2742, 2743, 2963, 2968, 2988 can be installed.
- F/C 2751 must be placed in either slot I3 (CPU side) or in slot I4.
- If one F/C 2969 is installed, place it in slot I1 through I8 (I/O side).
- If two F/C 2969 are installed, place one in slot I1 through I4 (I/O side) and the other in slot I5 through I8.
- F/C 2963 and 2988 cannot be placed in slot I5.
- Maximum of one F/C 2732, 2733, 2969, 6205, 6225 per PCI bus.
- F/C 6205 cannot be placed in slot I5 to I8.

- If two F/C 6225 are installed, each must be placed in a separate PCI bus using slot I2 or I3 (CPU side), slot I1 to I4 (I/O side) or slot I5 to I8 (I/O side).
- If two F/C 2732 are installed, one must be placed in slot I2 or I3 (CPU side) and the other must be placed in slot I1 to I4 (I/O side).
- If two F/C 2733 are installed, one must be placed in slot I2 or I3 (CPU side) and the other must be placed in slot I1 to I4 (I/O side).

332 MHz Wide Node

- No more than four (in any combination) of F/C 2741, 2742, 2743, 2963, 2968, 2988 can be installed.
- If one F/C 2969 is installed, no more than two (in any combination) of F/C 2741, 2742, 2743, 2963, 2968, 2988 can be installed.
- If two F/C 2969 are installed, none of F/C 2741, 2742, 2743, 2963, 2968, 2988 can be installed.
- F/C 2751 must be placed in either slot I3 (CPU side) or in slot I4, except: If F/C 2969 is placed in slot I4, F/C 2751 must be placed in slot I3 (I/O side).
- If one F/C 2969 is installed, it must be placed in slot I2 or I3 (CPU side) or in slot I4.
- If two F/C 2969 are installed, place one in slot I2 or I3 (CPU side) and the other in slot I4.
- F/C 2732, 2733, 2751, 2947, 2962, 2963, 2968 (when operating in 100 Mbps mode), 2969, 2988, 6205, 6206, 6207, 6208 (when operating in SCSI–2 Fast/Wide mode), 6209 (when operating in Fast/Wide mode or to tape), 6215, 6225, 6310 cannot be placed in slot I5 through I8.
- Maximum of one F/C 2732, 2733, 2969, 6205, 6225 per PCI bus.
- If two F/C 6225 are installed, each must be placed in a separate PCI bus using slot I2 or I3 (CPU side), slot I1 to I4 (I/O side) or slot I5 to I8 (I/O side).
- If two F/C 2732 are installed, one must be placed in slot I2 or I3 (CPU side) and the other must be placed in slot I1 to I4 (I/O side).
- If two F/C 2733 are installed, one must be placed in slot I2 or I3 (CPU side) and the other must be placed in slot I1 to I4 (I/O side).

POWER3 and 332 MHz Thin Node

- No more than four (in any combination) of F/C 2741, 2742, 2743, 2963, 2968, 2988 can be installed.
- If one F/C 2969 is installed, no more than two (in any combination) of F/C 2741, 2742, 2743, 2963, 2968, 2988 can be installed.
- If two F/C 2969 are installed, none of F/C 2741, 2742, 2743, 2963, 2968, 2988 can be installed.
- F/C 2751 must be placed in slot I3. (If only one of any other adapter is installed, placing the other adapter in slot I2 initially avoids moving it if you install F/C 2751 later.)
- Maximum of one F/C 2732, 2733, 2969, 6205, 6225 per thin node.

Suggested PCI Adapter Quantities for Optimum Operation

The guidelines in this section help you configure your PCI nodes for optimum operation with good throughput for each adapter. To achieve this, each adapter type is assigned a ***weighting factor***, which provides the following:

1. Estimates of the quantity of adapters to use concurrently
2. The bus locations for the different adapter types

Weighting Factors

The weighting factors are based on the node and PCI bus architecture, and processor and memory utilization for larger I/O read and write operations. (Larger and smaller I/O reads and writes refers to the basic I/O payload.) Nodes are assumed to have the maximum quantity of CPUs along with sufficient memory as required by a particular application.

Smaller I/O reads and writes increase the required node resources and decrease the quantity of adapters from that which is suggested for optimum operation.

The weighting factor for each PCI adapter type is shown in Table 27.

Table 27 (Page 1 of 2). PCI Adapter Weighting Factors

Feature	Description	Type	Weighting Factor	Notes
2732	Serial HIPPI SW	Comm	High	
2733	Serial HIPPI LW	Comm	High	
2741	FDDI LP SAS	Comm	Low	
2742	FDDI LP DAS	Comm	Low	
2743	FDDI UP SAS	Comm	Low	
2751	ESCON CU Emulation	Comm	Medium	
2920	Token Ring	Comm	Low	
2943	WAN RS232, 8-port	Comm	Low	
2944	WAN RS232, 128-port	Comm	Low	
2947	ARTIC960Hx, Multi 4-port	Comm	Low	
2962	Multiprotocol, 2-port	Comm	Low	
2963	ATM 155 UTP	Comm	Medium	
2968	Ethernet 10/100	Comm	Low (10) Medium (100)*	2
2969	Gigabit Ethernet	Comm	High	
2985	Ethernet 10 BNC/RJ-45	Comm	Low	
2987	Ethernet 10 AUI/RJ-45	Comm	Low	
2988	ATM 155 MMF	Comm	Medium	
4959	Token Ring	Comm	Low	
6205	Dual Channel Ultra2 SCSI	Storage	High	5
6206	Ultra SCSI SE	Storage	Low (F) Medium (F/W)* High (Ultra)	3

Table 27 (Page 2 of 2). PCI Adapter Weighting Factors

Feature	Description	Type	Weighting Factor	Notes
6207	Ultra SCSI DE	Storage	Low (F) Medium (F/W) High (Ultra)*	4
6215	SSA RAID 5	Storage	Medium (RAID) High (Dual Loop)	
6225	SSA RAID	Storage	High	6
6310	ARTIC960RxD WAN DT Quad	Comm	Low	

Notes:

1. Asterisk (*) indicates the ***default*** weighting factor used by the configurator
2. Low for 10 Mbps operation, Medium* for 100
3. Low for Fast SCSI operation, Medium* for Fast/Wide, High for Ultra
4. Low for Fast SCSI operation, Medium for Fast/Wide, High* for Ultra
5. Medium for single channel in Fast SCSI operation, High for all other single or dual channel Fast SCSI, Fast/Wide, Ultra or Dual Channel Ultra2 operation
6. Medium* for RAID single loop operation, High for non-RAID

Following are lists of weighting factor guidelines and suggested quantities of adapters (by node type, PCI bus, and weighting factor) to help you achieve optimum operation on PCI buses:

Adapter Guidelines for using Weighting Factors

1. Distribute adapters across the PCI buses to equalize the weighting factor on each bus (application usage might require a different distribution).
2. Place adapters with high and medium weighting factors in slots on a ***primary*** PCI bus.
3. Except as suggested otherwise in this section, adapters with a low weighting factor can be placed in slots on a secondary PCI bus where allowed by "PCI Adapter Plugging Rules and Restrictions" on page 113. (Adapters on a primary PCI bus usually give better performance than on a secondary bus.)
4. F/C 2969 is a 64-bit PCI adapter, capable of operating in a 32-bit slot at lower throughput.
5. The total quantity of adapters used on a node can actually be fewer than the sum suggested below, due to system resource limitations.

POWER3 High Node

Select ***one*** of the following options for PCI Bus 0:

- 1 High
- 2 Medium
- 1 Medium and 2 Low

- 3 Low

Select ***one*** of the following options for PCI Bus 1:

- 1 High
- 2 Medium
- 1 Medium and 1 Low
- 2 Low

SP Expansion I/O Unit

Select ***one*** of the following options for ***each*** PCI Bus (0, 1, 2, and 3):

- 1 High
- 2 Medium
- 1 Medium and 1 Low
- 2 Low

POWER3 Thin and Wide Node

Select ***one*** of the following options for PCI Bus 1:

- 1 High
- 2 Medium
- 1 Medium and 1 Low
- 2 Low

POWER3 Wide Node

Select ***one*** of the following options for ***both*** PCI Bus 2 and PCI Bus 3:

- 1 High
- 2 Medium and 2 Low
- 1 Medium and 3 Low
- 4 Low

332 MHz Thin and Wide Node

Select ***one*** of the following options for PCI Bus 1:

- 1 High
- 2 Medium
- 1 Medium and 1 Low
- 2 Low

332 Mhz Wide Node

Select ***one*** of the following options for PCI Bus 2 and PCI Bus 3 ***combined***:

- 1 High (place on Bus 2)
- 2 Medium (place on Bus 2) and 2 Low (should be on Bus 2)
- 1 Medium (place on Bus 2) and 4 Low (3 should be on Bus 2 with precedence given to comm-type adapters, and 1 on Bus 3)

]
]

- 6 Low (4 on Bus 2, with precedence given to comm-type adapters, and 2 should be on Bus 3)

MCA Bus Adapter Requirements for Wide, Thin and High Nodes

The following communication adapters are available for MCA bus thin, wide and high nodes. You need the information in the following table to determine how many adapters can be used in each node type and to determine the resulting power load.

Note: Check node chapters for bus placement restrictions or adapter incompatibilities.

Some of the communications adapters listed here **are not** supported on high nodes.

These features are described in Chapter 18, “MCA Communication Adapters” on page 161.

Table 28 (Page 1 of 3). Micro Channel Adapter Requirements for Wide, Thin, and High Nodes

Feature Code	MCA Adapter Name	Number of MCA Slots Required	Max. Number Allowed per Node Wide/Thin/High	Notes
1902	Optics Daughter Card	0	2 / 1 / NA	9
1904	Fibre Channel 1 GB	1	2 / 2 / NA	1, 9
1906	Fibre Channel 266	1	2 / 2 / NA	1, 9
2402	IBM Network Terminal Accelerator 256	1	7 / 4 / 4	9
2403	IBM Network Terminal Accelerator 2048	1	7 / 4 / 4	9
2410	SCSI-2 External I/O Controller	1	7 / 4 / NA	
2412	Enhanced SCSI-2 Differential Fast/Wide Adapter/A	1	7 / 4 / 14	
2415	SCSI-2 Fast/Wide Adapter/A	1	7 / 4 / 14	
2416	SCSI-2 Differential Fast/Wide Adapter/A	1	7 / 4 / 14	9
2420	SCSI-2 Differential External I/O Controller	1	7 / 2 / NA	9
2700	4-Port Multiprotocol Communications Controller	1	7 / 3 / 8	
2723	FDDI Dual Ring	1	3 / 2 / 4	3
2724	FDDI SAS Single Ring	1	6 / 2 / 8	
2735	HIPPI	5	1 / NA / 2	4
2754	S/390 ESCON Channel Emulator Adapter	2	2 / 1 / 4	
2755	BMCA	1	2 / 2 / 2	5, 6

Table 28 (Page 2 of 3). Micro Channel Adapter Requirements for Wide, Thin, and High Nodes				
Feature Code	**MCA Adapter Name**	**Number of MCA Slots Required**	**Max. Number Allowed per Node Wide/Thin/High**	**Notes**
2756	ESCON Control Unit Adapter	2	2 / 1 / 4	
2930	RS-232 8-port Adapter	1	7 / 4 / 14	
2940	8-port Async Adapter	1	7 / 4 / 14	9
2960	X.25 Interface Co-Processor/2	1	7 / 4 / 8	
2970	Token-Ring	1	7 / 4 / 12	
2972	Auto Token-Ring LANstreamer MC 32	1	7 / 3 / 12	
2980	Ethernet	1	7 / 3 / 12	2
2984	ATM TURBOWAYS 100	1	2 / 2 / 2	9
2989	ATM TURBOWAYS 155	1	4 / 2 / 4	9
2992	Ethernet/FDX 10 Mbps TP/AUI MC Adapter	1	7 / 3 / 12	2
2993	Ethernet/FDX 10 Mbps BNC MC Adapter	1	7 / 3 / 12	2
2994	10/100 Ethernet Twisted Pair MC Adapter	1	2 / 2 / 4	
4224	Ethernet 10BaseT Transceiver	0	8 / 4 / 15	
6212	9333 HPSA (High Performance Subsystem Adapter)	1	6 / 2 / 8	7
6214	SSA 4-Port Adapter	1	4 / 2 / 8	
6216	SSA4-Port Adapter	1	4 / 2 / 8	
6217	SSA 4-Port RAID Adapter	1	4 / 2 / 8	
6219	Micro Channel SSA Multi-Initiator/RAID EL Adapter	1	4 / 2 / 8	8
6222	SSA Fast-Write Cache Option	0	Mounts on F/C 6219	
6305	Digital Trunk Dual	1	6 / 3 / 2	
7006	Realtime Interface Co-Processor Portmaster	1	7 / 4 / 8	
8128	128-Port Async Controller	1	7 / 4 / 7	

Table 28 (Page 3 of 3). Micro Channel Adapter Requirements for Wide, Thin, and High Nodes				
Feature Code	**MCA Adapter Name**	**Number of MCA Slots Required**	**Max. Number Allowed per Node** **Wide/Thin/High**	**Notes**

Notes:

1. Not supported in 120 MHz thin nodes or 135 MHz wide nodes.
2. High nodes and wide nodes have a minimum of one if used.
3. FDDI dual ring adapters (**F/C 2723**) have a mandatory prerequisite of the FDDI-SAS (**F/C 2724**).
4. The HIPPI feature (**F/C 2735**) uses three physical MCA slots and requires a total of five slots to satisfy power and thermal requirements.
5. The BMCA node-to-node (**F/C 2752**) cables are required on any node having the BMCA adapter and not having an external host connection.
6. BMCA adapters cannot be installed in two adjacent MCA slots due do physical cabling constraints. There is a limit of 32 adapters per frame, and a limit of 16 cables exiting the frame.
7. A maximum of 128 9333 High Performance Subsystem Adapter cables is allowed per frame.
8. Will not operate in SSA loops containing F/C 6214 or F/C 6216.
9. Withdrawn from production.

Chapter 17. PCI Communication Adapters

This chapter contains details on all available PCI-type communication adapters for the RS/6000 SP system. These features are installed in SMP-type processor nodes to connect SP systems to external networks and storage devices.

Network connections through SP nodes are typically slower than, and might not have the availability of, network connections through an SP Switch Router. For details, see Chapter 14, “RS/6000 SP Switch Routers (M/T 9077 04S and 16S)” on page 79.

PCI Adapter Rules

For PCI adapter plugging rules, restrictions, and maximum and suggested quantities, see “PCI Bus I/O Adapter Requirements for SMP Nodes” on page 109.

Table 29 lists all currently available PCI adapters.

Table 29 (Page 1 of 2). Available RS/6000 SP PCI Adapter Features

Feature Code	Adapter Type
2732	“Short-Wave Serial HIPPI PCI Adapter (F/C 2732)” on page 122
2733	“Long-Wave Serial HIPPI PCI Adapter (F/C 2733)” on page 123
2741	“FDDI SK-NET LP SAS PCI Adapter (F/C 2741)” on page 124
2742	“FDDI SK-NET LP DAS PCI Adapter (F/C 2742)” on page 127
2743	“FDDI SK-NET UP DAS PCI Adapter (F/C 2743)” on page 132
2751	“S/390 ESCON Channel PCI Adapter (F/C 2751)” on page 133
2920	“Auto LANstreamer Token Ring PCI Adapter (F/C 2920)” on page 134
2943	“8-Port Async PCI Adapter EIA 232/RS-422 (F/C 2943)” on page 135
2944	“WAN 128-Port Async PCI Adapter EIA-232 (F/C 2944)” on page 136
2947	“ARTIC960Hx 4-Port Selectable PCI Adapter (F/C 2947)” on page 138
2962	“2-Port Multiprotocol X.25 PCI Adapter (F/C 2962)” on page 139
2963	“TURBOWAYS 155 UTP ATM PCI Adapter (F/C 2963)” on page 140
2968	“10/100 Ethernet 10BaseTX PCI Adapter (F/C 2968)” on page 142
2969	“Gigabit Ethernet - SX PCI Adapter (F/C 2969)” on page 143
2985	“10Base2 and 10BaseT (BNC/RJ-45) Ethernet LAN PCI Adapter (F/C 2985)” on page 144
2987	“10Base5 and 10BaseT (AUI/RJ-45) Ethernet LAN PCI Adapter (F/C 2987)” on page 146
2988	“TURBOWAYS 155 ATM PCI Adapter (F/C 2988)” on page 148
4959	“High-Speed Token-Ring PCI Adapter (F/C 4959)” on page 149
6205	“Dual Channel Ultra2 SCSI PCI Adapter (F/C 6205)” on page 150
6206	“SCSI-2 Ultra/Wide SE PCI Adapter (F/C 6206)” on page 152

Table 29 (Page 2 of 2). Available RS/6000 SP PCI Adapter Features

Feature Code	Adapter Type
6207	"SCSI-2 Ultra/Wide DE PCI Adapter (F/C 6207)" on page 154
6222	"SSA Fast-Write Cache Option (F/C 6222)" on page 157
6225	"Advanced SerialRAID PCI Adapter (F/C 6225)" on page 157
6235	"32 MB Fast-Write Cache Option Card (F/C 6235)" on page 159
6310	"ARTIC960RxD Quad Digital Trunk PCI Adapter (F/C 6310)" on page 159

Short-Wave Serial HIPPI PCI Adapter (F/C 2732)

The Short-Wave Serial HIPPI adapter (F/C 2732) provides high-speed connectivity via the ANSI serial HIPPI channel. It provides (via short-wave optics) the capability to participate in supercomputer environments, attach to disk-array subsystems, other SP systems, HIPPI switches, other vendor computers, and tape subsystems. It is a 32-bit, 33 MHz universial PCI serial HIPPI adapter and supports TCP/IP for communication. Data is sent and received over optical fiber at 1.2 Gbps using the HIPPI standard 20/24-bit encoding scheme. The effective maximum data rate of the HIPPI interface is 800 Mbps.

Feature Characteristics

This feature has the following characteristics:

- Single-slot, full-size 32-bit PCI adapter
- PCI 2.1 Specification compatible
- Intel 960 processor
- 2 MB DRAM program store
- 2 MB transmit and receive RAM
- Short-wave optics

Feature Components

This feature order provides the following:

- Adapter card
- Diagnostic wrap plugs
- Installation instructions

Customer Components

You must supply the following components for this feature:

- Short-wave cabling
- Dual SC connector 50/125 micron multi-mode fiber

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot.

Software Requirements

This feature has the following software requirements:

- AIX 4.3.2 or later installed on the node
- PSSP 3.1 or later installed on the node
- Order PID 5765-E07 for serial HIPPI driver set

Long-Wave Serial HIPPI PCI Adapter (F/C 2733)

The Long-Wave Serial HIPPI adapter (F/C 2733) provides high-speed connectivity via the ANSI serial HIPPI channel. It provides (via long-wave optics) the capability to participate in supercomputer environments, attach to disk-array subsystems, other SP systems, HIPPI switches, other vendor computers, and tape subsystems. It is a 32-bit, 33 MHz universial PCI serial HIPPI adapter and supports TCP/IP for communication. Data is sent and received over optical fiber at 1.2 Gbps using the HIPPI standard 20/24-bit encoding scheme. The effective maximum data rate of the HIPPI interface is 800 Mbps.

Feature Characteristics

This feature has the following characteristics:

- Single-slot, full-size 32-bit PCI adapter
- PCI 2.1 Specification compatible
- Intel 960 processor
- 2 MB DRAM program store
- 2 MB transmit and receive RAM
- Long-wave optics

Feature Components

This feature order provides the following:

- Adapter card
- Diagnostic wrap plugs
- Installation instructions

Customer Components

You must supply the following components for this feature:

- Short-wave cabling
- Dual SC connector 50/125 micron multimode fiber

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot.

Software Requirements

This feature has the following software requirements:

- AIX 4.3.2 or later installed on the node
- PSSP 3.1 or later installed on the node
- Order PID 5765-E07 for serial HIPPI driver set

FDDI SK-NET LP SAS PCI Adapter (F/C 2741)

The SYSKONNECT SK-NET FDDI-LP SAS PCI Adapter (F/C 2741) is a fiber optical FDDI Single Attach Station that is compatible with the FDDI-ANSI X3T12 specifications and FDDI Standard Series. The adapter provides single attachment to a FDDI concentrator (or point-to-point) using fiber optic cabling (not supplied with the adapter).

Feature Characteristics

This feature has the following characteristics:

- Supports single-ring FDDI attachment at 100 Mbps via a customer-supplied FDDI concentrator
- Supports all TCP/IP protocols and ANSI Station Management (SMT) 7.3

Feature Components

This feature order provides the following:

- Adapter card
- Diagnostic wrap plug
- Diskette with adapter device driver
- Installation instructions

Customer Components

You must supply the following components for this feature:

- A FDDI concentrator such as the IBM 8240 (or equivalent) concentrator to connect to your FDDI local area network
- One 62.5/125 micron multimode fiber duplex cable with SC connectors

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot.

Software Requirements

This feature has the following software requirements:

- AIX 4.2.1 or later installed on the node
- PSSP 2.4 or later installed on the node
- Adapter device driver and FDDI common code (provided with adapter)

FDDI Typical SP Configuration

Figure 11 shows a typical FDDI configuration for the SP system.

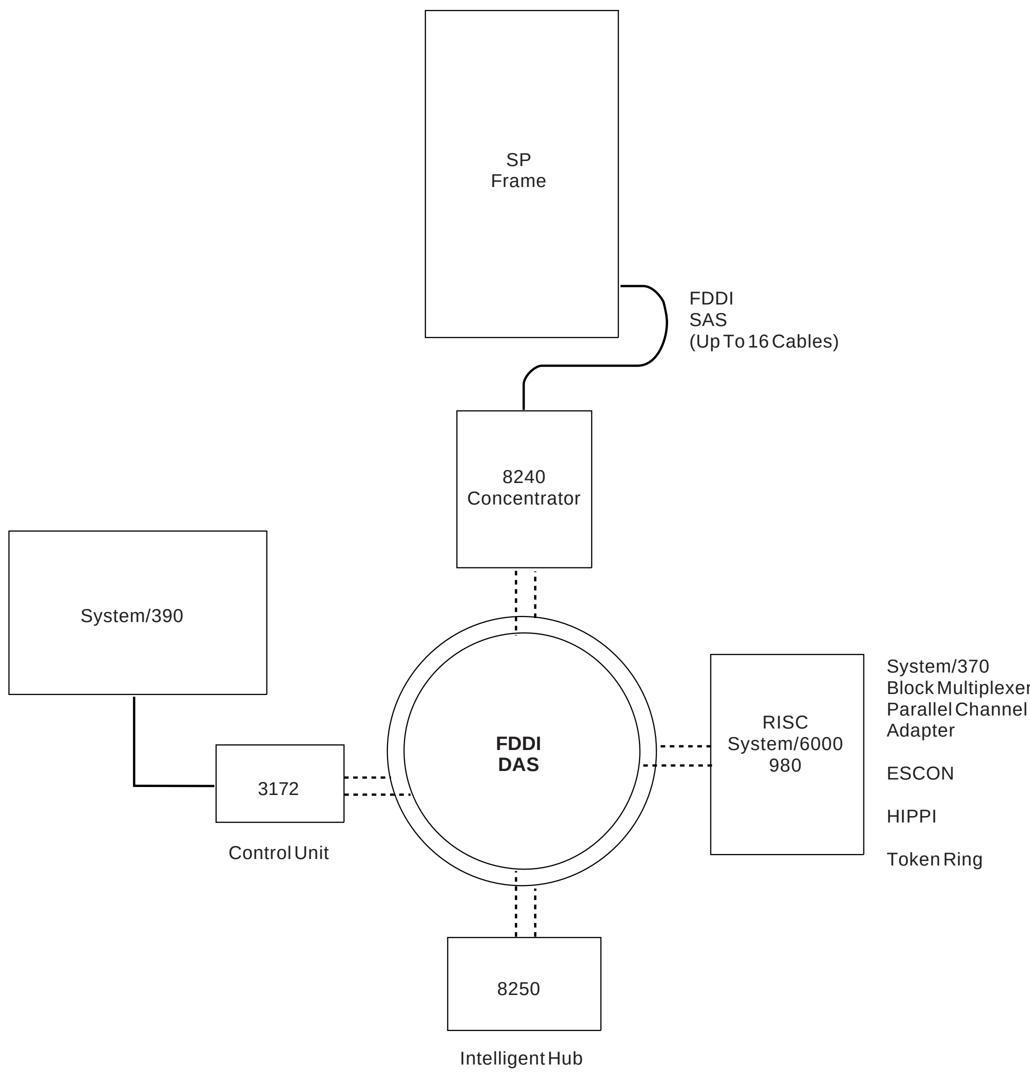


Figure 11. Typical FDDI Configuration for the SP System

FDDI Single-Ring Attachment Station

Figure 12 on page 126 shows a typical FDDI single-ring attachment station (SAS) cabling from the RS/6000 SP frame to the IBM 8240 Concentrator:

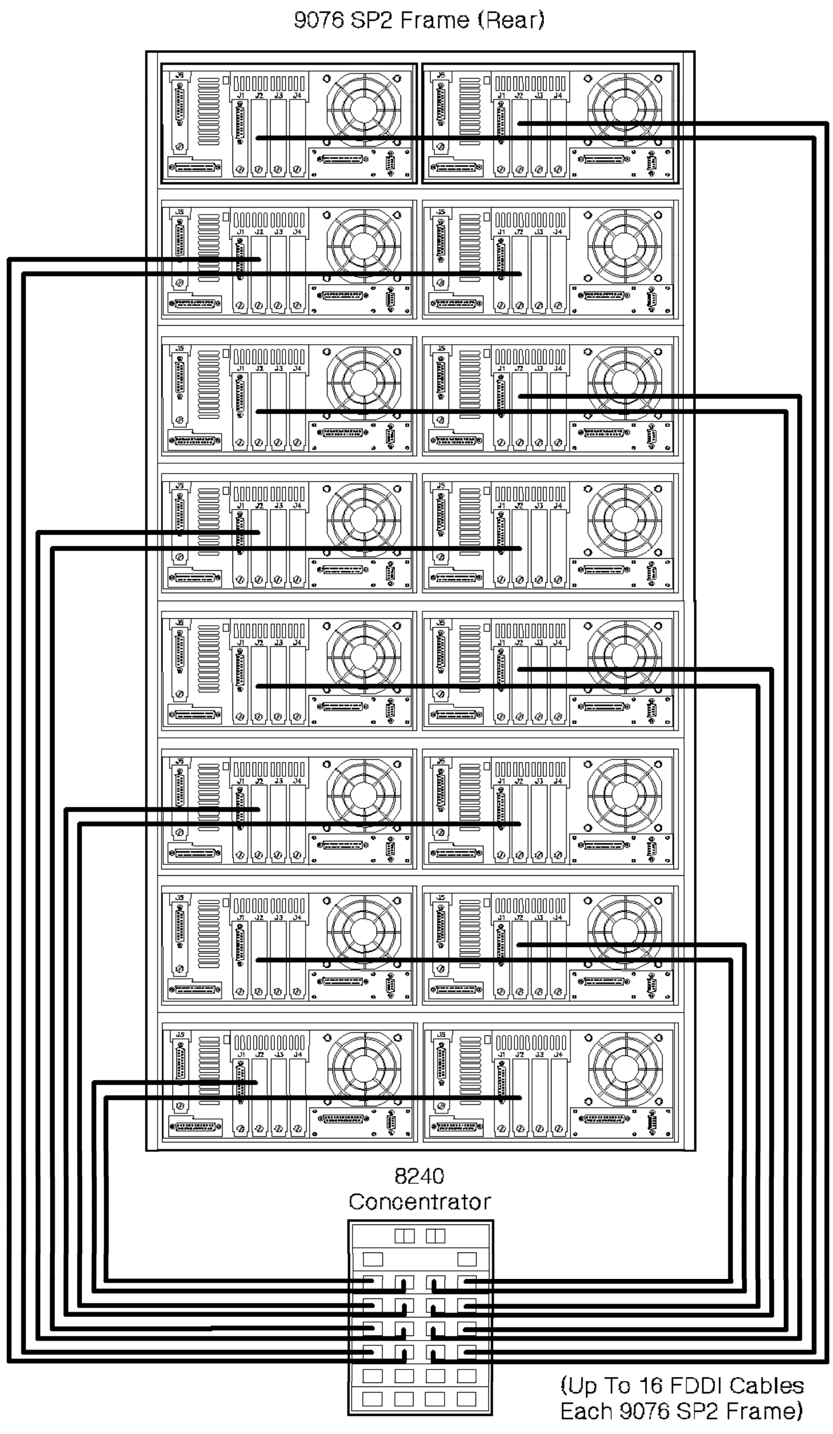


Figure 12. Typical FDDI Single-Ring Attachment Cabling for the SP System

The IBM 8240 Concentrator provides six plug modules. Each module has four port fiber modules or four port copper-shielded modules. The SP supports only the fiber connection.

External Cabling Routing for FDDI Cables

The SP uses a maximum of 120 inches of FDDI cable budget. Table 30 shows the cable budget needed to reach individual nodes in an SP frame.

Table 30. Cable Budget Information for FDDI Feature

To Node	Measured in Millimeters	Measured in Inches
1	1780	71
2	1500	59
3	1680	66
4	1980	78
5	2160	85
6	1850	73
7	2030	80
8	2340	92
9	2510	99
10	2210	87
11	2390	94
12	2690	106
13	2870	113
14	2570	101
15	2740	108
16	3050	120

FDDI SK-NET LP DAS PCI Adapter (F/C 2742)

The SYSKONNECT SK-NET FDDI-LP DAS PCI Adapter (F/C 2742) is a fiber optical FDDI Dual Attach Station that is compatible with the FDDI-ANSI X3T12 specifications and FDDI Standard Series. The adapter provides either dual attachment to the main ring path or dual homing to one or two FDDI concentrators using fiber optic cabling (not supplied with the adapter).

Feature Characteristics

This feature has the following characteristics:

- Supports dual ring FDDI attachment at 100 Mbps
- Supports all TCP/IP protocols and ANSI Station Management (SMT) 7.3

Feature Components

This feature order provides the following:

- Adapter card
- Diagnostic wrap plug
- Diskette with adapter device driver
- Installation instructions

Customer Components

You must supply the following components for this feature:

- A FDDI concentrator such as the IBM 8240 (or equivalent) concentrator to connect to the FDDI network for dual homing configurations
- Two 62.5/125 micron multimode fiber duplex cables with SC connectors

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot

Software Requirements

This feature has the following software requirements:

- AIX 4.2.1 or later installed on the node
- PSSP 2.4 or later installed on the node
- Adapter device driver and FDDI common code (provided with adapter)

FDDI Typical SP Configuration

Figure 13 on page 129 shows a typical FDDI configuration for the SP system.

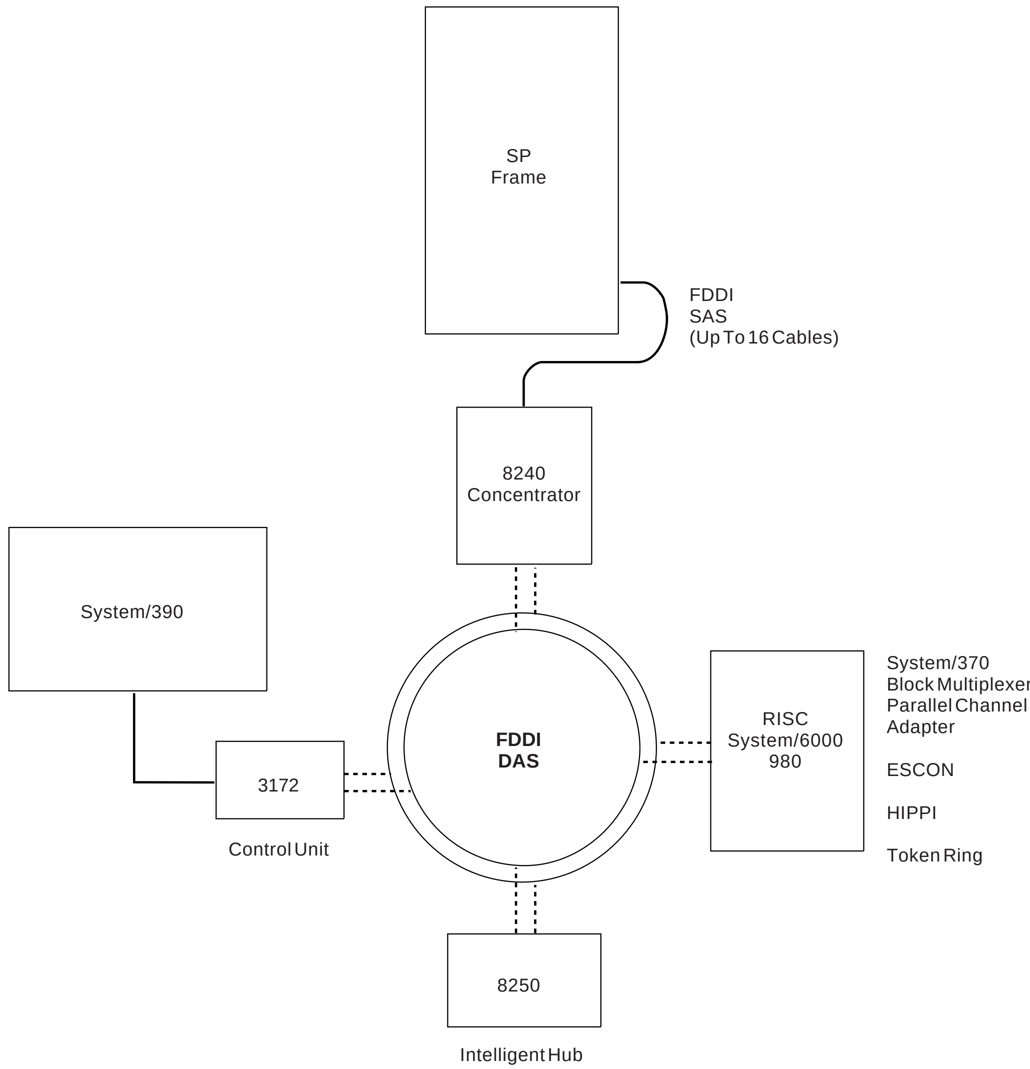


Figure 13. Typical FDDI Configuration for the SP System

FDDI Dual-Ring Attachment Station

Figure 14 on page 130 shows typical FDDI dual-ring attachment cabling from the SP frame to a concentrator or an external LAN.

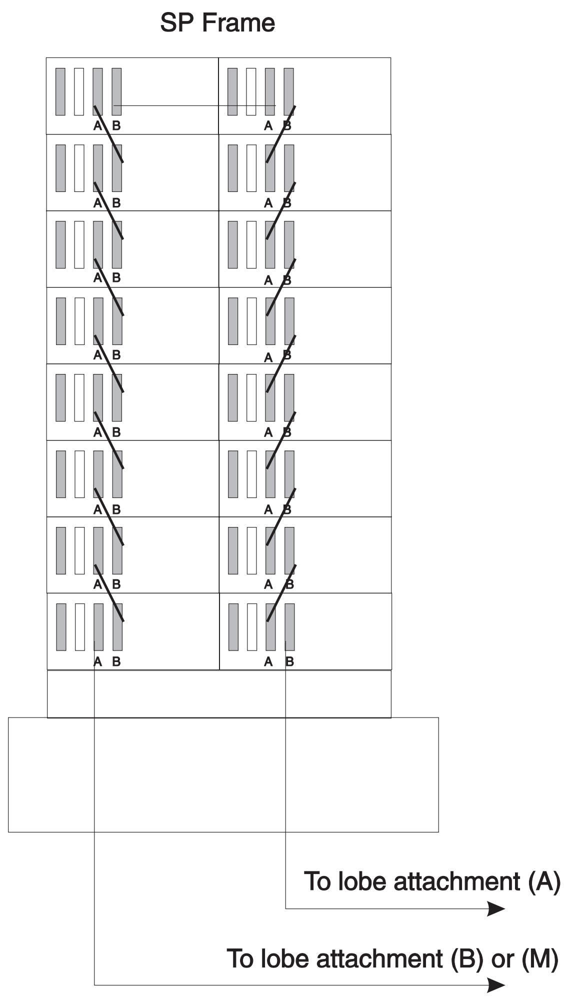


Figure 14. Typical FDDI Dual-Ring Attachment Cabling for the SP System

FDDI Dual Homing Cabling

Figure 15 on page 131 shows a typical FDDI dual homing cabling from the SP frame to a concentrator.

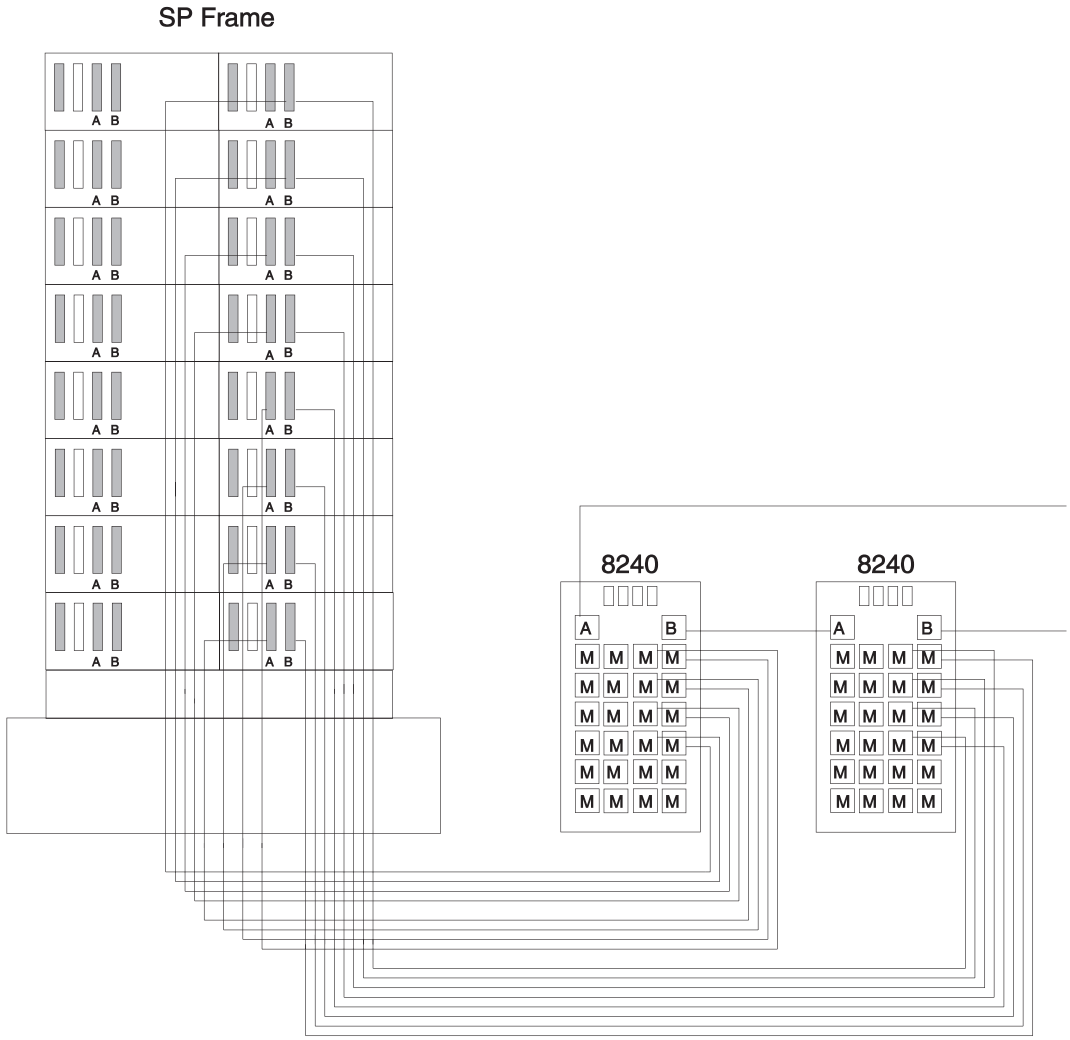


Figure 15. Typical FDDI Dual Homing Cabling for the SP System

External Cabling Routing for FDDI Cables

The SP uses a maximum of 120 inches of FDDI cable budget. Table 31 on page 132 shows the cable budget needed to reach individual nodes in an SP frame.

Table 31. Cable Budget Information for FDDI Feature		
To Node	**Measured in Millimeters**	**Measured in Inches**
1	1780	71
2	1500	59
3	1680	66
4	1980	78
5	2160	85
6	1850	73
7	2030	80
8	2340	92
9	2510	99
10	2210	87
11	2390	94
12	2690	106
13	2870	113
14	2570	101
15	2740	108
16	3050	120

FDDI SK-NET UP DAS PCI Adapter (F/C 2743)

The SYSKONNECT SK-NET FDDI-UP DAS PCI Adapter (F/C 2743) is a fiber optical FDDI Dual Attach Station that is compatible with the FDDI-ANSI X3T12 specifications and FDDI Standard Series. The adapter provides single attachment to a FDDI concentrator (or point to point) using Category 5 Unshielded Twisted Pair cabling (not supplied with the adapter).

Feature Characteristics

This feature has the following characteristics:

- Supports single ring FDDI attachment at 100 Mbps
- Supports all TCP/IP protocols and ANSI Station Management (SMT) 7.3

Feature Components

This feature order provides the following:

- Adapter card
- Diagnostic wrap plug
- Diskette with adapter device driver
- Installation instructions

Customer Components

You must supply the following components for this feature:

- A FDDI concentrator such as the IBM 8240 (or equivalent) concentrator to connect to the FDDI network for dual homing configurations
- One Unshielded Twister Pair Category 5 cable

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot.

Software Requirements

This feature has the following software requirements:

- AIX 4.2.1 or later installed on the node
- PSSP 2.4 or later installed on the node
- Adapter device driver and FDDI common code (provided with adapter)

FDDI Typical SP Configuration

See "FDDI SK-NET LP SAS PCI Adapter (F/C 2741)" on page 124 for a typical SP system FDDI configuration.

S/390 ESCON Channel PCI Adapter (F/C 2751)

The PCI S/390 ESCON Channel Adapter (F/C 2751) provides the SP system an attachment to IBM Enterprise Systems Connection (ESCON) channels on System/390 mainframes. This direct ESCON channel connection provides a fiber optic link that can take advantage of ESCON Directors (fiber optic switches) permitting multiple channel connections. Supports: VM/ESA, MVS/ESA, and OS/390.

Feature Characteristics

This feature has the following characteristics:

- Full length PCI adapter
- Supports attachment to either 10 MB or 17 MB ESCON channels
- Supports VM, MVS, and OS/390
- Supports CLIO/S
- Supports ESCON multiple Image Facility (EMIF)
- Maximum distance supported, 43 Km using LED and XDF ESCON links
- S/390 TCP/IP for VM and MVS
- PCI 32-bit Bus Master Adapter

Feature Components

This feature order provides the following:

- One full length PCI adapter
- CD-ROM with device drivers
- Instruction manual
- Diagnostic wrap plug

Customer Components

The customer must supply the following components for this feature:

- ESCON cabling, requires 62.5/125 multimode fiber cable with ESCON duplex connectors on both ends
- AIX program feature, ESCON Control Unit LPP 5765-D49

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot

Required Software

This feature has the following software requirements:

- AIX 4.3.2 or later
- PSSP 3.1 or later
- Device drivers (included with adapter)
- ESCON Control Unit LPP (separately ordered as LPP 5765-D49)

Auto LANstreamer Token Ring PCI Adapter (F/C 2920)

The PCI Auto LANstreamer Token Ring Adapter (F/C 2920) is a PCI 16/4 Token Ring Adapter that is compatible with IEEE 802.5 specifications. The adapter has two external connections: RJ-45 to attach to UTP cabling and a 9-pin D-Shell to attach to STP cabling.

Feature Characteristics

This feature has the following characteristics:

- Complies with IEEE 802.5 specifications
- Attaches to 4 Mbps or 16 Mbps token-ring area networks
- Supports both full and half duplex operations
- PCI 32-bit Bus Master Adapter

Feature Components

This feature order provides the following:

- Adapter card
- Diskette with adapter device driver
- Installation instructions

Customer Components

The customer must supply the following components for this feature:

- Network equipment such as a MAU and/or Switching Hub to connect the Token-Ring network
- UTP or STP Cable to attach the adapter to the Token-Ring network

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot

Required Software

This feature has the following software requirements:

- AIX 4.2.1 or later installed on the node
- PSSP 2.4 or later installed on the node
- Adapter device driver

Cable Routing

For planning attachment of the RS/6000 SP system to a token-ring network, refer to *Token-Ring Network Introduction and Planning Guide*, GA27-3677, for configuration and attachment options.

8-Port Async PCI Adapter EIA 232/RS-422 (F/C 2943)

The 8-port Async feature (**F/C 2943**) provides the RS/6000 SP with up to eight EIA 232 or RS-422 asynchronous serial lines from a single PCI bus slot. This adapter adheres to the Peripheral Component Interconnect (PCI) Revision 2.1 standards for EIA 232 and RS-422. It features a low cost, high performance 32-bit card, 33 MHz bus speed, and a PCI bus transfer rate of 132 Mbps.

This adapter provides a single DB-78 output which connects directly to the 8-port DB-25 connector box. All eight ports are software programmable to support either protocol at baud rates up to 230 K. The full set of modem control lines for asynchronous communication are provided for each port. Devices such as, terminals, modems, processors, printers, and controllers may be attached.

Feature Characteristics

This feature has the following characteristics:

- 8-port asynchronous device connections
- 32-bit Bus Master PCI bus (132 Mbps)
- Short-form factor PCI adapter
- EIA-232 maximum distance 31 m and 62 m dependent on baud rate and RAN
- RS-422 maximum distance 1200 m dependent on baud rate
- 230 K maximum baud rate
- Supports TxD, RxD, RTS, CTS, DSR, DCD, DTR, and RI on EIA 232
- Supports +TxD, -TxD, +RxD, and -RxD on RS-422

Feature Components

This feature order provides the following:

- Adapter card
- 25-pin diagnostic wrap plug
- Diskette with adapter device driver
- Installation instructions
- Includes external 3 m DB78 cable to 8-port DB25 breakout box

Customer Supplied Components

A 3 m cable with attached breakout box is supplied with each adapter. You must supply all cables needed to connect peripheral equipment to this adapter.

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot

Required Software

This feature has the following software requirements:

- AIX 4.3.2 or later installed on the node
- PSSP 3.1 or later installed on the node
- Adapter device driver LPP image (provided with adapter)

WAN 128-Port Async PCI Adapter EIA-232 (F/C 2944)

The 128-port Async feature (F/C 2944) provides the RS/6000 SP with up to 128 EIA-232 asynchronous serial lines from a single PCI bus slot. This adapter adheres to the Peripheral Component Interconnect PCI standard. It features a low cost, high performance 32-bit card, 33 MHz bus speed, and a PCI bus transfer rate of 132 Mbps.

Two 2.4 Mbps synchronous channels link the adapter to a maximum of eight 16-port remote async nodes (RANs). Each synchronous channel uses an HD-15 female connector to link up to four RANs. Each RAN supports either EIA-232 or RS-422 connections (sixteen per RAN) and up to eight RANs may be connected together yielding a total of 128 ports. The RAN utilizes an RJ-45 connector to provide interface signals at speeds up to 230K baud at a limited number of ports.

Feature Characteristics

This feature has the following characteristics:

- 32-bit Bus Master PCI bus
- Two synchronous channels to RAN
- EIA-232 maximum distance 31 m and 62 m dependent on baud rate and RAN
- RS-422 maximum distance 1200 m dependent on baud rate

Customer Supplied Components

F/C 2944 uses the following optional remote asynchronous nodes (RANs) and device cables which are available from IBM:

- 1.2 Mbps RANs and cables:

  F/C 8130 1.2 Mbps remote asynchronous node, 16-port, EIA-232 (US)

  F/C 8131 128-port asynchronous controller node cable, 4.5 m

  F/C 8132 128-port asynchronous controller cable 23 cm (9 in.)

  F/C 8133 RJ-45 to DB-25 converter cable

  F/C 8134 1.2 Mbps remote asynchronous node, 16-port, EIA-232 (World Trade)

  F/C 8136 1.2 Mbps rack mountable remote asynchronous node, 16-port, EIA-232

- 2.4 Mbps RANs and cables:

  F/C 8137 2.4 Mbps enhanced remote asynchronous node, 16-port, EIA-232

  F/C 8138 2.4 Mbps enhanced remote asynchronous node, 16-port, RS-422

  F/C 2934 Asynchronous terminal/printer cable, EIA-232

  F/C 3124 Serial port to serial port cable for drawer-to-drawer connections

  F/C 3125 Serial port to serial port cable for rack-to-rack connections

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot

Required Software

This feature has the following software requirements:

- AIX 4.2.1 or later installed on the node
- PSSP 2.4 or later installed on the node
- Adapter device driver LPP image (provided with adapter)

ARTIC960Hx 4-Port Selectable PCI Adapter (F/C 2947)

The ARTIC960Hx 4-Port Selectable PCI Adapter is a one-slot, standard-length, 32-bit PCI card. It provides 4-Ports of either EIA-232, EIA530, RS-449, X.21, or V.35. Only one standard can be used at a time. Each port supports speeds up to 2.0 Mbps. Software support is provided by ARTIC960 Support for AIX, Developer's Kit, AIX versions 4.2.1 or 4.3.2 or later, that provide SDLC and Bisync support. The adapter can also be used for real-time device control, telephony signaling, and custom serial communication protocols.

This adapter is also equipped with a high-performance, eight-channel DMA controller. This DMA controller supports intelligent DMA operations, such as data buffer chaining and end-of-frame processing, to support high-performance communications protocols and high-throughput applications. The DMA controller is fully programmable for OEM and third-party device drivers.

Feature Characteristics

This feature has the following characteristics:

- One 120-pin port
- Supports up to four connections of the same type
- Data transfer rates of up to 2 Mbps
- Supported interfaces are:
  - EIA-232
  - EIA-530
  - RS-449
  - X.21
  - V.35
- Support for SDLC and X.25 full-duplex, synchronous protocols

Feature Components

- One ARTIC960Hx adapter (F/C 2947)
- A connecting cable (required); the following are available from IBM:

  F/C 2861 ARTIC960Hx 4-port EIA-232 cable

  F/C 2862 ARTIC960Hx 4-port RS-449 cable

  F/C 2863 ARTIC960Hx 4-port X.21 cable

  F/C 2864 ARTIC960Hx 4-port V.35 (DTE) cable

  F/C 2865 ARTIC960Hx 4-port EIA-530 cable

Hardware Requirements

This feature has the following hardware requirements:

- One 32-bit Peripheral Component Interconnect (PCI) adapter slot

Required Software

This feature has the following software requirements:

- AIX 4.2.1 and APAR IX81861, AIX 4.3.2 and APAR IX81860 (for SDLC or Bisync) or later
- Adapter device driver (provided with adapter)

2-Port Multiprotocol X.25 PCI Adapter (F/C 2962)

The 2-Port Multiprotocol adapter (F/C 2962) provides the RS/6000 SP with high speed connections between stand alone system units on a wide area network (WAN). This adapter adheres to the Peripheral Component Interconnect PCI standard and also supports SDLC and X.25 protocols. The 2-port Multiprotocol adapter connects to WAN lines through externally attached data communication equipment including Channel Service Units (CSU), Data Service Units (DSU), and synchronous modems.

This adapter operates at speeds up to 2.048 Mbps and provides two ports that accommodate four selectable interfaces. These interfaces are:

- EIA 232D/V.24
- V.35
- V.36/EIA 449
- X.21

Interface configuration is selected by the type of cable attached. These cables are ordered separately and you may configure with the 2-Port Multiprotocol adapter with two different cables.

Feature Characteristics

This feature has the following characteristics:

- 32-bit Bus Master PCI 2.1 adapter
- Provides two, 36-pin high density (male) ports
- Provides four interface types, EIA 232D/V.24, V.35, V.36/EIA 449, and X.21
- Simultaneously supports two different interfaces
- Supports SDLC and X.25 full duplex synchronous protocols

Customer Supplied Components

If you plan to operate this adapter using X.25 protocols, then you must separately order the IBM AIXLINK/X.25 LPP (5696-926). This package provides a V.24, V.35, or X.21 port connection to X.25 packet switched networks.

The system interface is determined by the cable connected to this adapter. See Table 32 on page 140 for a list of available cables and the interface supported by each cable.

Note: The 2-port Multiprotocol Adapter can be configured with different cable types on each port.

Table 32. Cable Information for 2-port Multiprotocol Adapter		
Cable Feature Code	**Interface Configuration**	**Cable Terminations (Length)**
2951	EIA 232D/V.24	36-pin to male DB25 (3 m)
2952	V.35	36-pin to 34-pin male (3 m)
2953	V.36/EIA 449	36-pin to 37-pin male (3 m)
2954	X.21	36-pin to male DB15 (3 m)

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot

Required Software

This feature has the following software requirements:

- AIX 4.3.2 or later
- PSSP 3.1 or later
- SDLC protocol support provided as part of the AIX Base Operating System
- X.25 protocol support requires a separately ordered LPP, IBM AIXLINK/X.25 (5696-926)
- This adapter also functions with AIX 4.2.1 and PSSP 2.4

TURBOWAYS 155 UTP ATM PCI Adapter (F/C 2963)

The TURBOWAYS 155 UTP ATM adapter (F/C 2963) enables TCP/IP applications to work in an asynchronous transfer mode (ATM) environment. This adapter provides dedicated 155 Mbps, full-duplex connection to ATM networks using either Permanent Virtual Circuits (PVC) or ATM Forum compliant Switched Virtual Circuits (SVC) UNI 3.1 signalling. The adapter supports AAL-5 adaptation layer interface and communication with devices located on an ATM network, bridged token ring, Ethernet, or other LAN. LAN Emulation (LANE) is provided by the AIX operating system.

The TURBOWAYS 155 UTP ATM adapter requires customer provided CAT5 High Speed Unshielded Twisted Pair (UTP) or Shielded Twisted Pair (STP) cables. These cables must be certified for ATM operation. Maximum cable length is 100 m and all cables must be terminated with RJ45 connectors.

Feature Characteristics

This feature has the following characteristics:

- 32-bit Bus Master PCI 2.1 adapter
- External RJ45 connector
- Provides signaling channel setup
- Provides virtual connection setup and tear down
- Supports point-to-point and point-to-multipoint switching

- Supports virtual circuits (maximum 1024)
- Supports classical IP and ATRP over ATM (RFC 1577)
- Supports Ethernet LAN Emulation and token ring
- Supports ATM SNMP
- Best effort service

Customer Components

You must supply the following components with this feature:

- Category 5 High Speed Unshielded Twisted Pair cables (or shielded) with RJ45 connectors (100 m maximum length)
- If you plan to use multipoint connections, you must provide an ATM switch

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot

Required Software

This feature requires the following software:

- PSSP 3.1 or later
- AIX 4.3.2 or later
- This adapter will also function with PSSP 2.4 and AIX 4.2.1

ATM Cable Routing

Figure 16 on page 142 shows typical ATM cabling from the SP frame to a customer-supplied ATM switch. Customer-supplied UTP ATM cables require an RJ45 type connector at the ATM adapter end and at the switch.

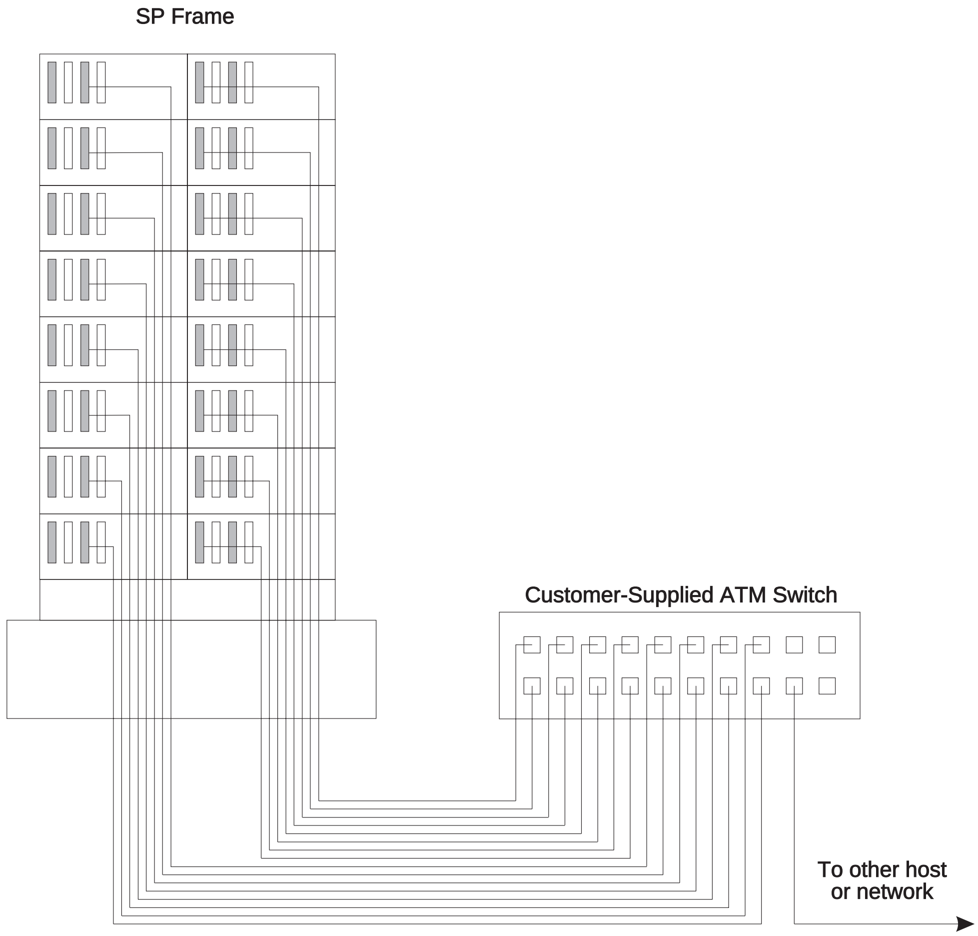


Figure 16. Typical ATM Cabling for the SP System

10/100 Ethernet 10BaseTX PCI Adapter (F/C 2968)

The IBM 10/100 Ethernet TX PCI Adapter (F/C 2968) is a 10/100 PCI Ethernet Adapter that is compatible with IEEE 802.3 and 802.3u specifications. The adapter has one RJ-45 connection that supports connections to 100BaseTX and 10BaseT networks.

Feature Characteristics

This feature has the following characteristics and requirements:

- Compatible with IEEE 802.3 Standards
- 32-bit Bus Master PCI Bus 132 Mbps
- Supports auto-negotiatation of media speed and duplex operation
- Supports both full and half duplex operation over 10BaseT networks via the RJ-45 connector

Feature Components

This feature order provides the following:

- Adapter card
- Diskette with adapter device driver
- Installation Instructions.

Customer Supplied Components

You must supply the following components for this feature:

- Network equipment such as a hub or switch required to attach to 10BaseT Ethernet LANs
- All Ethernet cables

Note: For 100BaseTX connections, Unshielded Twisted Pair (UTP) Category 5 cabling is required.

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot

Required Software

This feature has the following software requirements:

- AIX 4.2.1 or later installed on the Node
- PSSP 2.4 or later installed on the Node
- Adapter device driver (provided with adapter)

Gigabit Ethernet - SX PCI Adapter (F/C 2969)

The PCI Gigabit Ethernet - SX Adapter (F/C 2969) is a 1000 Mbps PCI Ethernet adapter that is compatible with IEEE 802.3z specifications. The adapter has one external fiber connection that attaches to 1000BaseSX networks via 50 and 62.5 micron multi-mode cables with SC connectors.

Feature Characteristics

This feature has the following characteristics and requirements:

- Compatible with IEEE 802.3z Standards
- Supports full duplex operation over 1000BaseSX networks
- Supports jumbo frames with AIX 4.3.2 Device Driver

Feature Components

This feature order provides the following:

- Adapter card
- Fiber wrap plug
- Installation instructions

Customer Supplied Components

You must supply the following components for this feature:

- Network equipment such as a switch or router is required to attach to 1000BaseSX networks
- All Ethernet cables

  Note: The maximum operating distances for the fiber cables are:

  - 260 meters with 62.5 micron multimode fiber
  - 440 meters with 50 micron multimode fiber

Hardware Requirements

This feature has the following hardware requirement:

- One (1) Peripheral Component Interconnect (PCI) 32-bit or 64-bit adapter slot in POWER3 nodes
- One (1) Peripheral Component Interconnect (PCI) 32-bit adapter slot in 332 MHz nodes

Required Software

This feature has the following software requirements:

- POWER3 thin and wide nodes
  - PSSP 3.1 and AIX 4.3.2 or later
- 332 Mhz thin and wide nodes
  - PSSP 3.1 and AIX 4.3.2 or later

10Base2 and 10BaseT (BNC/RJ-45) Ethernet LAN PCI Adapter (F/C 2985)

The PCI Ethernet BNC/RJ-45 Adapter (F/C 2985) is a 10 Mbps PCI Ethernet adapter that is compatible with IEEE 802.3 specifications. The adapter has two external connections: BNC to attach to 10Base2 networks and RJ-45 to attach to 10BaseT networks.

Feature Characteristics

This feature has the following characteristics and requirements:

- 10 Mbps Ethernet compatible with IEEE 802.3 Standards
- 32-bit Bus Master PCI Bus 132 Mbps
- Supports half duplex operations over 10Base2 networks via the BNC connector
- Supports both full and half duplex operation over 10BaseT networks via the RJ-45 connector

Feature Components

This feature order provides the following:

- Adapter card
- RJ-45 and BNC diagnostic wrap plugs
- Installation instructions

Customer Supplied Components

You must supply the following components for this feature:

- Network equipment such as a hub or switch required to attach to 10BaseT Ethernet LANs
- All Ethernet cables

Note: For 10BaseT connections, Unshielded Twisted Pair (UTP) Category 3, 4, or 5 cabling is required. UTP Category 5 cabling is strongly suggested to facilitate upgrades to 100 Mbps Ethernet LAN without cabling changes.

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot.

Required Software

This feature has the following software requirements:

- AIX 4.2.1 or later installed on the Node
- PSSP 2.4 or later installed on the Node
- Adapter device driver (part of base AIX BOS code)

Cable Routing

Figure 17 on page 146 represents a typical Ethernet cable routing in an SP frame.

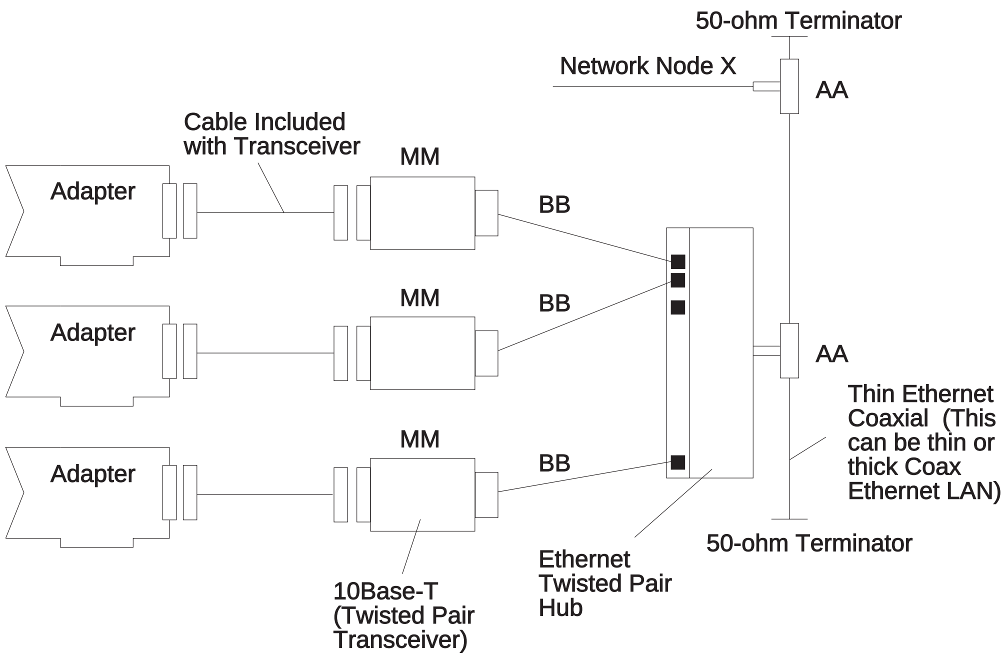


Figure 17. Ethernet Cable Routing

10Base5 and 10BaseT (AUI/RJ-45) Ethernet LAN PCI Adapter (F/C 2987)

The PCI Ethernet BNC/RJ-45 Adapter (F/C 2987) is a 10 Mbps PCI Ethernet adapter that is compatible with IEEE 802.3 specifications. The adapter has two external connections: BNC to attach to 10Base5 networks and RJ-45 to attach to 10BaseT networks.

Feature Characteristics

This feature has the following characteristics and requirements:

- 10 Mbps Ethernet compatible with IEEE 802.3 standards
- 32-bit Bus Master PCI Bus 132 Mbps
- Supports half duplex operations over 10Base5 networks via the BNC connector
- Supports both full and half duplex operation over 10BaseT networks via the RJ-45 connector

Feature Components

This feature order provides the following:

- Adapter card
- RJ-45 and AUI diagnostic wrap plugs
- Installation instructions

Customer Supplied Components

You must supply the following components for this feature:

- Network equipment such as a hub or switch required to attach to 10BaseT Ethernet LANs
- All Ethernet cables

Note: For 10BaseT connections, unshielded twisted pair (UTP) Category 3, 4, or 5 cabling is required. UTP Category 5 cabling is strongly suggested to facilitate upgrades to 100 Mbps Ethernet LAN without cabling changes.

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot

Required Software

This feature has the following software requirements:

- AIX 4.2.1 or later installed on the node
- PSSP 2.4 or later installed on the node
- Adapter device driver (part of base AIX BOS code)

Cable Routing

Figure 18 represents a typical Ethernet cable routing in an SP frame.

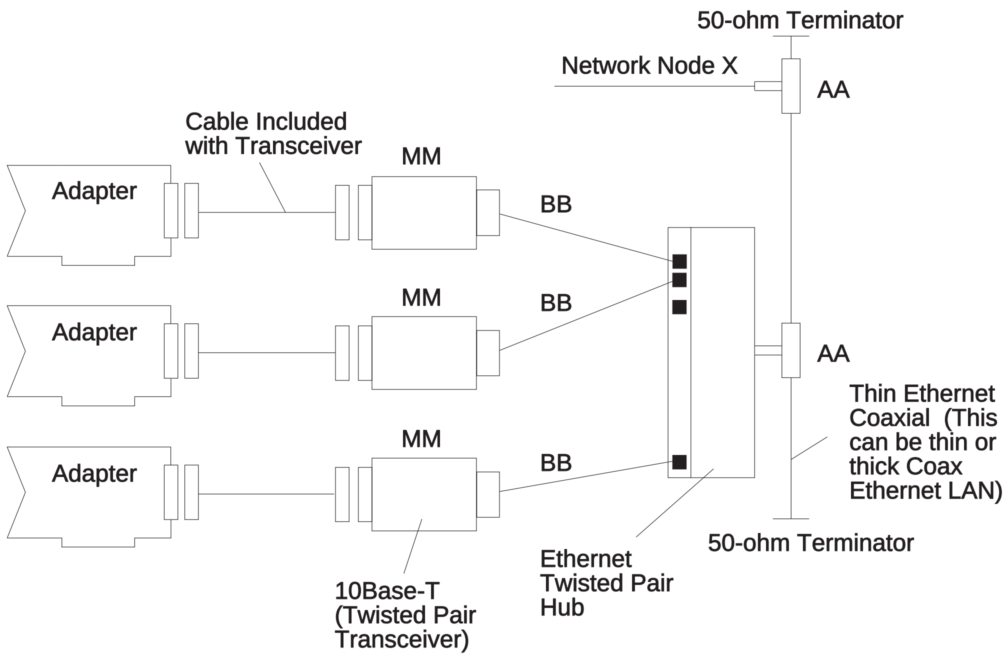


Figure 18. Ethernet Cable Routing

TURBOWAYS 155 ATM PCI Adapter (F/C 2988)

The TURBOWAYS 155 ATM adapter (F/C 2988) enable TCP/IP applications to work in an asynchronous transfer mode (ATM) environment. This adapter provides dedicated 155 Mbps, full-duplex connection to ATM networks using either Permanent Virtual Circuits (PVC) or ATM Forum compliant Switched Virtual Circuits (SVC) UNI 3.1 signalling. The adapter supports AAL-5 adaptation layer interface and communication with devices located on an ATM network, bridged token ring, Ethernet, or other LAN. LAN Emulation (LANE) is provided by the AIX operating system.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Provides signaling channel setup
- Provides virtual connection setup and tear down
- Supports point-to-point and point-to-multipoint switching
- Supports virtual circuits (maximum 1024)
- Supports classical IP and ATRP over ATM (RFC 1577)
- Supports Ethernet LAN Emulation and token ring
- Supports ATM SNMP

Customer Components

You must supply the following components with this feature:

- Plenum rated 62.5/125 multimode fiber cables terminated with an SC connector.
- An ATM switch.

Required Software

This feature requires the following software:

- PSSP 2.4
- AIX 4.2.1 or later

ATM Cable Routing

Figure 19 on page 149 shows typical ATM cabling from the SP frame to a customer-supplied ATM switch. Customer-supplied ATM cables requires an “SC” type connector at the ATM adapter end. Connector requirements at the switch end may vary. The cable type is 62.5/125um multimode fiber.

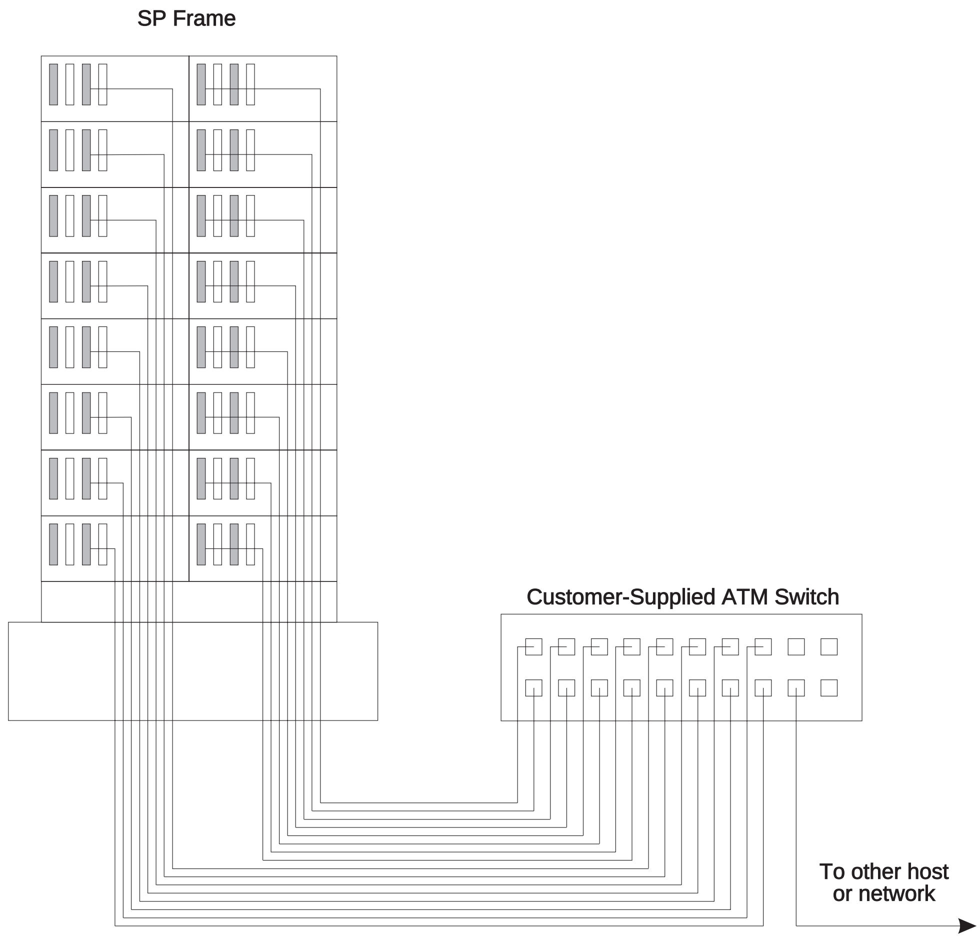


Figure 19. Typical ATM Cabling for the SP System

High-Speed Token-Ring PCI Adapter (F/C 4959)

The High-Speed Token-Ring PCI Adapter (F/C 4959) is a PCI 16/4 Token Ring Adapter that is compatible with IEEE 802.5 specifications. The adapter has two external connections: RJ-45 to attach to UTP cabling and a 9-pin D-Shell to attach to STP cabling.

Feature Characteristics

This feature has the following characteristics:

- Supports full duplex operation at all three speeds
- Supports both UTP-5 (RJ-45) and STP (9-Pin D-shell)
- PCI bus specification 2.1:
  - Fits in PCI half-size slots
  - Supports both 5.0 and 3.3 volt signaling
  - Supports PCI data streaming
  - Operates in 64-bit slots as a 32-bit device
  - Operational at PCI bus speeds from 16 MHz to 33 MHz

- Consumes less than 2 watts of power
- Includes adapter and ring-status LEDs
- Supports field update of on-card microcode, via sectored FLASH EPROM
- On-card diagnostics implemented in microcode
- FCC Class B and CISPR Class B certified
- Supports NIM functions

Feature Components

This feature order provides the following:

- Adapter card
- CD-ROM with adapter device driver
- Installation instructions

Customer Components

You must supply the following components for this feature:

- Network equipment such as a MAU and/or switching hub to connect the token-ring network
- UTP or STP cable to attach to the token-ring network

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot per adapter

Software Requirements

This feature has the following software requirements:

- AIX 4.2.1, 4.3.3 or later installed on the node

  Note: Requires an update to operate properly. The update CD-ROM is provided with the adapter.

- PSSP 3.1 or later installed on the node
- Adapter device driver (provided with the adapter)

Typical SP System Configuration

For planning attachment of the RS/6000 SP system to a token ring network, refer to *Token-Ring Network Introduction and Planning Guide* for configuration and attachment options.

Dual Channel Ultra2 SCSI PCI Adapter (F/C 6205)

The Dual Channel Ultra2 SCSI PCI Adapter (F/C 6205) is an ideal solution for applications requiring large block data transfers (more than 64K block size) in a multi-disk-drive environment utilizing Ultra/Ultra2 SCSI protocol. It provides up to 160 MBps aggregate SCSI throughput and is able to support single-ended Fast/Ultra devices or LVD Ultra/Ultra2 devices. The dual channels offer increased connectivity without utilizing an additional PCI slot. One or both channels can be dedicated to LVD devices or as an alternative, one channel can be used to support mixed performance single-ended devices. Industry standard VHDCI connectors are available for external connection to each channel.

Feature Characteristics

This feature has the following characteristics:

- Two Ultra2/LVD SCSI buses
- PCI bus specification 2.1
  - Fits in PCI full-size slots
  - Supports both 5.0 and 3.3 volt signaling
  - Supports PCI data streaming
  - Two independent DMA Channels
  - 64-bit PCI Bus Master adapter also operates in a 32-bit PCI slot
  - Operational at PCI bus speeds from 16 MHz to 33 MHz
- Supports 16 bit single ended or LVD connections
- Uses Ultra2 SCSI standard external VLHDCI (Very High Density Cable Interconnect or 8mm) SCSI connectors per channel
- Ultra2 SCSI provides increased connectivity (cable length and number of SCSI devices supported) over Ultra SCSI
- NIM Boot
- Native Boot support on AIX 4.3.3

Feature Components

This feature order provides the following:

- Adapter card
- CD-ROM with adapter device driver
- Installation instructions

Customer Components

You must supply the following components for this feature:

- Cabling

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot per adapter

Software Requirements

This feature has the following software requirements:

- AIX 4.3.2 or later installed on the node
- PSSP 3.1 or later installed on the node
- Adapter device driver (provided with the adapter)

SCSI-2 Ultra/Wide SE PCI Adapter (F/C 6206)

The PCI SCSI-2 Ultra/Wide Single Ended Adapter (F/C 6206) provides a single ended SCSI-2 Ultra/Wide interface that can burst data between devices on the SCSI bus at 40 MBps (twice the fast/wide rate) using block sizes greater than 64K. It conforms to SCSI-2 standards and Fast-20 (Ultra) documentation. Feature Code 6206 supports both internal and external devices connected to the same SCSI bus. Industry standard SCSI P (68-pin) connectors are incorporated on the adapter.

Feature Characteristics

This feature has the following characteristics:

- 32-bit Bus Master PCI 2.1 adapter
- Supports attachment of internal and external single ended 8-bit and 16-bit SCSI or Ultra SCSI devices.
  - External connections on J2 with 68 pin SCSI-3 standard P connector
  - Internal connections on J3 with 68 pin high density SCSI connector for 16-bit attachments
  - Internal connections on J4 with 50 pin (2x25) SCSI connector for 8-bit attachments

Adapter Limitations

- Data transfer rates are limited to the speed of the slowest attached device. For example, if you connect an Ultra drive and a fast/wide drive, the adapter will limit data transfers to fast/wide rates.
- If a cable is attached to the external J2 connector, data transfer rates will be limited to fast/wide rates.
- Ultra data transfer rates can only be achieved using the internal connections with cable lengths of 1.5 m or less.
- External cable lengths are limited to 3 m for fast/wide data transfer rates.
- The internal J3 and J4 connectors cannot be used at the same time.

Customer Components

You must supply the following components for this feature:

- If you are using F/C 6206 to configure independent internal DASD in an 332 MHz SMP wide node, you must also order F/C 1241.

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot per adapter
- Optional cables listed below

Note: Single Ended (SE) SCSI adapters ***cannot*** inter-operate with Differential SCSI adapters in twin-tailed (high availability) configurations.

Software Requirements

This feature has the following software requirements:

- AIX 4.3.2 or later installed on the node
- PSSP 3.1 or later installed on the node
- This adapter also functions with AIX 4.2.1 and PSSP 2.4

F/C 6206 Cable Options

The following optional cables are available for the F/C 6206 SCSI adapter:

F/C 2117 16-bit SE external Y-cable, 0.9 m

F/C 2424 16–bit adapter-to-adapter SCSI cable, 0.6 m long

F/C 2425 16-bit adapter-to-adapter SCSI cable, 2.5 m long

All cables must conform to X3T9.2/90-048 standards.

See “Feature Characteristics” on page 152 for a list of restrictions on cables used with F/C 6206.

Note: Due to the short length of PCI SCSI cables, you must pay close attention to cable planning. You may want to limit these adapters to the lower nodes in a frame and you will want to consider such issues as frame layout and service clearances as you plan your system configuration.

SCSI-2 Ultra Cable Routing

Figure 20 represents the cable routing to the SCSI-2 Single End Ultra feature installed in an SP frame, from an IBM 9076 SP Frame to an IBM 7015 Expansion Rack.

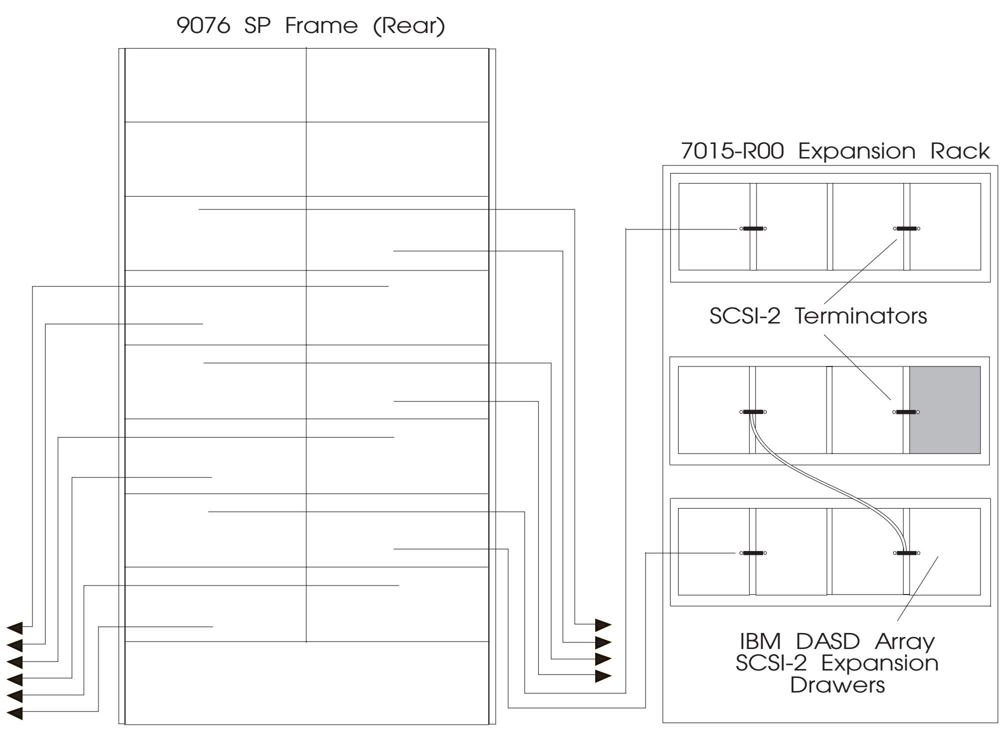


Figure 20. SCSI-2 Ultra Configuration for Processor Cabling

External Cable Routing

The SP uses a maximum of 120 inches of SCSI-2 Ultra/Wide cable to reach the most distant node in a frame. Table 33 shows the cable budget needed to reach individual nodes in an SP frame. Subtracting these values from the overall cable length will give you the cable length available to reach other devices.

Note: When an external cable is connected to F/C 6206, data transfer rates through this adapter are limited to fast/wide rates. At fast/wide data transfer rates, maximum cable length increases to 3 m for this adapter.

Table 33. Cable Budget Information for SCSI-2 Fast/Wide Feature

To Node	Measured in Millimeters	Measured in Inches
1	1780	71
2	1500	59
3	1680	66
4	1980	78
5	2160	85
6	1850	73
7	2030	80
8	2340	92
9	2510	99
10	2210	87
11	2390	94
12	2690	106
13	2870	113
14	2570	101
15	2740	108
16	3050	120

SCSI-2 Ultra/Wide DE PCI Adapter (F/C 6207)

The PCI SCSI-2 Ultra/Wide Differential Adapter (F/C 6207) provides a differential SCSI-2 Ultra/Wide interface that can burst data between devices on the SCSI bus at 40 MBps. F/C 6207 supports Ultra and Fast/Wide synchronous data transfers and it supports external devices (no internal connections) up to 25 m away. This adapter conforms to SCSI-2 standards and the Fast-20 (Ultra) documentation. Industry standard SCSI P (68-pin) connectors are incorporated on the adapter.

Note: Data transfer rates with F/C 6207 are limited to the speed of the slowest device on the SCSI bus.

Feature Characteristics

This feature has the following characteristics:

- 32-bit Bus Master Adapter
- Supports attachment of external 8-bit or 16-bit SCSI devices on the J2 port using a 68 pin SCSI-3 standard connector

Customer Components

Optional cables are available through IBM.

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot per adapter

Note: Single Ended (SE) and Double Ended SCSI adapters **cannot** be twin-tailed to the same external disk array when used in a high-availability configuration.

Software Requirements

This feature has the following software requirements:

- AIX 4.3.1 or later installed on the node
- PSSP 3.1 or later installed on the node
- This adapter also functions with AIX 4.2.1 and PSSP 2.4

F/C 6207 Cable Options

The following optional cables are available for the F/C 6207 SCSI adapter:

F/C 2114 16-bit DE external Y-cable, 0.9 m

F/C 2424 16-bit adapter-to-adapter SCSI cable, 0.6 m long

F/C 2425 16-bit adapter-to-adapter SCSI cable, 2.5 m long

All cables must conform to X3T9.2/90-048 standards.

Note: F/C 6207 supports a maximum cable length of 25 m.

SCSI-2 F/W Cable Routing

Figure 21 on page 156 represents the cable routing to the SCSI-2 Differential Ultra/Wide feature installed in an SP frame, from an IBM 9076 SP Frame to an IBM 7015 Expansion Rack.

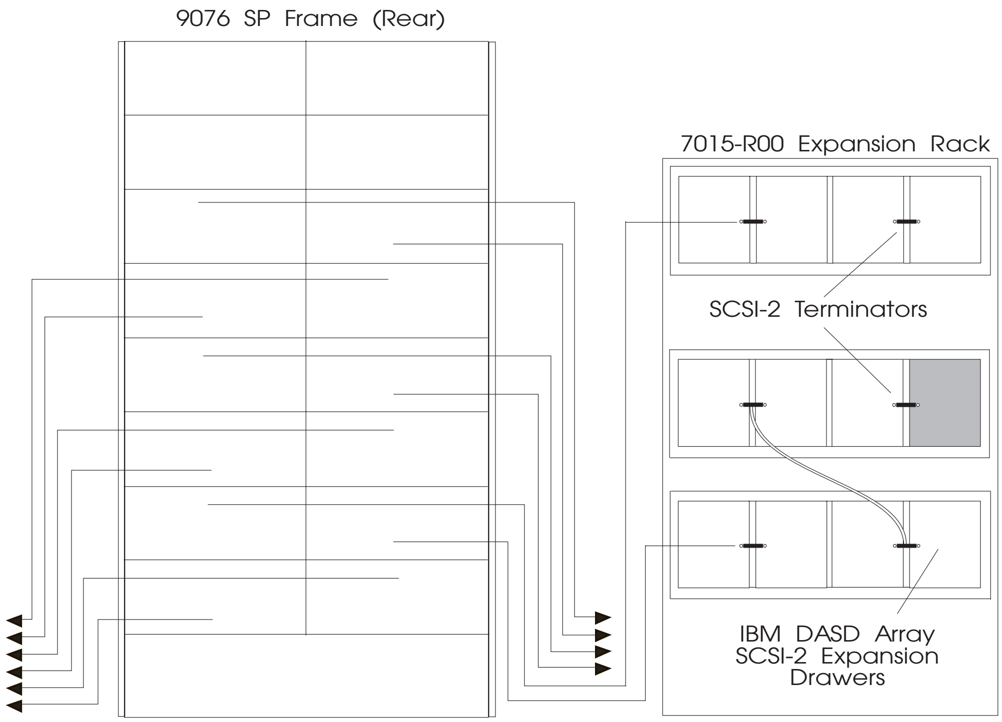


Figure 21. SCSI-2 Ultra/Wide Configuration for Processor Cabling

External Cable Routing

The SP uses a maximum of 120 inches of SCSI-2 Ultra/Wide cable to reach the most distant node in a frame. Table 34 on page 157 shows the cable budget needed to reach individual nodes in an SP frame. Subtracting these values from the overall cable length will give you the cable length available to reach other devices. Remember, F/C 6207 supports a maximum cable length of 25 m.

Table 34. Cable Budget Information for SCSI-2 Ultra/Wide Feature

To Node	Measured in Millimeters	Measured in Inches
1	1780	71
2	1500	59
3	1680	66
4	1980	78
5	2160	85
6	1850	73
7	2030	80
8	2340	92
9	2510	99
10	2210	87
11	2390	94
12	2690	106
13	2870	113
14	2570	101
15	2740	108
16	3050	120

SSA Fast-Write Cache Option (F/C 6222)

The SSA Fast-Write Cache is an optional 4 MB fast-write module that plugs into the PCI SSA RAID 5 Adapter (F/C 6215). The F/C 6222 cache option uses non-volatile RAM having over seven years of memory retention. Non-volatile memory allows you to transfer the cache module from a failing Multi-Initiator adapter to a new adapter during the unlikely event of an adapter failure. This helps insure data integrity and operational reliability.

- Only one F/C 6222 is supported on each PCI SSA RAID 5 adapter (F/C 6215)
- Requires PSSP 2.4 or greater and either AIX 4.2.1 or later

Advanced SerialRAID PCI Adapter (F/C 6225)

The Advanced SerialRAID Adapter (F/C 6225) has a data transfer rate of up to 160 MBps per loop. This high-performance multi-initiator Serial Storage Architecture (SSA) adapter provides eight-initiator non-RAID capability, two-initiator RAID-5 capability, and one-initiator RAID-0 capability. The adapter utilizes the SSA Enhanced Loop (EL) architecture which offers a choice for SSA HA data protection; disk mirroring for the best performance or multi-initiator RAID for the lowest total system cost. SSA EL adapter architecture enables RS/6000 SP PCI systems to share SSA storage in a multi-host SSA environment (cluster/SP). The Advanced SerialRAID Adapter with up to 160 MBps data transfer rate per loop and optional 32 MB Fast-Write Cache increases the RS/6000 SP storage performance in single-initiator and multi-initiator/multi-host environments. Boot support is only via the AIX Network Install Manager (NIM). The adapter accepts a 32 MB Fast-Write Cache Option Card (F/C 6235) in either a one-initiator RAID or one-initiator non-RAID application.

Feature Characteristics

- Up to 160 MBps data transfer rates per loop
- Support for the following options:
  - 8-way JBOD
  - 2-way RAID 5
  - 1-way RAID 0
  - Fast Write Cache with failover (F/C 6235)
  - TMSSA and fencing (used primarily by HACMP)
  - Two adapters in same host on same loop - automatic adapter takeover on failure
  - Hot spares on same loop - automatic rebuild on disk failure (RAID 5 configurations)
- Interoperates with PCI SSA Multi-Initiator/RAID EL Adapter (F/C 6215) and MCA SSA Multi-Initiator/RAID EL Adapter (F/C 6219)
- PCI 2.1 compatible, universal 3.3/5 volt adapter
- Native and NIM boot/install from JBOD disks:
  - Boot after NIM AIX install on AIX 4.2.1 and 4.3.2/n
  - Boot after Native AIX install on AIX 4.3.n
- Supports 48 drives per loop, 96 drives per adapter
- Operates at 40 MB/s on SSA link when attached to another 40 MBps capable port

Feature Components

This feature order provides the following:

- Adapter card
- CD-ROM with adapter device driver
- Installation instructions

Customer Components

No customer components required.

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot.

Software Requirements

This feature has the following software requirements:

- AIX 4.2.1, 4.3.2 or later installed on the node

  Note: Requires updates to operate properly. An update CD-ROM (9903, or later) containing these updates can be obtained by calling 1-800-879-2755 in USA and ordering feature number 0837 for AIX Version 4.2.1 or feature number 0838 for AIX Version 4.3.2.

- PSSP 3.1 or later installed on the node
- Adapter device driver (provided with the adapter)

Limitiations

The adapter has the following limitations:

- Will not operate in SSA configurations supporting High-Performance 4-Port SSA Adapter (F/C 6214) or Enhanced 4-Port SSA Serial Adapter, Micro Channel (F/C 6216)
- No native IPL boot support from SSA disk drives
- RAID arrays must have all array members in the same SSA loop
- PCI system interface only

Typical SP System Configuration

The Advanced SerialRAID Adapter operated in a RAID 5 configuration supports (2+P) to (15+P) arrays and up to six (15+P) arrays. The adapter also supports hot spares in RAID 5 mode. For help in configuring your system, consult the *Advanced Serial Raid Adapter User Guide* which is shipped with the adapter.

32 MB Fast-Write Cache Option Card (F/C 6235)

The 32 MB Fast-Write Cache Option Card is a 32 MB fast-write optional feature that plugs into the Advanced SerialRAID Adapter (F/C 6225) and the Advanced SerialRAID Plus Adapter (F/C 6230). It utilizes non-volatile RAM. If an Advanced SerialRAID Adapter fails, a replacement adapter can be installed and the fast-write cache can be removed from the failing adapter and installed in the new adapter insuring data integrity. The 32 MB Fast-Write Cache Option Card provides a significant improvement of data throughput and response time under certain conditions compared to SSA RAID adapters without the fast-write cache. The response time and data transfer improvement using the optional card varies depending upon data block sizes, percentage of sequential writes, and machine type/model application parameters. The 32 MB Fast-Write Cache Option Card plugged into the Advanced SerialRAID Adapter operates in either non-RAID or RAID 5 mode, in a single-initiator configuration.

ARTIC960RxD Quad Digital Trunk PCI Adapter (F/C 6310)

The ARTIC960RxD Quad Digital Trunk Adapter provides voice processing for up to four T1 or E1 digital trunk lines, providing connectivity for 96 (T1) or 120 (E1) voice channels in a single PCI slot. The voice processing function is provided by DirectTalk for AIX, Version 2.1 LPP. The adapter provides high-function control of I/O operations and serves to off-load I/O tasks from the system microprocessor.

Feature Characteristics

This feature has the following characteristics:

- 32-bit PCI 2.1 adapter
- One 36-pin, high-density port
- Support for up to four (4) T1 or E1 trunk lines

- Supports voice processing using DirectTalk for AIX

Feature Components

- One ARTIC960RxD adapter (F/C 6310)
- A connecting cable (required); the following cables are available from IBM:

  F/C 2709 ARTIC960Hx 4-port T1 RJ45 cable

  F/C 2710 ARTIC960Hx 4-port E1 RJ45 cable

  F/C 2871 ARTIC960RxD Quad DTA, T1, 100 ohm, 3 m 4-port cable

  F/C 2872 ARTIC960RxD Quad DTA, T1, 100 ohm, 15 m extension cable

  F/C 2873 ARTIC960RxD Quad DTA, E1, 120 ohm balanced, 3 m 4-port cable

  F/C 2874 ARTIC960RxD Quad DTA, E1, 120 ohm balanced, 7.5 m extension cable

  F/C 2875 ARTIC960RxD Quad DTA, E1, 75 ohm unbalanced-grounded, 1.8 m 4-port cable

  F/C 2876 ARTIC960RxD Quad DTA, E1, 75 ohm unbalanced-ungrounded, 1.8 m 4-port cable

  F/C 2877 ARTIC960RxD Quad DTA, H.100, 4-drop cable

Hardware Requirements

This feature has the following hardware requirements:

- One 32-bit Peripheral Component Interconnect (PCI) adapter slot

Required Software

This feature has the following software requirements:

- AIX 4.2.1, AIX 4.3.2 or later
- DirectTalk for AIX, Version 2.1 LPP (5765-B81) to provide voice processing
- Adapter device driver (provided with adapter)

Chapter 18. MCA Communication Adapters

This chapter contains planning information for MCA-type communication adapters. These features are installed in SP system nodes and are used to connect the SP system with external networks. Network connections through SP system nodes are typically slower, and might not have the availability of, network connections through an SP Switch Router.

For more information on SP Switch Routers, see Chapter 14, “RS/6000 SP Switch Routers (M/T 9077 04S and 16S)” on page 79.

Table 35 (Page 1 of 2). Available MCA Adapter Features

Feature Code	Adapter Description
2410	SCSI-2 High Performance External I/O Controller
2412	Enhanced SCSI-2 Differential Fast/Wide Adapter/A
2415	SCSI-2 Fast/Wide Adapter/A
2700	4-Port Multiprotocol Communications Controller
2723	FDDI Dual-Ring Attachment
2724	FDDI Single-Ring Attachment
2735	High Performance Parallel Interface - HIPPI
2754	S/390 ESCON Channel Emulator Adapter
2755	Block Multiplexer Channel Adapter - BMCA
2756	ESCON Control Unit Adapter
2930	8-Port Async Adapter-EIA-232
2960	X.25 Interface Co-Processor/2
2970	Token-Ring High Performance Network Adapter
2972	Auto Token-Ring LANstreamer MC 32 Adapter
2980	Ethernet High Performance LAN Adapter
2989	TURBOWAYS 155 ATM Adapter
2992	High-Performance Ethernet LAN Adapter (AUI/10BaseT)
2993	High-Performance Ethernet LAN Adapter (BNC)
2994	10/100 Ethernet Twisted Pair MC Adapter
4224	Ethernet 10BaseT Transceiver
6212	9333 High Performance Subsystem Adapter
6214	SSA 4-Port Adapter
6216	Enhanced SSA 4-Port Adapter
6217	SSA 4-Port RAID Adapter
6219	Micro Channel SSA Multi-Initiator/RAID EL Adapter(accepts optional SSA Fast-Write Cache module (F/C 6222))
6305	Digital Trunk Dual Adapter
7006	Realtime Interface Co-Processor Portmaster Adapter/A
8128	128-Port Async Controller

Table 35 (Page 2 of 2). Available MCA Adapter Features

Feature Code	Adapter Description

Notes:

1. Check Table 58 on page 214 for a summary of software and cabling requirements for each communication adapter.
2. If you are planning for a configuration in a multi-host SCSI environment using 7134's or 7135's, see "Planning for Multihost SCSI Environments" on page 201.

SCSI-2 High Performance External I/O Controller (F/C 2410) MCA

The SCSI-2 External I/O Controller feature (**F/C 2410**) allows you to attach external single-ended SCSI and SCSI-2 devices. This feature provides for attachment of one IBM 9334 Expansion Unit Model 500 or up to four external IBM supported SCSI devices with IBM supported cables.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Provides an adapter that conforms to ANSI Doc X3.131 - 1986
- Accepts multiple commands per device from your SP system
- Supports a data rate of up to 10 megabytes per second (synchronous protocol)
- Acts as a SCSI-2 initiator (command issuer)
- Provides SCSI-2 parity support
- Includes a standard Micro Channel form factor card
- Requires one Micro Channel adapter (MCA) slot
- Supports a maximum of four adapters per SP thin processor node and seven adapters per wide processor node
- Provides a Micro Channel interface with:
  - 4-byte (32-bit) bus master
  - Streaming data support
  - Address and data parity support
  - Supports command tagged queuing

Feature Components

IBM provides the SCSI-2 External I/O adapter card.

Customer Components

You must supply the following components for this feature:

- Cables to the adapter (ordered with IBM 9334 Expansion Units)
- Direct access storage devices or tape drives

Required Software

See Table 58 on page 214 for requirements.

Site Preparation

Site planning for this feature involves preparing for the installation of the I/O cables attached to the RS/6000 SP frame from the IBM 9334 Expansion Units. This adapter provides SCSI bus signal cable quality and a maximum SCSI bus length of up to 3.75 meters (12.3 feet).

SCSI-2 Cable Routing

Figure 22 represents the cable routing to the SCSI-2 External I/O Controller feature installed in an SP frame from an IBM 9076 SP Frame to an IBM 7015 Expansion Rack.

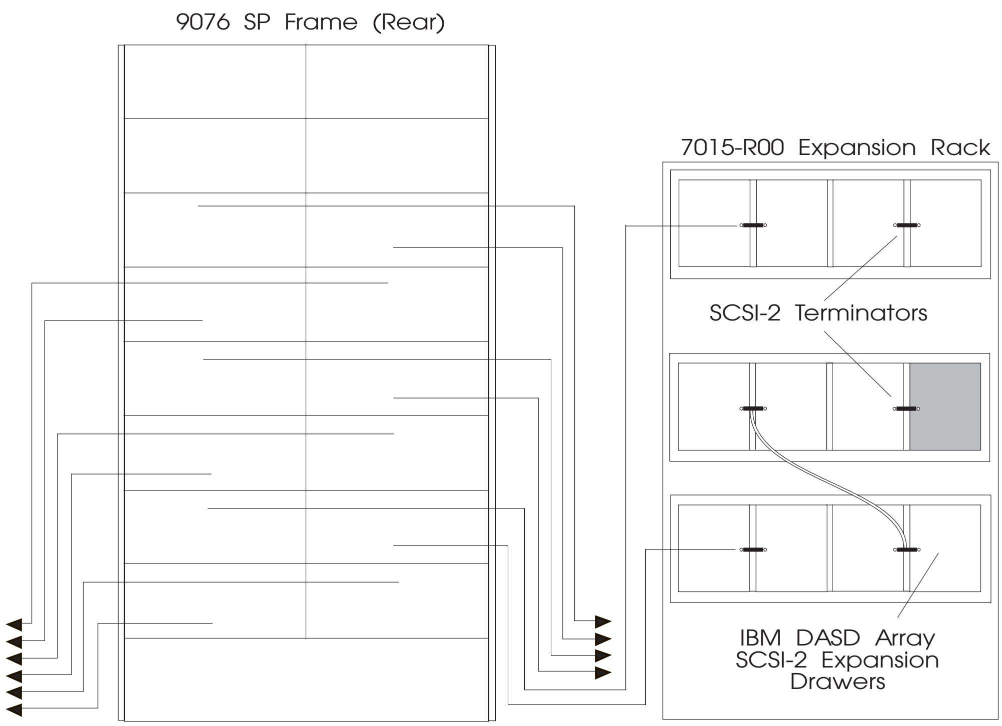


Figure 22. SCSI-2 External I/O Configuration for Processor Cabling

External Cable Routing

Table 36 on page 164 shows cable budget information for individual nodes within the RS/6000 SP frame with the adapter feature installed. The distances are measured from the back of the processor node to the floor. The SP uses a maximum of 120 inches of SCSI-2 External feature cable budget.

Table 36. Cable Budget Information for SCSI-2 External I/O Feature		
To Node	**Measured in Millimeters**	**Measured in Inches**
1	1780	71
2	1500	59
3	1680	66
4	1980	78
5	2160	85
6	1850	73
7	2030	80
8	2340	92
9	2510	99
10	2210	87
11	2390	94
12	2690	106
13	2870	113
14	2570	101
15	2740	108
16	3050	120

Enhanced SCSI-2 Differential Fast/Wide Adapter/A (F/C 2412) MCA

The IBM Enhanced SCSI-2 Differential Fast/Wide Adapter/A is a dual ported fast (10 MHz) and wide (2 bytes wide) SCSI Micro Channel Adapter that can provide synchronous SCSI bus data rates of up to 20 megabytes per second.

This adapter provides high performance attachment to Differential SCSI disks, disk subsystems, tape devices and read/write optical subsystems. The maximum data rate depends on system and application configurations. This adapter has one internal single ended port and one external differential port. The internal port is capable of attaching up to six single ended devices; the external port is capable of addressing up to fifteen differential devices. The number of physical devices attached to each port is limited by SCSI bus cabling restrictions. The internal port of this adapter supports either 8-bit or 16-bit devices via an 8-bit or a 16-bit connector. Only one of these two connectors may be used at one time. (Devices of different bus attachment widths cannot be connected/used at the same time.) The external Differential SCSI bus is capable of supporting cable lengths of 25 meters (82 feet).

Additional system, subsystem and high availability connections are also available with the differential system-to-system and Y-cable features.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Controller conforms to ANSI Doc X3T9.2/86-109 rev 10h
- Accepts multiple commands per device from system
- SCSI-2 data rate of up to 20 MB per second (synchronous protocol)

- Up to 1200 operations per second of 4 Kbyte data block transfers; actual performance levels depend on system and application configurations.
- Acts as SCSI initiator (command issuer)
- SCSI parity support
- Micro Channel Interface:
  - 4 byte (32-bit) Bus Master
  - Streaming data support (40 MB/sec burst)
  - Address and data parity support
- Occupies one Micro Channel slot
- Supports Command Tagged Queuing (as SCSI initiator)

Required Software

See Table 58 on page 214 for requirements.

SCSI-2 Fast/Wide Adapter/A (F/C 2415) MCA

The SCSI-2 Fast/Wide adapter feature (**F/C 2415**) is a dual-ported fast (10 MHz) and wide (two bytes) adapter. It provides synchronous SCSI bus rates up to 20 megabytes per second and attaches to single-ended (SE) SCSI disks, CD-ROMs, tape drives, R/W optical devices, and storage subsystems. The maximum data rate depends on the maximum rate of the attached device.

This adapter has one internal SE port and one external SE port. Each SE port can address up to seven SE SCSI devices. The number of physical devices attached to each port is limited by SCSI bus cabling restrictions. The internal port supports either 8-bit or 16-bit devices via an internal fast/wide cable with an interposer for fast-only devices. External cabling may be up to six meters (19.6 feet) when attached to the 9334-010 or 9334-500, or three meters when attached to anything else, and is supplied by the attaching device.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Conforms to ANSI Doc X3T9.2/86-109 (Revision 10H)
- Accepts multiple commands per device from your RS/6000 SP system
- Supports a SCSI-2 Fast/Wide data rate of up to 20 megabytes per second (synchronous protocol)
- Acts as a SCSI-2 Fast/Wide initiator (command issuer)
- Requires one Micro Channel adapter (MCA) slot
- Support a maximum of four adapters per RS/6000 SP thin processor node and seven adapters per wide processor node
- Supports command tagged queuing (as SCSI-2 Fast/Wide initiator)
- Provides a Micro Channel interface with:
  - 4 byte (32-bit) bus master
  - Streaming data support (40 megabytes per second burst)

– Address and data parity support

Feature Components

IBM provides the SCSI-2 Fast/Wide adapter card.

Customer Components

You must supply the following components for this feature:

- Cables for the adapter (ordered with IBM 9334 Expansion Units)
- Direct access storage devices or tape drives

Note: This feature (or F/C 2416) is a corequisite of the internal Fast/Wide DASD features. A wide node Fast/Wide cable (F/C 1240) is required to utilize internal Fast/Wide DASD.

Required Software

This feature (or F/C 2416) is a corequisite of the Fast/Wide DASD features (F/C 3032, 3033 or 3034). The Parallel System Support Programs (PSSP) Version 1, Release 2, must be installed when utilizing Fast/Wide DASD. (See Table 59 on page 222 for DASD sizes and feature notes.)

See Table 58 on page 214 for requirements.

Site Preparation

Site planning for the SCSI-2 Fast/Wide adapter feature involves preparing for the installation of the I/O cables attached to the RS/6000 SP frame from the IBM 9334 unit(s). If you are planning to configure a multihost SCSI environment with 7134's or 7135's, see “Planning for Multihost SCSI Environments” on page 201.

SCSI-2 F/W Cable Routing

Figure 23 on page 167 represents the cable routing from the SCSI-2 Fast/Wide adapter feature installed in an SP frame, from an IBM 9076 SP Frame to an IBM 7015 Expansion Rack.

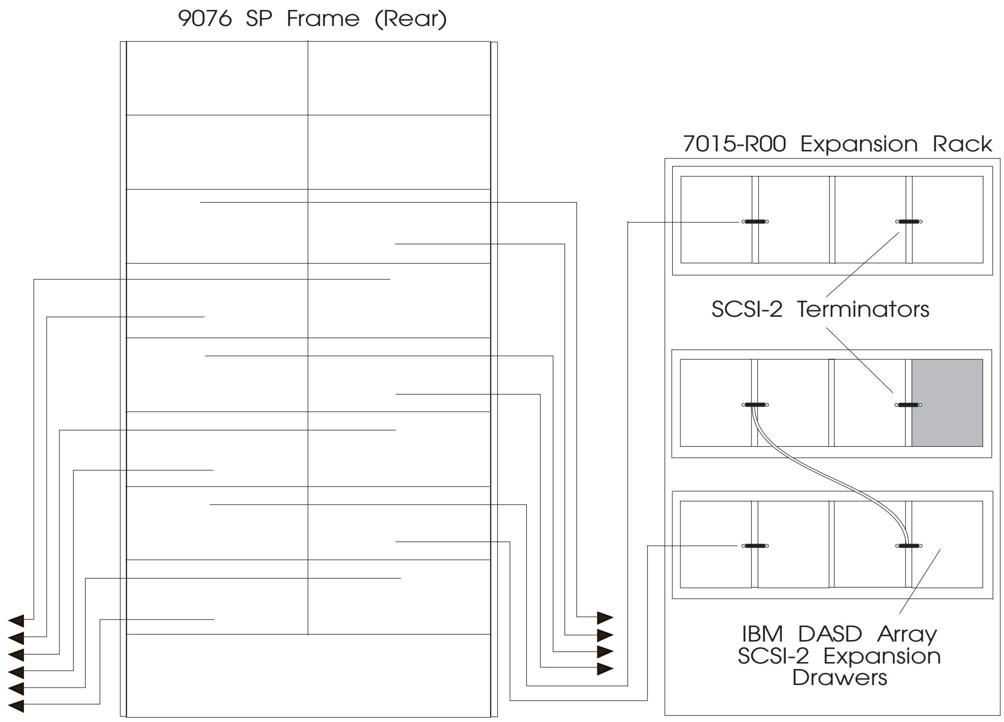


Figure 23. SCSI-2 Fast/Wide Configuration for Processor Cabling

External Cable Routing

The SP uses a maximum of 120 inches of SCSI-2 Fast/Wide cable budget. Table 37 on page 168 shows the cable budget needed to reach individual nodes in an SP frame.

Table 37. Cable Budget Information for SCSI-2 Fast/Wide Feature		
To Node	**Measured in Millimeters**	**Measured in Inches**
1	1780	71
2	1500	59
3	1680	66
4	1980	78
5	2160	85
6	1850	73
7	2030	80
8	2340	92
9	2510	99
10	2210	87
11	2390	94
12	2690	106
13	2870	113
14	2570	101
15	2740	108
16	3050	120

4-Port Multiprotocol Communications Controller - (F/C 2700) MCA

The 4-port Multiprotocol Communications Controller feature (**F/C 2700**) attaches the RS/6000 500 series to synchronous communications networks using EIA-232D, EIA-422A, A.35, and X.21 physical specifications. The adapter supports SDLC and BSC protocols, prepares all inbound and outbound data, performs address searches, and in general relieves the system processor of many communications tasks. It is designed to support data rates up to 64 Kbps per port with appropriate user provided software.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Provides 512 KB RAM for data buffering
- Supports four ports concurrently
- Uses four physical interfaces (EIA-232D, EIA-422A, V.35, X.21)
- Provides CRC generation and checking
- Provides a Micro Channel interface with 16-bit bus master
- Requires a standard Micro Channel form factor card
- A maximum of seven adapters per SP frame can be installed and they must be installed in the bottom four shelves of an SP frame.

Feature Components

IBM provides the 4-port Multiprotocol Communications Controller with support for the following four interfaces: EIA-232D on Ports 0, 1, 2, and 3, EIA-422A on Ports 0 and 2, CCITT V.35 on Ports 0 and 1, and CCITT X.21 on Port 0. Surge protection is provided on the EIA-422A port 2 interface.

Devices attach to the adapter via a 4-Port Multiprotocol Interface Cable (F/C 2705).

Customer Components

See Table 38 on page 170 for descriptions.

Required Software

See Table 58 on page 214 for requirements.

Cable Routing

Figure 24 on page 170 represents the cable routing to the 4-port Multiprotocol Communications Controller feature installed in an SP frame.

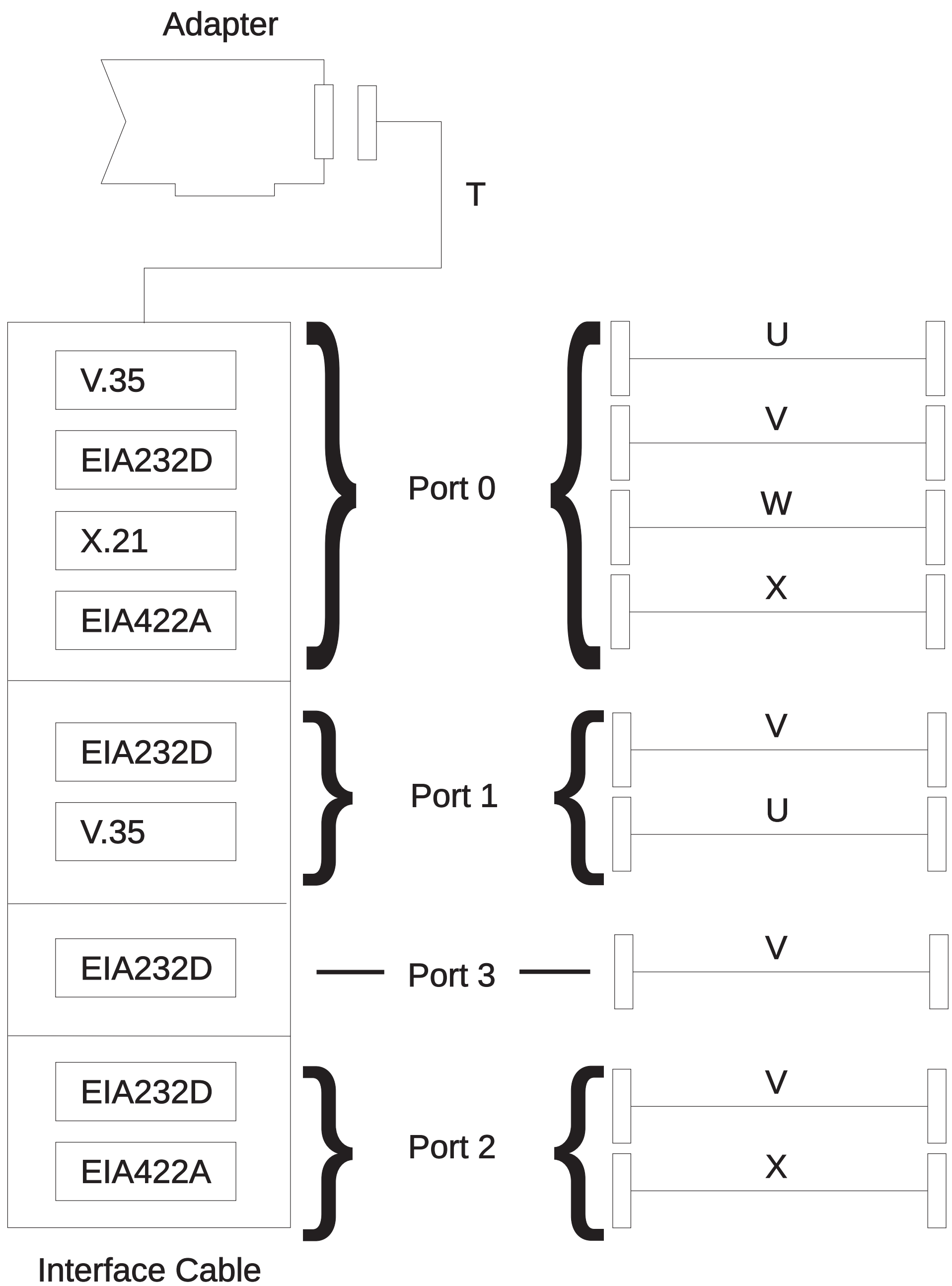


Figure 24. 4-Port Multiprotocol Communications Controller for Processor Cabling

Table 38 (Page 1 of 2). Cable Information for 4-Port Multiprotocol Communications Controller

Cable Letter	Cable Description	Part Number	Feature Code	Length m (ft)
T	Interface/Breakout Box	53F2622	2705	3 (10)
U	V.35 cable, if customer-supplied, must meet V.35 requirements	71F0162	2702	2 (6.5)

Table 38 (Page 2 of 2). Cable Information for 4-Port Multiprotocol Communications Controller				
Cable Letter	**Cable Description**	**Part Number**	**Feature Code**	**Length m (ft)**
V	EIA-232D/V.24 cable, if customer-supplied, must meet EIA-232D/V.24 requirements	71F0165	2706	3 (10)
W	X.21 cable, if customer-supplied, must meet X.21 cable requirements	71F0164	2704	3 (10)
X	If customer-supplied, must meet EIA-422A requirements	N/A	N/A	N/A

Fiber Distributed Data Interface - FDDI - (F/C 2724, 2723) MCA

The SP supports both single-ring (**F/C 2724**) and dual-ring (**F/C 2723**) attachment.

The FDDI single-ring attachment station (SAS) adapter attaches the SP directly to a primary ring of a FDDI network via a concentrator. The FDDI concentrator offers additional protection by isolating the network from routine on/off activity and individual failure of an SP processor node.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Supports single-ring FDDI attachment at 100 Mbps via a customer-supplied FDDI concentrator
- Supports all TCP/IP protocols and ANSI Station Management (SMT) 6.2. An application programming interface is provided for the device driver
- Does not support AIX booting via the FDDI adapter
- Requires one Micro Channel adapter (MCA) slot responsibility of the customer

Feature Components

This feature order contains one FDDI card and includes one microcode disk.

Customer Components

You must supply the following components for this feature:

- A FDDI concentrator such as the IBM 8240 (or equivalent) concentrator to connect to your FDDI local area network
- FDDI fiber optic cables from the processor nodes to the FDDI concentrator
- AIX FDDI Device Driver (AIX Version 3.2.5 (or later) Extended Support Programming Feature)

Site Preparation

Site planning for the FDDI feature involves preparing your site for the installation of raceways or other similar hardware to protect and route the I/O cables attached from the SP frame to the IBM 8240 Concentrator (or equivalent device), or application file server.

Raised-Floor Installation

Raised floor installations require under-floor raceways. The FDDI cables are vulnerable to damage and must be protected within a raceway.

FDDI Typical SP Configuration

Figure 25 shows a typical FDDI configuration for the SP system.

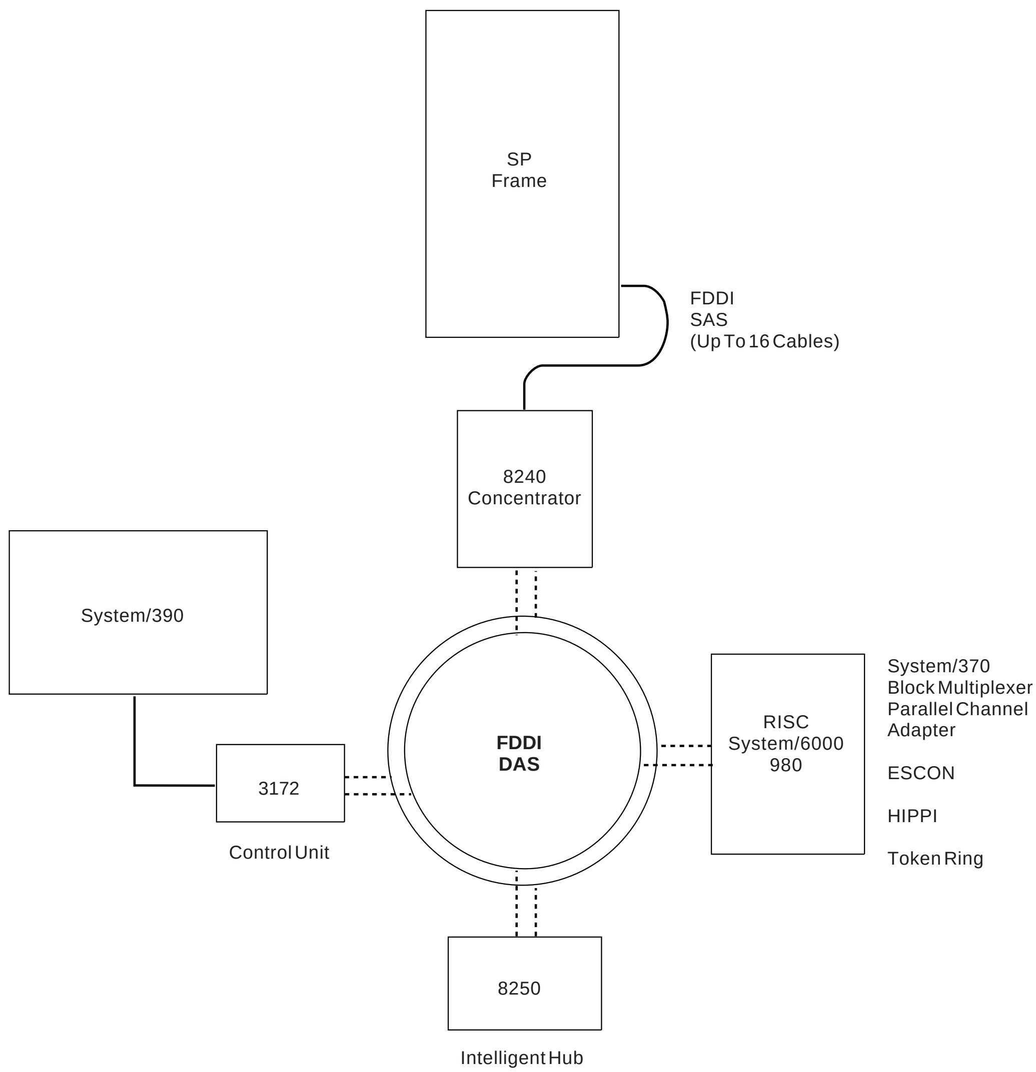


Figure 25. Typical FDDI Configuration for the SP System.

FDDI Single-Ring Attachment Station

Figure 26 shows a typical FDDI single-ring attachment station (SAS) cabling from the RS/6000 SP frame to the IBM 8240 Concentrator:

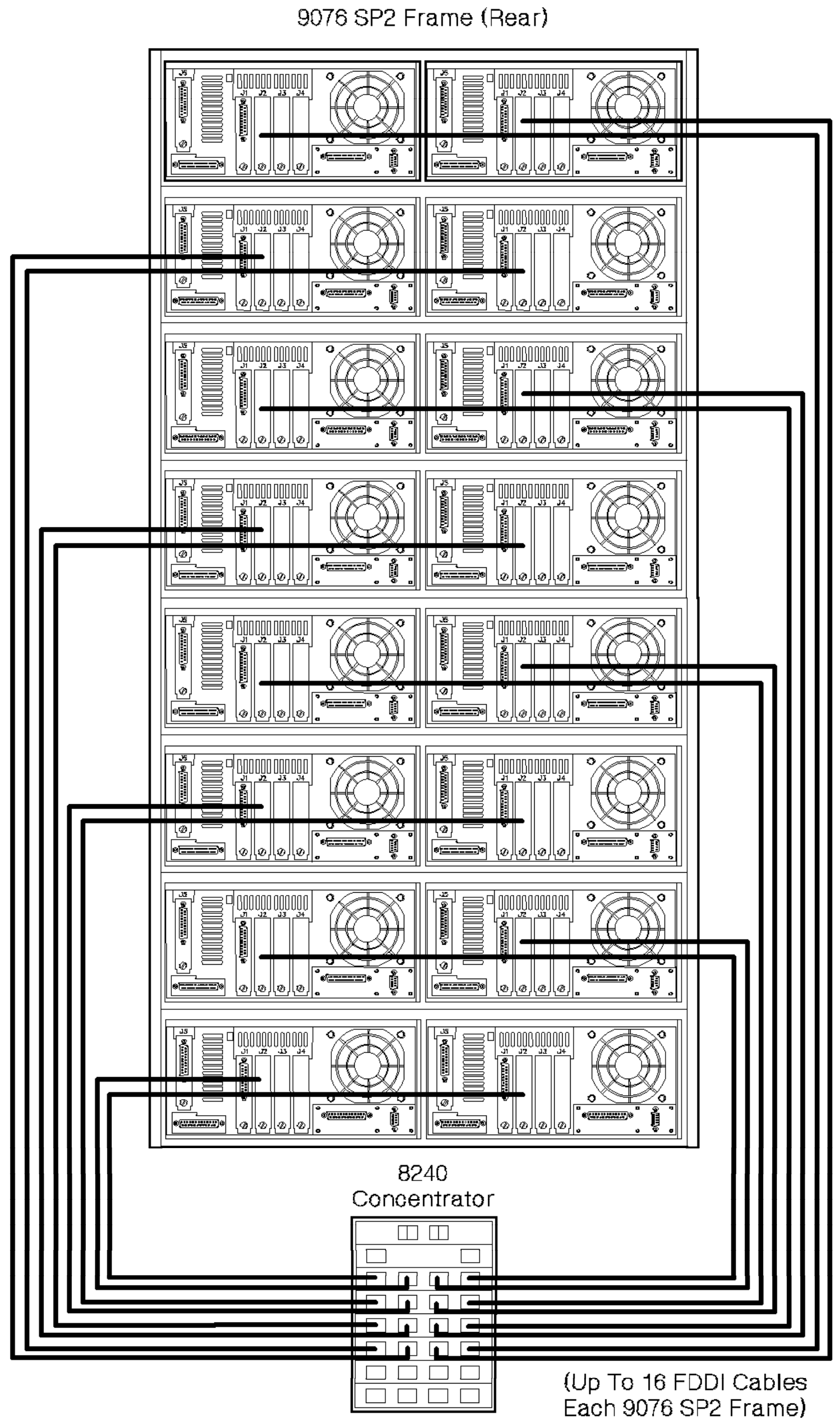


Figure 26. Typical FDDI Single-Ring Attachment Cabling for the SP System

The IBM 8240 Concentrator provides six plug modules. Each module has four port fiber modules or four port copper-shielded modules. The SP supports only the fiber connection.

FDDI Dual-Ring Attachment Station

Figure 27 shows typical FDDI dual-ring attachment cabling from the SP frame to a concentrator or an external LAN.

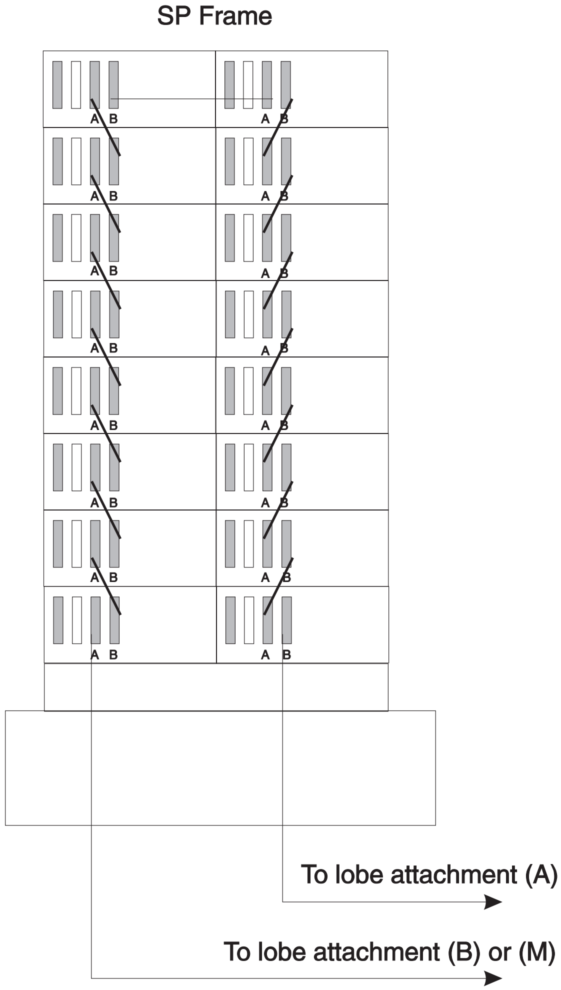


Figure 27. Typical FDDI Dual-Ring Attachment Cabling for the SP System

FDDI Dual Homing Cabling

Figure 28 on page 175 shows a typical FDDI dual homing cabling from the SP frame to a concentrator.

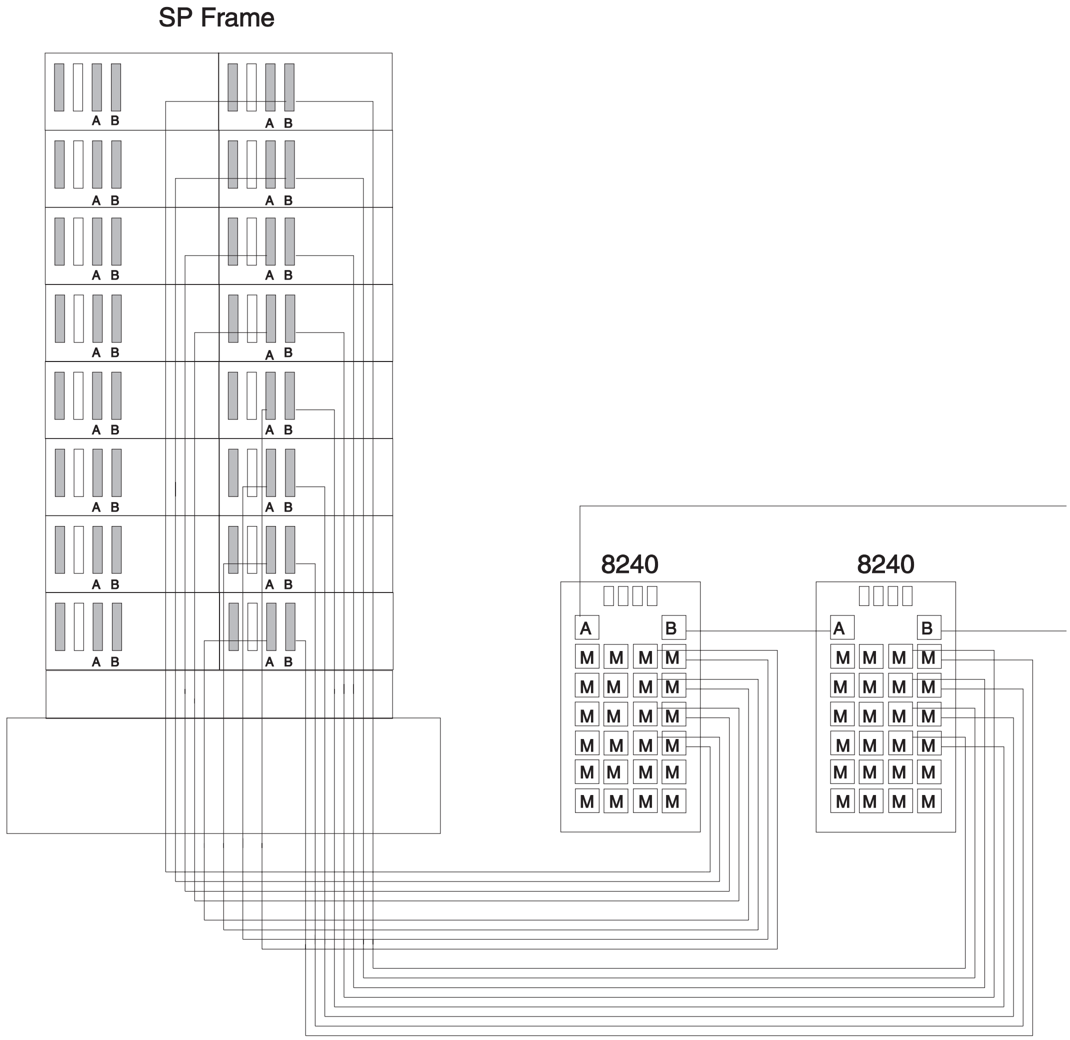


Figure 28. Typical FDDI Dual Homing Cabling for the SP System

External Cabling Routing for FDDI Cables

The SP uses a maximum of 120 inches of FDDI cable budget. Table 39 on page 176 shows the cable budget needed to reach individual nodes in an SP frame.

Table 39. Cable Budget Information for FDDI Feature		
To Node	**Measured in Millimeters**	**Measured in Inches**
1	1780	71
2	1500	59
3	1680	66
4	1980	78
5	2160	85
6	1850	73
7	2030	80
8	2340	92
9	2510	99
10	2210	87
11	2390	94
12	2690	106
13	2870	113
14	2570	101
15	2740	108
16	3050	120

High Performance Parallel Interface - HIPPI - (F/C 2735) MCA

The High Performance Parallel Interface (HIPPI) (**F/C 2735**) provides high-speed connectivity to super computers, RS/6000 processors, HIPPI fiber optic extenders, IBM 9570 Disk Array, and other disk arrays and tape systems.

This feature provides an efficient simplex/duplex point-to-point HIPPI interface achieving peak rates of 100 megabytes per second (simultaneous in each direction) over a distance of up to 25 meters via copper cabling. This distance can be extended using HIPPI extenders. The adapter can be used for either communication or storage-channel applications.

The HIPPI adapter set occupies three adjacent Micro Channel slots. However, because of power considerations, the adapter set currently must be considered to occupy five Micro Channel slots.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Provides first-parity bus master for direct memory access (DMA)
- Provides 64-bit wide data streaming
  - Supports address and data parity
  - Consists of three type-5 Micro Channel cards
  - Supports TCP/IP, UDP, IPI-3 master and slave, and user-defined upper level protocols
  - Supports one card IPI-3 protocol accelerator

– Provides 1 MB each transmit and receive data RAM

– Provides sustained IPI-3 data rates up to 66 megabytes per second to the application layer

Customer Components

You must supply industry-standard HIPPI cables up to 25 meters.

Required Software

See Table 58 on page 214 for requirements.

This feature also requires program number 5696-658 and related PTFs of AIX HIPPI Driver Group/6000

HIPPI Cable Routing

The HIPPI 100-pin connector is keyed and must be carefully aligned before insertion into the node receptacle. Figure 29 on page 178 shows HIPPI cables connecting to the transmit card and receive card in the back of the SP node.

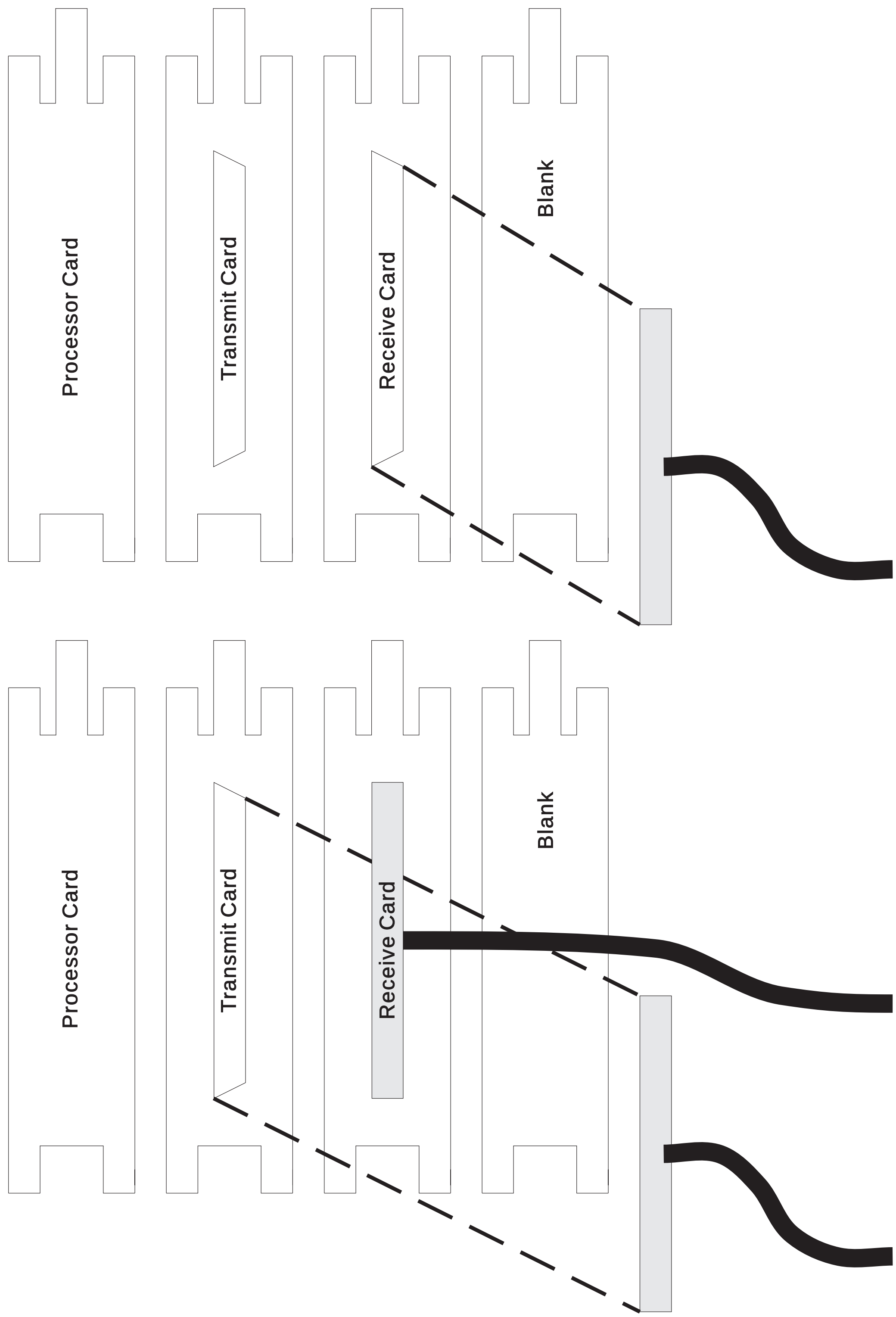


Figure 29. HIPPI Cabling for the SP System

S/390 ESCON Channel Emulator Adapter (F/C 2754) MCA

This adapter provides attachment capability via the IBM ESCON architecture for selected tapes providing IBM customers with more choices for implementing data access applications by an ESCON Channel attachment of S/390 tapes to RS/6000 systems. Supporting a data transfer rate of up to 17 MB per second (Mbps), the ESCON Emulator adapter allows attachment of ESCON attached tape subsystems. The adapter uses two Micro Channel slots. A maximum of two adapters may be installed per processor, depending upon slot availability. Designed to support specifications for ESCON devices, the ESCON Emulator adapter conforms to most of the standard Micro Channel specifications that are required for tape subsystems. One wrap plug, two diagnostic diskettes (stand-alone and runtime), publications, and two device driver diskettes are included with the hardware adapter. Channel cables are also required and should be ordered separately. The ESCON Emulator adapter supports the following tape devices with appropriate software installed:

- IBM 3490 Magnetic Tape Subsystem, all models
- IBM 3490E Magnetic Tape Subsystem, all models
- IBM 3494 Tape Library Dataserver
- IBM 3495 Tape Library Dataserver

Block Multiplexer Channel Adapter - BMCA - (F/C 2755) MCA

A DB78 bus/tag terminator is shipped with **F/C 2753** to end the bus and tag channel string, so you do not need to supply serpentine bus and tag terminators for the channels connected to the SP BMCA feature (**F/C 2755**).

Configuring the Host Channel

In addition, you need to configure the host channel on your System/370 or System/390 for the BMCA feature. Refer to *Block Multiplexer Channel Adapter User's Guide and Service Information*, SC23-2427, for host channel definition information.

BMCA Single Node Cabling

Figure 30 on page 180 represents a typical BMCA configuration for a single RS/6000 SP processor node that is cabled to a host channel.

This configuration includes:

- F/C 2755 - Block Multiplexer Channel Adapter
- F/C 2753 - Block Multiplexer Channel Adapter Cable - (P/N 54G3361)

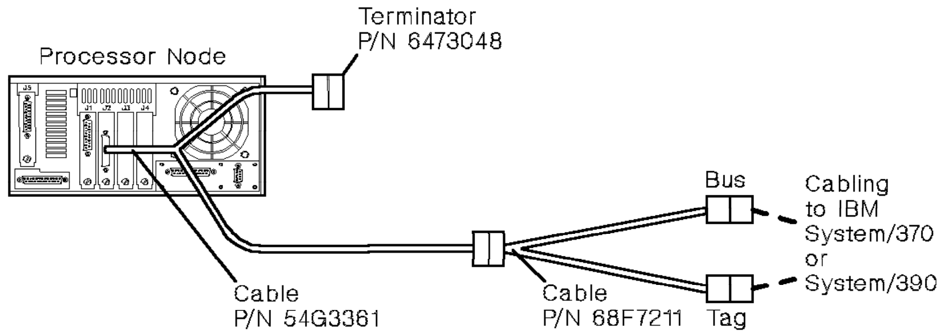


Figure 30. BMCA Single-Node Cabling Configuration

BMCA Node-to-Node Cabling

Figure 31 represents a typical BMCA configuration for a RS/6000 SP system that has daisy-chained node-to-node cables going to a host channel. This configuration includes:

- F/C 2755 - Block Multiplexer Channel Adapter
- F/C 2752 - Block Multiplexer Node-to-Node Channel Adapter Cable - (P/N 54G3360)
- F/C 2753 - Block Multiplexer Channel Adapter Cable - (P/N 54G3361)

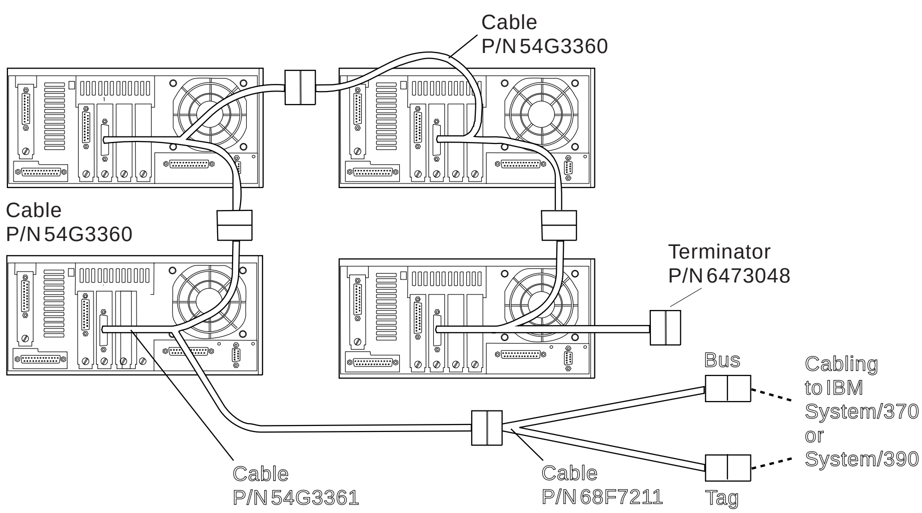


Figure 31. BMCA Node-to-Node Cabling Configuration

The Block Multiplexer node-to-node cable (**F/C 2752**) is only long enough to connect adapters in adjacent nodes. If your configuration requires that you space the adapters a greater distance apart, and are daisy chaining them on the same channel, then you will have to order **F/C 2753**. This feature contains a Y-cable with one longer end that normally leads from the adapter out of the SP frame.

Using this feature will leave you with one surplus bus and tag translator cable (P/N 68F7211).

Therefore, it is desirable to space the nodes with the block multiplexer channel adapters next to one another if they are going to be daisy chained to the same channel.

Refer to "Channel Adapter Cables" on page 183 for a description of the BMCA channel adapter cables.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Connects to VM/SP, VM/XA, VM/ESA, MVS/SP, MVS/XA, MVS/ESA, and AIX/ESA environments
- Establishes user-written protocol similar to channel-to-channel (CTC).
- Supports TCP/IP protocol for VM and MVS (Requires Version 2, Release 2, or newer versions)
- Supports attachment to ESCON networks using the IBM ESCON Converter 9034 Model 1
- Supports attachment to the IBM 3044 Channel Extender Model 2.
- Provides application program interface (API) support at the device driver level
- Provides maximum channel speed up to 4.5 megabytes for hardware peak performance
- Provides block multiplexer channel support, with efficient adapter design
- Supports connection to the System/370 and System/390 family of processors with a dedicated channel
- Provides a Micro Channel interface with
  - Four-byte (32-bit) bus master
  - Streaming data support
  - Address and data parity support
- One dedicated Micro Channel (MCA) adapter slot
- With daisy-chaining, each host channel can support up to eight adapters
- Node-to-node connections, in a daisy-chain, require the use of F/C 2752
- A terminator is required on the last adapter cable
- Nodes must be physically adjacent (vertically and horizontally)

Feature Components

This table describes the BMCA feature codes:

Feature	Contents
2752	• BMCA Node-to-Node Channel Adapter Cable (P/N 54G3360)
2753	• One D78 bus/tag terminator (P/N 6473048) • One Y-cable (P/N 68F7211) to host system bus and tag • One Y-cable (P/N 54G3361) at RS/6000 processor node
2755	• Adapter Field Replaceable Unit (FRU) • One microcode disk • One D78 diagnostic wrap plug • One bus diagnostic wrap plug • One tag diagnostic wrap plug • One ESD pad • One ESD pad label

Customer Components

You must provide bus and tag cables to your host system from the RS/6000 SP system.

Required Software

This feature requires the following software:

- See Table 58 on page 214 for requirements.
- AIX BMCA Device Driver (AIX Version 3.2.5 (or later) Extended Support Programming Feature)
- Host software as described in TCP/IP Version 2.2 for MVS (program number 5735-HAL) or VM (program number 5735-FAL)

Optional Software

The IBM Client Input/Output Sockets (CLIO/S), (program number 5799-FET) is a set of application programming interfaces (API) that can be used with your RS/6000 SP system for high-speed data transfer and distributed jobs across a client/server environment. CLIO/S provides an API to tape drives in an MVS/ESA environment.

See your IBM marketing representative for more information.

Site Preparation

IBM recommends a raised-floor installation only.

Cable Connections

Cable considerations include:

- A maximum of 122 meters (400 feet) of bus and tag channel cable is allowed.
- Each Feature 2753 used is the equivalent of 25 feet and each Feature 2752 used is the equivalent of 3 feet.
- The serpentine bus and tag cables connect Feature 2753 Y-cable under the floor at the rear of the RS/6000 SP frame.

Channel Adapter Cables

The BMCA requires the following cables:

- Block Multiplexer Channel Adapter Cable

  The BMCA cable attaches the BMCA adapter card in the RS/6000 SP processor node to a host processor System/370 or System/390 channel.

- Block Multiplexer Node-to-Node Channel Adapter Cable

  The Block Multiplexer Node-to-Node Channel Adapter Cable forms a daisy-chain of RS/6000 SP BMCA cables. A maximum of eight RS/6000 SP processor nodes may be daisy-chained to a host System/370 or System/390 channel.

Limitations

Limitations for connectivity of adapter types include:

- A maximum of two BMCA adapter per RS/6000 SP processor node may be installed
- Three connectivity features may be installed in each RS/6000 SP frame, in addition to the Ethernet adapter card
- SNA and XA multipath connection are not supported by BMCA
- Automated system monitoring of the BMCA feature is not available at this time

A host processor System/370 or System/390 channel must be dedicated to the RS/6000 SP BMCA. No input/output devices other than the RS/6000 SP Block Multiplexer Channel Adapters can be attached to the channel string.

ESCON Control Unit Adapter (F/C 2756) MCA

This adapter (**F/C 2756**) allows you the ability to attach SP nodes to the IBM Enterprise System Connection (ESCON) channels of the System/390. The adapter attaches directly to an ESCON channel, providing fiber optical links using LED technology. It also attaches to ESCON Directors (fiber optic switches) to allow for large numbers of connections.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Supports attachment of either 10 MB or 17 MB ESCON channels
- Supports a maximum distance of 43 km using a combination of LED and Laser ESCON links
- Provides support for TCP/IP protocols on VM/ESA, MVS/ESA, and AIX/ESA
- Provides support for CLAW (Common Link Access to Workstations) protocol on VM/ESA, MVS/ESA, and AIX/ESA
- Supports a maximum of one adapter per thin node or two per wide node

Required Software

This feature requires the following software:

- See Table 58 on page 214 for requirements.
- AIX programming feature 5056 (and related updates), which is a Licensed Program Product (LPP)
- Host software as described in IBM TCP/IP version 2.2 for MVS (program number 5735-HAL) or VM (program number 5735-FAL)
- User-written application programs for CLAW, 3088, or IBM Client Input/Output Sockets (CLIO/S)

Optional Software

CLIO/S, (program number 5799-FET) is a set of application programming interfaces (API) which can be used with your RS/6000 SP system for high-speed data transfer and distributed jobs across a client/server environment. CLIO/S provides an API to tape drives in an MVS/ESA environment.

See your IBM marketing representative for more information.

8-Port Async Adapter - EIA-232 - (F/C 2930) MCA

The 8-port Async feature (**F/C 2930**) provides the RS/6000 500 series system with up to eight EIA-232 asynchronous serial devices such as terminals and printers. The 8-port Async adapter contains all of the electronics required to support eight asynchronous ports and uses one I/O card slot.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Provides data rates up to 38.4 Kbps per port
- Supports 16-byte buffering on transmit and receive
- Single 78-pin output connector (multiport interface cable attaches to this connector)
- Full set of modem control lines for asynchronous communications
- Supports the TxD, RxD, RTS, CTS, DSR, DCD, DTR, and RI interface signals
- Requires a standard Micro Channel form factor card
- Provides 8-bit/16-bit Micro Channel slave interface
- Supports cabling up to 61 meters (200 feet)
- A maximum of four adapters per thin node or seven adapters per wide node and a maximum of 32 adapters per SP frame can be installed.

Feature Components

IBM provides the 8-port Async adapter EIA-232, which is designed to comply with requirements for EIA-232-D and CCITT recommendations V.24/V.28 Series 100 (start-stop). This adapter requires the Multiport Interface Cable (F/C 2995). The Multiport Interface Cable (F/C 2995) allows up to eight devices to attach to the

8-Port Async Adapters (EIA-232, EIA-422A and MIL-STD 188-US only) by providing eight 25-pin D shell connectors. This cable is 3 meters (9.8 ft.) long.

Customer Components

See Table 40 for descriptions.

Required Software

See Table 58 on page 214 for requirements.

Cable Routing

Figure 32 represents the cable routing to the 8-port Async adapter EIA-232 feature installed in an SP frame.

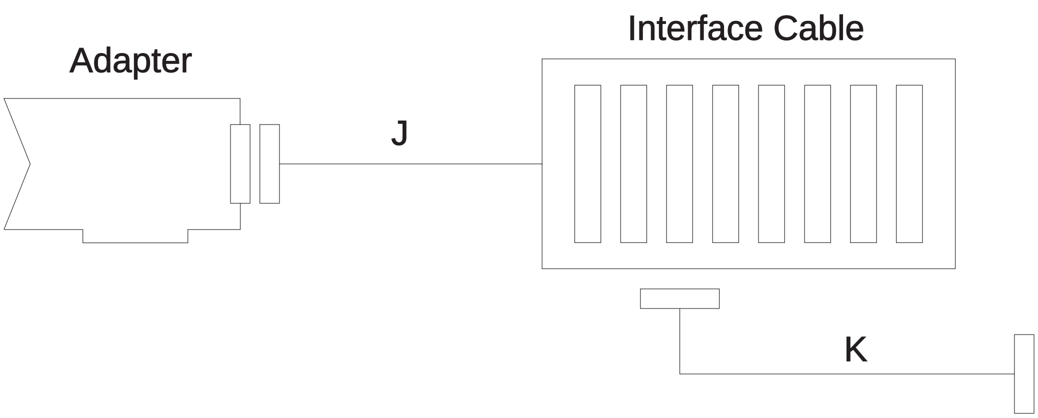


Figure 32. 8-Port Async Adapter EIA-232 for Processor Cabling

Table 40. Cable Information for 8-Port Async Adapter - EIA-232

Cable Letter	Cable Description	Part Number	Feature Code	Length m (ft)
J	Part of cable assembly Cable and box	00F5531 00F5524	2995	3 (10)
K	Terminal cable EIA-232, if customer-supplied, must meet EIA-232 requirements	12H1204	2934	3 (10)

X.25 Interface Co-Processor/2 - (F/C 2960) MCA

The X.25 Interface Co-Processor/2 feature (**F/C 2960**) attaches the RS/6000 500 series to an X.25 Packet Switched network. The X.25 adapter provides a single port that accommodates one of the following selectable interfaces: X.21, EIA-232D/V.24, and V.35. This adapter allows the systems to be attached to an X.25 network, and its on-board software is capable of processing inbound and outbound data streams to offload communications tasks from the system processor.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Provides 512 KB RAM for data buffering
- Uses three physical interfaces (X.21, EIA-232-D/V.24, V.35)
- Provides full-duplex, synchronous or asynchronous protocol
- Provides a Micro Channel interface with 16-bit bus master
- Requires a standard Micro Channel form factor card
- Requires installation in the bottom four shelves of an SP frame.
- Limits are dependent on the cable type:
  - For F/C 2976 (X.21), the limit is 32
  - For F/C 2977 (X.24), the limit is 8
  - For F/C 2978 (X.35), the limit is 64
- Requires installation with one of the following cables: F/C 2976, F/C 2977, F/C 2978

Feature Components

IBM provides the X.25 Interface Co-Processor/2 adapter, which you must install with one of the following cables: F/C 2976, F/C 2977, F/C 2978. These cables are priced separately and also separately orderable.

Separate cables of 3 meter (9.8 feet) or 6 meter (19.6 feet) are available for the adapter (two lengths for each interface). A wrap plug is included for each.

Customer Components

See Table 41 on page 187 for descriptions.

Required Software

See Table 58 on page 214 for requirements.

Cable Routing

Figure 33 represents the cable routing to the X.25 Interface Co-Processor/2 adapter feature installed in an SP frame.

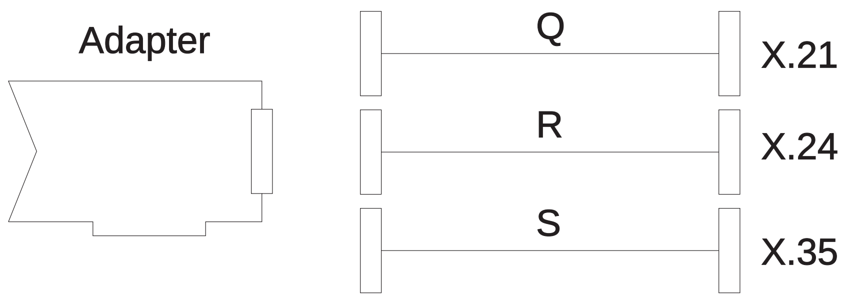


Figure 33. X.25 Interface Co-Processor/2 for Processor Cabling

Table 41. Cable Information for X.25 Interface Co-Processor/2				
Cable Letter	**Cable Description**	**Part Number**	**Feature Code**	**Length m (ft)**
Q	X.25 Attachment cable-X.21	07F3150	2965	3 (10)
		53F3926	2976	6 (20)
R	X.25 Attachment cable-V.24	07F3160	2966	3 (10)
		53F3927	2977	6 (20)
S	X.25 Attachment cable-V.35	07F3170	2967	3 (10)
		53F3928	2978	6 (20)

Token-Ring High Performance Network Adapter (F/C 2970) MCA

The Token-Ring High Performance Network adapter (F/C 2970) is designed to allow an SP node to attach to 4 Mbps or 16 Mbps Token-Ring local area network. This adapter is cable-and-network compatible with all IBM PS/2 Token-Ring adapters. The required cable is included with the adapter and is 20 feet in length. Extension cables may be ordered separately.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Complies with IEEE 802.5 specifications
- Provides a Micro Channel interface with:
  - 2-byte bus master
  - Streaming data support
- Requires one Micro Channel (MCA) slot
- Supports a maximum of four adapters per thin node or seven per wide node

For planning attachment of the RS/6000 SP system to a token-ring network, refer to the *Token-Ring Network Introduction and Planning Guide*, GA27-3677 for configuration and attachment options. Two sample token-ring attachment methods are illustrated in the following two figures.

Figure 34 on page 188 illustrates attachment via the IBM 8230 Controlled Access Unit. The 8230 is a wiring concentrator that allows up to 80 attaching devices to have access to the ring. It is designed for rack-mounted installations in wiring closets. The 8230 base unit, when used alone or in conjunction with up to four lobe attachment modules, functions as a copper repeater or optical fiber converter at either four or 16 Mbps.

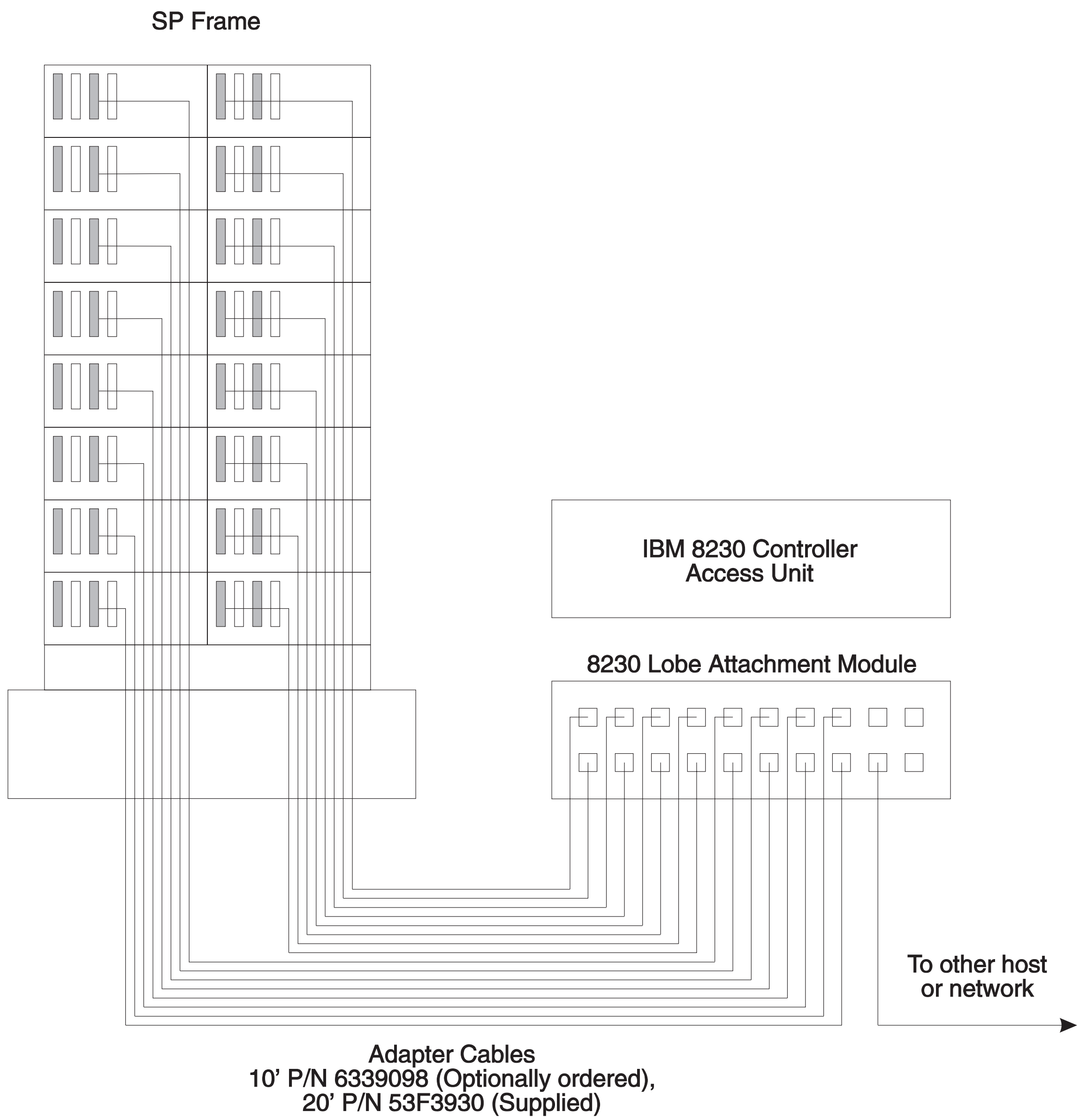


Figure 34. Token-Ring Attachment via the IBM 8230 Controlled Access Unit

Figure 35 on page 189 illustrates attachment via the IBM 8228 Multistation Attachment Unit. The 8228 is an 8-lobe wiring concentrator that can be installed in a rack in a wiring closet or in a component housing that has been wall mounted or placed on a shelf or table. Each 8228 allows up to eight attaching devices to have access to the ring.

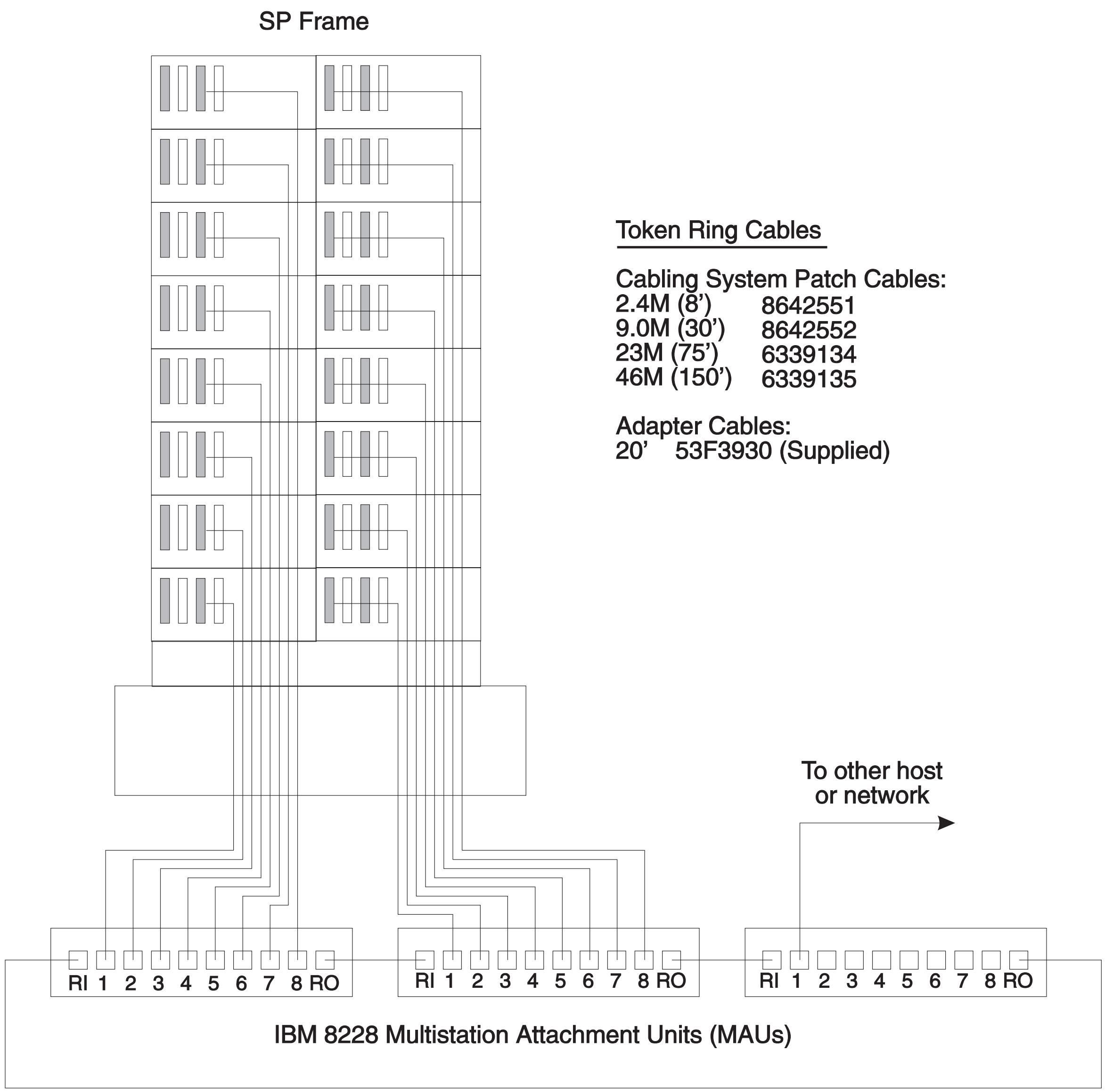


Figure 35. Token-Ring Attachment via the IBM 8228 Multistation Attachment Unit

The 8230, when used in conjunction with the 8228, offers significant network management and access control advantages over the 8228 alone. Using these units together, you can control access to the network so that only those attaching devices whose adapter addresses are registered with the LAN Network Manager for use on a specific 8230 lobe can gain access to the network.

Auto Token-Ring LANstreamer MC 32 Adapter - (F/C 2972) MCA

The IBM Auto Token-Ring LANstreamer MC 32 feature (**F/C 2972**) is designed to allow a RS/6000 system to attach to 4 Mbps or 16 Mbps token-ring local area networks. The adapter automatically selects the correct token-ring speed (4 or 16 Mbps). It is cable and network compatible with all IBM PS/2 Token adapters, which means that no new cables or network components are required.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Provides a Micro Channel interface with 4-byte (32-bit) bus master
- Requires a standard Micro Channel form factor card (Type 3)
- Attaches to 4 Mbps or 16 Mbps token-ring area networks
- Complies with IEEE 802.5 specifications
- A maximum of eight adapters per Micro Channel may be installed

Feature Components

IBM provides the Auto Token-Ring LANstreamer MC 32 adapter, which has one connector, RJ-45, which is used to attach to UTP cabling. A 10-inch conversion cable is included with the adapter to attach to STP cabling.

Customer Components

None.

Required Software

See Table 58 on page 214 for requirements.

Cable Routing

Figure 36 represents the cable routing to the Auto Token-Ring LANstreamer MC 32 adapter feature installed in an SP frame.

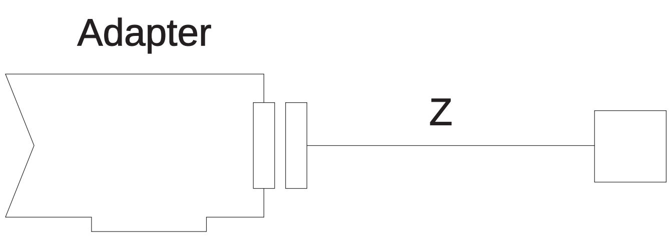


Figure 36. Auto Token-Ring LANstreamer MC 32 for Processor Cabling

Table 42. Cable Information for Auto Token-Ring LANstreamer MC 32 Adapter

Cable Letter	Cable Description	Part Number	Feature Code	Length m (ft)
Z	10-Inch Conversion cable (shipped with the adapter, converts from a 9 pin D-shell connector to an RJ-45 connector	60G1066	N/A	.25 (.8)
	or 10-foot data to RJ45 cable	60G1063	N/A	3 (10)

Ethernet High Performance LAN Adapter (F/C 2980) MCA

The Ethernet High Performance LAN Adapter (F/C 2980) is a high performance MCA architecture Busmaster adapter that provides a connection to 10 MB Carrier Sense Multiple Access/Collision Detection (CSMA/CD) Ethernet networks. The primary use of this adapter is to attach the 9076 system to Ethernet networks. F/C 2980 has both a 10Base2 (BNC) connector and a 10Base5 (15 pin, thick) connector, but only one connector may be used at one time.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Compatible with IEEE 802.5 and Ethernet version 2 networks
- When attaching the 9076 system using RG58A/U coaxial cable, an external transceiver is required.

Customer Supplied Components

You must supply the following components for this feature:

- All Ethernet cables
- Transceivers as needed
- Adapter-to-transceiver cables
- Transceiver wrap plugs
- Adapter wrap plugs

Required Software

See Table 58 on page 214 for requirements.

TURBOWAYS 155 ATM Adapter (F/C 2989) MCA

The TURBOWAYS 155 ATM adapter (**F/C 2989**) enables TCP/IP applications to work in an asynchronous transfer mode (ATM) environment. One virtual connection dedicated to each IP address and a transformation of each IP address to the corresponding virtual connection is performed.

The initial release supports AAL-5 adaptation layer interface and supports 1024 active virtual connections.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Provides self configuration, no system monitor support
- Provides signaling channel setup
- Provides bandwidth allocation and management
- Provides reliable, connection-oriented pipe between the SVC component and the ATM switch
- Provides virtual connection setup and tear down
- Processes messages sent by the switch

- Process synchronization
- Provides Micro Channel streaming
- Handles hardware and software interrupts
- Provides diagnosis
- Supports a maximum of two adapters per node

Customer Components

You must supply the following components with this feature:

- The multimode fiber interface cables
- An ATM switch

Notes:

1. EMEA: Order these components through CABLEX ordering system.
2. You can connect optical ports using 62.5 micron multimode fiber, terminated with SC industry standard connectors.

Required Software

This feature requires the following software:

- For TURBOWAYS 155 ATM, AIX Version 4.1.4 shipped after 10/20/95. The device driver is part of the AIX Base Operating System
- If you elect to install network management facilities, the SNMP (Simple Network Management Protocol) agent function must be configured and you must install an SNMP manager such as IBM NetView/6000.

See Table 58 on page 214 for requirements.

ATM Cable Routing

Figure 72 on page 321 shows typical ATM cabling from the SP frame to a customer-supplied ATM switch. Customer-supplied ATM cables requires an “SC” type connector at the ATM adapter end. Connector requirements at the switch end may vary. The cable type is 62.5/125um multimode fiber.

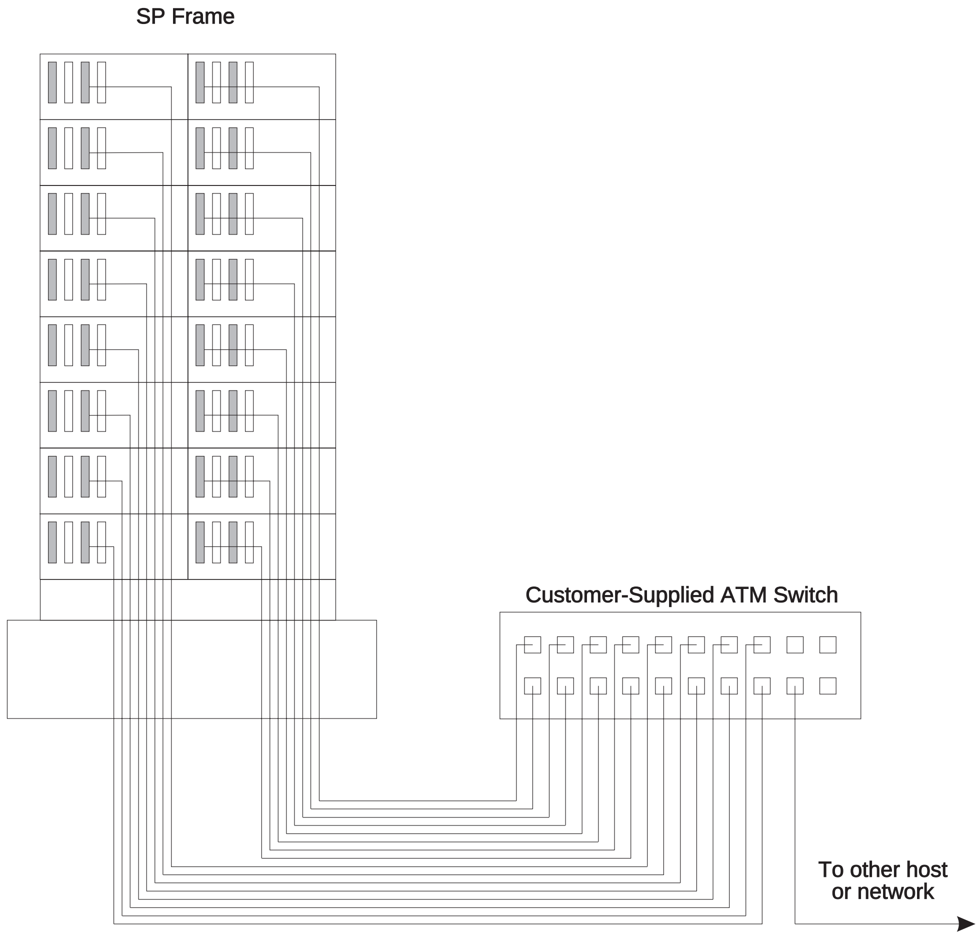


Figure 37. Typical ATM Cabling for the SP System

High-Performance Ethernet LAN Adapter AUI and 10Base-T (F/C 2992) MCA

This adapter allows the RS/6000 SP system to attach to 10 Mbps Ethernet networks. F/C 2992 provides both an AUI port and a 10BaseT (RJ-45) Ethernet connection. Only one of the two ports may be used at one time. This adapter has a parallel processing design which reduces latency and increases data throughput.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- 32-bit Busmaster Micro Channel Interface Address and data parity support
- Compatible with IEEE 802.3 or Ethernet Version 2 Interfaces
- 10BaseT port may be attached to a full duplex switch for full duplex operation over twisted pair wires
- The AUI port allows connection to any Ethernet network by using an appropriate transceiver

Customer Supplied Components

You must supply the following components for this feature:

- All Ethernet cables
- Transceivers for AUI connection
- Adapter-to-transceiver cables
- Transceiver wrap plugs

Required Software

See Table 58 on page 214 for requirements.

High-Performance Ethernet LAN Adapter 10Base2 (BNC) (F/C 2993) MCA

This adapter allows the RS/6000 SP system to attach to 10 Mbps Ethernet networks. F/C 2993 provides a 10Base2 (BNC) Ethernet connection. This adapter has a parallel processing design which reduces latency and increases data throughput.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- 32-bit Busmaster Micro Channel Interface Address and data parity support
- Compatible with IEEE 802.3 or Ethernet Version 2 Interfaces
- 10Base2 BNC connectors

Customer Supplied Components

You must supply the following components for this feature:

- All Ethernet cables

Required Software

See Table 58 on page 214 for requirements.

10/100 Ethernet Twisted Pair MC Adapter (F/C 2994) MCA

The 10/100 Ethernet twisted pair MC adapter allows the RS/6000 SP system to attach to both 100Base-TX (IEEE 802.3u) and 10Base-T (IEEE 802.3) Ethernet networks. The adapter automatically senses network transfer rates and selects the appropriate rate at power-up. F/C 2994 provides network attachment through a single, RJ-45 port that supports category 5 unshielded twisted pair (UTP) wiring for 100Base-TX connections and category 3, 4, or 5 UTP wiring for 10Base-T connections. Type 100 VG wiring is not supported.

Note: If your network currently operates at 10 Mbps and your plans include migration to 100 Mbps operation, you should consider using category 5 cable now.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Auto-selects between 10 Mbps and 100 Mbps operation at power-up
- Type 3 Micro Channel form factor
- 32-bit Busmaster Micro Channel Interface
- Supports full 64-bit streaming with 80 MB capability on Micro Channel bus
- Micro Channel address and data parity generation/detection
- Full frame buffering on both transmit and receive
- Supports both full and half duplex operation at 10 Mbps and 100 Mbps

Customer Supplied Components

You must supply the following components for this feature:

- Repeaters and switches are required for attachment to networks that are not using 10Base-T or 100Base-TX technology
- All Ethernet cables

Required Software

See Table 58 on page 214 for requirements.

Ethernet 10BaseT Transceiver - (F/C 4224) MCA

The Ethernet 10BaseT Transceiver feature (**F/C 4224**) provides the complete attachment unit interface (AUI) to a twisted pair LAN connection.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Provides selectable link test via an external toggle switch
- Provides selectable SQE signal via an internal jumper
- Includes the following LEDs: transmit, receive/link, collision, and jabber

Feature Components

IBM provides the Ethernet 10BaseT Transceiver, which is connected to a 15-pin DIX Ethernet connection via a transceiver (AUI) cable and converts the signal to 10BaseT. The medium connection is made through an RJ-45 receptacle.

The Ethernet 10BaseT Transceiver dimensions are 2-7/8 inches x 2-1/8 inches, and can be used on Ethernet feature F/C 2980.

Customer Components

None.

Required Software

See Table 58 on page 214 for requirements.

9333 High Performance Subsystem Adapter (F/C 6212) MCA

The 9333 High Performance Subsystem adapter (**F/C 6212**) allows attachment of four (per adapter) 9333 High Performance Disk Drive Subsystems to a RS/6000 processor.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Provides a high-speed, 8 Mbps, full-duplex, point-to-point serial-link connection to the system
- Requires one Micro Channel adapter (MCA) slot
- Supports a maximum of two adapter per thin node and six adapters per wide node
- Supports a maximum of 128 HPSA cables per frame
- Provides maximum storage of eight gigabytes per adapter for a single subsystem, to a maximum of 32 gigabytes per adapter for four subsystems
- Supports cabling which is ordered with the adapter in 3-meter (9 feet, 10 inches) and 10-meter (32 feet, 9 inches) lengths

Note: You cannot have more than six total adapters in a 2AX or 3AX system.

Feature Components

IBM provides the HPSA adapter card.

Customer Components

You must supply the following components for this feature:

- Cables to the HPSA (ordered with IBM 9333 Differential Expansion Units)

Required Software

See Table 58 on page 214 for requirements.

Site Preparation

Site planning for the HPSA feature involves preparing for the installation of the I/O cables attached to the SP frame from the IBM 9333 Unit.

High Performance Subsystem Adapter Cable Routing

Figure 38 on page 197 represents the cable routing from the 9333 High Performance Subsystem Adapter [1] installed in an SP frame to an IBM 9333 Expansion Unit installed in an IBM 7202 Expansion Rack.

[1] The name of this adapter should not be confused with the High Performance Switch (**F/C 4010**), the HiPS Adapter-1 (**F/C 4017**) or the HiPS Adapter-2 (**F/C 4018**)

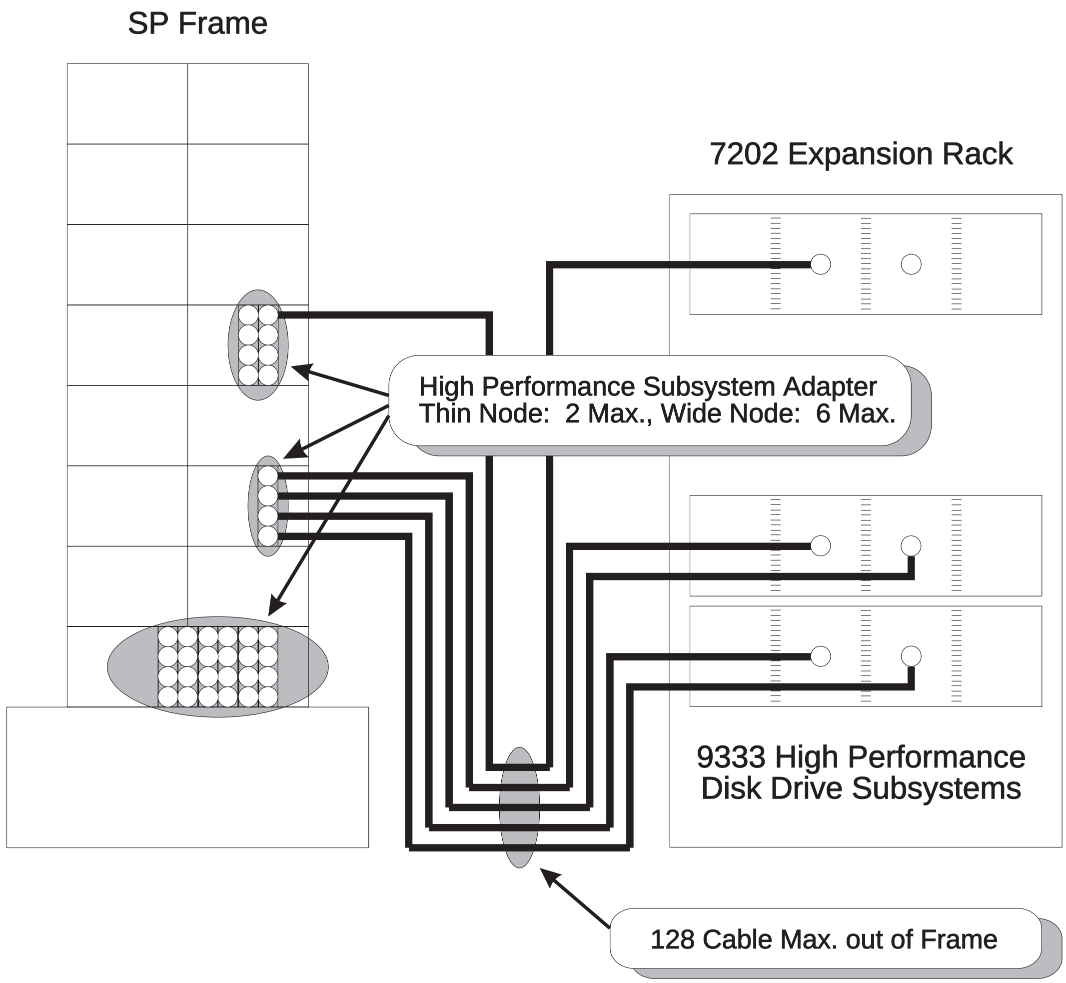


Figure 38. High Performance Subsystem Adapter (HPSA) Cabling for the SP System

External Cable Routing

Table 43 on page 198 shows cable budget information for individual nodes within the SP frame with the HPSA feature installed. The distances are measured from the back of the processor node to the floor. The SP uses a maximum of 120 inches of HPSA cable budget.

To Node	Measured in Millimeters	Measured in Inches
1	1780	71
2	1500	59
3	1680	66
4	1980	78
5	2160	85
6	1850	73
7	2030	80
8	2340	92
9	2510	99
10	2210	87
11	2390	94
12	2690	106
13	2870	113
14	2570	101
15	2740	108
16	3050	120

Table 43. Cable Budget Information for the HPSA Feature

SSA 4-Port Adapter (F/C 6214) MCA

The SSA 4-Port adapter (**F/C 6214**) provides Serial Storage Architecture (SSA) connections that can be configured to provide two SSA loops. Each loop will support the attachment of up to 48 devices (96 devices per adapter). Each adapter will support attachment of up to 6 maximum configuration IBM 7133 Serial Storage Architecture Disk Subsystems (96 drives) for a total disk drive capacity of 432 GB, using 4.5 GB disk drives.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Standard Micro Channel Type 5 form factor card
- Micro Channel interface:
  - 8-byte bus master
  - Address and data parity support
- Occupies one Micro Channel Slot
- Supports up to 3000 I/O ops/sec

Note: On AIX 3.2.5, you can only have two SSA 4-port adapters in one loop.

Required Software

See Table 58 on page 214 for requirements.

Enhanced SSA 4-Port Adapter (F/C 6216) MCA

The Enhanced SSA 4-Port Adapter serves as an interface between systems using Micro Channel Architecture (MCA) and devices using Serial Storage Architecture (SSA). F/C 6216 provides 4 SSA ports for the attachment of data storage devices. The adapter's 4 ports are arranged in two configurable pairs providing two SSA loops. Each loop will support the attachment of 48 devices or 96 devices per adapter card. F/C 6216 also supports six IBM 7133 SSA Subsystems per adapter. This permits attaching up to 96 disk drives for a storage capacity of 432 GB per adapter when using 4.5 GB disk drives.

Feature Characteristics and Requirements

- Standard Micro Channel Type 5 form factor card Micro Channel Interface for:
  - Streaming Data Support (40 or 80 MB/sec burst)
  - Address and Data Parity Support
- Occupies one Micro Channel slot
- Supports up to 3000 I/O operations per second

Software Requirements

- Requires AIX 4.1.4 or later
- High availability configurations require HACMP 4.1 or later

SSA 4-Port RAID Adapter (F/C 6217) MCA

The SSA 4-Port RAID adapter (**F/C 6217**) is a new addition to the SSA family of adapters for SP systems. The SSA 4-Port adapter offers the Redundant Array of Independent Disks (RAID) 5 function, which provides protection to your data in the event of a disk drive failure. This adapter also supports attachment to a non-RAID disk in a single-initiator per loop environment. A utility program is provided to control the RAID configuration.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- RAID 5 Arrays from 2-data plus parity to 15-data plus parity
- Up to 32 2-data plus parity RAID 5 Array groups per adapter
- Up to 6 15-data plus parity RAID 5 Array groups per adapter
- Streaming data support
- Attachment of up to 48 SSA disk drives per loop (2 SSA loops per adapter) or up to a total of 96 SSA disk drives
- Support for a maximum of:
  - Two adapters per thin node
  - Four adapters per wide node

– Eight adapters per high node

Required Software

See Table 58 on page 214 for requirements.

Micro Channel SSA Multi-Initiator/RAID EL Adapter (F/C 6219) and SSA Fast-Write Cache Option (F/C 6222) MCA

The Micro Channel SSA Multi-Initiator/RAID EL Adapter can be configured as either a two initiator non-RAID adapter or as a one initiator RAID 5 adapter. This adapter has four ports and two SSA loops supporting 48 SSA disk drives per loop (96 drives per adapter). F/C 6219 also supports HACMP functions.

The Micro Channel SSA multi-initiator/RAID EL adapter also supports a 4 MB Fast-Write Cache option (F/C 6222) that improves write performance in both the RAID 5 and non-RAID configurations. Details on the F/C 6222 option are listed below.

Devices Supported by F/C 6219

- All 7133 models
- 7131-405 Internal RS/6000 SSA disk drive configurations
- The NAPA Optical Extender

Feature Characteristics and Requirements

- Type 5 Micro Channel form factor
- 32-bit Bus, busmaster for data, bus slave for I/O registers
- 8-byte multiplexed streaming as both bus master and bus slave yielding a peak bandwidth of up to 80 MB/s
- Support for Hot Spares in RAID 5 mode
- RAID 5 arrays from (2+P) up to (15+P)
- Up to 6, (15+P) RAID 5 Array Groups per adapter
- All members of a RAID 5 array must be on the same SSA loop
- DOES NOT support 160 MHz thin nodes
- DOES NOT operate in SSA loops containing F/C 6214 of F/C 6216

Required Software

See Table 58 on page 214 for requirements.

SSA Fast-Write Cache Option (F/C 6222)

The SSA Fast-Write Cache is an optional 4 MB fast-write module that plugs into the Micro Channel SSA Multi-Initiator/RAID EL Adapter (F/C 6219). The Fast-Write Cache provides up to 10 times faster data throughput and response times when compared to Multi-Initiator RAID adapters without the F/C 6222 option. The level of improvement is dependent on data block sizes, percentage of sequential writes, machine type, and application.

The F/C 6222 cache option uses non-volatile RAM having over seven years of memory retention. Non-volatile memory allows you to transfer the cache module from a failing Multi-Initiator adapter to a new adapter during the unlikely event of an adapter failure. This helps insure data integrity and operational reliability

Feature Characteristics and Requirements

- Operates in one initiator non-RAID or one initiator RAID 5 mode configurations
- Only one F/C 6222 is supported on each Micro Channel SSA Multi-Initiator/RAID EL adapter (F/C 6219)
- Requires PSSP 2.2 or greater and either AIX 4.1.5 or AIX 4.2.1

Planning for Multihost SCSI Environments

This section describes the planning considerations for configurations with multiple SP nodes sharing a SCSI bus. Although the most common of these configurations use IBM RAIDiant Array 7135s, these considerations generally apply to IBM High-Density SCSI Disk Subsystem 7134s also, except where specific features of the 7135 are involved.

- AIX **F/C 5059** is a prerequisite.
- AIX PTF's for SCSI F/W adapters should be current.
- SCSI-2 Differential F/W Adapter/A (**F/C 2415**) should be at ECA 193 (μCode Level 72M).
- A maximum of *four* nodes and *two* 7135 DACs (Dual Active Controllers) can be connected to a bus.
- You need the following APAR:
  - IX52765 for AIX 3.2.5
  - IX52770 for AIX 4.1.3

  Note: This APAR helps you avoid “ghost disks” and other errors that can prevent successful switching of DASD between nodes.
- The 7135 automatic Dual Active Controller (DAC) failover feature requires two SCSI-2 Differential F/W Adapter/A cards per node. Each Card is on a SCSI bus tied to a DAC in the 7135.

SCSI Addressing for Attached DASD

SCSI addressing is constrained in that addresses 0, 1, and 2 cannot be assigned to the SCSI-2 Differential F/W Adapter/A. The 7135 addresses are assigned either odd or even addresses, depending on the DAC. The addresses are assigned through SMIT panels at installation.

When assigning addresses, use the configuration examples and tables provided in this section.

7135 Dual-Bus Dual Active Controllers

Figure 39 shows a configuration without a single point of failure but with additional controller, adapter and cabling costs. It is the configuration supported by HACMP and the 7135 DAC switchover feature. For more information on the 7135 DAC switchover feature, see *IBM AIX for RS/6000 System Overview*,

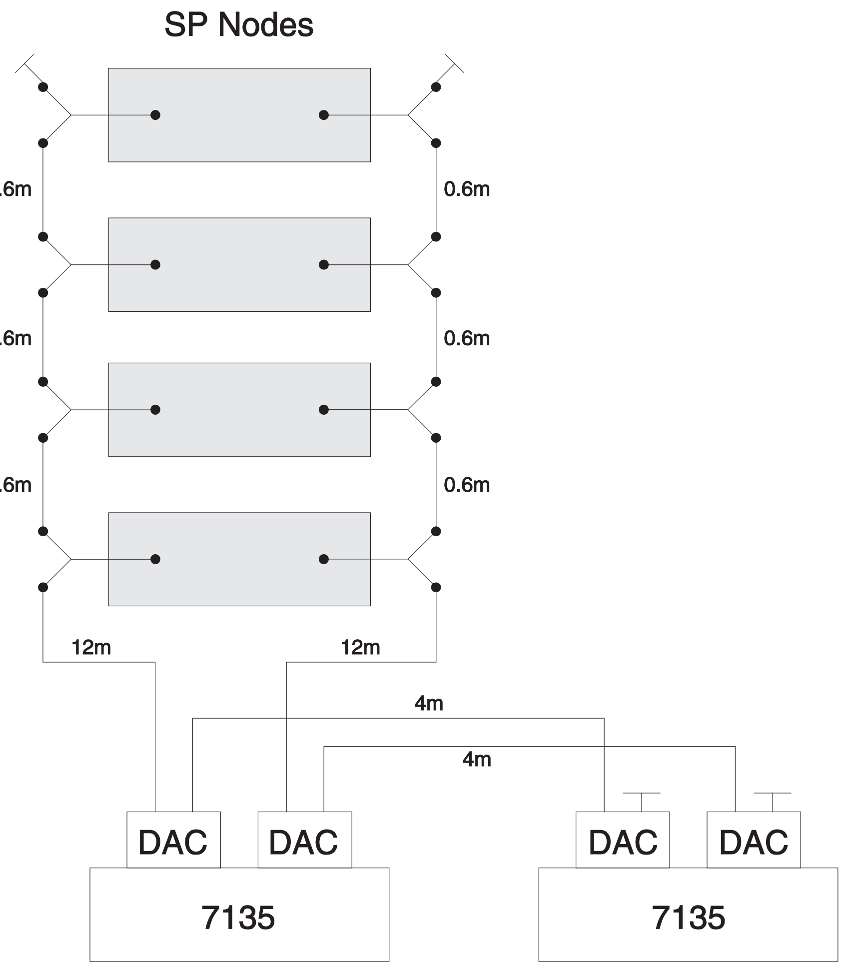


Figure 39. 7135 Dual-Bus DAC Cabling Configuration

Cabling Requirements

Table 44 shows the cable requirements for the 7135 Dual-Bus DAC.

Table 44 (Page 1 of 2). Cable Requirements for the 7135 Dual-Bus DAC (See Note 2)

Number of Cables	Cable (See Figure 39)	Part Number
8	Y-cables (Note 2)	PN 52G4234
6	0.6M system-to-system cables (Note 2)	PN 52G4291
2	12M cables (Note 1)	PN 67G1262
2	4M cables	PN 67G1261

Number of Cables	Cable (See Figure 39 on page 202)	Part Number
Note: 1. One 12M cable is shipped with each 7135. 2. For fewer nodes than shown in Figure 39, remove two Y-cables and two 0.6M cables for each node removed, and use only as many lines of the address table as needed. For a single 7135 configuration, remove one 0.6M cable and don't use the 7135B lines of the address table (Table 45 on page 203).		

Table 44 (Page 2 of 2). Cable Requirements for the 7135 Dual-Bus DAC (See Note 2)

Address Assignments

Table 45 shows the address assignments for the 7135 Dual-Bus DAC.

Table 45. Address Assignments for 7135 Dual-Bus DAC

Unit	Bus 1	SCSI Address	Bus 2	SCSI Address
7135A	DAC1	SCSI-0	DAC2	SCSI-1
7135B	DAC2	SCSI-1	DAC1	SCSI-0
Node1	ADP1	SCSI-4	ADP2	SCSI-4
Node2	ADP1	SCSI-5	ADP2	SCSI-5
Node3	ADP1	SCSI-6	ADP2	SCSI-6
Node4	ADP1	SCSI-7	ADP2	SCSI-7

7135 Single-Bus Dual Active Controllers

Figure 40 on page 204 shows a configuration with only the bus as a single point of failure but costs a second controller in the 7135.

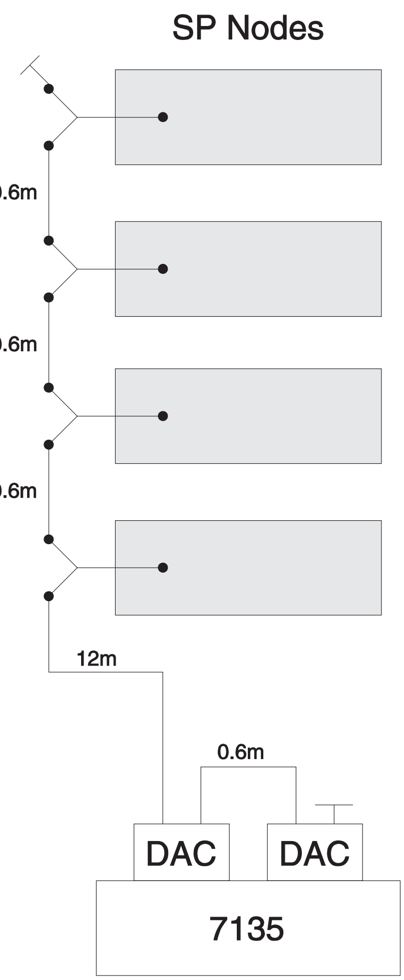


Figure 40. 7135 Single-Bus DAC Cabling Configuration

Cabling Requirements

Table 46 shows the cable requirements for the 7135 Single-Bus DAC.

Table 46. Cable Requirements for 7135 Single-Bus DAC (See Note 2)

Number of Cables	Cable (See Figure 40)	Part Number
4	Y-cables (Note 2)	PN 52G4234
3	0.6M system-to-system cables (Note 2)	PN 52G4291
1	12M cables (Note 1)	PN 67G1262

Note:

1. One 12M cable is shipped with the 7135.
2. For fewer nodes than shown in Figure 40, remove one Y-cable and one 0.6M cable for each node removed, and use only as many lines of the address table as needed.

Address Assignments

Table 47 shows the address assignments for the 7135 Single-Bus DAC.

Table 47. Address Assignments for 7135 Single-Bus DAC		
Unit	**Bus 1**	**SCSI Address**
7135	DAC1	SCSI-0
7135	DAC2	SCSI-1
Node1	ADP1	SCSI-4
Node2	ADP1	SCSI-5
Node3	ADP1	SCSI-6
Node4	ADP1	SCSI-7

7135 Single-Bus Single-DAC

Figure 41 shows a minimum configuration.

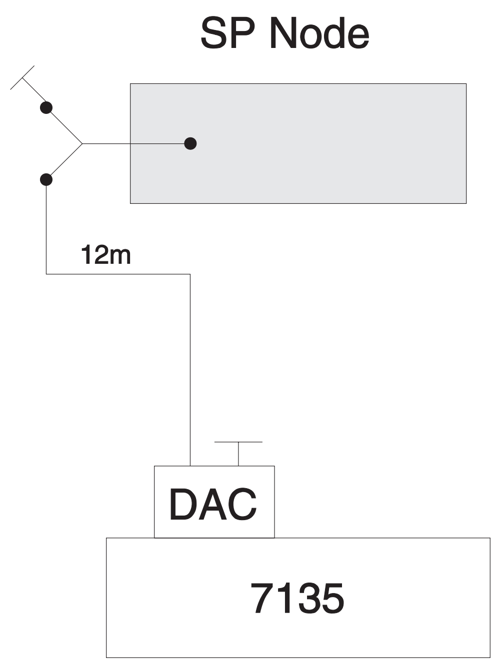


Figure 41. 7135 Single-Bus Single-DAC Cabling Configuration

Cabling Requirements

Table 48 shows the cable requirements for the 7135 Single-Bus Single-DAC. See *Adapters, Devices & Cable Information*, SA23-2764 for more information on cabling the SCSI Adapter.

Table 48. Cable Requirements for 7135 Single-Bus Single-DAC		
Number of Cables	**Cable (See Figure 41)**	**Part Number**
1	Y-cable	PN 52G4234
Note: One 12M cable currently ships with each 7135.		

Address Assignments

Table 49 shows the address assignments for the 7135 Single-Bus Single-DAC.

Table 49. Address Assignments for 7135 Single-Bus Single-DAC

Unit	Bus 1	SCSI Address
7135A	DAC1	SCSI-0
Node1	ADP1	SCSI-4

External Cable Routing

The SP uses a maximum of 120 inches of SCSI-2 cable budget. Table 50 shows the cable budget needed to reach individual nodes in an SP frame.

Table 50. Cable Budget Information for SCSI-2 Fast/Wide Feature

To Node	Measured in Millimeters	Measured in Inches
1	1780	71
2	1500	59
3	1680	66
4	1980	78
5	2160	85
6	1850	73
7	2030	80
8	2340	92
9	2510	99
10	2210	87
11	2390	94
12	2690	106
13	2870	113
14	2570	101
15	2740	108
16	3050	120

Digital Trunk Dual Adapter - (F/C 6305)

The Digital Trunk Dual feature (**F/C 6305**) attaches up to two 9291 Single-Digital Trunk Processor models or 9295 Multiple Digital Trunk Processor features to a RS/6000 500 series system.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Allows up to 48 T1 or 60 CEPT telephone channels to be attached to it
- Limits a maximum of three Digital Trunk Dual adapters (F/C 6305) or Digital Trunk adapters (F/C 6300), in any combination, may be attached to a RS/6000 500 series system

Feature Components

IBM provides the Digital Trunk Dual adapter.

Required Software

See Table 58 on page 214 for requirements.

Cable Routing

Figure 42 represents the cable routing to the Digital Trunk Dual feature installed in an SP frame.

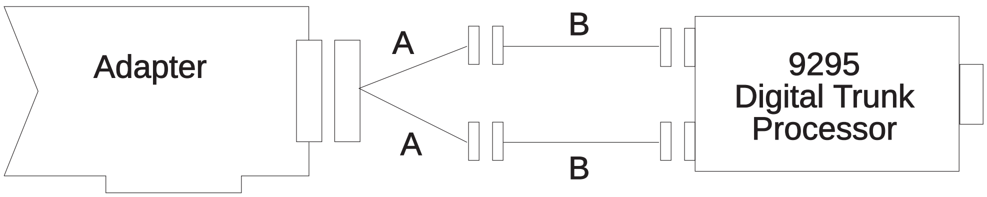


Figure 42. Digital Trunk Dual Adapter for Processor Cabling

Table 51. Cable Information for Digital Trunk Dual Adapter

Cable Letter	Cable Description	Part Number	Feature Code	Length m (ft)
A	9-inch cable	43G3318	N/A	N/A
B	2 meter cable	34F0873	N/A	N/A

Realtime Interface Co-Processor Portmaster Adapter/A - (F/C 7006)

The Realtime Interface Co-Processor Portmaster feature (**F/C 7006**) is a full function Micro Channel bus master that complements and extends the capabilities of the IBM Realtime Interface Co-Processor family of adapters. Bus master extensions for the adapter include capabilities and services that address both adapter-to-system and adapter-to-adapter data transfers under DMA control.

The adapter uses the multimaster capability of the Micro Channel bus architecture by taking control of the system unit bus and communicating directly with system memory or with other I/O adapters without interrupting the system unit processor.

Throughput speeds vary depending upon the number of ports operating concurrently and the software application. With the selection of the appropriate Interface Board, full-duplex rates of up to 64 Kbps running simultaneously on each of eight ports or up to 2.048 Mbps for a single port can be achieved with the Realtime Interface Co-Processor Portmaster Adapter/A.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Provides a 12.5 MHz Intel 80185 microprocessor
- Provides adapter-to-adapter and adapter-to-system Micro Channel bus master support
- Supports up to eight serial I/O ports (asynchronous or synchronous) available through a family of Interface Boards and cables

- Provides performance up to 64 Kbps full-duplex for each of eight ports running concurrently
- Provides performance of up to 2.048 Mbps full duplex for a single port
- Supports dynamically managed adapter storage
- Requires installation in the bottom four shelves of an SP frame
- Limits per SP tall frame is dependent on the interface cable:
  - For F/C 7042 and F/C 7108, the limit is 16
  - For F/C 7044 and F/C 7108, the limit is 32
  - For F/C 7046 and F/C 7106, the limit is 8
  - For F/C 7048 and F/C 7110, the limit is 32
- Limit per SP short frame is 7

Feature Components

IBM provides the Realtime Interface Co-Processor Portmaster Adapter/A. High-speed data rates for multiple ports rely on the use of DMA, with two channels being provided for each port. All ports can be programmed for asynchronous, bit synchronous, or character synchronous protocols, using either DMA or interrupt mode.

Timer support is also provided. There may be up to 255 timers set with increments ranging from 5 milliseconds to 327 seconds. A watchdog timer is also provided.

Related Features: The following features are related:

- F/C 7042 - 8-Port RS-232 Interface Board/A
- F/C 7044 - 8-Port RS-422 Interface Board/A
- F/C 7046 - 6-Port V.35 Interface Board/A
- F/C 7048 - 6-Port X.21 Interface Board/A
- F/C 7106 - 6-Port V.35 Cable (WT only)
- F/C 7108 - 8-Port Cable (WT only)
- F/C 7110 - 6-Port X.21 Cable (WT only)

Customer Components

None.

Required Software

See Table 58 on page 214 for requirements.

Additional software is required to program the adapter and must be ordered separately. Software support can be provided by IBM Realtime Interface Co-Processor AIX Support for RS/6000 (5696-038).

Cable Routing

The Realtime Interface Co-processor Portmaster Adapter/A must be used with an Electronic Interface Board (EIB) and the appropriate device interface breakout box (cable). The figures that follow illustrate the configurations of the Realtime Interface Co-processor Portmaster Adapter/A with an EIB and device interface breakout box and cable.

8-Port EIA-232-D Portmaster Adapter (F/C 7042)

Figure 43 represents the Realtime Interface Co-processor Portmaster Adapter/A with the 8-Port EIA-232-D EIB (F/C 7042) attached to a device interface breakout box (cable).

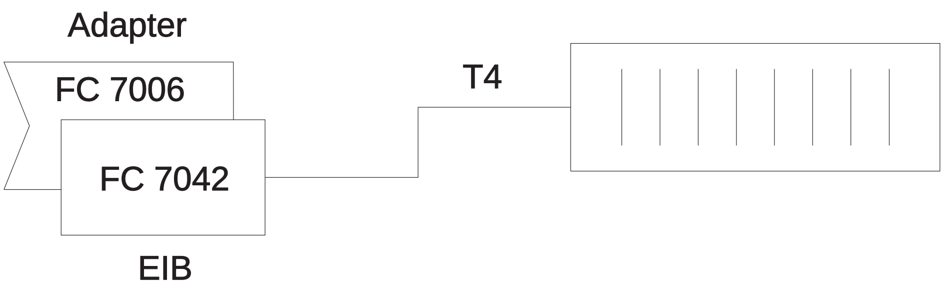


Figure 43. 8-Port EIA-232-D EIB Cabling

Table 52. Cable Information for 8-Port EIA-232-D

Cable Letter	Cable Description	Part Number	Feature Code	Length m (ft)
T4	8-Port 232/422 Portmaster device interface breakout box (cable)	53F2619	7108	1.2 (4)

8-Port EIA-422-A Portmaster Adapter (F/C 7044)

Figure 44 represents the Realtime Interface Co-processor Portmaster Adapter/A with the 8-Port EIA-422-A EIB (F/C 7044) attached to a device interface breakout box (cable).

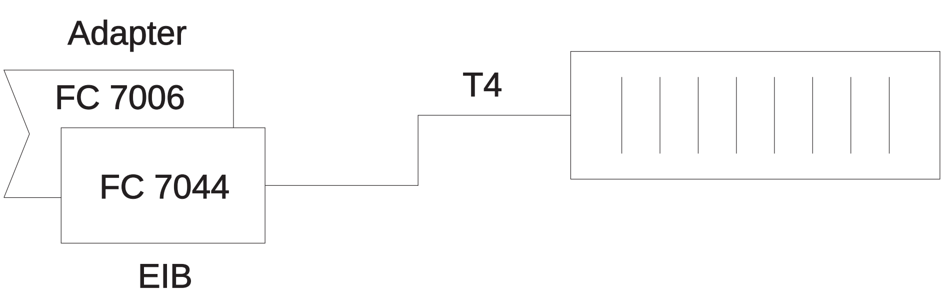


Figure 44. 8-Port EIA-422-A EIB Cabling

Table 53. Cable Information for 8-Port EIA-422-A				
Cable Letter	**Cable Description**	**Part Number**	**Feature Code**	**Length m (ft)**
T4	8-Port 232/422 Portmaster device interface breakout box (cable)	53F2619	7108	1.2 (4)

6-Port V.35 Portmaster Adapter (F/C 7046)

Figure 45 represents the Realtime Interface Co-processor Portmaster Adapter/A with the 6-Port V.35 EIB (F/C 7046) attached to a device interface breakout box (cable).

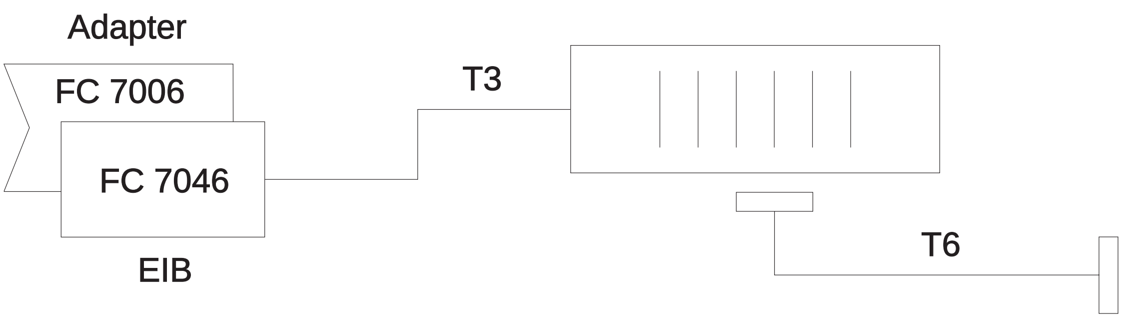


Figure 45. 6-Port V.35 EIB Cabling

Table 54. Cable Information for 6-Port V.35				
Cable Letter	**Cable Description**	**Part Number**	**Feature Code**	**Length m (ft)**
T3	6-Port V.35 Portmaster with device interface breakout box (cable)	72F0165	7106	1.2 (4)
T6	6-Port V.35 Network Attachment (cable)	11H4958	7107	2 (6.5)

6-Port X.21 Portmaster Adapter (F/C 7048)

Figure 46 represents the Realtime Interface Co-processor Portmaster Adapter/A with the 6-Port X.21 EIB (F/C 7048) attached to a device interface breakout box (cable).

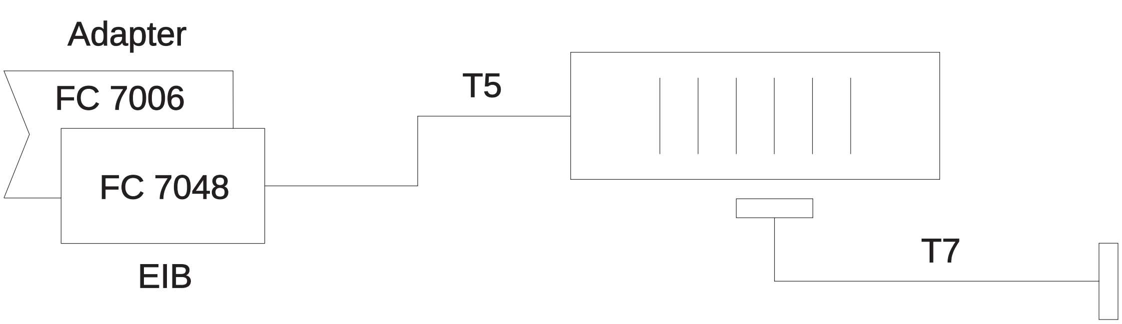


Figure 46. 6-Port X.21 EIB Cabling

Table 55. Cable Information for 6-Port X.21				
Cable Letter	**Cable Description**	**Part Number**	**Feature Code**	**Length m (ft)**
T5	6-Port X.21 Portmaster with device interface breakout box (cable)	05F2028	7110	1.2 (4)
T7	6-Port X.21 Network Attachment (cable)	11H4957	7111	2 (6.5)

128-Port Async Controller - (F/C 8128)

The 128-Port Async Controller feature (**F/C 8128**) provides attachment for a high concentration of asynchronous lines (up to 128) from a single Micro Channel slot. Two synchronous channels link the adapter to a maximum of eight 16-Port Remote Async nodes (F/C 8120-US and Canada only), and up to four 16-Port Remote Async nodes can be linked to each synchronous channel. This configuration provides the ability to attach up to 128 EIA-232 devices per adapter.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Supports 128 ports per card
- Provides sustained throughput of 38.4 Kbps per port (half-duplex) with 64 ports active and 15 Kbps per port (half-duplex) with 128 ports active
- Provides sustained 16-port remote async node throughput of 38.4 Kbps per port (half-duplex) with all ports active
- Supports the maximum EIA-232 distance of 62 meters (200 feet)
- Supports the following interface signals: Tx, Rx, RTS, CTS, DTR, DSR, DCD, RI
- Provides the maximum external interface speed of 57.6 Kbps (Note that the current AIX operating environment supports the maximum of 38.4 Kbps)
- A maximum of seven adapters per SP frame can be installed and they must be installed in the bottom four shelves of an SP frame

Feature Components

IBM provides the 128-Port Async Controller subsystem, which is compatible with all temperature, humidity, vibration, EMC, and other environmental limits of the base RS/6000 product.

One 4.5 meter (15 feet) cable (F/C 8131 or customer-supplied cables) is available to connect the adapter to the first Remote Async node on each synchronous channel. Additional Remote Async nodes may be connected to each synchronous channel in a daisy chain configuration, using either the 4.5 meter (15 feet) cable (F/C 8131) or the 23 cm (9 inch) cable (F/C 8132). IBM recommends that you use the shorter cable when stacking Remote Async nodes. Customer-supplied cables may also be substituted.

You can use the RJ-45 to DB-25 Converter cable (F/C 8133-quantity of four per order) to attach devices having a DB-25 connector to the Remote Async nodes. One RJ-45 wrap plug and two Controller Line Terminator plugs are included with each adapter order. Each Remote Async node order (F/C 8130) includes a US/Canadian power supply. Power supplies are not separately orderable.

Customer Components

See Table 57 on page 214 for descriptions.

Required Software

See Table 58 on page 214 for requirements.

Cable Routing

A number of cabling scenarios are possible when installing this feature. Figure 47 on page 213 represents a typical configuration in which eight Remote Async Nodes are attached to the 128-port Async Controller using both 4-wire and 8-wire direct cabling. Note that in the figure below, cables NB and NC are available or can be customer-supplied. The ND cable in the figure below is a customer-supplied cable.

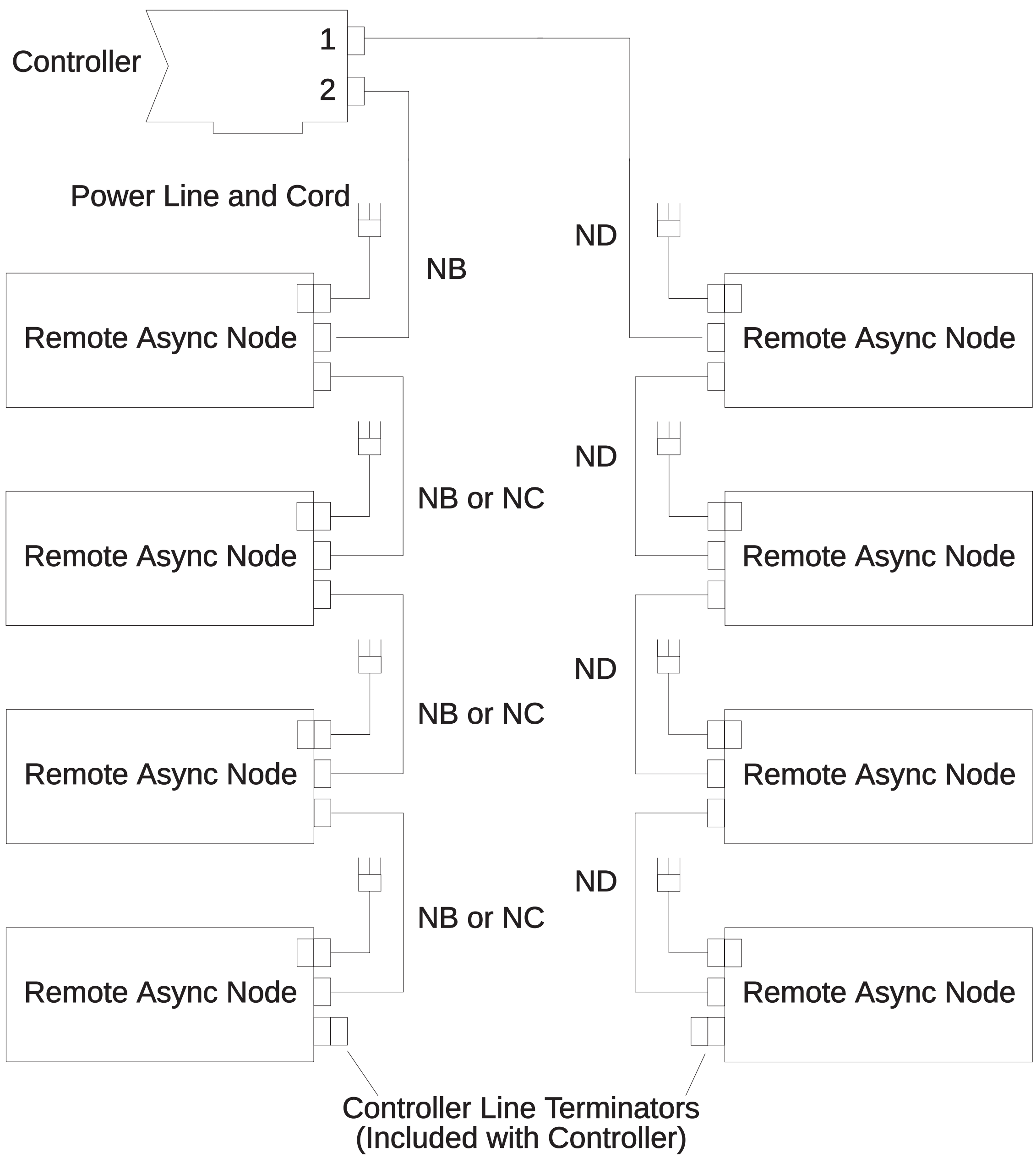


Figure 47. 128-Port Async Controller Cabling

The 128-Port Async Controller supports up to four Remote Async Nodes on each controller line using the following attachment options:

Table 56. Attachment Options for 128-Port Async Controller

Attachment Method	Recommended Environment	Benefit
Direct attach 8-wire 4-wire	Moderate to heavy async data loads Light async data loads	Maximum performance Reduced cabling cost
Remote attach Synchronous modems	Light async data loads	Remote location

You can use any combination of 8-wire cabling and synchronous modems to attach Remote Async nodes. However, 4-wire cabling cannot be used in combination with 8-wire cabling or synchronous modems on the same controller line.

The following table shows the cables that are used to configure the 128-Port Async Controller.

Table 57. Cable Information for 128-Port Async Controller

Cable Letter	Cable Description	Part Number	Feature Code	Length m (ft)
NB	128-Port Async Controller cable, 8-wire	43G0937	8131	4.57 (15)
NC	128-Port Async Controller cable, 8-wire	43G0936	8132	.23 (.75)
ND	128-Port Async Controller cable, 4-wire customer-supplied	N/A	N/A	N/A

Software and Cable Requirements for SP Communications Adapters

Table 58 (Page 1 of 6). Software and Cabling Requirements for MCA Communications Adapters

Feature Code	Adapter Name	Software Requirements and Notes	Cable Requirements
Standard	**SP Ethernet**	None	None
1904	**Fibre Channel** 1GB	AIX 4.1.4 or AIX 3.2.5	• Requires the Optics Daughter Card, 1-Port, 1063 Mbps (F/C 1902). • Multimode Fibre Channel cables ordered separately, contact your IBM representative. • Refer to *Planning for Fiber Optic Channel Links* (GA23-0367).
1906	**Fibre Channel** 266	AIX 3.2.5 Requires the following which is ordered separately: • 5756-030 FC 5062 AIX Fibre Channel Adapter/266 Device Driver/6000 and any updates.	• Multimode Fibre Channel cables ordered separately, contact your IBM representative. • Refer to *Planning for Fiber Optic Channel Links* (GA23-0367).
2402	IBM Network Terminal Accelerator - 256 Session	AIX 4.2 or later or AIX 3.2.5	Connected to a 15-pin DIX Ethernet connection via a transceiver (AUI) cable and converts the signal to 10BaseT or 10Base2.
2403	IBM Network Terminal Accelerator - 2048 session	AIX 4.2 or later or AIX 3.2.5	Connected to a 15-pin DIX Ethernet connection via a transceiver (AUI) cable and converts the signal to 10BaseT or 10Base2.
2410	**SCSI-2** External I/O Controller	AIX 4.2 or later, AIX 4.1.4, or AIX 3.2.5	Cabling is ordered with any SCSI-2 Single-Ended (SE) interface.

Table 58 (Page 2 of 6). Software and Cabling Requirements for MCA Communications Adapters			
Feature Code	**Adapter Name**	**Software Requirements and Notes**	**Cable Requirements**
2412	**Enhanced SCSI-2** Differential Fast/Wide	AIX 4.2 or later, AIX 4.1.3, or 3.2.5 with all PTFs installed	Same as for SCSI-2 Differential Fast/Wide (above).
2415	**SCSI-2** Fast/Wide	AIX 4.2 or later, AIX 4.1.1, or AIX 3.2.5 **Note:** This feature (or F/C 2416) is a corequisite of the Fast/Wide DASD features (F/C 3032, 3033 or 3034). The Parallel System Support Programs (PSSP) Version 1, Release 2, must be installed when utilizing Fast/Wide DASD. (See Table 59 on page 222 for DASD sizes and feature notes.)	Cabling is ordered with one of the following: • Single-Ended (SE) SCSI disks • CD-ROMs • Tape Devices • Read/Write (R/W) Optical Devices • Storage Subsystems **Note**: This feature (or F/C 2416) is a corequisite of the Fast/Wide DASD features (F/C 3032, 3033 or 3034). A wide node Fast/Wide cable (F/C 1240) is required to utilize internal Fast/Wide DASD.
2416	**SCSI-2** Differential Fast/Wide	AIX 4.2 or later, AIX 4.1.1, or AIX 3.2.5 **Note:** This feature (or F/C 2415) is a corequisite of the Fast/Wide DASD features (F/C 3032, 3033 or 3034). The Parallel System Support Programs (PSSP) Version 1, Release 2, must be installed when utilizing Fast/Wide DASD. (See Table 59 on page 222 for DASD sizes and feature notes.)	Cabling is ordered with one of the following: • IBM 3514 High Availability Disk Array Models 212 or 213 • IBM 9334 SCSI Exp. Unit 011, 501. • IBM 3490E Models C11, C22, E01, E11. • IBM 7134 High Density SCSI Disk Subsystem. • IBM 7204 External Disk Drive Model 315. **Note**: This feature (or F/C 2415) is a corequisite of the Fast/Wide DASD features (F/C 3032, 3033 or 3034). A wide node Fast/Wide cable (F/C 1240) is required to utilize internal Fast/Wide DASD.
2420	**SCSI-2** Differential External I/O Controller	AIX 4.2 or later, AIX 4.1.4, or AIX 3.2.5	Cabling is ordered with one of the following: • IBM 9334 SCSI Exp. Unit Models 011, 501. • IBM 7135 RAIDiant Array. • IBM 3490E Models C11, C22, E01, E11. • IBM 3995 Optical Library Models 063, 163, A63. • IBM 7204 External Disk Drive Model 215.
2700	4-Port Multiprotocol Communications Controller	AIX 4.2 or later, AIX 4.1.1, or AIX 3.2.5	Requires a 4-Port Multiprotocol Interface Cable

Table 58 (Page 3 of 6). Software and Cabling Requirements for MCA Communications Adapters			
Feature Code	**Adapter Name**	**Software Requirements and Notes**	**Cable Requirements**
2723	**FDDI** dual ring (DR)	AIX 4.2 or later, AIX 4.1.1, or AIX 3.2.5	• Multi-Mode FDDI optical fiber jumper cables: – Can be ordered from an IBM cabling distributor. – Refer to *FDDI Introduction and Planning Guide* GA27-3892, and *Cabling System Optical Fiber Planning and Installation Guide*, GA27-3943. • Requires two customer-supplied concentrators for dual homing • No concentrator required for dual access
2724	**FDDI** single ring (SAS)	AIX 4.2 or later, AIX 4.1.1, or AIX 3.2.5 Extended Support Programming feature (F/C 5054) for AIX/6000 Version 3.2.5 or later (program number 5756-030); order separately	• Multi-Mode FDDI optical fiber jumper cables: – Can be ordered from an IBM cabling distributor. – Refer to *FDDI Introduction and Planning Guide* GA27-3892, and *Cabling System Optical Fiber Planning and Installation Guide*, GA27-3943. • Requires a customer-supplied concentrator.
2735	**HiPPI**	AIX 4.2 or later, AIX 4.1.4, or AIX 3.2.5 5696-658 and related PTFs of AIX HiPPI Driver Group/6000.	Requires customer-supplied industry standard HiPPI cables up to 25 meters.
2754	**S/390 ESCON** Channel Emulator	AIX 4.2 or later, AIX 4.1.4, or AIX 3.2.5	• Multimode ESCON Fiber optical cables ordered separately • Refer to *Planning for Fiber Optic Channel Links* (GA23-0367), and *S/390 ESCON Channel Emulator User's Guide and Service Information*, (SA23-2722).
2755	**BMCA**	AIX 4.2 or later, AIX 4.1.4, or AIX 3.2.5 Requires the following which are ordered separately: • 5756-030 AIX/6000 Version 3.2.5 (or later) Extended Support Programming feature (F/C 5055) and related PTFs. • TCP/IP Version 2.2 for MVS (5735-HAL) or VM (5735-FAL) at the host. **Note:** Optional Software - PRPQ 5799-FET CLIO, refer to RPQ P88672.	• F/C 2752 (node-to-node cable) attaches the SP to S/370 or S/390 through F/C 2753 (node-to-host cable) • Up to eight F/C 2752s can be attached to S/370 or S/390. – Requires standard bus and tag cables from F/C 2753 to host.

Table 58 (Page 4 of 6). *Software and Cabling Requirements for MCA Communications Adapters*			
Feature Code	**Adapter Name**	**Software Requirements and Notes**	**Cable Requirements**
2756	**ESCON** Control Unit	AIX 4.2 or later, AIX 4.1.4, or AIX 3.2.5 Requires the following which are ordered separately: • 5756-030 AIX programming feature 5056 and updates. • TCP/IP Version 2.2 for MVS (5735-HAL) or VM (5735-FAL) at the host. **Note:** Optional Software - PRPQ 5799-FET CLIO, refer to RPQ P88672.	• Multimode ESCON fiber optical cables ordered separately. • Refer to *Planning for Fiber Optic Channel Links* (GA23-0367).
2930	8-Port **Async** Adapter - EIA-232	AIX 4.2 or later, AIX 4.1.1, or AIX 3.2.5	Supports cabling up to 61 meters (200 feet)
2940	8-Port **Async** Adapter - EIA-422A	AIX 4.2 or later, AIX 4.1.1, or AIX 3.2.5	Supports cabling up to 1200 meters (4000 feet)
2960	X.25 Interface Co-Processor/2	AIX 4.2 or later, AIX 4.1.3, or AIX 3.2.5	Separate cables of either 3 meter (9.8 feet) length or 6 meter (19.6 feet) are available (two lengths for each). A wrap plug is included with each cable.
2970	**Token-Ring**	AIX 4.2 or later, AIX 4.1.1, or AIX 3.2.5	• Required 20-foot cable is included. • Extension cables may be ordered separately.
2972	**Auto Token-Ring** LANstreamer MC 32	AIX 4.2 or later, AIX 4.1.1, or AIX 3.2.5	• Cable and network compatible with all IBM PS/2 Token adapters. • No new cables or network components are required. • Includes one connector, RJ-45, which is used to attach to UTP cabling. • Includes a 10-inch conversion cable to attach to STP cabling.
2980	**Ethernet**	AIX 4.2 or later, AIX 4.1.1, or AIX 3.2.5	• One "Y" connector and 50-ohm terminator is supplied per adapter. • Customer must supply the appropriate cable for connection to the 50-ohm or RG-58A/U coaxial cables.
2984	TURBOWAYS 100 **ATM**	AIX 4.2 or later, AIX 4.1.4, or AIX 3.2.5 • Requires the separately ordered TURBOWAYS 100 ATM Device Driver (5056-030 F/C 5063) and any updates. If you have AIX 4.1.4, the driver is part of AIX Base Operating System. • If the customer elects to install network management, the SNMP agent function must be configured and the customer must install an SNMP manager such as IBM NetView/6000.	• Required cables must be ordered separately. • EMEA: order through CABLEX ordering system. • **Note:** Optical ports may be connected using 62.5 micron multi-mode fiber, terminated with SC industry standard connectors.

Table 58 (Page 5 of 6). Software and Cabling Requirements for MCA Communications Adapters			
Feature Code	**Adapter Name**	**Software Requirements and Notes**	**Cable Requirements**
2989	TURBOWAYS 155 **ATM**	AIX 4.2 or later, AIX 4.1.4 (Driver is part of AIX Base Operating System.) • If the customer elects to install network management, the SNMP agent function must be configured and the customer must install an SNMP manager such as IBM NetView/6000.	• Required cables must be ordered separately. • EMEA: order through CABLEX ordering system. • **Note:** Optical ports may be connected using 62.5 micron multi-mode fiber, terminated with SC industry standard connectors.
2992	**Ethernet/FDX** 10 Mbps TP/AUI MC	AIX 4.2 or later or AIX 4.1.4 Corequisite PSSP 2.2	• Compatible with IEEE 802.3 or Ethernet Version 2 interfaces. • Requires 10BaseT (twisted pair) and 10Base5 (AUI) connectors.
2993	**Ethernet/FDX** 10 Mbps BNC/AUI MC	AIX 4.2 or later or AIX 4.1.4 Corequisite PSSP 2.2	• Compatible with IEEE 802.3 or Ethernet Version 2 interfaces. • Requires 10Base2 (BNC) and 10Base5 (AUI) connectors.
2994	**10/100 Ethernet** 10 Mbps or 100 Mbps TP MC	AIX 4.1.5 or AIX 4.2.1 Corequisite PSSP 2.2 or later	• Compatible with IEEE 802.3 for 10Base-T (minimum req.) • Compatible with IEEE 802.3u for 100Base-TX
4224	Ethernet 10BaseT Transceiver	AIX 4.1 or later and AIX 3.2.5	Connected to a 15-pin DIX Ethernet connection via a transceiver (AUI) cable and converts the signal to 10BaseT.
6212	**9333 HPSA** *(high-performance subsystem)*	AIX 4.2 or later, AIX 4.1.1, or AIX 3.2.5	• Ordered with High Performance Disk Drive Subsystem • 3 or 10 meters in length • A maximum of 128 9333 cables per SP frame is allowed.
6214	**SSA** 4-Port Adapter	AIX 4.2 or later, AIX 4.1.4, or AIX 3.2.5	Cabling is ordered with the IBM 7133 SSA Disk Subsystem (Model 010 or 500).
6216	Enhanced **SSA** 4-Port Adapter	AIX 4.2 or later, AIX 4.1.4, or AIX 3.2.5	Cabling is ordered with the IBM 7133 SSA Disk Subsystem.
6217	**SSA** 4-Port RAID Adapter	AIX 4.2.1 or AIX 4.1.5	Cabling is ordered with the IBM 7133 SSA Disk Subsystem.
6219	**SSA** Multi-Initiator RAID Adapter	AIX 4.1.5 or AIX 4.2.1 Corequisite PSSP 2.2 or later	Cabling is ordered with the IBM SSA Disk Subsystems.
6222	SSA Fast-Write Cache Option (fits F/C 6219)	Same Requirements as F/C 6219.	No cables required, module mounts onto F/C 6219 board.
6305	Digital Trunk Dual Adapter	AIX 4.2 or later, AIX 4.1.1, or AIX 3.2.5	• Y-cable (43G3318) - 20 cm (7.9 in.) long • CSU cable, T1 only (34F0875) • RR cable to 9291/9295 assebler 6.6 (34F0873) • Wrap plug (34F0876)

Table 58 (Page 6 of 6). Software and Cabling Requirements for MCA Communications Adapters			
Feature Code	**Adapter Name**	**Software Requirements and Notes**	**Cable Requirements**
7006	Realtime Interface Co-Processor Portmaster Adapter/A	AIX 4.2 or later, AIX 4.1.1, or AIX 3.2.5	The Realtime Interface Co-processor Portmaster Adapter/A must be used with an Electronic Interface Board (EIB) and the appropriate device interface breakout box and cable. There are different specifications for the Realtime Interface Co-processor Portmaster Adapter/A as follows: • 8-Port EIA-232-D Portmaster Adapter/A specifications - Portmaster interface cable (53F2619) • 8-Port EIA-422-A Portmaster Adapter/A specifications - 8P Portmaster interface cable (53F2619) • 6-Port V.35 Portmaster Adapter/A specifications - 6P V.35 Portmaster interface cable (72F0165) • 6-Port X.21 Portmaster Adapter/A specifications - 6P X.21 Portmaster interface cable (05F2028)
8128	128-Port Async Controller	AIX 4.2 or later, AIX 4.1.1, or AIX 3.2.5	• One 4.5 meter (15 feet) cable is available to connect the adapter to the first Remote Async node on each synchronous channel. • Can also use either the 4.5 meter (15 feet) cable or the 23 cm. (9 inch) cable when stacking Remote Async nodes. • Customer supplied cables may also be substituted.

Notes:

1. The SP includes 5756-030 AIX for RS/6000 Version 3.2.5 and additional PTF's (1-2 users). Call IBM support center and request the PTF's referenced in APAR IX42623. (EMEA does not refer to the APAR.)
2. Customer-supplied attachment cables are required to interface the SP system with the customer network. The SP system provides connections to a 10 megabit Carrier Sense Multiple Access/Collision Detection (CSMA/CD) Ethernet network. Connections are made with a 50-ohm coaxial cable as specified by IEEE 802.3 10Base2 (thin coax).

Chapter 19. Direct Access Storage Devices (DASD)

Direct Access Storage Devices (DASD) are either internally or externally mounted. Internal DASD are installed in DASD bays within the node, while external DASD are mounted in separate DASD frames.

Internal DASD

To improve overall SP system availability, disk mirroring is available for POWER3 and 332 MHz SMP nodes. The mirrored DASD are available as a 4.5 GB Ultra SCSI High Availability Disk Pair (F/C 2904), a 9.1 GB disk pair (F/C 2909), and a 18.2 GB disk pair (F/C 2918). These are standard features for POWER3 SMP thin and wide nodes and are optionally available for 332 MHz SMP nodes.

Note: The 4.5 GB disk pair is not available on POWER3 high nodes.

Both F/C 2900 and F/C 2908 Ultra SCSI (16-bit) are 25 mm (1 in.) high internal disk drives. These drives provide improved performance and storage over the withdrawn DASD units. Ultra SCSI disk drives support the Ultra bandwidth of 40 MBps and the fast/wide bandwidth of 20 MBps.

The 9.1 GB DASD unit (F/C 2908) has a denser storage technology than that used in previous SP system internal DASD. This technology allows F/C 2908 to be packaged into a reduced-height 25 mm case. Previous 9.1 GB units were 41 mm (1.6 inches) high. This height reduction allows F/C 2908 to be installed in nodes that could not previously use 9.1 GB drives (such as the 200 MHz SMP High Node).

This denser storage technology also supports higher maximum media data transfer rates. Previous 9.1 GB DASD units transferred data at 15.4 MBps while the new unit transfers data at rates of 22.4 MBps. This enables F/C 2908 to sustain a greater portion of the SCSI bandwidth than its predecessor.

Ultra DASD Data Transfer Rates

To utilize the full data-transfer capability of the Ultra DASD units, you ***must*** have one of these two Ultra SCSI adapters installed in the node:

- F/C 6206 for internal connections (see “SCSI-2 Ultra/Wide SE PCI Adapter (F/C 6206)” on page 152 for details)
- F/C 6208 for external connections (see “SCSI-2 Fast/Wide SE PCI Adapter 4-A (F/C 6208)” on page 321 for details)

If an Ultra SCSI adapter is not available or if it is not installed, F/C 2900 and F/C 2908 will operate in the fast/wide mode. Also, if you are using an Ultra SCSI adapter and you have a mix of fast/wide and Ultra drives installed in a node, the adapter will default to fast/wide data transfer rates.

Internal DASD Configurations

Previous node designs required a minimum amount of internal storage. However, recent designs allow you to configure some nodes without internal DASD (with external booting). The tables in this section contain the following DASD information:

- DASD feature options available for each node type; see Table 59.
- Minimum and maximum DASD capacities for each node type; see Table 60 on page 223.

Table 59 (Page 1 of 2). DASD Options for Current Node Types

Feature Code	DASD Size	DASD Type	Node Type
2900	4.5 GB	Ultra SCSI	332 MHz SMP Thin 332 MHz SMP Wide 160 MHz Thin
2904	4.5 GB	Ultra SCSI disk pair	POWER3 SMP Thin POWER3 SMP Wide 332 MHz SMP Thin 332 MHz SMP Wide
2908	9.1 GB	Ultra SCSI	332 MHz SMP Thin 332 MHz SMP Wide 160 MHz Thin
2909	9.1 GB	Ultra SCSI disk pair	POWER3 SMP High POWER3 SMP Thin POWER3 SMP Wide 332 MHz SMP Thin 332 MHz SMP Wide
2918	18.2 GB	Ultra SCSI disk pair	POWER3 SMP High POWER3 SMP Thin POWER3 SMP Wide 332 MHz SMP Thin 332 MHz SMP Wide
3800	9.1 GB	Ultra SCSI disk pair	SP Expansion I/O Unit
3802	9.1 GB	SSA disk pair	SP Expansion I/O Unit
3803	18.2 GB	Ultra SCSI disk pair	SP Expansion I/O Unit
Reference Information for Withdrawn DASD			
3000	4.5 GB	Fast / Wide	332 MHz SMP Thin 332 MHz SMP Wide 200 MHz High 160 MHz Thin 135 MHz Wide

Feature Code	DASD Size	DASD Type	Node Type
3010	9.1 GB	Fast / Wide	332 MHz SMP Thin 332 MHz SMP Wide 160 MHz Thin 135 MHz Wide

Table 59 (Page 2 of 2). DASD Options for Current Node Types

Notes:

1. Some nodes support independent mirroring. Consult node chapters for details.
2. Some node types have a minimum prerequisite and a maximum allowable DASD allocation. Consult the respective node chapters for details.
3. Some nodes require Micro Channel adapters and cables to utilize particular DASD options.

Table 60 shows internal DASD actual capacities, ***irrespective of mirroring***. Note that DASD features for all POWER3 SMP nodes and SP Expansion I/O Units are offered ***only*** as disk pairs (see Table 59 on page 222).

Table 60. Internal DASD Total Capacities for Current Node Types

Node Type	Minimum DASD	Maximum Allowable DASD
POWER3 SMP High Node	18.2 GB	36.4 GB
SP Expansion I/O Unit	18.2 GB	72.8 GB
POWER3 SMP Wide Node	9.1 GB	72.8 GB
POWER3 SMP Thin Node	9.1 GB	36.4 GB
332 MHz SMP Wide Node	4.5 GB	72.8 GB
332 MHz SMP Thin Node	4.5 GB	36.4 GB
160 MHz Thin Node	4.5 GB	18.2 GB

Notes:

1. Zero DASD is an option with external boot (see “External Boot Disks” on page 226).

Planning Information for Internal DASD

Some nodes require adapters to attach internal DASD while other nodes have integral SCSI drops for that purpose. Also, each node has optional SCSI adapters which allow you to configure internal and external DASD to meet your needs. Specific information for DASD requirements and options for each node type can be found in the following sections:

POWER3 SMP High Nodes

See “DASD Requirements and Options” on page 13.

SP Expansion I/O Units

See “DASD Options” on page 14.

POWER3 SMP Wide Nodes

See “Direct Access Storage Device (DASD) Requirements and Options” on page 17.

POWER3 SMP Thin Nodes

See “Direct Access Storage Device (DASD) Requirements and Options” on page 21.

332 MHz SMP Wide Nodes

See “Direct Access Storage Device (DASD) Requirements and Options” on page 27.

332 MHz SMP Thin Nodes

See “Direct Access Storage Device (DASD) Requirements and Options” on page 31.

160 MHz Uniprocessor Thin Nodes

See “Direct Access Storage Device (DASD) Requirements and Options” on page 36.

200 MHz SMP High Nodes (Withdrawn)

See “Direct Access Storage Device (DASD) Requirements and Options” on page 293.

135 MHz Uniprocessor Wide Nodes (Withdrawn)

See “Direct Access Storage Device (DASD) Requirements and Options” on page 297.

External DASD

External DASD can be used to greatly increase the storage capacity of your SP system. The available capacity is limited only by such issues as the following:

- How many adapter slots are available in your system?
- Are you using data protection, such as RAID5?
- Are you using disk mirroring?
- What are your required data storage and retrieval rates?
- Do you need hot spares?

In addition, there are hardware configuration issues that your IBM representative can help you assess.

The following external DASD subsystems are compatible with the IBM R/S 6000 SP System:

2104 The 2104 Expandable Storage Plus disk enclosure has space for up to ten hot-swappable Ultra2 (LVD) disk drives, including high-performance 9.1, 18.2, and 36.4 GB (7,200 and 10,020 rpm) Ultrastar drives. It offers affordable high performance, high availability, redundant power and cooling, and HACMP support for clustered server environments.

2104 models available include:

- 2104 Model TL1 (tower with 10 bays)
- 2104 Model DL1 (frame-mount drawer with 10 bays)

VS 2100 The Versatile Storage Server 2100 disk subsystem attaches to the SP system through multiple SCSI-2 fast/wide DE adapters or differential Ultra SCSI adapters. Up to eight dual-port Ultra SCSI adapters can be installed in the VS 2100. Each adapter provides two Ultra SCSI buses that support up to four hosts each. All hosts must be of the same type, and cable lengths cannot exceed 20 m (65 ft.).

The VS 2100 supports high performance processors and up to 6 GB of memory. Up to eighteen 7133 drawers can be controlled by the VS 2100. Four of these drawers are installed in the base frame and the others are mounted in optional 2105-100 frames. In order to size your system, you need to know your projected workload and I/O rates.

7027 The 7027 High Capacity Storage Drawer provides large amounts of SCSI disk space in a standard frame. The base system includes four 2.2 GB, hot-swappable disk drives and includes twenty additional hot-swappable, one-inch disk bays. The 7027 will support up to twenty 2.2 GB drives or ten 4.5 GB drives connected through two internal SCSI attachments. This unit provides up to 53.8 GB of storage. An optional expansion unit adds up to six additional 2.2 GB (or three 4.5 GB) drive bays for 67.3 GB of storage.

There are two model 7027s:

- 7027 HSC connects to the host through a single ended SCSI
- 7027 HSD connects to the host through a differential SCSI

The 7027 has standard redundant fans, dual power cords, remote power-on, and hot-swappable disks that work with an optional N+1 power supply to meet high availability requirements. A twin initiator option is available for the configurations without the expansion unit. The 7027 attaches to your SP system through a fast/wide SCSI-2 PCI RAID adapter that enables RAID 0, 1, or 5 support.

7131-105 The 7131 Model 105 SCSI Multi-Storage Tower incorporates disk-drive modules, tape, and CD-ROM options. The 7131-105 is initially configured with two disk drives of either 2.2, 4.5, or 9.1 GB each. The tower also has three additional hot-swappable slots and two media slots. The hot-swappable slots can be configured with a mix of available drives. The media slots will accept additional disks, tape, or optical storage options.

7131 SCSI Multi-Storage Tower Model 105 supports a total of 63.7 GB of disk capacity with RAID 0, 1, and 5 support. The SCSI-2 interface operates in a fast/wide mode using optional single-ended or differential adapters. High Availability Cluster Multi-Processing (HACMP) is supported and with two towers and you can mirror data.

7131-405 The 7131 Model 405 SSA Multi-Storage Tower provides high performance SSA (Serial Storage Architecture) that exceeds the capabilities of SCSI-attached storage. The 7131-405 is initially configured with two Ultra disk drives of either 2.2, 4.5, or 9.1 GB each. The tower also has three additional hot-swappable disk slots that can be configured with a mix of available drives.

7131 SSA Multi-Storage Tower Model 405 supports a total of 45.5 GB of disk capacity with RAID 5 support. The SSA interface can be connected to multiple systems. Using a 4-port adapter, two hosts can be attached.

With an enhanced 4-port SSA adapter, up to eight hosts can be attached. The 7131-405 can be configured for either MCA or PCI, RAID or non-RAID applications by your choice of adapters. Using two towers, you can mirror data.

7133 The 7133 SSA Disk Subsystem provides high performance SSA (Serial Storage Architecture) storage. The 7133 is available in four models:

- 7133 010 (frame mounted)
- 7133 500 (frame mounted)
- 7133 020 (tower unit)
- 7133 600 (tower unit)

The 7133 010 and 500 can be configured with three different disk modules using a mix of 1.1 GB, 2.2 GB, and 4.5 GB Ultra disk drives. The 7133 020 and 600 can be configured with combinations of 2.2 GB, 4.5 GB, and 9.1 GB Ultra disk drives. All drives are hot-swappable using auto-docking carriers.

7133 SSA Disk Subsystems support a total of 145 GB of disk capacity per unit and 873 GB per host adapter. Single-host attachment with RAID 5 support is available for PCI and MCA systems. The SSA interface can also be connected to multiple systems. Using a 4-port adapter, two hosts can be attached. With an enhanced 4-port SSA adapter, up to eight hosts can be attached.

7137 All 7137 Disk Array Subsystems have a base configuration of three drives, a high performance controller card and redundant power supplies. Each model can be expanded to a maximum of eight drives. All drives are hot-swappable. All 7137 Disk Arrays attach to your SP system through a fast/wide SCSI-2 differential interface.

The models available in the 7137 line include:

- 7137 Model 413 (tower with 2.1 GB drives)
- 7137 Model 513 (frame mount with 2.1 GB drives)
- 7137 Model 414 (tower with 4.3 GB drives)
- 7137 Model 514 (frame mount with 4.3 GB drives)
- 7137 Model 415 (tower with 8.8 GB drives)
- 7137 Model 515 (frame mount with 8.8 GB drives)

Models 413, 414, 513, and 514 have a standard 1 MB write cache and a 4 MB optional cache. Models 415 and 515 have a standard 4 MB cache. The 7137 also supports RAID 0 and 5 and HACMP.

External Boot Disks

Some external DASD subsystems can be used as boot disks for some node types. If you configure your SP system with external boot disks, nodes attached to the external boot subsystem can be configured without any internal disks. To specify a node with external booting, and to enable the no-internal DASD option, order the following feature codes:

- **F/C 9121** for nodes using an external SSA DASD subsystem
- **F/C 9124** for nodes using an external SCSI DASD subsystem

Consult the tables in each section below for valid system configurations.

External SSA DASD (F/C 9121)

This section lists the external SSA DASD that are valid boot disks for SP nodes.

7133 SSA Disk Subsystem: The following 7133 models are supported for external booting in the SP system:

- 7133 010
- 7133 500
- 7133 020
- 7133 600

Table 61 lists the SP node types that can be configured for external booting with the 7133.

Table 61. SP Nodes Supporting Bootable SSA Functions With the 7133

Node Type	**Supported Adapters**
POWER3 high node (F/C 2054)	F/C 6225
POWER3 wide node (F/C 2053)	F/C 6225
POWER3 thin node (F/C 2052)	F/C 6225
332 MHz wide node (F/C 2051)	F/C 6225
332 MHz thin node (F/C 2050)	F/C 6225
160 MHz thin node (F/C 2022)	F/C 6214, 6216, 6217, 6219
Reference information for withdrawn nodes	
200 MHz high node (F/C 2009)	F/C 6214, 6216, 6217, 6219
135 MHz wide node (F/C 2007)	F/C 6214, 6216, 6217, 6219
120 MHz thin node	F/C 6214, 6216, 6217, 6219
112 MHz SMP high node	F/C 6214, 6216, 6217, 6219
77 MHz wide node	F/C 6214, 6216, 6217, 6219

Notes:

1. If you do not see a node listed, it **is not supported** for external booting using the 7133.

External SCSI DASD (F/C 9124)

This section lists the external SCSI DASD that are valid boot disks for SP nodes.

7027 High Capacity Storage Drawer (SCSI): The following 7027 model is supported for external booting in the SP system:

- 7027 HSD

Table 62 on page 228 lists the SP node types that can be configured for external booting with the 7027.

Table 62. SP Nodes Supporting Bootable SCSI Functions With the 7027

Node Type	Supported Adapters
POWER3 SMP high node (F/C 2054)	F/C 6207
POWER3 SMP wide node (F/C 2053)	F/C 6207, 6209
POWER3 SMP thin node (F/C 2052)	F/C 6207, 6209
332 MHz SMP wide node (F/C 2051)	F/C 6207, 6209
332 MHz SMP thin node (F/C 2050)	F/C 6207, 6209
160 MHz thin node (F/C 2022)	F/C 2412, 2416, 2420
Reference information for withdrawn nodes	
200 MHz high node (F/C 2009)	F/C 2412, 2416, 2420
135 MHz wide node (F/C 2007)	F/C 2412, 2416, 2420
120 MHz thin node	F/C 2412, 2416, 2420
112 MHz high node	F/C 2412, 2416, 2420
77 MHz wide node	F/C 2412, 2416, 2420
66 MHz wide node	F/C 2412, 2416, 2420
66 MHz thin node (and thin 2)	F/C 2412, 2416, 2420

Notes:

1. If you do not see a node listed, it **is not supported** for external booting using the 7027.
2. F/C 2416 and 2420 are withdrawn from production.

7131 SCSI Multi-Storage Tower: The following 7131 model is supported for external booting in the SP system:

- 7131 Model 105

Table 63 on page 229 lists the SP node types that can be configured for external booting with the 7131.

Table 63. SP Nodes Supporting Bootable SCSI Functions With the 7131

Node Type	Supported Adapters
POWER3 SMP high node (F/C 2054)	F/C 6207
POWER3 SMP wide node (F/C 2053)	F/C 6207, 6209
POWER3 SMP thin node (F/C 2052)	F/C 6207, 6209
332 MHz SMP wide node (F/C 2051)	F/C 6207, 6209
332 MHz SMP thin node (F/C 2050)	F/C 6207, 6209
160 MHz thin node (F/C 2022)	F/C 2412, 2416, or 2420
Reference information for withdrawn nodes	
200 MHz high node (F/C 2009)	F/C 2412, 2416, 2420
135 MHz wide node (F/C 2007)	F/C 2412, 2416, 2420
120 MHz thin node	F/C 2412, 2416, 2420
112 MHz high node	F/C 2412, 2416, 2420
77 MHz wide node	F/C 2412, 2416, 2420
66 MHz wide node	F/C 2412, 2416, 2420
66 MHz thin node (and thin 2)	F/C 2412, 2416, 2420

Notes:

1. If you do not see a node listed, it **is not supported** for external booting using the 7131.
2. F/C 2416 and 2420 are withdrawn from production.

Chapter 20. Power and Electrical Requirements

This chapter describes the planning tasks for your RS/6000 SP power and electrical needs. Tables and examples are included to help you calculate the power and electrical requirements for your particular system configuration. A worksheet you can photocopy to calculate and record your power requirements is in Table 68 on page 240.

RS/6000 SP system frames each contain an individual power subsystem with an attached line cord. You, along with your IBM representative, must plan for your power needs based on the frame configuration you select.

Remember to keep in mind any future power loads and branch circuit requirements as you design your system wiring.

Note: The air conditioning system at your installation must provide year-around temperature and humidity control. Use the information in this section to assist in assessing your site's air conditioning requirements.

Evaluating RS/6000 SP Power Requirements

RS/6000 SP frame power is provided by the Scalable Electric Power Base Unit (SEPBU). SP1 systems and early SP2 systems prior to S/N 76300 used the Power Distribution Unit (PDU). The PDU is withdrawn from production; for reference information, see “Withdrawn Power Supplies” on page 350.

Scalable Electric Power Base Unit (SEPBU)

What is a SEPBU?

The Scalable Electric Power Base Unit (SEPBU) provides base (+12V) and bulk (+48V) power for the SP system. It draws only the electrical current required to support the number of nodes installed in the SP frame. The SEPBU occupies the area in the base of the frame which held the Power Distribution Unit (PDU) and ac-to-dc converters in earlier systems.

Three phase SEPBUs accept both low voltage (200-240 V ac) and high voltage (380-415 V ac) input options without the use of an external transformer. Single phase SEPBUs accept only low voltage (200-240 V ac) power. A 4.3 meter (14 feet) ac input line cord (6 feet for Chicago, IL) is supplied with both the three phase and the single phase SEPBUs.

Note: For floor layout planning purposes; power drops to the frames must be within the reach of the ac line cord supplied with the SP frames.

Base Power Regulators: Power supply modules, called base power regulators (BPRs), are installed in the SEPBU to provide scalable power output configurations. The modular design allows you to reconfigure the SEPBU to meet changing power requirements as you expand or reconfigure your SP system.

Circuit Breakers: The power supply modules contain individual circuit breakers (CBs). The SEPBU has no mainline circuit breaker. The branch CB that protects the installation wiring also protects the input section of the SEPBU. The proper branch circuit CB is required for safe installation and operation of the SEPBU. See Table 64 on page 234 and Table 65 on page 235 for circuit breaker specifications.

Balancing Circuit Breaker Performance: SP frames connected to ***High voltage (380-415 V)*** branch feeds are often protected by current limiting miniature circuit breakers or supplementary protectors. The most commonly used protectors have a C-curve time-current characteristic offering moderate transient overload capability.

The same type of protector is used in the SEPBU books. Thus, some planning is required to set up a system with branch breakers and book breakers that trip in a coordinated manner. In SP installations where branch and book breakers have similar characteristics, an electrical fault in a SEPBU module can result in the branch circuit breaker tripping simultaneously with the circuit breaker on the SEPBU module. Thus, rather than the SEPBU functioning in N–mode, the entire frame powers-down.

When you plan a new installation (or an upgrade) to an existing ***High voltage (380-415 V)*** system, slow-transfer type circuit breakers should be installed in the branch circuits supplying the frames.

The following slow transfer circuit breakers have been tested and are recommended for ***10.5 kW / 30 amp*** (4 book, high voltage) SEPBUs:

Siemens (ITE) EFC3M030

Eaton (Heinemann) CD3-A3-AB0030-01B

Philips (Airpax) 219-3-1-66-5-8-30

The following slow transfer circuit breakers have been tested and are recommended for ***7.0 kW / 20 amp*** (3 book, high voltage) SEPBUs:

Siemens (ITE) EFC3M020

Eaton (Heinemann) CD3-A3-AB0020-01B

Philips (Airpax) 219-3-1-66-5-8-20

Beyond the branch circuit, you must also coordinate the response time of circuit breakers from the building main to the branch feed. Failure to do so can result in the loss of power to a large portion of an installation if an overload develops in a branch circuit. Since the building distribution path can include a wide variety of circuit breakers and possible UPS devices, site-specific research is required. For electrical planning assistance, contact your IBM Global Services representative.

SEPBU Power Control Interface

The SEPBU Power Control Interface provides remote power control. The interface allows an SP system with a SEPBU to either control or be controlled by external devices (such as disk units or tape drives) or another SP system with a SEPBU. The SEPBU provides two main (MAIN) outputs (+15V @ 0.8A maximum) to control external devices.

Outputs from different SEPBUs can be connected in parallel to allow either SEPBU to control the device. In addition, two auxiliary (AUX) inputs allow external devices to control the SP. These inputs accept +10 to 30 V (20mA maximum) for power on signal control. A local/auxiliary (LOC/AUX) switch at the rear of the SEPBU overrides the remote power control input when placed in the local (LOC) position.

Attention – Powering-Off Frames with Power Control Interface

Powering-off a frame that is configured to use the Power Control Interface can power-down all attached frames or features, causing all parallel jobs to terminate. The switch network cannot be restarted until power is restored to the frame or until the frame is removed from the active configuration in a multi-frame system.

Power Control Interface Cable Planning: Take cable lengths into account when you implement the Power Control Interface capabilities of the SEPBU. A 10-meter (33 feet) cable (**P/N 00G1277**) is required to connect the SP system Power Control Interface to external devices or to other SP frames. For each SP frame connected by the 10-meter cable, an additional cable (**P/N 42F6839**) is required to adapt the 10-meter cable to the SEPBU Power Control Interface inputs/outputs within one of the frames; you need to order both cables. See Appendix C, “SEPBU Power Control Interface” on page 363 for more information.

System Monitor: The System Monitor software controls all power modules in an SP frame with a single setting. By selecting the Frame Environment Layout window for a frame, you can monitor status of the power modules and turn the power on or off for the entire frame or systems that are configured using the Power Control Interface.

Emergency Power Off: The main power switch on the SP frame can act as the unit emergency power off (UEPO) switch when used with the Power Control Interface. For more information, see Appendix C, “SEPBU Power Control Interface” on page 363.

SEPBU Power Requirements

The SEPBU uses either three-phase or single-phase voltage inputs.

- Single-phase SEPBUs are used in 1.25 m frames. Redundant power (N+1) is an optional feature on single phase SEPBUs.
  - Current 1.25 m frames have 5.0 kW SEPBUs. Order **F/C 1213** for N+1 power redundancy on 5.0 kW SEPBUs.
  - Older 1.25 m frames were equipped with 3.5 kW SEPBUs. Order **F/C 1211** for N+1 power redundancy on 3.5 kW SEPBUs.

  Note: Frames with older 3.5 kW SEPBUs ***must*** be upgraded to 5.0 kW service before SMP wide and thin nodes can be installed. See “Upgrading Power Systems in Early SP Frames” on page 244 for more information.

- Three-phase SEPBUs are used in 1.93 m frames and in older 2.01 m tall frames. The SEPBUs used in these frames have N+1 redundant power as a standard feature.
  - Current 1.93 m frames have 10.5 kW SEPBUs.
  - Older 2.01 m frames were equipped with 7.0 kW SEPBUs.

  Note: Frames with older 7.0 kW SEPBUs ***must*** be upgraded to 10.5 kW service before SMP wide and thin nodes can be installed. See “Upgrading Power Systems in Early SP Frames” on page 244 for more information.

A green/yellow safety ground is required for all configurations. The SEPBU is not phase-rotation sensitive. The proper branch circuit with appropriate circuit breaker (CB) must be used based on the output power scales listed in the first columns of Table 64 on page 234 and Table 65 on page 235. A CB with motor-start characteristics should be used to allow inrush currents during the power-on of the SP system. The electrical service that you provide must be capable of an inrush current of 90 amperes maximum peak. This inrush current decays within five cycles.

The SEPBU is capable of supporting higher power configurations. Fifty-ampere branch circuit cables can be installed but must have branch circuit CBs appropriate for the SEPBU according to Table 64 and Table 65 on page 235. This facilitates higher power configurations for future growth, without having to rewire branch circuits.

As always, you must adhere to local electrical codes at your site.

Frame-to-Frame Grounding

In order to maintain your entire SP system at the same electrical potential, frame-to-frame ground cables ***must*** be installed between all frames in your SP system. IBM ships these ground cables (P/N 46G5695) with the SP system and attaches them during system installation.

Frame-to-frame ground cables must also be installed to all optional SP equipment such as SP-Attached Servers and SP Switch Routers.

SEPBU Low Voltage (200-240 V ac) Requirements

Table 64 describes RS/6000 SP voltage requirements for the Scalable Electric Power Base Unit (SEPBU) low-voltage input range.

Table 64 (Page 1 of 2). SEPBU Low Voltage (200-240 V ac) Requirements

Output Power Scale	Number of BPRs	Ratings	Branch Circuit Required	Configuration	Plug Position
5.0 kW	1	Single-phase, 50/60Hz, 30 ampere	40 amp preferred 50 amp acceptable	1.25 m frames without redundant power	POS D
5.0 kW	2	Single-phase, 50/60Hz, 30 ampere	40 amp preferred 50 amp acceptable	1.25 m frames with n+1 redundant power	POS C,D
10.5 kW	3	Three-phase, 50/60Hz, 35 ampere	50 amp preferred 60 amp acceptable	1.93 m frames with n+1 redundant power	POS A,B,C
Reference information for withdrawn units					

Table 64 (Page 2 of 2). SEPBU Low Voltage (200-240 V ac) Requirements					
Output Power Scale	**Number of BPRs**	**Ratings**	**Branch Circuit Required**	**Configuration**	**Plug Position**
3.5 kW	1	Single-phase, 50/60Hz, 24 ampere	30 ampere	Withdrawn Model 2AX and 3AX systems without redundant power	POS D
3.5 kW	2	Single-phase, 50/60Hz, 24 ampere	30 ampere	Withdrawn Model 2AX and 3AX systems with n+1 redundant power	POS C,D
7.0 kW	3	Three-phase, 50/60Hz, 24 ampere	30 ampere	Default on withdrawn 2.01 m frames with n+1 redundant power	POS A,B,C
10.5 kW	4	Three-phase, 50/60Hz, 35 ampere	50 amp preferred 60 amp acceptable	1.93 m frames with n+1 redundant power	POS A,B,C,D

SEPBU High Voltage (380-415 V ac) Requirements

Table 65 describes RS/6000 SP voltage requirements for the SEPBU high-voltage input range.

Table 65. SEPBU High Voltage (380-415 V ac) Requirements					
Output Power Scale	**Number of BPRs**	**Ratings**	**Branch Circuit Required**	**Configuration**	**Plug Position**
10.5 kW	3	Three-phase, 50/60Hz, 20 ampere	30 ampere	1.93 m frames with n+1 redundant power	POS A,B,C
Reference information for withdrawn units:					
7.0 kW	3	Three-phase, 50/60Hz, 16 ampere	20 ampere	Default on withdrawn 2.01 m frames with n+1 redundant power	POS A,B,C
10.5 kW	4	Three-phase, 50/60Hz, 20 ampere	30 ampere	1.93 m frames with n+1 redundant power	POS A,B,C,D
Note: 1.25 m frames are not offered with a high voltage SEPBU configuration.					

Evaluating Power Line Cords, Plugs, and Receptacles

Once you have decided on a system configuration to fit your computing needs, you can evaluate your requirements for ac line cords and plugs which are supplied with your RS/6000 SP system.

RS/6000 SP ac Line Cord and Branch Circuit Requirements

The configuration of the ac line cord shipped with your SP system depends on your location and the power requirements of your system.

1. For SEPBU-equipped systems, refer to the following tables:
   - 10.5 kW, see Table 66 on page 237
   - 5.0 kW, see Table 67 on page 238
   - 7.0 kW (withdrawn), see Table 125 on page 357
   - 3.5 kW (withdrawn), see Table 126 on page 358
2. A 200-240 V ac (nominal), 50 amp. service (50 amp. preferred, 60 amp. acceptable) with appropriate wire size and circuit breaker is required for 1.93 m frames. Other frame styles and SP systems using high voltage supplies have alternate requirements. See Table 64 on page 234 or Table 65 on page 235 for specific circuit requirements.

   A branch circuit breaker with motor-start characteristics should be used to allow for the in-rush currents when you apply power to the RS/6000 SP system.
3. For each RS/6000 SP input line cord, a receptacle with an internal jumper between the metal back-box and the grounding wire is required if the branch circuit wiring uses metallic conduit. This jumper is in addition to the required grounding wire.
4. You ***must*** adhere to local electrical codes at your site.

Power Line Cord Specifications for SEPBU-equipped Frames

This section describes the ac line cords that IBM supplies with your RS/6000 SP frame. The tables in this section also list the required customer-supplied mating connectors. You need to supply either the receptacle or the in-line connector, depending on your specific site requirements.

Phase Connections

On 1.93 m and 2.01 m frames, the SEPBU ac line cord is four-wire cable designed for three-phase power with a safety ground. There is no neutral connection to the RS/6000 SP and their are no phase rotation requirements.

Note: For some line cords supplied without a plug, the blue conductor is to be connected to a non-neutral phase. This is permitted by international standards for four-wire systems.

On 1.25 m frames, the ac line cord is a three-wire cable designed for single-phase power (phase-to-phase or phase-to-neutral) with a safety ground. This allows 1.25 m frames to be installed in all countries using phase-to-phase or phase-to-neutral connectors as appropriate for a specific country.

1.93 m Frames

Table 66 applies to 1.93 m frames using the 10.5 kW SEPBU. This table describes the ***IBM-supplied*** ac line cords and the required ***customer-supplied*** mating connectors. You, as the customer, must supply either the receptacle or the in-line connector, depending on your site requirements.

The information for 7.0 kW SEPBUs in 2.01 m frames is listed in "Power Line Cord Specifications for Withdrawn SEPBUs" on page 357.

Table 66. Power Line Cord Specifications for Frames with 10.5 kW SEPBUs

Location	Length meters (feet)	Plug Type	Conductor Dimension mm^2 (AWG)	Customer-supplied Parts	
				Connector (Note 3)	**Receptacle (Note 4)**
North America (including Canada) and Japan	4.3 (14)	Hubbell P/N 460P9V05 (Note 5)	8.4 (#8)	Any IEC309 460C9W (Note 5)	Any IEC309 460R9W (Note 5)
Chicago, USA (F/C 9986)	1.8 (6)				
AP (excluding Japan)	4.3 (14)	None (Note 1)	8.4 (#8)	(Note 1)	(Note 1)
EMEA (Note 2)	4.3 (14)	None (Note 1)	6 (#10)	(Note 1)	(Note 1)
LA	4.3 (14)	None (Note 1)	8.4 (#8)	(Note 1)	(Note 1)

Notes:

1. Terminations to be supplied by customer per local requirements.
2. Except for Bulgaria, Liberia, Libya, Saudi Arabia, Somalia, Syria and Egypt, conductor dimensions are 8.4 mm^2 (#8 AWG).
3. The connector cannot be installed on a metal conduit because it is a safety hazard.
4. IBM suggests using IEC309 components in powering their equipment to comply with the National Electric Code (NEC) and to provide a safe environment for IBM service personnel and customer facilities personnel. If the Feature Code selection for the product specifies an IEC309 plug, IBM suggests that it is attached to an IEC309 receptacle mounted in a metallic back-box with the ground pin of the receptacle attached to the ground lug in the box.
5. Applies to 200-240 V ac installations only.

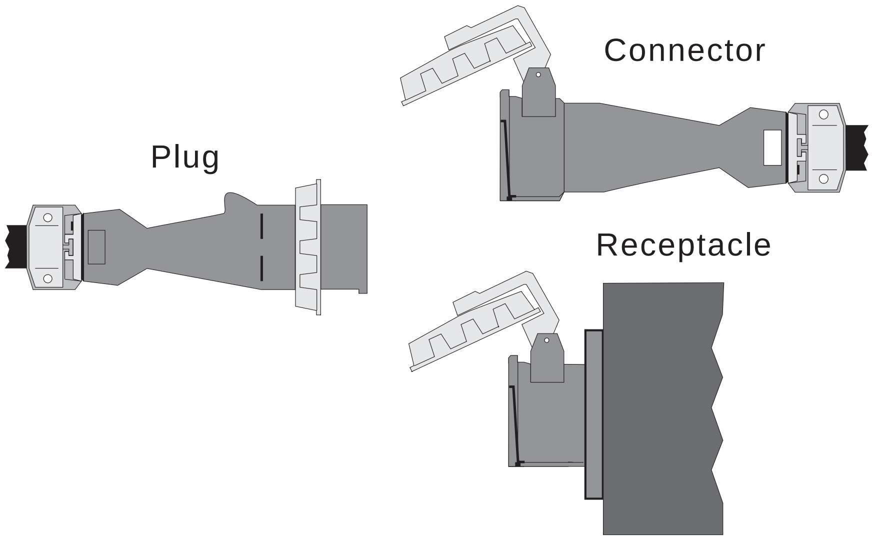


Figure 48. Customer-Supplied In-Line Connector and Receptacle for Three-Phase Power

1.25 m Frames

The information in Table 67 applies to the ***IBM-supplied*** ac line cords and the required ***customer-supplied*** mating connectors used with the 5.0 kW SEPBU. The 5 kW SEPBUs do not have a high voltage option and can only be connected to a 200-240 V ac input line (phase-phase or phase-neutral).

You, as the customer, must supply either the receptacle or the in-line connector, depending on your site requirements.

Table 67. Power Line Cord Specifications for SP Systems with 5.0 kW SEPBU

Location	Length meters (feet)	Plug Type	Conductor Dimension mm² (AWG)	Customer-supplied Parts	
				Connector	**Receptacle**
North America (including Canada) and Japan	4.3 (14)	Russell-Stoll P/N 9P53U0 ***or*** 9P53G0/KF (See Note 1)	13.5 (#6)	Russell-Stoll P/N 9C53U0	Russell-Stoll P/N 9R53U0
Chicago, IL (F/C 9986)	1.8 (6)				
AP (excluding Japan)	4.3 (14)	None (Note 2)	13.5 (#6)	(Note 2)	(Note 2)
EMEA	4.3 (14)	None (Note 2)	13.5 (#6)	(Note 2)	(Note 2)
LA	4.3 (14)	None (Note 2)	13.5 (#6)	(Note 2)	(Note 2)

Notes:

1. Either of the plug P/Ns might be on the line cord and both are compatible with the listed connector and receptacle
2. Terminations to be supplied by customer per local requirements

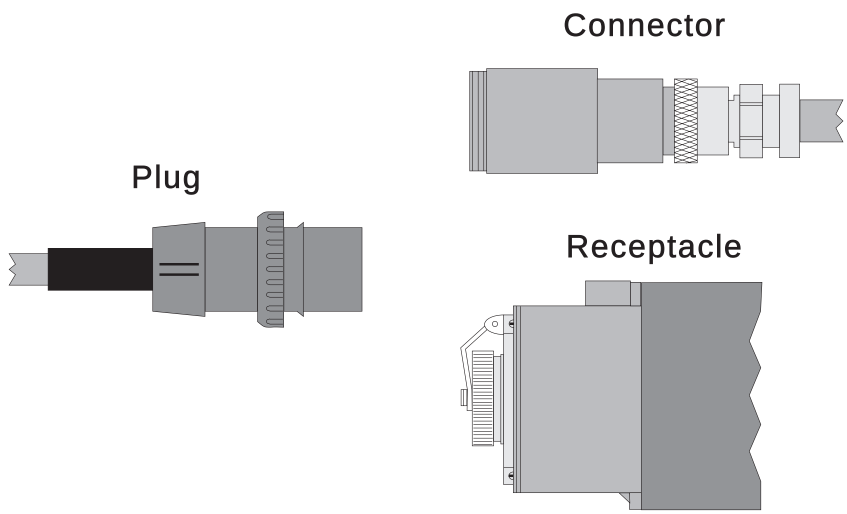


Figure 49. Customer-Supplied In-Line Connector and Receptacle for Single-Phase Power

Planning for Power Requirements of SP Frames and Features

The total power requirement of your RS/6000 SP system is the sum of the power required by all of the following individual components:

- Each base frame with integral power subsystem
- Each processor node
- All options and adapters in each node
- Each switch
- All auxiliary equipment, such as SP-Attached Servers, routers, RAIDs, extension nodes, printers, etc.

  For the RS/6000 SP Switch Router, this information can be found in publications listed in the "Bibliography" on page 375, in the "RS/6000 SP Switch Router" list. For the SP-Attached Server, see "Power Requirements for SP-Attached Servers" on page 44.

  For the power usage of auxiliary equipment obtained from other vendors, consult the documentation provided for that equipment.

After calculating frame power requirements (see "Using the SP Frame Power Computation Worksheet"), add the total of all auxiliary equipment power to the total power usage of all the frames in your system.

Using the SP Frame Power Computation Worksheet

Make one copy of Table 68 on page 240 for each frame in your SP system. Fill in the worksheet copies using your quantities of all applicable features. Complete the calculations, using the power factors given for each feature, to determine the total power requirement of each frame.

Table 68 (Page 1 of 3). SP System Frame Power Computation Worksheet

System Name____________________ Frame Number_____ Quantity of Frames in System______

Component	Feature	Qty. x Factor	Watts
Frame	Empty frame with power subsystem (**500, 550, T70, 1500, 1550**)	(1) x 41	41
Nodes	POWER3 SMP High Node (**F/C 2054**)	(___) x 575	
	SP Expansion I/O Unit (**F/C 2055**)	(___) x 52	
	POWER3 SMP Wide Node (**F/C 2053**)	(___) x 130	
	POWER3 SMP Thin Node (**F/C 2052**)	(___) x 85	
	332 MHz SMP Wide Node (**F/C 2051**)	(___) x 180	
	332 MHz SMP Thin Node (**F/C 2050**)	(___) x 133.8	
	160 MHz Uniprocessor Thin Node (**F/C 2022**)	(___) x 135	
		Node subtotal	
CPUs	POWER3 SMP High Node CPU card (**F/C 4849**)	(___) x 132	
	POWER3 SMP Thin or Wide Node CPU card (**F/C 4342**)	(___) x 113	
	332 MHz SMP Thin or Wide Node CPU card (**F/C 4320**)	(___) x 76.5	
		CPU subtotal	
Memory	POWER3 SMP High Node memory card (**F/C 4880**)	(___) x 66	
	POWER3 SMP Thin and Wide Node memory card (**F/C 4098**)	(___) x 65	
	332 MHz SMP Thin and Wide Node memory card (**F/C 4093**)	(___) x 39.8	
	160 MHz Uniprocessor Thin Node memory card (**F/C 4086, 7, 8, 9**)	(___) x 11.5	
		Memory subtotal	
Switches	SP Switch (**F/C 4011, 4008**) (See Note 4)	(___) x 167	
DASD	4.5 GB Ultra SCSI (**F/C 2900**)	(___) x 8.9	
	4.5 GB Ultra SCSI disk pair (**F/C 2904**)	(___) x 17.8	
	9.1 GB Ultra SCSI (**F/C 2908**)	(___) x 22.1	
	9.1 GB Ultra SCSI disk pair (**F/C 2909**)	(___) x 44.2	
	18.2 GB Ultra SCSI disk pair (**F/C 2918**)	(___) x 57.6	
	9.1 GB Ultra SCSI disk pair (**F/C 3800**)	(___) x 44.2	
	9.1 SSA disk pair (**F/C 3802**)	(___) x 54.2	
	18.2 GB Ultra SCSI disk pair (**F/C 3803**)	(___) x 57.6	
		DASD subtotal	

Table 68 (Page 2 of 3). SP System Frame Power Computation Worksheet

System Name____________________ Frame Number_____ Quantity of Frames in System______

Component	Feature	Qty. x Factor	Watts
PCI adapters	Serial HIPPI SW (**F/C 2732**)	(___) x 39.7	
	Serial HIPPI LW (**F/C 2733**)	(___) x 39.7	
	FDDI SK-NET LP SAS (**F/C 2741**)	(___) x 9.9	
	FDDI SK-NET LP DAS (**F/C 2742**)	(___) x 15.2	
	FDDI SK-NET UP DAS (**F/C 2743**)	(___) x 9.9	
	ESCON Channel (**F/C 2751**)	(___) x 22.8	
	Token Ring (**F/C 2920**)	(___) x 2.3	
	8-Port Async (**F/C 2943**)	(___) x 19.1	
	WAN 128-Port Async (**F/C 2944**)	(___) x 9.0	
	ARTIC960Hx 4-Port Selectable (**F/C 2947**)	(___) x 26.9	
	2-Port Multiprotocol X.25 (**F/C 2962**)	(___) x 10.8	
	TURBOWAYS 155 UTP ATM (**F/C 2963**)	(___) x 10.5	
	10/100 Ethernet 10BaseTX (**F/C 2968**)	(___) x 9.1	
	Gibabit Ethernet-SX (**F/C 2969**)	(___) x 27.4	
PCI adapters	10Base2/10BaseT Ethernet LAN (**F/C 2985**)	(___) x 3.0	
	10Base5/10BaseT Ethernet LAN (**F/C 2987**)	(___) x 5.0	
	TURBOWAYS 155 ATM (**F/C 2988**)	(___) x 10.2	
	Token Ring (**F/C 4959**)	(___) x 2.7	
	Ultra2 SCSI (**F/C 6205**)	(___) x 24.5	
	SCSI-2 Ultra/Wide SE (**F/C 6206**)	(___) x 11.9	
	SCSI-2 Ultra/Wide DE (**F/C 6207**)	(___) x 11.9	
	SCSI-2 Fast/Wide SE (**F/C 6208**)	(___) x 11.9	
	SCSI-2 Fast/Wide DE (**F/C 6209**)	(___) x 11.9	
	SSA RAID 5 (**F/C 6225**)	(___) x 36.5	
	SSA RAID 5 (**F/C 6230**)	(___) x 36.5	
	F/W Cache Module (**F/C 6235**)	(___) x 5.9	
	ARTIC960RxD Quad Digital Trunk (**F/C 6310**)	(___) x 30.4	
	PCI subtotal		
MCA adapters	MCA slots occupied in uniprocessor thin nodes	(___) x 46	
	MCA slots occupied in uniprocessor high and wide nodes	(___) x 35.6	
	MCA subtotal		
Total Power for Frame			

Table 68 (Page 3 of 3). SP System Frame Power Computation Worksheet

System Name____________________ Frame Number_____ Quantity of Frames in System______

Component	Feature	Qty. x Factor	Watts

Notes:

1. The SEPBU has a power factor of 1, thus W = VA
2. The PDU power supply ***does not*** have a power factor of 1:
   - For frames with a PDU, multiply W x 1.16 for VA
   - For a PDU ***and*** High-voltage transformer, multiply W x 1.19 for VA
3. 1 Watt = 3.412 BTU/Hour
4. SP Switch ***adapter*** power is included in the ***node*** power factors given for all SMP-type nodes

Obtaining Power System Backup Devices

The primary power supply to your SP system can be protected with either an uninterruptible power supply (UPS) or a dual line cord static transfer switch (STS). Both options are available through IBM. For more information on performance and availability, contact:

IBM Global Services
1-888-426-4343
Request the “UPS” connection.

Ask for information on your choice of the following:

- Uninterruptible power supplies
- Dual line cord static switches

Evaluating Location and Availability of Receptacles

Consider the location and availability of adequate electrical power outlets to ensure maximum reliability for your RS/6000 SP system. Ensure that you plan the frame positions with consideration given to power cord lengths in addition to any communication cable length requirements, such as Ethernet and RS-232 cables.

Evaluating Primary Computer Power Service

While a dedicated power supply is not necessary for maximum reliability, the computer room power panel should connect to feeders that do not serve other loads. Connect electrical noise producing devices such as motors or air conditioning equipment to panels separate from those feeding the system frames.

Installing Emergency Power-Off Controls at Your Site

As a safety precaution, provide emergency power-off controls for disconnecting the main service wiring that supplies the RS/6000 SP system. Install these controls at a convenient place for the operators and next to the main exit doors of the room after checking local electrical codes for further guidelines.

Protecting Branch Circuits and Connecting Ground Conductors

The following are recommendations for protecting your ac wiring:

1. Install circuit protection for the individual branch circuits that complies with national and local electrical codes.
2. Label each protector to identify the branch circuit that it controls.

   IBM ac line cords contain an insulated equipment-grounding wire (solid green or green with yellow stripe) that connects the machine frame to the ground terminal at the power plug. Electrical branch circuits provide a ground pin at the branch receptacle.
3. Connect the ground pin through a green ground wire to the building ground at the electrical service entrance box.

   If your building does not have a ground pin at the receptacle, upgrade these systems to provide a properly grounded receptacle before connecting an RS/6000 SP System. This ensures electrical safety and reduces the possibility of electrical interference problems.
4. Ensure that the ground has sufficiently low impedance to limit the voltage to ground and to facilitate the operation of protective devices in the electrical circuit. For example, the ground path should not exceed one (1) ohm for 120-volt, 20-ampere branch circuit devices. Your local requirements might be more stringent.
5. Ensure that all grounds entering the room are interconnected somewhere within the building to provide a common ground potential. This includes any separate power sources, lighting and convenience outlets, and other grounded objects such as building steel, plumbing and duct work.
6. Ensure that the equipment grounding conductor to the power distribution center is electrically bonded to the enclosure and to the connector grounding terminal. Refer to Figure 50 on page 244, which shows the correct wiring of a typical power distribution system. The conduit must not be used as the only grounding means and it must be connected in parallel with any grounding wires it contains.

Frame-to-Frame Grounding

In order to maintain your entire SP system at the same electrical potential, frame-to-frame ground cables ***must*** be installed between all frames in your SP system. IBM ships these ground cables (P/N 46G5695) with the SP system and attaches them during system installation.

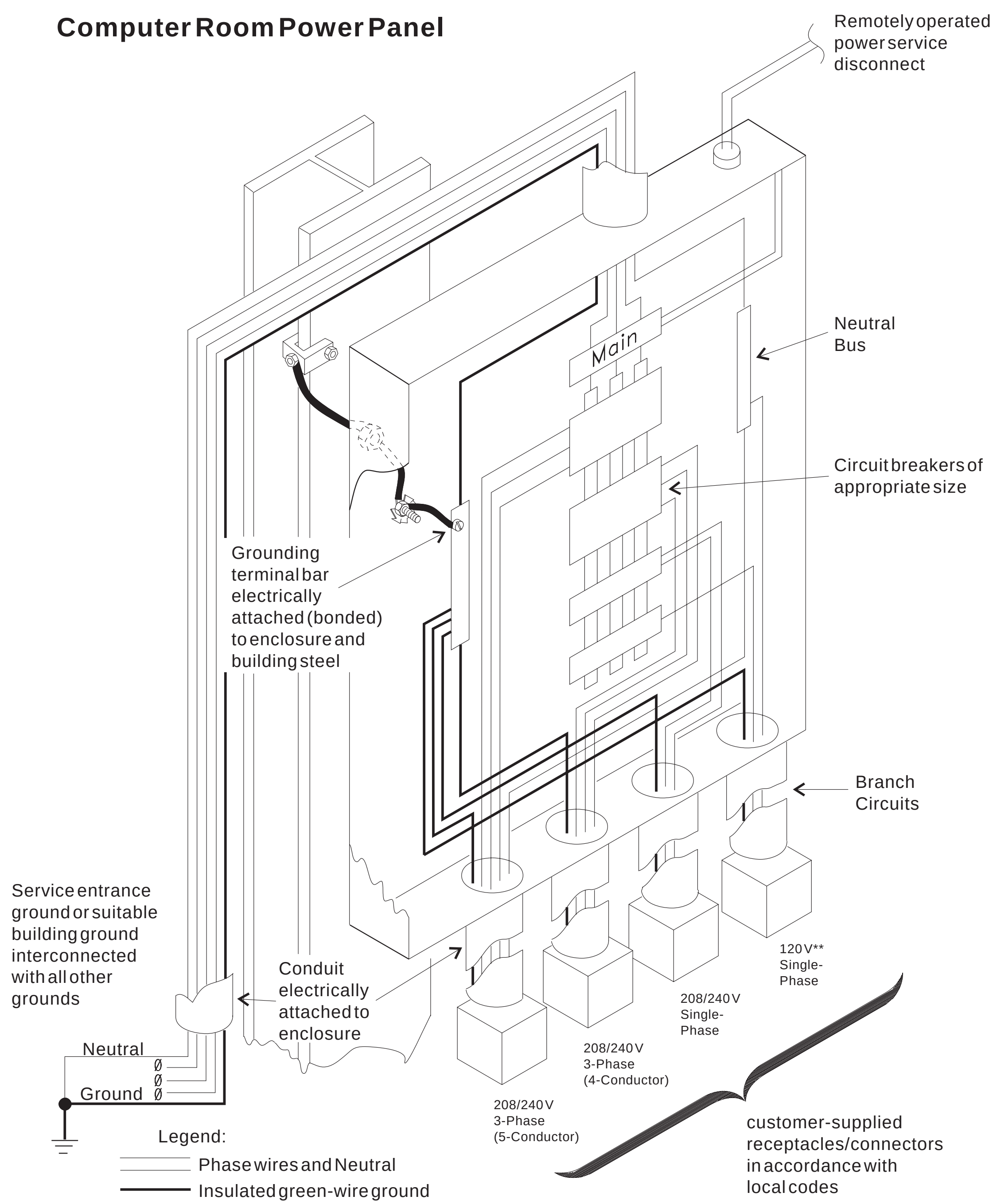


Figure 50. Typical Power Distribution System

Upgrading Power Systems in Early SP Frames

Early SP systems were equipped with a 7.0 kW power supply in 2.01 m frames and a 3.5 kW supply in 1.25 m frames. Before you can install POWER3 or 332 MHz SMP wide or thin nodes in an early SP frame, you ***must*** upgrade the existing SEPBU or PDU power supply. SMP wide and thin nodes require 10.5 kW service in 2.01 m frames and 5.0 kW service in 1.25 m frames. Each type of power supply upgrade has a specific feature code. When you order the feature code required for your SP system, you receive all of the components needed to upgrade one SP frame. You must supply any components not directly attached to the SP frame.

Use the following feature codes to order power system upgrades:

- These ***no-charge*** features enable you to upgrade early power subsystems with the initial order of each SMP wide or thin node in a frame:
  - **F/C 9932** for PDU equipped frames.
  - **F/C 9933** for 7.0 kW SEPBU equipped frames.
  - **F/C 9934** for 3.5 kW SEPBU equipped frames.
- These ***priced*** features enable you to upgrade existing power subsystems if you do not order new SMP wide or thin nodes:
  - **F/C 8500** for PDU equipped frames.
  - **F/C 8501** for 7.0 kW SEPBU equipped frames.
  - **F/C 8502** for 3.5 kW SEPBU equipped frames.

Upgrading 2.01 m Frames with 7.0 kW SEPBUs

Either **F/C 9933** or **F/C 8501** is required when you install SMP wide or thin nodes into a 2.01 m frame equipped with a 7.0 kW SEPBU power supply. This feature code supplies the following replacement parts and new components you need to complete your SEPBU upgrade to 10.5 kW service:

- An additional 3.5 kW SEPBU power book for 10.5 kW service with N+1 power redundancy.
- Eight 48 V dc frame power cables with heavier-gage wire, in-line circuit breakers, and a 1-to-2 breakout.
- A new line cord with connector (see Table 66 on page 237 for plug details).
- New power rating information plates.

Note: Power system upgrades on early SP frames (SN 76000 to SN 76131) require line cord modifications. A certified electrician must make these changes.

Customer-Supplied Components

You must make the following preparations and supply these components in order to complete the power system upgrade for your SP system:

- Electrical service and circuit breakers capable of handling up to 50-amp. loads. See Table 64 on page 234 and Table 65 on page 235 for branch circuit requirements.
  - A 50-amp. circuit breaker is preferred, but a 60-amp. circuit breaker is acceptable
- All wall receptacles or line connectors. See Table 66 on page 237 for specifications.
- Any site changes needed to accommodate underfloor power connectors.

Upgrading 1.25 m Frames with 3.5 kW SEPBUs

Either **F/C 9934** or **F/C 8502** is required when you install SMP wide or thin nodes into a 1.25 m frame equipped with a 3.5 kW SEPBU power supply. This feature code supplies the following replacement parts and new components you need to complete your SEPBU upgrade to 5.0 kW service:

- A replacement SEPBU base enclosure with higher-rated backplane.
- Either:
  - A 5.0 kW SEPBU power book to replace the existing 3.5 kW unit
  - ***or***
  - A 5.0 kW SEPBU power book with N+1 power redundancy to replace an existing 3.5 kW unit equipped with the N+1 option.
- Four 48 V dc frame power cables with heavier-gage wire, in-line circuit breakers, and a 1-to-2 breakout.
- A new line cord with connector (see Table 67 on page 238 for plug details).
- New power rating information plates.

Customer-Supplied Components

You must make the following preparations and supply these components in order to complete the power system upgrade for your SP system:

- Electrical service and circuit breakers capable of handling up to 40-amp. loads. See Table 64 on page 234 for branch circuit requirements.
  - A 40-amp. circuit breaker is preferred, but a 50-amp. circuit breaker is acceptable
- All wall receptacles or line connectors. See Table 67 on page 238 for specifications.
- Any site changes needed to accommodate underfloor power connectors.

Upgrading 2.01 m Frames with PDU

Either **F/C 9932** or **F/C 8500** is required when you install SMP wide or thin nodes into a 2.01 m frame equipped with a PDU power supply. This feature code replaces the PDU with a 10.5 kW SEPBU and supplies the following components:

- A four-book, 10.5 kW SEPBU with N+1 power redundancy.
- Eight 48 V dc frame power cables with heavier-gage wire, in-line circuit breakers, and a 1-to-2 breakout.
- A new line cord with connector (see Table 66 on page 237 for plug details).
- New power rating information plates.

Note: Power system upgrades on early SP frames (SN 76000 to SN 76131) require line cord modifications. A certified electrician must make these changes.

Customer-Supplied Components

You must make the following preparations and supply these components in order to complete the power system upgrade for your SP system:

- Electrical service and circuit breakers capable of handling up to 50-amp. loads. See Table 64 on page 234 and Table 65 on page 235 for branch circuit requirements.
  - A 50-amp. circuit breaker is preferred, but a 60-amp. circuit breaker is acceptable
- All wall receptacles or line connectors. See Table 66 on page 237 for specifications.
- Any site changes needed to accommodate underfloor power connectors.

Chapter 21. Environmental Factors

After planning your overall RS/6000 SP system configuration, you can prepare your site environment. Preparing the environment in advance ensures that it is suitable for your SP system when it arrives.

Environmental Specifications of the RS/6000 SP

The RS/6000 SP system operates in conditions typical for digital devices marketed for commercial, industrial, or scientific environments; exclusive of home or general use environments.

Operating, Shipping, and Storage Environment

Table 69 lists the environmental specifications for operating, shipping, and storage of the RS/6000 SP system.

Table 69. Temperature and Humidity Specifications for RS/6000 SP systems

Environments	**Maximum Dry Bulb**	**Relative Humidity**	**Maximum Wet Bulb**
Operating Environment	10° to 32°C (50° to 89.6°F)	8% to 80%	23°C (73.4°F)
Non-operating Environment	10° to 43°C (50° to 109.4°F)	8% to 80% (noncondensing)	27°C (80.6°F)
Storage Environment	1° to 60°C (33.8° to 140°F)	5% to 80% (noncondensing)	29°C (84.2°F)
Shipping Environment	-40° to 60°C (-40° to 140°F)	5% to 100% (noncondensing)	29°C (84.2°F)

Thermal Shock Precautions

Warmup-Time Alert

An SP system in its shipping crates has many layers of material protecting it and has considerable thermal mass. If you are not certain that warmth has sufficiently penetrated into the system, delay opening the shipping crates!

Although it is permissible to ship and store your RS/6000 SP system in cold environments without damage (see Table 69), you must allow all SP hardware to gradually warm up to room temperature before you open the shipping container.

Two hazards can result from exposing unprotected, cold components to a warm environment:

1. Condensation can form, creating a failure potential for electronic components.
2. DASD can fail at power-up due to precision clearances, moisture, and lubrication problems.

Because these are potentially serious conditions, you must allow sufficient time for the core modules of your SP system to reach thermal equilibrium with the operating environment. The time required to reach equilibrium varies depending on the environmental extremes to which the system was exposed.

Recommended Operating Point and Range

Table 70 lists the optimum operating point and the recommended operating range for RS/6000 SP systems.

Table 70. Recommended Operating Range for RS/6000 SP systems

Environment	Temperature	Relative Humidity
Optimum Operating Environment	22°C (72°F)	45%
Recommended Operating Range	20° to 25°C (68° to 72°F)	40% to 50%

Note: For temperature measurement procedures, see “Completing a Temperature Survey” on page 254.

Acoustical Environment of the RS/6000 SP System

The following table lists the acoustical noise emissions of the RS/6000 SP system.

Acoustical Emissions for 1.93 m frames

Table 71. Declared Acoustical Noise Emission Values for Components and a Selected Custom Configuration Installed in 1.93 m Frames

Feature Code Description	L_{WAd}		L_{pAm}		$<L_{pA}>_m$	
	Operating (B)	**Idling (B)**	**Operating (dB)**	**Idling (dB)**	**Operating (dB)**	**Idling (dB)**
FC 2022 160-MHz Thin Node Pair	6.1	6.1	N/A	N/A	45	45
(2) FC 2050 332-MHz SMP Thin Nodes	6.2	6.2	N/A	N/A	46	46
FC 2051 332-MHz SMP Wide Node	6.1	6.1	N/A	N/A	45	45
(2) FC 2052 POWER3 Thin Nodes	6.3	6.3	N/A	N/A	47	47
FC 2053 POWER3 Wide Node	6.2	6.2	N/A	N/A	45	45
FC 2054 POWER3 High Node	6.4	6.4	N/A	N/A	53	53
FC 2055 SP Expansion I/O Unit	6.5	6.5	N/A	N/A	54	54
FC 4008/4011 SPS-8/SPS Switch	5.7	5.7	N/A	N/A	46	46
SEPBU, 4 power books (used in 1.93 m frames)	6.5	6.5	N/A	N/A	49	49
SEPBU, 1 power book (used in 1.25 m frames)	6.1	6.1	N/A	N/A	44	44
Selected configuration: (1) FC 2054, (1) FC 2055, (1) FC 2051, (4) FC 2052, (1) FC 4011, 3-book SEPBU	7.1	7.1	N/A	N/A	55	55

Definitions:

L_{WAd} The declared (upper limit) sound power level for a random sample of machines.

L_{pAm} The mean value of the A-weighted sound pressure levels at the operator position (if any) for a random sample of machines.

$<L_{pA}>_m$ The mean value of the A-weighted sound pressure levels at the one meter (bystander) positions for a random sample of machines.

N/A Not applicable (no operator position).

B, dB Abbreviations for bels and decibels, respectively.

All measurements made in accordance with ISO 7779, and reported in conformance with ISO 9296.

Evaluating Your Site Environment

Evaluate the suitability of environmental factors at your site based on the information in the following sections.

Evaluating Thermal Output

The air conditioning system at your installation must provide year-round temperature and humidity control. Use Table 68 on page 240 to determine the thermal output of your SP system. Use your power consumption results from the worksheets to calculate the heat output of your system. Based on your analysis, changes to your air conditioning system might be required to maintain the proper operating environment for the RS/6000 SP system.

If you have an air conditioning system that discharges cooled air under the raised floor, use perforated floor tiles in front of the SP frames to achieve the recommended operating temperature.

Thermal Planning Considerations for Your Site

The recommended temperature range for an operating SP system is 20° to 25° C (68° to 72° F). Use the following guidelines when planning your SP installation to help ensure that the optimum environment is created:

- Do not place perforated tiles directly under any of the SP frames (see Figure 51 on page 253).
- Align SP frames perpendicular to air conditioner outlets, if possible. This allows for better airflow into and around the system.
- Plug all cable cutouts with a pillow (P/N 2317361).
- Make cable cutouts in floor tiles as close to the recommended size as possible.
- Adjust the positioning and number of perforated tiles to achieve optimum temperatures. As a guideline, install one fully perforated tile, without dampers, per ton of air conditioning capacity (see Figure 51 on page 253).
- Ensure that all power requirements are met as specified in the *IBM General Information Manual: Installation Manual–Physical Planning*, GC22-7072
- Ensure that the room meets the requirements for cleanliness as specified in the *IBM General Information Manual: Installation Manual–Physical Planning*, GC22-7072
- Ensure that the exhaust from other SP frames or other manufacturer's equipment is not venting into the air intakes of other SP units. If SP frames are placed into rows, the air intakes should be facing each other. Enough underfloor air must be supplied for all units (see Figure 51 on page 253).
- At least one perforated tile, without a flow adjusting damper, is usually required for each SP frame. More may be required depending on the heat load .
- Install SP frames so that the frame front is aligned with the edge of the perforated tile (see Figure 51 on page 253).
- When two rows of frames are installed facing each other, each row requires its own set of perforated tiles. Allow 44 inches of clearance between the rows. The front of each row should be aligned with the tile seam. This allows the greatest flexibility in arranging perforated tiles for cooling.

- Place perforated tiles 2 m away from the front of air conditioning units to help eliminate short cycling.
- For new computer rooms and rebalancing activities, start off with one perforated tile per ton of air conditioning. Add or delete tiles in areas that do not meet temperature recommendations.
- Perform a load-balance assessment between heat-load and cooling capacity. Do this by sections of the room and not as one calculation for the entire room.
- Provide adequate cooling capacity, including redundant cooling, for each section of the room. This should include a minimum of one extra air conditioning unit per room section.

If you need assistance with this type of activity, your branch office or area installation planning representative can assist you in achieving and maintaining the proper environment for your data processing equipment.

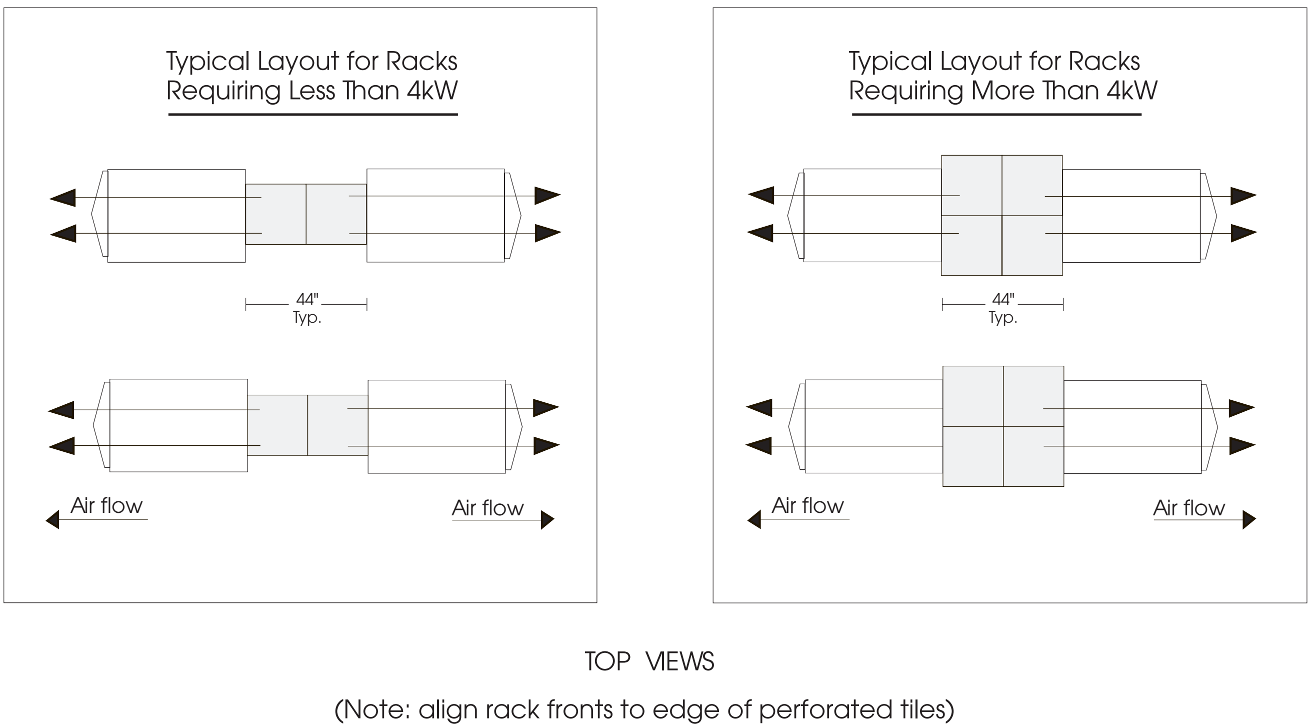


Figure 51. Frame Layout for Optimal Air Flow Using Perforated Tiles

Assessing the Total Heat Load of Your Installation

This procedure describes how to do a total heat load assessment, which will indicate your installation's overall environmental balance point.

1. Determine the total equipment heat load. This is the sum of the heat loads for every piece of heat generating equipment in the room. Divide the total kW for all equipment by 3.516 to determine the total equipment heat load in tons.

   Note: Use the values listed in Table 68 on page 240 to determine the heat load for RS/6000 SP system frames and their components. In the case of the RS/6000 SP Switch Router, you can find this information in the Ascend publications listed in the bibliography of this book under

“RS/6000 SP Switch Router.” For the SP-Attached Server, see “SP-Attached Server Environmental Specifications” on page 45 .

For information on other auxiliary equipment, consult with the respective vendors of that equipment.

2. Determine the general room heat load. This is the heat load caused by lights, power distribution units, and people in the room. Calculate this value by dividing the square foot area of the room by 300 and then multiplying the result by 0.8. The result is the general room heat load in tons.
3. Combine the total equipment load in tons with the general room load in tons. This equals the total room heat load.
4. Determine current air conditioning capacities for cooling and air flow as follows:
   - Number of air conditioning units x number of tons = tons of air conditioning
   - Number of air conditioning units x number of cubic feet per minute (CFM) per unit = total CFM
5. Determine the total number of fully perforated tiles needed in the room (one per ton of cooling).
6. Once you have gathered the above information:
   - For ***new*** installations, use this information as a basis for calculating air conditioning requirements. For ***existing*** installations, use this information to evaluate your present air conditioning configuration.
   - Compare this value (total room heat load) against the total air conditioning capacity of the room. There should be a minimum of 25% additional air conditioning capacity over the maximum room heat load.
   - After you have looked at the entire room or your planned layout, break the room into logical sections as defined by size, air flow blockages, air conditioning unit locations, and so on. Then perform the above comparison to ensure enough cooling capacity exists in each section to allow one air conditioning unit to be shut down without causing temperatures to rise.
   - Determine if the installation has proper airflow. As a minimum, there should be one fully perforated tile per ton of air conditioning capacity. Each row of SP frames placed in parallel rows requires its own set of perforated tiles.
7. Once the installation is complete, adjust the perforated tile positions and the number of tiles to achieve the optimum operating temperature for each SP frame. See, “Completing a Temperature Survey” for instructions on measuring temperatures.
8. Allow the room to stabilize for 24 hours, and then resurvey the temperatures. Adjust the number of tiles and their positions to further optimize the temperature in the room.

For thermal planning assistance, contact your IBM Global Services representative.

Completing a Temperature Survey

If you suspect that computer room temperatures are not optimal, it is strongly recommended that you complete a temperature survey.

1. Record the frame air inlet temperatures at the following locations:
   - Bottom center at the front of the frame

- Midpoint at the front of the frame
- Top center at the front of the frame

2. Temperatures should be taken about 25 to 50 mm (1 to 2 inches) in front of the outside covers
3. All temperatures should fall within the 20° to 25° C recommended operating range

If your installation does not reasonably meet the recommended temperature range, see “Assessing the Total Heat Load of Your Installation” on page 253 for help on planning corrective actions.

Evaluating Electromagnetic Interference

Any location can have electromagnetic fields that could interfere with the normal operation of the RS/6000 SP system. These fields are generated by AC power paths, radio frequency transmitters, and other sources. If you suspect that any of these RF sources are near your proposed installation, it is appropriate to assess the environment to determine whether any special installation or product considerations are advisable to reduce possible interference. Consult your IBM Global Services planning representative for guidelines.

Evaluating Electrostatic Discharge

Electrostatic charges can accumulate on people and furniture because of direct contact with floor coverings or movement while in contact with furniture coverings. Discharge of static electricity to a metal surface on the RS/6000 SP frame can interfere with the system's operation and cause discomfort to anyone who comes in contact with it.

Some factors that contribute to electrostatic discharge are:

- High-resistance floor covering
- Carpeting without anti-static properties
- Plastic seat covers
- Synthetic fabrics in clothing
- Low humidity (less than 20%) [2]

If you suspect one or more of these factors affect your site, consult with your IBM Global Services planning representative for guidelines.

Attention

In order to maintain your entire SP system at the same electrical potential, you ***must*** attach a frame-to-frame ground between all frames in your SP system using IBM cables (P/N 46G5695).

[2] See “Recommended Operating Point and Range” on page 250.

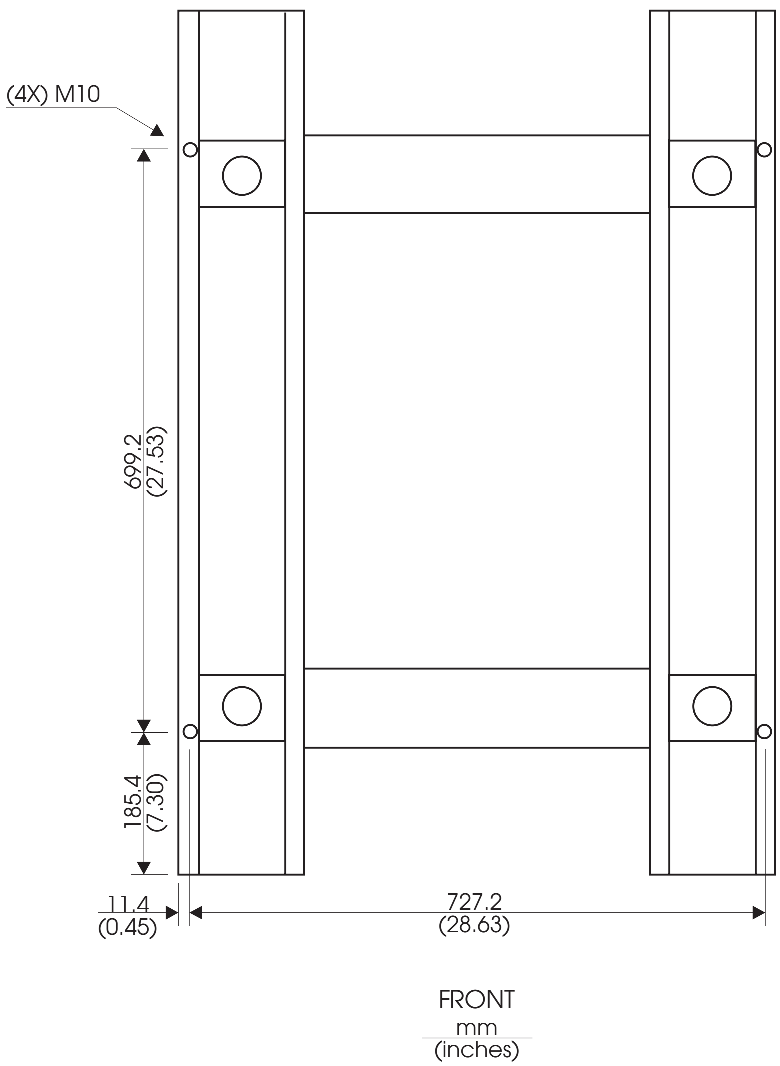
] ## Frame Tie-down Considerations

] If your site is in a geographical area that is susceptible to severe earthquakes, you
] might have additional installation considerations. Check with your IBM
] representative and your local building codes for guidance.

] Frame tie-down protection devices are available through IBM Global Services.

] ### 1.93 m and 1.36 m Frame Tie-down Locations

] The 1.93 m RS/6000 SP frame and the 1.36 m frame have four M10 tapped holes
] in the bottom of the frame for attachment to customer-supplied tie-down devices.
] See Figure 52 for hole locations.



] *Figure 52. Locations of Tie-down Holes on the 1.93 m and 1.36 m Frames. Bottom View*
] *Showing Locations of M10 Tapped Holes for Frame Tie-Down Use.*

1.25 m and 2.01 m Frame Tie-Down Locations

The 1.25 m short frame and the withdrawn 2.01 m RS/6000 SP frame have two M10 tapped holes in each side of the frame for attachment to customer-supplied tie-down devices. See Figure 53 and Table 72 for hole locations.

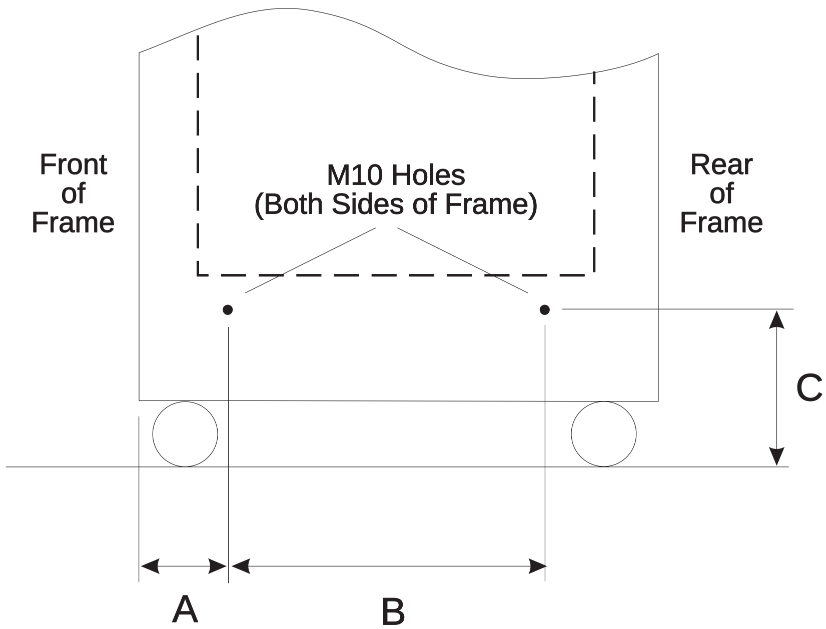


Figure 53. Locations for M10 Tapped Holes in 1.25 m and 2.01 m Frames

Table 72. Specifications for Tie-down Hole Locations (See figure above)

Frame	A (Front of Frame to M10 Hole)	B (M10 Hole to M10 Hole)	C (M10 Hole to Floor)
1.25m (49 in.)	150mm (5.9 in.)	615mm (24.2 in.)	90mm (3.5 in.)
2.01 m (79 in.) (After midyear 1996)	175mm (6.9 in.)	565mm (22.2 in.)	123mm (4.8 in.)
2.01 m (79 in.)	150mm (5.9 in.)	615mm (24.2 in.)	123mm (4.8 in.)

Chapter 22. Floor Plans

Use the information in this chapter to plan your RS/6000 SP installation site.

Planning Your RS/6000 SP Installation Site

Site planning for a successful installation includes the following:

- Determining all the components of your system
- Developing a good floor plan
- Planning site alterations

Determining the Devices to Include in Your System

Determine the quantity of RS/6000 SP frames, control workstations, and file servers to include in your RS/6000 SP configuration. Ensure that your list includes all auxiliary equipment, such as RAIDs and SSAs, Extension Nodes, printers, and all other I/O devices attached to your SP system. Add this information to your site floor plan.

Developing Your Floor Plan

Developing a floor plan for your RS/6000 SP system helps you organize and accomplish other site planning tasks. See "RS/6000 SP Physical Specifications and Illustrations" for physical specifications, space requirements, and the service access needs of your system.

Planning Your Site Alterations

Use the information in this chapter, as well as the results of your electrical power calculations and cooling requirements, to help you plan any alterations. Remember also to consider additional utility needs, such as electrical outlets, cable connections, and communication equipment.

For information regarding the physical specifications of any auxiliary equipment, such as footprints and power requirements, consult the documentation provided with that equipment.

RS/6000 SP Physical Specifications and Illustrations

Use this section to help develop your site installation plan. Included here are the physical dimensions and weights of RS/6000 SP frames and components, their space requirements, required service clearances, weight distribution areas, cut-away views of all frame types, and floor layout illustrations of multiple-frame systems.

Doorway and Obstruction Clearance Alert

Make certain that your SP system components can clear all doorways and any other obstructions between your receiving dock and the final location of the system. If you have any clearance restrictions, you must contact a commercial mover or rigger to transport the system through the doorway or past the obstruction.

Keep in mind that a fully populated SP frame can weigh 984 kg (2165 lbs); proper consideration must be given to the mass of the frames and the fragile nature of electronic components.

SP System Physical Dimensions and Weights

The tables in this section give the physical dimensions and weights of SP system frames and processor nodes.

1.93 m Frames

Table 73 gives the physical dimensions and weights of the 1.93 m (75.8 in.) frame with covers.

Table 73. Dimensions and Weights of the 1.93 m Frame (with covers)

Specification	Dimensions and Weights
Width	922 mm (36.3 in.)
Depth	1295 mm (51 in.)
Height	1925 mm (75.8 in.)
Weight • Minimum Base Configuration • Maximum Populated Configuration	 • 441 kg (971 lbs) • 984 kg (2165 lbs)

1.36 m Frames

Table 74 gives the physical dimensions and weights of the 1.36 m (53.5 in.) frame with covers.

Table 74. Dimensions and Weights of the 1.36 m Frame (with covers)

Specification	Dimensions and Weights
Width	802 mm (31.5 in.)
Depth	1273 mm (50 in.)
Height	1355 mm (53.5 in.)
Weight • Minimum Base Configuration • Maximum Populated Configuration	 • 412 kg (902 lbs) • 538 kg (1185 lbs)

1.25 m Frames

Table 75 gives the physical dimensions and weights of the 1.25 m (49 in.) frame with covers.

Table 75. Dimensions and Weights of 1.25 m Frames (with covers)

Specification	**Dimensions**
Width	711 mm (28 in.)
Depth	915 mm (36 in.) (no covers) 1015 mm (40 in.)
Height	1245 mm (49 in.)
Weight • 1 Drawer installed • 4 Drawers installed	 • 232 kg (510 lbs) • 414 kg (910 lbs)

SP Switch Frames Produced After 4/98 (F/C 2031)

Table 76 gives the physical dimensions and weights of SP Switch Frames (F/C 2031) with covers.

Table 76. Dimensions and Weights of Switch Frames (F/C 2031) (with covers)

Specification	**Dimensions and Weights**
Width	922 mm (36.3 in.)
Depth	1519 mm (59.8 in.)
Height	1925 mm (75.8 in.)
Weight • 4 Switches (Basic Frame)	 • 579 kg (1275 lbs)

Processor Node and Component Dimensions and Weights

Table 77 on page 262 lists the weights and dimensions of available processor nodes. The maximum weight shown is for a node with a full complement of DASD, memory, and adapters; the mimimum weight is for a minimum configuration. Dimensions shown are for the node alone, without its enclosure.

Node type	Maximum weight	Minimum weight	Dimensions (W x H x D)	Notes
POWER3 High	137 kg 302 lbs	108 kg 237 lbs	560 x 356 x 1016 mm 22 x 14 x 40 in.	
SP Expansion I/O Unit	28 kg 62 lbs	18 kg 39 lbs	280 x 160 x 813 mm 11 x 6.3 x 32 in.	5
POWER3 and 332 MHz Thin	19 kg 42 lbs	17 kg 37 lbs	280 x 160 x 725 mm 11.1 x 6.3 x 28.6 in.	1, 2
POWER3 and 332 MHz Wide	38 kg 84 lbs	32 kg 70 lbs	560 x 160 x 725 mm 22.1 x 6.3 x 28.6 in.	1
160 MHz Thin	15 kg 32 lbs	11 kg 25 lbs	285 x 158 x 684 mm 11.2 x 6.2 x 26.9 in.	2
Reference information for withdrawn nodes				
200 MHz High	77 kg 170 lbs	67 kg 147 lbs	445 x 260 x 840 mm 17.5 x 10.3 x 33.1 in.	3
135 MHz Wide	23 kg 51 lbs	16 kg 35 lbs	572 x 175 x 670 mm 22.5 x 6.9 x 26.4 in.	4

Table 77. Weights and dimensions of processor nodes and components

Notes:

1. Requires enclosure unit, 17 kg (36 lbs) additional
2. Weight of a single (1) thin node
3. Requires circuit breaker asm., 3.6 kg (8 lbs) additional
4. Requires enclosure unit, 4.5 kg (10 lbs) additional
5. Requires mounting shelf, 12.3 kg (27 lbs)

Wooden Shipping Container Dimensions and Weights

This section contains physical specifications for the wooden ARBO shipping containers for RS/6000 SP frames.

1.93 m Frame

Table 78 describes the physical dimensions and weights of the shipping container for 1.93 m frame assembly with covers.

Please note that these wooden shipping containers are used only for shipments outside the U.S.A.

Table 78. Dimensions and Weights of Shipping Container for 1.93 m Frame Assembly With Covers

Specification	Dimensions and Weights
Length	1448 mm (57 in.)
Width	965 mm (38 in.)
Height	2185 mm (86 in.)
Weight (loaded)	1065 kg (2343 lbs)
Weight (empty)	174 kg (382 lbs)

Note: Frame skirts and ship group items are shipped on a separate pallet.

1.36 m Frame

Table 79 describes the physical dimensions and weights of the shipping container for 1.36 m frame assembly with covers.

Please note that these wooden shipping containers are used only for shipments outside the U.S.A.

Table 79. Dimensions and Weights of Shipping Container for 1.36 m Frame Assembly With Covers

Specification	**Dimensions and Weights**
Length	1460 mm (57.5 in.)
Width	1105 mm (43.5 in.)
Height	1651 mm (65 in.)
Weight (empty)	205 kg (451 lbs.)

1.25 m Frame

All 1.25 m frames, including those shipped within the U.S.A., are packaged in one reusable, wooden shipping container for the frame assembly, covers and ship group items.

Table 80 describes the physical dimensions and weights of the shipping container for 1.25 m frames.

Table 80. Dimensions and Weights of Shipping Container for 1.25 m Frame Assembly With Covers

Specification	**Dimensions and Weights**
Length	1226 mm (48.25 in.)
Width	908 mm (35.75 in.)
Height	1512 mm (59.5 in.)
Weight (empty)	91 kg (200 lbs)

Returning Wooden Shipping Containers

Wooden ARBO shipping containers are returnable, from U.S.A. addresses, for reuse. After unpacking the containers at their final destination, take the following steps to return them:

Note: Do not return shipping containers from locations ***outside*** the U.S.A.

1. Ensure that the containers are empty of all SP system components. Container parts such as ramps and supports should be placed in the bottom of the container. Front and rear doors should be securely closed with klimp fasteners.
2. Ship the container(s) via common carrier, based on consolidation center location, to the following address (also found on the ARBO box label):

   Atlantic Metal Products
   21 Fadem Road
   Springfield, New Jersey 07081
   Attn: B. Santoriello
3. Bill the charges to the following third-party:

IBM-922
STI
P.O. Box 4093
Iselin, NJ 08830

Site Floor Preparation Considerations

Raised Floor Installations

Use this section as a guide to installing your RS/6000 SP System on a raised floor. For installing your system on floor level, see “Non-Raised Floor Installations” on page 265.

Floor Preparation for All Frame Types: Based on your planned configuration, establish a floor plan that details the location of all the equipment that you plan to install in and around your RS/6000 SP system.

Refer to the cut-away view of each frame type in order to locate the position and size of your floor cutouts. Note that for a raised floor rated at 345 kg/m² (70 lbs/ft.²), you ***must*** follow the minimum service clearances given in Table 81 on page 267 to maintain floor loading limits.

Notes:

1. All measurements are taken from the outside edge of the machine frame.
2. The dimensions shown for each frame type are required for correct weight distribution and servicing. If the dimensions are altered, or clearances are overlapped, you should obtain the services of a qualified consultant or structural engineer to determine floor loading.

Cutting and Placement of Floor Tiles:

1. Establish a floor plan identifying panels to be cut, noting their positions and orientations.
2. Label or number each panel to be cut.
3. If molding is used around the cutout, enlarge the cutout by the thickness of the molding.
4. For small cable access openings, make the floor cutout larger than the frame opening to more easily allow cables to be passed through the cutout. An additional 25 mm (1 in.) in length and width is sufficient.
5. You can make a floor panel cutout considerably larger than the frame access opening, provided that the cutout does not interfere with leveling pad or caster clearance.
6. Allow a minimum of 25 mm (1 in.) clearance between a cutout edge and a leveling pad or caster edge clearance.
7. Provide additional support pedestals at the following areas:
   a. Panels substantially weakened by cutting
   b. Corner cut panels that do not have load bearing stringers
   c. Panels identified by the panel manufacturer as requiring additional support if cut
   d. Panels that might tip with a load placed on them

Raised floor cutouts should be protected by electrically non-conductive molding, appropriately sized, with edges treated to prevent cable damage and to allow safe handling of machines during installation and removal.

For more information about physical planning, you can refer to *IBM General Information Manual: Installation Manual – Physical Planning*.

Floor Preparation for 1.93 m Frames: The diagrams in “Multi-Frame System Floor Planning and Illustrations” on page 277 show the required clearances between 1.93 m frames and adjacent units. This information is detailed in Table 81 on page 267 and illustrated in Figure 54 on page 269.

The size and location of the 1.93 m frame cable cut-out and the location of the casters are illustrated in Figure 55 on page 270.

Floor Preparation for 1.36 m Frames: Refer to Figure 56 on page 271 for the required clearances between the 1.36 m frame and adjacent units.

The size and location of the 1.36 m frame cable cut-out and the location of the casters are illustrated in Figure 57 on page 272.

Floor Preparation for 1.25 m Frames: Refer to Figure 58 on page 273 for the required clearances between the 1.25 m frame and other adjacent units.

Floor Preparation for SP Switch Frames Produced After 4/98: Refer to Figure 60 on page 275 and Table 81 on page 267 for the required clearances between the 1.93 m SP Switch frame and adjacent units.

The size and location of the 1.93 m SP Switch frame's cable cut-out and the location of the frame's casters are illustrated in Figure 61 on page 276.

Non-Raised Floor Installations

Non-Raised Floor Alert

Non-raised floor installations ***are not suggested*** for large-scale RS/6000 SP systems due to the extensive inter-frame cabling requirements.

Floor Preparation for All Frame Types: If you place cables or cable assemblies on the floor surface, you must protect them from physical damage. Additionally, this cable protection must allow frame doors to swing fully without interference. Any protective covering must not block any more of the machine base than is necessary for the cables to enter the machine. For ease of cable installation, units should be located on the same side of the machine in which the cables enter. If this is not possible, extra cable length must be allowed for proper routing and organization of cables.

Notes:

1. All measurements are taken from the outside edge of the machine frame.
2. The dimensions shown in the illustrations for each frame type are ***required*** for correct weight distribution and servicing. If the dimensions are altered, or clearances are overlapped, you should obtain the services of a qualified consultant or structural engineer to determine floor loading.

Floor Preparation for 1.93 m Frames: The clearance between the floor and the bottom of the rear door of the 1.93 m frame is 76 mm (3 in.). The front and side skirt clearance is 25 mm (1 in.) off the floor. The diagrams in “Multi-Frame System Floor Planning and Illustrations” on page 277 show the required clearances between 1.93 m frames and adjacent units. This information is also detailed in Table 81 on page 267 and illustrated in Figure 54 on page 269.

The size and location of the 1.93 m frame cable cut-out and the location of the casters are illustrated in Figure 55 on page 270.

Floor Preparation for 1.36 m Frames: The clearance between the floor and the bottom of the rear door of the 1.36 m frame is 76 mm (3 in.).

Refer to Figure 56 on page 271 for the required clearances around the 1.36 m frame. For information on cable access points and casters, see Figure 57 on page 272.

Floor Preparation for 1.25 m Frames: The clearance between the floor and the bottom of the rear door of the 1.25 m frame is 76 mm (3 in.).

Refer to Figure 58 on page 273 for the required clearances between the 1.25 m frame and other adjacent units. For information about 1.25 m frame cable access points and leveling devices, see Figure 59 on page 274.

Floor Preparation for SP Switch Frames Produced after 4/98: The clearance between the floor and the bottom of the rear door of the 1.93 m SP Switch frame is 76 mm (3 in.). The front and side skirts' clearance is 25 mm (1 in.) off the floor.

Refer to Figure 60 on page 275 and Table 81 on page 267 for the required clearances between SP Switch frames and adjacent units. For information about the frame's cable cut-out, see Figure 61 on page 276.

Storing Service Equipment

Where required, certain service equipment is shipped with the RS/6000 SP system or with system upgrade components. This equipment is used to install and service nodes in the system frames. Please make provisions to store this equipment so that it can be made available to service personnel, as needed. Service equipment includes the following:

- Ladder and stool (**F/C 9203**)
  - Platform ladder - 914 mm (36 in) high
  - Step stool - 355 mm (14 in) high

Service Clearance Specifications for Frames

1.93 m Frame

Table 81 lists the service clearances for 1.93 m (75.8 in.) SP frames. Illustrations in "Multi-Frame System Floor Planning and Illustrations" on page 277 show these service clearances as applied to typical SP system layouts. Service clearances for both the 1.93 m frame and the 1.93 m SP Switch frame are also illustrated in Figure 54 on page 269 and Figure 60 on page 275.

Table 81. Service Clearances for 1.93 m SP Frames

Service Area	**Dimensions**
Front Clearance	1118 mm (44 in.)
Rear Clearance	915 mm (36 in.)
Side Clearance	• End frames on each row **require** a minimum of 915 mm (36 in.) between the side of the frame and the wall. • Frames within a row require 368 mm (14.5 in.) between each frame. • When four or more frames are installed in a row, there **must** be a minimum of 915 mm (36 in.) between each fourth and fifth frame for efficient service access
Ceiling	Recommended distances: 2438 mm (96 in.) from floor to ceiling, or 488 mm (19.2 in.) from the top of the frame to the ceiling.
Note: Primary service access for the nodes is from the front of the frame. When viewed from the front, the service door swings to the right. If you do not install your SP frames with the required service clearances, this creates a potential service problem for frames on the left end of a row. This problem results from the fact that you need a service ladder to access the upper nodes. If there is not 915 mm (36 in.) between the left end frames and the wall, the service engineer will not be able to maneuver the service ladder into position from the side of the frame and the front of the frame will be blocked by the open door. Therefore, if you must install frames less than 915 mm (36 in.) from the left wall, you **must** increase the front clearance to 1525 mm (60 in.), allowing the service ladder to be placed in front of the frame.	

1.36 m Frame

Table 82 lists the service clearances for 1.36 m (53.5 in.) SP frames.

Table 82. Service Clearances for 1.36 m (53.5 in.) Frames

Service Area	**Dimensions** *(See Figure 56 on page 271)*
Front	1118 mm (44 in.)
Rear	914 mm (36 in.)
Sides	914 mm (36 in.)

1.25 m Frame

Table 83 lists the service clearances for 1.25 m (49 in.) SP frames.

Table 83. Service Clearances for 1.25 m (49 in.) Frames

Service Area	**Dimensions** *(See Figure 58 on page 273)*
Front	1118 mm (44 in.)
Rear	762 mm (30 in.)
Sides	75 mm (3 in.) on both sides

Note: An access path of not less than 762 mm (30 in.) wide must be maintained to allow access between the front and back of the system.

Service Clearance and Frame Footprint Illustrations

This section contains drawings of frames and specifications you use to help develop your floor plans.

1.93 m Frame

This section contains illustrations for 1.93 m frames.

Service Clearances for 1.93 m Frame: Figure 54 illustrates the service clearances and the associated weight distribution area for 1.93 m (75.8 in.) frames.

Note: Clearance dimensions are shown to the frame, not the skirts. Side clearances shown in this illustration may vary. See Table 81 on page 267 for specific dimensions.

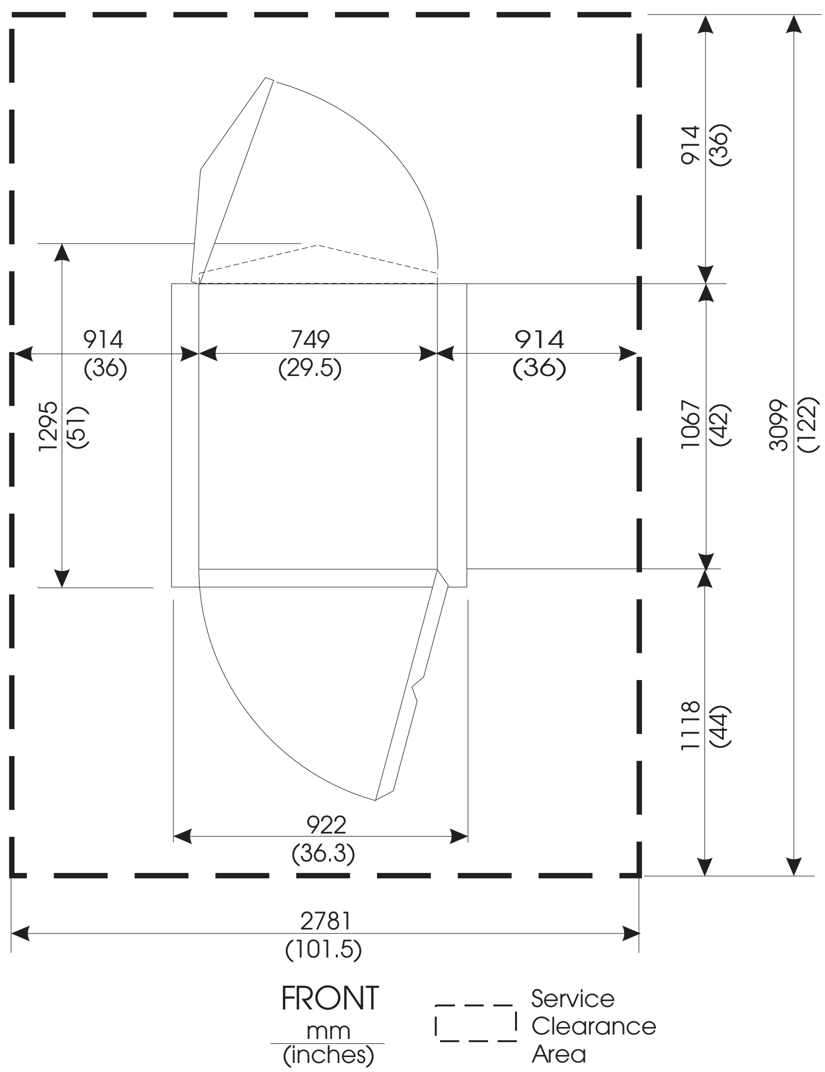


Figure 54. Service Clearances for 1.93 m Frames (not to scale)

Cut-away View of 1.93 m Frame: The following figure details the location and size of the casters and cable cut-out on the base of the 1.93 m frame. For frame tie-down points, see “Frame Tie-down Considerations” on page 256.

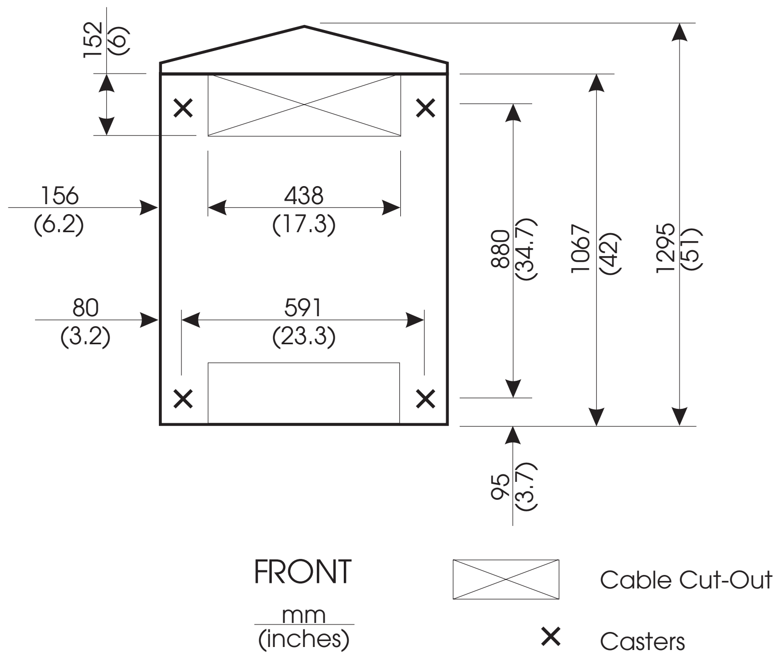


Figure 55. 1.93 m Frame: Cable Cut-out Dimensions and Caster Locations (not to scale).

Notes:

1. Frame outline is shown. Rear cover added for orientation, side covers have been omitted.
2. Front cut-out is not used with SP systems.
3. Leveling pads are replaced with wheel chocks for 1.93 m frames.

1.36 m Frame

This section contains illustrations for 1.36 m frames.

Service Clearances for 1.36 m Frame: Figure 56 illustrates the service clearances and the associated weight distribution area for 1.36 m (53.5 in.) frames.

Note: Clearance dimensions are shown to the frame, not the covers.

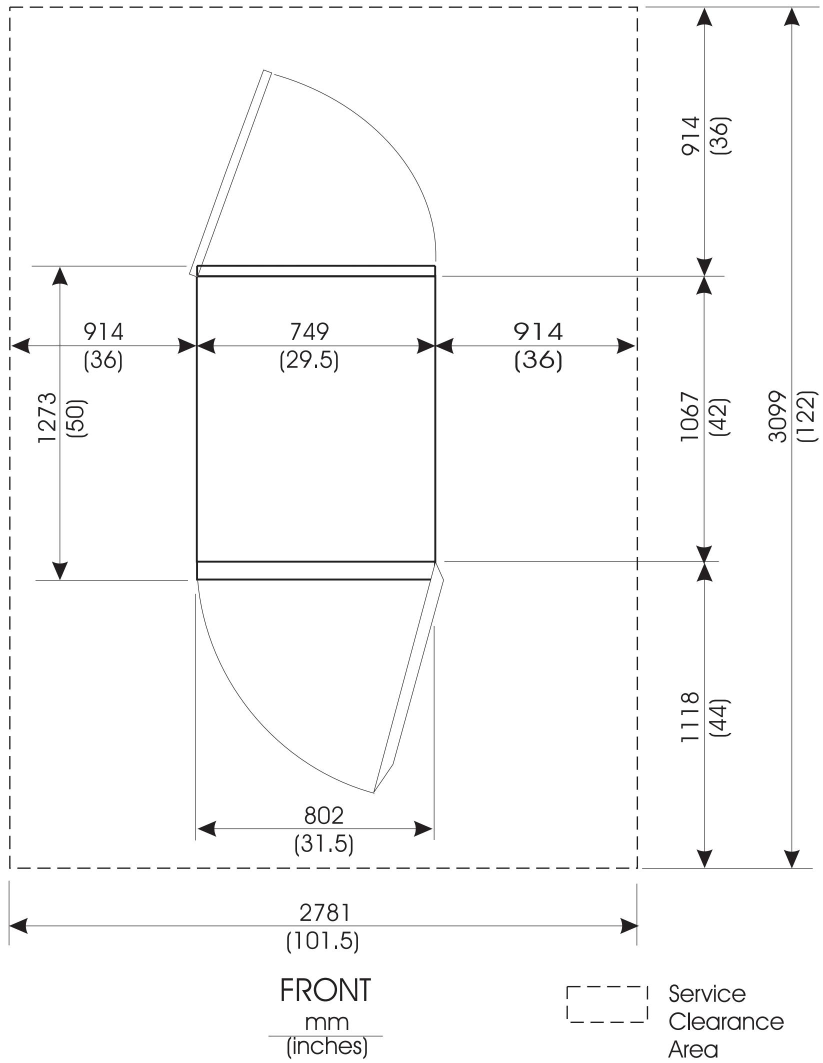


Figure 56. Service Clearances for 1.36 m Frames (not to scale)

Cut-away View of 1.36 m Frame: The following figure details the location and size of the casters and cable cut-out on the base of the 1.36 m frame. For frame tie-down points, see "Frame Tie-down Considerations" on page 256.

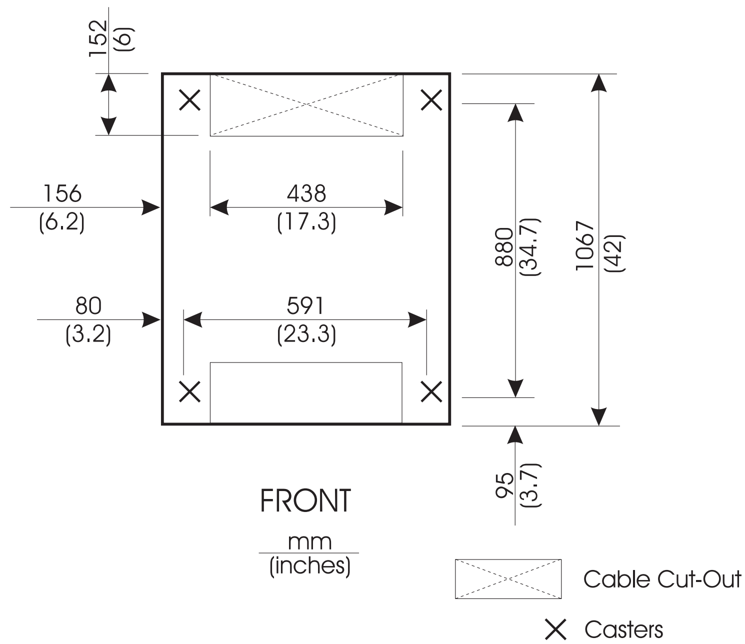


Figure 57. 1.36 m Frame: Cable Cut-out Dimensions and Caster Locations (not to scale).

Notes:

1. Frame outline is shown.
2. Front cut-out is not used
3. Leveling pads are replaced with wheel chocks for 1.36 m frames.

1.25 m Frame

This section contains illustrations for 1.25 m frames.

Service Clearances and Weight Distribution for 1.25 m Frame

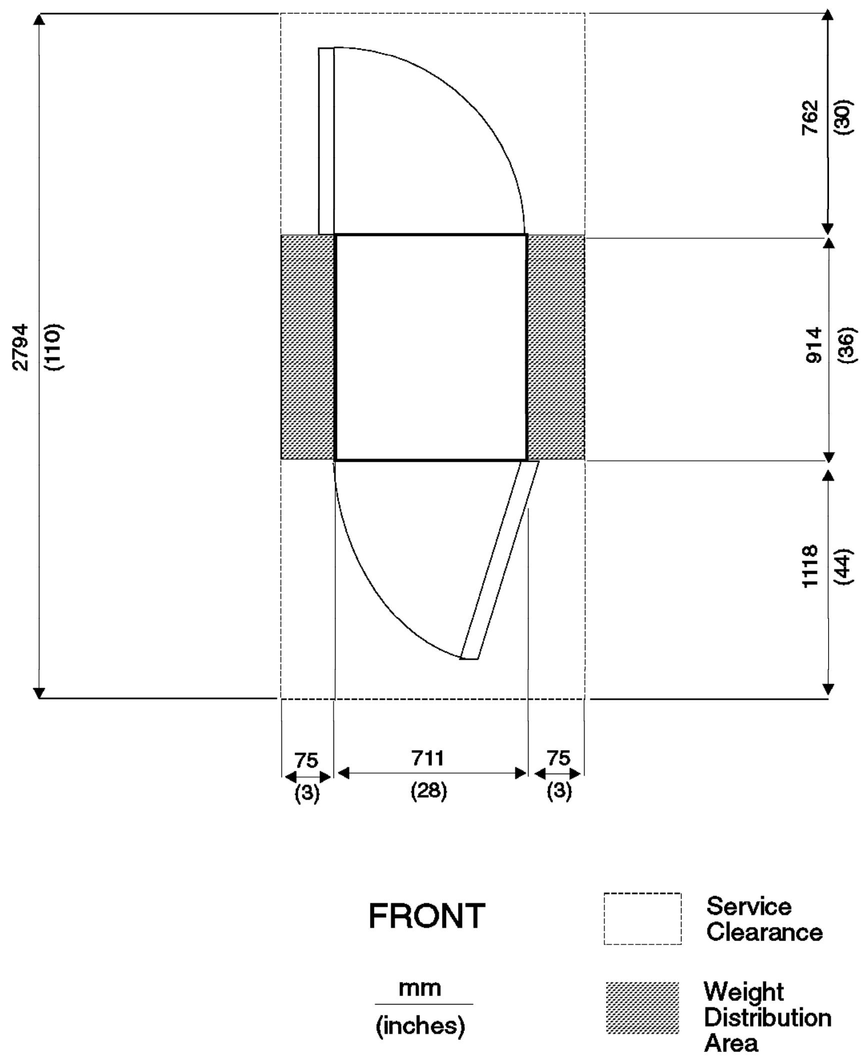


Figure 58. Service Clearances and Weight Distribution 1.25 m Frames (not to scale)

Notes:

1. The Weight Distribution Area applies to both raised and non-raised floor applications.
2. An access path of not less than 762 mm (30 in.) wide must be maintained to allow access between the front and back of the system.

Cut-away View of the 1.25 m (49 in.) Frames: Figure 59 details the location and size of the casters, leveling pads, ac power cord, and input/output cable egress on the base of the 1.25 m frame. Dimensions are shown in mm and inches.

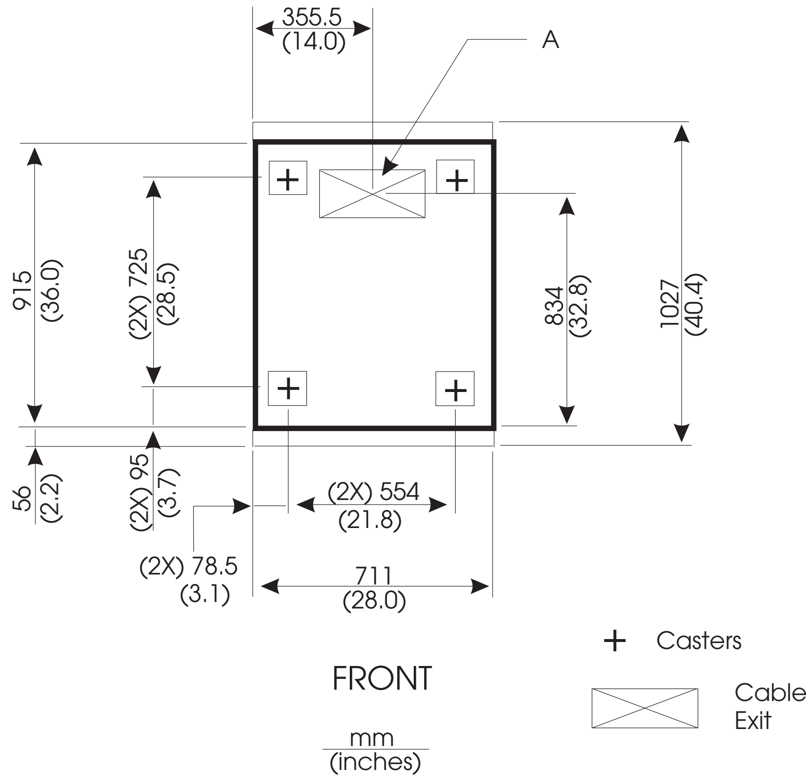


Figure 59. Floor Cutout Dimensions for the 1.25 m (49 in.) Frame

Table 84. Floor Cutout Dimensions for the 1.25 m (49 in.) Frame

Cutout	**Size**	**Use**
A	102 mm (4.0 in.) x 388.4 mm (15.3 in.)	Input/output cables and power cord

SP Switch Frames

This section contains illustrations for 1.93 m switch frames.

Service Clearances for 1.93 m SP Switch Frames (F/C 2031 only) Produced After 4/98: Figure 60 illustrates the service clearances and associated weight distribution area for the 1.93 m SP switch frame.

Note: Clearance dimensions are shown to the frame, not the skirts. Side clearances shown in this illustration may vary. See Table 81 on page 267 for specific dimensions.

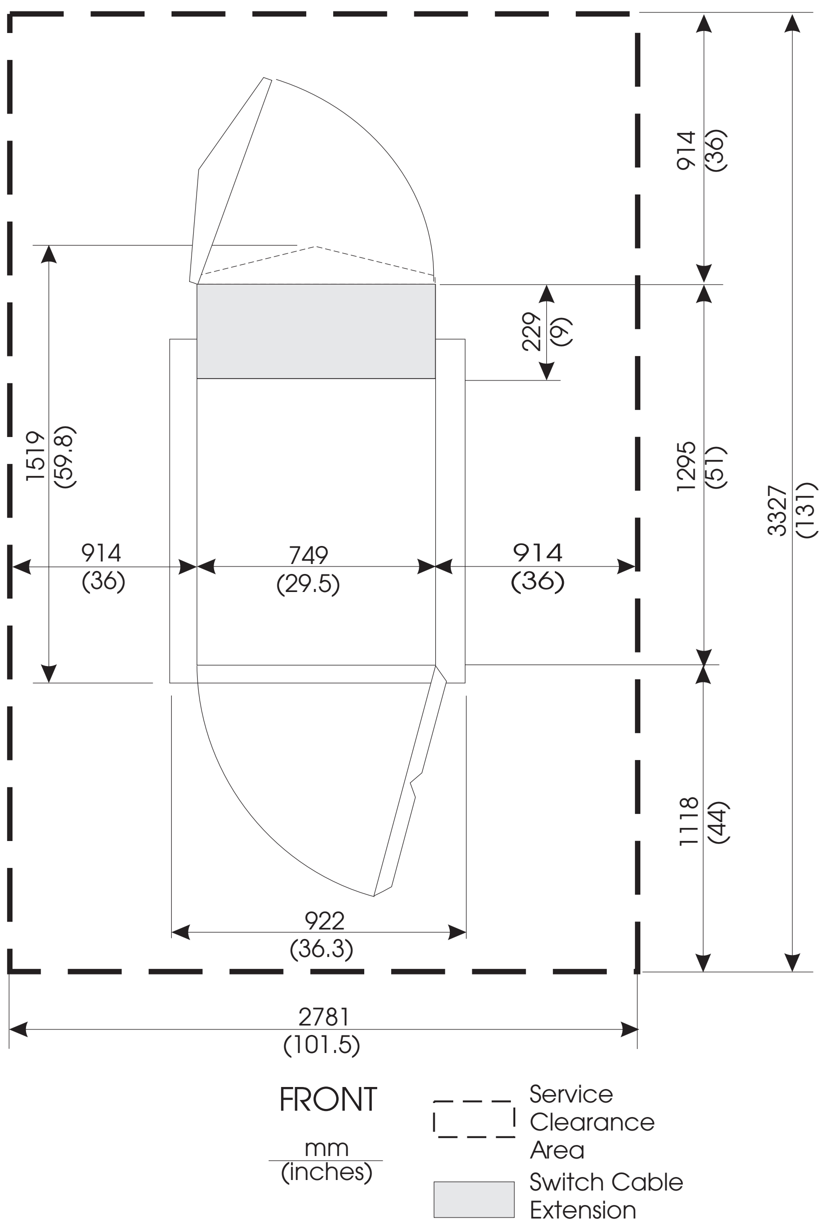


Figure 60. 1.93 m SP Switch Frame Service Clearances For Frames Produced After 4/98 (not to scale)

Cut-away View of 1.93 m SP Switch Frames (F/C 2031 only) Produced After 4/98: The following figure details the location of the casters and cable cut-out on the base of the 1.93 m SP Switch frame. See "Frame Tie-down Considerations" on page 256 for tie-down locations.

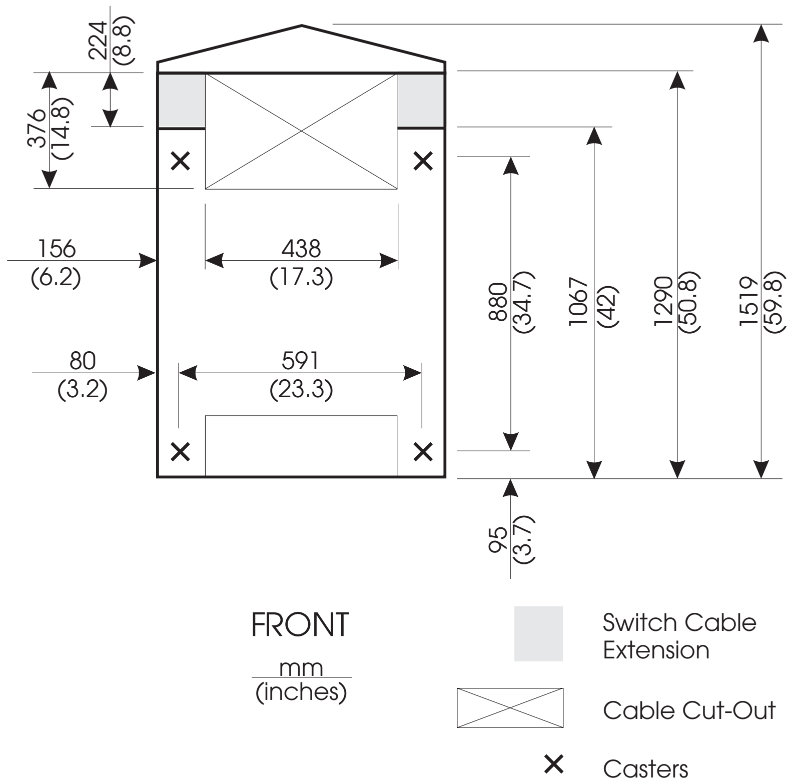


Figure 61. 1.93 m SP Switch Frame: Cable Cut-out Dimensions and Caster Locations For Frames Produced After 4/98 (not to scale).

Notes:

1. Frame outline is shown. Rear cover added for orientation, side covers have been omitted.
2. Front cut-out is not used with SP systems.
3. Leveling pads have been replaced with wheel chocks on 1.93 m frames.

Multi-Frame System Floor Planning and Illustrations

This section contains specifications, configurator rules, and floor planning considerations for the following multi-frame configurations:

- Model 500
- Basic Model 550
- Moderate-scale Model 550
- Large-scale Model 550

Model 500 SP Systems

Quantity of Frames
1 to 4

Model 500 base frame plus up to three F/C 1500 expansion frames.

Quantity of Nodes
1 to 8

Nodes must be ordered and placed according to configurator rules.

Service Clearances
See "Service Clearance Specifications for Frames" on page 267 and Figure 58 on page 273.

Switch
Model 500 SP systems may be either switchless or equipped with one SP Switch-8 in the first frame only.

If switch-configured, all nodes must have the appropriate switch adapter installed.

Switch Cables
5, 10, and 15 meter; customer-selectable.

Switch cables are required if the system is switch-configured.

Ground Cables
All frames must be grounded together by connecting each frame to its closest neighbor on each side with the frame-to-frame ground cable (**P/N 46G5695**). The frames must be within 3 meters (10 ft.) of each other.

Basic Model 550 SP Systems

Quantity of Frames
1 to 16 frames in a non-switched configuration.

1 or 2 frames if configured with the SP Switch-8.

Quantity of Nodes
1 to 64 nodes in a non-switched configuration.

1 to 8 nodes in configurations using the SP Switch-8

Note: Nodes must be ordered and placed according to configurator rules.

Service Clearances
See "Service Clearance Specifications for Frames" on page 267, Figure 54 on page 269 and Figure 62 on page 278.

Switches
The basic Model 550 SP system can be either a switchless system or equipped with one SP Switch-8 in the first frame only.

	If switch-configured, all nodes must have the appropriate switch adapter installed.
Switch Cables	5, 10, and 15 meter; customer-selectable.
Ground Cables	All frames must be grounded together by connecting each frame to its closest neighbor on each side with the frame-to-frame ground cable (**P/N 46G5695**). The frames must be within 3 meters (10 feet) of each other.

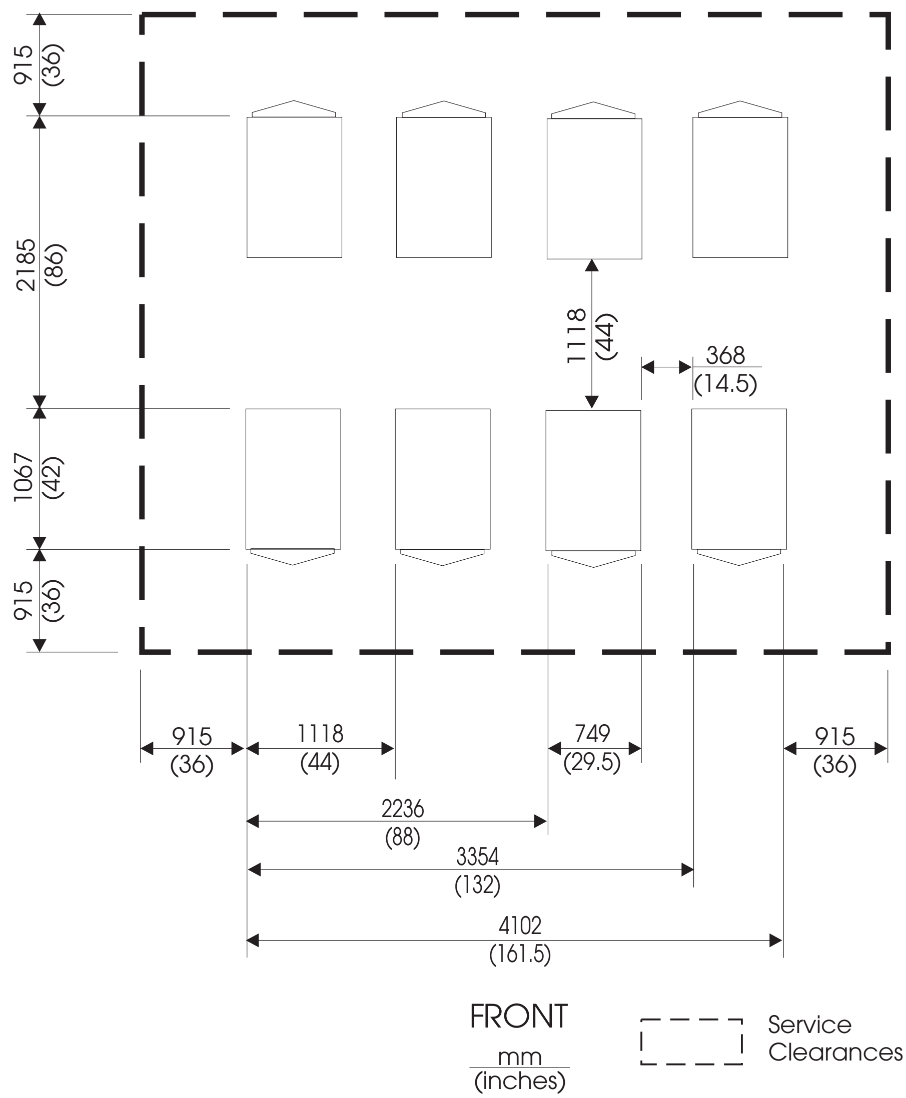


Figure 62. Basic Model 550 SP System. This is a typical configuration showing frame-to-frame service clearances. Your system might have fewer or more frames. Actual layout is highly dependent on your building layout.

Moderate-Scale Model 550 SP Systems

Quantity of Frames	1 to 18
Quantity of Nodes	1 to 80 **Note:** Nodes must be ordered and placed according to configurator rules.
Service Clearances	See "Service Clearance Specifications for Frames" on page 267, Figure 54 on page 269 and Figure 63 on page 280.
Switches	Moderate-scale systems typically use single-stage switching (all switches are mounted in processor frames). In this configuration, up to five SP switches can be used. Nodes in frames without switches must "share" the unused switch ports in the switch-equipped frames. All nodes must have the appropriate switch adapter installed. Moderate-scale systems can also be configured with two-stage switching; for details, see"Considerations for Future Switch Expansion" on page 102. **Notes:** 1. No more than 64 of the 80 nodes may be high nodes. 2. Thin nodes cannot be used for switch sharing.
Switch Cables	5, 10, and 15 meter; customer-selectable.
Ground Cables	All frames must be grounded together by connecting each frame to its closest neighbor on each side with the frame-to-frame ground cable (**P/N 46G5695**). The frames must be within 3 meters (10 ft.) of each other.

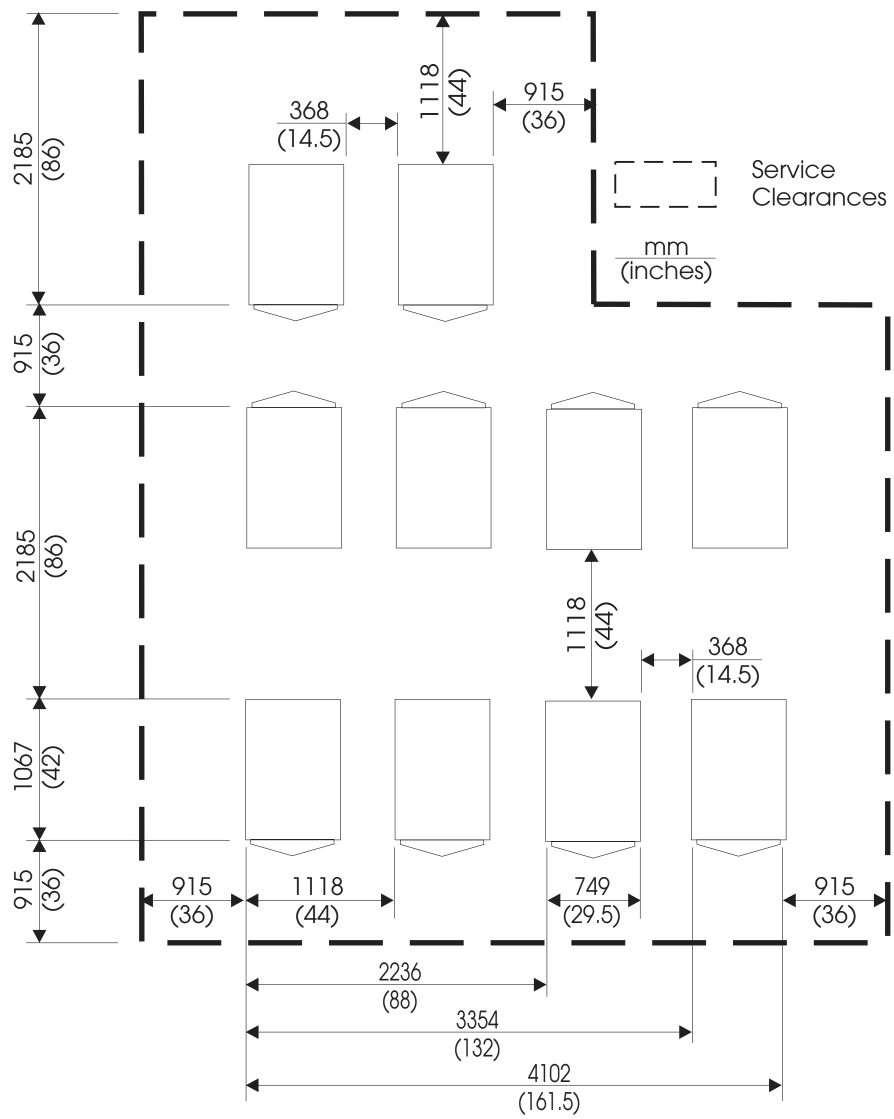


Figure 63. Moderate-Scale Model 550 SP System. This is a typical configuration showing frame-to-frame service clearances and frame orientations. Your system might have fewer or more frames. Actual layout is highly dependent on your building layout.

Large-Scale Model 550 SP Systems

Quantity of Frames
1 to 24 processor frames **plus** one SP Switch Frame in the standard configuration. Consult your IBM sales representative for information on larger, special-order systems.

Quantity of Nodes
65 to 128 nodes in the standard configuration. Consult your IBM sales representative for information on systems with fewer or more nodes.

Note: All nodes must be ordered and placed according to configurator rules.

Service Clearances
See "Service Clearance Specifications for Frames" on page 267, Figure 54 on page 269 and Figure 64 on page 282.

Switches	Large-scale systems use two-stage switching. This means that the switches in the first switch layer are mounted in the processor frames while the other switches in the second switch layer are mounted in a dedicated SP Switch Frame (F/C 2031). Nodes can be mounted in switchless frames and “share” unused switch ports in the switch-equipped frames. All nodes must have the appropriate switch adapter installed. **Notes:** 1. No more than 64 of the 128 nodes can be high nodes. 2. Thin nodes cannot be used for switch sharing.
Switch Cables	5, 10, and 15 meter; customer-selectable.
Ground Cables	All frames must be grounded together by connecting each frame to its closest neighbor on each side with the frame-to-frame ground cable (**P/N 46G5695**). The frames must be within 3 meters (10 ft.) of each other.

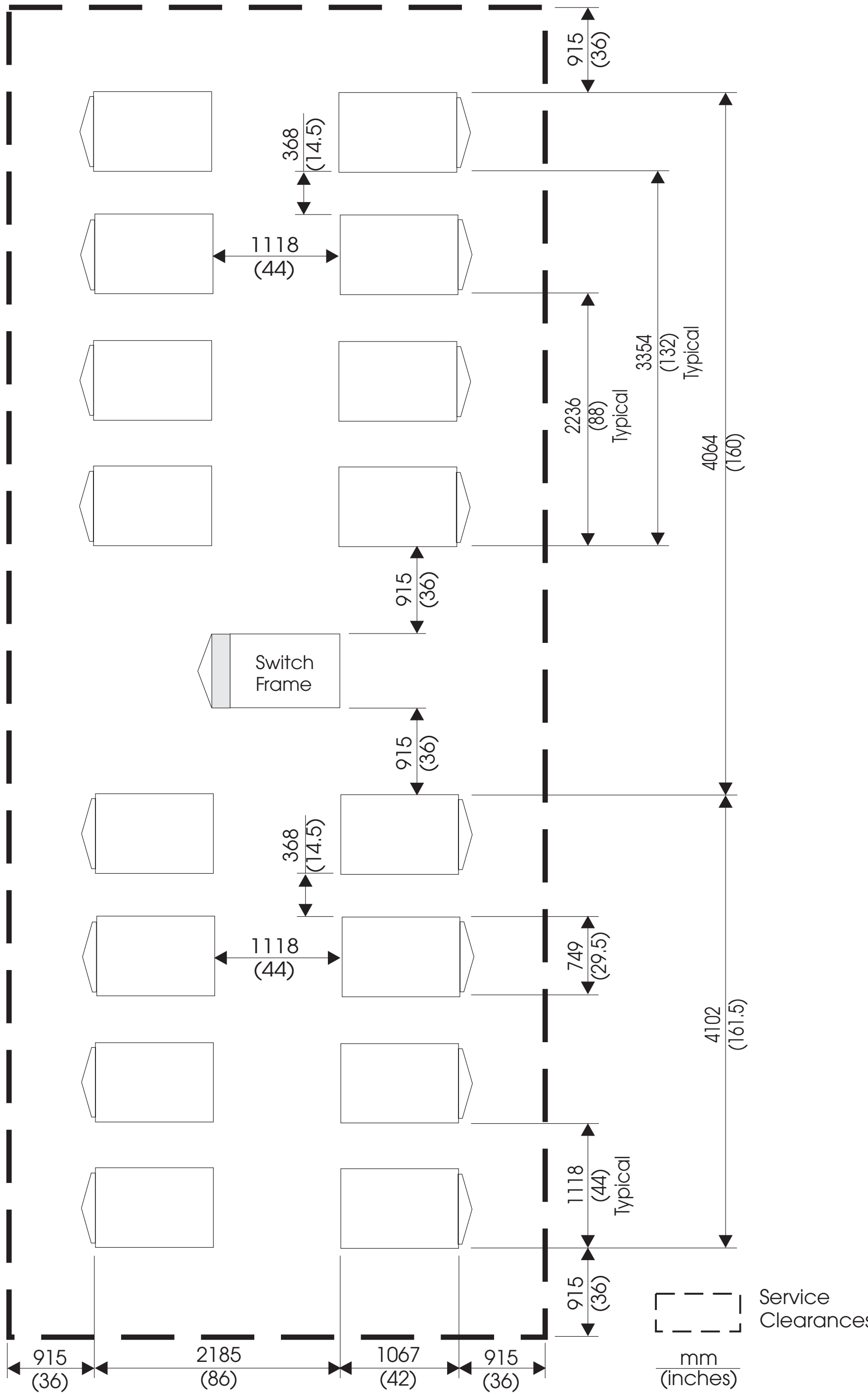


Figure 64. Large-Scale Model 550 SP System. This is a typical configuration showing frame-to-frame service clearances and frame orientations. Please note the required, extra-width service isles between every fourth and fifth frame. Your system might have fewer or more frames. Actual layout is highly dependent on your building layout.

RS/6000 SP System Floor Load Analysis

Use this section to determine your floor loading per unit area.

Attention – Floor Load Limits

> To prevent possible damage, ***your calculated value*** for floor loading must be less than:
>
> - 345 kg/m^2 (70 lbs/ft^2) for raised floors
> - 245 kg/m^2 (50 lbs/ft^2) for non-raised floors
>
> If the result of your floor loading calculation is ***more than*** 345 kg/m^2 (70 lbs/ft^2), consult a local structural engineer.

Your SP system can have a wide variety of frame designs and auxiliary equipment. Floor load calculations must be based on your entire system, including all its components. System-based floor loading calculations are based on architectural constants and specific variables as follows:

Constant values:

1. The area of each frame:
   - 1.93 m and 1.36 m frames - 0.75 m X 1.07 m (29.5 in. X 42 in.)
   - 1.25 and 2.01 frames - 0.711 m X 0.914 m (28 in. X 36 in.)
2. Live loads - service personnel and test equipment (75 kg/m^2 for all floor types)
3. Static loads - cables and tiles:
   - 50 kg/m^2 for raised floors
   - 0 kg/m^2 for non-raised floors

Variable values:

1. The total mass of your system
2. The total area available for installing your system
3. The total area occupied by your system's frames
4. The area required for service and weight distribution

Calculate the floor load for your entire SP system by using the above constants and your actual values for the above variables in the following equation:

Floor Load Formula

Floor Load = (M + (K_1 * S) + (K_2 * T)) / T

Where:

- Floor Load = mass per unit area
- T = total area available for your installation
- S = service clearance area = T – (the area of each frame times the quantity of frames in your system)
- M = the total system mass
- K_1 = live load constant = 75 kg/m^2 (34 lbs/ft^2) for all floor types
- K_2 = static load constant = 50 kg/m^2 (23 lbs/ft^2) for raised floors

  Note: The static load constant is applied to raised floor installations only. For non-raised floors, K_2 = 0, thus the term (K_2 * T) is also 0.

Once you determine that the floor loading for your installation is ***below the maximum*** allowed value of 345 kg/m^2 (70 lbs/ft^2), you can continue planning your system layout using the minimum recommended service clearances given in “Service Clearance Specifications for Frames” on page 267. If the result of your floor loading calculation is ***more than*** 345 kg/m^2 (70 lbs/ft^2), consult a local structural engineer.

Appendix A. SP System Upgrades, Conversions, and Feature Additions

This appendix contains information on available RS6000 SP upgrades, conversions, and feature additions. This information is intended to help you as the customer plan for upgrades which enhance SP system performance and capability. Examples of typical upgrades include adding frames to your SP system, installing new higher-performance nodes, and converting MCA-type nodes to PCI nodes.

Adding Nodes

Adding POWER3 High Nodes

POWER3 High Nodes can be added to any Model 550 or F/C 1550 expansion frame that has available drawer space.

POWER3 High Nodes can also be added to Models 20X, 30X, or 40X only with the addition of a tall, deep expansion frame (F/C 1550), since the POWER3 High Node does not physically fit into the old-style frame. According to configurator rules, if there are no existing POWER3 High Nodes in your system, the MES will include a tall, deep expansion frame. If you determine that a new frame is not required, use RPQ8P2091 to delete the frame from the MES.

The POWER3 High Node Lift Tool is required and included to install these nodes. The tool is returned after use.

Adding SP Expansion I/O Units

SP Expansion I/O Units for POWER3 High Nodes can be installed only in Model 550, Model T70, or F/C 1550 expansion frames.

If more than eight SP Expansion I/O Units are installed in a single frame, an EMC cover gasket set (ECA065) must be installed in that frame.

Adding POWER3 and 332 MHz Thin and Wide Nodes

POWER3 and 332 MHz Thin and Wide Nodes can be added to earlier SP systems. Adding these nodes to earlier frames requires a power system upgrade. Both PDU and SEPBU power subsystems must be upgraded to a 10.5 kW level SEPBU.

Adding Frames

You can add a tall expansion frame (F/C 1550) to a Model 550, 20X, 30X, or 40X system allowing additional nodes to be installed.

You can add a short expansion frame (F/C 1500) to a Model 500 (eight nodes maximum) system.

Adding Switches

SP Switches can be added in the following configurations:

- Switchless to SP Switch (F/C 4011) or SP Switch-8 (F/C 4008)
- High Performance Switch (F/C 4010) to SP Switch (F/C 4011)
- High Performance Switch LC8 (F/C 4007) to SP Switch-8 (F/C 4008)

Upgrading Nodes

Upgrading POWER3 and 332 MHZ Thin and Wide Nodes to POWER3 High Nodes

Several earlier node types can be upgraded to POWER3 High Nodes. These nodes require a tall, deep frame (Model 550 or F/C 1550).

POWER3 High Nodes can be configured into Models 20X, 30X, or 40X only with the addition of a tall, deep expansion frame (F/C 1550), since the POWER3 High Node does not physically fit into the old-style frame. According to configurator rules, if there are no existing POWER3 High Nodes in your system, the MES will include a tall, deep expansion frame. If you determine that a new frame is not required, use RPQ8P2091 to delete the frame from the MES.

The POWER3 High Node Lift Tool is required and included to install these nodes. The tool is returned after use.

The following nodes can be upgraded to POWER3 High Nodes:

- POWER3 Thin Nodes (F/C 2050)
- POWER3 Wide Nodes (F/C 2051)
- 332 MHz Thin Nodes (F/C 2052)
- 332 MHz Wide Nodes (F/C 2053)

Note that these are one-for-one upgrades since some of the parts in the older node are transferred to the replacement node. Thus for example, you cannot upgrade four thin nodes to one POWER3 High Node.

Upgrading POWER3 and 332 MHz Thin and Wide Nodes

The following node-to-node conversions are available:

- 332 MHz Thin Node (F/C 2050) to 332 MHz Wide Node (F/C 2051)
- 332 MHz Thin Node (F/C 2050) to POWER3 Thin Node (F/C 2052)
- 332 MHz Thin Node (F/C 2050) to POWER3 Wide Node (F/C 2053)
- 332 MHz Wide Node (F/C 2051) to POWER3 Wide Node (F/C 2053)
- POWER3 Thin Node (F/C 2052) to POWER3 Wide Node (F/C 2053)

Note that these are one-for-one upgrades since some of the parts in the older nodes are used in the replacement nodes. If the node being converted contains multiple processor cards, at least one of the processor cards must be installed in the new replacement node. Additional processor cards can also be installed in the new node or can be used in other supported nodes in the system.

Replacing Early Processor Nodes

Several replacement features are available to replace withdrawn early processor nodes with 332 MHz and POWER3 SMP Thin and Wide nodes. For details, contact your IBM sales representative.

Upgrading Frames

Upgrading Model 500 and F/C 1500 to Model 550 and F/C 1550

This conversion is available if you want to upgrade your Model 500 short-frame SP system with a maximum of eight nodes to a Model 550 tall-frame system with a maximum capacity of 128 nodes. You receive a new tall frame with its integral SEPBU power subsystem and linecord and then your nodes are transferred from the old frame to the new. In this case, the system retains its original serial number.

Upgrading Model T70 to Model 550

This conversion transfers the POWER3 High Node and any SP Expansion I/O Units in a Model T70 Workgroup Server to a Model 550 tall frame.

Appendix B. Withdrawn RS/6000 SP Features

This appendix contains information on RS6000 SP features that are withdrawn from production. These features are no longer available from IBM. Included are withdrawn processor nodes, switches, I/O adapters, models and frames, and power components. This information is provided for reference purposes and can, for example, be helpful if you are upgrading an existing system.

Withdrawn Processor Node Features

The following processor node features have been withdrawn from production, but are still supported:

F/C 2002 Two 66 MHz POWER2 thin nodes

F/C 2003 One 66 MHz POWER2 wide node

F/C 2004 Two 66 MHz thin nodes

F/C 2005 One 77 MHz POWER2 wide node

F/C 2006 One 112 MHz SMP high node

] **F/C 2007** One 135 MHz uniprocessor wide node

F/C 2008 Two 120 MHz thin nodes

] **F/C 2009** One 200 MHz SMP high node

Processor Node Comparisons

Table 85 contains a brief description of all current and withdrawn processor node drawer features, for comparison purposes.

Table 85 (Page 1 of 2). Processor node comparisons

Feature Code	Description
2002	Thin node drawer consisting of two 66 MHz POWER2 processor nodes which can be asymmetrically configured for memory, DASD and adapters. Each node has an Ethernet for the system control network, two memory card slots, four Micro Channel slots, and two DASD bays.
2003	Wide node drawer consisting of one 66 MHz POWER2 processor node. This node has eight memory card slots, eight Micro Channel and four DASD bays. The Ethernet High Performance LAN adapter (**F/C 2980**) is a prerequisite on all wide nodes.
2004	Thin node drawer consisting of a high performance Thin Node 2 CPU card packaged in an SP thin processor node. The CPU requires the equivalent of two memory cards to maintain high bandwidth to memory. Due to packaging constraints, this is accomplished using a single memory card plus SIMMs on the CPU card. In addition, a new +4 V dc power supply is added to provide an additional required voltage. Other than these changes, the Thin Node 2 processor node components are the same as thin processor node type **F/C 2002**.

Table 85 (Page 2 of 2). Processor node comparisons

Feature Code	Description
2005	Wide node drawer consisting of one 77 MHz POWER2 processor node. This node has eight memory card slots, eight Micro Channel and four DASD bays. The Ethernet High Performance LAN adapter (**F/C 2980**) is a prerequisite on all wide nodes.
2006	604 high node consisting of a 2-, 4-, 6-, or 8-way symmetric multiprocessing system that uses PowerPC 604 processors that operate at 112 MHz. The 604 high node occupies two drawers (four slots) in a frame, has four memory card slots, 16 Micro Channel, three DASD bays and four CPU cards (two CPUs per card).
2007	Wide node drawer consisting of one 135 MHz wide node. This node has eight memory card slots, eight Micro Channel, and four DASD bays. The Ethernet High Performance LAN adapter (**F/C 2980**) is a prerequisite on all wide nodes.
2008	Thin node drawer consisting of two 120 MHz thin nodes. Each node has four memory card slots, four Micro Channel, and two DASD bays.
2009	604e high node consisting of a 2-, 4-, 6-, or 8-way symmetric multiprocessing system that uses PowerPC 604e processors that operate at 200 MHz. The 604e high node occupies two drawers (four slots) in a frame, has four memory card slots, 16 Micro Channel, four DASD bays and four CPU cards (two CPUs per card).
2022	Thin node drawer consisting of two 160 MHz thin nodes. Each node has four memory card slots, four Micro Channel, and two DASD bays.
2050	One 332 MHz SMP thin node, can be ordered and installed singly or in pairs. A node pair occupies one drawer. Each node may be equipped with either two or four processors and has two memory slots, two PCI slots, two DASD bays, and a dedicated MX slot for an optional SP Switch MX adapter.
2051	One 332 MHz SMP wide node occupying one drawer. Each node may be equipped with either two or four processors and has two memory slots, ten PCI slots, four DASD bays, and a dedicated MX slot for an optional SP Switch MX adapter.
2052	POWER3 SMP thin nodes use PCI bus architecture and have either one or two 200 MHz 64-bit PowerPC processors per node. They have two memory slots supporting up to 4 GB of memory, two 32-bit PCI slots for communication adapters, a dedicated Mezzanine Bus (MX) slot for an optional switch adapter, integrated Ethernet with BNC and RJ45 ports, and two DASD bays supporting up to 18.2 GB of mirrored disk storage.
2053	POWER3 SMP wide nodes use PCI bus architecture and havee either one or two 200 MHz 64-bit PowerPC processors per node. They have two memory slots supporting up to 4 GB of memory, ten PCI slots (two 32-bit and eight 64-bit) for communication adapters, a dedicated Mezzanine Bus (MX) slot for an optional switch adapter, integrated Ethernet with BNC and RJ45 ports, and four DASD bays supporting up to 36.4 GB of mirrored disk storage.
2054	POWER3 SMP high nodes use PCI bus architecture and have either two, four, six, or eight 222 MHz 64-bit PowerPC processors per node, four memory slots supporting up to 16 GB of memory, one 32-bit and four 64-bit PCI adapter slots, three pairs of expansion I/O connectors supporting up to three loops of two SP expansion I/O units each, integrated Ultra SCSI bus, integrated Ethernet (10BaseT/100BaseTX or 10Base2), and two internal DASD bays supporting up to 18.2 GB of mirrored disk storage.

] # Withdrawn 200 MHz High Node (F/C 2009)

Description

200 MHZ SMP high nodes (F/C 2009) have MCA bus subsystems and use either two, four, six, or eight 200 MHz 604e PowerPC processors per node. These nodes are functionally equivalent to an IBM RS/6000 7015-R50 workstation. Your IBM RS/6000 SP system **must** be operating at PSSP 2.3 (or later) to use these nodes.

High nodes occupy two full drawers allowing four high nodes in a tall frame and two in a short frame. The high node is supported in the both frame types with or without switch networks. Using a switch, up to sixty-four high nodes may be supported in tall frame SP systems.

Note: High nodes **are not** supported with the 8-port High Performance Switch (HPS-LC8).

High nodes can be mixed with all current processor nodes in either the same frame or in the same system partition. However, the different physical sizes results in changes to the set of configurations which are supported.

High nodes have an optional redundant DC power supply (F/C 6293), which can be ordered separately.

200 MHz SMP high nodes support customer applications through the second and third serial ports (S2 and S3). The serial ports provide an EIA-232 9-position D-shell device end connector (male). Serial cables to use these ports are customer provided and must meet EIA-232 industry standards.

Bus Description

Each high node has 16 MCA slots, arranged in two groups of eight slots, 0/1 through 0/8 and 1/1 through 1/8. Like the wide nodes, a logical gap separates the two groups of MCA slots in the high node. As in the wide node, this creates a limitation in the high nodes which forbids card sets from straddling the gap.

Adapter Placement Restrictions: A **required** Ethernet adapter **must** be placed in slot 0/1.

A **required** SCSI-2 adapter **must** be placed in slot 0/8.

Requirements and Options

F/C 2009 Requirements

This feature code returns **one** 200 MHz SMP high node.

200 MHz SMP high nodes require two full node drawers. These nodes are asymmetrically configured for memory, DASD, and adapters. Up to four 200 MHz SMP high nodes may be installed in one tall frame and up to two in a short frame. Mandatory prerequisites are:

- PSSP 2.3 or later (consult IBM for possible PTF requirements)
- Two processors (mounted in one slot)

- 256 MB of memory
- 4.5 GB of DASD
- One Ethernet adapter
- One fast/wide SCSI adapter

F/C 2009 Options

Each 200 MHz SMP wide node is functionally equivalent to a RS/6000 7015-R50 and has:

- Four processor slots allowing a maximum of eight processors per node
- Four memory slots supporting up to 4 GB of memory
- Sixteen MCA slots for communication adapters (two with mandatory occupancy)
- Four DASD bays supporting up to 36.4 GB of storage
- Two external nine pin RS-232 ports at S2 and S3
  - These connections have active heartbeat and are available for customer applications.

Processor Requirements and Options

SMP high nodes require a minimum of two 200 MHz 604e PowerPC processors mounted on one card. However you can order additional processor cards (F/C 4324) to configure the node with a total of eight CPUs.

Table 86. Processor Options for 200 MHz High Nodes

Feature Code	Multiplier	Description	Comments
4324	X 1	Two processors	minimum required
4324	X 2	Four processors	
4324	X 3	Six processors	
4324	X 4	Eight processors	maximum allowed

Memory Requirements and Options

Note: 200 MHz high nodes have specific memory configurations that should be avoided. See Appendix D, "604/604e High Node Memory Configurations" on page 365 for specific details.

There are four memory slots in the 200 MHz high node (A, B, C, and D). The minimum configuration is one 256-megabyte (MB) card in slot A. Beyond that, you can use any combination of the following feature codes, up to a maximum of four total memory cards. (The maximum would therefore be four 1-gigabyte cards for a total of 4 GB).

Table 87. Optional Memory Features for 604e High Nodes

Memory Size	Feature Code
256 Megabytes	4029
512 Megabytes	4154
1 Gigabyte	4030

Note: When upgrading a 112 MHz high node to a 200 MHz high node, the 64 MB card (F/C 4155) from the 112 MHz configuration is not supported in the 200 MHz configuration. You must upgrade these cards to a supported memory size.

Direct Access Storage Device (DASD) Requirements and Options

200 MHz SMP high nodes can have up to four internal DASD attached through a **required** SCSI-2 adapter mounted in slot 0/8. The 200 MHz SMP high node requires a minimum of 4.5 GB of DASD and has a maximum of 36.4 GB of internal disk storage. Also, additional external storage devices can be accessed through optional SCSI-2 adapters (F/C 2412, F/C 2415, or F/C 2416).

Optional direct access storage devices are available as follows:

F/C 2900 4.5 GB Ultra SCSI disk drive (operating in fast/wide mode only)
F/C 2908 9.1 GB Ultra SCSI disk drive (operating in fast/wide mode only)
F/C 3000 4.5 GB fast/wide disk drive (withdrawn)

Switch and Communication Adapter Requirements and Options

Switch Adapters: In switch configured systems, 200 MHz SMP high nodes require one of the following switch adapters depending on the type of switch in use:

- SP Switch Adapter (F/C 4020)
  - For more information on this adapters, see Chapter 13, “SP Switches (F/C 4011 and F/C 4008)” on page 73.
- High Performance Switch Adapter (F/C 4018)
  - For more information on this adapters, see “High Performance Switches (F/C 4010 and F/C 4007)” on page 306.

High Performance Switch Alert

The High Performance series of switches (F/C 4010 and F/C 4007) are being phased out and are not available for new systems, however, they will still be available (through MES upgrade orders only) for existing systems that are already equipped with High Performance switches.

High Performance Switches **are not** compatible with:

- SP Switches
- SP Switch Routers
- 332 MHz SMP nodes
- POWER3 SMP nodes
- PSSP 3.1
- SP-attached servers

If you are upgrading your system to include any of these items, you **must** replace the High Performance Switches with SP Switches.

Communication Adapters: The 200 MHz SMP high node has sixteen MCA slots. However, two of the slots (0/1 for Ethernet and 0/8 for SCSI-2) have mandatory occupancies. This leaves fourteen usable MCA slots per high node. However, if your SP system is switch configured, another MCA slot will be occupied by the required SP Switch adapter.

A full line of MCA adapters is offered for these nodes including:

- SCSI-2
- Ethernet
- Token Ring
- FDDI
- HIPPI
- ATM
- WAN Concentrator
- SSA RAID5

For more information about these adapters, see “MCA Bus Adapter Requirements for Wide, Thin and High Nodes” on page 118 and Chapter 18, “MCA Communication Adapters” on page 161.

Note: The **required** 10BaseT/10Base2 Ethernet adapter for the SP Ethernet uses one of the available MCA slots. This Ethernet adapter is ordered separately and **must** be placed in slot 0/1.

Withdrawn 135 MHz Uniprocessor Wide Node (F/C 2007)

Description

135 MHz uniprocessor wide nodes (F/C 2007) have MCA bus subsystems and contain one IBM RS/6000 POWER2 135 MHz processor per node. The 135 MHz uniprocessor thin node is functionally equivalent to an IBM RS/6000 7013–595 deskside system. Your IBM RS/6000 SP system **must** be operating at PSSP 2.1 (or later) to use these nodes.

The wide node occupies a full drawer and can be packaged up to eight per tall frame. If a **uniprocessor** wide node is the first node in a frame, you **must** install another node drawer in that frame. The second node drawer can be any node type.

If the second node drawer contains thin nodes:

- If the thin nodes are **uniprocessor** thin nodes, a thin node **pair** must be used.
- If the thin nodes are **SMP** thin nodes, a **single** SMP thin node may be used.

Bus Description

The 135 MHz uniprocessor wide node has eight MCA slots arranged in two groups of four slots, 0/1 through 0/4 and 1/1 through 1/4. The **required** Ethernet adapter for the SP Ethernet uses one of the available MCA slots and it **must** be placed in the 0/1 slot.

Adapter Placement Restrictions: A **required** Ethernet adapter **must** be placed in slot 0/1.

If your SP system will be configured with an SP Switch, the **required** SP Switch adapter **must** be placed in slot 0/4.

HIPPI adapters use three MCA slots but power requirements necessitate leaving two extra slots empty. Therefore, a HIPPI installation uses five MCA slots. A typical installation would have:

- The HIPPI controller card in slot 1/1, the send card in slot 1/2, and the receive card in slot 1/3
- Slot 1/4 **must** be left blank
- Either slot 0/2, 0/3, or 0/4 **must** also be left blank to satisfy power requirements
  - Remember, slot 0/1 is occupied by the required Ethernet adapter.
  - This configuration assumes a switch adapter is not required.

Uniprocessor wide nodes support FDDI adapters. However, there are two limitations on these cards:

1. The DAS card used to connect the FDDI adapters **must** be placed in a lower slot address than the parent card. In other words, if the FDDI card is in slot 1/4, the DAS card must go in slot 1/3.
2. The DAS card and its parent FDDI card **cannot** straddle the logical gap between slot 1/4 and slot 0/1.

Requirements and Options

F/C 2007 Requirements

This feature code returns **one** 135 MHz uniprocessor wide node.

Requires one full drawer (two thin node slots). This option is symmetrically configured for memory; only two, four, or eight card configurations are supported. Mandatory prerequisites are:

- PSSP 2.1 or later (consult IBM for possible PTF requirements).
- 64 MB memory.
- 2 GB of DASD.
- One Ethernet adapter.
- It this node is the first node in a frame, you **must** fill another node drawer in that frame.

F/C 2007 Options

Each 135 MHz wide node is functionally equivalent to a RS/6000 7013-595 and has:

- Eight memory card slots supporting up to 2 GB of memory.
- Eight micro channel adapter slots (one with mandatory occupancy).
- Four DASD bays supporting up to 36.4 GB of storage.

Processor Requirements and Options

This uniprocessor wide node has a single 135 MHz Power2 processor. There are no CPU options for this node.

Memory Requirements and Options

In addition to the eight MCA slots, the 135 MHz wide node has eight memory card slots. These nodes require a minimum memory of 64 MB and have a maximum limit of 2 GB using cards placed in the configurations given in Table 88. The memory used in these configurations is either type S5.0 or type S4.6 (some configurations may have mixed memory types).

All memory cards **must** be installed in pairs and only two, four or eight card configurations are supported. The memory cards must be symmetrical in the first two or four card configurations, as well as the last four cards. If you are using eight cards, the first group of four and the last four cards may have different memory capacities.

To use the following table:

1. Select the memory capacity needed.
2. Using the number given in the parenthesis, order multiple instances of the listed feature code.
3. Place the memory cards into the node slots listed in the table.

Table 88 (Page 1 of 2). Optional Memory Features for 135 MHz Wide Nodes

Memory Size *(per node)*	**Description**	**Memory Slot**	**Feature Code**	**Order Type**
64 Megabytes	Two 32-megabyte cards of standard memory *(prereq)*	D, H	4076 (2x)	Prereq
128 Megabytes	Retains the standard 32-megabyte cards in Slots D and H, and adds a 32-megabyte card to Slots B and F	B, D, F, H	4076 (4x)	Factory or Field
128 Megabytes	Substitutes the standard 32-megabyte cards in Slots D and H with 64-megabyte cards	D, H	4077 (2x)	Factory or Field
256 Megabytes	Removes the standard 32-megabyte cards in Slots D and H, and adds a 64-megabyte card to Slots B, D, F, H	B, D, F, H	4077 (4x)	Factory or Field
256 Megabytes	Retains the standard 32-megabyte cards in Slots D and H, and adds a 32-megabyte card to Slots A, B, C, E, F, G	A, B, C, D, E, F, G, H	4076 (8x)	Factory or Field
256 Megabytes	Substitutes the standard 32-megabyte cards in Slots D and H with two 128-megabyte cards	D, H	4078 (2x)	Factory or Field
512 Megabytes	Removes the standard 32-megabyte cards in Slots D and H, and adds a 64-megabyte card in all slots	A, B, C, D, E, F, G, H	4077 (8x)	Factory or Field
512 Megabytes	Removes the standard 32-megabyte cards in Slots D and H, and adds 128-megabyte cards in slots B, D, F, and H	B, D, F, H	4078 (4x)	Factory or Field
512 Megabytes	Substitutes the standard 32-megabyte cards in Slots D and H with 256-megabyte cards	D, H	4079 (2x)	Factory or Field

Table 88 (Page 2 of 2). Optional Memory Features for 135 MHz Wide Nodes				
Memory Size *(per node)*	**Description**	**Memory Slot**	**Feature Code**	**Order Type**
1 Gigabyte	Removes the standard 32-megabyte cards in Slots D and H, and adds 128-megabyte cards to all slots	A, B, C, D, E, F, G, H	4078 (8x)	Factory or Field
1 Gigabyte	Removes the standard 32-megabyte cards in Slots D and H, and adds 256-megabyte cards to Slots B, D, F, and H	B, D, F, H,	4079 (4x)	Factory or Field
2 Gigabyte	Removes the standard 32-megabyte cards in Slots D and H, and adds 256-megabyte cards to all slots	A, B, C, D, E, F, G, H	4079 (8x)	Factory or Field

Note:

1. Order Single In-Line Memory Module (SIMM) kit (**F/C 5064**) for installation on previously installed 32-megabyte memory cards (**F/C 4076**) for field upgrade to 64 megabytes. (Quantity: 1 kit per card)
2. Order SIMM kit (**F/C 5129**) for installation on previously installed 32-megabyte (**F/C 4076**) and 64-megabyte (**F/C 4077**) (Quantity: 1 kit per card) memory cards for field upgrade to 128 megabytes.
3. **Guidelines for Wide Node Memory Expansion:**

   For wide nodes, all memory cards must be installed in pairs and only two, four, or eight-card configurations are supported, as follows:
   - Two-card configurations: cards must be plugged into the **D** and **H** positions.
   - Four-card configurations: cards must be plugged into the **B, D, F** and **H** positions.
   - Eight-card configurations: cards must be plugged into the **A** through **H** positions.
     – Positions **A, C, E, G** must have the same card size.
     – Positions **B, D, F, H** must have the same card size.

Upgrading Wide Node Memory

Some incompatibilities exist between the memory types used on wide nodes. You **must** review "Wide Node Memory Upgrade Notice" on page 302 before proceeding.

Memory cards and DIMMs **are not** interchangeable between SMP and uniprocessor thin nodes.

Direct Access Storage Device (DASD) Requirements and Options

135 MHz uniprocessor wide nodes can have up to four internal DASD attached through an integrated SCSI-2 network. These wide nodes require a minimum of 4.5 GB of DASD (older nodes may have 2.2 GB) and have a maximum of 36.4 GB of internal disk storage. Also, external storage devices can be accessed through optional SCSI-2 adapters (F/C 2412, F/C 2415, or F/C 2416).

Note: This node does not require special cables or adapters to mount internal fast/wide DASD. However, F/C 1240 provides an independent internal SCSI hookup that:

- Eliminates the DASD controller as a single point of failure during mirroring
- Increases disk performance
- Balances disk loading

To use this option, you must install one of the following SCSI-2 adapters: F/C 2412, F/C 2415, or F/C 2416.

Optional direct access storage devices are available as follows:

F/C 2900 4.5 GB Ultra SCSI disk drive (operating in fast/wide mode only)
F/C 2908 9.1 GB Ultra SCSI disk drive (operating in fast/wide mode only)
F/C 3000: 4.5 GB fast/wide disk drive (withdrawn)
F/C 3010: 9.1 GB fast/wide disk drive (withdrawn)

Switch and Communication Adapter Requirements and Options

Switch Adapters: In switch configured systems, 135 MHz wide nodes require one of the following switch adapters depending on the type of switch in use:

- SP Switch Adapter (F/C 4020)
  - For more information on this adapter see Chapter 13, "SP Switches (F/C 4011 and F/C 4008)" on page 73.
- High Performance Switch Adapter (F/C 4018)
  - For more information on this adapter see "High Performance Switches (F/C 4010 and F/C 4007)" on page 306.

Note: When used in a 135 MHz wide node, the SP Switch adapter **must** be placed in slot 0/4.

Switch adapters for uniprocessor wide nodes **are not** interchangeable with switch adapters used on SMP wide nodes.

High Performance Switch Alert

The High Performance series of switches (F/C 4010 and F/C 4008) are being phased out and are not available for new systems, however, they will still be available (through MES upgrade orders only) for existing systems that are already equipped with High Performance switches.

High Performance Switches **are not** compatible with:

- SP Switches
- SP Switch Routers
- 332 MHz SMP nodes
- POWER3 SMP nodes
- PSSP 3.1
- SP-attached servers

If you are upgrading your system to include any of these items, you **must** replace the High Performance Switches with SP Switches.

Communication Adapters: The 135 MHz uniprocessor wide node has eight Micro Channel adapter (MCA) slots. If your SP system will be configured to use an SP switch, one of the MCA slots will be occupied by the required SP switch adapter card.

A full line of MCA adapters is offered for these nodes including:

- SCSI-2
- Ethernet
- Token Ring

- FDDI
- HIPPI
- ATM
- WAN Concentrator
- SSA RAID5

For more information about these adapters, see “MCA Bus Adapter Requirements for Wide, Thin and High Nodes” on page 118 and Chapter 18, “MCA Communication Adapters” on page 161.

Note: The **required** 10BaseT/10Base2 Ethernet adapter for the SP Ethernet uses one of the available MCA slots. This Ethernet adapter is ordered separately and **must** be placed in slot 0/1.

Withdrawn Early Processor Nodes

This section contains reference information for the earliest withdrawn processor nodes.

Processor Options for 112 MHz High Nodes

Table 89. Processor Options for 112 MHz High Nodes

Feature Code	Multiplier	Description	Comments
4301	X 1	Two processors	minimum required
4301	X 2	Four processors	
4301	X 3	Six processors	
4301	X 4	Eight processors	maximum allowed

Withdrawn Thin Node Memory Options

Optional Memory Features for 120 MHz Thin Node (F/C 2008): The 120 MHz thin node has a minimum requirement of two memory cards per node. All cards must be symmetrical in size and must be installed in two or four card increments. The 120 MHz thin node requires a minimum memory size of 64 MB and has a maximum limit of 1 GB (four 256 MB cards).

Note: For optimal performance, use four, 32 MB cards as a minimum memory option.

Table 90. Optional Memory Features for Thin Processor Nodes (F/C 2008)

Feature Code	Description	Order Type
4076	32 MB card	Factory or Field
4077	64 MB card	Factory or Field
4078	128 MB card	Factory or Field
4079	256 MB card	Factory or Field

Thin Node Memory Upgrade Notice: All new 120 MHz thin nodes can be equipped with the feature codes listed in Table 90. These memory options are configured with type S5.0 memory. Existing 66 MHz thin nodes were configured with either Type S4.5 or Type S4.6 memory. The **S4.6** memory in the 66 MHz nodes can be reused when upgrading the 66 MHz processors to 120 MHz. However, type S4.6 memory **cannot** be mixed with the type S5.0 memory in thin nodes.

Type S4.5 memory is **not supported** in a 120 MHz thin node and those memory features must be replaced during the node upgrade. To find out if your system has type S4.5 memory, issue the following command:

```
lscfg -v sysplanar0 ] more
```

This command provides the part numbers and EC levels of the system planar, including memory cards. Within the memory section of the list that is displayed, look for the following EC levels:

Table 91. Type S4.5 Memory Information

EC Level	Card Size	Feature Code	Part Number
33	32 MB	4067	65G1800
33	64 MB	4069	65G1801
33	128 MB	4090	65G1802
34	256 MB	4095	52G4685

If these EC levels are displayed, that node has S4.5 memory and the memory **must** be replaced before the node can be upgraded.

If the nodes you want to upgrade have type S4.5 memory, contact the Order Support Group for assistance.

Optional Memory Features for Withdrawn 62 MHz and 66 MHz Thin Nodes (F/C 2001/2002)

Withdrawn Thin nodes: Both types of 66 MHz thin nodes have been withdrawn from production but they are still supported. These 66 MHz thin nodes have two memory slots and will support between 64 and 512 MB of memory. Also, the 66 MHz thin node will support a 1 MB SIMM module on the CPU card while the 66 MHz thin node 2 will support a 2 MB SIMM module on the CPU card.

See "Thin Node Memory Upgrade Notice" for restrictions.

Note: Each feature code listed in Table 92 on page 301 represents one memory card. When more than one card must be ordered, the table notes the quantity required in parenthesis beneath the feature code.

Table 92. Optional Memory Features for Thin Processor Nodes (F/C 2001/2002)			
Memory Size *(per node)*	**Description**	**Feature Code**	**Order Type**
64 Megabytes	Standard *prereq* card in Slot C	4069	Prereq
128 Megabytes	Retains the standard 64-megabyte card in Slot C and adds a 64-megabyte card to Slot B	4069	Field
128 Megabytes	Substitutes the standard 64-megabyte card in Slot C with one 128-megabyte card	4090	Field
192 Megabytes	Substitutes the standard 64-megabyte card in Slot C with one 128-megabyte card, and adds a 64-megabyte card in Slot B.	4090 and 4069	Field
256 Megabytes	Substitutes the standard 64-megabyte card with two 128-megabyte cards	4090 (2x)	Field
256 Megabytes	Substitutes the standard 64-megabyte card in Slot C with one 256-megabyte card	4095	Field
384 Megabytes	Substitutes the standard 64-megabyte card in Slot C with one 256-megabyte card, and adds a 128-megabyte card in Slot B.	4095 and 4090	Field
512 Megabytes	Substitutes the standard 64-megabyte card in Slot C with two 256-megabyte cards	4095 (2x)	Field

Optional Memory Features for 66 MHz Thin Node 2 Nodes (F/C 2004)

Table 93. Optional Memory Features for Thin Processor Node 2 (F/C 2004)				
Memory Size *(per node)*	**Memory Size on CPU Card**	**Feature Code**	**Memory Card Size (Slot C)**	**Feature Code**
64 Megabytes (Prerequisite)	32 Megabytes	4053	32 Megabytes	4067
128 Megabytes (Prerequisite)	64 Megabytes	4054	64 Megabytes	4069
256 Megabytes	128 Megabytes	4055	128 Megabytes	4090
512 Megabytes	256 Megabytes	4056	256 Megabytes	4095
64 Megabytes (SIMM upgrade)	32-64 Megabytes	5064	32-64 Megabytes	5064
128 Megabytes (SIMM upgrade)	32/64-128 Megabytes	5129	32/64-128 Megabytes	5129
Note: The Thin Node 2 requires one memory card plus 8 memory SIMMs plugged on the CPU card.				

Memory Options for Withdrawn Wide Nodes

Optional Memory Features for Withdrawn 77 MHz Wide Processor Nodes

Withdrawn Wide nodes: The 77 MHz wide node has the same memory options as the 135 MHz wide node.

See “Wide Node Memory Upgrade Notice” on page 302 for restrictions.

Table 94. Optional Memory Features for 77 MHz Wide Processor Nodes				
Memory Size *(per node)*	**Description**	**Memory Slot**	**Feature Code**	**Order Type**
64 Megabytes	Two 32-megabyte cards of standard memory *(prereq)*	D, H	4076 (2x)	Prereq
128 Megabytes	Retains the standard 32-megabyte cards in Slots D and H, and adds a 32-megabyte card to Slots B and F	B, D, F, H	4076	Factory or Field
128 Megabytes	Substitutes the standard 32-megabyte cards in Slots D and H with 64-megabyte cards	D, H	4077 (2x)	Factory or Field
256 Megabytes	Removes the standard 32-megabyte cards in Slots D and H, and adds a 64-megabyte card to Slots B, D, F, H	B, D, F, H	4077 (4x)	Factory or Field
256 Megabytes	Retains the standard 32-megabyte cards in Slots D and H, and adds a 32-megabyte card to Slots A, B, C, E, F, G	A, B, C, D, E, F, G, H	4076 (6x)	Factory or Field
256 Megabytes	Substitutes the standard 32-megabyte cards in Slots D and H with two 128-megabyte cards	D, H	4078 (2x)	Factory or Field
512 Megabytes	Removes the standard 32-megabyte cards in Slots D and H, and adds a 64-megabyte card in all slots	A, B, C, D, E, F, G, H	4077 (8x)	Factory or Field
512 Megabytes	Removes the standard 32-megabyte cards in Slots D and H, and adds 128-megabyte cards in slots B, D, F, and H	B, D, F, H	4078 (4x)	Factory or Field
512 Megabytes	Substitutes the standard 32-megabyte cards in Slots D and H with 256-megabyte cards	D, H	4079 (2x)	Factory or Field
1 Gigabyte	Removes the standard 32-megabyte cards in Slots D and H, and adds 128-megabyte cards to all slots	A, B, C, D, E, F, G, H	4078 (8x)	Factory or Field
1 Gigabyte	Removes the standard 32-megabyte cards in Slots D and H, and adds 256-megabyte cards to Slots B, D, F, and H	B, D, F, H,	4079 (4x)	Factory or Field
2 Gigabyte	Removes the standard 32-megabyte cards in Slots D and H, and adds 256-megabyte cards to all slots	A, B, C, D, E, F, G, H	4079 (8x)	Factory or Field

Note:

1. Order Single In-Line Memory Module (SIMM) kit (**F/C 5064**) for installation on previously installed 32-megabyte memory cards (**F/C 4076**) for field upgrade to 64 megabytes. (Quantity: 1 kit per card)
2. Order SIMM kit (**F/C 5129**) for installation on previously installed 32-megabyte (**F/C 4076**) and 64-megabyte (**F/C 4077**) (Quantity: 1 kit per card) memory cards for field upgrade to 128 megabytes.
3. **Guidelines for Wide Node Memory Expansion:**

   For wide nodes, all memory cards must be installed in pairs and only two, four, or eight-card configurations are supported, as follows:
   - Two-card configurations: cards must be plugged into the **D** and **H** positions.
   - Four-card configurations: cards must be plugged into the **B, D, F** and **H** positions.
   - Eight-card configurations: cards must be plugged into the **A** through **H** positions.
     – Positions **A, C, E, G** must have the same card size.
     – Positions **B, D, F, H** must have the same card size.

Wide Node Memory Upgrade Notice: All new 135 MHz wide nodes and existing 77 MHz wide nodes use S5.0 memory. However, 66 MHz wide nodes were configured with either Type S4.6 or Type S4.5 memory cards. Type S4.6 memory cards can be used to upgrade wide nodes in the field and, on wide nodes, these two memory types **can** be mixed.

Type **S4.5** memory **is not** supported in a 135 MHz wide node and those memory features must be replaced during the node upgrade. To find out if your system has type S4.5 memory, issue the following command:

lscfg -v sysplanar0] more

This command provides the part numbers and EC levels of the system planar, including memory cards. Within the memory section of the list that is displayed, look for the following EC levels:

Table 95. Type S4.5 Memory Information

EC Level	Card Size	Feature Code	Part Number
33	32 MB	4067	65G1800
33	64 MB	4069	65G1801
33	128 MB	4090	65G1802
34	256 MB	4095	52G4685

If these EC levels are displayed, that node has S4.5 memory and the memory **must** be replaced before the node can be upgraded.

If the nodes you want to upgrade have type S4.5 memory, contact the Order Support Group for assistance.

Optional Memory Features for 66 MHz Wide Processor Nodes

Note: Each feature code listed in Table 96 represents one memory card. When more than one card must be ordered, the table notes the quantity required in parenthesis beneath the feature code.

Table 96 (Page 1 of 2). Optional Memory Features for 66 MHz Wide Processor Nodes

Memory Size *(per node)*	**Description**	**Memory Slot**	**Feature Code**	**Order Type**
64 Megabytes	Two 32-megabyte cards of standard memory *(prereq)*	D, H	4067 (2x)	Prereq
128 Megabytes	Retains the standard 32-megabyte cards in Slots D and H, and adds a 32-megabyte card to Slots B and F	B, D, F, H	4067	Field
128 Megabytes	Substitutes the standard 32-megabyte cards in Slots D and H with 64-megabyte cards	D, H	4069 (2x)	Field
256 Megabytes	Removes the standard 32-megabyte cards in Slots D and H, and adds a 64-megabyte card to Slots B, D, F, H	B, D, F, H	4069 (4x)	Field
256 Megabytes	Retains the standard 32-megabyte cards in Slots D and H, and adds a 32-megabyte card to Slots A, B, C, E, F, G	A, B, C, D, E, F, G, H	4067 (6x)	Field
256 Megabytes	Substitutes the standard 32-megabyte cards in Slots D and H with two 128-megabyte cards	D, H	4090 (2x)	Field
512 Megabytes	Removes the standard 32-megabyte cards in Slots D and H, and adds a 64-megabyte card in all slots	A, B, C, D, E, F, G, H	4069 (8x)	Field

Table 96 (Page 2 of 2). Optional Memory Features for 66 MHz Wide Processor Nodes				
Memory Size *(per node)*	**Description**	**Memory Slot**	**Feature Code**	**Order Type**
512 Megabytes	Removes the standard 32-megabyte cards in Slots D and H, and adds 128-megabyte cards in slots B, D, F, and H	B, D, F, H	4090 (4x)	Field
512 Megabytes	Substitutes the standard 32-megabyte cards in Slots D and H with 256-megabyte cards	D, H	4095 (2x)	Field
1 Gigabyte	Removes the standard 32-megabyte cards in Slots D and H, and adds 128-megabyte cards to all slots	A, B, C, D, E, F, G, H	4090 (8x)	Field
1 Gigabyte	Removes the standard 32-megabyte cards in Slots D and H, and adds 256-megabyte cards to Slots B, D, F, and H	B, D, F, H,	4095 (4x)	Field
2 Gigabyte	Removes the standard 32-megabyte cards in Slots D and H, and adds 256-megabyte cards to all slots	A, B, C, D, E, F, G, H	4095 (8x)	Field

Note:

1. Order Single In-Line Memory Module (SIMM) kit (**F/C 5064**) for installation on previously installed 32-megabyte memory cards (**F/C 4067**) for field upgrade to 64 megabytes. (Quantity: 1 kit per card)
2. Order SIMM kit (**F/C 5129**) for installation on previously installed 32-megabyte (**F/C 4067**) and 64-megabyte (**F/C 4069**) (Quantity: 1 kit per card) memory cards for field upgrade to 128 megabytes.
3. **Guidelines for Wide Node Memory Expansion:**

   For wide nodes, all memory cards must be installed in pairs and only two, four, or eight-card configurations are supported, as follows:
   - Two-card configurations: cards must be plugged into the **D** and **H** positions.
   - Four-card configurations: cards must be plugged into the **B, D, F** and **H** positions.
   - Eight-card configurations: cards must be plugged into the **A** through **H** positions.
     – Positions **A, C, E, G** must have the same card size.
     – Positions **B, D, F, H** must have the same card size.

Withdrawn High Node Memory Options

Note: Both the 200 MHz and the 112 MHz high nodes have specific memory configurations that should be avoided see Appendix D, "604/604e High Node Memory Configurations" on page 365 for specific details.

Optional Memory Features for Withdrawn 112 MHz (604) High Nodes: There are four memory slots in the 604 high node (A, B, C, and D). The minimum configuration is one 64 MB card in slot A. Beyond that, you can use any combination of the following feature codes, up to a maximum of four total memory cards. (The maximum would therefore be four 512 MB cards for a total of 2 GB).

Table 97. Optional Memory Features for 604 High Nodes	
Memory Size	**Feature Code**
64 Megabytes	4155
128 Megabytes	4156
256 Megabytes	4157
512 Megabytes	4158

Optional Direct Access Storage Devices (DASD)

DASD Options for Withdrawn 120 MHz Thin Nodes Wide Nodes: The RS/6000 SP system provides capacity for up to two DASDs in the 120 MHz thin processor nodes (18 GB max). These node types have 4.5 GB of DASD as the minimum prerequisite.

Note: Existing 120 MHz thin nodes may have 2.2 GB of DASD installed.

Optional direct access storage devices are available for these uniprocessor nodes as follows:

F/C 3000: 4.5 GB fast/wide disk drive
F/C 3010: 9.1 GB fast/wide disk drive
F/C 3033: 2.2 GB fast/wide disk drive (not available after 8/97)

Note: These nodes do not require any special cables or adapters in order to mount fast/wide DASD.

DASD Options for 604 (112 MHz) High Nodes: The RS/6000 SP system provides capacity three DASD per 604 high node (up to 6.6 GB).

For 604 SMP high nodes, the following is available:

F/C 3031: 2.2 GB fast disk drive

The 604 high node has a standard DASD default of 2.2 GB. However if you are going to have more than 1 GB of memory then you must have 4.4 GB of DASD in that node.

DASD Reference for Withdrawn Units

For Withdrawn 66 and 77 MHz Thin and Wide Nodes: Direct access storage devices (DASD) are available for both types of non-SMP processor nodes as follows:

F/C 2555 1 GB fast drive
F/C 3032: 1.1 GB fast/wide disk drive
F/C 3033: 2.2 GB fast/wide disk drive (not available after 8/97)
F/C 3000: 4.5 GB fast/wide disk drive
F/C 3010: 9.1 GB fast/wide disk drive

Note: For a 66 MHz wide node or a 77 MHz wide node, you need F/C 1240 and either F/C 2415 or F/C 2416 to enable a SCSI-2 Fast/Wide drive.

Table 98. DASD Features for Withdrawn Nodes			
Feature Code	**DASD Size**	**DASD Type**	**Node Type**
3000	4.5 GB	Fast / Wide	120 MHz Thin
3010	9.1 GB	Fast / Wide	120 MHz Thin
3031	2.2 GB	Fast	112 MHz High
Note: • Each node type has a minimum prerequisite and a maximum allowable DASD allocation. Consult the chapter on each node for details about DASD limits. • Some older nodes may require Micro Channel adapters and cables to utilize some DASD options.			
Reference for withdrawn DASD			
2555	1 Gigabyte	Fast	wide/thin
2580	2 Gigabytes	Fast	wide/thin
3032	1.1 Gigabytes	Fast / Wide	wide/thin
3033	2.2 Gigabytes	Fast / Wide	wide/thin
3034	4.5 Gigabytes	Fast / Wide	wide/thin

Table 99. DASD Limits by Node Type		
Node Type	**Required Minimum DASD**	**Maximum Allowable DASD**
120 MHz Thin	4.5 GB (2.2 GB allowed on existing nodes)	18.2 GB
112 MHz High	2.2 GB	6.6 GB

]
Withdrawn Switches

This section contains information on withdrawn switches.

High Performance Switches (F/C 4010 and F/C 4007)

Switches

Switches provide a message passing network that connects all processor nodes with a minimum of four paths between any pair of nodes. A switch feature code provides you with a switch assembly and the cables to support node connections. The number of cables you will receive depends on the type of switch you ordered.

There are two basic switch types:

1. SP Switches
2. High Performance Switches

This chapter contains information on the two types of High Performance Switch:

1. F/C 4010 High Performance Switches (16-port)
2. F/C 4007 High Performance HiPS-LC8 Switch (8-port)

For information on the SP Switch series, see Chapter 13, "SP Switches (F/C 4011 and F/C 4008)" on page 73.

High Performance switches **are not** compatible with the following:

- SP Switches
- POWER3 SMP wide nodes
- 332 MHz SMP wide nodes
- POWER3 SMP thin nodes
- 332 MHz SMP thin nodes
- SP Switch Routers
- SP-attached servers
- PSSP 3.1

F/C 4010 High Performance Switch

Note: High Performance switches are being phased out and are not available for new systems, however, they will still be available (through MES upgrade orders only) for existing systems that are already equipped with High Performance switches.

High Performance switches provide communication between nodes, supplying a minimum of four paths between any pair of nodes. The **required** High Performance Switch Adapter-2 (F/C 4018) connects each SP node to the switch subsystem. One of these adapters must be ordered for each node in a switch configured SP system.

When you order F/C 4010, you will receive one 16-port High Performance Switch and all internal cables needed to connect up to sixteen nodes to the switch. Internal cables can only be used in the frame that the switch is mounted in. If you are connecting nodes mounted in a nonswitched expansion frame to a switch, you must use separately ordered external cables (see "Switch-to-Node Cabling" on page 102). All frame-to-frame cables needed to make switch connections between frames must also be ordered separately. High performance Switch cables are only available by MES.

For information on cabling requirements for multiple frame systems, see "Planning for Switch Cabling" on page 101. Also the *IBM RS/6000 SP: Planning Volume 2, Control Workstation and Software Environment* book contains a great deal of important information regarding planning system expansions using a switch.

You cannot mix High Performance switches with SP Switches in a system or in separate system partitions. To take advantage of the SP Switch's performance, you must upgrade all switches to SP Switches.

F/C 4007 High Performance LC-8 Switch

Note: The High Performance LC-8 is only available through MES upgrade orders for *existing* systems already equipped with High Performance LC-8 switches.

Eight port switches are a low cost alternative to the full size sixteen port switches. The 8-port High Performance Switch (HiPS-LC8) (**F/C 4007**) provides switch functions for up to eight processor nodes. The High Performance LC-8 only has one switch chip. Therefore, only a single partition is possible. This switch is not compatible with high nodes.

F/C 4007 consists of one 8-port High Performance Switch and all of the internal cables needed to connect up to eight nodes to the switch in a single frame system. Internal cables can only be used in the frame that the switch is mounted in. Nodes mounted in a nonswitched expansion frame require separately ordered external cables (see “Switch-to-Node Cabling” on page 102).

For upgrades to greater than eight node support, **F/C 4007** is replaced by the High Performance Switch, **F/C 4010**. The HiPS-LC8 switch use a similar network topology, proprietary protocol and communication physical layer as F/C 4010.

Switch Adapters

If you plan to use a switch in your SP system, you will need a switch adapter to connect each node to the switch subsystem. One switch adapter is needed for each node. The HiPS Adapter-2 (**F/C 4018**) is used in systems where the HiPS or HiPS-LC8 is installed. This adapter is only available for *existing* HiPS equipped systems.

Note: The HiPS Adapter-2, and the SPS Adapter cannot coexist in the same system configuration. Similarly, the HiPS Adapter-2, and the SP Switch MX Adapter have the same coexistence restriction.

This information is tabulated in Table 15 on page 76.

Planning Switch Networks

Once you have connected nodes to the switch, you must also connect each switch using the cables provided with each switch. To do this, you will need to know the number and length of each type of cable you will need. The type of cable will also vary depending on whether the frame is a nonswitched expansion frame or if it has an integral switch (model frame or switched expansion frame).

For detailed instructions on completing this process, see “Planning for Switch Cabling” on page 101.

F/C 2030 High Performance Switch Frames

High Performance Switch frames (F/C 2030) consist of a 2.01 m tall frame configured with four High Performance Switches. These frames have been withdrawn.

]
Withdrawn Communication Adapters

This section contains information on withdrawn communication and I/O adapters.

IBM Network Terminal Accelerator - 256 Session (F/C 2402) MCA

The IBM Network Terminal Accelerator feature (**F/C 2402**) is an Ethernet adapter that accelerates network performance by off-loading the telnet and rlogin daemons, TCP/IP protocol stack and virtual terminal I/O management from the RS/6000 system. The network adapter buffers the system from frequent CPU intensive packet interrupts, increases terminal I/O throughput and the number of concurrent online user sessions, and reduces context switches, which dramatically reduces the CPU load.

The network adapter software provides a pass-through capability for other Ethernet protocols, which can eliminate the need for a separate Ethernet adapter. The network adapter supports onboard simple network management protocol (SNMP) for network management.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Provides a Micro Channel interface with 4-byte (32-bit) bus master
- Requires one Micro Channel adapter (MCA) slot
- Provides a 25 MHz high performance RS/6000 processor with 2 MB of DRAM memory with parity support
- Provides one 10 Mbps Ethernet interface
- Complies with IEEE 802.5 specifications
- Supports up to 256 concurrent login sessions using telnet or rlogin
- Requires RS/6000 500 series systems to have the additional cooling fan feature (F/C 6506) installed

Feature Components

IBM provides the Network Terminal Accelerator Ethernet adapter, which includes one network terminal accelerator connection and 256 network terminal accelerator sessions.

Customer Components

See Table 100 on page 310 and Table 101 on page 311 for descriptions.

Required Software

See Table 58 on page 214 for requirements.

Nonraised-Floor Installations

IBM recommends raceways for office floor and other above-floor installations to protect cables from being damaged.

Cable Routing (10Base-T Cabling)

Figure 65 on page 310 represents the 10Base-T cable routing to the IBM Network Terminal Accelerator adapter (256 session) feature installed in an SP frame.

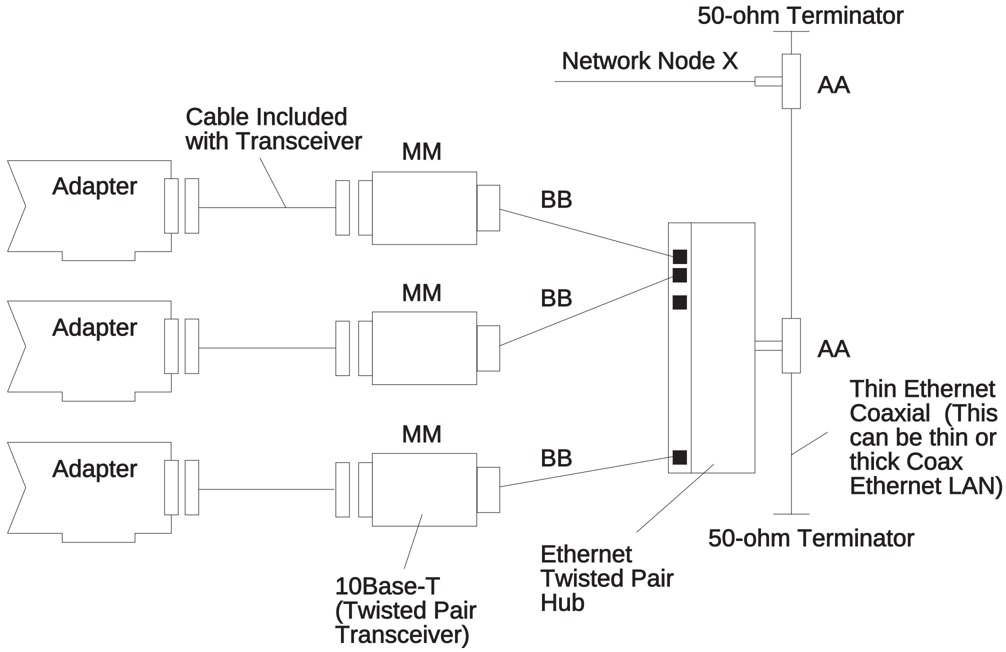


Figure 65. IBM Network Terminal Accelerator for Processor Cabling (10Base-T)

Table 100. Cable Information for IBM Network Terminal Accelerator (256 Session)

Cable Letter	Cable Description	Part Number	Feature Code	Length m (ft)
AA	Customer-supplied coaxial T-shaped or L-shaped connector is recommended.	N/A	N/A	N/A
BB	Customer-supplied RJ-45 twisted-pair cable.	N/A	N/A	N/A
MM	Ethernet 10Base-T transceiver cable (feature code includes cable).	02G7429 02G7434	4224	1 (3)

Cable Routing (10Base-2 Cabling)

Figure 66 on page 311 represents the 10Base-2 cable routing to the IBM Network Terminal Accelerator adapter (256 session) feature installed in an SP frame.

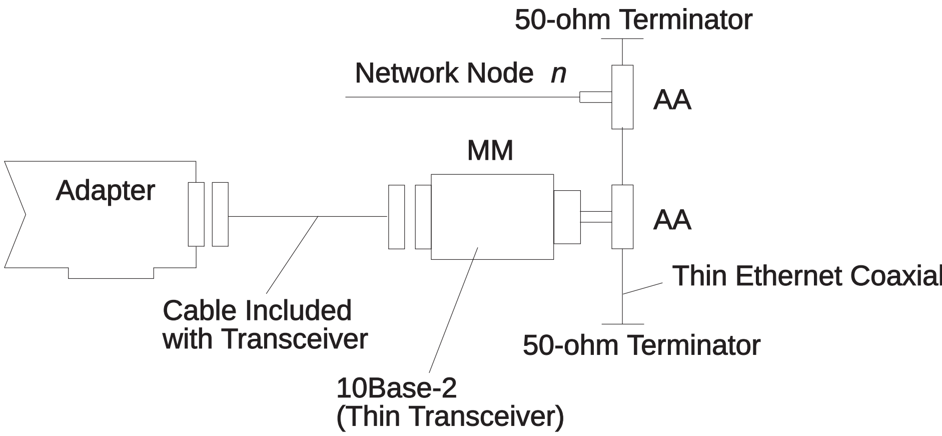


Figure 66. IBM Network Terminal Accelerator for Processor Cabling (10Base-2)

Table 101. Cable Information for IBM Network Terminal Accelerator (256 Session)

Cable Letter	Cable Description	Part Number	Feature Code	Length m (ft)
AA	Customer-supplied coaxial T-shaped or L-shaped connector is recommended.	N/A	N/A	N/A
MM	Ethernet 10Base-2 transceiver cable (feature code includes cable).	02G7435	4223	1 (3)

IBM Network Terminal Accelerator - 2048 Session (F/C 2403) MCA

The IBM Network Terminal Accelerator feature (**F/C 2403**) is an Ethernet adapter that accelerates network performance by off-loading the telnet and rlogin daemons, TCP/IP protocol stack and virtual terminal I/O management from the RS/6000 system. The adapter buffers the system from frequent CPU intensive packet interrupts, increases terminal I/O throughput and the number of concurrent online user sessions by up to three times, and reduces context switches, which dramatically reduces the CPU load.

The network adapter software provides a pass-through capability for other Ethernet protocols, which can eliminate the need for a separate Ethernet adapter. The network adapter supports onboard SNMP for network management.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Provides a Micro Channel interface with 4-byte (32-bit) bus master
- Requires one MCA slot
- Provides a 25 MHz high performance RS/6000 processor with 8 MB of DRAM memory with parity support
- Provides one 10 Mbps Ethernet interface
- Complies with IEEE 802.5 specifications
- Supports up to 2048 concurrent login sessions using telnet or rlogin

- Requires RS/6000 500 series systems to have the additional cooling fan feature (F/C 6506) installed

Feature Components

IBM provides the Network Terminal Accelerator Ethernet adapter, which includes one network terminal accelerator connection and 2048 network terminal accelerator sessions.

Customer Components

See Table 102 and Table 103 on page 313 for descriptions.

Required Software

See Table 58 on page 214 for requirements.

Nonraised-Floor Installations

IBM recommends raceways for office floor and other above-floor installations to protect cables from being damaged.

Cable Routing (10Base-T Cabling)

Figure 67 represents the 10Base-T cable routing to the IBM Network Terminal Accelerator adapter (2048 session) feature installed in an SP frame.

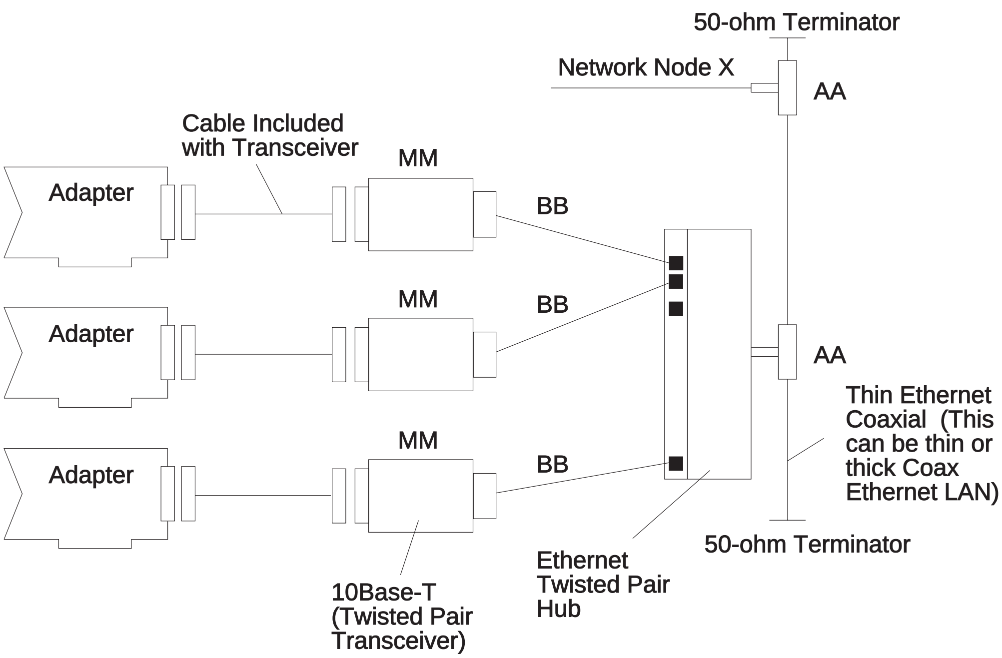


Figure 67. IBM Network Terminal Accelerator for Processor Cabling (10Base-T)

Table 102 (Page 1 of 2). Cable Information for IBM Network Terminal Accelerator (2048 Session)

Cable Letter	Cable Description	Part Number	Feature Code	Length m (ft)
AA	Customer-supplied coaxial T-shaped or L-shaped connector is recommended.	N/A	N/A	N/A

Table 102 (Page 2 of 2). Cable Information for IBM Network Terminal Accelerator (2048 Session)				
Cable Letter	**Cable Description**	**Part Number**	**Feature Code**	**Length m (ft)**
BB	Customer-supplied RJ-45 twisted-pair cable.	N/A	N/A	N/A
MM	Ethernet 10Base-T transceiver cable (feature code includes cable).	02G7429 02G7434	4224	1 (3)

Cable Routing (10Base-2 Cabling)

Figure 68 represents the 10Base-2 cable routing to the IBM Network Terminal Accelerator adapter (2048 session) feature installed in an SP frame.

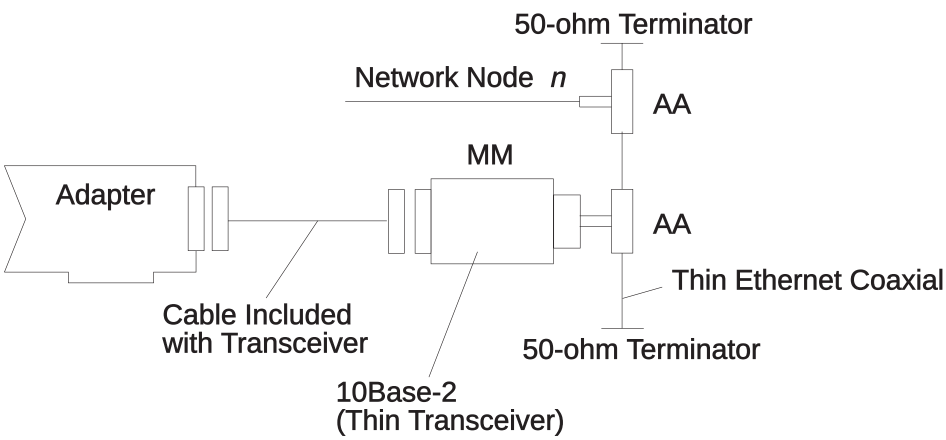


Figure 68. IBM Network Terminal Accelerator for Processor Cabling (10Base-2)

Table 103. Cable Information for IBM Network Terminal Accelerator (2048 Session)				
Cable Letter	**Cable Description**	**Part Number**	**Feature Code**	**Length m (ft)**
AA	Customer-supplied coaxial T-shaped or L-shaped connector is recommended.	N/A	N/A	N/A
MM	Ethernet 10Base-2 transceiver cable (feature code includes cable).	02G7435	4223	1 (3)

SCSI-2 Differential Fast/Wide Adapter/A (F/C 2416) MCA

The SCSI-2 Differential Fast/Wide feature (**F/C 2416**) is a dual-ported fast (10 MHz) and wide (two bytes) adapter. It provides synchronous SCSI bus rates up to 20 Mbps and attaches to SCSI fixed disks, CD-ROM devices, tape drives, R/W optical devices, and storage subsystems. The maximum data rate depends on the maximum rate of the attached device.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Provides an adapter that conforms to ANSI Doc X3T9.2/86-109 (Revision 10H)
- Accepts multiple commands per device from your RS/6000 SP system
- Supports a SCSI-2 Fast/Wide data rate of up to 20 megabytes per second (synchronous protocol)
- Acts as a SCSI-2 Fast/Wide initiator (command issuer)
- Acts as a SCSI-2 Fast/Wide target of commands from another initiator
- Provides SCSI-2 Fast/Wide parity support
- Requires one Micro Channel adapter (MCA) slot
- Supports a maximum of two adapters per RS/6000 SP thin processor node and four adapters per wide processor node
- Supports command tagged queuing (as SCSI-2 Fast/Wide initiator)

Feature Components

IBM provides the SCSI-2 Differential Fast/Wide adapter card.

Customer Components

You must supply the following components for this feature:

- Cables from the adapter (ordered with IBM 9334 Differential Expansion Units)
- Direct access storage devices or tape drives

Note: This feature (or F/C 2415) is a corequisite of the internal Fast/Wide DASD features. A wide node Fast/Wide cable (F/C 1240) is required to utilize internal Fast/Wide DASD.

Required Software

This feature (or F/C 2415) is a corequisite of the Fast/Wide DASD features (F/C 3032, 3033 or 3034). The Parallel System Support Programs (PSSP) Version 1, Release 2, must be installed when utilizing Fast/Wide DASD. (See Table 59 on page 222 for DASD sizes and feature notes).

See Table 58 on page 214 for requirements.

Site Preparation

Site planning for the SCSI-2 Differential Fast/Wide feature involves preparing for the installation of the I/O cables attached to the RS/6000 SP frame from the IBM 9334 Differential Expansion Units.

SCSI-2 Differential F/W Cable Routing

"SCSI-2 Differential High Performance External I/O Controller (F/C 2420) MCA" on page 316 represents the cable routing to the SCSI-2 Differential Fast/Wide feature installed in a SP frame, from an IBM 9076 SP Frame to an IBM 7015 Expansion Rack.

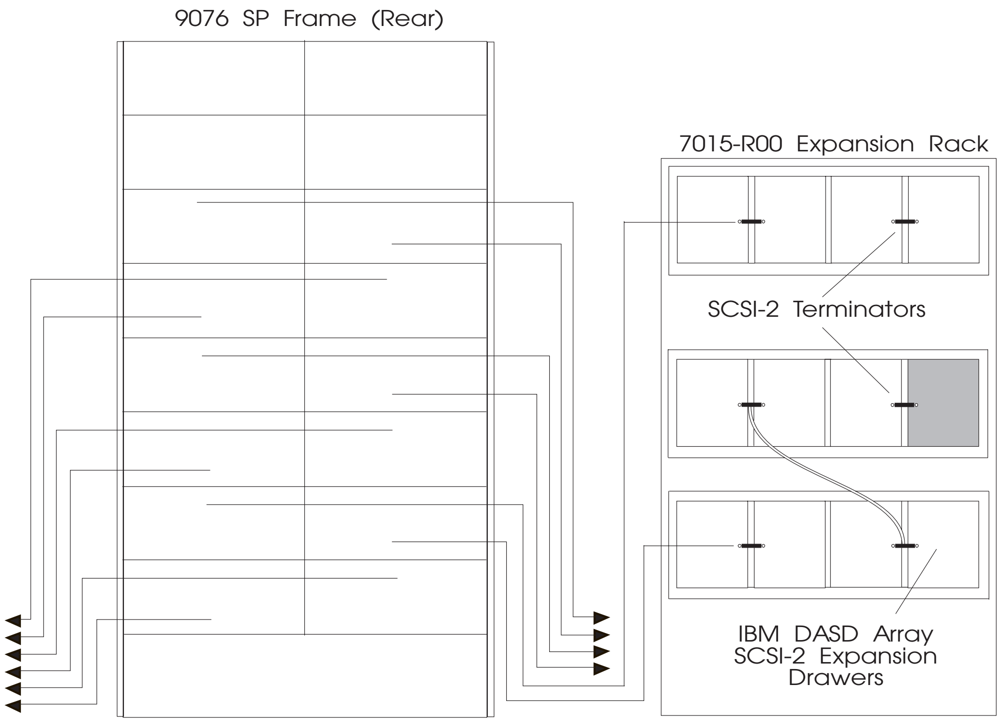


Figure 69. SCSI-2 Fast/Wide Configuration for Processor Cabling

External Cable Routing

The SP uses a maximum of 120 inches of SCSI-2 Fast/Wide cable budget. Table 104 on page 316 shows the cable budget needed to reach individual nodes in an SP frame.

Table 104. Cable Budget Information for SCSI-2 Fast/Wide Feature		
To Node	**Measured in Millimeters**	**Measured in Inches**
1	1780	71
2	1500	59
3	1680	66
4	1980	78
5	2160	85
6	1850	73
7	2030	80
8	2340	92
9	2510	99
10	2210	87
11	2390	94
12	2690	106
13	2870	113
14	2570	101
15	2740	108
16	3050	120

SCSI-2 Differential High Performance External I/O Controller (F/C 2420) MCA

The SCSI-2 Differential External I/O Controller feature (**F/C 2420**) allows you to attach external SCSI-2 differential devices. This adapter provides SCSI bus signal cable quality and a maximum SCSI bus length of up to 19 meters (62.3 feet).

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Provides an adapter that conforms to ANSI Doc X3T9.2/86-109 (Revision 10H)
- Accepts multiple commands per device from your SP system
- Supports a data rate of up to 10 megabytes per second (synchronous protocol)
- Acts as a SCSI-2 initiator (command issuer)
- Acts as a SCSI-2 target of commands from another initiator
- Provides SCSI-2 parity support
- Requires one Micro Channel adapter (MCA) slot
- Supports a maximum of two adapters per SP thin processor node and four adapters per wide processor node
- Supports command tagged queuing (as SCSI-2 initiator)

Feature Components

IBM provides the SCSI-2 Differential External I/O adapter card.

Customer Components

You must supply the following components for this feature:

- Cables to the adapter (ordered with IBM 9334 Differential Expansion Units)
- Direct access storage devices or tape drives

Required Software

See Table 58 on page 214 for requirements.

Site Preparation

Site planning for this feature involves preparing for the installation of the I/O cables attached to the RS/6000 SP frame from the IBM 9334 Differential Expansion Unit(s).

SCSI-2 Cable Routing

Figure 70 represents the cable routing to the SCSI-2 Differential External feature installed in an SP frame from an IBM 9076 SP Frame to an IBM 7015 Expansion Rack.

I/O Configuration for Processor Cabling

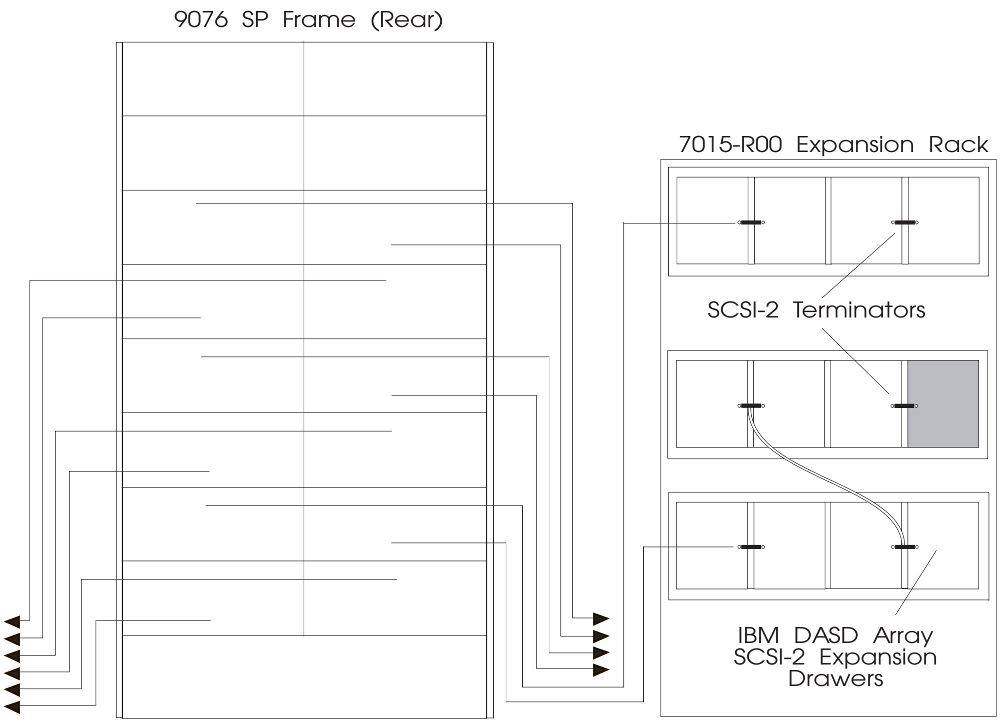


Figure 70. SCSI-2 Differential External

External Cable Routing

Table 105 shows cable budget information for individual nodes within the RS/6000 SP frame with the adapter feature installed. The distances are measured from the back of the processor node to the floor. The SP uses a maximum of 120 inches of SCSI-2 Differential External feature cable budget.

Table 105. Cable Budget Information for SCSI-2 Differential External I/O Feature

To Node	Measured in Millimeters	Measured in Inches
1	1780	71
2	1500	59
3	1680	66
4	1980	78
5	2160	85
6	1850	73
7	2030	80
8	2340	92
9	2510	99
10	2210	87
11	2390	94
12	2690	106
13	2870	113
14	2570	101
15	2740	108
16	3050	120

8-Port Async Adapter - EIA-422A - (F/C 2940) MCA

The 8-port Async feature (**F/C 2940**) provides the RS/6000 500 series system with up to eight EIA-422A asynchronous serial devices such as terminals and printers. The 8-port Async adapter contains all of the electronics required to support eight asynchronous ports and uses one I/O card slot.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Provides data rates up to 38.4 Kbps per port
- Supports 16-byte buffering on transmit and receive
- Provides surge protection circuitry
- Supports the TxD and RxD interface signals
- Requires a standard Micro Channel form factor card
- Provides 8-bit/16-bit Micro Channel slave interface
- Complies with requirements for EIA-422A
- Supports cabling up to 1200 meters (4000 feet)
- A maximum of seven adapters per SP frame can be installed and they must be installed in the bottom four shelves of an SP frame.

Feature Components

IBM provides the 8-port Async adapter EIA-422A, which is designed to comply with requirements for EIA-422A. The eight connectors for device attachment are provided in a Multiport Interface Cable (F/C 2995).

Customer Components

See Table 106 for descriptions.

Required Software

See Table 58 on page 214 for requirements.

Nonraised-Floor Installations

IBM recommends raceways for office floor and other above-floor installations to protect cables from being damaged.

Cable Routing

Figure 71 represents the cable routing to the 8-port Async adapter EIA-422A feature installed in an SP frame.

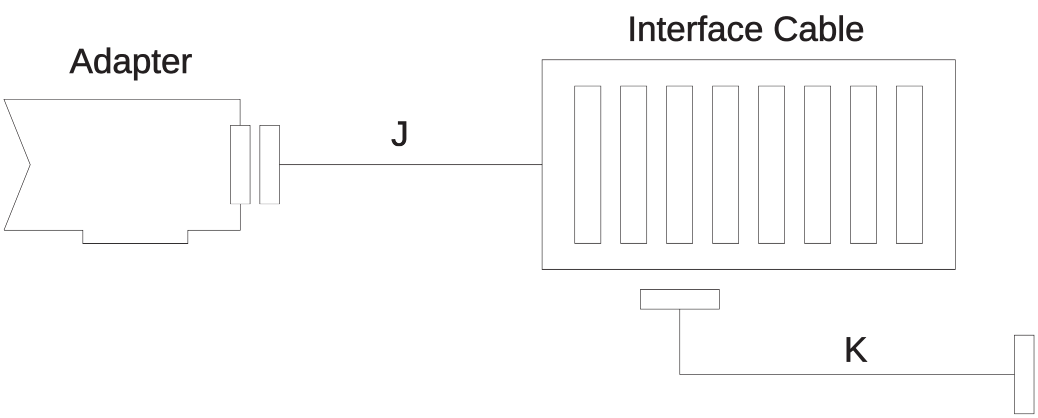


Figure 71. 8-Port Async Adapter EIA-422A for Processor Cabling

Table 106. Cable Information for 8-Port Async Adapter - EIA-422A

Cable Letter	Cable Description	Part Number	Feature Code	Length m (ft)
J	Part of cable assembly Cable and box	00F5531 00F5524	2995	3 (10)
K	Terminal cable-EIA-422A, if customer-supplied, must meet EIA-422A requirements	30F8966	2945	20 (65.5)

TURBOWAYS 100 ATM Adapter (F/C 2984) MCA

The TURBOWAYS 100 ATM adapter (**F/C 2984**) enables TCP/IP applications to work in an asynchronous transfer mode (ATM) environment. One virtual connection dedicated to each IP address and a transformation of each IP address to the corresponding virtual connection is performed.

The initial release supports AAL-5 adaptation layer interface and supports 1024 active virtual connections.

Feature Characteristics and Requirements

This feature has the following characteristics and requirements:

- Provides self configuration, no system monitor support
- Provides signaling channel setup
- Provides bandwidth allocation and management
- Provides reliable, connection-oriented pipe between the SVC component and the ATM switch
- Provides virtual connection setup and tear down
- Processes messages sent by the switch
- Process synchronization
- Provides Micro Channel streaming
- Handles hardware and software interrupts
- Provides diagnosis
- Supports a maximum of two adapters per node

Customer Components

You must supply the following components with this feature:

- The multimode fiber interface cables
- An ATM switch

Notes:

1. EMEA: Order these components through CABLEX ordering system.
2. You can connect optical ports using 62.5 micron multimode fiber, terminated with SC industry standard connectors.

Required Software

This feature requires the following software:

- For TURBOWAYS 100 ATM, the separately ordered TURBOWAYS 100 ATM Device Driver (5056-030 F/C 5063) and any updates

  Also, AIX Version 3.2.5 shipped after 6/3/94 (labelled Version 3.2.5 3250-01-04). If you have AIX Version 4.1.4 shipped after 10/20/95, the device driver is part of the AIX Base Operating System.

- If you elect to install network management facilities, the SNMP (Simple Network Management Protocol) agent function must be configured and you must install an SNMP manager such as IBM NetView/6000.

See Table 58 on page 214 for requirements.

ATM Cable Routing

Figure 72 shows typical ATM cabling from the SP frame to a customer-supplied ATM switch. Customer-supplied ATM cables requires an "SC" type connector at the ATM adapter end. Connector requirements at the switch end may vary. The cable type is 62.5/125um multimode fiber.

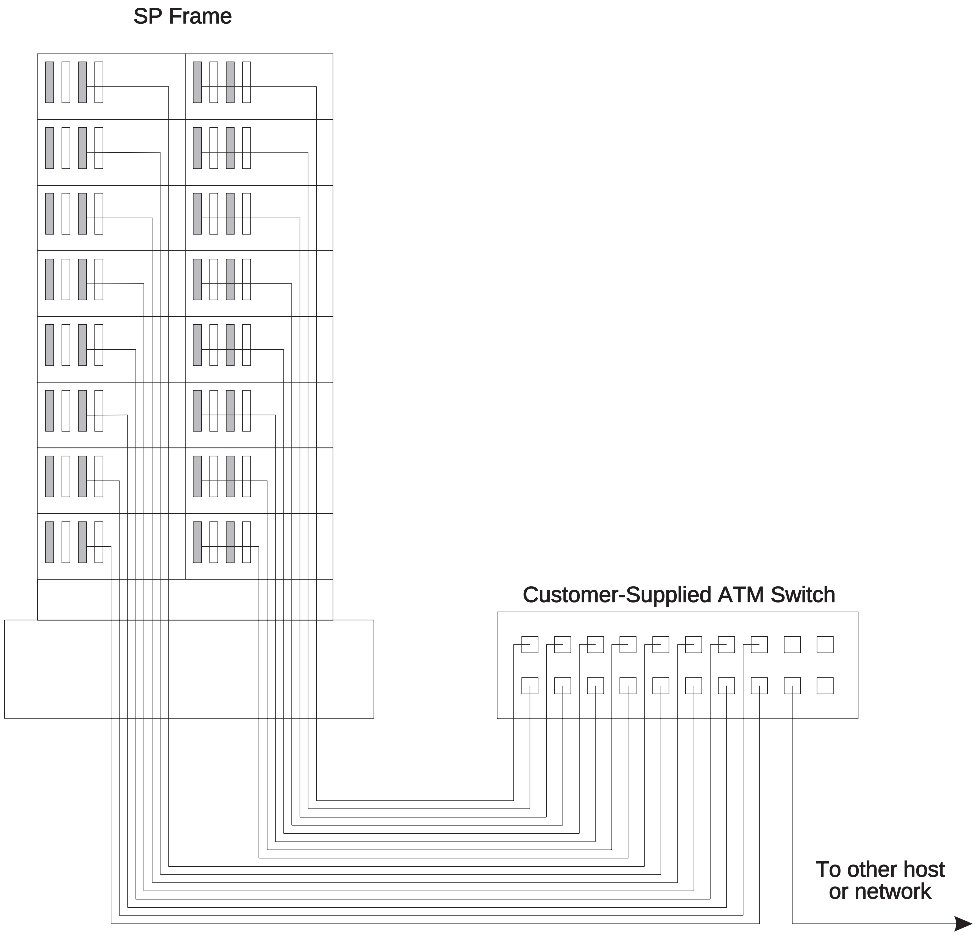


Figure 72. Typical ATM Cabling for the SP System

SCSI-2 Fast/Wide SE PCI Adapter 4-A (F/C 6208)

The PCI SCSI-2 Fast/Wide Single Ended Adapter **(F/C 6208)** provides a single ended SCSI-2 Fast/Wide interface that can burst data between devices on the SCSI bus at 20 MBps. It conforms to SCSI-2 standards and supports Fast/Wide synchronous data rates of up to 10 MHz. Feature code 6208 supports both internal and external devices connected to the same SCSI bus.

Feature Characteristics

This feature has the following characteristics:

- 32-bit Bus Master Adapter
- Supports attachment of internal and external single ended 8-bit and 16-bit SCSI devices.
  - External connections on J2 with 68 pin SCSI-3 standard P connector

– Internal connections on J3 with 68 pin high density SCSI connector for 16-bit attachments and on J4 with 50 pin SCSI connector for 8-bit attachments

Note: The J3 and J4 connectors **cannot** be used at the same time.

Customer Components

You must supply the following components for this feature:

- If you are using F/C 6208 to connect internal DASD in an 332 MHz SMP wide node, you must also order F/C 1241.

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot per adapter.

Note: Single Ended (SE) SCSI adapters **cannot** interoperate with Differential SCSI adapters in twin-tailed (high availability) configurations.

Software Requirements

This feature has the following software requirements:

- AIX 4.2.1 or later installed on the node
- PSSP 2.4 or later installed on the node

F/C 6208 Cable Options

The following optional cables are available for the F/C 6208 SCSI adapter:

F/C 2117 16-bit SE external Y-cable, 0.9 m

F/C 2424 16-bit adapter-to-adapter SCSI cable, 0.6 m long

F/C 2425 16-bit adapter-to-adapter SCSI cable, 2.5 m long

All cables must conform to X3T9.2/90-048 standards.

Note: Due to the short length of PCI SCSI cables, you must pay close attention to cable planning. You may want to limit these adapters to the lower nodes in a frame and you will want to consider such issues as frame layout and service clearances as you plan your system configuration.

SCSI-2 F/W Cable Routing

Figure 73 on page 323 represents the cable routing to the SCSI-2 Single End Fast/Wide feature installed in an SP frame, from an IBM 9076 SP Frame to an IBM 7015 Expansion Rack.

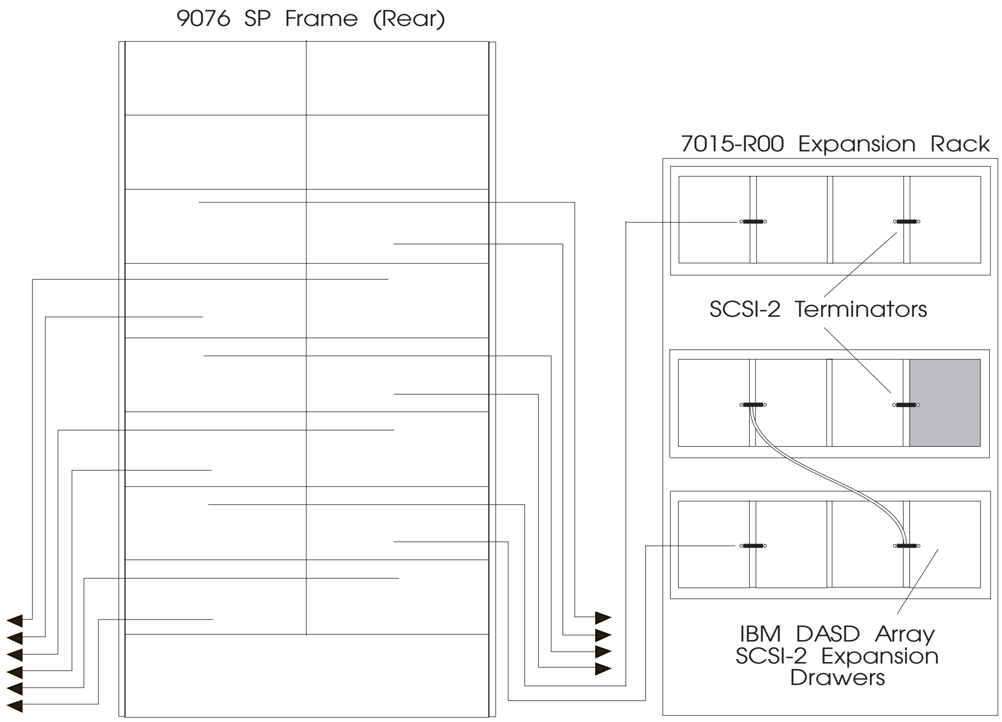


Figure 73. SCSI-2 Fast/Wide Configuration for Processor Cabling

External Cable Routing

The SP uses a maximum of 120 inches of SCSI-2 Fast/Wide cable to reach the most distant node in a frame. Table 107 on page 324 shows the cable budget needed to reach individual nodes in an SP frame. Subtracting these values from the overall cable length will give you the cable length available to reach other devices.

Note: When an external cable is connected to F/C 6207, maximum cable length is 3 m for this adapter.

Table 107. Cable Budget Information for SCSI-2 Fast/Wide Feature		
To Node	**Measured in Millimeters**	**Measured in Inches**
1	1780	71
2	1500	59
3	1680	66
4	1980	78
5	2160	85
6	1850	73
7	2030	80
8	2340	92
9	2510	99
10	2210	87
11	2390	94
12	2690	106
13	2870	113
14	2570	101
15	2740	108
16	3050	120

SCSI-2 Fast/Wide DE PCI Adapter 4-B (F/C 6209)

The PCI SCSI-2 Fast/Wide Differential Adapter **(F/C 6209)** provides a differential SCSI-2 Fast/Wide interface that can burst data between devices on the SCSI bus at 20 MBps. It conforms to SCSI-2 standards and supports Fast/Wide synchronous data rates of up to 10 MHz. Feature Code 6209 supports external devices connected to the same SCSI bus.

Feature Characteristics

This feature has the following characteristics:

- 32-bit Bus Master Adapter
- Supports attachment of external 16-bit SCSI devices on the J2 port using a 68 pin SCSI-3 standard P connector

Customer Components

None.

Hardware Requirements

This feature has the following hardware requirements:

- One Peripheral Component Interconnect (PCI) adapter slot per adapter

Note: Single Ended (SE) and Double Ended SCSI adapters **cannot** be twin-tailed to the same external disk array when used in a high-availability configuration.

Software Requirements

This feature has the following software requirements:

- AIX 4.2.1 or later installed on the node
- PSSP 2.4 or later installed on the node

F/C 6209 Cable Options

The following optional cables are available for the F/C 6209 SCSI adapter:

F/C 2114 16-bit DE external Y-cable, 0.9 m

F/C 2424 16-bit adapter-to-adapter SCSI cable, 0.6 m long

F/C 2425 16-bit adapter-to-adapter SCSI cable, 2.5 m long

All cables must conform to X3T9.2/90-048 standards.

Note: Due to the short length of PCI SCSI cables, you must pay close attention to cable planning. You may want to limit these adapters to the lower nodes in a frame and you will want to consider such issues as frame layout and service clearances as you plan your system configuration.

SCSI-2 F/W Cable Routing

Figure 74 represents the cable routing to the SCSI-2 Differential Fast/Wide feature installed in an SP frame, from an IBM 9076 SP Frame to an IBM 7015 Expansion Rack.

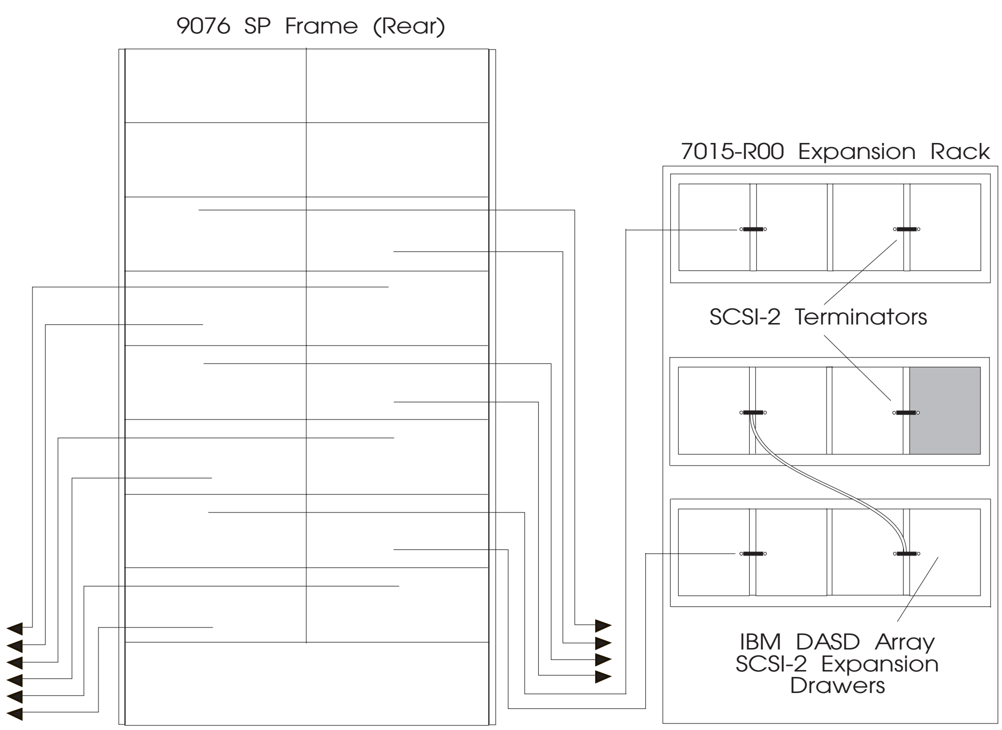


Figure 74. SCSI-2 Fast/Wide Configuration for Processor Cabling

External Cable Routing

The SP uses a maximum of 120 inches of SCSI-2 Fast/Wide cable to reach the most distant node in a frame. Table 108 shows the cable budget needed to reach individual nodes in an SP frame. Subtracting these values from the overall cable length will give you the cable length available to reach other devices. Remember, F/C 6209 supports a maximum cable length of 25 m.

Table 108. Cable Budget Information for SCSI-2 Fast/Wide Feature

To Node	Measured in Millimeters	Measured in Inches
1	1780	71
2	1500	59
3	1680	66
4	1980	78
5	2160	85
6	1850	73
7	2030	80
8	2340	92
9	2510	99
10	2210	87
11	2390	94
12	2690	106
13	2870	113
14	2570	101
15	2740	108
16	3050	120

SSA RAID 5 PCI Adapter (F/C 6215)

The PCI SSA RAID 5 Adapter supports RAID 5 SSA disk arrays and can be used to access non-RAID disks between multiple hosts. It has the capability to improve write response time in the single initiator mode for both RAID and non-RAID disks by the addition of the Fast-Write Cache Option (F/C 6222).

Devices Supported by F/C 6215

- All 7133 models
- 7131-405 internal RS/6000 SSA disk drive configurations
- The NAPA optical extender

Feature Characteristics and Requirements

- 32-bit PCI bus
- Support for floating hot spares on the same loop
- RAID 5 arrays from (2+P) up to (15+P)
- Up to 6 (15+P) or 32 (2+P) RAID 5 array groups per adapter
- All members of a RAID 5 array must be on the same SSA loop

Required Software

This feature has the following software requirements:

- AIX 4.2.1 or later installed on the node
- PSSP 2.4 or later installed on the node
- Adapter device driver and FDDI common code (provided with adapter)

Withdrawn Models and Frames

This section contains reference information for all withdrawn frames and models.

Withdrawn Model and Frame Overview

SP System Hardware Revision

With the introduction of the revised SP frame designs, all previous SP frames and the corresponding system feature codes have been withdrawn from production. The information in this section is included for reference purposes only.

A 79 inch frame has eight drawers and can house up to 16 thin nodes, eight wide nodes, or four high nodes. A 49 inch frame has four drawers and can therefore house up to eight thin nodes, four wide nodes, or two high nodes. All three types of nodes can be mixed together in both frames.

The RS/6000 SP frame contains redundant power supplies; if one power supply fails, another takes over. The frame is also designed for concurrent maintenance; each processor node can be removed and repaired without interrupting operations on the other nodes.

Both 79 inch and 49 inch frames will fit into one of four categories depending on how your SP system is configured. These categories are:

- Model frame.
- Expansion frame.
- Switch expansion frame.
- Logical switch expansion frame.

The *model frame* is always the first frame in an SP system and it designates the type or "model class" of your SP system. The base level model frame contains a power supply, and either a single high or wide node or a pair of thin nodes. You may add other nodes as frame space permits. If it is a switch capable frame, you may expand your system. Any other frames that you connect to the model frame receives one of the other three designations.

Another type of switch capable frame is the base level *expansion frame*. These frames contain a power supply, an SP switch, and either a single high or wide node or a pair of thin nodes. You may add other nodes as frame space and system configuration rules permit. Up to seven expansion frames may be added to the model frame as SP configuration rules permit. The nodes in the model frame and expansion frames communicate via switch-to-switch data transfers.

Switch expansion frames contain only SP switches; they do not contain any processor nodes. Switch expansion frames are used to connect model frames and switched expansion frames that have maximized the capacity of their integral switch. Switch expansion frames can only transfer data within the local SP system. The base level switch expansion frame contains up to four SP switches. A switch expansion frame with four SP switches will support up to 128 nodes mounted on various configurations of switch capable frames and logical switch expansion frames.

Logical switch expansion frames are added to systems with switch capable frames to take advantage of unused switch ports that result from certain system configurations. For example, some switches have ports to attach up to 16 nodes. If you have a frame with eight wide nodes, the frame is fully populated yet only eight of the sixteen switch ports are used. In this case, you can add logical switch expansion frames to the switch capable frame to take advantage of the eight unused switch ports. Logical switch expansion frames do not contain any switches.

Uniprocessor and SMP Thin Node Pair Alert

Frames which have uniprocessor thin nodes **cannot** be used as nonswitched expansion frames. Similarly if a frame has uniprocessor thin nodes and a switch with unused switch ports, it **cannot** have a nonswitched expansion frame attached to the unused switch ports. Frames having uniprocessor thin nodes installed require an SP switch for expansion.

SMP thin nodes may be used as single thin nodes. Frames having single SMP thin nodes only may be used for expansion and switch sharing. However, if a pair of SMP thin nodes is used, uniprocessor thin node rules apply to expansion and switch sharing.

Withdrawn Model Class Systems

The model classes in the RS/6000 SP system range from a 1.25 m (49 inch) entry system to a highly-parallel, large-scalable system. This section describes the following RS/6000 SP model classes:

Model 2AX Class: No switch, 1 to 8 processor nodes, 1.25 m (49 inch) system
Model 3AX Class: 8-port switch, 1 to 8 processor nodes, 1.25 m (49 inch) system
Model 3BX Class: 8-port switch, 1 to 8 processor nodes, 2.01 m (79 inch)
Model 20X Class: No switch, 1 to 64 processor nodes
Model 30X Class: Single-staged switching, 1 to 80 processor nodes
Model 40X Class: Two-staged switching, 65 to 128 processor nodes (standard configuration, alternate configurations possible)

Withdrawn Model 2AX Class System

The Model 2AX is a 1.25 m (49 inch) system with **no** switch. The system consists of 1 to 8 processor nodes. Each member of the 2AX family comes with the following node types:

- **2AA:** has two integral 160 MHz thin nodes. This model supports a maximum of eight nodes in any combination.
- **2A7:** has an integral 135 MHz wide node. **Requires** either one additional wide node or two additional thin nodes in the first frame. This model supports a maximum of eight nodes in any combination.

- **2A8:** has two integral 120 MHz thin nodes. This model supports a maximum of eight nodes in any combination.
- **2A9:** has an integral 200 MHz (604e) high node. The model frame will take mixed nodes based on placement rules. A total of eight nodes can be supported using expansion frames. If all high nodes are used, your system may have three additional 49 inch expansion frames.

Note:

- 102X expansion frames can be added for additional node drawer space within the total node limits.
- Both the model frame and the expansion frames in a 2AX system have an integral **single phase** power supply.
- Models 2A2, 2A3, 2A4, and 2A5 are out of production.

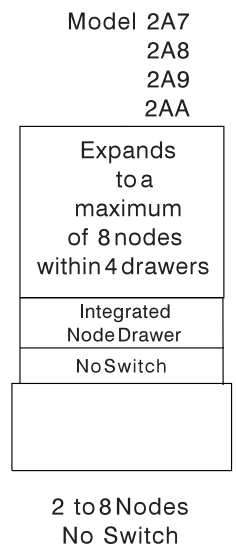


Figure 75. Model 2AX Low-Cost Frame

Withdrawn Model 3AX Class System

The Model 3AX is a 1.25 m (49 inch) system. The system consists of 1–8 processor nodes. The frame **requires** one SP Switch-8 (**F/C 4008**). Also each node **requires** an SP Switch Adapter (**F/C 4020**). Older systems may have a High Performance Switch-LC8 but this switch option is no longer available. Each member of the 3AX family comes with the following node types:

- **3AA:** has two integral 160 MHz thin nodes. This model supports a maximum of eight nodes in any combination.
- **3A7:** has an integral 135 MHz wide node. **Requires** either one additional wide node or two additional thin nodes in the first frame. This model supports a maximum of eight nodes in any combination.
- **3A8:** has two integral 120 MHz thin nodes. This model supports a maximum of eight nodes in any combination.
- **3A9:** has an integral 200 MHz (604e) high node. The model frame will take mixed nodes based on placement rules. A total of eight nodes can be

supported using expansion frames. If all high nodes are used, your system may have three additional 49 inch expansion frames.

Note:

- 102X expansion frames can be added for additional node drawer space within the total node limits.
- Both the model frame and the expansion frames in a 3AX system have an integral **single phase** power supply.
- Models 3A2, 3A3, 3A4, and 3A5 are out of production.
- Older systems may have a High Performance Switch-LC8. This switch option is no longer available for new SP systems however, the switch is available for existing systems.

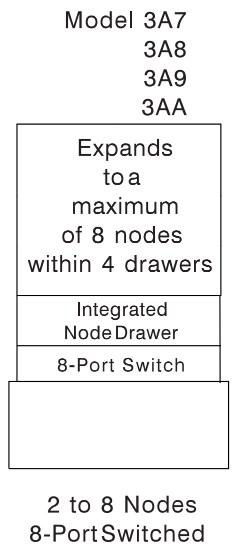


Figure 76. Model 3AX Low-Cost Frame

Withdrawn Model 3BX Class System

The Model 3BX is a 2.01 m (79 inch) frame system. The system consists of 1–8 processor nodes. The frame **requires** one SP Switch-8 (**F/C 4008**). Also each node **requires** an SP Switch Adapter (**F/C 4020**). Each member of the 3BX family comes with the following node types:

- **3BA:** has two integral 160 MHz thin nodes. This model supports a maximum of eight nodes in any node combination.
- **3B7:** has an integral 135 MHz wide node. **Requires** either one additional wide or high node or two additional thin nodes in the first frame. This model supports a maximum of eight nodes in any combination.
- **3B8:** has two integral 120 MHz thin nodes. This model supports a maximum of eight nodes in any node combination.
- **3B9:** has an integral 200 MHz (604e) high node. The model frame will take mixed nodes based on placement rules. A total of eight nodes can be supported.

Note:

- Expansion frames are supported in this system **only if** the model frame is filled before the total node count of eight is reached.
- Both the model frame and the expansion frames in a 3BX system have an integral power supply requiring a **three phase** source.
- Models 3B2, 3B3, 3B4, and 3B5 are out of production.
- Older systems may have a High Performance Switch-LC8. This switch option is no longer available for new SP systems however, the switch is available for existing systems.

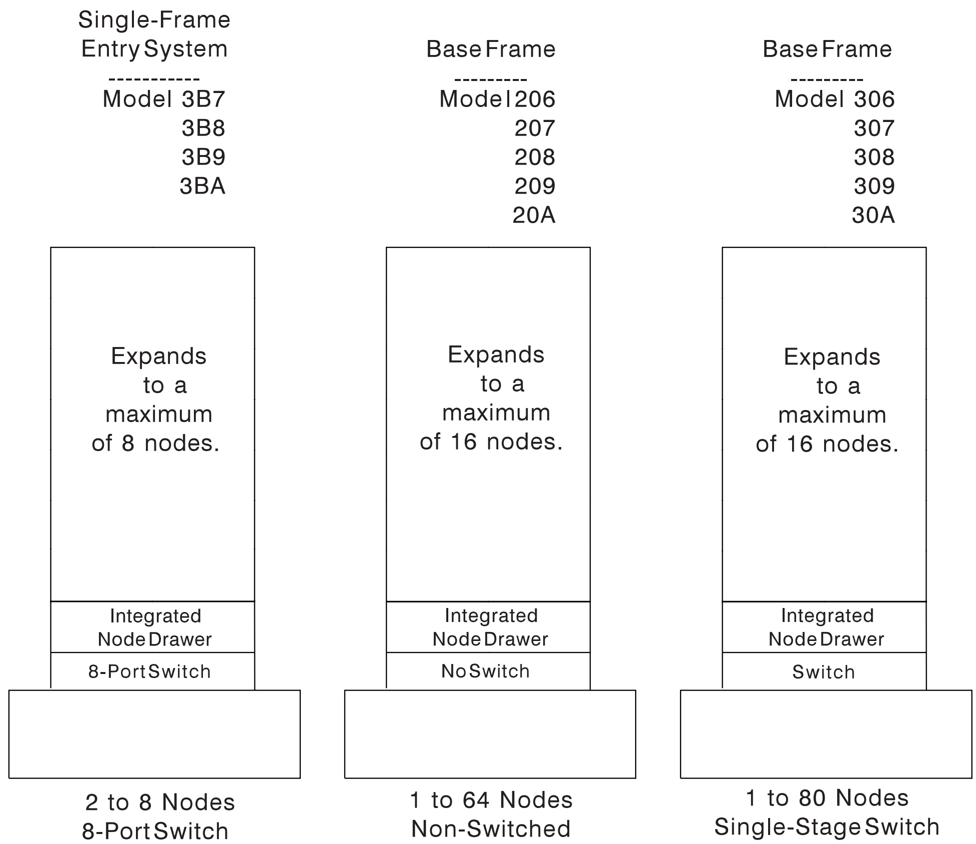


Figure 77. Model 3BX, 20X, and 30X Frames

Withdrawn Model 20X Class System

The Model 20X is a scalable system consisting of 1 to 64 processor nodes mounted in 2.01 m (79 inch) frames. The 20X SP system **does not** support a switch. However, each model in this class supports open systems LAN connectivity, including the Fiber Distributed Data Interface (FDDI) and Ethernet.

Each member of the 20X family comes with the following node types:

- **20A:** has two integral 160 MHz thin nodes.
- **206:** has an integral 112 MHz (604) high node. The model frame will take mixed nodes based on placement rules.
- **207:** has an integral 135 MHz wide node. **Requires** either one additional wide node or two additional thin nodes in the first frame.
- **208:** has two integral 120 MHz thin nodes.

- **209:** has an integral 200 MHz (604e) high node. The model frame will take mixed nodes based on placement rules.

Note:

- Both the model frame and the expansion frames in a 20X system have an integral power supply requiring a **three phase** source.
- Models 202, 203, 204, and 205 are out of production.

Withdrawn Model 30X Class System

The Model 30X is a moderately parallel, scalable system consisting of 1 to 80 processor nodes mounted in 2.01 m (79 inch) frames. However, **no more than** 64 of the 80 nodes may be high nodes. The first frame (the model frame) **requires** one SP Switch (**F/C 4011**). Also each node **requires** an SP Switch Adapter (**F/C 4020**). You may have up to five switch frames in your 30X system.

The Model 30X provides high performance parallel communication and reliable concurrent data transmission using the Internet protocol (IP). Each member of the 30X family comes with the following node types:

- **30A:** has two integral 160 MHz thin nodes.
- **306:** has an integral 112 MHz (604) high node. The model frame will take mixed nodes based on placement rules.
- **307:** has an integral 135 MHz wide node. **Requires** either one additional wide or high node or two additional thin nodes in the first frame.
- **308:** has two integral 120 MHz thin nodes.
- **309:** has an integral 200 MHz (604e) high node. The model frame will take mixed nodes based on placement rules.

Note:

- Both the model frame and the expansion frames in a 30X system have an integral power supply requiring a **three phase** source.
- Models 302, 303, 304, and 305 are out of production.
- Older systems may have a High Performance Switch-LC8. This switch option is no longer available for new SP systems however, the switch is available for existing systems.

Withdrawn Model 40X Class System

The Model 40X is a highly parallel, large scalable system consisting of 65 to 128 processor nodes (standard configuration, other configurations with fewer nodes and more nodes are available, consult your IBM representative for more information) mounted in 2.01 m (79 inch) frames. However, **no more than** 64 of the 128 nodes may be high nodes. This system has a **minimum prerequisite** of two frames and also **requires** a second stage switch frame for high performance parallel communication. This provides reliable concurrent data transmission using the Internet protocol (IP).

The first switching layer is provided by a **mandatory prerequisite** of one SP Switch (**F/C 4011**) per frame. All nodes in the system must have SP Switch Adapter (**F/C 4020**) plugged on each node. See “Switch Overview” on page 73 for more information on the switch. A second switching layer is provided by a switch expansion frame (**F/C 2030/1**), which is a prerequisite on all 40X class systems.

Each member of the 40X family comes with the following node types:

- **40A:** has two integral 160 MHz thin nodes.
- **406:** has an integral 112 MHz (604) high node. The model frame will take mixed nodes based on placement rules.
- **407:** has an integral 135 MHz wide node.
- **408:** has two integral 120 MHz thin nodes.
- **409:** has an integral 200 MHz (604e) high node. The model frame will take mixed nodes based on placement rules.

Note:

- Both the model frame and the expansion frames in a 40X system have an integral power supply requiring a **three phase** source.
- Models 402, 403, 404, and 405 are out of production.
- Older systems may have a High Performance Switch. This switch option is no longer available for new SP systems however, the switch is available for existing systems.

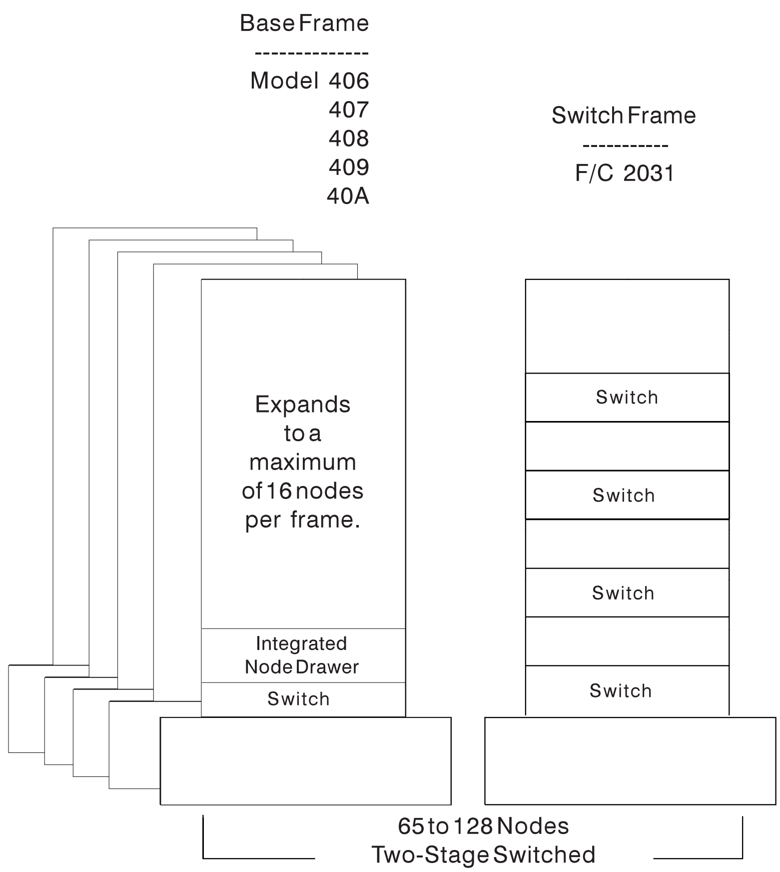


Figure 78. RS/6000 SP Model 40X Base Frames and Switch Frame (F/C 2030/1)

] Withdrawn Model Class System Configurations

Model 20X Class

Figure 79 illustrates the Model 20X class multiple frame configuration. This is a typical configuration, your system may have fewer frames or more frames. Your frame layout will be highly dependent on your building layout.

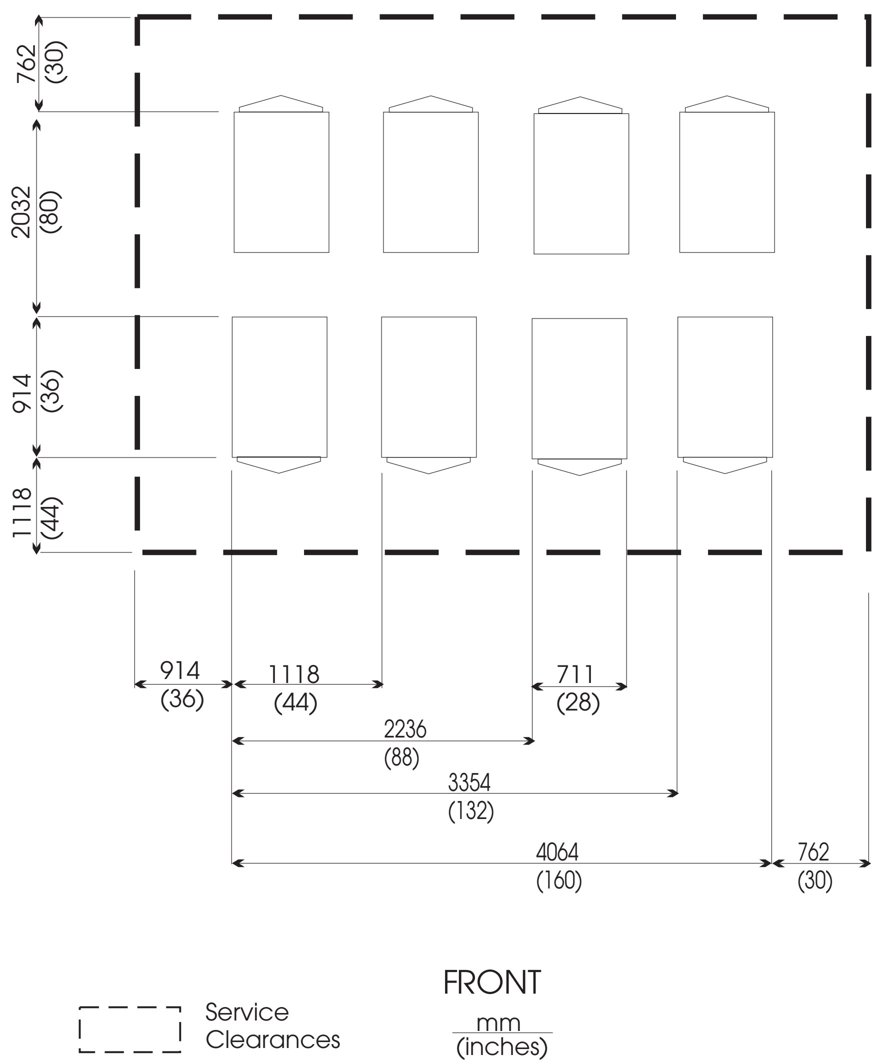


Figure 79. Model 20X Class Multiple Frame Configuration

Note: All dimensions to frame surfaces without covers.

Model 20X Class Multiple Frame Considerations

Number of Frames	1 to 16
Number of Nodes	1 to 64
Service Clearances	See "Service Clearance Specifications for Frames" on page 267 and Figure 82 on page 341
Switch	None
Switch Cables	None

Ground Cables	All frames must be grounded together by connecting each frame to its closest neighbor on each side with the frame-to-frame ground cable (**P/N 46G5695**) The frames must be within 3 meters (10 feet) of each other.
High Voltage Transformer	See "Withdrawn Power Distribution Unit (PDU)" on page 351 for information related to this obsolete feature.

Model 30X Class

Figure 80 illustrates the Model 30X class multiple frame configuration. This is a typical configuration, your system may have fewer frames or more frames. Your frame layout will be highly dependent on your building layout.

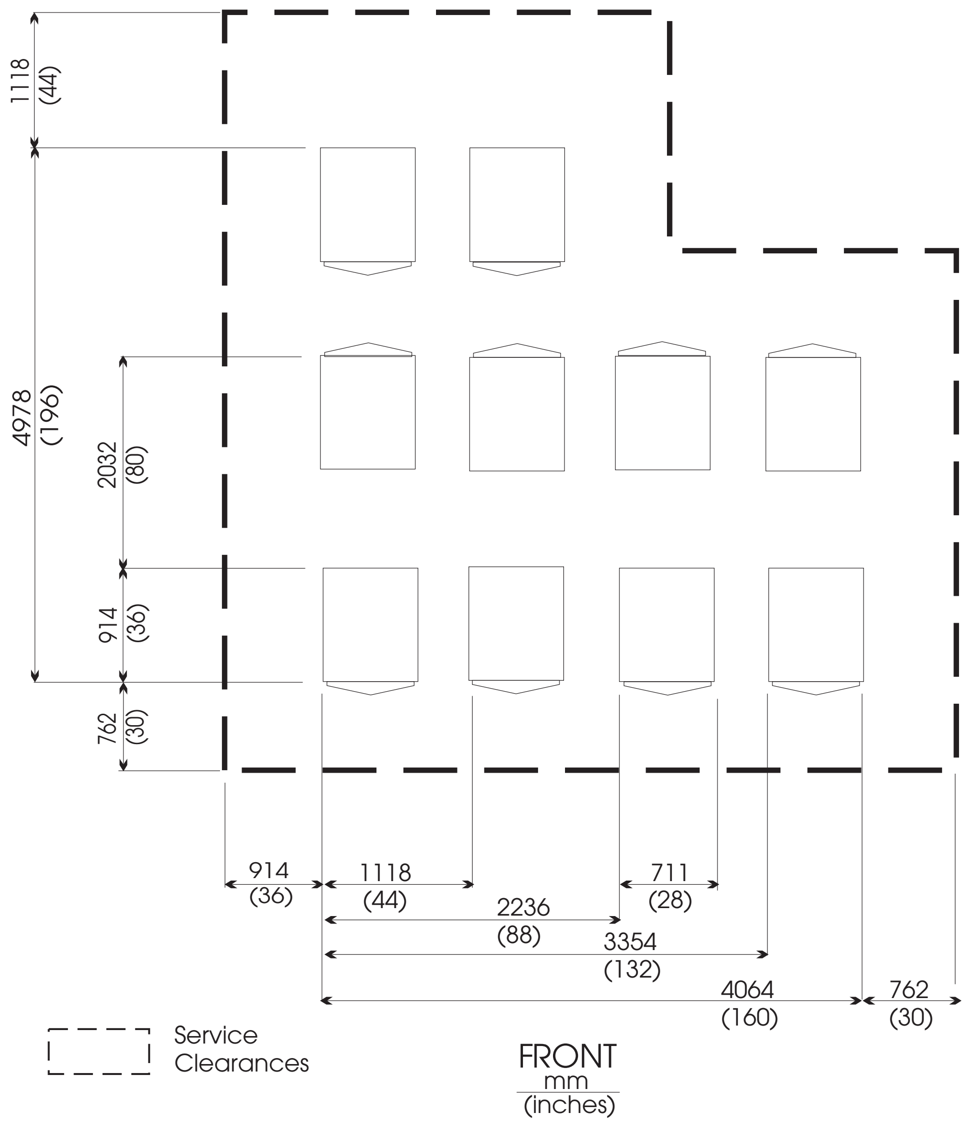


Figure 80. Model 30X Class Multiple Frame Configuration

Note: All dimensions to frame surfaces without covers.

Model 30X Class Multiple Frame Considerations

Number of Frames	1 to 18
Number of Nodes	1 to 80
Service Clearances	See "Service Clearance Specifications for Frames" on page 267 and Figure 82 on page 341
Switch	One per frame except for F/Cs 1016, 1017, and 1019 which do not have switches mounted in the frame.
Switch (External) Cables	5 meter, 10 meter and 15 meter customer selectable
Ground Cables	All frames must be grounded together by connecting each frame to its closest neighbor on each side with the frame-to-frame ground cable (**P/N 46G5695**). The frames must be within 3 meters (10 feet) of each other.
High Voltage Transformer	See "Withdrawn Power Distribution Unit (PDU)" on page 351 for information related to this obsolete feature.

Model 40X Class

Figure 81 on page 337 illustrates the Model 40X class multiple frame configuration. This is a typical configuration, your system may have fewer frames or more frames. Your frame layout will be highly dependent on your building layout.

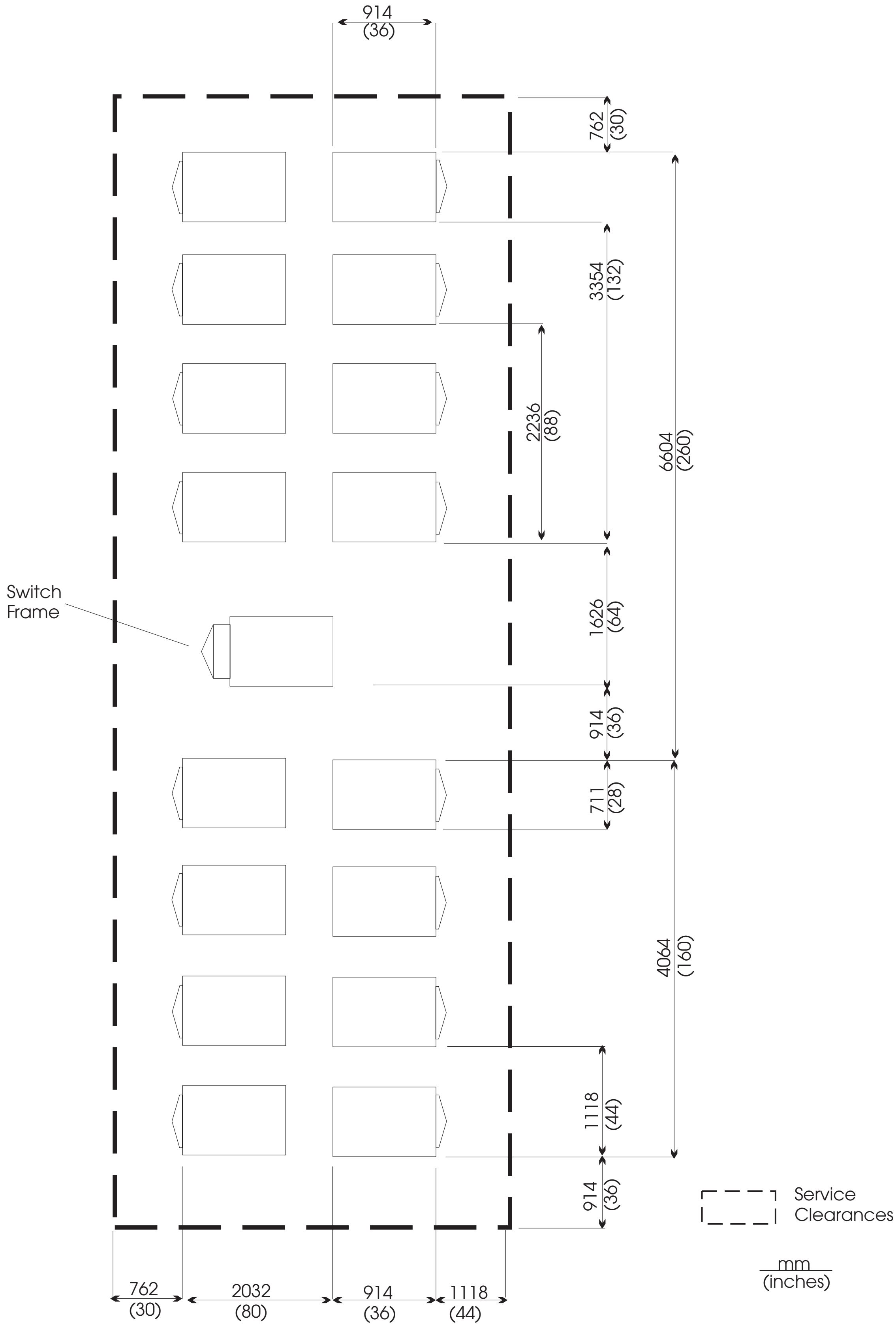


Figure 81. Model 40X Class Multiple Frame Configuration

Model 40X Class Multiple Frame Considerations

Number of Frames 1 to 24 plus one switch frame allows up to 25 frames in the standard configuration. Consult your IBM representative for more information.

Number of Switch Frames One in the standard configuration. Consult your IBM representative for more information.

Number of Nodes 65 to 128 (standard), configurations with fewer nodes or more nodes are possible. Consult your IBM representative for more information.

Service Clearances See "Service Clearance Specifications for Frames" on page 267 and Figure 82 on page 341

Switch Model frames and expansion frames have one switch per frame. F/Cs 1016, 1017, and 1019 are logical switch expansion frames and do not have switches mounted in the frame.

The switch frame (F/C 2031), which is required in the 40X system, has four switches (and no processor nodes) in the standard configuration.

Switch (External) Cables 5 meter, 10 meter and 15 meter customer selectable

Ground Cables All frames must be grounded together by connecting each frame to its closest neighbor on each side with the frame-to-frame ground cable (**P/N 46G5695**). The frames must be within 3 meters (10 feet) of each other.

High Voltage Transformer See "Withdrawn Power Distribution Unit (PDU)" on page 351 for information related to this obsolete feature.

Note: All dimensions to frame surfaces without covers.

] Withdrawn 2.01 m Frame Dimensions and Weights

Table 109 provides information on the physical dimensions and weights of the 2.01 m (79 in.) frame with covers.

Table 109. Dimensions and Weights of the 2.01 m Frame (with covers)

Specification	**Dimensions (with covers)**
Width	915 millimeters (36 inches)
Depth	1118 millimeters (44 inches)
Height	2007 millimeters (79 inches)
Weight • Minimum Base Configuration • Maximum Populated Configuration	 • 398 kilograms (875 pounds) • 759 kilograms (1670 pounds)

] Withdrawn SP Switch Frames Produced Before 4/98 (F/Cs 2030/1)

Table 110 provides information on the physical dimensions and weights of SP Switch Frames (F/C 2030/1) with covers.

Table 110. Dimensions and Weights of Switch Frames (F/C 2030/1) (with covers)

Specification	Dimensions and Weights
Width	915 mm (36 in.)
Depth	1422 mm (56 in.)
Height	2007 mm (79 in.)
Weight • 4 Switches (Basic Frame)	 • 499 kg (1100 lbs.)

Withdrawn 2.01 m Frame Shipping Containers

All 2.01 frames are packaged in two reusable wooden containers, with the first containing the 2.01 m frame assembly and the second containing the covers and ship group items.

Table 111 describes the physical dimensions and weights of the shipping container for the 2.01 m (79 in.) frame assembly.

Table 111. Dimensions and Weights of Shipping Containers for 2.01 m Frame Assembly

Specification	Dimensions and Weights
Length	1069 millimeters (42 inches)
Width	915 millimeters (36 inches)
Height	2274 millimeters (89.5 inches)
Weight (loaded)	680 kilograms (1500 pounds)
Weight (empty)	113 kilograms (250 pounds)

Table 112 describes the physical dimensions of the container for the 2.01 m frame covers and ship group items.

Table 112. Dimensions and Weights of Shipping Container for 2.01 m (79 in.) Frame Covers and Ship Group Items

Specification	Dimensions and Weights
Length	1069 millimeters (42 inches)
Width	864 millimeters (34 inches)
Height	2218 millimeters (87.3 inches)
Weight (loaded)	281 kilograms (620 pounds)
Weight (empty)	113 kilograms (250 pounds)

Withdrawn Frame Service Clearances

Withdrawn 2.01 m Frame Service Clearances

Table 113 provides information on service clearance for 2.01 m (79 in.) SP frames.

Table 113. Service Clearances for Withdrawn 2.01 m (79 in.) Frames

Service Area	**Dimensions** *(See Figure 82 on page 341 and Figure 86 on page 348)*
Front	1118 mm (44 in.)
Rear	762 mm (30 in.)
Sides	For left side of farthest left frame in a row: • 914 mm (36 in.) (If this cannot be accommodated, a front clearance of 1525 mm (60 in.) is required.) **Notes:** 1. 36 in. is required on the left side of the left frame because that is the side on which the ladder will be placed during service. (The door opens toward the right side.) If that is not possible, 60 in. of front clearance are required, as the ladder will have to be placed at the front, with room for the wide nodes to be removed or put into service position. 2. When four or more frames are installed in a row, there must be a minimum of 36 in. between each fourth and fifth frame to allow service personnel sufficient time to access both sides of the frames during maintenance. For right side of farthest right frame in a row: • 762 mm (30 in.)
Ceiling	Recommended distances: 2438 mm (96 in.) from floor to ceiling, or 406 mm (16 in.) from the top of the frame to the ceiling.
Note: Side-by-side placement of frames is driven by raised/non-raised floor load ratings. It is recommended that spacing between frame corners be at least 406 mm (16 in.).	

Service Clearances and Weight Distribution for Withdrawn 2.01 m Frames (Not to Scale)

Figure 82 illustrates the service clearances and weight distribution for the withdrawn 2.01 m (79 in.) frame.

Note: Clearance dimensions are shown to the frame, not the skirts. Side clearances shown in this illustration may vary. See Table 113 on page 340 for specific dimensions.

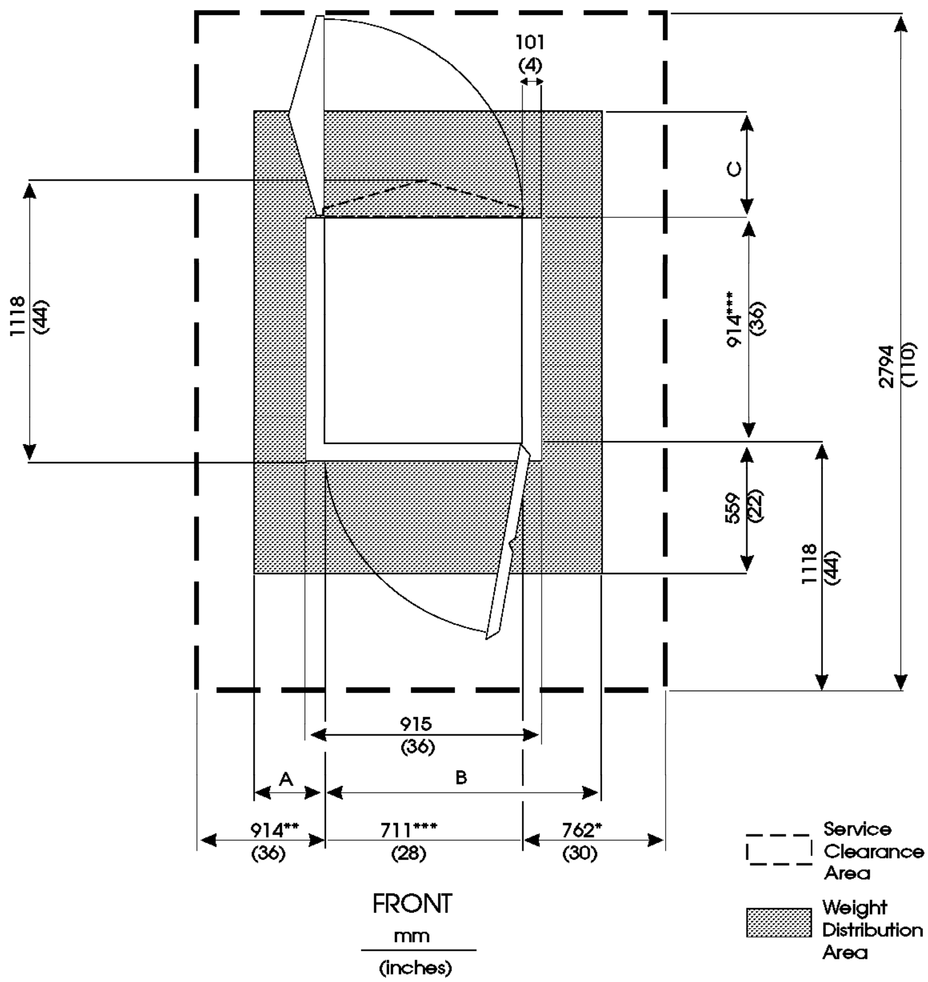


Figure 82. Service Clearances and Weight Distribution for Withdrawn 2.01 m Frames (Not to Scale)

* Right-Hand Side Service Clearance For Last Frame In Row
** Left-Hand Side Service Clearance For Last Frame In Row
***Actual Frame Dimensions

Cut-away View of the Withdrawn 2.01 m Frame

The following figure details the location and size of the casters, leveling pads, ac power cord, and input/output cable egress on the base of the RS/6000 SP frame. Dimensions are shown in mm and in.. See “Frame Tie-down Considerations” on page 256 for information on seismic protection.

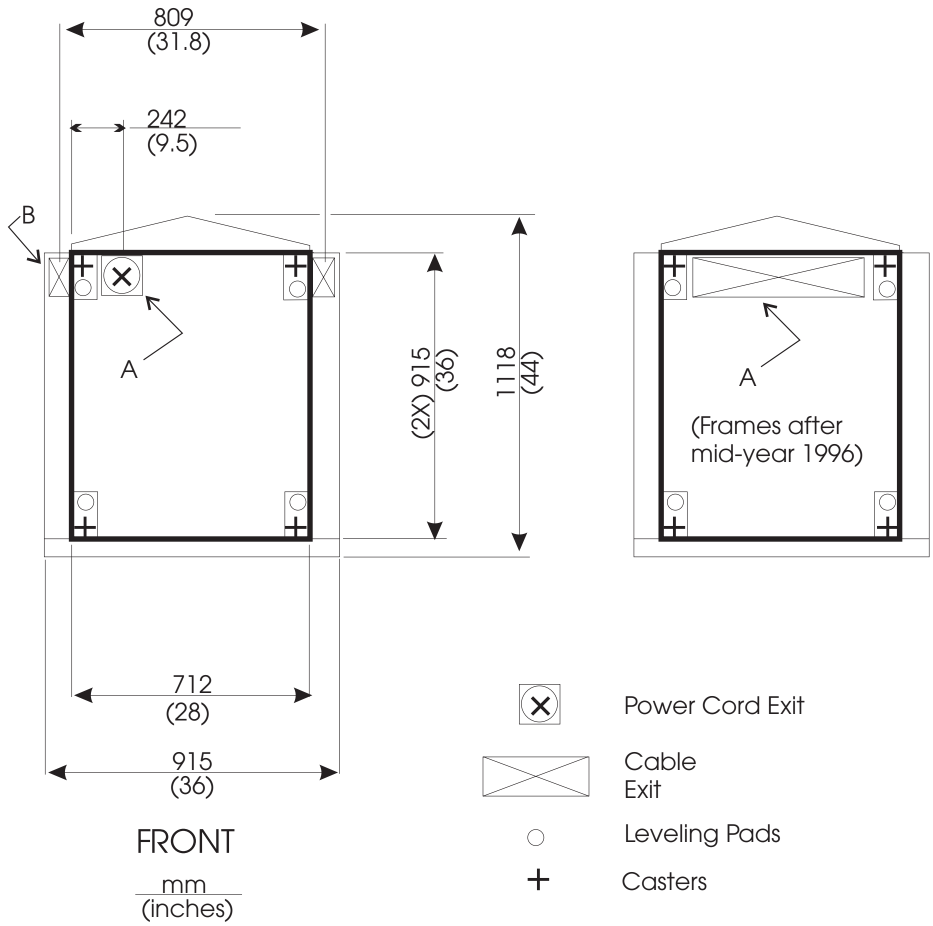


Figure 83. Floor Cutout Dimensions for the Withdrawn SP 2.01 m (79 in.) Frame.

This figure details the location of the casters, leveling pads (not used after mid-year 1997), ac power cord, and input/output cable egress on the base of the RS/6000 SP

Note: Darker lines indicate outline of frame without covers or skirts.

Table 114. Floor Cutout Dimensions of the Withdrawn 2.01 m (79 in.) Frame

Cutout	Size	Use
A	102 mm (4 in.) x 102 mm (4 in.)	Power cord
	102 mm (4 in.) x 407 mm (18.5 in.)	Power cord and input/output cables on factory orders after mid-year 1996
B	83 mm (3.25 in.) x 152 (6 in.)	Input/output cables

Withdrawn Expansion Frames and Logical Switch Expansion Frames

Separately frames are available for scaling your SP system. These frames belong in one of two categories:

- Expansion frames.
- Logical switch expansion frames.

Both frame types contain a power supply and an integrated node drawer containing either a high or wide node or a thin node pair. The main difference between the two frame types is that an expansion frame may contain an SP switch while a logical switch expansion frame does not.

Both frame types have a maximum capability to add seven additional drawers in the 79 inch frames and three additional drawers in the 49 inch models. These optional node drawers can be wide, thin, high, or mixed. The exceptions are the **F/C 1017** frame, which is used for wide node expansion only and the **F/C 1019** frame, which is used with wide nodes and high nodes.

Expansion frames were added to model frames as follows:

Table 115. Withdrawn Optional Expansion Frames						
Feature Code	**Frame Height**	**Use With Model Frame**	**Integrated Node Type**	**Expansion Drawers Available**	**High Nodes Allowed per Frame**	**Notes**
Withdrawn 2.01 m (79") Frame Options						
1006	2.01 m (79")	20X, 30X, 40X	112 MHz High	6	4	30X and 40X require SP switch
1007	2.01 m (79")	20X, 30X, 40X, 3BX	135 MHz Wide	7	3	30X and 40X require SP switch
1008	2.01 m (79")	20X, 30X, 40X, 3BX	120 MHz Thin (pair)	7	3	30X and 40X require SP switch
1009	2.01 m (79")	20X, 30X, 40X,	200 MHz High	6	4	30X and 40X require SP switch
1016	2.01 m (79")	30X, 40X, 3BX, 1006	112 MHz High	3	3	logical switch expansion only, wide and high nodes only, three frame max.
1017	2.01 m (79")	30X, 40X, 1007	135 MHz Wide	7	3	logical switch expansion only, wide and high nodes only, use with wide node parent frame, one frame max.
1019	2.01 m (79")	30X, 40X, 3BX, 1009	200 MHz High	3	3	logical switch expansion only, three frame max.
1032	2.01 m (79")	20X, 30X, 3BX, 40X	160 MHz Thin (pair)	7	3	30X and 40X require SP switch
Withdrawn 1.25 m (49") Frame Options						
1027	1.25 m (49")	2AX, 3AX	135 MHz Wide	3	1	3AX requires SP Switch-8
1028	1.25 m (49")	2AX, 3AX	120 MHz Thin (pair)	3	1	3AX requires SP Switch-8
1029	1.25 m (49")	2AX, 3AX	200 MHz High	2	2	3AX requires SP Switch-8, three frame maximum
1052	1.25 m (49")	2AX, 3AX	160 MHz Thin (pair)	3	1	3AX requires SP Switch-8
Switch Frame Options						
2031	2.01 m (79")	40X	4 SP Switches	4 SP Switches	NA	switch expansion frame, prerequisite for any 40X system

Expansion frame reference for withdrawn units:

The following expansion frames have been withdrawn from production but are still supported:

F/C 1002: For expansion with Model 20X, 30X, and 40X systems

F/C 1003: For expansion with Model 20X, 30X, and 40X systems

F/C 1004: For expansion with Model 20X, 30X, and 40X systems

F/C 1005: For expansion with Model 20X, 30X, and 40X systems

F/C 1010: For expansion with Model 30X, 40X or F/C 1003, 1005 with all wide or high nodes installed.

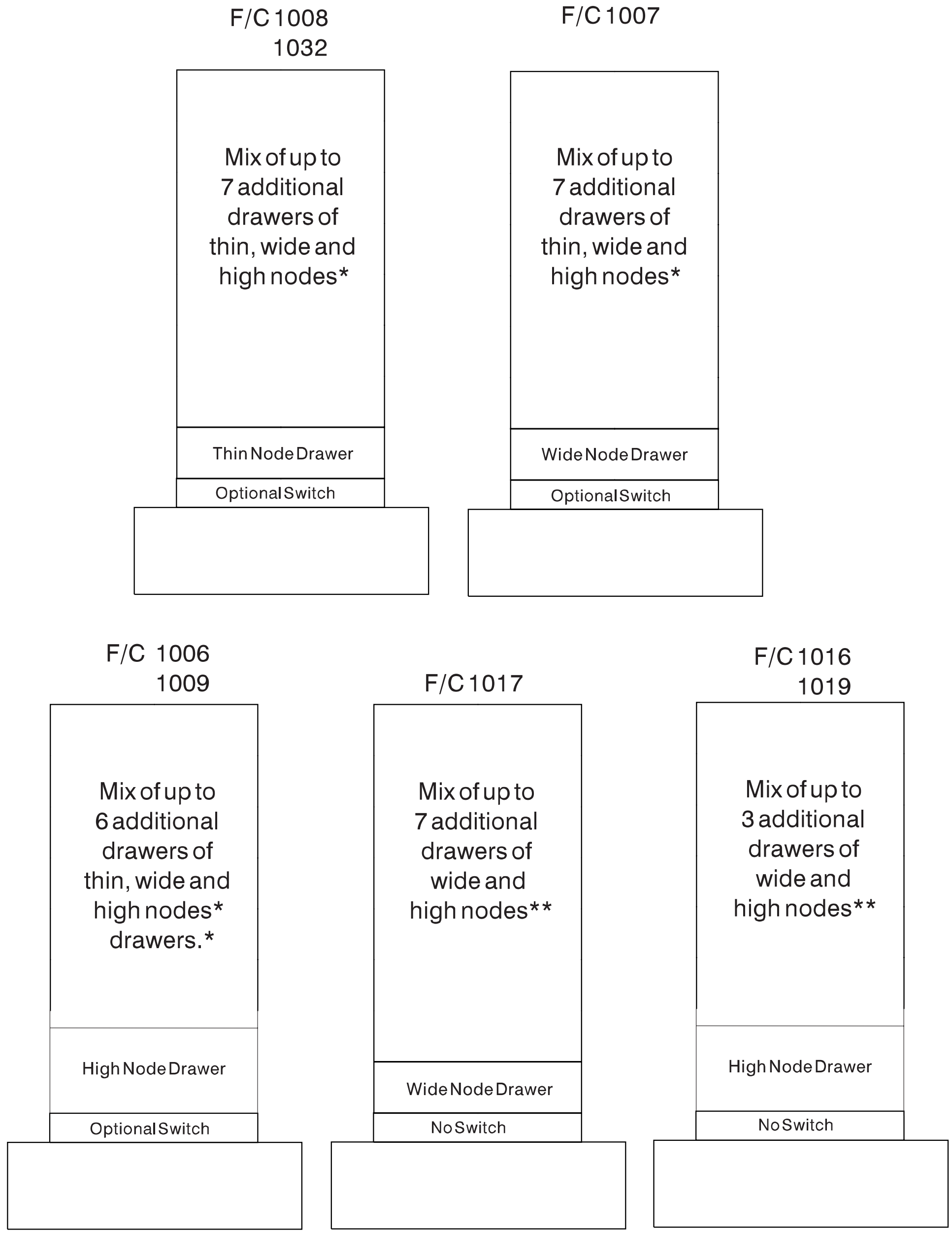
F/C 1015: For expansion with Model 30X, 40X or F/C 1003, 1005 with all wide or high nodes installed.

F/C 1022: For expansion with Model 2AX and 3AX systems

F/C 1023: For expansion with Model 2AX and 3AX systems

F/C 1024: For expansion with Model 2AX and 3AX systems

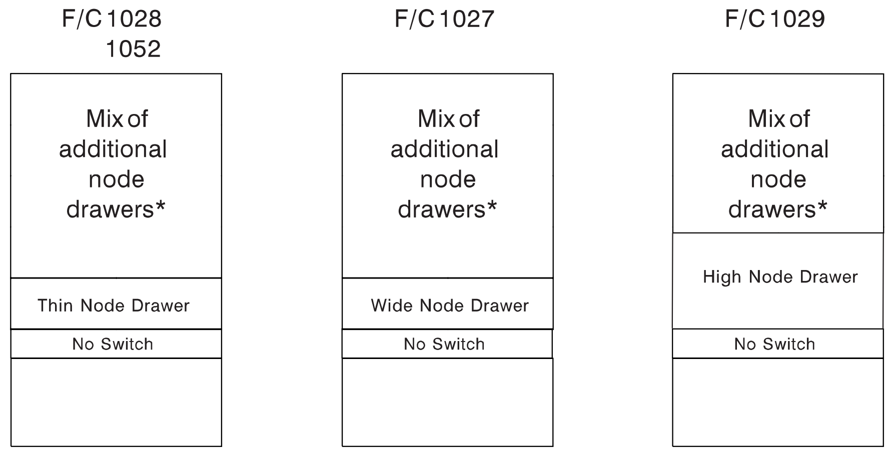
F/C 1025: For expansion with Model 2AX and 3AX systems



* Two thin nodes per drawer, one wide node per drawer, or one 604 high node per double drawer (twice as much space as a wide node, four times as much space as a thin node).

** One wide node per drawer, or one 604 high node per double drawer (twice as much space as a wide node).

Figure 84. RS/6000 SP F/C 1006, 1007, 1008, 1016, 1017, 1019, and 1032 Expansion Frames



* 102X and 1052 expansion frames can contain up to 4 node drawers (total system maximum is 8 nodes).

Figure 85. RS/6000 SP F/C 1027, 1028, 1029, and 1052 Expansion Frames

Service Clearances and Weight Distribution for Withdrawn 2.01 m SP Switch Frames (F/Cs 2030 and 2031) Produced Before 4/98

Figure 86 on page 348 illustrates the service clearances and weight distribution for the SP switch frame.

Note: Clearance dimensions are shown to the frame, not the skirts. Side clearances shown in this illustration may vary. See Table 113 on page 340 for specific dimensions.

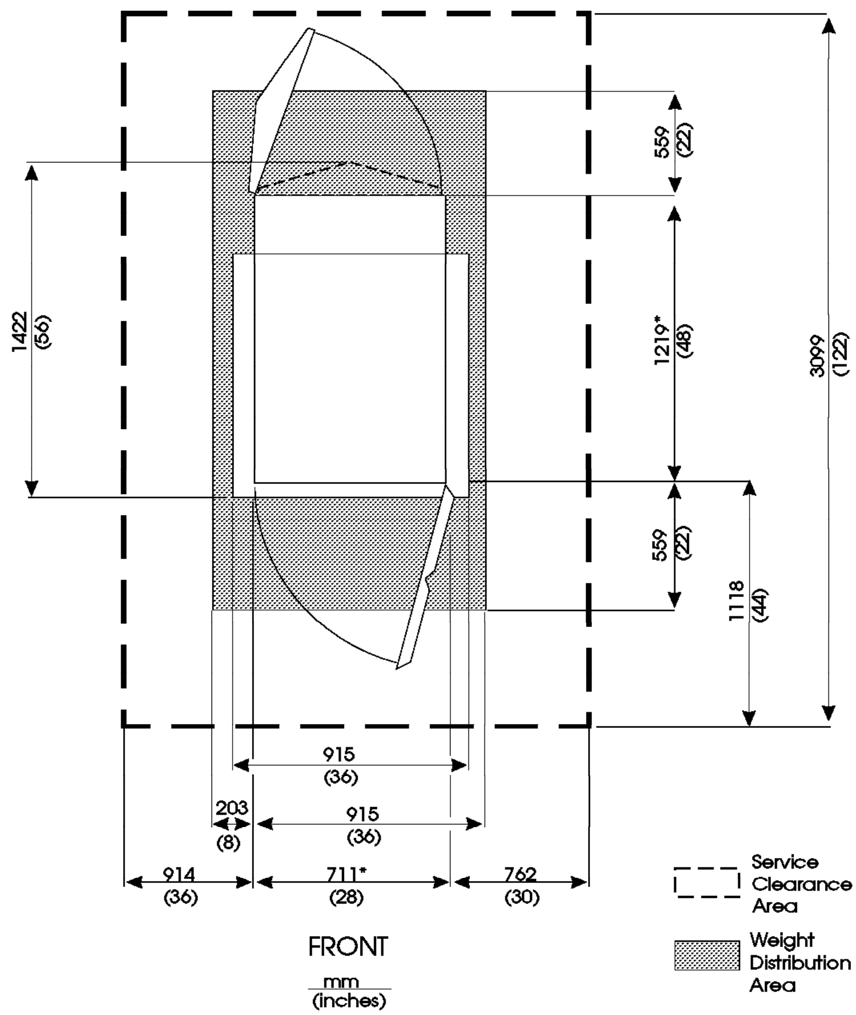


Figure 86. Service Clearances and Weight Distribution for 2.01 m SP Switch Frames Produced Before 4/98 (Not to Scale)

* Actual Frame Dimensions

Cut-away View of the Withdrawn 2.01 m SP Switch Frames Produced Before 4/98 (F/Cs 2030 and 2031)

The following figure details the location and size of the casters, leveling pads, ac power cord, and input/output cable egress on the base of the SP Switch frame. Dimensions are shown in mm and in.. See “Frame Tie-down Considerations” on page 256 for information on seismic protection.

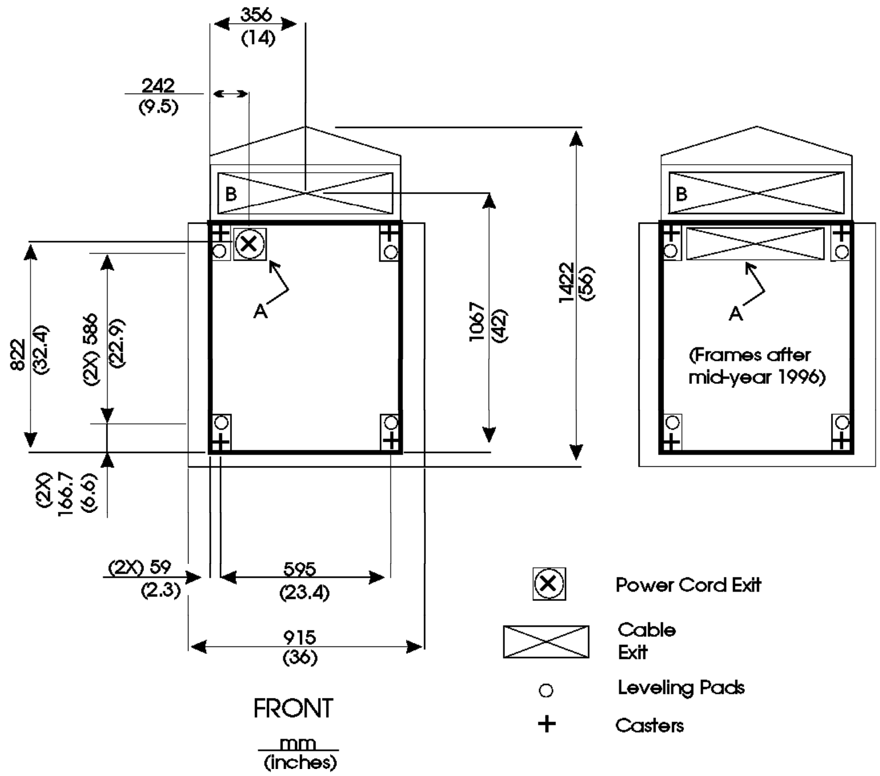


Figure 87. Floor Dimensions for 2.01 m SP Switch Frames Produced Before 4/98 (Not to Scale). This figure details the location of the casters, leveling pads, ac power cord, and input/output cable egress on the base of the SP Switch Frame.

Table 116. Floor Cutout Dimensions of the SP Switch Frame

Cutout	Size	Use
A	102 mm (4 in.) x 102 mm (4 in.)	Power cord
	102 mm (4 in.) x 407 mm (18.5 in.)	Power cord and input/output cables on factory orders after mid-year 1996
B	660 mm (26 in.) x 254 mm (10 in.)	Data cables

Acoustical Emissions for Withdrawn 2.01 m Frames

Table 117. Declared Acoustical Noise Emission Values for Components and a Selected Custom Configuration Installed in 2.01 M Frames						
Feature Code Description	**L_{WAd}**		**L_{pAm}**		**$<L_{pA}>_m$**	
	Operating (B)	**Idling (B)**	**Operating (dB)**	**Idling (dB)**	**Operating (dB)**	**Idling (dB)**
FC 2007 135-MHz Wide Node	5.8	5.8	N/A	N/A	42	42
FC 2008 120-MHz Thin Node Drawer	6.0	6.0	N/A	N/A	44	44
FC 2009 604e High Node	6.3	6.3	N/A	N/A	47	47
FC 2022 160-MHz Thin Node Drawer	6.1	6.1	N/A	N/A	45	45
FC 4008/4011 SPS-8/SPS Switch	5.3	5.3	N/A	N/A	37	37
SEPBU, 3 power books (used in 2.01 m frames)	6.4	6.4	N/A	N/A	48	48
SEPBU, 1 power book (used in 1.25 m frames)	6.1	6.1	N/A	N/A	44	44
Selected Configuration of 2.01 m Frame: 3-book SEPBU, FC 2008, FC 2022, Two FC 2007's, FC 2009, FC 4011	6.9	6.9	N/A	N/A	53	53

Definitions:

L_{WAd} The declared (upper limit) sound power level for a random sample of machines.

L_{pAm} The mean value of the A-weighted sound pressure levels at the operator position (if any) for a random sample of machines.

$<L_{pA}>_m$ The mean value of the A-weighted sound pressure levels at the one meter (bystander) positions for a random sample of machines.

N/A Not applicable (e.g., no operator position).

B, dB Abbreviations for bels and decibels, respectively.

The levels given above are for the components installed in an RS/6000 SP Frame.

All measurements made in accordance with ISO 7779, and reported in conformance with ISO 9296.

]
Withdrawn Power Supplies

Withdrawn Power Distribution Unit (PDU)

What is a PDU?

Some early SP systems shipped with a PDU type power supply. Also, a few of these units had an external high voltage transformer. These configurations are no longer in use. Information on these systems is included here for reference purposes only.

Note: PDUs **must** be replaced before the current SMP nodes can be used in PDU equipped frames. For more information, see "Upgrading Power Systems in Early SP Frames" on page 244.

PDU Power Requirements: The PDU power requirements that follow pertain only to the SP1 and some SP2 systems (prior to S/N 76300).

PDU Voltage Requirements: Table 118 summarizes the voltage requirements for the Power Distribution Unit.

Table 118. PDU Voltage Requirements

Environment	Specifications
Voltage	• 200 V ac to 240 V ac, three-phase, 24 amperes, 50-60 Hertz, 30-ampere circuit breaker with appropriate wire gauge required • 380 V ac to 415 V ac, three-phase, 16 amperes, 50-60 Hertz, 20-ampere Circuit Breaker with appropriate wire gauge required (with high-voltage transformer feature)

Notes:

1. If you plan to add the high voltage-transformer feature, three percent must be added to the kVA and heat loads.
2. The service that you provide must be capable of an inrush current of 90 amperes maximum peak. This inrush current decays within five cycles.

SP Electrical and Thermal Requirements (PDU Installed): Table 119 on page 352 describes the electrical and thermal requirements for the *maximum* RS/6000 SP configuration described. To calculate power requirements for each separate SP frame and feature, see "Planning for Power Requirements of SP Frames and Features" on page 239. Use this information for planning your data center's electrical and air conditioning requirements.

Table 119. SP Maximum Electrical and Thermal Requirements (PDU Installed)
Maximum for Thin Node Frame: **Electrical Load** = 7787.7 VA **Thermal Load** = 6713.6 watts (22.906 kBTUs/hour) *(based on the following maximum configuration)* Thin node frame: 16 x Thin nodes and the SP Switch (**F/C 4011**) in frame • Each node: – 4 memory cards – 2 DASD – 4 MCA
Maximum for Wide Node Frame: **Electrical Load** = 5931.7 VA **Thermal Load** = 5113.6 watts (17.447 kBTUs/hour) *(based on the following maximum configuration)* Wide node frame: 8 x Wide nodes and the SP Switch (**F/C 4011**) in frame • Each node: – 8 memory cards – 4 DASD – 8 MCA
Maximum for High Node Frame: **Electrical Load** = 6007.8 VA **Thermal Load** = 5179.2 watts (17.671 kBTUs/hour) *(based on the following maximum configuration)* High Node frame: 4 x High Node's and the SP Switch (**F/C 4011**) in frame • Each node: – 4 memory cards – 4 DASD (604e high node) or 3 DASD (604 high node) – 16 MCA – 4 CPU cards

Base Frame Power Requirements: Table 120 lists the power requirements for an empty frame containing only a PDU and power system.

Table 120. Base Frame Power Requirements

	Power Load	Heat Load	
Description	**Volt Amperes**	**Watts**	**BTUs/Hour**
Empty frame with PDU and power system	48	41	139.9

Power Line Cord Requirements for RS/6000 SP High-Voltage Transformer

Note

1. The high-voltage transformer is connected to SP frames with a PDU only. The SEPBU does not require a transformer.
2. An SP frame with a PDU and the high-voltage transformer option can coexist in a multiframe system which includes an SP frame with a SEPBU installed.
3. The following tasks are performed only if you have a PDU installed and have ordered the high-voltage transformer.

If you are using the high-voltage transformer, you need to connect it to the RS/6000 SP frame and your high-voltage ac electrical outlet. A 4.3-meter (14-foot) ac input line cord is provided with the high-voltage transformer, but you must supply line termination according to the requirements of your organization and local electrical and safety codes.

The 14-foot ac input line cord, supplied with your high-voltage transformer, has the following requirements:

1. A 380-415 volt (nominal) 20-ampere branch circuit with appropriate wire size and circuit breaker is required. The input to the transformer is a three-phase and safety ground, four-wire system. There is no neutral connection to the input of the transformer. The transformer has no phase rotation requirements. A branch circuit breaker with motor start characteristics should be used to allow for the inrush currents when the RS/6000 SP system is powered on.

   Note: For some line cords supplied without a plug, the blue conductor is to be connected to a phase-not-neutral. This is allowed by international standards for four-wire systems.

2. You must adhere to local electrical codes at your site.
3. The 14-foot line cord of the RS/6000 SP frame is connected to the output receptacle J01 of the high-voltage transformer.

Figure 88 on page 354 shows the 380-415 V ac input voltage option (**F/C 9921**).

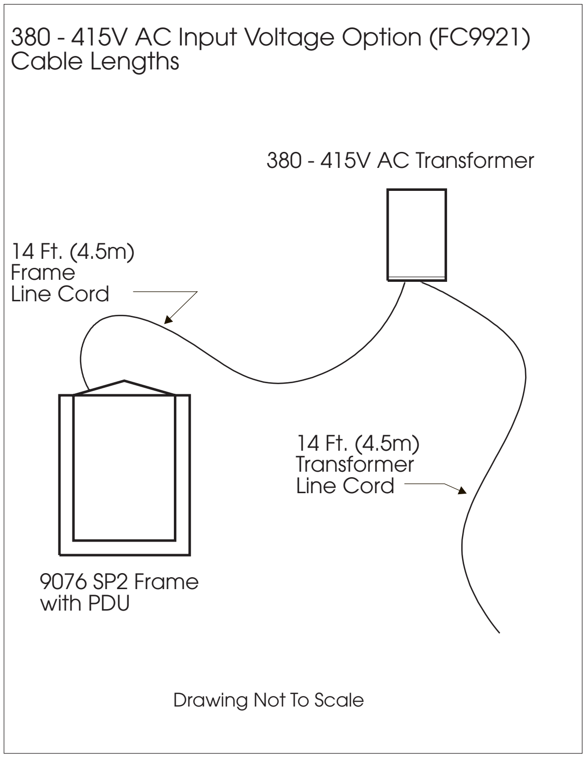


Figure 88. Cable Lengths for the High-Voltage Transformer

Note: To facilitate coexistence and upgrades, the power drop should be within the reach of the 14-foot line cord from the SP frame.

Cutaway View of the SP High-Voltage Transformer Feature: The following figure details the position and size of the casters, and input/output cable egress for this RS/6000 SP feature. Dimensions are shown in millimeters and inches.

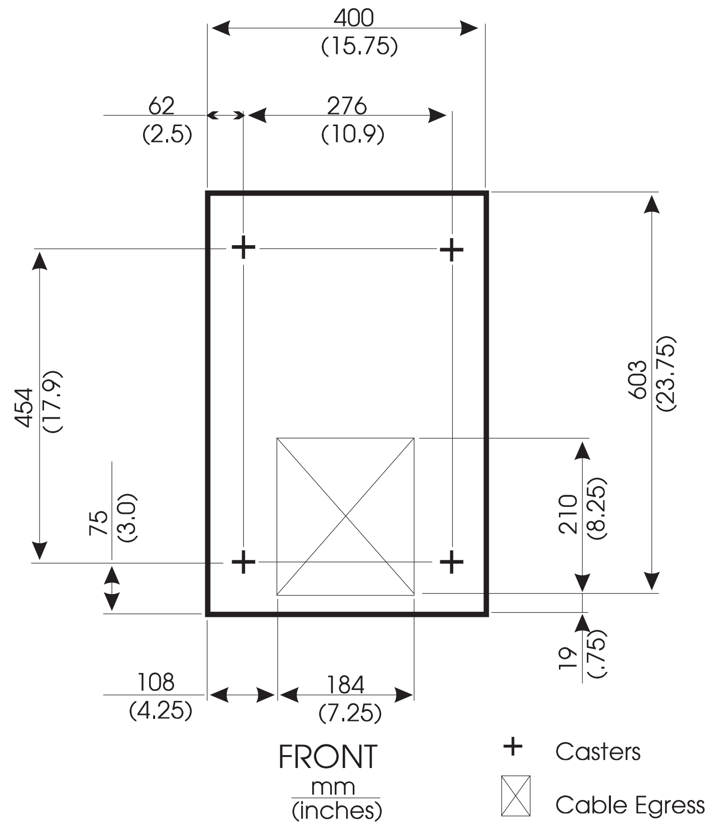


Figure 89. Floor Dimensions of the SP High-Voltage Transformer Feature

- **For all frame types,** the transformer cable exit must be located within 3 meters (10 feet) of the cable exit on the frame it serves. One transformer is required for each frame when the high voltage option is required.
- Because of the frame-to-frame grounding strap required with SP systems, the maximum distance between RS/6000 SP frames, connected with the high-voltage transformer feature, is 3 meters (10 feet).
- No weight distribution area is required for this unit.

Power Line Cord Specifications for PDU Installations: Table 121 on page 356 contains information for ac line cord specifications for SP systems with the PDU installed.

Table 121. ac Line Cord Specifications for SP Systems with the PDU Installed					
Location	**Length meters (feet)**	**Plug Type**	**Conductor Dimension mm² (AWG)**	**Customer-supplied Parts (Note 2)**	
				Connector	**Receptacle (Note 3)**
North America and Canada Chicago, USA (F/C 9986)	4.3 (14) 1.8 (6)	Hubbell P/N 430P9V04 (Note 2)	6 (#10)	Any IEC309 430C9W	Any IEC309 430R9W
AP	4.3 (14)	None (Note 1)	6 (#10)	(Note 1)	(Note 1)
EMEA	4.3 (14)	None (Note 1)	6 (#10)	(Note 1)	(Note 1)
LA	4.3 (14)	None (Note 1)	6 (#10)	(Note 1)	(Note 1)

Notes:

1. Terminations to be supplied by customer per local requirements.
2. IBM does not supply an AC line cord mating connector or a receptacle.
3. IBM recommends using IEC309 components in powering their equipment to comply with the National Electric Code (NEC) and to provide a safe environment for IBM service personnel and customer facilities personnel. If the Feature Code selection for the product specifies an IEC309 plug, IBM recommends that it is attached to an IEC309 receptacle mounted in a metallic back box with the ground pin of the receptacle attached to the ground lug in the box.

Service Clearances for SP High-Voltage Transformer (F/C 9921): Table 122 provides information on service clearance for SP High-Voltage Transformer (F/C 9921).

Table 122. Service Clearances for SP High-Voltage Transformer (F/C 9921)

Front	**Sides**
460 millimeters (18 inches) in front	50 millimeters (two inches) on all other sides

Notes:

1. Maximum distance between RS/6000 SP frames, connected with the high-voltage transformer feature, is 10 feet.
2. No weight distribution area is required for this unit.

Physical Dimensions and Weight of SP High-Voltage Transformer Feature: Table 123 and Table 124 on page 357 provide information on the physical dimensions and weight of the SP High-Voltage Transformer (F/C 9921).

Table 123. Physical Dimensions of SP High-Voltage Transformer (F/C 9921)

Specification	**Dimensions**
Length	636 millimeters (25 inches)
Width	496 millimeters (16 inches)
Height	514 millimeters (20 inches)

Table 124. Weight Specification of SP High-Voltage Transformer (F/C 9921)	
Specification	**Weight**
Weight	123 kilograms (270 pounds)

Power Line Cord Specifications for Withdrawn SEPBUs

These tables describe the ac line cords that IBM supplies with the RS/6000 SP frame and the required customer-supplied mating connectors. You need to supply either the receptacle or the in-line connector, depending on your specific site requirements.

7.0 kW SEPBUs: The information contained in Table 125 pertains to SP frames using the 7.0 kW SEPBU.

Table 125. Power Line Cord Specifications for SP Systems with 7.0 kW SEPBU

Location	Length meters (feet)	Plug Type	Conductor Dimension mm^2 (AWG)	Customer-supplied Parts (Note 4)	
				Connector (Note 3)	**Receptacle (Note 5)**
North America (including Canada) and Japan	4.3 (14)	Hubbell P/N 430P9V04 (Note 6)	8.4 (#8)	Any IEC309 430C9W (Note 6)	Any IEC309 430R9W (Note 6)
Chicago, USA (F/C 9986)	1.8 (6)				
AP (excluding Japan)	4.3 (14)	None (Note 1)	8.4 (#8)	(Note 1)	(Note 1)
EMEA (Note 2)	4.3 (14)	None (Note 1)	6 (#10)	(Note 1)	(Note 1)
LA	4.3 (14)	None (Note 1)	8.4 (#8)	(Note 1)	(Note 1)

Notes:

1. Terminations to be supplied by customer per local requirements.
2. Except for Bulgaria, Liberia, Libya, Saudi Arabia, Somalia, Syria and Egypt, conductor dimensions are 8.4 mm^2 (#8 AWG).
3. The connector cannot be installed on a metal conduit because it is a safety hazard.
4. IBM does not supply an ac line cord mating connector or a receptacle.
5. IBM recommends using IEC309 components in powering their equipment to comply with the National Electric Code (NEC) and to provide a safe environment for IBM service personnel and customer facilities personnel. If the Feature Code selection for the product specifies an IEC309 plug, IBM recommends that it is attached to an IEC309 receptacle mounted in a metallic back box with the ground pin of the receptacle attached to the ground lug in the box.
6. Applies to 200-240 V ac installations only.

3.5 kW SEPBUs: The information contained in Table 126 on page 358 pertains to the 3.5 kW, 200-240 V ac input SEPBU (phase-phase or phase-neutral) installations.

Table 126. Power Line Cord Specifications for SP Systems with 3.5 kW SEPBU					
Location	**Length meters (feet)**	**Plug Type**	**Conductor Dimension mm² (AWG)**	**Customer-supplied Parts (Note 1)**	
				Connector	**Receptacle**
North America (including Canada) and Japan	4.3 (14)	Russell-Stoll P/N 3750DP	6 (#10)	Russell-Stoll P/N 3933	Russell-Stoll P/N 3753
Chicago, USA (F/C 9986)	1.8 (6)				
AP (excluding Japan)	4.3 (14)	None (Note 2)	6 (#10)	(Note 2)	(Note 2)
EMEA	4.3 (14)	None (Note 2)	6 (#10)	(Note 2)	(Note 2)
LA	4.3 (14)	None (Note 2)	6 (#10)	(Note 2)	(Note 2)

Notes:

1. IBM does not supply ac line cord mating connector or receptacle.
2. Terminations to be supplied by customer per local requirements.

Electrical and Thermal Loads for Withdrawn Frames

Requirements for Withdrawn 2.01 m Frames with 7.0 kW SEPBUs

Frames Withdrawn From Production

These frames have been withdrawn from production. They will not support SMP wide or thin nodes **unless** the SEPBU is upgraded. See "Upgrading Power Systems in Early SP Frames" on page 244 for more information.

Table 127 on page 359 describes electrical and thermal requirements for the *maximum* RS/6000 SP configuration described in the table. For customized configurations, see "Planning for Power Requirements of SP Frames and Features" on page 239. This additional information will help you calculate power requirements for each frame and feature in your system. Use this information for planning your installation's electrical and air conditioning requirements.

Table 127 (Page 1 of 2). Maximum Electrical and Thermal Requirements for 2.01 m Frames with 7.0 kW SEPBUs

Maximum for Uniprocessor Thin Node Frames:

Electrical Load = 6713.6 VA
Thermal Load = 6713.6 watts (22.906 kBTUs/hour)

(based on the following maximum configuration)

Thin node frame:
16 x Thin nodes and the SP Switch (**F/C 4011**) in frame

- Each node:
  - 4 memory cards
  - 2 DASD
  - 4 MCA
- SEPBU with 3 power supply modules (BPRs)

Maximum for Uniprocessor Wide Node Frames:

Electrical Load = 5113.6 VA
Thermal Load = 5113.6 watts (17.447 kBTUs/hour)

(based on the following maximum configuration)

Wide node frame:
8 x Wide nodes and the SP Switch (**F/C 4011**) in frame

- Each node:
  - 8 memory cards
  - 4 DASD
  - 8 MCA
- SEPBU with 3 power supply modules (BPRs)

Maximum for 200 MHz SMP High Node Frames:

Electrical Load = 5179.2 VA
Thermal Load = 5179.2 watts (17.671 kBTUs/hour)

(based on the following maximum configuration)

High Node frame:
4 x High Nodes and the SP Switch (**F/C 4011**) in frame

- Each node:
  - 4 memory cards
  - 4 DASD (604e high node) or 3 DASD (604 high node)
  - 16 MCA
  - 4 CPU cards
- SEPBU with 3 power supply modules (BPRs)

Maximum for Switch Frames - F/C 2031:

Electrical Load = 709 VA
Thermal Load = 709 watts (2.419 kBTUs/hour)

(based on the following maximum configuration)

SP Switch Frame (**F/C 2031**):

- 4 SP Switches
- SEPBU with 3 power supply modules (BPRs)

Table 127 (Page 2 of 2). Maximum Electrical and Thermal Requirements for 2.01 m Frames with 7.0 kW SEPBUs
Maximum for SP Switch Frames - F/C 2031 (Special Bid): **Electrical Load** = 1377 VA **Thermal Load** = 1377 watts (4.698 kBTUs/hour) *(based on the following maximum configuration)* SP Switch Frame (**F/C 2031**) with RPQ: • 8 SP Switches (**F/C 4011**) (special bid only) • SEPBU with 3 power supply modules (BPRs)

Requirements for 1.25 m Frames with Withdrawn 3.5 kW SEPBUs

Frames Withdrawn From Production

These frames have been withdrawn from production. They will not support SMP wide or thin nodes **unless** the SEPBU is upgraded. See "Upgrading Power Systems in Early SP Frames" on page 244 for more information.

Table 128 describes the electrical and thermal requirements for the Model 3AX frame, based on the **maximum** configuration described in the table. For customized configurations, see "Planning for Power Requirements of SP Frames and Features" on page 239 which references information you will need to calculate the power requirements for your 3AX frame.

Table 128 (Page 1 of 2). Maximum Electrical and Thermal Requirements for 1.25 m Frames with 3.5 kW SEPBUs

Maximum for Thin Node Frames:
 	
Power Load = 3460.8 VA
Heat Load = 3460.8 watts (11.808 kBTUs/Hr)
 	
(based on the following maximum configuration)
 	
Thin Node Frame Maximum:
8 x Thin Nodes and the 8-port SP Switch (F/C 4008) in 3AX frames only.
• Each node:
  – 4 memory cards
  – 2 DASD
  – 4 MCA
• SEPBU with 2 power supply modules (BPRs) - N+1 Power Option Installed

Table 128 (Page 2 of 2). Maximum Electrical and Thermal Requirements for 1.25 m Frames with 3.5 kW SEPBUs
Maximum for Wide Node Frames: **Power Load** = 2660.8 VA **Heat Load** = 2660.8 watts (9.078 kBTUs/Hr) *(based on the following maximum configuration)* Wide Node Frame: 4 x Wide Nodes and the 8-port SP Switch (F/C 4008) in 3AX frames only. • Each node: – 8 memory cards – 4 DASD – 8 MCA • SEPBU with 2 power supply modules (BPRs) - N+1 Power Option Installed
Maximum for High Node Frames: **Power Load** = 2693.6 VA **Heat Load** = 2693.6 watts (9.190 kBTUs/Hr) *(based on the following maximum configuration)* High Node Frame: 2 x High Nodes and the 8-port SP Switch (F/C 4008) in 3AX frames only. • Each node: – 8 processors – 4 memory cards – 4 DASD – 16 MCA • SEPBU with 2 power supply modules (BPRs) - N+1 Power Option Installed

Appendix C. SEPBU Power Control Interface

This appendix describes the SEPBU Power Control Interface function. The SEPBU power unit includes a Power Control Interface function. This function allows the user to configure computer system(s) and associated hardware (such as disk units, tape drives) to control power On/Off for the various components. For example, the user may have external disk unit power controlled by RS/6000 SP frame power, causing the disk unit power to be synchronized to the RS/6000 SP frame power.

RS/6000 SP Power Control Interface Function

The RS/6000 SP SEPBU power unit contains a Power Control Interface card. This card has a AUX/LOC switch, two MAIN output jacks, and two AUX input jacks.

The Auxiliary/Local (AUX/LOC) switch controls whether power for this frame is controlled by:

AUX: Power-On/Off signals from the AUX jacks
LOC: Frame main power switch.

Normally, this switch is left in the LOC position for local control; in the LOC position, Power Control Interface signals will not affect power for this frame. Local power control on this frame can result in signals sent to the MAIN jacks. In this way power On/Off signals can be sent to other equipment (including other RS/6000 SP frames).

When the switch is in the AUX position, local power controls, such as the main power switch, will have no effect. Power-On/Off signals arriving at the AUX jack from another machine will control this SEPBU power state.

Typical Configurations

The following are some Power Control Interface configurations used to illustrate typical uses of the Power Control Interface function. Customer and system configurations may utilize one or more of the following configuration types concerning the Power Control Interface function. Note that using the Power Control Interface function can affect impact of certain outages and service operations; this should be taken into consideration when determining an effective Power Control Interface configuration.

No Power Control Interface Control

The Power Control Interface switches of all RS/6000 SP frames are in “LOC” position. No cabling is necessary. Power control of each frame and attached unit is independent of all other units.

RS/6000 SP Chained Control

First RS/6000 SP frame has Power Control Interface switch in LOC position; all other RS/6000 SP frames have Power Control Interface switches in the AUX position. A Power Control Interface cable is run from the MAIN jack in the first frame to a AUX jack in second frame. Another Power Control Interface cable is run from the MAIN jack in the second frame to a AUX jack in third frame, and so on.

Powering On/Off the first RS/6000 SP frame controls power of all other attached frames. Remember that this may affect how certain outages or service operations will impact the customer.

RS/6000 SP Cross-Control

All RS/6000 SP frames have Power Control Interface switch in AUX position. A Power Control Interface cable is run from the MAIN jack in each frame to a AUX jack in another frame.

Powering On/Off any RS/6000 SP frame controls power of all other attached frames. Remember that this may affect how certain outages or service operations will impact the customer.

RS/6000 SP Control of Peripherals

A Power Control Interface cable is run from RS/6000 SP frame MAIN jack to a AUX jack on the peripheral Power Control Interface panel. Powering on/off this frame will have the corresponding effect on the attached peripheral(s). If the peripheral is connected to processors in more than one RS/6000 SP frame, certain outages or service operations may have an undesirable impact on the customer. In other cases, this may allow proper power synchronization of the processing units with their respective peripherals.

Note: See also “SEPBU Power Control Interface” on page 232 for information on the Power Control Interface function.

Appendix D. 604/604e High Node Memory Configurations

Due to an architectural limitation in 604 and 604e high nodes, there are several memory configurations that have a portion of the total memory disabled. When these systems are powered on, this problem will not be detected, even though the disabled memory capacity can range from 64 MB to 256 MB depending on the total memory configuration. **However, by planning the size and location of DIMM additions, this limitation can be circumvented.**

This problem can occur during the following:

- System Updates - When adding memory cards with 64MB DIMMs to machines which already have DIMMs of less than 64MB may result in memory banks being disabled. This activity involves four memory cards per node.
- New Builds - Ordering a high node which has three 256 MB cards and one 512 MB card will result in the functional memory being 1.0 GB instead of 1.2 GB.

Table 129 gives an overview of the configurations that do not completely register (most of these configurations are rarely used). If you set up a high node with the memory configurations listed in this table, you will loose a portion of that memory capacity. All of the configurations listed pertain to type **SF5** memory only.

Table 129 (Page 1 of 2). Memory Configurations with Registration Conflicts

Configuration Style	Card Size (MB)	DIMM Quantity	DIMM Size (MB)	Configuration Style	Card Size (MB)	DIMM Quantity	DIMM Size (MB)
A	1024	16	64	B	1024	16	64
	512	16	32		512	16	32
	512	16	32		512	16	32
	512	8	64		256	4	64
C	1024	16	64	D	1024	16	64
	512	16	32		512	16	32
	512	8	64		512	8	64
	256	16	16		128	16	8
E	1024	16	64	F	1024	16	64
	512	16	32		512	16	32
	256	16	16		256	4	64
	256	4	64		128	16	8
G	1024	16	64	H	1024	16	64
	512	8	64		512	8	64
	256	16	16		256	16	16
	256	16	16		128	16	8

Table 129 (Page 2 of 2). Memory Configurations with Registration Conflicts							
Configuration Style	**Card Size (MB)**	**DIMM Quantity**	**DIMM Size (MB)**	**Configuration Style**	**Card Size (MB)**	**DIMM Quantity**	**DIMM Size (MB)**
I	1024	16	64	J	1024	16	64
	512	8	64		256	16	16
	128	16	8		256	16	16
	128	16	8		256	4	64
K	1024	16	64	L	1024	16	64
	256	16	16		256	4	64
	256	4	64		128	16	8
	128	16	8		128	16	8
M	512	16	32	N	512	16	32
	512	8	64		512	8	64
	256	16	16		256	16	16
	256	16	16		128	16	8
O	512	16	32	P	512	16	32
	512	8	64		256	16	16
	128	16	8		256	16	16
	128	16	8		256	4	64
Q	512	16	32	R	512	16	32
	256	16	16		256	4	64
	256	4	64		128	16	8
	128	16	8		128	16	8
S	512	8	64	T	512	8	64
	256	16	16		256	4	64
	128	16	8		256	4	64
	128	16	8		256	4	64
U	256	16	16				
	256	4	64				
	128	16	8				
	128	16	8				

Notes:

1. **Do not** use the configurations listed in this table.
2. This table identifies size and population of the memory cards after the DIMMs or cards are added to the system.
3. The order of the cards in the slots is not important.

Glossary of Terms and Abbreviations

This glossary includes terms and definitions from:

- The *IBM Dictionary of Computing*, New York: McGraw-Hill, 1994.
- The *American National Standard Dictionary for Information Systems*, ANSI X3.172-1990, copyright 1990 by the American National Standards Institute (ANSI). Copies can be purchased from the American National Standards Institute, 1430 Broadway, New York, New York 10018. Definitions are identified by the symbol (A) after the definition.
- The *ANSI/EIA Standard - 440A: Fiber Optic Terminology* copyright 1989 by the Electronics Industries Association (EIA). Copies can be purchased from the Electronic Industries Association, 2001 Pennsylvania Avenue N.W., Washington, D.C. 20006. Definitions are identified by the symbol (E) after the definition.
- The *Information Technology Vocabulary* developed by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and the International Electrotechnical Commission (ISO/IEC JTC1/SC1). Definitions of published parts of this vocabulary are identified by the symbol (I) after the definition; definitions taken from draft international standards, committee drafts, and working papers being developed by ISO/IEC JTC1/SC1 are identified by the symbol (T) after the definition, indicating that final agreement has not yet been reached among the participating National Bodies of SC1.

The following cross-references are used in this glossary:

Contrast with. This refers to a term that has an opposed or substantively different meaning.
See. This refers the reader to multiple-word terms in which this term appears.
See also. This refers the reader to terms that have a related, but not synonymous, meaning.
Synonym for. This indicates that the term has the same meaning as a preferred term, which is defined in the glossary.

This section contains some of the terms that are commonly used in the SP publications.

IBM is grateful to the American National Standards Institute (ANSI) for permission to reprint its definitions from the American National Standard *Vocabulary for Information Processing* (Copyright 1970 by American National Standards Institute, Incorporated), which was prepared by Subcommittee X3K5 on Terminology and Glossary of the American National Standards Committee X3. ANSI definitions are preceded by an asterisk (*).

Other definitions in this glossary are taken from *IBM Vocabulary for Data Processing, Telecommunications, and Office Systems* (SC20-1699) and *IBM DATABASE 2 Application Programming Guide for TSO Users* (SC26-4081).

A

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 a user or server.

Authorization. The process of obtaining permission to perform specific actions.

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.

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.

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.

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.

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 mounted in the Sp Switch expansion frame.

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.

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 mounted on frames that contain nodes.

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 ³ 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 SP 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.

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.

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.

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.

Bibliography

This bibliography helps you find product documentation related to the RS/6000 SP hardware and software products.

You can find most of the IBM product information for RS/6000 SP products on the World Wide Web. Formats for both viewing and downloading are available.

SP related documentation is shipped with the PSSP product in a variety of formats and can be installed on your system. The man pages for public code that PSSP includes are also available online.

You can order hard copies of the product documentation from IBM. This bibliography lists the titles that are available and their order numbers.

Finally, this bibliography contains a list of non-IBM publications that discuss parallel computing and other topics related to the RS/6000 SP.

Finding documentation on the World Wide Web

Most of the RS/6000 SP hardware and software books are available from the IBM RS/6000 web site at **http://www.rs6000.ibm.com**. You can view a book or download a Portable Document Format (PDF) version of it. At the time this manual was published, the full path to the "RS/6000 SP Product Documentation Library" page was **http://www.rs6000.ibm.com/resource/aix_resource/sp_books**. However, the structure of the RS/6000 web site can change over time.

MKTTOOLS

An online version of this document is made available on MKTTOOLS for IBM marketing and service representatives. To subscribe to future updates or to get the current version, type the following on VM:

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The following SP system publication packages are available:

Publication	Package Name
IBM RS/6000 SP: Installation and Relocation	GA227441
IBM RS/6000 SP: System Service Guide	GA227442
IBM RS/6000 SP: SP Switch Service Guide	GA227443
IBM RS/6000 SP: Uniprocessor Node Service Guide	GA227445
IBM RS/6000: 604 and 604e SMP High Node Service Guide	GA227446
IBM RS/6000 SP: SMP Thin and Wide Node Service Guide	GA227447
IBM RS/6000 SP: POWER3 SMP High Node Service Guide	GA227448
IBM RS/6000 SP: Planning, Volume 1, Hardware and Physical Environment	GA227280
IBM RS/6000 SP: Planning, Volume 2, Control Workstation and Software Environment	GA227281

Accessing documentation online

On the same medium as the PSSP product code, IBM ships man pages, HTML files, and PDF files. In order to use these publications, you must first install the **ssp.docs** file set.

To view the HTML publications, you need access to an HTML document browser such as Netscape. The HTML files and an index that links to them are installed in the **/usr/lpp/ssp/html** directory. Once installed, you can also view the HTML files from the RS/6000 SP Resource Center.

If you have installed the SP Resource Center on your SP system, you can access it by entering the **/usr/lpp/ssp/bin/resource_center** command. If you have the SP Resource Center on CD-ROM, see the **readme.txt** file for information about how to run it.

To view the PDF publications, you need access to the Adobe Acrobat Reader 3.0.1. The Acrobat Reader is shipped with the AIX Version 4.3 Bonus Pack and is also freely available for downloading from the Adobe web site at URL **http://www.adobe.com**.

Manual pages for public code

The following manual pages for public code are available in this product:

SUP	/usr/lpp/ssp/man/man1/sup.1
NTP	/usr/lpp/ssp/man/man8/xntpd.8
	/usr/lpp/ssp/man/man8/xntpdc.8
Perl (Version 4.036)	/usr/lpp/ssp/perl/man/perl.man
	/usr/lpp/ssp/perl/man/h2ph.man
	/usr/lpp/ssp/perl/man/s2p.man
	/usr/lpp/ssp/perl/man/a2p.man
Perl (Version 5.003)	Man pages are in the /usr/lpp/ssp/perl5/man/man1 directory

Manual pages and other documentation for **Tcl**, **TclX**, **Tk**, and **expect** can be found in the compressed **tar** files located in the **/usr/lpp/ssp/public** directory.

RS/6000 SP planning publications

This section lists the IBM product documentation for planning for the IBM RS/6000 SP hardware and software.

- *IBM RS/6000 SP: Planning, Volume 1, Hardware and Physical Environment*, GA22-7280
- *IBM RS/6000 SP: Planning, Volume 2, Control Workstation and Software Environment*, GA22-7281

RS/6000 SP hardware service library

This section lists the IBM product documentation for IBM RS/6000 SP hardware maintenance.

- *IBM RS/6000 SP: Installation and Relocation*, GA22-7441
- *IBM RS/6000 SP: System Service Guide*, GA22-7442
- *IBM RS/6000 SP: SP Switch Service Guide*, GA22-7443
- *IBM RS/6000 SP: Uniprocessor Node Service Guide*, GA22-7445
- *IBM RS/6000: 604 and 604e SMP High Node Service Guide*, GA22-7446
- *IBM RS/6000 SP: SMP Thin and Wide Node Service Guide*, GA22-7447

- *IBM RS/6000 SP: POWER3 SMP High Node Service Guide*, GA22-7448

As an alternative to ordering the individual books, you can use GBOF-5437 to order the complete RS6000 SP hardware service library.

RS/6000 SP standard ship group publications

The following publications are shipped with each system:

- *Diagnostic Information for Micro Channel Bus Systems*, SA38-0532
- *Adapters, Devices and Cable Information for Micro Channel Bus Systems*, SA38-0533
- *Diagnostic Information for Multiple Bus Systems*, SA38-0509
- *Adapters, Devices and Cable Information for Multiple Bus Systems*, SA38-0516
- *IBM RS/6000 SP: Installation and Relocation*, GA22-7441
- *IBM RS/6000 SP: System Service Guide*, GA22-7442
- *IBM RS/6000 SP: SP Switch Service Guide*, GA22-7443
- *IBM RS/6000 SP: Uniprocessor Node Service Guide*, GA22-7445
- *IBM RS/6000: 604 and 604e SMP High Node Service Guide*, GA22-7446
- *IBM RS/6000 SP: SMP Thin and Wide Node Service Guide*, GA22-7447
- *IBM RS/6000 SP: POWER3 SMP High Node Service Guide*, GA22-7448
- *IBM RS/6000 Scalable POWERparallel Systems: Planning, Volume 1, Hardware and Physical Environment*, GA22-7280
- *Service Director for 9076 RISC System/6000 SP CE Information Guide*, ZA38-0383

RS/6000 SP Switch Router publications

The RS/6000 SP Switch Router is based on the Ascend GRF switched IP router product from Ascend Communications, Inc.. You can order the SP Switch Router as the IBM 9077.

The following publications are shipped with the SP Switch Router. You can also order these publications from IBM using the order numbers shown.

- *Ascend GRF Getting Started*, GA22-7368
- *Ascend GRF Configuration Guide*, GA22-7366
- *Ascend GRF Reference Guide*, GA22-7367
- *IBM SP Switch Router Adapter Guide*, GA22-7310.

Adapters

- *SP Switch Router Adapter Guide*, GA22-7310
- *FDDI Introduction and Planning Guide*, GA27-3892
- *FDDI User’s Guide and Programming Reference*, SC28-2823
- *Planning for Fiber Optic Channel Links*, GA23-0367
- *IBM Token-Ring Network Introduction and Planning Guide*, GA27-3677
- *RS/6000 Token Ring Adapter Card*, G511-1681
- *HIPPI User's Guide and Programmer's Reference*, SA23-0369 and SA23-2488
- *AIX Parallel and ESCON Channel Tape Attachment/6000 Installation and User's Guide*, GA32-0311

- *9334 SCSI Expansion Units Operator Guide*, GA33-3232
- *9334 Models 010 and 011 SCSI Expansion Units: Installation and Service Guide*, SY33-0165
- *9334 Models 500 and 501 SCSI Expansion Units: Installation and Service Guide*, SY33-0167
- *SCSI-2 Fast/Wide Adapter*, SC23-2646
- *IBM SCSI-2 Fast/Wide Adapter/A Technical Reference*, S83G-7545
- *Turboways 100 User's Guide ATM*, GA27-4057
- *9333 Model 010 and 011 High-Performance Disk-Drive Subsystem Operator Guide*, GA33-3208
- *9333 Model 010 and 011 High-Performance Disk-Drive Subsystem Installation and Service Guide*, SY33-0161
- *9333 Model 010 and 011 High-Performance Disk-Drive Subsystem Hardware Technical Information*, SA33-3209
- *9333 Model 500 and 501 High-Performance Disk-Drive Subsystem Operator Guide*, GA33-3234
- *9333 Model 500 and 501 High-Performance Disk-Drive Subsystem Installation and Service Guide*, SY33-0168
- *9333 Model 500 and 501 High-Performance Disk-Drive Subsystem Hardware Technical Information*, SA33-3235
- *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers Installation and User's Guide*, GC35-0154

Network connectivity

- *IBM LAN Cabling System Planning and Installation Guide*, GA27-3361
- *IBM Cabling System Optical Fiber Planning and Installation Guide*, GA27-3943
- *IBM 8250/8260/8285 Planning and Site Preparation Guide*, GA33-0285
- *IBM 6611 Network Processor: Introduction and Planning Guide*, GK2T-0334

Other service publications

- *IBM AIX Version 3.2 Problem Solving Guide and Reference*, SC23-2204
- *IBM AIX Version 4 Problem Solving Guide and Reference*, SC23-2606
- *IBM AIX Version 4.3 Problem Solving Guide and Reference*, SC23-4123
- *7012 300 Series Operator Guide*, SA23-2623
- *7012 300 Series Installation and Service Guide*, SA23-2624
- *7013 500 Series Operator Guide*, SA38-0530
- *7013 500 Series Installation and Service Guide*, SA38-0531
- *Electrical Safety for IBM Customer Engineers*, S229-8124
- *7015 Model R30 CPU Enclosure Operator Guide*, SA23-2742
- *7015 Model R30 CPU Enclosure Installation and Service Guide*, SA23-2743
- *RS/6000 7017 S Series Installation and Service Guide*, SA38-0548
- *Supplement for RS/6000 7017 S Series Installation and Service*, SN32-9059
- *RS/6000 7017 S Series User's Guide*, SA38-0549

RS/6000 SP software publications

This section lists the IBM product documentation for software products related to the IBM RS/6000 SP. These products include:

- IBM Parallel System Support Programs for AIX (PSSP)
- IBM LoadLeveler for AIX (LoadLeveler)

- IBM Parallel Environment for AIX (Parallel Environment)
- IBM General Parallel File System for AIX (GPFS)
- IBM Engineering and Scientific Subroutine Library (ESSL) for AIX
- IBM Parallel ESSL for AIX
- IBM High Availability Cluster Multi-Processing for AIX (HACMP)
- IBM Client Input Output/Sockets (CLIO/S)
- IBM Network Tape Access and Control System for AIX (NetTAPE)

PSSP Publications

IBM RS/6000 SP:

- *Planning, Volume 2, Control Workstation and Software Environment*, GA22-7281

PSSP:

- *Installation and Migration Guide*, GA22-7347
- *Administration Guide*, SA22-7348
- *Managing Shared Disks*, SA22-7349
- *Performance Monitoring Guide and Reference*, SA22-7353
- *Diagnosis Guide*, GA22-7350
- *Command and Technical Reference*, SA22-7351
- *Messages Reference*, GA22-7352

RS/6000 Cluster Technology (RSCT):

- *Event Management Programming Guide and Reference*, SA22-7354
- *Group Services Programming Guide and Reference*, SA22-7355

As an alternative to ordering the individual books, you can use SBOF-8587 to order the PSSP software library.

LoadLeveler Publications

LoadLeveler:

- *Using and Administering*, SA22-7311
- *Diagnosis and Messages Guide*, GA22-7277

GPFS Publications

GPFS:

- *Installation and Administration Guide*, SA22-7278

Parallel Environment Publications

Parallel Environment:

- *Installation Guide*, GC28-1981
- *Hitchhiker's Guide*, GC23-3895
- *Operation and Use, Volume 1*, SC28-1979
- *Operation and Use, Volume 2*, SC28-1980
- *MPI Programming and Subroutine Reference*, GC23-3894
- *MPL Programming and Subroutine Reference*, GC23-3893
- *Messages*, GC28-1982

As an alternative to ordering the individual books, you can use SBOF-8588 to order the PE library.

Parallel ESSL and ESSL Publications

- *ESSL Products: General Information*, GC23-0529
- *Parallel ESSL: Guide and Reference*, SA22-7273
- *ESSL: Guide and Reference*, SA22-7272

HACMP Publications

HACMP:

- *Concepts and Facilities*, SC23-1938
- *Planning Guide*, SC23-1939
- *Installation Guide*, SC23-1940
- *Administration Guide*, SC23-1941
- *Troubleshooting Guide*, SC23-1942
- *Programming Locking Applications*, SC23-1943
- *Programming Client Applications*, SC23-1944
- *Master Index and Glossary*, SC23-1945
- *HANFS for AIX Installation and Administration Guide*, SC23-1946
- *Enhanced Scalability Installation and Administration Guide*, SC23-1972

CLIO/S Publications

CLIO/S:

- *General Information*, GC23-3879
- *User's Guide and Reference*, GC28-1676

NetTAPE Publications

NetTAPE:

- *General Information*, GC23-3990
- *User's Guide and Reference*, available from your IBM representative

AIX and related product publications

For the latest information on AIX and related products, including RS/6000 hardware products, see *AIX and Related Products Documentation Overview*, SC23-2456. You can order a hard copy of the book from IBM. You can also view it online from the "AIX Online Publications and Books" page of the RS/6000 web site, at URL **http://www.rs6000.ibm.com/resource/aix_resource/Pubs**.

Redbooks

IBM's International Technical Support Organization (ITSO) has published a number of redbooks related to the RS/6000 SP. For a current list, see the ITSO website, at URL **http://www.redbooks.ibm.com**.

Non-IBM publications

Here are some non-IBM publications that you may find helpful.

- Almasi, G., Gottlieb, A., *Highly Parallel Computing*, Benjamin-Cummings Publishing Company, Inc., 1989.
- Foster, I., *Designing and Building Parallel Programs*, Addison-Wesley, 1995.
- Gropp, W., Lusk, E., Skjellum, A., *Using MPI*, The MIT Press, 1994.
- Message Passing Interface Forum, *MPI: A Message-Passing Interface Standard, Version 1.1*, University of Tennessee, Knoxville, Tennessee, June 6, 1995.
- Message Passing Interface Forum, *MPI-2: Extensions to the Message-Passing Interface, Version 2.0*, University of Tennessee, Knoxville, Tennessee, July 18, 1997.
- Ousterhout, John K., *Tcl and the Tk Toolkit*, Addison-Wesley, Reading, MA, 1994, ISBN 0-201-63337-X.
- Pfister, Gregory, F., *In Search of Clusters*, Prentice Hall, 1998.

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