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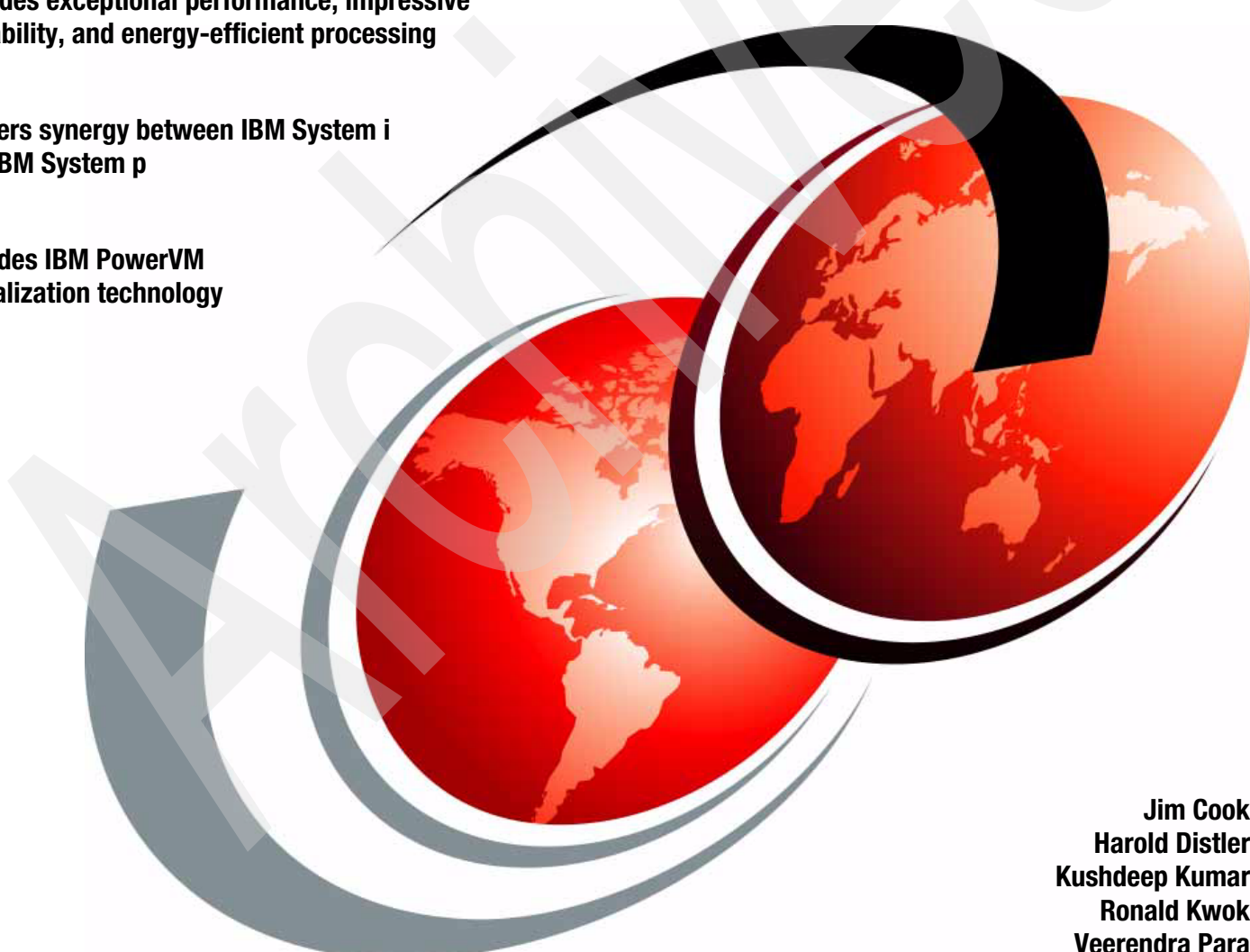# IBM Power 570 and IBM Power 595 (POWER6) System Builder

Provides exceptional performance, impressive scalability, and energy-efficient processing

Delivers synergy between IBM System i and IBM System p

Includes IBM PowerVM virtualization technology

Jim Cook
Harold Distler
Kushdeep Kumar
Ronald Kwok
Veerendra Para

Redpaper

IBM

International Technical Support Organization

IBM Power 570 and IBM Power 595 (POWER6) System Builder

December 2008

Note: Before using this information and the product it supports, read the information in "Notices" on page xi.

First Edition (December 2008)

This edition applies to AIX releases 5.3 and 6.1, IBM i 5.4 with Licensed Machine Code V5R4M5 and IBM i 6.1, and Linux systems whose release levels and service levels are listed throughout this paper.

Contents

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Preface

IBM® System i® and IBM System p® platforms unify the value of their servers into a single, powerful lineup of servers based on industry-leading POWER6™ processor technology with support for the IBM AIX®, IBM i (formerly known as i5/OS®), and Linux® operating systems. This new, single portfolio of IBM Power Systems™ servers offers industry-leading technology, continued IBM innovation, and the flexibility to deploy the operating system that your business requires.

The Power 570 and Power 595 models announced in April 2008 are fully converged. The Power 520 and Power 550 models announced January 2008 and the April 2008 announcements brought these models very close to complete convergence. The October 2008 announcements and firmware made available November 2008 brought full convergence for the Power 520 and Power 550.

This IBM Redpaper publication is intended for professionals who want to acquire a better understanding of IBM Power Systems products, including:

► Clients
► Sales and marketing professionals
► Technical support professionals
► IBM Business Partners

This paper provides hardware-focused processor, memory, and I/O feature descriptions that are supported by the POWER6 Power 570 and Power 595 servers. The goal of this paper is to ensure that customers with IBM System i and IBM System p experience understand the POWER6 capabilities on these servers with a focus on hardware technology and features starting with this single comprehensive paper that covers the following IBM Power 570 and IBM Power 595 Machine Type and Models (MTMs):

► POWER6 570 9406-MMA
► POWER6 570 9117-MMA
► POWER6 595 9119-FFA

A companion paper will available for the POWER6 520 and 550 MTMs (*IBM Power 520 and Power 550 (POWER6) System Builder*, REDP-4412). Available now are the following POWER6 technical overview and introduction papers:

► Power 520 (*IBM Power Systems 520 Technical Overview and Introduction*, REDP-4403)
► Power 550 (*IBM System p 550 Technical Overview and Introduction*, REDP-4404)
► Power 570 (*IBM System p 570 Technical Overview and Introduction*, REDP-4405)
► Power 595 (*IBM Power 595 Technical Overview and Introduction*, REDP-4440)

This paper does not replace the latest marketing materials, tools, and other IBM publications that are available. For complete documentation, refer to the IBM Systems Hardware Information Center:

http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp

This paper is based upon the current set of IBM Power Systems documentation that is available in various IBM publications and IBM Power Systems Web sites. However, it also provides significant additional information—all in one document. When appropriate, this paper points to these other sources for more detailed or more frequently updated information.

Common POWER6 capabilities that we address in this paper include:

► PowerVM™ virtualization
► EnergyScale™ technology that provides features such as power trending, power-saving, thermal measurement, and processor napping
► Mainframe-based continuous reliability, availability, and serviceability.
► I/O feature terminology, technology, and technical descriptions
► Supported operating system release level requirements
► Hardware decimal floating point support

We include MTM chapters that specifically address processor, memory, and I/O features that are supported by that MTM. Then, following these MTM chapters is a large feature descriptions chapter, Chapter 4, "Feature descriptions and related information" on page 187, and various specific topic chapters and appendixes.

We also include summaries of AIX and IBM i operating system capabilities and associated licensed program products that are available.

Note: Unless otherwise noted in the text, the term $POWER5$™ in this paper includes both POWER5 and POWER5+™ processor technology systems.

Important: This paper focuses on the POWER6 Power 570 and Power 595 MTMs. However, many chapter contents, tables and appendixes in this paper include information that also applies to POWER6 Power 520 and Power 550 MTMs. Specific Power 520 and Power 550 information not included in this paper includes descriptions of their MTM processor enclosure capabilities and I/O features that are supported only on the Power 520 and Power 550 MTMs. This paper integrates the I/O features announced during October 2008 but does not fully integrate the announced Power 560 and 32-way Power 570. Full integration of these MTMs is planned for a future update.

The team that wrote this paper

This paper was produced by a team of specialists from around the world working at the International Technical Support Organization (ITSO), Rochester Center.

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Thanks to the following people for their contributions to this project:

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Introduction to the POWER6 IBM Power System servers

This chapter provides an overview of the POWER6 IBM Power Systems servers capabilities that are available on the following systems:

► IBM Power 570
► IBM Power 595

This chapter also addresses terms and capabilities that are common across all POWER6 servers except IBM Blade models. We correlate IBM System i and IBM System p terminology.

Topics that we cover in this chapter include:

► IBM brand and model-specific Machine Type Model (MTM) naming conventions

► Processor enclosure/system unit/CEC terms

► I/O hardware terminology such as HSL, RIO, 12X, controllers, adapters, I/O drawer, I/O tower, I/O expansion unit, and so forth

► IBM System i I/O processor (IOP) features that are required by certain I/O adapters (IOAs), also commonly referred to as controllers

► POWER6 hardware implementation of Floating Decimal Point support

► PowerVM brand name and PowerVM edition capabilities

► Hardware availability and energy management and control capabilities

► POWER6 hardware implementation of Floating Decimal Arithmetic data and calculations

► Operating system and release levels that are required to support POWER6 technology systems

Important: This paper focuses on the POWER6 Power 570 and Power 595 MTM capabilities announced through September 2008. However, many of chapter contents, tables, and appendixes include information that also applies to POWER6 Power 520 and Power 5250 MTMs. This paper does not include descriptions of the Power 520 and Power 550 processor enclosure capabilities and I/O features that are supported only on the Power 520 and Power 550 MTMs.

1

1.1 IBM Power Systems models

IBM System i and IBM System p platforms are unifying the value of their servers into a single lineup of servers based on industry-leading POWER6 processor technology with support for the IBM AIX, IBM i (formerly known as *i5/OS*), and Linux operating systems. This new, single portfolio of IBM Power Systems servers offers industry-leading technology, continued IBM innovation, and the flexibility to deploy the operating system that your business requires.

> **Important:** This paper covers Power 570 and Power 595 MTM capabilities announced April 2008 through September 2008. It does not include details on the 07 October, 2008 announcements for the POWER6 Power 560, 570, and 595, which include new processor speed options, memory options, and expanded I/O support.
>
> The key Power 570 and Power 595 hardware enhancements that were announced in October 2008 include:
>
> ► New Power 560 16-core system (MTM 8234-EMA)
>
>   – 3.6 GHz POWER6 processors
>   – Max CPW: 48,500 ##rperf
>   – 4, 8, and 16 core Express™ configurations
>   – AIX 5.3, AIX 6.1 IBM i 6.1, SUSE® Linux Enterprise Server, Red Hat Enterprise
>
> ► New Power 570 32-core system (MTM 9117-MMA)
>
>   – 4.2 GHz POWER6 processors
>   – Max CPW: 104,800 ##rperf
>   – 8, 16, 24, and 32-core configurations
>   – IBM i 5.4 and IBM i 6.1 support
>
> ► Enhanced Power 570 16-core system (9117-MMA)
>
>   – 5.0 GHz POWER6 processors
>   – Max CPW: 77,600 ##rperf
>   – 4, 8, 12, 16-core configurations
>   – IBM i 5.4 and IBM i 6.1 support
>
> ► Enhanced Power 595 (9119-FHA) capabilities:
>
>   – Hot-node Add and Hot-node Repair on Power 595 enables resources to be added or repaired without shutting down the system
>   – Add additional processor books
>   – Repair a processor book with a failed component
>   – Add memory to an existing processor book
>   – New 5 GHz processor book enables 64 GB DDR2 memory features:
>   • #4705 processor book provides updated Direct Current Adapters (DCAs)
>   • Existing 5 GHz processor books can convert to new book at no charge
>   – Enabling POWER5 DDR2 memory migration to Power 595
>
> A system firmware update available 21 November 2008 is required to enable IBM i to run on the 8203-E4A and 8204-E8A MTMs. For more information, refer to 1.6.8, "System firmware and HMC levels" on page 38.

Important: Key POWER6-based capabilities available on the 9117-MMA and 9119-FHA MTMs also in the 07 October 2008 announcement include:

► 428 GB (IBM i formatted) #3658 and 450 GB (AIX/Linux formatted) # 3649 3.5 inch 15 k rpm SAS disk drive supported in the 8203-E4A, 8204-E8A, 9117-MMA system units and #5886 EXP 12S Disk Drawer. #3658 is supported by IBM i 5.4 (with LIC V5R4M5) #3649 is supported by AIX 5.3 and AIX 6.1.

► #5735 8 Gigabit PCI Express (PCIe) Dual Port Fibre Channel Adapter, which is supported under the following operating systems on MTMs 8203-E4A, 8204-E8A, 9117-MMA:
  – AIX 5.3 and AIX 6.1
  – IBM i 5.4 and IBM i 6.1
  – SUSE Linux Enterprise Server and Red Hat Enterprise Linux

  It supports 8 Gbps, 4 Gbps, and 2 Gbps speeds, depending on the SAN network hardware.

► #5772 10 Gigabit PCIe Ethernet-LR PCI Express Adapter is a Fiber Optic Server Adapter with a Long Range adapter that provides a high-performance interface and fiber LAN connectors on the optical modules. It is supported under the following operating systems on MTMs 8203-E4A, 8204-E8A, and 9117-MMA:
  – AIX 5.3 and AIX 6.1
  – IBM i 6.1
  – SUSE Linux Enterprise Server and Red Hat Enterprise Linux

► #2728 4 port USB PCIe Adapter is a PCIe 4-port USB adapter that provides support for USB devices. It is supported under the following operating systems on MTMs 8203-E4A, 8204-E8A, and 9117-MMA:
  – AIX 5.3 and AIX 6.1
  – SUSE Linux Enterprise Server and Red Hat Enterprise Linux

► Expanded upgrades into the 9117-MMA and 9119-FHA

This paper focuses on the POWER6 Power 570 and Power 595 MTMs announced April 2008 through 30 September 2008. Thus, it does not include additional details on the content announced on or after 07 October 2008.

This publication does not include the following IBM 6.1 support announced December 2008:

► Support of the IBM i SAN volume Controller (SVC) through a VIOS partition under the IBM PowerVM editions. IBM i supports IBM Systems Storage SAN Volume Controller (SVC) and the SVC Entry Edition (SVC EE) with PowerVM Virtual I/O Server (VIOS) configurations.

  For more information, go to:

  http://www.ibm.com/systems/storage/software/virtualization/svc/index.html

► Support of the IBM Systems Storage DS3200 disk subsystem through a VIOS partition running on BladeCenter® JS12 and BladeCenter JS22 configuration.

  For more information, go to:

  http://www-03.ibm.com/systems/storage/disk/ds3000/ds3200/index.html

The POWER6 models are designed to continue the tradition of the corresponding IBM POWER5 and the IBM POWER5+ processor-based System i and System p models.

Examples include the System p POWER5 and the corresponding POWER6 520 models and the System i POWER5 570 (9406 series) and the converged POWER6 570 (9117-MMA).

System Builder publications commonly refer to each POWER6 Power 520, Power 550, Power 570, and Power 595 model by their Machine Type Model (MTM) identification, as shown in Table 1-1.

Table 1-1   Power Systems MTM identification

System model	MTMs
Power 520	8203-E4A 9407-M15 9408-M25
Power 550	8204-E8A 9409-M50
Power 570	Unified 9117-MMA[a]
Power 595	9119-FHA

a. Although the unified 9117-MMA is the focus of this paper, in some cases we also mention the pre-unification System p 9117-MMA and System i 9406-MMA.

This paper provides comprehensive hardware-focused technical information about the IBM Power 570 and Power 595 POWER6 technology servers. A separate publication addresses the Power 520 and 550 POWER6 technology servers, *IBM Power 520 and IBM Power 550 (POWER6) System Builder*, REDP-4412.

This paper also includes summary level software information that addresses the following topics:

► AIX, IBM i, and Linux operating system levels that run on POWER6 processor technology servers. See 1.6, "Operating system levels required on POWER6 processors" on page 32.

► The licensed program release levels that are supported.

The new IBM Power Systems servers offer exceptional reliability, availability, and serviceability (RAS) functions, including:

► Built-in reliability through use of highly reliable components

► Recovery from intermittent errors or failover to redundant components

► Detection and reporting of failures and impending failures

► Hardware that initiates actions automatically to affect error correction, repair, or component replacement

1.2 General POWER6 technology capabilities

> **Note:** The remaining topics of this chapter are topics that are generally shared across all of the IBM Power Systems 570 and 595 servers. A discussion of these topics provides the necessary background information and terminology to readers who are familiar with IBM i as well as readers who are familiar with AIX. Some information that we present in this chapter is duplicated within the individual MTM chapters, where appropriate.

In this paper, we use the terminology *Power 5nn* to mean the corresponding POWER6 520, 550, 570, and 595 models.

While this paper includes a large amount of content, its intent is not to replace existing IBM POWER6 Power 520, 550, 570, and 595 hardware-based documentation. Instead, we discuss topics that readers most frequently need in order to minimize time spent when doing Web research.

The following papers provide a good overview of IBM POWER6 hardware:

► *IBM Power Systems 520 Technical Overview and Introduction*, REDP-4403
► *IBM System p 550 Technical Overview and Introduction*, REDP-4404
► *IBM System p 570 Technical Overview and Introduction*, REDP-4405
► *IBM Power 595 Technical Overview and Introduction*, REDP-4440

These documents supplement the POWER6 documentation that you can find at the IBM Systems Information Center:

http://publib.boulder.ibm.com/infocenter/systems

The following documents provide excellent summary table information:

► *IBM Power Systems Facts and Features*
► *IBM Power Systems I/O Facts and Features*

You can find these documents at:

http://www-03.ibm.com/systems/p/hardware/reports/factsfeatures.html

Throughout this paper and in "Related publications" on page 991, we provide references (including, where appropriate, Web addresses) to these and other sources of POWER6 documentation.

1.2.1 System unit, processor enclosure, and CEC terms

In several IBM Power System publications, the terms *system unit*, *processor enclosure*, *Central Electronics Complex* (CEC), *building block*, or *node* are all used to refer to "minimum hardware configuration" versus additional I/O enclosures. In the following list, we discuss these terms as they apply to each POWER6 model:

► Power 520

The POWER6 520 includes the following MTMs:

– 8203-E4A
– 9407-M15
– 9408-M25

The Power 520 is a single system unit or processor enclosure that packages the following components:

– Processor cores
– Memory DIMMs
– An Integrated Virtual Ethernet (IVE) adapter (some times also referred to as the *embedded Host Ethernet Adapter*)
– PCI card slots
– Up to six SAS disks and associated disk adapter (controller)
– An optional internal DVD device
– Up to two optional GX adapters that support either RIO-2 or 12X I/O loops.

The one-way processor configurations of the 8203-E4A and 9407-M15 have some restrictions, such as no support for a GX adapter.

The system unit or processor enclosure is occasionally also referred to as the *520 CEC*.

► Power 550

The POWER6 550 includes the following MTMs:

– 8204-E8A
– 9409-M50

The Power 550 is a single system unit or processor enclosure that packages the following components:

– Processor cores
– Memory DIMMs
– An Integrated Virtual Ethernet (IVE) adapter (some times also referred to as the *embedded Host Ethernet Adapter*)
– PCI card slots
– Up to six SAS disks and associated disk adapter (controller)
– An optional internal DVD device
– Up to two optional GX adapters that support either RIO-2 or 12X I/O loops

The system unit or processor enclosure is occasionally also referenced as the "550 CEC."

► Power 570

The POWER6 570 includes the following MTMs:

– 9406-MMA (System i)
– 9117-MMA

The Power 570 has one to four processor enclosures. Each processor enclosure packages the following components:

– Processor cores (four per enclosure)
– Memory DIMMs
– An Integrated Virtual Ethernet (IVE) adapter (some times also referred to as the *embedded Host Ethernet Adapter*)
– PCI card slots
– Up to six SAS disks and associated disk adapter (controller)
– Optional internal DVD device and optional internal DVD device
– Up to two optional GX adapters that support either RIO-2 or 12X I/O loops

Each processor enclosure must contain processor cores, memory DIMMs, and an IVE adapter. Other features are optional.

Each processor enclosure is also referenced as the *570 CEC*, a *building block*, or a *node*. The terms building block and node are typically used when discussing adding another building block or node to increase the capacity of a configured Power 570. The capability to add a processor enclosure while the system is active is commonly referred to as *hot node add*.

This first processor enclosure contains the primary active Service Processor and the Operator Panel, if an Operator Panel is present in the system. If a second processor enclosure (CEC), which adds processor cores 5 through 8, is part of the system configuration, the backup service processor is contained in this second processor (CEC) enclosure

► Power 595

The POWER6 595 is MTM 9117-FHA.

The Power 595 consists of a system rack and one or two powered expansion racks. The 42U-tall, 24 inch system rack houses the following components:

– The CEC, Bulk Power Assemblies (BPA), and I/O drawers that are located at the bottom of the rack
– A redundant power subsystem
– Mounting slots for one to eight processor books
– Other cooling and electrical components

Each processor book contains:

– Eight processor cores that are packaged on four multi-chip modules (MCMs)

– 32 DDR2 memory DIMM slots

– Up to four GX adapters (RIO-2 or 12x)

– Two Distributed Converter Assemblies (DCAs)

– Two Node Controller (NC) service processors (primary and redundant). The node controller cards communicate to the HMC through the Bulk Power Hub (BPH) and are connected to both front and rear Ethernet ports on the BPH.

Each powered expansion rack has space for up to eight I/O expansion drawers, redundant Bulk Power Assemblies (BPA), and an optional battery backup capability. In addition, the powered expansion rack includes support for one bolt-on, non-powered expansion rack for support of additional I/O drawers.

For more details about the Power 570 and Power 595, see the following chapters:

1.2.2 SAS and SCSI bus technology

POWER6 servers introduce Serial-attached SCSI (SAS) technology only for disk drives within the system unit. (POWER6 offers SAS-attached tape devices as well.) SAS is described in ANSI/INCITS 376-2003, an American National Standard Institute standard.

Compared to parallel SCSI, SAS is a relatively new method for communicating with computer peripheral devices (for example I/O devices). It employs a serial (one bit at a time) means of digital data transfer over thin cables. SAS offers the following advantages over the older parallel SCSI technologies:

► The cables are thinner, and the connectors are less bulky.

► Serial data transfer allows the use of longer cables than parallel data transfer.

► In general, the hardware for serial interfaces is less costly than the hardware for equivalent parallel interfaces.

Table 1-2 briefly compares SAS and SCSI technology attributes.

Table 1-2   Comparison of SAS and SCSI technologies

SAS	SCSI (also called *parallel SCSI*)
Point-to-point interface	Multi-drop interface
No terminators required	Terminators required
Up to 16 000 devices supported per port	Maximum of 8, 16, or 32 devices supported per port
Transfer rates up to 375 MBps per initiator-target pair	Transfer rates up to 320 MBps shared across each SCSI bus

Over time, most new I/O disk and tape devices will be supported using only SAS connectivity.

The Power 520, Power 550, and Power 570 servers support SAS technology in the system unit. Selected SAS adapters are also supported in external I/O enclosures by specific POWER6 MTMs and specific operating systems. For more information, see the processor technology MTM chapters included in this paper in Chapter 2, "IBM Power 570 Model 9117-MMA" on page 41 and Chapter 3, "IBM Power 595 model 9119-FHA" on page 99.

1.2.3 General I/O terminology and configuration summary

System i and System p customers might be familiar with terms that in some cases are the same between the two customer sets and in other cases are different. In this section, we discuss these terms to help customers with a specific knowledge of System i or System p to understand the new hardware features, as well as, in the case of I/O support, to understand features that are currently available on POWER5 technology servers that are or are not supported on POWER6 servers.

Historically, there have been some operating system-specific requirement differences in the I/O hardware and related software support areas among System i and System p hardware technologies. These differences impact the capabilities and requirements for various I/O adapters and operating system support for these adapters. In some cases, I/O-related hardware is supported as part of an upgrade into a POWER6 technology, server but that hardware product cannot be ordered new.

Examples of AIX and Linux unique I/O features include:

► 7031-D24/T24 EXP24 Disk Enclosure
► #5794 I/O Drawer
► 7311-D20 I/O Expansion Drawer (I/O enclosures)
► Graphic adapters
► Specific WAN and LAN adapters
► SAS disk and tape controllers
► iSCSI adapters
► Specific Fibre Channel adapters

Examples of IBM i unique I/O features include:

► #5094, #5294, #5088, #0588, and #0595 I/O drawers and towers (I/O enclosures)
► I/O Processors (IOPs)
► IOP-based PCI adapter cards
► Very large write cache disk adapters (also termed *controllers*)
► Specific Fibre Channel adapters

- ► iSCSI adapters
- ► Specific WAN/LAN adapters

Some System p existing enclosures or drawers use the Machine Type Model (MTM) naming convention, such as the 7031-D24/T24 EXP24 Disk Enclosure and the 7311-D20 I/O Expansion Drawer. In some cases, a System i existing enclosure can have a different feature number and slightly different descriptive text used in documentation when the hardware is almost identical.

Table 1-3 on page 14 lists the System i and System p I/O enclosure and rack enclosure numbers, includes text descriptions, and indicates whether the enclosures are supported on the POWER6 models. In the table, note that although some almost identical System i and System p enclosures are listed together in the same row, there are technical detail differences. For example, the System i enclosure supports IOP cards while the System p enclosure does not.

The following items expand on these terminology and I/O configuration support considerations.

- ► Disk physical sector size and operating system considerations

    Disks attached to AIX, Linux, and IBM i operating systems have different sector formatting requirements. The AIX and Linux disks have 512 byte sectors, and IBM i formatted disks use 520 byte sectors. The additional sector bytes are used by IBM i as part of the implementation of its object security. Because of the formatting differences, different orderable feature numbers are used and different disk capacity values are listed, in some cases for the same physical disk.

    At the time of publication, the IBM i disk sector size also prohibits IBM i, that is using an adapter owned by an IBM i partition, from accessing disk storage attached through a SAN Volume Controller (SVC) and prohibits directly accessing storage servers other than the DS6000™ and DS8000™ set of products.

    When use of a DS4000™ product or a SAN controlled by an SVC is required, the IBM disks can be virtualized (served) through an AIX or IBM Virtual I/O Server (VIOS) partition, which requires IBM i 6.1 release level on the client partition.

- ► HSL and RIO terminology

    System i uses *HSL*, and System p uses *RIO* as different terms for the same I/O loop attachment technology. The POWER5 and POWER6 technology systems use the second generation of this technology, and thus *HSL-2* or *RIO-2* are the terms now used. In this paper, we use *RIO-2* in most cases. If you see *HSL-2*, remember that it is the same loop technology as RIO-2.

    Some earlier System p documents might also use RIO-G instead of RIO-2.

- ► 12x terminology

    12x is a newer and faster technology, when compared to RIO-2 high speed I/O loop technology. The *12* refers to the number of wires within the 12x cable. Potentially, 12x technology offers up to 50% more bandwidth than HSL technology. The 12x loop technology from IBM is based upon the participation of IBM with the InfiniBand® Trade Association (IBTA). IBM 12x implementation is not 100% InfiniBand compliant. Therefore, this paper does not use 12x and InfiniBand terms interchangeably.

    I/O enclosures with RIO-2 adapters must be attached to a RIO-2 loop. I/O enclosures with 12X adapter must be attached to a 12x loop. RIO-2 and 12x enclosures cannot be mixed on the same loop because they are not compatible. RIO-2 and 12x cables are different.

► RIO-2, 12X loop, and SAN Fibre Channel I/O placement performance considerations:

RIO-2 technology loops support up to 2 gigabytes per second (GBps). 12X loop technology supports potentially 50% more maximum throughput rates than RIO-2. A SAN Fibre Channel connection throughput at the adapter level is up to 4 gigabits per second (Gbps), for example the #5749 and #5774 adapters. The SAN network typology also affects maximum throughput rates.

In many environments the application workloads accessing the I/O devices on the loop or SAN network do not "stress" the maximum throughput rates that are supported by these connection technologies.

However, there are environments where the workloads and placement of devices that are accessed by these workloads do stress the maximum loop and Fibre Channel and SAN network capacities. While detailed I/O performance sizing is beyond the scope of this paper, Take into account the following I/O device placement considerations when you anticipate heavy I/Os per second rates:

– Each I/O enclosure on a loop reduces the maximum throughput capacity by a significant percentage, depending upon I/O rates to devices on that loop.

– In high I/Os per second environments, consider positioning the I/O enclosure to receive the highest I/O rates physically closest to the system's GX adapter on the loop.

We provide expanded hardware placement performance considerations, including an example showing closest to the system's Gx adapter on the loop, in 9.1, "Power systems I/O enclosures and expansion unit schematics" on page 802.

You can also see other examples of RIO-2 loop topology in *Power Systems Expansion Units and Disk-Drive Enclosures,* SA76-0151, which is available in the Information Center.

– Place the enclosures expected to perform a high I/Os per second rate on separate loops or place SAN adapters on separate cabling network.

– For SAN adapters, consider configuring and using multipath (multipath adapters) support to the external storage device.

– Assume that you have a workload to save, do not put both the high speed disks that contain the data and the high speed tape devices on the same loop or within the same I/O enclosure.

– When using a two port Fibre Channel Adapter (for example #5749 or #5774), do not put both disks and high speed tapes on the same adapter.

► PCIe terminology

PCIe uses a term called *lanes* to refer to its technology characteristics. Each lane can support a data rate of 2.5 Gbps for both send and receive. The slowest and smallest PCIe comes in one lane (referred to as *X1*) with the fastest PCIe up to 32 lanes (*x32*).

Think of lanes as data paths. The more lanes there are, the faster the data can flow, which is similar to an auto highway with multiple driving lanes. The size of the adapter and slot vary proportionally to the number of lanes.

Because the physical size varies for both the adapter and slot, for an adapter that has more lanes than a slot, the PCIe adapter cannot physically be plugged to that slot. In the reverse case, if the slot has more lanes than the adapter, then the adapter can be plugged into that slot. PCIe adapters are supported in a slot with an equal number of lanes or higher number. When you see *x8* associated with a PCIe card slot or adapter, that means the card slot or adapter supports eight lanes.

PCIe adapters use a different type of slot than PCI and PCI-X adapters. If you attempt to force an adapter into the wrong type of slot, you can damage the adapter or the slot. A PCI adapter can be installed in a PCI-X slot, and a PCI-X adapter can be installed in a PCI

adapter slot. A PCIe adapter cannot be installed in a PCI or PCI-X adapter slot, and a PCI or PCI-X adapter cannot be installed in a PCIe slot.

► I/O adapter or I/O controller terminology

You will see the word *adapter* and the word *controller* as the title of various I/O feature numbers, each of which supports attachment of other I/O hardware, such as tape or disk devices or a communications (LAN or WAN) cable. In this case, the terms adapter and controller mean the same general capability. In some System i I/O documentation, you might also see the acronym *IOA*, meaning *I/O adapter*. In this paper, we generally use IOA, controller, and adapter interchangeably.

Some hardware documentation refers to an adapter or controller as *Host Bus Adapter* (HBA). This term is typically used in both IBM and non-IBM publications when referring to adapters and controllers that use one of the following:

– A Small Computer System Interface (iSCSI) adapter that supports IBM i Windows® integration with an IBM System x™ computer HBA

– A Fibre Channel adapter connection within an IBM external Storage Server, for example, the DS8000 series of storage servers

► I/O processor (IOP) and IOA relationships

System i has a history of supporting a hardware component called an *I/O Processor* (IOP). IOPs are used as a front end to older technology IOAs, providing support or efficiencies that are not available in the older IOAs. Some IOPs can support multiple IOAs.

System p configurations have not used IOPs.

Originally, the IOP processor technology was faster than IOA processor technology. Earlier IBM i operating system code implementation took advantage of off-load protocol coding and decoding from the CPU. Thus, microcode was placed in the IOP to deliver the fastest possible performance for customers. Some examples include SNA and TCP/IP support where some low level communication data protocol processing was a joint venture between an IOA and its supporting IOP. The operating system's microcode understands this IOP-IOA relationship.

IOAs introduced over the last two to three years have very fast processors and do not require a supporting IOP. Among the System i community, these adapters are sometimes referred to as *smart IOAs* that can operate with or without an IOP. Sometimes these IOAs are also referred to as a *dual mode IOA*.

IOAs also do not run with an IOP, which is sometimes referred to as an *IOP-less* IOA.

AIX or Linux client partitions hosted by an IBM i partition are not aware of any unique IBM i I/O hardware requirements.

AIX or Linux users consider IOP-less IOAs as the "normal" I/O environment. New orders for IBM i, AIX, and Linux operating systems should specify the smart or IOP-less IOAs. However, some tape devices supported under IBM i require an IOA that requires an IOP. Other chapters in this publication, such as Chapter 4, "Feature descriptions and related information" on page 187 and Chapter 10, "Tape and optical storage attachment summary" on page 827, contain this information.

The POWER6 Power 520, Power 550, and Power 570 processor enclosure does not support IOP cards. Thus, if an IOP-IOA combination is required for functional support reasons, a "remote" RIO-2 I/O loop and an appropriate I/O enclosure supporting an IOP is required. The one processor configurations of the Power 520 8203-E4A and 9407-M15 do not support remote I/O loops. See 1.2.4, "I/O enclosures attaching using 12x or RIO-2 I/O loop adapters" on page 13 for more information about I/O enclosures.

As previously indicated, certain device types supported under IBM i require an IOA running under a supported IOP. These device types are generally within one of the following two categories:

– SNA (and SDLC over WAN lines)

Several years ago, when there were many SNA-based communications networks, the earlier versions of IBM i took advantage of the IOP capacities and moved some protocol encoding and decoding implementation into the IOP, offloading CPU utilization. For POWER6 customer environments using SNA communications need to consider to continue to use the supported communication IOP-IOA pair cards. Alternatives are to convert to TCP/IP support or use the new "no IOP IOAs" and IBM i 5.4 and IBM i 6.1 SNA Enterprise Extender (EE) support.

SNA EE packages SNA protocol within an IP frame such that the IOA is unaware of SNA protocols and data formatting. EE offers several advantages over IBM i supported AnyNet® (SNA over TCP/IP) but does require SNA EE support at both ends of the communications conversation. A consideration in this area would be IBM i communicating with an older IBM 5250 remote controller which does not support SNA EE. OEM vendors provide solutions in this area.

> **Note:** Starting with IBM i 5.4, either SNA direct (native SNA) or Enterprise Extender support can be used over the supported IOP-IOA pair. The IBM i System Support planning and upgrade Web site contains additional information about IBM i SNA support for future releases:
>
> http://www-304.ibm.com/systems/support/i/planning/upgrade/futuresftwr.html

– Specific tape device support

Some tape hardware, for example, the older non-LTO high speed tape devices, are supported by IBM i only with the older IOP-IOA cards.

IBM i 5.4 (with machine code LIC 5.4.5) and 6.1 support the following classes of IOAs:

► IOP required IOAs

► IOP-less only IOAs, which are supported by IBM i, AIX, and Linux releases. Some of these IOAs are supported by IBM i 5.4 with a larger set by IBM i 6.1.

► Dual mode (smart) IOAs, without an IOP configuration, are supported by AIX or Linux releases or IBM i 5.4 and IBM i 6.1. With an IOP, Dual mode (smart) IOAs are supported by IBM i.

> **Note:** In some cases, the same adapter card can be ordered with a feature code that designates "with an IOP" and a different feature code that designates "without an IOP." You cannot generally assume that the same adapter, that is the card physically plugged into a supporting card slot, will run without an IOP. It might or might not run without an IOP. Be sure to read the feature description details for specific capabilities in Chapter 4, "Feature descriptions and related information" on page 187.
>
> Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909 includes a table that shows feature numbers that are converted to a new feature number when installed on a POWER6 system.

The IOP and IOA card relationships affect card placement rules within the system unit and I/O enclosure PCI-X and PCIe card slots. For example the POWER6 system units do not support IOP cards. Some card slots within an I/O enclosure should be used with higher speed adapters.

This paper generally discusses card placement considerations but does not provide detailed rules. For POWER6 configurations, refer to the following publications available in the IBM Systems Hardware Information Center under the Power Systems category at:

http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp

► For PCI placement information associated with the April 2008 POWER6-based IBM Power 520 9407-M15, 9408-M25, and 9409-M50 model configurations, refer to the *Power Systems PCI Adapter Placement Guide for Machine Type 940x,* SA76-0096.

► For PCI placement information associated with January 2008 and the April 2008 POWER6-based IBM Power 520 8203-E4A, IBM Power 550 8204-E8A, IBM Power 570 9117-MMA, and IBM Power 595 9119-FHA model configurations, refer to the *Power Systems PCI Adapter Placement Guide for Machine Type 820x and 91xx,* SA76-0090.

1.2.4 I/O enclosures attaching using 12x or RIO-2 I/O loop adapters

As described earlier in this chapter, each POWER6 520, 550, or 570 system unit supports zero, one, or two GX+ adapters for attaching I/O enclosures in addition to any enclosures that are supported by the system unit's five I/O expansion slots.

The POWER6 595 supports from one to eight processor books. Each processor book supports up to four GX+ adapters.

The following technology GX+ adapters are available for attaching I/O enclosures:

► 12X offers the potential of total loop capacity greater than the maximum capacity of RIO-2 technology, and 12X is the implementation from IBM based upon the industry-defined InfiniBand architecture. *12X* means that the I/O data has 12 paths for transmitting and receiving data. Specific I/O enclosures supporting 12x connections do not support RIO-2 connections.

► RIO-2 is the second generation of RIO I/O enclosure attachment technology. System i customers are familiar with the HSL name for the same RIO level technology. That is, RIO-2 and HSL-2 are exactly the same technology. In most cases within this paper, we use the term *RIO-2*.

The processor enclosure or processor book contains the appropriate GX+ adapter feature number, and the loop-attached I/O enclosure adapter must match the host RIO-2 or12x adapter. I/O enclosures that support IOP cards connect to a system using a RIO-2 adapter.

Several specific feature numbered I/O enclosures use the following terminology:

► I/O drawer
► I/O tower
► I/O expansion unit

When describing the specific feature number in this paper, we use the specific enclosure name. When discussing supported I/O enclosures generally, we use the term I/O enclosure.

Chapter 4, "Feature descriptions and related information" on page 187 uses the feature description text from the appropriate IBM Power System model sales manual pages.

In the next two sections, 1.2.5, "Common I/O enclosures from existing System i and System p configurations that are supported on POWER6" on page 14, and 1.2.6, "Common racks from System i and System p configurations" on page 17, we place the most commonly configured System i and System p I/O enclosures and racks in rows that help identify their disk and PCI card support. Where appropriate, we place both the System i and System p enclosure descriptions that represent identical or almost identical hardware within the same table row.

1.2.5 Common I/O enclosures from existing System i and System p configurations that are supported on POWER6

This section describes the external I/O enclosures, which include I/O drawers, I/O expansion units, and I/O towers.

Table 1-3 provides a summary of all the supported I/O enclosures. It lists the System i and System p feature numbers as appropriate. (Note that we repeat this table in the upgrade information included in Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909.)

> **Note:** We do not include every possible I/O enclosure that System i or System p supports prior to the availability of POWER6 systems that can be supported on POWER6. However, we do include new I/O enclosures as well as a few of the older technology enclosures not supported on POWER6 configurations announced during 2008 or later. We have columns for the following POWER6 systems:
>
> ► Power 520 (8203-E4A, 9407-M15, and 9408-M25)
> ► Power 550 (8204-E8A and 9409-M50)
> ► Power 570 (9117-MMA)
> ► Power 595 (9119-FHA)

Table 1-3   I/O enclosures

Enclosure	DASD	PCI slots	System adapter requirements for POWER6 connection	EIU / Width (in.)	8203 - E4A	9408 - M25	8204 - E8A	9409 - M50	9117 - MMA	9119 - FHA
System i 5074/5079	15-90 10 k rpm disks	14	Not supported	4U / 19	N	N	N	N	N	N
System p 7311-D10	0	6	Not supported	4U / 19	N	N	N	N	N	N
System p 7311-D20 System i 0595 (rack) 5095 (tower) [3, 6]	12 SCSI 10 k[7], 15 k rpm	7 PCI-X	GX+ adapter card FC 5614 (RIO-2 loop)	4U / 19 5U / 19	✓ A L ✓ i	✓ A L ✓ i	✓ A L ✓ i	✓ A L ✓ i	✓ A L ✓ i	N ✓ i
System i 5094 5294 (2x 5094)[1]	SCSI 10 k [7], 1 5k rpm up to 45 SCSI disk slots up to 90 SCSI disk slots	14 28	GX+ adapter card FC 5614 (RIO-2 loop)	19	✓ i	✓ i	✓ i	✓ i	✓ i	✓ i
System i 5096 5296 (2x 5096) [2]	0 / 0	14 28	GX+ adapter card FC 5614 (RIO-2 loop)	19	✓ i	✓ i	✓ i	✓ i	✓ i	✓ i
System p 7311-D11 System i 5790	0 0	6	GX+ adapter card FC 5614 (RIO-2 loop	4U / 19	✓ A L ✓ i	✓ A L ✓ i	✓ A L ✓ i	✓ A L ✓ i	✓ A L ✓ ✓ i	✓ A L ✓

Enclosure	DASD	PCI slots	System adapter requirements for POWER6 connection	EIU / Width (in.)	8203 - E4A	9408 - M25	8204 - E8A	9409 - M50	9117 - MMA	9119 - FHA
System i 0588 (rack) 5088 (tower)[1]	0	14	GX+ adapter card FC 5614 (RIO-2 loop) RPQ or #6417 (MES) or #9517 for RIO-2 adapter in 0588	8U /19	✓i	✓i	✓i	✓i	✓i	✓i
System p 7314-G30 System i 5796	0 0	6 PCI-X DDR 266 MHz	GX+ adapter card FC 5616 (12x loop)	4U / 19	✓AL N	✓AL ✓i	✓AL N	✓AL ✓i	✓AL ✓i	N N
System p 7031-T24/ D24 System i 5786	24 SCSI 10 k[7] rpm, 15 k rpm 24 SCSI 10 k[7]rpm, 15 k rpm	0	Any supported SCSI adapter	4U / 19	✓AL N	✓AL ✓ALi	✓AL N	AL ✓ALi	✓AL ✓ALi	✓AL ✓ALi
#5886 EXP 12S SAS Disk Drawer	12 SAS 15 k rpm	0	Any supported SAS adapter or the external port of the FC 8345 backplane.	2U / 19	✓ALi	✓ALi	✓ALi	✓ALi	✓ALi	✓ALi
#5791 24 inch RIO-2 I/O drawer	16 SCSI 10 k[7]rpm, 15 k rpm	20	GX+ adapter card FC 1814 (RIO-2 loop)	4U /24	N	N	N	N	N	✓AL
#5807 24 inch RIO-2 I/O drawer (Model Upgrade Carry-Over Indicator for #5791)	16 SCSI 10 k[7]rpm, 15 k rpm	20	GX+ adapter card FC 1814 (RIO-2 loop)	4U / 24	N	N	N	N	N	✓AL
#5794 I/O Drawer	8 SCSI 10 k[7]rpm, 15 k rpm	20	GX+ adapter card FC 1814 (RIO-2 loop)	4U / 24	N	N	N	N	N	✓AL
#5808 24 inch RIO-2 I/O drawer (Model Upgrade Carry-Over Indicator for #5794)	8 SCSI 10 k[7]rpm, 15k rpm	20	GX+ adapter card FC 1814 (RIO-2 loop)	4U / 24	N	N	N	N	N	✓AL
#5809 24 inch RIO-2 I/O drawer (Model Upgrade Carry-Over Indicator for converted #4643) (7040-61D I/O Drawer [1]) with DCA	16 SCSI 10 k[7]rpm, 15 k rpm		GX+ adapter card FC 1814 (RIO-2 loop) Effectively becomes a #5791. See #5791 Enclosure column.	4U / 24	N	N	N	N	N	✓AL
#5797 12X I/O Drawer PCI-X, with repeater [4, 5]	16 SCSI 15 k rpm	20	GX+ adapter card FC 1816 (12X loop)	4U / 24	N	N	N	N	N	✓ALi

Enclosure	DASD	PCI slots	System adapter requirements for POWER6 connection	EIU / Width (in.)	8203 - E4A	9408 - M25	8204 - E8A	9409 - M50	9117 - MMA	9119 - FHA
#5798 2X I/O Drawer PCI-X, no repeater[4, 5]	16 SCSI 15 k rpm	20	GX+ adapter card FC 1816 (12X loop)	4U / 24	N	N	N	N	N	✓ A L i
#5720 DVD/Tape SAS External Storage Unit (1U)	0. This media drawer provides the system with two bays for media (DVD, SAS tape) devices. One SAS controller in either a #5797 or #5791 I/O drawer drives both bays.		Note: The #5720 Media Drawer is not available when the #6331 Battery Backup is ordered.	1U / 24 [8]	N	N	N	N	N	✓
#5791 Special conversion	Beginning 21 November 2008, you can optionally convert #5791 I/O drawers purchased with the 9119-FHA to the newer #5797/#5798 at a lowered cost than a new #5797/#5798. PCI cards and SCSI disk drives can be moved from the #5791 and placed in #5797/5798. Important note: Conversions from I/O drawers with #5807, #5808, or #5809 carry over feature available December 2008.				N	N	N	N	N	✓

Enclosure	DASD	PCI slots	System adapter requirements for POWER6 connection	EIU / Width (in.)	8203 - E4A	9408 - M25	8204 - E8A	9409 - M50	9117 - MMA	9119 - FHA

General Notes:
- ✓= Supported
- N = Not supported
- A = Supported by AIX
- L = Supported by Linux
- i = Supported by IBM i

See the Features Description chapter for required release levels.

Note that although some almost identical System i and System p enclosures are listed in the same table row, there are technical detail differences with these enclosures. For example, the System i enclosure can support IOP cards while the System p enclosure does not. The AIX and IBM i operating system software is very specific to supporting hardware based upon a specific MTM or feature code value. This value determines whether a similar hardware enclosure or card might not be supported by an operating system.

The following chapters in this paper provide additional details about the I/O enclosures that we list in this table:
- Chapter 4, "Feature descriptions and related information" on page 187
  Note that most hardware features have specific cable requirements. In this paper, most cable descriptions are either in the individual MTM chapters or included in Chapter 11, "RIO-2 12X SPCN line cord SAS and communication cables for IBM Power Systems models" on page 857.
- Chapter 9, "IBM Power systems I/O enclosures schematics" on page 801
- Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909

GX adapters listed under the Requirements for POWER6 connection column of this table are the Power System GX adapter card. The enclosure requires a corresponding loop adapter card that is not included in this table. See Chapter 4, "Feature descriptions and related information" on page 187.

Specific Notes:
1. Cannot order as new as of November 2008.
2. Order using RPQ 847230, 847231 as of November 2008
3. Order using RPQ 847232 as of November 2008
4. Available November 2008.
5. IBM i 5.4 and 6.1 releases do not support the disks attached to the embedded zero write cache disk controller within the enclosure. IBM i supports disks attached to the appropriate adapters that can use the PCI-X slots within the enclosure.
6. The 0595 and 7311-D20 are almost identical except 7311-D20 is 4U high, and 0595 is 5U high.
7. Z = 10k rpm not recommended
8. The #5720 media drawer occupies 1U of rack space in either the 12U or 34U positions in the 595 system.

The chapters that follow in this paper provide additional information about these I/O enclosures and the cards that are supported by these enclosures.

1.2.6 Common racks from System i and System p configurations

In this section, we list the supported racks for the IBM Power System technology systems in two groups. The first group, unless an exception is noted, applies to all rack configured POWER6 systems. The second group applies only to the POWER6 595 model.

Note: When using this information, keep in mind the following notes:

► Where appropriate, we list the System i feature first, followed by the System p feature. In some cases, the separate features might be supported only in upgraded configurations (and not new configurations).

► In cases where a physical rack is the same for both a System i and a System p order number and that rack is supported on POWER6, the IBM configurator tool might list the System i or System p rack number, dependent upon the primary operating system specified on the order. While physically the same rack, some supported features within the rack might be listed by default based upon the primary operating system specified.

Some features that are delivered as part a either a System p rack or a System i rack might be different. For example, be sure to order the #0553 only when required to support rack integration of MES orders prior to shipment from IBM manufacturing.

Table 1-4 lists the supported racks for the IBM Power System technology.

Table 1-4   Supported racks for the IBM Power System technology

Model	Feature	Description
Power 520, Power 550, Power 570, Power 595 servers	#0551 and #7014-T00	19 inch 1.8 meter 36U Rack. Feature #0551 is equivalent to the #7014-T00 rack.
	#0553 and #7014-T42	19 inch 2.0 meter 42U Rack. Feature #0553 is equivalent to the #7014-T42 rack.
	#0554 and #7014-S11	19 inch 0.6 meter 11 U Rack. Feature #0554 is equivalent to the #7014-S11 rack. Feature #0554 or cannot be ordered new as of April 2008. The #0554/#7014-S11 does not support the Power 570 processor enclosures.
	#0555 and #7014-S25	19 inch 1.3 meter (25U). Feature #0555 is equivalent to the #7014-S25 rack.

Model	Feature	Description
Power 595 servers	Power 595 System Rack	The 42U-tall, 24 inch system rack that houses the CEC, BPA, and I/O drawers.
	#5792 (not available for new orders)	9119-595 powered Expansion Rack. Used for additional 24 inch I/O drawer expansion. The #5792 supports the RIO-2 I/O Drawers (#5791 and #5794). It does not support the 12X I/O Drawers (#5797 nor #5798). It can support a bolted on Expansion Rack #8691.
	#8691	Expansion Rack, 24 inch, 42U, unpowered. Power can come from attachment to either the 595 system rack or a #5792.
	#6954	Power Expansion Rack, 24 inch, 42U powered. Uses the same power components provided in the Power 595 system rack.
	#6953	24 inch unpowered Expansion Rack. Can be bolted to the side of a powered Expansion Rack.
	#5881	Migrated Bolt-on rack. An indicator feature used when the #8691 Bolt-on rack is migrated from a 9119-595. A 24 inch Bolt-on Expansion rack for RIO-2 I/O drawers #5791, #5807, #5808, and #5809.
	#5882	Migrated Self-Powered rack. An indicator feature used when the #5792 Powered Expansion rack is migrated from a 9119-595. A 24 inch Self Powered Expansion rack for RIO-2 I/O drawers #5791, #5807, #5808, or #5809.

The chapters that follow provide additional information about these racks.

1.3 IBM PowerVM naming and editions

PowerVM is the family of technologies, capabilities, and offerings that deliver industry-leading virtualization on Power servers. It is the umbrella branding term for Power Systems Virtualization capabilities, under control of the POWER6 Hypervisor, that include:

► Dynamic LPAR: Movement of processor capacity and main storage amounts from one partition to another, Virtual LAN, and Virtual SCSI.

► Micro-partitioning: Up to 10 micro-partitions per processor.

► Multiple Shared Processor Pools: Partitions can be assigned to use specific pools.

► Virtual I/O Server: A Virtual I/O server partition can own I/O that is used by client partitions.

► Shared Dedicated Capacity: A partition using dedicated processors can enable its processor capacity, when not being used, for use by other processors.

► PowerVM Lx86: Run many Linux applications directly on the Power System server.

► PowerVM Live Partition Mobility: Allows you to move a running logical partition, including its operating system and running applications, from one POWER6 system to another without any shutdown or without disrupting the operation of that logical partition.

The PowerVM capabilities are available in the following editions:

► PowerVM Express Edition:

  – Up to three partitions on the server
  – Virtual I/O Server
  – Shared Processor Pool
  – PowerVM Lx86

► PowerVM Standard Edition, which includes the PowerVM Express Edition capabilities plus:

  – Micro-Partitioning™ with up to 10 micro-partitions per processor
  – Multiple Shared Processor Pools
  – Virtual I/O Server with Integrated Virtualization Manager (IVM)
  – Shared dedicated processor capacity

► PowerVM Enterprise Edition, which includes the PowerVM Standard Edition capabilities plus:

  – Live Partition Mobility

> **Note:** For POWER6-based servers, those planning to use micro-partitioning must order one of the PowerVM editions and associated software maintenance. You must order either the additional cost PowerVM Express Edition, PowerVM Standard Edition, or PowerVM Enterprise Edition.
>
> For POWER5, POWER5+, and POWER6 9406-MMA based IBM System i models the LPAR capabilities, including micro-partitioning are included in the cost of the system firmware and the IBM i based licensed machine code. You did not explicitly order a PowerVM edition. With the exception that the POWER5+ Model 515 required PowerVM if micro-partitioning is used.
>
> The POWER6 PowerVM edition requirement applies to upgrades into a POWER6 model as well as the purchase of a new server.
>
> There is one upgrade into a POWER6 server exception. When upgrading from a POWER6 570 9406-MMA to a POWER6 570 9117-MMA, micro-partitioning is provided with the upgrade at no charge if #0397 is included on the upgrade order.

For more information, refer to Appendix E, "IBM PowerVM" on page 951.

1.4 Hardware availability and energy management facilities

This section discusses the broad range of hardware-based availability facilities that are built into POWER6 technology servers.

1.4.1 Reliability, fault tolerance, and data integrity

The reliability of systems starts with components, devices, and subsystems that are designed to be fault tolerant. During the design and development process, subsystems go through

rigorous verification and integration testing processes. During system manufacturing, systems go through a thorough testing process to help ensure the highest level of product quality.

The system cache and memory offer error checking and correcting (ECC) fault-tolerant features. ECC is designed to correct environmentally induced, single-bit, intermittent memory failures and single-bit hard failures. With ECC, the likelihood of memory failures is reduced substantially. ECC also provides double-bit memory error detection that helps protect data integrity in the event of a double-bit memory failure.

Disk drive data protection (commonly referred to as *RAID*) is offered by specific disk capable adapters. Disk data mirroring (same data written to two different physical disks) is supported by the IBM i, AIX, and Linux operating systems. Because the industry uses different RAID levels definitions to cover disk data spreading, disk data mirroring and true RAID disk array parity data striping can be confusing when describing disk adapter RAID capabilities, we have included specifics about IBM i, AIX, and Linux disk data protection implementations in Appendix C, "RAID history and definitions summary" on page 905.

The supported operating systems also offer their own additional layer of data protection such as AIX and Linux Journaled File System, also known as *JFS* or *JFS2*, and the standard IBM i journaling facility. IBM i comes with standard journaling support, with optional journaling extensions. All operating systems have optional IBM and non-IBM software products for high availability that include clustering capabilities among multiple partitions and multiple systems.

For AIX and Linux operating systems JFS, the recommended file system for 32-bit kernels, now supports extents on the Linux operating system. This feature is designed to substantially reduce or eliminate fragmentation. Its successor, JFS2, is the recommended file system for 64-bit kernels.

With 64-bit addressing, a maximum file system size of 32 TB and maximum file size of 16 TB, JFS2 is highly recommended for systems running the AIX operating system.

Further coverage of software high availability products is beyond the scope of this paper. Consult the Information Center for the operations system availability functions. The primary IBM availability Web site for Power Systems contains more detailed information IBM availability software products and is available at:

http://www.ibm.com/systems/power/software/availability/

The following topics summarize reliability and availability facilities integrated into the POWER6 technology hardware.

Memory error correction extensions

The memory has single-error-bit correction and double-error-bit detection ECC circuitry. The memory chips are organized such that the failure of any specific memory module only affects a single bit within an ECC word (bit scattering), thus allowing for error correction and continued operation in the presence of a complete DRAM chip failure (Chipkill™ recovery). The double-bit detection is designed to help maintain data integrity by detecting and reporting multiple errors beyond what the ECC circuitry can correct.

Memory protection features include hardware scrubbing, thresholding, and dynamic bit steering. Dynamic bit steering uses correctable error thresholding to determine when available spare memory modules on each DIMM should be used to replace ones that have exceeded their threshold value.

Redundancy for cache array self-healing

Although the most likely failure event in a processor is a soft single-bit error in one of its caches, other events can occur, and they need to be distinguished from one another. For caches and their directories, hardware and firmware keep track of whether permanent errors are being corrected beyond a threshold. If exceeded, a deferred repair error log is created.

Caches and directories on the POWER6 chip are manufactured with spare bits in their arrays that can be accessed through programmable steering logic to replace faulty bits in the respective arrays. This is analogous to the redundant bit steering employed in main storage as a mechanism that is designed to help avoid physical repair, and is also implemented in POWER6 systems. The steering logic is activated during processor initialization and is initiated by the built-in system-test (BIST) at power-on time.

When correctable error cache exceeds a set threshold, systems using the POWER6 processor invoke a dynamic cache line delete function, which enables them to stop using bad cache and eliminates exposure to greater problems.

Fault monitoring functions

When a POWER6-based system is turned on, BIST and power-on self-test (POST) check processor, cache, memory, and associated hardware required for proper booting of the operating system. If a noncritical error is detected or if the errors occur in resources that can be removed from the system configuration, the restarting process is designed to proceed to completion. The errors are logged in the system nonvolatile RAM (NVRAM).

Disk drive fault tracking is designed to alert the system administrator of an impending disk drive failure before it impacts customer operation.

Service Processor

The Service Processor (SP) is embedded in every system unit. SP provides the capability to diagnose, check the status of, and sense the operational conditions of a system. It runs on its own power boundary and does not require resources from a system processor to be operational to perform its tasks.

The SP supports surveillance of the connection to the HMC and to the system firmware (Hypervisor). It also provides several remote power control options, environmental monitoring, reset, restart, remote maintenance, and diagnostic functions, including console mirroring. The SP menus run under the Advanced System Monitor Interface (ASMI) and can be accessed concurrently with system operation allowing nondisruptive abilities to change system default parameters.

Mutual surveillance

The SP monitors the operation of the firmware during the boot process, and also monitors the Hypervisor for termination. The Hypervisor monitors the SP and performs a reset or reload if it detects the loss of the SP. If the reset or reload does not correct the problem with the SP, the Hypervisor notifies the operating system, and the operating system can take appropriate action, including calling for service.

Environmental monitoring functions

POWER6-based servers include a range of environmental monitoring functions:

► Temperature monitoring increases the fan speed rotation when ambient temperature is above the normal operating range or when a redundant fan fails.

► Temperature monitoring warns the system administrator of potential environmental-related problems (for example, air conditioning and air circulation around the system) so that

appropriate corrective actions can be taken before a critical failure threshold is reached. It also performs an orderly system shutdown when the operating temperature exceeds the critical level.

► Fan speed monitoring provides a warning and an orderly system shutdown when the speed is out of operational specification.

► Voltage monitoring provides warning and an orderly system shutdown when the voltages are out of operational specification.

For more information about these POWER6 energy-related monitoring (and more) functions, see 1.4.2, "IBM EnergyScale technology" on page 28.

POWER6 processor enhancement functions

One of the significant mainframe-inspired availability enhancements in systems with the POWER6 processor is the ability to do processor instruction retry and alternate processor recovery. This ability significantly reduces exposure to both hard (logic) and soft (transient) errors in the processor core.

Soft failures in the processor core are transient (intermittent) errors and often are due to cosmic rays or other sources of radiation, and generally are not repeatable. When an error is encountered in the core, the POWER6 processor will first automatically retry the instruction. If the source of the error is truly transient, the instruction succeeds, and the system continues as before. On predecessor IBM systems, this error would have caused a checkstop.

Hard failures are more difficult, being true logical errors that are replicated each time the instruction is repeated. Retrying the instruction will not help in this situation, because the instruction will continue to fail.

Systems with POWER6 processors introduce the ability to extract the failing instruction from the faulty core and retry it elsewhere in the system, after which the failing core is dynamically deconfigured and called out for replacement. The entire process is transparent to the partition owning the failing instruction. Systems with POWER6 processors are designed to avoid what would have been a full system outage on earlier models.

POWER6 single processor checkstopping

Another major advancement in POWER6 processors is single processor checkstopping. Prior to POWER6 processors, a processor checkstop resulted in a system checkstop. A new feature is the ability to contain many processor checkstops to the partition that was using the processor at the time. This feature significantly reduces the probability of any one processor affecting total system availability.

Partition availability priority

You have the ability to assign availability priorities to partitions when the system needs to allocate or deallocate processor capacity dynamically. In the context of a processor error processing, if an alternate processor recovery event is out of operational specification, the failing processor is flagged as *non-operational*. This can require a spare processor in order to protect a workload. If an unassigned processor is available, it is used as though it is the failing processor core. If a different processor core is not available, the system determines which partition has the lowest priority and attempts to claim the needed resource. On a properly configured POWER6 processor-based server, this ability allows that capacity to be first obtained from, for example, a test partition instead of a financial accounting system.

POWER6 cache availability

The Power servers continue to be at the forefront of cache availability enhancements. While L3 cache line delete (also called *Pellston healing*) was introduced with POWER4™

processors, the POWER6 processor line pioneers L2 cache line delete. In the event that an uncorrectable error occurs in L2 or L3 cache, the system can remove the offending line of cache dynamically without requiring a restart. In addition, POWER6 processors utilize an inclusive L1/L2 cache design and a write-through cache policy on all levels, helping to ensure that data is written to main memory as soon as possible. POWER6 processors also continue to offer hardware-assisted memory scrubbing.

Special uncorrectable error handling

Uncorrectable errors are difficult for any system to tolerate, although there are some situations where they can be shown to be irrelevant. For example, if an uncorrectable error occurs in cached data that will never again be read or where a fresh write of the data is imminent, it is unwise to protect the user by forcing an immediate reboot.

Special Uncorrectable Error (SUE) handling was an IBM innovation introduced for POWER5 processors, where an uncorrectable error in memory or cache does not immediately cause the system to terminate. Rather, the system tags the data and determines whether it will ever be used again. If the error is irrelevant, it does not force a checkstop.

PCI extended error handling

Prior to POWER5 processors, PCI bus parity errors caused a global machine check interrupt, which eventually required a system reboot to continue. In systems using POWER6 processors, I/O drawer hardware, system firmware, and AIX interaction have been designed to allow transparent recovery of intermittent PCI bus parity errors and graceful transition to the I/O device available state in the case of a permanent parity error in the PCI bus. This mechanism is called *PCI extended error handling* (EEH).

EEH-enabled adapters respond to a special data packet generated from the affected PCI slot hardware by calling system firmware, which will examine the affected bus, allow the device driver to reset it, and continue without a system reboot. Currently, there is limited support for the Linux operating system, depending upon driver availability.

Predictive failure and dynamic component de-allocation

Servers with POWER™ processors have long had the capability to perform predictive failure analysis on certain critical components such as processors and memory. When these components exhibit symptoms that would indicate a failure is imminent, the system can dynamically deallocate and call home about the failing part before the error is propagated system-wide. In many cases this is transparent, especially if the system contains Capacity on Demand (CoD) components. If no CoD resources are available, the system will first attempt to reallocate resources in such a way that will avoid unplanned outages. In the event that insufficient resources exist to maintain full system availability, these servers will attempt to maintain partition availability by user-defined priority.

Uncorrectable error recovery

When the auto-restart option is enabled, the system can automatically restart following an unrecoverable software error, hardware failure, or environmentally induced alternating current (ac) power failure.

Additional hardware availability features

Additional hardware-based availability features are available, Some are naturally available, based upon the specific adapter feature being hot pluggable. This includes, for example, GX+ I/O loop adapters, and other hot add capabilities. Some hot add capabilities might require specifically a ordered hot add feature or following a proper pre-hot add configuration setup.

For more information, see the following chapters:

► Chapter 2, "IBM Power 570 Model 9117-MMA" on page 41
► Chapter 3, "IBM Power 595 model 9119-FHA" on page 99

Some of the additional hot add or hot repair capabilities are as follows:

► Power supply replacement (procedure slightly different between 9117-MMA and 9119-FHA)

► 9117-MMA Hot-Processor Enclosure (node) Add / Cold-Processor Enclosure (node) Repair

An additional processor closure can be added, provided that the system has a spare ordered previously and that unused connectors on the attached Service Interface Cable and space available in the rack are immediately below the processor enclosure.

► RAID Hot Spare Disk Add

This option allows one or more disk drives on a stand-by (hot spare). If a drive fails, the second drive is brought online automatically in place of the failed drive. This option minimizes the time that the array is running unprotected and is available for disk controllers running either RAID-5 or RAID-6. At least one drive per disk controller is required for the arrays protected. This protection option is not applicable to mirrored configurations.

Serviceability

The purpose of serviceability is to repair the system while attempting to minimize or eliminate service cost (within budget objectives), while maintaining high customer satisfaction. Serviceability includes system installation, MES (system upgrades or downgrades), and system maintenance or repair. Depending upon the system and warranty contract, service can be performed by the customer, an IBM representative, or an authorized warranty service provider.

The serviceability features delivered in this system provide a highly efficient service environment by incorporating the following attributes:

► Design for Customer Set Up (CSU), Customer Installed Features (CIF), and Customer Replaceable Units (CRU)
► Error detection and Fault Isolation (ED/FI)
► First Failure Data Capture (FFDC)
► Converged service approach across multiple IBM server platforms

Service environments

The POWER6 processor-based platforms support two main service environments:

► No Hardware Management Console (HMC).

There are two service strategies for non-HMC systems

– *Full system partition*: A single partition owns all the server resources and only one operating system can be installed.

– *Partitioned system*: In this configuration, the system can have more than one partition and can be running more than one operating system. In this environment, partitions are managed by the Integrated Virtualization Manager (IVM), which provides some of the functions provided by the HMC.

► Attachment to one or more HMCs is supported by the system.

This is the default configuration for servers supporting logical partitions with dedicated or virtual I/O. In this case, all servers have at least one logical partition. The HMC is a dedicated server that provides functions for configuring and managing servers for either partitioned or full-system partition using a GUI or command-line interface (CLI). An HMC attached to the system allows support personnel (with client authorization) to remotely log in to review error logs and perform remote maintenance if required.

Service Interface

The Service Interface allows support personnel to communicate with the service support applications in a server using a console, interface, or terminal. Delivering a clear, concise view of available service applications, the Service Interface allows the support team to manage system resources and service information in an efficient and effective way. Applications available through the Service Interface are carefully configured and placed to give service providers access to important service functions.

Different service interfaces are used depending on the state of the system and its operating environment. The primary service interfaces are:

► LEDs
► Operator Panel
► Service Processor menu
► Operating system service menu
► Service Focal Point™ on the HMC
► Service Focal Point Lite on IVM

In the guiding light LED implementation, when a fault condition is detected on the POWER6 processor-based product, an amber System Attention LED will be illuminated. Upon arrival at the server, a service provider sets the identify mode, selecting a specific problem to be identified for repair by the guiding light method. The guiding light system pinpoints the exact part by flashing the amber identity LED associated with the part to be replaced.

The system can clearly identify components for replacement by using specific component level indicators and can also guide the servicer directly to the component by signaling (causing to flash) the Rack/Frame System Identify indicator and the Drawer Identify indicator on the drawer containing the component. The flashing identify LEDs direct the servicer to the correct system, the correct enclosure, and the correct component.

First Failure Data Capture and Error Data Analysis

First Failure Data Capture (FFDC) is a technique that helps ensure that when a fault is detected in a system, the root cause of the fault will be captured without the need to re-create the problem or run any sort of extending tracing or diagnostics program. For the vast majority of faults, a good FFDC design means that the root cause can also be detected automatically without servicer intervention.

First Failure Data Capture FFDC information, error data analysis, and fault isolation are necessary to implement the advanced serviceability techniques that enable efficient service of the systems and to help determine the failing items.

In the absence of FFDC and Error Data Analysis, diagnostics are often required to re-create the failure and determine the failing items.

Diagnostics

General diagnostic objectives are to detect and identify problems such that they can be resolved quickly. Elements of the diagnostics strategy from IBM include:

► Provide a Common Error Code format equivalent to a System Reference Code, System Reference Number, Checkpoint, or Firmware error code.

► Provide fault detection and problem isolation procedures. Support remote connection ability to be used by the IBM Remote Support Center or IBM Designated Service.

► Provide interactive intelligence within the diagnostics with detailed online failure information while connected to the back-end system from IBM.

Because of the FFDC technology designed into IBM Servers, it is very rate that you must try to recreate the failure to run diagnostics. Solid® and intermittent errors are designed to be correctly detected and isolated at the time the failure occurs. Run-time and boot-time diagnostics fall into this category.

Concurrent maintenance

The system continues the POWER5 support of concurrent maintenance of power, cooling, PCI adapters, media devices, operator panel, and firmware updates (when possible). The determination of whether a firmware release can be updated concurrently is identified in the readme information file that is released with the firmware.

Error Handling and Reporting

In the unlikely event of system hardware or environmentally induced failure, the system run-time error capture capability systematically analyzes the hardware error signature to determine the cause of failure. The analysis result is stored in system Non-Volatile Random Access Memory (NVRAM), memory that does not lose its information when power is turned off. When the system can be restarted successfully, either manually or automatically, the error is reported to the IBM i, AIX, or Linux operating system. Error Log Analysis (ELA) can be used to display the failure cause and the physical location.

When an HMC is attached, an ELA routine analyzes the error, forwards the event to the Service Focal Point (SFP) application running on the HMC, and notifies the system administrator that it has isolated a likely cause of the system problem. The Service Processor event log also records unrecoverable checkstop conditions, forwards them to the SFP application, and notifies the system administrator. After the information is logged in the SFP application, if the system is properly configured, a call home service request is initiated and the pertinent failure data with service parts information and part locations is sent to an IBM Service organization. Customer contact information and specific system-related data such as the machine type, model, and serial number, along with error log data related to the failure are sent to IBM Service.

IBM Electronic Services

IBM Electronic Service Agent™ and IBM Electronic Services Web Portal comprise the IBM Electronic Services solution. IBM is dedicated to providing fast, exceptional support to clients who use IBM servers.

Electronic Service Agent (ESA) automatically reports hardware events, such as system errors and performance issues. Systems enabled with this tool call home to IBM Support, 24 hours a day, 7 days a week at no additional cost. ESA implementation is also included at no additional cost with every 9117-MMA and 9119-FHA servers, customers, however, have the final choice whether to have ESA installed or to waive the free implementation.

As part of an increased focus on better service, Electronic Service Agent can be configured at installation time. IBM systems support representatives configure the tool when the system is installed, at no charge. In support of this program, a new security white paper describes the secure data exchange between the Hardware Management Console (HMC) and the IBM Service Delivery Center (SDC) and the methods and protocols for this exchange.

To read the white paper and prepare for Electronic Service Agent installation, follow these steps:

1. Go to the Reference Guide section at:

   http://www.ibm.com/support/electronic

2. Select your country and click **Go**.

3. The next page has summaries of how to use Electronic Service Agent. One of these summaries is the connectivity guide. Click **IBM Electronic Service Agent Connectivity Guide**.

IBM Support Web site

For Power Systems POWER6 environments, IBM offers two links to the same set of service and software maintenance functions, which are tailored differently for System i (IBM i) and System p (AIX):

▶ System i

   http://www.ibm.com/systems/support/i

▶ System p

   http://www.ibm.com/systems/support/p

One area of key capabilities easily accessible from either initial Web page the link to Fix Central. Fix Central functions include identification of the latest system firmware, HMC firmware, operating system fix levels, electronic download of fixes and fix groups, searches through a knowledge database, and fix searches.

1.4.2 IBM EnergyScale technology

IBM EnergyScale technology is featured on the IBM POWER6 processor-based systems. It provides functions to help the user understand and control IBM server power and cooling usage. IBM EnergyScale features and hardware and software requirements are as follows:

▶ Power Trending

   EnergyScale provides continuous power usage data collection (monitoring), which enables the administrators with the information to predict power consumption across their infrastructure and to react to business and processing needs. For example, an administrator can adjust server consumption to reduce electrical costs. To collect power data for the 520, you do not need any additional hardware, because it collects the information internally.

▶ Energy Saver Mode

   Energy (formerly *Power*) Saver Mode reduces the voltage and frequency by a fixed percentage. This percentage is predetermined to be within a safe operating limit and is not user configurable. Under current implementation this is a 14% frequency drop. When CPU utilization is low, Energy Saver Mode has no impact on performance. Energy Saver Mode can reduce the processor usage up to a 30%. Energy Saver Mode is not supported during boot or reboot although it is a persistent condition that will be sustained after the boot

when the system starts executing instructions. Energy Saver is only supported with 4.0 GHz processors and faster.

► Energy Capping

Energy Capping (formerly Power Capping) enforces a user specified limit on power usage. Energy Capping is not a power saving mechanism. It enforces power caps by actually throttling the processors in the system, degrading performance significantly. The idea of a power cap is to set something that should never be reached but frees up *margined power* in the data center. The margined power is the amount of extra power that is allocated to a server during its installation in a data center. It is based on the server environmental specifications that usually are never reached because server specifications are always based on maximum configurations and worst case scenarios.

► Processor Core Nap

The IBM POWER6 processor uses a low-power mode called *Nap* that stops processor execution when there is no work to do on that processor core (both threads are idle). Nap mode allows the hardware to clock off most of the circuits inside the processor core. Reducing active power consumption by turning off the clocks allows the temperature to fall, which further reduces leakage (static) power of the circuits causing a cumulative effect. Unlicensed cores are kept in core Nap until they are licensed and return to core Nap whenever they are unlicensed again.

► EnergyScale for I/O

IBM POWER6 processor-based systems automatically turn off pluggable, PCI adapter slots that are empty or that are not being used to save approximately 14 watts per slot. System firmware automatically scans all pluggable PCI slots at regular intervals looking for ones that meet the criteria for being not in use and powers them off. This support is available for all POWER6 processor-based servers, and the expansion units that they support. Note that it applies to hot pluggable PCI slots only.

Thermal power management device

The EnergyScale architecture implementation of performance aware power and thermal management for POWER6 processor based systems uses an optional plug-in card, containing a micro-controller called thermal power management device (TPMD). The TPMD card is part of the energy management of performance and thermal proposal, which optimizes the processor performance dynamically, depending on processor power and system workload.

The EnergyScale design supports a number of power and thermal management policies:

► Benchmark

Maximizes the single-threaded performance of the system by putting one core of each processor into a low-power state, like in POWER6 the nap mode.

► Maximum performance

The EnergyScale implementation regulates the system in such way as to use the maximum performance possible without violating the power or thermal limits of the system.

► Energy cap

The system will be set to a previous defined power usage limit.

► Maximum power savings

EnergyScale attempts to save as much power as possible for a given workload.

► Optimal power/performance

In this mode the EnergyScale implementation changes the system to the most optimal power/performance settings on the basis of workload characteristics and the power and thermal environment.

> **Note:** A TPMD card is standard for an initial order. The system will not boot without an installed TPMD card.

EnergyScale architecture is implemented by firmware running on the TPMD and the Service Processor of the system User interfaces to the EnergyScale functions are through the Advanced Systems Management Interface (ASMI), HMC, and the IBM Systems Director Active Energy Manager™ management software, which is a plug-in to the IBM Director software.

Table 1-5 shows the user interfaces to the EnergyScale functions.

Table 1-5   EnergyScale function's software interfaces

EnergyScale functions	ASMI	HMC	Active Energy Manager
Power Trending	N	N	Y
Energy (Power) Saver Mode	Y	Y	Y
Schedule Energy Saver Mode Operation	N	Y	Y
Energy (POwer) Capping	N	N	Y
Schedule Energy Capping Operation	N	N	Y

To learn more about the capabilities of the IBM EnergyScale for POWER6 based systems and Active Energy Manager, refer to:

► Active Energy Manager Web site (as an extension to IBM Director)

http://www-03.ibm.com/systems/management/director/extensions/actengmrg.html

► IBM whitepaper, *IBM EnergyScale for POWER6 Processor-Based Systems*, April 2008

http://www-03.ibm.com/systems/p/hardware/whitepapers/energyscale.html

► *Going Green with IBM Systems Director Active Energy Manager*, REDP-4361

http://www.ibm.com/redbooks

1.5 POWER6 floating point decimal arithmetic data and calculations

POWER6 processor technology brings hardware decimal floating point implementation as a replacement for software provided decimal floating point implementation. Depending on the number of times decimal floating point arithmetic runs in an application, this can speed up decimal floating point arithmetic and results accuracy.

For more detailed information, refer to the following POWER6 technical overview publications:

► *IBM Power Systems 520 Technical Overview and Introduction*, REDP-4403
► *IBM System p 550 Technical Overview and Introduction*, REDP-4404
► *IBM Power 595 Technical Overview and Introduction*, REDP-4440

The decimal floating-point (DFP) processor shares the 32 floating-point registers (FPRs) and the floating-point status and control register (FPSCR) with the binary floating-point (BFP) processor. However, the interpretation of data formats in the FPRs, and the meaning of some control and status bits in the FPSCR are different between the BFP and DFP processors.

Enabling applications that run on POWER6 systems to take advantage of the hardware decimal floating point support depends on the programming language release level that the application uses and the operating system in which the application is running, as follows:

► Java™ applications

   Applications running IBM Technology for Java 6.0 32-bit and 64-bit JVM™ automatically take advantage of the hardware assist during the initial Just in Time (JIT) processing. Applications running under IBM i require release level 6.1. Java 5.0 does not use DCP.

► C and C++ applications

   For the C and C++ compilers running under AIX and Linux systems, as of V9.0 there is DFP support through the POWER6 hardware instructions. Software emulation is supported on all other POWER architectures.

   Running under IBM i 6.1, support for DFP has been added to the IBM i 6.1 ILE C compiler. If a C program that uses DFP data is compiled on POWER 6 hardware, hardware DFP instructions will be generated; otherwise, software emulation will be used.

   IBM i support for DFP in the ILE C++ compiler is planned for a future release.

   For your information, C and C++ on z/OS®, as of V1R9, use hardware DFP support where the run time code detects hardware analogous to POWER 6.

► IBM i ILE RPG and COBOL

   These languages do not use decimal floating point. The normal zoned decimal or packed decimal instructions receive normal performance gains merely by running under IBM i 6.1 on POWER6.

   IBM i 6.1 supports decimal floating point data, for example, in DB2® for i5/OS tables. If the RPG or COBOL compiler encounters a decimal float variable in an externally-described file or data structure, it will ignore the variable and issue an identifying information message.

► Some applications, such those available from SAP®, that run on POWER6-based systems might provide specific ways to take advantage of decimal floating point.

   For example, the SAP NetWeaver® 7.10 ABAP™ kernel introduces a new SAP ABAP data type called $DECFLOAT$ to enable more accurate and consistent results from decimal floating point computations. The decimal floating point (DFP) support by SAP NetWeaver leverages the built-in DFP feature of POWER6 processors. This allows for simplified ABAP-coding while increasing numeric accuracy and with a potential for significant performance improvements.

1.6 Operating system levels required on POWER6 processors

Newer IBM i, AIX, and Linux releases are required to run a POWER6 processor-based server. The following operating system release levels are required by each MTM:

- ► Power 520 8203-E4A

    - AIX V5.3 with the 5300-06 Technology Level with Service Pack 7 or later
    - AIX V5.3 with the 5300-07 Technology Level or later
    - AIX V6.1 or later
    - SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 1 for Power or later
    - Red Hat Enterprise Linux V4.5 for Power or later
    - Red Hat Enterprise Linux V5.1 for Power or later

- ► Power 520 9407-M15, 9408-M25

    - IBM i operating system 5.4 (5722-SS1) with 5.4.5 machine code or later
    - IBM i operating system 6.1 (5761-SS1) or later
    - AIX for POWER Version 5.3 with the 5300-08 Technology Level or later
    - AIX Version 6.1 with the 6100-01 Technology Level or later
    - SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 1 for Power or later
    - Red Hat Enterprise Linux V4.5 for Power or later
    - Red Hat Enterprise Linux V5.1 for Power or later

- ► Power 550 8204-E8A

    - AIX V5.3 with the 5300-06 Technology Level with Service Pack 7 or later
    - AIX V5.3 with the 5300-07 Technology Level or later
    - AIX V6.1 or later
    - SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 1 for Power or later
    - Red Hat Enterprise Linux V4.5 for Power or later
    - Red Hat Enterprise Linux V5.1 for Power or later

- ► Power 550 9409-M50

    - IBM i operating system 5.4 (5722-SS1) with 5.4.5 machine code or later
    - IBM i operating system 6.1 (5761-SS1) or later
    - AIX for POWER Version 5.3 with the 5300-08 Technology Level or later
    - AIX Version 6.1 with the 6100-01 Technology Level or later
    - SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 1 for Power or later
    - Red Hat Enterprise Linux V4.5 for Power or later
    - Red Hat Enterprise Linux V5.1 for Power or later

- ► Power 570 9117-MMA

    - AIX 5.2 with Technology Level 5200-10 or later
    - AIX 5.3 with Technology Level 5300-06 or later
    - AIX 6.1 or later
    - IBM i operating system 5.4 (5722-SS1) with 5.4.5 machine code or later
    - IBM i operating system 6.1 (5761-SS1) or later
    - SUSE Linux Enterprise Server 10 SP1 for POWER or later
    - Red Hat Enterprise Linux 4.5 for POWER or later
    - Red Hat Enterprise Linux 5.1 for POWER or later
    - Red Hat Enterprise Linux V5.1 for Power or later

- ► Power 595 9119-FHA

    - AIX 5.2 with Technology Level 5200-10 or later
    - AIX 5.3 with the 5300-06 Technology Level and Service Pack 7 or later
    - AIX 5.3 with the 5300-07 Technology Level and Service Pack 4 or later
    - AIX 5.3 with the 5300-08 Technology Level or later
    - AIX 6.1 with the 6100-00 Technology Level and Service Pack 5 or later

- AIX 6.1 with the 6100-01 Technology Level or later
- IBM i operating system 5.4 (5722-SS1) with 5.4.5 machine code or later
- IBM i operating system 6.1 (5761-SS1) or later
- SUSE Linux Enterprise Server 10 Service Pack 2 for POWER or later
- Red Hat Enterprise Linux 4.7 for POWER or later
- Red Hat Enterprise Linux 5.2 for POWER or later

> **Note:** The required releases include the following exceptions:
>
> ► PowerVM (#7942 and #7995) are not supported on AIX 5L™ for POWER V5.2.
>
> ► Not all features available with the Power 570 are supported with each available operating system. Verify the specific feature detail to identify which of the available operating systems are supported.
>
> ► Supported IBM i console choices include:
>
> – Operations console attached using Ethernet port (LAN console) or WAN port (ops console)
>
> – Hardware Management Console (HMC)
>
> ► A twinaxial console is not supported unless an HMC is present on the system. A 9944-100 Thin Console is not supported by IBM i on POWER6 systems.

IBM periodically releases fixes, group fixes, and cumulative fix packages the IBM i operating system. You can order these packages or download them from the following Web address:

http://www-933.ibm.com/eserver/support/fixes/fixcentral

You need to select a product (hardware) family. For POWER6, select **Power**.

A sequence of selection fields display as you select an entry for a previous field. Selection fields include a selection of an operating system (for example IBM i, AIX, or Linux) and other software categories that include microcode, firmware, and others. For most options you must select a release level.

The Fix Central Web site provides information about how to obtain the software through the media (for example, the CD-ROM). You can also use the Fix Central Web site to search for and download individual operating system fixes licensed program fixes, and additional information. Part of the fix processing includes Fix Central connecting with your IBM i or AIX operating system to identify fixes that are already installed and whether additional fixes are required.

1.6.1 IBM AIX 5.3

If installing IBM AIX 5L 5.3 on the 8203-E4A and 8204-E8A, the following minimum requirements must be met:

► AIX 5L for POWER V5.3 with 5300-07 Technology Level or later
► IBM AIX V6.1 with T6100-01 Technology Level or later

IBM periodically releases maintenance packages (service packs or technology levels) for the AIX 5L operating system. You can order these packages, or you can download them at:

http://www-912.ibm.com/eserver/support/fixes/fixcentral/main/pseries/aix

You need to select the release level. The Fix Central Web site also provides information about how to obtain the software through the media (for example, the CD-ROM).

You can also get individual operating system fixes and information about obtaining AIX 5L service at this site. From AIX 5L V5.3 the Service Update Management Assistant, which helps the administrator to automate the task of checking and downloading operating system downloads, is part of the base operating system. For more information about the `suma` command functionality, refer to:

http://www14.software.ibm.com/webapp/set2/sas/f/suma/home.html

AIX 5L is supported on the System p servers in partitions with dedicated processors (LPARs), and shared-processor partitions (micro-partitions). When combined with one of the PowerVM features, AIX 5L Version 5.3 or later can make use of all the existing and new virtualization features such as micro-partitions, virtual I/O, virtual LAN, PowerVM Live Partition Mobility, to name a few.

1.6.2 IBM AIX V6.1

IBM AIX 6.1 recently became available and includes significant new capabilities for virtualization, security features, continuous availability features and manageability. AIX V6.1 is the first generally available version of AIX V6.

AIX V6.1 features include the following support:

► PowerVM AIX 6 Workload Partitions (WPAR) software based virtualization

► Live Application Mobility with the IBM PowerVM AIX 6 Workload Partitions Manager™ for AIX (5765-WPM)

► 64-bit Kernel for higher scalability and performance

► Dynamic logical partitioning and Micro-Partitioning support

► Support for Multiple Shared-Processor Pools

► Trusted AIX - MultiLevel, compartmentalized security

► Integrated Role Based Access Control

► Encrypting JFS2 file system

► Kernel exploitation of POWER6 Storage Keys for greater reliability

► Robust journaled file system and Logical Volume Manager (LVM) software including integrated file system snapshot

► Tools for managing the systems environment (System Management) with System Management Interface Tool (SMIT) and the IBM Systems Director Console for AIX

1.6.3 IBM i 5.4

IBM i 5.4 (formerly IBM i5/OS V5R4) runs on POWER6, POWER5, and older technology System i models. Together with IBM i 5.4 is the minimum IBM i release level that is required on POWER6 technology systems. It contains a wide range of medium to small enhancements and new functions built on top of the integrated work management, performance management, database (DB2 for i5/OS), security, and backup and recovery functions of IBM i as well as the System i Navigator graphical interface to these functions.

IBM i 5.4 includes the following enhancements:

► Support of POWER6 processor technology models.

► Support of large write cache disk controllers (IOAs).

► Expanded support of IOAs that do not require IOPs.

- More flexible back up and recovery options and extended support in local remote journaling and cross-site mirroring and clustering.

- Expanded DB2 and SQL functions and graphical management.

- Support for IBM Control Language (CL) extensions.

- Initial release support of IBM Technology for Java 32-bit JVM.

- Support for IBM Express Runtime Web Environments for i5/OS, which contains a wide range of capabilities that are intended to get someone new or just beginning to use the Web in a Web application serving environment.

- Expanded handling of 5250 workstation applications running in a Web environment using the WebFacing and HATS components

- Licensed program enhancements include Backup Recovery and Media Services, and application development enhancements including RPG, COBOL, and C/C++.

> **Note:** IBM i 5.4 can be a hosting partition to AIX or Linux partitions for I/O devices. 9407-M15, 9408-M25, and 9409-M50 MTMs can support some I/O hardware (adapters or devices) that are directly attached to the AIX or Linux partition. For a list of such adapters, see Appendix G, "9407-M15, 9408-M25, 9409-M50, 9406-MMA direct attachment to AIX and Linux partition feature summary" on page 965.

1.6.4 IBM i 6.1

IBM i 6.1 runs on POWER6, POWER5, and the last generation of System i 8xx models (800, 810, 825, 870, and 890). As with previous releases, IBM i 6.1 builds on top of the IBM i integrated capabilities with enhancement primarily in the following areas:

- IBM i security, including greatly expanded data encryption/decryption and network intrusion detection.

- Support for the IBM PCI-X (#5749) and PCIe Fibre Channel (#5774) IOP-less adapters and a new performance improved code path for attached IBM System Storage™ DS8000 configurations.

- Expanded base save/restore, journaling and clustering support.

- New IBM high availability products that take advantage of the ex.panded 6.1 save/restore, journaling and clustering support

- System i PowerHA™ for IBM i, formerly known as High Availability Solutions Manager (HASM), and IBM iCluster® for IBM i.

- Logical partitioning extensions including support of multiple shared processor pools and IBM i 6.1 as a client partition to another 6.1 server partition or a server IBM Virtual I/O Server partition. The VIOS partition can be on a POWER6 server or a POWER6 IBM Blade JS22 or JS12.

- Expanded DB2 and SQL functions, graphical management of the database, and generally improved performance.

- Integrated Web application server and Web Services server (for those getting started with Web services).

- Integrated browser-based IBM Systems Director Navigator for i5/OS that includes a new Investigate Performance Data graphically function.

- ► Initial release support of IBM Technology for Java 64-bit JVM.
- ► RPG COBOL and C/C++ enhancements, as well as new packaging of the application development tools (the WebSphere® Development Studio and Rational® Developer suite of tools).

Note: IBM i 6.1 can be a hosting partition to AIX or Linux partitions for I/O devices as well as another IBM i 6.1 client partition. 9407-M15, 9408-M25, and 9409-M50 MTMs can support some I/O hardware (adapters or devices) that are directly attached to the AIX or Linux partition. For a list of such adapters, see Appendix G, "9407-M15, 9408-M25, 9409-M50, 9406-MMA direct attachment to AIX and Linux partition feature summary" on page 965.

Note: IBM i 6.1 takes maximum advantage of machine instructions used on POWER5 and POWER6 technology systems compared to previous IBM i releases. Application programs compiled or created on IBM i 6.1 take advantage of the restructured program object automatically. For application programs created on prior releases that are loaded (restored) onto an IBM i 6.1 partition, an object conversion (re-translation) must be performed prior to or at first execution of the program.

You can find planning information and examples in *IBM i5/OS Program Conversion: Getting Ready for i5/OS V6R1*, REDP-4293.

Feedback from IBM i 6.1 customers through September 2008 indicates almost all application program retranslation has occurred with no or minor disruption to normal production mode activities.

1.6.5 IBM i support of IBM System Storage Enterprise Disk products

IBM i 5.4 and 6.1 provide support to specific models of System Storage Enterprise Disk products. This support is based the operating system level and the specific Fibre Channel (FC) adapters that are connected to a Storage Area Network.

IBM i supports the DS8100 and DS8300 directly through adapters that are owned by the IBM i partition. DS6000 series are supported but not recommended for performance reasons.

IBM i 6.1 provides distinctly improved performance in high disk I/O rates through the following specific FC adapters that are owned by an IBM i 6.1 partition and that are running on a POWER6 MTM:

- ► #5749: 4 Gigabit Dual-Port Fibre Channel PCI-X 2.0 DDR Adapter
- ► #5774: 4 Gigabit PCI Express (PCIe) Dual Port Fibre Channel Adapter
- ► #5735: 8 Gigabit PCI Express Dual Port Fibre Channel Adapter

The improved performance on these adapters is only for DS8100 and DS8300 storage servers.

IBM i support of the moderate performance and storage capacity System Storage Enterprise Disk products requires an IBM i 6.1 partition to be configured as a virtual I/O client to a PowerVM Virtual I/O Server (VIOS) partition. Support through VIOS includes:

► Fiber Channel adapters IBM SAN supported:

    – #5743/5744 PCI-e 4 Gb
    – #5758/5759 PCI-X 4 GB
    – #5716 PCI-X 2 Gb

    IBM i can run through an IBM SAN Volume Controller (SVC) and the SVC Entry Edition (SVC EE) with PowerVM Virtual I/O Server (VIOS) configurations.

Through December 2008, VIOS does not support #5749 PCI-X or any IOP-based Fibre Channel adapters:

► VIOS running on a Power 520, Power 550, Power 570, or Power 595 server

    System Storage Disk products supported:

    – DS3400
    – DS4700
    – DS4800

► VIOS running on a BladeCenter JS12 and JS22

    System Storage Disk products supported:

    – DS3200
    – DS3400 (BladeCenter H)
    – DS4700
    – DS4800
    – DS8000

    IBM SAN Volume Controller (SVC) and the SVC Entry Edition (SVC EE)

1.6.6 Linux systems summary

Linux is an open source operating system that runs on numerous platforms from embedded systems to mainframe computers. It provides a UNIX-like implementation across many computer architectures. This section discusses two brands of Linux to be run in partitions.

The supported versions of Linux systems includes:

► Novell® SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 1 for Power or later
► Red Hat Enterprise Linux V4.5 for Power or later
► Red Hat Enterprise Linux V5.1 for Power or later

The PowerVM features are supported in Version 2.6.9 and above of the Linux kernel. The commercially available latest distributions from Red Hat, Inc. (RHEL AS 5) and Novell SUSE Linux (SLES 10) support the IBM system p 64-bit architectures and are based on this 2.6 kernel series.

If you want to configure Linux partitions in virtualized System p systems, take into account the following considerations:

► Not all devices and features that are supported by the AIX operating system are supported in logical partitions running the Linux operating system.

► Linux operating system licenses are ordered separately from the hardware. You can acquire Linux operating system licenses from IBM, to be included with their System 520 or from other Linux distributors.

More information

For information about the features and external devices supported by Linux refer to:

http://www-03.ibm.com/systems/p/os/linux/index.html

For information about SUSE Linux Enterprise Server 10, refer to:

http://www.novell.com/products/server

For information about Red Hat Enterprise Linux Advanced Server 5, refer to:

http://www.redhat.com/rhel/features

1.6.7 Supported virtualization features

SLES 10, RHEL AS 4.5, and RHEL AS 5 support the following virtualization features:

▶ Virtual SCSI, including for the boot device

▶ Shared-processor partitions and virtual processors, capped and uncapped

▶ Dedicated-processor partitions

▶ Dynamic reconfiguration of processors

▶ Virtual Ethernet, including connections through the Shared Ethernet Adapter in the Virtual I/O Server to a physical Ethernet connection

▶ Simultaneous multithreading

SLES 10, RHEL AS 4.5, and RHEL AS 5 do *not* support the following features:

▶ Dynamic reconfiguration of memory

▶ Dynamic reconfiguration of I/O slot

> **Note:** IBM only supports the Linux systems of clients with a Support Line contract covering Linux. Otherwise, contact the Linux distributor for support.

1.6.8 System firmware and HMC levels

HMC firmware and system firmware available during mid-2008 supported the POWER6 MTMs that we describe in this paper. HMC and system firmware level updates are continually made available.

IBM provides Web sites that you can use to determine which HMC levels and system firmware levels are required to support specific MTMs at the system level, specific I/O features, and operating system support. The information includes which HMC firmware levels support which MTM system firmware levels.

Firmware levels for the POWER6 Power Systems MTM have an identifying prefix for each MTM group as follows:

▶ Power 520 (8203-E4A) prefix is $EMnnnnn$. For example, EL340_nnn. EL340_039 is required to support IBM i, enhanced power and thermal management, and other I/O support announced for 21 November 2008 availability. This includes support for the #5735 8 GB fiber channel adapter.

▶ Power 550 (8204-E8A) prefix is $EMnnnnn$. For example, EL340_nnn. EL340_039 is required to support IBM i, enhanced power and thermal management, and other I/O

support announced for 21 November 2008 availability. This includes support for the #5735 8 GB fiber channel adapter.

- ▶ Power 570 (9117-MMA) prefix is *EMnnnnn* (for example, EM340_nnn). EM340_041 is required to support hardware announced for general availability November 2008. This includes enhanced power and thermal management, and other I/O support announced for 21 November 2008 availability. This includes support for the #5735 8 GB Fibre Channel adapter.

- ▶ Power 560 (8234-EMA) prefix is *EMnnnnn* (for example, EM340_nnn). EM340_041 is required to support hardware announced for general availability November 2008. This includes enhanced power and thermal management, and other I/O support announced for 21 November 2008 availability. This includes support for the #5735 8 GB fiber channel adapter.

- ▶ Power 595 (9119-FHA) prefix is *EHnnnnn* (for example, EH340_nnn). EH34_039 is required to support hardware announced for general availability November 2008. This includes support for concurrent processor node addition, as well as cold node repair or removal, support for up to 32 I/O drawers in two powered I/O racks, support for migrating memory DIMMs from POWER5 model 59x systems to model FHA systems, support for concurrently connecting an I/O rack to a model FHA system and support for the 8 GB fiber channel adapter, F/C 5735.

> **Note:** Service packs remain available for En320 firmware levels. In general service packs continue for approximately one year on each firmware level. Customers have a choice of moving to a new service pack on their existing level (in general, system power off not required) or a newer level of firmware, which requires a system power off and power on. In general, the service packs deliver fixes for problems found, but do not support new functions or new hardware. The new firmware release levels are normally required when new functions or new hardware support become available.

Important Web sites include:

- ▶ For the latest firmware and HMC level code, go to the IBM support Web site Fix Central:

  http://www.ibm.com/support/fixcentral/
  a. Select the Power Product Group (for example, Power Systems).
  b. Select the Firmware and HMC Product (for example, 9117-MMA MTM).
  c. Follow the next set of instructions.

- ▶ IBM Prerequisites available at:

  https://www-912.ibm.com

  Select the MTM, operating system, and I/O adapter on which you want information.

- ▶ Microcode downloads available at:

  http://www14.software.ibm.com/webapp/set2/firmware/gjsn

  Select the MTM (for example, 9119-FHA) or the hardware adapter for which you want information.

1.7 Hardware withdrawal summary

The appropriate MTM sales manual pages and the feature descriptions in Chapter 4, "Feature descriptions and related information" on page 187, identify hardware features that are no longer marketed by IBM.

The iSeries® and System i System Builder publications provided a tabular list of hardware features (which was updated periodically) that were withdrawn from marketing (no longer sold as new) and that were withdrawn from technical support. Integration of System i and System p existing hardware in this paper and continual announcements make determining what information to include in that list difficult and, thus, make the list unmanageable.

To determine the hardware that is withdrawn from marketing, refer to the IBM announcement letters that are available on the Web at:

http://www.ibm.com/common/ssi/index.wss

You can search for hardware and software capabilities that are withdrawn using the following words:

► *withdrawal*
► *withdrawal* AND *power systems*
► *withdrawal* AND *System p*
► *withdrawal* AND *System i*

You can also add the word *software* or *hardware* to the above search suggestions to narrow your results.

You can also refer to the planning and upgrades Web site starting with:

http://www.ibm.com/systems/support/i/planning/upgrade/

On the Upgrades planning (tab) page, select the Future SW/HW link. Select the Hardware link. Review the wide range of I/O support information, including planned end of support.

2

IBM Power 570 Model 9117-MMA

In this chapter, we provide summary charts and diagrams and identify the processor features that are associated with the POWER6 570 model. We also include System i 9406-MMA information as well.

2.1 IBM Power 570 Model 9117-MMA overview

The IBM System i and IBM System p are unifying the value of their servers into a single, powerful line of servers that are based on industry-leading POWER6 processor technology with support for the IBM i operating system (formerly known as i5/OS), IBM AIX, and Linux operating systems. This single portfolio of Power Systems servers offers industry-leading technology, continued IBM innovation, and the flexibility to deploy the operating system that your business requires. The 9117-MMA mid-range server is designed to deliver outstanding price and performance, mainframe-inspired reliability and availability features, flexible capacity upgrades, and innovative virtualization technologies.

> **Note:** Although we include information about the POWER6 9406-MMA in this chapter, the focus of the chapter is the unified 9117-MMA features.

The innovative POWER6 processor within the 9117-MMA servers delivers outstanding performance for running IBM i, AIX, and Linux operating systems applications. Combined with IBM i 6.1, AIX, and Linux operating systems, you can experience significant improvements in Java and IBM WebSphere applications.

Designed for energy efficiency, the POWER6 architecture with IBM EnergyScale technology includes features that measure the system's energy use and that direct policies toward the energy-efficient operation of the server. In addition, the underlying hardware automatically adjusts to deliver the optimal infrastructure operating solution that you want.

POWER6 processor technology brings hardware decimal floating point implementation as a replacement for software that provided decimal floating point implementation. For more information, refer to 1.5, "POWER6 floating point decimal arithmetic data and calculations" on page 30.

The 9117-MMA delivers outstanding performance as an application or as a database server in addition to supporting consolidation projects to simplify the IT infrastructure. It supports virtual partitions, enabling clients to create additional IBM i, AIX, and Linux partitions for test, development, and production workloads without downtime.

The modular-built system uses one to four enclosures, each enclosure is four EIA units (4U) tall and is housed in a 19 inch rack. A system can have four drawers (a total of 16U) for a total of 16 processors. It supports IBM i, AIX, and Linux operating systems to broaden the application offerings available and increase ways you can manage growth, complexity, and risk.

Figure 2-1 shows a rack with a 16-way configuration.

Power 570

- Up to 16 processors
- 4,100 to 76,900 CPW
- rPerf to 134.35
- Max 768 GB memory
- Max 338 TB disk
- RIO-2 and 12X I/O
- IBM i, Linux, and AIX
- P30 software tier
- F5 processor group

Figure 2-1   9117-MMA 16-Way system rack example

The 9117-MMA includes the following key characteristics:

► Powerful POWER6 processors
► 2-, 4-, 8-, 12-, and 16-core configurations
► Three processor frequency choices (3.5 GHz, 4.2 GHz, and 4.7 GHz)
► Up to 768 GB of DDR2 memory
► Memory frequencies of up to 667 MHz
► Six SAS DASD drives per enclosure (24 maximum per system)
► Maximum disk bays and storage with IBM i formatted drives (1200 / 338 TB)
► Maximum disk bays and storage with I/O drawers with AIX formatted drives (264 / 79.2 TB)
► Modular rack mount design with one to four processor (CEC) enclosures
► Hot-Processor Enclosure (node) Add and Cold-Processor Enclosure (node) Repair
► Seven I/O expansion slots per enclosure (28 maximum per system)
► Dynamic logical partitions, up to 160 per system (optional)
► Innovative on demand features for both processors and memory
► Integrated Virtual Ethernet ports (select from 1 Gb and 10 Gb options)

These Power Systems servers offer exceptional reliability, availability, and serviceability (RAS) functions including:

► Built-in reliability through the use of highly engineered components

► Recovery from intermittent errors or failover to redundant components

► Detection and reporting of failures and impending failures

► Hardware that initiates actions to effect error correction, repair, or component replacement automatically

Note: Included in the tables in this chapter are rPerf, CPW, and Domino® Notesbench Mail and Calendaring Users (MCU) performance rating values, where available. These values are used for relative performance ratings among IBM systems. CPW and MCU ratings are used for comparisons among IBM systems or partitions running IBM i. rPerf values are used for performance comparisons among IBM systems or partitions running AIX.

This chapter lists some CPW and rPerf values for various number of processors that are activated within the 9117-MMA. For additional information, refer to Appendix H, "Processor feature numbers, system performance and IBM i QPRCFEAT system value" on page 967.

Note that IBM i has sometimes separated CPW values into two workload categories:

► Interactive or 5250 OLTP workload CPW (5250 CPW)

POWER5 and Power Systems support of 5250 applications is purchased at a processor level. The feature is called *5250 Enterprise Enablement*. You can order the first enablement as a *base* enablement up to a *full* enablement (the maximum number of processors that are supported by the MTM). Full enablement offers a reduced price above some number of individual processor at time enablements.

► Non-interactive workload CPW

Do not use CPW or rPerf as the sole metric for sizing workloads on any IBM Power Systems model.

Additional considerations for sizing or capacity planning workloads include the relative proportions of CPU utilization, disk I/O-per-second rates, and for example, application designed "waits for work to do."

We recommend that you size an IBM System i model workload using a sizing tool, such as the IBM Systems Workload Estimator, which is available at:

http://www.ibm.com/servers/eserver/iseries/perfmgmt/sizing.html

You can also use Performance Navigator from the Midrange Performance Group:

http://www.mpginc.com

In addition, consider using BMC Patrol for iSeries - Predict, which is available at:

http://www.bmc.com

The 9117-MMA is designed to be installed in a 7014-T00 or 7014-T42 (42 U) rack. An existing 7014-T00 or 7014-T42 rack can be used for the 9117-MMA if sufficient space and power are available. The 9117-MMA is not supported in the 7014-S11 rack.

The 36U 1.8 meter rack (#0551) and the 42U 2.0 meter rack (#0553) are available for order on MES upgrade orders only. For initial system orders, order the racks as Machine Type 7014, Models T00 or T42. Refer to Figure 2-2 for further details.
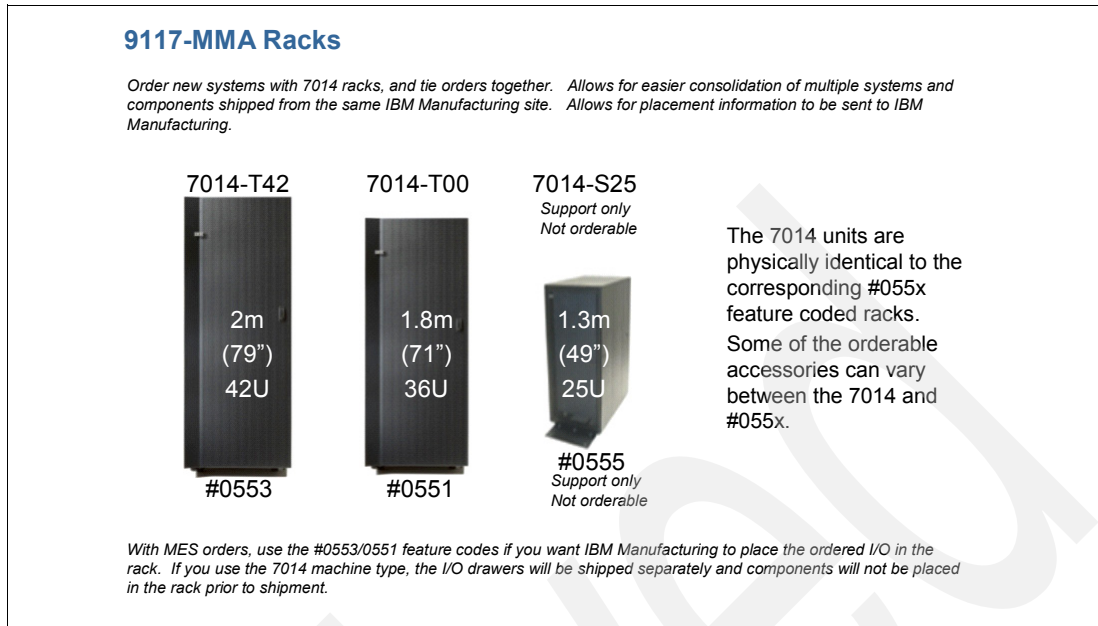
Figure 2-2   9117-MMA racks

For 9117-MMA configurations with two, three, or four drawers, all drawers must be installed together in the same rack in a continuous space of 8U, 12U, or 16U within the rack. The uppermost enclosure in the system is the base enclosure. This enclosure contains the active Service Processor and the Operator Panel if an Operator Panel is present in the system. If a second CEC enclosure is part of the system, the backup service processor is contained in the second CEC enclosure. The service processor is a component of the Service Interface Card in these enclosures.

When using the IBM hardware and software ordering tool (the IBM configurator), the 7014 is not checked automatically by default. You can edit the configurator to add the 7014 rack.

If you are looking for scalability and expandability, the 9117-MMA 1/4-way offers an excellent package to ensure that your Power Systems server can handle business growth.

The 9117-MMA 1/4-way server on demand capabilities allow you to grow quickly from a single active core to four active cores by simply activating additional processors. Fully configured, the 16-way 9117-MMA supports up to 768 GB memory and up to:

▶ 48 RIO-2 I/O expansion units under IBM i (6 per loop)
▶ 32 RIO-2 I/O expansion units under AIX and Linux (4 per loop)
▶ 32 12X I/O expansion units under AIX, IBM i, and Linux (4 per loop)

The POWER6 DDR2 memory uses a new memory architecture to provide greater bandwidth and capacity, which enables operating at a higher data rate for large memory configurations. Dual mode (smart) IOA Fibre Channel Adapters deliver enhanced performance with IBM DS8000 SANs.

IBM PowerVM delivers advanced virtualization technologies. With PowerVM Standard Edition, the 9117-MMA server can support up to 10 partitions per core, supporting multiple IBM i, AIX, and Linux operating environments on a single system.

The 9117-MMA can also support multiple shared processor pools, enabling the capping of processor resources on a group of partitions. Virtual I/O Server (VIOS) offers storage and

Ethernet virtualization for IBM i, AIX, and Linux partitions. In addition, with PowerVM Lx86, you can run 32-bit Linux on x86 applications in Linux environments on the 9117-MMA.

Figure 2-3 shows up to four building blocks (processor and memory enclosures) that are available to support a 4 processor 9117-MMA (one block) up to a 16 processor 9117-MMA (4 blocks).
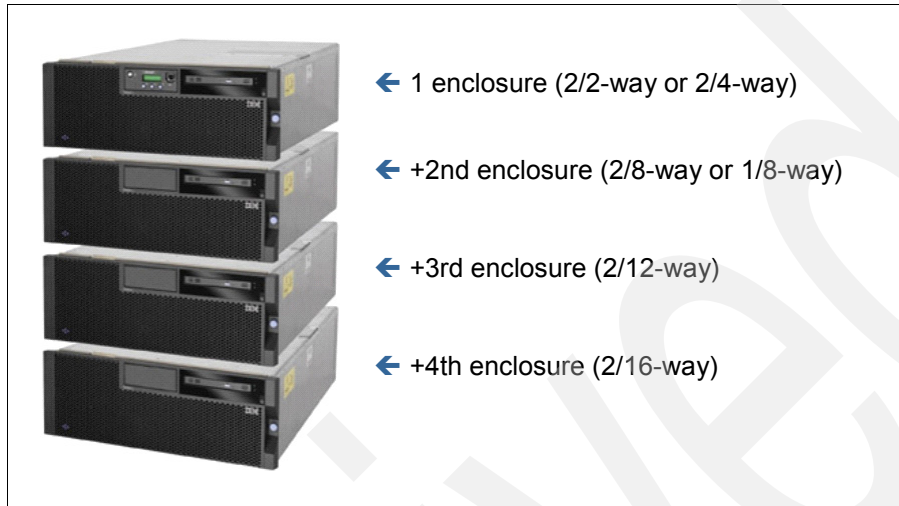
Figure 2-3   9117-MMA building block

System unit and processor enclosure: In this paper, we use several terms such as *system unit*, *processor enclosure*, or *node* to represent the physical enclosure that include a set of available processor cards, memory cards, and I/O slots for the IBM Power 570 Model 9117-MMA. The IBM Power 595 9119-FHA system unit is actually contained within a larger frame.

For the POWER5 and 9117-MMA models, some IBM documentation refers to each processor enclosure as simply a *building block*.

The term *CEC* is used also to refer to a single Power 570 building block.

In addition to processor and memory cards, each processor enclosure (building block) has support for a limited number of I/O devices or I/O loop (GX) adapters and can support up to two GX (I/O loop) adapters for additional I/O attachments as we describe later in this chapter.

9117-MMA systems now support adding an additional processor enclosure (node, CEC) to a system, without shutting down the system (Add), provided sufficient cabling is ordered and used before the attempt to add.

The additional 9117-MMA enclosure can be ordered as a system upgrade (MES order) and added to the original system while operations continue. The additional resources of the newly added enclosure can then be assigned to existing applications or new applications as required. This capability is available to existing 9117-MMA systems after upgrading to firmware level EM320_051 or later.

To take advantage of this new feature, the system must have spare previously ordered, unused connectors on the attached Service Interface Cable and space available in the rack immediately below the system. If a new Service Interface Cable is required, the system will need to be powered down to install the new cable.

9117-MMA systems that have experienced a failure and auto recovered by rebooting after Guarding Out the failed CEC enclosures can now have the deactivated enclosure removed so it can be repaired without powering down the system a second time. Once repaired, the enclosure can be reintegrated back into the active system without powering down the system (Cold-node Repair). The resources of the repaired CEC enclosure can then be reassigned to existing applications or new applications as required. This capability is available to all 9117-MMA systems after upgrading to firmware level EM320_051 or later. With this in mind, proper planning must be done to ensure that all prerequisites from a server (firmware and operating system levels) and from an infrastructure (racking, placement, and cabling) viewpoints are covered.

Figure 2-4 depicts adding a node to an existing two node configuration.
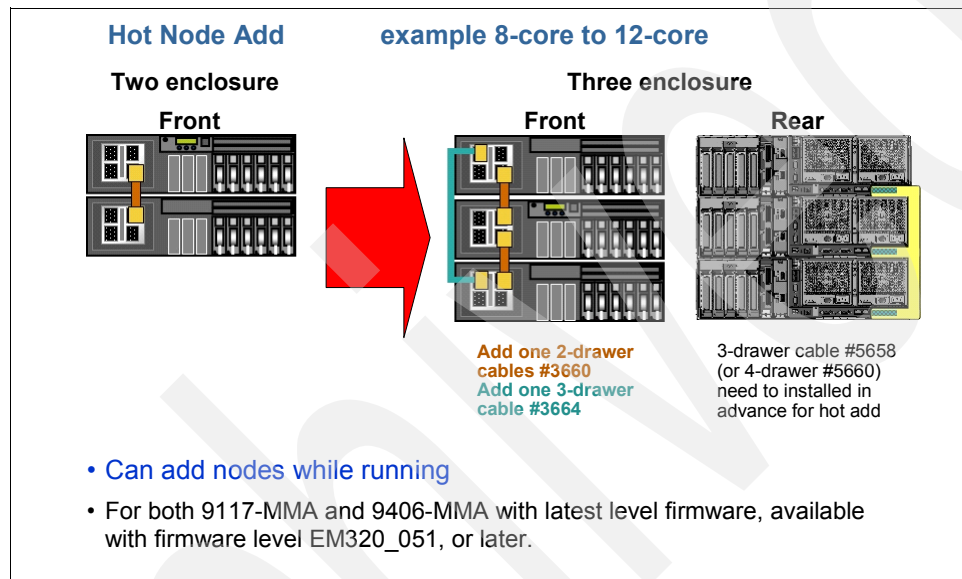
Figure 2-4   Hot processor enclosure (node) Add

The POWER6 570 commercial processing workload (CPW) ratings are approximately 70% higher than equivalent POWER5 systems and approximately 30% higher than equivalent POWER5+ systems. Improved performance compared to POWER5 and POWER5+ models is also realized for Lotus® Domino Mail and Calendar Users (approximately 35% improvement over similarly configured POWER5+ 570 model) and the IBM internal WebSphere Application Server stock broker benchmark application Trade6 (approximately 45% improvement over similarly configured POWER5+ 570 model). This improvement is accomplished within the same footprint, electrical power, and cooling parameters as the POWER5+ system.

With its advanced virtualization technologies, the POWER6 570 can run multiple operating systems and application environments simultaneously. POWER6 570 shares the following key characteristics with POWER5+ technology models:

► The ability to run IBM i, Linux, and AIX applications on a single system and to integrate IBM eServer™ xSeries® (System x) servers running Windows or Linux

► Advanced Power Virtualization feature for IBM i, AIX, and Linux support

► Micro-Partitioning (up to 10 partitions per processor, 160 per system)

► Simultaneous multithreading (SMT) where a single processor can process multiple threads

- Dynamic logical partition (LPAR) movement of processor capacity, memory, and I/O devices
- Capacity on Demand options supported on POWER5+ models:
  - Permanent Capacity Upgrade on Demand (CUoD) for processors and permanent CUoD for memory
  - Trial Capacity on Demand (CoD)
  - On/Off CoD
- Continued support of most RIO (HSL) loop and RIO (HSL) I/O enclosures currently supported on POWER5 systems
- IBM i V5R4M0 RAID hot spare option (adding a planned for disk), which was introduced in October 2007

  This option allows one or more disk drives to be placed on stand-by (hot spare). If a drive fails, the second drive is brought online automatically in place of the failed drive. This option minimizes the time that the array is running unprotected and is available for disk controllers running either RAID-5 or RAID-6. At least one drive per disk controller is required for the arrays protected. This protection option is not applicable to mirrored configurations.

  Using either a Service Tools interface or an iSeries Navigator interface (select **Configuration and Service → Hardware**), configure a RAID set with a hot spare to enable this automated function. See the #0347 RAID Hot Spare Specify as described in 4.4, "Feature code availability" on page 190 for more information.

The following new capabilities and offerings are offered exclusively on the 9117-MMA:

- Utility Capacity on Demand (Utility CoD)

  With Utility Capacity on Demand, granularity can be achieved down to a single 9117-MMA processor minute. When enabled, it can provide additional processor capability automatically when a workload peak occurs. See 2.8, "9117-MMA Capacity on Demand" on page 90 for more information about all POWER6 CoD capabilities.

- P30 software across the 1 to 16 processor activations

  This feature offers significant cost advantages compared to the POWER5 technology-based 570 models.

- IBM i and Capacity BackUp Editions

  IBM i has offered capacity backup edition options previous to POWER6 availability. For POWER6 Capacity BackUp Editions, two software editions are available. No Standard nor Enterprise Edition is available. The IBM i and Capacity BackUp Editions offers significant cost advantages compared to the POWER5 technology-based 570 models.

- 12X loop technology (for POWER6) supporting the 12X I/O enclosure (#5796), also called a *12X channel*

  POWER6 570 system unit can have up to two GX adapters. An RIO-2 GX adapter #1800 allows a loop to attach up to six HSL I/O enclosures. The system unit 12X Channel GX Adapter #1802 allows a loop to attach up to four 12X I/O enclosures.

  Each POWER6 570 system unit can have up to one of the following adapter combinations:
  - Two RIO-2 GX adapters
  - Two 12X GX adapters
  - One RIO-2 GX adapter and one 12X GX adapter

12X is a new loop for I/O attachment technology. The *12* refers to the number of wires within the 12X cable. Potentially, 12X technology offers up to 50% more bandwidth than HSL technology.

12X loop technology is based upon the participation of IBM with the InfiniBand Trade Association® (IBTA). IBM 12X support is not 100% compliant; therefore, in this paper, we do not commonly use the InfiniBand term.

HSL I/O enclosures must be attached to an HSL loop. 12X I/O enclosures must be attached to a 12X loop. HSL and 12X enclosures cannot be mixed on the same loop because they are not compatible.

For POWER6 570 models, the only supported I/O drawer supporting 12X loop attachment is the #5796 12X I/O Drawer. Two #5796 drawers can be enclosed in a #7314 enclosure. The #5796 has the following key characteristics:

– Six high-speed, PCI-X DDR slots per #5796

– Dual mode ("smart") IOAs or IOP-less IOAs only (no IOP support)

– The #5796 is similar to the HSL #5790 with the following key differences:

  • The #5796 can support higher workload levels.
  • The #5790 has six PCI-X slots, which can support IOPs.
  • The #5790 has a maximum of six 5790s per HSL loop.

Note: The #5796 is supported only on the 9117-MMA model.

Disk controllers for attaching disks in the #5786 EXP24 Disk Drawer is supported in both an RIO-2 I/O enclosure and a 12X I/O enclosure. The #5786 is supported also on System i Models 800, 810, 825, 870, and 890 as well as 520, 550, 570, 595, and 9117-MMA.

The 5xx systems (POWER5 and POWER6) can be clustered. HSL-attached I/O units can be switched, assuming that all I/O enclosures have the faster RIO-2 adapters, indicated by #6417 and #9517.

► #5636, #5637, or #5639 Integrated Virtual Ethernet (IVE)

When ordering a 9117-MMA processor enclosure (identified by #5626), specify either a #5636, #5637, or #5639 IVE. The *Host Ethernet Adapter* (HEA) is the term used in most system documentation for IVE. This adapter replaces the POWER5 technology-based embedded two port Ethernet Adapter in the system unit. You must specify one of the three available processor enclosure adapters:

– #5636: Two Ethernet 10/100/1000 Mbps ports and two serial ports
– #5637: Two Ethernet 10/100/1000/10000 Mbps ports and one serial port
– #5639: Four Ethernet 10/100/1000 Mbps ports and one serial port

These adapters are currently supported only in the POWER6 570 system unit or one of its additional three processor enclosures. These adapters are not supported in an I/O tower or drawer. IBM manufacturing installs this adapter in its own special slot. It does not use a PCI-X or PCIe slot.

These adapters provide significant options for use in a system with multiple partitions. Each port can be owned by a different partition, or multiple MAC addresses can allow up to eight partitions to share a port. A maximum of 16 MAC addresses is supported with the #5636. A maximum of 32 MAC addresses is supported with the #5637. A maximum of 32 MAC addresses is supported with the #5639.

For more information on the adapter capabilities, refer to Chapter 8, "Integrated Virtual Ethernet" on page 789. See also the feature descriptions within Chapter 4, "Feature descriptions and related information" on page 187.

► Support for a new larger capacity 282 GB disk drive

This disk drive is supported as a load source device (no longer available as of 30 January 2009).

► The software offering *Value Packs for Popular IBM i Software Products*, which includes DB2 Value Pack for IBM i with optional features for Database, and Operations Value Pack for IBM i with optional features for operations management

These value packs are designed to offer these valuable software products, at a reduced total set of products cost to clients who purchase a new 9117-MMA, which no longer bundles these software products in the base configuration. For more information about the IBM i value packs, see "IBM i V6R1 software" on page 882 and "i5/OS V5R4 software" on page 888.

Hardware requirements

The 9117-MMA should be installed in a new or existing 7014-T00 or -T42 rack, which provides:

► Proper dimensions

► Mounting surfaces

► Power distribution

► Ventilation

► Stability

► Other functional requirements

The design of the 9117-MMA is optimized for use in an IBM 7014-T00 or -T42 rack. Both the front cover and the external processor fabric cables occupy space on the front left side of an IBM 7014 rack that might not be available in non-IBM racks.

Minimum system configuration

Each model MMA system must include a minimum of one CEC enclosure (4U) with the following items:

► The following configuration:

- 1X - System Enclosure with Bezel (#5626)
- 2X - Power Cords (#6671) or similar power cord
- 1X - Rack-Mount Rail Kit (#7164)
- 1X - Processor Enclosure and Backplane (#5663)
- 1X - I/O Backplane (#5666)
- 1X - System Midplane (#5667)
- 1X - SAS DASD Backplane (#5668)
- 1X - Power Distribution Backplane (#7870)
- 1X - System Port riser card (one of #5636, #5637, or #5639)
- 1X - Service Interface Card (#5648)
- 2X - Power Supplies (#5628) (not required on Model upgrade with Processor #5621)
- 2X - Processor Power Regulator (#5625)

► 1X - Processor Card (one of these):

- 3.5 GHz POWER6, 2-Core Processor Card, 0-core active, #5620
- 4.2 GHz POWER6, 2-Core Processor Card, 0-core active, #5621 (available for model upgrade only)
- 4.2 GHz POWER6, 2-Core Processor Card, 0-core active, #5622
- 4.7 GHz POWER6, 2-Core Processor Card, 0-core active, #7380

- 2X - Processor Activations (two each of one of these):

  - One Processor Activation for Processor Feature #7380, #5403
  - One Processor Activation for Processor Feature #5620, #5670
  - One Processor Activation for Processor Feature #5621, #5671
  - One Processor Activation for Processor Feature #5622, #5672

- 2 GB Active Memory™: 1X - 0/4 GB (4 X 1 GB) DIMMs, 667 MHz, DDR2, POWER6 CoD Memory, #5693 (or any memory feature that results in at least 2 GB of active memory)

- 2X - Activation of 1 GB DDR2 - POWER6 Memory, #5680

- Disk drive: For AIX and Linux, 1 SAS disk formatted for the operating system. IBM i requires disks to be protected by either disk mirroring (2 disks minimum) or RAID protection (RAID 5 requires a minimum of 3 disks). Additionally, IBM i offers a load source option that enables zero disks within the CEC. All disks can be within a SAN-attached IBM System Storage disk server.

- #9XXX Language Group Specify

- Primary Operating System indicator (one of #2145, #2146, or #2147)

- 1X - System Ship Group #5699

The 9117-MMA requires at least one HMC to manage the system, whether there are one or up to four building block processor enclosures. 1X HMC Machine Type 7042 is preferred, Machine Type 7310 is acceptable if upgraded to HMC machine code V7. The HMC can be shared with other systems.

Additional optional features can be added, as desired.

2.1.1 Operating systems and editions

The POWER6 570 supports partitions running IBM i, AIX, and Linux at the following release levels:

- If installing the AIX operating system, one of these release levels:

  - AIX 5L for POWER V5.2 with Technology Level 5200-10 or later
  - AIX 5L for POWER V5.3 with Technology Level 5300-06 or later
  - AIX 6 for POWER V6.1 or later

- If installing the IBM i operating system, one of these release levels:

  - IBM i 5.4 with V5R4M5 machine code or later
  - IBM i 6.1 or later

- If installing the Linux operating system, one of these release levels:

  - SUSE Linux Enterprise Server 10 SP1 for POWER or later
  - Red Hat Enterprise Linux 4.5 for POWER or later
  - Red Hat Enterprise Linux 5.1 for POWER or later

Note: PowerVM features (#7942 and 7995) are not supported on AIX 5L for POWER V5.2.

Not all features available with the 9117-MMA are supported with each available operating system.

Verify the specific feature details. In this paper, 1.6, "Operating system levels required on POWER6 processors" on page 32 lists the operating system levels that are required to operate a POWER6 system. The I/O feature descriptions in Chapter 4, "Feature descriptions and related information" on page 187 provide feature-specific operating system level

information. New features become available over time. Thus, always verify product-specific support information in the latest MTM sales manual or the IBM pre-requisites Web site (hardware and release level supporting selected hardware) at:

http://www-912.ibm.com/e_dir/eServerPrereq.nsf/

If you are installing the 9117-MMA server within the Cluster 1600, you need CSM V1.4 or later (AIX or Linux).

The IBM i, AIX, and Linux release levels are identical to those supported on the 9406-MMA and 2007 System p 9117-MMA model.

Two new System i editions simplify choices. The POWER6 570 delivers product flexibility with IBM i and Capacity BackUp. No 5250 OLTP capacity is included in either the IBM i or Capacity BackUp Edition, but it can be added on a per processor basis using 5250 Enterprise Enablement features.

> **Notes:**
>
> ► Starting with a single IBM i edition, you can customize the 9117-MMA using a processor to run multiple transaction processing, collaborative processing, and application processing workloads.
>
> ► The single 5250 workstation job exception applies to either the IBM i edition or Capacity BackUp Edition, as it does, for example, with a POWER5+ 570 Standard Edition. That is, a single 5250 session can be used to perform necessary functions. To operate multiple active 5250 sessions, you can purchase a 5250 OLTP Enterprise Enablement per processor or an "all processors" option. Enterprise Enablement is separate from the 9406-MMA editions.

2.1.2 System unit (CEC) and features

The 9117-MMA is available as a 2/2-way, 2/4-way, 2/8-way or 2/16-way system. The 9406-MMA is available as a 1/4-way, 2/8-way, 3/12-way (using miscellaneous equipment specification (MES) only), or 4/16-way system, while the Capacity BackUp Edition is available as a 1/4-way, 1/8-way, or 2/16-way system. Each POWER6 570 system unit (processor enclosure) supports two dual-core processor cards and up to six Serial Attached SCSI (SAS) technology disk drives.

Each processor card supports twelve buffered memory slots (dual inline memory module (DIMM) DDR2) that allow memory to be plugged into the processor card (direct attach). Memory is plugged in quads.

► 4U 19 inch rack-mount system enclosure

► One to four system enclosures; 16U maximum system size

► Two processor sockets per enclosure

► POWER6, 64-bit, 3.5 GHz, Dual Core Processor (#5620)

– 12 DDR2 POWER6 Memory DIMM sockets per processor card
– 2-, 4-, 8-, 12-, or 16-core configurations
– L2 cache: 4 MB per core, 8 MB per dual core
– L3 cache: 32 MB per dual core
– 2 GB to 384 GB of POWER6 DDR2 memory

- ► POWER6, 64-bit, 4.2 GHz, Dual Core Processor (#5622)

  - – 12 DDR2 POWER6 Memory DIMM sockets per processor card
  - – 2-, 4-, 8-, 12-, or 16-core configurations
  - – L2 cache: 4 MB per core, 8 MB per dual core
  - – L3 cache: 32 MB per dual core
  - – 2 GB to 768 GB of POWER6 DDR2 memory

- ► POWER6, 64-bit, 4.2 GHz, Dual Core Processor (#5621) (available for upgrade systems only)

  - – Eight DDR2 DIMM sockets per processor card
  - – 4-, 8-, 12-, or 16-core configurations
  - – L2 cache: 4 MB per core, 8 MB per dual core
  - – L3 cache: 32 MB per dual core
  - – 2 GB to 256 GB DDR2 memory, (same memory features as 9117-570)

- ► POWER6, 64-bit, 4.7 GHz, Dual Core Processor (#7380)

  - – 12 DDR2 POWER6 Memory DIMM sockets per processor card
  - – 2-, 4-, 8-, 12-, or 16-core configurations
  - – L2 cache: 4 MB per core, 8 MB per Dual Core
  - – L3 cache: 32 MB per Dual Core
  - – 2 GB to 768 GB of POWER6 DDR2 memory

- ► One slimline DVD drive slot per enclosure

- ► Two USB 2.0 ports for optional AIX/Linux partition usage only

- ► Integrated Virtual Ethernet card

  One or the other of the following mandatory options are installed, depending upon your initial order:

  - – Option 1: Four 1 Gb Ethernet ports and one serial port #5639
  - – Option 2: Two 1 GB Ethernet ports and two serial ports #5636
  - – Option 3: Two 10 GB SR Ethernet ports and one serial port #5637

- ► One service interface card.

- ► Four HMC ports per system (two per enclosure) to support the attachment of two HMCs and two SPCN ports.

- ► Six PCI slots

  - – Four Peripheral Component Interconnect Express (PCIe) slots (three if an optional RIO-2 or 12X GX card is used for a second loop in a processor enclosure)

  - – Two PCI-X DDR slots (IOP-less IOAs only)

PCIe adapters and slots offer potentially faster throughput than are available with PCI, PCI-X, and PCI-X double data rate (DDR) technology. However, PCIe adapters that are currently available are approximately the same speed as PCI-X adapters.

PCIe (supported only on POWER6 technology-based models) uses a term called *lanes* to refer to its capabilities. Each lane can support a data rate of 2.5 Gbps in both send and receive. The slowest and smallest PCIe comes in one lane (referred to as *X1*) with the fastest PCIe up to 32 lanes (x32). Think of lanes as data paths. The more lanes there are, the faster the data can flow, which is similar to an auto highway with multiple driving lanes. The size of the adapter and slot vary proportionally to the number of lanes. Because the physical size varies for both adapter and slot, an adapter with more lanes than the slot has cannot physically be plugged together. In the reverse, if the slot has more lanes than the adapter, then the adapter can be plugged into the slot. In summary, PCIe adapters are supported in a slot with an equal number of lanes or less.

All four PCIe slots in the 9117-MMA processor enclosure are x8.

PCI, PCI-X, and PCI-X DDR cards have the same form factor. A PCIe card has a different form factor. All PCIe and all PCI-X DDR slots do not support an IOP feature card. As of the July 2007 announcement, PCIe slots are available only within the POWER6 processor enclosure.

PCIe adapters and slots are physically incompatible with PCI, PCI-X, and PCI-X DDR adapters and slots. PCIe adapters and slots only support IOP-less mode of operation. PCI-X DDR slots only support IOP-less operation.

The PCIe Ethernet adapters support Operations Console over LAN. The PCIe 2-Line WAN with Modem IOAs support the use of IBM i Operations Console Direct Attach. This IBM i console option uses a special cable #0367 attached to a user-supplied Windows workstation.

For these WAN and Ethernet adapters, direct Systems Network Architecture (SNA) is not supported. For the WAN adapters, this means the Create Line SDLC (CRTLINSDLC) command is not supported. SNA using IBM i SNA Enterprise Extender configuration (preferred) or AnyNet is supported.

If you need direct support of CRTLINSDLC, you must use a WAN or LAN adapter associated with a supported IOP.

► Six hot-swappable 3.5 inch SAS disk bays per enclosure

► One hot-plug, slim-line media bay per enclosure (optional)

► Redundant cooling

► Redundant power including redundant power regulators and dual power cords

► One dedicated GX slot for either a RIO-2 or 12X loop

► One optional GX slot for a second RIO-2 or 12X loop (blocks PCIe slot C6 does not have to match the GX adapter in the dedicated slot)

► Rack mount specify code

For items that are specifically orderable, Chapter 4, "Feature descriptions and related information" on page 187 includes more information.

Note: The 9117-MMA does not use edition-to-edition or server-to-server feature changes. For each increase in processor capacity of one to four, add one #5626 enclosure through an MES order. Thus, the server or edition feature code cannot be used to know the maximum *n*-way of a system configuration.

When adding a #5626 processor enclosure, for each #5626, you must also add the following items:

► A #0423 feature

  This feature counts the number of enclosures.

► At least one processor activation

► One IVE feature, which is also known as one HEA

  You must select either the 2-port or 4-port adapter or accept the new order default for one of these adapters.

► One Service Interface feature

► The appropriate Processor Fabric and Service Processor Cables to connect the enclosures together

► At least two memory features and their activation features

  Alternatively you might already have enough extra memory features and activations on the system to move at least 8 DIMMs to each new enclosure.

Optionally, you can also add:

► One DVD drive
► One to six SAS disk drives
► PCI cards supported in the enclosure
► One to two, HSL/12X loops adapters
► I/O enclosures supported by the HSL or 12X loop adapter or adapters
► I/O enclosure, I/O controller, IOP (if necessary), and I/O devices desired to be placed within a supporting I/O enclosure

2.1.3 9406-MMA editions

The POWER6 570 model IBM i and CBU Editions offer a flexible structure for you to order systems. Each edition includes a specific number of base (no charge) processor activations, one IBM i processor license entitlement, and other software and voucher content. Either 1, 2, or 4 processor activations are provided and are indicated by the quantity of base processor activation feature #7783. You can add 5250 OLTP capability to any IBM i or CBU Edition using 5250 Enterprise Enablement features.

Table 2-1 lists the 9406-MMA edition summary

Table 2-1   9406-MMA edition summary

	Server Feature	Edition	Processor Feature	Base Processor Activation	Base IBM i Activation	Base 5250 Enterprise Enablement	Software licence group
i OS 1/4-way	4910	5460	2 x 7380	1	1	0	P30
i OS 2/8-way	4911	5461	4 x 7380	2	1	0	P30
i OS 4/16-way	4912	5462	8 x 7380	4	1	0	P30

	Server Feature	Edition	Processor Feature	Base Processor Activation	Base IBM i Activation	Base 5250 Enterprise Enablement	Software licence group
CBU 1/4-way	4922	7053	2 x 7380	1	1	0	P30
CBU 1/8-way	4923	7058	4 x 7380	1	1	0	P30
CBU 2/16-way	4924	7063	8 x 7380	2	1	0	P30

2.1.4 9117-MMA minimum and maximum capacities

The tables in this section provide the minimum and maximum system capacities for the IBM Power 570 Model 9117-MMA. The values are package dependent.

> **Note:** As stated earlier, do *not* use CPW or rPerf as the sole metric for sizing workloads on any IBM POWER6 model. Use these metrics as initial sizing values, and then use a sizing or capacity planning tool such as one of the following:
>
> ► The IBM Systems Workload Estimator, which is available at:
>
>   http://www.ibm.com/servers/eserver/iseries/perfmgmt/sizing.html
>
> ► The Performance Navigator from the Midrange Performance Group. You can learn more about this tool at:
>
>   http://www.mpginc.com
>
> ► The IBMC product BMC Patrol for iSeries - Predict. You can learn more about this tool at:
>
>   http://www.bmc.com

Table 2-2 shows the values for a 3.5 GHz processor.

Table 2-2   3.5 GHz processor

	Model 9117-MMA				
Processor feature	**#5620 x 1**	**#5620 x 2**	**#5620 x 4**	**#5620 x 6**	**#5620 x 8**
Number Type Clock speed of processor	2/2 POWER6 3.5 GHz	2/4 POWER6 3.5 GHz	2/8 POWER6 3.5 GHz	2/12 POWER6 3.5GHz	2/16 POWER6 3.5GHz
Relative system performance[1, 2]					
Processor CPW (min/max)	8150/8150	8150/16100	8150/30100	8150/43100	8150/57600
Mail and Calendar Users[2a]					
5250 CPW[5]	0/8150	0/16100	0/30100	0/43100	0/57600
with Enterprise Enablement[6c] (single/max)	4100/8150	4100/16100	4100/30100	4100/43100	4100/57600
Relative Performance (rPerf)	15.85	31.69	58.95	83.35	105.75
L2 Cache (MB) per dual core processor	8	8	8	8	8
L3 Cache (MB) per dual core processor	32	32	32	32	32
Main storage (GB minimum/maximum)	2/96	4/192	8/384	12/576	16/768
Main storage DDR2 DIMMs (quads minimum/maximum)	1/3	2/6	4/12	3/18	4/24
LPAR (10 per processor)[11]	20	20/40	20/80	20/120	20/160

Processor feature	Model 9117-MMA				
	#5620 x 1	#5620 x 2	#5620 x 4	#5620 x 6	#5620 x 8
Minimum IBM i level/LIC level[8]	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5
Minimum AIX level/Technology Level	V5.2 /5200-10	V5.2 /5200-10	V5.2 /5200-10	V5.2 /5200-10	V5.2 /5200-10
Minimum Level: SUSE Linux Enterprise Server Red Hat Enterprise Linux	10 SP1 4.5/5.1	10 SP1 4.5/5.1	10 SP1 4.5/5.1	10 SP1 4.5/5.1	10 SP1 4.5/5.1
Software group[6c]	P30	P30	P30	P30	P30
Disk storage (TB)[7d] Integrated minimum[7b] Total maximum[7a] DASD arms maximum Arms Processor Enclosure (node) External LUNS Physical packaging Rack Design - EIA units External ports RIO-G(12X) Max external loops RIO-G(12X)[12]	77 276 6 276 4 4 (4) 1 (1)	154 546 6 546 4 4 (4) 2 (2)	225 800 12 800 8 8 (8) 4 (4)	338 1200 18 1200 12 12 (12) 6 (6)	338 1200 24 1200 16 16 (16) 8 (8)
Max HSL I/O drawers	6	12	24	36	48
Max 12X I/O drawers	4	8	16	24	32
Max PCI card slots - HSL (system unit only)[10]	90 (5)	173 (5)	346 (10)	519 (15)	692 (20)
Max PCI card slots - 12X (system unit only)[10]	30 (5)	53 (5)	106 (10)	159 (15)	212 (20)
Communication lines[3]	100	200	400	480	480
LAN ports (IVE/HEA only in CEC)	50 (4)	96 (4)	128 (8)	128 (12)	128 (16)
Integrated xSeries Servers External xSeries Servers (IXA)	18 8	36 16	48 32	48 48	48 57
iSCSI Twinaxial workstation controllers	24 75	42 75	84 75	126 75	168 75
Twinaxial workstations Internal DVD-ROM/ DVD-RAM[4]	3000 1	3000 1	3000 2	3000 3	3000 4
Feature I/O Tower Tape/CD-ROM/DVD (combined system partition)	26	26	26	26	26
External tape (combined system partition)	48	48	48	48	48
External optical/CD/DVD (combined system partition)	18	18	18	18	18
Cryptographic coprocessor (combined system partition)	32	32	32	32	32
Cryptographic accelerator (combined system partition)	8	8	8	8	8

Table 2-3 shows the values for a 4.2 GHz processor

Table 2-3   4.2 GHz processor

Processor feature	Model 9117-MMA				
	#5621 x 1/ #5622 x 1	#5621 x2/ #5622 x 2	#5621 x 4/ #5622 x 4	#5621 x 6/ #5622 x 6	#5621 x 8/ #5622 x 8
Number Type Clock speed of processor	2/2 POWER6/ 4.2 GHz	2/4 POWER6/ 4.2 GHz	2/8 POWER6/ 4.2 GHz	2/12 POWER6/ 4.2 GHz	2/16 POWER6/ 4.2 GHz
Relative system performance[1, 2]					
Processor CPW (min/max)	9650/9650	9650/19200	9650/35500	9650/50500	9650/68600
Mail and Calendar Users[2a]					
5250 CPW [5]	0/9650	0/19200	0/35500	0/50500	0/68600
with Enterprise Enablement[6c] (single/max)	4900/9650	4900/19200	4900/35500	4900/50500	4900/68600
Relative Performance (rPerf)	18.38	36.76	68.38	96.68	122.67
L2 Cache (MB) per dual core processor	8	8	8	8	8
L3 Cache (MB) per dual core processor	32	32	32	32	32
Main storage (GB minimum/maximum)	2/96	4/192	8/384	12/576	16/768
Main storage DDR2 DIMMs (quads minimum/maximum)	1/3	2/6	4/12	3/18	4/24
LPAR (10 per processor)[11]	20	20/40	20/80	20/120	20/160
Minimum IBM i level/LIC level[8]	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5
Minimum AIX level/Technology Level	V5.2 /5200-10	V5.2 /5200-10	V5.2 /5200-10	V5.2 /5200-10	V5.2 /5200-10
Minimum Level: SUSE Linux Enterprise Server Red Hat Enterprise Linux	10 SP1 4.5/5.1	10 SP1 4.5/5.1	10 SP1 4.5/5.1	10 SP1 4.5/5.1	10 SP1 4.5/5.1
Software group [6c]	P30	P30	P30	P30	P30

Disk storage (TB) [7d]
  Integrated minimum[7b]
  Total maximum [7a]
	77	154	225	338	338

DASD arms maximum	276	546	800	1200	1200
Arms Processor Enclosure (node)	6	6	12	18	24
External LUNS	276	546	800	1200	1200

Physical packaging
  Rack Design - EIA units
  External ports RIO-G (12X)
	4
	4 (4)
		4
		4 (4)
			8
			8 (8)
				12
				12 (12)
					16
					16 (16)

Max external loops RIO-G (12X)[12]	1 (1)	2 (2)	4 (4)	6 (6)	8 (8)
Max HSL I/O drawers	6	12	24	36	48
Max 12X I/O drawers	4	8	16	24	32
Max PCI card slots - HSL (system unit only)[10]	90 (5)	173 (5)	346 (10)	519 (15)	692 (20)
Max PCI card slots - 12X(system unit only)[10]	30 (5)	53 (5)	106 (10)	159 (15)	212 (20)

Processor feature	Model 9117-MMA				
	#5621 x 1/ #5622 x 1	#5621 x2/ #5622 x 2	#5621 x 4/ #5622 x 4	#5621 x 6/ #5622 x 6	#5621 x 8/ #5622 x 8
Communication lines[3]	100	200	400	480	480
LAN ports (IVE/HEA only in CEC)	50 (4)	96 (4)	128 (8)	128 (12)	128 (16)
Integrated xSeries Servers	18	36	48	48	48
External xSeries Servers (IXA)	8	16	32	48	57
iSCSI	24	42	84	126	168
Twinaxial workstation controllers	75	75	75	75	75
Twinaxial workstations	3000	3000	3000	3000	3000
Internal DVD-ROM/ DVD-RAM [4]	1	1	2	3	4
Feature I/O Tower Tape/CD-ROM/DVD (combined system partition)	26	26	26	26	26
External tape (combined system partition)	48	48	48	48	48
External optical/CD/DVD (combined system partition)	18	18	18	18	18
Cryptographic coprocessor (combined system partition)	32	32	32	32	32
Cryptographic accelerator (combined system partition)	8	8	8	8	8

Table 2-4 shows the values for a 4.7 GHz processor

Table 2-4   4.7 GHz processor

Processor feature	Model 9117-MMA				
	#7380 x 1	#7380 x 2	#7380 x 4	#7380 x 6	#7380 x 8
Number Type Clock speed of processor	2/2 POWER6/ 4.7 GHz	2/4 POWER6/ 4.7 GHz	2/8 POWER6/ 4.7 GHz	2/12 POWER6/ 4.7 GHz	2/16 POWER6/ 4.7 GHz
Relative system performance[1, 2]					
Processor CPW (min/max)	10800/10800	10800/21200	10800/40100	10800/58000	10800/76900
Mail and Calendar Users[2a]	24200/24200	24200/47800	24200/89700	24200/130000	24200/172000
5250 CPW [5]	0/10800	0/21200	0/40100	0/58000	0/76900
with Enterprise Enablement[6c] (single/max)	5400/10800	5400/21200	5400/40100	5400/58000	5400/76900
Relative Performance (rPerf)	15.85	31.69	58.95	83.35	105.75
L2 Cache (MB) per dual core processor	8	8	8	8	8
L3 Cache (MB) per dual core processor	32	32	32	32	32
Main storage (GB minimum/maximum)	2/96	4/192	8/384	12/576	16/768
Main storage DDR2 DIMMs (quads minimum/maximum)	1/3	2/6	4/12	3/18	4/24
LPAR (10 per processor)[11]	20	20/40	20/80	20/120	20/160

Processor feature	Model 9117-MMA				
	#7380 x 1	#7380 x 2	#7380 x 4	#7380 x 6	#7380 x 8
Minimum IBM i level/LIC level[8]	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5
Minimum AIX level/Technology Level	V5.2 /5200-10	V5.2 /5200-10	V5.2 /5200-10	V5.2 /5200-10	V5.2 /5200-10
Minimum Level: SUSE Linux Enterprise Server Red Hat Enterprise Linux	10 SP1 4.5/5.1	10 SP1 4.5/5.1	10 SP1 4.5/5.1	10 SP1 4.5/5.1	10 SP1 4.5/5.1
Software group[6c]	P30	P30	P30	P30	P30
Disk storage (TB)[7d] Integrated minimum[7b] Total maximum [7a]	77	154	225	338	338
DASD arms maximum	276	546	800	1200	1200
Arms Processor Enclosure (node)	6	6	12	18	24
External LUNS	276	546	800	1200	1200
Physical packaging					
Rack Design - EIA units	4	4	8	12	16
External ports RIO-G(12X)	4 (4)	4 (4)	8 (8)	12 (12)	16 (16)
Max external loops RIO-G(12X)[12]	1 (1)	2 (2)	4 (4)	6 (6)	8 (8)
Max HSL I/O drawers	6	12	24	36	48
Max 12X I/O drawers	4	8	16	24	32
Max PCI card slots - HSL (system unit only)[10]	90 (5)	173 (5)	346 (10)	519 (15)	692 (20)
Max PCI card slots - 12X(system unit only)[10]	30 (5)	53 (5)	106 (10)	159 (15)	212 (20)
Communication lines [3]	100	200	400	480	480
LAN ports (IVE/HEA only in CEC)	50 (4)	96 (4)	128 (8)	128 (12)	128 (16)
Integrated xSeries Servers	18	36	48	48	48
External xSeries Servers (IXA)	8	16	32	48	57
iSCSI	24	42	84	126	168
Twinaxial workstation controllers	75	75	75	75	75
Twinaxial workstations	3000	3000	3000	3000	3000
Internal DVD-ROM/ DVD-RAM [4]	1	1	2	3	4
Feature I/O Tower Tape/CD-ROM/DVD (combined system partition)	26	26	26	26	26
External tape (combined system partition)	48	48	48	48	48
External optical/CD/DVD (combined system partition)	18	18	18	18	18
Cryptographic coprocessor (combined system partition)	32	32	32	32	32
Cryptographic accelerator (combined system partition)	8	8	8	8	8

2.2 Notes for IBM Power 570 Model 9117-MMA

Note 1	CPW is used to measure the relative performance ratings of all System i model processors announced from September 1996 onward. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application running determine what performance is achievable. Do not use CPW to compare performance of System i models with other hardware platforms or real-world i5/OS applications. As a reminder, do not use CPW or rPerf as the sole metric for sizing workloads on any IBM Power Systems model. Additional considerations include disk I/O-per-second rates and application workload attributes. We recommend that you size an IBM provided workload sizing tool, such as the IBM Systems Workload Estimator, which is available at: http://www-03.ibm.com/systems/i/advantages/perfmgmt/sizing.html You can also use Performance Navigator from the Midrange Performance Group. More information is available at: http://www.mpginc.com **Note**: Use the minimum operating system release level listed in these tables as part of your sizing estimate.
Note 2	Processor performance represents the relative performance (maximum capacity) of a processor feature running CPW in a client/server environment. Processor capacity is achievable when the commercial workload is not constrained by main storage and direct access storage device (DASD). Performance of the 5250 CPW represents the relative performance that is available to perform host-centric workloads. The amount of 5250 CPW capacity consumed reduces the available processor capacity by the same amount.
Note 2a	Lotus Mail and Calendaring (MCU) workload ratings are projected based on the CPW ratings. MCU ratings are no longer provided starting with the POWER6 520, 550, 9117-MMA 570, and 9119-FHA 595 processor technology models announced during 2008 or later. MCU workload ratings were announced for the System i POWER6 9406-MMA 4.7 GHz processor announced during 2007. Therefore, the 9406-MMA MCU ratings are replicated for the corresponding 4.7 GHz processor 9117-MMA. The IBM Systems Workload Estimator should be used for sizing Domino mail and application workloads. When sizing Domino on i, the latest maintenance release of the selected version is assumed. The IBM Systems Workload Estimator is available at: http://www.ibm.com/servers/eserver/iseries/perfmgmt/sizing.html
Note 3	One line is used if the #5544 System Console on Operations Console is used. One line can be used if the #5548 System Console on 100 Mbps Ethernet is selected and the #0367 Operations Console PCI Cable must be connected. The numbers include the ECS line.
Note 4	There must be at least one DVD-ROM or DVD-RAM per system. You can have one per building block for each system.

Note 5	5250 CPW (Interactive) is an approximate value that reflects the amount of Processor CPW that can be used for workloads performing 5250-based tasks. Keep in mind the following points:
	► The IBM Power 570 Model 9117-MMA IBM i Edition provides zero CPW for 5250 work. Limited 5250 CPW is available for a system administrator to user 5250 display device I/O to manage various aspects of the server. Multiple administrative jobs exceed this capability. There is a single job or console exception for interactive (5250 OLTP) work. This means that, when a single job within an IBM i partition (or the entire system IBM i) is active and that job performs 5250 OLTP functions, almost total processor capacity of that partition (or system) is available for the work being done by that single job. This is true regardless of the system limitations associated with interactive application capacity. Keep this in mind when performing certain functions, such as running a CPU-intensive query or service diagnostics. When multiple jobs performing 5250 functions become active, the single job exception is no longer available and their performance is severely restricted. When more than one job must be active, consider running these CPU-intensive functions as batch jobs rather than from a 5250 workstation. ► The IBM Power 570 Model 9117-MMA IBM, with IBM i ordered can add 5250 OLTP by using the 5250 Enterprise Enablement features. ► A task submitted through a 5250 session (5250 device or 5250 emulation) that does display or printer I/O requires 5250 CPW. ► A task submitted through a 5250 session (5250 device or 5250 emulation) as a "batch" job is not considered 5250 OLTP work and does not require any 5250 CPW unless the task does display or printer I/O. ► Maximum 5250 CPW is equivalent to the Processor CPW for the active processor.

Note 6c	Software group is determined by the combination of processor feature and edition feature. Display the QPRCFEAT system value or DSPHDWRSC TYPE(*AHW) to display the processor feature code value. This value is also shown for the Capacity Card CCIN value when using SST to perform a Capacity Upgrade on Demand. The following table provides a cross-reference.

Processor	Server feature	Edition feature	Software group	Processor feature code or QPRCFEAT value
#7380	#4910 (1-4 Way)	#5460 IBM i	P30	#5460 (7054 with full 5250 Enterprise Enablement)
	#4911 (1-8 Way)	#5461 IBM i	P30	#5461 (7051 with full 5250 Enterprise Enablement)
	#4912 (1-16 Way)	#5462 IBM i	P30	#5462 (7056 with full 5250 Enterprise Enablement)
	MES to 12 Way	NA	P30	#5470 (7018 with full 5250 Enterprise Enablement)
	#4922 (1-4 Way)	#7053 Capacity BackUp	P30	#7053 (7054 with full 5250 Enterprise Enablement)
	#4923 (1-8 Way)	#7058 Capacity BackUp	P30	#7058 (7059 with full 5250 Enterprise Enablement)
	#4924 (1-16 Way)	#7063 Capacity BackUp	P30	#7063 (7064 with full 5250 Enterprise Enablement)
	MES to 12-Way	MES to 12-Way Capacity BackUp	P30	#7047(7019 with full 5250 Enterprise Enablement)

Note 7	External DASD cannot exceed the maximum system capacity or the maximum number of disk arms.
Note 7a	The total maximum DASD capacity (no mirroring or RAID protections) assumes 282.25 GB disk drives, which were announced in July 2007. External DASD cannot exceed the maximum system capacity or the maximum number of disk arms. Note the following points: ▶ Depending upon your use of mirroring or RAID-5/RAID-6 protection, protected maximum storage is less than what is listed here. ▶ Disk drives up to the 282.25 GB disk drive are supported as a load source disk by IBM i. IBM i requires all disks to be protected by RAID 5/6 or disk mirroring. Depending upon the protection mechanism that you choose, the maximum storage is reduced when using RAID 5/6 or disk mirroring.
Note 7b	Starting with IBM i 5.4, you can use a SAN-attached disk instead of using an internal disk to be used as an IBM i load source (boot device). Specify code #0837 is for IBM i SAN load source boot, which can use a disk in a SAN-attached supported IBM disk storage server as follows: ▶ With IBM i 5.4 and V5R4M5 licensed machine code or later: ▶ #2847 PCI IOP with SAN Load Source and attached #2787 PCI-X Fibre Channel Disk Controller or #5760 4 Gbps Single Port Fibre Channel PCI-X 2.0 Adapter ▶ With IBM i 6.1 or later: ▶ #2847 PCI IOP with SAN Load Source and attached #2787 PCI-X Fibre Channel Disk Controller or #5760 4 Gbps Single Port Fibre Channel PCI-X 2.0 Adapter ▶ #5749 4 Gigabit Dual-Port Fibre Channel PCI-X 2.0 DDR Adapter (without an IOP) ▶ #5774 4 Gigabit PCI Express Dual Port Fibre Channel Adapter (without an OP)
Note 7d	Hot spares are not considered configured units. Therefore, they do not count against the system maximums. The maximum number of GB stated in this 9117-MMA table for each server feature is less than the stated maximum value. The maximum value assumes that the maximum number of supported disk drives are configured and each such disk has a 282.25 GB capacity. Because IBM i also requires the load source disks to be protected (mirrored or RAID (minimum of three disks) protection), the maximum disk storage values shown in the table must be reduced by the number and size of disks dedicated to load source and load source protection. For example, assuming two disk mirrored load source configuration using SAS drives, each of 139.5 GB, actual maximum disk storage on a 16-way configuration can be estimated to be approximately: 387825 GB – (2 x 142.75 GB) = 387539 GB This is still approximately 387 TB.
Note 8	IBM i V5R4 with License Internal Code V5R4M5 with the latest level of the LIC and Cumulative PTF package available for the IBM System i POWER6 570 with a 4.7 GHz processor. For the latest information, refer to the IBM prerequisite page at: http://www-912.ibm.com/e_dir/eServerPrereq.nsf/UpgradeCategories/Hardware?opendocument
Note 9	Does not apply to POWER6 570 models.
Note 10	The processor enclosure (system unit, also referenced as CEC) has four PCIe slots and two PCI-X DDR slots. When a second RIO-G or 12X loop is required in a processor enclosure, one PCIe card slot (C6) in that system unit is blocked by the RIO-G or 12X adapter. The processor enclosure does not support IOP cards. PCIe slots are currently not supported in any supported I/O tower or drawer enclosure.
Note 11	A maximum of 10 active partitions per activated processor. A maximum of 160 partitions applies to any model with six or more activated processors. Customers who need a larger partition configuration, should work with the IBM Lab to ensure a smoothly functioning and supported configuration can be offered/used. IBM Lab can be contacted at: http://www-03.ibm.com/systems/services/labservices/index.html
Note 12	RIO-G and 12X expansion drawers/towers cannot be mixed on a loop. However, one loop can be RIO-G and the other loop can be 12X.

2.3 Hardware Management Console

To support connectivity to any POWER6 model, Hardware Management Console (HMC) V7R3.1.0 or later is required. This release of HMC introduces a browser-based interface. To connect your browser to the HMC running V7R3.1.0, enable remote Web access on the HMC and enter a Web address similar to the following example:

`https://`*HMC host name or HMC IP address*

The required minimum 9117-MMA system firmware level is version EM310. Level 320_076 or later is recommended.

For information about the required firmware level, see 1.6, "Operating system levels required on POWER6 processors" on page 32.

The following HMC models are supported:

- ► 7042-C06 (announced on 22 May 2007)
- ► 7042-CR4 (announced on 22 May 2007)
- ► 7310-C05 (withdrawn from marketing on 21 September 2007)
- ► 7310-C04 (withdrawn from marketing on 31 August 2006)
- ► 7310-C03 (withdrawn from marketing on 30 June 2005)
- ► 7310-CR3 (withdrawn from marketing on 27 April 2007)
- ► 7310-CR2 (withdrawn from marketing on 29 April 2005)

HMC V7R3.1.0 can also operate with POWER5 technology-based systems running at system-firmware level SF240_299 or later.

If an HMC Machine Type 7310 is attached to a POWER5 based system, it must be updated to HMC licensed machine code Version 7 Release 3.1.0 before attaching to a 9117-MMA.

HMC licensed machine code V7R3.1.0 provides a Web browser-based interface to the HMC. The following browsers are supported:

- ► Firefox 1.5.0.6 or later
- ► Microsoft® Internet Explorer® 6.0 or later

WebSM is not supported as an interface to HMC V7R3.1.0 or later. WebSM continues to be supported to HMC V6 or later.

For more information about supported HMC and firmware levels and updating HMC and firmware levels, refer to the HMC Web page at:

http://www14.software.ibm.com/webapp/set2/sas/f/hmc/home.html

2.4 Comparing 2007 POWER6 570 models with 2008 9117-MMA

There are only a few I/O feature number changes between the 2007 System i 9406-MMA POWER6 and the 2008 9117-MMA with the same processor 4.7 GHz speed feature. Differences are included in Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. In this section, we provide additional information.

Key considerations include:

- ► Upgrade paths from POWER5 and POWER5+ 570 remain the same.
- ► Memory features and rules remain the same.

- IBM i I/O (disk drives, controllers, drawers, and so forth) remain the same.

- IBM i software tier remain the same.

- Performance and function remain the same.

- 2008 9117-MMA is ordered differently, with more visibility to component prices.

- New AIX I/O features are available.

- If this is a new server (in contrast to an MES model upgrade), additional processor speed (clock speed) options are available.

- If you want less than 24x7 SBD warranty and maintenance, you can get it.

- If you wanted fewer activations or no virtualization, you can get it.

There are fewer considerations between the 2007 POWER6 System p 9117-MMA and the unified 2008 9117-MMA. In this section, we provide additional information. Differences are noted in Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909.

Key considerations include:

- Performance and function remain the same.

- Upgrade paths from POWER5 and POWER5+ 570 remain the same.

- GHz options, memory features, and configuration rules remain the same.

- AIX I/O hardware that is available (plus additional) remains the same.

- Warranty remains the same.

- The 9117-MMA is similar to but different than ordering the 9406-MMA. Most notable are I/O hardware feature codes. For more information, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909.

- New AIX SAS I/O announcements, including SAS RAID adapter and split backplane enhancement.

- Expanded capability for running IBM i partitions and using IBM i I/O capabilities.

- With latest firmware in May 2008, any 9117-MMA system is enabled to run IBM i after the appropriate hardware or software is ordered and installed.

2.4.1 IBM 9406-MMA compared to IBM Power 570 Model 9117-MMA

IBM i is supported on all clock speeds of the 9117-MMA at GA, including 3.5 GHz, 4.2 GHz, and 4.7 GHz. Selected I/O devices are operating system dependent and operating systems might have minimum prerequisites for use. Other than those requirements, no additional limitations are being announced.

With the unified 9117-MMA, you can take advantage of the full range of IBM i, AIX, and LInux operating system options and associated licensed programs and operating system specific applications.

Existing 9117-MMA or 9406-MMA systems will need to have the latest firmware applied (eFW 3.2.2) in order to upgrade to the new 9117-MMA system capabilities. All new systems shipping after GA will also have new covers to reflect the new naming.

To determine the latest system firmware and microcode levels that you need and to download the code, visit the firmware and microcode downloads Web site:

http://www14.software.ibm.com/webapp/set2/firmware/gjsn

Figure 2-5 compares key 9406-MMA and 9117-MMA processor enclosure and operating system considerations. The blue text (lighter colored text) highlights important 9117-MMA considerations from an IBM i viewpoint.

9406-MMA	9117-MMA
4.7 GHz	3.5 GHz, 4.2 GHz, 4.7 GHz
Up to 16-way 1/4-core, 2/8-core, 3/12-core, 4/16-core (+CBU 1/8 and 2/16)	Up to 16-way 2/2-core, 2/4-core, 2/8-core, 2/12-core, 2/16-core
Add proc enclosure through MES adds 4-core – minimum 1 activation	Add proc enclosure through MES adds 4-core – minimum 0 activation
Micro-partitioning in base	Micro-partitioning through PowerVM
IBM i always included	IBM i now supported
Editions: IBM i and CBU. Use no-charge features in edition package. 5250 not part of edition.	No Editions. No no-charge features which ship real hardware
Processor and memory CoD 4.7 GHz activations	Processor and memory CoD Activations for all GHz

Figure 2-5   9406-MMA compared to 9117-MMA

2.5 9117-MMA server feature and system unit

The topics in this section summarize key 9117-MMA features and system unit (processor enclosure) capabilities.

2.5.1 9117-MMA server features

The 9117-MMA server includes the following features:

► Up to 76,900 CPW
► rPerf to 134.35
► Up to 768 GB memory
► Full 5250 OLTP capability
► Five PCI express (PCIe)/PCI-X DDR slots
► Up to six hot-swap SAS disk drives in the system unit
► Imbedded SAS disk/tape/DVD controller in the system unit
► SAS RAID adapter support.
► Optional 175 MB write cache with auxiliary write cache protection in the system unit
► Up to two I/O loops (HSL/RIO I/O and 12X) and associated I/O drawers/towers
► Up to 546 disk drives (1.7 TB)
► One integrated virtual Ethernet adapter with up to four ports
► One slim line media bay for a DVD-ROM or DVD-RAM drive per building block
► Redundant, hot-swap power and cooling capability
► Hot-Processor Enclosure (node) Add / Cold-Processor Enclosure (node) Repair
► EnergyScale technology
► Machine type and model upgrades from models 9406-570 and 9406-MMA

2.6 System specifications

Figure 2-6 illustrates a top left, front view of a 9117-MMA processor enclosure.
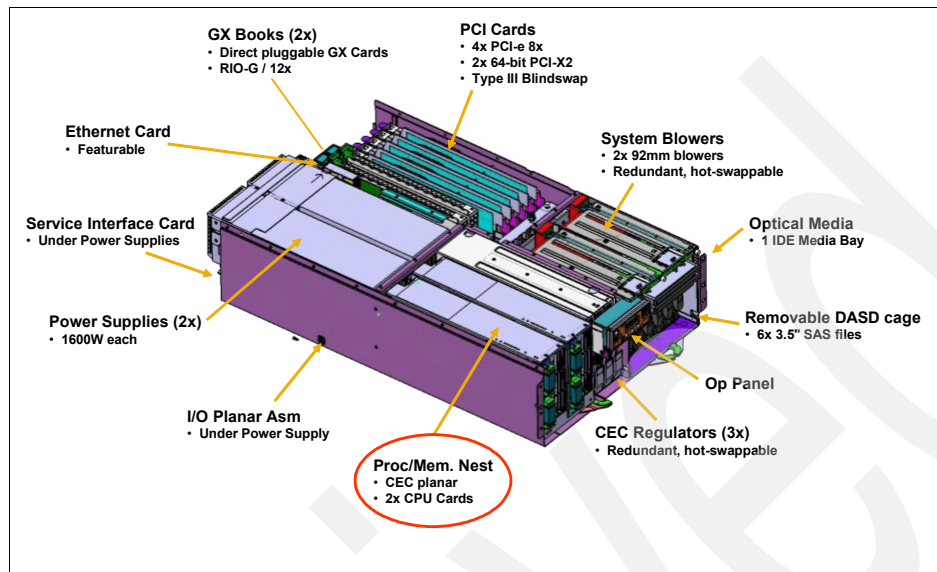
Figure 2-6   9117-MMA processor enclosure (CEC) overview

This section provides an overview of the specifications for the 9117-MMA processor enclosure.

2.6.1 Physical specifications

The system is available only in a rack-mounted form factor. It is a modular-built system utilizing between one and four building block enclosures. Each of these CEC drawer building blocks is packaged in a 4U[1] rack-mounted enclosure. The major physical attributes for each building block are shown in Table 2-5.

Table 2-5   Physical packaging of CEC drawer

Dimension	One CEC drawer
Height	174 mm (6.85 in)
Width	483 mm (19.0 in.)
Depth	► 824 mm (32.4 in.) from front of Bezel to rear of Power Supply ► 674 mm (25.6 in.) front rack rail mounting surface to I/O Adapter Bulkhead ► 793 mm (31.2 in.) front rack rail mounting surface to rear of Power Supply
Weight	63.6 kg (140 lb.)

To help ensure the installation and serviceability in non-IBM, industry-standard racks, review the vendor's installation planning information for any product-specific installation requirements.

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[1] One Electronic Industries Association Unit (1U) is 44.45 mm (1.75 in).

For installation planning information, refer to the planning Web site at:

http://publib.boulder.ibm.com/infocenter/systems/scope/hw/topic/iphdx/abstract_sit
e_hw_planning_guide.htm

2.6.2 Operating Environment

Table 2-6 lists the general system specifications of a single Central Electronics Complex (CEC) enclosure.

Table 2-6   System specifications

Description	Range (operating)
Operating temperature	5 to 35 degrees C (41 to 95 degrees F)
Relative humidity	8% to 80%[a]
Maximum wet bulb	23 degrees C (73 degrees F)
Noise level	► With 3.5 GHz processors FC 5620: 7.1 bels ► With 3.5 GHz processors FC 5620 and acoustic rack doors: 6.7 bels ► With 4.2 GHz processors FC 5622: 7.1 bels ► With 4.2 GHz processors FC 5622 and acoustic rack doors: 6.7 bels ► With 4.7 GHz processors FC 7380: 7.4 bels ► With 4.7 GHz processors FC 7380 and acoustic rack doors: 6.9 bels
Operating voltage	200 to 240 V ac 50/60 Hz
Maximum power consumption	1400 watts (maximum)
Maximum power source loading	1.428 kVA (maximum)
Maximum thermal output	4778 BTU[b] per hr (maximum)
Maximum altitude	3048 m (10 000 ft)

a. All tape media used must have a relative humidity range of 20% to 80%.
b. British Thermal Unit

The appropriate system power cord is added automatically by the configurator based on the country in which the order is placed. For default power cord, other power cord options, and additional technical planning information, refer to the planning Web site at:

http://publib.boulder.ibm.com/infocenter/systems/scope/hw/topic/iphdx/abstract_site
_hw_planning_guide.htm

2.6.3 9117-MMA systems Capacity BackUp capability (applies to IBM i only)

The 9117-MMA systems Capacity BackUp (CBU) designation can help meet your requirements for a second system to use for backup, high availability, and disaster recovery. It enables you to transfer IBM i processor license entitlements and 5250 Enterprise Enablement entitlements that were purchased for a primary machine temporarily to a secondary CBU-designated system. Temporarily transferring these resources instead of purchasing them for your secondary system can result in significant savings. Processor activations cannot be transferred.

The Capacity BackUp specify feature #4891 is available only as part of a new server purchase or during an MES upgrade from an existing Capacity BackUp system to a

9117-MMA. Certain system prerequisites must be met and system registration and approval are required before the Capacity BackUp specify feature can be applied on a new server.

Standard IBM i terms and conditions do not allow either IBM i processor license entitlements or 5250 OLTP (Enterprise Enablement) entitlements to be transferred permanently or temporarily. These entitlements remain with the machine they were ordered for. When you register the association between your primary and on-order Capacity BackUp system, you must agree to certain terms and conditions regarding the temporary transfer.

After a Capacity BackUp system designation is approved and the system is installed, you can temporarily move your optional IBM i processor license entitlement and 5250 Enterprise Enablement entitlements from the primary system to the Capacity BackUp system when the primary system is down or while the primary system processors are inactive. The Capacity BackUp system can then better support failover and role swapping for a full range of test, disaster recovery, and high availability scenarios. Temporary entitlement transfer means that the entitlement is a property transferred from the primary system to the Capacity BackUp system and can remain in use on the Capacity BackUp system as long as the registered primary and Capacity BackUp system are in deployment for the high availability or disaster recovery operation.

The primary system for a 9117-MMA server can be:

► 9119-FHA
► 9406-595
► 9117-MMA
► 9406-MMA
► 9406-570

These systems have IBM i software licenses with an IBM i P30 software tier or higher. The primary machine must be in the same enterprise as the Capacity BackUp system.

Before you can transfer IBM i processor license entitlements temporarily from the registered primary system, you must have more than one IBM i processor license on the primary machine and at least one IBM i processor license on the Capacity BackUp server. An activated processor must be available on the Capacity BackUp server to use the transferred entitlement. You can then transfer any IBM i processor entitlements above the minimum one, assuming the total IBM i workload on the primary system does not require the IBM i entitlement that you want to transfer during the time of the transfer. During this temporary transfer, the Capacity BackUp system's internal records of its total number of IBM i processor license entitlements are not updated, and you might see IBM i license non-compliance warning messages from the Capacity BackUp system. Such messages that arise in this situation do not mean you are not in compliance.

Before you can temporarily transfer 5250 entitlements, you must have more than one 5250 Enterprise Enablement entitlement on the primary server and at least one 5250 Enterprise Enablement entitlement on the Capacity BackUp system. You can then transfer the entitlements that are not required on the primary server during the time of transfer and that are above the minimum of one entitlement.

For example, if you have a eight-core 9117-MMA as your primary system with four IBM i processor license entitlements (three above the minimum) and two 5250 Enterprise Enablement entitlements (one above the minimum), you can temporarily transfer up to three IBM i entitlements and one 5250 Enterprise Enablement entitlement. During the temporary transfer, the Capacity BackUp system's internal records of its total number of IBM i processor entitlements is not updated, and you might see IBM i license non-compliance warning messages from the Capacity BackUp system.

If your primary or Capacity BackUp system is sold or discontinued from use, any temporary entitlement transfers must be returned to the machine on which they were originally acquired.

For Capacity BackUp registration and further information, visit:

http://www.ibm.com/systems/power/hardware/cbu

Capacity BackUp offerings

9117-MMA systems Capacity BackUp includes offerings for the following environments:

► IBM i HA and DR environments

► Consolidation environments (IBM i, AIX, and Linux)

Figure 2-7 shows the 9117-MMA Capacity BackUp offering for IBM i.
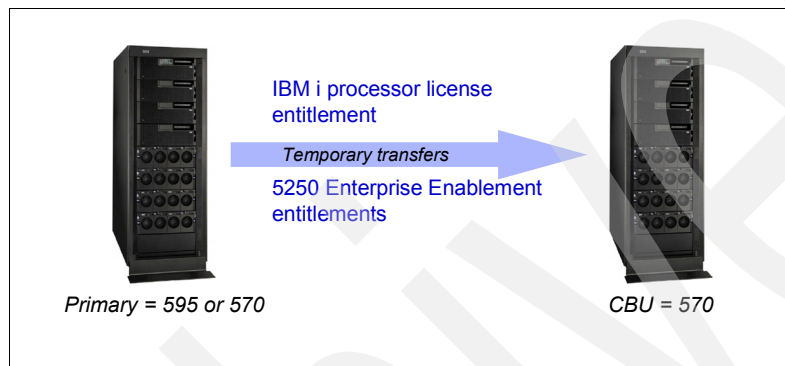
Figure 2-7   9117-MMA CBU for IBM i

Prerequisites

9117-MMA systems Capacity BackUp prerequisites include:

► New 9117-MMA server order (or MES model upgrade of existing POWER5 570 Capacity BackUp server)

► Primary server must be a model 595 or a 570

► Must purchase minimum of one IBM i processor license entitlement for new 570 Capacity BackUp

► If needed, must purchase minimum of one permanent 5250 enterprise enablement entitlement for new 570 CBU

► Registration of the primary system and Capacity BackUp is required prior to the order for Capacity BackUp (new or MES upgrade) being manufactured

Offering advantages

Advantages of the Capacity BackUp offering include:

► Temporary transfer of IBM i processor license entitlements from primary to CBU system

► Temporary transfer of 5250 Enterprise Enablement entitlements from primary to CBU

Ordering information

When you order the Capacity BackUp offering, you need to consider the following information:

- ► Feature code #4891 designates Capacity BackUp and *must* be included on the initial order. You must indicate CBU on a new order. It cannot be specified later on an MES.

- ► Register for Capacity BackUp at the following Web address:

  http://www.ibm.com/systems/power/hardware/cbu/index

- ► Orders do not ship unless registered and approved.

Table 2-7 lists the key comparisons between the 9406-570 and 9117-MMA when using Capacity BackUp.

Table 2-7   Comparing Capacity BackUp offerings

Key Comparisons	9406-570	9117-MMA
For Disaster Recovery or High Availability	Yes	Yes
Savings of IBM i and optionally 5250 temporary transfer	Yes	Yes
Lower priced hardware and maintenance	Yes	No
Edition feature code used	CBU	No
Capacity BackUp Specify feature code #4891	No	Yes
Prerequisite of a Power 570 or Power 595 as primary system	Yes	Yes
Registration of primary system to qualify	Yes	Yes
No charge On/Off CoD if primary system down by disaster	Yes	Yes
Primary system must be same software tier or larger	Yes	Yes

Software licensing for IBM i is included with the active processors for the Capacity BackUp server and is not required with the use of temporary capacity. AIX software licensing for permanently active processors is licensed separately. AIX software licensing of inactive processors is typically not required in the event of a disaster. IBM software licensing is not required on the Capacity BackUp server. Non-IBM software licensing is based on the software tier or conditional use licensing explicitly required by the software provider.

2.7 9117-MMA configuration and features

This section provides information about the 9117-MMA configuration and features.

2.7.1 9117-MMA configuration

Table 2-8 lists a summary of the 9117-MMA configuration.

Table 2-8   Summary of 9117-MMA configurations

IBM Power 570 Model 9117-MMA[a]	
Processor	POWER6 3.5 GHz, 4.2 GHz, and 4.7 GHz
Processor cache per chip (two cores per chip)	8 MB L2 and 32MB L3
Processor card feature	#5620, #5621, #5622, #7380
n-way	2/2 way, 2/4 way, 2/8 way, 2/12 way, 2/16 way
CPW	8150/76, 900
rPerf	15.85 minimum 134.35 maximum
Memory/Main store	2 GB minimum 768 GB maximum
Disk storage[b]	70 GB minimum 1.8 TB system unit maximum per enclosure 7.2 TB system maximum
Disk arms[a]	2 minimum 6 system unit maximum per enclosure 1200 (IBM i) 264 (AIX) system maximum
Disk controller[a]	Minimum 1 embedded 60 system maximum
DVD drive	1 minimum 4 system maximum
HSL or 12X loops	0 minimum 8 maximum
HSL I/O drawers/towers	6 minimum 48 maximum
12X I/O drawers	4 minimum 32 maximum
PCI slots	6 in system unit 692 system maximum (RIO) 212 system maximum (12X)
Communication lines	2 minimum[c] 480 system maximum
LAN ports usable by IBM i	2 minimum 128 system maximum
IVE LAN Ports CEC	2 minimum 16 maximum
Maximum twinax devices	3000
IOP-based cards supported (such as twinax and older tape)	None in system unit Yes in HSL-attached I/O

IBM Power 570 Model 9117-MMA[a]	
Windows integration ▸ Integrated xSeries Servers ▸ Integrated xSeries Adapters ▸ iSCSI adapters (PCI-X)	Yes-48 maximum Yes-57 maximum Yes-168 maximum
Crypto coprocessor Crypto accelerator	32 8
IBM i Software Tier	P30
IBM AIX Processor Group	F5
Server feature	#7830

a. Some maximums and combinations of devices might be subject to configuration restrictions.
b. Does not include the option of Fibre Channel attached disk storage using SAN.
c. One 2-line WAN adapter in most countries.

2.7.2 Reliability, availability, and serviceability (RAS)

The reliability of the IBM 9117-MMA starts with components, devices, and subsystems that are designed to be fault-tolerant. During the design and development process, subsystems go through rigorous verification and integration testing processes. During system manufacturing, systems go through a thorough testing process to help ensure high product quality levels.

The 9117-MMA L3 cache and system memory offers error checking and correcting (ECC) fault-tolerant features. ECC is designed to correct environmentally induced, single-bit, intermittent memory failures and single-bit hard failures. With ECC, the likelihood of memory failures is substantially reduced. ECC also provides double-bit memory error detection that helps protect data integrity in the event of a double-bit memory failure.

Redundant service processor hardware is installed in 9117-MMA. If a second CEC enclosure is part of the system the backup service processor is contained in the second CEC enclosure. The service processor is a component of the Service Interface Card in these enclosures.

This enables hot failover if a service processor fails. This function requires the hardware management console (HMC) to be attached to the service interface card in both processor enclosure one and two. The service interface card in both enclosures must also be connected using an SPCN power control cable (#6006 or similar).

The AIX operating system supports disk mirroring and disk controller duplexing while Linux supports DASD mirroring (RAID 1) through software. Additionally, some hardware RAID adapters are supported on AIX and Linux as well.

When using the AIX operating system, the Journaled File System, also known as JFS or JFS2, helps maintain file system consistency and reduces the likelihood of data loss when the system is abnormally halted due to a power failure. JFS, for 32-bit kernels, and JFS2 for 64-bit kernels are designed to substantially reduce or eliminate fragmentation.

IBM i, in releases 5.4 and especially 6.1, provides many ways to backup important system and applications components and data. IBM i 6.1 provides further extensions to the "save while active" status of objects. High availability business partners have provided a rich set of high availability products and offerings in this area.

In January 2008, IBM introduced the System i High Availability Solutions Manager (HASM). This product builds upon IBM i 6.1 operation system's set of "base availability enhancements." During 2008, HASM was renamed as *IBM PowerHA for i*.

PowerHA for i is the IBM high availability disk based clustering solution for the IBM i 6.1 operating system. PowerHA for i when combined with IBM i clustering technology delivers a complete high availability and disaster recovery solution for your business applications running in the IBM System i environment. PowerHA for i enables you to support high availability capabilities with either native disk storage or the IBM DS8000 or DS6000 storage servers.

For information about operating system support for selected RAS features, refer to Appendix I, "POWER6 reliability, availability and serviceability summary" on page 979.

2.7.3 Memory considerations

Figure 2-8 shows the physical layout of POWER6 memory DIMMs relative to the processor card.

> **Note:** In the figure, the blue (lighter) text shows 9117-MMA additions over the 9406-MMA additions to the 9406-MMA. The black (darker) text shows items that are identical to the 9406-MMA.
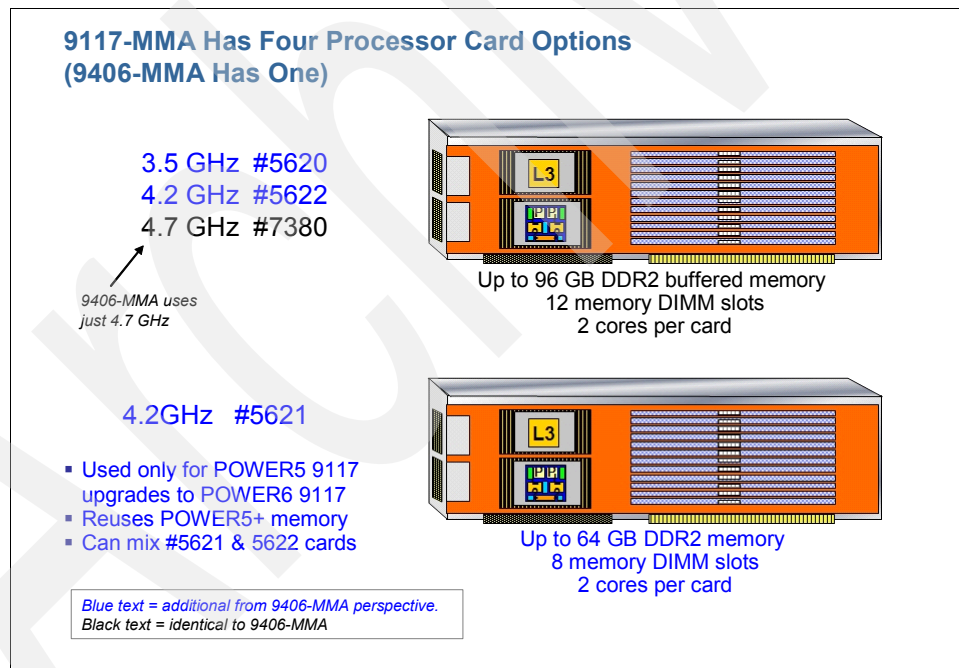
Figure 2-8   9117-MMA Memory options

Twelve DDR2 memory DIMM slots with error checking and correcting (ECC) are used in each 9117-MMA processor card. Memory DIMMs are plugged in quads (one memory feature equals four DIMMs). At least one quad of memory DIMMs (one memory feature) is required on each processor card. Can mix different size or speed memory features in the same system but cannot mix 400 MHz with the 667/533 MHz on the same processor card. You can mix 667 MHz and 533 MHz on the same processor card. The system will run all memory at the slowest installed speed.

The buffered memory of POWER6 enables both a higher bandwidth from the memory and a larger capacity. The larger capacity is important for Database and Java applications that use a large amount of memory. Larger bandwidth is important to feed the faster processor, higher bandwidth I/O operations, and the movement or copying of data from one memory location to another.

With POWER5 technology, a bus connects two DIMMs to the processor. With POWER6, a bus connects the processor card to one DIMM. A second bus connects the first DIMM to a second DIMM, and a third bus connects the second DIMM to a third DIMM. Because each bus has two connections on it, the rate at which data can be transferred across the bus is higher than the POWER5 structure. Data from the third DIMM is transferred or "buffered" from one bus to another at this same higher rate. This daisy chain of DIMMs allows more DIMMs to be connected (increasing capacity) while maintaining the higher bandwidth.

On POWER6 models, all memory is on demand. You must purchase at least half the capacity worth of DDR2 buffered memory activations when buying from IBM. Each 1 GB buffered DDR2 activation feature is #5680.

For best flexibility, memory activation is associated with the system, not the memory DIMMs. If you move memory to a different system, DDR2 buffered memory activations remain on the original system and remain available for any DIMMs that are plugged in.

On/Off memory capability is billed in 1 GB days.

Table 2-9 summarizes the memory additions features.

Table 2-9   Memory additions feature

Memory	Memory feature	# DIMMs	Maximum GB processor	MHz
0/4 GB	#5693	4 x 1 GB	12 GB	667
0/8 GB	#5694	4 x 2 GB	24 GB	667
0/16 GB	#5695	4 x 4 GB	48 GB	533
0/32 GB	#5696	4 x 8 GB	96 GB	400

Carryover DDR2 Memory DIMMs require #5621. The following memory cards can be supported when upgrading to the 9117-MMA:

► 2 GB (4 X 0.5 GB) DDR2 Memory, 533 MHz (#7892)
► 4 GB (4 X 1 GB) DDR2 Memory, 533 MHz (#7893)
► 8 GB (4 X 2 GB) DDR2 Memory, 533 MHz (#7894)
► 16 GB (4 X 4 GB) DDR2 Memory, 533 MHz (#4497)
► 16 GB (4 X 4 GB) DDR2 Memory, 400 MHz (#4499)
► 4/8 GB (4 X 2 GB) DDR2 Memory, 533 MHz (#4495)
► 8/16 GB (4 X 4 GB) DDR2 Memory, 533 MHz (#4496)

Memory placement rules

Figure 2-9 shows the memory slots that are required by the different configuration options that follow after the figure.
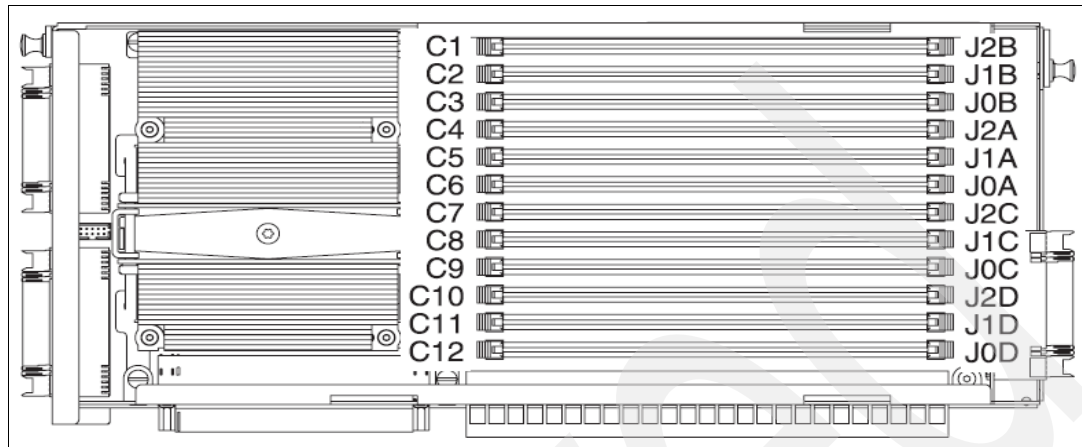
Figure 2-9 Memory module locations on the processor card

Each processor card feature must have a minimum of four DIMMs installed, including any inactive processor card features that are present in the system.

Most memory features includes a total of four DIMMs. A minimum of four DIMMs from any memory feature must be placed on the same processor card. Every memory feature attached to a processor card must have a plug location as follows:

► The first set of four memory dimms must be plugged in DIMM sockets J0A, J0B, J0C, and J0D.

► The second set of four memory dimms must be plugged in DIMM sockets J1A, J1B, J1C, and J1D.

► The third set of four memory dimms (for processor cards able to accept 12 DIMMs) must be plugged in DIMM sockets J2A, J2B, J2C, and J2D.

When configuring the memory in a 9117-MMA, placing two memory features (8 DIMMs) on a single processor card provides the maximum available memory bandwidth. Adding the third memory feature provides additional memory capacity but does not increase memory bandwidth. You can improve system performance that is dependent on memory bandwidth by purchasing two smaller features per processor card as opposed to one large feature per processor card. When placing an order, ensure that the order has 2X memory features for every processor card feature on the order.

All POWER6 memory features must be purchased with sufficient permanent memory activation features so that each memory feature is at least 50% active, except memory feature #8129, which must be purchased with the activation feature #5681 for 100% activation.

Memory features #5692, #5693, #5694, and #5695 can be mixed on the same POWER6 processor card.

Memory features #5696 and #8129 (8x 5696) cannot be mixed with any other memory feature on a single processor card. A processor card with memory feature #5696 or #8129 can be mixed in the same CEC enclosure with a processor card containing other POWER6 memory features.

Memory features #5696 and #8129 cannot be used on processor card feature #5620.

For processor feature number #5621, different memory size or frequency features cannot be mixed on the same processor card. All of the memory features on a single processor card must be the same size in GB when fully active and must have the same frequency. Feature #7894 and #4495 can be mixed on the same processor card because #4495 is 8 GB when fully active. Feature #4497 and #4496 can be mixed on the same processor card because #4496 is 16 GB when fully active. The two processor cards in a single CEC enclosure might have different memory features installed. Processor cards in different enclosures in the same system might have different memory features installed.

For all processors and all system configurations, if memory features in a single system have different frequencies, all memory in the system will function according to the lowest frequency present.

Each system must contain a minimum of 2 GB of active system memory.

Processor card feature numbers #7380, #5620, and #5622 have 12 memory DIMM slots and must be populated with POWER6 DDR2 Memory DIMMs.

Processor card feature number #5621 has eight DIMM slots. These slots do not accept POWER6 DDR2 Memory DIMMs.

Memory Capacity on Demand activations activate memory hardware only in the system serial number for which they are purchased. If you move memory hardware to another system, the memory cannot be functional in that system until arrangements are made to move the memory activations or purchase additional memory activations. (Contact your IBM Representative or IBM Business Partner for more information.)

It is recommended that memory be installed evenly across all processor cards in the system. Balancing memory across the installed processor cards allows memory access in a consistent manner and typically results in the best possible performance for your configuration.

Take into account plans for future memory upgrades when deciding which memory feature size to use at the time of initial system order.

The maximum memory configurable depends upon the clock of the POWER6 processor cores selected, as follows:

► 192 GB of 667 MHz DDR2
► 384 GB of 533 MHz DDR2
► 768 GB of 400 MHz DDR

Table 2-10 lists the memory plugging order.

Table 2-10   Memory plugging order

System unit	Processor card	Where to install memory module
Enclosure 1	P2-C1	Slots J0A, J0B, J0C, J0D
Enclosure 1	P2-C2	Slots J1A, J1B, J1C, J1D
Enclosure 2	P2-C1	Slots J0A, J0B, J0C, J0D
Enclosure 2	P2-C2	Slots J1A, J1B, J1C, J1D
Enclosure 3	P2-C1	Slots J0A, J0B, J0C, J0D
Enclosure 3	P2-C2	Slots J1A, J1B, J1C, J1D
Enclosure 4	P2-C1	Slots J0A, J0B, J0C, J0D

System unit	Processor card	Where to install memory module
Enclosure 4	P2-C2	Slots J1A, J1B, J1C, J1D
Enclosure 4	P2-C1	Slots J2A, J2B, J2C, J2D
Enclosure 4	P2-C2	Slots J2A, J2B, J2C, J2D
Enclosure 3	P2-C1	Slots J2A, J2B, J2C, J2D
Enclosure 3	P2-C2	Slots J2A, J2B, J2C, J2D
Enclosure 2	P2-C1	Slots J2A, J2B, J2C, J2D
Enclosure 2	P2-C2	Slots J2A, J2B, J2C, J2D
Enclosure 1	P2-C1	Slots J2A, J2B, J2C, J2D
Enclosure 1	P2-C2	Slots J2A, J2B, J2C, J2D

OEM memory

OEM memory is not supported or certified for use in 9117-MMA. If the 9117-MMA is populated with OEM memory, you can experience unexpected and unpredictable behavior, especially when the system is using micro-partitioning technology.

All IBM memory is identified by an IBM logo and a white label that is printed with a barcode and an alphanumeric string, as illustrated in Figure 2-6.
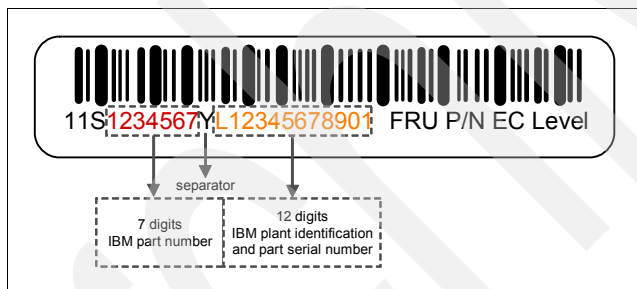
Figure 2-10   IBM memory certification label

Memory throughput

The memory subsystem throughput is based on the speed of the memory. For processors, there are four memory channels, each with single 2 byte read and 1 byte write. Memory channels of POWER6 memory controller are connected to memory buffers. The processor chip has two POWER6 processors. The DDR2 bus allows double reads or writes per clock cycle. If a 667 MHz memory feature is selected, the throughput is (4 x 2 x 2 x 2 x 667) + (4 x 1x 2 x 2 x 667) or 32016 MBps or 32 GBps. These values are maximum theoretical throughputs for comparison purposes only.

Table 2-11provides the theoretical throughput values of 4.7 GHz processors and 667 Mhz memory configuration.

Table 2-11   Theoretical throughput values

Memory	Bandwidth
L1 (Data)	72.5 GBps
L2 / Chip	300.8 GBps

Memory	Bandwidth
L3 / Chip	37.6 GBps
Memory / Chip	32 GBps
Inter-Processor Enclosure (node) Buses (16-cores)	75.2 GBps
Intra-Processor Enclosure (node) Buses (16-cores)	100.26 GBps

2.7.4 PCI slots and GX+ slot

The internal I/O subsystem resides on the system planar which supports a mixture of both PCIe and PCI-X slots. All PCIe or PCI-X slots are hot pluggable and Enhanced Error Handling (EEH) enabled. In the unlikely event of a problem, EEH-enabled adapters respond to a special data packet generated from the affected PCIe or PCI-X slot hardware by calling system firmware, which examines the affected bus, allows the device driver to reset it, and continues without a system reboot.

Figure 2-11 and Figure 2-12 show the back view of the CEC.
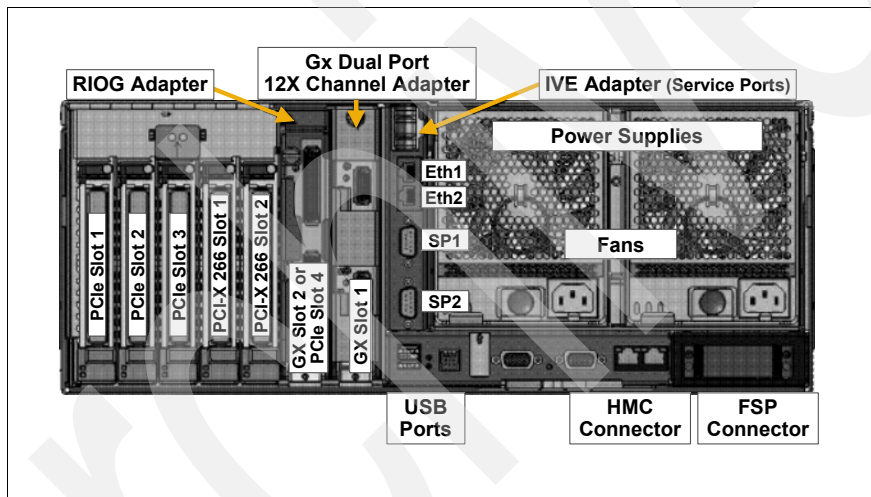
Figure 2-11   9117-MMA rear view
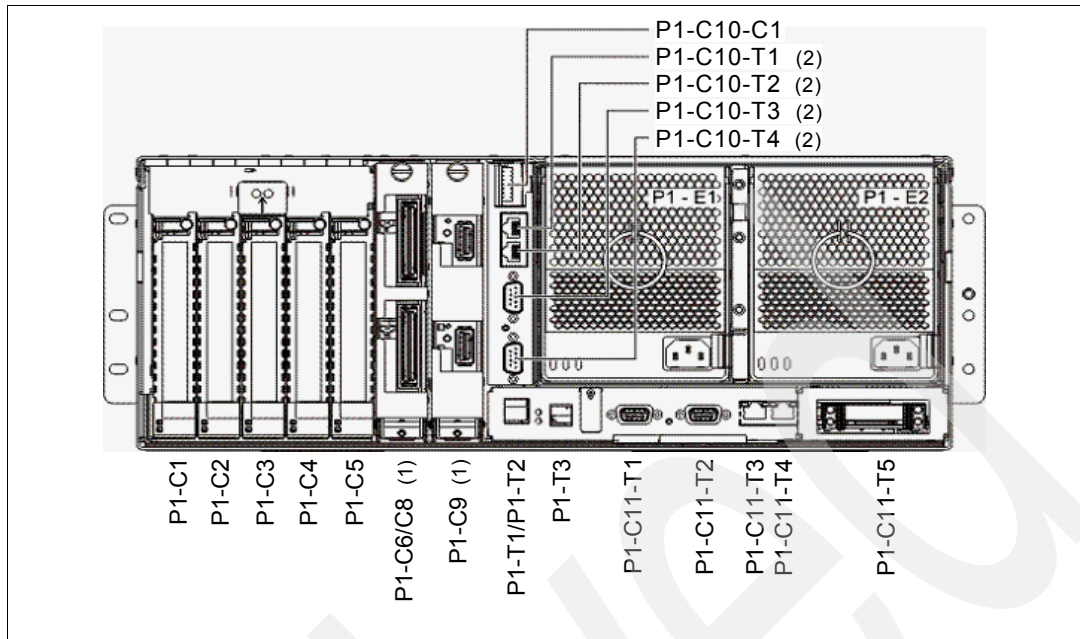
Figure 2-12   9117-MMA line drawing of rear view

The system unit contains seven hot-swap PCI slots per enclosure:

► P1-C1 through P1-C3 and PCI-C6 are PCIe slots (x8 long).

► P1-C1 through P1-C3 are full length. P1-C6 is short form.

► P1-C4 and P1-C5 are PCI-X slots: 64-bit, DDR technology.

► GX slots for either RIO-2 or 12X adapters, one base (1). As shown, P1-C9 is a base 12X and P1-C6-C8 is an optional RIO-2 adapter. When a second GX adapter is configured, P1-C6 is not available as a PCIe slot.

► The IVE (HEA) is shown as a specify feature #5636, two Ethernet ports (P1-C10-T1, P1-C10-T2) and two serial ports (P1-C10-T3, P1-C10-T4) of which port 2, location P1-C10-T3 (top port) is used by IBM i for uninterruptible power supply communications (2). A #1827 cable is required.

Alternatively, either of the following IVE features can be specified on the new system order:

– #5639 IVE (HEA) four 1 Gbps Ethernet ports with one serial port

– The serial port is used by IBM i for uninterruptible power supply communication only. A #1827 cable is required.

– #5637 IVE (HEA) two 10 Gbps (Short Range ports

More information on the three available IVE adapters is provided in 2.7.11, "Integrated Virtual Ethernet daughter cards" on page 87.

► P1-C11-T1 and P1-C11-T2 are for SPCN 0 and SPCN 1 connections.

► P1-C11-T3 is for HMC 1 and P1-C11-T4 is for HMC 2 connections.

► P1-C11-T5 is used if connecting multiple processor enclosures. This port connects the service interface cards.

► P1-C10-C1 is used by IBM service personnel.

Each 9117-MMA CEC enclosure has two PCI-X slots, four PCIe slots, and two GX+ slots. One of the PCIe slots shares physical space with one of the GX+ slots such that a maximum of seven adapters can be used in a single CEC enclosure. The two PCI-X 2.0 DDR slots are full length, 64-bit, 266 MHz slots. There are three full length PCIe 8X slots and one short form factor PCIe 8X slot. The 2 GX+ slots support short form factor GX adapters.

Table 2-12 lists the slots on the back side of the CEC enclosure.

Table 2-12   Processor enclosure PCI slots

Slot ID	Adapter type	Slot size
P1-C1	PCIe 8X	Full length
P1-C2	PCIe 8X	Full length
P1-C3	PCIe 8X	Full length
P1-C4	PCI-X 2.0 DDR	Full length
P1-C5	PCI-X 2.0 DDR	Full length
P1-C6/P1-C8	PCIe 8X / GX+	Short form factor
P1-C9	GX+	Short form factor

Adapter slots P1-C6 and P1-C8 share the same physical space in a CEC enclosure. When a GX+ adapter is installed in GX slot P1-C8, PCIe slot P1-C6 cannot be used.

A system configuration with only two Processors (2/2 W) does not support the use of GX slot P1-C9. In this configuration only the P1-C8 GX slot will function. (This slot is physically shared with PCIe slot P1-C6.) Adding a second processor feature card to the enclosure allows the P1-C9 slot to function. The processors on the second processor feature card do not have to be active. This single GX slot availability applies only to a 2/2 W, single CEC Enclosure system configuration.

The 9117-MMA I/O slot population rules are complex. Extensive configuration rules and checking procedures are incorporated into the Marketing Configurator ECFGPWR to help ensure a valid system configuration. Configurations generated without using the ECFGPWR configurator might create orders that cannot be built, resulting in possible order rejection or delayed delivery.

Feature maximum limits in the feature descriptions of this document for adapters and devices might not provide optimal system performance. These limits are given to assist with connectivity and functional assurance. The maximum values shown here apply to the features installed in the system CEC enclosures. Adding remote I/O drawers increases these limits.

Hot-plug options

The following options are hot-plug capable:

► GX Adapters
► System ac power supplies

  One functional power supply must remain installed at all times while the system is operating.

► Disk drives

► Most PCI adapters

► Processor power regulators

    Two functional power regulators must remain installed at all times while the system is operating.

You can find more information in the IBM Systems Hardware Information Center, which is available at:

http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp

In the information center, expand a specific POWER6 MTM (for example, 8204-E8A or 9117-MMA) and then expand the category "Troubleshooting, service, and support for POWER6 processor-based systems." Select the appropriate hardware feature for additional information.

If the system boot device or system console is attached using an I/O adapter feature, that adapter might not be hot-plugged.

The following adapters are not hot-plug capable:

► POWER GXT135P Graphics Accelerator with Digital Support (#2849)
► 2-port Multi-protocol PCI Adapter (#2962)

2.7.5 SAS disk and SAS disk controller

In the system unit, six 3.5 inch 15 k rpm SAS disk drive bays or disk slots allow up to 7.2 TB of IBM i disk storage. SAS disk drives formatted for IBM i are supported in three capacities:

► 69.7 GB
► 139.5 GB
► 283.7 GB

AIX, Linux, or VIOS formatted SAS drives are also supported in 73.4 GB, 146.8 GB, or 300 GB capacities.

There are six disk bays in each 9117-MMA processor enclosure (see Figure 2-13). Using a split backplane option allows AIX or Linux to use these as two sets of three disk bays instead of one set of six bays. Each set of disk bays is run by a different controller (one embedded and one in a PCI slot). The extra granularity can be very useful for supporting small partitions or mirroring disk controllers.

Enhanced Power 570 Split Backplane Support

Ext SAS Cable #3679 or similar

PCI-e SAS Card   #5909

Connects Into DASD Backplane

- #5909 Alternate SAS Controller for 3 OF 6 Internal SAS
- For AIX or Linux
- Single slot implementation vs. two slot implementation
- Split 6 SAS disk slots in CEC into 3+3 slots
    – PCIe card handles 3 slots, imbedded controller handles 3 slots
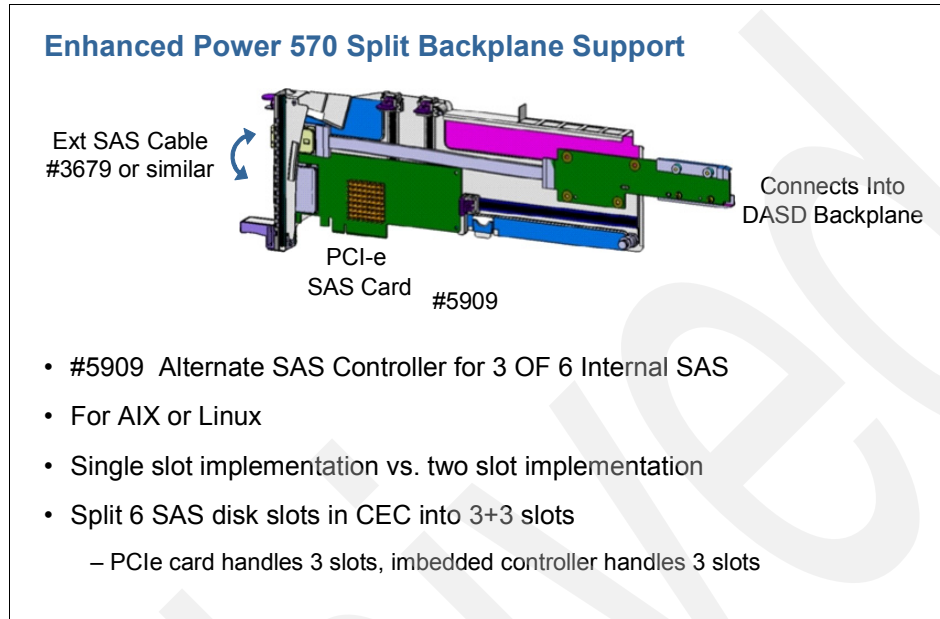
Figure 2-13   9117-MMA split backplane

SAS controller #5909 offers a single-slot split SAS backplane capability by combining an internal cable and a SAS controller in a single slot in the CEC enclosure. (Feature codes #5900, #3650, #3651, and #3679 continue to function as before but require two slots to perform this function. Feature #3650 allows for control of three of the six internal SAS DASD, while feature #3651 allows for control of six of the internal SAS DASD. Either of these features take up one PCI Express slot in the system. Additionally, SAS cable #3679 is required to connect either 3650 or 3651 to the PCI-X DDR SAS adapter #5900).

#5902 PCI-X DDR Dual - X4 3Gb SAS RAID Adapter for AIX or Linux:

► Two #5902 provide high performance, PROTECTED SAS disk controller solution for up to four #5886 EXP 12S Disk Drawers (up to 48 disk)

► Two #5902 mirror their 175 MB write cache data and mirror RAID parity footprints between the adapters for superior availability.

► With proper cabling, multiple wide ports are used to provide redundant paths to each dual port SAS disk System I/O drawer

► Supported on POWER6 processor-based servers only

The same embedded controller that runs the disk drives also runs the SAS tape slot and the slimline DVD drive in the system unit.

For a supported 9117-MMA configuration, disk drives must be protected by either mirroring or RAID.

2.7.6 9117-MMA I/O loop, drawer, and tower options

Remote I/O drawer and tower support includes:

► Up to 20 I/O drawers on a RIO-2 interface (7311-D11)

► Up to 48 I/O drawers and towers on a RIO-2 interface (7311-D20 or features #0595, #5790, #0588, #5088, #5094, #5096, #5294, and #5296)

► Up to 32 I/O drawers on a 12X Channel interface (7314-G30 or feature #5796)

► Up to 110 SAS DASD I/O drawers on SAS PCI controllers (feature #5886)

► Up to 60 DASD Expansion drawers (7031-D24 or feature #5786)

Remote I/O drawer availability includes:

► PCI/SCSI Disk Expansion Drawer (#0595) (IBM i partition only)

► TotalStorage® EXP24 Disk Drawer (#5786) (IBM i partition only)

► PCI Expansion Drawer (#5790) (IBM i partition only)

► PCI DDR 12X Expansion Drawer (#5796)

► EXP 12S SAS Drawer (#5886)

► 7311-D20 Rack Mounted High Density Drawer (AIX/Linux Partitions only)

For details about the drawers, refer to Chapter 4, "Feature descriptions and related information" on page 187.

For more information specifically about the 12X #5796, see "New I/O loop 12X I/O architecture support" on page 732.

2.7.7 HSL and RIO

The 9117-MMA system supports HSL I/O enclosures that allow for PCI-X slots and, in some cases, disk slots. These enclosures were previously available on POWER5 systems. The PCI slots are PCI-X slots that support IOPs, not PCI-X DDR slots. These enclosures are:

► #0595/#5095 (7 PCI-X slots and 12 SCSI disk slots)

► #5094/#5294 (14 PCI-X slots and 15 to 45 SCSI disk slots)

► #5096/#5296 (14 PCI-X slots and 0 disk slots)

► #0588/#5088 (14 PCI-X slots and 0 disk slots)

► #5790 (6 PCI-X slots and 0 disk slots)

The following enclosures are supported but no longer orderable (withdrawn from marketing):

► #0588 and #5088
► #5094 and #5294
► #5096 and #5296

The #0595, #5095, #5096, and #5790 can be ordered as new HSL I/O enclosures.

All of these HSL/RIO I/O enclosures are system attached through RIO-2 physical ports and run over an RIO-2 interface. I/O units that were attached to earlier systems using the HSL-1 interface (#9877, #9886, #9887, #2886, and #2887) must be upgraded before being attached to the Power 550 system. This includes the #0588/#5088, which previously had supported the RIO-2 interface only with an RPQ on POWER5 and POWER5+ systems. You can order the RIO-2 interface as #6417 (MES) or #9517 (from factory with new I/O tower or drawer).

The #5786 EXP24 disk enclosure is also supported. This I/O enclosure holds up to 24 internal 15k rpm SCSI disk drives that are run by a disk controller in a PCI slot located in the Power 550 processor, 12X, or HSL enclosure.

The expansion unit attached to port 0 of the RIO-2 or 12X adapter on the system unit is the first unit in a loop. Figure 2-14 shows the connector locations.
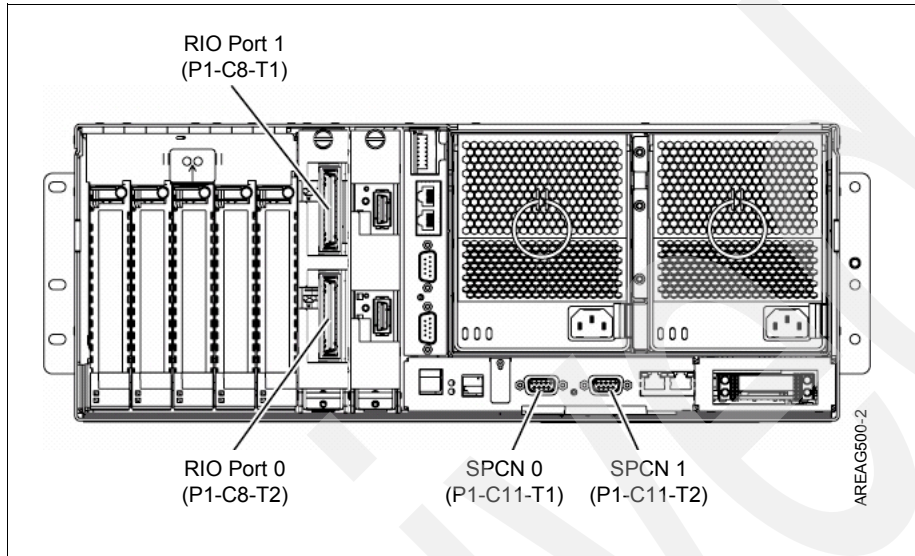
Figure 2-14   9117-MMA RIO-2 and SPCN connector locations

Table 2-13 lists the loop options.

Table 2-13   Loop options

12X (InfiniBand)	RIO-2
Up to 50% faster than RIO-2	Up to 2 GBps
Supported 12X I/O with PCI slots[a] #5796 I/O drawer (no IOPs in #5796)	Supported RIO-2 I/O with PCI slots[a] ► #5790 I/O drawer ► #0595/5095 I/O units ► #5094/5294 I/O tower[b] ► #0588/5088 I/O units[c] ► #5096/5296 I/O tower (RPQ available)
Max 4 12X drawers per loop	Max 6 RIO-2 towers/drawers per loop
Max 8 m per cable segment	Max 10 m per RIO-2 cable segment (15 m at HSL-1 speed)

a. Lists do not show disk drawers or IXA.
b. Supported but additional units not orderable on POWER6.
c. Withdrawn from marketing. Needs #6417 RIO-2 adapter. RPQ not required to order on POWER6 server.

2.7.8 12X Cables connection

Figure 2-15 depicts a 12x cable connection to the system showing a #5796 I/O drawer. Key 12x cable connection characteristics include:

► 12X different from RIO-2 cables

► Must match cable length and #5796 adapter

► 4 cable lengths

   – #1829 0.6 meter

      • For #5796 to #5796

      • Not for CEC; needs more cable length to allow for processor enclosure to slide in/out of rack

   – #1830 1.5 meter

   – #1840 3.0 meter

      • Need long run adapter

      • Exception for CEC attach

   – #1834 8.0 meter

      • Need long run adapter
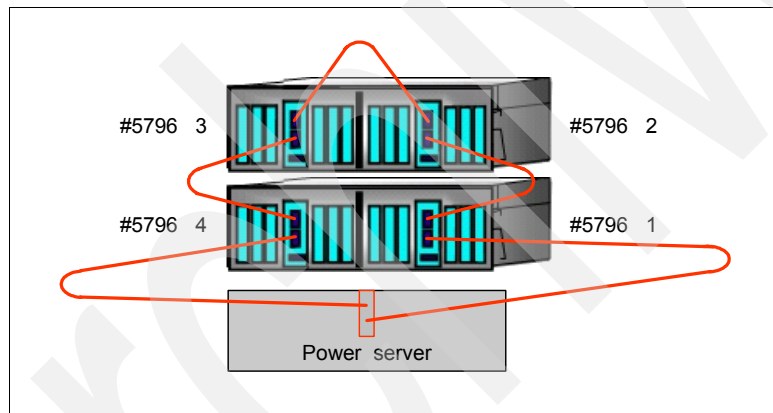
Figure 2-15   12X connection

Supported Cabling	0.6 m #1829	1.5 m #1830	3.0 m #1840	8.0 m #1834
#5796-SR to #5796-SR	Y	Y	N	N
#5796-SR to #5796-LR	Y	Y	Y	N
#5796-LR to #5796-LR	Y	Y	Y	Y
#5796-SR to CEC #1802	N	Y	Y	N
#5796-LR to CEC #1802	N	Y	Y	Y
Note: S = short run, LR = long run				

2.7.9 Disk and disk controller protection rules

The 9117-MMA is designed to minimize single points of failure. To have an IBM supported configuration, the following minimum level of integrated disk storage is required:

► All disk drives must to be protected by RAID or mirroring.

► All disk controllers with write cache must be protected by either auxiliary write cache or by mirroring the controller. If SCSI disk controllers such as the 40 MB write cache #5703 and the 90 MB write cache #5776 and #5737 are used, they must be mirrored, as these cards do not have an auxiliary write cache option.

2.7.10 IBM i consoles

Select one of the following IBM i consoles:

► Operations console attached through Ethernet port (LAN console) or WAN port (ops console)

► Hardware Management Console (HMC)

A twinaxial console is not supported unless an HMC is present on the system. A 9944-100 Thin Console is not supported.

2.7.11 Integrated Virtual Ethernet daughter cards

Each CEC enclosure must contain one Virtual Ethernet (HEA) Integrated I/O port card (#5636, #5637, or #5639) as shown in Figure 2-16. This selection is available only when a CEC enclosure is first ordered from the factory. Features #5636, #5637, and #5639 can be mixed in multi-enclosure systems. Either #5636 dual port 10 Mbps, 100 Mbps, and 1000 Mbps or #5637 dual port 10 Mbps, 100 Mbps, 1000 Mbps, and 10000 Mbps or #5639 four port 10 Mbps, 100 Mbps, and 1000 Mbps can be selected. The Ethernet ports can be virtualized to different partitions, offering flexible configurations.

► #5636: Two Ethernet 10 Mbps, 100 Mbps, and 1000 Mbps ports and two serial ports
► #5637: Two Ethernet 10 Mbps, 100 Mbps, and 1000 Mbps ports and one serial port
► #5639: Four Ethernet 10 Mbps, 100 Mbps, and 1000 Mbps ports and one serial port
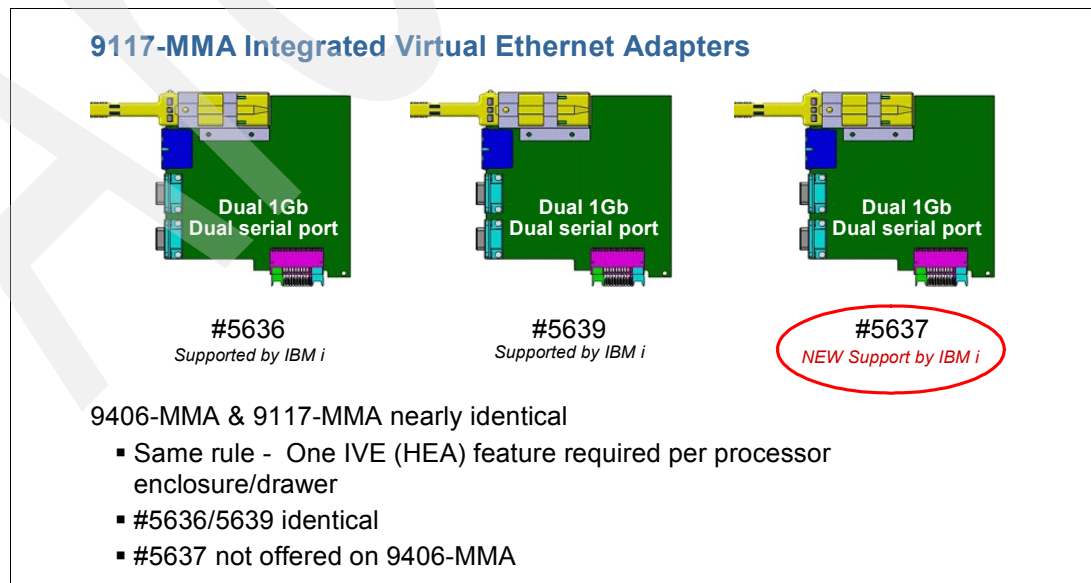
Figure 2-16   Integrated Virtual Ethernet adapters

2.7.12 IBM EnergyScale technology

IBM EnergyScale technology is featured on the IBM POWER6 processor-based systems. It provides functions to help the user understand and control IBM server power and cooling usage. Refer to 1.4.2, "IBM EnergyScale technology" on page 28 for more details.

2.7.13 Additional components

Each 9117-MMA system with two or more CEC enclosures (eight or more processor cores) must have one Power Control Cable (#6006 or similar) to connect the Service Interface Card in the first enclosure to the Service Interface Card in the second enclosure.

There are two ac power supplies in each CEC enclosure; the second is required to provide redundant power for enhanced system availability. A CEC enclosure continues to function with one working power supply. A failed power supply can be hot swapped but must remain in the system until the replacement power supply is available for exchange.

There are three Processor Power Regulators in each CEC enclosure. The third processor is required to provide redundant power to the processors for enhanced system availability. The processors continue to function if there are at least two working Power Regulators in the enclosure. A failed (third) Power Regulator can be hot swapped but must remain in the system until the replacement power regulator is available for exchange.

Two Processor Power Regulators in a single enclosure do not provide redundancy for any processor configuration. A third Processor Power Regulator is required to provide redundant power support to either one or two processor cards in the enclosure.

All CEC enclosures must ship with three Processor Power Regulators (#5625) except for the system configurations with one or two feature #5620 processors in a single CEC enclosure.

A system configuration with one or two of processor feature #5620 in a single enclosure can ship with two Processor Power Regulators (#5625). In these configurations, the Processor Power Regulators do not provide redundant power support to the processors.

Each model MMA system must include a minimum of the following items:

► One CEC enclosure (4U) with the following:
    – 1X - System Enclosure with Bezel (#5626)
    – 2X - Power Cords (#6671) or similar power cord
► 1X - Rack-Mount Rail Kit (#7164)
► 1X - Processor Enclosure and Backplane (#5663)
► 1X - I/O Backplane (#5666)
► 1X - System Midplane (#5667)
► 1X - SAS DASD Backplane (#5668)
► 1X - Power Distribution Backplane (#7870)
► 1X - System Port riser card (one of #5636, #5637, or #5639)
► 1X - Service Interface Card (#5648)
► 2X - Power Supplies (#5628) (not required on Model upgrade with Processor #5621)
► 2X - Processor Power Regulator (#5625)
► 1X - HMC - Machine Type 7042 is preferred, Machine Type 7310 is acceptable if upgraded to HMC machine code V7. The HMC can be shared with other systems.

- ► 1X - Processor Card (one of these):
  - – 3.5 GHz POWER6, 2-Core Processor Card, 0-core active, #5620
  - – 4.2 GHz POWER6, 2-Core Processor Card, 0-core active, #5621 (available for model upgrade only)
  - – 4.2 GHz POWER6, 2-Core Processor Card, 0-core active, #5622
  - – 4.7 GHz POWER6, 2-Core Processor Card, 0-core active, #7380
- ► 2X - Processor Activations (two each of one of these):
  - – One Processor Activation for Processor Feature #7380, #5403
  - – One Processor Activation for Processor Feature #5620, #5670
  - – One Processor Activation for Processor Feature #5621, #5671
  - – One Processor Activation for Processor Feature #5622, #5672
- ► 2 GB Active Memory: 1X - 0/4 GB (4 X 1 GB) DIMMs, 667 MHz, DDR2, POWER6 CoD Memory, #5693 (or any memory feature that results in at least 2 GB of active memory)
- ► 2X - Activation of 1 GB DDR2 - POWER6 Memory, #5680
- ► Disk Drive: 1X - SAS Disk Drive, formatted to match the system Primary OS indicator selected
- ► #9XXX Language Group Specify
- ► Primary Operating System indicator (one of 2145, 2146, or 2147)
- ► 1X - System Ship Group #5699
- ► For Service Support the, 9117-MMA must have access to a device capable of reading a CD-ROM or must be attached to a network with a NIM server available.
- ► Additional optional features can be added, as desired

For additional information about the 9117-MMA, visit:

http://www.ibm.com/systems/power

2.7.14 Customer setup

The 9117-MMA is not a system-wide customer setup for initial configuration or for model upgrades. Customer setup applies to some hardware components. Customer setup features include:

- ► PCI-X Adapters
- ► GX Adapters
- ► External Cables
- ► Power Supplies
- ► DASD Devices
- ► Media Devices
- ► CPU Power Regulator
- ► Service Interface Card
- ► Operator Panel
- ► Displays, Keyboards, Cables, and so forth
- ► Racks
- ► I/O Drawers

Non-CSU MES features include:

► Processors
► Memory
► CEC Enclosures
► System Backplanes

2.7.15 Tape cartridges

No internal tape drive support.

2.8 9117-MMA Capacity on Demand

Several types of Capacity on Demand (CoD) are optionally available on the 9117-MMA server to help meet changing resource requirements in an on demand environment by using resources installed on the system but not activated.

Capacity Upgrade on Demand (CUoD) allows you to purchase additional permanent processor or memory capacity and dynamically activate them when needed. After IBM receives your order, an activation code unique to your server is generated. The activation code is mailed to you and also posted at:

http://www.ibm.com/systems/power/hardware/cod

Enter the activation code into your server using the hardware management console or the advanced system manager interface, and your newly activated processors are ready to be dynamically allocated when needed.

Adequate operating system processor licenses (IBM i, AIX, or Linux) must be available for all permanently activated processors that have been assigned to a partition or pool.

Trial CoD is a no additional charge feature that allows you up to 30 days use of available inactive processor and memory resource. It is intended to be used as a benchmarking aid to determine how your applications will perform with the addition of the available inactive resource in your system. Trial CoD is enabled by registering at the CoD Web site and electronically receiving an activation key. Clients can request either a Standard or an Exception Trial, visit:

https://www-912.ibm.com/tcod_reg.nsf/TrialCod?OpenForm

A Standard Trial provides up to 30 contiguous days use of up to two additional processors or up to 4 GB of memory, depending on the installed inactive hardware on the system. One standard trial is included with each new system. Standard Trials for processor and memory are renewed with the purchase of a processor activation on an MES order.

An Exception Trial provides up to 30 contiguous days use of all inactive processors or memory in the system. One processor and memory exception trial is supplied with each new system. Exception trial use is one time only and is not renewed when additional resources are purchased.

Utility CoD autonomically provides additional processor performance on a temporary basis within the shared processor pool. Utility CoD enables you to place a quantity of inactive processors into the server's default Shared Processor Pool, which then become available to the pool's resource manager. When the server recognizes that the combined processor utilization within the shared pool exceeds 100% of the level of base (purchased/active)

processors assigned across uncapped partitions, then a Utility CoD Processor Minute is charged and this level of performance is available for the next minute of use.

If additional workload requires a higher level of performance, the system allows the additional Utility CoD processors to be used automatically. The system continuously monitors automatically and charges for the performance needed above the base (permanent) level. Registration and usage reporting for Utility CoD is made using a public Web site and payment is based on reported usage. Utility CoD requires PowerVM (#7942 or #7995) to be active.

If a 9117-MMA server uses the IBM i operating system in addition to any other supported operating system on the same server, the Client must inform the sales team placing the billing feature order which operating system caused the temporary Utility CoD processor use so that the correct feature can be used for billing.

Detailed information, including step-by-step directions for ordering, enabling, and using CUoD is available in the Capacity on Demand Planning Guide found at:

http://www.ibm.com/systems/power/hardware/cod

Table 2-14   9117-MMA on Demand features

Processor	3.5 GHz #5620	4.2 GHz #5621/#5622	4.7 GHz #7380
1 processor base activation (no charge)	N/A	N/A	N/A
1 processor CUoD (permanent) activation	5670	5671/5672	5403
On/Off (temporary) enablement	7951	7951	7951
30 processor days pre-paid (Trial CoD)	N/A	N/A	N/A
1 On/Off processor day billing (without IBM i)	5650	5653	5656
100 minutes On/Off utility billing (without IBM i)	5640	5641	5404
1 On/Off processor day billing (with IBM i)	5483	5484	5485
100 minutes On/Off utility billing (with IBM i)	5481	5482	5480
Memory			
On/Off 1 GB - 1 Day Billing	5691	5691	5691
Memory enablement feature (for On/Off)	7954	7954	7954
256 GB Memory activation (to server, not to DIMMs)	8478	8478	8478
1 GB activation (to server, not to memory DIMMs)	5680	5680	5680
2 GB, 4 GB, 8 GB, 16 GB, 32 GB activation features	7272 - 7276	7272 - 7276	7272 - 7276
5250 Enterprise Enablement (5250 OLTP)			
Base enablement (1 processor's worth)	9299	9299	9299
Enablement (1 addtional processor's worth)	5490	5490	5490
Full Enterprise Enablement	5491	5491	5491
Base full Enterprise Enablement	-	-	-

2.8.1 Disks, boot devices, load source, and media devices

A device capable of reading a CD-ROM must be attached to the system and available to perform operating system installation, maintenance, problem determination and service actions such as maintaining system firmware and I/O microcode at their latest levels. Alternatively, the system must be attached to a network with an AIX NIM server configured to perform these functions.

System boot is supported through DASD in a remote DASD drawer attached to a PCI adapter or an I/O drawer attached to GX adapter, or from a network using LAN adapters.

The minimum system configuration requires at least one SAS disk drive in one of the CEC enclosures.

Each CEC enclosure can support one media device when the optional Media Enclosure and Backplane feature (#5629) is ordered. Any supported DVD-ROM or DVD-RAM drive can be installed. A 4 CEC system can support up to 4 media devices.

The model MMA supports only the new SAS DASD hard disks internally. The older SCSI DASD hard files can be attached to the model MMA but must be located in a remote I/O drawer. Either the 7031-D24 or the 7311-D20 are compatible with the DASD carriers used on the model 570 DASD files. The DASD files from the model 570 can be moved directly into these I/O drawers.

2.8.2 IBM i load source location outside the CEC

Starting with V5.4, IBM i can be ordered to have its normal load source disk positioned outside of the processor enclosure (system unit, CEC). AIX and Linux partitions can also have their boot software loaded from a source disk outside of the system unit. The following sections provide additional information.

IBM i load source location
The load source drive can be placed in any of the following locations:

► Within the system unit enclosure (processor enclosure)

 If this option is selected for the 9117-MMA (POWER6), you must also select mirroring to protect the load source. Currently the embedded SAS disk controller in the processor enclosure does not support RAID protection

► Within a storage area network (SAN) logical disk enclosure (SAN load source option)

► Within a RIO-2 or 12X I/O loop attached I/O enclosure (tower or drawer)

With an HMC, client can assign IBM i load source drive outside of system unit (models 520, 525, 550, 570, and 595 POWER5 and later). One can also do this without an HMC for POWER6 systems, but they must come with the latest firmware. Refer to the Information Center topic "Using D-mode IPL to refresh the vital product data" for information about how to do this.

IBM Manufacturing supports this for the following models:

► SAN load source for POWER5 and later models

► For POWER6 machines including model 520, 550, 570, and 595

- ► Non-CEC load source features using the POWER6 520, 550, and 570 models
  - #0720 Load Source in #0595/#5095 I/O tower/drawer
  - #0721 Load Source in #5094/#5294 I/O tower/drawer
  - #0725 Load Source in #5786/#5787 EXP24 Disk Enclosure
  - #0727 Load Source in #5886 EXP 12S Disk Drawer
- ► Related features or specifies:
  - #0719 No Disk in System Unit for POWER6 520/550/570 (not a pre-requisite of #0720, #0721, and #0725)
  - #0837 SAN Load Source
  - #0830, #0834, #0835, #0836, #0838, #0839, #0840, or #0841 for specific disk feature number (indicates technology and capacity)

Feature and specify codes for these load source options are described in Chapter 4, "Feature descriptions and related information" on page 187.

> **Note:** Starting with IBM i V5.4 with Licensed Internal Code (LIC) V5R4M0, IBM i requires a minimum IBM i load source size of 17 GB. The minimum disk capacity supported on POWER6 MTMs is approximately 35 GB, and the minimum operating system release level is IBM i 5.4 with Machine Code V5R4M5.

2.9 9117-MMA system unit schematics and locations

In this section, we present system views that show desk-side and rack-mount of the front with and without the front cover, side, or top cover and the rear.

2.9.1 Model 9117-MMA processor card layout

The POWER6 processor capitalizes on all the enhancements brought by the POWER5 chip. Two of the enhancements of the POWER6 processor is the ability to do processor instruction retry and alternate processor recovery. This significantly reduces exposure to both hard (logic) and soft (transient) errors in the processor core.

The POWER6 processor implements the 64-bit IBM Power Architecture® technology. Each POWER6 chip incorporates two dual-threaded Simultaneous Multithreading processor cores, a private 4 MB level 2 cache (L2) for each processor, a 36 MB L3 cache controller shared by the two processors, integrated memory controller and data interconnect switch and support logic for dynamic power management, dynamic configuration and recovery, and system monitoring.

POWER5 and POWER5+ had approximately 2 MB (1.88 MB) of L2 cache that was shared by the two cores on the same processor card. POWER6 has 4 MB of L2 cache for each core, for a total of 8 MB on the card (chip). For applications that access a large amount of data, this increase in L2 cache size (approximately 4 x) significantly improves performance.

Figure 2-17 shows the POWER6 processor card typology.

The POWER6™ Chip

- 64 bit, dual core chip
    - 1 core = 1 processor = 1 way
- Up to 4.7 GHz
- 790 million transistors
- 8 MB on chip L2 cache
- 32 MB off chip L3 cache
- 300 GBps processor bandwidth
- Energy efficient
- Built using IBM's state-of-the-art 65 nanometer process
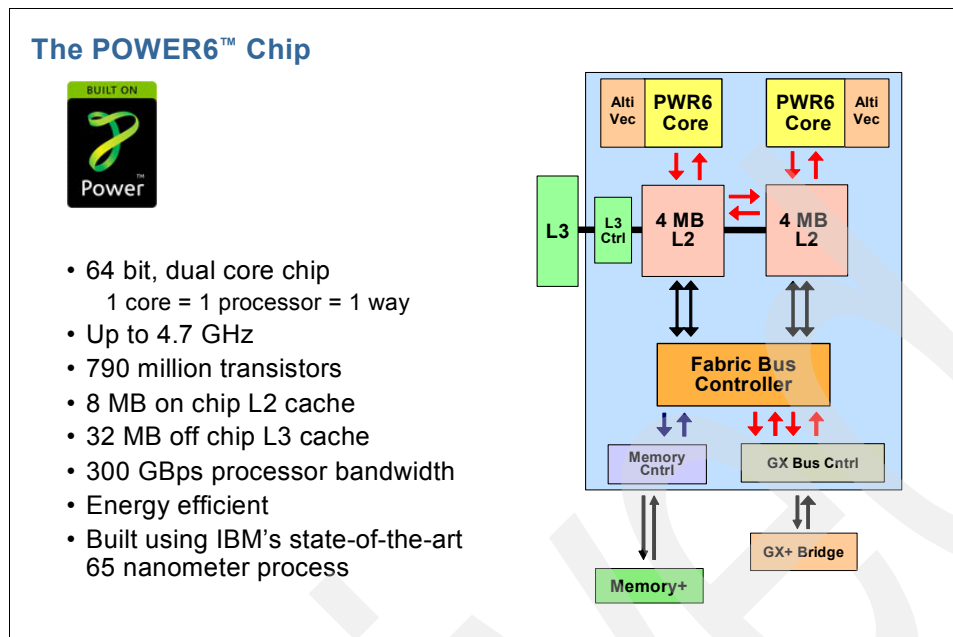
Figure 2-17   POWER6 processor card typology

2.9.2 View of a single 9117-MMA enclosure

The following figures show the 9117-MMA enclosure.

Figure 2-18   9117-MMA
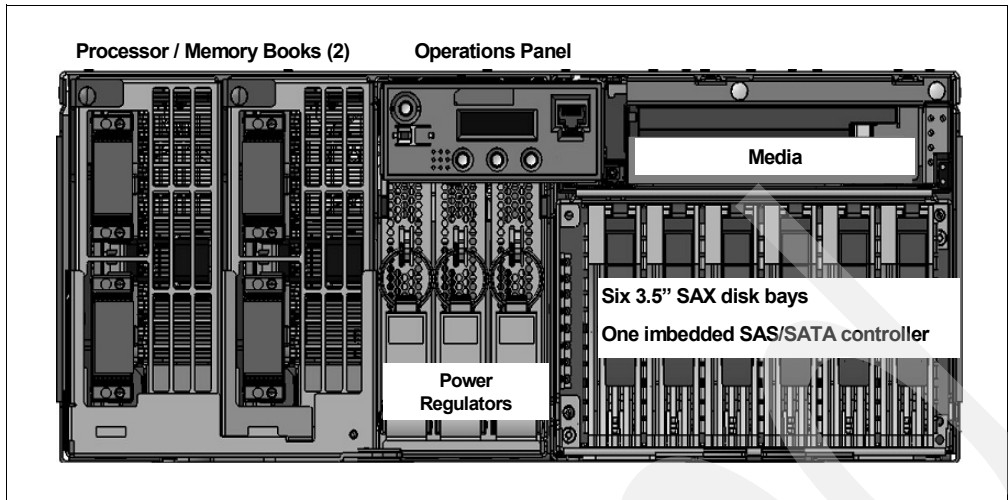
Figure 2-19   9117-MMA front view
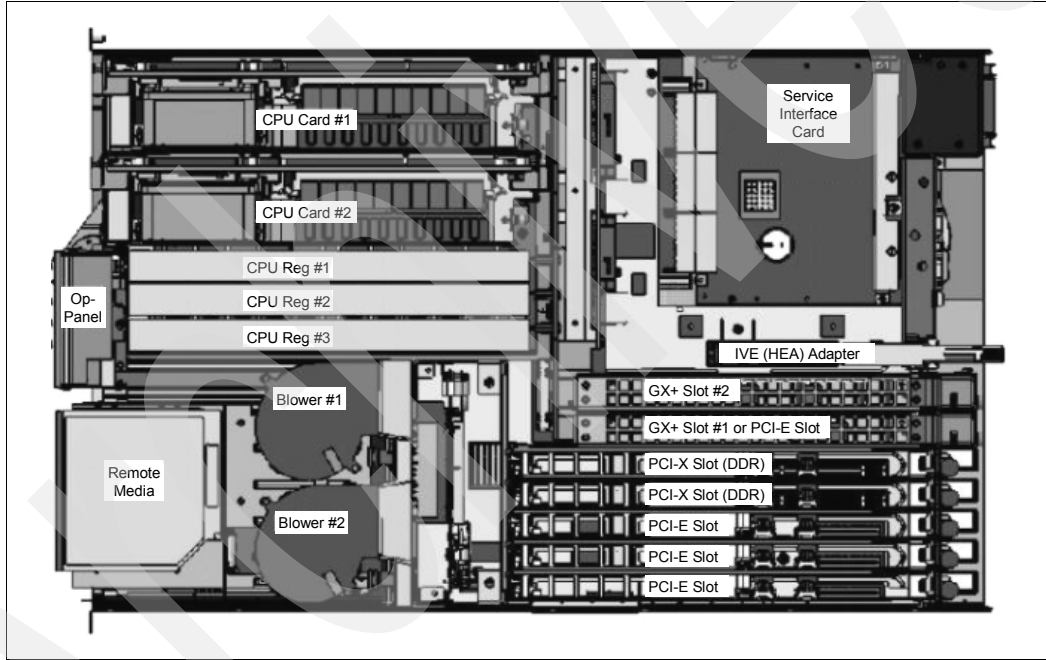
Figure 2-20   9117-MMA top view
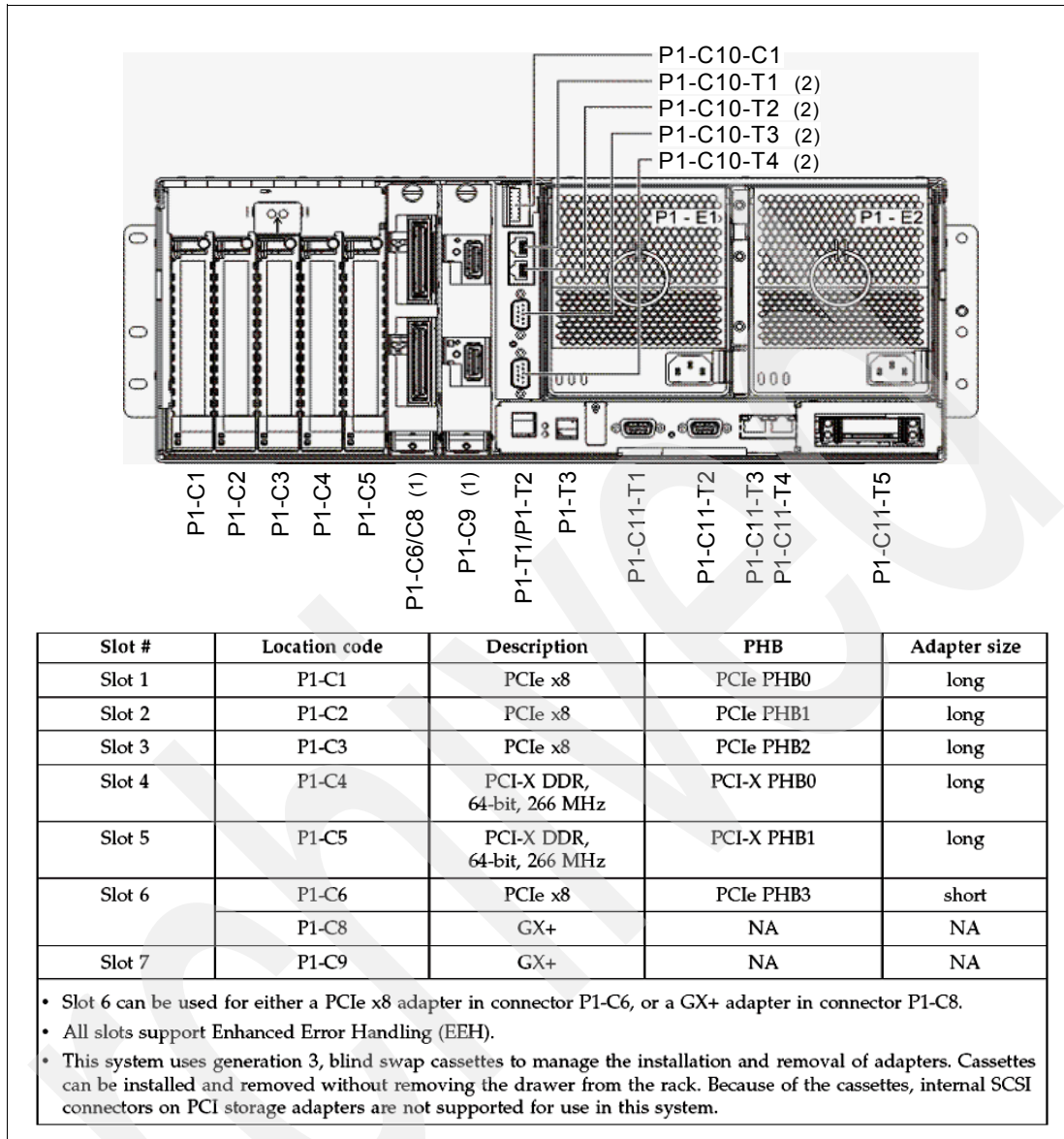
Figure 2-21   9117-MMA rear view

The figure contains the following diagram labels and table:

P1-C10-C1
P1-C10-T1 (2)
P1-C10-T2 (2)
P1-C10-T3 (2)
P1-C10-T4 (2)

P1 - E1   P1 - E2

P1-C1
P1-C2
P1-C3
P1-C4
P1-C5
P1-C6/C8 (1)
P1-C9 (1)
P1-T1/P1-T2
P1-T3
P1-C11-T1
P1-C11-T2
P1-C11-T3
P1-C11-T4
P1-C11-T5

Slot #	Location code	Description	PHB	Adapter size
Slot 1	P1-C1	PCIe x8	PCIe PHB0	long
Slot 2	P1-C2	PCIe x8	PCIe PHB1	long
Slot 3	P1-C3	PCIe x8	PCIe PHB2	long
Slot 4	P1-C4	PCI-X DDR, 64-bit, 266 MHz	PCI-X PHB0	long
Slot 5	P1-C5	PCI-X DDR, 64-bit, 266 MHz	PCI-X PHB1	long
Slot 6	P1-C6	PCIe x8	PCIe PHB3	short
	P1-C8	GX+	NA	NA
Slot 7	P1-C9	GX+	NA	NA

- Slot 6 can be used for either a PCIe x8 adapter in connector P1-C6, or a GX+ adapter in connector P1-C8.
- All slots support Enhanced Error Handling (EEH).
- This system uses generation 3, blind swap cassettes to manage the installation and removal of adapters. Cassettes can be installed and removed without removing the drawer from the rack. Because of the cassettes, internal SCSI connectors on PCI storage adapters are not supported for use in this system.

2.9.3 9117-MMA processor enclosure fabric connection cables

Figure 2-22 shows the front view of the fabric cables and associated features for new and MES configurations. Connecting the processor enclosures is generally similar to connecting the POWER5-base 570 models. The text color in the figure corresponds to the fabric cable that is shown.
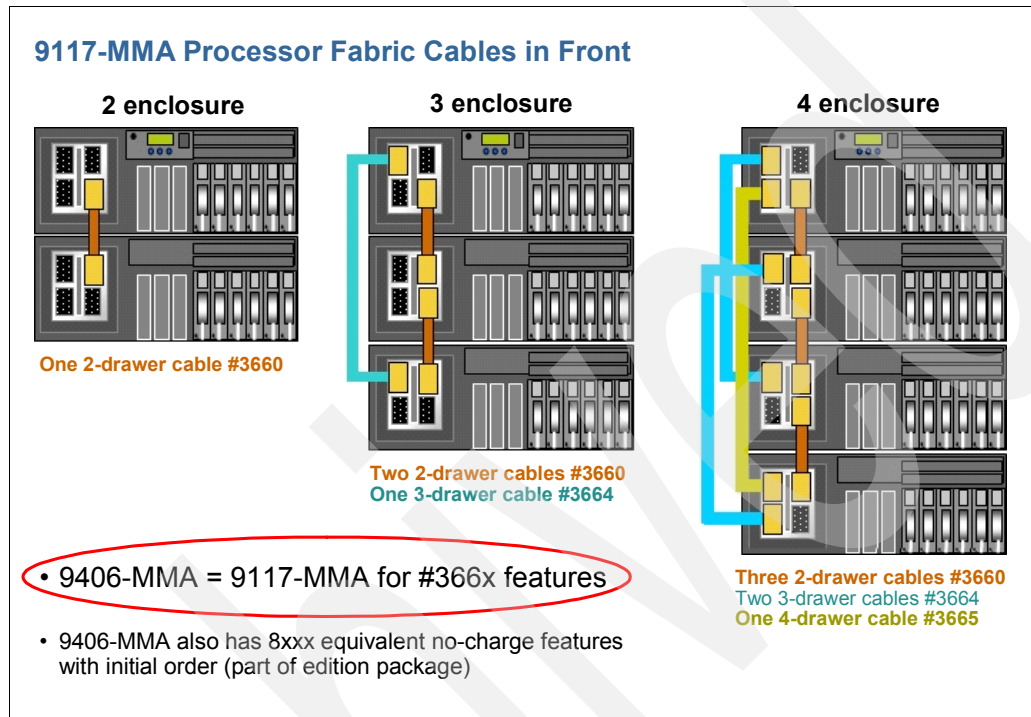
Figure 2-22   Processor Fabric Cables in front

2.9.4 9117-MMA processor enclosure service processor cable connections

Figure 2-23 shows the front view of the fabric cables and associated features for new and MES configurations. Connecting the processor enclosures is generally similar to connecting the POWER5-base 570 models. The text color in the figure corresponds to the fabric cable that is shown.
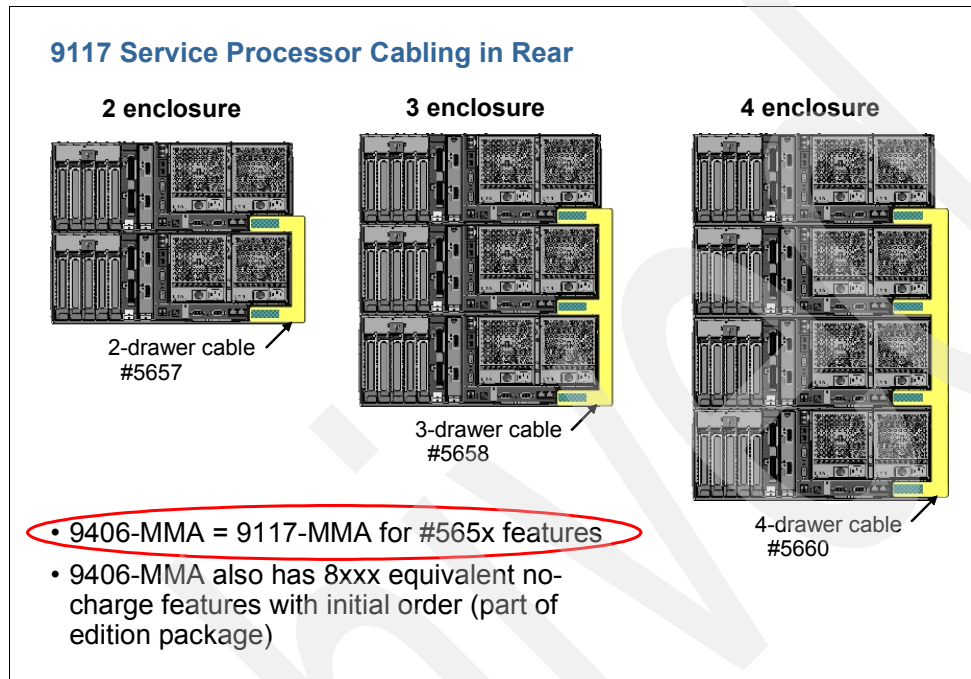
Figure 2-23   9117-MMA service processor cabling in rear

2.10 Upgrade considerations from POWER5 to POWER6

Existing POWER5 and POWER5+ 570 systems from both System i and System p can be upgraded to the new 9117-MMA: All upgrades from the 9117-570 are to the 4.2 GHz frequency, which is consistent with previous options. All upgrades from the 9406-570 are to the 4.7 GHz frequency, also consistent with previous options. Upgrades from the 9406-MMA to the 9117-MMA are also available at no additional charge.

These upgrades require a system power down, replacement of a system card, and a firmware update. The upgrades also need to be ordered through the IBM configurator. Upgrades from existing 9117-MMA systems are also available through new firmware which became available in mid-2008.

For details about upgrade options, refer to Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909

3

IBM Power 595 model 9119-FHA

In this chapter, we provide summary charts and diagrams and identify the processor features that are associated with each IBM Power 595 model 9119-FHA.

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3.1 IBM Power 595 9119-MMA overview

The IBM System i and IBM System p unify the value of their servers into a single, powerful lineup of servers based on industry-leading POWER6 processor technology with support for the IBM i operating system (formerly known as *i5/OS*), IBM AIX, and Linux operating systems. This single portfolio of Power Systems servers offers IBM clients industry-leading technology, continued IBM innovation, and the flexibility to deploy the operating system that the business requires.

The 9119-FHA is an enterprise server to support IBM i, AIX, or Linux applications simultaneously. Breaking the 5.0 GHz barrier to deliver industry-leading scalability, performance and availability for the New Enterprise Data Center, it is designed to help enterprises deploy the most cost effective and flexible IT infrastructure. As the most powerful member of the IBM Power Systems family, this server provides exceptional performance, massive scalability and energy-efficient processing for a full range of complex, mission-critical applications for the most demanding of computing requirements.

Equipped with ultra-high frequency POWER6 processors in up to 64-core, multiprocessing (SMP) configurations, the 9119-FHA server can scale rapidly and seamlessly to address the changing needs of today's data center. With advanced PowerVM virtualization, EnergyScale technology and Capacity on Demand (CoD) options, the 9119-FHA helps businesses take control of their IT infrastructure and confidently consolidate multiple UNIX, IBM i (formerly known as i5/OS), and Linux application workloads onto a single system.

The 9119-FHA brings new economics to IT operations with the 9119-FHA, a 64-core system with 5.0 GHz or 4.2 GHz POWER6 processors:

► Consolidate energy-wasting, under-utilized servers with the industry leading performance of 9119-FHA for large-scale consolidation.

► Increase IT efficiency with the leadership virtualization of Power Systems Software™, supporting IBM i, AIX, and Linux operating system applications.

► Improve infrastructure resilience. 9119-FHA enables the highest levels of Power Architecture reliability, availability and serviceability.

► Enable rapid service delivery. Capacity on Demand for processors and memory and PowerVM help provide seamless, non-disruptive growth.

► Exercise upgrade options to deliver additional performance at attractive prices that leverage current investments in POWER5 systems.

POWER6 processor technology brings hardware decimal floating point implementation as a replacement for software provided decimal floating point implementation, bringing compute-intensive workloads to a higher level. Refer to 1.5, "POWER6 floating point decimal arithmetic data and calculations"

As shown in Figure 3-1, the Power Systems 595 9119-FHA is a 1- to 8-node symmetric multiprocessor (SMP) system packaged in a 20 EIA unit (20 U) tall central electronics complex (CEC) cage that fits in a 50 inch deep, 24 inch rack. It provides memory expansion capability of up to 4 TB per system.

IBM Power Systems 595 (9119-FHA)

Cores and GHz	POWER6: 8 - 64 core 4.2 and 5.0 GHz
Processor Book chips, cache, memory slots	8 cores per book Four 2-core processor chips per book 4 MB L2 cache per core 32 MB L3 cache per processor chip 32 DIMM slots per book
System Memory	16GB to 4 TB
I/O loops	Up to 4 loops per book Up to 32 loops per system; RIO-2/HSL-2 or 12X
24-inch Remote I/O Drawers	12X-attach (available 11/2008): max 30 RIO-2 attach:max 12
19-inch Remote IO Drawers (IBM i)	RIO-2 attach (available 09/2008): Max: 96
Micro-partitioning	Via PowerVM
Virtualization	Up to 254 partitions
RAS and energy measurement capabilities	Very significant

Figure 3-1   IBM Power 595 9119-MMA

The 9119-FHA server offers:

► Rack-mount design with up to eight 8-core 9119-FHA processor books

► 4.2 GHz and 5.0 GHz processors in 8-, 16-, 24-, 32-, 40-, 48-, 56-, and 64-core configurations

► Up to 4096 GB of DDR2 memory

► Maximum disk drives and disk storage (no RAID5 and RAID6 and no mirroring) with 24 inch I/O drawers and AIX formatted drives:

   – 480 / 70.5 TB with 146 GB drives
   – 480 / 144.0 TB with 300 GB drives

► Maximum disk drives and storage (no RAID5 and RAID6 and no mirroring) with 19 inch I/O drawers with IBM i formatted drives:

   – 2200 / 620 TB with 282 GB drives

► Maximum disk drives and storage (no RAID5 and RAID6 and no mirroring) with 19 inch I/O drawers with AIX formatted drives:

   – 960 SCSI disks / 288 TB
   – 2220 SAS disks / 666 TB

► Up to 480 hot-swap internal SCSI disk bays

► Up to 448 hot-swap PCI-2X slots and 192 PCI-X slots

► Up to 960 hot-swap external SCSI disks bays

► Up to 2220 hot-swap SAS disk bays

► Redundant power subsystem

- ▶ Dynamic LPAR and CoD
- ▶ Optional PowerVM technologies
- ▶ Support for IBM i, AIX, and Linux operating systems

Similar to other Power Systems servers the 9117-FHA offers exceptional reliability, availability, and serviceability (RAS) functions including:

- ▶ Built-in reliability through use of highly reliable components
- ▶ Recovery from intermittent errors or failover to redundant components
- ▶ Detection and reporting of failures and impending failures
- ▶ Hardware that automatically initiates actions to affect error correction, repair, or component replacement

With the 9119-FHA server, you have the freedom to choose the operating system environment and applications that best fit business needs and have the confidence that the system will be ready to handle future requirements as well.

You have the ability to upgrade a POWER5 processor-based System p 590 or System p 9119-595 or System i 595 servers to the 9119-FHA and know your investment in IBM Power Architecture technology continues.

With extraordinary power, proven IBM technology and expansive growth potential, the 9119-FHA server is ready as your business demands expand.

The SMP server can be configured with one to eight POWER6, 4.2 GHz or 5.0 GHz, 8-core processor books. An 8-core book contains four multi-chip modules (MCMs), each with two processor cores and each processor core capable of SMT where a single processor core can operate as two processors.

Each dual-core processor uses sophisticated, 64-bit, copper-based IBM Power Architecture technology. Each processor core within an MCM is supported by 4 MB of private Level 2 cache and each 2 processor core chip contains 32 MB of shared Level 3 cache. Each 8 core processor book also includes 32 DIMM slots for buffered DDR2 memory cards and four Remote RIO-2 and 12X I/O adapter cards for connection of loop attached system I/O drawers.

Up to 30 I/O drawers can be configured with two 24 inch, powered I/O racks on a 9119-FHA Server. Each I/O drawer has two 12X data-lane High Speed Serial/Deserial ports (HSS) capable of a full-duplex peak data bandwidth of 3 GBps (decoded data) in each direction. Each I/O drawer contains twenty 3.3-volt, PCI-X adapter slots and up to 16 disk bays.

No 5 V keyed slots or 5 V only adapters are supported. Each I/O drawer will have 14 PCI-X 2.0, 266 MBps slots and six PCI-X 1.0, 133 MBps slots. Fully configured, the 9119-FHA can support 600 PCI adapters and 480 SCSI disks (70.5 TB) at 15,000 rpm. RAID storage is not supported in these I/O drawers.

In addition to the above 24 inch rack-mountable I/O drawers, there are available standard, 2-meter high, 19 inch I/O racks for mounting both SCSI and SAS DASD drawers. Each DASD drawer is individually powered by redundant, 220 V power supplies. These DASD drawers can be configured for either RAID or non-RAID disk storage. A maximum of 40 SCSI drawers, each with 24 DASD disks, and 185 SAS drawers, each with 12 DASD disks, can be mounted in 19 inch racks. The maximum number of disks available in 19 inch racks is 960 hot-swap SCSI disks (288 TB) and 2220 hot-swap SAS disks (666 TB).

The POWER6 595 is machine type-model (MTM) 9119-FHA. This machine type represents a change from the machine type and model numbers used historically for System i (iSeries) model typically using 9406 570 and 9406 595. This change for System i clients facilitates the simpler, more granular and transparent feature structure for the unified product, with single set of pricing and terms for hardware supporting all operating systems. This product introduction represents merely a model change to FHA for the System p5® 590/595, which was already machine type 9119 (as in 9119-590 and 9119-595 which upgrade into a 9119-FHA).

3.1.1 Hardware requirements

The following minimums are always required:

► One IBM Power 9119-FHA Server (9119-FHA)

► One 8-Core, POWER6 Processor Book 0-Core Active (#4694)

► Three 1-Core, Processor Activations, 37.5% active (3 x #4754)

► Four identical memory features (0/4 GB or larger)

► Sixteen 1 GB memory activations (16 x #5680)

► One Power Cable Group, First Processor Book (#6961)

► Four Bulk Power Regulators (#6333)

► Two Power Distribution Assemblies (#6334)

► Two Line Cords, selected depending on country and voltage

► One Pair of doors (front/back), either slimline or acoustic

► One Universal Lift Tool/Shelf/Stool and Adapter (#3759 and #3761)

► One Language Specify (#93xx - country dependent)

► One HMC (7042-COx/CRx) attached using Ethernet cables

► One I/O Loop Adapter, either 12X I/O Loop Adapter (#1816) or RIO-2 I/O Loop Adapter (#1814), depending on I/O drawer selection

► One I/O drawer providing PCI slots attached to the I/O loop

  – For a new server shipment, this will be the 12X I/O Drawer (#5797 or #5798) located at A05 in the CEC frame when the #5798 is available (November 2008)

    • Two Enhanced 12X I/O Bus Cables, 2.5 m (#1831)
    • One Enhanced 12X I/O Cable, 0.6 m (#1829)

  – Prior to the availability of #5798 support (November 2008), new 91190-FHA system configurations that ship will use a RIO-2 attached I/O drawer based upon the primary operating system specified on the order.

If an AIX or Linux operating system is specified as the primary operating system, the following minimum items are required:

► One Primary Operating System Indicator for AIX (#2146) or for Linux (#2147)

► One PCI-X 2.0 SAS Adapter (#5900) or PCI LAN Adapter for attachment of a device to read CD media or attachment to a NIM server

► Two 15,000 rpm, 146.8 GB, SCSI Disk Drives (#3279), or larger

- ► One RIO-2 I/O Drawer (#5791 or a mitigated drawer #5807, #5808, #5809), located at A05 in CEC Rack prior to #5798 availability
  - Two RIO-2 I/O Bus Cables, 2.5 m (#3168)
  - One Remote I/O Cable, 0.6 m (#7924)
  - One UPIC Cable Group (#6942), BPD1 to I/O Drawer at A05 in CEC rack

If IBM i operating system is specified as the primary operating system, the following minimum items are required:

- ► One Primary Operating System Indicator for IBM i (#2145)
- ► One System console specify
- ► One Load Source Specify (either SAN or internal)
  - If SAN: Requires Fibre Channel Adapter (for example, #5749)
  - If internal: Requires disk controller (for example, #5782) and minimum of two disk drives (for example, #4327)
- ► One PCI-X 2.0 SAS Adapter (#5912) for attachment of a DVD drive
- ► One RIO-attached PCI Expansion Drawer (#5790) prior to #5798 availability
  - Rack space in a Dual I/O Unit Enclosure (#7307 or #7311)
  - One RIO-2 Bus Adapter (#6438)
  - Two RIO-2 I/O Bus Cables, 8 m (#3170)
  - Two power cords (for example, #6459)
  - Two Power Control Cable, 6 m SPCN (#6008)
- ► One Media Drawer to hold a DVD drive
  - 7214-1U2 Media Drawer, 19 inch prior to #5798/#5720 availability
    • One DVD drive (for example, #5756)
    • Power cords (for example, #6671)
    • SAS cable (for example, #3684) for attachment to #5912 SAS adapter
  - 9119-FHA Media Drawer, 24 inch (#5720) with #5798 availability
    • One DVD drive (for example, #5756)
- ► One 19 inch rack to hold the #5790 and 7214-1U2
- ► One PDU for power in 19 inch rack (for example, #7188), (second PDU recommended, for example, #7188)

3.1.2 Operating systems and release levels

One or more of the following operating systems are supported with the required release levels indicated:

- ► AIX 5.3 with the 5300-06 Technology Level and Service Pack 7 or later
- ► AIX 5.3 with the 5300-07 Technology Level and Service Pack 4 or later
- ► AIX 5.3 with the 5300-08 Technology Level or later
- ► AIX 6.1 with the 6100-00 Technology Level and Service Pack 5 or later
- ► AIX 6.1 with the 6100-01 Technology Level or later
- ► IBM i 5.4 (formerly known as i5/OS V5R4) or later
- ► IBM i 6.1 (formerly known as i5/OS V6R1) or later
- ► SUSE Linux Enterprise Server 10 Service Pack 2 or later
- ► Red Hat Enterprise Linux 4.7 or later
- ► Red Hat Enterprise Linux 5.2 or later

Notes:

- ► Not all system features are available under each of the operating systems or the different release levels.

- ► Disclaimer: Some hardware components contained in this chapter are identified with planned availability dates. All statements regarding future direction and intent of IBM are subject to change or withdrawal without notice, and represent goals and objectives only.

- ► For systems ordered with the Linux operating system, IBM ships the most current version available from the distributor. If you require a different version than that shipped by IBM, you must obtain it through download from the Linux distributor's Web site. Information concerning access to a distributor's Web site is located on the product registration card delivered to you as part of your Linux operating system order.

  For systems and features that operate with Linux, visit:

  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

3.1.3 9119-FHA minimum and maximum capacities

The tables that follow provide the minimum and maximum system capacities for the 9119-FHA. The tables and listed values are grouped according to processor speed (4.2 GHz and 5.0 GHz).

> **Note**: Included in the tables in this chapter are rPerf, CPW, and Domino Notesbench Mail and Calendaring Users (MCU) performance rating values, where available. These values are used for relative performance ratings among IBM systems. CPW and MCU ratings are used for comparisons among IBM systems or partitions running IBM i. rPerf values are used for performance comparisons among IBM systems or partitions running AIX.
>
> This chapter lists some CPW and rPerf values for various number of processors that are activated within the 9119-FHA. For additional information in this publication, refer to Appendix H, "Processor feature numbers, system performance and IBM i QPRCFEAT system value" on page 967.
>
> Note that IBM i has sometimes separated CPW values into two workload categories:
>
> ► Interactive or 5250 OLTP workload CPW (5250 CPW)
>
>   POWER5 and Power Systems support of 5250 applications is purchased at a processor level. The feature is called *5250 Enterprise Enablement*. You can order the first enablement as a *base* enablement up to a *full* enablement (the maximum number of processors that are supported by the MTM). Full enablement offers a reduced price above some number of individual processor at time enablements.
>
> ► Non-interactive workload CPW
>
> Do not use CPW or rPerf as the sole metric for sizing workloads on any IBM Power Systems model.
>
> Additional considerations for sizing or capacity planning workloads include the relative proportions of CPU utilization, disk I/O-per-second rates, and for example, application designed "waits for work to do."
>
> We recommend that you size an IBM System i model workload using a sizing tool, such as the IBM Systems Workload Estimator, which you can access at the following address:
>
> http://www.ibm.com/servers/eserver/iseries/perfmgmt/sizing.html
>
> You can also use Performance Navigator from the Midrange Performance Group:
>
> http://www.mpginc.com
>
> In addition, consider using BMC Patrol for iSeries - Predict, which is available at:
>
> http://www.bmc.com

Table 3-1 shows the values for a 4.2 GHz processor.

Table 3-1   4.2 GHz processor

Processor feature (1x = book)	Model 9119-FHA							
	#4694 x 1	#4694 x 2	#4694 x 3	#4694 x 4	#4694 x 5	#4694 x 6	#4694 x 7	#4694 x 8
Number/type/ speed of processor	8 POWER6	16 POWER6	24 POWER6	32 POWER6	40 POWER6	48 POWER6	56 POWER6	64 POWER6
Relative system performance[1, 2]								
Processor CPW (min/max)	35500	66400	93800	128000	Note 1a	Note 1a	Note 1a	256200
Mail and Calendar Users[2a]								
5250 CPW[5]	0/35500	0/66400	0/93800	0/128000	Note 1a	Note 1a	Note 1a	0/256200
with Enterprise Enablement (single/max)	4700/ 35500	4700/ 66400	4700/ 93800	4700/ 128000	Note 1a	Note 1a	Note 1a	4700/ 256200
Relative Performance (rPerf)	75.58	142.9	204.7	266.51	320.05	373.6	426.74	479.89
L2 Cache (MB) per processor card (4 MB per core, 8 cores per	8	8	8	8	8	8	8	8
L3 Cache (MB) per processor card (4 cards per book)	32	32	32	32	32	32	32	32
Main storage (GB minimum/maximum)	16/256	32/512	48/768	64/1024	80/1280	96/1536	112/1792	138/2048
Main storage DDR2 DIMMs (quads minimum/maximum)	4/8	8/16	12/24	16/32	20/40	24/48	28/56	32/64
LPAR (10)[8]	80	160	240	254	254	254	254	254
Minimum IBM i level/LIC level[7]	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5
Minimum AIX level/Technology Level	V5.3 /5300-06	V5.3 /5300-06	V5.3 /5300-06	V5.3 /5300-06	V5.3 /5300-06	V5.3 /5300-06	V5.3 /5300-06	V5.3 /5300-06
Minimum Level SUSE LINUX Enterprise Server	10 SP2	10 SP2	10 SP2	10 SP2	10 SP2	10 SP2	10 SP2	10 SP2
Software group	P50	P50	P50	P50	P50	P50	P50	P50
Processor Group	H5	H5	H5	H5	H5	H5	H5	H5
Disk storage (TB) [6d]								
Integrated minimum[6b]								
Total maximum 19" I/O Drawers[6a]	225	451	620	620	620	620	620	620
DASD arms maximum	800	1600	2200	2200	2200	2200	2200	2200
Internal arms	800	1600	2200	2200	2200	2200	2200	2200
External LUNS	800	1600	2200	2200	2200	2200	2200	2200
Physical packaging								
Rack Design - EIA units	20	20	20	20	20	20	20	20
External ports RIO-G(12X)	8	16	24	32	40	48	56	64
Max external loops RIO-G(12X)[10]	4	8	12	16	20	24	28	32

Processor feature (1x = book)	Model 9119-FHA							
	#4694 x 1	#4694 x 2	#4694 x 3	#4694 x 4	#4694 x 5	#4694 x 6	#4694 x 7	#4694 x 8
Max HSL I/O drawers	18	42	66	72	96	96	96	96
Max 12X I/O drawers	4	8	12	16	20	24	28	30
Max PCI card slots - HSL	324	672	1008	1008	1152	1152	1152	1152
Max PCI card slots - 12X	80	160	240	320	400	480	560	600
Communication lines[3]	300	600	600	600	600	600	600	600
LAN ports	160	160	160	160	160	160	160	160
Integrated xSeries Servers	48	60	60	60	60	60	60	60
External xSeries Servers (IXA)	24	48	57	57	57	57	57	57
iSCSI	80	160	160	160	160	160	160	160
Twinaxial workstation controllers	100	100	100	100	100	100	100	100
Twinaxial workstations	4000	4000	4000	4000	4000	4000	4000	4000
Internal DVD-ROM/ DVD-RAM [4]	2	2	2	2	2	2	2	2
Internal CD-ROM/Tape	0	0	0	0	0			
Feature I/O Tower Tape/CD-ROM/DVD	24	24	24	24	24	24	24	24
External tape (combined system) partition)	64	64	64	64	64	64	64	64
External optical/CD/DVD (combined system partition)	26	26	26	26	26	26	26	26
Cryptographic coprocessor (combined system partition)	32	32	32	32	32	32	32	32
Cryptographic accelerator (combined system partition)	4	4	4	4	4	4	4	4

Table 3-2 shows the values for a 5.0 GHz processor.

Table 3-2   5.0 GHz processor

Processor feature (1x = book)	Model 9119-FHA							
	#4695 x 1	#4695 x 2	#4695 x 3	#4695 x 4	#4695 x 5	#4695 x 6	#4695 x 7	#4695 x 8
Number/type/clock speed of processor	8 POWER6/ 5.0 GHz	16 POWER6/ 5.0 GHz	24 POWER6/ 5.0 GHz	32 POWER6/ 5.0 GHz	40 POWER6/ 5.0 GHz	48 POWER6/ 5.0 GHz	56 POWER6/ 5.0 GHz	64 POWER6/ 5.0 GHz
Relative system performance[1, 2]								
Processor CPW (min/max)	41000	77000	108100	147900	Note 1a	Note 1a	Note 1a	294700
Mail and Calendar Users[2a]								
5250 CPW[5]	0/41000	0/77000	0/108100	0/147900	Note 1a	Note 1a	Note 1a	0/294700
with Enterprise Enablement[6c] (single/max)	5400/ 41000	5400/ 77000	5400/ 108100	5400/ 147900	Note 1a	Note 1a	Note 1a	5400/ 294700
Relative Performance (rPerf)	87.1	164.67	235.9	307.12	368.82	430.53	491.77	553.01
L2 Cache (MB) per processor card (4 MB per core, 8 cores per book)	8	8	8	8	8	8	8	8

Processor feature (1x = book)	Model 9119-FHA							
	#4695 x 1	#4695 x 2	#4695 x 3	#4695 x 4	#4695 x 5	#4695 x 6	#4695 x 7	#4695 x 8
L3 Cache (MB) per processor card (4 cards per book)	32	32	32	32	32	32	32	32
Main storage (GB minimum/maximum)	16/512	32/1024	48/1536	64/2048	80/2560	96/3072	112/3584	138/4096
Main storage DDR2 DIMMs (quads minimum/maximum)	4/8	8/16	12/24	16/32	20/40	24/48	28/56	32/64
LPAR (10)[8]	80	160	240	254	254	254	254	254
Minimum IBM i level/LIC level[7]	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5	V5R4M0/ V5R4M5
Minimum AIX level/Technology Level	V5.3 /5300-06 SP7	V5.3 /5300-06 SP7	V5.3 /5300-06 SP7	V5.3 /5300-06 SP7	V5.3 /5300-06 SP7	V5.3 /5300-06 SP7	V5.3 /5300-06 SP7	V5.3 /5300-06 SP7
Minimum Level: SUSE LINUX Enterprise Server Red Hat Enterprise Linux	10 SP2 4.7/5.2	10 SP2 4.7/5.2	10 SP2 4.7/5.2	10 SP2 4.7/5.2	10 SP2 4.7/5.2	10 SP2 4.7/5.2	10 SP2 4.7/5.2	10 SP2 4.7/5.2
Software group	P50	P50	P50	P50	P50	P50	P50	P50
Processor group	H5	H5	H5	H5	H5	H5	H5	H5
Disk storage (TB) [6d] Integrated minimum[6b] Total maximum 19" I/O Drawers[6a]	225	451	620	620	620	620	620	620
DASD arms maximum	800	1600	2200	2200	2200	2200	2200	2200
Internal arms	800	1600	2200	2200	2200	2200	2200	2200
External LUNS	800	1600	2200	2200	2200	2200	2200	2200
Physical packaging Rack Design - EIA units	20	20	20	20	20	20	20	20
External ports RIO-G(12X)	8	16	24	32	40	48	56	64
Max external loops RIO-G(12X)[10]	4 (4)	8 (8)	12 (12)	16 (16)	20 (20)	24 (24)	28 (28)	30 (32)
Max HSL I/O drawers	18	42	66	72	96	96	96	96
Max 12X I/O drawers	4	8	12	16	20	24	28	30
Max PCI card slots - HSL	324	672	1008	1008	1152	1152	1152	1152
Max PCI card slots - 12X	80	160	240	320	400	480	560	600
Communication lines [3]	300	600	600	600	600	600	600	600
LAN ports	160	160	160	160	160	160	160	160
Integrated xSeries Servers	48	60	60	60	60	60	60	60
External xSeries Servers (IXA)	24	48	57	57	57	57	57	57
iSCSI	80	160	160	160	160	160	160	160
Twinaxial workstation controllers	100	100	100	100	100	100	100	100
Twinaxial workstations	4000	4000	4000	4000	4000	4000	4000	4000
Internal DVD-ROM/ DVD-RAM [4]	2	2	2	2	2	2	2	2
Internal CD-ROM/Tape	0	0	0	0	0			
Feature I/O Tower Tape/CD-ROM/DVD (combined system partition)	24	24	24	24	24	24	24	24

Processor feature (1x = book)	Model 9119-FHA							
	#4695 x 1	#4695 x 2	#4695 x 3	#4695 x 4	#4695 x 5	#4695 x 6	#4695 x 7	#4695 x 8
External tape (combined system) partition)	64	64	64	64	64	64	64	64
External optical/CD/DVD (combined system partition)	26	26	26	26	26	26	26	26
Cryptographic coprocessor (combined system partition)	32	32	32	32	32	32	32	32
Cryptographic accelerator (combined system partition)	4	4	4	4	4	4	4	4

3.2 Notes for IBM Power 595 model 9119-FHA

Note 1	CPW is used to measure the relative performance ratings of all System i model processors announced from September 1996 onward. The CPW value is measured on maximum configurations. The type and number of disk devices, the number of workstation controllers, the amount of memory, the system model, other factors, and the application running determine what performance is achievable. Do not use CPW to compare performance of System i models with other hardware platforms or real-world i5/OS applications. As a reminder, do *not* use CPW, as well as rPerf, as the sole metric for sizing workloads on any IBM Power Systems model. Additional considerations include disk I/O-per-second rates and application workload attributes. We recommend that you size an IBM provided workload sizing tool, such as the IBM Systems Workload Estimator, which you can access at: http://www-03.ibm.com/systems/i/advantages/perfmgmt/sizing.html You can also use Performance Navigator from the Midrange Performance Group, which you can learn more about at the following address: http://www.mpginc.com **Note**: Use the "minimum operating system release level" listed in these tables as part of your sizing estimate.
Note 1a	To estimate these values refer to "POWER6 processor feature and performance summary table" on page 969
Note 2	Processor performance represents the relative performance (maximum capacity) of a processor feature running CPW in a client/server environment. Processor capacity is achievable when the commercial workload is not constrained by main storage and direct access storage device (DASD). Performance of the 5250 CPW represents the relative performance that is available to perform host-centric workloads. The amount of 5250 CPW capacity consumed reduces the available processor capacity by the same amount.
Note 2a	Lotus Mail and Calendaring (MCU) workload ratings are projected based on the CPW ratings. MCU ratings are no longer provided starting with the POWER6 520, 550, 9117-MMA 570, and 9119-FHA 9119-FHA processor technology models. Use the IBM Systems Workload Estimator for sizing Domino mail and application workloads. When sizing Domino on IBM i, the latest maintenance release of the selected version is assumed. You can find IBM Systems Workload Estimator at: http://www.ibm.com/servers/eserver/iseries/perfmgmt/sizing.html
Note 3	One line is used if the #5544 System Console on Operations Console is used. One line can be used if the #5548 System Console on 100 Mbps Ethernet is selected and the #0367 Operations Console PCI Cable must be connected. The numbers include the ECS line.
Note 4	There must be one DVD-ROM or DVD-RAM per system. See the details for each system.

Note 5	5250 CPW (Interactive) is an approximate value that reflects the amount of Processor CPW that can be used for workloads performing 5250-based tasks. Keep in mind the following points:
	► The 9119-FHA IBM i edition provides zero CPW for 5250 work. Limited 5250 CPW is available for a system administrator to user 5250 display device I/O to manage various aspects of the server. Multiple administrative jobs exceed this capability.
	There is a single job or console exception for interactive (5250 OLTP) work. This means that, when a single job within an i5/OS partition (or the entire system i5/OS) is active and that job performs 5250 OLTP functions, almost total processor capacity of that partition (or system) is available for the work being done by that single job. This is true regardless of the system limitations associated with interactive application capacity.
	Keep this in mind when performing certain functions, such as running a CPU-intensive query or service diagnostics. When multiple jobs performing 5250 functions become active, the single job exception is no longer available and their performance is severely restricted. When more than one job must be active, consider running these CPU-intensive functions as batch jobs rather than from a 5250 workstation.
	► The System i 9406-MMA i5/OS Edition can add 5250 OLTP by using the 5250 Enterprise Enablement features.
	► A task submitted through a 5250 session (5250 device or 5250 emulation) that does display or printer I/O requires 5250 CPW.
	► A task submitted through a 5250 session (5250 device or 5250 emulation) as a "batch" job is not considered 5250 OLTP work and does not require any 5250 CPW unless the task does display or printer I/O.
	► Maximum 5250 CPW is equivalent to the Processor CPW for the active processor.
Note 6	External DASD cannot exceed the maximum system capacity or the maximum number of disk arms.
Note 6a	The total maximum DASD capacity (no mirroring or RAID protections) assumes IBM i formatted 282.25 GB disk drives, which were announced in July 2007. External DASD cannot exceed the maximum system capacity or the maximum number of disk arms. Note the following points:
	► Depending upon your use of mirroring or RAID-5/RAID-6 protection, protected maximum storage is less than what is listed here.
	► Disk drives up to the 282.25 GB disk drive are supported as a load source disk by IBM i. IBM i requires all disks to be protected by RAID 5/6 or disk mirroring. Depending upon the protection mechanism that you choose, the maximum storage is reduced when using RAID 5/6 or disk mirroring.
Note 6b	Starting with IBM release 5.4 you can use a SAN-attached disk instead of using an internal disk to be used as an IBM i load source (boot device). Specify code #0837 is for IBM i SAN load source boot, which can use a disk in a SAN-attached supported IBM disk storage server as follows.
	► Any supported System i or POWER6 MTM:
	► IBM i 5.4 (and on a POWER6 MTM with IBM i V5R4M5 licensed machine code or later): #2847 PCI IOP with SAN Load Source and attached #2787 PCI-X Fibre Channel Disk Controller or #5760 4 Gbps Single Port Fibre Channel PCI-X 2.0 Adapter
	► POWER6 MTM with IBM i 6.1 or later, any of:
	► #2847 PCI IOP with SAN Load Source and attached #2787 PCI-X Fibre Channel Disk Controller or #5760 4 Gbps Single Port Fibre Channel PCI-X 2.0 Adapter
	► #5749 4 Gigabit Dual-Port Fibre Channel PCI-X 2.0 DDR Adapter

Note 6c	Hot spares are not considered configured units. Therefore, they do not count against the system maximums. The maximum number of TB stated in this 9119-FHA table for each server feature is less than the stated maximum value. The maximum value assumes that the maximum number of supported disk drives are configured and each such disk has a 282.25 GB capacity. Because IBM i also requires the load source disks to be protected (mirrored or RAID (minimum of three disks) protection), the maximum disk storage values shown in the table must be reduced by the number and size of disks dedicated to load source and load source protection. For example, assuming two disk mirrored load source configuration using SAS drives, each of 139.5 GB, actual maximum disk storage on a 16-way configuration can be estimated to be approximately: `387825 GB – (2 x 142.75 GB) = 387539 GB` This is still approximately 387 TB.
Note 7	IBM i 5.4 with License Internal Code V5R4M5 with the latest level of the LIC and Cumulative PTF package available for the 9119-FHA. For the latest information, refer to the IBM Prerequisite Web page at: `http://www-912.ibm.com/e_dir/eServerPrereq.nsf/UpgradeCategories/Hardware?opendocument`
Note 8	A maximum of 10 active partitions per activated processor, up to a total of 254 active partitions. There is a maximum of 32 processors per IBM i partition (Model 9119-FHA or larger only). Customers who need a larger partition configuration, should work with the IBM Lab to ensure a smoothly functioning and supported configuration can be offered/used. IBM Lab can be contacted at: `http://www-03.ibm.com/systems/services/labservices/index.html`
Note 9	A maximum of 10 active partitions per activated processor, up to a total of 254 active partitions. There is a maximum of 32 processors per IBM i partition (Model 9119-FHA or larger only). Customers who need a larger partition configuration, should work with the IBM Lab to ensure a smoothly functioning and supported configuration can be offered/used. IBM Lab can be contacted at: `http://www-03.ibm.com/systems/services/labservices/index.html`
Note 10	RIO-G and 12X expansion drawers/towers cannot be mixed on a loop. However, one loop can be RIO-G and the other loop can be 12X.

3.3 Hardware Management Console

The Hardware Management Console (HMC) is a dedicated workstation that provides a graphical user interface for configuring, operating, and performing basic system tasks for POWER6 processor-based (as well as POWER5 and POWER5+ processor-based) systems that function in either non-partitioned, partitioned, or clustered environments. In addition the HMC is used to configure and manage partitions. One HMC is capable of controlling multiple POWER5, POWER5+, and POWER6 processor-based systems.

An HMC is required for 595 configurations. Newer HMC models include:

► The HMC 7042 Model C06 is a deskside model with one integrated 10/100/1000 Mbps Ethernet port, and two additional PCI slots.

► The HMC 7042 Model CR4 is a 1U, 19 inch rack-mountable drawer that has two native 10/100/1000 Mbps Ethernet ports and two additional PCI slots.

Additional HMC models supporting the Power 595 are listed later in this chapter.

At the time of writing, one HMC supports up to 48 POWER5, POWER5+ and POWER6 processor-based systems and up to 254 LPARs using the HMC machine code Version 7.3. For updates of the machine code and HMC functions and hardware prerequisites, refer to the following Web site:

`https://www14.software.ibm.com/webapp/set2/sas/f/hmc/home.html`

Figure 3-2 shows HMC connections to the 9119-FHA server, as well as Ethernet switch and associated processor books.

Power 595 Switch Layout Bulk Ethernet Hub

- Dual (redundancy) 24 port Ethernet switches
  - Front and Back
- Service Processor, Power Supply and HMC communications
- Not Integrated Virtual Ethernet Adapters as with Power 520, 550, 570
  - Not directly used by AIX, Linux or IBM i
- No feature code used to order the hub

BPC = bulk power controller, FSP = flexible service processor   ser p = service processor

Figure 3-2   HMC connections

For more details about HMC and the possible network connections, refer to the following resources:

► IBM Systems Hardware Management Information Center:

  http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp

  Search for *hardware management console*.

► *Hardware Management Console V7 Handbook*, SG24-7491, which is available at:

  http://www.redbooks.ibm.com/abstracts/sg247491.html?Open

To support connectivity to any POWER6 model, HMC Version 7 Release 3.1.0 or later is required. V7R3.1.0 introduces a browser-based interface. To connect your browser to the HMC running V7R3.1.0, enable remote Web access on the HMC and enter a Web address similar to the following example:

https://*HMC host name or HMC IP address*

For information about the latest firmware levels, see 1.6, "Operating system levels required on POWER6 processors" on page 32.

The following HMC models are supported:

► 7042-C06 (announced on 22 May 2007)
► 7042-CR4 (announced on 22 May 2007)
► 7310-C05 (withdrawn from marketing on 21 September 2007)
► 7310-C04 (withdrawn from marketing on 31 August 2006)
► 7310-C03 (withdrawn from marketing on 30 June 2005)
► 7310-CR3 (withdrawn from marketing on 27 April 2007)
► 7310-CR2 (withdrawn from marketing on 29 April 2005)

HMC V7R3.1.0 can also operate with POWER5 technology-based systems running at system-firmware level SF240_299 or later.

If an HMC Machine Type 7310 is attached to a POWER5 based system, it must be updated to HMC licensed machine code V7R3.1.0 before attaching to a 9406-MMA.

HMC licensed machine code V7R3.1.0 provides a Web browser-based interface to the HMC. The following browsers are supported:

► Firefox 1.5.0.6 or later
► Microsoft Internet Explorer 6.0 or later

WebSM is not supported as an interface to HMC V7R3.1.0 or later. WebSM continues to be supported to HMC Version 6 or older.

For more information about supported HMC and firmware levels and updating HMC and firmware levels, refer to the HMC Web page, which is available at:

http://www14.software.ibm.com/webapp/set2/sas/f/hmc/home.html

3.3.1 Comparing 9119-FHA to 9406-595 and 9119-595

Figure 3-3 and Figure 3-4 show views of the POWER6 595 from POWER5 and POWER5+ System i and then System p viewpoints.

Power 595 (from a System i perspective)

Many similarities

Some differences

Optional 19 inch rack I/O

• POWER5/POWER5+
• 9406-595 running IBM i, AIX, and Linux
• 16-core processor book granularity up to 64-core
• DDR2 memory cards
• Memory and HSL(RIO) loops scale with books
• 19 inch I/O drawers
• i5/OS V5R3, IBM i 5.4 and IBM i 6.1 with IBM i P50/P60 software tier

• POWER6
• 9119-FHA running IBM i, AIX, and Linux
• 8-core processor book granularity up to 64-core
• Buffered DDR2 DIMMs
• Memory and RIO/12X loops scale with books (RIO=HSL)
• 24 inch and 19 inch I/O drawers
• IBM i 5.4 and IBM i 6.1 with IBM i P50 software tier

Figure 3-3   9119-FHA compared to a 9406-595

The 9119-FHA has been introduced as newest enterprise server in the IBM Power Systems family, and as the follow-on and effective replacement to the very successful System p5 9119-FHA, System p5 590 as well as the System i 9119-FHA servers. It is the largest, most scalable and most reliable server to support IBM i, AIX, and Linux applications on a single POWER architecture system.

The 9119-FHA is offered in 8-core processor books versus 16-core POWER5 processor books, so it provides a more granular purchase option for processor CoD. Capacity on Demand options are generally consistent with the POWER5 59x offerings, with options for Processor CUoD (in increments of one processor), Memory CUoD (in increments of 1 GB) is available with On/Off Processor CoD, On/Off Memory CoD, Trial CoD, Utility CoD.

Power 595 (from a System p perspective)

Many similarities

Some differences

- POWER5/POWER5+
- 9119-590/595 running AIX, Linux, **limited** IBM i
- 16-core processor book granularity up to 64-core
- DDR2 memory cards
- Memory and RIO loops scale with books
- 24 inch I/O drawers
- Option for first expansion rack powered from CEC frame

- POWER6
- 9119-FHA running AIX, IBM i, and Linux
- 8-core processor book granularity up to 64-core
- Buffered DDR2 DIMMs
- Memory and RIO/12X loops scale with books
- 24 inch and 19 inch I/O drawers
- First expansion rack always powered from its own bulk power supply

Figure 3-4   Comparing System p POWER5 595 to POWER6 595

3.4 Software requirements

As previously listed in 3.1.2, "Operating systems and release levels" on page 105, we list the operating system release levels required to run on the 9119-FHA:

▶ AIX 5.3 with the 5300-06 Technology Level and Service Pack 7 or later
▶ AIX 5.3 with the 5300-07 Technology Level and Service Pack 4 or later
▶ AIX 5.3 with the 5300-08 Technology Level or later
▶ AIX 6.1 with the 6100-00 Technology Level and Service Pack 5 or later
▶ AIX 6.1 with the 6100-01 Technology Level or later
▶ IBM i 5.4 (formerly known as i5/OS V5R4) or later
▶ IBM i 6.1 (formerly known as i5/OS V6R1) or later
▶ SUSE Linux Enterprise Server 10 Service Pack 2 for POWER or later
▶ Red Hat Enterprise Linux 4.7 for POWER or later
▶ Red Hat Enterprise Linux 5.2 for POWER or later

IBM PowerVM Standard Edition supports micro-partitioning and other Power virtualization technologies in order to run multiple operating systems per core concurrently on POWER6 processor-based systems.

PowerVM Enterprise Edition extends PowerVM Standard Edition by adding Live Partition Mobility support. See Appendix E, "IBM PowerVM" on page 951 for more PowerVM information.

If installed, PowerVM licensing is required for all active processors. Some features might require updates.

See also the PowerVM Web site:

http://www-03.ibm.com/systems/power/software/virtualization/

For additional prerequisite information, visit:

http://www-912.ibm.com/e_dir/eServerPrereq.nsf

3.5 IBM Power 9119-FHA server physical characteristics

The following topics provide physical hardware dimension, weight, and electrical details.

3.5.1 Physical specifications

Key specifications are described in this section. Table 3-3 lists the major 9119-FHA server dimensions.

Table 3-3   9119-FHA server dimensions

Dimension	Rack only	Rack with side doors	Slimline		Acoustic	
			1 Frame	2 Frames	1 Frame	2 Frames
Height	201.4 cm (79.3 in)	201.4 cm (79.3 in)	201.4 cm (79.3 in)	201.4 cm (79.3 in)	201.4 cm (79.3 in)	201.4 cm (79.3 in)
Width	74.9 cm (29.5 in)	77.5 cm (30.5 in)	77.5 cm (30.5 in)	156.7 cm (61.7 in)	77.5 cm (30.5 in)	156.7 cm (61.7 in)
Depth	127.3 cm (50.1 in)	127.3 cm (50.1 in)	148.6 cm (58.5 in)[a] 152.1 cm (61.3 in)[b]	148.6 cm (58.5 in)[c] 152.1 cm (61.3 in)[d]	180.6 cm (71.1 in)	180.6 cm (71.1 in)

a. Rack with slimline and side doors, one or two frames
b. Rack with slimline front door and rear door heat exchanger (RDHX), system rack only
c. Rack with slimline and side doors, one or two frames
d. Rack with slimline front door and rear door heat exchanger (RDHX), system rack only

Table 3-4 provides the 9119-FHA server full system weights.

Table 3-4   9119-FHA server full system weights (no covers)

Frame	With integrated battery backup	Without integrated battery backup
A Frame (system rack)	1542 kg (3400 lb)	1451 kg (3200 lb)
A Frame (powered expansion rack)	1452 kg (3200 lb)	1361 kg (3000 lb)
Z Frame (bolt-on expansion rack)	N/A	1157 kg (2559 lb)

Table 3-5 provides the weights of the 9119-FHA covers.

Table 3-5   9119-FHA cover weights

Covers	Weight
Side covers pair	50 kg (110 lb)
Slimline doors, single	15 kg (33 lb)
Acoustic doors, single (Expansion frame)	25 kg (56 lb)
Acoustic doors, single (System rack)	20 Kg (46 lb)

Table 3-6 provides the 9119-FHA shipping crate dimensions.

Table 3-6   IBM 9119-FHA shipping crate dimensions

Covers	Weight
Height	231 cm (91 in)
Width	94 cm (37 in)
Depth	162 cm (63.5 in)
Weight	Varies by configuration. Max 1724 kg (3800 lb)

To assure that non-IBM industry-standard racks are installable and serviceable, review the installation planning information for any product-specific installation requirements.

For installation planning information, refer to the planning Web site at:

http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp?topic=/iphdx/abstract_site_hw_planning_guide.htm

Service clearances

There are several possible rack configurations for 9119-FHA systems. Figure 3-5 shows the service clearances for a two rack configuration with acoustical doors.

Note: The p5-9119-FHA server must be installed in a raised floor environment.
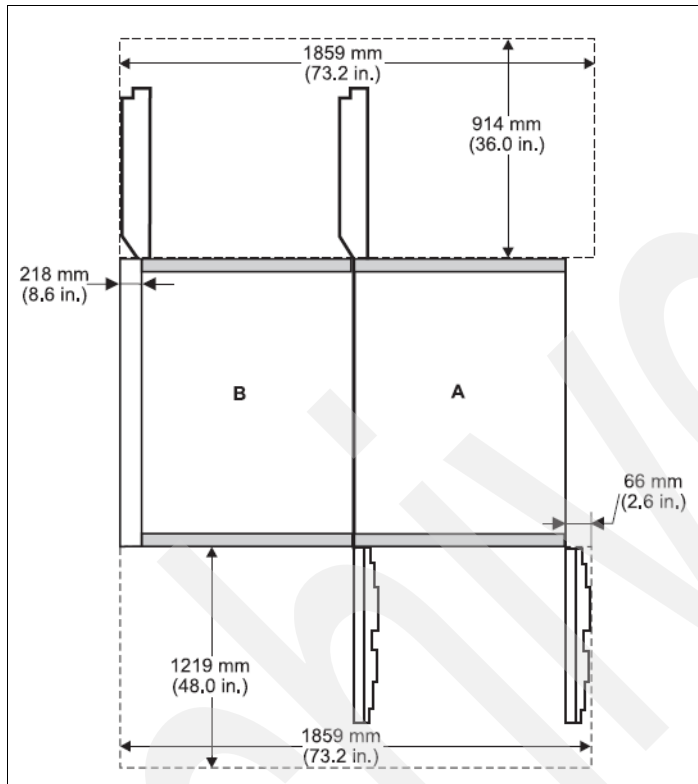
Figure 3-5   Service clearances for a two rack system configuration with acoustic doors

You can see the service clearances for other configurations at:

http://publib.boulder.ibm.com/infocenter/eserver/v1r3s/index.jsp?topic=/iphad/serviceclearance.htm

Figure 3-6 shows the front of the system rack.

Important: If the 9119-FHA server must pass through a doorway opening less than 2.02 meters (79.5 inches), you need to order the compact handling option (#7960), which ships the rack in two parts.
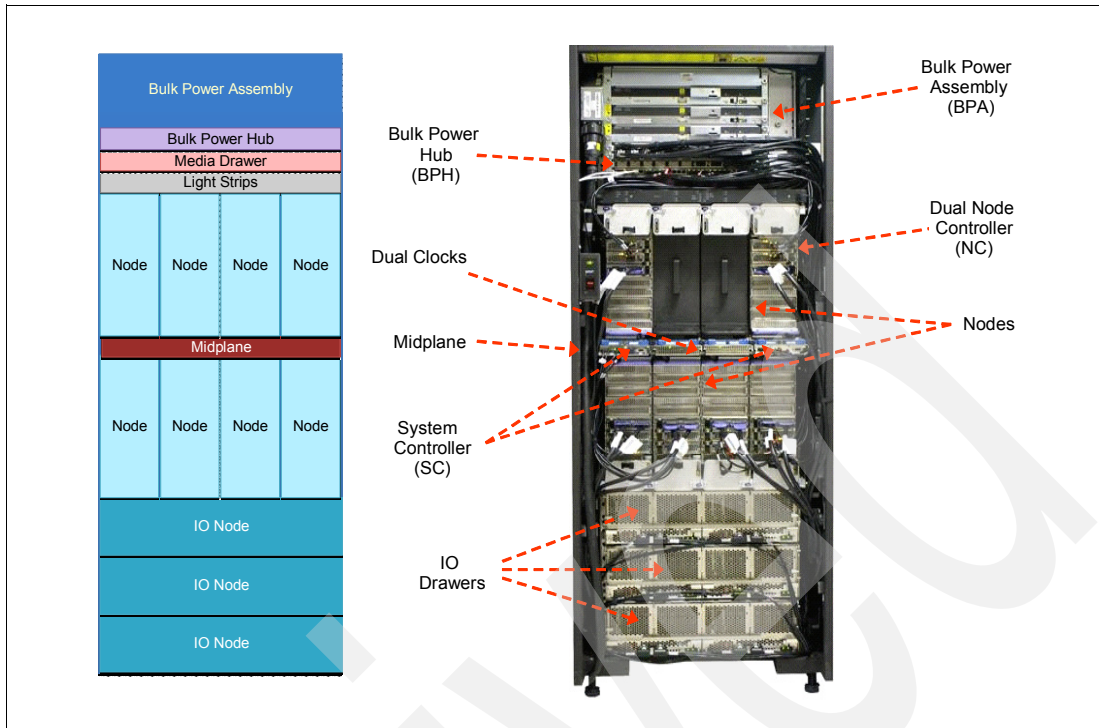
Figure 3-6   9119-FHA front view

Figure 3-7 shows a picture of the rear view of the system rack.
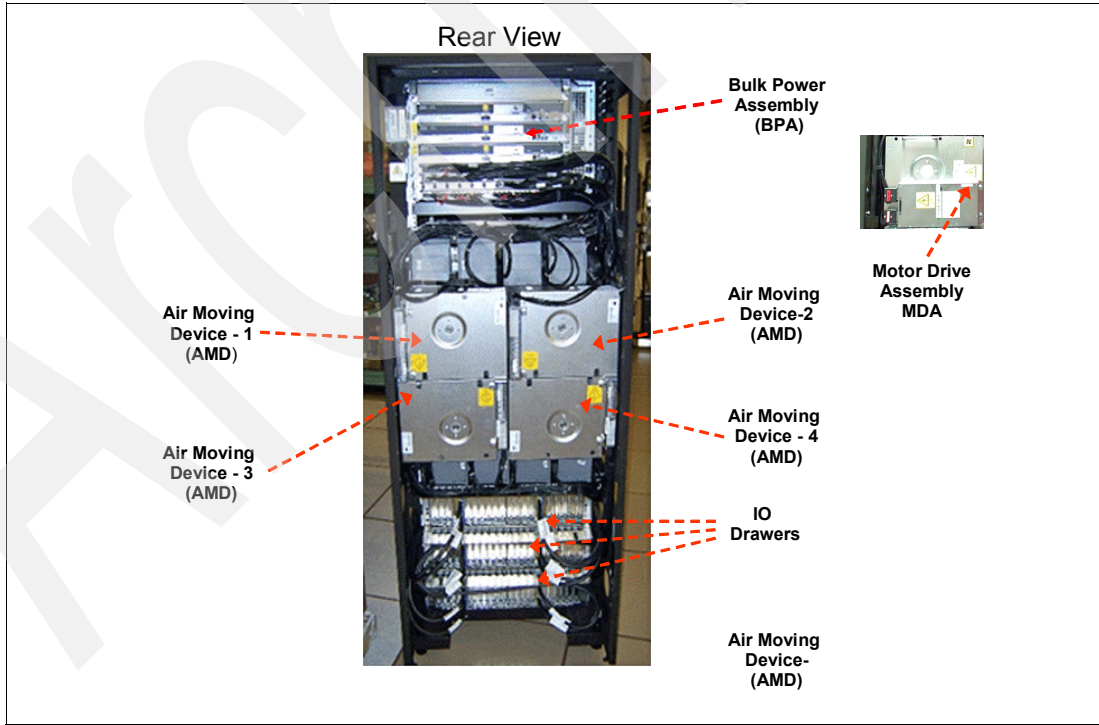
Figure 3-7   Model 9119-FHA rear view

In 3.9, "9119-FHA system unit schematics and locations" on page 184, we show line-drawings of the front and rear views.

3.5.2 Operating environment

Table 3-7 lists the general system specifications for the 9119-FHA server.

Table 3-7   IBM 9119-FHA server specifications

Description	Range
Recommended operating temperature (8-core, 16-core, and 32-core configurations)	10 degrees to 32 degrees C[a] (50 degrees to 89.6 degrees F)
Recommended operating temperature (48-core and 64-core configurations)	10 degrees to 28 degrees C[a] (50 degrees to 82.4 degrees F)
Relative humidity	20% to 80%
Maximum wet bulb	23 degrees C (73 degrees F) (operating)
Sound power	► Declared A-weighted sound power level, per ISO 9296: 9.2 bels (with slimline doors) ► Declared A-weighted sound power level, per ISO 9296: 8.2 bels (with acoustical doors)
Sound pressure	► Declared A-weighted 1 meter sound pressure level, per ISO 9296: 79 decibels (with slimline doors) ► Declared A-weighted 1 meter sound pressure level, per ISO 9296: 69 decibels (with acoustical doors)

a. The maximum temperatures of 32° C (90° F) and 28° C (82° F) are linearly derated above 1295 m (4250 ft).

Note: Noise levels are given for the principal (typical) configuration of the CEC rack. The 10-dB reduction in noise levels with the acoustical doors corresponds to a factor of 10 reduction. That is, the noise level from a single rack with slimline doors would be about the same as the noise level from 10 racks with acoustical doors, combined.

3.5.3 Power requirements

All 9119-FHA configurations are designed with a fully redundant power system. To take full advantage of the power subsystem redundancy and reliability features, connect each of the two power cords to different distribution panels.

Table 3-8 lists the electrical and thermal characteristics for the 9119-FHA server.

Table 3-8   IBM 9119-FHA server specifications

Description	Range
Operating voltages	▶ 3-phase V ac at 50/60 Hz): 200 to 240 V; 380 to 415 V; 480 V ▶ Rated current (A per phase): 48 A or 63 A or 80 A; 34 A or 43 A; 24 A or 34 A ▶ Power consumption: 27,500 watts (maximum for full CEC, three I/O drawers) ▶ Power source loading: 27.7 kVA ▶ Thermal output: 27,500 joules per second (93,840 Btu per hr) maximum
Inrush current	134
Power Factor	0.99
Operating frequency	50/60 plus or minus 0.5 Hz
Maximum Power (Fully configured 4.2 GHz system)	23.3 KW
Maximum Power (Fully configured 5.0 GHz system)	28.3 KW
Maximum thermal output (4.2 GHz processor)	74.4 KBTU/hr
Maximum thermal output (5.0 GHz processor)	83.6 KBTU/hr

Table 3-9 lists the 9119-FHA electrical characteristics for 4.2 GHz and 5.0 GHz 9119-FHA servers and the Powered Expansion Rack (U.S., Canada, and Japan).

Table 3-9   Electrical characteristics (U.S., Canada, and Japan)

Description	U.S., Canada, Japan		U.S. high voltage	
Voltage and Frequency	200-240 V at 50-60 Hz		480 V at 50-60 Hz	
4.2 GHz Server				
System Rating	48 A	63 A	24 A	24 A
Plug rating	60 A	100 A	30 A	30 A
Recommended circuit breaker rating	60 A	80 A	30 A	30 A
Cord size	6 AWG	6 AWG	8 AWG	8 AWG
Recommended receptacle	IEC60309, 60 A, type 460R9W	IEC60309, 100 A, type 4100R9W	IEC60309, 30 A, type 430R7W	IEC60309, 30 A, type 430R7W

Description	U.S., Canada, Japan		U.S. high voltage	
5.0 GHz Server				
System Rating	48 A	63 A	24 A	34 A
Plug rating	60 A	100 A	30 A	60 A
Recommended circuit breaker rating	60 A	100 A	30 A	60 A
Cord size	6 AWG	4 AWG	8 AWG	6 AWG
Recommended receptacle	IEC60309, 60 A, type 460R9W	IEC60309, 100 A, type 4100R9W	IEC60309, 30 A, type 430R7W	IEC60309, 30 A, type 430R7W
Powered Expansion Rack				
System Rating	48 A	63 A	24 A	24 A
Plug rating	60 A	100 A	30 A	30 A
Recommended circuit breaker rating	60 A	80 A	30 A	30 A
Cord size	6 AWG	6 AWG	8 AWG	8 AWG
Recommended receptacle	IEC60309, 60 A, type 460R9W	IEC60309, 100 A, type 4100R9W	IEC60309, 30 A, type 430R7W	IEC60309, 30 A, type 430R7W

Table 3-10 lists the 9119-FHA electrical characteristics for 4.2 GHz and 5.0 GHz 9119-FHA servers and the Powered Expansion Rack (World Trade).

Table 3-10   Electrical characteristics (World Trade)

Description	World Trade			
Voltage and frequency	200-240 V at 50-60 Hz		380/415 V at 50-60 Hz	
4.2 GHz server				
System Rating	48 A	63 A	34 A	34 A
Plug rating	no plug	no plug	no plug	no plug
Recommended circuit breaker rating	60 A	80 A	40 A	40 A
Cord size	6 AWG	6 AWG	8 AWG	8 AWG
Recommended receptacle	Not specified Electrician installed	Not specified Electrician installed	Not specified Electrician installed	Not specified Electrician installed

Description	World Trade			
5.0 GHz Server				
System Rating	48 A	80 A	34 A	43 A
Plug rating	no plug	no plug	no plug	no plug
Recommended circuit breaker rating	60 A	100 A	40A	63A
Cord size	6 AWG	4 AWG	8 AWG	6 AWG
Recommended receptacle	Not specified Electrician installed	Not specified Electrician installed	Not specified Electrician installed	Not specified Electrician installed
Powered Expansion Rack				
System Rating	48 A	63 A	34 A	34 A
Plug rating	no plug	no plug	no plug	no plug
Recommended circuit breaker rating	60 A	80 A	40 A	40 A
Cord size	6 AWG	6 AWG	8 AWG	8 AWG
Recommended receptacle	Not specified Electrician installed	Not specified Electrician installed	Not specified Electrician installed	Not specified Electrician installed

Energy consumption summary

This product meet the requirements for computer energy consumption efficiency as defined by the Energy saving Law - Japan:

► Product Category (2005 law): C

► Product Category (2007 law): B

► Computer Energy Consumption Efficiency - 2005 law (Watts/MTOPS): 0.0977 (for 16-core, Standard system configuration)

► Computer Energy Consumption Efficiency - 2007 law (Watts/MTOPS): 0.0977 (for 16-core, Standard system configuration)

EMC conformance classification

Around the world, many countries have set regulations and laws that govern the use of Electromagnetic Compatibility (EMC). For example, in Europe the Electromagnetic Compatibility Directive 2004/108/EC sets the requirements for the control of immunity and emissions. In the United States, the FCC governs the requirements for the control of immunity and emissions Electromagnetic emissions relate to radio frequency waves that are emitted from an electronic device during normal operation. These electromagnetic waves can interfere with the normal operation of other electronic equipment.

This 9119-FHA and its enclosures equipment is subject to FCC rules and complies with the appropriate FCC rules before final delivery to the buyer or centers of distribution.

► U.S.: FCC CFR47 Part 15 Class A
► Europe: CISPR 22 Class A; "CE" Mark of Conformity
► Japan: VCCI-1
► Korea: Korean Requirement Class A

Homologation - Telecom environmental testing (Safety and EMC)

Homologation approval for specific countries has been initiated with the IBM Homologation and Type Approval (H&TA) organization in LaGaude, France.

The Power 9119-FHA Server (9119-FHA) and applicable features meet the environmental testing requirements of the country telecom and have been designed and tested in compliance with the Full Quality Assurance Approval (FQAA) process as delivered by the British Approval Board for Telecom (BABT), the U.K. telecom regulatory authority.

Product safety, country testing, and certification

The following countries and testing organizations have certified system safety for the 9119-FHA:

► U.S.: Underwriter Laboratories
► Canada: CNL (CSA or cUL)
► Germany/Europe: GS Mark (Safety, TUV, EN60 950)

General requirements

The Power 9119-FHA Server (9119-FHA) is in compliance with IBM Corporate Bulletin C-B 0-2594-000 Statement of Conformity of IBM Product to External Standard (Suppliers Declaration).

For additional technical planning information, refer to the planning Web site at:

http://publib.boulder.ibm.com/infocenter/systems/scope/hw/topic/iphdx/abstract_site_hw_planning_guide.htm

3.6 IBM Power 9119-FHA configuration and features details

The following topics supply additional details on selected 9119-FHA configuration and features. Much of the following information is a subset of more detailed information that is contained within *IBM Power 595 Technical Overview and Introduction*, REDP-4440.

3.6.1 Central electronics complex details

The 9119-FHA central electronics complex (CEC) is a 20U tall, 24 inch wide rack-mounted configuration. It houses the system processors, memory, redundant system service processors, I/O drawer connection capability, and associated components. The CEC is installed directly below the power subsystem.

The CEC features a packaging concept based on *books*. The books contain processors memory, and connectors to I/O drawers and other servers. In this paper, we refer to these books as *processor books*. The processor books are located in the CEC, which is mounted in the primary rack.

Each processor book assembly contains many components, some of which include:

► The processor book planar which provides support for four Multi-Chip modules (MCM), 32 memory DIMM slots, a connector to the midplane, four I/O adapter connectors, two node controller connectors, and one VPD card connector.

► A node power distribution planar which provides support for all DCA connectors, memory, and air temperature sensors.

► The processor book Vital Product Data (VPD) card which holds the VPD and SVPD (CoD) for processor book information. Routes sense and control signals pass between the DCAs and processor book planar (DIMM LED Control). The VPD card plugs into processor book planar and the node power distribution planar.

► Two Distributed Converter Assemblies (DCAs) located at the back of each processor book.

► Four RIO-2 or 12x I/O hub adapter slots (two wide and two narrow) which are located at the front of the processor book.

► Two embedded Node Controller Service Processor cards (NC) located in the front of the processor book. The node controller cards communicate to the HMC through the Bulk Power Hub (BPH) and are connected to both front and rear Ethernet ports on the BPH.

Figure 3-8 shows a book and its components.
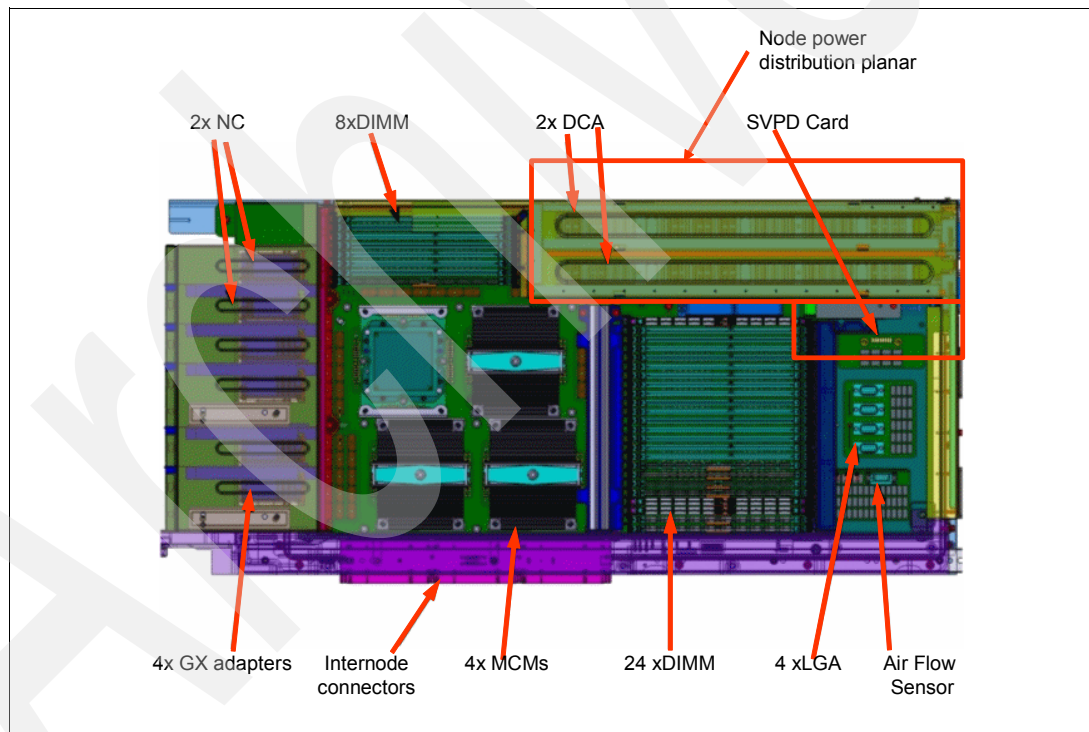
Figure 3-8   Processor book cards layout

Each processor book cage contains two embedded controllers called Node Controllers (NCs), which interface with all of the logic in the corresponding book. Two NCs are used for each processor book to avoid any single point of failure. The controllers operate in master/slave configuration. At any given time, one controller performs the master role while the other controller operates in standby mode, ready to take over the master's responsibilities if the master fails.

Power for the 595 CEC is supplied from dc bulk power assemblies in the system rack. The bulk power is converted to the power levels required for the CEC using two dc to dc power converters (DCAs). We provide more information about power later in the following sections:

- ► 3.6.5, "A dc converter assembly" on page 129
- ► 3.6.7, "Bulk power assembly" on page 131
- ► 3.6.8, "Bulk power controller" on page 134

Processor book placement

Up to eight processor books can reside in the system unit CEC cage. The processor books slide into the midplane card which is located in the middle of the CEC cage. Support is provided for up to four books on top and four books on the bottom of the midplane. Table 3-11 lists the processor books, which are installed in a specific sequence.

Two *oscillator* (system clock) cards are also connected to the midplane. One oscillator card operates as the primary and the other as a backup. In case the primary oscillator would fail, the backup card detects the failure and continues to provide the clock signal so that no outage occurs due to an oscillator failure.

Table 3-11   Processor book installation sequence

Plug sequence	PU book	Location code	Orientation
1	Book 1	Un-P9 (Node Location P9)	Bottom
2	Book 2	Un-P5 (Node Location P5)	Top
3	Book 3	Un-P6 (Node Location P6)	Bottom
4	Book 4	Un-P2 (Node Location P2)	Top
5	Book 5	Un-P7 (Node Location P7	Bottom
6	Book 6	Un-P8 (Node Location P8)	Bottom
7	Book 7	Un-P3 (Node Location P3)	Top
8	Book 8	Un-P4 (Node Location P 4)	Top

Figure 3-9 shows details the processor book installation sequence.
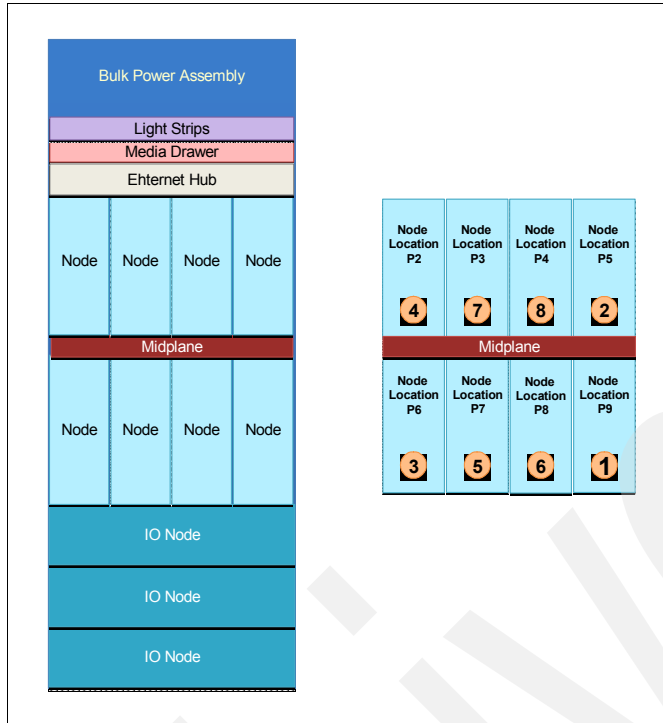
Figure 3-9   Processor book layout

3.6.2 Processor books

The 9119-FHA server can be configured with one to eight POWER6, 4.2 GHz or 5.0 GHz, 8-core processor books. All processor books installed in a 9119-FHA server must operate at the same speed.

Each 8-core book contains four 64-bit SMP POWER6 processor chips packaged in four multi-chip modules (MCMs). The processor book also provides 32 DIMM slots for DDR2 memory DIMMs and four GX bus slots for remote I/O hubs cards (RIO-2 and 12x) which are used to connect system I/O drawers.

In this chapter, we use the terms *GX adapter* and *remote I/O hub* (or just *I/O hub*) to represent the same physical component.

Figure 3-10 shows a high-level view of the POWER6 processor chip (card). Each processor core has its private 4 MB L2 cache that can be accessed quickly by the other core on the chip and all cores in the system configuration. The 32 MB L3 cache local to the processor card chip can be accessed by all processor cores on the system.

L1 Data and L1 Instruction caches are within each POWER6 processor core. For information about how the caches and memory can be accessed across all processor cores on the system, see 3.6.6, "MCM system interconnect" on page 130.
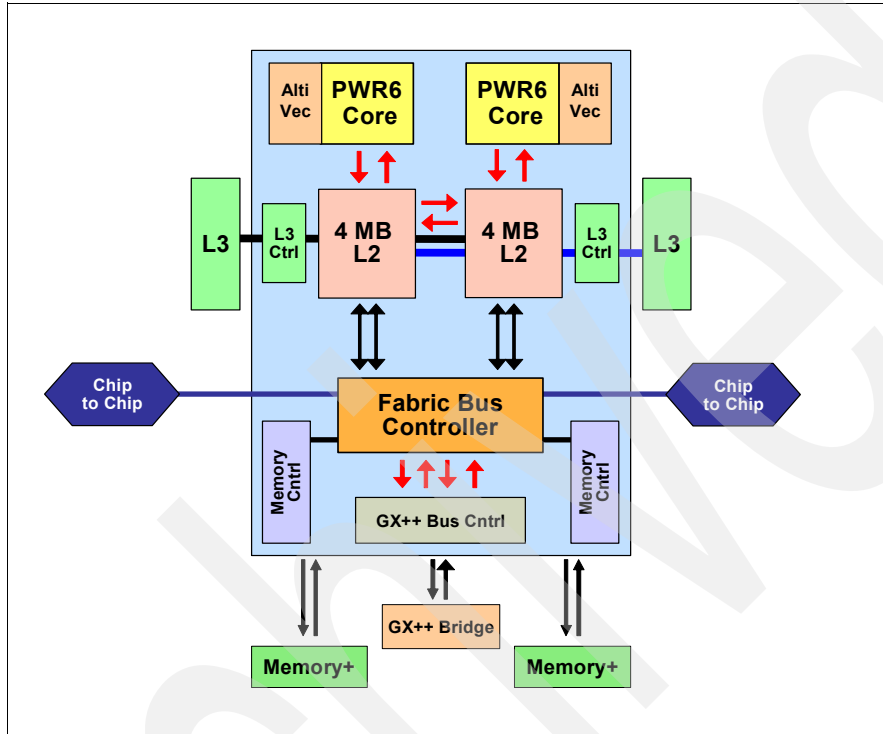
Figure 3-10   POWER6 processor

3.6.3 Reliability, availability, and serviceability

Extensive mainframe-inspired reliability, availability, and serviceability (RAS) features, a fundamental part of the system design of the 9119-FHA server, help to keep mission-critical applications running reliably around-the-clock.

The System Control Structure (SCS) can be seen as key infrastructure for delivering mainframe RAS characteristics (for example CoD support functions, On-chip array sparing) and Error detection, isolation, and reporting functions such as instant failure detection, isolation of failed parts, continued system operation, deferred maintenance, call-home providing detailed problem analysis, pointing to FRU to be replaced. The System Control Structure (SCS) provides system initialization and error reporting and facilitates service. Embedded service processor based control cards reside in the CEC cage (redundant System Controllers-SC), node (redundant Node Controllers-NC), and in the Bulk Power Controller (BPC). We discuss the power components, including the BPC, in more detail in 3.6.7, "Bulk power assembly" on page 131.

RAS includes the following features:

- ► Processor Instruction Retry
- ► Alternate Processor Recovery
- ► Selective dynamic firmware updates
- ► IBM Chipkill ECC, bit-steering memory
- ► ECC L2 cache, L3 cache
- ► Redundant service processors with automatic failover
- ► Redundant system clocks with dynamic failover
- ► Hot-swappable disk bays
- ► Hot-plug/blind-swap PCI-X slots
- ► Hot-add I/O drawers
- ► Hot-plug power supplies and cooling fans
- ► Dynamic Processor Deallocation
- ► Dynamic deallocation of logical partitions and PCI bus slots
- ► Extended error handling on PCI-X slots
- ► Redundant power supplies and cooling fans
- ► Battery backup and redundant battery backup (optional)

For information about operating system support for selected RAS features, refer to
Appendix I, "POWER6 reliability, availability and serviceability summary" on page 979.

3.6.4 System controller card

There are two server processor cards on the CEC midplane. These service processor cards
are referred to as system controllers (SC).

The System Power Control Network (SPCN) control software and the system controller
software run on the embedded system controller service processor (SC). SPCN is a serial
communication network that interconnects the operating system and power components of all
IBM Power Systems. It reports power failures in connected components directly to the
operating system and plays a vital role in system VPD along with helping map logical to
physical relationships. SPCN also provides selective operating system control of power to
support concurrent system upgrade and repair.

3.6.5 A dc converter assembly

Two redundant concurrently maintainable dc-to-dc converter assemblies (DCAs) generate dc
power for the CEC. The DCAs convert mains isolated 350 V dc to voltage levels appropriate
for the processors, memory and CEC contained I/O hub cards. Industry-standard dc-to-dc
voltage regulator module (VRM) technology is used.

The DCA does not support multiple core voltage domains per processor. The processor book
planar is wired to support a core voltage or nest domain and a cache array voltage domain for
each of the 4 MCMs. A common I/O voltage domain is shared among all CEC logic.

3.6.6 MCM system interconnect

The 9119-FHA utilizes point to point SMP fabric interfaces between processor node books. Each processor book holds a processor node consisting of four dual core processors designated S, T, U, and V in Figure 3-11.
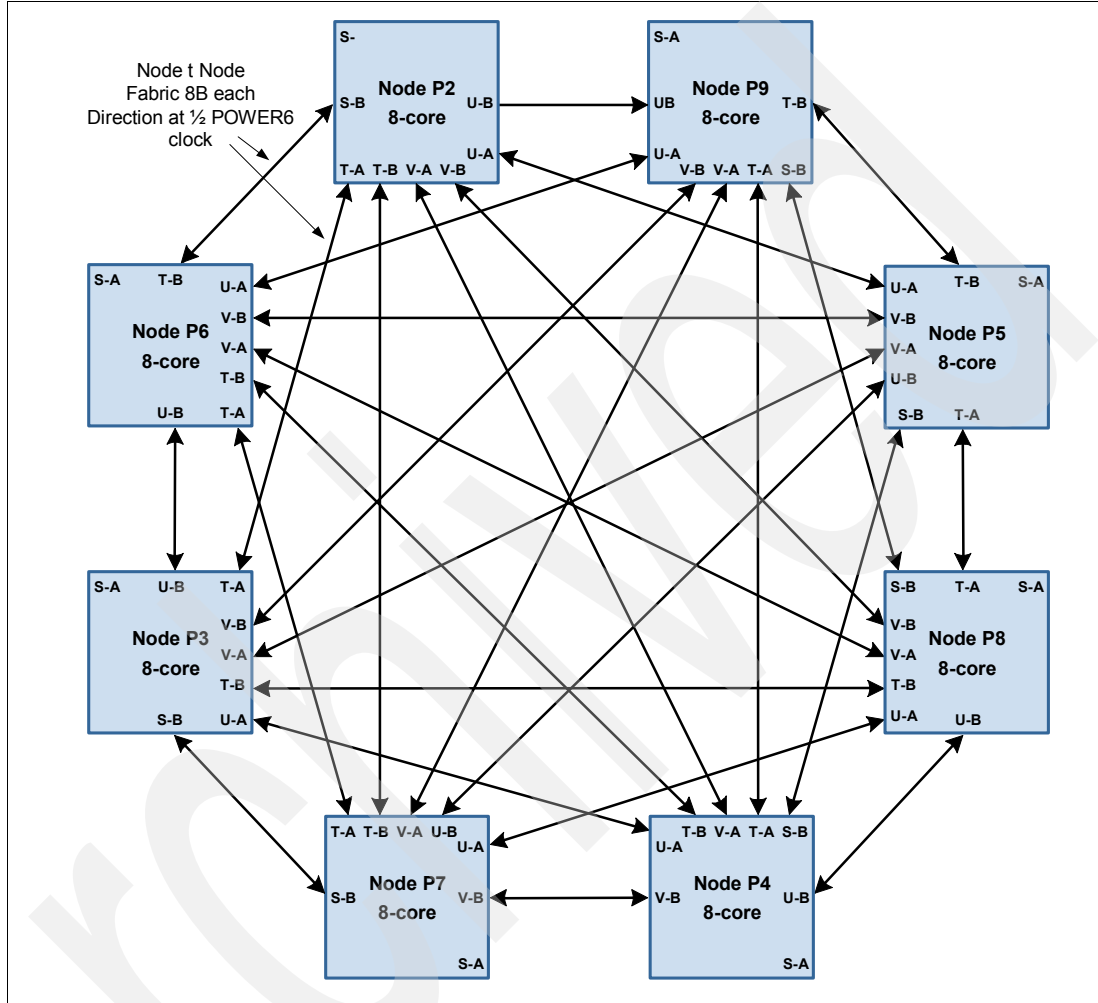
Figure 3-11   9119-FHA 64-core node access topology

The bus topology is no longer ring-based as in POWER5, but rather a multi-tier, fully-connected topology to reduce latency, to increase redundancy, and to improve concurrent maintenance. Reliability is improved with ECC on the external I/Os as well as ECC and parity on the internal chip wires.

Books can be considered as *nodes*. Each node has instruction caches per MCM card with 4 MB L2 cache per processor core, 8 MB L2 cache local to that processor chip card, and memory cards (DIMMs). Consider the total book caches and memory as *local* to that node.

As was initially implemented on with POWER4 technology systems, the IBM i and AIX operating systems attempt to dispatch work (a task or thread) to a processor that had previously processed that same task or thread, which increases the changes of instructions and data being already in local cache or memory for fastest possible execution.

The next higher priority is to dispatch a task to a processor within the same processor card and so on through processors within a local node. As thousands of tasks are dispatched

across an entire systems instructions and data need to be accessed outside of a processor within a local node. Figure 3-11 illustrates the POWER6 multi-tier, fully-connected topology for the fastest access to instructions and data across all nodes within the system.

Books (nodes) are interconnected by a point-to-point connection topology. This allows every book to communicate with every other book. Data transfer never has to go through another book (for example to access contents within a "remote node" (not on the processor card chip cache or cache or memory within a book) to address the requested data or control information. Inter-book communication takes place at the Level 2 (L2) cache level (as indicated in the "Chip to Chip" area of Figure 3-10 on page 128.

Figure 3-11 illustrates the potential for a large, robust,64-core system that uses 8-byte SMP interconnect links, both L3 data ports to maximize L3 bandwidth, and all eight memory channels per chip.

3.6.7 Bulk power assembly

The 9119-FHA system employs a universal front-end power system. It can accept nominal ac inputs from 200 - 480 V at 50 or 60 Hz and converts this to a main isolated 350 V dc nominal bulk power. The Bulk Power Assembly (BPA) holds the bulk power components.

The primary system rack and powered expansion rack always incorporate two bulk power assemblies for redundancy. These provide 350 V dc power for devices located in those racks and associated nonpowered expansion racks. These bulk power assemblies are mounted in front and rear positions and occupy the top 8U of the rack. To help provide optimum system availability, these bulk power assemblies should be powered from separate power sources with separate line cords.

The 9119-FHA has both primary and redundant BPAs. The BPAs provide the prime power conversion and dc distribution for devices located in the POWER6 9119-FHA CEC rack. They are comprised of the following individual components, all of which support concurrent maintenance and require no special tools:

► Bulk Power Controller: The Bulk Power Controller (BPC) is the BPA's main power and CEC controller.

► Bulk Power Distributor: The BPD distributes 350 V dc to FRUs in the system frame, including the Air Moving Devices and Distributed Converter Assemblies. A BPA has either one or two BPDs.

► Bulk Power Enclosure: The Bulk Power Enclosure (BPE) is the metal enclosure containing the BPA components.

► Bulk Power Fan: The Bulk Power Fan (BPF) cools the BPA components.

► Bulk Power Hub: The Bulk Power Hub (BPH) is a 24 port 10/100 Ethernet switch.

► Bulk Power Regulator: The Bulk Power Regulator (BPR) is the main front-end power supply. A BPA has up to four BPRs, each capable of supplying 8 KW of 350 V dc power.

Figure 3-12 shows these power components.
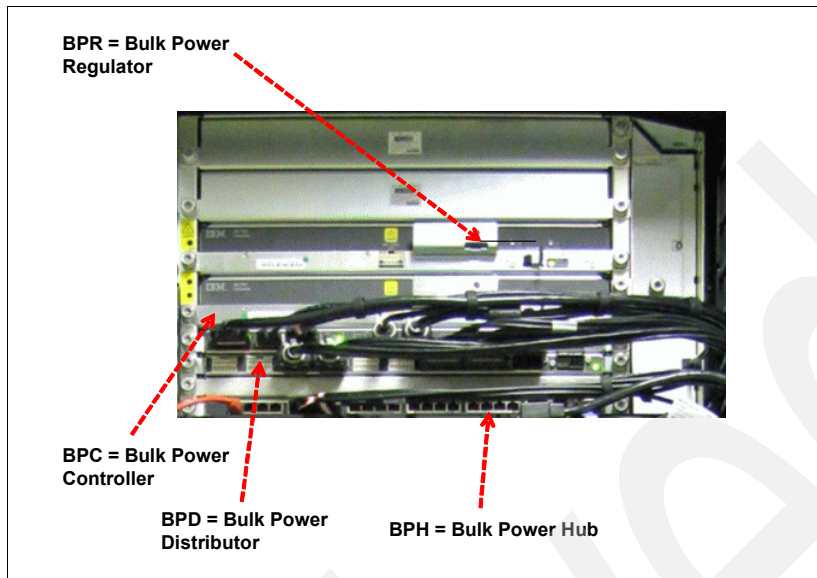
Figure 3-12   Bulk power assembly

The power subsystem in the primary system rack is capable of supporting 9119-FHA servers with one to eight processor books installed, a media drawer, and up to three I/O drawers. A non-powered expansion rack can only be attached to a powered expansion rack. Attachment of non-powered expansion racks to the system rack is not supported. The number of BPR and BPD assemblies varies, depending on the number of processor books, I/O drawers, and battery backup features that are installed along with the final rack configuration.

Bulk power hub

A 24-port 10/100 Ethernet switch serves as the 9119-FHA bulk power hub (BPH) that is contained in each of the redundant bulk power assemblies located in the front and rear at the top the CEC rack. The BPH provides the network connections for the System Control Structure (SCS), which in turn provide system initialization and error reporting, and facilitate service operations. The system controllers, the processor book node controllers, and BPC use the BPH to communicate to the Hardware Management Console.

Figure 3-13 shows the bulk power hubs.
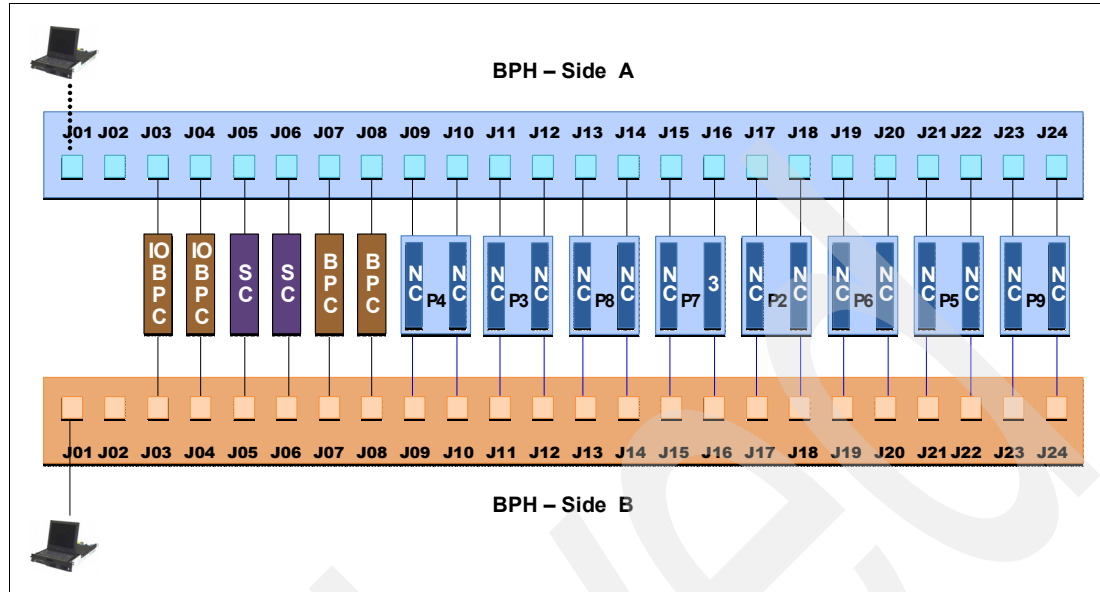
Figure 3-13   Bulk power hubs

Table 3-12 lists the BPH location codes.

Table 3-12   Bulk power hub location codes

Location code	Component	Location code	Component
Un-Px-C4	Bulk Power Hub (front or rear)	Un-Px-C4-J13	Processor book 6 (node P8) Node Controller 0
Un-Px-C4-J01	Hardware Management Console	Un-Px-C4-J14	Processor book 6 (node P8) Node Controller 1
Un-Px-C4-J02	Service mobile computer	Un-Px-C4-J15	Processor book 5 (node P7) Node Controller 0
Un-Px-C4-J03	Open	Un-Px-C4-J16	Processor book 5 (node P7) Node Controller 1
Un-Px-C4-J04	Corresponding BPH in powered I/O rack	Un-Px-C4-J17	Processor book 4 (node P2) Node Controller 0
Un-Px-C4-J05	System Controller 0 (in CEC midplane)	Un-Px-C4-J18	Processor book 4 (node P2) Node Controller 1
Un-Px-C4-J06	System Controller 1 (in CEC midplane)	Un-Px-C4-J19	Processor book 3 (node P6) Node Controller 0
Un-Px-C4-J07	Front BPC	Un-Px-C4-J20	Processor book 3 (node P6) Node Controller 1
Un-Px-C4-J08	Rear BPC	Un-Px-C4-J21	Processor book 2 (node P5) Node Controller 0
Un-Px-C4-J09	Processor book 8 (node P4) Node Controller 0	Un-Px-C4-J22	Processor book 2 (node P5) Node Controller 1

Location code	Component	Location code	Component
Un-Px-C4-J10	Processor book 8 (node P4) Node Controller 1	Un-Px-C4-J23	Processor book 1 (node P9) Node Controller 0
Un-Px-C4-J11	Processor book 7 (node P3) Node Controller 0	Un-Px-C4-J24	Processor book 1 (node P9) Node Controller 1
Un-Px-C4-J12	Processor book 7 (node P3) Node Controller 1		

3.6.8 Bulk power controller

One bulk power controller (BPC) is located in each BPA. Figure 3-14 shows a BPC. The BPC provides the base power connections for the internal power cables. Eight power connectors are provided for attaching system components. In addition, the BPC contains a Service Processor card that provides service processor functions within the power subsystem.
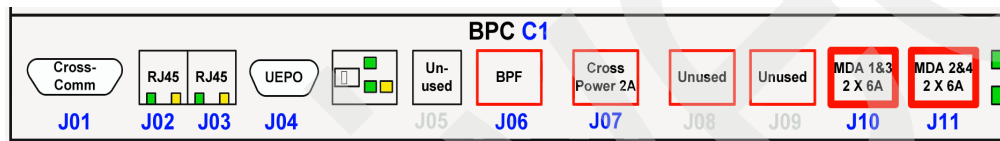
Figure 3-14   Bulk power controller

Table 3-13 lists the BPC component location codes.

Table 3-13   Bulk Power Controller (BPC) component location codes

Location code	Component	Location code	Component
Un-Px-C1	Bulk Power Controller (front or rear)	Un-Px-C1-J06	Bulk Power Fan
Un-Px-C1-J01	BPC Cross Communication	Un-Px-C1-J07	BPC Cross Power
Un-Px-C1-J02	Ethernet to Bulk Power Hub	Un-Px-C1-J08	Not used
Un-Px-C1-J03	Ethernet to Bulk Power Hub	Un-Px-C1-J09	Not used
Un-Px-C1-J04	Panel	Un-Px-C1-J10	UEPO MDA 1 and MDA 3 (one Y cable powers two MDAs)
Un-Px-C1-J05	Not used	Un-Px-C1-J11	MDA 2 and MDA 4 (one Y cable powers two MDAs)

Bulk power distribution (BPD)

Redundant bulk power distribution (BPD) assemblies provide additional power connections to support the system cooling fans, dc power converters contained in the CEC, and the I/O drawers. Each power distribution assembly provides ten power connections. Two additional BPD assemblies are provided with each Powered Expansion Rack.

Figure 3-15 shows the BPD assembly.
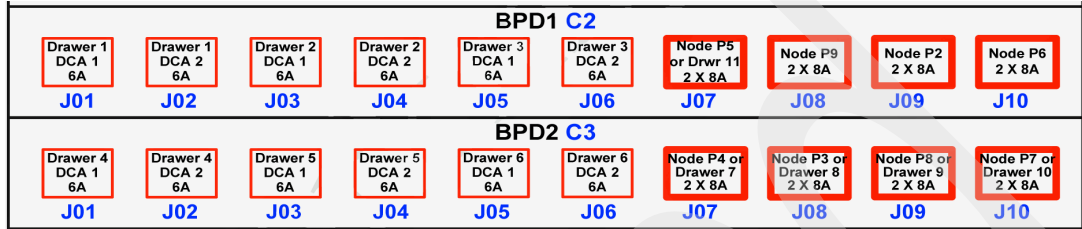
Figure 3-15   Bulk power distribution assembly

Table 3-14 lists the BPD assembly component location codes.

Table 3-14   Bulk power distribution assembly component location codes

Location code	Component	Location code	Component
Un-Px-C2	Bulk Power Distributor 1 (front or rear)	Un-Px-C3	Bulk Power Distributor 2
Un-Px-C2-J01	I/O Drawer 1, DCA 2	Un-Px-C3-J01	I/O Drawer 4, DCA 2
Un-Px-C2-J02	I/O Drawer 1, DCA 1	Un-Px-C3-J02	I/O Drawer 4, DCA 1
Un-Px-C2-J03	I/O Drawer 2, DCA 2	Un-Px-C3-J03	I/O Drawer 5, DCA 2
Un-Px-C2-J04	I/O Drawer 2, DCA 1	Un-Px-C3-J04	I/O Drawer 5, DCA 1
Un-Px-C2-J05	I/O Drawer 3, DCA 2	Un-Px-C3-J05	I/O Drawer 6, DCA 2
Un-Px-C2-J06	I/O Drawer 3, DCA 1	Un-Px-C3-J06	I/O Drawer 6, DCA 1
Un-Px-C2-J07	Processor book 2 (node P5)	Un-Px-C3-J07	Processor book 8 (node P4) or I/O Drawer 7
Un-Px-C2-J08	Processor book 1 (node P9)	Un-Px-C3-J08	Processor book 7 (node P3) or I/O Drawer 8
Un-Px-C2-J09	Processor book 4 (node P2)	Un-Px-C3-J09	Processor book 6 (node P8) or I/O Drawer 9
Un-Px-C2-J10	Processor book 3 (node P6)	Un-Px-C3-J10	Processor book 5 (node P7) or I/O Drawer 10

Bulk power regulators

The redundant bulk power regulators (BPR) interface to the bulk power assemblies to help ensure proper power is supplied to the system components. Figure 3-16 shows four BPR assemblies. The BPRs are always installed in pairs in the front and rear bulk power assemblies to provide redundancy. One to four Bulk Power Regulators (BPRs) are installed in each BPA. A BPR is capable of supplying 8 KW of 350 V dc power. The number of bulk power regulators required is configuration dependent, based on the number of processor MCMs and I/O drawers installed. Figure 3-16 details the BPR assembly.
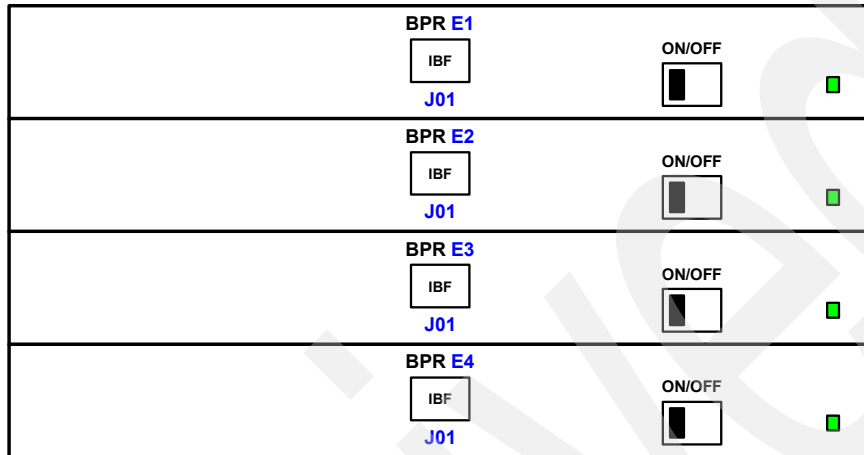
Figure 3-16   Bulk power regulator assemblies

Table 3-15 lists the BPR component location codes.

Table 3-15   Bulk power regulator (component location codes

Location code	Component	Location code	Component
Un-Px-E1	Bulk Power Regulator 4 (front or rear)	Un-Px-E3	Bulk Power Regulator 2 (front or rear)
Un-Px-E1-J01	Not used	Un-Px-E3-J01	Integrated Battery feature connector
Un-Px-E2	Bulk Power Regulator 3 (front or rear)	Un-Px-E4	Bulk Power Regulator 1 (front or rear)
Un-Px-E2-J01	Not used	Un-Px-E4-J01	Integrated Battery feature connector

Bulk power fan

Each bulk power assembly has a bulk power fan for cooling the components of the bulk power enclosure. The bulk power fan is powered through the universal power input cable (UPIC) connected to connector J06 on the BPC. The BPF is shown in Figure 3-17.
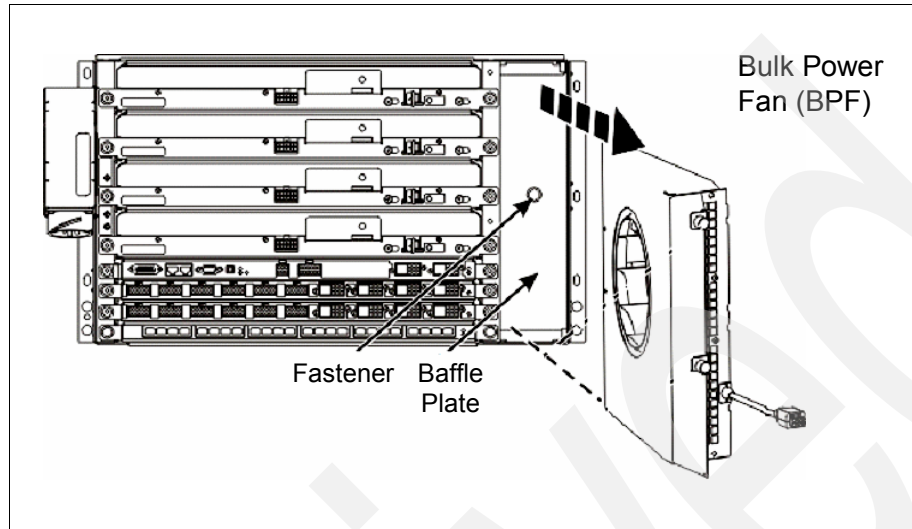
Figure 3-17   Bulk power fan

Integrated battery backup

An optional integrated battery backup feature (IBF) is available for the 9119-FHA server. The battery backup units are designed to protect against power line disturbances and to provide sufficient, redundant power to allow an orderly system shutdown in the event of a power failure. The battery backup units attach to the system bulk power regulators.

Each IBF is 2U high, and IBF units are located in each configured rack, such as CEC, Powered Expansion Rack, and non-powered Bolt-on Rack. When ordered, the IBFs displace the media drawer or an I/O drawer. In the CEC rack, two positions, U9 and U11 (located below the processor books) each are occupied by redundant battery backup units. When positions U9 and U11 are occupied by battery backup units, they replace one I/O drawer position.

When ordered, each unit provides both primary and redundant backup power and occupy 2U of rack space. Each unit occupies both front and rear positions in the rack. The front rack positions provide primary battery backup of the power subsystem, and the rear rack positions provide redundant battery backup. The media drawer is not available when the battery backup feature is ordered. In the Powered Expansion Rack (#6494), two battery backup units are located in locations 9 and 11, displacing one I/O drawer. As in the CEC rack, these battery backup units provide both primary and redundant battery backup of the power subsystem.

System cooling

CEC cooling is provided by up to four high pressure, high flow blowers which mount to a plenum on the rear of the CEC cage (refer to Figure 3-15 on page 136). Air is drawn through all plugged nodes in parallel. In a hot room or under certain fault conditions, blowers will speed up to maintain sufficient cooling. Figure 3-18 details the air flow through the CEC.
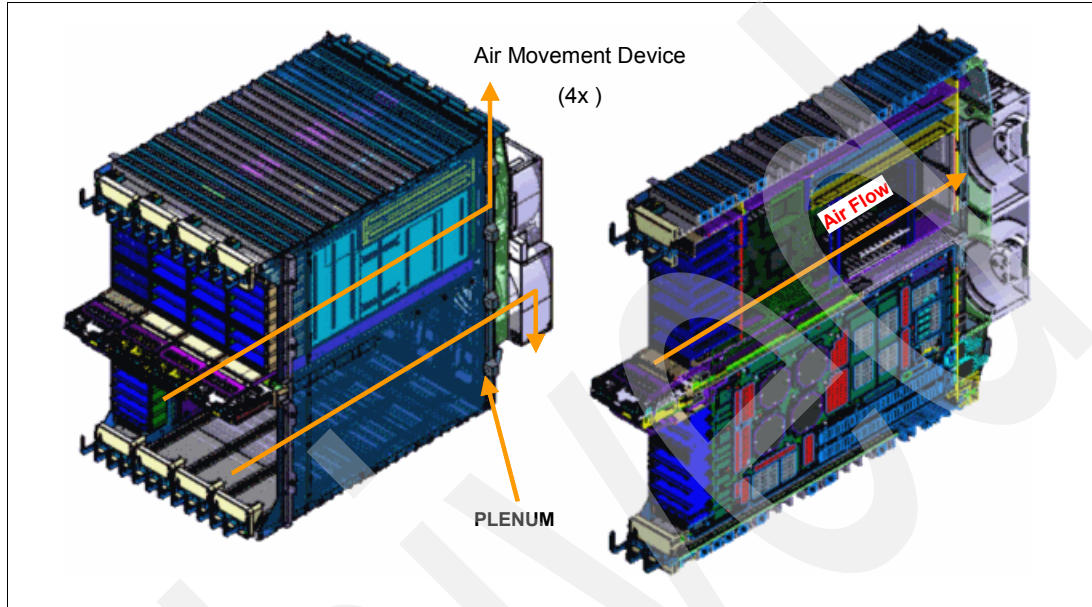
Figure 3-18   CEC internal air flow

There are four motor drive assemblies (MDAs) that mount on the four air movement devices, and a light strip LED identifies the MDAs and the air movement devices:

► MDA 1 and 3 are powered through a Y-cable from the BPC – Connector J10.
► MDA 2 and 4 are powered through a Y-cable from the BPC – Connector J11.

Table 3-16 details the blower population.

Table 3-16   Processor book blower locations

Processor book quantity	Air Movement Device
1 or 2 processor books	A1 and A3
3 or more processor books	A1, A2, A3, A4

Light strips

The 9119-FHA server uses a front and back light strip for service. Both the front and rear light strips have redundant control modules that can receive input from either system controller (SC).

3.6.9 Memory considerations

The 9119-FHA uses DDR2 DRAM memory cards. Each processor book provides 32 memory card slots for a maximum of 256 memory cards per server. The minimum system memory is 16 GB of active memory per processor book. Memory must be configured with a minimum of four identical memory features per processor book, excluding feature #5697 (4 DDR2 DIMMs per feature). Feature #5697, 0/64 GB memory must be installed with eight identical features.

Different memory features cannot be mixed within a processor book. For example, in a 4.2 GHz processor book (#4694), four 0/4 GB (#5693) features, 100% activated DIMMs are required to satisfy the minimum active system memory of 16 GB. For two 4.2 GHz or 5.0 GHz processor books (#4694 or #4695), four 0/4 GB (#5693) features, 100% activated in each processor book is required to satisfy the minimum active system memory of 32 GB. If 0/8 GB (#5694) features are used, then the same minimum system memory requirements can be satisfied with 50% of the DIMMs activated.

Figure 3-19 shows a DDR2 with buffered memory.
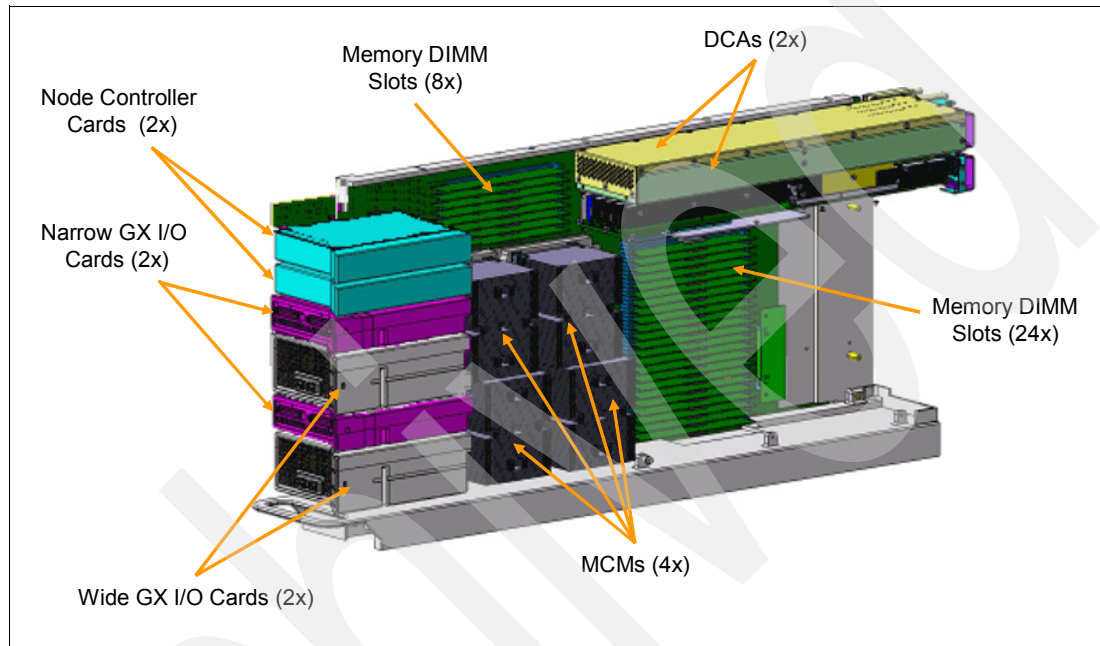
Figure 3-19   DDR2 buffered memory

In summary, memory DIMM plugging rules per processor book include:

► Minimum of four identical memory features (one feature per 2-core MCM)

► Cannot mix different size/type DIMMs in same processor book (different books can use different DIMMs)

► Must have four, six, or eight identical memory features

Each processor book has four dual-core MCMs, each of which are serviced by one or two memory features (4 DIMMs per feature). DDR2 memory features must be installed in increments of one per MCM (4 DIMM cards per memory feature), evenly distributing memory throughout the processor books installed. Incremental memory for each processor book must be added in identical feature pairs (8 DIMMs). As a result, each processor book will contain either four, six, or eight identical memory features (two per MCM) which equals a maximum of 32 DDR2 memory DIMM cards.

Excluding the 0/4 GB and 0/64 GB memory (#5693 and #5697) memory features, the other memory features 5694, 5695, and 5696 must be 50% activated as a minimum at the time of order with either feature 5680 or 5681.

Features #5693 and #5697 must be 100% activated with either feature 5680 or 5681 at the time of purchase. Also, all bulk order memory features #8201, #8202, #8203, #8204, and #8205 must be activated 100% at the time of order with feature #5681.

Maximum system memory is 4096 GB and 64 memory features (eight features per processor book or 256 DDR2 cards per system).

DDR1 memory is not supported.

DDR2 memory card (#7814) 9119-590, 9119-FHA, 4 GB, 533 MHz is not supported.

Migrated DDR2 memory cards from POWER5 System p 590 and 595 and System i 595 donor servers are supported in a 9119-FHA server. These are the 4501, 4502, and 4503 memory features.

If migrating DDR2 memory, each migrated DDR2 memory feature requires an interposer feature. Each memory size (0/8, 0/16, and 0/32 GB) has its own individual interposer, which is one feature #5605 per 0/8 GB feature, one feature #5611 per 0/16 GB feature, and one feature #5584 per 0/32 GB feature. Each interposer feature is comprised of four interposer cards.

DDR2 migrated memory features must be migrated in pairs. Four interposers are required for each migrated DDR2 feature (4 DIMMs/feature). Interposer cards must be used in increments of two within the same processor book. Each 9119-FHA processor book can contain a maximum of 32 interposer cards.

In general, mixing memory within processor books is not allowed, whereas mixing memory across the entire POWER6 9119-FHA server is allowed. Within a 9119-FHA server, each individual processor book can contain a memory different from that contained in another processor book. However, within a processor book, all memory must be comprised of identical memory features.

Thus, within a 9119-FHA processor book, migrated interposer memory cannot be mixed with 9119-FHA memory features, even if they are the same size. Within a 9119-FHA server, it is recommended that mixed memory should not be different by more than 2x in size. That is, a mix of 8 GB and 16 GB features is acceptable, but a mix of 4 GB and 16 GB is not recommended within a server.

Table 3-17 summarizes the memory features.

Table 3-17   9119-FHA memory features

DIMM Size	Memory speed[1]	Memory Feature[2]	DIMMs per Feature	Memory Feature	1 book Min/Max	8 book Maximum
1 GB	667 MHz	#5693	4	0/4 GB	16/32 GB	256 GB
2 GB	667 MHz	#5694	4	0/8 GB	32/64 GB	512 GB
4 GB	533 MHz	#5695	4	0/16 GB	64/128 GB	1 TB
8 GB	400 MHz	#5696	4	0/32 GB	128/256 GB	2 TB
16 GB[3]	400 MHz	#5697	4	0/64 GB	512/512 GB	4 TB

Rules per processor book
▶ Minimum of 4 identical memory features (one feature per 2-core MCM).
▶ Cannot mix different size/type DIMMs in same processor book. Different books can use different DIMMs.
▶ Must have 4, 6, or 8 identical memory features.[1]
▶ Mixing memory features of different MHz speeds is not recommended. Depending upon your particular book configuration memory speed access can tend toward the slowest installed speed.
▶ 820x bulk memory package and 450x migrated memory features not shown

Notes
1. Each processor book runs its memory at that memory's MHz.
2. If 0/64 GB feature, minimum = 8 features per book, versus 4 features.
3. Available only on 5.0 GHz 9119-FHA, not on 4.2 GHz 9119-FHA.

Memory placement rules

Each processor book features four MCMs. Figure 3-20 shows the physical card slot layout of the MCMs and their corresponding memory (4 DIMMs each) units.
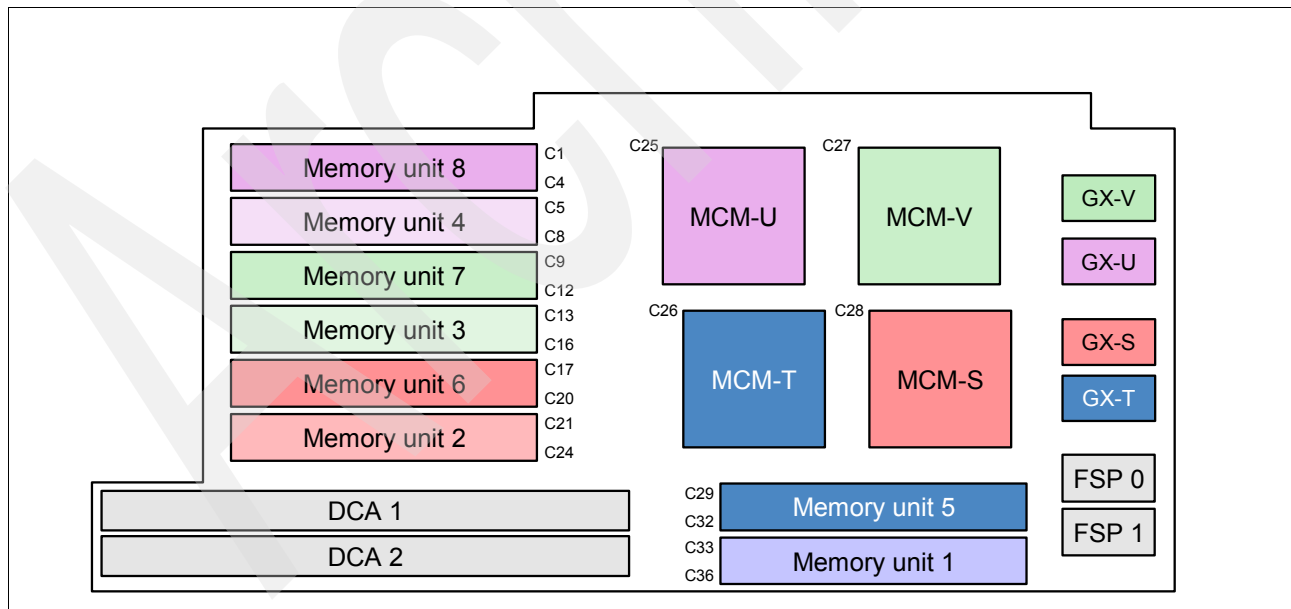
Figure 3-20   Processor book with MCM and memory locations

Table 3-18 shows the sequence in which the memory DIMMs are populated within the processor book. Memory units one through four must be populated on every processor book. Memory units five through eight are populated in pairs (5 and 6, 7 and 8) and do not have to be uniformly populated across the installed processor books. For example, on a system with

three processor books, it is acceptable to have memory units 5 and 6 populated on just one of the processor books.

Table 3-18   Memory DIMM installation sequence

Installation sequence	Memory unit	MCM
1	C33-C36	MCM-S (C28)
2	C21-C24	MCM-T (C26)
3	C13-C16	MCM-V (C27)
4	C5-C8	MCM-U (C25)
5	C29-C32	MCM-S (C28)
6	C17-C20	MCM-T(C26)
7	C9-C12	MCM-V (C27)
8	C1-C4	MCM-U (C25)

As stated earlier, within a 9119-FHA server, individual processor books can contain memory different from that contained in another processor book. However, within a processor book, all memory must be comprised using identical memory features.

For balanced memory performance within a 9119-FHA server, IBM recommends mixed memory size DIMMS should not be different by more than 2x in size. That is, a mix of 8 GB and 16 GB features is acceptable, but a mix of 4 GB and 16 GB is not recommended within a server.

When multiple DIMM sizes are ordered, smaller DIMM sizes are placed in the fewest processor books possible, while insuring that the quantity of remaining larger DIMMs are adequate to populate at least one feature code per MCM module. The largest DIMM size is spread out among all remaining processor books. This tends to balance the memory throughout the system.

For memory upgrades, DIMMs are added first to those books with fewer DIMMs until all books have the same number of DIMMs. Any remaining memory is then distributed round robin amongst all books having that size DIMM.

The following memory configuration and placement rules apply to the 9119-FHA server:

► At initial order, each installed processor book must have a minimum of:
  – Four memory units installed (50% populated). The memory units must use the same DIMM size within the processor book. Different DIMM sizes can be used within the 9119-FHA server. For 16 GB DIMMs, memory units must be installed in groups of eight.
  – 6 GB of memory activated.
► Memory upgrades can be added in groups of two units (16 GB DIMMs must be added in groups of eight units)
  – For memory upgrades, you are not required to add memory to all processor books.
  – You must maintain the same DIMM sizes within a processor book when adding
  – memory.
  – Processors books will be 50% (initial), 75%, or 100% populated. Put another way, each processor book will have either, four, six, or eight memory units installed.

Memory bandwidth

The 9119-FHA memory subsystem consists of L1, L2, and L3 caches along with the main memory. Table 3-19 shows the bandwidths for these memory components.

Table 3-19   Memory bandwidth

Description	Bus size	Bandwidth
L1 (data)	2 x 8 bytes	80 GBps
L2	2 x 32 bytes	160 GBps
L3	4 x 8 bytes	80 GBps (per 2-core MCM) 2.56 TBps (per 64-core system)
Main memory	4 x 1 byte (write) 4 x 2 bytes (read)	42.7 GBps (per 2-core MCM) 1.33 TBps (per 64-core system)

3.6.10 Internal I/O subsystem

The 9119-FHA utilizes remote I/O drawers for directly attached PCI or PCI-X adapters and disk capabilities housed within I/O enclosures. The 9119-FHA supports I/O DASD and media drawers through Remote I/O (RIO), the same as System i terminology High Speed Loop (HSL), and 12x Host Channel Adapters (HCA) that are located in the front of the processor books. These are collectively referred to as GX adapters.

There are a two types of GX adapter cards supported in the 9119-FHA servers:

► Remote I/O-2 (RIO-2) dual port Loop Adapter (#1814)
► GX dual port 12X adapter (#1816)

Drawer connections are always made in loops to help protect against a single point-of-failure resulting from an open, missing, or disconnected cable. Systems with non-looped configurations would have a higher exposure to degraded performance and serviceability.

RIO-2 loop connections operate bidirectional at 1 GBps (2 GBps aggregate). RIO-2 loops connect to the system CEC through RIO-2 loop attachment adapters (#1814). Each adapter has two ports and can support one RIO-2 loop. Up to four of the adapters can be installed in each 8-core processor book.

12X loop connections operate bidirectional at 3 GBps (6 GBps aggregate). 12x loops connect to the system CEC through 12x loop attachment adapters (#1816). Each adapter has two ports and can support one 12x loop.

Up to four of the GX adapters, in any RIO-2 or 12X combination, can be installed in each 8-core processor book: two wide and two narrow. Beginning with the adapter slot closest to Node Controller 0, the slots alternate narrow-wide-narrow-wide. In the illustration at left, GX slots T and U are narrow, and S and V are wide.

Figure 3-21 details the GX adapter layout for a two processor books configuration.
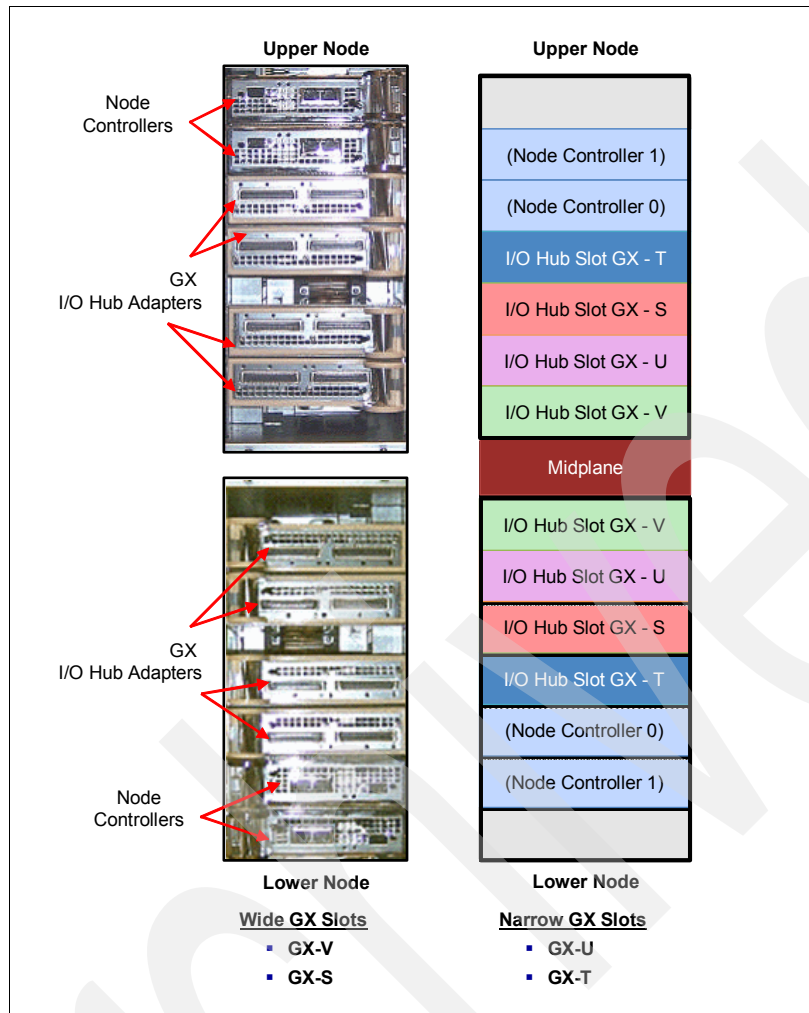
Figure 3-21   GX adapter placement

The term *I/O hub is* another way of referring to the GX adapter. For I/O hub plugging rules refer to "I/O hub adapter plugging rules" on page 146.

Each processor book on the 9119-FHA server provides four GX busses for the attachment of GX bus adapters. A fully configured 9119-FHA server with eight processor books supports up to 32 GX bus adapters. Figure 3-22 shows the GX bus adapter locations.
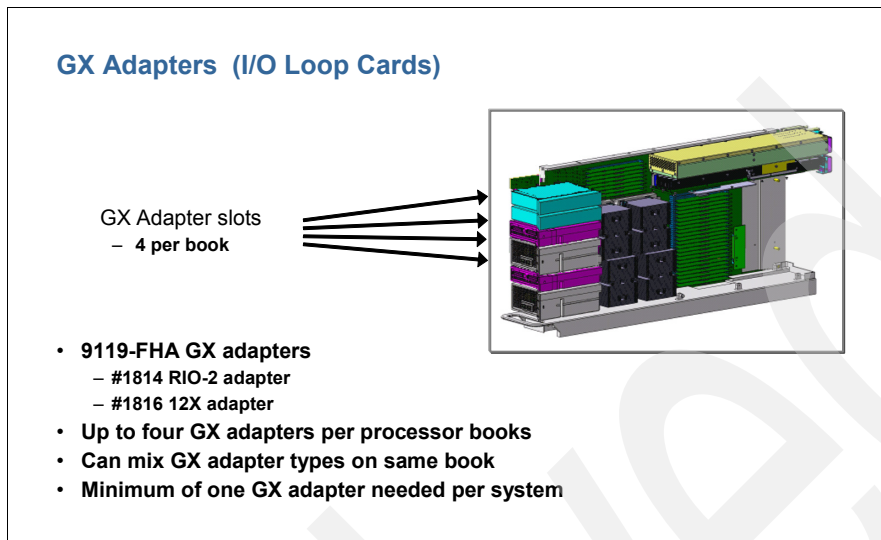
Figure 3-22   GX bus adapters

The processor book provides two narrow and two wide GX bus adapter slots. Narrow adapters will fit into both narrow and wide GX bus slots.

Connection technology

RIO-2 and 12x connectivity is provided using GX bus adapter based, remote I/O hubs. Table 3-20 lists these remote I/O hubs.

Table 3-20   Remote I/O hub GX adapters

Feature	Description	Form factor	Attach to drawers	Support		
				AIX	IBM i	Linux
1814	Remote I/O-2 (RIO-2) Loop Adapter, Two Port	narrow	5791, 5794	✓		✓
			0595, 5094/5294 5096/5296		✓	
1816	GX Dual-Port 12x HCA	narrow	5797, 5798	✓	✓	✓

Each I/O hub provides two ports that can connect internal 24 inch I/O drawers within the system rack or that can connect I/O drawers and enclosures with the following configurations:

► Within a 24 inch #6954 powered expansion rack

► Within a 24 inch #6953 non-powered expansion rack (attached to a #6954)

► Within a 19 inch (System i) such as a #0553 19 inch 2 meter rack

The RIO-2 I/O hubs are currently available. The 12x I/O hubs are planned to be available 21 November 2008.

Figure 3-23 shows the connector orientation for the RIO-2 and 12X hubs.
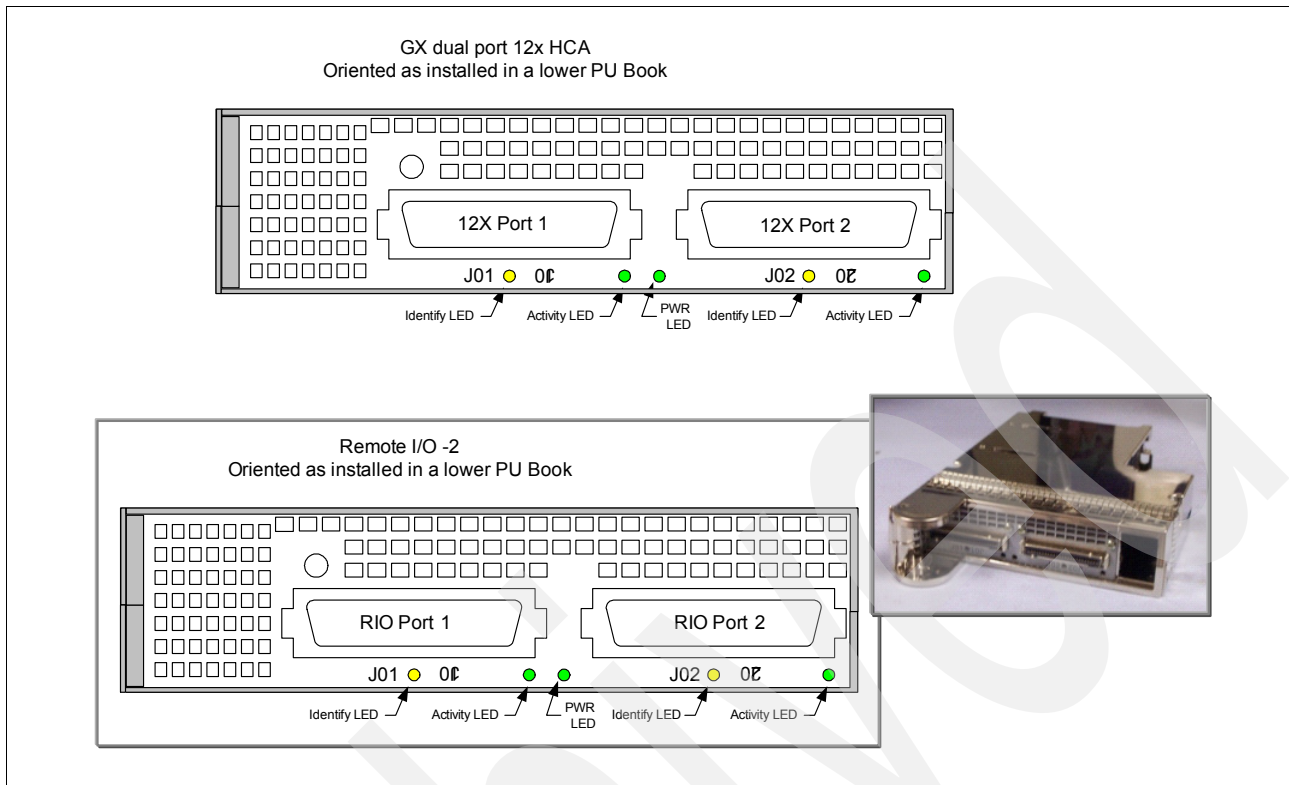
Figure 3-23   RIO-2 and 12X connector locations

I/O hub adapter plugging rules

This section provides an overview of the basics of connecting I/O enclosures to GX adapters within the 9119-FHA processor books (*nodes*). Although we provide much information here, the number of variations to GX adapter plugging rules and associated cable connections to I/O enclosures is quite large. The amount of information is more than we can include in this section and is beyond the scope of this paper.

All POWER5 and POWER6 595 configurations require working with your authorized IBM hardware service representative, with setting up a new configuration and, depending upon the extent of new hardware that you want to connect, with connecting hardware that was ordered after the original installation. These representatives attend IBM training courses that specifically address this topic.

The I/O hubs are evenly distributed across the installed processor books on a new system order. This new order follows the processor book plugging sequence listed in Table 3-11 on page 126 and Figure 3-9 on page 127 along with the following priorities:

► Bottom narrow slots across all processor nodes
► Upper narrow slots across all processor nodes
► Bottom wide slots across all processor nodes
► Upper wide slots across all processor nodes

This information (bottom and upper notation) is applicable regardless of the orientation of the processor books (upper or lower). That is, the bottom means bottom whether you are plugging into a processor book installed in an upper or lower location.

Important: When a new 9119-FHA server is manufactured, the I/O hubs are distributed evenly across the installed processor books. I/O connections are then distributed across these installed I/O hubs. If you add additional I/O hubs during an upgrade, they are installed so that the end result is an even balance across all new and existing processor books. Therefore, the cabling relationship between the I/O hubs and drawers can vary with each 9119-FHA server. We recommend that you document these connections to assist with system layout and maintenance. I/O hubs cards can be hot-added.

Concurrent re-balancing of I/O hub cards is not supported.

Figure 3-24 shows an example of the I/O hub installation sequence for a fully configured system with eight processor books (Node 2 through Node 9) and 32 I/O hubs. The plugging sequence is indicated by a number within each white square in the left upper corner of each rectangle (adapter) shown.

Node P2 Plug seq. 4	Node P3 Plug seq. 7	Node P4 Plug seq. 8	Node P5 Plug seq. 2
12 Narrow	15 Narrow	16 Narrow	10 Narrow
28 Wide	31 Wide	32 Wide	26 Wide
4 Narrow	7 Narrow	8 Narrow	2 Narrow
20 Wide	23 Wide	24 Wide	18 Wide
Mid-plane			
27 Wide	29 Wide	30 Wide	25 Wide
11 Narrow	13 Narrow	14 Narrow	9 Narrow
19 Wide	21 Wide	22 Wide	17 Wide
3 Narrow	5 Narrow	6 Narrow	1 Narrow
Plug seq. 3 Node P6	Plug seq. 5 Node P7	Plug seq. 6 Node P8	Plug seq. 1 Node P9

Figure 3-24   I/O hub installation sequence

Wide slots can accept both narrow and wide hub adapters.

Figure 3-25 depicts two nodes (upper and lower) that uses the following rules:

► Narrow slots (Pn-C38, Pn-C40) are populated first, unless an adapter needs to plug into a wide adapter slot (Pn-C37, Pn-C39).

► Populate from the bottom up.

► Distribute GX hub adapters among all PU books, starting with the first book plugged and proceeding in book plug order up to a maximum of 32 GX adapters.
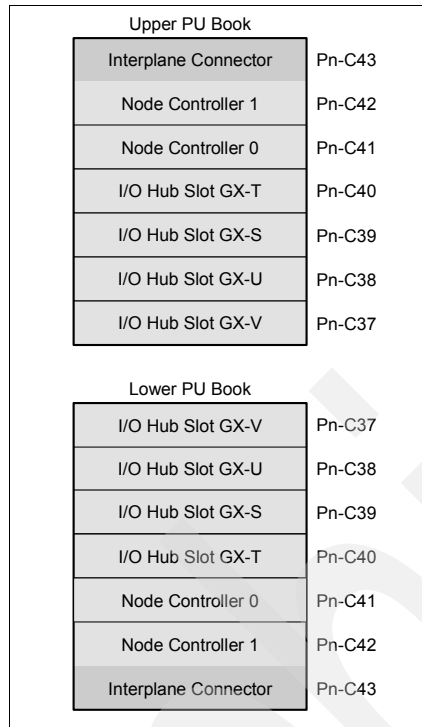
Figure 3-25   Two processor books view of I/O hub (GX adapter) pugging rules

Figure 3-26 depicts some rules for plugging GX adapter plugging rules from one to eight processor books (nodes). The eight book configuration is identical to that shown in Figure 3-24 on page 147.

1 Book System

				4
				2
				3
				1
				Book P9

2 Book System

			Book P5
			4
			8
			2
			6
			7
			3
			5
			1
			Book P9

3 Book System

			Book P5
			5
			11
			2
			8
12			10
6			4
9			7
3			1
Book P6			Book P9

4 Book System

Book P2			Book P5
8			6
16			14
4			2
12			10
15			13
7			5
11			9
3			1
Book P6			Book P9

5 Book System

Book P2			Book P5
9			7
19			17
4			2
14			12
18	20		16
8	10		6
13	15		11
3	5		1
Book P6	Book P7		Book P9

6 Book System

Book P2			Book P5
10			8
22			20
4			2
16			14
21	23	24	19
9	11	12	7
15	17	18	13
3	5	6	1
Book P6	Book P7	Book P8	Book P9

7 Book System

Book P2	Book P3		Book P5
11	14		9
25	28		23
4	7		2
18	21		16
24	26	27	22
10	12	13	8
17	19	20	15
3	5	6	1
Book P6	Book P7	Book P8	Book P9

8 Book System

Book P2	Book P3	Book P4	Book P5
12	15	16	10
28	31	32	26
4	7	8	2
20	23	24	18
27	29	30	25
11	13	14	9
19	21	22	17
3	5	6	1
Book P6	Book P7	Book P8	Book P9

Figure 3-26   One through eight processor books (nodes) view of I/O Hub (GX adapter) plugging rules

Additional notes regarding Figure 3-26:

► When adding I/O hub cards to existing Nodes, follow the plugging order previously listed in this topic.

► When adding I/O hub cards to newly added nodes, add I/O hub cards to the new nodes using the following rules;

► Leave existing I/O hub cards as is.

► Populate the new node with as many I/O hub cards until the new node has as many hub cards as an existing node with the least number of hub cards.

► Continue adding any remaining hub cards in node plug order, starting with the node with the least hub cards and in the lowest plug order and following with the plugging order described earlier.

3.6.11 Power 9119-FHA I/O loop, drawer, and tower options

The following topics provide additional I/O details regarding I/O enclosures (drawer and towers), associated RIO-2 or 12X I/O loop feature numbers, and operating system support.

24 inch internal I/O drawers
The internal I/O drawers (24 inch) provide storage and I/O connectivity for the 9119-FHA server. Table 3-21 lists the available internal I/O drawers.

Table 3-21   Internal I/O drawers

Feature	Description	Connection Adapter	Support		
			AIX	IBM i	Linux
5791	I/O drawer, 20 slots, 16 disk bays	1814	✓		✓
5797	12x I/O drawer, 20 slots, 16 disk bays, with repeater	1816	✓	✓	✓
5798	12x I/O drawer, 20 slots, 16 disk bays, no repeater	1816	✓	✓	✓

I/O drawers #5791 and #5797 (with repeater) are supported in the system (CEC) rack, powered expansion racks, and nonpowered expansion racks. I/O drawer #5798 (without repeater) is only supported in the system rack.

> **Note:** I/O drawers #5797 and #5798 have a planned availability date of 21 November 2008.

Figure 3-27 shows the components that make up an internal I/O drawer. The I/O riser cards provide RIO-2 or 12x ports that are connected through cables to the I/O hubs located in the processor books within the CEC.
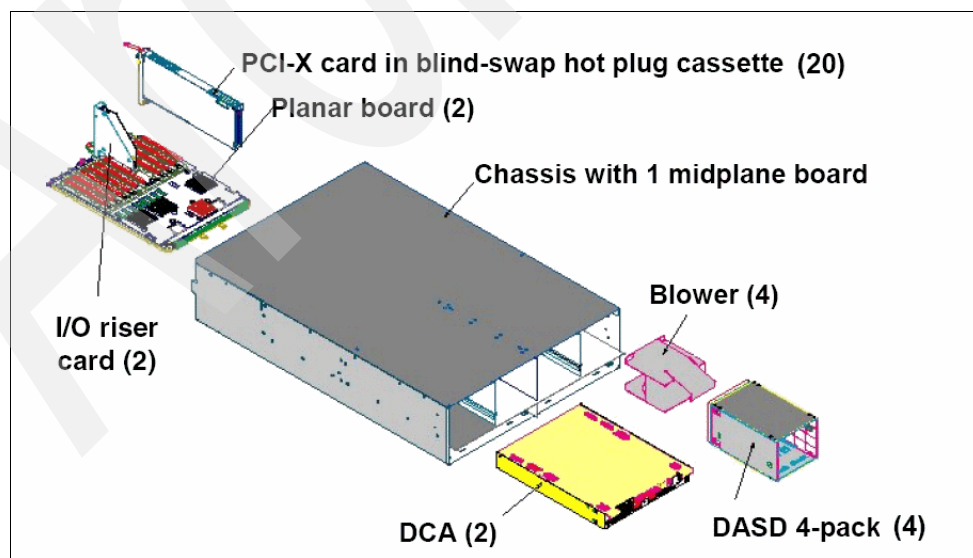
Figure 3-27   I/O drawer internal view

Each I/O drawer is divided into two halves. Each half contains 10 blind-swap adapter slots (3.3 volt) and two Ultra3 SCSI 4-pack backplanes for a total of 20 adapter slots and 16 hot-swap disk bays per drawer. The internal SCSI backplanes provide support for the internal drives and do not have an external SCSI connector. Each half of the I/O drawer is powered separately.

Additional I/O drawer configuration requirements include:

► A blind-swap hot-plug cassette is provided in each PCI-X slot of the I/O drawer. Cassettes not containing an adapter are shipped with a plastic filler card installed to help ensure proper environmental characteristics for the drawer. Additional blind-swap hot-plug cassettes can be ordered: #4599, PCI Blind Swap Cassette Kit.

► All 10 adapter slots on each I/O drawer planar are capable of supporting either 64-bit or 32-bit 3.3 V based adapters.

► For maximum throughout, It is recommended that you use two I/O hubs per adapter drawer (one I/O hub per 10 slot planar). This is known as dual-barrel cabling configuration. Single-barrel configuration is supported for configurations with a large number of internal I/O drawers.

Table 3-22 provides a feature comparison for the RIO-2 and 12x based internal I/O drawers.

Table 3-22   Internal I/O drawer feature comparison

Feature / Function	5791 drawer	5797, 5798 drawers
Connection technology	RIO-2	12x
Bandwidth per connection port (4 ports per drawer)	1.7 GBps sustained 2 GBps peak	5 GBps sustained 6 GBps peak
PCI-X (133 MHz) slots	10 per planar (20 total)	3 per planar (6 total)
PCI-X 2.0 (266 MHz)	slots none	7 per planar (14 total)
Ultra3 SCSI busses	2 per planar (4 total)	2 per planar (4 total)
SCSI disk bays	8 per planar (16 total)	8 per planar (16 total)
Maximum drawers per system	12	30 (5797) 3 (5798) 30 (5797+5798)

RIO-2 based internal I/O drawer (#5791)

The 5791 internal I/O drawer uses RIO-2 connectivity to the CEC. All 20 slots are PCI-X based. Figure 3-28 shows an internal diagram of the #5791 internal I/O drawer. Each EADS-X controls multiple PCI slots. Each EADS-x is in turn controlled by a bridge controller.
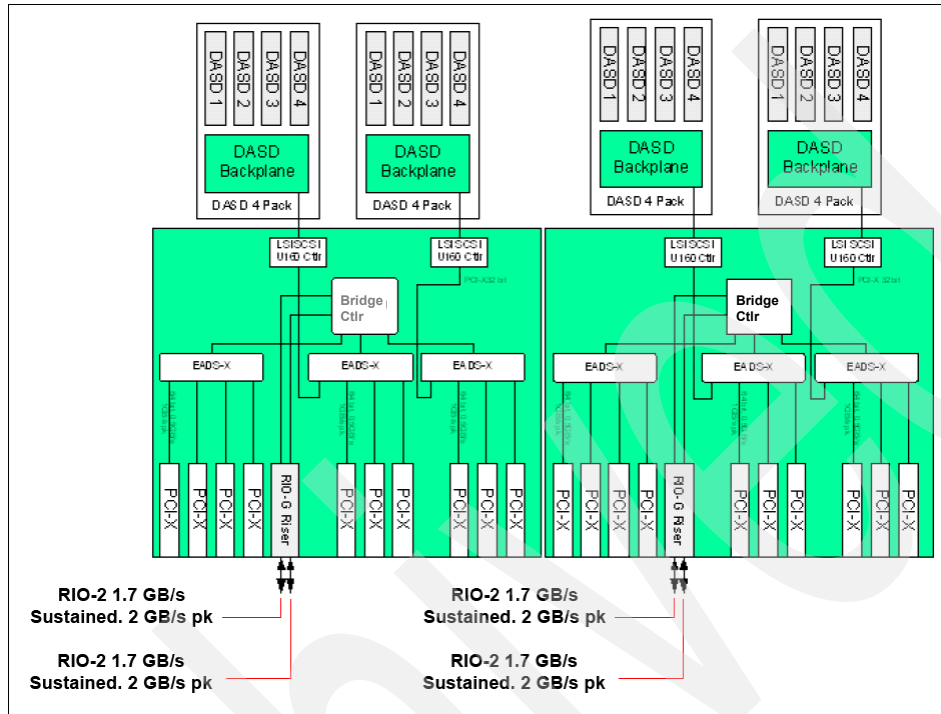
Figure 3-28   #5791 Internal I/O expansion drawer (RIO-2)

12X based internal I/O drawers (#5797 and #5798)

The #5797 and #5798 internal I/O drawers use 12X connectivity to the CEC. Each of these I/O drawers provide a total of 14 PCI-X 2.0 (266 MHz) slots and 6 PCI-X (133 MHz) slots. Figure 3-29 shows an internal diagram of the #5797 and #5798 internal I/O drawers. Both EADS-X and bridge controller components interface with multiple PCI slots.
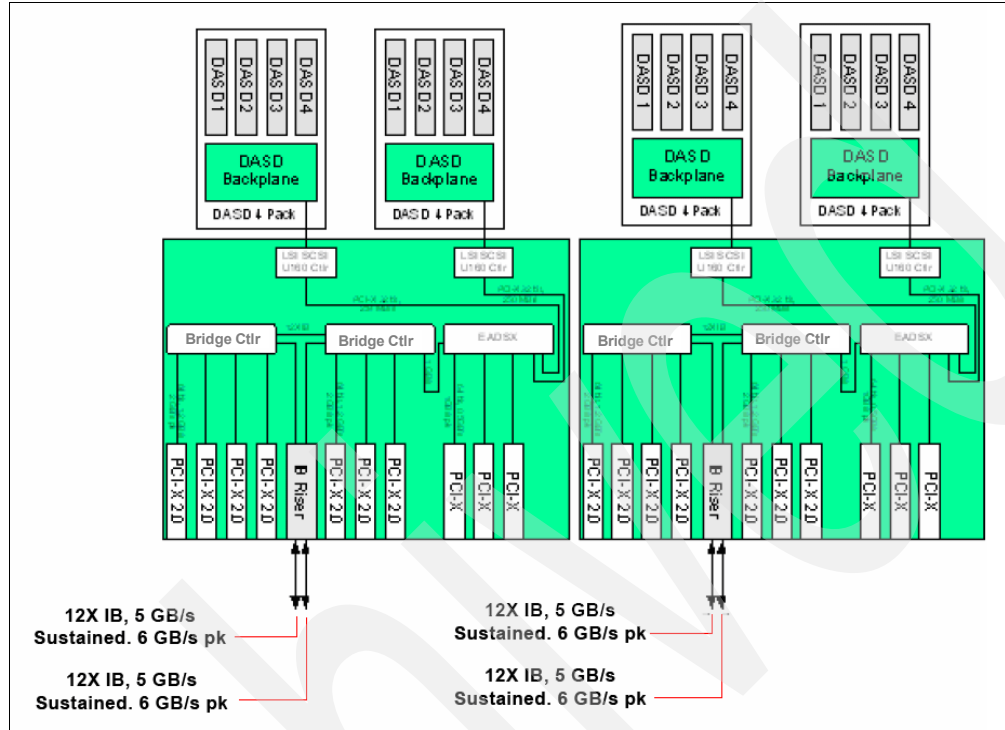
Figure 3-29   #5797 and #5798 Internal I/O drawers (12x)

The 9119-FHA server has the following maximum requirements:

► Maximum, all 24 inch drawers: 30 12x or 12 RIO-2
► Maximum, all 19 inch I/O drawers with PCI slots: 96

Figure 3-30 on page 154 shows an example of the drawer installation sequence (numbers within parentheses (#nn) when the battery backup feature (IBF) is not installed and I/O drawer location #3 is not used. Location #3 can be used but is not in this example. See the text within drawer location #3. If the IBF is installed, the battery backup units are located where I/O drawer #2 would have been located.

Other figures that follow show examples of other possible 9117-FHA rack and I/O enclosure configurations.

Some notes regarding what is shown in Figure 3-30:

► The orange colored EIA units indicate required components, for example processor book #1, Bulk Power Controller (BPC), Bulk Power Regulator (BPR), and I/O drawer #1.

► This is an example of a system (CEC) frame and three 24 inch expansion racks plus one 19 inch rack. It is used as a model for the following additional notes. This example is not all inclusive of all GX adapter connection possibilities. This example shows all #5797/5798 drawers (available, starting November 2008) within the 24 inch racks.

► You can use up to 12 5791/5794 I/O drawers in place of the 5797 drawers (same UPIC cables).

► The system (CEC) frame power connects to the corresponding power connection in the top of the #6954 powered expansion racks. An IBM i configuration could include only 19 inch racks. Figure 3-33 on page 157 depicts a simplified version of that configuration.

► If the configuration had only system unit drawers, connection #1 is required. You can use system CEC drawer location #2 (assuming no Integrated Battery Backup feature) and a third (#3) drawer location for a#5797/#5798 I/O drawer could be placed in the system CEC. The place for drawer 3 is currently un-occupied as indicated with the text "no I/O drawer because #6954 quantity is more than one." Thus, connection sequence #3 is shown as the #5797 I/O drawer in the left 6954 powered expansion unit #1.

► In this example configuration IBM i could use up to two addtional RIO-2 loops and 19 inch I/O drawers, such as the #0553 shown here.
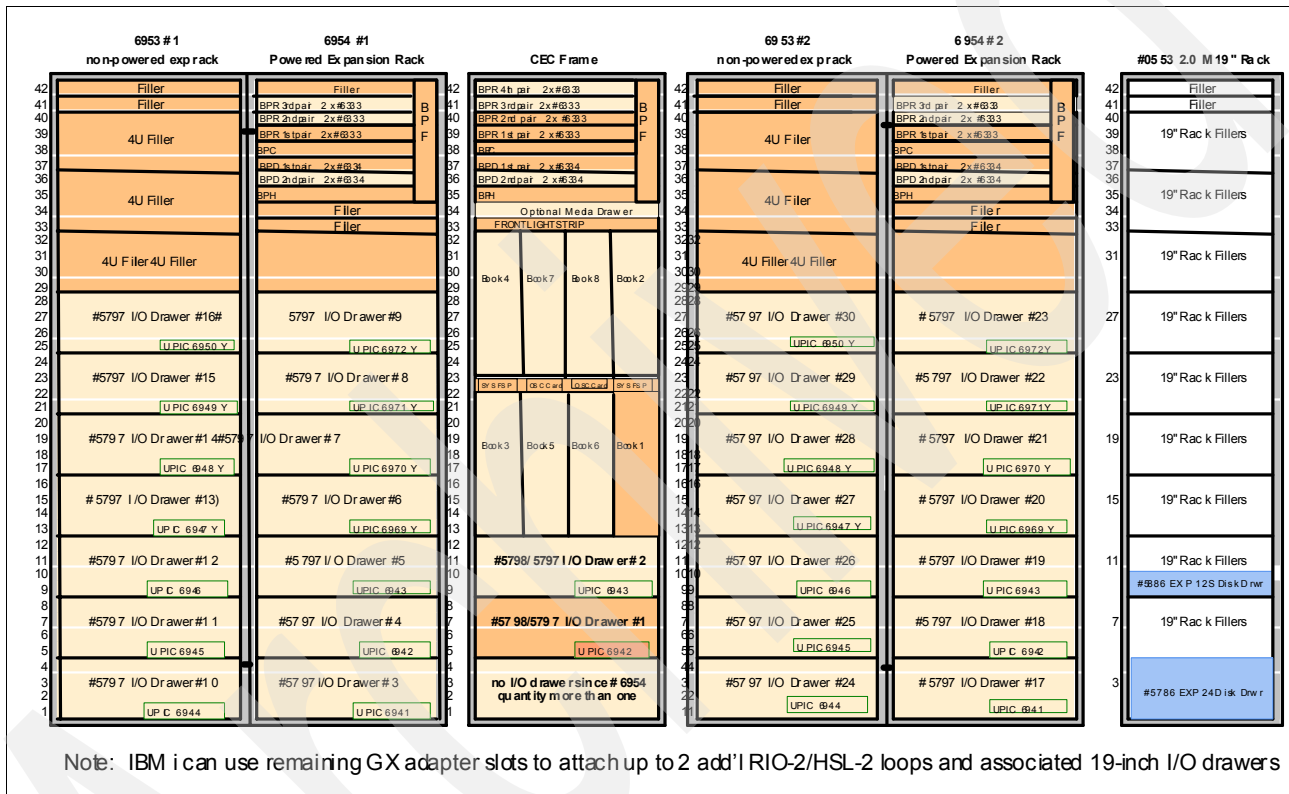
Figure 3-30   9119-FHA I/O expansion drawer locations

Addtional rack configurations are shown in Figure 3-31, Figure 3-32, and Figure 3-33. Note that the system CEC frame shows all three I/O drawer slots occupied.

Figure 3-30 shows all #5797/5798 drawers (available, starting November 2008). You can use up to 12 #5791 and #5794 I/O drawers in place of the #5797 drawers (same UPIC cables). The system CEC frame shows all three I/O drawer slots occupied. IBM i can use remaining GX adapter slots to attach up to 15 additional RIO-2/HSL-2 loops and associated 19 inch I/O drawers.

Figure 3-31   Example 9119-FHA with three 24 inch frame and racks

Figure 3-32 represents a possible configuration prior to the availability of #5797 and #5798 I/O drawers, starting in November 2008.

9119-FHA Max 24-inch Frame/Rack Configuration

Maximum of 12 24 inch I/O drawers #5791, #5794, #5807, and #5808 (prior to November 2008 and 12X I/O drawers)

6953 #1 non-powered exp rack

42	Filler
41	Filler
40	4U Filler
39	
38	
37	
36	4U Filler
35	
34	
33	
32	4U Filler
31	
30	
29	
28	4U Filler
27	
26	
25	
24	
23	4U Filler
22	
21	
20	
19	4U Filler
18	
17	
16	
15	4U Filler
14	
13	
12	
11	4U Filler
10	
9	
8	
7	#5791/5794 I/O Drawer #12
6	
5	UPIC 6945
4	
3	#5791/5794 I/O Drawer #11
2	
1	UPIC 6944

6954 #1 Powered Expansion Rack

42	Filler
41	BPR 3rd pair 2 x #6333
40	BPR 2nd pair 2 x #6333
39	BPR 1st pair 2 x #6333
38	BPC
37	BPD 1st pair 2 x #6334
36	BPD 2nd pair 2 x #6334
35	BPH
34	Filler
33	Filler
32	4U Filler
31	
30	
29	
28	#5791/5794 I/O Drawer #10
27	
26	
25	UPIC 6972 Y
24	
23	#5791/5794 I/O Drawer #9
22	
21	UPIC 6971 Y
20	
19	#5791/5794 I/O Drawer #8
18	
17	UPIC 6970 Y
16	
15	#5791/5794 I/O Drawer #7
14	
13	UPIC 6969 Y
12	
11	#5791/5794 I/O Drawer #6
10	
9	UPIC 6943
8	
7	#5794/5794 I/O Drawer #5
6	
5	UPIC 6942
4	
3	#5791/5794 I/O Drawer #4
2	
1	UPIC 6941

(B P F)

CEC Frame

42	BPR 4th pair 2 x #6333
41	BPR 3rd pair 2 x #6333
40	BPR 2nd pair 2 x #6333
39	BPR 1st pair 2 x #6333
38	BPC
37	BPD 1st pair 2 x #6334
36	BPD 2nd pair 2 x #6334
35	BPH
34	Optional Media Drawer
33	FRONT LIGHT STRIP
32	Book 4 Book 7 Book 8 Book 2
31	
30	
29	
28	
27	
26	
25	
24	
23	SYS FSP OSC Card OSC Card SYS FSP
22	
21	
20	
19	Book 3 Book 5 Book 6 Book 1
18	
17	
16	
15	
14	
13	
12	
11	#5791/5794 I/O Drawer #2
10	
9	UPIC 6943
8	
7	**#5791 I/O Drawer #1**
6	
5	UPIC 6942
4	
3	#5791/5794 I/O Drawer #3
2	
1	UPIC 6941

(B P F)

#0553 2.0 M 19" Rack

42	Filler
41	Filler
40	19" Rack Fillers
39	
38	
37	
36	
35	19" Rack Fillers
34	
33	
32	
31	19" Rack Fillers
30	
29	
28	
27	19" Rack Fillers
26	
25	
24	
23	19" Rack Fillers
22	
21	
20	
19	19" Rack Fillers
18	
17	
16	
15	19" Rack Fillers
14	
13	
12	
11	19" Rack Fillers
10	#5886 EXP 12S Disk Drwr
9	
8	
7	19" Rack Fillers
6	
5	
4	
3	#5786 EXP24 Disk Drwr
2	
1	

Note: IBM i can use remaining GX adapter slots to attach up to 18 add'l RIO-2/HSL-2 loops and associated 19-inch I/O drawers

Figure 3-32   Example 9119-FHA with three 24 inch frame and rack prior to November 2008 availability of 12X I/O drawers

Figure 3-33 shows a 9119-FHA system frame with only a 19 inch rack. It depicts a simplified configuration with IBM i as the primary operating system. Notes about Figure 3-33 include:

► More darkly shaded areas indicate minimum components.

► Prior to November 2008, you should use the #5790 for initial PCI slots. A #5790 PCI-X slot could contain a fibre channel adapter, such as a #5749, which could connect to DS8000 series IBM external storage server. In that configuration a LUN on the DS8000 could be used as an IBM i external load source device if specify feature #0837 is used.

► The #5786 EXP24 connected to the appropriate SCSI disk controller within the #5790 is shown. A disk within the #5786 could be used as an IBM i load source. #0725 is the IBM i load source specify for a #5786.

  The EXP24 shown here is not required, if you use external SAN for load source or another 19 inch I/O drawer with disk slots.

► One #5790 is required in this example.

► One removable media drawer is required (#7212-103 and #7214-1U2 are listed).

► SPCN cables (two) are required to connect the system service processors - SYS FSP (two) to the #5790 shown.

► The RIO-2 cables (two) of the RIO-2 GX adapter (#1814) in processor book #1 are shown connecting to the corresponding RIO-2 adapter (#6438) within the #5790.

CEC Frame (Front)

```
42  BPR 4th pair  2 x #6333
41  BPR 3rd pair  2 x #6333
40  BPR 2nd pair  2 x #6333
39  BPR 1st pair  2 x #6333
38  BPC                        B
37  BPD 1st pair  2 x #6334    P
36  BPD 2nd pair  2 x #6334    F
35  BPH
34  Filler
33  FRONT LIGHT STRIP
32
31
30
29
28  Book 4   Book 7   Book 8   Book 2
27
26
25
24
23
22  SYS FSP  OSC Card  OSC Card  SYS FSP
21
20
19
18
17  Book P3  Book 5   Book 6   Book 1
16
15
14
13
12
11
10
 9
 8
 7
 6
 5
 4
 3
 2
 1
```

19-inch Rack
#0553 2.0 Meter orderable

```
42
41
40
39
38
37
36
35
34
33
32
31
30
29
28
27
26
25
24
23                                          #7212-103 for
22                                          SCSI DVD +
21                                          tape
20  removeable media drawer
19                                          #7214-1U2 for
18                                          SAS DVD +
17
16
15
14                                          #7311
13                                          Enclosure
12                                          (for up to
11                                          2x #5790)
10
 9                                          19" PDU to
 8   #5790 six                              Wall Linecord
 7   PCI-X slots                            #6656 et.al.
 6
 5
 4   #5786 EXP24 Disk drawer
 3   attached to SCSI controller in #5790
 2
 1
```

2x SPCN Cables

#1814 RIO-2 GX adapter in book… 2x RIO-2 cables

Figure 3-33   Example 595 system (CEC) frame with only a 19 inch rack containing I/O enclosure used by IBM i

Additionally, Figure 3-33 shows:

► A #7311 and #7311 Dual I/O Unit Enclosure. Alternatively a #7307 Dual I/O Unit Enclosure could be used.

► A #6656 4.3 m (14-ft) 1PH/24A Power Cord. Several power cord features can be chosen, Some are country-specific.

The following topics provide additional information about I/O attachments.

Internal I/O drawer attachment

The internal I/O drawers are connected to the 9119-FHA server CEC using RIO-2 or 12x technology. Drawer connections are made in loops to help protect against errors resulting from an open, missing, or disconnected cable. If a fault is detected, the system can reduce the speed on a cable, or disable part of the loop to maintain system availability.

Each RIO-2 or 12x I/O attachment adapter (I/O hub) has two ports and can support one loop. A maximum of one internal I/O drawer can be attached to each loop. Up to four I/O hub attachment adapters can be installed in each 8-core processor book. Up to 12 RIO-2 or 30 12x I/O drawers are supported per 9119-FHA server.

I/O drawers can be connected to the CEC in either single-loop or dual-loop mode:

► Single-loop (Figure 3-34 on page 159) mode connects an entire I/O drawer to the CEC using one RIO-2 or 12x loop. In this configuration, the two I/O planars in the I/O drawer are connected together using a short cable. Single-loop connection requires one RIO-2 Loop Attachment Adapter (#1814) or GX Dual-Port 12x (#1816) per I/O drawer.

► Dual-loop (Figure 3-35 on page 160) mode connects each of the two I/O planars (within the I/O drawer) to the CEC on separate loops. Dual-loop connection requires two I/O hub attachment adapters (#1814 or #1816) per connected I/O drawer. With a dual-loop configurations, the overall I/O bandwidth per drawer is higher.

Note: It is recommended that you use dual-loop mode whenever possible to provide the maximum bandwidth between the I/O drawer and the CEC.

Table 3-23 lists the number of single-looped and double-looped I/O drawers that can be connected to a 9119-FHA server based on the number of processor books installed.

Table 3-23   Number of RIO-2 and 12X drawers that can be connected

Number of installed processor books	RIO-2 (#5791)		12x (#5797 and #5798)	
	Single-looped	Dual-looped	Single-looped	Dual-looped
1	4	2	4	2
2	8	4	8	4
3	12	6	12	6
4	12	8	16	8
5	12	10	20	10
6	12	12	24	12
7	12	12	28	14
8	12	12	30	15

Single loop (full-drawer) cabling

Figure 3-34 shows single loop I/O drawer connections.
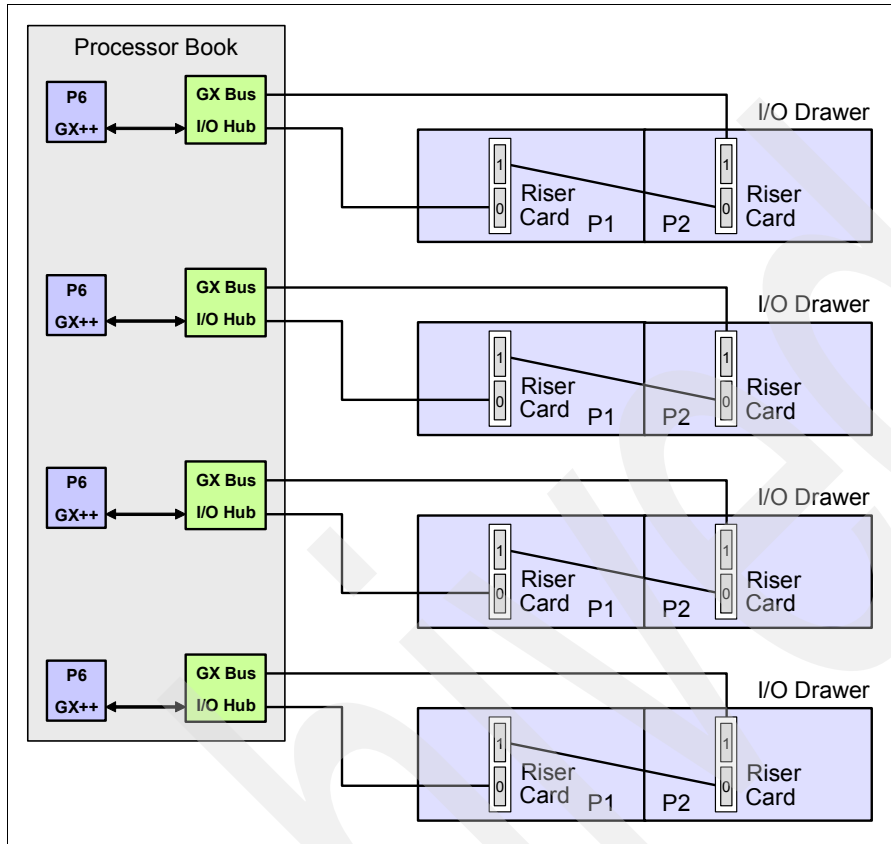
Figure 3-34   Single loop I/O drawer cabling

The short cable connecting the two halves of the drawer ensures that each planar (P1 and P2) within the drawer can access the I/O hub adapter card, even if one of the main connection cables is disconnected or damaged.

Dual looped (half-drawer) cabling

Each of the two. internal I/O drawer planars can be cabled and addressed by an I/O hub individually using the preferred, dual loop (half drawer) cabling, as shown in Figure 3-35.
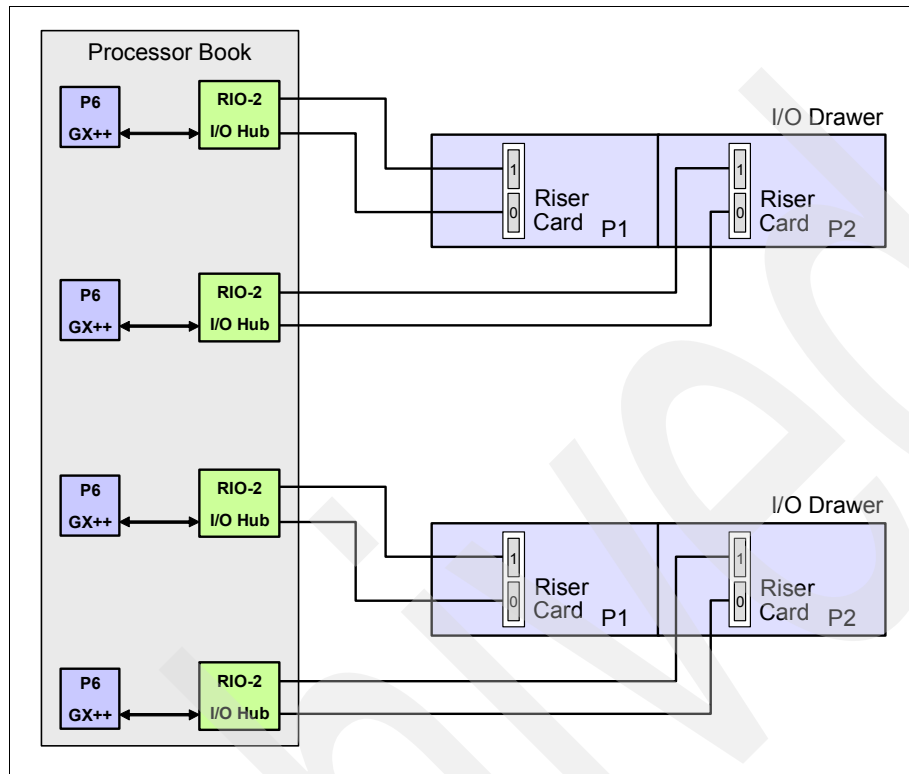
Figure 3-35   Dual loop I/O drawer (FC 5791)

I/O drawer to I/O hub cabling sequence

The I/O expansion drawers are connected using loops to the I/O hubs in the same order that the I/O hubs were installed, as described in "Connection technology" on page 145. Most installations will use dual loop configurations for the I/O expansion drawers and, therefore, each planar (half) of the drawer will be connected to an individual I/O hub adapter as follows:

► The I/O expansion drawers are cabled in numerical order.

► Viewed from the rear side of the rack, the left-hand planar is cabled first, followed by the right-hand planar of the same I/O expansion drawer.

► For each planer:

  – The lower connector on the I/O expansion drawer riser card connects to the left-hand connector on the I/O hub adapter in the processor book.

  – The upper connector on the I/O expansion drawer riser card connects to the right-hand connector on the I/O hub adapter in the processor book.

Loop connection sequence

The I/O expansion drawer loops are cabled to the I/O hubs using an even distribution across all of the installed processor books. The order follows the processor book plugging sequence listed in Table 3-11 on page 126 along with the following priorities:

1. I/O hubs installed in bottom narrow slots across all processor nodes.

2. I/O hubs installed in upper narrow slots across all processor nodes.

3. I/O hubs installed in bottom wide slots across all processor nodes.

4. I/O hubs installed in upper wide slots across all processor nodes.

This information (bottom and upper notation) is applicable regardless of the orientation of the processor books (upper or lower). That is, bottom means bottom whether you are plugging into an upper or lower processor book.

Figure 3-36 provides an example of the loop cabling between an I/O expansion drawer and an I/O hub for a 9119-FHA server with one processor book, four I/O hubs, and two I/O expansion drawers.

Figure 3-36   Expansion drawer to I/O hub loop cabling

> **Note:** For ongoing management of the 9119-FHA system, it is important to keep up-to-date cabling documentation for the internal I/O drawers. Depending on when processor books and I/O hubs are added to your server, the cabling layout might be different from the standard cabling diagrams provided in the installation guide.

3.6.12 PCI adapter support summary

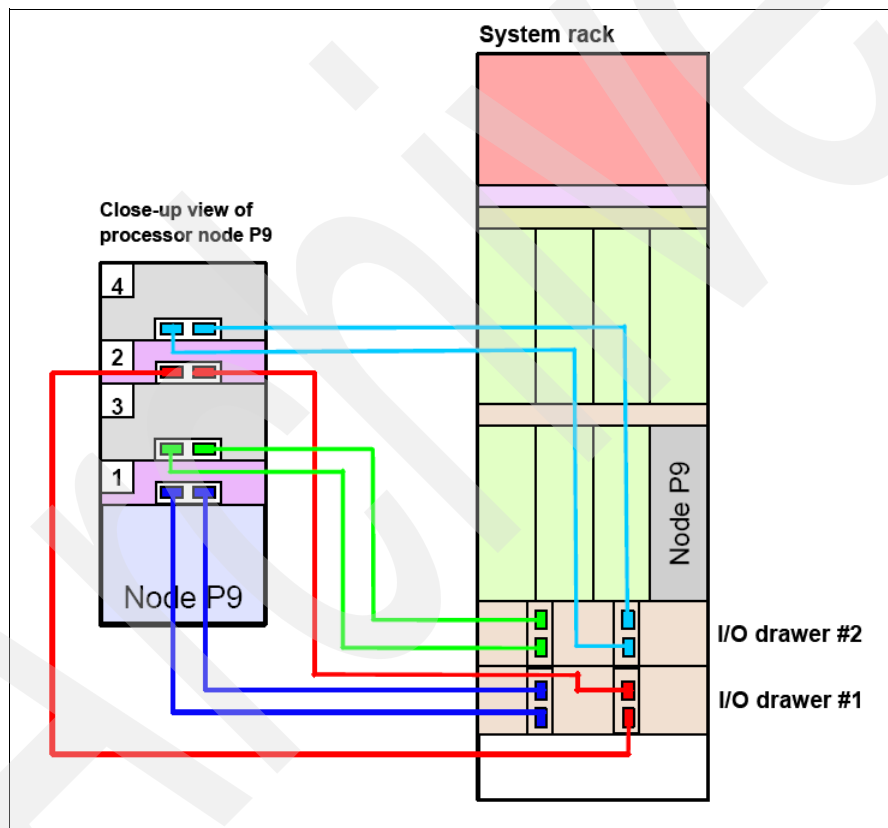This topic lists most of the PCI adapters supported on the 9117-FHA. IBM offers PCI and PCI-extended (PCI-X) adapters for the 9119-FHA server. All adapters support Extended Error Handling (EEH). A PCI, PCI-X, and PCI-X 2.0 adapters can be installed in any available PCI-X pr PCI-X 2.0 slot.

Most of the PCI-X and PCI-X 2.0 adapters for the 9119-FHA server are capable of being hot-plugged. Any PCI adapter supporting a boot device or system console should not be hot-plugged. The POWER GXT135P Graphics Accelerator with Digital Support (FC 2849) is not hot-plug-capable

System maximum limits for adapters and devices might not provide optimal system performance. These limits are given to help assure connectivity and function.

For complete PCI card placement guidance in a POWER6 configuration, including the system unit and I/O enclosures attached to loops, refer to the following resources:

► The IBM Systems Hardware Information Center under the Power Systems category at:

http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp

► For PCI placement information, refer to the Power Systems PCI Adapter Placement Guide for Machine Type 820x and 91xx, SA76-0090.

► Before adding or rearranging adapters, use the System Planning Tool to validate the new adapter configuration. The System Planning Tool Web site is available at:

http://www-03.ibm.com/servers/eserver/support/tools/systemplanningtool/

► If you are installing a new feature, ensure that you have the software required to support the new feature and determine whether there are any existing PTF prerequisites to install. To do this, use the IBM Prerequisite Web site that is available at:

http://www-912.ibm.com/e_dir/eServerPrereq.nsf

In the feature summary tables that follow:

► The tables list one-line descriptions for the adapters. In this paper, you can find the full descriptions of the adapters in Chapter 4, "Feature descriptions and related information" on page 187.

► Some adapters exclusively supported with the IBM i operating system might require an IOP adapter to function properly.

► Over time additional features might be withdrawn from marketing, which is typically included in announcement letters. IBM has several Web sites to help determine if the I/O feature is supported for upgrades, new orders, and not new orders. Use the following resources to determine the current support for a feature:

  – IBM prerequisites Web site

  https://www-912.ibm.com/e_dir/eServerPrereq.nsf

  – Planning and upgrades Web site

  http://www-304.ibm.com/systems/support/i/planning/migrationupgrade.htm

Select the technology and the machine type (for example, in our example select **Power** and machine type **9119-FHA**). Then, select the Planning tab and click **Go**. On the next window, select **Plans and Upgrades** under Support and Downloads.

Alternatively, for System i models, use the following Web address:

http://www.ibm.com/systems/support/i/planning/upgrade/index.html

Note: When using the IBM i operating system, some adapters might require feature #2844 PCI IOP adapter card. These adapters are noted by ✓^{iop} in the support column under the IBM i heading.

LAN adapters

Table 3-24 lists the LAN adapters that are available for the 9119-FHA server.

Table 3-24   Available LAN adapters

Feature Code	Adapter Description	Size	Maximum	Support		
				AIX	IBM i	Linux
5700	1-Port Gigabit Ethernet-SX PCI-X Adapter	Short	640	✓	✓	✓
5701	1-Port 10/100/1000 Base-TX Ethernet PCI-X Adapter	Short	640	✓	✓	✓
5706	2-Port 10/100/1000 Base-TX Ethernet PCI-X Adapter	Short	640	✓	✓	✓
5707	2-Port Gigabit Ethernet-SX PCI-X Adapter	Short	640	✓	✓	✓
5718	1 Port 10 Gigabit Ethernet-SR PCI-X Adapter	Short	640	✓		✓
5719	1 Port 10 Gigabit Ethernet-LR PCI-X Adapter	Short	640	✓		✓
5721	1 Port 10 Gigabit Ethernet-SR PCI-X (Fiber)	Short	448	✓	✓	✓
5722	1 Port 10 Gigabit Ethernet-LR PCI-X (Fiber)	Short	640	✓		✓
5740	4-port 10/100/1000 Gigabit Ethernet PCI-X	Short	640	✓		✓
5767	2-Port 10/100/1000 Base-TX Ethernet PCI Express Adapter	Short	448	✓	✓	✓
3709	1-Port PCI 100/10 Mbps Ethernet IOA (System i #2840 migrated as #3709)	Short	448		✓	

Note: AIX Network Install Manager (NIM) boot capability is supported with adapter feature codes #5700, #5701, and #5707.

SCSI adapters

Table 3-25 lists the SCSI adapters which are available for the 9119-FHA server.

Table 3-25   Available SCSI adapters

Feature Code	Adapter Description	Size	Maximum	Support		
				AIX	IBM i	Linux
5583	5777 Controller with AUX Write Cache No IOP	Long	288		✓	
5736	PCI-X Dual Channel Ultra320 SCSI Adapter (no IOP)	Long	128	✓	✓	✓
5776	PCI-X Disk Controller-90 MB No IOP	Long	192		✓	
5777	PCI-X Disk Controller-1.5 GB No IOP	Long	288		✓	

Feature Code	Adapter Description	Size	Maximum	Support		
				AIX	IBM i	Linux
5778	PCI-X EXP24 Ctl-1.5 GB No IOP	Long	192		✓	
5780	PCI-X EXP24 Ctl-1.5 GB No IOP	Long	256		✓	
5782	PCI-X EXP24 Ctl-1.5 GB No IOP	Long	384		✓	
5806	PCI-X DDR Dual Channel Ultra320 SCSI Adapter	Long	168		✓[a]	

a. #5806 specifies a controlling IOP (for example a #2844) is required, which is used for IBM i support of tape library devices that are attached to a #5736 adapter within a System i configuration being upgraded into a POWER6 MTM. Up through IBM i 6.1, IBM i requires an IOP to support the high speed tape library configurations. On the System i configuration, #5736 indicates that an IOP is required. On the POWER6 MTMs #5736 means no IOP.

iSCSI adapters

iSCSI is an open, standards-based approach by which SCSI information is encapsulated using the TCP/IP protocol to allow its transport over IP networks. It allows transfer of data between storage and servers in block I/O formats (defined by the iSCSI protocol). Thus, iSCSI support enables the creation of IP SANs. With iSCSI, an existing network can transfer SCSI commands and data with full location independence and define the rules and processes to accomplish the communication. The iSCSI protocol is defined in iSCSI IETF draft-20. For more information about this standard, refer to:

http://tools.ietf.org/html/rfc3720

Although iSCSI can be, by design, supported over any physical media that supports TCP/IP as a transport, today's implementations are only on Gigabit Ethernet. At the physical and link level layers, systems that support iSCSI can be directly connected to standard Gigabit Ethernet switches and IP routers. iSCSI also enables the access to block-level storage that resides on Fibre Channel SANs over an IP network using iSCSI-to-Fibre Channel gateways such as storage routers and switches.

The IBM iSCSI adapters in the 9119-FHA server offer the advantage of increased bandwidth through the hardware support of the iSCSI protocol. The 1 Gigabit iSCSI TOE PCI-X adapters support hardware encapsulation of SCSI commands and data into TCP and transport it over the Ethernet using IP packets. The adapter operates as an iSCSI TCP/IP Offload Engine. This offload function eliminates host protocol processing and reduces CPU interrupts. The adapter uses a small form factor LC type fiber optic connector or copper RJ45 connector.

Table 3-26 lists the iSCSI adapters which are available for the 9119-FHA server.

Table 3-26   Available iSCSI adapter

Feature Code	Adapter Description	Size	Maximum	Support		
				AIX	IBM i	Linux
5713	Gigabit iSCSI TOE PCI-X on copper media adapter	Short	48	✓	✓	✓
5714	Gigabit iSCSI TOE PCI-X on optical media adapter	Short	48	✓	✓	✓

IBM iSCSI software Host Support Kit

The iSCSI protocol can also be used over standard Gigabit Ethernet adapters. To utilize this approach, download the appropriate iSCSI Host Utilities Kit for your operating system from the IBM NAS support Web site:

http://www.ibm.com/storage/support/nas/

The iSCSI Host Support Kit on AIX 5L and Linux operating systems acts as a software iSCSI initiator and allows access to iSCSI target storage devices using standard Gigabit Ethernet network adapters. To ensure the best performance, enable TCP Large Send, TCP send and receive flow control, and Jumbo Frame for the Gigabit Ethernet Adapter and the iSCSI target. Also, tune network options and interface parameters for maximum iSCSI I/O throughput in the operating system based on your performance monitoring data.

SAS adapters

Serial Attached SCSI (SAS) is a new interface that provides enhancements over parallel SCSI with its point to point high frequency connections. SAS physical links are a set of four wires used as two differential signal pairs. One differential signal transmits in one direction while the other differential signal transmits in the opposite direction. Data can be transmitted in both directions simultaneously. Table 3-27 on page 165 lists the SAS adapters which are available for the 9119-FHA server.

Table 3-27   Available SAS adapters

Feature Code	Adapter Description	Size	Maximum	Support		
				AIX	IBM i	Linux
5900	PCI-X DDR Dual -x4 SAS Adapter	Short	192	✓		✓
5902[a]	PCI-X DDR Dual - x4 3 Gb SAS RAID Adapter	Long	192	✓		✓
5912[b]	PCI-X DDR Dual - x4 SAS Adapter	Short	192	✓	✓	✓

a. The SAS RAID adapter must be installed in pairs. The SAS RAID adapter cannot be used to drive tape and DVD media devices.
b. IBM i 5.4.5 or later does not support the dual controller configuration or RAID 10. For more information about attaching the 5886 EXP 12S I/O enclosure, see Chapter 6, "EXP 12S SAS Disk Enclosure" on page 755.

Fibre Channel adapters

The 9119-FHA server supports direct or SAN connection to devices using Fibre Channel adapters. Use these adapters for attaching high speed tape devices, tape libraries, and IBm System Storage disk controllers such as the DS8000 series. 4 Gbps Fibre Channel adapters are available in either single-port or dual-port configuration.

All of these adapters have LC connectors. If you are attaching a device or switch with an SC type fiber connector, an LC-SC 50 Micron Fiber Converter Cable (FC 2456) or an LC-SC 62.5 Micron Fiber Converter Cable (FC 2459) is required. Supported data rates between the server and the attached device or switch are as follows:

► Distances of up to 500 meters running at 1 Gbps, distances up to 300 meters running at 2 Gbps data rate, and distances up to 150 meters running at 4 Gbps.

► When these adapters are used with IBM supported Fibre Channel storage switches supporting long-wave optics, distances of up to 10 kilometers are capable running at either 1 Gbps, 2 Gbps, or 4 Gbps data rates.

Table 3-28 provides a summary of the Fibre Channel adapters that are available for the 9119-FHA server.

Table 3-28   Available Fibre Channel adapter

Feature Code	Adapter Description	Size	Maximum	Support		
				AIX	IBM i	Linux
5749	4 Gbps Fibre Channel (2-port)	Short	512		✓[a]	
5758	4 Gigabit single-port Fibre Channel PCI-X 2.0 Adapter (LC)	Short	512	✓		✓
5759	4 Gigabit dual-port Fibre Channel PCI-X 2.0 Adapter (LC)	Short	512	✓		✓
5760	PCI-X Fibre Channel Disk Controller	Short	512		✓[b]	
5761	PCI-X Fibre Channel Tape Controller	Short	512		✓[b]	
General note; Typically high speed capable devices, such as tape devices (usually within a tape library) or disk storage server devices, are connected using these adapters. Some of these adapters physically support connecting both tape devices and disk devices on the same adapter which could be on the same I/O loop with other high speed capable devices. When mixing high speed devices on the same adapter or on the same I/O loop there might be significant performance considerations during concurrent tape and disk operations at high I/Os per second rates. One example would be backing up a large amount of data stored on disks to tape devices all connected to the same adapter or I/O loop. While specific performance assessments and considerations are beyond the scope of this paper, we do provide some additional information about this topic in 9.1, "Power systems I/O enclosures and expansion unit schematics" on page 802. We suggest including your IBM representative as a participant in evaluations that you perform in this area.						

a. DS8000 model support only. IBM i 6.1 required.
b. IBM i requires a supporting IOP, for example, a #2844.

Asynchronous, WAN, and modem adapters

The asynchronous PCI-X adapters provide connection of asynchronous EIA-232 or RS-422 devices. The two port features can have different communication protocol capabilities on each port.

Table 3-29 lists the asynchronous, WAN, and modem adapters that are available for the 9119-FHA server.

Table 3-29   Available asynchronous, WAN, and modem adapters

Feature Code	Adapter Description	Size	Maximum	Support		
				AIX	IBM i	Linux
2943	8-Port Asynchronous Adapter EIA-232/RS-422	Short	18	✓		
5723	2-Port Asynchronous EIA-232 PCI Adapter	Short	16	✓		✓
6805	PCI 2-Line WAN IOA No IOP	Short	199		✓	
6808	PCI 4-Modem WAN IOA No IOP	Long	99		✓	
6833	PCI 2-Line WAN with Modem IOA No IOP	Short	239		✓	
Note: IBM i standard SNA and SDLC communications support requires adapters that are supported by IOPs. See the following for more information in this area: ► Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909 ► WAN and LAN adapter descriptions in Chapter 4, "Feature descriptions and related information" on page 187. Features supported on the 9117-MMA but not formally supported on the 9119-FHA that are supported by an IOP include: ► #2793/#2893 2-Line WAN IOA with Modem, use port 1 (line 2) ► #2794/#2894 2-Line WAN IOA with Modem, use port 1 (line 2) ► #2772/#2773 PCI Dual WAN/Modem IOA ► #2742 2-Line WAN IOA Contact your IBM marketing representative for upgrade considerations.						

PCI-X cryptographic coprocessor and accelerator adapters

The PCI-X cryptographic coprocessor and accelerator orderable features provide encryption support as cryptographic processing and cryptographic processing performance features.

The Cryptographic Accelerator feature is targeted to high-transaction-rate secure Web applications using SSL/TLS. The capabilities, firmware, and operating system support varies. The encryption support, varying by feature, includes:

► Federal Information Processing Standard (FIPS) level nnn support
► Financial PIN processing and credit card functions
► Tamper proof support (self destruction if tampering is detected)

For more information, see the feature descriptions in Chapter 4, "Feature descriptions and related information" on page 187.

Table 3-30 list the supported 9119-FHA supported encryption adapters.

For more information, refer to:

http://www.ibm.com/security/cryptocards/

Table 3-30   Available cryptographic adapters

Feature Code	Adapter Description	Size	Maximum	Support		
				AIX	IBM i	Linux
4764	PCI-X Cryptographic Coprocessor (FIPS 4)	Short	32	✓	✓	
4801, 4802	PCI Cryptographic Coprocessor	Short	8		✓	
4805	PCI Cryptographic Accelerator	Short	4		✓	

Note: These features might have country-specific usage. Refer to your IBM marketing representative for availability or restrictions.

IOP PCI card (System i)

The I/O processor (IOP) PCI card is used to drive I/O Adapter (IOA) cards that are located in expansion drawers, expansion units, expansion frames, and towers. Certain IOA cards or functions (as described in the IOA feature description in Chapter 4, "Feature descriptions and related information" on page 187) require an IOP under IBM i. These associated IOP and IOA PCI cards are used exclusively by the IBM i operating system. Depending upon the performance capabilities of the IOA, each IOP card can support up to four IOA cards.

Table 3-31 lists the IOP adapter that is available for the 9119-FHA server.

Table 3-31   Available IOP card

Feature Code	Adapter Description	Size	Maximum	Support		
				AIX	IBM i	Linux
2844	PCI IOP	Short	182		✓	

Remote I/O PCI adapters in I/O enclosures and drawers

Table 3-32 lists RIO-2 remote I/O (RIO) loop adapters within various I/O enclosures that are used to attach the I/O enclosure to the 9119-FHA server. These adapters provide two RIO-2 ports that can be used to connect to a RIO loop of the 9119-FHA server. These are the enclosure RIO-2 adapters that correspond to the 9119-FHA's RIO-2 I/O Loop Adapter (#1814).

Table 3-32   Available RIO-2 PCI adapters in I/O enclosures

Feature Code	Adapter Description	Size	Maximum	Support		
				AIX	IBM i	Linux
6417	RIO-2 Bus Adapter, copper RIO-2 connectivity. The #6417 has two RIO-2 ports in #0595, #5094, #5294, 5096, 5296 PCI expansion towers and expansion units.	Short	12	✓[a]	✓	✓[a]
6438	RIO-2 Remote I/O Loop Adapter in #5790 PCI drawer	Short	128	✓	✓	✓
6699	RIO-2 Remote I/O Loop Adapter in #0595 PCI/SCSI Disk expansion drawers	Short	48	✓[a]	✓	✓[a]

a. These adapters are supported by AIX and Linux on System i MTMs (for example, the POWER5 595). If that system is upgraded to a 9119-FHA, these adapters are supported by AIX and Linux. They should not be ordered with new 05nn or 5nn I/O enclosures.

USB and graphics adapters

The 2-Port USB PCI adapter is available for the connection of a keyboard and a mouse. The POWER GXT135P is a 2-D graphics adapter that provides support for analog and digital monitors. Table 3-33 lists the available USB and graphics adapters.

Table 3-33   USB and graphics adapters

Feature Code	Adapter Description	Size	Maximum	Support		
				AIX	IBM i	Linux
2738	2-Port USB PCI Adapter	Short	16	✓		✓
2849	POWER GXT135P Graphics Accelerator with Digital Support	Short	8	✓		✓

Internal storage

A variety of SCSI and SAS disk drives are available for installation in the expansion drawers, units, and towers. Table 3-34 lists the disk drives which are available for the 9119-FHA server.

Table 3-34   Disk drive options

Feature Code	Description	Supported I/O drawers	Support		
			AIX	IBM i	Linux
3279[a]	146.8 GB 15 k rpm Ultra320 SCSI Disk Drive Assembly	5786, 5791, 5797. 5798	✓		✓
3647	146 GB 15 k rpm SAS Disk Drive	5886	✓		✓

Feature Code	Description	Supported I/O drawers	Support		
			AIX	IBM i	Linux
3648	300 GB 15 k rpm SAS Disk Drive	5886	✓		✓
3677	139.5 GB 15 k rpm SAS Disk Drive	5886		✓	
3678	283.7 GB 15 k rpm SAS Disk Drive	5886		✓	
4328	141.12 GB 15 k rpm Disk Unit (SCSI)	5786		✓	

a. #5786 is supported only with IBM i. #5791 is supported only with AIX and Linux. For IBM i, use 4328

Media drawers

Tape and DVD support is provided though the use of a media drawers Table 3-35 lists the different media drawers available for the 9119-FHA server. Only one media drawer is supported per 9119-FHA system.

Table 3-35   Media drawers

Feature Code	Description	Maximum Allowed	Support		
			AIX	IBM i	Linux
7214-1U2	Media Drawer, 19 inch	1	✓	✓	✓
5720[a]	DVD/Tape SAS External Storage Unit	1	✓		✓

a. #5720 DVD/Tape SAS External Storage Unit is not available when the battery backup feature is ordered.

A DVD media device must be available to perform OS installation, maintenance, problem determination, and service actions such as maintaining system firmware and I/O microcode. Certain configurations can utilize an AIX NIM (Network Install Manager) server. The installation and use of an AIX NIM server is a client responsibility. All Linux only systems must have a DVD media device available. Table 3-36 lists the available tape and media devices.

Table 3-36   Available tape and DVD media devices

Feature Code	Description	Maximum Allowed	Support		
			AIX	IBM i	Linux
5619	80/160 GB DAT160 SAS Tape Drive	1	✓	✓	✓
5746	Half High 800 GB / 1.6 TB LTO4 SAS Tape Drive	1	✓	✓	✓
5756	Slimline DVD-ROM Drive 2	2	✓	✓	✓
5757	IBM 4.7 GB Slimline DVD-RAM Drive	2	✓	✓	✓

Media drawer, 19 inch (7214-1U2)

Figure 3-37 shows the Media Drawer, 19 inch rack mounted media drawer with two media bays.

Figure 3-37   19 inch Media Drawer, 19 inch (7214-1U2)

Each bay in the 7214-1U2 media drawer supports a tape drive or DVD (one or two) media devices and is connected by a single SAS controller (#5912) which drives all of the devices in the media drawer. The SAS controller must be placed into a PCI Expansion Drawer (#5790). The 7214-1U2 media drawer must be mounted in a 19 inch rack with 1U of available space. Up to two SAS tape drives can be configured in this media drawer.

DVD/Tape SAS External Storage Unit (#5720)

Figure 3-38 shows the DVD/Tape SAS External Storage in a 24 inch rack mounted media drawer with two media bays.

Figure 3-38   DVD/Tape SAS External Storage Unit (#5720)

Each bay supports a tape drive or DVD (one or two) media device. A maximum of one tape drive and two DVD devices is allowed per drawer. The media drawer is connected using a single SAS controller (#5912) which drives all of the devices in the media drawer. The SAS controller must be placed into an internal I/O drawer (#5791, #5797, or #5798).

The #5720 media drawer is mounted in the systems (CEC) rack at position U12 or U34. If it is mounted in the U12 location (below the processor books), one I/O drawer position in the system rack will be eliminated.

External I/O enclosures

The 9119-FHA server supports three external I/O enclosures which are mounted in 19 inch racks. These enclosures are listed in Table 3-37.

Table 3-37   External I/O enclosures

Feature Code	Description	Maximum Allowed	Support		
			AIX	IBM i	Linux
5786	TotalStorage EXP24 Disk Drawer	110		✓	
5790	PCI Expansion Drawer	96		✓	
5886	EXP 12S Expansion Drawer	12	✓	✓	✓

TotalStorage EXP24 Disk Drawer (#5786)

The TotalStorage EXP24 Disk Drawer provides 24 disk bays. The EXP24 requires 4U of mounting space in a 19 inch rack and features redundant power, redundant cooling. The

EXP24 uses Ultra™ 320 SCSI drive interface connections. The 24 disk bays are organized into four independent groups of six drive bays.

Disk groups are enabled using Ultra 320 SCSI repeater cards (#5741/#5742) which are connected to an Ultra 320 SCSI adapters. Up to four repeater cards are supported per #5786 unit.

Repeater card #5741 can be used to connect one group of six disk drives to a SCSI initiator. Repeater card #5742 can be used to connect one group of six drives to one or two different SCSI initiators, or it can be used to connect two groups of six drives to one SCSI initiator.

For more information, refer to Chapter 5, "IBM TotalStorage EXP24 disk enclosures" on page 745.

PCI Expansion Drawer (#5790)

The PCI Expansion Drawer (#5790) provides six full-length, 64-bit, 3.3 V 133 MHz hot-plug PCI slots. PCI cards are mounted in blind swap cassettes which allow adapter cards to be added/removed without opening the drawer. The PCI Expansion Drawer is connected using the RIO-2 interface adapter (#6438). Redundant and concurrently maintainable power and cooling is included.

The #5790 drawer mounts in a 19" rack using a Dual I/O unit Enclosure (#7307). Each Dual I/O Enclosure supports one or two #5790 PCI Expansion drawers.

Note: The PCI Expansion Drawer (#5790) became available September 2007.

EXP 12S Expansion Drawer (#5886)

The EXP 12S Expansion Drawer (#5886) provides 12 hot-swap SAS storage bays. Redundant power supplies and two Service Managers are included in the drawer. The EXP 12S requires 2U of mounting space in a 19 inch rack. The enclosure attaches to the 9119-FHA server using a SAS controller card (#5900 or #5912).

For more information, see Chapter 6, "EXP 12S SAS Disk Enclosure" on page 755.

3.6.13 Consoles

The term *console* can have several different meanings, depending upon the operating system support and whether the "device" is used for general control of the functions that are performed on the operating system or the functions that also include booting, starting the system, or even loading basic microcode or low level fixes. In this section, we focus on a *console device* that is supported by an operating system that includes general operation and also system booting and low level microcode loading.

IBM i consoles

If your operating system is IBM i, select one of the following console devices:

► Operations console attached through Ethernet port (LAN console) or WAN port (ops console)

► Hardware Management Console (HMC)

A twinaxial console is not supported unless an HMC is present on the system. A 9944-100 Thin Console is not supported.

AIX or Linux consoles

When your operating system is AIX or Linux, select one of the following console devices:

► HMC
► Virtual (VTTY)
► Supported Graphical device (terminal)

Virtual (TTY) console Each partition needs to have access to a system console. Tasks such as operating system installation, network setup, and some problem analysis activities require access to a system console. The POWER Hypervisor™ provides the virtual console using a virtual TTY or serial adapter and a set of Hypervisor calls to operate on them. Virtual TTY is a standard feature of the 9119-FHA server and hardware management console.

The graphics terminal is available to users who want a graphical user interface (GUI) to their AIX or Linux systems. To use the graphics terminal, plug the graphics adapter into a PCI slot in the back of the server. You can connect a standard monitor, keyboard, and mouse to the adapter to use the terminal. This connection allows you to access the SMS menus, as well as an operating system console.

3.6.14 IBM EnergyScale technology

IBM EnergyScale technology is featured on the IBM POWER6 processor-based systems. It provides functions to help the user understand and control IBM server power and cooling usage. Refer to 1.4.2, "IBM EnergyScale technology" on page 28 for more details.

3.6.15 Additional components

This section discusses additional important hardware components.

System VPD cards

The following types of VPD cards are available:

► Vital Product Data (VPD)
► Smartchip VPD (SVPD)

VPD for all Field Replaceable Unit FRUs are stored in Serial EPROM (SEEPROM). VPD SEEPROM modules are provided on daughter cards on the midplane and on a VPD daughter card part of processor book assembly, Both are redundant. Both SEEPROMs on the midplane daughter card will be accessible from both System Controller cards. Both SEEPROMs on the processor book card will be accessible from both Node Controller cards. VPD daughter cards on midplane and processor book planar are not FRUs and are not replaced if one SEEPROM module fails.

> **Note:** For more information about the 9119-FHA midplane, oscillator card, and node controller cards functions, refer to *IBM Power 595 Technical Overview and Introduction*, REDP-4440.

Oscillator card

There are two (redundant) oscillator cards on the CEC midplane. These oscillator cards are sometimes referred to as clock cards. An oscillator card provides clock signals to the entire system. This card is actively redundant, but only one is active at a time. In the event of a clock failure, the system dynamically switches to the redundant oscillator card. System clocks are initialized based on data in the PU Book VPD. Both oscillators must be initialized so that the standby oscillator can dynamically switch if the primary oscillator fails.

Node Controller card

There are two embedded Node Controller service processor cards on every processor book, these service processor cards are referred as node controllers (NC). They plug on processor book planar.

3.6.16 Customer setup

A thorough systems assurance process must be performed before ordering a 9119-FHA configuration. An authorized IBM representative must be part of the ordering process. Additionally, setting up the 9119-FHA to become operational is a detailed process. Thus, an authorized IBM representative is required to get the Power 595 operational with appropriate efficiency

3.7 Capacity Upgrade on Demand

Several types of Capacity on Demand (CoD) are optionally available on the 9119-FHA server to help meet changing resource requirements in an on demand environment by using resources that are installed on the system but that are not activated. Capacity Upgrade on Demand (CUoD) allows you to purchase and activate additional processor or memory capacity features. The following sections provide additional details for the 9119-FHA.

3.7.1 Capacity on Demand for processors

Capacity on Demand (CoD) for processors is available for the 9119-FHA servers. CoD for processors allows inactive processors to be installed in the 9119-FHA server and can be permanently activated by the customer as required.

All processor books available on the 9119-FHA are initially implemented as 8-core CoD offerings with zero active processors.

The minimum number of permanently activated processors is based on the number of processor books installed as follows:

► One processor book installed requires three permanently activated processors.
► Two processor books installed require six permanently activated processors.
► Three processor books installed require nine permanently activated processors.
► Four processor books installed require 12 permanently activated processors.
► Five processor books installed require 15 permanently activated processors.
► Six processor books installed require 18 permanently activated processors.
► Seven processor books installed require 21 permanently activated processors.
► Eight processor books installed require 24 permanently activated processors.

Additional processors on the CoD MCMs are activated in increments of one by ordering the appropriate activation feature number. If more than one processor is to be activated at the same time, the activation feature should be ordered in multiples.

After receiving an order for a CoD for processors activation feature, IBM provides a 32-character encrypted key. This key is entered into the system to activate the desired number of additional processors.

CoD processors that have not been activated are available to the 9119-FHA server for dynamic processor sparing when running AIX, IBM i, and supported Linux releases on POWER6. If the server detects the impending failure of an active processor, it will attempt to

activate one of the unused CoD processors and add it to the system configuration. This helps to keep the server's processing power at full strength until a repair action can be scheduled.

3.7.2 On/Off Capacity on Demand

IBM Power Systems On/Off Capacity on Demand delivers great flexibility in meeting peak demands that are temporary in duration. Inactive processors and memory can be temporarily activated with a simple request made from the HMC. Before requesting temporary capacity, the server must be registered and an On/Off enablement activation feature must be ordered and installed.

Table 3-38 shows features that are used to order processor enablement codes and support billing charges on the 9119-FHA.

Table 3-38   Processor enablement codes and support charges

Processor Feature	On/Off Cod Processor Enablement Feature	On/Off Cod Processor Billing Feature	IBM i On/Off Cod Processor Billing Feature
4694	7971	5941	5943
4695	7971	5942	5944
4694	7971	7234	5945
4695	7971	7244	5946

Table 3-39 shows features that are used to order memory enablement codes and support billing charges on the 9119-FHA.

Table 3-39   Memory enablement codes and billing charges

Memory Feature	On/Off Cod memory Enablement Feature	On/Off Cod memory Billing Feature
5693	7973	5691
5694	7973	5691
5695	7973	5691
5696	7973	5691
5697	7973	5691
4501	7973	5691
4502	7973	5691
4503	7973	5691

The On/Off CoD process consists of three steps: Enablement, Activation, and Billing.

On/Off CoD enablement: Step-by-step

To enable On/Off CoD, you must follow these steps:

1. The sales channel (IBM Business Partner) must sign one of the following contracts, if applicable:

   – IBM Business Partner Agreement, Distributor Attachment for On/Off Capacity On Demand

   – IBM Business Partner Agreement for Solution Providers, attachment for On/Off Capacity On Demand

   – IBM Business Partner Agreement, attachment for On/Off Capacity On Demand

2. The sales channel (IBM Business Partner or IBM Direct) must register at the following Web site:

   http://www.ibm.com/servers/eserver/iseries/ondemand/cod

   Then, follow these steps:

   a. Client initiates request for On/Off CoD use by requesting Sales channel to enable the machine for temporary capacity.

   b. Client must complete and sign the following contracts. It is the sales channel's responsibility to return the signed contract to the responsible CSO organization and fax a copy to IBM at 507-253-4553.

      • Required: IBM Customer Agreement, Attachment for On/Off Capacity On Demand; IBM Supplement for On/Off Capacity On Demand

      • Optional: IBM Addendum for On/Off Capacity On Demand Alternative Reporting

   c. The sales channel places an order for processor or memory enablement features.

   d. The sales channel updates the Web site registration data with information about the customer machine being enabled for temporary capacity.

   Note: The order for an enablement feature will not be fulfilled until this step is completed.

   e. IBM generates an enablement code and mails or posts it.

   f. The customer retrieves the enablement code and applies it to the server.

On/Off activation requests: Description

When On/Off CoD temporary capacity is needed, simply use the HMC menu for On/Off CoD and specify how many of the inactive processors or gigabytes of memory you want to activate temporarily for some number of days.

You are billed for the days requested, whether the capacity is assigned to partitions or left in the shared processor pool.

At the end of the temporary period (days that you requested), you must ensure the temporarily activated capacity is available to be reclaimed by the server (not assigned to partitions), or you will be billed for any unreturned processor days (per the contract you signed).

On/Off CoD activation requests: Step-by-step

When there is a need for temporary capacity, use the On/Off CoD temporary capacity HMC menu for the server and specify how many of the inactive processors or gigabytes (GB) of memory you want to activate temporarily for some number of days. The user must assign the

temporary capacity to a partition (whether or not the machine is configured for LPAR) to begin using temporary capacity.

On/Off CoD billing: Description

The contract, signed by the client before receiving the enablement code, requires On/Off CoD user to report billing data at least once a month (whether there is activity or not). This data is used to determine the proper amount to bill at the end of each billing period (calendar quarter).

Failure to report billing data for use of temporary processor or memory capacity during a billing quarter will result in default billing equivalent to 90 processor days of temporary capacity.

The sales channel will be notified of customer requests for temporary capacity. As a result, the sales channel must order a quantity of billing features (one feature for each billable processor and memory day reported).

On/Off CoD billing: Step-by-step

The client must report billing data (requested and unreturned processor and memory days) at a minimum of once per month either electronically or using fax (stated requirement in the signed contract). At the end of each billing period (calendar quarter), IBM processes the accumulated data reported and notifies the sales channel for proper billing. The sales channel places an order for the appropriate quantity of billing features (one processor billing feature ordered for each processor day used, or one memory day for each memory day utilized).

IBM ships a billing notice (notifies customer of billing actions) to the ship-to address on the order as part of the fulfillment process. The customer pays the sales channel, and the sales channel pays IBM for the fulfillment of the billing features.

3.7.3 Utility CoD

Utility CoD autonomically provides additional processor performance on a temporary basis within the shared processor pool. Utility CoD enables you to place a quantity of inactive processors into the server's Shared Processor Pool, which then becomes available to the pool's resource manager.

When the server recognizes that the combined processor utilization within the shared pool exceeds 100% of the level of base (purchased/active) processors assigned across uncapped partitions, then a Utility CoD Processor Minute is charged and this level of performance is available for the next minute of use.

If additional workload requires a higher level of performance, the system will automatically allow the additional Utility CoD processors to be used and the system automatically and continuously monitors and charges for the performance needed above the base (permanent) level. Registration and usage reporting for Utility CoD is made using a public Web site and payment is based on reported usage. Utility CoD requires PowerVM Standard Edition (#7943) or PowerVM Enterprise Edition (#8002) to be active on the 9119-FHA.

Table 3-40 lists the processor Utility CoD feature and description.

Table 3-40 Utility CoD feature and description

Utility Billing Processor Feature	Utility CoD Feature Description
5941	100 Processor minutes for #4694 (4.2 GHz)
5942	100 Processor minutes for #4695 (5.0 GHz)
5943	100 Processor minutes for #4694, IBM i
5944	100 Processor minutes for #4695, IBM i

Table 3-41 lists processor on/off CoD feature and description.

Table 3-41 Utility CoD feature and description

Utility Billing Processor Feature	On/Off Processor CoD Feature Description
5945	On/Off Proc CoD Billing, 1 Proc-Day, for #4694, IBM i
5946	On/Off Proc CoD Billing, 1 Proc-Day, for #4695, IBM i
7234	On/Off Proc CoD Billing, 1 Proc-Day, for #4694
7244	On/Off Proc CoD Billing, 1 Proc-Day, for #4695

3.7.4 Trial Capacity on Demand

Trial Capacity on Demand (CoD) is a function delivered with all Power Systems servers supporting CUoD resources. Those servers with standby CUoD processors or memory are capable of using a one-time, no-cost activation for a maximum period of 30 consecutive days. This enhancement allows for benchmarking of CUoD resources or can be used to provide immediate access to standby resources when the purchase of a permanent activation is pending.

Trial CoD is a complimentary service offered by IBM. Although IBM intends to continue it for the foreseeable future, IBM reserves the right to withdraw Trial CoD at any time, with or without notice.

3.7.5 Capacity backup configurations for the 9119-FHA

The 9119-FHA system's capacity backup (CBU) designation can help meet your requirements for a second system to use for backup, high availability, and disaster recovery (DR). It enables you to temporarily transfer IBM i processor license entitlements and IBM i 5250 Enterprise Enablement entitlements purchased for a primary machine to a secondary CBU-designated system. Temporarily transferring these resources instead of purchasing them for your secondary system might result in significant savings.

Activations of IBM 9119-FHA (CBU) servers are made using the On/Off Capacity on Demand function. The same terms and contracts apply to CBU servers as apply to ones using On/Off CoD.

An IBM 9119-FHA for disaster recovery offers an offsite, disaster recovery system at an affordable price. A 4/32-core or 4/64-core 9119-FHA takes advantage of On/Off CoD capabilities into an effective backup server. The offering includes:

► Four processors that are permanently activated and can be used for any workload

► Either 28 or 60 standby processors to be used in the event of a disaster

► Either 1800 (4/32-core) or 3600 (4/64-core) of On/Off CoD processor days available for testing or for use in the event of a disaster

Note: In a CBU environment, the secondary CBU system has some advantages, which we describe later in this section. However, you need to plan for the following key considerations to take advantage of the CBU options:

► Processor activations cannot be transferred from the primary system to the backup secondary system.

► For a CBU designated system, when you register the association between your primary and on-order CBU system, you must agree to certain terms and conditions that do allow for temporary transfer of IBM i processor entitlements from the registered primary system.

Outside of the CBU agreement, standard IBM i terms and conditions do not allow either IBM i processor license entitlements or IBM i 5250 OLTP (Enterprise Enablement) entitlements to be transferred permanently or temporarily. These entitlements remain with the machine they were ordered for.

The primary system for a 9119-FHA server can be one of the following servers:

► POWER6 9119-FHA
► POWER5 9406-595

The secondary CBU (disaster recovery) system can be POWER6 9119-FHA. For disaster recovery, the 9119-FHA used as a CBU system is offered in the following configurations:

► 4/32 POWER6 4.2 GHz CBU system: Must configure 4 x #7569 and 4 x #4754
► 4/64 POWER6 4.2 GHz CBU system: Must configure 8 x #7569 and 4 x #4754
► 4/32 POWER6 5.0 GHz CBU system: Must configure 4 x #7571 and 4 x #4755
► 4/64 POWER6 5.0 GHz CBU system: Must configure 8 x #7571 and 4 x #4755

I/O and memory minimums and maximums are the same as the primary system IBM 9119-FHA offerings.

The CBU/DR offering allows flexibility in defining the number of active and standby processors for 9119-FHA customized configurations. Activations of IBM 9119-FHA (CBU) servers are made using the On/Off Capacity on Demand function. The same terms and contracts apply to CBU servers as apply to ones using On/Off CoD.

An IBM 9119-FHA for DR offers an offsite, disaster recovery machine at an affordable price. A 4/32-core or 4/64-core 9119-FHA leverages On/Off CoD capabilities into an effective backup server.The offering includes:

► Four processors that are activated permanently and can be used for any workload

► Either 28 or 60 standby processors to be used in the event of a disaster

► Either 1800 (4/32-core) or 3600 (4/64-core) of On/Off CoD processor days available for testing or for use in the event of a disaster

The standby processors cannot be activated permanently. For the On/Off CoD processor days included in the offering, additional usage days can be purchased at regular On/Off CoD activation prices. However, regular use of standby processors outside a disaster is costly.

These systems have IBM i software licenses with an IBM i P50 or higher. The primary machine must be in the same enterprise as the CBU system.

The CBU specify feature 4895 is independent of the use the special 9119-FHA CBU for disaster recovery processor features. The CBU specify feature 4896 can be used on any qualifying 9119-FHA server. The CBU specify feature 4896 is available only as part of a new server purchase or during a model MES upgrade to a 9119-FHA (for example, from a POWER5 9406 570, POWER5 9406 595, POWER5 9119-590, or POWER5 9119-595 to POWER6 9119-FHA).

Certain system prerequisites must be met and system registration and approval are required before the CBU specify feature can be applied on a new server.

When you register the association between your primary and on-order CBU system, you must agree to certain terms and conditions regarding the temporary transfer. Once a CBU system designation is approved and the system is installed, you can temporarily move your *optional* IBM i processor license entitlement and 5250 Enterprise Enablement entitlements from the primary system to the CBU system when the primary system is down or while the primary system processors are inactive. The CBU system can then better support failover and role swapping for a full range of test, disaster recovery, and high availability scenarios.

Temporary entitlement transfer means that the entitlement is a property transferred from the primary system to the CBU system and can remain in use on the CBU as long as the registered primary and CBU system are in deployment for the high availability or disaster recovery operation.

Before you can temporarily transfer IBM i processor license entitlements from the registered primary system, you must have more than a defined minimum number of IBM i processor entitlements on the primary machine and at least one IBM i processor license on the CBU server. An activated processor must be available on the CBU server to use the transferred entitlement. You can then transfer any IBM i processor entitlements above the defined minimum, assuming the total IBM i workload on the primary system does not require the IBM i entitlement you would like to transfer during the time of the transfer.

The defined minimum number of IBM i processor licenses are:

► One on a 9119-FHA primary machine
► Four on a 9406 595 primary machine

During this temporary transfer, the CBU system's internal records of the total number of IBM i processor license entitlements are not updated, and you might see IBM i license noncompliance warning messages from the CBU system. Such messages that arise in this situation do not mean that you are not in compliance.

Before you can temporarily transfer 5250 Enterprise Enablement entitlements, you must have more than a defined minimum number of 5250 Enterprise Enablement entitlements on the primary server and at least one 5250 Enterprise Enablement entitlement on the CBU system. You can then transfer the 5250 entitlements that are not required on the primary server during the time of transfer and that are above the minimum number of entitlements.

The defined minimum number of 5250 Enterprise Enablements entitlements are:

► One on a 9119-FHA primary server
► Four on a 9406-595 primary server

For example, if you have a 32-core POWER6 9119-FHA as your primary system with 10 IBM i processor license entitlements (nine above the minimum) and two 5250 Enterprise Enablement entitlements (one above the minimum), you can temporarily transfer up to nine IBM i entitlements and up to one 5250 Enterprise Enablement entitlement. During the temporary transfer, the CBU system's internal records of its total number of IBM i processor entitlements is not updated, and you might see IBM i license noncompliance warning messages from the CBU system.

If your primary or CBU machine is sold or discontinued from use, any temporary entitlement transfers must be returned to the machine on which they were originally acquired.

For CBU registration and further information, refer to:

http://www.ibm.com/systems/power/hardware/cbu

Table 3-42 summarizes 9119-FHA On Demand processor and memory options and associated on demand feature numbers. For information about Capacity on Demand capabilities, see 3.7, "Capacity Upgrade on Demand" on page 174.

For more information about Capacity on Demand usage, refer to:

http://www.ibm.com/systems/power/hardware/cod

Table 3-42   9119-FHA On Demand features

	4.2 GHz[a] #4694	5.0 GHz[a] #4695
Processor		
1 processor base activation (no charge)	N/A	N/A
1 processor CUoD (permanent) activation	4754	4755
On/Off (temporary) enablement	7971	7971
30 processor days pre-paid (Trial CoD)	N/A	N/A
1 On/Off processor day billing (without IBM i)	7234	7244
100 minutes On/Off utility billing (without IBM i)	5941	5942
1 On/Off processor day billing (with IBM i)	5945	5946
100 minutes On/Off utility billing (with IBM i)	5943	5944

	4.2 GHz[a] #4694	5.0 GHz[a] #4695
Memory		
On/Off 1 GB-1Day Billing	5691	5691
Memory enablement feature (for On/Off)	7973	7973
1 GB activation (to server, not to memory DIMMs)	5680[b]	5680
256 GB Memory activation (to server, not to DIMMs)	5681[c]	5681
1 GB activation for migrated #4501, #4502, and #4503	Not available	5883
256 GB activation for migration 4501/4502/4503	5884	5884
5250 Enterprise Enablement (5250 OLTP)		
Enablement (1 additional processor's worth)	4995	4995
Full Enterprise Enablement	4996	4996

a. CBU for DR processor features are #7569 (4.2 GHz) and #7571 (5.0 GHz). The rest of the On Demand features are the same as with no CBU configuration.

b. Features #7669, #8471, and #8494 converted to #5680 and #5883 during memory conversion and migration. Original feature not used.

c. Features #7280, #8472, and #8495 converted to #5681 and #5884 during memory conversion and migration. Original feature not used.

Software licensing for IBM i is included with the active processors for the server and is not required with the use of temporary capacity. AIX software licensing for permanently active processors is licensed separately. AIX software licensing of inactive processors is typically not required in the event of a disaster. IBM software licensing is not required on the server. Non-IBM software licensing is based on the software tier or conditional use licensing explicitly required by the software provider.

Table 3-43 contrasts the key characteristic differences between the CBU option available on a POWER5 595 model(9406 595) compared to a POWER6 595 model CBU offering.

Table 3-43   CBU comparisons

KEY COMPARISONS	9406 595	9119-FHA
For Disaster Recovery or High Availability	Yes	Yes
Savings of IBM i and, optionally, 5250 temporary transfer	Yes	Yes
Lower priced hardware and maintenance	Yes	No
Edition feature code used	CBU	No
CBU Specify feature code #4896	No	Yes
Prerequisite of a 9119-FHA as primary system	Yes	Yes
Registration of primary system to qualify	Yes	Yes
No charge On/Off CoD if primary system down by disaster	Yes	Yes
Primary system must be same software tier or larger	Yes	Yes

3.8 Disks, boot devices, load source, and media devices

The 9119-FHA server must have access to a device capable of reading CD media or to a NIM server. The recommended devices for reading CD/DVD media are the 9119-FHA (#5720), 7214-1U2, or 7212-103. These devices attach through a PCI SCSI / SAS adapter in one of the system I/O drawers.

If an AIX or Linux operating system is specified as the primary operating system, a NIM server can be used. If used, it must be attached through a PCI LAN adapter in one of the system I/O drawers. An Ethernet connection is recommended.

If an AIX or Linux operating system is specified as the primary operating system, a minimum of two internal SCSI hard disks is required per 9119-FHA server. It is recommended that these disks be used as mirrored boot devices. These disks should be mounted in the first I/O drawer whenever possible. This configuration provides service personnel the maximum amount of diagnostic information if the system encounters errors in the boot sequence.

Boot support is also available from local SCSI and Fibre Channel adapters, or from networks through Ethernet or token-ring adapters.

Consideration should also be given to the placement of the AIX rootvg volume group in the first I/O drawer. This allows AIX to boot any time other I/O drawers are found offline during boot.

If the boot source other than internal disk is configured, the supporting adapter should also be in the first I/O drawer.

The 9119-FHA incorporates an Early Power Off Warning (EPOW) capability that assists in performing an orderly system shutdown in the event of a sudden power loss. IBM recommends use of the Integrated Battery Backup features or an uninterruptible power system (UPS) to help ensure against loss of data due to power failures.

3.8.1 IBM i load source location outside the CEC

AIX, IBM i, and Linux must have a specified load source (boot) disk adapter. This section provides details about this support on the 9119-FHA for the different operating systems.

With an HMC, you can assign an IBM i load source (boot drive). IBM i 5.4 and 6.1 join the other supported operating systems to provide this function. You can also use the Integrated Virtualization Manager to do this on the Power 520 and Power 550 MTMs. However, on the 9117-MMA and 9119-FHA, you must use an HMC interface.

► IBM Manufacturing and eConfig support for the following models:
  – SAN load source for POWER5 and later models
  – For POWER6 MTMs
► Load source features using the POWER6 520/550/570/9119-FHA

  – #0720   Load Source in #0595/5095 I/O tower/drawer
  – #0721   Load Source in #5094/5294 I/O tower/drawer
  – #0725   Load Source in #5786/5787 EXP24 Disk Enclosure
  – #0727   Load Source in #5886 EXP 12S Disk Drawer

- ► Related features or specifies:
  - #0837 SAN Load Source
  - #0830, #0834, #0835, #0836, #0838, #0839, #0840, or #0841 for a specific disk feature number (indicates technology and capacity).

We describe these specify codes and features in Chapter 4, "Feature descriptions and related information" on page 187.

3.9 9119-FHA system unit schematics and locations

Figure 3-39 provides a front and rear view of the 9118-FHA system unit.
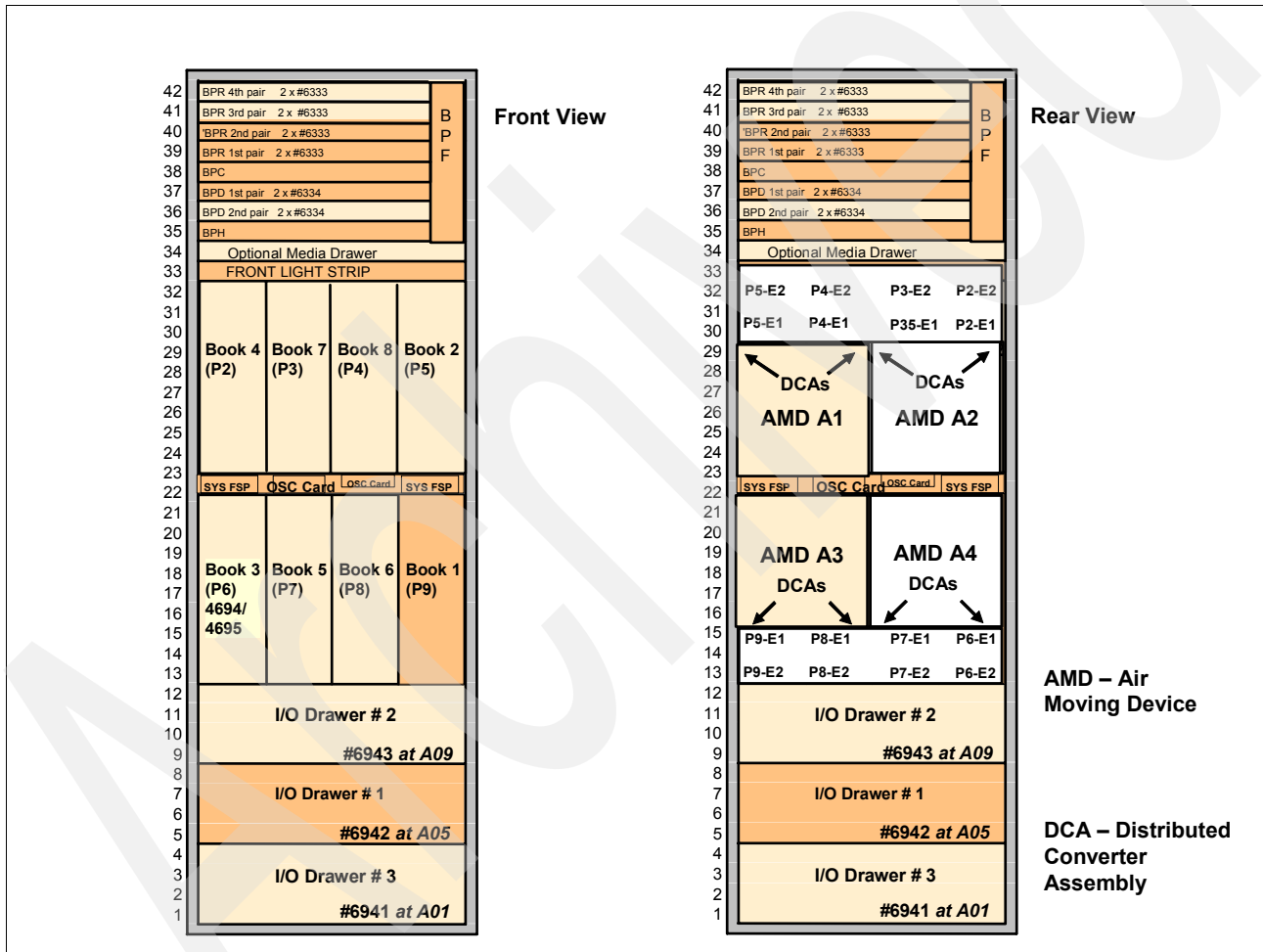

Figure 3-39 Front and rear views

Features #6941, #6942, and #6943 connect the drawer to the GX adapter in the processor book.

Figure 3-40 shows the Emergency Power Off switch location in the system rack.
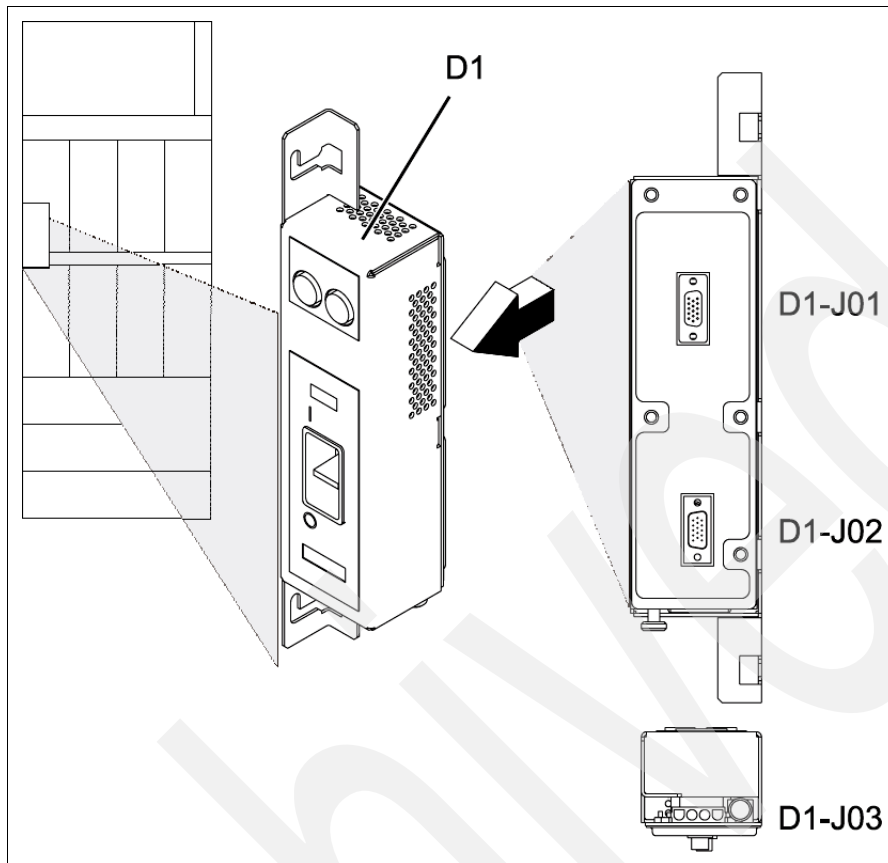

Figure 3-40   9119-FHA EPO (Emergency Power Off)

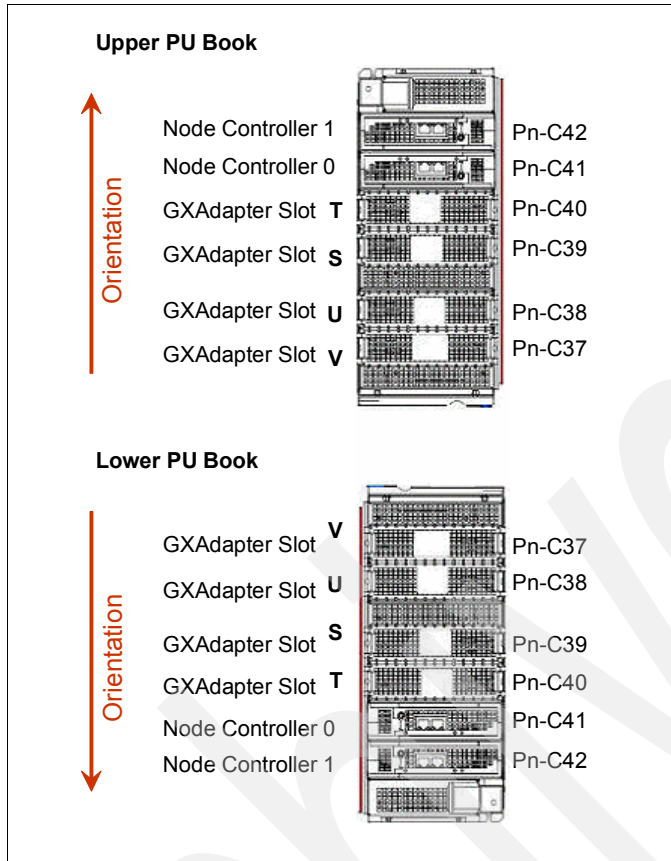Figure 3-41 show the process or book and GX adapter placement for a two processor book configuration.

Figure 3-41   Two processor books with GX adapter placement

Feature descriptions and related information

In this chapter, we describe the supported features for the following systems:

- ▶ IBM POWER6 MTMs System i (9406-MMA)
- ▶ IBM Power 570 Model MMA (9117-MMA)
- ▶ IBM Power Model 595 (9119-FHA)

We include information about local area networks (LANs) and wide area networks (WANs), disk units, internal tape units, CD-ROM, DVD-RAM, DVD-ROM, and magnetic media controllers. We also describe processor features and memory.

We list the feature code and descriptions of all the feature codes that are presently available in numeric order per the IBM Sales Manual. Always consult the IBM Sales Manual for the latest information about feature codes:

`http://www-01.ibm.com/common/ssi/index.wss?buttonpressed=DET002PT005&DET015PGL002=DET001PEF012&submit.x=15&submit.y=20`

Check the IBM Prerequisite Web site for the latest hardware, operating system, firmware, HMC code, and PTFs that are required for support.

`https://www-912.ibm.com/e_dir/eserverprereq.nsf`

Some IBM i tape device support and direct SAN support requires an adapter that has a supporting IOP as indicated in the feature descriptions. For IOP-required tape support summaries, refer to Chapter 10, "Tape and optical storage attachment summary" on page 827.

4.1 Using the feature descriptions in this chapter

When reviewing the feature descriptions in this chapter, there are several phrases, terms, and considerations that you need to keep in mind:

► For each feature, we list:

– *Supporting MTM numbers*: 8203-E4A, 9407-M15, 9408-M25, 8204-E8A, 9409-M50, 9117-MMA (includes 9406-MMA), 9119-FHA

– *Minimum required*: 0

– *Maximum allowed*: This value includes the system unit, processor enclosure, and system wide. For 1-way 8203-E4A or 9408-M15, the value is for the system unit.

– *Supporting operating system*: AIX, IBM i, or Linux and, where appropriate, operating system release level.

– *Initial Order/MES/Both/Supported*: The values indicate if the feature can be ordered new (initial order), for after initial order (MES), for both new and MES orders (Both), and supported but cannot be ordered new or as an MES (Supported).

– *CSU Yes* or *CSU No*: *Yes* indicates the part can be installed by the customer. *No* means the part must be installed by IBM Service representative

– *Restrictions*: For example a communications protocol is not supported on a WAN adapter.

► Previous System i System Builder publications contained a Customer Set Up (CSU) Matrix. We provide this information within each feature description.

► PCI card placement rules: This paper provides some card placement details within a system unit, processor enclosure, or RIO-2 or 12X I/O loop I/O enclosure. Schematic drawings for System i I/O enclosures showing where IOP or IOA cards can be placed are shown in Chapter 9, "IBM Power systems I/O enclosures schematics" on page 801.

For the most complete description of PCI card placement rules refer to:

– If you are adding or moving adapters, be sure to use the System Planning Tool to validate the new adapter placement plan before you physically install or move the adapters. You can find the System Planning Tool at:

http://www-03.ibm.com/servers/eserver/support/tools/systemplanningtool/

– The PDF files for Power Systems PCI Adapter Placement Guide for Machine Type 940x and Power Systems PCI Adapter Placement Guide for Machine Type 820x and 91xx. These are located at the IBM Systems Hardware Information Center, which is available at:

http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp

Select Power System Information and then the model. Select the appropriate PDF file for the model in which you are interested.

– If you are installing a new feature, ensure that you have the software that is required to support the new feature and that you determine if there are any existing PTF prerequisites. You can use the IBM i Prerequisite Web site at:

http://www-912.ibm.com/e_dir/eServerPrereq.nsf

For reference purposes, in this chapter, we provide summary table feature information for direct-attached disks and disk controllers in 4.9, "Summary: System i direct attach disks, disk controller features, CCINs" on page 730.

When your system is operational, the ordered feature code might not appear in hardware information reports or display on the system or in HMC or IVM windows. The corresponding value displayed is a CCIN value. Some CCIN values are the same as the orderable feature number but most are not. You can determine a CCIN value for the corresponding feature code by using the IBM System Planning Tool or by consulting Chapter 7, "Feature code to CCIN cross-reference" on page 769.

Notes:

▶ In the MTM type chapters in this paper, we list the minimum operating system release levels that are required on POWER6. In this chapter, we list the supported release levels for all adapters and I/O enclosures.

Some IBM i supported adapters previously required attachment to a supporting IOP. IBM i 5.4 with machine code V5R4M5 provides additional support for some IOP-less adapters. IBM i 6.1 expands the range of IOP-less adapter support.

The feature description identifies this support level.

If you do not know the code level, consult the product announcement letter or IBM Sales Manual or check with your IBM service representative.

▶ Some feature descriptions in this chapter do not fully identify the required minimum operating system level. For example, a feature that is supported with IBM i 5.4 might require additional PTFs or an IBM cumulative fix level. Some features require a different machine code (LIC) level.

The IBM Prerequisite Web site is the first place to go for the latest information on PTF level. You can find the PTF prerequisites for a specific feature code. On the Hardware tab of the IBM eServer Prerequisite tool, specify the model and machine type and click **Go**. Then in the Search results box, click the necessary link under the feature code. The IBM i Prerequisite tool is located at:

http://www-912.ibm.com/e_dir/eServerPrereq.nsf

▶ For many IBM tape and disk device firmware level status consider also searching the IBM System Storage Web site. Direct links to IBM tape and disk storage categories are:

http://www-03.ibm.com/systems/storage/disk/
http://www-03.ibm.com/systems/storage/tape/index.html

▶ You can find the RIO-2, 12X, System Power Control Network (SPCN) feature codes and descriptions in Chapter 11, "RIO-2 12X SPCN line cord SAS and communication cables for IBM Power Systems models" on page 857.

4.2 PCI card placement for IBM i family of processor models

Peripheral Component Interconnect Express (PCIe) adapter slots can support higher speeds and capacities than the PCI-X generation of PCI slots. PCIe and PCI-X slots are physically different. PCIe adapters cannot plug into a PCI-X slot and vice versa. PCIe adapters do not use an IOP. The POWER6 systems that support the RIO-2 loop support the placement of I/O processors (IOPs) and I/O adapters (IOAs) in I/O drawers or towers.

PCIe architecture changes the configuration rules that are associated with card placement in IBM Power Models 9117-MMA and 9119 FHA. Server models support the Smart IOA (IOP-less), which allows increased configuration flexibility.

> **Important:** When working with PCI cards, keep in mind the following important considerations:
>
> ► The PCI cards are placed correctly by IBM with the initial system order.
>
> ► For new orders or when you move cards, the PCI placement rules documented in *Power Systems PCI Adapter Placement Guide for Machine Type 820x and 91xx,* SA76-0090, can help with proper configuration.
>
> ► If you do not fully understand or follow the configuration rules and restrictions, you can create a hardware configuration that does not work properly, works marginally, or quits working when a system is upgraded to future software releases.
>
> ► The POWER6 model processor enclosures do not support System i IOP cards.
>
> ► Through December 2008, no IBM supported RIO-2 or 12X loop attached I/O enclosures (drawers) support PCIe adapter technology.

4.3 Feature code conversion equivalent table

For information about upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909.

4.4 Feature code availability

The table that follows lists the feature code and descriptions of all the feature codes that are presently available in numeric order per the IBM Sales Manual.

Power and packaging	
#0032	**#0032 Specify Code for External High Speed Modem** Required if an external high speed modem is shipped with the system. The exact machine type-model of the modem that is shipped varies based on what is currently stocked in manufacturing. **For 9117-MMA (#0032)** ► Minimum required: 0 ► Maximum allowed: 480 (Initial order maximum: 250) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later **For 9119-FHA (#0032)** ► Minimum required: 0 ► Maximum allowed: 480 (Initial order maximum: 250) ► OS level required: – IBM i 5.4 with V5R4M5 machine code – IBM i 6.1 or later Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#0040	**#0040 Mirrored System Disk Level Specify Code** Indicates the level of disk protection that is desired and ensures that adequate hardware is in the final configuration. Attributes provided: Device-level mirrored protection Attributes required: Minimum of two disk units **For 9117-MMA (#0040) and 9119-FHA (#0040)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No
#0441	**#0041 Device Parity Protection-All Specify Code** Indicates the level of disk protection that is desired and ensures that adequate hardware is in the final configuration. Attributes provided: RAID Data Protection Attributes required: RAID-capable disk unit controller **For 9117-MMA (#0041) and 9119-FHA (#0041)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No
#0042	**#0042 Mirrored System IOP Level Specify Code** Indicates the level of disk protection that is desired and ensures that adequate hardware is in the final configuration. Attributes provided: IOP-level mirrored protection Attributes required: Minimum of four disk units **For 9117-MMA (#0042) and 9119-FHA (#0042)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No

#0043	**#0043 Mirrored System Bus Level Specify Cod**e Indicates the level of disk protection that is desired and ensures that adequate hardware is in the final configuration. **Note**: For new systems, the marketing configurator produces an error on an order if sufficient disk units, IOPs, and expansion units are not included on the order to support bus-level mirrored protection for all disk units. New, preloaded systems ship with bus-level mirroring enabled. Attributes provided: Bus-level mirrored protection Attributes required: Minimum of four disk units **For 9117-MMA (#0043) and 9119-FHA (#0043)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No partition not support
#0047	**#0047 Device Parity RAID-6 All Specify Code** Indicates the level of disk protection that is desired and ensures that adequate hardware is in the final configuration. Attributes provided: RAID-6 Data Protection Attributes required: RAID-6 capable disk unit controller **For 9117-MMA (#0047) and 9119-FHA (#0047)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No **Note**: For model 570, the disk drives inside the system unit use RAID-5 arrays because the integrated disk controllers are not capable of RAID-6.
#0092	**#0092 External xSeries Attach** Added to an order for each Direct Attached xSeries Server that is connected to the system. The marketing configurators use this code to determine the number of HSL and SPCN cables that are required and to ensure that the number of External xSeries Servers does not exceed the system limit. Each External xSeries Server is cabled with a pair of HSL cables and is attached to the SPCN string similar to other HSL attached I/O towers. **For 9406-MMA (#0092)** ▶ Minimum required: 0 ▶ Maximum allowed: 57 (Initial order maximum: 57) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes

#0140	**#0140 Logical Partitioning Specify**
	Used to specify that this system is logically partitioned. A quantity of one #0140 is required on the order or system for each logical partition running i5/OS. Initial system orders and model upgrade orders that include this specify code ship without RAID or mirroring enabled.
	For 9406-MMA (#0140)
	► Minimum required: 0
	► Maximum allowed: 160 (Initial order maximum: 160)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes
#0141	**#0141 HSL OptiConnect Specify**
	Specifies that this system is part of a cluster using HSL OptiConnect. This code allows additional HSL cables to be ordered for clustered systems.
	For 9406-MMA (#0141)
	► Minimum required: 0
	► Maximum allowed: 1 (Initial order maximum: 1)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes
#0142	**#0142 Linux Partition Specify**
	Used to specify that this system is logically partitioned with a Linux partition. A quantity of one #0142 needs to be on the order or system for each Linux partition that is required.
	Direct-attach features are not allowed in OS/400® partitions.
	There are no minimum number of Linux direct-attached features that are required per Linux partition. A Linux partition can exist without any direct-attach features in it. In this case, the system provides virtual I/O for those Linux partitions that contain no direct-attach features.
	Attributes provided: One Linux Partition
	Attributes required: #0140 Logical Partitioning Specify
	For 9406-MMA (#0142)
	► Minimum required: 0
	► Maximum allowed: 159 (Initial order maximum: 159)
	► OS level required:
	– Red Hat Enterprise Linux AS for POWER Version 4 or later
	– SUSE LINUX Enterprise Server 9 for POWER or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes

#0145	**#0145 AIX Partition Specify** Used to specify that this system is logically partitioned with an AIX partition. A quantity of one #0145 needs to on the order or inventory records for each AIX partition that is required. AIX offered or supported features are allowed only within an AIX partition. AIX offered or supported features are not allowed in i5/OS partitions. There are no minimum number of AIX direct-attached features required per AIX partition. An AIX partition can exist without any AIX features in it. In this case, the system provides virtual I/O for those AIX partitions that contain no AIX features. Attributes provided: AIX Secondary Partition Attributes required: Logical Partitioning Specify (#0140) **For 9406-MMA (#0145)** ▸ Minimum required: 0 ▸ Maximum allowed: 159 (Initial order maximum: 159) ▸ OS level required: AIX 5L for POWER V5.2S for IBM eServer or later ▸ Initial Order/MES/Both/Supported: Both ▸ CSU: Yes
#0205	**#0205 RISC-to-RISC Data Migration** Used on initial orders to designate that the new server only receive a partial load of i5/OS in IBM manufacturing. When #0205 is on the order, manufacturing loads only SLIC and up through QSYS of i5/OS. Ensure that enough storage is ordered to contain the additional OS code that is loaded following the installation of the system at the client location. Specify code #0205 is mutually exclusive with #5000, SW Preload Required. The migration process requires that the installed model be at the same version and release level of i5/OS and other licensed programs as the new server. You can find more information and an updated i5/OS Upgrade and Data Migration Road Map (RISC-RISC) at: http://publib.boulder.ibm.com/iseries/ Attributes provided: Partial load of the i5/OS in IBM Mfg. Attributes required: #2145, primary OS IBM i and partition specify codes, for POWER6 of #0533 or #0534 (originally #0267) and RISC to RISC Data Migration from client's existing system **For 9117-MMA (#0047) and 9119-FHA (#0047)** ▸ Minimum required: 0 ▸ Maximum allowed: 1 (Initial order maximum: 0) ▸ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▸ Initial Order/MES/Both/Supported: Initial ▸ CSU: Not applicable ▸ Return parts MES: No
#0212	**#0212 Rack Content Specify 7045/SW4 - 4U** Indicator of rack space utilization for 7045/SW4. Attributes provided: Indicator of rack space utilization Attributes required: 4U of rack space **For 9119-FHA (#0212)** ▸ Not supported on POWER6.

#0223	**#0223 100 Mbps Token-Ring Specify** Indicates that a #2744 100/16/4 Mbps token-ring adapter is used on an integrated xSeries server. For each #2744 used on or with an integrated server, one #0223 is required on the order or system inventory records. **For 9406-MMA (#0223)** ▶ Minimum required: 0 ▶ Maximum allowed: 128 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes
#0224	**#0224 100/10 Mbps Ethernet Specify** Indicates that a #4838 100/10 Mbps Ethernet adapter is used on an integrated xSeries server. For each #4838 used on an integrated server, one #0224 is required on the order or on the inventory records. Attributes provided: #4838 installed on Integrated xSeries Server Attributes required: Integrated xSeries Server and #4838 **For 9406-MMA (#0224)** ▶ Minimum required: 0 ▶ Maximum allowed: 128 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes
#0225	**#0225 1 Gbps Ethernet Specify** Indicates that a #2743 or #2760 1 Gbps Ethernet adapter is used on an integrated xSeries server. For each #2743 or #2760 used on an integrated server, one #0225 is required on the order or on the inventory records. Attributes provided: #2743 or #2760 installed on Integrated xSeries Server Attributes required: Integrated xSeries Server and (#2743 or #2760) **For 9406-MMA (#0225)** ▶ Minimum required: 0 ▶ Maximum allowed: 128 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes
#0226	**#0226 1 Gbps Ethernet Specify** Indicates that a #5700 or #5701 1 Gbps Ethernet adapter is used on an integrated xSeries server. One #0226 is required for each #5700 or #5701 used. Attributes provided: #5700 or #5701 installed on Integrated xSeries Server Attributes required: Integrated xSeries Server and (#5700 or #5701) **For 9117-MMA (#0226) and 9119-FHA (#0226)** ▶ Minimum required: 0 ▶ Maximum allowed: 128 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No

#0265	**#0265 AIX Partition Specify** Used to indicate the number of partitions the system is running under AIX. Attributes provided: None Attributes required: None **For 9117-MMA (#0265)** ▶ Minimum required: 0 ▶ Maximum allowed: 160 (Initial order maximum: 160) ▶ OS level required: None **For 9119-FHA (#0265)** ▶ Minimum required: 0 ▶ Maximum allowed: 254 (Initial order maximum: 254) ▶ OS level required: Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#0266	**#0266 Linux Partition Specify** Used to indicate the number of partitions the system is running under Linux. Attributes provided: None Attributes required: None **For 9117-MMA (#0266)** ▶ Minimum required: 0 ▶ Maximum allowed: 160 (Initial order maximum: 160) ▶ OS level required: None **For 9119-FHA (#0266)** ▶ Minimum required: 0 ▶ Maximum allowed: 254 (Initial order maximum: 254) Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#0267	**#0267 i5/OS Partition Specify**
	Used to indicate the number of partitions the system is running under i5/OS.
	
	Attributes provided: None
	Attributes required: None
	
	For 9117-MMA (#0267)
	► Minimum required: 0
	► Maximum allowed: 160 (Initial order maximum: 160)
	► OS level required:
	   – IBM i 5.4 with LIC 5.4
	   – IBM i 6.1 or later
	
	For 9119-FHA (#0267)
	► Minimum required: 0
	► Maximum allowed: 254 (Initial order maximum: 254)
	► OS level required:
	   – IBM i 5.4 with LIC 5.4
	   – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: Not applicable
	Return parts MES: Not applicable

#0274	**#0274 Media Drawer, 19-in**
	Specifies that a 7214-1U2 SAS Media Drawer is configured in a 9119-FHA, 19 inch rack.
	
	Attributes provided: Media Drawer
	Attributes required: 19 inch rack with 1U of space.
	
	For 9119-FHA (#0274)
	► Minimum required: 0
	► Maximum allowed: 1 (Initial order maximum: 1)
	► OS level required:
	   – AIX 5L for POWER version 5.3 with the 5300-08 Technology Level or later
	   – AIX Version 6.1 with the 6100-01 Technology Level or later
	   – AIX 5L for POWER version 5.3 with the 5300-06 Technology Level and Service Pack 7 or later
	   – AIX 5L for POWER version 5.3 with the 5300-07 Technology Level and Service Pack 4 or later
	   – AIX Version 6.1 with the 6100-00 Technology Level and Service Pack 5 or later
	   – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: No
	Return parts MES: No
	
	Note: The media drawer has the following requirements:
	► 19 inch rack #0533 with 1U of space
	► Must be located in a 19 inch rack in a range from 5U thru 12U
	► PCI Expansion Drawer, #5790
	► SAS PCIX 2.0 Dual Controller, #5912 or #5902
	► SAS cable such as #3684 for attachment to #5912 or #5902

#0275	**#0275 CSC Specify**
	For exclusive use by the IBM Custom Solution Center. Marketing configurator support is not required or provided. Having #0275 on the order causes the order content to be routed internally to the Custom Solution Center build area.
	
	Attributes provided: None
	Attributes required: None
	
	For 9117-MMA (#02275) and 9119-FHA (#0275)
	▶ Minimum required: 0
	▶ Maximum allowed: 1PO (Initial order maximum: 1)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No

#0276	**#0276 CSC Specify**
	For exclusive use by the IBM Custom Solution Center. Marketing configurator support is not required or provided.
	
	Attributes provided: None
	Attributes required: None
	
	For 9119-FHA (#0276)
	▶ Minimum required: 0
	▶ Maximum allowed: 1 (Initial order maximum: 1)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	▶ Initial Order/MES/Both/Supported: Initial
	▶ CSU: Not applicable
	▶ Return parts MES: No
	
	Note: One per order.

#0277	**#0277 CSC Specify**
	For exclusive use by the IBM Custom Solution Center. Marketing configurator support is not required or provided.
	
	Attributes provided: None
	Attributes required: None
	
	For 9119-FHA (#0277)
	▶ Minimum required: 0
	▶ Maximum allowed: 1 (Initial order maximum: 1)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	▶ Initial Order/MES/Both/Supported: Initial
	▶ CSU: Not applicable
	▶ Return parts MES: No
	
	Note: One per order.

#0278	**#0278 CSC Specify**
	For exclusive use by the IBM Custom Solution Center. Marketing configurator support is not required or provided.
	Attributes provided: None Attributes required: None
	For 9119-FHA (#0278) ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 0) ► OS level required: 　– IBM i 5.4 with V5R4M5 machine code 　– IBM i 6.1 or later ► Initial Order/MES/Both/Supported: Supported ► CSU: Not applicable ► Return parts MES: No
	Note: One per order.
#0279	**#0279 CSC Specify**
	For exclusive use by the IBM Custom Solution Center. Marketing configurator support is not required/provided.
	Attributes provided: None Attributes required: None
	For 9119-FHA (#0279) ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: 　– IBM i 5.4 with V5R4M5 machine code 　– IBM i 6.1 or later ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: No
	Note: One per order.
#0280	**#0280 CSC Specify**
	For exclusive use by the IBM Custom Solution Center. Marketing configurator support is not required or provided.
	Attributes provided: None Attributes required: None
	For 9119-FHA (#0280) ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: 　– IBM i 5.4 with V5R4M5 machine code 　– IBM i 6.1 or later ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: No
	Note: One per order.

#0281	**#0281 CSC Specify**
	For exclusive use by the IBM Custom Solution Center. Marketing configurator support is not required or provided.
	
	Attributes provided: None
	Attributes required: None
	
	For 9119-FHA (#0281)
	► Minimum required: 0
	► Maximum allowed: 1 (Initial order maximum: 1)
	► OS level required:
	   – IBM i 5.4 with V5R4M5 machine code
	   – IBM i 6.1 or later
	► Initial Order/MES/Both/Supported: Initial
	► CSU: Not applicable
	► Return parts MES: No
	
	Note: One per order.

#0282	**#0282 CSC Specify**
	For exclusive use by the IBM Custom Solution Center. Marketing configurator support is not required or provided.
	
	Attributes provided: None
	Attributes required: None
	
	For 9119-FHA (#0282)
	► Minimum required: 0
	► Maximum allowed: 1 (Initial order maximum: 1)
	► OS level required:
	   – IBM i 5.4 with V5R4M5 machine code
	   – IBM i 6.1 or later
	► Initial Order/MES/Both/Supported: Initial
	► CSU: Not applicable
	► Return parts MES: No
	
	Note: One per order.

#0290	**#0290 Ext Tape Attached through #5736**
	Used to indicate one external port of a #5736 that is used to control an external tape device.
	
	Attributes provided: Placement code for IBM Configurator Tools
	Attributes required:
	► #5736 PCI-X Disk/Tape Controller with IOP
	► #5775 PCI-X Disk/Tape Controller with no IOP
	
	For 9117-MMA (#0290) and 9119-FHA (#0290)
	► Minimum required: 0
	► Maximum allowed: 48 (Initial order maximum: 48)
	► OS level required:
	   – IBM i 5.4 with V5R4M5 machine code
	   – IBM i 6.1 or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes
	► Return parts MES: No

#0296	**#0296 Specify Custom Data Protection**
	Specifies that a system has multiple IBM i partitions and that data protection schemes should be considered separately for each partition instead of only for an overall system level. Each partition's data protection scheme can be different or the same.
	
	Attributes provided: Not applicable
	Attributes required: Not applicable
	
	For 9117-MMA (#0296)
	▶ Minimum required: 0
	▶ Maximum allowed: 1 (Initial order maximum: 1)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No

#0299	**#0299 MES Conversion Analysis** (No longer available as of 01 November 2007.) Temporarily holds an order in IBM manufacturing. It is used when an already installed #2780 or #2757 is converted to a #5580 or #5581. It allows time for an automated tool to analyze the existing customer configuration and identify if special I/O configuration planning is required. **For 9406-MMA (#0299)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes

#0300	**#0300 Specify code for #5736/#5775**
	Indicates that the external port of a #5736 or #5775 is connected to one six pack of disk slots on a #5786 or #5787 TotalStorage EXP24 Disk Drawer or Tower. A #5736 or #5775 connected to a #5786 or #5787 is not capable of attaching or driving any additional internal disk units.
	
	Attributes provided: Not applicable
	Attributes required: At a minimum, the existence of one #5736 or #5775 per each #0300
	
	For 9119-FHA (#0300)
	▶ Minimum required: 0
	▶ Maximum allowed: 229 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	▶ Initial Order/MES/Both/Supported: Supported
	▶ CSU: Yes
	▶ Return parts MES: No

#0301	**#0301 EXP24 Attach through #5737/#5776**
	Indicates that one external port of a #5737 or #5776 is connected to one or two six packs of disk slots on a #5786 or #5787 TotalStorage EXP24 Disk Drawer or Tower.
	Both external ports of a #5737 or #5776 can be connected to #5786s or #5787s. Both ports of a #5737 or #5776 can connect to the same #5786 or #5787 or to different #5786sor #5787s. With both ports connected to #5786s or #5787s, a #5737 or #5776 is not capable of attaching or driving any additional internal disk units or internal tape or optical devices.
	Attributes provided: None Attributes required: At a minimum, the existence of one #5737 or #5776 per pair of #0301s
	For 9406-MMA (#0301) ► Minimum required: 0 ► Maximum allowed: 229 (Initial order maximum: 229) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes
#0302	**#0302 Specify EXP24 Attach through Existing Controller**
	Used to help IBM configuration tools. It is used on an EXP24 Disk Enclosure MES order to indicate that an already installed disk controller is used to control an EXP24 6 pack or 12 pack of disk drives. Therefore, fewer disk controllers or disk controller ports are required on the EXP24 MES order. The marketing configurator determines the quantity (if any) of #0302 on a given EXP24 Disk Enclosure MES order.
	Attributes provided: Not applicable Attributes required: Existing SCSI disk controller port being used to connect to an EXP24 enclosure
	For 9117-MMA (#0302) and 9119-FHA (#0302) ► Minimum required: 0 ► Maximum allowed: 229 (Initial order maximum: 0) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: MES ► CSU: Yes ► Return parts MES: No

#0308	**#0308 Mirrored Level System Specify Code**
	Indicates the level of disk protection desired and helps ensure that adequate hardware is in the final configuration.
	For new systems, the marketing configurator shows an error if sufficient disk units and disk controllers are not included on the order to support IOA-level mirroring protection. #0308 causes all disk units to be placed into configurations capable of IOA-level mirroring. Each disk unit and its mirrored pair must be on a different disk controller.
	Note: The load source disk unit in a new, preloaded system is device-level mirrored (same protection as provided with feature #0040). Thus, the load source is controlled by the first disk unit controller on the first system bus and is mirrored with a similar disk unit that is also attached to the same first disk controller on the first system bus.
	For upgrade orders, #0308 causes the marketing configurator to show an error if sufficient disk units and disk controllers are not available to provide the capability to enable IOA-level mirrored protection for all DASD.
	It is the client's responsibility to start mirroring on the system.
	Attributes provided: IOA level system mirroring Attributes required: A minimum of two disk controllers and a even number of disk units (with a minimum of four disk units on a system)
	For 9117-MMA (#0308) and 9119-FHA (#0308) ▸ Minimum required: 0 ▸ Maximum allowed: 1 (Initial order maximum: 1) ▸ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▸ Initial Order/MES/Both/Supported: Both ▸ CSU: Yes ▸ Return parts MES: No
#0309	**#0309 Specify SAS Controller Port Attach**
	Specifies that a SAS controller for port attachment is present.
	Attributes provided: Not applicable Attributes required: Existing SAS disk controller port being used to connect to a Charlotte enclosure
	For 9119-FHA (#0309) ▸ Minimum required: 0 ▸ Maximum allowed: 110 (Initial order maximum: 110) ▸ OS level required: – IBM i 5.4 with V5R4M5 machine code – IBM i 6.1 or later ▸ Initial Order/MES/Both/Supported: Both ▸ CSU: Yes ▸ Return parts MES: No

#0310	**#0310 EXP24 Attach through #5739/#5778** Indicates that one port of a #5739, #5778, #5781, #5782, #5799, or #5800 is connected to one or two 6 packs of disk slots of a #5786 or #5787 TotalStorage EXP24 Disk Drawer or Tower. All three external ports of a #5739, #5778, #5781, #5782, #5799, or #5800 can be connected to #5786s or #5787s. All three ports of a #5739, #5778, #5781, #5782, #5799, #5800 can connect to the same #5786 or #5787 or to different 5786s or 5787s. Attributes provided: None Attributes required: At a minimum, the existence of one #5739, #5778, #5781, #5782, #5799, or #5800 per each trio of #0310s **For 9406-MMA (#0310)** ▶ Minimum required: 0 ▶ Maximum allowed: 228 (Initial order maximum: 228) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes
#0319	**#0319 Specify FSP/Node Redundancy Enablement** Indicates that dynamic, failover service processor (FSP) redundancy and processor node redundancy are required. A minimum of four #7818 adapters must be installed in appropriate HSL/RIO adapter slots for 32-way servers and above. Attributes provided: Failover service processor (FSP) and node redundancy. Attributes required: Two or more processor books with four or more #7818 adapters and firmware level SF235_xxx **For 9119-FHA (#0319)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Not applicable ▶ Return parts MES:

#0325	**#0325 IPCS Extension Cables for NT**
	(No longer available as of 08 May 2007.)
	
	Provides extension cables for the display, mouse, and keyboard that are required when running an integrated xSeries server with the NT operating system. This feature should be used when longer cables are required to attach the display, mouse, and keyboard to the integrated xSeries server.
	
	Note: The keyboard cable that is supplied with this feature is for a standard keyboard connection, not a USB attached keyboard.
	
	Attributes provided: Connectivity for keyboard, display and mouse
	Attributes required: Integrated xSeries Server with NT Operating System, keyboard, display, and mouse.
	
	For 9117-MMA (#0325) and 9119-FHA (#0325)
	▶ Minimum required: 0
	▶ Maximum allowed: 48 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	▶ Initial Order/MES/Both/Supported: Supported
	▶ CSU: Yes
	▶ Return parts MES: No

#0347	**#0347 RAID Hot Spare Specify** Indicates to IBM configuration tools and to IBM Manufacturing that RAID-5 or RAID-6 disk arrays should be further protected using the i5/OS function of RAID hot spare. If specified, IBM ships a configuration that has at least one stand-by disk drive for each disk controller in the system or designated partition. The customer can alter the hot spare configuration selecting different options after the system is installed. Attributes provided: Not applicable Attributes required: Existence of #0041 or #0047 **For 9117-MMA (#0347) and 9119-FHA (#0347)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No
#0348	**#0348 V.24/EIA232 6.1 m (20-ft) PCI Cable** Provides a 20 foot WAN PCI cable that supports a V.24 or a EIA232 electrical connection interface. Attributes provided: Not applicable Attributes required: Not applicable **For 9117-MMA (#0348) and 9119-FHA (#0348)** ▶ Minimum required: 0 ▶ Maximum allowed: 480 (Initial order maximum: 250) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No

#0349	**#0349 V.24/EIA232 15.2 m (50-ft) PCI Cable**
	(No longer available as of 15 December 2002.)
	
	Provides a 50 foot WAN PCI cable that supports a V.24 or a EIA232 electrical connection interface.
	
	Attributes provided: Not applicable
	Attributes required: Not applicable
	
	For 9117-MMA (#0349) and 9119-FHA (#0349)
	▶ Minimum required: 0
	▶ Maximum allowed: 480 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	▶ Initial Order/MES/Both/Supported: Supported
	▶ CSU: Yes
	▶ Return parts MES: No

#0353	**#0353 V.35 6.1 m (20-ft) PCI Cable**
	Provides a 20 foot WAN PCI cable that supports a V.35 electrical connection interface.
	
	Attributes provided: Not applicable
	Attributes required: Not applicable
	
	For 9117-MMA (#0353) and 9119-FHA (#0353)
	► Minimum required: 0
	► Maximum allowed: 480 (Initial order maximum: 250)
	► OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes
	► Return parts MES: No

#0354	**#0354 V.35 15.2 m (50-ft) PCI Cable**
	(No longer available as of 15 December 2002.)
	
	Provides a 50 foot WAN PCI cable that supports a V.35 electrical connection interface.
	
	Attributes provided: Not applicable
	Attributes required: Not applicable
	
	For 9117-MMA (#0354) and 9119-FHA (#0354)
	► Minimum required: 0
	► Maximum allowed: 480 (Initial order maximum: 0)
	► OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes
	► Return parts MES: No

#0356	**#0356 V.36 6.1 m (20-ft) PCI Cable**
	(No longer available as of 01 December 2007.)
	
	Provides a 20 foot WAN PCI cable that supports a V.36 electrical connection interface.
	
	Attributes provided: Not applicable
	Attributes required: Not applicable
	
	For 9117-MMA (#0356) and 9119-FHA (#0356)
	► Minimum required: 0
	► Maximum allowed: 480 (Initial order maximum: 0)
	► OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes
	► Return parts MES: No

#0359	**#0359 X.21 6.1 m (20-ft) PCI Cable**
	Provides a 20 foot WAN PCI cable that supports a X.21 electrical connection interface.
	
	Attributes provided: Not applicable
	Attributes required: Not applicable
	
	For 9117-MMA (#0359) and 9119-FHA (#0359)
	► Minimum required: 0
	► Maximum allowed: 480 (Initial order maximum: 250)
	► OS level required:
	   – IBM i 5.4 with V5R4M5 machine code
	   – IBM i 6.1 or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes
	► Return parts MES: No

#0360	**#0360 X.21 15.2 m (50-ft) PCI Cable**
	(No longer available as of 15 December 2002.)
	
	Provides a 50 foot WAN PCI cable that supports a X.21 electrical connection interface.
	
	Attributes provided: Not applicable
	Attributes required: Not applicable
	
	For 9117-MMA (#0360) and 9119-FHA (#0360)
	► Minimum required: 0
	► Maximum allowed: 480 (Initial order maximum: 0)
	► OS level required:
	   – IBM i 5.4 with V5R4M5 machine code
	   – IBM i 6.1 or later
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes
	► Return parts MES: No

#0365	**#0365 X.21 15.2 m (50-ft) PCI Cable**
	(No longer available as of 15 December 2002.)
	
	Provides a 50 foot WAN PCI cable that supports a v.24 electrical connection interface.
	
	Attributes provided: Not applicable
	Attributes required: Not applicable
	
	For 9117-MMA (#0365) and 9119-FHA (#0365)
	► Minimum required: 0
	► Maximum allowed: 480 (Initial order maximum: 0)
	► OS level required:
	   – IBM i 5.4 with V5R4M5 machine code
	   – IBM i 6.1 or later
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes
	► Return parts MES: No

#0367	**#0367 V.24/EIA232 24.4 m (80-ft) PCI Cable** Requires one RVX port (communications port, not modem port). A customer can select a #0367 for each i5/OS partition. There is a maximum of one #0367 per card. If a card has two RVX ports, a #0367 can connect to one port and the other port can be used for other comm support. Features supporting the #0367 cable are #6833, #6834. If a system has #5544, then at a minimum, one #0367 is required. This feature ships a PCI card compatible Operations Console cable. This cable ships with a 25-pin to 9-pin adapter. Attributes provided: Not applicable Attributes required: Not applicable **For 9117-MMA (#0367) and 9119-FHA (#0367)** ▶ Minimum required: 0 ▶ Maximum allowed: 160 (Initial order maximum: 160) ▶ OS level required: – IBM i 5.4 with V5R4M5 machine code – IBM i 6.1 or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No
#0371	**#0371 LC-SC Adapter Kit (50 um)** 50 micron fiber LC-SC conversion kit. **Note**: This feature is supported as #2456 on unified POWER6 MTMs. **For 9406-MMA (#0371)** ▶ Minimum required: 0 ▶ Maximum allowed: 288 (Initial order maximum: 250) ▶ OS level required: – IBM i 5.4 with V5R4M5 machine code or later – AIX 5L for POWER V5.2S for IBM eServer or later – Red Hat Enterprise Linux AS for POWER Version 4 or later – SUSE LINUX Enterprise Server 9 for POWER or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes
#0372	**#0372 LC-SC Adapter Kit (62.5 um)** 62.5 micron fiber LC-SC conversion kit. **For 9406-MMA (#0372)** ▶ Minimum required: 0 ▶ Maximum allowed: 288 (Initial order maximum: 250) ▶ OS level required: – IBM i 5.4 with V5R4M5 machine code or later – AIX 5L for POWER V5.2S for IBM eServer or later – Red Hat Enterprise Linux AS for POWER Version 4 or later – SUSE LINUX Enterprise Server 9 for POWER or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes

#0373	**#0373 UPS Factory Integration Specify** Used in manufacturing to ensure that an uninterruptible power supply that is ordered from IBM under a separate machine type or model is associated with the system order and is shipped concurrently. Attributes provided: Not applicable Attributes required: Ordered machine type-model UPS. **For 9117-MMA (#0373)** ▶ Minimum required: 0 ▶ Maximum allowed: 42 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Not applicable ▶ Return parts MES: No **Note**: Available only when ordered with 19 inch feature code rack on an MES order. Maximum is 36 with rack feature 0551.
#0374	**#0374 HMC Factory Integration Specify** Used in manufacturing to ensure that an HMC ordered from IBM under a separate machine type/model is associated with the system order and is shipped concurrently. Attributes provided: Not applicable Attributes required: Ordered machine type-model HMC. **For 9117-MMA (#0374)** ▶ Minimum required: 0 ▶ Maximum allowed: 42 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Not applicable ▶ Return parts MES: No **Note**: Available only when ordered with 19 inch feature code rack on an MES order. Maximum is 36 with rack feature 0551.
#0375	**#0375 Display Factory Integration Specify** Used in manufacturing to ensure that a display ordered from IBM under a separate machine type/model, is associated with the system order, and is shipped concurrently. Attributes provided: Not applicable Attributes required: Ordered machine type-model display. **For 9117-MMA (#0375)** ▶ Minimum required: 0 ▶ Maximum allowed: 42 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Not applicable ▶ Return parts MES: No **Note**: Available only when ordered with 19 inch feature code rack on an MES order. Maximum is 36 with rack feature 0551.

#0376	**#0376 Reserve Rack Space for UPS** Used in manufacturing to reserve 1 EIA of rack space in the bottom of the rack for later client installation of a UPS. Attributes provided: 1 EIA rack space reserved. Attributes required: Ordered rack feature. **For 9117-MMA (#0376)** ► Minimum required: 0 ► Maximum allowed: 42 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: MES ► CSU: Not applicable ► Return parts MES: No **Note**: Available only when ordered with 19 inch feature code rack on an MES order. Maximum is 36 with rack feature 0551.
#0377	**#0377 Reserve Rack Space for HMC** Used in manufacturing to reserve 1 EIA of rack space in the middle of the rack for later client installation of a rack-mounted HMC. Attributes provided: 1 EIA rack space reserved. Attributes required: Ordered rack feature. **For 9117-MMA (#0377)** ► Minimum required: 0 ► Maximum allowed: 42 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: MES ► CSU: Not applicable ► Return parts MES: No **Note**: Available only when ordered with 19 inch feature code rack on an MES order. Maximum is 36 with rack feature 0551.
#0378	**#0378 Reserve Rack Space for Display** Used in manufacturing to reserve 1 EIA of rack space in the middle of the rack for later client installation of an HMC rack-mounted display such as the 7316. Attributes provided: 1 EIA rack space reserved. Attributes required: Ordered rack feature. **For 9117-MMA (#0378)** ► Minimum required: 0 ► Maximum allowed: 42 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: MES ► CSU: Not applicable ► Return parts MES: No **Note**: Available only when ordered with 19 inch feature code rack on an MES order. Maximum is 36 with rack feature 0551.

#0395	**#0395 MTM Upgrade Indicator** Machine type model upgrade indicator for upgrades from a 9406-570/MMA to a 9117-MMA. **For 9117-MMA (#0395)** ► Minimum required: 0 ► Maximum allowed: 4 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: MES ► CSU: Yes ► Return parts MES: No
#0396	**#0396 RPO MES Indicator** Machine type model upgrade RPO MES indicator. **For 9406-MMA (#0396)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: MES ► CSU: Yes
#0397	**#0397 MMA to MMA Upgrade Indicator** Indicates that this 9117-MMA system was created as a Model Conversion from a 9406-MMA. This feature can be added only to MES orders when placing an order for a Model Conversion from 9406-MMA to 9117-MMA. Attributes provided: 9406 function carryover indicator Attributes required: 9406-MMA model conversion **For 9117-MMA (#0397)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: MES ► CSU: Not applicable ► Return parts MES: No
#0423	**#0423 Admin 570 Enclosure Count** Specifies the number of drawers in a POWER6 570 configuration. Attributes provided: This feature code specifies the number of drawers in a Model 570 configuration **For 9406-MMA (#0423)** ► Minimum required: 1 ► Maximum allowed: 4 (Initial order maximum: 4) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: Yes

#0446	**#0446 512 MB DDR Server Memory**
	512 MB DDR memory for an Integrated xSeries Server.
	
	Attributes provided: 512 MB memory for Integrated xSeries Server
	Attributes required: One memory slot on Integrated xSeries Server
	
	For 9117-MMA (#0446)
	► Minimum required: 0
	► Maximum allowed: 192 (Initial order maximum: 0)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#0446)
	► Minimum required: 0
	► Maximum allowed: 144 (Initial order maximum: 144)
	► OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No
	
	Note: This feature is ordered for Integrated xSeries Server in towers or cages that are designated as *Customer Set Up* and for Integrated xSeries Server in towers or cages that are designated as *Install By IBM*. This feature is known as *#9726* on System i models upgrading to unified POWER6 MTMs.

#0447	**#0447 1 GB DDR Server Memory**
	1 GB DDR memory for an Integrated xSeries Server.
	
	Attributes provided: 1 GB memory for Integrated xSeries Server
	Attributes required: One memory slot on Integrated xSeries Server
	
	For 9117-MMA (#0447)
	► Minimum required: 0
	► Maximum allowed: 102 (Initial order maximum: 0)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#0447)
	► Minimum required: 0
	► Maximum allowed: 144 (Initial order maximum: 0)
	► OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No
	
	Note: This feature is ordered for Integrated xSeries Server in towers or cages that are designated as *Customer Set Up* and for Integrated xSeries Server in towers or cages that are designated as *Install By IBM*.

#0453	**#0453 Customer Specified Placement** (No longer available as of 30 May 2008.) Requests that IBM deliver the system to the customer according to the slot in drawer hardware placement defined by the account team. Eliminates the need to have these parts relocated in the customers environment as can happen if the order is placed without this feature code. Client placement specifications are collected using the System Planning Tool (SPT) and processed through the marketing configurator. (Use of the SPT is not required). Requires that the account team submit the output of the marketing configurator into IBM manufacturing using the CSP Web site, which is available at: http://www.ibm.com/eserver/power/csp U.S. Business Partners and Distributors can bypass this step. Requires that the account team assure that the marketing configurator output submitted reflects the actual order placed. Attributes provided: I/O component placement Attributes required: Marketing Configurator output submitted to the CSP Web site. (U.S. Business Partners and Distributors can bypass this step.) **For 9117-MMA (#0453)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: No
#0454	**#0454 LPAR Partition Init** Configures a partition and assigns the correct resources as specified by the customer. Attributes provided: Partition and resources assigned to that partition Attributes required: #0453, #0456 or #8453 **For 9406-MMA (#0454)** ▶ Minimum required: 0 ▶ Maximum allowed: 10 (Initial order maximum: 10) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable
#0455	**#0455 LPAR Software Preload** Loads the Operating System (i5/OS or AIX 5L) and selected Licensed Program Products (LPPs) specified by the customer for a partition configured through #0454 LPAR Partition Initialization. Attributes provided: LPPs and i5/OS or AIX 5L loaded in a partition Attributes required: #0453, #0456, or #8453 and #0454 **For 9406-MMA (#0455)** ▶ Minimum required: 0 ▶ Maximum allowed: 10 (Initial order maximum: 10) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable

#0474	**#0474 SAP Express A1 specify**
	For 9406-MMA (#0474)
	▶ Minimum required: 0
	▶ Maximum allowed: No Max (Initial order maximum: 250)
	▶ OS level required: Not applicable
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
#0533	**#0533 IBM i 5.4 with Machine Code V5R4M5 Specify Code**
	Indicates the correct level of code when IBM i is specified.
	Attributes provided: IBM i 5.4 with V5R4M5 machine code Indicator
	Attributes required: IBM i
	For 9117-MMA (#0533) and 9119-FHA (#0533)
	▶ Minimum required: 0
	▶ Maximum allowed: 1 (Initial order maximum: 1)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No
#0534	**#0534 IBM i 6.1 Specify Code**
	Indicates the correct level of code when IBM i is specified.
	Attributes provided: IBM i 6.1 indicator
	Attributes required: IBM i
	For 9117-MMA (#0534) and 9119-FHA (#5349)
	▶ Minimum required: 0
	▶ Maximum allowed: 1 (Initial order maximum: 1)
	▶ OS level required: IBM i 6.1 with V6R1M0 machine code or later
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No

#0551	**#0551 System i 36U 1.8m Rack**
	Provides a 19 inch, 1.8 meter high rack with 36 EIA units of total space for installing rack mounted CECs or expansion units. One of the following features are required on the #0551:
	► #6068 - Optional Front Door for 1.8 m Rack
	► #6246 - 1.8 m Rack Trim Kit
	► #6248 - 1.8 m Rack Acoustic Doors®
	The following features are also orderable on the #0551:
	► #0599 - Rack Filler Panel Kit
	► #6580 - Optional Rack Security Kit
	► #7840 - Side-By-Side for 1.8 m Racks
	► #7841 - Ruggedize Rack Kit
	The #0551 can support up to eight PDUs, four mounted vertically and four mounted horizontally. Each PDU mounted horizontally takes up 1 EIA of rack space. The following PDUs are supported:
	► #7188 - Power Distribution Unit (12, C-13 sockets)
	► #7109 - Power Distribution Unit (12, C-13 sockets)
	Attributes provided: 19 inch, 1.8 meter, 36 EIA Rack
	Attributes required: #6068, #6246, or #6248.
	For 9117-MMA (#0551) and 9119-FHA (#0551)
	► Minimum required: 0
	► Maximum allowed: No Max (Initial order maximum: 0)
	► OS level required: Not applicable
	► Initial Order/MES/Both/Supported: MES
	► CSU: Yes
	► Return parts MES: No
#0553	**#0553 System i 42U 2.0m Rack**
	Provides a 19 inch, 2.0 meter high rack with 42 EIA units of total space for installing rack mounted CECs or expansion units. One of the following features are required on the #0553:
	► #6069 - Optional Front Door for 2.0 m Rack
	► #6247 - 2.0 m Rack Trim Kit
	► #6249 - 2.0 m Rack Acoustic Doors
	The #0553 can support up to nine power distribution units (PDU), four mounted vertically and five mounted horizontally. Each PDU mounted horizontally takes up 1 EIA of rack space. The following PDUs are supported:
	► #7188 - Power Distribution Unit (12, C13 sockets)
	► #7109 - Power Distribution Unit (12, C13 sockets)
	Attributes provided: 19 inch, 2.0 meter, 42 EIA Rack
	Attributes required: #6069 or #6247 or #6249
	For 9117-MMA (#0553) and 9119-FHA (#0553)
	► Minimum required: 0
	► Maximum allowed: No maximum (Initial order maximum: 0)
	► OS level required: Not applicable
	► Initial Order/MES/Both/Supported: MES
	► CSU: Yes
	► Return parts MES: No

#0554	**#0554 System i 11U .6m Rack** Provides a 19 inch, .6 meter (24 inch) high rack with 11 EIA units of total space for installing rack mounted CECs or expansion units. The #0554 includes a lockable front door. Filler panels and a perforated front door are included to help provide proper airflow and cooling. A rear door is not offered. Attributes provided: 19 inch, .6 meter, 11 EIA Rack Attributes required: None **For 9117-MMA (#0554) and 9119-FHA (#0554)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#0555	**#0555 System i 25U 1.3m Rack** Provides a 19 inch, 1.3 meter (49 inch) high rack with 25 EIA units of total space for installing rack-mounted CECs or expansion units. The #0555 includes lockable front and rear doors. Filler panels and perforated doors are included to help provide proper airflow and cooling. Attributes provided: 19 inch, 1.3M, 25 EIA Rack Attributes required: None **For 9117-MMA (#0555) and 9119-FHA (#0555)** ► Maximum allowed: No maximum (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No

| #0588 | **#0588 PCI-X Expansion Unit in Rack**
(No longer available as of 01 June 2006.)

The equivalent of a #5088 PCI-X Expansion Unit, but the #0588 is a rack mounted unit. An #0588 is eight EIA units high and has 14 PCI-X slots for PCI IOPs and IOAs. Disk units and removable media are not supported in the #0588. The #0588 cannot be converted to a #5088. A #5088 cannot be converted to a #0588.

PCI IOAs are supported by feature #3705 or #2844 PCI IOPs. A #2844 can be used in a #0588.

The #0588 has two redundant 575W power supplies and two integrated PDU compatible line cords. Both line cords can be connected to the same PDU or to separate PDUs in a rack. When the line cords are connected to separate PDUs, and those PDUs are connected to two different power sources, the #0588 has dual line cord capability.

A bus adapter to provide the RIO-2 interface to the system is included.

Cables must be ordered to attach to the RIO-2 ports.

Select the appropriate cables based on desired cable length.
► #3156 - 1.75 m RIO-2 Cable
► #3168 - 2.5 m RIO-2 Cable
► #3146 - 1 m RIO-2 Cable
► #3147 - 3.5 m RIO-2 Cable
► #3148 - 10 m RIO-2 Cable
► #1485 - 15 m RIO-2 Cable

For each I/O tower or unit select one of the following SPCN cables:
► #1466 - 30 m SPCN Cable -supported only
► #6001 - 2 m SPCN Cable - supported only
► #6006 - 3 m SPCN Cable
► #6007 - 15 m SPCN Cable
► #6008 - 6 m SPCN Cable
► #6029 - 30 m SPCN Cable

Attributes provided: 14 PCI-X slots
Attributes required: RIO-2 cables, SPCN cables

For 9117-MMA (#0558) and 9119-FHA (#0558)
► Minimum required: 0
► Maximum allowed: 48 (Initial order maximum: 0)
► OS level required:
  – AIX supported only for migration from M/T 9406
  – IBM i 5.4 with V5R4M5 machine code or later
► Initial Order/MES/Both/Supported: Supported
► CSU: Yes
► Return parts MES: No |

#0595	**#0595 PCI-X Expansion Unit in Rack**
	A rack mounted Remote I/O drawer. The #0595 has seven PCI-X IOP/IOA slots and supports up to 12 SCSI disk units. #0595 uses five EIA units of space in a 19 inch rack.
	
	Attributes provided: 7 PCI slots and 12 disk positions
	Attributes required: RIO-2 interface
	
	For 9117-MMA (#0595) and 9119-FHA (#0595)
	► Minimum required: 0
	► Maximum allowed: 48 (Initial order maximum: 48)
	► OS level required:
	  – AIX supported only for migration from M/T 9406
	  – IBM i 5.4 with V5R4M5 machine code or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes
	► Return parts MES: No.

#0599	**#0599 Rack Filler Kit** Provides rack filler panels for IBM 19 inch racks. The #0599 provides three 1-EIA -unit filler panels and one 3-EIA-unit filler panel. These are snap-on panels. Attributes provided: Snap on rack filler panels Attributes required: 19 inch rack **For 9117-MMA (#0599) and 9119-FHA (#0599)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 250) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No
#0600	**#0600 CCEP** Allows the shipping of an order prior to the scheduled ship date. #0600 alerts IBM manufacturing to ship order prior to scheduled ship date. This is an exception process, and nothing will be announced. #0600 is added to each order manually. **For 9406-MMA (#0600)** ► Minimum required: 0 ► Maximum allowed: 1PO (Initial order maximum: 1) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes

#0603	**#0603 Direct Attach-2744**
	(No longer available as of 01 June 2006)
	
	#0603 is ordered when the function of a #2744 IOA is required but the card will be controlled by a non-OS/400 operating system. Cards controlled by a non-OS/400 operating system do not use or require PCI IOPs. Direct attach cards are supported only in a non-OS/400 partition.
	
	Prerequisites:
	▸ #0140 Logical Partitioning Specify.
	▸ #0142 Linux Partitioning Specify.
	
	Attributes provided: #2744 controlled by Linux operating system
	Attributes required: #0140, #0142
	
	For 9406-MMA (#0603)
	▸ Minimum required: 0
	▸ Maximum allowed: 120 (Initial order maximum: 0)
	▸ OS level required:
	  – Red Hat Enterprise Linux AS for POWER Version 4 or later
	  – SUSE Linux Enterprise Server 9 for POWER or later
	▸ Initial Order/MES/Both/Supported: Supported
	▸ CSU: Yes
	
	Note: This feature is supported for conversion only on the model MMA and cannot be ordered.

#0613	**#0613 Direct Attach-2742**
	Ordered when the function of a #2742 IOA is required but the card is controlled by a non-i5/OS operating system. Cards controlled by a non-i5/OS operating system do not use or require PCI IOPs. Direct attach cards are supported only in a non-i5/OS partition.
	
	Prerequisites:
	▸ #0140 Logical Partitioning Specify
	▸ #0142 Linux Partitioning Specify
	
	Attributes provided: #2742 controlled by Linux operating system
	Attributes required: #0140, #0142
	
	For 9406-MMA (#0613)
	▸ Minimum required: 0
	▸ Maximum allowed: 240 (Initial order maximum: 240)
	▸ OS level required:
	  – Red Hat Enterprise Linux AS for POWER Version 4 or later
	  – SUSE LINUX Enterprise Server 9 for POWER or later
	▸ Initial Order/MES/Both/Supported: Both
	▸ CSU: Yes

#0614	**#0614 Direct Attach-2793**
	Ordered when the function of a #2793 IOA is required but the card is controlled by a non-i5/OS operating system. Cards controlled by a non-i5/OS operating system do not use or require PCI IOPs. Direct attach cards are supported only in a non-i5/ OS partition.
	
	Prerequisites:
	► #0140 Logical Partitioning Specify.
	► #0142 Linux Partitioning Specify.
	
	Attributes provided: #2793 controlled by Linux operating system
	Attributes required: #0140, #0142
	
	For 9406-MMA (#0614)
	► Minimum required: 0
	► Maximum allowed: 240 (Initial order maximum: 240)
	► OS level required:
	  – Red Hat Enterprise Linux AS for POWER Version 4 or later
	  – SUSE LINUX Enterprise Server 9 for POWER or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes

#0616	**#0616 Direct Attach-2805**
	Ordered when the function of a #2805 IOA is required but the card is controlled by a non-i5/OS operating system. Cards controlled by a non-i5/OS operating system do not use or require PCI IOPs.
	
	Prerequisites:
	► #0140 Logical Partitioning Specify.
	► #0142 Linux Partitioning Specify.
	
	Attributes provided: #2805 controlled by Linux operating system
	Attributes required: #0140 or #0142
	
	For 9406-MMA (#0616)
	► Minimum required: 0
	► Maximum allowed: 120 (Initial order maximum: 120)
	► OS level required:
	  – Red Hat Enterprise Linux AS for POWER Version 4 or later
	  – SUSE LINUX Enterprise Server 9 for POWER or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes

#0620	**#0620 Direct Attach-5700**
	Ordered when the function of a #5700 IOA is required but the card is controlled by a non-i5/OS operating system. Cards controlled by a non-i5/OS operating system do not use or require PCI IOPs. Direct attach cards are supported only in a non-i5/OS partition.
	
	#0620, #5700, and #6800 are physically the same adapter card but have different feature numbers to indicate to IBM configurator tools that an IOP is or is not being used in the configuration.
	
	Prerequisites:
	▶ #0140 Logical Partitioning Specify.
	▶ #0142 Linux Partition Specify or #0145 AIX Partition Specify
	
	Attributes provided: #5700 controlled by AIX or Linux operating system
	Attributes required: #0140 and (#0142 or #0145)
	
	For 9406-MMA (#0620)
	▶ Minimum required: 0
	▶ Maximum allowed: 124 (Initial order maximum: 124)
	▶ OS level required:
	    – AIX 5L for POWER V5.2S for IBM eServer or later
	    – Red Hat Enterprise Linux AS for POWER Version 4 or later
	    – SUSE LINUX Enterprise Server 9 for POWER or later
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes

#0621	**#0621 Direct Attach-5701**
	Ordered when the function of a #5701 IOA is required but the card is controlled by a non-i5/OS operating system. Cards controlled by a non-i5/OS operating system do not use or require PCI IOPs. Direct attach cards are supported only in a non-i5/OS partition.
	
	#0621, #5701, and #6801 are physically the same adapter card but have different feature numbers to indicate to IBM configurator tools that an IOP is or is not being used in the configuration.
	
	Prerequisites:
	▶ #0140 Logical Partitioning Specify.
	▶ #0142 Linux Partition Specify or #0145 AIX Partition Specify
	
	Attributes provided: #5701 controlled by AIX or Linux operating system
	Attributes required: #0140 and (#0142 or #0145)
	
	For 9406-MMA (#0621)
	▶ Minimum required: 0
	▶ Maximum allowed: 124 (Initial order maximum: 124)
	▶ OS level required:
	    – AIX 5L for POWER V5.2S for IBM eServer or later
	    – Red Hat Enterprise Linux AS for POWER Version 4 or later
	    – SUSE LINUX Enterprise Server 9 for POWER or later
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes

#0623	**#0623 Direct Attach-2849**
	(No longer available as of 01 June 2006.)
	
	Ordered when the function of a #2849 IOA is required but the card is controlled by a non-OS/400 operating system. Cards controlled by a non-OS/400 operating system do not use or require PCI IOPs. Direct attach cards are supported only in a non-OS/400 partition.
	
	Attributes provided: #2849 controlled by Linux operating system
	Attributes required: #0140 or #0142
	
	For 9406-MMA (#0623)
	▶ Minimum required: 0
	▶ Maximum allowed: 124 (Initial order maximum: 0)
	▶ OS level required:
	  – Red Hat Enterprise Linux AS for POWER Version 4 or later
	  – SUSE LINUX Enterprise Server 9 for POWER or later
	▶ Initial Order/MES/Both/Supported: Supported
	▶ CSU: Yes

#0624	**#0624 Direct Attach-5702**
	(No longer available as of 01 June 2006.)
	
	Ordered when the function of a #5702 IOA is required but the card is controlled by a non-OS/400 operating system. Cards controlled by a non-OS/400 operating system do not use or require PCI IOPs. Direct attach cards are supported only in a non-OS/400 partition.
	
	Prerequisites:
	▶ #0140 Logical Partitioning Specify.
	▶ #0142 Linux Partitioning Specify.
	
	Attributes provided: #5702 controlled by Linux operating system
	Attributes required: #0140, #0142
	
	For 9406-MMA (#0624)
	▶ Minimum required: 0
	▶ Maximum allowed: 24 (Initial order maximum: 0)
	▶ OS level required:
	  – Red Hat Enterprise Linux AS for POWER Version 4 or later
	  – SUSE LINUX Enterprise Server 9 for POWER or later
	▶ Initial Order/MES/Both/Supported: Supported
	▶ CSU: Yes
	
	Note: This feature is supported for conversion only on the model 675 and cannot be ordered.

| #0625 | **#0625 Direct Attach-5704**
(No longer available as of 01 June 2006.)

Ordered when the function of a PCI-X Fibre Chan Tape Ctlr (#5704) is required and the card is controlled by an AIX or Linux operating system. Cards controlled by a AIX or Linux operating system do not use or require PCI IOPs.

Direct attach cards are supported only in an LPAR partition.

Attributes provided: Attachment of external tape devices
Attributes required: #0140 and (#0142 or #0145)

For 9406-MMA (#0625)
▶ Minimum required: 0
▶ Maximum allowed: 48 (Initial order maximum: 0)
▶ OS level required:
  – AIX 5L for POWER V5.2S for IBM eServer or later
  – Red Hat Enterprise Linux AS for POWER Version 4 or later
  – SUSE LINUX Enterprise Server 9 for POWER or later
▶ Initial Order/MES/Both/Supported: Supported
▶ CSU: Yes |
| #0626 | **#0626 Direct Attach-2787**
(No longer available as of 01 June 2006.)

Ordered when the function of a #2787 IOA is required but the card is controlled by a non-OS/400 operating system. Cards controlled by a non-OS/400 operating system do not use or require PCI IOPs. Direct attach cards are supported only in a non-OS/400 partition.

Note: An optics cleaning kit (P/N 46G6844) and instruction sheet (P/N 21P6238, form number SY27-2604) is supplied, one per system, when a #0626 or #2787 is ordered.

Prerequisites:
▶ #0140 Logical Partitioning Specify.
▶ #0142 Linux Partitioning Specify.

Attributes provided: #2787 controlled by Linux operating system
Attributes required: #0140, #0142

For 9406-MMA (#0626)
▶ Minimum required: 0
▶ Maximum allowed: 290 (Initial order maximum: 0)
▶ OS level required:
  – Red Hat Enterprise Linux AS for POWER Version 4 or later
  – SUSE LINUX Enterprise Server 9 for POWER or later
▶ Initial Order/MES/Both/Supported: Supported
▶ CSU: Yes |

#0629	**#0629 4 Gbps Fibre Channel (1-Port)**
	Provides a 4 Gbps single port fibre channel PCI-X 2.0 adapter, which is a 64-bit address or data, short form factor PCI-X adapter with an LC type external fiber connector. It enables a single initiator over an optical fiber link or loop. With the use of appropriate optical fiber cabling, this adapter enables you to set up a network of high-speed local and remote storage.
	
	This feature is for use only in AIX and Linux partitions. The #0629 negotiates automatically for the highest data rate between adapter and an attaching device at 1 Gbps, 2 Gbps, or 4 Gbps of which the device or switch is capable. Distances of up to 500 meters running at 1 Gbps data rate and up to 300 meters running at 2 Gbps data rate and 4 Gbps data rate up to 150 meters are supported between the adapter and an attaching device or switch. When used with IBM supported fibre channel storage switches supporting long-wave optics, distances of up to 10 kilometers are capable of running at either 1 Gbps, 2 Gbps, or 4 Gbps data rates.
	
	#0629 can be used to attach devices either directly or by means of fibre channel switches. If attaching a device or switch with an SC type fiber connector, an LC-SC 50 Micron Fiber Converter Cable (#2456) or an LC-SC 62.5 Micron Fiber Converter Cable (#0372) is required.
	
	Attributes provided: One-port fibre channel adapter
	Attributes required: One empty PCI-X slot
	
	For 9406-MMA (#0629)
	► Minimum required: 0
	► Maximum allowed: 48 (Initial order maximum: 48)
	► OS level required:
	  – AIX 5L for Power V5.2 for IBM eServer or later
	  – Red Hat Enterprise Linux AS for POWER Version 4 or later
	  – SUSE Linux Enterprise Server 9 for POWER or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes

#0630	**#0630 PCI-X 1 Gbps iSCSI TOE-Copper**
	Provides a 1 Gbps iSCSI TOE PCI-X adapter that encapsulates SCSI commands and data into TCP and transports them over the Ethernet through IP packets. The adapter operates as an iSCSI TCP/IP Offload Engine (TOE). This offload of the host eliminates protocol processing and reduces CPU interrupts. The adapter uses RJ45 1 Gbps Ethernet connector. This iSCSI adapter can be used to initiate requests to external storage devices from AIX 5L and Linux partitions.
	
	Attributes provided: Offload of host protocol processing
	Attributes required: Available PCI-X Slot
	
	For 9406-MMA (#0630)
	► Minimum required: 0
	► Maximum allowed: 63 (Initial order maximum: 63)
	► OS level required:
	  – AIX 5L for POWER V5.2 for IBM eServer or later
	  – SUSE Linux Enterprise Server 9 for POWER or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes

#0631	**#0631 PCI-X 1 Gbps iSCSI TOE-Optic** Provides a 1 Gbps iSCSI TOE PCI-X adapter that encapsulates SCSI commands and data into TCP and transports them over the Ethernet through IP packets. The adapter operates as an iSCSI TCP/IP Offload Engine (TOE). This offload of the host eliminates protocol processing and reduces CPU interrupts. The adapter uses small form factor LC type fiber optic connector. This iSCSI adapter can be used to initiate requests to external storage devices from AIX 5L and Linux partitions. Attributes provided: Offload of host protocol processing Attributes required: Available PCI-X Slot **For 9406-MMA (#0631)** ▶ Minimum required: 0 ▶ Maximum allowed: 63 (Initial order maximum: 63) ▶ OS level required: – AIX 5L for POWER V5.2 for IBM eServer or later – SUSE Linux Enterprise Server 9 for POWER or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes
#0632	**#0632 PCI USB 2.0 Adapter** Provides for the connection of one USB keyboard and mouse. The #0632 is usable only in Linux or AIX partitions. **Note**: #0632 is converted to #2738 on unified POWER6 MTMs. Limitation: Limited to USB 1.1 support with AIX Attributes provided: USB Keyboard or Mouse Attachment Attributes required: One available PCI slot **For 9406-MMA (#0632)** ▶ Minimum required: 0 ▶ Maximum allowed: 12 (Initial order maximum: 12) ▶ OS level required: – AIX 5L for POWER V5.2S for IBM eServer or later – Red Hat Enterprise Linux AS for POWER Version 4 or later – SUSE LINUX Enterprise Server 9 for POWER or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes

#0633	**#0633 Graphics Adapter**
	The #0633 POWER GXT135P Graphics Accelerator with Digital Support is a versatile 2D graphics accelerator that can be configured to operate in either 8-bit or 24-bit color modes. This adapter supports both analog and digital monitors.
	Note: #0633 is converted to #2849 on unified POWER6 MTMs
	Hardware description:
	► 128-bit graphics processor
	► 8-bit CLUT or 24-bit true color
	► 16 MB SDRAM
	► 32-bit PCI interface
	► Universal PCI (5.0v or 3.3v)
	► 1 hardware color map
	► Features supported:
	► Up to approximately 16.7 million colors
	► Rectangular clipping
	► 2 analog monitor outputs at up to 1280 x 1024 resolution
	► 1 analog monitor output at up to 2048 x 1536 resolution
	► 1 digital monitor output at up to 1600 x 1200 resolution
	► 60 to 85 Hz refresh rates (ISO 9241, Part 3)
	► APIs supported:
	► X Window System and Motif
	► UMS 2.3.0 (no hardware scaling)
	Software requirements:
	► AIX Versions 5.1 or 5.2 (analog or digital support) or later
	► AIX 4.3 (analog support only)
	Attributes provided: 2D Graphics
	Attributes required: 1 PCI slot
	For 9406-MMA (#0633)
	► Minimum required: 0
	► Maximum allowed: 8 (Initial order maximum: 8)
	► OS level required:
	– AIX 5L for POWER V5.2S for IBM eServer or later
	– Red Hat Enterprise Linux AS for POWER Version 4 or later
	– SUSE LINUX Enterprise Server 9 for POWER or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes

| #0635 | **#0635 SDLC/X.25 2-port Adapter**
(No longer available as of 01 December 2005.)

Provides high-speed connections between stand-alone system units on a WAN. To access WAN lines, the #0635 adapter connects through external communications equipment including Channel Service Units (CSU), Data Service Units (DSU) or through synchronous modems.

This adapter together with IBM AIXlink/X.25 provides a two-port connection to X.25 packet switched networks. IBM AIXlink/X.25 is a separately orderable LPP (5696-926).

Note: This feature is converted to #2962 on unified POWER6 MTMS.

The #0635 with an appropriate cable is compatible with:
▶ X.21 DCE - Using 2-Port Cable, X.21 (#2954)
▶ CCITT X.21 Signalling
▶ CCITT V.11 Electrical
▶ CCITT X.27 Electrical
▶ EIA-422-A Electrical
▶ ISO 4903 Connector for DCE side of an X.21 VHSI Modem Cable
▶ V.24 DCE - Using 2-Port Cable, V.24/EIA-232 (#2951)
▶ CCITT V.24 Signalling
▶ CCITT V.28 Electrical
▶ CCITT X.21bis Electrical and Signalling
▶ EIA-232-C Electrical and Signalling
▶ ISO 2110 Connector for DCE side of an V.24 VHSI Modem Cable
▶ V.35 DCE - Using 2-Port Cable, V.35 (#2952)
▶ CCITT V.35 Some signals for signalling
▶ CCITT V.28 Some signals for electrical and signalling
▶ ISO 2593 Connector for DCE side of an V.35 VHSI Modem Cable
▶ V.36 DCE - Using 2-Port Cable, V.36/EIA-449 (#2953)
▶ CCITT V.10 Electrical
▶ CCITT V.11 Electrical

Attributes provided: High speed WAN connection
Attributes required: One PCI slot, #0140 and #0145

For 9406-MMA (#0635)
▶ Minimum required: 0
▶ Maximum allowed: 12 (Initial order maximum: 0)
▶ OS level required: AIX 5L for POWER V5.2S for IBM eServer or later
▶ Initial Order/MES/Both/Supported: Supported
▶ CSU: Yes
▶ Max = max on series p |

#0645	**#0645 Direct Attach-5712** (No longer available as of 01 June 2006.) Ordered when the function of a #5712 PCI-X Tape Controller is required and the card is controlled by a non-OS/400 operating system. Cards controlled by a non-OS/400 operating system do not use or require PCI IOPs. Direct attach cards are supported only in a non-OS/400 partition. The #0645 has 2 SCSI buses, each SCSI bus can be either internal (internal port) or external (external port), but not both. Internal devices connect to the internal ports (1 or 2) and are driven at the Ultra320 SCSI bus data rate of 320 MBps. The 2 external ports have VHDCI connectors and also are driven at the Ultra320 SCSI bus date rate of 320 MBps. A #2118 VHDCI to P Converter Cable is available to connect to external devices with type P connectors. Attributes provided: Attachment capability of up to 2 internal SCSI devices and up to 2 external SCSI devices, maximum of 2 total. Attributes required: One available 3.3 volt PCI or PCI-X slot and #0140. **For 9406-MMA (#0645)** ► Minimum required: 0 ► Maximum allowed: 168 (Initial order maximum: 0) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes

#0646	**#0646 Direct Attach-5716**
	(No longer available as of 15 October 2004.)
	
	Ordered when the function of a #5716 is required but this card is controlled by a Linux or AIX operating system. Cards controlled by a Linux or AIX operating system do not use or require PCI IOPs. Direct attach cards are supported in only Linux or AIX LPAR partitions.
	
	Attributes provided: Fibre Channel device attachment
	Attributes required: PCI slot and #0140 and (#0142 or #0145)
	
	For 9406-MMA (#0646)
	► Minimum required: 0
	► Maximum allowed: 24 (Initial order maximum: 0)
	► OS level required:
	  – AIX 5L for POWER V5.2S for IBM eServer or later
	  – Red Hat Enterprise Linux AS for POWER Version 4 or later
	  – SUSE LINUX Enterprise Server 9 for POWER or later
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes

#0647	**#0647 PCI-X Disk/Tape Ctlr No IOP**
	Provides a PCI-X Disk/Tape SCSI Controller with zero write cache and without RAID support. A maximum of six disk drives are supported on the #0647. Removable media devices (tape, optical libraries, CD-ROM, DVD-ROM, and DVD-RAM) are also supported on the #0647.
	
	The #0647 has two U320 buses each with a bus data rate of up to 320 MBps. Each SCSI bus can be either internal (using an internal port) or external (using an external port), but not both. There are four physical ports on the #0647, two internal and two external.
	
	Internal devices connect to the internal ports (1 or 2). External devices connect to the external ports (1 or 2) and use an LVD (Low Voltage Differential) interface and VHDCI connectors. A #2118 VHDCI to P Converter Cable is available to connect to external devices with type P connectors.
	
	#0647, #5736, #5766, and #5775 are physically the same adapter card but have different feature numbers to indicate to IBM configurator tools how the card is being used. #0647 indicates that the card is dedicated to an AIX 5L or Linux partition and an IOP is not being used.
	
	Attributes provided: Two Ultra320 SCSI VHDCI ports that can be either internal or external but not both.
	Attributes required: One available 3.3 volt PCI or PCI-X slot
	
	For 9406-MMA (#0647)
	► Minimum required: 0
	► Maximum allowed: 270 (Initial order maximum: 250)
	► OS level required:
	  – AIX 5L for POWER V5.2 for IBM eServer or later
	  – Red Hat Enterprise Linux AS for POWER Version 4 or later
	  – SUSE Linux Enterprise Server 9 for POWER or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes

#0694	**#0694 - #5094 Equivalent**
	A #0694 is used by the marketing configurator to keep track of which units within a #5294 are connected to this system.
	
	For each #5294 ordered, the marketing configurator adds two #0694 specify codes. #0694s can be added to, or deleted from, system inventory records, but at least one #0694 must exist for each #5294 on the inventory records. If an existing #5294 is to be shared between two systems, one #0694 must be removed from the system that the #5294 was ordered against, and one #0694 must be added to the other sharing system. The adds and deletes are done as record purpose only (RPO) changes.
	
	Attributes provided: None
	Attributes required: At least one #5294 or the sharing of a#5294 or #8094(top unit) with another system.
	
	For 9117-MMA (#0694) and 9119-FHA (#0694)
	► Minimum required: 0
	► Maximum allowed: 48 (Initial order maximum: 0)
	► OS level required:
	  – AIX supported only for migration from M/T 9406
	  – IBM i 5.4 with V5R4M5 machine code or later
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes
	► Return parts MES: No

#0696	**#0696 - #5096 Equivalent**
	Used by the marketing configurator to keep track of which units within a #5296 are connected to this system.
	
	For each #5296 ordered, the marketing configurator will add two #0696 specify codes. #0696s can be added to, or deleted from system inventory records, but at least one #0696 must exist for each #5296 on the inventory records. If an existing #5296 is to be shared between two systems, one #0696 must be removed from the system that the #5296 was ordered against, and one #0696 must be added to the other sharing system. These adds and deletes are done as record purpose only (RPO) changes.
	
	Attributes provided: None
	Attributes required: At least one #5296, or the sharing of a #5296 with another system
	
	For 9117-MMA (#0696) and 9119-FHA (#0696)
	▶ Minimum required: 0
	▶ Maximum allowed: 48 (Initial order maximum: 0)
	▶ OS level required:
	  – AIX supported only for migration from M/T 9406
	  – IBM i 5.4 with V5R4M5 machine code or later
	▶ Initial Order/MES/Both/Supported: Supported
	▶ CSU: Yes
	▶ Return parts MES: No

#0710	**#0710 Balanced Warehouse™ Solution** Specifies that the DS4000 EXP810 ordered will be a component of the Balanced Warehouse Solution. This feature will automatically be selected by the configurator when a Balanced Warehouse solution is configured. The solution will be integrated at the Customer Solution Center. Attributes provided: None Attributes required: None **For 9117-MMA (#0710)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
#0719	**#0719 Load Source Not in CEC** Indicates to the IBM Marketing configurator tools and IBM manufacturing that disk drives will not be placed in the system unit, but will be placed in I/O drawers or in external SAN attached disk. Attributes provided: System units are shipped with no disk units placed inside. Attributes required: Load source in expansion unit specify. **For 9117-MMA (#0719)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No

#0720	**#0720 Load Source in #0595** Specifies that i5/OS load source disk drive is placed in a #0595 I/O Expansion Unit. Attributes provided: External load source placement capability Attributes required: DASD Slot 1 open in #0595 drawer **For 9117-MMA (#0720)** ▸ Minimum required: 0 ▸ Maximum allowed: 1 (Initial order maximum: 1) ▸ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▸ Initial Order/MES/Both/Supported: Both ▸ CSU: Yes ▸ Return parts MES: No
#0721	**#0721 Load Source in #5094/5294** Specifies that IBM i load source disk drive is placed in a #5094 or #5294 I/O Expansion Unit. Attributes provided: External load source placement capability Attributes required: DASD Slot 1 open in #5094 or 5294 drawer **For 9117-MMA (#0721)** ▸ Minimum required: 0 ▸ Maximum allowed: 1 (Initial order maximum: 1) ▸ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▸ Initial Order/MES/Both/Supported: Supported ▸ CSU: Yes ▸ Return parts MES: No
#0725	**#0725 Specify Load Source in #5786** Specifies that IBM i load source disk drive is placed in a #5786 Disk Enclosure. Attributes provided: External load source placement capability Attributes required: DASD Slot 1 open in #5786 Disk Enclosure **For 9117-MMA (#0725) and 9119-FHA (#0725)** ▸ Minimum required: 0 ▸ Maximum allowed: 1 (Initial order maximum: 1) ▸ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▸ Initial Order/MES/Both/Supported: Both ▸ CSU: Yes ▸ Return parts MES: No
#0727	**#0727 Specify #5886 Load Source placement** Specifies that Load/Source DASD are placed in an EXP 12S SAS DASD drawer. Attributes provided: External load source placement capability Attributes required: DASD Slot 1 open in drawer **For 9117-MMA (#0727) and 9119-FHA (#0727)** ▸ Minimum required: 0 ▸ Maximum allowed: 1 (Initial order maximum: 1) ▸ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▸ Initial Order/MES/Both/Supported: Both ▸ CSU: Not applicable ▸ Return parts MES: No

#0830	**#0830 #4319 Load Source Specify** Indicates that a #4319 Disk Unit is being used as the Load Source. Attributes provided: None **For 9117-MMA (#0830) and 9119-FHA (#0830)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 0) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#0834	**#0834 #4326 Load Source Specify** Indicates that a #4326 Disk Unit is being used as the Load Source. Attributes provided: None **For 9117-MMA (#0834 and 9119-FHA (#0834)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 0) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#0835	**#0835 #4327 Load Source Specify** (No longer available as of 30 January 2009.) Indicates that a #4327 Disk Unit is being used as the Load Source. Attributes provided: None **For 9117-MMA (#0835) and 9119-FHA (#0835)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No

#0836	**#0836 - #4328 Load Source Specify**
	Indicates that a #4328 Disk Unit is being used as the Load Source.
	
	Attributes provided: None
	
	For 9117-MMA (#0836 and 9119-FHA (#0836)
	► Minimum required: 0
	► Maximum allowed: 1 (Initial order maximum: 0)
	► OS level required:
	   – IBM i 5.4 with V5R4M5 machine code
	   – IBM i 6.1 or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes
	► Return parts MES: No

#0837	**#0837 SAN Load Source Specify**
	Indicates that a SAN drive is being used as the IBM i Load Source for the system.
	
	The following Fibre Channel adapters support an IBM i Load Source LUN within a supported IBM System Storage server, such as the DS8000 series (M/T 2107).
	
	► With IBM i 5.4 and V5R4M5 licensed machine code or later:
	  – #2847 PCI IOP with SAN Load Source and attached #2787 PCI-X Fibre Channel Disk Controller or #5760 4 Gbps Single Port Fibre Channel PCI-X 2.0 Adapter. MultiPath to the Load Source is not supported.
	► With IBM i 6.1 or later:
	  – #2847 PCI IOP with SAN Load Source and attached #2787 PCI-X Fibre Channel Disk Controller or #5760 4 Gbps Single Port Fibre Channel PCI-X 2.0 Adapter. MultiPath to the Load Source is not supported.
	  – #5749 4 Gigabit Dual-Port Fibre Channel PCI-X 2.0 DDR Adapter (without an IOP). MultiPath to the Load Source is supported.
	  – #5774 4 Gigabit PCI Express Dual Port Fibre Channel Adapter (without an OP). MultiPath to the Load Source is supported.
	
	Attributes provided: Ability to load IBM i from a SAN disk enclosure
	
	For 9117-MMA (#0837) and 9119-FHA (#0837)
	► Minimum required: 0
	► Maximum allowed: 1 (Initial order maximum: 1)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes
	► Return parts MES: No
	
	Note: the #5774 is not currently supported on a 9119-FHA configuration.

#0838	**#0838 #3676 Load Source Specify** (No longer available as of 28 November 2008.) Indicates that a #3676 Disk Unit is being used as the Load Source. Attributes provided: None **For 9117-MMA (#0838) and 9119-FHA (#0838)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No
#0839	**#0839 #3677 Load Source Specify** Indicates that a #3677 Disk Unit is being used as the Load Source. Attributes provided: None **For 9117-MMA (#0839) and 9119-FHA (#0839)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No

#0840	**#0840 #3678 Load Source Specify** Indicates that a #3678 Disk Unit is being used as the Load Source. Attributes provided: None **For 9117-MMA (#0840) and 9119-FHA (#0840)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No
#0841	**#0841 #4329 Load Source Specify** (No longer available as of 30 January 2009.) Indicates that a #4329 Disk Unit is being used as the Load Source. Attributes provided: None **For 9117-MMA (#0841) and 9119-FHA (#0841)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No
#0983	**#0983 US TAA Compliance Indicator** Indicates that the product was assembled in a manufacturing plant in the U.S. or in a country approved under the U.S. Trade Agreement Act. Attributes provided: None Attributes required: None **For 9117-MMA (#0983) and 9119-FHA (#0983)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: No
#1025	**#1025 Modem Cable US/Canada and General Use** Modem cable, used with #2893, #6808, and #6833 adapters. Maximum of two per adapter. Select this cable for use with your modem if there is not another cable feature that is identified as specific to your country. **For 9117-MMA (#1025)** ► Minimum required: 0 ► Maximum allowed: 480 (Initial order maximum: 250) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later **For 9119-FHA (#1025)** ► Minimum required: 0 ► Maximum allowed: 320 (Initial order maximum: 250) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#1120	**#1120 Decline Service Agent Install Indicator** Service Agent is a basic component of your System p Server and is an important tool in maintaining the high availability you expect from your IBM system and the service response time you expect from your IBM service team. You should select this feature only if you do not intend to have the IBM SSR install eSA at the time your system is being installed. Before selecting this feature please discuss this decision with your IBM Account Team or IBM Business Partner. Service Agent installation by an IBM SSR is available to you for no additional charge during initial server installation only. Attributes provided: Documents Customers intention to not allow the IBM SSR to install Service Agent during system installation Attributes required: None **For 9117-MMA (#1120) and 9119-FHA (#1120)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
#1266	**#1266 35.16 GB 15 k rpm Disk Unit** (No longer available as of 08 May 2007.) Provides a 15 000 rpm disk unit with 35.16 GB capacity and a SCSI interface. #1266 is installed in a #5786 TotalStorage EXP24 Disk Drawer or a #5787 TotalStorage EXP24 Disk Tower. #1266 is physically identical to a #4326 disk unit, but it has a different feature number to enable IBM configuration tools to better understand its placement. Attributes provided: 35.16 GB disk unit Attributes required: Disk unit slot in #5786 or #5787 and a disk unit controller **For 9406-MMA (#1266)** ▶ Minimum required: 0 ▶ Maximum allowed: 1372 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes
#1267	**#1267 70.56 GB 15 k rpm Disk Unit** Provides a 15 000 rpm disk unit with 70.56 GB capacity and a SCSI interface. #1267 is installed in a #5786 TotalStorage EXP24 Disk Drawer or a #5787 TotalStorage EXP24 Disk Tower. #1267 is physically identical to a #4327 disk unit, but it has a different feature number to enable IBM configuration tools to better understand its placement. Attributes provided: 70.56 GB disk unit Attributes required: Disk unit slot in #5786 or #5787 and a disk unit controller **For 9406-MMA (#1267)** ▶ Minimum required: 0 ▶ Maximum allowed: 1372 (Initial order maximum: 250) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes

#1268	**#1268 141.12 GB 15 k rpm Disk Unit** Provides a 15 000 rpm disk unit with 141.12 GB capacity and an Ultra320 SCSI interface. #1268 is installed in a #5786 TotalStorage EXP24 Disk Drawer or a #5787 TotalStorage EXP24 Disk Tower. #1268 is physically identical to a #4328 disk unit, but it has a different feature number to help enable IBM configuration tools to better understand its placement. Attributes provided: 141.12 GB disk unit Attributes required: Disk unit slot in #5786 or #5787 and a disk unit controller **For 9406-MMA (#1268)** ► Minimum required: 0 ► Maximum allowed: 1372 (Initial order maximum: 250) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes
#1269	**#1269 282.25 GB 15 k rpm Disk Unit** Provides a 15 000 rpm disk unit with 282.25 GB of storage capacity and an Ultra320 SCSI interface speed of up to 320 MBps. #1269 is installed in a #5786 TotalStorage EXP24 Disk Drawer or a #5787 TotalStorage EXP24 Disk Tower. **Note**: This drive is not supported as a load source drive with IBM i 5.4 with machine code V5R4M5 or earlier. Attributes provided: 282.25 GB 15 k rpm disk unit. Attributes required: One disk drive bay in a #5786 or #5787. **For 9406-MMA (#1269)** ► Minimum required: 0 ► Maximum allowed: 1372 (Initial order maximum: 250) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes

#1292	**#1292 300 GB 15 k rpm Disk Unit**
	Provides a 15 000 rpm disk unit with 300 GB of storage capacity and an Ultra320 SCSI interface speed of up to 320 MBps. #1292 is installed in a #5786 TotalStorage EXP24 Disk Drawer or a #5787 TotalStorage EXP24 Disk Tower.
	
	Attributes provided: 300 GB 15 k rpm disk unit.
	Attributes required: One disk drive bay in a #5786 or #5787.
	
	For 9406-MMA (#1292)
	► Minimum required: 0
	► Maximum allowed: 1372 (Initial order maximum: 250)
	► OS level required:
	  – AIX 5L for POWER V5.2 for IBM eServer or later
	  – Red Hat Enterprise Linux AS for POWER Version 4 with quarterly update 3 or later
	  – SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes

#1293	**#1293 36.4 GB 10 k rpm Disk Unit**
	(No longer available as of 06 February 2007.)
	
	Provides a 10 000 rpm disk unit with 36.4 GB of storage capacity and an industry standard Ultra320 SCSI interface speed of up to 320 MBps. #1293 is installed in a #5786 TotalStorage EXP24 Disk Drawer or a #5787 TotalStorage EXP24 Disk Tower. #1293 is physically identical to a #1893 disk unit, but it has a different feature number to enable IBM configuration tools to better understand its placement.
	
	Attributes provided: 36.4 GB disk unit.
	Attributes required: One disk drive bay in a #5786 or #5787.
	
	For 9406-MMA (#1293)
	▶ Minimum required: 0
	▶ Maximum allowed: 1372 (Initial order maximum: 0)
	▶ OS level required:
	  – AIX 5L for POWER V5.2 for IBM eServer or later
	  – Red Hat Enterprise Linux AS for POWER Version 4 with quarterly update 3 or later
	  – SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later
	▶ Initial Order/MES/Both/Supported: Supported
	▶ CSU: Yes

#1294	**#1294 73.4 GB 10 k rpm Disk Unit**
	(No longer available as of 08 May 2007.)
	
	Provides a 10 000 rpm disk unit with 73.4 GB of storage capacity and an industry standard Ultra320 SCSI interface speed of up to 320 MBps. #1294 is installed in a #5786 TotalStorage EXP24 Disk Drawer or a #5787 TotalStorage EXP24 Disk Tower. #1294 is physically identical to a #1894 disk unit, but it has a different feature number to enable IBM configuration tools to better understand its placement.
	
	Attributes provided: 73.4 GB disk unit.
	Attributes required: One disk drive bay in a #5786 or #5787.
	
	For 9406-MMA (#1294)
	▶ Minimum required: 0
	▶ Maximum allowed: 1372 (Initial order maximum: 0)
	▶ OS level required:
	  – AIX 5L for POWER V5.2 for IBM eServer or later
	  – Red Hat Enterprise Linux AS for POWER Version 4 with quarterly update 3 or later
	  – SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later
	▶ Initial Order/MES/Both/Supported: Supported
	▶ CSU: Yes

#1295	**#1295 146.8 GB 10 k rpm Disk Unit**
	(No longer available as of 08 May 2007.)
	
	Provides a 10 000 rpm disk unit with 146.8 GB of storage capacity and an industry standard Ultra320 SCSI interface speed of up to 320 MBps. #1295 is installed in a #5786 TotalStorage EXP24 Disk Drawer or a #5787 TotalStorage EXP24 Disk Tower. #1295 is physically identical to a #1895 disk unit, but it has a different feature number to enable IBM configuration tools to better understand its placement.
	
	Attributes provided: 146.8 GB of disk storage mounted in a carrier.
	Attributes required: One disk drive bay in a #5786 or #5787.
	
	For 9406-MMA (#1295)
	► Minimum required: 0
	► Maximum allowed: 1372 (Initial order maximum: 0)
	► OS level required:
	  – AIX 5L for POWER V5.2 for IBM eServer or later
	  – Red Hat Enterprise Linux AS for POWER Version 4 with quarterly update 3 or later
	  – SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes

#1296	**#1296 - 36.4 GB 15 k rpm Disk Unit** (No longer available as of 08 May 2007.) Provides a 15 k rpm disk unit with 36.4 GB of storage capacity and an industry standard Ultra320 SCSI interface speed of up to 320 MBps. #1296 is installed in a #5786 TotalStorage EXP24 Disk Drawer or a #5787 TotalStorage EXP24 Disk Tower. #1296 is physically identical to a #1896 disk unit, but it has a different feature number to enable IBM configuration tools to better understand its placement. Attributes provided: 36.4 GB disk unit Attributes required: One disk drive bay in a #5786 or #5787 For 9406-MMA (#1296) Minimum required: 0 Maximum allowed: 1372 (Initial order maximum: 0) OS level required: ► AIX 5L for POWER V5.2 for IBM eServer or later ► Red Hat Enterprise Linux AS for POWER Version 4 with quarterly update 3 or later ► SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later Initial Order/MES/Both/Supported: Supported CSU: Yes

#1297	**#1297 73.4 GB 15 k rpm Disk Unit**
	Provides a 15 000 rpm disk unit with 73.4 GB of storage capacity and an industry standard Ultra320 SCSI interface speed of up to 320 MBps. #1297 is installed in a #5786 TotalStorage EXP24 Disk Drawer or a #5787 TotalStorage EXP24 Disk Tower. #1297 is physically identical to a #1897 disk unit, but it has a different feature number to enable IBM configuration tools to better understand its placement.
	
	Attributes provided: 73.4 GB disk unit
	Attributes required: One disk drive bay in a #5786 or #5787
	
	For 9406-MMA (#1297)
	► Minimum required: 0
	► Maximum allowed: 1372 (Initial order maximum: 250)
	► OS level required:
	  – AIX 5L for POWER V5.2 for IBM eServer or later
	  – Red Hat Enterprise Linux AS for POWER Version 4 with quarterly update 3 or later
	  – SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes

#1298	**#1298 146.8 GB 15 k rpm Disk Unit**
	Provides a 15 000 rpm disk unit with 146.8 GB of storage capacity and an industry standard Ultra320 SCSI interface speed of up to 320 MBps. #1298 is installed in a #5786 TotalStorage EXP24 Disk Drawer or a #5787 TotalStorage EXP24 Disk Tower. #1298 is physically identical to a #1898 disk unit, but it has a different feature number to enable IBM configuration tools to better understand its placement.
	
	Attributes provided: 146.8 GB of disk storage mounted in a carrier.
	Attributes required: One disk drive bay in a #5786 or #5787.
	
	For 9406-MMA (#1298)
	▶ Minimum required: 0
	▶ Maximum allowed: 1372 (Initial order maximum: 250)
	▶ OS level required:
	  – AIX 5L for POWER V5.2 for IBM eServer or later
	  – Red Hat Enterprise Linux AS for POWER Version 4 with quarterly update 3 or later
	  – SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes

#1299	**#1299 300 GB 10 k rpm Disk Unit**
	(No longer available as of 01 November 2007.)
	
	Provides a 10 000 rpm disk unit with 300 GB of storage capacity and an industry standard Ultra320 SCSI interface speed of up to 320 MBps. #1299 is installed in a #5786 TotalStorage EXP24 Disk Drawer or a #5787 TotalStorage EXP24 Disk Tower. #1299 is physically identical to a #3578 disk unit, but it has a different feature number to enable IBM configuration tools to better understand its placement.
	
	Attributes provided: 300 GB 10 k rpm disk unit.
	Attributes required: One disk drive bay in a #5786 or #5787.
	
	For 9406-MMA (#1299)
	▶ Minimum required: 0
	▶ Maximum allowed: 1372 (Initial order maximum: 250)
	▶ OS level required:
	  – AIX 5L for POWER V5.2 for IBM eServer or later
	  – Red Hat Enterprise Linux AS for POWER Version 4 with quarterly update 3 or later
	  – SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later
	▶ Initial Order/MES/Both/Supported: Supported
	▶ CSU: Yes

#1307	**#1307 1.75 m HSL-2/RIO-2 Cable** Provides a 1.75 m HSL-2/RIO-G cable for use in connecting a tower/system unit with an HSL-2/RIO-G port to a tower/ system unit with an HSL-2/RIO-G port. Attributes provided: Attributes requires: **For 9406-MMA (#1307)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 250) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes

#1308	**#1308 2.5 m HSL-2/RIO-2 Cable** Provides a 1.75 m HSL-2/RIO-G cable for use in connecting a tower/system unit with an HSL-2/RIO-G port to a tower or system unit with an HSL-2/RIO-G port. **For 9406-MMA (#1308)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 250) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes
#1311	**#1311 System Unique Identifier** After 255 scratch installs, the system ID counter wraps and a new system ID must be created. Feature #1311 can be ordered as an MES to regenerate a customer's system ID. Attributes provided: Not applicable Attributes required: Not applicable **For 9117-MMA (#1311) and 9119-FHA (#1311)** ▶ Minimum required: 0 ▶ Maximum allowed: 1PO (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No
#1406	**#1406 200V 16A 4.3 m (14-ft) TL Line Cord** (No longer available as of 01 December 2007.) Attributes provided: None Attributes required: None **For 9117-MMA (#1406) and 9119-FHA (#1406)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#1410	**#1410 200 V 6-ft Line Cord** (No longer available as of 01 December 2007.) **For 9406-MMA (#1410)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 250) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes
#1411	**#1411 200 V 14-ft Line Cord** (No longer available as of 01 December 2007.) **For 9406-MMA (#1411)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 250) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes

#1412	**#1412 125 V 6-ft Line Cord** (No longer available as of 01 December 2007.) **For 9406-MMA (#1412)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 250) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: Yes
#1413	**#1413 125 V 4.3 m (14-ft) Line Cord** (No longer available as of 15 April 2005.) Attributes provided: None Attributes required: None **For 9117-MMA (#01413) and 9119-FHA (#1413)** ► Minimum required: 0 ► Maximum allowed: 104 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#1414	**#1414 200 V 1.8 m (6-ft) Locking Line Cord** (No longer available as of 01 December 2007.) Attributes provided: None Attributes required: None **For 9117-MMA (#1414) and 9119-FHA (#1414)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#1415	**#1415 200 V 1.8 m (6-ft) Watertight Line Cord** (No longer available as of 01 December 2007.) Attributes provided: None Attributes required: None **For 9117-MMA (#1415) and 9119-FHA (#1415)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No

#1416	**#1416 200 V 4.3 m (14-ft) Locking Line Cord** (No longer available as of 15 January 2003.) Attributes provided: None Attributes required: None **For 9117-MMA (#1416) and 9119-FHA (#1416)** ► Minimum required: 0 ► Maximum allowed: 104 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#1417	**#1417 200 V 4.3 m (14-ft) Watertight Line Cord** (No longer available as of 15 January 2003.) Attributes provided: None Attributes required: None **For 9117-MMA (#1417) and 9119-FHA (#1417)** ► Minimum required: 0 ► Maximum allowed: 104 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#1418	**#1418 4.3 m 200 V/16A Power Cord S. Africa** Attributes provided: None Attributes required: None **For 9117-MMA (#1418) and 9119-FHA (#1418)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#1419	**#1419 4.3 m 200 V/16A Power Cord Israel** Attributes provided: None Attributes required: None **For 9117-MMA (#1419) and 9119-FHA (#1419)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No

#1420	**#1420 4.3 m 200 V/16A Power Cord EU/Asia** Attributes provided: None Attributes required: None **For 9117-MMA (#1420) and 9119-FHA (#1420)** ► Minimum required: 0 ► Maximum allowed: No max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#1421	**#1421 4.3 m 200 V/16A Power Cord CH/DK** Attributes provided: None Attributes required: None **For 9117-MMA (#1421) and 9119-FHA (#1421)** ► Minimum required: 0 ► Maximum allowed: No max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#1422	**#1422 3 m IEC 320 C13/14 PDU Cord** (No longer available as of 01 December 2007.) Used from a racked device to a #5160, #5161, #5162, #5163, or #7188 Power Distribution Unit in that same rack. The replacement PDU cord is #6671. **For 9406-MMA (#1422)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 250) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: Yes
#1424	**#1424 200V 1.8 m (6-ft) Locking Line Cord** (No longer available as of 15 December 2002.) Attributes provided: None Attributes required: None **For 9117-MMA (#1424 and 9119-FHA (#1424)** ► Minimum required: 0 ► Maximum allowed: 104 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No

#1425	**#1425 200V 1.8 m (6-ft) Watertight Line Cord** (No longer available as of 15 December 2002.) Attributes provided: None Attributes required: None **For 9117-MMA (#1425) and 9119-FHA (#1425)** ► Minimum required: 0 ► Maximum allowed: 104 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#1426	**#1426 200V 4.3 m (14-ft) Locking Line Cord** (No longer available as of 15 January 2005.) Attributes provided: None Attributes required: None **For 9117-MMA (#1426) and 9119-FHA (#1426)** ► Minimum required: 0 ► Maximum allowed: 104 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#1427	**#1427 200 V 4.3 m (14-ft) Watertight Line Cord** (No longer available as of 15 January 2005.) Attributes provided: None Attributes required: None **For 9117-MMA (#1427) and 9119-FHA (#1427)** ► Minimum required: 0 ► Maximum allowed: 104 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#1438	**#1438 4.3 m 200 V/10A Power Cord AU/NZ** (No longer available as of 15 April 2005.) Attributes provided: None Attributes required: None **For 9119-FHA (#1438)** ► Minimum required: 0 ► Maximum allowed: No max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No

#1439	**#1439 4.3 m 200 V/10A Power Cord EU/Asia** Attributes provided: None Attributes required: None **For 9117-MMA (#1439)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#1440	**#1440 4.3 m 200 V/10A Power Cord Denmark** (No longer available as of 01 December 2007.) Attributes provided: None Attributes required: None **For 9117-MMA (#1440) and 9119-FHA (#1440)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#1441	**#1441 4.3 m 200 V/10A Power Cord S. Afric** Attributes provided: None Attributes required: None **For 9117-MMA (#1441)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#1442	**#1442 4.3 m 200 V/10A Power Cord Swiss** (No longer available as of 01 December 2007.) Attributes provided: None Attributes required: None **For 9117-MMA (#1442) and 9119-FHA (#1442)** ▶ Minimum required: 0 ▶ Maximum allowed: No max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No

#1443	**#1443 4.3 m 200 V/10A Power Cord UK** (No longer available as of 01 December 2007.) Attributes provided: None Attributes required: None **For 9117-MMA (#1443) and 9119-FHA (#1443)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#1445	**#1445 4.3 m 200 V/10A Power Cord Israel** (No longer available as of 01 December 2007.) Attributes provided: None Attributes required: None **For 9117-MMA (#1445) and 9119-FHA (#1445)** ▶ Minimum required: 0 ▶ Maximum allowed: No max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#1449	**#1449 4.3 m 200 V/32A Power Cord EU 1-PH** (No longer available as of 15 January 2005.) Attributes provided: None Attributes required: None **For 9117-MMA (#1449) and 9119-FHA (#1449)** ▶ Minimum required: 0 ▶ Maximum allowed: 104 (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#1450	**#1450 4.3 m 200 V/16A Power Cord EU 2-PH** (No longer available as of 15 October 2004.) Attributes provided: None Attributes required: None **For 9117-MMA (#1450) and 9119-FHA (#1450)** ▶ Minimum required: 0 ▶ Maximum allowed: 104 (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No

#1451	**#1451 200 V (6-ft) 1.8 m Line Cord** Attributes provided: None Attributes required: None **For 9117-MMA (#1451) and 9119-FHA (#1451)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#1452	**#1452 200 V (14-ft) 4.3 m Line Cord** Attributes provided: None Attributes required: None **For 9117-MMA (#1452) and 9119-FHA (#1452)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#1453	**#1453 200 V (6-ft) 1.8 m Locking Line Cord** Attributes provided: None Attributes required: None **For 9117-MMA (#1453) and 9119-FHA (#1453)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#1454	**#1454 200 V 12A (14-ft) 4.3 m TL Line Cord** Attributes provided: None Attributes required: None **For 9117-MMA (#1454) and 9119-FHA (#1454)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#1455	**#1455 200 V (6-ft) 1.8 m Watertight Line Cord** Attributes provided: None Attributes required: None **For 9117-MMA (#1455) and 9119-FHA (#1455)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No

#1456	**#1456 200 V 4.3 m (14-ft) Watertight Line Cord**
	Attributes provided: None
	Attributes required: None
	For 9117-MMA (#1456) and 9119-FHA (#1456)
	► Minimum required: 0
	► Maximum allowed: No Max (Initial order maximum: 0)
	► OS level required: Not applicable
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes
	► Return parts MES: No
#1457	**#1457 200 V 1.8 m (6-ft) Upper Line Cord**
	(No longer available as of 01 December 2007.)
	Attributes provided: None
	Attributes required: None
	For 9117-MMA (#1457) and 9119-FHA (#1457)
	► Minimum required: 0
	► Maximum allowed: No Max (Initial order maximum: 0)
	► OS level required: Not applicable
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes
	► Return parts MES: No
#1458	**#1458 200 V 1.8 m (6-ft) Upper Locking Cord**
	(No longer available as of 01 December 2007.)
	Attributes provided: None
	Attributes required: None
	For 9117-MMA (#1458) and 9119-FHA (#1458)
	► Minimum required: 0
	► Maximum allowed: No Max (Initial order maximum: 0)
	► OS level required: Not applicable
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes
	► Return parts MES: No
#1459	**#1459 200 V 1.8 m (6-ft) Upper Locking Cord**
	Attributes provided: None
	Attributes required: None
	For 9117-MMA (#1459) and 9119-FHA (#1459)
	► Minimum required: 0
	► Maximum allowed: No Max (Initial order maximum: 0)
	► OS level required: Not applicable
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes
	► Return parts MES: No

#1460	**#1460 3 m Copper RIO Cable** Provides a 3 meter RIO cable for use in connecting a tower or CEC unit with a RIO port to a tower or CEC unit with a RIO port. Attributes provided: Not applicable Attributes required: Not applicable **For 9117-MMA (#1460) and 9119-FHA (#1460)** ▶ Minimum required: 0 ▶ Maximum allowed: 57 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No
#1461	**#1461 6 m Copper RIO Cable** Provides a 6 meter RIO cable for use in connecting a tower or CEC unit with a RIO port to a tower or CEC unit with a RIO port. Attributes provided: Not applicable Attributes required: Not applicable **For 9117-MMA (#1461) and 9119-FHA (#1461)** ▶ Minimum required: 0 ▶ Maximum allowed: 57 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No
#1462	**#1462 15 m RIO Cable** Provides a 15 meter RIO cable for use in connecting a tower or CEC unit with an RIO port to a tower or CEC unit with an RIO port. Attributes provided: Not applicable Attributes required: Not applicable **For 9117-MMA (#1462) and 9119-FHA (#1462)** ▶ Minimum required: 0 ▶ Maximum allowed: 57 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No
#1463	**#1463 2 m SPCN Cable** Provides a 2 meter SPCN cable for use in daisy chain connecting a tower or CEC unit to a tower unit as part of the System Power Control Network. **For 9406-MMA (#1463)** ▶ Minimum required: 0 ▶ Maximum allowed: 74 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes

#1464	**#1464 6 m SPCN Cable** Provides a 6 meter SPCN cable for use in daisy chain connecting a tower or CEC unit to a tower unit as part of the System Power Control Network. **For 9406-MMA (#1464)** ▶ Minimum required: 0 ▶ Maximum allowed: 74 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes
#1465	**#1465 15 m SPCN Cable** Provides a 15 meter SPCN cable for use in daisy chain connecting a tower or CEC unit to a tower unit as part of the System Power Control Network. **For 9406-MMA (#1465)** ▶ Minimum required: 0 ▶ Maximum allowed: 74 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes
#1466	**#1466 30 m SPCN Cable** Provides a 30 meter SPCN cable for use in daisy chain connecting a tower or CEC unit to a tower unit as part of the System Power Control Network. Attributes provided: Not applicable Attributes required: Not applicable **For 9117-MMA (#1466) and 9119-FHA (#1466)** ▶ Minimum required: 0 ▶ Maximum allowed: 74 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#1474	**#1474 6 m RIO to RIO-2 Cable** Provides a 6 meter RIO to RIO-2 Cable for use in connecting a tower or CEC unit with an RIO port to a tower or CEC unit with an RIO-2 port. Attributes provided: One RIO to RIO-2 cable Attributes required: One RIO port and one RIO-2 port **For 9117-MMA (#1474) and 9119-FHA (#1474)** ▶ Minimum required: 0 ▶ Maximum allowed: 72 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No

#1475	**#1475 10 m RIO to RIO-2 Cable** Provides a 10 meter RIO to RIO-2 Cable for use in connecting a tower/CEC unit with an RIO port to a tower or CEC unit with an RIO-2 port. Attributes provided: Not applicable Attributes required: Not applicable **For 9117-MMA (#1475) and 9119-FHA (#1475)** ▶ Minimum required: 0 ▶ Maximum allowed: 72 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No
#1476	**#1476 4.3 m 200 V/12A Pwr Cd UK** Attributes provided: Not applicable Attributes required: Not applicable **For 9117-MMA (#1476)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#1477	**#1477 4.3 m 200 V/16A Pwr Cd** Attributes provided: Not applicable Attributes required: Not applicable **For 9117-MMA (#1477) and 9119-FHA (#1477)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#1481	**#1481 1.2 m HSL-2/RIO-2 Cable** Provides a 1.2 meter HSL-2/RIO-G Cable for use in connecting a tower or CEC unit with an HSL-2/RIO-G port to another tower/CEC unit with an HSL-2/RIO-G port. **Note**: This feature is converted to #3146 on unified POWER6 MTMs. **For 9406-MMA (#1481)** ▶ Minimum required: 0 ▶ Maximum allowed: 56 (Initial order maximum: 56) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes

#1482	**#1482 3.5 m HSL-2/RIO-2 Cable** Provides a 3.5 meter HSL-2/RIO-G Cable for use in connecting a tower or CEC unit with an HSL-2/RIO-G port to another tower or CEC unit with an HSL-2/RIO-G port. **For 9406-MMA (#1482)** ► Minimum required: 0 ► Maximum allowed: 56 (Initial order maximum: 56) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes
#1483	**#1483 10 m HSL-2/RIO-2 Cable** Provides a 10 meter HSL-2/RIO-G Cable for use in connecting a tower or CEC unit with an HSL-2/RIO-G port to another tower or CEC unit with an HSL-2/RIO-G port. **For 9406-MMA (#1483)** ► Minimum required: 0 ► Maximum allowed: 56 (Initial order maximum: 56) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes
#1485	**#1485 Remote I/O Cable, 15 m** This 15 meter RIO-2 cable is available to connect the processor complex and the I/O drawers. It can also be utilized to connect I/O drawers mounted in separate racks. Attributes provided: Interconnection of CEC and I/O drawers Attributes required: None **For 9117-MMA (#1485) and 9119-FHA (#1485)** ► Minimum required: 0 ► Maximum allowed: 72 (Initial order maximum: 72) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No
#1487	**#1487 3 m RIO to RIO-2 Cable** A 3 meter RIO to RIO-2 Cable to connect a tower or CEC unit with a RIO port to a tower or CEC unit with an RIO-2 port. Attributes provided: One RIO to RIO-2 cable Attributes required: One RIO port and one RIO-2 port **For 9117-MMA (#1487) and 9119-FHA (#1487)** ► Minimum required: 0 ► Maximum allowed: 72 (Initial order maximum: 72) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No

#1700	**#1700 IPCS Keyboard/Mouse for NT** Provides a keyboard and mouse for use on the Integrated xSeries Server, which is required for running the Windows operating system. Note that some Integrated xSeries Servers can support USB keyboards. The keyboard that is provided with this feature is a standard attached keyboard, not a USB attached keyboard. Attributes provided: Keyboard/Mouse for IXS-standard attach Attributes required: None **For 9117-MMA (#1700) and 9119-FHA (#1700)** ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No

#1800	**#1800 GX Dual Port RIO-2 Attach**
	Provides two RIO-2 remote I/O ports for attaching up to four I/O drawers to the system in a single loop.
	
	Attributes provided: Two RIO-2 remote I/O ports
	Attributes required: available GX slot
	
	For 9117-MMA (#1800)
	▶ Minimum required: 0
	▶ Maximum allowed: 8 (Initial order maximum: 8)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No
	
	Note: Installing a GX adapter in GX slot P1-C8 prevents a PCIe adapter from being installed in PCI slot P1-C6.
	
	Note: Two GX adapters per CEC enclosure maximum.

| #1802 | **#1802 GX Dual Port 12X Channel Attach**
Provides two 12X connections for 12X Channel applications. This adapter allows the attachment of I/O Drawers designed for the 12X Channel. The adapter plugs into a GX bus slot in a system enclosure. The 12X Channel is connected in a loop and uses both connectors on the adapter. Up to four I/O Drawers can be attached in a single loop. This adapter must be used with the 12X cables.

Attributes provided: Two 12X Channel remote I/O ports
Attributes required: available GX slot

For 9117-MMA (#1802)
▶ Minimum required: 0
▶ Maximum allowed: 8 (Initial order maximum: 8)
▶ OS level required:
  – AIX 5.2 TL10 or later
  – AIX 5.3 TL6 or later
  – IBM i 5.4 with V5R4M5 machine code or later
  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
▶ Initial Order/MES/Both/Supported: Both
▶ CSU: Yes
▶ Return parts MES: No

Note: Installing a GX adapter in GX slot P1-C8 prevents a PCIe adapter from being installed in PCI slot P1-C6.

Note: Two GX adapters per CEC enclosure maximum. |
| #1810 | **#1810 GX Dual-port 4x HCA**
Provides an adapter that enables the attachment to supported InfiniBand switches. This adapter plugs in to the system backplane (GX slot). Connection to supported InfiniBand switches are accomplished by using the 4x Cables.

Not supported on POWER6 models. |

#1814	**#1814 Remote I/O-2 (RIO-2) Loop Adapter, Two Port**
	The #1814 provides two RIO-2 connections for the attachment of one RIO-2 loop.
	
	Attributes provided: Two ports for one RIO-2 loop connection
	Attributes required: Available adapter position
	
	For 9119-FHA (#1814)
	► Minimum required: 0
	► Maximum allowed: 32 (Initial order maximum: 32)
	► OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	  Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	► Initial Order/MES/Both/Supported: Both
	► CSU: No
	► Return parts MES: No
	
	Notes:
	► Supports a maximum of 12 RIO-2 I/O drawers.
	► Not supported by i5/OS.
	► Initial orders must order a minimum of one.

#1816	**#1816 GX Dual-port 12x HCA**
	Provides two 12x connections for dual channel applications.
	
	Attributes provided: Two 2 ports for 12x HCA connection
	Attributes required: Available adapter position
	
	For 9119-FHA (#1816)
	► Minimum required: 0
	► Maximum allowed: 32 (Initial order maximum: 32)
	► OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	  Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	► Initial Order/MES/Both/Supported: Both
	► CSU: No
	► Return parts MES: No
	
	Note: Initial Orders must order a minimum of 1.

#1827	**#1827 Serial-UPS Conversion Cable** A 0.14 meter adapter cable with a female 9-pin D-shell connector on each end. #1827 converts the CEC serial port 2 to an SPCN/UPS port, providing an additional port for UPS control. The mode of the port cannot be changed during runtime, a re-IPL is required to change the mode when the adapter cable is connected or disconnected. Attributes provided: One additional SPCN/UPS port Attributes required: CEC serial port 2 **For 9406-MMA (#1827)** ▶ Minimum required: 0 ▶ Maximum allowed: 2 (Initial order maximum: 2) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes
#1828	**#1828 1.5 m 12X to 4X Channel Conversion Cable** This cable is a 12X channel to 4X channel converter. It supports attaching a 4X Infiniband switch to a 12X channel adapter. It is a 1.5 meter long copper cable. This cable has a one 4X channel connector and one 12X channel connector. Attributes provided: 12X channel to 4X channel conversion cable Attributes required: 12X channel adapter **For 9117-MMA (#1828)** ▶ Minimum required: 0 ▶ Maximum allowed: 16 (Initial order maximum: 16) ▶ OS level required: None **Note**: Four per CEC enclosure. **For 9119-FHA (#1828)** ▶ Minimum required: 0 ▶ Maximum allowed: 250 (Initial order maximum: 250) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#1829	**#1829 0.6 m 12X Cable** When used with a 19 inch rack mount I/O drawer, this 0.6 meter cable is used in a 12X channel external I/O Drawer attachment loop between two 12X channel I/O drawers in the same loop. When used with a 24 inch rack mount I/O drawer, this 0.6 meter cable is used as a jumper between the two halves of the I/O Drawer when both halves are included in the same 12X loop. Attributes provided: 0.6 Meter 12X cable Attributes required: 12X Channel remote I/O drawer loop **For 9117-MMA (#1829)** ▶ Minimum required: 0 ▶ Maximum allowed: 24 (Initial order maximum: 24) ▶ OS level required: Not applicable **For 9119-FHA (#1829)** ▶ Minimum required: 0 ▶ Maximum allowed: 32 (Initial order maximum: 32) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#1830	**#1830 1.5 m 12X cable** This 1.5 meter cable is used to attach a 12X channel I/O Drawer to a 12X channel adapter in the Host system or can be used between two I/O drawers in a 12X channel loop. Select the 12X cable length from those offered that best meets your cabling needs. Attributes provided: 1.5 meter 12X cable Attributes required: 12X Channel remote I/O drawer loop **For 9117-MMA (#1830)** ▶ Minimum required: 0 ▶ Maximum allowed: 24 (Initial order maximum: 24) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No
#1831	**#1831 2.5 m 12X Cable** This 2.5 meter cable is used to attach a 12X channel I/O Drawer to a 12X channel adapter in the Host system or can be used between two I/O drawers in a 12X channel loop. Select the 12X cable length, from those offered that best meets your cabling needs. Attributes provided: 2.5 meter 12X Cable Attributes required: 12X Channel remote I/O drawer loop **For 9119-FHA (#1831)** ▶ Minimum required: 0 ▶ Maximum allowed: 12 (Initial order maximum: 12) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No

#1834	**#1834 8.0 m 12X Cable** This 8 meter cable is used to attach a 12X channel I/O Drawer to a 12X channel adapter in the Host system or can be used between two I/O drawers in a 12X channel loop. Select the 12X cable length from those offered that best meets your cabling needs and the cable length restrictions for your application. Attributes provided: 8.0 meter 12X Cable Attributes required: 12X Channel remote I/O drawer loop **For 9117-MMA (#1834)** ► Minimum required: 0 ► Maximum allowed: 40 (Initial order maximum: 40) ► OS level required: Not applicable **For 9119-FHA (#1834)** ► Minimum required: 0 ► Maximum allowed: 124 (Initial order maximum: 124) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#1835	**#1835 3 m 4x Cable** This 3 meter 4x cable is utilized to connect to supported InfiniBand switches. Not supported on unified POWER6 MTMs.
#1836	**#1836 8 m 4x Cable** This 8 meter 4x cable is utilized to connect to supported InfiniBand switches. Not supported on unified POWER6 MTMs
#1838	**(#1838) 8 m 12x to three 4x Cable** This 8.0 meter 12x to three 4x cable is utilized to connect 4X channel devices to a 12X channel adapter. Not supported on unified POWER6 MTMs
#1839	**#1839 1.5 m 4x Cable** (No longer available as of 29 August 2008.) This 1.5 meter 4x cable is utilized to connect to supported InfiniBand switches. Not supported on unified POWER6 MTMs
#1840	**#1840 3.0 m 12X Cable** This 3 meter cable is used to attach a 12X channel I/O Drawer to a 12X channel adapter in the Host system or can be used between two I/O drawers in a 12X channel loop. Select the 12X cable length, from those offered that best meets your cabling needs. Attributes provided: 3.0 m 12x Cable Attributes required: 12X Channel remote I/O drawer loop **For 9117-MMA (#1840)** ► Minimum required: 0 ► Maximum allowed: 40 (Initial order maximum: 40) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No

#1841	**#1841 3 m 12X to 4X Channel Conversion Cable** This cable is a 12X channel to 4X channel converter. It supports attaching a 4X Infiniband Switch to a 12X channel adapter. It is a 3 meter long copper cable. This cable has a one 4X channel connector and one 12X channel connector. Attributes provided: 12X channel to 4X channel conversion cable Attributes required: 12X channel adapter **For 9117-MMA (#1841)** ▶ Minimum required: 0 ▶ Maximum allowed: 16 (Initial order maximum: 16) ▶ OS level required: None **For 9119-FHA (#1841)** ▶ Minimum required: 0 ▶ Maximum allowed: No max (Initial order maximum: 250) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No Note: 4 per CEC enclosure.
#1842	**#1842 10 m 12X to 4X Channel Conversion Cable** This cable is a 12X channel to 4X channel converter. It supports attaching a 4X Infiniband Switch to a 12X channel adapter. It is a 10 meter long copper cable. This cable has a one 4X channel connector and one 12X channel connector. Attributes provided: 12X channel to 4X channel conversion cable Attributes required: 12X channel adapter **For 9117-MMA (#1842)** ▶ Minimum required: 0 ▶ Maximum allowed: 16 (Initial order maximum: 16) ▶ OS level required: None **For 9119-FHA (#1842)** ▶ Minimum required: 0 ▶ Maximum allowed: No max (Initial order maximum: 250) ▶ OS level required: None Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No **Note**: Four per CEC enclosure maximum.

#1845	**#1845 Operator Panel** The system Operator Panel is used one per system for both single CEC enclosure and multi CEC enclosure configurations. Attributes provided: Operator Panel Attributes required: None **For 9117-MMA (#1845)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No **Note**: An operator panel is required only on systems that do not have an attached HMC. On systems with an HMC the operator panel is optional, a virtual system OP Panel is available on the HMC display.
#1846	**#1846 Operator Panel** Provides an operator panel that controls single-drawer or multi-drawer systems. Attributes provided: Operator panel Attributes required: None **For 9117-MMA (#1846)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No **Note**: An operator panel is required only on systems that do not have an attached HMC. On systems with an HMC the operator panel is optional, a virtual system OP Panel is available on the HMC display.
#1847	**#1847 Processor Cable, Two-Drawer System** This cable provides the required interconnections between processors in separate drawers of a two-drawer system. It is a flat cable that connects to the front of each drawer. Not Supported on POWER6.
#1848	**#1848 Processor Cable, Three-Drawer System** This cable provides the required interconnections between processors in separate drawers of a three-drawer system. It is a flat cable that connects to the front of each drawer. Not Supported on POWER6.
#1849	**#1849 Processor Cable, Four-Drawer System** This cable provides the required interconnections between processors in separate drawers of a four-drawer system. It is a flat cable that connects to the front of each drawer. Not Supported on POWER6.

#1850	**#1850 VHDCI to P Converter Cable** (No longer available as of 12 September 2006.) The #1850 VHDCI to P Converter Cable is used to convert from a Mini-68-pin VHDCI connector to a 68-pin P style connector. The cable has a male Mini-68-pin VHDCI connector on one end and a female 68-pin P style connector on the other. Length = 0.3 meters. Attributes provided: Attachment of supported SCSI external device with P style connector to an integrated SCSI adapter with VHDCI Mini-68-pin connector. Attributes required: None **For 9406-MMA (#1850)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Supported as #2118 on unified POWER6 MTMs. ► CSU: Yes
#1851	**#1851 0.6 m SCSI P-P Cable** (No longer available as of 15 January 2005.) The #1851 0.6 meter SCSI P-P Cable provides a 16-bit connection between any two differential or single ended SCSI devices having 68-pin connectors. It can be used to attach an external SCSI device to a SCSI adapter card. Attributes provided: 0.6 meter SCSI cable with 68-pin connectors at each end Attributes required: 68-pin SCSI Interface **For 9406-MMA (#1851)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Supported as #2424 on unified POWER6 MTMs. ► CSU: Yes
#1852	**#1852 2.5 m SCSI P-P Cable** (No longer available as of 12 September 2006.) The #1852 2.5 meter SCSI P-P Cable provides a 16-bit connection between any two differential or single ended SCSI devices having 68-pin connectors. It can be used to attach an external SCSI device to a SCSI adapter card. Attributes provided: 2.5 meter SCSI cable with 68-pin connectors at each end Attributes required: 68-pin SCSI Interface **For 9406-MMA (#1852)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Supported as #2425 on unified POWER6 MTMs ► CSU: Yes

#1855	**#1855 4-port EIA 232 Cable** (No longer available as of 23 June 2006.) Provides 4 ports of EIA 232 connectivity for the #2947 PCI Multiprotocol Adapter. **Note**: #1855 is converted to #2861 on unified POWER6 MTMs. Attributes provided: 4-port EIA-232 cable for #2947 Attributes required: One #2947 adapter **For 9406-MMA (#1855)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes
#1857	**#1857 SP Flex Cable, Two-Drawer System** This cable provides the required Service Processor interconnections between separate drawers of a two-drawer system. It is a flat cable that connects to the rear of each drawer. Not supported on POWER6.
#1858	**#1858 SP Flex Cable, Three-Drawer System** This cable provides the required Service Processor interconnections between separate drawers of a three-drawer system. It is a flat cable that connects to the rear of each drawer. Not supported on POWER6.
#1859	**#1859 SP Flex Cable, Four-Drawer System** This cable provides the required Service Processor interconnections between separate drawers of a four-drawer system. It is a flat cable that connects to the rear of each drawer. Not supported on POWER6.y
#1860	**#1860 ASYNC Terminal/Prt Cable** A 4 meter cable and transposer (2 parts) that allows external async devices such as printers or terminals to be attached directly to a 9-pin serial port. **Note**: This feature is converted to #3926 on unified POWER6 MTMs. Attributes provided: None Attributes required: None **For 9406-MMA (#1860)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 99) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes

#1873	**#1873 Dwr to Dwr Serial Cable** A 3.7 meter cable that provides a null-modem connection between the serial ports of two system drawers that are mounted within the same rack. The cable has a DB25 female connector at each end. Attributes provided: Two drawers connected by serial ports Attributes required: Two drawers with available serial ports on each drawer **For 9406-MMA (#1873)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 48) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Qty = 48 based on number of supported towers/drawers = 48
#1874	**#1874 Rack to Rack Serial Cable** An 8 meter cable that provides a null-modem connection between the serial ports of two system drawers that are mounted in separate racks. The cable has a DB25 female connector at each end. Attributes provided: Two drawers connected by serial ports Attributes required: Two drawers with available serial ports on each drawer **For 9406-MMA (#1874)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 48) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Qty = 48 based on number of supported towers/drawers = 48
#1875	**#1875 Serial Port Converter Cable** Converts the 9-pin serial port on the system to a 25-pin serial port that allows the user to attach 25-pin serial devices to the system. **Note**: This feature is converted to #3925 on unified POWER6 MTMs. Attributes provided: 25-pin serial port on system Attributes required: Available 9-pin serial port on system **For 9406-MMA (#1875)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 48) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Qty = 48 based on number of supported towers/drawers = 48

#1893	**#1893 36.4 GB 10 k rpm Disk Unit**
	(No longer available as of 15 April 2005.)
	
	The #1893 36.4 GB 10 000 rpm Ultra320 SCSI Disk Drive Assembly provides 36.4 GB of storage capacity and supports the industry standard Ultra320 SCSI interface speed of up to 320 MBps.
	
	Characteristics:
	► Form Factor: 3.5 inch, 1 inch (25 mm) high
	► Cable included: No
	► External Interface: Ultra320 SCSI (16-bit, Low Voltage Differential)
	► Attachment Industry Spec: SCSI U320
	► Average Seek Time: 4.82 ms (based on four READS to one WRITE)
	► Average Latency: 2.99 ms
	► Rotational Speed: 10 000 rpm
	► Maximum Data Transfer Rate: 67 MBps
	
	Limitation: This disk drive requires attachment to a supported Ultra320 SCSI Adapter in an system that supports an Ultra320 SCSI cable/backplane in order for the drive to run at 320 MBps. Also, any and all other SCSI devices on the same SCSI bus must also be Ultra2, Ultra3, or Ultra320 SCSI devices in order for this disk drive to run at 320 MBps.
	
	Attributes provided: 36.4 GB of disk storage mounted in a carrier
	Attributes required: One disk drive bay
	
	For 9406-MMA (#1893)
	► Minimum required: 0
	► Maximum allowed: 1372 (Initial order maximum: 0)
	► OS level required:
	  – AIX 5L for POWER V5.2 for IBM eServer or later
	  – Red Hat Enterprise Linux AS for POWER Version 4 with quarterly update 3 or later
	  – SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes

| #1894 | **#1894 73.4 GB 10 k rpm Disk Unit**
(No longer available as of 13 July 2007.)

The #1894 73.4 GB 10 000 rpm Ultra320 SCSI Disk Drive Assembly provides 73.4 GB of storage capacity and supports the industry standard Ultra320 SCSI interface speed of up to 320 MBps.

Characteristics:
▶ Form Factor: 3.5 inch, 1 inch (25 mm) high
▶ Cable included: No
▶ External Interface: Ultra320 SCSI (16-bit, Low Voltage Differential)
▶ Attachment Industry Spec: SCSI U320
▶ Average Seek Time: 4.82 ms (based on four READS to one WRITE)
▶ Average Latency: 2.99 ms
▶ Rotational Speed: 10 000 rpm
▶ Maximum Data Transfer Rate: 67 MBps

Limitation: This disk drive requires attachment to a supported Ultra320 SCSI Adapter in an system that supports an Ultra320 SCSI cable/backplane in order for the drive to run at 320 MBps. Also, any and all other SCSI devices on the same SCSI bus must also be Ultra2, Ultra3, or Ultra320 SCSI devices in order for this disk drive to run at 320 MBps.

Attributes provided: 73.4 GB of disk storage mounted in a carrier
Attributes required: One disk drive bay

For 9406-MMA (#1894)
▶ Minimum required: 0
▶ Maximum allowed: 1372 (Initial order maximum: 0)
▶ OS level required:
    – AIX 5L for POWER V5.2 for IBM eServer or later
    – Red Hat Enterprise Linux AS for POWER Version 4 with quarterly update 3 or later
    – SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later
▶ Initial Order/MES/Both/Supported: Supported
▶ CSU: Yes |

#1895	**#1895 146.8 GB 10 k rpm Disk Unit**
	(No longer available as of 13 July 2007.)
	
	The #1895 146.8 GB 10 000 rpm Ultra320 SCSI Disk Drive Assembly provides 146.8 GB of storage capacity and supports the industry standard Ultra320 SCSI interface speed of up to 320 MBps.
	
	Characteristics:
	▶ Form Factor: 3.5 inch, 1 inch (25 mm) high
	▶ Cable included: No
	▶ External Interface: Ultra320 SCSI (16-bit, Low Voltage Differential)
	▶ Attachment Industry Spec: SCSI U320
	▶ Average Seek Time: 4.94 ms (based on four READS to one WRITE)
	▶ Average Latency: 2.99 ms
	▶ Rotational Speed: 10 000 rpm
	▶ Maximum Data Transfer Rate: 67 MBps
	
	Limitation: This disk drive requires attachment to a supported Ultra320 SCSI Adapter in a system that supports an Ultra320 SCSI cable/backplane in order for the drive to run at 320 MBps. Also, any and all other SCSI devices on the same SCSI bus must also be Ultra2, Ultra3, or Ultra320 SCSI devices in order for this disk drive to run at 320 MBps.
	
	Attributes provided: 146.8 GB of disk storage mounted in a carrier.
	Attributes required: One disk drive bay.
	
	For 9406-MMA (#1895)
	▶ Minimum required: 0
	▶ Maximum allowed: 1372 (Initial order maximum: 0)
	▶ OS level required:
	   – AIX 5L for POWER V5.2 for IBM eServer or later
	   – Red Hat Enterprise Linux AS for POWER Version 4 with quarterly update 3 or later
	   – SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later
	▶ Initial Order/MES/Both/Supported: Supported
	▶ CSU: Yes

#1896	**#1896 36.4 GB 15 k rpm Disk Unit**
	(No longer available as of 08 May 2007.)
	
	The #1896 36.4 GB 15 000 rpm Ultra320 SCSI Disk Drive Assembly provides 36.4 GB of storage capacity and supports the industry standard Ultra320 SCSI interface speed of up to 320 MBps.
	
	Characteristics:
	► Form Factor: 3.5 inch, 1 inch (25 mm) high
	► Cable included: No
	► External Interface: Ultra320 SCSI (16-bit, Low Voltage Differential)
	► Attachment Industry Spec: SCSI U320
	► Average Seek Time: 3.7 ms (based on four READS to one WRITE)
	► Average Latency: 2 ms
	► Rotational Speed: 15 000 rpm
	► Maximum Data Transfer Rate: 83 MBps
	
	Limitation: This disk drive requires attachment to a supported Ultra320 SCSI Adapter in a system that supports an Ultra320 SCSI cable/backplane in order for the drive to run at 320 MBps. Also, any and all other SCSI devices on the same SCSI bus must also be Ultra2, Ultra3, or Ultra320 SCSI devices in order for this disk drive to run at 320 MBps.
	
	Attributes provided: 36.4 GB of disk storage mounted in a carrier.
	Attributes required: One disk drive bay.
	
	For 9406-MMA (#1896)
	► Minimum required: 0
	► Maximum allowed: 1372 (Initial order maximum: 0)
	► OS level required:
	  – AIX 5L for POWER V5.2 for IBM eServer or later
	  – Red Hat Enterprise Linux AS for POWER Version 4 with quarterly update 3 or later
	  – SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes

#1897	**#1897 73.4 GB 15 k rpm Disk Unit**
	The #1897 73.4 GB 15 000 rpm Ultra320 SCSI Disk Drive Assembly provides 73.4 GB of storage capacity and supports the industry standard Ultra320 SCSI interface speed of up to 320 MBps.
	
	Characteristics:
	► Form Factor: 3.5 inch, 1 inch (25 mm) high
	► Cable included: No
	► External Interface: Ultra320 SCSI (16-bit, Low Voltage Differential)
	► Attachment Industry Spec: SCSI U320
	► Average Seek Time: 3.7 ms (based on four READS to one WRITE)
	► Average Latency: 2 ms
	► Rotational Speed: 15 000 rpm
	► Maximum Data Transfer Rate: 83 MBps
	
	Limitation: This disk drive requires attachment to a supported Ultra320 SCSI Adapter in a system that supports an Ultra320 SCSI cable/backplane in order for the drive to run at 320 MBps. Also, any and all other SCSI devices on the same SCSI bus must also be Ultra2, Ultra3, or Ultra320 SCSI devices in order for this disk drive to run at 320 MBps.
	
	Attributes provided: 73.4 GB of disk storage mounted in a carrier.
	Attributes required: One disk drive bay.
	
	For 9406-MMA (#1897)
	► Minimum required: 0
	► Maximum allowed: 1372 (Initial order maximum: 250)
	► OS level required:
	  – AIX 5L for POWER V5.2 for IBM eServer or later
	  – Red Hat Enterprise Linux AS for POWER Version 4 with quarterly update 3 or later
	  – SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes

#1898	**#1898 146.8 GB Disk Unit**
	Provides a 15 000 rpm disk unit with 146.8 GB of storage capacity for AIX 5L and Linux partitions.
	
	Characteristics:
	▶ Form factor: 3.5 inch, 1 inch (25 mm) high
	▶ Cable included: No
	▶ External interface: Ultra320 SCSI (16-bit, Low Voltage Differential)
	▶ Attachment Industry Spec: SCSI U320
	▶ Average seek time: 3.7 ms (based on four reads to one write)
	▶ Average latency: 2 ms
	▶ Rotational speed: 15 000 rpm
	▶ Maximum data transfer rate: 83 MBps
	
	Limitation: This disk drive requires attachment to a supported Ultra320 SCSI adapter in a system that supports an Ultra320 SCSI cable/backplane in order for the drive to run at 320 MBps. Also, any and all other SCSI devices on the same SCSI bus must also be Ultra2, Ultra3, or Ultra320 SCSI devices in order for this disk drive to run at 320 MBps.
	
	Attributes provided: 146.8 GB of disk storage mounted in a carrier.
	Attributes required: One disk drive bay.
	
	For 9406-MMA (#1898)
	▶ Minimum required: 0
	▶ Maximum allowed: 1372 (Initial order maximum: 250)
	▶ OS level required:
	    – AIX 5L for POWER V5.2 for IBM eServer or later
	    – Red Hat Enterprise Linux AS for POWER Version 4 with quarterly update 3 or later
	    – SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes

#2114	**#2114 PCI SCSI Adapter 16-Bit Differential External Y Cable** Attributes provided: Attachment of multiple hosts to the PCI SCSI-2 differential adapter Attributes required: 1 external SCSI-2 Fast/Wide Port **For 9117-MMA (#2114) and 9119-FHA (#2114)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No

#2118	**#2118 Converter Cable, VHDCI to P, Mini-68-pin to 68-pin, 0.3 m** 0.3M 16-bit SCSI cable used to convert from a Mini-68-pin VHDCI connector to a 68-pin P style connector. Cable has male Mini-68-pin VHDCI connector on one end and a female 68-pin P style connector on the other. Length = 0.3 meters. Attributes provided: Attachment of supported external subsystem to integrated SCSI port or SCSI adapter with VHDCI Mini-68-pin connector. Attributes required: None **For 9117-MMA (#2118)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None **For 9119-FHA (#2118)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum: 0) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Supported CSU: Yes Return parts MES: No
#2124	**#2124 Ultra 320 SCSI Cable 1 m** Ultra 320 SCSI Cable 1 meter for I/O drawer attachment. Attributes provided: Interface to Ultra 320 SCSI Repeater Card Attributes required: None **For 9117-MMA (#2124) and 9119-FHA (#2124)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 250) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No
#2125	**#2125 Ultra 320 SCSI Cable 3 m** Ultra 320 SCSI Cable 3 meter for I/O Drawer attachment. Attributes provided: Attachment to Ultra 320 SCSI Repeater Card Attributes required: None **For 9117-MMA (#2125) and 9119-FHA (#2125)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 250) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No

#2126	**#2126 Ultra 320 SCSI Cable 5 m** Ultra 320 SCSI Cable 5 meter for attachment to I/O drawer. Attributes provided: Attachment to Ultra 320 SCSI Repeater Card Attributes required: None **For 9117-MMA (#2126) and 9119-FHA (#2126)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 250) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No
#2127	**#2127 Ultra 320 SCSI Cable 10 m** Ultra 320 SCSI Cable 10 meter for attachment to I/O drawer. Attributes provided: Attachment to Ultra 320 SCSI Repeater Card Attributes required: None **For 9117-MMA (#2127) and 9119-FHA (#2127)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 250) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No
#2128	**#2128 Ultra 320 SCSI Cable 20 m** Ultra 320 SCSI Cable 20 meter for attachment to I/O drawer. Attributes provided: Attachment to Ultra 320 SCSI Repeater Card Attributes required: None ► For 9117-MMA (#2128) and 9119-FHA (#2128) ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 250) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No
#2138	**#2138 0.55 m Ultra 320 SCSI Cable** Ultra 320 SCSI Cable 0.55 meter for I/O Drawer attachment. Attributes provided: Attachment to Ultra 320 SCSI Repeater Card Attributes required: None **For 9117-MMA (#2138) and 9119-FHA (#2138)** ► Minimum required: 0 ► Maximum allowed: 229 (Initial order maximum: 229) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No

#2145	**#2145 Primary OS - IBM i Operating System** Indicates clients intend to use IBM i on the primary system partition. This feature is used as a Manufacturing Routing indicator and does not deliver parts, software, or services. Attributes provided: None Attributes required: Indicates clients intend to use IBM i on the primary system partition. **For 9117-MMA (#2145) and 9119-FHA (#2145)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 1) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Not applicable ▶ Return parts MES: No **Note**: Only one of features #2145, #2146, or #2147 can exist on a system Configuration report.
#2146	**#2146 Primary OS - AIX** Indicates clients intend to use the AIX operating system on the primary system partition. This feature is used as a Manufacturing Routing indicator and does not deliver parts, software, or services. Attributes provided: None Attributes required: Indicates clients intend to use the AIX operating system on the primary system partition. **For 9117-MMA (#2146) and 9119-FHA (#2146)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 1) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Not applicable ▶ Return parts MES: No **Note**: Only one of features #2145, #2146, or #2147 can exist on a system Configuration report.
#2147	**#2147 Primary OS - Linux** Indicates clients intend to use the Linux operating system on the primary system partition. This feature is used as a Manufacturing Routing indicator and does not deliver parts, software, or services. Attributes provided: None Attributes required: Indicates clients intend to use the Linux operating system on the primary system partition. **For 9117-MMA (#2147) and 9119-FHA (#2147)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 1) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Not applicable ▶ Return parts MES: No **Note**: Only one of features #2145, #2146, or #2147 can exist on a system Configuration report.

#2424	**#2424 0.6 m 16-bit SCSI-2 System-to-System Cable** This cable provides a 16-bit connection between any two differential or single ended SCSI devices having 68-pin connectors. It can be used to attach an external SCSI device to a SCSI adapter card in an RS/6000® system. Attributes provided: 0.6 meter SCSI cable with 68-pin connectors at each end Attributes required: 68-pin SCSI Interface **For 9117-MMA (#2424)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#2425	**#2425 2.5 m 16-bit SCSI-2 System-to-System Cable** This cable provides a 16-bit connection between any two differential or single ended SCSI devices having 68-pin connectors. It can be used to attach an external SCSI device to a SCSI adapter card. **Note**: This feature is supported as #1852 on upgrading systems into the unified POWER6 MTMs. Attributes provided: 2.5 meter SCSI cable with 68-pin connectors at each end Attributes required: 68-pin SCSI Interface **For 9117-MMA (#2425)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None **For 9119-FHA (#2425)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 0) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Supported CSU: Yes Return parts MES: No

#2456	**#2456 2 m LC-SC 50 Micron Fiber Converter Cable** The 50 micron fiber cable is used to convert from LC type to SC type connectors. The 2 meter cable has a male LC type connector on one end and a female SC type connector on the other. **Note**: This feature is converted from #0371 on systems upgrading into unified POWER6 MTMs. Attributes provided: Cable with (1X) LC type plug and (1X) SC type receptacle Attributes required: None **For 9117-MMA (#2456)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#2456)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 99) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#2459	**#2459 LC-SC 62.5 Micron Fiber Converter Cable** The 62.5 micron fiber cable is used to convert from LC type to SC type connectors. The 2 meter cable has a male LC type connector on one end and a female SC type connector on the other. This feature is converted from #0372 on systems upgrading into unified POWER6 MTMs. Attributes provided: Cable with (1X) LC type plug and (1X) SC type receptacle Attributes required: None **For 9117-MMA (#2459)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#2459)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 99) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#2498	**#2498 PCI 4-Channel Ultra3 SCSI RAID Adapter**
	The RS/6000 PCI 4-Channel Ultra3 SCSI RAID Adapter(#2498) is a non- bootable high performance Ultra3 SCSI RAID Adapter providing RAID 0,1,1E, 5, or 5E capability and can address up to 60 16-bit SCSI physical disk drives on four independent SCSI buses.
	To increase the data writing performance, a 128 MB fast-write cache is provided as a resident part of this adapter. The 128 MB fast-write cache is a resident feature of the PCI 4-Channel Ultra3 SCSI RAID Adapter that utilizes non-volatile RAM. During the unlikely event of an PCI 4-Channel Ultra3 SCSI RAID Adapter failure, a replacement PCI 4-Channel Ultra3 SCSI RAID Adapter can be installed and the fast-write cache can be removed from the failing adapter and installed in the new adapter to help ensure data integrity. The 128 MB fast-write cache can provide an significant improvement in data throughput and response time during certain sequence write operations compared to SCSI RAID adapters without the fast-write cache. The response time and data transfer improvement will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters.
	The PCI 4-Channel Ultra3 SCSI RAID Adapter has four independent Ultra3 SCSI buses. There are two internal ports and four external ports. The two internal ports are shared with two of the external ports. Two of the four busses can drive either an internal port or an external port. The other two busses only drive external ports. The internal ports can be used to provide an internal RAID solution on supporting RS/6000 systems. Systems with one or two internal six pack disks can attach to a PCI 4-Channel Ultra3 SCSI RAID Adapter. The four external ports provide connectivity to an IBM 2104-DU3 Expandable Storage Plus Drawer or 2104-TU3 Expandable Storage Plus Tower at up to 160 MBps SCSI bus data rate. The four external ports also provide connectivity to an IBM 2104-DL1 Expandable Storage Plus Drawer or 2104-TL1 Expandable Storage Plus Tower at up to 80 MBps SCSI bus data rate.
	Limitations: Not supported on POWER6 MTMs.
	The four external ports do not support the connection to the IBM 7131-105 external Fast/Wide SCSI disk enclosure. Although the PCI 4-Channel Ultra3 SCSI RAID Adapter has ports that run at Ultra3 SCSI speeds (up to 160 MBps) and Ultra2 SCSI speeds (up to 80 MBps), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system backplane.
	For full support and to take full advantage of the Ultra3 (up to 160 MBps) speed of this adapter, the proper AIX level also needs to be considered. AIX 4.3.3 with appropriate APAR updates or later AIX versions support the full range of SCSI bus data rates (including Ultra3 SCSI up to 160 MByte/s). Check the AIX level your system has or is able to support.

#2591	**#2591 External USB 1.44 MB Diskette Drive**
	The externally attached USB diskette drive provides storage capacity up to 1.44 MB on a high density (2HD) floppy disk and 720 KB on a double density floppy disk. Includes 350mm (13.7 in) captured cable with standard USB connector.
	
	Limitations:
	▶ Maximum 1 USB diskette per adapter
	▶ Up to 1 Keyboard and Mouse also supported on the adapter with the diskette drive at the same time
	▶ No system boot capability
	▶ Not to be operated upside down or with eject button down
	
	Characteristics:
	▶ Capacity - 1.44 MB (2HD disk) or 720 KB (double density disk)
	▶ Physical Dimensions: Width=103 mm (4.05 in), Height=17.6 mm (.69 in), Depth=141.8 mm (5.58 in)
	▶ Color: Black
	▶ Data Rate: 12 Mbps
	▶ Max Power Consumption: 2.36 Watt (seek)
	▶ Operates in all positions except those noted in the limitations above
	
	Attributes provided: External diskette drive
	Attributes required: 1 available USB port
	
	For 9117-MMA (#2591)
	▶ Minimum required: 0
	▶ Maximum allowed: 24 (Initial order maximum: 0)
	▶ OS level required:
	   – AIX 5.2 TL10 or later
	   – AIX 5.3 TL6 or later
	   For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	   http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	
	For 9119-FHA (#2591)
	▶ Minimum required: 0
	▶ Maximum allowed: 99 (Initial order maximum: 0)
	▶ OS level required:
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: Does not apply

| #2634 | **#2634 16X/48X (max) IDE DVD-ROM Drive**
The 16X/48X (max) IDE DVD-ROM Drive is an internal tray loading DVD-ROM drive providing up to 7200 KBps (CD-ROM) and 22.16 MBps (DVD-ROM) data transfer rates. It is a 5.25 inch half-high form factor multi-session capable, DVD-ROM drive which provides state of the art performance and supports existing 650 MB CD-ROM, 4.7 GB DVD-ROM, and 9.4 GB DVD-ROM (double-sided) discs. This drive also reads Type II (removable from cartridge) DVD-RAM discs at DVD-ROM speeds. System boot and install functions are supported with CD-ROM and DVD-RAM media.

Characteristics:
▶ Media Data Transfer Rate: CD-ROM=7200 KBps (max): DVD-ROM=22.16 MBps (max)
▶ Interface: IDE/ATAPI
▶ Avg. Random Access Time: CD-ROM=90 ms(typical); DVD-ROM=135 ms(typical)
▶ Buffer Memory: 256 KB
▶ Media capacity: CD-ROM=650 MB; DVD-ROM= 4.7 GB (single sided); 9.4 GB (double-sided)
▶ Multisession capable (Reads CD/R & CD-R/W media)
▶ 5.25 inch half-high form factor
▶ Operates in either vertical or horizontal positions
▶ Interface supports standard and extended XA formats
▶ Loading tray supports 12cm and 8cm disks

Limitations:
▶ Not supported on POWER6 MTMs.
▶ DVD video is not supported.
▶ This DVD-ROM drive is limited to reading only CD-type formatted media when running with AIX 5.1 software.

Attributes provided: 16X/48X (max) IDE DVD-ROM Drive
Attributes required: 1 half-high media bay

For 9119-FHA (#2634) |
| #2640 | **#2640 IDE Slimline DVD-ROM Drive**
The 8X/24X (max) Slimline IDE DVD-ROM Drive is an internal tray loading DVD-ROM drive providing up to 3600 KBps (CD-ROM) and 10.3 MBps (DVD-ROM) data transfer rates. It is a 12.7 mm Slimline form factor multi-session capable, DVD-ROM drive which provides state of the art performance and supports existing 650 MB CD-ROM, 4.7 GB DVD-ROM, and 9.4 GB DVD-ROM (double-sided) discs. This drive also reads Type II (removable from cartridge) DVD-RAM discs at DVD-ROM speeds. System boot and install functions are supported with CD-ROM and DVD-RAM media.

Characteristics:
▶ Media Data Transfer Rate: CD-ROM=3600 KBps (max): DVD-ROM=10.3 MBps (max)
▶ Interface: IDE/ATAPI
▶ Avg. Random Access Time: CD-ROM=95 ms (typical); DVD-ROM=150 ms (typical)
▶ Buffer Memory: 256 KB
▶ Media capacity: CD-ROM=650 MB; DVD-ROM= 4.7 GB (single sided); 9.4 GB (double-sided)
▶ Multisession capable (Reads CD/R & CD-R/W media)
▶ 12.7 mm Slimline form factor
▶ Operates in either vertical or horizontal positions
▶ Interface supports standard and extended XA formats
▶ Loading tray supports 12cm and 8cm disks

Limitations:
▶ DVD video is not supported.
▶ DVD-ROM only reads CD-type formatted media with AIX 5.1.

Attributes provided: 8X/24X (max) IDE DVD-ROM Drive
Attributes required: 1 Slimline media bay

For 9117-MMA (#2640)
▶ Not supported on POWER6. |

#2737	**#2737 Keyboard/Mouse Attachment Card - PCI** This PCI card provides for connection of one USB keyboard and mouse. Attributes provided: USB Keyboard/Mouse Attachment Attributes required: Empty PCI slot **For 9117-MMA (#2737)** ► Minimum required: 0 ► Maximum allowed: 8 (Initial order maximum: 0) ► OS level required: AIX 5.2 or AIX 5.3 or later For information about support for this adapter on Red Hat Enterprise Linux and SUSE Linux, see: http://www.ibm.com/systems/p/hardware/factsfeatures.html **For 9119-FHA (#2737)** ► Not supported on POWER6.

#2738	**#2738 2-Port USB PCI Adapter**
	The 2-Port USB PCI Adapter is a USB 2.0 capable adapter that provides for the connection of one USB keyboard and mouse.
	
	Limitation: Limited to USB 1.1 support with AIX
	
	Attributes provided: USB Keyboard/Mouse Attachment
	Attributes required: One available PCI slot
	
	For 9117-MMA (#2738)
	► Minimum required: 0
	► Maximum allowed: 8 (Initial order maximum: 8)
	► OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	
	For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	
	For 9119-FHA (#2738)
	► Minimum required: 0
	► Maximum allowed: 16 (Initial order maximum: 16)
	► OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
	
	Note: Two per CEC enclosure maximum.

| #2742 | **#2742 PCI Two-Line WAN IOA**
A WAN IOA that supports up to two multiple protocol communications (RVX) ports when one or two of the following cables are attached:
▶ #0348 - V.24/EIA232 20-ft PCI Cable
▶ #0349 - V.24/EIA232 50-ft PCI Cable (support only, not orderable)
▶ #0353 - V.35 20-ft PCI Cable
▶ #0354 - V.35 50-ft PCI Cable
▶ #0355 - V.35 80-ft PCI Cable (support only, not orderable)
▶ #0356 - V.36 20-ft PCI Cable
▶ #0358 - V.36 80-ft PCI Cable (support only, not orderable)
▶ #0359 - X.21 20-ft PCI Cable
▶ #0360 - X.21 50-ft PCI Cable
▶ #0365 - V.24/EIA232 80-ft PCI Cable
▶ #0367 - Operations Console PCI Cable

Note: The #0367 cable ships with a 25-pin to 9-pin adapter.

Multiple #0367 cables can be ordered (but only one per #2742) to serve as consoles for secondary partitions when Logical Partitioning is utilized.

When #2742 is selected to support ECS, one of following cables must be specified:
▶ #0348 V.24/EIA232 20-ft PCI Cable
▶ #0349 V.24/EIA232 50-ft PCI Cable (support only, not orderable)
▶ #0365 V.24/EIA232 80-ft PCI Cable
▶ #2742 does not support remote power on.

IBM strongly encourages customers to move to the direct connection (which is HTTP/HTTPS and VPN). http://www-912.ibm.com/s_dir/slkbase.NSF/643d2723f2907f0b8625661300765a2a/d3a4642013af49b5862571470061e36b?OpenDocument

Attributes provided: two RVX comm ports
Attributes required: one 3v PCI/PCI-X slot

For 9406-MMA (#2742)
▶ Minimum required: 0
▶ Maximum allowed: 240 (Initial order maximum: 240)
▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
▶ Initial Order/MES/Both/Supported: Both
▶ CSU: Yes |

#2744	**#2744 PCI 100 Mbps Token-Ring IOA** (No longer available as of 01 June 2006.) The PCI 100 Mbps token-ring IOA provides a single attachment to a 100 Mbps, 16 Mbps, or 4 Mbps token-ring network. The feature consists of an IOA card, internal code that supplies IEEE 802.5 Media Access Control (MAC) and IEEE 802.2 Logical Link Control (LLC) functions. This IOA operates in half-or full-duplex mode. A 2.44 m (8-ft) token-ring cable is included with this feature. As an alternative, you can attach a separately priced twisted-pair cable to the RJ45 connection on the IOA. IBM Cabling System patch cables, included with this feature, can increase the length as required. Prerequisites: If #2744 is used on an Integrated xSeries Server, one #0223 (100 Mbps Token-Ring Specify) is required for each #2744. **For 9406-MMA (#2744)** ▶ Minimum required: 0 ▶ Maximum allowed: 528 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Qty = 528 - 48 x 11 ▶ Use RPQ 8A1708 for support on upgrades to 8203-E4A, 8204-E8A, 9117-MMA, or 9119-FHA

#2749	**#2749 PCI Ultra Mag Media Controller**
	Provides Ultra SCSI attachment capability for an external tape device or an external optical device.
	
	For 9117-MMA (#2749)
	▶ Minimum required: 0
	▶ Maximum allowed: 48 (Initial order maximum: 0)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#2749)
	▶ Minimum required: 0
	▶ Maximum allowed: 57 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No
	
	Note: This adapter is not allowed in the CEC enclosures.

#2757	**#2757 PCI-X Ultra RAID Disk Controller**
	A PCI-X SCSI controller with a maximum compressed write cache of 757 MB. The #2757 provides RAID-5 protection for internal disks and also supports internal tape units, internal CD or DVD-ROM and internal DVD-RAM units.
	
	The #2757 has four LVD SCSI buses that support up to 20 internal disk units.
	
	Hardware data compression is not supported.
	
	In addition to providing RAID-5 protection for disks, the #2757 is also a high-performance controller for disks protected by system mirroring or disks with no data protection.
	
	A minimum of three disk units of the same capacity are needed for a valid RAID-5 configuration. A maximum of six arrays are allowed per controller, with a maximum of 18 disk units allowed per array. All disk units in an array must be of the same capacity.
	
	Parity is spread across either two, four, eight, or sixteen disk units in an array. If an array of three disk units is started, parity is spread across two disk units. If an array of four to seven disk units is started, parity is spread across four disk units. If an array of eight to fifteen disk units is started, parity is spread across eight disk units. If an array of sixteen to eighteen disk units is started, parity is spread across sixteen disk units.
	
	The number of arrays and size of each array can be influenced by specifying an optimization of either balance, performance, or capacity in Operations Navigator when starting arrays. An optimization of balance is the default when starting arrays from the green screens. If disk units are included into an existing array, parity can be spread across less than the preferred number of disk units. In this case the RAID function must be stopped and started to redistribute the parity.
	
	The #2757 can also control up to two internal removable media devices (tape, CD-ROM, or DVD-ROM or RAM).
	
	Attributes provided: Controller for up to 20 disk units and two internal removable media devices
	Attributes required: One 3V PCI slot. This feature is only orderable as part of a feature conversion to #5581.
	
	For 9117-MMA (#2757)
	▶ Minimum required: 0
	▶ Maximum allowed: 100 (Initial order maximum: 0)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#2757)
	▶ Minimum required: 0
	▶ Maximum allowed: 192 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No
	
	Note: This adapter is not allowed in the CEC enclosures.

#2780	**#2780 PCI-X Ultra4 RAID Disk Controller**
	The #2780 is an Ultra4 (Ultra320) SCSI controller with a maximum compressed write cache of 757 MB and a maximum compressed read cache size of 1 GB, that provides RAID-5 protection for internal disks and also supports internal tape units, CD-ROM and DVD units. The #2780 has four Ultra4 (Ultra320) SCSI buses.
	
	In addition to providing RAID-5 protection for disks, #2780 is also designed to work as a high performance controller for disks protected by system mirroring or disks with no protection.
	
	This controller also uses a Cache Battery Pack with can be replaced concurrent with system operation.
	
	The #2780 controller supports a maximum of 20 disk units.
	
	A minimum of three disk units of the same capacity are needed for a valid RAID-5 configuration. A maximum of six arrays are allowed per controller, with a maximum of 18 disk units allowed per array. All disk units in an array must be of the same capacity.
	
	Parity is spread across either two, four, eight, or 16 disk units in an array. If an array of three disk units is started, parity is spread across two disk units. If an array of four to seven disk units is started, parity is spread across four disk units. If an array of 8-15 disk units is started, parity is spread across eight disk units. If an array of 16-18 disk units is started, parity is spread across 16 disk units.
	
	The number of arrays and size of each array can be influenced by specifying an optimization of either *Balance*, *Performance*, or *Capacity* in Operations Navigator when starting arrays. An optimization of Balance will be used by default when starting arrays from the green screens. If disk units are included into an existing array, the number of parity drives does not increase, so parity can be spread across less than the preferred number of disk units. In this case the RAID function must be stopped and then started in order to redistribute the parity.
	
	Note: This controller does not support DASD compression.
	
	Attributes provided: SCSI Raid Controller
	Attributes required: One 3V long PCI slot
	
	For 9117-MMA (#2780)
	▸ Minimum required: 0
	▸ Maximum allowed: 100 (Initial order maximum: 0)
	▸ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#2780)
	▸ Minimum required: 0
	▸ Maximum allowed: 192 (Initial order maximum: 0)
	▸ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#2787	**#2787 PCI-X Fibre Chan Disk Controller**
	Provides Fibre Channel attachment for external disk devices. #2787 supports point-to-point and arbitrated loop topologies and has an LC type cable connector. Each #2787 is shipped with a wrap connector (P/N 05N6767). This feature supports 64-bit, 133 MHz PCI-X bus speeds. #0626 is a Linux direct attach version of this adapter.
	
	One of the following adapter kits is required when connecting SC type cables to the #2787:
	► #2456: LC-SC Adapter Kit (50 um) can be ordered, both on initial, model upgrades, and simple MES orders. This optional kit is used to attach SC-type 50 micron fiber cables to a #2787. This kit contains a 2 m LC-ST cable and ST-SC adapter for 50 micron fibre cables.
	► #2459: LC-SC Adapter Kit (62.5 um) can be ordered, both on initial, model upgrades, and simple MES orders. This optional kit is used to attach SC-type 62.5 micron fiber cables to a #2787. This kit contains a 2 m LC-ST cable and ST-SC adapter for 62.5 micron fibre cables.
	
	An optics cleaning kit and instruction sheet is shipped with the #2787. The customer must supply all Fibre Channel cables for this controller.
	
	Attributes provided: Fiber attachment of external DASD
	Attributes required: One PCI slot
	
	For 9117-MMA (#2787)
	► Minimum required: 0
	► Maximum allowed: 144 (Initial order maximum: 0)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#2787)
	► Minimum required: 0
	► Maximum allowed: 289 (Initial order maximum: 0)
	► OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No
	
	Note: Not allowed in a CEC enclosure.

| #2793 | **#2793 - PCI 2-Line WAN with Modem**
The #2793 is a 2-line or port WAN with modem adapter. This feature is the non-Complex Impedance Matching (CIM) version offered in all countries except Australia and New Zealand.

Port 0 is the modem port and supports V.92 56K Async PPP, V.92 data modem, V.44 data compression, V.34 FAX modem and FAX functions, such as ECM and 2D/1D conversion. Port 0 does not provide Sync modem capabilities (SDLC and Sync PPP).

Port 1 is the RVX port and supports multiple communications protocols, including synchronous operations.

Select one of the following cables to attach to port 0(modem port):
► #1010 Modem Cable - Austria
► #1011 Modem Cable - Belgium
► #1012 Modem Cable - Africa
► #1013 Modem Cable - Israel
► #1014 Modem Cable - Italy
► #1015 Modem Cable - France
► #1016 Modem Cable - Germany
► #1017 Modem Cable - UK
► #1018 Modem Cable - Iceland/Sweden
► #1020 Modem Cable - HK/NZ
► #1021 Modem Cable - Fin/Nor
► #1022 Modem Cable - Netherlands
► #1023 Modem Cable - Swiss
► #1024 Modem Cable - Denmark
► #1025 Modem Cable - US/Canada

Select one of the following cables to attach to port 1(RVX port):
► #0348 - V.24/EIA232 20-ft PCI Cable
► #0353 - V.35 20-ft PCI Cable
► #0356 - V.36 20-ft PCI Cable
► #0359 - X.21 20-ft PCI Cable
► #0367 - Operations Console PCI Cable (ships with a 25-pin to 9-pin adapter)

Multiple #0367 cables can be ordered but only one per #2793) to serve as consoles for secondary partitions when Logical Partitioning is utilized.

ECS is supported from both the modem port, and the RVX port. The following cable is required to support ECS from the RVX port:
► #0348 - V.24/EIA232 20-ft PCI Cable

IBM strongly encourages customers to move to the direct connection (which is HTTP/HTTPS and VPN). http://www-912.ibm.com/s_dir/slkbase.NSF/643d2723f2907f0b8625661300765a2a/d3a4642013af49b58625 71470061e36b?OpenDocument

The #2793 does not support the remote ring indicate function.

Attributes provided: One RVX port and one integrated modem port
Attributes required: One PCI slot (3 volt)

For 9406-MMA (#2793)
► Minimum required: 0
► Maximum allowed: 240 (Initial order maximum: 240)
► OS level required: IBM i 5.4 with V5R4M5 machine code or later
► Initial Order/MES/Both/Supported: Both
► CSU: Yes
► Not supported on unified POWER6 MTMs. |

#2805	**#2805 - PCI Quad Modem IOA** The #2805 is a four-line WAN modem adapter, with four RJ-11 ports, supports V.92 56 k Async SLIP/PPP and V.34 Fax applications at data rates up to 33.6 k through integrated modems. Connection to the V.92 ports is through telephone cable. The V.92 functions offer increased upload throughput, improved V.44 data compression, and shortened modem synchronization periods. The call waiting and modem on hold functions associated with V.92 are not supported. Remote power on through ring-indicator and SDLC are not supported. #2805 is non-Complex Impedance Matching (CIM). A minimum of one modem cable must be ordered for each #2805. All modem cables installed on a system must be the same feature number. ► #1010 Modem Cable - Austria ► #1011 Modem Cable - Belgium ► #1012 Modem Cable - Africa ► #1013 Modem Cable - Israel ► #1014 Modem Cable - Italy ► #1015 Modem Cable - France ► #1016 Modem Cable - Germany ► #1017 Modem Cable - UK ► #1018 Modem Cable - Iceland/Sweden ► #1020 Modem Cable - HK/NZ ► #1021 Modem Cable - Fin/Nor ► #1022 Modem Cable - Netherlands ► #1023 Modem Cable - Swiss ► #1024 Modem Cable - Denmark ► #1025 Modem Cable - US/Canada Attributes provided: four WAN ports Attributes required: one PCI slot **For 9406-MMA (#2805)** ► Minimum required: 0 ► Maximum allowed: 120 (Initial order maximum: 120) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes
#2843	**#2843 PCI IOP** (No longer available as of 15 October 2004.) #2843 is a PCI I/O processor with 64 MB of memory which drives PCI IOA cards. #2843 can drive a maximum of four IOAs, subject to configuration restrictions. Attributes provided: support for up to 4 PCI IOAs Attributes required: one PCI slot **For 9406-MMA (#2843)** ► Minimum required: 0 ► Maximum allowed: 288 (Initial order maximum: 0) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Supported as a #3705 on 9117-MMA, 9119-FHA ► CSU: Yes

#2844	**#2844 PCI IOP**
	#2844 is a PCI I/O processor that drives PCI IOA cards in RIO-2 attached PCI or PCI-X I/O expansion towers/units. A #2844 can drive a maximum of four IOAs, subject to configuration restrictions.
	
	Attributes provided: Support for up to four PCI adapters
	Attributes required: One 3V PCI slot (either short or long)
	
	For 9117-MMA (#2844)
	▶ Minimum required: 0
	▶ Maximum allowed: 288 (Initial order maximum: 250)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#2844)
	▶ Minimum required: 0
	▶ Maximum allowed: 182 (Initial order maximum: 182)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No

#2847	**#2847 PCI IOP for SAN Load Source**
	Provides the specialized function required to attach IBM i load source through a fibre channel adapter and boot from that load source. With IBM i 6.1, #2847 PCI IOP for SAN Load Source supports multipath for the i5/OS load source disk unit, along with supporting multipath for all other logical units (LUNs) attached to this IOP. A minimum of two IOPs are required for enabling redundancy. For more information, see *iSeries and IBM TotalStorage: A Guide to Implementing External Disk on eServer i5*, SG24-7120.
	
	Attributes provided: Load source support through fiber channel.
	Attributes required: See IBM i release level.
	
	For 9117-MMA (#2847)
	▶ Minimum required: 0
	▶ Maximum allowed: 288 (Initial order maximum: 250)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	For 9119-FHA (#2847)
	▶ Minimum required: 0
	▶ Maximum allowed: No Max (Initial order maximum: 250)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No

#2848	**#2848 POWER GXT135P Graphics Accelerator** The POWER GXT135P is a versatile, low-priced 2D graphics accelerator for RS/6000 workstations and pSeries® servers. It can be configured to operate in either 8-bit or 24-bit color modes. Hardware description: ▶ 128-bit graphics processor ▶ 8-bit CLUT or 24-bit true color ▶ 16 MB SDRAM ▶ 32-bit PCI interface ▶ Universal PCI (5.0v or 3.3v) ▶ 1 hardware color map Features supported: ▶ Up to approximately 16.7 million colors ▶ Rectangular clipping ▶ 2 analog monitor outputs ▶ Up to 1600 x 1200 resolution ▶ 60 to 85 Hz refresh rates (ISO 9241, Part 3) APIs supported: ▶ X Window System and Motif ▶ UMS 2.3.0 (no hardware scaling) ▶ Not supported on POWER6.

#2849	**#2849 POWER GXT135P Graphics Accelerator with Digital Support**
	The POWER GXT135P is a versatile, low-priced 2D graphics accelerator for RS/6000 workstations and pSeries servers. It can be configured to operate in either 8-bit or 24-bit color modes. This adapter supports both analog and digital monitors. Its predecessor, Feature Number 2848, supported only analog monitors.
	Hardware description:
	► 128-bit graphics processor
	► 8-bit CLUT or 24-bit true color
	► 16 MB SDRAM
	► 32-bit PCI interface
	► Universal PCI (5.0v or 3.3v)
	► 1 hardware color map
	Features supported:
	► Up to approximately 16.7 million colors Rectangular clipping
	► 2 analog monitor outputs at up to 1280 x 1024 resolution
	► 1 analog monitor output at up to 2048 x 1536 resolution
	► 1 digital monitor output at up to 1600 x 1200 resolution
	► 60 to 85 Hz refresh rates (ISO 9241, Part 3)
	APIs supported:
	► X Window System and Motif
	► UMS 2.3.0 (no hardware scaling)
	Software requirements:
	► AIX Versions 5.1 or 5.2 or 5.3 (analog or digital support)
	► AIX Version 4.3 (analog support only)
	The total number of Graphics Adapters in any one partition cannot exceed four.
	Attributes provided: 2D Graphics
	Attributes required: 1 PCI slot
	For 9117-MMA (#2849) and 9119-FHA (#2849)
	► Minimum required: 0
	► Maximum allowed: 8 (Initial order maximum: 8)
	► OS level required:
	– AIX 5.2 TL10 or later
	– AIX 5.3 TL6 or later
	For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes
	► Return parts MES: No
#2861	**#2861 ARTIC960Hx 4-Port EIA-232 Cable**
	Attributes provided: 4-port EIA-232 cable for (#2947)
	Attributes required: One #2947 adapter
	For 9117-MMA (#2861) and 9119-FHA (#2861)
	► Minimum required: 0
	► Maximum allowed: no max (Initial order maximum: 0)
	► OS level required: None
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes
	► Return parts MES: No

#2863	**#2863 ARTIC960Hx 4-Port X.21 Cable** Attributes provided: 4-port X.21 cable for #2947 Attributes required: One #2947 adapter **For 9117-MMA (#2863) and 9119-FHA (#2863)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#2864	**#2864 ARTIC960Hx 4-Port V.35 (DTE) Cable** Attributes provided: 4-port X.35 (DTE) cable for (#2947) Attributes required: One #2947 adapter **For 9117-MMA (#2864) and 9119-FHA (#2864)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#2877	**#2877 IBM ARTIC960RxD Quad DTA, H.100, 4-Drop Cable** This cable provides the capability to interconnect adapters that provide H.100 bus connectors. This 4-position cable should be used when four or less adapters with H.100 connectors will be interconnected. When more than 4 and less than or equal to 8 adapters will be connected, the H.100 Bus 8-Drop Cable (#4353) should be used. Attributes provided: H.100 bus connection between adapters Attributes required: Two to Four H.100 adapters **For 9117-MMA (#2877)** ► Not supported on POWER6.

| #2893 | **#2893 PCIe 2-Line WAN with Modem**
A 2-line or port WAN with modem PCIe adapter that runs without an IOP. This feature is the non-CIM (Complex Impedance Matching) version offered in all countries except Australia and New Zealand. #2893 and #9693 are physically identical cards.

Port 0 is the modem port and supports V.92 56K Async PPP, V.92 data modem, V.44 data compression, V.34 FAX modem and FAX functions, such as ECM and 2D/1D conversion. Port 0 does not provide Sync modem capabilities (SDLC and Sync PPP). Port 1 is the RVX port and supports multiple communications protocols, including synchronous operations.

The following support applies to this IOP-less adapter:
▶ Port 0 is the modem port and supports:
  – Fax
  – SNA communications is supported through IBM i AnyNet or Enterprise Extender functions
  – V.92 56K Async SLIP/PPP
▶ Port 1 is the RVX port and supports multiple communications protocols, including synchronous operations.
  – Async SLIP/PPP
  – Bisync
  – Fax
  – PPP
  – SNA communications is supported through IBM i AnyNet or Enterprise Extender functions
  – X.21

One PCIe slot is required.

Restrictions:
▶ X.25 is not supported
▶ Remote power on through ring-indicator is not supported
▶ SNA using CRTLINSDLC is not supported

Select one of the following cables to attach to port 0 (modem port):
▶ #1010 Modem Cable - Austria
▶ #1011 Modem Cable - Belgium
▶ #1012 Modem Cable - Africa
▶ #1013 Modem Cable - Israel (supported only, not orderable)
▶ #1014 Modem Cable - Italy
▶ #1015 Modem Cable - France
▶ #1016 Modem Cable - Germany
▶ #1017 Modem Cable - UK
▶ #1018 Modem Cable - Iceland/Sweden
▶ #1020 Modem Cable - HK/NZ
▶ #1021 Modem Cable - Fin/Nor
▶ #1022 Modem Cable - Netherlands
▶ #1023 Modem Cable - Swiss
▶ #1024 Modem Cable - Denmark
▶ #1025 Modem Cable - US/Canada |

#2893 Continued	Select one of the following cables to attach to port 1 (RVX port):
	► #0348 - V.24/EIA232 20-ft PCI Cable
	► #0353 - V.35 20-ft PCI Cable
	► #0356 - V.36 20-ft PCI Cable (supported only, not available)
	► #0359 - X.21 20-ft PCI Cable
	► #0367 - Operations Console PCI Cable (ships with a 25-pin to 9-pin adapter)
	
	Multiple #0367 cables can be ordered but only one per #2893) to serve as consoles for secondary partitions when Logical Partitioning is utilized. ECS is supported from both the modem port, and the RVX port. ECS is supported from the RVX port with #0348 - V.24/EIA232 20-Ft PCI Cable.
	
	IBM strongly encourages customers to move to the direct connection (which is HTTP/HTTPS and VPN). http://www-912.ibm.com/s_dir/slkbase.NSF/643d2723f2907f0b8625661300765a2a/d3a4642013af49b5862571470061e36b?OpenDocument
	
	For further configuration information, refer to: http://www.iseries.ibm.com/tstudio/planning/esa/esa.htm
	
	Attributes provided: One PCIe slot
	Attributes required: Modem
	
	For 9117-MMA (#2893)
	► Minimum required: 0
	► Maximum allowed: 16 (Initial order maximum: 16, four maximum in each CEC enclosure)
	► OS level required:
	  – IBM i 5.4 with V5R4M5 machine code or later
	  – SUSE LINUX Enterprise Server 10 SP 1 for POWER Systems or later
	  – Red Hat Enterprise Linux Version 4.6 or later
	  – Red Hat Enterprise Linux Version 5.2 or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: The #2893 is a Customer Install Feature
	► Return parts MES: No

#2894	**#2894 PCIe 2-Line WAN with Modem CIM**
	A 2-line/port WAN with modem PCIe adapter that runs without an IOP. This feature is the CIM (Complex Impedance Matching) version of the #2893 and is required only in Australia and New Zealand. #2894 and #9694 are physically identical cards.
	Port 0 is the modem port and supports V.92 56K Async PPP, V.92 data modem, V.44 data compression, V.34 FAX modem and FAX functions, such as ECM and 2D/1D conversion. Port 0 does not provide Sync modem capabilities (SDLC and Sync PPP). Port 1 is the RVX port and supports multiple communications protocols, including synchronous operations. The following support applies to this IOP-less adapter:
 ▶ Port 0 is the modem port and supports:
  – Fax
  – SNA communications is supported through IBM i AnyNet or Enterprise Extender functions
  – V.92 56K Async SLIP/PPP
 ▶ Port 1 is the RVX port and supports multiple communications protocols, including synchronous operations.
  – Async SLIP/PPP
  – Bisync
  – Fax
  – PPP
  – SNA communications is supported through IBM i AnyNet or Enterprise Extender functions
  – X.21
Restrictions:
 ▶ X.25 is not supported.
 ▶ Remote power on through ring-indicator is not supported
 ▶ SNA using CRTLINSDLC is not supported

Select one of the following cables to attach to port 0(modem port):
 ▶ #1019 Modem Cable - Australia
 ▶ #1020 Modem Cable - HK/NZ
Select one of the following cables to attach to port 1(RVX port):
 ▶ #0348 - V.24/EIA232 20-ft PCI Cable
 ▶ #0353 - V.35 20-ft PCI Cable
 ▶ #0356 - V.36 20-ft PCI Cable (supported only, not orderable)
 ▶ #0359 - X.21 20-ft PCI Cable
 ▶ #0367 - Operations Console PCI Cable (ships with a 25-pin to 9-pin adapter)

Multiple #0367 cables can be ordered but only one per #2893) to serve as consoles for secondary partitions when Logical Partitioning is utilized. ECS is supported from both the modem port, and the RVX port.
ECS is supported from the RVX port with #0348 - V.24/EIA232 20-Ft PCI Cable. For further configuration information, refer to:
http://www.iseries.ibm.com/tstudio/planning/esa/esa.htm

IBM strongly encourages customers to move to the direct connection (which is HTTP/HTTPS and VPN).
http://www-912.ibm.com/s_dir/slkbase.NSF/643d2723f2907f0b8625661300765a2a/d3a4642013af49b5862571470061e36b?OpenDocument

Attributes provided: One PCIe slot
Attributes required: Modem

For 9117-MMA, 9406-MMA (#2894)
 ▶ Minimum required: 0
 ▶ Maximum allowed: 16 (Initial order maximum: 16, 4 per processor enclosure)
 ▶ OS level required:
  – IBM i 5.4 with V5R4M5 machine code or later
  – SUSE LINUX Enterprise Server 10 SP 1 for POWER Systems or later
  – Red Hat Enterprise Linux Version 4.6 or later
  – Red Hat Enterprise Linux Version 5.2 or later
 ▶ Initial Order/MES/Both/Supported: Both
 ▶ CSU: The #2894 is a Customer Install Feature.
 ▶ Return parts MES: No |

#2917	**#2917 English U/L DBCS** All systems require a #29XX specify code. A 29XX code is required on all model upgrades, even if one is already on the records. Machine history at the IBM plant is used to ship the proper language when the 29XX code is not on an MES order. These features have country-specific usage. **For 9406-MMA (#2917)** ► Minimum required: 0 ► Maximum allowed: 1PO (Initial order maximum: 1) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes
#2924	**#2924 English** All systems require a #29XX specify code. A 29XX code is required on all model upgrades, even if one is already on the records. Machine history at the IBM plant is used to ship the proper language when the 29XX code is not on an MES order. These features have country-specific usage. **For 9406-MMA (#2924)** ► Minimum required: 0 ► Maximum allowed: 1PO (Initial order maximum: 1) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes
#2934	**#2934 Asynchronous Terminal/Printer Cable EIA-232** The Asynchronous Printer/Terminal Cable is used for attaching printers, plotters, and terminals that support the EIA-232 standard to any asynchronous adapter. This cable is the equivalent of the combination of FC 2936 (modem cable) and FC 2937 (printer/terminal interposer) and replaces this method of printer/terminal attachment. This cable is 3 meters (9.8 feet) long, uses DB25 connectors and is supported on all RS/6000 systems using any asynchronous ports. It is used in conjunction with: ► #2931 (8-port Async Adapter EIA232, ISA bus) ► #8133 (RJ45-DB25 converter cable for 16-port RANs 8130, 8134, 8136) Attributes provided: EIA232 device attachment capability Attributes required: Any RS/6000 Asynchronous port **For 9117-MMA (#2934)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None **For 9119-FHA (#2934)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum: 0) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#2936	**#2936 Asynchronous Cable EIA-232/V.24** Used to attach a modem to the standard I/O ports with the 10-pin to 25-pin converter cable (#3925), 8-port Cable Assembly, 16-Port Cable Assembly, 16-Port Asynchronous Concentrator (with RJ-45 to DB-25 Converter Cable feature #6402) or the 16-Port EIA-232 Remote Async Node (with RJ45 to DB25 Converter Cable feature #8133). The cable is 3 meters (9.8 feet) in length. Attributes provided: Modem attachment to async or serial port Attributes required: Async or serial port **For 9117-MMA (#2936)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) **For 9119-FHA (#2936)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 0) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#2943	**#2943 8-Port Asynchronous Adapter EIA-232/RS-422, PCI bus**
	For connection of up to 8 asynchronous EIA-232 or RS-422 devices. All eight ports are software programmable to support either EIA-232E or RS-422A protocols, at up to 230K baud.
	
	Attributes provided: 8 Async ports
	Attributes required: One PCI slot
	
	For 9117-MMA (#2943)
	▶ Minimum required: 0
	▶ Maximum allowed: 42 (Initial order maximum: 42)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	
	For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	
	Note: Two per CEC enclosure maximum.
	
	For 9119-FHA (#2943)
	▶ Minimum required: 0
	▶ Maximum allowed: 18 (Initial order maximum: 18)
	▶ OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No

#2944	**#2944 128-Port Asynchronous Controller, PCI bus** The 128-Port Async Adapter subsystem provides attachment for a high concentration of asynchronous lines (up to 128) from a single PCI bus slot. This gives the system the ability to serve a large number of user of EIA-232 or RS-422 devices such as terminals, printers, and modems. Two 2.4 Mbps synchronous channels link the adapter to a maximum of eight 16-Port Remote Async Nodes (RANs), up to four RANs can be linked to each synchronous channel. RANs can also be used with this adapter. If these RANs are connected the synchronous channel the data rate drops down to 1.2 Mbps. For the best results keep the previous and new RAN's on separate synchronous channels. Not supported on POWER6.
#2946	**#2946 Turboways 622 Mbps PCI MMF ATM Adapter** The IBM Turboways 622 Mbps PCI MMF ATM Adapter is a 64-bit, Universal PCI Adapter. This adapter provides direct access to the ATM network at a dedicated 622 Mbps full-duplex connection. The Turboways 622 Mbps PCI MMF ATM Adapter is a short form-factor adapter that interfaces to the system through the PCI bus and connects to the 622 Mbps ATM network through dual-SC type, multi-mode fiber cables. The Turboways 622 Mbps PCI MMF ATM Adapter utilizes 16 MB of SDRAM for control and 16 MB of SDRAM for packet memory. This ATM adapter also provides a hardware assist for TCP checksum, which can provide a performance improvement by minimizing the host CPU cycles. Not supported on POWER6.

#2947	**#2947 IBM ARTIC960Hx 4-Port Multiprotocol PCI Adapter**
	The IBM ARTIC960Hx 4-Port Selectable PCI Adapter (#2947) is a one-slot, standard length, 32-bit PCI card. The adapter provides 4-Ports:
	▶ EIA-232
	▶ EIA530
	▶ RS-449
	▶ X.21
	▶ V.35
	Each port supports speeds of up 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
	▶ AIX Versions 4.1.5, 4.2.1, 4.3.1, or later that provide AIXLink X.25 LPP Version 1.1.5 support
	Note: This adapter can have AIX 5.1 support limitations. To view the latest AIX 5.1 support limitation statements, go to:
	http://www.ibm.com/servers/aix/os/adapters/51.html
	Attributes provided: One to four WAN connections at up to 2.0 Mbps
	Attributes required:
	▶ One full length 32-bit PCI slot, AIX Version 4.2.1, 4.3.2, or later (for SDLC or Bisync support)
	▶ AIX Version 4.1.5, 4.2.1, 4.3.1, or later (for AIXLink X.25 LPP Version 1.1.5 support)
	For 9117-MMA (#2947)
	▶ Minimum required: 0
	▶ Maximum allowed: 20 (Initial order maximum: 0)
	▶ OS level required:
	– AIX 5.2 TL10 or later
	– AIX 5.3 TL6 or later
	Note: Two per CEC enclosure maximum.
	For 9119-FHA (#2947)
	▶ Minimum required: 0
	▶ Maximum allowed: 16 (Initial order maximum: 0)
	▶ OS level required:
	– AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	– AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	– AIX Version 5.3 with the 5300-08 Technology Level or later
	– AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	– AIX Version 6.1 with the 6100-01 Technology Level or later
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: Does not apply

#2951	**#2951 Cable, V.24 / EIA-232** V.24 cable for use with #2962 - 2-Port Multiprotocol Adapter. Maximum of two cables per #2962. (This Attributes provided: V.24 Cable Attributes required: #2962 Adapter **For 9117-MMA (#2951)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 0) ▶ OS level required: None **For 9119-FHA (#2951)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: Initial Order/MES/Both/Supported: Supported CSU: Yes Return parts MES: Does not apply
#2952	**#2952 Cable, V.35** V.35 cable for use with #2962 - 2-Port Multiprotocol Adapter. Maximum of two cables per #2962. Attributes provided: V.35 Cable Attributes required: #2962 Adapter **For 9117-MMA (#2952)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 0) ▶ OS level required: None **For 9119-FHA (#2952)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: Initial Order/MES/Both/Supported: Supported CSU: Yes Return parts MES: Does not apply
#2953	**#2953 Cable, V.36 / EIA-499** V.36/EIA-499 cable for use with #2962 - 2-Port Multiprotocol Adapter. Maximum of two cables per #2962. Attributes provided: V.36 Cable Attributes required: #2962 Adapter **For 9117-MMA (#2953)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 0) ▶ OS level required: None **For 9119-FHA (#2953)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: Initial Order/MES/Both/Supported: Supported CSU: Yes Return parts MES: Does not apply

#2954	**#2954 Cable, X.21** X.21 cable for use with #2962 2-Port Multiprotocol Adapter. Maximum of two cables per #2962. Attributes provided: X.21 Cable Attributes required: #2962 Adapter **For 9117-MMA (#2954)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 0) ▶ OS level required: None **For 9119-FHA (#2954)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: Initial Order/MES/Both/Supported: Supported CSU: Yes Return parts MES: Does not apply
#2958	**#2958 Universal Japanese** All systems require a #29XX specify code. A 29XX code is required on all model upgrades, even if one is already on the records. Machine history at the IBM plant is used to ship the proper language when the 29XX code is not on an MES order. These features have country-specific usage. **For 9406-MMA (#2958)** ▶ Minimum required: 0 ▶ Maximum allowed: 1PO (Initial order maximum: 1) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes

| #2962 | **#2962 2-Port Multiprotocol PCI Adapter**
This adapter provides high-speed connections between stand-alone system units on a WAN. To access WAN lines, the 2-Port Multiprotocol PCI Adapter connects through external communications equipment including Channel Service Units (CSU), Data Service Units (DSU), or through synchronous modems.

This adapter together with IBM AIXlink/X.25 provides a two-port connection to X.25 packet switched networks. IBM AIXlink/X.25 is a separately orderable LPP (5696-926).

2-Port Multiprotocol PCI Adapter with an appropriate cable is compatible with:
▶ X.21 DCE - Using 2-Port Cable, X.21 (#2954)
  – CCITT X.21 Signalling
  – CCITT V.11 Electrical
  – CCITT X.27 Electrical
  – EIA-422-A Electrical
  – ISO 4903 Connector for DCE side of an X.21 VHSI Modem Cable
▶ V.24 DCE - Using 2-Port Cable, V.24/EIA-232 (#2951)
  – CCITT V.24 Signalling
  – CCITT V.28 Electrical
  – CCITT X.21bis Electrical and Signalling
  – EIA-232-C Electrical and Signalling
  – ISO 2110 Connector for DCE side of an V.24 VHSI Modem Cable
▶ V.35 DCE - Using 2-Port Cable, V.35 (#2952)
  – CCITT V.35 Some signals for signalling
  – CCITT V.28 Some signals for electrical and signalling
  – ISO 2593 Connector for DCE side of an V.35 VHSI Modem Cable
▶ V.36 DCE - Using 2-Port Cable, V.36/EIA-449 (#2953)
  – CCITT V.10 Electrical
  – CCITT V.11 Electrical

Attributes provided: Two high speed WAN connections
Attributes required: One PCI slot

For 9117-MMA (#2962)
▶ Minimum required: 0
▶ Maximum allowed: 8 (Initial order maximum: 0)
▶ OS level required: AIX 5.2 or AIX 5.3 or later

For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
http://www.ibm.com/systems/p/hardware/factsfeatures.html

Note: Two per CEC enclosure maximum.

For 9119-FHA (#2962)
▶ Minimum required:
▶ Maximum allowed: (Initial order maximum:)
▶ OS level required:

Initial Order/MES/Both/Supported: Supported
CSU: Yes
Return parts MES: Does not apply |

#3124	**#3124 Serial-to-Serial Port Cable for Drawer/Drawer** This 3.7 meter cable is available to provide a null-modem connection between the serial ports of two system drawers that are mounted within the same rack. The cable provides a DB25 female connector at each end. Attributes provided: None Attributes required: None **For 9117-MMA (#3124)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No
#3125	**#3125 Serial-to-Serial Port Cable for Rack/Rack** This 8 meter cable is available to provide a null-modem connection between the serial ports of two system drawers that are mounted in separate racks. The cable provides a DB25 female connector at each end. Attributes provided: None Attributes required: None **For 9117-MMA (#3125) and 9119-FHA (#3125)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No
#3146	**#3146 RIO-2 (Remote I/O-2) Cbl, 1.2 m** This 1.2 meter RIO-2 (Remote I/O-2) cable connects two RIO-2 based I/ O planars within an I/O drawer. Attributes provided: 1.2M RIO-2 Cable Attributes required: I/O Drawer and two RIO-2 I/O planars **For 9117-MMA (#3146)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: No Max) ▶ OS level required: None **For 9119-FHA (#3146)** ▶ Minimum required: 0 ▶ Maximum allowed: 128 (Initial order maximum: 12) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#3147	**#3147 RIO-2 (Remote I/O-2) Cbl, 3.5 m** This 3.5 meter RIO-2 (Remote I/O-2) cable is available to connect the processor complex and the I/O drawers. It can also be utilized to connect I/O drawers mounted in separate racks. Attributes provided: Interconnection of CEC and I/O drawers Attributes required: None **For 9117-MMA (#3147)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: No Max) ► OS level required: None **For 9119-FHA (#3147)** ► Minimum required: 0 ► Maximum allowed: 128 (Initial order maximum: 12) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#3148	**#3148 RIO-2 (Remote I/O-2) Cable, 10 m** This 10 meter RIO-2 (Remote I/O-2) cable is available to connect the processor complex and the I/O drawers. It can also be utilized to connect I/O drawers mounted in separate racks. Attributes provided: Interconnection of CEC and I/O drawers Attributes required: None **For 9117-MMA (#3148)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: No Max) ► OS level required: None **For 9119-FHA (#3147)** ► Minimum required: 0 ► Maximum allowed: 128 (Initial order maximum: 12) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#3156	**#3156 RIO-2 (Remote I/O-2) Cable, 1.75 m** This 1.75 meter RIO-2 (Remote I/O-2) cable is utilized to connect RIO-2 based I/O planars and I/O drawers to the system CEC. Attributes provided: 1.75 meter RIO-2 Cable Attributes required: I/O Drawer and two RIO-2 connectors on the system CEC. **For 9117-MMA (#3156)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: No Max) ► OS level required: None ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No

#3157	**#3157 18.2 GB 10 000 rpm Ultra3 SCSI Disk Drive Assembly**
	The 18.2 GB 10 000 rpm Ultra3 SCSI Disk Drive Assembly provides 18.2 GB of storage capacity and supports the industry standard Ultra3 SCSI interface speed of up to 160 MBps.
	Characteristics:
	► Form Factor: 3.5 inch, 1 inch (25 mm) high
	► Cable included: No
	► External Interface: Ultra3 SCSI (16-bit, Low Voltage Differential)
	► Attachment Industry Spec: SCSI-3 fast 80
	► Average Seek Time: 6.02 ms (based on four READS to one WRITE)
	► Average Latency: 2.99 ms
	► Rotational Speed: 10 000 rpm
	► Maximum Data Transfer Rate: 44.3 MBps
	Limitation: This disk drive requires attachment to a supported Ultra3 SCSI Adapter in an system that supports an Ultra3 SCSI cable or backplane in order for the drive to run at 160 MBps. Also, any and all other SCSI devices on the same SCSI bus must also be Ultra2 or Ultra3 SCSI devices in order for this disk drive to run at 160 MBps.
	Attributes provided: 18.2 GB of disk storage mounted in a carrier.
	Attributes required: One disk drive bay.
	For 9119-FHA (#3157)
	► Minimum required: 0
	► Maximum allowed: 540 (Initial order maximum: 0)
	► OS level required:
	– AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	– AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	– AIX Version 5.3 with the 5300-08 Technology Level or later
	– AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	– AIX Version 6.1 with the 6100-01 Technology Level or later
	– SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	– Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Not applicable
	► Return parts MES: No

#3158	**#3158 36.4 GB 10 k rpm Ultra3 SCSI Disk Drive Assembly**

	The 36.4 GB 10 000 rpm Ultra3 SCSI Disk Drive Assembly provides 36.4 GB of storage capacity and supports the industry standard Ultra3 SCSI interface speed of up to 160 MBps.
	
	Characteristics:
	► Form Factor: 3.5 inch, 1 inch (25 mm) high
	► Cable included: No
	► External Interface: Ultra3 SCSI (16-bit, Low Voltage Differential)
	► Attachment Industry Spec: SCSI-3 fast 80
	► Average Seek Time: 6.02 ms (based on four READS to one WRITE)
	► Average Latency: 2.99 ms
	► Rotational Speed: 10 000 rpm
	► Maximum Data Transfer Rate: 44.3 MBps
	
	Limitation: This disk drive requires attachment to a supported Ultra3 SCSI Adapter in an system that supports an Ultra3 SCSI cable/ backplane in order for the drive to run at 160 MBps. Also, any and all other SCSI devices on the same SCSI bus must also be Ultra2 or Ultra3 SCSI devices in order for this disk drive to run at 160 MBps.
	
	Attributes provided: 36.4 GB of disk storage mounted in a carrier.
	Attributes required: One disk drive bay.
	
	For 9119-FHA (#3158)
	► Minimum required: 0
	► Maximum allowed: 540 (Initial order maximum: 0)
	► OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	  Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Not applicable
	► Return parts MES: No

#3159	**#3159 73.4 GB 10 k rpm Ultra3 SCSI Disk Drive Assembly**
	The 73.4 GB 10 000 rpm Ultra3 SCSI Disk Drive Assembly provides 73.4 GB of storage capacity and supports the industry standard Ultra3 SCSI interface speed of up to 160 MBps.
	
	Characteristics:
	▶ Form Factor: 3.5 inch, 1 inch (25 mm) high
	▶ Cable included: No
	▶ External Interface: Ultra3 SCSI (16-bit, Low Voltage Differential)
	▶ Attachment Industry Spec: SCSI-3 fast 80
	▶ Average Seek Time: 5.38 ms (based on four READS to one WRITE)
	▶ Average Latency: 3.00 ms
	▶ Rotational Speed: 10 000 rpm
	▶ Maximum Data Transfer Rate: 83.88 MBps
	
	Limitation: This disk drive requires attachment to a supported Ultra3 SCSI Adapter in an system that supports an Ultra3 SCSI cable/ backplane in order for the drive to run at 160 MBps. Also, any and all other SCSI devices on the same SCSI bus must also be Ultra2 or Ultra3 SCSI devices in order for this disk drive to run at 160 MBps.
	
	Attributes provided: 73.4 GB of disk storage mounted in a carrier.
	Attributes required: One disk drive bay.
	
	For 9119-FHA (#3159)
	▶ Minimum required: 0
	▶ Maximum allowed: 540 (Initial order maximum: 0)
	▶ OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	  Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	▶ Initial Order/MES/Both/Supported: Supported
	▶ CSU: Not applicable
	▶ Return parts MES: No

#3168	**#3168 RIO-2 (Remote I/O-2) Cbl, 2.5 m** This 2.5 meter RIO-2 (Remote I/O-2) cable is utilized to connect RIO-2 based I/O planars and I/O drawers to the system CEC. Attributes provided: 2.5 meter RIO-2 Cable Attributes required: I/O Drawer and two RIO-2 connectors on the system CEC. **For 9117-MMA (#3168)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: No Max) ▶ OS level required: None **For 9119-FHA (#3168)** ▶ Minimum required: 0 ▶ Maximum allowed: 128 (Initial order maximum: 12) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#3170	**#3170 RIO-2 (Remote I/O-2) Cbl, 8.0 m** This 8 meter RIO-2 (Remote I/O-2)cable is available to connect the processor complex and the I/O drawers. It can also be utilized to connect I/O drawers mounted in separate racks. Attributes provided: Interconnection of CEC and I/O drawers Attributes required: None **For 9119-FHA (#3170)** ► Minimum required: 0 ► Maximum allowed: 128 (Initial order maximum: 12) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No
#3256	**#3256 Switch Cbl. (SNI) 20m Optical** The Switch Cables, 20 meter Optical, are used within the pSeries High Performance Switch (HPS) network to enable optic connections between the switch port connection card (optical) within the HPS for switch to switch applications. #3256 delivers an optical cable pair consisting of a tranmitter cable and receiver cable. It can also be used to connect the #7817 to the HPS. Attributes provided: Switch Cables, 20 meter Optical Attributes required: None **For 9119-FHA (#3256)** ► Not supported on POWER6.
#3257	**#3257 Switch Cbl. (SNI) 40 m Optical** The Switch Cables, 40 meter Optical, are used within the pSeries High Performance Switch (HPS) network to enable optic connections between the switch port connection card (optical) within the HPS for switch to switch applications. #3257 delivers an optical cable pair consisting of a tranmitter cable and receiver cable. Attributes provided: Switch Cables, 40 meter Optical Attributes required: None **For 9119-FHA (#3257)** ► Not supported on POWER6.

#3273	**#3273 36.4 GB 10 k rpm Ultra320 SCSI Disk Drive Assembly**
	The 36.4 GB 10 000 rpm Ultra320 SCSI Disk Drive Assembly provides 36.4 GB of storage capacity and supports the industry standard Ultra320 SCSI interface speed of up to 320 MBps.
	Characteristics:
	▶ Form Factor: 3.5 inch, 1 inch (25 mm) high
	▶ Cable included: No
	▶ External Interface: Ultra320 SCSI (16-bit, Low Voltage Differential)
	▶ Attachment Industry Spec: SCSI U320
	▶ Average Seek Time: 4.82 ms (based on four READS to one WRITE)
	▶ Average Latency: 2.99 ms
	▶ Rotational Speed: 10 000 rpm
	▶ Maximum Data Transfer Rate: 67 MBps
	Limitation: This disk drive requires attachment to a supported Ultra320 SCSI Adapter in an system that supports an Ultra320 SCSI cable/backplane in order for the drive to run at 320 MBps. Also, any and all other SCSI devices on the same SCSI bus must also be Ultra2, Ultra3, or Ultra320 SCSI devices in order for this disk drive to run at 320 MBps.
	Attributes provided: 36.4 GB of disk storage mounted in a carrier.
	Attributes required: One disk drive bay.
	For 9117-MMA (#3273)
	▶ Minimum required: 0
	▶ Maximum allowed: 1440 (Initial order maximum: 0)
	▶ OS level required:
	– AIX 5.2 TL10 or later
	– AIX 5.3 TL6 or later
	For information about support on Red Hat Enterprise Linux and SUSE, refer to:
	`http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument`
	For 9119-FHA (#3273)
	▶ Minimum required: 0
	▶ Maximum allowed: 278 (Initial order maximum: 0)
	▶ OS level required:
	– AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	– AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	– AIX Version 5.3 with the 5300-08 Technology Level or later
	– AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	– AIX Version 6.1 with the 6100-01 Technology Level or later
	– SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	– Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	`http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures`
	Initial Order/MES/Both/Supported: Supported
	CSU: Not applicable
	Return parts MES: Does not apply

| #3274 | **#3274 73.4 GB 10 k rpm Ultra320 SCSI Disk Drive Assembly**
The 73.4 GB 10 000 rpm Ultra320 SCSI Disk Drive Assembly provides 73.4 GB of storage capacity and supports the industry standard Ultra320 SCSI interface speed of up to 320 MBps.

Characteristics:
▶ Form Factor: 3.5 inch, 1 inch (25 mm) high
▶ Cable included: No
▶ External Interface: Ultra320 SCSI (16-bit, Low Voltage Differential)
▶ Attachment Industry Spec: SCSI U320
▶ Average Seek Time: 4.82 ms (based on four READS to one WRITE)
▶ Average Latency: 2.99 ms
▶ Rotational Speed: 10 000 rpm
▶ Maximum Data Transfer Rate: 67 MBps

Limitation: This disk drive requires attachment to a supported Ultra320 SCSI Adapter in an system that supports an Ultra320 SCSI cable/backplane in order for the drive to run at 320 MBps. Also, any and all other SCSI devices on the same SCSI bus must also be Ultra2, Ultra3, or Ultra320 SCSI devices in order for this disk drive to run at 320 MBps.

Attributes provided: 73.4 GB of disk storage mounted in a carrier.
Attributes required: One disk drive bay.

For 9117-MMA (#3274)
▶ Minimum required: 0
▶ Maximum allowed: 1440 (Initial order maximum: 0)
▶ OS level required: AIX 5.2 TL10 or later, AIX 5.3 TL6 or later, i5/OS - Not Supported

For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument

For 9119-FHA (#3274)
▶ Minimum required: 0
▶ Maximum allowed: 278 (Initial order maximum: 0)
▶ OS level required:
   – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
   – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
   – AIX Version 5.3 with the 5300-08 Technology Level or later
   – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
   – AIX Version 6.1 with the 6100-01 Technology Level or later
   – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
   – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later

Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

Initial Order/MES/Both/Supported: Supported
CSU: Not applicable
Return parts MES: Does not apply |

| #3275 | **#3275 146.8 GB 10 k rpm Ultra320 SCSI Disk Drive Assembly**
The 146.8 GB 10 000 rpm Ultra320 SCSI Disk Drive Assembly provides 146.8 GB of storage capacity and supports the industry standard Ultra320 SCSI interface speed of up to 320 MBps.

Characteristics:
▶ Form Factor: 3.5 inch, 1 inch (25 mm) high
▶ Cable included: No
▶ External Interface: Ultra320 SCSI (16-bit, Low Voltage Differential)
▶ Attachment Industry Spec: SCSI U320
▶ Average Seek Time: 4.94 ms (based on four READS to one WRITE)
▶ Average Latency: 2.99 ms
▶ Rotational Speed: 10 000 rpm
▶ Maximum Data Transfer Rate: 67 MBps

Limitation: This disk drive requires attachment to a supported Ultra320 SCSI Adapter in a system that supports an Ultra320 SCSI cable/ backplane in order for the drive to run at 320 MBps. Also, any and all other SCSI devices on the same SCSI bus must also be Ultra2, Ultra3, or Ultra320 SCSI devices in order for this disk drive to run at 320 MBps.

Attributes provided: 146.8 GB of disk storage mounted in a carrier.
Attributes required: One disk drive bay.

For 9117-MMA (#3275)
▶ Minimum required: 0
▶ Maximum allowed: 1440 (Initial order maximum: 0)
▶ OS level required:
    – AIX 5.2 TL10 or later
    – AIX 5.3 TL6 or later

For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
`http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument`

For 9119-FHA (#3275)
▶ Minimum required: 0
▶ Maximum allowed: 278 (Initial order maximum: 0)
▶ OS level required:
    – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
    – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
    – AIX Version 5.3 with the 5300-08 Technology Level or later
    – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
    – AIX Version 6.1 with the 6100-01 Technology Level or later
    – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
    – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later

Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
`http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html`

Initial Order/MES/Both/Supported: Supported
CSU: Not applicable
Return parts MES: Does not apply |

#3277	**#3277 36.4 GB 15 k rpm Ultra320 SCSI Disk Drive Assembly**
	The 36.4 GB 15 000 rpm Ultra320 SCSI Disk Drive Assembly provides 36.4 GB of storage capacity and supports the industry standard Ultra3 SCSI interface speed of up to 320 MBps.
	
	Characteristics:
	▶ Form Factor: 3.5 inch, 1 inch (25 mm) high
	▶ Cable included: No
	▶ External Interface: Ultra320 SCSI (16-bit, Low Voltage Differential)
	▶ Attachment Industry Spec: SCSI U320
	▶ Average Seek Time: 3.7 ms (based on four READS to one WRITE)
	▶ Average Latency: 2 ms
	▶ Rotational Speed: 15 000 rpm
	▶ Maximum Data Transfer Rate: 83 MBps
	
	Limitation: This disk drive requires attachment to a supported Ultra320 SCSI Adapter in a system that supports an Ultra320 SCSI cable/ backplane in order for the drive to run at 320 MBps. Also, any and all other SCSI devices on the same SCSI bus must also be Ultra2, Ultra3, or Ultra320 SCSI devices in order for this disk drive to run at 320 MBps.
	
	Attributes provided: 36.4 GB of disk storage mounted in a carrier.
	Attributes required: One disk drive bay.
	
	For 9117-MMA (#3277)
	▶ Minimum required: 0
	▶ Maximum allowed: 1440 (Initial order maximum: 0)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	
	For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	`http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument`
	
	For 9119-FHA (#3275)
	▶ Minimum required: 0
	▶ Maximum allowed: 278 (Initial order maximum: 0)
	▶ OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	`http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html`
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Not applicable
	Return parts MES: Does not apply

#3278	**#3278 73.4 GB 15 k rpm Ultra320 SCSI Disk Drive Assembly**
	The 73.4 GB 15 000 rpm Ultra320 SCSI Disk Drive Assembly provides 73.4 GB of storage capacity and supports the industry standard Ultra3 SCSI interface speed of up to 320 MBps.
	Characteristics:
	► Form Factor: 3.5 inch, 1 inch (25 mm) high
	► Cable included: No
	► External Interface: Ultra320 SCSI (16-bit, Low Voltage Differential)
	► Attachment Industry Spec: SCSI U320
	► Average Seek Time: 3.7 ms (based on four READS to one WRITE)
	► Average Latency: 2 ms
	► Rotational Speed: 15 000 rpm
	► Maximum Data Transfer Rate: 83 MBps
	Limitation: This disk drive requires attachment to a supported Ultra320 SCSI Adapter in a system that supports an Ultra320 SCSI cable/ backplane in order for the drive to run at 320 MBps. Also, any and all other SCSI devices on the same SCSI bus must also be Ultra2, Ultra3, or Ultra320 SCSI devices in order for this disk drive to run at 320 MBps.
	Attributes provided: 73.4 GB of disk storage mounted in a carrier.
	Attributes required: One disk drive bay.
	For 9117-MMA (#3278)
	► Minimum required: 0
	► Maximum allowed: 1440 (Initial order maximum: 0)
	► OS level required:
	– AIX 5.2 TL10 or later
	– AIX 5.3 TL6 or later
	For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to: http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	For 9119-FHA (#3275)
	► Minimum required: 0
	► Maximum allowed: 278 (Initial order maximum: 0)
	► OS level required:
	– AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	– AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	– AIX Version 5.3 with the 5300-08 Technology Level or later
	– AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	– AIX Version 6.1 with the 6100-01 Technology Level or later
	– SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	– Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	Initial Order/MES/Both/Supported: MES
	CSU: Not applicable
	Return parts MES: Does not apply

#3279	**#3279 146.8 GB 15 k rpm Ultra320 SCSI Disk Drive Assembly**
	The 146.8 GB 15 000 rpm Ultra320 SCSI Disk Drive Assembly provides 146.8 GB of storage capacity and supports the industry standard Ultra3 SCSI interface speed of up to 320 MBps.
	Characteristics:
	▶ Form Factor: 3.5 inch, 1 inch (25 mm) high
	▶ Cable included: No
	▶ External Interface: Ultra320 SCSI (16-bit, Low Voltage Differential)
	▶ Attachment Industry Spec: SCSI U320
	▶ Average Seek Time: 3.7 ms (based on four READS to one WRITE)
	▶ Average Latency: 2 ms
	▶ Rotational Speed: 15 000 rpm
	▶ Maximum Data Transfer Rate:107 MBps
	Limitation: This disk drive requires attachment to a supported Ultra320 SCSI Adapter in a system that supports an Ultra320 SCSI cable/ backplane in order for the drive to run at 320 MBps. Also, any and all other SCSI devices on the same SCSI bus must also be Ultra2, Ultra3, or Ultra320 SCSI devices in order for this disk drive to run at 320 MBps.
	Attributes provided: 146.8 GB of disk storage mounted in a carrier.
	Attributes required: One disk drive bay.
	For 9117-MMA (#3279)
	▶ Minimum required: 0
	▶ Maximum allowed: 1440 (Initial order maximum: 0)
	▶ OS level required:
	– AIX 5.2 TL10 or later
	– AIX 5.3 TL6 or later
	For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	For 9119-FHA (#3275)
	▶ Minimum required: 0
	▶ Maximum allowed: 278 (Initial order maximum: 0)
	▶ OS level required:
	– AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	– AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	– AIX Version 5.3 with the 5300-08 Technology Level or later
	– AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	– AIX Version 6.1 with the 6100-01 Technology Level or later
	– SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	– Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	Initial Order/MES/Both/Supported: MES
	CSU: Not applicable
	Return parts MES: Does not apply

| #3578 | **#3578 300 GB 10 k rpm Ultra320 SCSI Disk Drive Assembly**
(No longer available as of 14 September 2007.)

The 300 GB 10 000 rpm Ultra320 SCSI Disk Drive Assembly provides 300 GB of storage capacity and supports the industry standard Ultra320 SCSI interface speed of up to 320 MBps.

Characteristics:
▶ Form Factor: 3.5 inch, 1 inch (25 mm) high
▶ Cable included: No
▶ External Interface: Ultra320 SCSI (16-bit, Low Voltage Differential)
▶ Attachment Industry Spec: SCSI U320
▶ Average Seek Time: 4.9 ms (based on four READS to one WRITE)
▶ Average Latency: 2.99 ms
▶ Rotational Speed: 10 000 rpm
▶ Maximum Data Transfer Rate: 88 MBps

Limitation: This disk drive requires attachment to a supported Ultra320 SCSI Adapter in a system that supports an Ultra320 SCSI cable/ backplane in order for the drive to run at 320 MBps. Also, any and all other SCSI devices on the same SCSI bus must also be Ultra2, Ultra3, or Ultra320 SCSI devices in order for this disk drive to run at 320 MBps.

Attributes provided: 300 GB of disk storage mounted in a carrier.
Attributes required: One disk drive bay.

For 9117-MMA (#3578)
▶ Minimum required: 0
▶ Maximum allowed: 1440 (Initial order maximum: 0)
▶ OS level required:
  – AIX 5.2 TL10 or later
  – AIX 5.3 TL6 or later

For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument

For 9119-FHA (#3578)
▶ Minimum required: 0
▶ Maximum allowed: 540 (Initial order maximum: 0)
▶ OS level required:
  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
  – AIX Version 5.3 with the 5300-08 Technology Level or later
  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
  – AIX Version 6.1 with the 6100-01 Technology Level or later
  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later

Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

Initial Order/MES/Both/Supported: Supported
CSU: Yes
Return parts MES: No
Note: Six drives per CEC Enclosure, and twelve per #5886. |

#3585	**#3585 300 GB 15 k rpm SCSI Disk Drive**
	The 300 GB 15 000 rpm Ultra320 SCSI Disk Drive Assembly provides 300 GB of storage capacity and supports the industry standard Ultra3 SCSI interface speed of up to 320 MBps.
	
	Characteristics:
	▸ Form Factor: 3.5 inch, 1 inch (25 mm) high
	▸ Cable included: No
	▸ External Interface: Ultra320 SCSI (16-bit, Low Voltage Differential)
	▸ Attachment Industry Spec: SCSI U320
	▸ Average Seek Time: 3.7 ms (based on four READS to one WRITE)
	▸ Average Latency: 2 ms
	▸ Rotational Speed: 15 000 rpm
	▸ Maximum Data Transfer Rate: 107 MBps
	
	Limitation: This disk drive requires attachment to a supported Ultra320 SCSI Adapter in a system that supports an Ultra320 SCSI cable or backplane in order for the drive to run at 320 MBps. Also, any and all other SCSI devices on the same SCSI bus must also be Ultra2, Ultra3, or Ultra320 SCSI devices in order for this disk drive to run at 320 MBps.
	
	Attributes provided: 300 GB of disk storage
	Attributes required: one disk drive bay
	
	For 9117-MMA (#3585)
	▸ Minimum required: 0
	▸ Maximum allowed: 1440 (Initial order maximum: 0)
	▸ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	
	For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	
	For 9119-FHA (#3585)
	▸ Minimum required: 0
	▸ Maximum allowed: 540 (Initial order maximum: 0)
	▸ OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	
	Initial Order/MES/Both/Supported: MES
	CSU: Not applicable
	Return parts MES: Does not apply

#3627	**#3627 IBM P76/P77 Color Monitor, Business Black, Captured Cable** (No longer available as of 29 August 2008.) The P76/P77 monitor has the following general characteristics: ► Business Black color ► 17 inch Flat Trinitron CRT with a viewable image size of 406 mm (16.0 in) measured diagonally, incorporating a 0.24 mm stripe pitch for bright, high-definition images. ► Designed to provide reduced flicker operation at an optimum 1024 x 768 pels at up to 85 Hz non-interlaced, with a maximum addressability of 1600 x 1200 pels at 70 Hz. **Note**: The P76 and P77 monitors are functionally equivalent. Attributes provided: Color Monitor Attributes required: Graphics Adapter **For 9117-MMA (#3627) and 9119-FHA (#3627)** ► Not supported on POWER6.
#3628	**#3628 IBM P260/P275 Color Monitor, Business Black, and Cable** (No longer available as of 29 August 2008.) The P260/P275 monitor has the following general characteristics: ► Business black color ► 21 inch Flat Trinitron** CRT with a viewable image size of 503 mm (19.8 inches) measured diagonally, incorporating a 0.24 mm stripe pitch for bright, high-definition images. ► Designed to provide reduced flicker operation at an optimum addressability of 1600 x 1200 pels at up to 85 Hz non-interlaced. **Note**: The P260 and P275 monitors are functionally equivalent. Attributes provided: Color Monitor Attributes required: Graphics Adapter **For 9117-MMA (#3628) and 9119-FHA (#3628)** ► Not supported on POWER6.
#3635	**#3635 T210 Flat-Panel Monitor** The T210 flat-panel monitor has the following general characteristics: ► Business black color ► 21 inch TFT LCD digital screen with a viewable image size of 528 mm (20.8 inches) measured diagonally, incorporating a 0.207 mm pixel pitch/type for bright, high-definition images. ► Designed to provide flicker free operation at a maximum resolution of 2048 x 1536 pels at 60 Hz. ► Tilt/swivel stand Attributes provided: Color Flat-panel Monitor Attributes required: Graphics Adapter **For 9117-MMA (#3625) and 9119-FHA (#3625)** ► Minimum required: 0 ► Maximum allowed: 8 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No

#3636	**#3636 L200P Flat Panel Monitor**
	The L200p flat-panel monitor has the following general characteristics:
	► Business black color
	► 20.1 inch TFT LCD digital screen with a viewable image size of 510 mm (20.1 inches) measured diagonally, incorporating a 0.255 mm pixel pitch/type for bright, high-definition images.
	► Designed to provide flicker free operation at a maximum resolution of 1600 x 1200 pels at 75 Hz in analog mode and 1600 x 1200 pels at 60 Hz in digital mode.
	► Tilt/swivel stand
	Attributes provided: Color Flat-panel Monitor
	Attributes required: Graphics Adapter
	For 9117-MMA (#3636) and 9119-FHA (#3636)
	► Minimum required: 0
	► Maximum allowed: 8 (Initial order maximum: 0)
	► OS level required: None
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes
	► Return parts MES: No
#3637	**#3637 IBM T541H /L150p 15-in TFT Color Monitor**
	Both the T541H and L150p monitors have the following general characteristics:
	► Business Black color
	► 15 inch TFT LCD digital screen with a viewable image size of 381 mm (15.0 inches) measured diagonally, incorporating a 0.297 mm pixel pitch/type for bright, high-definition images.
	► Designed to provide flicker free operation at a maximum resolution of 1024 x 768 pels at 75 Hz in analog mode and 1024 x 768 pels at 60 Hz in digital mode.
	► Tilt/swivel stand
	► Supports 2D Graphics Adapters only
	Attributes provided: Color Flat-panel Monitor
	Attributes required: 2D Graphics Adapter
	For 9117-MMA (#3637) and 9119-FHA (#3637)
	► Minimum required: 0
	► Maximum allowed: 8 (Initial order maximum: 0)
	► OS level required: None
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes
	► Return parts MES: No
#3638	**#3638 IBM C220p 21-in Color Monitor, Business Black, and Cable**
	The IBM C220p monitor has the following general characteristics:
	► Business black color
	► 21.0 inch Flat Aperture Grille CRT with a viewable image size of 508 mm (20.0 inches) measured diagonally, incorporating a 0.248 mm pixel pitch for bright, high-definition images.
	► Designed to provide reduced flicker operation at an optimum and maximum supported addressability of 1600 x 1200 pels at up to 85 Hz (Vesa)non-interlaced. Capable of 2048 x 1636 at 75 Hz (Vesa).
	► Tilt/swivel stand
	► Dual input allows attachment to two systems concurrently.
	► Depth: 483.6 mm (19.0 in)
	► Height: 516.4 mm (20.3 in)
	► Width: 512.8 mm (20.2 in)
	► Weight: 30.5 kg (67.2 lbs)
	Attributes provided: Color Monitor
	Attributes required: Graphics Adapter
	For 9117-MMA (#3638) and 9119-FHA (#3638)
	► Not supported on POWER6.

| #3639 | **#3639 IBM ThinkVision L170p Flat Panel Monitor**
The IBM ThinkVision L170p LCD flat-panel monitor has the following general characteristics:
▶ Business black color
▶ 17.0 inch LCD digital screen with a viewable image size of 432 mm (17.0 inches) measured diagonally, incorporating a 0.264 mm pixel pitch/type for bright, high-definition images.
▶ Maximum resolution of 1280 x 1024.
▶ Tilt/swivel and height adjustable stand
▶ Analog or digital connection
▶ Dual input allows attachment to two systems concurrently.
▶ Internal power
▶ Depth: 237.0 mm (9.3 in)
▶ Height: 457.0 mm (18.0 in)
▶ Width: 400.0 mm (15.7 in)
▶ Weight: 5.7 kg (12.6 lbs)
▶ Viewing angle: Vertical 170 degrees; horizontal 170 degrees
▶ Contrast ratio: 500:1 (typical)
▶ Video inputs: 15-pin D / DVI-D
▶ Two removable cables: one analog and one digital

Attributes provided: Color Flat-panel Monitor
Attributes required: Graphics Adapter

For 9117-MMA (#3639) and 9119-FHA (#3639)
▶ Minimum required: 0
▶ Maximum allowed: 8 (Initial order maximum: 0)
▶ OS level required: None
▶ Initial Order/MES/Both/Supported: Supported
▶ CSU: Yes
▶ Return parts MES: No |
| #3640 | **#3640 ThinkVision L171p Flat Panel Monitor**
The ThinkVision L171p LCD flat-panel monitor has the following general characteristics:
▶ Business black color
▶ 17.0 inch LCD digital screen with a viewable image size of 432 mm (17.0 inches) measured diagonally, incorporating a 0.280mm pixel pitch/type for bright, high-definition images.
▶ Maximum resolution of 1280 x 1024.
▶ Tilt/swivel and height adjustable stand
▶ Analog or digital connection
▶ Dual input allows attachment to two systems concurrently.
▶ Internal power
▶ Depth: 237.0 mm (9.3 in)
▶ Height: 457.0 mm (18.0 in)
▶ Width: 400.0 mm (15.7 in)
▶ Weight: 5.7 kg (12.6 lbs)
▶ Viewing angle: Vertical 170 degrees; horizontal 170 degrees
▶ Contrast ratio: 800:1 (typical)
▶ Video inputs: 15-pin D / DVI-D
▶ Two removable cables: one analog and one digital
▶ RoHS compliant

Attributes provided: Color Flat-panel Monitor
Attributes required: Graphics Adapter

For 9117-MMA (#3640) and 9119-FHA (#3640)
▶ Minimum required: 0
▶ Maximum allowed: 8 (Initial order maximum: 0)
▶ OS level required: None
▶ Initial Order/MES/Both/Supported: Supported
▶ CSU: Yes
▶ Return parts MES: No |

#3641	**#3641 IBM T115 Flat Panel Monitor** The IBM T115 LCD flat-panel monitor has the following general characteristics: ▶ Business black color ▶ 15.0 inch LCD digital screen with a viewable image size of 381 mm (15.0 inches) measured diagonally, incorporating a 0.297mm pixel pitch/type for bright, high-definition images. ▶ Maximum resolution of 1024 x 768 (XGA) ▶ Tilt adjustable stand ▶ Analog connection ▶ Internal power ▶ Depth (with stand): 144 mm (6.67 in) ▶ Height (max with stand): 361 mm (14.2 in) ▶ Width: 362 mm (14.2 in) ▶ Weight: 2.9 kg (6.4 lbs) ▶ Contrast ratio: 400:1 (typical) ▶ Brightness: 250cd/m2 (typical) ▶ Viewing angles (H/V): 130 degrees/100 degree **For 9117-MMA (#3641) and 9119-FHA (#3641)** ▶ Minimum required: 0 ▶ Maximum allowed: 8 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#3642	**#3642 ThinkVision L191p Flat Panel Monitor** The ThinkVision L191p LCD flat-panel monitor has the following general characteristics: ▶ Business black color ▶ 19.0 inch LCD digital screen with a viewable image size of 483 mm (19.0 in) measured diagonally, incorporating a 0.294mm pixel pitch/type for bright, high-definition images. ▶ Maximum resolution of 1280 x 1024. ▶ Tilt/swivel and height adjustable stand ▶ Analog or digital connection ▶ Dual input allows attachment to two systems concurrently. ▶ Internal power ▶ Depth: 237.0 mm (9.3 in) ▶ Height: 457.0 mm (18.0 in) ▶ Width: 408.0 mm (16.1 in) ▶ Weight: 7.1 kg (15.7 lbs) ▶ Contrast ratio: 1000:1 (typical) ▶ Video inputs: 15-pin D / DVI-D ▶ Two removable cables, one analog and one digital Attributes provided: Color Flat-panel Monitor Attributes required: Graphics Adapter **For 9117-MMA (#3642) and 9119-FHA (#3642)** ▶ Minimum required: 0 ▶ Maximum allowed: 8 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No

#3643	**#3643 IBM T120 Flat Panel Monitor** (No longer available as of 25 January 2008.) The IBM T120 LCD flat-panel monitor has the following general characteristics: ▶ Business black color ▶ 20.1 inch LCD digital screen with a viewable image size of 511 mm (20.1 in) measured diagonally, incorporating a 0.255 mm pixel pitch/type for bright, high-definition images. ▶ Maximum resolution of 1600 x 1200 (UXGA) ▶ Tilt/lift adjustable stand ▶ Analog and digital connections ▶ Internal power ▶ Depth (with stand): 246 mm (9.7 in) ▶ Height (maximum with stand): 416.6 mm (16.5 in) ▶ Width: 445.6 mm (17.5 in) ▶ Weight: 7.5 kg (16.5 lbs) ▶ Contrast ratio: 700:1 (typical) ▶ Brightness:300cd/m2 (typical) ▶ Viewing angles(H/V): 178 degrees/178 degrees ▶ Video inputs: 15-pin D / DVI-D ▶ Two removable cables, one analog and one digital ▶ Attributes provided: Color Flat-panel Monitor ▶ Attributes required: Graphics Adapter **For 9117-MMA (#3643) and 9119-FHA (#3643)** ▶ Minimum required: 0 ▶ Maximum allowed: 8 (Initial order maximum: 8) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No
#3644	**#3644 IBM T119 Flat Panel Monitor** The IBM T119 LCD flat-panel monitor has the following general characteristics: ▶ Business black color ▶ 19.0 inch LCD digital screen with a viewable image size of 483 mm (19.0 in) measured diagonally, incorporating a 0.294 mm pixel pitch/type for bright, high-definition images. ▶ Maximum resolution of 1280 x 1024 (SXGA) ▶ Tilt/lift adjustable stand ▶ Analog and digital connections ▶ Internal power ▶ Depth (with stand): 246 mm (9.7 in) ▶ Height (max with stand): 443.6 mm (17.5 in) ▶ Width: 418 mm (16.5 in) ▶ Weight: 7.4 kg (16.3 lbs) ▶ Contrast ratio: 550:1 (typical) ▶ Brightness:250cd/m2 (typical) ▶ Viewing angles (H/V): 140 degrees/135 degrees ▶ Video inputs: 15-pin D / DVI-D ▶ Two removable cables, one analog and one digital Attributes provided: Color Flat-panel Monitor Attributes required: Graphics Adapter **For 9117-MMA (#3644) and 9119-FHA (#3644)** ▶ Minimum required: 0 ▶ Maximum allowed: 8 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No

#3645	**#3645 IBM T117 Flat Panel Monitor**
	The IBM T117 LCD flat-panel monitor has the following general characteristics:
	▶ Business black color
	▶ 17.0 inch LCD digital screen with a viewable image size of 432 mm (17.0 in) measured diagonally, incorporating a 0.264 mm pixel pitch/type for bright, high-definition images.
	▶ Maximum resolution of 1280 x 1024 (SXGA)
	▶ Tilt/lift adjustable stand
	▶ Analog and digital connections
	▶ Internal power
	▶ Depth (with stand): 246 mm (9.7 in)
	▶ Height (max with stand): 395.5 mm (15.6 in)
	▶ Width: 375.4 mm (14.8 in)
	▶ Weight: 5.8 kg (12.8 lbs)
	▶ Contrast ratio: 500:1 (typical)
	▶ Brightness: 300cd/m2 (typical)
	▶ Viewing angles (H/V): 140 degrees/130 degrees
	▶ Video inputs: 15-pin D / DVI-D
	▶ Two removable cables, one analog and one digital
	Attributes provided: Color Flat-panel Monitor
	Attributes required: Graphics Adapter
	For 9117-MMA (#3644) and 9119-FHA (#3644)
	▶ Minimum required: 0
	▶ Maximum allowed: 8 (Initial order maximum: 8)
	▶ OS level required: None
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No

#3646	**#3646 73 GB 15 k rpm SAS DISK DRIVE 73.4 GB Serial**
	(No longer available as of 28 November 2008.)
	
	Attached SCSI (SAS) DASD device, in a carrier capable of providing Hot Swap support. Provides 73.4 GB of storage capacity. Supports the industry standard SAS interface. Can be used only in a drawer/system designed to support the SAS interface.
	
	Characteristics:
	▶ Form Factor: 3.5 inch Form Factor, 1 inch drive.
	▶ Cable included: No
	▶ External Interface: standard SAS Dual Port
	▶ Rotational Speed: 15 000 rpm
	▶ Interface Speed: 300 MBps
	▶ Format: 512 bytes per sector default, 528 bytes per sector possible with reformat.
	▶ Attributes provided: 73.4 GB of disk storage mounted in a carrier.
	▶ Attributes required: one disk drive bay
	
	For 9117-MMA (#3646)
	▶ Minimum required: 0
	▶ Maximum allowed: 1344 (Initial order maximum: 250)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	
	For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	
	For 9119-FHA (#3646)
	▶ Minimum required: 0
	▶ Maximum allowed: 144 (Initial order maximum: 144)
	▶ OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
	
	Note: Six drives per CEC Enclosure, and 12 per #5886.

#3647	**#3647 146 GB 15 k rpm SAS Disk Drive**
	146.8 GB Serial Attached SCSI (SAS) DASD device, in a carrier capable of providing Hot Swap support. Provides 146.8 GB of storage capacity. Supports the industry standard SAS SCSI interface. Can be used only in a drawer/system designed to support the SAS SCSI interface.
	Characteristics:
	▶ Form Factor: 3.5 inch Form Factor, 1 inch drive.
	▶ Cable included: No
	▶ External Interface: standard SAS Dual Port
	▶ Rotational Speed: 15 000 rpm
	▶ Interface Speed: 300 MBps
	▶ Format: 512 bytes per sector default, 528 bytes per sector possible with reformat.
	▶ Attributes provided: 146.8 GB of Disk Storage mounted in a carrier
	▶ Attributes required: one SAS Drive Slot
	For 9117-MMA (#3647)
	▶ Minimum required: 0
	▶ Maximum allowed: 1344 (Initial order maximum: 250)
	▶ OS level required:
	– AIX 5.2 TL10 or later
	– AIX 5.3 TL6 or later
	For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to: `http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument`
	For 9119-FHA (#3647)
	▶ Minimum required: 0
	▶ Maximum allowed: 144 (Initial order maximum: 144)
	▶ OS level required:
	– AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	– AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	– AIX Version 5.3 with the 5300-08 Technology Level or later
	– AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	– AIX Version 6.1 with the 6100-01 Technology Level or later
	– SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	– Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to: `http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html`
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
	Note: Six drives per CEC enclosure, and 12 per #5886.

| #3648 | **#3648 300 GB 15 k rpm SAS Disk Drive**
300 GB Serial Attached SCSI (SAS) DASD device, in a carrier capable of providing Hot Swap support. Provides 300 GB of storage capacity. Supports the industry standard SAS SCSI interface. Can be used only in a drawer/system designed to support the SAS SCSI interface.

Characteristics:
▶ Form Factor: 3.5 inch Form Factor, 1 inch drive.
▶ Cable included: No
▶ External Interface: standard SAS Dual Port
▶ Rotational Speed: 15 000 rpm
▶ Interface Speed: 300 MBps
▶ Format: 512 bytes per sector default, 528 bytes per sector possible with reformat.
▶ Attributes provided: 300 GB of Disk Storage mounted in a carrier

For 9117-MMA (#3648)
▶ Minimum required: 0
▶ Maximum allowed: 1344 (Initial order maximum: 250)
▶ OS level required:
  – AIX 5.2 TL10 or later
  – AIX 5.3 TL6 or later

For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument

For 9119-FHA (#3648)
▶ Minimum required: 0
▶ Maximum allowed: 144 (Initial order maximum: 144)
▶ OS level required:
  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
  – AIX Version 5.3 with the 5300-08 Technology Level or later
  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
  – AIX Version 6.1 with the 6100-01 Technology Level or later
  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later

Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

Initial Order/MES/Both/Supported: Both
CSU: Yes
Return parts MES: No

Note: Six drives per CEC enclosure, and 12 per #5886. |

| #3649 | **#3649 450 GB 15k rpm SAS Disk Drive**
3.5-inch Serial Attached SCSI (SAS) DASD device, in a carrier that is capable of providing Hot Swap support. Provides 450 GB of storage capacity when formatted for AIX or Linux. Supports the industry-standard SAS SCSI interface. Can be used only in a system unit, processor enclosure or I/O drawer designed to support the SAS interface.

Characteristics:
► Form Factor: 3.5 inch Form Factor, 1 inch drive
► Cable included: No
► External Interface: standard SAS Dual Port
► Rotational Speed: 15 000 rpm
► Interface Speed: 300 MBps
► Format: 512 Bytes/sector default, 528 bytes per sector possible with reformat
► Attributes required: one SAS disk drive bay

Supported in 8203-E4A, 8204-E8A, 9117-MMA, system units and processor enclosures and #5886 SAS disk I/O drawers (includes 9119-FHA).
Minimum required: 0
Maximum allowed:
► 8203-E4A: 294 (Initial order maximum: 250)
► 8204-E8A: 582 (Initial order maximum: 250)
► 9117-MMA: 1344 (Initial order maximum: 250)
► 9119-FHA: 2220 (Initial order maximum: 2220)

OS level required:
► AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
► AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
► AIX Version 5.3 with the 5300-08 Technology Level or later
► AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
► AIX Version 6.1 with the 6100-01 Technology Level or later
► SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
► Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later

Not all AIX features operate with Linux. For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument

Refer to the following URL for systems and features that operate with Linux:
http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

Initial Order/MES/Both/Supported: Both
CSU: Yes
Return parts MES: No

Note: Six drives per Power 520, 550, 570 CEC enclosure, and twelve per #5886.
Maximum allowed is a combined total for this feature and other supported SAS disks. |

#3650	**#3650 External connection for 3 of 6 internal SAS Disk Slots** Allows three of the internal SAS disk slots (SAS disks slots 4, 5, and 6) in a CEC enclosure to be controlled by a SAS controller adapter (or adapters) in an expansion adapter slots, located in the same MMA system. With this feature the connection to the 3 internal SAS disk slots is transferred from the internal controller to a Mini SAS 4x receptacle on the rear bulkhead of the CEC enclosure at adapter slot location P1-C3. This feature occupies slot location P1-C3. An external cable, feature 3679, or 3667 (or similar cable) is required to connect the Mini SAS 4x bulkhead connector to the SAS controller adapters. The SAS controller adapters require additional slots. The SAS controller adapters are not a part of this feature. Attributes provided: External connection for 3 of 6 internal SAS Disk slots. Attributes required: Slot P1-C3 in the CEC enclosure (PCIe slot) plus a separate slots that are required for the external SAS Adapter. **For 9117-MMA (#3650)** ▸ Minimum required: 0 ▸ Maximum allowed: 4 (Initial order maximum: 4) ▸ OS level required: None ▸ Initial Order/MES/Both/Supported: Both ▸ CSU: Yes ▸ Return parts MES: No **Note**: One per CEC enclosure maximum.
#3651	**#3651 External connection for the 6 internal SAS Disk slots** Allows external control of the six internal SAS Disk slots in a CEC enclosure. This feature allows the six internal SAS disk slots in a CEC enclosure to be controlled by a SAS controller adapter(or adapters) in an expansion adapter slots, located in the same MMA system. With this feature the control of the internal SAS drive slots is transferred from the internal controller to a Mini SAS 4x receptacle on the rear bulkhead of the CEC enclosure at adapter slot location P1-C3. This feature occupies slot location P1-C3. An external cable, feature 3679, or 3667 (or similar cable) is required to connect the Mini SAS 4x bulkhead connector to the SAS controller adapters. The SAS controller adapters require additional PCI slots. The SAS controller adapters are not a part of this feature. Attributes provided: External connection for the 6 internal SAS Disk slots Attributes required: Slot P1-C3 in the CEC enclosure (PCIe slot) plus separate slots required for the external SAS Adapters. **For 9117-MMA (#3651)** ▸ Minimum required: 0 ▸ Maximum allowed: 4 (Initial order maximum: 4) ▸ OS level required: None ▸ Initial Order/MES/Both/Supported: Both ▸ CSU: Yes ▸ Return parts MES: No **Note**: One per CEC enclosure maximum.

#3652	**#3652 SAS Cable (EE) Drawer to Drawer 1M** SAS Cable (EE), connects a second SAS disk drawer to a primary SAS disk drawer attached to a SAS controller adapter. This cable has one Mini SAS 4x cable plug connector on each end. Both connectors must be attached to an ENCLOSURE UP Arrow port on the ESM module of the attaching drawers. Follow the directions on the connector labels when attaching the connectors on this cable. This cable supports both Single and Dual path configurations. All supported configurations require two of this feature to attach a secondary disk drawer to the primary disk drawer. The length of this cable is 1 meter. Choose the SAS (EE) cable length to match the distance between the two SAS drawers. Attributes provided: SAS Disk drawer to SAS Disk drawer attach cable Attributes required: Primary SAS Disk drawer properly configured **For 9117-MMA (#3652)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#3652)** ▶ Minimum required: 0 ▶ Maximum allowed: 12 (Initial order maximum: 12) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#3653	**#3653 SAS Cable (EE) Drawer to Drawer 3M** SAS Cable (EE), connects a second SAS disk drawer to a primary SAS disk drawer attached to a SAS controller adapter. This cable has one Mini SAS 4x cable plug connector on each end. Both connectors must be attached to an ENCLOSURE UP Arrow port on the ESM module of the attaching drawers. Follow the directions on the connector labels when attaching the connectors on this cable. This cable supports both Single and Dual path configurations. All supported configurations require two of this feature to attach a secondary disk drawer to the primary disk drawer. The length of this cable is 3 meter. Choose the SAS (EE) cable length to match the distance between the two SAS drawers. Attributes provided: SAS Disk drawer to SAS Disk drawer attach cable Attributes required: Primary SAS Disk drawer properly configured **For 9117-MMA (#3653)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#3652)** ▶ Minimum required: 0 ▶ Maximum allowed: 12 (Initial order maximum: 12) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#3654	**#3654 SAS Cable (EE) Drawer to Drawer 6 m**
	SAS Cable (EE), connects a second SAS disk drawer to a primary SAS disk drawer attached to a SAS controller adapter. This cable has one Mini SAS 4x cable plug connector on each end. Both connectors must be attached to an ENCLOSURE UP Arrow port on the ESM module of the attaching drawers. Follow the directions on the connector labels when attaching the connectors on this cable. This cable supports both Single and Dual path configurations. All supported configurations require two of this feature to attach a secondary disk drawer to the primary disk drawer. The length of this cable is 6 meter. Choose the SAS (EE) cable length to match the distance between the two SAS drawers.
	Attributes provided: SAS Disk drawer to SAS Disk drawer attach cable
	Attributes required: Primary SAS Disk drawer properly configured
	For 9117-MMA (#3654)
	► Minimum required: 0
	► Maximum allowed: no max (Initial order maximum: no max)
	► OS level required: None
	For 9119-FHA (#3652)
	► Minimum required: 0
	► Maximum allowed: 12 (Initial order maximum: 12)
	► OS level required: Not applicable
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
#3658	**#3658 428 GB 15 k rpm SAS Disk Drive**
	3.5 inch Serial Attached SCSI (SAS) DASD device, in a carrier capable of providing Hot Swap support. Provides 428 GB of storage capacity when formatted for IBM i. Supports the industry standard SAS interface. Can be used only in a system unit, processor enclosure or I/O drawer designed to support the SAS interface.
	Characteristics:
	► Form Factor: 3.5 inch Form Factor, 1 inch drive
	► Cable included: No
	► External Interface: standard SAS Dual Port
	► Rotational Speed: 15 000 rpm
	► Interface Speed: 300 MBps
	► Format: 528 bytes per sector default, 512 Bytes. 528 bytes per sector possible with reformat
	► Attributes provided: 428 GB SAS disk storage mounted in a carrier.
	► Attributes required: one SAS disk drive bay
	Supported in 8203-E4A, 8204-E8A, 9117-MMA, system units and processor enclosures and #5886 SAS disk I/O drawers (includes 9119-FHA)
	► Minimum required: 0
	► Maximum allowed:
	– 8203-E4A: 294 (Initial order maximum: 250)
	– 8204-E8A: 582 (Initial order maximum: 250)
	– 9117-MMA: 1344 (Initial order maximum: 250)
	– 9119-FHA: 2220 (Initial order maximum: 2220)
	► OS level required: IBM i 6.1
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes
	► Return parts MES: No
	Note: Six drives per Power 520, 550, 570 CEC enclosure, and 12 per #5886.
	Maximum allowed is a combined total for this feature and other supported SAS disks. For IBM i load source, specify #0844. Support not announced for 9407-M15, 9408-M24, 9409-M50, 9406-MMA.

#3660	**#3660 Processor Fabric Cable, 2 enclosure** This cable is a modular component of the external Processor Fabric Bus. One of these cables is required for each pair of adjacent CEC enclosures in the system stack. One feature is required for a connection between drawers 1 and 2, a second feature is required for a connection between drawers 2 and 3, and a third feature is required for a connection between drawers 3 and 4. Attributes provided: External Processor Fabric Bus Attributes required: A two or more CEC enclosure system **For 9117-MMA (#3660)** ▶ Minimum required: 0 ▶ Maximum allowed: 3 (Initial order maximum: 3) ▶ OS level required: None **For 9119-FHA (#3652)** Minimum required: 0 Maximum allowed: 12 (Initial order maximum: 12) OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#3661	**#3661 SAS Cable (X) Adapter to SAS Enclosure, Dual Controller/Dual Path 3 m** This SAS cable (X) connects a SAS disk drawer to two SAS controller adapters. This cable supports dual controller/dual path attach between two SAS controller adapters and the SAS disk drawer. The SAS controller adapters can be in the same or in different host systems. This cable has four Mini SAS 4x plug connectors. Two of the Mini SAS 4x plug connectors attach to the adapters and are keyed as END DEVICES. Two of the Mini SAS 4x plug connectors attach to the SAS disk drawer and are keyed for ENCLOSURE DOWN Arrow. All of the connectors are wired in 2x mode. Follow the directions on the connector labels when attaching the connectors on this cable. This cable is 3 meters long, choose the SAS (X) cable length that matches the distance between the adapters and the SAS disk drawer. The adapter legs of this cable are each 2.5 meters long. Attributes provided: connection between two SAS controller adapters and a SAS disk drawer Attributes required: two SAS controller adapters and a SAS disk drawer **For 9117-MMA (#3661) and 9119-FHA (#3661)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: No max) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No

#3662	**#3662 SAS Cable (X) Adapter to SAS Enclosure, Dual Controller Dual Path 6 m** This SAS cable (X) connects a SAS disk drawer to two SAS controller adapters. This cable supports dual controller/dual path attach between two SAS controller adapters and the SAS disk drawer. The SAS controller adapters can be in the same or in different host systems. This cable has four Mini SAS 4x plug connectors. Two of the Mini SAS 4x plug connectors attach to the adapters and are keyed as END DEVICES. Two of the Mini SAS 4x plug connectors attach to the SAS disk drawer and are keyed for ENCLOSURE DOWN Arrow. All of the connectors are wired in 2x mode. Follow the directions on the connector labels when attaching the connectors on this cable. This cable is 6 meters long, choose the SAS (X) cable length that matches the distance between the adapters and the SAS disk drawer. The adapter legs of this cable are each 5.5 meters long. Attributes provided: connection between two SAS controller adapters and a SAS disk drawer Attributes required: two SAS controller adapters and a SAS disk drawer **For 9117-MMA (#3662) and 9119-FHA (#3662)** ▶ Minimum required: 0 ▶ Maximum allowed: No max (Initial order maximum: No max) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No
#3663	**#3663 SAS Cable (X) Adapter to SAS Enclosure, Dual Controller Dual Path 15M** This SAS cable (X) connects a SAS disk drawer to two SAS controller adapters. This cable supports dual controller/dual path attach between two SAS controller adapters and the SAS disk drawer. The SAS controller adapters can be in the same or in different host systems. This cable has four Mini SAS 4x plug connectors. Two of the Mini SAS 4x plug connectors attach to the adapters and are keyed as END DEVICES. Two of the Mini SAS 4x plug connectors attach to the SAS disk drawer and are keyed for ENCLOSURE DOWN Arrow. All of the connectors are wired in 2x mode. Follow the directions on the connector labels when attaching the connectors on this cable. This cable is 15 meters long, choose the SAS (X) cable length that matches the distance between the adapters and the SAS disk drawer. The adapter legs of this cable are each 14.5 meters long. Attributes provided: connection between two SAS controller adapters and a SAS disk drawer Attributes required: two SAS controller adapters and a SAS disk drawer **For 9117-MMA (#3663) and 9119-FHA (#3663)** ▶ Minimum required: 0 ▶ Maximum allowed: No max (Initial order maximum: No max) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No

#3664	**#3664 Processor Fabric Cable, 3 enclosure** This cable is a modular component of the external Processor Fabric Bus. One of these cables is required for each three CEC enclosure combination in the system stack. One of these features is required for a connection between drawers 1 and 3, and a second feature is required for a connection between drawers 2 and 4. Attributes provided: External Processor Fabric Bus Attributes required: A three or more CEC enclosure system **For 9117-MMA (#3664)** ▶ Minimum required: 0 ▶ Maximum allowed: 2 (Initial order maximum: 2) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No
#3665	**#3665 Processor Fabric Cable, 4 enclosure** This cable is a modular component of the external Processor Fabric Bus. One of these cables is required for each four CEC enclosure combination in the system stack. One of these features is required for a connection between drawers 1 and 4. Attributes provided: External Processor Fabric Bus Attributes required: A 4 CEC enclosure system **For 9117-MMA (#3665)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No
#3667	**#3667 SAS Cable (YR) 1 m** This Y cable has three Mini SAS 4x plug connectors. The single connector end is wired in 4x mode and is keyed for attachment to an ENCLOSURE OUT. On the dual connector end, the connectors are each wired in 2x mode and are keyed for attachment to an END DEVICE. This cable connects two SAS RAID Adapters to a bulkhead port for accessing internal SAS disks. This cable is 1 meter long. Attributes provided: Cable to support RAID application for internal SAS disks Attributes required: Two supported SAS RAID adapters. **For 9117-MMA (#3667)** ▶ Minimum required: 0 ▶ Maximum allowed: 4 (Initial order maximum: 4) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: **Note**: On the Power 570, this cable requires the use of an alternate SAS Controller feature such as #3650 or #3651 (or similar), purchased separately.

#3676	**#3676 69.7 GB 15 k rpm SAS Disk Drive**
	(No longer available as of 28 November 2008.)
	
	Provides a 15 000 rpm 3.5 inch disk unit with 69.7 GB capacity and a Serially Attached SCSI (SAS) interface. #3676 is mounted in a carrier and Hot Swap is supported.
	
	Attributes provided: 69.7 GB Disk Unit
	Attributes required: Disk Unit Slot and a SAS Disk Unit Controller
	
	For 9117-MMA (#3676)
	▶ Minimum required: 0
	▶ Maximum allowed: 1344 (Initial order maximum: 250)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#3676)
	▶ Minimum required: 0
	▶ Maximum allowed: 144 (Initial order maximum: 144)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
	
	Note: Six drives per CEC enclosure, and 12 per #5886.

#3677	**#3677 139.5 GB 15 k rpm SAS Disk Drive**
	Provides a 15 000 rpm 3.5 inch disk unit with 139.5 GB capacity and a Serially Attached SCSI (SAS) interface. #3677 is mounted in a carrier and hot swap is supported.
	
	Attributes provided: 139.5 GB Disk Unit
	Attributes required: Disk Unit Slot and a SAS Disk Unit Controller
	
	For 9117-MMA (#3677)
	▶ Minimum required: 0
	▶ Maximum allowed: 1344 (Initial order maximum: 250)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#3677)
	▶ Minimum required: 0
	▶ Maximum allowed: 144 (Initial order maximum: 144)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
	
	Note: Six drives per CEC enclosure, and 12 per #5886.

#3678	**#3678 283.7 GB 15 k rpm SAS Disk Drive**
	Provides a 15 000 rpm 3.5 inch disk unit with 283.7 GB capacity and a Serially Attached SCSI (SAS) interface. #3678 is mounted in a carrier and hot swap is supported.
	
	Attributes provided: 283.7 GB Disk Unit
	Attributes required: Disk Unit Slot and a SAS Disk Unit Controller
	
	For 9117-MMA (#3678)
	▸ Minimum required: 0
	▸ Maximum allowed: 1344 (Initial order maximum: 250)
	▸ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#3678)
	▸ Minimum required: 0
	▸ Maximum allowed: 144 (Initial order maximum: 144)
	▸ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
	
	Note: Six drives per CEC enclosure, and 12 per #5886.

#3679	**#3679 SAS Cable (AI) 1 m** This cable has two Mini SAS 4x plug connectors, and is wired in 4x mode. Both ends are keyed for attachment to an END DEVICE. Connects a SAS Adapter to a bulkhead port for accessing internal SAS disks. This cable is 1 meter long. Attributes provided: SAS 4x Cable Attributes required: Internal disks and feature to crate the internal disk port **For 9117-MMA (#3679)** ▸ Minimum required: 0 ▸ Maximum allowed: 4 (Initial order maximum: 4) ▸ OS level required: None **Note**: One per CEC enclosure maximum. **For 9119-FHA (#3679)** ▸ Minimum required: 0 ▸ Maximum allowed: No max (Initial order maximum: No max) ▸ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#3684	**#3684 SAS Cable (AE) Adapter to Enclosure, single controller/single path 3M**
	This SAS cable (AE) connects a SAS Controller to a media expansion drawer. This cable can also be used to connect two SAS adapters to a SAS disk drawer in a specific dual controller HA two system JBOD configuration using two #5912 controllers. Single controller/single path connections are supported with this cable only for this specific JBOD configuration and as such, two #5912 SAS controllers and two (AE style) cables are required for a supported configuration. The two SAS adapters must be in different host systems/partitions. This cable has one Mini SAS 4X plug connector on the adapter end wired in 4x mode and one Mini SAS 4X plug connector on the drawer end, wired in 4x mode. Follow the directions on the connector labels when attaching the connectors on this cable. This cable is 3 meters long, select the SAS (AE) cable length that best matches the distance between the host system and the remote SAS drawer being attached.
	Attributes provided: Connection between a SAS controller and a media expansion drawer or connection between #5912 SAS controller and a SAS disk drawer in a dual controller HA two system JBOD configuration only
	Attributes required: SAS media expansion drawer or SAS disk drawer and a SAS controller adapter
	For 9117-MMA (#3684) and 9119-FHA (#3684)
	► Minimum required: 0
	► Maximum allowed: No max (Initial order maximum: No max)
	► OS level required: None
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes
	► Return parts MES: No
#3685	**#3685 SAS Cable (AE) Adapter to Enclosure, single controller single path 6 m**
	This SAS cable (AE) connects a SAS Controller to a media expansion drawer. This cable can also be used to connect two SAS adapters to a SAS disk drawer in a specific dual controller HA two system JBOD configuration using two #5912 controllers. Single controller/single path connections are supported with this cable only for this specific JBOD configuration and as such, two #5912 SAS controllers and two (AE style) cables are required for a supported configuration. The two SAS adapters must be in different host systems/partitions. This cable has one Mini SAS 4X plug connector on the adapter end wired in 4x mode and one Mini SAS 4X plug connector on the drawer end, wired in 4x mode. Follow the directions on the connector labels when attaching the connectors on this cable. This cable is 6 meters long, select the SAS (AE) cable length that best matches the distance between the host system and the remote SAS drawer being attached.
	Attributes provided: Connection between a SAS controller and a media expansion drawer or connection between #5912 SAS controller and a SAS disk drawer in a dual controller HA two system JBOD configuration only
	Attributes required: SAS media expansion drawer or SAS disk drawer, and a SAS controller adapter
	For 9117-MMA (#3685) and 9119-FHA (#3685)
	► Minimum required: 0
	► Maximum allowed: no max (Initial order maximum: no max)
	► OS level required: None
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes
	► Return parts MES: No

#3691	**#3691 SAS Cable (YO) Adapter to SAS Enclosure, Single Controller/Dual Path 1.5 m**
	This SAS cable (YO) connects a remote SAS drawer to a SAS controller adapter. This cable supports single controller/dual path attach between the SAS controller adapter and the SAS disk drawer. This cable has one Mini SAS 4X plug connector on the adapter end keyed for an END DEVICE, wired in 4x mode and two Mini SAS 4X plug connectors on the drawer end keyed for ENCLOSURE DOWN Arrow, both are wired in 2x mode. Follow the directions on the connector labels when attaching the connectors on this cable. This cable is 1.5 meters long, choose the SAS (YO) cable length that matches the distance between the adapter and the SAS disk drawer.
	Attributes provided: connection between SAS controller adapter and a SAS disk drawer
	Attributes required: SAS controller adapter and a SAS disk drawer
	For 9117-MMA (#3691) and 9119-FHA (#3691)
	▶ Minimum required: 0
	▶ Maximum allowed: no max (Initial order maximum: no max)
	▶ OS level required: None
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No
#3692	**#3692 SAS Cable (YO) Adapter to SAS Enclosure, Single Controller/Dual Path 3 m**
	This SAS cable (YO) connects a remote SAS drawer to a SAS controller adapter. This cable supports single controller/dual path attach between the SAS controller adapter and the SAS disk drawer. This cable has one Mini SAS 4X plug connector on the adapter end keyed for an END DEVICE, wired in 4x mode and two Mini SAS 4X plug connectors on the drawer end keyed for ENCLOSURE DOWN Arrow, both are wired in 2x mode. Follow the directions on the connector labels when attaching the connectors on this cable. This cable is 3 meters long, choose the SAS (YO) cable length that matches the distance between the adapter and the SAS disk drawer.
	Attributes provided: connection between SAS controller adapter and a SAS disk drawer
	Attributes required: SAS controller adapter and a SAS disk drawer
	For 9117-MMA (#3692) and 9119-FHA (#3692)
	▶ Minimum required: 0
	▶ Maximum allowed: no max (Initial order maximum: no max)
	▶ OS level required: None
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No
#3693	**#3693 SAS Cable (YO) Adapter to SAS Enclosure, Single Controller/Dual Path 6 m**
	This SAS cable (YO) connects a remote SAS drawer to a SAS controller adapter. This cable supports single controller/dual path attach between the SAS controller adapter and the SAS disk drawer. This cable has one Mini SAS 4X plug connector on the adapter end keyed for an END DEVICE, wired in 4x mode and two Mini SAS 4X plug connectors on the drawer end keyed for ENCLOSURE DOWN Arrow, both are wired in 2x mode. Follow the directions on the connector labels when attaching the connectors on this cable. This cable is 6 meters long, choose the SAS (YO) cable length that matches the distance between the adapter and the SAS disk drawer.
	Attributes provided: connection between SAS controller adapter and a SAS disk drawer
	Attributes required: SAS controller adapter and a SAS disk drawer
	For 9117-MMA (#3693) and 9119-FHA (#3693)
	▶ Minimum required: 0
	▶ Maximum allowed: no max (Initial order maximum: no max)
	▶ OS level required: None
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No

#3694	**#3694 SAS Cable (YO) Adapter to SAS Enclosure, Single Controller Dual Path 15 m** This SAS cable (YO) connects a remote SAS drawer to a SAS controller adapter. This cable supports single controller/dual path attach between the SAS controller adapter and the SAS disk drawer. This cable has one Mini SAS 4X plug connector on the adapter end keyed for an END DEVICE, wired in 4x mode and two Mini SAS 4X plug connectors on the drawer end keyed for ENCLOSURE DOWN Arrow, both are wired in 2x mode. Follow the directions on the connector labels when attaching the connectors on this cable. This cable is 15 meters long, choose the SAS (YO) cable length that matches the distance between the adapter and the SAS disk drawer. Attributes provided: connection between SAS controller adapter and a SAS disk drawer Attributes required: SAS controller adapter and a SAS disk drawer **For 9117-MMA (#3694) and 9119-FHA (#3694)** ► Minimum required: 0 ► Maximum allowed: No max (Initial order maximum: no max) ► OS level required: None ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No

#3701	**#3701 LPAR Restrict Build Process**
	Added to an initial order system when multiple i5/OS partitions (#3702) are requested. This code instructs manufacturing to only load SLIC on the minimum number of DASD files (for example, do not spread across all available DASD units). Mutually exclusive with #5000 SW Preload and with #3703 - RISC-to-RISC Data Migration.
	
	Attributes provided: Not applicable
	Attributes required: Not applicable
	
	For 9119-FHA (#3701)
	► Minimum required: 0
	► Maximum allowed: 1 (Initial order maximum: 1)
	► OS level required:
	   – IBM i 5.4 with V5R4M5 machine code
	   – IBM i 6.1 or later
	► Initial Order/MES/Both/Supported: Initial
	► CSU: Not applicable
	► Return parts MES: No

#3704	**#3704 External xSeries Attach**
	Added to an order for each Direct Attached xSeries Server connected to the system. The marketing configurators use this code to determine the number of RIO and SPCN cables required and to insure that the number of External xSeries Servers does not exceed the system limit. Each External xSeries Server is cabled with a pair of RIO cables and attached to the SPCN string like all other HSL attached I/O towers.
	
	Attributes provided: Not applicable
	Attributes required: Not applicable
	
	For 9117-MMA (#3704)
	▶ Minimum required: 0
	▶ Maximum allowed: 57 (Initial order maximum: 0)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#3704)
	▶ Minimum required: 0
	▶ Maximum allowed: 57 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Not applicable
	Return parts MES: No

#3705	**#3705 PCI IOP**
	A PCI I/O processor with 64 MB of memory which drives PCI IOA cards. #3705 can drive a maximum of four IOAs, subject to configuration restrictions.
	
	Attributes provided: support for up to 4 PCI IOAs
	Attributes required: one PCI slot
	
	For 9117-MMA (#3705)
	▶ Minimum required: 0
	▶ Maximum allowed: 288 (Initial order maximum: 0)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#3705)
	▶ Minimum required: 0
	▶ Maximum allowed: 182 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No
	
	Note: The #3705 is the same physical card as the #2843 supported on the 9406-ccc technology systems.

#3706	**#3706 DVD-ROM**
	This DVD-ROM mounts in a removable media device slot. It can read 640 MB CD-ROM and 4.7 GB DVD-RAM media. #3706 can be used for Alternate IPL (IBM distributed CD-ROM media only) and program distribution.
	
	Attributes provided: DVD-ROM
	Attributes required: Removable media device slot in an I/O tower
	
	For 9117-MMA (#3706)
	► Minimum required: 0
	► Maximum allowed: 26 (Initial order maximum: 0)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#3706)
	► Minimum required: 0
	► Maximum allowed: 10 (Initial order maximum: 0)
	► OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#3707	**#3707 30 GB 1/4-in Cartridge Tape** The #3707 is a 30 GB 1/4 inch Cartridge Tape Unit that can be mounted in half-high, autodocking, removable media bays of expansion towers/units. The #3707 can be used for save or restore, alternate IPL, program distribution, migration and 1/4 inch cartridge tape exchange. Note: This feature is known as #4684 on System i models upgrading to unified POWER6 MTMs. A #3707 will read/write the following tape formats: ▶ 30 GB (up to 60 GB with compression in SLR60 format) with IBM SLR60-30GB Data Cartridge (19P4209) ▶ 25 GB (up to 50 GB with compression in MLR3 format) with IBM MLR3-25GB Data Cartridge (59H4128) ▶ 16 GB (up to 32 GB with compression in QIC5010 format) with IBM MLR1-16GB Data Cartridge (59H4175) ▶ 5 GB (up to 10 GB with compression in SLR100 format) with IBM SLR100-5GB Data Cartridge (35L0661) ▶ 2 GB (up to 4 GB with compression in QIC5010 format) with IBM MLR1-2GB Data Cartridge (35L0589) A #3707 is capable of read only support of the following tape formats: ▶ 4 GB (QIC4GB format) with SLR5-4GB Data Cartridge (59H3660) ▶ 2.5 GB (QIC2GB format) with IBM DC9250 Data Cartridge (16G8436) The #3707 has the these technical specifications for the primary recording format: ▶ Cartridge Capacity (Native) = 30.0 GB (1500-ft tape) ▶ Cartridge Capacity (Compression) = 60.0 GB (1500-ft tape) ▶ Data Rate (Native) = 4.0 MBps ▶ Data Rate (Compression) = 8.0 MBps Attributes provided: 30 GB 1/4 inch tape device Attributes required: half height, autodocking removable media bay and a disk controller in place to interface to this media bay. **For 9117-MMA (#3707)** ▶ Minimum required: 0 ▶ Maximum allowed: 26 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later **For 9119-FHA (#3707)** ▶ Minimum required: 0 ▶ Maximum allowed: 10 (Initial order maximum: 0) ▶ OS level required: – IBM i 5.4 with V5R4M5 machine code – IBM i 6.1 or later Initial Order/MES/Both/Supported: Supported CSU: Yes Return parts MES: No

#3708	**#3708 50 GB 1/4-in Cartridge Tape**
	Mounted in a removable media device slot of a system unit or an expansion tower, these tape units can be used for save/restore, alternate IPL, program distribution, migration and 1/4 inch cartridge tape exchange.
	Note: This feature is known as #4687 on System i models upgrading to unified POWER6 MTMs.
	The #3708 will read/write the following tape formats:
	▶ 50 GB (up to 100 GB with compression in SLR100 format) with IBM SLR100-50GB Data Cartridge (35L0968)
	▶ 30 GB (up to 60 GB with compression in SLR60 format) with IBM SLR60-30GB Data Cartridge (19P4209)
	▶ 25 GB (up to 50 GB with compression in MLR3 format) with IBM MLR3-25GB Data Cartridge (59H4128)
	▶ 5 GB (up to 10 GB with compression in SLR100 format) with IBM SLR100-5GB Data Cartridge (35L0661)
	The #3709 is capable of read only support of the following tape formats:
	▶ 16 GB (up to 32GB with compression in QIC5010 format) with IBM MLR1-16GB Data Cartridge (59H4175)
	▶ 4 GB (QIC4GB format) with SLR5-4GB data Cartridge (59H3660)
	▶ 2 GB (up to 4 GB with compression in QIC5010 format) with IBM MLR1-2GB
	Specifications for the primary recording format:
	▶ Cartridge Capacity (Native) = 50.0 GB (1500-ft tape)
	▶ Cartridge Capacity (Compression) = 100.0 GB (1500-ft tape)
	▶ Data Rate (Native) = 5.0 MBps
	▶ Data Rate (Compression) = 10.0 MBps
	Attributes provided: 50 GB 1/4 inch Cartridge Tape Device
	Attributes required: Half-high removable media bay and a controller in place to interface to this media bay
	For 9117-MMA (#3708)
	▶ Minimum required: 0
	▶ Maximum allowed: 26 (Initial order maximum: 0)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	For 9119-FHA (#3708)
	▶ Minimum required: 0
	▶ Maximum allowed: 10 (Initial order maximum: 0)
	▶ OS level required:
	– IBM i 5.4 with V5R4M5 machine code
	– IBM i 6.1 or later
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#3709	**#3709 PCI 100/10 Mbps Ethernet IOA** The #3709 allows attachment to standardized 100Mbps high-speed Ethernet LANs and allows attachment to existing 10 Mbps Ethernet LANs. This adapter comes with an RJ45 connector for attachment to UTP-5 media. The #3709 is not supported on/with any Integrated Netfinity® Server feature. Attributes provided: Attachment to 100/10 Mbps Ethernet LANs Attributes required: One PCI slot (3v or 5v) **For 9117-MMA (#3709)** ▶ Minimum required: 0 ▶ Maximum allowed: 120 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later **For 9119-FHA (#3709)** ▶ Minimum required: 0 ▶ Maximum allowed: 94 (Initial order maximum: 0) ▶ OS level required: 　– IBM i 5.4 with V5R4M5 machine code 　– IBM i 6.1 or later Initial Order/MES/Both/Supported: Supported CSU: Yes Return parts MES: No
#3756	**#3756 Service Tool Kit, High Performance Switch** This feature delivers the Service Took Kit for the High Performance Switch. Remove this feature from additional 7045-SW4 orders to prevent multiple quantities of the Tool Kit from being shipped. Every installation location with an HPS 7045-SW4 must have access to one Service Tool Kit. Failure to have at least one available in a location can result in delayed or prolonged maintenance times. Attributes provided: Service Tool Kit for 7045-SW4 Attributes required: 7045-SW4 **For 9119-FHA (#3756)** ▶ Not supported on POWER6.
#3757	**#3757 Service Shelf Tool Kit** This feature contains six separate tool kits which are required for the installation and maintenance of the p590 and p595 processor books and memory cards. Each kit weighs less than or equal to 40 pounds. Without this feature, installation and maintenance of the p590 and p595 CEC can be delayed. **For 9119-FHA (#3757)** ▶ Not supported on POWER6.
#3759	**#3759 Universal Lift Tool and Service Ladder** This feature delivers the Universal Lift Tool and Service Ladder for the 24 inch wide IBM servers. #3759 is a feature that is available on multiple server types (Power 595, Power 575 and the System z10™) Failure to have at least one #3759 available in a location can result in delayed or prolonged maintenance times Attributes provided: Universal Lift Tool and Service Ladder Attributes required: 24 inch wide IBM Server (Power 595, Power 575 or System z10) **For 9119-FHA (#3759)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No

#3761	**#3761 Universal Lift Tool Adapter** This adapter is required for use with the 9119-FHA server when the Univesal Lift Tool, #3759 is ordered. **For 9119-FHA (#3761)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: No ► Return parts MES: No
#3925	**#3925 Serial Port Converter Cable, 9-Pin to 25-Pin** This cable converts the 9-pin serial port on the system to a 25-pin serial port which allows the user to attach 25-pin serial devices to the system. Attributes provided: 9-Pin to 25-Pin connectivity Attributes required: None **For 9117-MMA (#3925)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None **For 9119-FHA (#3925)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum: 99) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#3926	**#3926 Asynch Printer/Terminal Cable, 9-pin to 25-pin, 4 m** This 4 meter cable and transposer (2 parts) allows external async devices such as printers or terminals to be attached directly to the 9-pin serial port. This is equivalent to using #3925 in combination with #2934. Attributes provided: None Attributes required: None **For 9117-MMA (#3926)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None **For 9119-FHA (#3926)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum: 99) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#3927	**#3927 Serial Port Null Modem Cable, 9-pin to 9-pin, 3.7 m** This 3.7 meter 9-pin to 9-pin Null modem Serial cable allows two EIA-232 communications ports to exchange data with one another without going through a modem. Attributes provided: 9-pin female connector at each end of the cable **For 9117-MMA (#3927)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No
#3928	**#3928 Serial Port Null Modem Cable, 9-pin to 9-pin, 10 m** This 10 meter 9-pin to 9-pin Null Modem Serial cable allows two EIA-232 communications ports to exchange data with one another without going through a modem. Attributes provided: 9-pin female connector at each end of the cable **For 9117-MMA (#3928) and 9119-FHA (#3928)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No
#4242	**#4242 6-ft Extender Cable for Displays (15-pin D-shell to 15-pin D-shell)** This cable is required to connect displays with a 15-pin "D" shell connector to the appropriate accelerator connector when it is farther away than the attached monitor cable can reach. Rack mounted systems are likely candidates for this extender cable. Attributes provided: 6 foot extension cable Attributes required: Supported monitor and adapter with a 15-pin "D" shell connector. **For 9117-MMA (#4242)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No
#4256	**#4256 Extender Cable - USB Keyboards, 2 m** Provides a 2 meter extension cable for use with USB keyboards. Attributes provided: 2 meter Extension Cable Attributes required: USB Keyboard **For 9117-MMA (#4256) and 9119-FHA (#4256)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No

#4253	**#4253 SCSI-to-IDE Interface Bridge** This converter card attaches to the back of an IDE Optical Storage device and creates an advanced SCSI-to-IDE interface bridge. It is being used with the 16/48X (max) IDE DVD-ROM drive (# 2634) to allow the drive to attach as an LVD SCSI DVD-ROM drive. With a built-in high-speed RISC micro-controller it can handle synchronous data transfer rates. The card contains a 68-pin connector, and acquires its power through a floppy drive connector. Attributes provided: one SCSI to IDE Interface Bridge Attributes required: one DVD-ROM drive (# 2634) **Limitations**: Not supported on POWER6 MTMs.
#4256	**#4256 Extender Cable - USB Keyboards, 2 m** Provides a 2 meter extension cable for use with USB keyboards. Attributes provided: 2 meter Extension Cable Attributes required: USB Keyboard **For 9119-FHA (#4256)** ▶ Minimum required: 0 ▶ Maximum allowed: No max (Initial order maximum: No max) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No
#4276	**#4276 VGA to DVI Connection Converter** This feature is a plug converter that will allow a Video device with a 15-pin D-shell VGA cable plug (such as a KVM switch) to connect to a graphics adapter with a 28-pin D-shell DVI receptacle connector. This device has both a 28-pin D-Shell DVI plug and a 15-pin D-shell VGA receptacle. Attributes provided: VGA to DVI connection converter Attributes required: VGA device and graphics adapter with DVI connector. **For 9117-MMA (#4276)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#4276)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#4319	**#4319 35.16 GB 10 k rpm Disk Unit**
	#4319 is a 10 000 rpm disk unit with 35.16 GB capacity and an Ultra2 SCSI interface.
	
	Attributes provided: 35.16 GB disk unit
	Attributes required: Disk unit slot and a disk unit controller
	
	For 9117-MMA (#4319)
	▸ Minimum required: 0
	▸ Maximum allowed: 1200 (Initial order maximum: 0)
	▸ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#4319)
	▸ Minimum required: 0
	▸ Maximum allowed: 546 (Initial order maximum: 0)
	▸ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#4326	**#4326 35.16 GB 15 k rpm Disk Unit**
	#4326 is a 15 000 rpm disk unit with 35.16 GB capacity and a SCSI interface.
	
	Attributes provided: 35.16 GB disk unit
	Attributes required: Disk unit slot and a disk unit controller
	
	For 9117-MMA (#4326)
	▸ Minimum required: 0
	▸ Maximum allowed: 1200 (Initial order maximum: 0)
	▸ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#4326)
	▸ Minimum required: 0
	▸ Maximum allowed: 546 (Initial order maximum: 0)
	▸ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#4327	**#4327 70.56 GB 15 k rpm Disk Unit**
	(No longer available as of 30 January 2009.)
	
	#4327 is a 15 000 rpm disk unit with 70.56 GB capacity and an Ultra320 SCSI interface.
	
	Attributes provided: 70.56 GB disk unit
	Attributes required: Disk unit slot and a disk unit controller
	
	For 9117-MMA (#4327)
	▶ Minimum required: 0
	▶ Maximum allowed: 1200 (Initial order maximum: 250)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#4327)
	▶ Minimum required: 0
	▶ Maximum allowed: 2640 (Initial order maximum: 254)
	▶ OS level required:
	    – IBM i 5.4 with V5R4M5 machine code
	    – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No

#4328	**#4328 141.12 GB 15 k rpm Disk Unit**
	Provides a 15 000 rpm disk unit with 141.12 GB capacity and a Ultra-4 (Ultra320) SCSI interface.
	
	Attributes provided: 141.12 GB disk unit
	Attributes required: Disk unit slot and a disk unit controller
	
	For 9117-MMA (#4328)
	▶ Minimum required: 0
	▶ Maximum allowed: 1200 (Initial order maximum: 250)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#4328)
	▶ Minimum required: 0
	▶ Maximum allowed: 2640 (Initial order maximum: 254)
	▶ OS level required:
	    – IBM i 5.4 with V5R4M5 machine code
	    – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No

#4329	**#4329 282.25 GB 15 k rpm Disk Unit**
	(No longer available as of 30 January 2009.)
	
	Provides a 15 000 rpm disk unit with 282.25 GB capacity and a Ultra-4 (Ultra320) SCSI interface.
	
	Attributes provided: 282.25 GB disk unit
	Attributes required: Disk unit slot and a disk unit controller
	
	For 9117-MMA (#4329)
	▶ Minimum required: 0
	▶ Maximum allowed: 1200 (Initial order maximum: 250)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#4329)
	▶ Minimum required: 0
	▶ Maximum allowed: 2640 (Initial order maximum: 254)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No

#4353	**#4353 H-100 Bus 8-position Cable** This cable provides the capability to interconnect adapters that provide H.100 bus connectors. This 8-position cable should be used when more than four and less than or equal to eight adapters with H.100 connectors will be interconnected. If four or less adapters are interconnected, the H.100 Bus 4-Drop Cable (#2877) should be used. Attributes provided: H.100 bus connection between adapters Attributes required: Four to eight H.100 adapters **For 9117-MMA (#4353) and 9119-FHA (#4353)** ▶ Not supported on POWER6.

#4430	**#4430 DVD-RAM**
	This DVD-RAM device reads and writes 4.7 GB on single sided media. Double sided media, must be manually flipped. It can also read 640 MB CD-ROM media. Mounted in a removable media device slot, this feature can be used for alternate IPL, program distribution, and data interchange.
	Attributes provided: DVD-RAM
	Attributes required: Removable media slot in an external I/O tower
	For 9117-MMA (#4430) and 9119-FHA (#4430)
	▶ Minimum required: 0
	▶ Maximum allowed: 26 (Initial order maximum: 0)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	For 9119-FHA (#4430)
	▶ Minimum required: 0
	▶ Maximum allowed: 24 (Initial order maximum: 0)
	▶ OS level required:
	– IBM i 5.4 with V5R4M5 machine code
	– IBM i 6.1 or later
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No
	Note: Not supported in the CEC enclosures.
#4452	**#4452 2 GB (4 x 512 MB) DIMMs, 208-pin, 266 MHz DDR1 SDRAM**
	Provides 2048 MB of system memory with four 512 MB DIMMs.
	Attributes provided: 2048 MB of system memory.
	Attributes required: Four empty memory DIMM positions.
	For 9117-MMA (#4452)
	▶ Not supported on POWER6.
#4453	**#4453 4 GB (4 x 1 GB) DIMMs, 208-pin, 266 MHz Stacked DDR1 SDRAM**
	Provides 4096 MB of system memory with four 1024 MB DIMMs.
	Attributes provided: 4096 MB of system memory.
	Attributes required: Four empty memory DIMM positions.
	For 9117-MMA (#4453)
	▶ Not supported on POWER6.
#4454	**#4454 8 GB (4 x 2 GB) DIMMs, 208-pin, 266 MHz Stacked DDR1 SDRAM**
	Provides 8192 MB of system memory with four 2048 MB DIMMs.
	Attributes provided: 8192 MB of system memory.
	Attributes required: Four empty memory DIMM positions.
	For 9117-MMA (#4454)
	▶ Minimum required: 0
	▶ Maximum allowed: 0 (Initial order maximum: 0)
	▶ Not supported on POWER6.

#4487	**#4487 50 GB 1/4-in Cartridge Tape**
	Mounted in a removable media device slot of an expansion tower, these tape units can be used for save/restore, alternate IPL, program distribution, migration and 1/4 inch cartridge tape exchange.
	
	The #4487 is capable of read/write with the following tape formats:
	▶ 50 GB (up to 100 GB with compression in SLR100 format) with IBM SLR100-50GB Data Cartridge (35L0968)
	▶ 30 GB (up to 60 GB with compression in SLR60 format) with IBM SLR60-30GB Data Cartridge (19P4209)
	▶ 25 GB (up to 50 GB with compression in MLR3 format) with IBM MLR3-25GB Data Cartridge (59H4128)
	▶ 5 GB (up to 10 GB with compression in SLR100 format) with
	▶ IBM SLR100-5GB Data Cartridge (35L0661)
	
	The #4487 is capable of read only support of the following tape formats:
	▶ 16 GB (up to 32 GB with compression in QIC5010 format) with IBM MLR1-16GB Data Cartridge (59H4175)
	▶ 4 GB (QIC4GB format) with SLR5-4GB Data Cartridge (59H3660)
	▶ 2 GB (up to 4 GB with compression in QIC5010 format) with IBM MLR1-2GB
	
	Specifications for the primary recording format:
	▶ Cartridge Capacity (Native) = 50.0 GB (1500-ft tape)
	▶ Cartridge Capacity (Compression) = 100.0 GB (1500-ft tape)
	▶ Data Rate (Native) = 5.0 MBps
	▶ Data Rate (Compression) = 10.0 MBps
	
	Attributes provided: 50 GB 1/4 inch cartridge tape
	Attributes required: Removable media slot and disk controller that can drive internal removable media.
	
	For 9117-MMA (#4487)
	▶ Minimum required: 0
	▶ Maximum allowed: 26 (Initial order maximum: 0)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#4487)
	▶ Minimum required: 0
	▶ Maximum allowed: 10 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#4490	**#4490 4 GB (4 x 1 GB) DIMMs, 208-pin, 266 MHz Stacked DDR1 SDRAM** Provides 4096 MB of system memory with four 1024 MB DIMMs. Attributes provided: 4096 MB of system memory. Attributes required: Four empty memory DIMM positions. **For 9117-MMA (#4490)** ▶ Provides 16384 MB of system memory with 4 4096 MB DIMMs. ▶ Attributes provided: 16384 MB of system memory. ▶ Attributes required: Four empty memory DIMM positions. **For 9117-MMA (#4491)** ▶ Not supported on POWER6.

#4492	**#4492 32 GB (4 x 8 GB) DIMMs, 208-pin, 200 MHz Stacked DDR1 SDRAM** (No longer available as of 21 March 2008.) Provides 32796 MB of system memory with four 8192 MB DIMMs. Attributes provided: 32796 MB of system memory. Attributes required: Four empty memory DIMM positions. **For 9117-MMA (#4492)** ▶ Not supported on POWER6.
#4494	**#4494 16 GB (4 x 4 GB) DIMMs, 208-pin, 200 MHz Stacked DDR1 SDRAM** (No longer available as of 21 March 2008.) Provides 16384 MB of system memory with four 4096 MB DIMMs. Attributes provided: 16384 MB of system memory. Attributes required: Four empty memory DIMM positions. **For 9117-MMA (#4494)** ▶ Not supported on POWER6.

#4495	**#4495 4/8 GB (4 X 2 GB) DIMMS, 276 PIN 533 MHz, DDR2 SDRAM**
	CoD Memory Feature is a total of 8 GB of memory. 4 GB are active with purchase of the feature. 4 GB are available for activation immediately (with the purchase of the activation feature) or at a later time (with the purchase of the activation feature). 276-pin DIMM, 533 MHz DDR2.
	
	Attributes provided: 8 GB of Memory, 4 GB active, 8 GB total memory available
	Attributes required: 4 empty DIMM slots
	
	For 9117-MMA (#4495)
	▶ Minimum required: 0
	▶ Maximum allowed: 16 (Initial order maximum: 0)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: No
	▶ Return parts MES: No
	
	Note: This Memory feature can only be used with Processor feature # 5621.

#4496	**#4496 8/16 GB (4 X 4 GB) DIMMs, 276 PIN, 533 MHz DDR2 SDRAM**
	CoD Memory Feature is a total of 16 GB of memory. 8 GB are active with purchase of the feature. 8 GB are available for activation immediately (with the purchase of the activation feature) or at a later time (with the purchase of the activation feature). 276-pin DIMM, 533 MHz DDR2.
	
	Attributes provided: 8 GB active memory, 16 GB total memory available
	Attributes required: 4 empty DIMM slots.
	
	For 9117-MMA (#4496)
	▶ Minimum required: 0
	▶ Maximum allowed: 0 (Initial order maximum: 16)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  `http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument`
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: Not applicable
	▶ Return parts MES: Does not apply
	
	Note: This Memory feature can only be used with Processor feature #5621.

#4497	**#4497 16 GB (4 X 4 GB) DIMMs, 276 PIN, 533 MHz, DDR2 SDRAM**
	Memory Feature is a total of 16 GB of memory. Four each 4 GB DIMMs. 276-pin DIMM, 533 MHz DDR2.
	
	Attributes provided: 16 GB of Memory.
	Attributes required: 4 empty DIMM slots.
	
	For 9117-MMA (#4497)
	▶ Minimum required: 0
	▶ Maximum allowed: 16 (Initial order maximum: 0)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  `http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument`
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: Not applicable
	▶ Return parts MES: Does not apply
	
	Note: This Memory feature can only be used with Processor feature # 5621.

#4498	**#4498 32 GB (4 X 8 GB) DIMMs, 276-pin, 400 MHz DDR2 SDRAM** Memory Feature is a total of 32 GB of memory. Four each 8 GB DIMMs. 276-pin DIMM, 400 MHz DDR2. Attributes provided: 32 GB of memory. Attributes required: 4 empty DIMM slots on processor card 8338. **For 9117-MMA (#4498)** ▶ Not supported on POWER6.

#4499	**#4499 16 GB (4 X 4 GB) DIMMs, 276-pin, 400 MHz DDR2 SDRAM** Memory Feature is a total of 16 GB of memory. Four each 4 GB DIMMs. 276-pin DIMM, 400 MHz DDR2. Attributes provided: 16 GB of memory Attributes required: 4 empty DIMM slots on processor card 8338 **For 9117-MMA (#4499)** ► Minimum required: 0 ► Maximum allowed: 16 (Initial order maximum: 0) ► OS level required: – AIX 5.2 TL10 or later – AIX 5.3 TL6 or later – IBM i 5.4 with V5R4M5 machine code or later For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to: http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument ► Initial Order/MES/Both/Supported: MES ► CSU: Not applicable ► Return parts MES: Does not apply
#4500	**#4500 0/4 GB 533 MHz DDR2 CoD Memory Card** This Capacity on Demand feature provides a four GB DDR2 memory card with zero GB of the memory active. When purchasing feature 4500, a minimum of 2 GB of the DDR2 memory is required to be activated (2 x #7669 DDR2 memory activations are required with every feature 4500 purchased). Memory activations are stored in the system, not on the memory card. If a DDR2 memory card is moved to a different system, that system will recognize zero GB as available on that memory card unless additional DDR2 memory activations are acquired or DDR2 memory activations are already present on that system. For the original system, the existing DDR2 memory activations remain and can be used for other DDR2 memory cards. For special situations, contact IBM CoD administration about transferring memory activations between systems. Attributes provided: Four GB DDR2 CoD memory card with 0 GB active. Attributes required: Empty memory slot. 100% of the memory must be activated through memory activation features #7669 or #7280 at time of purchase. DDR2 memory must be plugged in pairs of equal size. **For 9119-FHA (#4500)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later – AIX Version 5.3 with the 5300-08 Technology Level or later – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later – AIX Version 6.1 with the 6100-01 Technology Level or later – IBM i 5.4 with V5R4M5 machine code – IBM i 6.1 or later – Novell SUSE Linux Enterprise Server 10 SP2 for POWER or later – Red Hat Enterprise Linux version 4.7 and version 5.2 or later For systems and features that operate with Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: No ► Return parts MES: Feature conversion only **Notes**: ► Converts to either a #5693 or #5694. ► Does not migrate.

#4501	**#4501 0/8 GB 533 MHz DDR2 CoD Memory Card**
	This Capacity on Demand feature provides an eight GB DDR2 memory card with zero GB of the memory active. When purchasing feature 4501, a minimum of 4 GB of the DDR2 memory is required to be activated (4 x #7669 DDR2 memory activations are required with every feature 4501 purchased). Memory activations are stored in the system, not on the memory card. If a DDR2 memory card is moved to a different system, that system will recognize zero GB as available on that memory card unless additional DDR2 memory activations are acquired or DDR2 memory activations are already present on that system. For the original system, the existing DDR2 memory activations remain and can be used for other DDR2 memory cards. For special situations, contact IBM CoD administration about transferring memory activations between systems.

Attributes provided: Eight GB DDR2 CoD memory card with 0 GB active.
Attributes required: Empty memory slot. A minimum of 50% of the memory must be activated through memory activation features #7669 or #7280 at time of purchase. DDR2 memory must be plugged in pairs of equal size.

For 9119-FHA (#4501)
- Minimum required: 0
- Maximum allowed: 64 (Initial order maximum: 64)
- OS level required:
  - AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
  - AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
  - AIX Version 5.3 with the 5300-08 Technology Level or later
  - AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
  - AIX Version 6.1 with the 6100-01 Technology Level or later
  - IBM i 5.4 with V5R4M5 machine code
  - IBM i 6.1 or later
  - Novell SUSE Linux Enterprise Server 10 SP2 for POWER or later
  - Red Hat Enterprise Linux version 4.7 and version 5.2 or later

  For systems and features that operate with Linux, refer to:
  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
- Initial Order/MES/Both/Supported: Supported
- CSU: No
- Return parts MES: Feature conversion only

Notes:
- Converts to either a #5694 or #5695
- One #5694 must be ordered with each #4501 feature that migrates.

#4502	**#4502 0/16 GB 533 MHz DDR2 CoD Memory Card**
	This Capacity on Demand feature provides a sixteen GB DDR2 memory card with zero GB of the memory active. When purchasing feature 4502, a minimum of 8 GB of the DDR2 memory is required to be activated (8 x #7669 DDR2 minimum memory activations are required with every feature 4502 purchased). Memory activations are stored in the system, not on the memory card. If a DDR2 memory card is moved to a different system, that system will recognize zero GB as available on that memory card unless additional DDR2 memory activations are acquired or DDR2 memory activations are already present on that system. For the original system, the existing DDR2 memory activations remain and can be used for other DDR2 memory cards. For special situations, contact IBM CoD administration about transferring memory activations between systems.
	
	Attributes provided: Sixteen GB DDR2 CoD memory card with 0 GB active
	Attributes required:
	► Empty memory slot.
	► A 50% minimum of the memory must be activated through memory activation features #7669 or #7280 at time of purchase.
	► DDR2 Memory cards must be plugged in pairs of equal size.
	
	For 9119-FHA (#4502)
	► Minimum required: 0
	► Maximum allowed: 64 (Initial order maximum: 64)
	► OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	  – Novell SUSE Linux Enterprise Server 10 SP2 for POWER or later
	  – Red Hat Enterprise Linux version 4.7 and version 5.2 or later
	  For systems and features that operate with Linux, refer to:
	  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	► Initial Order/MES/Both/Supported: Supported
	► CSU: No
	► Return parts MES: Feature conversion only
	
	Notes:
	► Converts to either a #5695 or #5696.
	► One #5695 must be ordered with each #4502 feature that migrates.

| #4503 | **#4503 0/32 GB 400 MHz DDR2 CoD Memory Card**
This Capacity on Demand feature provides a thirty two GB DDR2 memory card with zero GB of the memory active. When purchasing feature 4503, a minimum of 32 GB of the DDR2 memory is required to be activated (32 x #7669 DDR2 memory activations are required with every feature 4503 purchased). Memory activations are stored in the system, not on the memory card. If a DDR2 memory card is moved to a different system, that system will recognize zero GB as available on that memory card unless additional DDR2 memory activations are acquired or DDR2 memory activations are already present on that system. For the original system, the existing DDR2 memory activations remain and can be used for other DDR2 memory cards. For special situations, contact IBM CoD administration about transferring memory activations between systems.

Attributes provided: Thirty two GB DDR2 CoD memory card with 0 GB active.
Attributes required:
▶ Empty memory slot.
▶ 100% of the memory must be activated through memory activation features #7669 or #7280 at time of purchase.
▶ DDR2 Memory cards must be plugged in pairs of equal size.

For 9119-FHA (#4503)
▶ Minimum required: 0
▶ Maximum allowed: 64 (Initial order maximum: 64)
▶ OS level required:
– AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
– AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
– AIX Version 5.3 with the 5300-08 Technology Level or later
– AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
– AIX Version 6.1 with the 6100-01 Technology Level or later
– IBM i 5.4 with V5R4M5 machine code
– IBM i 6.1 or later
– Novell SUSE Linux Enterprise Server 10 SP2 for POWER or later
– Red Hat Enterprise Linux version 4.7 and version 5.2 or later
For systems and features that operate with Linux, refer to:
http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
▶ Initial Order/MES/Both/Supported: Supported
▶ CSU: No
▶ Return parts MES: Feature conversion only

Notes:
▶ Converts to either a #5696 or #5697.
▶ One #5584 must be ordered with each #4503 feature that migrates. |
| #4599 | **#4599 PCI Blind Swap Cassette Kit, Single Wide Adapters, Universal**
This feature contains a blind swap cassette for single slot width PCI adapters. It also includes the necessary hardware to adapt the cassette to mount various sizes of PCI cards.

Attributes provided: Blind swap PCI cassette
Attributes required: PCI card and empty PCI adapter location

For 9119-FHA (#4599)
▶ Minimum required: 0
▶ Maximum allowed: 240 (Initial order maximum: 240)
▶ OS level required:
– IBM i 5.4 with V5R4M5 machine code
– IBM i 6.1 or later
▶ Initial Order/MES/Both/Supported: Both
▶ CSU: Yes
▶ Return parts MES: |

#4630	**#4630 DVD-RAM** This DVD-RAM device reads and writes 4.7 GB on single sided media. Double sided media, must be manually flipped. It can also read 640 MB CD-ROM media. Mounted in a removable media device slot, this feature can be used for alternate IPL, program distribution, and data interchange. Attributes provided: DVD-RAM Attributes required: Removable media device slot in an I/O tower or unit **For 9117-MMA (#4630) and 9119-FHA (#4630)** ▶ Minimum required: 0 ▶ Maximum allowed: 26 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No **Note**: Not supported in the CEC enclosures.
#4631	**#4631 - DVD-ROM** (No longer available as of 01 December 2005.) This DVD-ROM mounts in a removable media device slot. It can read 640 MB CD-ROM and 4.7 GB DVD-RAM media. #4631 can be used for Alternate IPL (IBM distributed CD-ROM media only) and program distribution. Attributes required: Removable media device slot in an I/O tower **For 9406-MMA (#4631)** ▶ Minimum required: 0 ▶ Maximum allowed: 96 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Supported as a #3706 on unified POWER6 MTMs ▶ CSU: Yes

#4633	**#4633 DVD-RAM**
	#4633 is a DVD-RAM that uses cartridgeless media only (this is different from the 4630, which can use cartridge media, but the media can be removed from the cartridge to be used in this drive). Media support will be limited to writing DVD-RAM only and reading of CD-ROM, CD-R, DVD-ROM, and DVD-RAM.
	
	Attributes provided: Read/Write of DVD-RAM media, Read only of CD-ROM, CD-R and DVD-ROM media
	Attributes required: Removable media device slot in an I/O tower
	
	For 9117-MMA (#4633)
	▶ Minimum required: 0
	▶ Maximum allowed: 26 (Initial order maximum: 0)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#4633)
	▶ Minimum required: 0
	▶ Maximum allowed: 24 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: MES
	CSU: Yes
	Return parts MES: No

#4643	**4643 7040-61D I/O Drawer Attachment Indicator**
	Indicates that a 7040-61D I/O drawer is being attached to the system.
	
	Attributes provided: 7040-61D I/O drawer indicator
	Attributes required: Empty I/O drawer location and RIO-2 ports
	
	For 9119-FHA (#4643)
	► Minimum required: 0
	► Maximum allowed: 12 (Initial order maximum: 12)
	► OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	  – Novell SUSE Linux Enterprise Server 10 SP2 for POWER or later
	  – Red Hat Enterprise Linux version 4.7 and version 5.2 or later
	  For systems and features that operate with Linux, refer to:
	  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	
	Not supported on unified POWER6 MTMs, Converted to #5809 on unified POWER6 MTMs.

#4644	**#4644 7045-SW4 Migrated Drawer Indicator** Indicates that a 7045-SW4 drawer is being migrated to a POWER5 rack environment. It is used to determine rack level power and cable requirements for the migrated location. Not supported on POWER6.
#4650	**#4650 Rack Indicator- Not Factory Integrated** This indicator is used to specify that the rack mountable device in this initial order should not be merged into a rack within IBM Manufacturing. **Note**: This *no additional charge* feature is placed on an initial order for a rack mountable device by the Configuration Tool when the order does not include a 19 inch rack. **Note**: A rack integration indicator is required on all 19 inch rack mountable device initial orders. One feature code from the group 4650 to 4666 must be listed on the order. More than one feature code from this group is not allowed. Attributes provided: System will not be shipped in a rack. Attributes required: None **For 9117-MMA (#4650)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: No

#4651	**#4651 Rack Indicator, Rack #1** When added to an initial rack order, this indicator is used to specify the first rack for a multi rack order, or the only rack for a single rack order. When added to an initial rack mountable device order, this indicator is used to specify that the rack mountable device (such as a system or I/O drawer) is to be mounted in rack #1. **Notes**: ► For 19 inch rack mountable device orders: One feature code from the group 4650 to 4666 must be listed on the order. More than one feature code from this group is not allowed. ► For 19 inch rack orders: If IBM Mfg. is to assemble a rack mountable device into the rack, one feature code selection from the group 4651 to 4666 must be listed on the order. More than one feature code selection from this group is not allowed. The quantity of this selected feature code on the 19 inch rack order must equal the number of rack mountable devices to be installed in the rack by IBM manufacturing. Attributes provided: Rack Integration/ Rack Specify Attributes required: Rack **For 9117-MMA (#4651)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: No
#4652	**#4652 Rack Indicator, Rack #2** When added to an initial rack order, this indicator is used to specify the second rack for a multi rack order. When added to an initial rack mountable device order, this indicator is used to specify that the rack mountable device (such as a system or I/O drawer) is to be mounted in rack #2 of a multi rack order. Notes: ► For 19 inch rack mountable device orders: One feature code from the group 4650 to 4666 must be listed on the order. More than one feature code from this group is not allowed. ► For 19 inch rack orders: If IBM manufacturing is to assemble a rack mountable device into the rack, one feature code selection from the group 4651 to 4666 must be listed on the order. More than one feature code selection from this group is not allowed. The quantity of this selected feature code on the 19 inch rack order must equal the number of rack mountable devices to be installed in the rack by IBM manufacturing. Attributes provided: Rack Integration/Rack specify Attributes required: Rack **For 9117-MMA (#4652)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: No

#4653	**#4653 Rack Indicator, Rack #3** When added to an initial rack order, this indicator is used to specify the third rack for a multi rack order. When added to an initial rack mountable device order, this indicator is used to specify that the rack mountable device (such as a system or I/O drawer) is to be mounted in rack #3 of a multi rack order. **Notes**: ▶ For 19 inch rack mountable device orders: One feature code from the group 4650 to 4666 must be listed on the order. More than one feature code from this group is not allowed. ▶ For 19 inch rack orders: If IBM manufacturing is to assemble a rack mountable device into the rack, one feature code selection from the group 4651 to 4666 must be listed on the order. More than one feature code selection from this group is not allowed. The quantity of this selected feature code on the 19 inch rack order must equal the number of rack mountable devices to be installed in the rack by IBM manufacturing. Attributes provided: Rack specify Attributes required: Rack **For 9117-MMA (#4653)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: No
#4654	**#4654 Rack Indicator, Rack #4** When added to an initial rack order, this indicator is used to specify the fourth rack for a multi rack order. When added to an initial rack mountable device order, this indicator is used to specify that the rack mountable device (such as a system or I/O drawer) is to be mounted in rack #4 of a multi rack order. Notes: ▶ For 19 inch rack mountable device orders: One feature code from the group 4650 to 4666 must be listed on the order. More than one feature code from this group is not allowed. ▶ For 19 inch rack orders: If IBM manufacturing is to assemble a rack mountable device into the rack, one feature code selection from the group 4651 to 4666 must be listed on the order. More than one feature code selection from this group is not allowed. The quantity of this selected feature code on the 19 inch rack order must equal the number of rack mountable devices to be installed in the rack by IBM manufacturing. Attributes provided: Rack specify Attributes required: Rack **For 9117-MMA (#4654)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: No

#4655	**#4655 Rack Indicator, Rack #5** When added to an initial rack order, this indicator is used to specify the fifth rack for a multi rack order. When added to an initial rack mountable device order, this indicator is used to specify that the rack mountable device (such as a system or I/O drawer) is to be mounted in rack #5 of a multi rack order. Notes: ▶ For 19 inch rack mountable device orders: One feature code from the group 4650 to 4666 must be listed on the order. More than one feature code from this group is not allowed. ▶ For 19 inch rack orders: If IBM manufacturing is to assemble a rack mountable device into the rack, one feature code selection from the group 4651 to 4666 must be listed on the order. More than one feature code selection from this group is not allowed. The quantity of this selected feature code on the 19 inch rack order must equal the number of rack mountable devices to be installed in the rack by IBM manufacturing. Attributes provided: Rack specify Attributes required: Rack **For 9117-MMA (#4655)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: No
#4656	**#4656 Rack Indicator, Rack #6** When added to an initial rack order, this indicator is used to specify the sixth rack for a multi rack order. When added to an initial rack mountable device order, this indicator is used to specify that the rack mountable device (such as a system or I/O drawer) is to be mounted in rack #6 of a multi rack order. **Notes**: ▶ For 19 inch rack mountable device orders: One feature code from the group 4650 to 4666 must be listed on the order. More than one feature code from this group is not allowed. ▶ For 19 inch rack orders: If IBM manufacturing is to assemble a rack mountable device into the rack, one feature code selection from the group 4651 to 4666 must be listed on the order. More than one feature code selection from this group is not allowed. The quantity of this selected feature code on the 19 inch rack order must equal the number of rack mountable devices to be installed in the rack by IBM manufacturing. Attributes provided: Rack specify Attributes required: Rack **For 9117-MMA (#4656)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: No

| #4657 | **#4657 Rack Indicator, Rack #7**
When added to an initial rack order, this indicator is used to specify the seventh rack for a multi rack order.

When added to an initial rack mountable device order, this indicator is used to specify that the rack mountable device (such as a system or I/O drawer) is to be mounted in rack #7 of a multi rack order.

Notes:
▶ For 19 inch rack mountable device orders: One feature code from the group 4650 to 4666 must be listed on the order. More than one feature code from this group is not allowed.
▶ For 19 inch rack orders: If IBM manufacturing is to assemble a rack mountable device into the rack, one feature code selection from the group 4651 to 4666 must be listed on the order. More than one feature code selection from this group is not allowed. The quantity of this selected feature code on the 19 inch rack order must equal the number of rack mountable devices to be installed in the rack by IBM manufacturing.

Attributes provided: Rack specify
Attributes required: Rack

For 9117-MMA (#4657)
▶ Minimum required: 0
▶ Maximum allowed: 1 (Initial order maximum: 1)
▶ OS level required: None
▶ Initial Order/MES/Both/Supported: Initial
▶ CSU: Not applicable
▶ Return parts MES: No |
| #4658 | **#4658 Rack Indicator, Rack #8**
When added to an initial rack order, this indicator is used to specify the eighth rack for a multi rack order.

When added to an initial rack mountable device order, this indicator is used to specify that the rack mountable device (such as a system or I/O drawer) is to be mounted in rack #8 of a multi rack order.

Notes:
▶ For 19 inch rack mountable device orders: One feature code from the group 4650 to 4666 must be listed on the order. More than one feature code from this group is not allowed.
▶ For 19 inch rack orders: If IBM manufacturing is to assemble a rack mountable device into the rack, one feature code selection from the group 4651 to 4666 must be listed on the order. More than one feature code selection from this group is not allowed. The quantity of this selected feature code on the 19 inch rack order must equal the number of rack mountable devices to be installed in the rack by IBM manufacturing.

Attributes provided: Rack specify
Attributes required: Rack

For 9117-MMA (#4658)
▶ Minimum required: 0
▶ Maximum allowed: 1 (Initial order maximum: 1)
▶ OS level required: None
▶ Initial Order/MES/Both/Supported: Initial
▶ CSU: Not applicable
▶ Return parts MES: No |

#4659	**#4659 Rack Indicator, Rack #9** When added to an initial rack order, this indicator is used to specify the ninth rack for a multi rack order. When added to an initial rack mountable device order, this indicator is used to specify that the rack mountable device (such as a system or I/O drawer) is to be mounted in rack #9 of a multi rack order. **Notes**: ► For 19 inch rack mountable device orders: One feature code from the group 4650 to 4666 must be listed on the order. More than one feature code from this group is not allowed. ► For 19 inch rack orders: If IBM manufacturing is to assemble a rack mountable device into the rack, one feature code selection from the group 4651 to 4666 must be listed on the order. More than one feature code selection from this group is not allowed. The quantity of this selected feature code on the 19 inch rack order must equal the number of rack mountable devices to be installed in the rack by IBM manufacturing. Attributes provided: Rack specify Attributes required: Rack **For 9117-MMA (#4659)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: No
#4660	**#4660 Rack Indicator, Rack #10** When added to an initial rack order, this indicator is used to specify the tenth rack for a multi rack order. When added to an initial rack mountable device order, this indicator is used to specify that the rack mountable device (such as a system or I/O drawer) is to be mounted in rack #10 of a multi rack order. **Notes**: ► For 19 inch rack mountable device orders: One feature code from the group 4650 to 4666 must be listed on the order. More than one feature code from this group is not allowed. ► For 19 inch rack orders: If IBM manufacturing is to assemble a rack mountable device into the rack, one feature code selection from the group 4651 to 4666 must be listed on the order. More than one feature code selection from this group is not allowed. The quantity of this selected feature code on the 19 inch rack order must equal the number of rack mountable devices to be installed in the rack by IBM manufacturing. Attributes provided: Rack specify Attributes required: Rack **For 9117-MMA (#4660)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: No

#4661	**#4661 Rack Indicator, Rack #11** When added to an initial rack order, this indicator is used to specify the eleventh rack for a multi rack order. When added to an initial rack mountable device order, this indicator is used to specify that the rack mountable device (such as a system or I/O drawer) is to be mounted in rack #11 of a multi rack order. **Notes**: ▶ For 19 inch rack mountable device orders: One feature code from the group 4650 to 4666 must be listed on the order. More than one feature code from this group is not allowed. ▶ For 19 inch rack orders: If IBM manufacturing is to assemble a rack mountable device into the rack, one feature code selection from the group 4651 to 4666 must be listed on the order. More than one feature code selection from this group is not allowed. The quantity of this selected feature code on the 19 inch rack order must equal the number of rack mountable devices to be installed in the rack by IBM manufacturing. Attributes provided: Rack specify Attributes required: Rack **For 9117-MMA (#4661)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: No
#4662	**#4662 Rack Indicator, Rack #12** When added to an initial rack order, this indicator is used to specify the twelfth rack for a multi rack order. When added to an initial rack mountable device order, this indicator is used to specify that the rack mountable device (such as a system or I/O drawer) is to be mounted in rack #12 of a multi rack order. **Notes**: ▶ For 19 inch rack mountable device orders: One feature code from the group 4650 to 4666 must be listed on the order. More than one feature code from this group is not allowed. ▶ For 19 inch rack orders: If IBM manufacturing is to assemble a rack mountable device into the rack, one feature code selection from the group 4651 to 4666 must be listed on the order. More than one feature code selection from this group is not allowed. The quantity of this selected feature code on the 19 inch rack order must equal the number of rack mountable devices to be installed in the rack by IBM manufacturing. Attributes provided: Rack specify Attributes required: Rack **For 9117-MMA (#4662)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: No

#4663	**#4663 Rack Indicator, Rack #13** When added to an initial rack order, this indicator is used to specify the thirteenth rack for a multi rack order. When added to an initial rack mountable device order, this indicator is used to specify that the rack mountable device (such as a system or I/O drawer) is to be mounted in rack #13 of a multi rack order. **Notes**: ▶ For 19 inch rack mountable device orders: One feature code from the group 4650 to 4666 must be listed on the order. More than one feature code from this group is not allowed. ▶ For 19 inch rack orders: If IBM manufacturing is to assemble a rack mountable device into the rack, one feature code selection from the group 4651 to 4666 must be listed on the order. More than one feature code selection from this group is not allowed. The quantity of this selected feature code on the 19 inch rack order must equal the number of rack mountable devices to be installed in the rack by IBM manufacturing. Attributes provided: Rack specify Attributes required: Rack **For 9117-MMA (#4663)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: No
#4664	**#4664 Rack Indicator, Rack #14** When added to an initial rack order, this indicator is used to specify the fourteenth rack for a multi rack order. When added to an initial rack mountable device order, this indicator is used to specify that the rack mountable device (such as a system or I/O drawer) is to be mounted in rack #14 of a multi rack order. **Notes**: ▶ For 19 inch rack mountable device orders: One feature code from the group 4650 to 4666 must be listed on the order. More than one feature code from this group is not allowed. ▶ For 19 inch rack orders: If IBM manufacturing is to assemble a rack mountable device into the rack, one feature code selection from the group 4651 to 4666 must be listed on the order. More than one feature code selection from this group is not allowed. The quantity of this selected feature code on the 19 inch rack order must equal the number of rack mountable devices to be installed in the rack by IBM manufacturing. Attributes provided: Rack specify Attributes required: Rack **For 9117-MMA (#4664)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: No ▶ Return parts MES: No

#4665	**#4655 Rack Indicator, Rack #15** When added to an initial rack order, this indicator is used to specify the fifteenth rack for a multi rack order. When added to an initial rack mountable device order, this indicator is used to specify that the rack mountable device (such as a system or I/O drawer) is to be mounted in rack #15 of a multi rack order. **Notes**: ▶ For 19 inch rack mountable device orders: One feature code from the group 4650 to 4666 must be listed on the order. More than one feature code from this group is not allowed. ▶ For 19 inch rack orders: If IBM manufacturing is to assemble a rack mountable device into the rack, one feature code selection from the group 4651 to 4666 must be listed on the order. More than one feature code selection from this group is not allowed. The quantity of this selected feature code on the 19 inch rack order must equal the number of rack mountable devices to be installed in the rack by IBM manufacturing. Attributes provided: Rack specify Attributes required: Rack **For 9117-MMA (#4665)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable
#4666	**#4666 Rack Indicator, Rack #16** When added to an initial rack order, this indicator is used to specify the sixteenth rack for a multi rack order. When added to an initial rack mountable device order, this indicator is used to specify that the rack mountable device (such as a system or I/O drawer) is to be mounted in rack #16 of a multi rack order. **Notes**: ▶ For 19 inch rack mountable device orders: One feature code from the group 4650 to 4666 must be listed on the order. More than one feature code from this group is not allowed. ▶ For 19 inch rack orders: If IBM manufacturing is to assemble a rack mountable device into the rack, one feature code selection from the group 4651 to 4666 must be listed on the order. More than one feature code selection from this group is not allowed. The quantity of this selected feature code on the 19 inch rack order must equal the number of rack mountable devices to be installed in the rack by IBM manufacturing. Attributes provided: Rack specify Attributes required: Rack **For 9117-MMA (#4666)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: No

#4687	**#4687 50 GB 1/4-in Cartridge Tape**
	Mounted in a removable media device slot of a system unit or an expansion tower, these tape units can be used for save/restore, alternate IPL, program distribution, migration and 1/4 inch cartridge tape exchange.
	#4687 will read/write the following tape formats:
	► 50 GB (up to 100 GB with compression in SLR100 format) with IBM SLR100-50GB Data Cartridge (35L0968)
	► 30 GB (up to 60 GB with compression in SLR60 format) with IBM SLR60-30GB Data Cartridge (19P4209)
	► 25 GB (up to 50 GB with compression in MLR3 format) with IBM MLR3-25GB Data Cartridge (59H4128)
	► 5 GB (up to 10 GB with compression in SLR100 format) with IBM SLR100-5GB Data Cartridge (35L0661)
	#4687 is capable of read only support of the following tape formats:
	► 16 GB (up to 32 GB with compression in QIC5010 format) with IBM MLR1-16GB Data Cartridge (59H4175)
	► 4 GB (QIC4GB format) with SLR5-4GB data Cartridge (59H3660)
	► 2 GB (up to 4 GB with compression in QIC5010 format) with IBM MLR1-2GB
	Specifications for the primary recording format:
	► Cartridge Capacity (Native) = 50.0 GB (1500-ft tape)
	► Cartridge Capacity (Compression) = 100.0 GB (1500-ft tape)
	► Data Rate (Native) = 5.0 MBps
	► Data Rate (Compression) = 10.0 MBps
	Attributes provided: 50 GB 1/4 inch Cartridge Tape Device
	Attributes required: Half-high removable media bay and a controller in place to interface to this media bay
	For 9406-MMA (#4687)
	► Minimum required: 0
	► Maximum allowed: 48 (Initial order maximum: 0)
	► OS level required:
	– IBM i 5.4 with V5R4M5 machine code or later
	– AIX 5.3L for POWER for IBM eServer or later
	– Red Hat Enterprise Linux AS for POWER Version 4.6 or later
	– SUSE LINUX Enterprise Server 10 SP2 for POWER or later
	► Initial Order/MES/Both/Supported: MES
	► CSU: Yes
#4690	**#4690 Rack Status Beacon Assembly**
	(No longer available as of 15 July 2005.)
	The Rack Status Beacon is designed to be placed on the top of a rack and cabled to multiple components inside the rack. Servers in the rack can be programmed to illuminate the beacon in response to any detected problems or changes in status. The Rack Status Beacon has redundant ac power inputs and draws its power from the rack Power Distribution Unit (PDU) outlets. At least one #6458 power cord must be ordered to connect the Rack Status Beacon to the PDU.
	Attributes provided: Indication of rack status
	Attributes required: Junction box (#4693) and at least 2 cables (#4691); one or two #6458 power cords
	For 9406-MMA (#4690)
	► Minimum required: 0
	► Maximum allowed: 48 (Initial order maximum: 0)
	► OS level required:
	– AIX 5L for POWER V5.2 for IBM eServer or later
	– Red Hat Enterprise Linux AS for POWER Version 4 with quarterly update 3 or later
	– SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes

#4691	**#4691 Rack Status Beacon Cable, Junction Box to Drawer or Status Beacon** Used to connect the Rack Status Beacon Junction Box to a supported rack drawer or to the Rack Status Beacon. Attributes provided: Connection between Rack Status Beacon components Attributes required: None **For 9117-MMA (#4691)** ▸ Not supported on POWER6.
#4692	**#4692 Rack Status Beacon Cable, Junction Box Daisy Chain** Used to connect two Rack Status Beacon Junction Boxes (#4693). Multiple Junction Boxes can be linked in series, as required. Attributes provided: Connection between (#4693) Junction Boxes Attributes required: Two or more (#4693) Junction Boxes For 9117-MMA (#4692) ▸ Not supported on POWER6.
#4693	**#4693 Rack Status Beacon Junction Box** Provides six input connectors and one output connector for racks configured with the Rack Status Beacon (#4690). Multiple Junction Boxes can be linked together in series with Daisy Chain Cable #4692. Attributes provided: Connection of multiple drawers to a single Rack Status Beacon (#4690). Attributes required: Feature #4690 and two or more #4691 cables. **For 9117-MMA (#4693)** ▸ Not supported on POWER6.

#4694	**#4694 0/8-core POWER6 4.2GHz CoD, 0-core Active Processor Book** Provides a POWER6 4.2 GHz processor book with Capacity on Demand. The processors are packaged on four Multi-Chip Modules (MCMs), each MCM containing a dual-core, 64 bit, copper-based processor. Each dual-core processor is supported by 4 MB of private L2 cache and 32 MB of shared L3 cache. Each 8-core processor book is dual threaded SMT which provides 4 I/O loop adapter slots which can be either RIO-2 loop adapter slots or 12X HCA loop adapter slots. It also provides 32 memory slots for a maximum of 8 memory feature codes. Attributes provided: 8-core processor book, 0-cores active. Attributes required: Available processor book slot. **For 9119-FHA (#4694)** ▶ Minimum required: 0 ▶ Maximum allowed: 8 (Initial order maximum: 8) ▶ OS level required: 　– AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later 　– AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later 　– AIX Version 5.3 with the 5300-08 Technology Level or later 　– AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later 　– AIX Version 6.1 with the 6100-01 Technology Level or later 　– IBM i 5.4 with V5R4M5 machine code 　– IBM i 6.1 or later 　– SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later 　– Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later 　Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to: 　`http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html` ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: Does not apply **Notes**: ▶ Required to have a minimum of 3 activations: 3/8-core minimum using #4754 x 3. ▶ Minimum initial order is 1. ▶ This processor (#4694) cannot be mixed with #4695 within a system.

#4695	**#4695 0/8-core POWER6 5.0GHz CoD, 0-core Active Processor Book** Provides a POWER6 5.0GHz processor book with Capacity on Demand. The processors are packaged on four Multi-Chip Modules (MCMs), each MCM containing a dual-core, 64 bit, copper-based processor. Each dual-core processor is supported by 4 MB of private L2 cache and 32 MB of shared L3 cache. Each 8-core processor book is dual threaded SMT which provides 4 I/O loop adapter slots which can be either RIO-2 loop adapter slots or 12X HCA loop adapter slots. It also provides 32 memory slots for a maximum of 8 memory feature codes. Attributes provided: 8-core processor book, 0-cores active. Attributes required: Available processor book slot. **For 9119-FHA (#4695)** ► Minimum required: 0 ► Maximum allowed: 8 (Initial order maximum: 8) ► OS level required: – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later – AIX Version 5.3 with the 5300-08 Technology Level or later – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later – AIX Version 6.1 with the 6100-01 Technology Level or later – IBM i 5.4 with V5R4M5 machine code – IBM i 6.1 or later – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html ► Initial Order/MES/Both/Supported: Both ► CSU: No ► Return parts MES: Does not apply **Notes**: ► Required to have a minimum of 3 activations: 3/ 8-core minimum using #4755 x 3. ► Minimum initial order is 2. ► This processor (#4695) cannot be mixed with #4694 within a system.
#4746	**#4746 PCI Twinaxial Workstation IOA** Provides support for up to 40 twinaxial displays and printers. A 20-ft cable with an 8-port expansion (breakout) box is included with this adapter. Each expansion port supports seven attached devices, allowing for 56 total attached devices, of which only 40 can be active. Attributes provided: Attachment of twinaxial devices. Attributes required: One PCI slot (3V or 5V) **For 9117-MMA (#4746)** ► Minimum required: 0 ► Maximum allowed: 100 (Initial order maximum: 100) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later **For 9119-FHA (#4746)** ► Minimum required: 0 ► Maximum allowed: 134 (Initial order maximum: 134) ► OS level required: – IBM i 5.4 with V5R4M5 machine code – IBM i 6.1 Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No **Note**: Not supported in the CEC enclosures.

#4654	**#4754 Processor Activation #4754**
	Permanently activates one processor on CoD processor feature #4694.
	
	Attributes provided: One processor activation
	Attributes required: Inactive CoD processor
	
	For 9119-FHA (#4754)
	▶ Minimum required: 0
	▶ Maximum allowed: 64 (Initial order maximum: 64)
	▶ OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	  Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	  `http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html`
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No

#4755	**#4755 Processor Activation #4755**
	Permanently activates one processor on CoD processor feature #4695.
	
	Attributes provided: One processor activation
	Attributes required: Inactive CoD processor
	
	For 9119-FHA (#4755)
	▶ Minimum required: 0
	▶ Maximum allowed: 64 (Initial order maximum: 64)
	▶ OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	  Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	  `http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html`
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No

#4764	**#4764 PCI-X Cryptographic Coprocessor (FIPS 4)**
	Provides both cryptographic coprocessor and secure-key cryptographic accelerator functions in a single PCI-X card. The coprocessor functions are targeted to banking and finance applications. Financial PIN processing and Europay, MasterCard, Visa (EMV) credit card functions are provided. EMV is a standard for integrated-chip based credit cards. The secure-key accelerator functions are targeted to improving the performance of Secure Sockets Layer (SSL) transactions. The #4764 provides the security and performance required to support eBusiness and emerging digital signature applications. Host application access to the cryptographic services of the #4764 are through the Common Cryptographic Architecture (CCA) application programming interfaces (APIs) or additionally (as of 3/30/2007) through Public-Key Cryptographic Standards (PKCS#11) APIs. Only one API can be loaded on a single feature 4764 card. The #4764 provides secure storage of cryptographic keys in a tamper-resistant hardware security module (HSM), which is designed to meet FIPS 140 security requirements. FIPS 140 is a U.S. Government National Institute of Standards & Technology (NIST) administered standard and certification program for cryptographic modules.
	The firmware for the #4764 is shipped on a CD that is part of the feature. Software installation documentation is shipped on the same CD.
	Note: Prior to 30 March 2007, only CCA was supported (available on CD LCD8-0477-00). Customers who install feature 4764 prior to 30 March 2007, who now want to install PKCS#11, can contact 1-800-IBM-SERV to request ECA 618 for use with feature 4764. Only one API can be loaded on a single feature 4764 card. Customers currently running with CCA support do not need this ECA as there is no newer version of the CCA function on this new CD.
	Attributes provided: ▶ Cryptographic Accelerator Function ▶ EMV-Based Credit Card Function ▶ CCA API Host Support ▶ PKCS#11 API (as of 30 March 2007); Both CCA APIs and PKCS#11 APIs are included on CD LCD8-0477-01, titled 4764 PCI-X ▶ Cryptographic Coprocessor Support Version 2.0. Attributes required: One PCI-X card slot per 4764 FC.
	Note: Only one API (CCA or PKCS11 but not both) can be loaded per 4764 Feature.
	For 9117-MMA (#4764) and 9119-FHA (#4764) ▶ Minimum required: 0 ▶ Maximum allowed: 32 (Initial order maximum: 32) ▶ OS level required: – AIX 5.2 TL10 or later – AIX 5.3 TL6 or later – IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No
	Note: Two maximum per CEC enclosure

| #4801 | **#4801 PCI Crypto Coprocessor**
#4801 provides a rich set of data encryption and authentication services for applications requiring high security. Cryptographic keys are stored in a tamper-resistant module on the coprocessor. This feature is ideally suited for banking and financial applications. With the tamper resistant-module the coprocessor can also be used to implement other advanced applications such as electronic postage metering.

Application services provided by the coprocessor include:
▶ Data encryption using Tripe-DES (Data Encryption Standard)
▶ Digital signature generation/verification using RSA public-key cryptography
▶ Data integrity checking using MD5 and SHA-1 secure hash algorithms
▶ Financial PIN support for automatic teller machine (ATM) networks
▶ Basic Secure Electronic Transaction (SET) block operations
▶ Secure storage of keys in a Federal Information Processing Standard (FIPS) 140-1 Level 3 tamper-resistant module
▶ The PCI Cryptographic Coprocessor is compatible with IBM's Common Cryptographic Architecture (CCA).

For more information, visit:
http://www.ibm.com/security/cryptocards/

Option 35 CCA Cryptographic Service Provider is required along with Cryptographic Access Provider 128-bit (5722-AC3) licensed program. Both Option 35 and the LPP are no-charge.

For 9117-MMA (#4801) and 9119-FHA (#4801)
▶ Minimum required: 0
▶ Maximum allowed: 32 (Initial order maximum: 0)
▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
▶ Initial Order/MES/Both/Supported: Supported
▶ CSU: Yes
▶ Return parts MES: No |
| #4805 | **#4805 PCI Crypto Accelerator**
Feature #4805 provides improved performance for high-transaction-rate secure Web applications which use the secure sockets layer (SSL) or transport layer security (TLS) protocols. SSL/ TLS is the predominant method for securing Web transactions. Applications using SSL/TLS include those transferring payment information (for example, credit card numbers) over the Internet, for example, between a Web browser and a server in the case of B2C or between servers in the case of B2B. Establishing SSL/TLS secure Web connections requires very compute intensive cryptographic processing. Feature #4805 off-loads cryptographic processing associated with the establishment of a SSL/TLS session, thus freeing the server for other processing.

The Cryptographic Accelerator is targeted to high-transaction-rate secure Web applications using SSL/TLS. If your application requires a FIPS 140-1 certified, tamper-resistant module for storing cryptographic keys or requires financial PIN processing, then features #4801 or #4802, Cryptographic Coprocessors should be your choice.

Note: FIPS 140-1 is a U.S. Government National Institute of Standards and Technology (NIST) administered standard and certification program for cryptographic modules.
http://www.ibm.com/eserver/iSeries/support

For 9117-MMA (#4805)
▶ Minimum required: 0
▶ Maximum allowed: 8 (Initial order maximum: 0)
▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later

For 9117-MMA (#4764) and 9119-FHA (#4764)
▶ Initial Order/MES/Both/Supported: Supported
▶ CSU: Yes
▶ Return parts MES: No |

| #4806 | **#4806 - PCI-X Crypto Coprocessor**
Provides both cryptographic coprocessor and secure-key cryptographic accelerator functions in a single PCI-X card. The coprocessor functions are targeted to banking and finance applications. Financial PIN processing and Europay, MasterCard, Visa (EMV) credit card functions are provided. EMV is a standard for integrated-chip based credit cards. The secure-key accelerator functions are targeted to improving the performance of i5/OS Secure Sockets Layer (SSL) transactions. The #4806 provides the security and performance required to support eBusiness and emerging digital signature applications.

The #4806 provides secure storage of cryptographic keys in a tamper-resistant hardware security module (HSM), which is designed to meet FIPS 140-1 and 2 security requirements. FIPS 140 is a U.S. Government National Institute of Standards and Technology (NIST) administered standard and certification program for cryptographic modules.

The firmware for the #4806 is available on a separately ordered/ distributed CD. This firmware is an LPO product: 5733-CY1 Cryptographic Device Manager. The #4806 also requires LPP 5722-AC3 Cryptographic Access Provider to enable data encryption.

This feature has country-specific usage. Refer to the IBM representatives in your country for availability or restrictions.

Attributes provided: Cryptographic Accelerator Function, EMV-Based Credit Card Function
Attributes required: One PCI-X card slot, LPO 5733-CY1, LPP 5722-AC3

Note: This feature is converted to #4764 on unified POWER6 MTMs.

For 9406-MMA (#4806)
►   Minimum required: 0
►   Maximum allowed: 8 (Initial order maximum: 8)
►   OS level required: IBM i 5.4 with V5R4M5 machine code or later
►   Initial Order/MES/Both/Supported: Both
►   CSU: Yes
►   System Max. table |

#4812	**#4812 PCI Integrated xSeries Server**
	#4812 is a double wide PCI card that contains a 2.0 GHz processor with 2 MB integrated L2 cache. It has two integrated 1000/100/10 Mbps ethernet ports, two USB 1.1 ports and traditional PC keyboard and mouse ports. A keyboard and mouse can either connect to the traditional ports or connect to the USB ports. There is an SVGA video port for connection of a display.
	#4812 has two memory slots. These slots must always contain a pair of identical memory features. Available memory features are: ► #0446 - 512 MB DDR Server Memory (MES only) ► #0447 - 1 GB DDR Server Memory (MES only)
	The #4812 requires an IOP #2844 to drive it. The IOP can be shared, but only one #4812 is permitted per IOP.
	When #4812 is ordered, the configurator will add two #0446 512 MB Server Memory features to the order. The two #0446 features can be replaced with two #0447 Optional 1 GB Server Memory features or the two server memory features can be removed from the order and two #0446 or two #0447 can be installed in the field. The configurator will also add to the order a #2844 PCI IOP to drive the #4812. The #2844 can be removed from the order for PCI slot conservation.
	The two integrated 1000/100/10 Mbps Ethernet LAN ports included on the #4812 provide attachment to IEEE standard 802.3ab high-speed (1 Gbps) Ethernet LANs. They can also be used to connect to existing 10 and 100 Mbps Ethernet networks. The adapter supports UTP CAT 5 or higher media interface and TCP/IP. The #4812 does not support any other LAN features and does not support native i5/OS functions.
	The following features are defaulted (where offered) and can be removed from the order: ► #0325 IPCS Extension Cable for Windows (for display, mouse and keyboard) ► #1700 IPCS Keyboard and Mouse for Windows
	Supported Windows versions: ► Windows 2000 Server ► Windows 2000 Advanced Server ► Windows Server® 2003 Standard Edition ► Windows Server 2003 Enterprise Edition ► Windows Server 2003 Web Edition
	For versions of Windows 2000, a display is required and must be connected to the #4812. For versions of Windows 2003, a display is not required but can be connected to the #4812 to support Windows. If no display is connected, the Virtual System Console is used.
	For Linux server products supported on #4812, refer to: http://www.ibm.com/eserver/iseries/integratedxseries/linux

#4812 Continued	**#4812 PCI Integrated xSeries Server**
	Attributes provided: Windows server functions
	Attributes required: IOP and two 3.3V PCI card slots
	
	For 9117-MMA (#4812)
	▶ Minimum required: 0
	▶ Maximum allowed: 57 (Initial order maximum: 0)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#4812)
	▶ Minimum required: 0
	▶ Maximum allowed: 48 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	(Return parts MES: No
	
	Note: #4812 can only be installed in expansion unit (not in #5790)

#4813	**#4813 PCI Integrated xSeries Server** #4813 is a double-wide PCI card that contains a 2.0 GHz processor with 2 MB integrated L2 cache. It has two integrated 1000/100/10 Mbps Ethernet ports, two USB 1.1 ports and traditional PC keyboard and mouse ports. A keyboard and mouse can connect to either the traditional ports or the USB ports. There is an SVGA video port for connection of a display. The #4813 is a #4812 encased in a double wide blind swap cassette. #4813 has two memory slots. These slots must always contain a pair of identical memory features. Available memory features are: ▶ #0446 - 512 MB DDR Server Memory (MES only) ▶ #0447 - 1 GB DDR Server Memory (MES only) The #4813 requires an IOP #2844 to drive it. The IOP can be shared, but only one #4813 is permitted per IOP. When #4813 is ordered, the configurator will add two #0446 (formerly #9726 on System i models) Base 512 MB Server Memory features to the order. The two #0446 features can be replaced with two #8546 Optional Base 1 GB Server Memory features or the two server memory features can be removed from the order and two #0446 or two #0447 can be installed in the field. The configurator will also add to the order a #2844 Base PCI IOP to drive the #4813. The #2844 can be removed from the order for PCI slot conservation. The two integrated 1000/100/10 Mbps Ethernet LAN ports included on the #4813 provide attachment to IEEE standard 802.3ab high-speed (1 Gbps) Ethernet LANs. They can also be used to connect to existing 10 and 100 Mbps Ethernet networks. The adapter supports UTP CAT 5 or higher media interface and TCP/IP. The #4813 does not support any other LAN features and does not support native i5/OS functions. The following features are defaulted (where offered) and can be removed from the order: ▶ #0325 IPCS Extension Cable for Windows (for display, mouse and keyboard) ▶ #1700 IPCS Keyboard and Mouse for Windows Supported Windows versions: ▶ Windows 2000 Server ▶ Windows 2000 Advanced Server ▶ Windows Server 2003 Standard Edition ▶ Windows Server 2003 Enterprise Edition ▶ Windows Server 2003 Web Edition For versions of Windows 2000, a display is required and must be connected to the #4813. For versions of Windows 2003, a display is not required but can be connected to the #4813 to support Windows. If no display is connected, the Virtual System Console is used. For Linux server products supported on #4813, visit: http://www.ibm.com/eserver/iseries/integratedxseries/linux Attributes provided: Windows server functions Attributes required: IOP and two 3.3V PCI card slots

#4813 Continued	**#4813 PCI Integrated xSeries Server**
	 For 9117-MMA (#4813)
	 ▶ Minimum required: 0
	 ▶ Maximum allowed: 57 (Initial order maximum: 0)
	 ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	 For 9119-FHA (#4813)
	 ▶ Minimum required: 0
	 ▶ Maximum allowed: 48 (Initial order maximum: 0)
	 ▶ OS level required:
	   – IBM i 5.4 with V5R4M5 machine code
	   – IBM i 6.1 or later
	
	 Initial Order/MES/Both/Supported: Supported
	 CSU: Yes
	 Return parts MES: No
	
	 Note: #4813 can only be installed in a #5790 PCI Expansion Drawer.

#4891	**#4891 CBU Specify** This specify code indicates this system has been properly registered as a Capacity BackUp system and has, through that registration been authorized to temporarily receive IBM i Operating System License Entitlements and 5250 Processor Enablement entitlements, from a primary system under the conditions specified at the time the system was registered. This feature is an indicator only. Authorization to use this system as a backup is obtained only by registering the system with IBM on the CBU Web site at: http://www.ibm.com/systems/power/hardware/cbu Attributes provided: Indicates the system has been registered for use as a CBU system for IBM i License entitlement purposes. Attributes required: #2145 Primary OS - IBM i **For 9117-MMA (#4891)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Not applicable ▶ Return parts MES: No **Note**: Feature #4891 can be ordered on an MES order only when ordered with a Model Conversion from Machine Type 9406.

#4896	**#4896 IBM i CBU Specify**
	This specify code indicates this system has been properly registered as a Capacity BackUp system and has, through that registration been authorized to temporarily receive IBM i operating system License Entitlements and 5250 Processor Enablement entitlements, from a primary system under the conditions specified at the time the system was registered. This feature is an indicator only, authorization to use this system as a backup is obtained only by registering the system with IBM on the IBM i CBU Web site.
	
	Attributes provided: Indicates the system has been registered for use as a CBU system for IBM i License entitlement purposes.
	Attributes required: # 2145 Primary OS - IBM i
	
	For 9119-FHA (#4896)
	► Minimum required: 0
	► Maximum allowed: 1 (Initial order maximum: 0)
	► OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	► Initial Order/MES/Both/Supported: MES
	► CSU: Not applicable
	► Return parts MES: Does not apply

#4911	**#4911 2/8W Serv Feat 570 4x7380** This server feature denotes the use of four #7380 0/2-way processor features with the initial installation of a POWER6 570. This represents a 8-way system in two processor enclosures. Later #5801 MES orders can increase the number of processor enclosures and increase the size n-way associated with the server feature. **For 9406-MMA (#4911)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: No
#4912	**#4912 4/16W Serv Feat 570 8x7380** This server feature denotes the use of eight #7380 0/2-way processor features with the initial installation of a POWER6 570. This represents a 16-way system in four processor enclosures. **For 9406-MMA (#4912)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: No
#4922	**#4922 - 1/4W Serv Feat 570 2x7380** This server feature denotes the use of two #7380 0/2-way processor features with the initial installation of a POWER6 570. This represents a 4-way system in one processor enclosure. Later #5801 MES orders can increase the number of processor enclosures and increase the size n-way associated with the server feature. **For 9406-MMA (#4922)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: No

#4923	**#4923 - 1/8W Serv Feat 570 4x7380** This server feature denotes the use of four #7380 0/2-way processor features with the initial installation of a POWER6 570. This represents a 8-way system in two processor enclosures. Later #5801 MES orders can increase the number of processor enclosures and increase the size n-way associated with the server feature. **For 9406-MMA (#4923)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No
#4924	**#4924 2/16W Serv Feat 570 8x7380** This server feature denotes the use of eight #7380 0/2-way processor features with the initial installation of a POWER6 570. This represents a 16-way system in four processor enclosures. **For 9406-MMA (#4924)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No
#4953	**#4953 IBM 64-bit/66 MHz PCI ATM 155 UTP Adapter** The IBM 64-bit/66 MHz PCI ATM 155 UTP Adapter provides dedicated, 155 Mbps full-duplex connection to ATM networks over either permanent virtual circuits (PVC) or switched virtual circuits (SVC). This adapter enables TCP/IP to run over an ATM network with Category-5 Unshielded Twisted Pair (UTP). It also supports communication with devices located on an ATM network or bridged to a token ring, Ethernet, or other LAN. Attributes provided: One ATM 155 UTP connector Attributes required: One PCI slot **For 9117-MMA (#4953) and 9119-FHA (#4953)** ▶ Not supported on POWER6.
#4957	**#4957 IBM 64-bit/66 MHz PCI ATM 155 MMF Adapter** The IBM 64-bit/66 MHz PCI ATM 155 MMF Adapter provides direct access to ATM networks. This 155 Mbps PCI ATM MMF Adapter provides dedicated 155 Mbps full-duplex connection using permanent virtual circuits (PVC) or switched virtual circuits (SVC) and enables TCP/IP to run over an ATM network. The adapter also supports communication with devices located on an ATM network or bridged to a token ring, Ethernet, or other LAN. This 155 Mbps PCI MMF ATM Adapter is compatible with: ▶ IBM 8285 ATM Workgroup Switch ▶ IBM 8260 ATM Subsystem ▶ IBM 8282 ATM Concentrator ▶ IBM 8281 ATM LAN Bridge Attributes provided: One ATM 155 Mbps MMF connection Attributes required: One PCI slot **For 9117-MMA (#4957) and 9119-FHA (#4957)** ▶ Not supported on POWER6.

#4959	**4959 IBM Token-Ring PCI Adapter** The IBM token-ring PCI Adapter for RS/6000 is a single slot, short, 32-bit, PCI adapter supporting 4 Mbps or 16 Mbps data rates, either half- duplex or full-duplex. Automatic Ring-Speed selection prevents "wrong speed" insertion into the ring, even when connected to speed-sensing hubs. This adapter will operate with either unshielded twisted pair (UTP) Cat 5 cable with RJ-45 connectors or shielded twisted pair (STP) Type 1A cabling with 9-pin D-shell connectors. The token-ring PCI Adapter will provide network boot capability. Attributes required: A single empty 32-bit PCI adapter slot. **For 9117-MMA (#4959) and 9119-FHA (#4959)** ► Not supported on POWER6.
#4960	**#4960 IBM e-business Cryptographic Accelerator** The IBM e-business Cryptographic Accelerator is a short form factor PCI Secure Socket Layer (SSL) hardware accelerator adapter. For Secure Web transaction, SSL operations is a key requirement. To do this, public-key cryptographic operations using SSL handshake protocol is employed. The IBM e-business Cryptographic Accelerator is a hardware cryptographic solution that off-loads this compute-intensive public-key cryptographic processing from the host. The overall operation control, including command decoding, is implemented in hardware and requires no on-card microprocessor subsystem. As such, the adapter is a less expensive alternative to those who do not need the high security of the on-card secure programming environment such as is offered by the PCI Cryptographic Coprocessor(#4958), but do need the high cryptographic performance that hardware acceleration provides by offloading the host processor. **Note**: The IBM e-business Cryptographic Accelerator is only supported by the industry standard PKCS #11 application programming interface (API) Version 2.01, and applications which interface to the PKCS #11 Support Program. Attributes provided: Data encryption using PCI bus to host Attributes required: 1 PCI slot **For 9117-MMA (#4960) and 9119-FHA (#4960)** ► Not supported on POWER6.

#4961	**#4961 IBM Universal 4-Port 10/100 Ethernet Adapter** IBM Universal 4-Port 10/100 Ethernet Adapter is a single slot, long, 64-bit, 33 MHz PCI adapter supporting 4 industry standard Ethernet 10 Base-T or 100 Base-T interfaces either half or full duplex. Each port is provided with it's own RJ-45 connector for attachment to standard CAT-3/5 Unshielded Twisted Pair (UTP) cable. The adapter is IEEE 802.3u compatible and provides full auto-negotiation for detecting speed and duplex capability across each port. Network boot capability and Network Install Manager (NIM) capability are available using this adapter if no specific limitation is stated. The IBM Universal 4-Port 10/100 Ethernet Adapter (#4961) should be considered where maximum port density is required per I/O card slot. But, for high end systems, where card slots are not the limiting factor and maximum throughput is required, the single port IBM 10/100 Mbps Ethernet PCI Adapter II (#4962) or the IBM 10/100 Mbps Ethernet PCI Adapter (#2968) are the preferred solutions. Below are some performance factors to consider when choosing the right adapter for your needs. These performance comparisons are based on all four ports of the IBM Universal 4-Port 10/100 Ethernet Adapter (#4961) being active. With all four ports under full bandwidth conditions, a single IBM Universal 4-Port 10/100 Ethernet Adapter (#4961) is expected to deliver up to 3 times the comparable performance of a single IBM 10/100 Mbps Ethernet PCI Adapter II (#4962) or the IBM 10/100 Mbps Ethernet PCI Adapter (#2968). Under most conditions, each port of the IBM Universal 4-Port 10/ 100 Ethernet Adapter (#4961) is expected to perform at greater than 50% the throughput of the single port of the IBM 10/100 Mbps Ethernet PCI Adapter II (#4962) or the IBM 10/100 Mbps Ethernet PCI Adapter (#2968). **Note**: The resulting performance in your environment compared to the above can vary and depends upon the RS/6000 model, the I/O configuration, and associated workload of your applications. Attributes provided: 4 ports of 10/100 Base-Tx Ethernet Attributes required: 1 PCI slot Not supported on POWER6.

#4962	**#4962 10/100 Mbps Ethernet PCI Adapter II**
	The 10/100 Mbps Ethernet PCI Adapter II is a small form factor, single port PCI ethernet adapter. This high performance, low power ethernet 10/100 Mbps LAN adapter can be used in both client and server PCI systems. The 10/100 Mbps Ethernet PCI Adapter II provides both 10Base-T and 100Base-TX full duplex ethernet LAN connectivity. The adapter supports Category-5 unshielded twisted pair cabling for both 10/100 Mbps and Category-3 unshielded twisted pair cabling for 10 Mbps.
	The 10/100 Mbps Ethernet PCI Adapter II supports:
	▶ Half / Full Duplex 10/100 Mbps Ethernet interface
	▶ 10/100 Mbps data rates
	▶ Auto-negotiation for 10/100 speed and half/full duplex
	▶ Network boot capability and Network Install Manager (NIM)
	▶ IEEE 802.3 Ethernet Specification
	▶ IEEE 802.3u Fast Ethernet Specification
	After 4/26/02, the 10/100 Mbps Ethernet PCI Adapter II supports the off-load of IP Security cryptographic algorithms by providing hardware assistance in performing data encryption and authentication. This support is provided with AIX 5.1 (with appropriate software updates) and later software. This IP Security function, normally performed with encryption software by the host, is off-loaded to this adapter to enhance network traffic throughput and reduce CPU utilization. If you are running with AIX 5.1, to invoke the IP Security function on the adapter, you must obtain AIX 5.1 software updates IY27069 and IY26514 or the 5100-02 Recommended Maintenance package. These updates can be obtained by ordering APAR IY28102, or by ordering the AIX 5.1 Update CD (LCD4-1103-03) dated 4/2002 or later.
	Notes:
	▶ This IP Security function is not supported with AIX 4.3 software.
	▶ An additional function called *Large Send* or sometimes known as *TCP Segmentation* is also available. This function offloads the TCP segmentation operation from the AIX IP layer to the adapter for outgoing (transmit side) TCP segments. Another function known as *Checksum Offload* which offloads the TCP/UDP Checksum Operation or workload from the CPU to the adapter is also available. Both these functions are available with AIX version 5.1 with APAR IY38248 or later software, or AIX version 5.2 with APAR IY38492 or later software.
	▶ Not supported on POWER6.

#4963	**#4963 PCI Cryptographic Coprocessor (FIPS-4)**
	The PCI Cryptographic Coprocessor (FIPS-4) is a 2/3 length PCI adapter which combines hardware and software to provide a wide variety of security services. The PCI Cryptographic Coprocessor (FIPS-4) is a second generation adapter of the Cryptographic Coprocessor family that provides high performance secure hardware engines for secure internet transactions such as transmitting data, verifying electronic signatures, bulk data encryption and decryption. In addition, the card is enclosed in a tamper proof enclosure to restrict access to on card resources, designed to FIPS 140-1 Level 4 standards.
	Security functions supported by the adapter include:
	► DES (Data Encryption Standard) (40 and 56 bit key) encryption and decryption, with pre-and post-padding; the coprocessor uses both ECB (electronic and codebook) and CBC (cipher block chain) modes of encryption.
	► MAC (Message Authentication) generation and MAC verification services
	► Triple DES (three key) encryption and decryption of eight-byte units
	► Secure RSA key-pair generation
	► RSA signature generation and signature verification at 18 signatures per second at 2048 bits
	► Hardware random number generation
	► Secure data storage and retrieval
	► Other non-cryptographic security utilities can be carried out using the onboard processor
	As part of this adapter's physical security features, the following events will cause an adapter shutdown and secure data zeroization:
	► Shipping/Storage Temperature less than -15C or greater than 95C
	► Dead Battery (VBAT less than 2.4V)
	► Supply Voltage greater than 3.3V/12V max
	► Mesh Sensor opens/shorts detection
	► X-ray exposure
	IBM offers software to enable your use of the Coprocessors. Two different approaches to cryptographic functions are offered for download from the following Web site:
	http://www.ibm.com/security/cryptocards
	PKCS #11 Version 2.01, an implementation of the industry-standard API
	IBM Common Cryptographic Architecture (CCA), featuring support of special interest to the finance industry. Under custom contract, IBM also offers toolkits that you can employ to develop extensions to the CCA offering and to develop your own application to exploit the secure computing environment and cryptographic hardware. For more information on custom contracts, refer to the following Web site:
	http://www.ibm.com/security/cryptocards
	For additional information about the IBM PCI Cryptographic Coprocessor, refer to the following Web site:
	http://www.ibm.com/security/cryptocards
	Limitations: The IBM PCI Cryptographic Coprocessor Adapter is a field only installed device in order to meet restrictive shipping requirements.
	Attributes provided: Data encryption using PCI bus to host
	Attributes required: 1 PCI slot
	For 9117-MMA (#4963) and 9119-FHA (#4963)
	► Not supported on POWER6.

| #4964 | **#4964 PCI Cryptographic Coprocessor**
The IBM PCI Cryptographic Coprocessor is a 2/3 length PCI adapter combining hardware and software designed to provide high performance hardware engines for secure internet transactions such as data exchange, verifying electronic signatures, bulk data encryption and decryption. Cryptographic processes are performed within a tamper resistant enclosure on the adapter that is designed to meet FIPS PUB 140-1 standard for commercial cryptographic devices at Level 3.

Security functions supported by the adapter includes:
► Data Encryption Standard (DES) (56 and 40 bit keys) encryption and decryption, with pre-and post-padding; the coprocessor uses both electronic and codebook (ECB) and cipher block chain (CBC) modes of encryption.
► Message Authentication (MAC) and financial PIN processing
► Triple DES encryption and decryption of general data
► RSA key-pair generation
► RSA signature generation and signature verification
► Secure Hashing Algorithm (SHA-1) in hardware
► Hardware random number generation
► Protected data storage and retrieval
► Other non-cryptographic security utilities can be carried out using the onboard processor

IBM offers software to enable your use of the Coprocessors. Two different approaches to cryptographic functions are offered for download at:
http://www.ibm.com/security/cryptocards

PKCS #11 Version 2.01, an implementation of the industry-standard API
IBM Common Cryptographic Architecture (CCA), featuring support of special interest to the finance industry. Under custom contract, IBM also offers toolkits that you can employ to develop extensions to the CCA offering and to develop your own application to exploit the secure computing environment and cryptographic hardware. For more information about custom contracts, refer to:
http://www.ibm.com/security/cryptocards

For additional information about the IBM PCI Cryptographic Coprocessor, refer to:
http://www.ibm.com/security/cryptocards

Limitations: The IBM PCI Cryptographic Coprocessor Adapter is a field only installed device in order to meet restrictive shipping requirements.

Note: This adapter can have AIX 5.1 support limitations. To view the latest AIX 5.1 support limitation statements, see:
http://www.ibm.com/servers/aix/os/adapters/51.html

Attributes provided: Data encryption using PCI bus to host
Attributes required: 1 PCI slot

For 9117-MMA (#4964) and 9119-FHA (#4964)
► Not supported on POWER6. |
| #4990 | **#4990 Single 5250 Enterprise Enablement**
Activates one processors worth of 5250 Enterprise Enablement on a 9117-MMA in an IBM i environment.

Attributes provided: One Processor of 5250 Enterprise Enablement
Attributes required: IBM i environment

For 9117-MMA (#4990)
► Minimum required: 0
► Maximum allowed: 16 (Initial order maximum: 16)
► OS level required: IBM i 5.4 with V5R4M5 machine code or later
► Initial Order/MES/Both/Supported: Both
► CSU: Not applicable
► Return parts MES: No |

#4991	**#4991 Full 5250 Enterprise Enablement** Fully activates 5250 Enterprise Enablement on a 9117-MMA in an IBM i environment Attributes provided: Full 5250 Enterprise Enablement Attributes required: IBM i environment **For 9117-MMA (#4991)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Not applicable ▶ Return parts MES: No

#4995	**#4995 Single #5250 Enterprise Enablement**
	Activates one processors worth of 5250 Enterprise Enablement on a 9119-FHA with IBM i environment. #4995 provides the 9119-FHA one processor's worth of 5250 OLTP capacity that can be spread across multiple physical processors or multiple partitions. A permanently activated processor and adequate IBM i operating system processor license entitlements are prerequisites.
	
	Attributes provided: One Processor of Enterprise Enablement
	Attributes required: 9119-FHA and an IBM i environment.
	
	For 9119-FHA (#4995)
	▶ Minimum required: 0
	▶ Maximum allowed: 64 (Initial order maximum: 64)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No

#4996	**#4996 Full #5250 Enterprise Enablement**
	Fully activates 5250 Enterprise Enablement on a 9119-FHA with IBM i environment. #4996 provides the 9119-FHA full activation of 5250 OLTP capacity that is spread across all multiple activated processors or multiple partitions. Permanently activated processors and adequate IBM i operating system processor license entitlements are prerequisites.
	
	Attributes provided: Full Enterprise Enablement
	Attributes required: 9119-FHA and IBM i environment.
	
	For 9119-FHA (#4996)
	▶ Minimum required: 0
	▶ Maximum allowed: 1 (Initial order maximum: 1)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No

#5000	**#5000 Software Preload Required** Indicates that preloaded software or consolidated I/O is shipped with the initial order. A maximum of one (#5000) is supported. This feature has country-specific usage. Attributes provided: Software Pre-load Attributes required: Not applicable **For 9117-MMA (#5000) and 9119-FHA (#5000)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: No
#5001	**#5001 Custom Service Specify** Specifies that the system will receive special request services from the Customer Solution Center (CSC). Attributes provided: Customization Attributes required: None **For 9117-MMA (#5001) and 9119-FHA (#5001)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
#5002	**#5002) Customer Solution Center - IBM Mfg** Indicates that machine is to be routed to the CSC. This feature has country-specific usage. Attributes provided: CSC support **For 9117-MMA (#5002) and 9119-FHA (#5002)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: No
#5005	**#5005 Software Preinstall** Licensed programs can be preinstalled on the media selected. To order this option, specify code (#5005) on the initial system order. The preinstalled licensed programs will be at the same release level as programs being shipped from the Program Libraries at the time the system is manufactured. Attributes provided: None Attributes required: None **For 9117-MMA (#5005) and 9119-FHA (#5005)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: Does not apply

#5088	**#5088 PCI-X Expansion Unit** (No longer available as of 01 June 2006.) The #5088 is an eight-EIA-unit-high top hat with is installed on top of a #5094 expansion tower. Each #5088 has 14 PCI-X slots for PCI IOPs and IOAs. Disk units and removable media are not supported within a #5088. Each #5088 has two redundant 575W power supplies and two internal power connectors that attach to the ac distribution box in the #5094. A #5094 can have one or two line cords, so the #5088 might or might not have dual line cord capability depending on the configuration of the #5094. If a #5088 is ordered together with a #5094, the #5094 will ship with a #5088 installed on top. The #5088 can also be ordered for field install on an existing #5074 or 5094. A #5088 cannot be installed on a #5294 or #5079. One or two RIO-2 cables must be ordered to attach the #5088 to the RIO-2 ports. Select the appropriate cable based on the cable length required. ▶ #3156 - 1.75 m RIO-2 Cable ▶ #3168 - 2.5 m RIO-2 Cable ▶ #3146 - 1 m RIO-2 Cable ▶ #3147 - 3.5 m RIO-2 Cable ▶ #3148 - 10 m RIO-2 Cable ▶ #1485 - 15 m RIO-2 Cable Each #5088 requires one of the following SPCN cables: ▶ #1466 - 30 m SPCN Cable-supported only ▶ #6001 - 2 m SPCN Cable -supported only ▶ #6006 - 3 m SPCN Cable ▶ #6007 - 15 m SPCN Cable ▶ #6008 - 6 m SPCN Cable ▶ #6029 - 30 m SPCN Cable Attributes provided: 14 PCI-X slots Attributes required: Two HSL connections **For 9117-MMA (#5088) and 9119-FHA (#5088)** ▶ Minimum required: 0 ▶ Maximum allowed: 48 (Initial order maximum: 0) ▶ OS level required: 　– AIX supported only for migration from M/T 9406 　– IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No

#5094	**(#5094 PCI-X Expansion Tower** The #5094 is an I/O expansion tower that can contain up to 45 disk units, has 14 PCI slots and two removable media bays. One bus adapter to provide the RIO-2 interface to the system is required with each #5094. Select one of the following: #9517 - Base HSL-2 Bus Adapter, to specify two copper RIO-2 ports One or two cables must be ordered to attach to the RIO-2 ports. Select the appropriate cable length required. The following RIO cables can be used with a #5094: ▶ #3256 1.75m RIO-2 Cable ▶ #3268 2.5m RIO-2 Cable ▶ #3146 1m RIO-2 Cable ▶ #3147 4m RIO-2 Cable ▶ #3148 10m RIO-2 Cable One SPCN cable is required for each #5094. Select from the following: ▶ #1466 30m SPCN Cable ▶ #6001 2m SPCN Cable ▶ #6006 3m SPCN Cable ▶ #6007 15m SPCN Cable ▶ #6008 6m SPCN Cable ▶ #6029 30m SPCN Cable Each #5094 can support 15 disk units without a #5108 installed. With #5108 installed, a #5094 can support up to 45 disk units, total. Each #5094 comes with redundant, hot-swap, power supplies. To enable further #5094 redundancy, dual line cord capability for the #5094 is provided by feature#5115. An additional #5094 line cord must be ordered when installing a #5115. Plugging in the second line cord, even if to the same outlet, enables the ac power modules to be redundant. The following line cords are supported on a #5094: ▶ #1399 - 4.3 m 300V/16A ▶ #1406 - 200 V 16A 14-ft TL Line Cord ▶ #6455 - 4.3 m 200 V/16A Pwr Cd Italy ▶ #1409 - 4.3 m 200 V/16A Pwr Cd AU/NZ ▶ #1418 - 4.3 m 200 V/16A Pwr Cd S Afric ▶ #1419 - 4.3 m 200 V/16A Pwr Cd Israel ▶ #1420 - 4.3 m 200 V/16A Pwr Cd EU/Asia ▶ #1421 - 4.3 m 200 V/16A Pwr Cd CH/DK ▶ #1451 - 200 V 6-ft Line Cord ▶ #1452 - 200 V 14-ft Line Cord ▶ #1453 - 200 V 6-ft Locking Line Cord ▶ #1454 - 200 V 12A 14-ft TL Line Cord (U.S. default) ▶ #1455 - 200 V 6-ft Wtrtght Line Cord ▶ #1456 - 200 V 14-ft Wtrtght Line Cord ▶ #1476 - 4.3 m 200 V/12A Pwr Cd UK The 45 disk unit positions are in groups of 15, each group of 15 disk units is further divided into three groups of five disk units, each group of five disk units supported on a separate SCSI (LVD-SCSI) bus from a #2757, #2780, or #5712 PCI Disk Unit Controller. The #5094 removable media bays are supported by the same #2757, #2780, or #5712 PCI Disk Unit Controller which supports the 5 base disk unit positions (disk slot positions D31 through D50).

#5094 Continued	**#5094 PCI-X Expansion Tower**
	Attributes provided: 14 PCI slots, up to 45 disk positions (15 base, 0 featurable), two removable media bays
	Attributes required: RIO-2 connection
	
	For 9117-MMA (#5094)
	▶ Minimum required: 0
	▶ Maximum allowed: 48 (Initial order maximum: 0)
	▶ OS level required:
	  – AIX supported only for migration from M/T 9406
	  – IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5094)
	▶ Minimum required: 0
	▶ Maximum allowed: 96 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#5095	**#5095 - PCI-X Expansion Tower**
	The #5095 is a stand-alone (desk side) PCI-X Expansion Tower that provides expanded I/O capability for iSeries systems. The #5095 has seven PCI-X IOP/IOA slots and supports up to 12 disk units.
	
	A #9844 Base PCI IOP is included with each #5095.
	
	Note: With the availability of V5R4, #9844 is no longer included with #5095.
	
	A bus adapter to provide the HSL interface to the system is required. Select one of the following:
	▶ #9517 - Base HSL-2 Bus Adapter, to specify two copper HSL-2 ports
	▶ #9876 - Base Optical Bus Adapter, to specify two optical HSL ports
	
	Note: If ordered for a 9408-M25 or 9409-M50 a #6699 (RIO-2 Bus Adapter) must be ordered instead of a #9517 or #9876.
	
	One or two HSL cables must be ordered with each #5095.
	
	When ordering cables to connect to the HSL interface, optical HSL, copper HSL, copper HSL-2, or copper HSL to HSL-2 cables are required. An HSL loop uses all optical or all copper ports/cables. A copper loop can intermix I/O towers/units with copper HSL and copper HSL-2 ports. Select the appropriate cable based on the type of HSL ports to which it is being attached, and the cable length required.
	
	The following HSL cables can be used with a #5095:
	▶ Copper HSL to HSL-2 (HSL on one end and HSL-2 on the other end)
	  – #1474 - 6 m HSL to HSL-2 Cable
	  – #1475 - 10 m HSL to HSL-2 Cable
	  – #1487 - 3 m HSL to HSL-2 Cable
	▶ Copper HSL-2 (HSL-2 on both ends of the cable)
	  – #1307 - 1.75 m HSL-2 Cable
	  – #3168 - 1.75 m HSL-2 Cable on unified POWER6 MTMs
	  – #1308 - 2.5 m HSL-2 Cable
	  – #3149 - 2.5 m HSL-2 Cable on unified POWER6 MTMs
	  – #1481 - 1.2 m HSL-2 Cable
	  – #3146 - 1.2 m HSL-2 Cable on unified POWER6 MTMs
	  – #1482 - 3.5 m HSL-2 Cable
	  – #3156 - 3.5 m HSL-2 Cable on unified POWER6 MTMs
	  – #1483 - 10 m HSL-2 Cable
	  – #1485 - 15 m HSL-2 Cable
	▶ Optical HSL (optical HSL connections on both ends of the cable)
	  – #1470 - 6 m HSL Optical Cable
	  – #1471 - 30 m HSL Optical Cable
	  – #1472 - 100 m HSL Optical Cable
	  – #1473 - 250 m HSL Optical Cable
	
	One SPCN cable is required with each #5095. Select one of the following:
	▶ #1463 - 2 m SPCN Cable
	▶ #1464 - 6 m SPCN Cable
	▶ #1465 - 15 m SPCN Cable
	▶ #1466 - 30 m SPCN Cable
	▶ #0369 - 100 m Optical SPCN Cable
	▶ #1468 - 250 m Optical SPCN Cable
	▶ #6001 - 2 m SPCN Cable
	▶ #6006 - 3 m SPCN Cable
	▶ #6007 - 15 m SPCN Cable
	▶ #6008 - 6 m SPCN Cable
	▶ #6029 - 30 m SPCN Cable

#5095 Continued	**5095 - PCI-X Expansion Tower**
	The #5095 has redundant power when feature #5138 is installed. The #5138 provides a second 435W power supply. In addition, when a #5138 is installed, a second line cord must be ordered. The presence of the #5138 and the second line cord, enables dual line cord capability.
	Select one of the following line cords, or select two if #5138 is ordered:
	▶ #1394 - 4.3 m 200V/10A Pwr Crd Brazil
	▶ #1395 - 4.3 m 200V/10A Pwr Cd China
	▶ #1397 - 4.3 m 200V/10A Pwr Crd Argent
	▶ #1398 - 4.3 m 100V/10A Pwr Crd Brazil
	▶ #1410 - 200 V 6-ft Line Cord
	▶ #1411 - 200 V 14-ft Line Cord
	▶ #1412 - 125 V 6-ft Line Cord
	▶ #1413 - 125 V 14-ft Line Cord
	▶ #1414 - 200 V 6-ft Locking Line Cord
	▶ #1415 - 200 V 6-ft Watertight Line Cord
	▶ #1416 - 200 V 14-ft Locking Line Cord
	▶ #1417 - 200 V 14-ft Wtrtght Line Cord
	▶ #1422 - 3 m IEC 320 C13/14 PDU Cord
	▶ #1438 - 4.3 m 200 V/10A Pwr Cd AU/NZ
	▶ #1439 - 4.3 m 200 V/10A Pwr Cd EU/Asia
	▶ #1440 - 4.3 m 200 V/10A Pwr Cd Denmark
	▶ #1441 - 4.3 m 200 V/10A Pwr Cd S Africa
	▶ #1442 - 4.3 m 200 V/10A Pwr Cd Swiss
	▶ #1443 - 4.3 m 200 V/10A Pwr Cd UK
	▶ #1444 - 4.3 m 200 V/10A Pwr Cd Italy
	▶ #1445 - 4.3 m 200 V/10A Pwr Cd Israel
	▶ #6458 - 14-ft Int 250 V/10A Pwr Cd
	▶ #6460 - 14-ft 125 V/15A Power Cord
	▶ #6469 - 14-ft 250 V/15A Power Cord
	▶ #6470 - 6-ft 125 V/15A Power Cord
	▶ #6471 - 9-ft 125 V/15A Power Cord
	▶ #6472 - 9-ft 250 V/16A Power Cord
	▶ #6473 - 9-ft 250 V/10A Power Cord
	▶ #6474 - 9-ft 250 V/13A Power Cord
	▶ #6475 - 9-ft 250 V/16A Power Cord
	▶ #6476 - 9-ft 250 V/10A Power Cord
	▶ #6477 - 9-ft 250 V/10A Power Cord
	▶ #6478 - 9-ft 250 V/16A Power Cord
	▶ #6479 - 9-ft 250 V/10A Power Cord
	▶ #6487 - 6-ft 250 V/15A Power Cord
	▶ #6488 - 9-ft Dual Voltage Pwr Cd
	▶ #6493 - 9-ft 250 V/10A Power Cord
	▶ #6494 - 9-ft 250 V/10A Power Cord
	▶ #6495 - 9-ft 250 V/10A Power Cord
	▶ #6496 - 9-ft 250 V/10A Power Cord
	▶ #6497 - 6-ft 250 V/15A Power Cord
	▶ #6498 - 6-ft 250 V/15A Power Cord
	▶ #6651 - 9-ft 127 V/15A Power Cord
	▶ #6659 - 9-ft 240 V/15A Power Cord
	▶ #6660 - 14-ft 127 V/15A Power Cord
	▶ #6669 - 14-ft 240 V/15A Power Cord
	▶ #6670 - 6-ft 125 V/15A Power Cord
	▶ #6680 - 9-ft 250 V/10A Power Cord
	▶ #6687 - 6-ft 250 V/15A Power Cord

#5095 Continued	Attributes provided: 7 PCI slots and 12 disk positions Attributes required: HSL cables (either copper or optical) **For 9406-MMA (#5095)** ► Minimum required: 0 ► Maximum allowed: 48 (Initial order maximum: 48) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later Initial Order/MES/Both/Supported: Both CSU: Yes
#5096	**#5096 PCI-X Exp Tower (no disk)** #5096 is an I/O expansion tower that has 14 PCI slots. It does not support disk units and does not support any internal removable media devices. A #5088 cannot be mounted on a #5096. One bus adapter to provide the RIO-2 interface to the system is required with each #5096. One or two cables must be ordered to attach to the RIO-2 ports. Select the appropriate cable based on the cable length required. The following RIO cables can be used with a #5096: ► #3156 - 1.75 m RIO-2 Cable ► #3168 - 2.5 m RIO-2 Cable ► #3146 1 m RIO-2 Cable ► #3147 4 m RIO-2 Cable ► #3148 10 m RIO-2 Cable One of the following SPCN cables is required for each #5096: ► #1466 30 m SPCN Cable ► #6001 2 m SPCN Cable ► #6006 3 m SPCN Cable ► #6007 15 m SPCN Cable ► #6008 6 m SPCN Cable ► #6029 30 m SPCN Cable No base IOP is included with the #5096. Each #5096 comes with redundant, hot-swap, power supplies. To enable further #5096 redundancy, dual line cord capability for the #5096 is provided by feature #5115. An additional #5096 line cord must be ordered when installing a #5115. Plugging in the second line cord, even if to the same outlet, enables the ac power modules to be redundant. The following line cords are supported on a #5096: ► #1399 - 4.3 m 300 V/16A ► #1406 - 200 V 16A 14-Ft TL Line Cord ► #4655 - 4.3 m 200 V/16A Pwr Cd Italy ► #1409 - 4.3 m 200 V/16A Pwr Cd AU/NZ ► #1418 - 4.3 m 200 V/16A Pwr Cd S Afric ► #1419 - 4.3 m 200 V/16A Pwr Cd Israel ► #1420 - 4.3 m 200 V/16A Pwr Cd EU/Asia ► #1421 - 4.3 m 200 V/16A Pwr Cd CH/DK ► #1451 - 200 V 6-ft Line Cord ► #1452 - 200 V 14-ft Line Cord ► #1453 - 200 V 6-ft Locking Line Cord ► #1454 - 200 V 12A 14-ft TL Line Cord (U.S. default) ► #1455 - 200 V 6-ft Wtrtght Line Cord ► #1456 - 200 V 14-ft Wtrtght Line Cord ► #1476 - 4.3 m 200 V/12A Pwr Cd UK Attributes provided: 14 PCI slots Attributes required: RIO-2 connection

#5096	**#5096 PCI-X Exp Tower (no disk)**
	For 9117-MMA (#5096)
	▶ Minimum required: 0
	▶ Maximum allowed: 48 (Initial order maximum: 0)
	▶ OS level required:
	  – AIX supported only for migration from M/T 9406
	  – IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5094)
	▶ Minimum required: 0
	▶ Maximum allowed: 96 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#5108	**#5108 30-Disk Expansion Feature**
	#5108 is a disk unit expansion enclosure feature for a single line cord #5094 PCI-X Expansion Tower. #5108 includes two 15-disk-unit enclosures, one 765-watt power supply, back-planes, and cables. One PCI Disk Unit Controller is required to support each 15-disk-unit enclosure.
	
	Attributes provided: 30 additional disk unit slots
	Attributes required: #5094 PCI-X Expansion Tower
	
	For 9117-MMA (#5108)
	▶ Minimum required: 0
	▶ Maximum allowed: 48 (Initial order maximum: 48)
	▶ OS level required IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5108)
	▶ Minimum required: 0
	▶ Maximum allowed: 12 (Initial order maximum: 12)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: MES
	CSU: No
	Return parts MES: No

#5115	**#5115 Dual Line Cords - Tower** #5115 is a dual line cord enabler for the upper unit in a #5094 PCI-X Expansion Tower. #5115 includes an additional power supply. An additional line cord must be specified. Plugging in the second line cord, even if to the same outlet, enables the ac power modules to be redundant. Attributes provided: Dual line cord capability Attributes required: #5094 **For 9117-MMA (#5115)** ▶ Minimum required: 0 ▶ Maximum allowed: 48 (Initial order maximum: 48) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later **For 9119-FHA (#5115)** ▶ Minimum required: 0 ▶ Maximum allowed: 12 (Initial order maximum: 12) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#5116	**#5116 Dual Line Cords - 5294 Tower** Provides dual line cord capability for a single enclosure in a #5294 tower. Two line cords must be specified for each #5116 ordered with a #5294. When ordering a #5116 for an installed #5294, an additional line cord must be specified for each #5116. The configurator will default two #5116s, for each #5294 ordered with a system that has dual line cords on the system unit. Plugging in the second line cord, even if to the same outlet, enables the ac power modules to be redundant. Attributes provided: Dual line cord capability for a single unit in a #5294 Attributes required: #5294 **For 9117-MMA (#5116)** ▶ Minimum required: 0 ▶ Maximum allowed: 48 (Initial order maximum: 48) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later **For 9119-FHA (#5116)** ▶ Minimum required: 0 ▶ Maximum allowed: 12 (Initial order maximum: 12) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#5138	**#5138 Redundant Power and Cooling** #5138 provides redundant power for the #0595 PCI-X Expansion Towers. #5138 includes a second 435W power supply, and requires that a second line cord be specified. The second line cord enables dual line cord capability. Attributes provided: Redundant Power Attributes required: #0595 PCI-X Expansion Tower. **For 9117-MMA (#5138)** ▶ Minimum required: 0 ▶ Maximum allowed: 48 (Initial order maximum: 48) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No

#5160	**#5160 Power Distribution Unit 1 Phase NEMA**
	Provides a single phase NEMA PDU for 19 inch Racks. Each PDU provides six outlets.
	
	System units or expansion units would use a #6458 line cord to connect to the #5160.
	
	The following line cords are supported on the #5160:
	▶ #1424 - 200 V 6-ft Locking Line Cord (supported, not orderable)
	▶ #1425 - 200 V 6-ft Wtrtght Line Cord (supported, not orderable)
	▶ #1426 - 200 V 14-ft Locking Line Cord
	▶ #1427 - 200 V 14-ft Wtrtght Line Cord
	▶ #1446 - 4.3 m 200 V/30A Pwr Cd Korea
	▶ #1447 - 4.3 m 200 V/30A Pwr Cd AU
	▶ #1448 - 4.3 m 200 V/30A Pwr Cd NZ (supported, not orderable)
	
	Attributes provided: Power Distribution Unit
	Attributes required: 19 inch Rack
	
	For 9117-MMA (#5160)
	▶ Minimum required: 0
	▶ Maximum allowed: 192 (Initial order maximum: 0)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5160)
	▶ Minimum required: 0
	▶ Maximum allowed: 250 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#5161	**#5161 Power Distribution Unit 1 Phase IEC**
	Provides a single phase IEC PDU for iSeries racks. Each PDU provides six outlets.
	
	System units or expansion units would use a #6458 line cord to connect to the #5161.
	
	The following line cord is supported on the #5161:
	▶ #1449 - 4.3m 200V/32A Pwr Cd EU 1-PH
	
	Attributes provided: Power Distribution Unit
	Attributes required: 19 Inch Rack
	
	For 9117-MMA (#5161)
	▶ Minimum required: 0
	▶ Maximum allowed: 192 (Initial order maximum: 0)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5161)
	▶ Minimum required: 0
	▶ Maximum allowed: 250 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#5262	**#5162 Power Distribution Unit 2 of 3 Phase**
	Provides a 2 of 3 phase Power Distribution Unit (PDU) for iSeries Racks. Each PDU provides six outlets.
	
	The following line cord is supported on the #5162:
	▶ #1450 - 4.3 m 200V/16A Pwr Cd EU 2-PH (supported, not orderable)
	
	Attributes provided: Power Distribution Unit
	Attributes required: 19-in Rack
	
	For 9117-MMA (#5162)
	▶ Minimum required: 0
	▶ Maximum allowed: 192 (Initial order maximum: 0)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5162)
	▶ Minimum required: 0
	▶ Maximum allowed: 250 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#5163	**#5163 Power Distribution Unit - 3 Phase**
	Provides a 3 phase Power Distribution Unit (PDU) for iSeries Racks. Each PDU provides six outlets.
	
	System units or expansion units use a #6458 line cord to connect to the #5163.
	
	The following line cord is supported on the #5163:
	▶ #1477 - 4.3m 200V/16A PWR CD
	
	Attributes provided: Power Distribution Unit
	Attributes required: 19 Inch Rack
	
	For 9117-MMA (#5163)
	▶ Minimum required: 0
	▶ Maximum allowed: 192 (Initial order maximum: 0)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5163)
	▶ Minimum required: 0
	▶ Maximum allowed: 250 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#5164	**#5164 Dual Pwr Cords - 8294/9194** #5164 provides dual line cord capability for the #9194 Base PCI-X Expansion Tower and the lower enclosure in the #8294 Optional Base 1.8M Rack. An additional line cord must be specified if #5164 is ordered on the #9194 or 8294. When ordering a #5164 for an installed #9194 or 8294, an additional line cord must also be ordered. The configurator will default a #5164 if the #9194 or 8294 is ordered on a system that has dual line cords on the system unit. Plugging in the second line cord, even if to the same outlet, enables the ac power modules to be redundant. Attributes provided: Dual line cord capability for the #9194 Base PCI-X Expansion Tower and the lower enclosure in a #8294 Optional Base1.8M Rack Attributes required: #9194 Base PCI-X Expansion Tower or #8294Optional Base 1.8 m Rack **For 9119-FHA (#5164)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No

#5165	**#5165 Dual Pwr Cords - 8294** #5165 provides dual line cord capability for the upper enclosure in the #8294 Optional Base 1.8M Rack. An additional line cord must be specified if #5165 is ordered on the #8294. When ordering a #5165 for an installed #8294, an additional line cord must also be ordered. The configurator will default a #5165 if the #8294 is ordered on a system that has dual line cords on the system unit. Plugging in the second line cord, even if to the same outlet, enables the ac power modules to be redundant. Attributes provided: Dual line cord capability for the upper enclosure in a #8294 Optional Base 1.8M Rack Attributes required: #8294 Optional Base 1.8M Rack **For 9119-FHA (#5165)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No
$5168	**#5168 30-Disk Exp for 9194 Tower** #5168 is a disk unit expansion enclosure feature for the #9194 Base PCI-X Expansion Tower. #5168 includes two 15-disk-unit enclosures, one power supply, back-planes and cables. One disk unit controller is required to support each of the two 15-disk-unit enclosures included with #5168. Attributes provided: 30 additional disk unit slots Attributes required: #9194 Base PCI-X Expansion Tower **For 9119-FHA (#5168)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: No ▶ Return parts MES: No

| #5294 | **#5294 1.8 m I/O Tower**
The #5294 is a I/O expansion tower that can contain up to 90 disk units, has 28 PCI slots and has four removable media bays.

Each #5294 is essentially two #5094 PCI Expansion Towers, with side covers and casters removed, placed in a 1.8M rack. Each #5294 counts as two #5094s towards the system model maximums.

Two bus adapters, to provide the RIO interfaces to the system, are required with each #5294.

The upper and lower enclosures (#5094s) in a #5294 are not connected internally by a RIO cable. If the #5294 is to be placed in a RIO loop (both upper and lower enclosure on same RIO loop), an RIO-2 cable is required to connect the upper and lower enclosures.

Select the appropriate cable based on the length required.

Select three or four (any combination) of the following RIO cables, on first #5094 on system, initial order. For additional #5094s or on an MES, select two, three or four (any combination) RIO-2 cables per tower:

The following RIO-2 cables can be used with a #5294:
▶ #3146 1 m RIO-2 Cable
▶ #3147 4 m RIO-2 Cable
▶ #3148 10 m RIO-2 Cable

Select two of the following SPCN cables for each #5294:
▶ #6001 2 m SPCN Cable
▶ #6008 6 m SPCN Cable
▶ #6007 15 m SPCN Cable
▶ #6006 3 m SPCN Cable
▶ #6007 15 m SPCN Cable
▶ #6008 6 m SPCN Cable
▶ #6029 30 m SPCN Cable

For each #5294 ordered, a quantity of two #0694(#5094 Equivalent) specify codes will be added to the order. If a #5294 is to be shared between two systems, one #0694 must be removed from the original ordering system and added to the sharing system, using an RPO (Record Purpose Only) change.

Each of the two tower units within a #5294 fully support 45 disk units (no #5108s need be ordered).

Dual line cord capability is available for the #5294 with feature #5116. With a #5116 installed, both tower units of a #5294 will have dual line cord capability. Two additional line cords (for a total of four) must be ordered when a #5116 is installed. Plugging in the second line cord from the upper and lower units, even if to the same outlet, enables each unit's ac power modules to be redundant. For the best power protection, the first and second line cords should be attached to different power sources.

The following line cords are supported on a #5294 (two line cord features required):
▶ #1399 - 4.3m 300V/16A
▶ #1406 - 200V 16A 14-Ft TL Line Cord
▶ #6455 - 4.3m 200V/16A Pwr Cd Italy
▶ #1409 - 4.3m 200V/16A Pwr Cd AU/NZ
▶ #1418 - 4.3m 200V/16A Pwr Cd S Afric
▶ #1419 - 4.3m 200V/16A Pwr Cd Israel
▶ #1420 - 4.3m 200V/16A Pwr Cd EU/Asia
▶ #1421 - 4.3m 200V/16A Pwr Cd CH/DK
▶ #1451 - 200V 6-Ft Line Cord
▶ #1452 - 200V 14-Ft Line Cord
▶ #1453 - 200V 6-Ft Locking Line Cord
▶ #1454 - 200V 12A 14-Ft TL Line Cord
▶ #1455 - 200V 6-Ft Wtrtght Line Cord
▶ #1456 - 200V 14-Ft Wtrtght Line Cord
▶ #1476 - 4.3m 200V/12A Pwr Cd UK |

#5294 Continued	**#5294 1.8 m I/O Tower**
	The 45 disk unit positions in each unit of a #5294, are in groups of 15, each group of 15 disk units is further divided into three groups of five disk units, each group of five disk units supported on a separate SCSI (LVD-SCSI) bus from a PCI Disk Unit Controller.
	The two removable media bays of each unit within a #5294 are supported by the same PCI Disk Unit Controller that supports disk unit positions D31 through D35) of each internal tower unit.
	Attributes provided: 28 PCI slots, 90 disk unit positions, four removable media bays
	Attributes required: RIO connections, two to four wall electrical outlets, at least one #0694 on the inventory records
	For 9117-MMA (#5294)
	▸ Minimum required: 0
	▸ Maximum allowed: 24 (Initial order maximum: 0)
	▸ OS level required:
	– AIX supported only for migration from M/T 9406
	– IBM i 5.4 with V5R4M5 machine code or later
	For 9119-FHA (#5294)
	▸ Minimum required: 0
	▸ Maximum allowed: 96 (Initial order maximum: 0)
	▸ OS level required:
	– IBM i 5.4 with V5R4M5 machine code
	– IBM i 6.1 or later
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#5296	**1.8 m I/O Tower (no disk)** The #5296 is a I/O expansion tower that has 28 PCI slots, no disk unit bays, and no removable media bays. Each #5296 is essentially two #5096 PCI-X Expansion Towers, with side covers and casters removed, placed in a 1.8 m rack. Each #5296 counts as two #5096s towards the system model maximums. Two bus adapters, to provide the RIO-2 interfaces to the system, are required with each #5296. Select two of the following: ▶ #6417 - Base RIO-2 Bus Adapter (for copper RIO-2 interfaces) The upper and lower enclosures (#5096s) in a #5296 are not connected internally by a RIO cable. If the #5296 is to be placed in an RIO loop (both upper and lower enclosure on same RIO loop), a RIO-2 cable is required to connect the upper and lower enclosures. A copper loop can intermix I/O towers/units with copper RIO and copper RIO-2 ports. Select the appropriate cable based on the cable length required. Select three or four of the following RIO cables, on initial orders, for the first #5296 on the system. For additional #5296s, or on an MES order, select two, three, or four of the following RIO cables per tower: ▶ #3156 - 1.75 m RIO-2 Cable ▶ #3168 - 2.5 m RIO-2 Cable ▶ #3146 1 m RIO-2 Cable ▶ #3147 4 m RIO-2 Cable ▶ #3148 10 m RIO-2 Cable Select two of the following SPCN cables for each #5296: ▶ #1466 30 m SPCN Cable ▶ #6001 2 m SPCN Cable ▶ #6006 3 m SPCN Cable ▶ #6007 15 m SPCN Cable ▶ #6008 6 m SPCN Cable ▶ #6029 30 m SPCN Cable No base IOPs are included with a #5296. For each #5296 ordered, a quantity of two #0694, #5096 Equivalent, specify codes will be added to the order. If a #5296 is to be shared between two systems, one #0694 must be removed from the original ordering system and added to the sharing system, using a Record Purpose Only (RPO) change. Dual line cord capability is available for the #5296 with feature #5116. With a #5116 installed, both tower units of a #5296 will have dual line cord capability. Two additional line cords (for a total of four), must be ordered when a #5116 is installed. Plugging in the second line cord from the upper and lower units, even if to the same outlet, enables each unit's ac power modules to be redundant. For the best power protection, the first and second line cords should be attached to different power sources. Two of the following line cords are required on a #5296: ▶ #1399 - 4.3 m 300 V/16A ▶ #1406 - 200 V 16A 14-ft TL Line Cord ▶ #6455 - 4.3 m 200 V/16A Pwr Cd Italy ▶ #1409 - 4.3 m 200 V/16A Pwr Cd AU/NZ ▶ #1418 - 4.3 m 200 V/16A Pwr Cd S Afric ▶ #1419 - 4.3 m 200 V/16A Pwr Cd Israel ▶ #1420 - 4.3 m 200 V/16A Pwr Cd EU/Asia ▶ #1421 - 4.3 m 200 V/16A Pwr Cd CH/DK ▶ #1451 - 200 V 6-ft Line Cord ▶ #1452 - 200 V 14-ft Line Cord ▶ #1453 - 200 V 6-ft Locking Line Cord ▶ #1454 - 200 V 12A 14-ft TL Line Cord ▶ #1455 - 200 V 6-ft Wtrtght Line Cord ▶ #1456 - 200 V 14-ft Wtrtght Line Cord ▶ #1476 - 4.3 m 200 V/12A Pwr Cd UK

#5296 Continued	**1.8 m I/O Tower (no disk)**
	Attributes provided: 28 PCI slots
	Attributes required: RIO connections, two to four wall electrical outlets, at least one #0696 on the inventory record
	
	For 9117-MMA (#5296)
	▶ Minimum required: 0
	▶ Maximum allowed: 24 (Initial order maximum: 0)
	▶ OS level required:
	   – AIX supported only for migration from M/T 9406
	   – IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5296)
	▶ Minimum required: 0
	▶ Maximum allowed: 96 (Initial order maximum: 0)
	▶ OS level required:
	   – IBM i 5.4 with V5R4M5 machine code
	   – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#5403	**#5403 One Processor Activation for Processor Feature #7380**
	Each occurrence of this feature will permanently activate one processor on Processor Card #7380
	
	Attributes provided: Activation of one processor on FC #7380
	Attributes required: FC #7380 with inactive processors
	
	For 9117-MMA (#5403)
	▶ Minimum required: 0
	▶ Maximum allowed: 16 (Initial order maximum: 16)
	▶ OS level required:
	   – AIX 5.2 TL10 or later
	   – AIX 5.3 TL6 or later
	   – IBM i 5.4 with V5R4M5 machine code or later
	   For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
	   http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No

#5404	**#5404 Utility Billing for FC# 7380- 100 processor minutes** Provides payment for temporary use of processor feature #7380 with supported AIX or Linux operating systems. Each occurrence of this feature will pay for 100 minutes of usage. The purchase of this feature occurs after the customer has 100 minutes of use on processors in the shared processor pool that are not permanently active. Attributes provided: Payment for temporary use of processor #7380 (AIX or Linux) Attributes required: At least one processor #7380 that is not permanently active **For 9117-MMA (#5404)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: AIX 5.3 TL6 or later For information about support on Red Hat Enterprise Linux and SUSE Linux, visit: http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: Does not apply **Note**: Utility CoD requires activation of PowerVM feature #7942 or #7995.
#5460	**#5460 - i5/OS Edition for #4910** Provides an i5/OS Edition for a POWER6 570 with server feature #4910. (1/4-way) Attributes provided: Provides an i5OS Edition for a model MMA with server feature #4910. **For 9406-MMA (#5460)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No
#5461	**#5461 - i5/OS Edition for #4911** Provides an i5/OS Edition for a POWER6 570 with server feature #4911. (2/8-way) Attributes provided: Provides an i5OS Edition for a POWER6 570 with server feature #4911. **For 9406-MMA (#5461)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No
#5462	**#5462 - i5/OS Edition for #4912** Provides an i5/OS Edition for a POWER6 570 with server feature #4911. (4/16-way) Attributes provided: Provides an i5/OS Edition for a POWER6 570 with server feature #4912. **For 9406-MMA (#5462)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No

#5480	**#5480 - Utility Billing for FC# 7380 with IBM i - 100 processor minutes**
	Provides payment for temporary use of processor feature #7380 with the IBM i operating system. Each occurrence of this feature will pay for 100 minutes of processor use. The purchase of this feature occurs after the customer has 100 minutes of use on processors in the shared processor pool that are not permanently active.
	
	Attributes provided: Payment for temporary use of processor #7380 (IBM i)
	Attributes required: At least one processor #7380 that is not permanently active.
	
	For 9117-MMA (#5480)
	► Minimum required: 0
	► Maximum allowed: no maximum (Initial order maximum: 0)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	► Initial Order/MES/Both/Supported: MES
	► CSU: Yes
	► Return parts MES: Does not apply
	
	Note: Utility CoD requires activation of PowerVM feature #7942.

#5481	**#5481 Utility Billing for FC# 5620 with IBM i - 100 processor minutes**
	Provides payment for temporary use of processor feature #5620 with the IBM i operating system. Each occurrence of this feature will pay for 100 minutes of processor use. The purchase of this feature occurs after the customer has 100 minutes of use on processors in the shared processor pool that are not permanently active.
	
	Attributes provided: Payment for temporary use of processor #5620 (IBM i)
	Attributes required: At least one processor #5620 that is not permanently active.
	
	For 9117-MMA (#5481)
	► Minimum required: 0
	► Maximum allowed: NO MAX (Initial order maximum: 0)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	► Initial Order/MES/Both/Supported: MES
	► CSU: Yes
	► Return parts MES: Does not apply
	
	Note: Utility CoD requires activation of PowerVM feature #7942.

#5482	**#5482 Utility Billing for FC# 5621/#5622 with IBM i - 100 processor minutes**
	Provides payment for temporary use of processor feature #5621or 5622 with the IBM i operating system. Each occurrence of this feature will pay for 100 minutes of processor use. The purchase of this feature occurs after the customer has 100 minutes of use on processors in the shared processor pool that are not permanently active.
	
	Attributes provided: Payment for temporary use of processor #5621 or 5622 (IBM i)
	Attributes required: At least one processor #5621 or 5622 that is not permanently active.
	
	For 9117-MMA (#5482)
	► Minimum required: 0
	► Maximum allowed: NO MAX (Initial order maximum: 0)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	► Initial Order/MES/Both/Supported: MES
	► CSU: Yes
	► Return parts MES: Does not apply
	
	Note: Utility CoD requires activation of PowerVM feature #7942.

#5483	**#5483 On/Off Processor Billing for FC#5620 with IBM i - 1 processor day**
	When an On/Off Processor Enablement feature is ordered and the associated enablement code is entered into the system, you must report your on/off use to IBM at least monthly. This information, used to compute your billing data, is then provided to your sales channel. The sales channel will place an order for a quantity of On/Off Processor Day Billing features and bill you. One #5483 should be ordered for each billable processor days use of feature 5620 with the IBM i operating system.
	
	Attributes provided: One processor day usage for feature #5620 (IBM i)
	Attributes required: On/Off Processor Enablement
	
	For 9117-MMA (#5483)
	► Minimum required: 0
	► Maximum allowed: NO MAX (Initial order maximum: 0)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	► Initial Order/MES/Both/Supported: MES
	► CSU: Yes
	► Return parts MES: Does not apply

#5484	**#5484 On/Off Processor Billing for FC#5621/5622 with IBM i - 1 processor day with IBM i**
	When an On/Off Processor Enablement feature is ordered and the associated enablement code is entered into the system, you must report your on/off usage to IBM at least monthly. This information, used to compute your billing data, is then provided to your sales channel. The sales channel will place an order for a quantity of On/Off Processor Day Billing features and bill you. One #5484 should be ordered for each billable processor days use of feature #5621 or #5622 with the IBM i operating system.
	
	Attributes provided: One processor day usage for feature #5621 or 5622 (IBM i)
	Attributes required: On/Off Processor Enablement
	
	For 9117-MMA (#5484)
	► Minimum required: 0
	► Maximum allowed: NO MAX (Initial order maximum: 0)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	► Initial Order/MES/Both/Supported: MES
	► CSU: Yes
	► Return parts MES: Does not apply

#5490	**#5490 - Enterprise Enablement** Provides one processors worth of 5250 OLTP capacity which can be spread across multiple physical processors or multiple partitions. A permanently activated processor and adequate i5/OS processor license entitlements are prerequisites. Attributes provided: Incremental 5250 OLTP capability Attributes required: Model 570 Enterprise Edition server **Note**: This feature is converted to #4990 on unified POWER6 MTMs. **For 9406-MMA (#5490)** ▶ Minimum required: 0 ▶ Maximum allowed: 12 (Initial order maximum: 12) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes
#5491	**#5491 - Full Enterprise Enable** #5491 is ordered when full 5250 OLTP capability is required for all permanently activated processors. Additional i5/OS licenses might also be required. Attributes provided: Complete 5250 OLTP capability Attributes required: Model 570 Enterprise Edition server **Note**: This feature is converted to #4991 on unified POWER6 MTMs. **For 9406-MMA (#5491)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes
#5544	**#5544 Sys Console on OP Console** When #5544 is on the order, the system console is driven by a WAN adapter. A #0367, Operations Console PCI cable is required on the system/order. Attributes provided: System Console on a WAN Connection Attributes required: WAN IOA, #0367 Operations Console PCI Cable **For 9117-MMA (#5544) and 9119-FHA (#5544)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No

#5546	**#5546 - Sys Console 100 Mbps Tkn Ring** (No longer available as of 01 June 2006.) With #5546, the system console is driven by a token-ring LAN adapter. #2744, PCI 100 Mbps token-ring IOA, is required on the server. This LAN adapter must be dedicated to console support/ functions and cannot be used for any other purpose. Attributes provided: System console on a token-ring connection Attributes required: #2744 PCI 100 Mbps token-ring IOA. **For 9406-MMA (#5546)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 0) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes
#5548	**#5548 Sys Console 100 Mbps Ethernet** With #5548, the system console is driven by an Ethernet LAN adapter. Some system unit Ethernet ports are not supported. A 100/10 Mbps Ethernet IOA is required on the system. This LAN adapter must be dedicated to console support functions and cannot be used for any other purpose. Attributes provided: System Console on a Ethernet Connection Attributes required: a 100/10 Mbps Ethernet LAN IOA. **For 9117-MMA (#5544) and 9119-FHA (#5544)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 0) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#5550	**#5550 Sys Console on HMC** With #5550, system console function is driven by the Hardware Management Console (HMC) connected to the system. The HMC is required if the following functions are desired/selected for the system: Attributes provided: System Console on Hardware Management Console (HMC) Attributes required: Hardware Management Console (HMC) **For 9117-MMA (#5550) and 9119-FHA (#5550)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No

#5553	**#5553 Sys Console-Ethernet No IOP** This specify indicates the use of an embedded CEC LAN port for the system console connection using Operations Console (LAN). Attributes provided: System console connection through an embedded CEC LAN port. Attributes required: Embedded CEC LAN port. **For 9117-MMA (#5553) and 9119-FHA (#5553)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No

#5554	**#5554 Mirror 35 GB Disk/Controller Package**
	Provides a disk unit controller (#2780 equivalent) and twelve (12) 15k rpm 35 GB disk units (#4326 equivalent) for servers doing mirroring. Either #0042 Mirrored System IOP Level or #0043 Mirrored System Bus Level is a prerequisite.
	
	Attributes provided: Twelve (12) 35 GB mirrored disk units
	Attributes required: PCI slot for disk controller, 12 disk unit slots and #0042 or #0043.
	
	For 9117-MMA (#5554)
	▶ Minimum required: 0
	▶ Maximum allowed: 100 (Initial order maximum: 0)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5554)
	▶ Minimum required: 0
	▶ Maximum allowed: 114 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#5555	**#5555 Mirror 70 GB Disk/Controller Package** Provides a disk unit controller (#2780 equivalent) and twelve (12) 15 000 rpm 70 GB disk units (#4327 equivalent) for servers doing mirroring. Either #0042 Mirrored System IOP Level or #0043 Mirrored System Bus Level is a prerequisite. Attributes provided: Twelve (12) 70 GB mirrored disk units Attributes required: PCI slot for disk controller, 12 disk unit slots and #0042 or #0043. **For 9117-MMA (#5555)** ▶ Minimum required: 0 ▶ Maximum allowed: 100 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later **For 9119-FHA (#5555)** ▶ Minimum required: 0 ▶ Maximum allowed: 114 (Initial order maximum: 0) ▶ OS level required: – IBM i 5.4 with V5R4M5 machine code – IBM i 6.1 or later Initial Order/MES/Both/Supported: Supported CSU: Yes Return parts MES: No
#5556	**#5556 Mirror 141 GB Disk/Controller Package** Provides a disk unit controller (#2780 equivalent) and twelve 15 k rpm 141 GB disk units (#4328 equivalent) for servers doing mirroring. Either #0042 Mirrored System IOP Level or #0043 Mirrored System Bus Level is a prerequisite. Attributes provided: Twelve 141 GB mirrored disk units Attributes required: PCI slot for disk controller, twelve disk unit slots and #0042 or #0043. **For 9117-MMA (#5556)** ▶ Minimum required: 0 ▶ Maximum allowed: 100 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later **For 9119-FHA (#5556)** ▶ Minimum required: 0 ▶ Maximum allowed: 114 (Initial order maximum: 0) ▶ OS level required: – IBM i 5.4 with V5R4M5 machine code – IBM i 6.1 or later Initial Order/MES/Both/Supported: Supported CSU: Yes Return parts MES: No

#5560	**#5560 Mirror 35 GB Drawer Package**
	This package feature includes one #0595 rackmount I/O expansion unit, one #2844 IOP, 12 #4326 35.16 GB 15 000 rpm disk units and two high- function, large write cache disk controllers (#2757 or newer) for servers doing mirroring. The I/O drawer requires five EIA of rack space and has a total of seven PCI-X IOP/IOA slots and 12 disk unit slots. Three PCI-X slots and 12 disk unit slots are filled with the package contents, but four PCI-X slots can be used by other PCI-X IOPs/IOAs.
	On IBM ordering, shipping, and inventory documentation, the component features specifically for the #0595 I/O drawer, the disk units, and the disk controllers will not be shown. The chargeable #5560 feature number will be shown and will carry the price and warranty for this package.
	Customers should use the specific component features such as #0595 for all planning and implementation documentation. The #0040 Mirrored System Disk Level is a prerequisite.
	A bus adapter to provide the RIO-2 interface to the system is required.
	One or two RIO-2 cables must be ordered with each #5560.
	Select the appropriate cable based on the length required.
	The following RIO-2 cables can be used with a #5560: ► #3156 - 1.75 m RIO-2 Cable ► #3168 - 2.5 m RIO-2 Cable ► #3146 1 m RIO-2 Cable ► #3147 4 m RIO-2 Cable ► #3148 10 m RIO-2 Cable
	One SPCN cable is required with each #5560. Select one of the following: ► #1466 30 m SPCN Cable ► #6001 2 m SPCN Cable ► #6006 3 m SPCN Cable ► #6007 15 m SPCN Cable ► #6008 6 m SPCN Cable ► #6029 30 m SPCN Cable
	The #5560 has redundant power when feature #5138 is installed. The #5138 provides a second 435W power supply. In addition, when a #5138 is installed, a second line cord must be ordered. The presence of the #5138 and the second line cord, enables dual line cord capability.

#5560 Continued	**#5560 Mirror 35 GB Drawer Package** Select one of the following line cords, or select two if #5138 is ordered: ► #1394 - 4.3 m 200 V/10A Pwr Crd Brazil ► #1395 - 4.3 m 200 V/10A Pwr Cd China ► #1397 - 4.3 m 200 V/10A Pwr Crd Argent ► #1398 - 4.3 m 100 V/10A Pwr Crd Brazil ► #1410 - 200 V 6-ft Line Cord ► #1411 - 200 V 14-ft Line Cord ► #1412 - 125 V 6-ft Line Cord ► #1413 - 125 V 14-ft Line Cord ► #1414 - 200 V 6-ft Locking Line Cord ► #1415 - 200 V 6-ft Watertight Line Cord ► #1416 - 200 V 14-ft Locking Line Cord ► #1417 - 200 V 14-ft Wtrtght Line Cord ► #1422 - 3 m IEC 320 C13/14 PDU Cord ► #1438 - 4.3 m 200 V/10A Pwr Cd AU/NZ ► #1439 - 4.3 m 200 V/10A Pwr Cd EU/Asia ► #1440 - 4.3 m 200 V/10A Pwr Cd Denmark ► #1441 - 4.3 m 200 V/10A Pwr Cd S Africa ► #1442 - 4.3 m 200 V/10A Pwr Cd Swiss ► #1443 - 4.3 m 200 V/10A Pwr Cd UK ► #1444 - 4.3 m 200 V/10A Pwr Cd Italy ► #1445 - 4.3 m 200 V/10A Pwr Cd Israel ► #6458 - 14-ft Int 250 V/10A Pwr Cd ► #6460 - 14-ft 125 V/15A Power Cord ► #6469 - 14-ft 250 V/15A Power Cord ► #6470 - 6-ft 125 V/15A Power Cord ► #6471 - 9-ft 125 V/15A Power Cord ► #6472 - 9-ft 250 V/16A Power Cord ► #6473 - 9-ft 250 V/10A Power Cord ► #6474 - 9-ft 250 V/13A Power Cord ► #6475 - 9-ft 250 V/16A Power Cord ► #6476 - 9-ft 250 V/10A Power Cord ► #6477 - 9-ft 250 V/10A Power Cord ► #6478 - 9-ft 250 V/16A Power Cord ► #6479 - 9-ft 250 V/10A Power Cord ► #6487 - 6-ft 250 V/15A Power Cord ► #6488 - 9-ft Dual Voltage Pwr Cd ► #6493 - 9-ft 250 V/10A Power Cord ► #6494 - 9-ft 250 V/10A Power Cord ► #6495 - 9-ft 250 V/10A Power Cord ► #6496 - 9-ft 250 V/10A Power Cord ► #6497 - 6-ft 250 V/15A Power Cord ► #6498 - 6-ft 250 V/15A Power Cord ► #6651 - 9-ft 127 V/15A Power Cord ► #6659 - 9-ft 240 V/15A Power Cord ► #6660 - 14-ft 127 V/15A Power Cord ► #6669 - 14-ft 240 V/15A Power Cord ► #6670 - 6-ft 125 V/15A Power Cord ► #6680 - 9-ft 250 V/10A Power Cord ► #6687 - 6-ft 250 V/15A Power Cord

#5560 Continued	**#5560 Mirror 35 GB Drawer Package**
	Attributes provided: 12 35.16 GB disk units and 7 PCI card slots
	Attributes required: #0040, 5 EIA rack space
	
	For 9117-MMA (#5560)
	▶ Minimum required: 0
	▶ Maximum allowed: 48 (Initial order maximum: 0)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5560)
	▶ Minimum required: 0
	▶ Maximum allowed: 48 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#5561	**#5561 Mirror 70 GB Drawer Package** Includes one #0595 rackmount I/O expansion unit, one #2844 IOP, twelve #4327 70.56 GB 15 k rpm disk units and two high- function, large write cache disk controllers (#2757 or newer) for servers doing mirroring. The I/O drawer requires five EIA of rack space and has a total of seven PCI-X IOP/IOA slots and 12 disk unit slots. Three PCI-X slots and 12 disk unit slots are filled with the package contents, but four PCI-X slots can be used by other PCI-X IOPs/IOAs. On IBM ordering, shipping, and inventory documentation, the component features specifically for the #0595 I/O drawer, the disk units, and the disk controllers will not be shown. The chargeable #5561 feature number will be shown and will carry the price and warranty for this package. Customers should use the specific component features such as #0595 for all planning and implementation documentation. The #0040 Mirrored System Disk Level is a prerequisite. A bus adapter to provide the HSL interface to the system is required. One or two RIO-2 cables must be ordered with each #5561. Select the appropriate cable based on the length that is required: ▶ #3156 - 1.75 m RIO-2 Cable ▶ #3168 - 2.5 m RIO-2 Cable ▶ #3146 1 m RIO-2 Cable ▶ #3147 4 m RIO-2 Cable ▶ #3148 10 m RIO-2 Cable One SPCN cable is required with each #5561. Select one of the following cables: ▶ #1466 30 m SPCN Cable ▶ #6001 2 m SPCN Cable ▶ #6006 3 m SPCN Cable ▶ #6007 15 m SPCN Cable ▶ #6008 6 m SPCN Cable ▶ #6029 30 m SPCN Cable The #5561 has redundant power when feature #5138 is installed. The #5138 provides a second 435W power supply. In addition, when a #5138 is installed, a second line cord must be ordered. The presence of the #5138 and the second line cord, enables dual line cord capability.

$5561 Continued	**#5561 Mirror 70 GB Drawer Package**
	Select one of the following line cords, or select two if #5138 is ordered:
	► #1394 - 4.3 m 200 V/10A Pwr Crd Brazil
	► #1395 - 4.3 m 200 V/10A Pwr Cd China
	► #1397 - 4.3 m 200 V/10A Pwr Crd Argent
	► #1398 - 4.3 m 100 V/10A Pwr Crd Brazil
	► #1410 - 200 V 6-ft Line Cord
	► #1411 - 200 V 14-ft Line Cord
	► #1412 - 125 V 6-ft Line Cord
	► #1413 - 125 V 14-ft Line Cord
	► #1414 - 200 V 6-ft Locking Line Cord
	► #1415 - 200 V 6-ft Watertight Line Cord
	► #1416 - 200 V 14-ft Locking Line Cord
	► #1417 - 200 V 14-ft Wtrtght Line Cord
	► #1422 - 3 m IEC 320 C13/14 PDU Cord
	► #1438 - 4.3 m 200 V/10A Pwr Cd AU/NZ
	► #1439 - 4.3 m 200 V/10A Pwr Cd EU/Asia
	► #1440 - 4.3 m 200 V/10A Pwr Cd Denmark
	► #1441 - 4.3 m 200 V/10A Pwr Cd S Africa
	► #1442 - 4.3 m 200 V/10A Pwr Cd Swiss
	► #1443 - 4.3 m 200 V/10A Pwr Cd UK
	► #1444 - 4.3 m 200 V/10A Pwr Cd Italy
	► #1445 - 4.3 m 200 V/10A Pwr Cd Israel
	► #6458 - 14-ft Int 250 V/10A Pwr Cd
	► #6460 - 14-ft 125 V/15A Power Cord
	► #6469 - 14-ft 250 V/15A Power Cord
	► #6470 - 6-ft 125 V/15A Power Cord
	► #6471 - 9-ft 125 V/15A Power Cord
	► #6472 - 9-ft 250 V/16A Power Cord
	► #6473 - 9-ft 250 V/10A Power Cord
	► #6474 - 9-ft 250 V/13A Power Cord
	► #6475 - 9-ft 250 V/16A Power Cord
	► #6476 - 9-ft 250 V/10A Power Cord
	► #6477 - 9-ft 250 V/10A Power Cord
	► #6478 - 9-ft 250 V/16A Power Cord
	► #6479 - 9-ft 250 V/10A Power Cord
	► #6487 - 6-ft 250 V/15A Power Cord
	► #6488 - 9-ft Dual Voltage Pwr Cd
	► #6493 - 9-ft 250 V/10A Power Cord
	► #6494 - 9-ft 250 V/10A Power Cord
	► #6495 - 9-ft 250 V/10A Power Cord
	► #6496 - 9-ft 250 V/10A Power Cord
	► #6497 - 6-ft 250 V/15A Power Cord
	► #6498 - 6-ft 250 V/15A Power Cord
	► #6651 - 9-ft 127 V/15A Power Cord
	► #6659 - 9-ft 240 V/15A Power Cord
	► #6660 - 14-ft 127 V/15A Power Cord
	► #6669 - 14-ft 240 V/15A Power Cord
	► #6670 - 6-ft 125 V/15A Power Cord
	► #6680 - 9-ft 250 V/10A Power Cord
	► #6687 - 6-ft 250 V/15A Power Cord

#5561 Continued	**#5561 Mirror 70 GB Drawer Package**
	Attributes provided: 12 70.56 GB disk units and 7 PCI card slots
	Attributes required: #0040, 5 EIA of rack space
	For 9117-MMA (#5561)
	▶ Minimum required: 0
	▶ Maximum allowed: 48 (Initial order maximum: 0)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	For 9119-FHA (#5561)
	▶ Minimum required: 0
	▶ Maximum allowed: 48 (Initial order maximum: 0)
	▶ OS level required:
	– IBM i 5.4 with V5R4M5 machine code
	– IBM i 6.1 or later
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#5562	**#5562 - Mirror 35 GB Tower Package** (No longer available as of 01 June 2006.) This package feature includes one #5095 tower, one #9844 IOP, twelve #4326 35.16 GB 15 k rpm disk units and two high-function, large write cache disk controllers (#2757 or newer) for servers doing mirroring. The #5095 has a total of seven PCI-X IOP/IOA slots and 12 disk unit slots. Three PCI-X slots and 12 disk unit slots are filled with the package contents, but four PCI-X slots can be used by other PCI-X IOPs/IOAs. On IBM ordering, shipping, and inventory documentation, the component features specifically for the #5095 tower, the disk units, and the disk controllers will not be shown. The chargeable #5562 feature number will be shown and will carry the price and warranty for this package. Customers should use the specific component features such as #5095 for all planning and implementation documentation. The #0040 Mirrored System Disk Level is a prerequisite. A bus adapter to provide the HSL interface to the system is required. Select one of the following: ▶ #9517 - Base HSL-2 Bus Adapter, to specify two copper HSL-2 ports ▶ #9876 - Base Optical Bus Adapter, to specify two optical HSL ports One or two HSL cables must be ordered with each #5562. When ordering cables to connect to the HSL interface, optical HSL, copper HSL, copper HSL-2, or copper HSL to HSL-2 cables are required. An HSL loop uses all optical or all copper ports/cables. A copper loop can intermix I/O towers/units with copper HSL and copper HSL-2 ports. Select the appropriate cable based on the type of HSL ports to which it is being attached, and the cable length required. The following HSL cables can be used with a #5562: ▶ Copper HSL to HSL-2 (HSL on one end and HSL-2 on the other end) – #1474 - 6 m HSL to HSL-2 Cable – #1475 - 10 m HSL to HSL-2 Cable – #1487 - 3 m HSL to HSL-2 Cable ▶ Copper HSL-2 (HSL-2 on both ends of the cable) – #1307 - 1.75 m HSL-2 Cable – #1308 - 2.5 m HSL-2 Cable – #1481 - 1.2 m HSL-2 Cable – #1482 - 3.5 m HSL-2 Cable – #1483 - 10 m HSL-2 Cable – #1485 - 15 m HSL-2 Cable ▶ Optical HSL (optical HSL connections on both ends of the cable) – #1470 - 6 m HSL Optical Cable – #1471 - 30 m HSL Optical Cable – #1472 - 100 m HSL Optical Cable – #1473 - 250 m HSL Optical Cable Select one of the following SPCN cables with each #5562: ▶ #1463 - 2 m SPCN Cable ▶ #1464 - 6 m SPCN Cable ▶ #1465 - 15 m SPCN Cable ▶ #1466 - 30 m SPCN Cable ▶ #0369 - 100 m Optical SPCN Cable ▶ #1468 - 250 m Optical SPCN Cable ▶ #6001 - 2 m SPCN Cable ▶ #6006 - 3 m SPCN Cable ▶ #6007 - 15 m SPCN Cable ▶ #6008 - 6 m SPCN Cable ▶ #6029 - 30 m SPCN Cable

#5562 Continued	**#5562 - Mirror 35 GB Tower Package**
	The #5562 has redundant power when feature #5138 is installed. The #5138 provides a second 435W power supply. In addition, when a #5138 is installed, a second line cord must be ordered. The presence of the #5138 and the second line cord, enables dual line cord capability.
	Select one of the following line cords, or select two if #5138 is ordered:
	▶ #1394 - 4.3 m 200V/10A Pwr Crd Brazil
	▶ #1395 - 4.3 m 200V/10A Pwr Cd China
	▶ #1397 - 4.3 m 200V/10A Pwr Crd Argent
	▶ #1398 - 4.3 m 100V/10A Pwr Crd Brazil
	▶ #1410 - 200 V 6-ft Line Cord
	▶ #1411 - 200 V 14-ft Line Cord
	▶ #1412 - 125 V 6-ft Line Cord
	▶ #1413 - 125 V 14-ft Line Cord
	▶ #1414 - 200 V 6-ft Locking Line Cord
	▶ #1415 - 200 V 6-ft Watertight Line Cord
	▶ #1416 - 200 V 14-ft Locking Line Cord
	▶ #1417 - 200 V 14-ft Wtrtght Line Cord
	▶ #1422 - 3 m IEC 320 C13/14 PDU Cord
	▶ #1438 - 4.3 m 200 V/10A Pwr Cd AU/NZ
	▶ #1439 - 4.3 m 200 V/10A Pwr Cd EU/Asia
	▶ #1440 - 4.3 m 200 V/10A Pwr Cd Denmark
	▶ #1441 - 4.3 m 200 V/10A Pwr Cd S Africa
	▶ #1442 - 4.3 m 200 V/10A Pwr Cd Swiss
	▶ #1443 - 4.3 m 200 V/10A Pwr Cd UK
	▶ #1444 - 4.3 m 200 V/10A Pwr Cd Italy
	▶ #1445 - 4.3 m 200 V/10A Pwr Cd Israel
	▶ #6458 - 14-ft Int 250 V/10A Pwr Cd
	▶ #6460 - 14-ft 125 V/15A Power Cord
	▶ #6469 - 14-ft 250 V/15A Power Cord
	▶ #6470 - 6-ft 125 V/15A Power Cord
	▶ #6471 - 9-ft 125 V/15A Power Cord
	▶ #6472 - 9-ft 250 V/16A Power Cord
	▶ #6473 - 9-ft 250 V/10A Power Cord
	▶ #6474 - 9-ft 250 V/13A Power Cord
	▶ #6475 - 9-ft 250 V/16A Power Cord
	▶ #6476 - 9-ft 250 V/10A Power Cord
	▶ #6477 - 9-ft 250 V/10A Power Cord
	▶ #6478 - 9-ft 250 V/16A Power Cord
	▶ #6479 - 9-ft 250 V/10A Power Cord
	▶ #6487 - 6-ft 250 V/15A Power Cord
	▶ #6488 - 9-ft Dual Voltage Pwr Cd
	▶ #6493 - 9-ft 250 V/10A Power Cord
	▶ #6494 - 9-ft 250 V/10A Power Cord
	▶ #6495 - 9-ft 250 V/10A Power Cord
	▶ #6496 - 9-ft 250 V/10A Power Cord
	▶ #6497 - 6-ft 250 V/15A Power Cord
	▶ #6498 - 6-ft 250 V/15A Power Cord
	▶ #6651 - 9-ft 127 V/15A Power Cord
	▶ #6659 - 9-ft 240 V/15A Power Cord
	▶ #6660 - 14-ft 127 V/15A Power Cord
	▶ #6669 - 14-ft 240 V/15A Power Cord
	▶ #6670 - 6-ft 125 V/15A Power Cord
	▶ #6680 - 9-ft 250 V/10A Power Cord
	▶ #6687 - 6-ft 250 V/15A Power Cord

#5562 Continued	**#5562 - Mirror 35 GB Tower Package** Attributes provided: 12 35.16 GB disk units and 7 PCI card slots Attributes required: #0040 **For 9406-MMA (#5562)** ► Minimum required: 0 ► Maximum allowed: 48 (Initial order maximum: 0) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes

#5563	**#5563 - Mirror 70 GB Tower Package**
	(No longer available as of 01 June 2006.)
	This package feature includes one #5095 tower, one #9844 IOP, twelve #4327 70.56 GB 15 k rpm disk units and two high-function, large write cache disk controllers (#2757 or newer) for servers doing mirroring. The #5095 has a total of seven PCI-X IOP/IOA slots and 12 disk unit slots. Three PCI-X slots and 12 disk unit slots are filled with the package contents, but four PCI-X slots can be used by other PCI-X IOPs/IOAs. On IBM ordering, shipping, and inventory documentation, the component features specifically for the #5095 tower, the disk units, and the disk controllers will not be shown. The chargeable #5563 feature number will be shown and will carry the price and warranty for this package. Customers should use the specific component features such as #5095 for all planning and implementation documentation. The #0040 Mirrored System Disk Level is a prerequisite.
	A bus adapter to provide the HSL interface to the system is required. Select one of the following:
	► #9517 - Base HSL-2 Bus Adapter, to specify two copper HSL-2 ports
	► #9876 - Base Optical Bus Adapter, to specify two optical HSL ports
	One or two HSL cables must be ordered with each #5563.
	When ordering cables to connect to the HSL interface, optical HSL, copper HSL, copper HSL-2, or copper HSL to HSL-2 cables are required. n HSL loop uses all optical or all copper ports/cables. A copper loop can intermix I/O towers/units with copper HSL and copper HSL-2 ports. Select the appropriate cable based on the type of HSL ports to which it is being attached, and the cable length required.
	The following HSL cables can be used with a #5563:
	► Copper HSL to HSL-2 (HSL on one end and HSL-2 on the other end)
	– #1474 - 6 m HSL to HSL-2 Cable
	– #1475 - 10 m HSL to HSL-2 Cable
	– #1487 - 3 m HSL to HSL-2 Cable
	► Copper HSL-2 (HSL-2 on both ends of the cable)
	– #1307 - 1.75 m HSL-2 Cable
	– #1308 - 2.5 m HSL-2 Cable
	– #1481 - 1.2 m HSL-2 Cable
	– #1482 - 3.5 m HSL-2 Cable
	– #1483 - 10 m HSL-2 Cable
	– #1485 - 15 m HSL-2 Cable
	► Optical HSL (optical HSL connections on both ends of the cable)
	– #1470 - 6 m HSL Optical Cable
	– #1471 - 30 m HSL Optical Cable
	– #1472 - 100 m HSL Optical Cable
	– #1473 - 250 m HSL Optical Cable
	One SPCN cable is required with each #5563. Select one of the following cables:
	► #1463 - 2 m SPCN Cable
	► #1464 - 6 m SPCN Cable
	► #1465 - 15 m SPCN Cable
	► #1466 - 30 m SPCN Cable
	► #0369 - 100 m Optical SPCN Cable
	► #1468 - 250 m Optical SPCN Cable
	► #6001 - 2 m SPCN Cable
	► #6006 - 3 m SPCN Cable
	► #6007 - 15 m SPCN Cable
	► #6008 - 6 m SPCN Cable
	► #6029 - 30 m SPCN Cable

| #5563 Continued | **#5563 - Mirror 70 GB Tower Package**
The #5563 has redundant power when feature #5138 is installed. The #5138 provides a second 435W power supply. In addition, when a #5138 is installed, a second line cord must be ordered. The presence of the #5138 and the second line cord, enables dual line cord capability.

Select one of the following line cords, or select two if #5138 is ordered:
▶ #1394 - 4.3 m 200 V/10A Pwr Crd Brazil
▶ #1395 - 4.3 m 200 V/10A Pwr Cd China
▶ #1397 - 4.3 m 200 V/10A Pwr Crd Argent
▶ #1398 - 4.3 m 100 V/10A Pwr Crd Brazil
▶ #1410 - 200 V 6-ft Line Cord
▶ #1411 - 200 V 14-ft Line Cord
▶ #1412 - 125 V 6-ft Line Cord
▶ #1413 - 125 V 14-ft Line Cord
▶ #1414 - 200 V 6-ft Locking Line Cord
▶ #1415 - 200 V 6-ft Watertight Line Cord
▶ #1416 - 200 V 14-ft Locking Line Cord
▶ #1417 - 200 V 14-ft Wtrtght Line Cord
▶ #1422 - 3 m IEC 320 C13/14 PDU Cord
▶ #1438 - 4.3 m 200 V/10A Pwr Cd AU/NZ
▶ #1439 - 4.3 m 200 V/10A Pwr Cd EU/Asia
▶ #1440 - 4.3 m 200 V/10A Pwr Cd Denmark
▶ #1441 - 4.3 m 200 V/10A Pwr Cd S Africa
▶ #1442 - 4.3 m 200 V/10A Pwr Cd Swiss
▶ #1443 - 4.3 m 200 V/10A Pwr Cd UK
▶ #1444 - 4.3 m 200 V/10A Pwr Cd Italy
▶ #1445 - 4.3 m 200 V/10A Pwr Cd Israel
▶ #6458 - 14-ft Int 250 V/10A Pwr Cd
▶ #6460 - 14-ft 125 V/15A Power Cord
▶ #6469 - 14-ft 250 V/15A Power Cord
▶ #6470 - 6-ft 125 V/15A Power Cord
▶ #6471 - 9-ft 125 V/15A Power Cord
▶ #6472 - 9-ft 250 V/16A Power Cord
▶ #6473 - 9-ft 250 V/10A Power Cord
▶ #6474 - 9-ft 250 V/13A Power Cord
▶ #6475 - 9-ft 250 V/16A Power Cord
▶ #6476 - 9-ft 250 V/10A Power Cord
▶ #6477 - 9-ft 250 V/10A Power Cord
▶ #6478 - 9-ft 250 V/16A Power Cord
▶ #6479 - 9-ft 250 V/10A Power Cord
▶ #6487 - 6-ft 250 V/15A Power Cord
▶ #6488 - 9-ft Dual Voltage Pwr Cd
▶ #6493 - 9-ft 250 V/10A Power Cord
▶ #6494 - 9-ft 250 V/10A Power Cord
▶ #6495 - 9-ft 250 V/10A Power Cord
▶ #6496 - 9-ft 250 V/10A Power Cord
▶ #6497 - 6-ft 250 V/15A Power Cord
▶ #6498 - 6-ft 250 V/15A Power Cord
▶ #6651 - 9-ft 127 V/15A Power Cord
▶ #6659 - 9-ft 240 V/15A Power Cord
▶ #6660 - 14-ft 127 V/15A Power Cord
▶ #6669 - 14-ft 240 V/15A Power Cord
▶ #6670 - 6-ft 125 V/15A Power Cord
▶ #6680 - 9-ft 250 V/10A Power Cord
▶ #6687 - 6-ft 250 V/15A Power Cord |

#5563 Continued	**#5563 - Mirror 70 GB Tower Package** Attributes provided: 12 70.56 GB disk units and 7 PCI card slots Attributes required: #0040 **For 9406-MMA (#5563)** ▸ Minimum required: 0 ▸ Maximum allowed: 48 (Initial order maximum: 0) ▸ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▸ Initial Order/MES/Both/Supported: Supported ▸ CSU: Yes

#5580	**#5580 (2780) Controller with Aux Write Cache**
	Provides a disk controller with auxiliary write cache to improve cache data redundancy. The #5580 includes a #2780 PCI-X Ultra4 RAID Disk Controller and a secondary IOA with 757 MB of auxiliary maximum compressed write cache. The #2780 and the secondary IOA each require one PCI-X slot and must be installed together in the same CEC or I/O unit/drawer/tower. The #2780 and the auxiliary write cache IOA are connected by a SCSI cable (provided). Feature #2780 will not appear on IBM ordering, shipping, or inventory documentation.
	
	The connecting SCSI cable is attached to port four of the #2780, reducing the number of SCSI buses that support disk drives from four to three. The reduction of SCSI buses can also reduce the number of disk drives supported by the #2780, depending on the CEC or I/O unit/ drawer/tower in which the #2780 is installed. No disk drives are driven by the auxiliary write cache IOA.
	
	Attributes provided: Disk Controller with auxiliary write cache
	Attributes required: Two PCI-X slots within the same CEC or I/O unit/drawer/tower
	
	For 9117-MMA (#5580)
	▸ Minimum required: 0
	▸ Maximum allowed: 100 (Initial order maximum: 0)
	▸ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5580)
	▸ Minimum required: 0
	▸ Maximum allowed: 180 (Initial order maximum: 0)
	▸ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No
	
	Note: This adapter is not allowed in the CEC enclosures.

#5581	**#5581 (2757) Controller with Aux Write Cache**
	Provides a disk controller with auxiliary write cache to improve cache data redundancy. The #5581 includes a #2757 PCI-X Ultra4 RAID Disk Controller and a secondary IOA with 757 MB of auxiliary maximum compressed write cache. The #2757 and the secondary IOA each require one PCI-X slot and must be installed together in the same CEC or I/O unit/drawer/tower. The #2757 and the auxiliary write cache IOA are connected by a SCSI cable (provided). Feature #2757 will not appear on IBM ordering, shipping, or inventory documentation.
	
	The connecting SCSI cable is attached to port four of the #2757, reducing the number of SCSI buses that support disk drives from four to three. The reduction of SCSI buses can also reduce the number of disk drives supported by the #2757, depending on the CEC or I/O unit/ drawer/tower in which the #2757 is installed. No disk drives are driven by the auxiliary write cache IOA.
	
	Attributes provided: Disk Controller with auxiliary write cache
	Attributes required: Two PCI-X slots within the same CEC or I/O unit/drawer/tower
	
	For 9117-MMA (#5581)
	▶ Minimum required: 0
	▶ Maximum allowed: 100 (Initial order maximum: 0)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5581)
	▶ Minimum required: 0
	▶ Maximum allowed: 180 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No
	
	Note: This adapter is not allowed in the CEC enclosures.

#5582	**#5582 - 5738 Ctlr with Aux Write Cache** Provides a disk controller with auxiliary write cache to improve cache data redundancy. #5582 includes a #5738 PCI-X RAID disk controller and an auxiliary write cache IOA with a maximum compressed write cache of 1.5 GB. #5738 and the auxiliary IOA each require one PCI-X slot and must be installed together in the same system unit or I/O unit/drawer/tower. #5738 and the auxiliary write cache IOA are connected by a SCSI cable (provided). Feature #5738 will not appear on IBM ordering, shipping, or inventory documentation. The connecting SCSI cable is attached to port four of the #5738, reducing the number of SCSI buses that support disk drives from four to three. The reduction of SCSI buses can also reduce the number of disk drives supported by the #5738, depending on the system unit or I/O unit/drawer/tower in which the #5738 is installed. No disk drives are driven by the auxiliary write cache IOA. #5582 and #5583 are physically the same adapter cards but have different feature numbers that denote to IBM configurator tools whether or not an IOP is required. #5582 indicates an IOP is used. Attributes provided: Disk controller with auxiliary write cache Attributes required: IOP and two PCI-X slots within the same system unit or I/O unit/ drawer/tower **For 9406-MMA (#5582)** ▶ Minimum required: 0 ▶ Maximum allowed: 240 (Initial order maximum: 240) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ 240 = 5 per tower * 48 towers

#5583	**#5583 (5777) Controller with Aux Write Cache**
	Provides a disk controller with auxiliary write cache to improve cache data redundancy. The #5583 includes a #5777 PCI-X disk controller and a secondary IOA with 1.5 GB of auxiliary maximum compressed write cache. #5777 and the secondary IOA each require one PCI-X slot and must be installed together in the same system unit or I/O unit/drawer/tower. The #5777 and the auxiliary write cache IOA are connected by a SCSI cable (provided). Feature #5777 will not appear on IBM ordering, shipping, or inventory documentation.
	
	The connecting SCSI cable is attached to port four of the #5777, reducing the number of SCSI buses that support disk drives from four to three. The reduction of SCSI buses can also reduce the number of disk drives supported by the #5777, depending on the system unit or I/O unit/drawer/tower in which the #5777 is installed. No disk drives are driven by the auxiliary write cache IOA. #5583 does not require an IOP.
	
	Attributes provided: Disk Controller with auxiliary write cache
	Attributes required: Two PCI-X slots within the same system unit or I/O unit/drawer/tower
	
	For 9117-MMA (#5583)
	▶ Minimum required: 0
	▶ Maximum allowed: 144 (Initial order maximum: 144)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5583)
	▶ Minimum required: 0
	▶ Maximum allowed: 288 (Initial order maximum: 0)
	▶ OS level required:
	    – IBM i 5.4 with V5R4M5 machine code
	    – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
	
	Note: This adapter is not allowed in the CEC enclosures.

| #5590 | **#5590 (2780) Controller with Aux Write Cache**
Provides a disk controller with auxiliary write cache to improve cache data redundancy. #5590 includes a #2780 PCI-X RAID Disk Controller with 757 MB of write cache and a secondary IOA with 1.5 GB of auxiliary maximum compressed write cache. The #2780 and the secondary IOA each require one PCI-X slot and must be installed together in the same system unit or I/O unit/drawer/tower. #2780 and the auxiliary write cache IOA are connected by the provided SCSI cable. Feature #2780 will not appear on IBM ordering, shipping, or inventory documentation.

The connecting SCSI cable is attached to port four of the #2780, reducing the number of SCSI buses that support disk drives from four to three. The reduction of SCSI buses can also reduce the number of disk drives supported by the #2780, depending on the system unit or I/O unit/drawer/tower in which the #2780 is installed. No disk drives are driven by the auxiliary write cache IOA.

Attributes provided: Disk Controller with auxiliary write cache
Attributes required: Two PCI-X slots within the same system unit or I/O unit/drawer/tower

For 9117-MMA (#5590)
▶ Minimum required: 0
▶ Maximum allowed: 100 (Initial order maximum: 0)
▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later

For 9119-FHA (#5590)
▶ Minimum required: 0
▶ Maximum allowed: 180 (Initial order maximum: 0)
▶ OS level required:
   – IBM i 5.4 with V5R4M5 machine code
   – IBM i 6.1 or later

Initial Order/MES/Both/Supported: Supported
CSU: Yes
Return parts MES: No |

#5591	**#5591 (2757) Controller with Aux Write Cache**
	Provides a disk controller with auxiliary write cache to improve cache data redundancy. The #5591 includes a #2757 PCI-X RAID Disk Controller with a 757 MB write cache and a secondary IOA with 1.5 GB of auxiliary maximum compressed write cache. The #2757 and the secondary IOA each require one PCI-X slot and must be installed together in the same system unit or I/O unit/drawer/tower. The #2757 and the auxiliary write cache IOA are connected by a SCSI cable (provided). Feature #2757 will not appear on IBM ordering, shipping, or inventory documentation.
	The connecting SCSI cable is attached to port four of the #2757, reducing the number of SCSI buses that support disk drives from four to three. The reduction of SCSI buses can also reduce the number of disk drives supported by the #2757, depending on the system unit or I/O unit/drawer/tower in which the #2757 is installed. No disk drives are driven by the auxiliary write cache IOA.
	Attributes provided: Disk Controller with auxiliary write cache Attributes required: Two PCI-X slots within the same system unit or I/O unit/drawer/tower
	For 9117-MMA (#5591) ▶ Minimum required: 0 ▶ Maximum allowed: 100 (Initial order maximum: 0) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later

	For 9119-FHA (#5591)
	▶ Minimum required: 0
	▶ Maximum allowed: 180 (Initial order maximum: 0)
	▶ OS level required:
	    – IBM i 5.4 with V5R4M5 machine code
	    – IBM i 6.1 or later

	Initial Order/MES/Both/Supported: Supported CSU: Yes Return parts MES: No

| #5605 | **#5605 4X Memory DIMM Interposers, Migrated #4501**
One #5605 provides four interposer cards, one for each of the four memory DIMMs on a #4501 memory card. Each #4501, DDR2 memory card contains 4 memory DIMMs, each of which require one interposer card when migrating to a 9119-FHA.

Attributes provided: Four interposer cards for mounting #4501 DIMMs
Attributes required:
► 4 empty DIMM slots
► #4501 DIMMs

For 9119-FHA (#5605)
► Minimum required: 0
► Maximum allowed: 64 (Initial order maximum: 64)
► OS level required:
  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
  – AIX Version 5.3 with the 5300-08 Technology Level or later
  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
  – AIX Version 6.1 with the 6100-01 Technology Level or later
  – IBM i 5.4 with V5R4M5 machine code
  – IBM i 6.1 or later
  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
  Not all AIX features operate with Linux. Refer to the following Web address for systems and features that operate with Linux:
  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
► Initial Order/MES/Both/Supported: MES
► CSU: No
► Return parts MES: No

Notes:
► Initial Order minimum = 4
► MES minimum order quantity = 2.
► Minimum of 50% of the memory must be activated through memory activation feature #5680 or #5681 at the time of purchase.
► Within a processor book, this memory cannot be mixed with #5693, #5694, #5695, #5696, or #5697.
► Within a processor book, this memory cannot be mixed with migrated memory using either #5584 nor #5611.
► If a interposer card is removed from the machine, it is a 0/8 GB card, no memory is activated. |

#5611	**#5611 4X Memory DIMM Interposers, Migrated #4502** One #5611 provides four interposer cards, one for each of the four memory DIMMs on a #4502 memory card. Each #4502, DDR2 memory card contains 4 memory DIMMs, each of which require one interposer card when migrating to a 9119-FHA. Attributes provided: Four inperposer cards for mounting #4502 DIMMs Attributes required: ▶ 4 empty DIMM slots ▶ #4502 DIMMs **For 9119-FHA (#5611)** ▶ Minimum required: 0 ▶ Maximum allowed: 64 (Initial order maximum: 64) ▶ OS level required: – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later – AIX Version 5.3 with the 5300-08 Technology Level or later – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later – AIX Version 6.1 with the 6100-01 Technology Level or later – IBM i 5.4 with V5R4M5 machine code – IBM i 6.1 or later – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: No ▶ Return parts MES: No **Notes**: ▶ Initial Order minimum = 4 ▶ MES minimum order quantity = 2. ▶ Minimum of 50% of the memory must be activated through memory activation feature #5680 or #5681 at the time of purchase. ▶ Within a processor book, this memory cannot be mixed with #5693, #5694, #5695, #5696 nor #5697. ▶ Within a processor book, this memory cannot be mixed with migrated memory using either #5584 nor #5605. interposer features. ▶ If a interposer card is removed from the machine, it is a 0/16 GB card, no memory is activated.

#5619	**#5619 80/160 GB DAT160 SAS Tape Drive**
	The Internal Tape Drive is a 5.25 inch, half-high for save/restore and archive functions. This DDS Gen5 tape drive uses the new larger IBM DAT160 and 4-mm data cartridges and is compression capable, providing a capacity of up to 160 GB (assuming 2:1 compression ratio) - a significant increase in capacity over the previous 36/72 GB 4-mm internal tape drives (when using DAT160 Data Cartridge)
	Characteristics
	► Capacity: 80 GB native mode, 160 GB (typical) compression mode
	► DDS Gen5
	► Form Factor: 5.25 inch half high
	► Media: IBM DAT160 and 4 mm media
	► Technology: Helical scan, rotating head
	► Operation: Streaming
	► Data Transfer Rate: 6 MBps native mode,
	► Interface: SAS
	► Compatibility: DDS4 (R/W), DAT72 (R/W) and DAT160 (R/W)
	Attributes provided: Attributes provided: 4 mm tape capability, Test Cartridge, and a Cleaning Cartridge
	Attributes required: One 1.6 inch (41 mm) half-high media
	For 9119-FHA (#5619)
	► Minimum required: 0
	► Maximum allowed: 1 (Initial order maximum: 1)
	► OS level required:
	– AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	– AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	– AIX Version 5.3 with the 5300-08 Technology Level or later
	– AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	– AIX Version 6.1 with the 6100-01 Technology Level or later
	– IBM i 5.4 with machine code V5R4M5. In addition to IBM i machine code 5.4.5, Info APAR II14355 is also required
	– IBM i 6.1 or later
	– SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	– Red Hat Enterprise Linux V4.7 for Power
	– Red Hat Enterprise Linux V5.2 for Power or later
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	► Initial Order/MES/Both/Supported: Both
	► CSU: No
	► Return parts MES: No
	Note: DVD/Tape SAS External Storage Unit #5720 is required.

#5620	**#5620 3.5 GHz Proc Card, 0/2 Core POWER6, 12 DDR2 Memory Slots**
	Dual-core 3.5 GHz POWER6 CUoD processor card. The two processors in this feature each have 4 MB of L2 cache and share 32 MB of L3 cache. There are 12 DDR2 DIMM slots on the processor card which can be used without activating the processors. Permanent activation of the processors requires purchase of the activation FC #5670.
	
	Attributes provided: Two 3.5 GHz Processors (inactive) on 1 Card
	Attributes required: Available processor socket
	
	For 9117-MMA (#5620)
	▶ Minimum required: 0
	▶ Maximum allowed: 8 (Initial order maximum: 8)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: No
	▶ Return parts MES: No

#5621	**#5621 4.2 GHz Proc Card, 0/2 Core POWER6, 8 DDR2 Memory Slots**
	Dual-core 4.2 GHz POWER6 CUoD processor card.
	The two processors in this feature each have 4 MB of L2 cache and share 32 MB of L3 cache. There are eight DDR2 DIMM slots on the processor card which can be used without activating the processors. Permanent activation of the processors requires purchase of the activation FC 5671. This processor can only be ordered when purchasing a model conversion upgrade from a 9117-570. The memory DIMM slots on this card are compatible with the DDR2 DIMMs used on the 9117-570 system. Processor feature number 5622 can be used to expand a system that was built with processor feature 5621. Processor features 5621 and 5622 cannot be mixed in the same CEC enclosure.
	
	Attributes provided: Two 4.2 GHz Processors (inactive) on 1 Card
	Attributes required: Available processor socket
	
	For 9117-MMA (#5621)
	▶ Minimum required: 0
	▶ Maximum allowed: 8 (Initial order maximum: 0)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: No
	▶ Return parts MES: No
	
	Note: This processor can only be ordered when placing an MES order for an Initial Model Upgrade order. To expand a system built initially with processor 5621, order CEC enclosures with processor 5622.

#5622	**#5622 4.2 GHz Proc Card, 0/2 Core POWER6, 12 DDR2 Memory Slots**
	Dual-core 4.2 GHz POWER6 CUoD processor card. The two processors in this feature each have 4 MB of L2 cache and share 32 MB of L3 cache. There are 12 DDR2 DIMM slots on the processor card which can be used without activating the processors. Permanent activation of the processors requires purchase of the activation FC 5672.
	
	Attributes provided: Two 4.2 GHz Processors (inactive) on 1 Card
	Attributes required: Available processor socket
	
	For 9117-MMA (#5622)
	▶ Minimum required: 0
	▶ Maximum allowed: 8 (Initial order maximum: 8)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
	  `http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument`
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: No
	▶ Return parts MES: No

#5625	**#5625 Proc Power Regulator** Provides the needed voltage regulation to operate the processors. Three power regulators in a single CEC enclosure with one or two processor feature cards provides redundant power regulator support. **Note**: Processor #5620 in a single enclosure system is supported with two Processor Power Regulators, all other configurations and processors require three regulators in each CEC enclosure. A system with two power regulators does not provide redundant power regulator support. Attributes provided: Required processor voltage regulation Attributes required: empty power regulator slot **For 9117-MMA (#5625)** ▶ Minimum required: 2 ▶ Maximum allowed: 12 (Initial order maximum: 12) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No **Note**: Three for each CEC enclosure.
#5626	**#5626 System CEC Enclosure with Bezel** Provides the chassis and bezel for one CEC enclosure. Attributes provided: Chassis and Bezel Attributes required: None **For 9117-MMA (#5626)** ▶ Minimum required: 0 ▶ Maximum allowed: 4 (Initial order maximum: 4) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No

#5628	**#5628 Sys ac Power Supply, 1600 W** One 1600 watt ac power supply. Two ac power supplies in a CEC enclosure provide redundant power support. If one should fail, it can be exchanged without interrupting the operation of the system. The system requires one functional power supply in each CEC enclosure to remain operational. Attributes provided: ac Power Attributes required: None **For 9117-MMA (#5628)** ▶ Minimum required: 2 ▶ Maximum allowed: 8 (Initial order maximum: 8) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No **Note**: Two power supplies are required for each CEC enclosure. When upgrading a 9117-570 to a 9117-MMA with Processor card #5621 this requirement can be met with 2 power supplies #7888. Features #7888 and #5628 cannot be mixed in the same CEC enclosure but can both be used in a system with two or more enclosures.
#5629	**#5629 Media Enclosure and Backplane** Sheet metal enclosure and Backplane for support of one media device in a single CEC Enclosure. Attributes provided: One media device slot Attributes required: None **For 9117-MMA (#5629)** ▶ Minimum required: 0 ▶ Maximum allowed: 4 (Initial order maximum: 4) ▶ OS level required: 　– AIX 5.2 TL10 or later 　– AIX 5.3 TL6 or later 　– IBM i 5.4 with V5R4M5 machine code or later 　For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to: 　http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No **Note**: One maximum in each CEC enclosure

#5636	**#5636 Integrated, 2X - 1 Gb Virtual Ethernet, I/O ports** Integrated I/O connectors for a CEC enclosure. Provides two 1 Gigabit Ethernet ports (connections) using RJ-45 that can be Virtualized into the system LPARs. The two system ports included with this feature do not function with the required HMC attached to the system. All of the connectors are on the rear bulkhead of the CEC enclosure. Features #5636, #5637 and #5639 can be mixed in multi enclosure systems. Attributes provided: HEA Integrated I/O Connections Attributes required: None **For 9117-MMA (#5636)** ▶ Minimum required: 0 ▶ Maximum allowed: 4 (Initial order maximum: 4) ▶ OS level required: – AIX 5.2 TL10 or later – AIX 5.3 TL6 or later – IBM i 5.4 with V5R4M5 machine code or later For information about support on Red Hat Enterprise Linux and SUSE Linux, visit: http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Not applicable ▶ Return parts MES: No **Note**: One maximum for each CEC enclosure. Exactly one of feature #5636, #5637 or #5639 is required in each CEC enclosure. This feature must be installed at the time the enclosure is built in the factory. This feature selection cannot be changed in the field.
#5637	**#5637 Integrated, 2X- 10 Gb (SR) Virtual Ethernet, I/O ports** Integrated I/O connectors for a CEC enclosure. Provides 2X-10 Gigabit - Short Range Ethernet connections (Optical) that can be Virtualized into the system LPARs. The system port included with this feature does not function with the required HMC attached. All of the connectors are on the rear bulkhead of the CEC enclosure. Features #5636, #5637 and #5639 can be mixed in multi enclosure systems. Attributes provided: HEA Integrated I/O Connections Attributes required: None **For 9117-MMA (#5637)** ▶ Minimum required: 0 ▶ Maximum allowed: 4 (Initial order maximum: 4) ▶ OS level required: – AIX 5.2 TL10 or later – AIX 5.3 TL6 or later – IBM i 5.4 with V5R4M5 machine code or later For information about support on Red Hat Enterprise Linux and SUSE Linux, visit: http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Not applicable ▶ Return parts MES: No **Note**: One maximum for each CEC enclosure. Exactly one of feature #5636, #5637, or #5639 is required in each CEC enclosure. This feature must be installed at the time the enclosure is built in the factory. This feature selection cannot be changed in the field.

| #5639 | **#5639 Integrated, 4X- 1 Gb Virtual Ethernet, I/O ports**
Integrated I/O connectors for a CEC enclosure. Provides 4X-1 Gigabit Ethernet connections (RJ-45) that can be Virtualized into the system LPARs. The system port included with this feature does not function with the required HMC attached. All of the connectors are on the rear bulkhead of the CEC enclosure. Features #5636, #5637, and #5639 can be mixed in multi enclosure systems

Attributes provided: HEA Integrated I/O Connections
Attributes required: None

For 9117-MMA (#5639)
► Minimum required: 0
► Maximum allowed: 4 (Initial order maximum: 4)
► OS level required
  – AIX 5.2 TL10 or later
  – AIX 5.3 TL6 or later
  – IBM i 5.4 with V5R4M5 machine code or later
  For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
► Initial Order/MES/Both/Supported: Both
► CSU: Not applicable
► Return parts MES: No

Note: One maximum for each CEC enclosure. Exactly one of feature #5636, #5637, or #5639 is required in each CEC enclosure. This feature must be installed at the time the enclosure is built in the factory. This feature selection cannot be changed in the field. |
| #5640 | **#5640 Utility Billing for FC# 5620- 100 processor minutes**
Provides payment for temporary use of processor feature #5620 with supported AIX or Linux operating systems. Each occurrence of this feature will pay for 100 minutes of usage. The purchase of this feature occurs after the customer has 100 minutes of use on processors in the shared processor pool that are not permanently active.

Attributes provided: Payment for temporary use of processor #5620 (AIX or Linux)
Attributes required: At least one processor #5620 that is not permanently active.

For 9117-MMA (#5640)
► Minimum required: 0
► Maximum allowed: no max (Initial order maximum: 0)
► OS level required: AIX 5.3 TL6 or later
  For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
► Initial Order/MES/Both/Supported: MES
► CSU: Yes
► Return parts MES: Does not apply

Note: Utility CoD requires activation of PowerVM feature #7942 or #7995. |

#5641	**#5641 Utility Billing for FC# 5621- 100 processor minutes**
	Provides payment for temporary use of processor feature #5621 or #5622 with supported AIX or Linux operating systems. Each occurrence of this feature will pay for 100 minutes of usage. The purchase of this feature occurs after the customer has 100 minutes of use on processors in the shared processor pool that are not permanently active.
	
	Attributes provided: Payment for temporary use of processor #5621 or #5622 (AIX or Linux)
	Attributes required: At least one processor #5621 or 5622 that is not permanently active
	
	For 9117-MMA (#5641)
	▶ Minimum required: 0
	▶ Maximum allowed: no max (Initial order maximum: 0)
	▶ OS level required: AIX 5.3 TL6 or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: Yes
	▶ Return parts MES: Does not apply
	
	Note: Utility CoD requires activation of PowerVM feature #7942 or #7995.

#5646	**#5646 Blind Swap Type III Cassette- PCI-X or PCIe, Short Slot** This feature contains a blind swap cassette for one, single width PCI Express adapter or PCI-X adapter designed to meet the short adapter size defined in the PCI Standard and used in a slot defined as a *short* slot. Use FC #5647 for PCI adapters that are mounted in a standard length PCI slot. Attributes provided: Mounting Hardware for a short PCI slot Attributes required: Empty PCI slot - Short **For 9117-MMA (#5646)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No **Note**: A full set of blind swap cassettes are shipped with each Initial I/O Drawer order. Slots without I/O Adapters will contain an empty cassette. Order additional cassettes only as required for spares.
#5647	**#5647 Blind Swap Type III Cassette- PCI-X or PCIe, Standard Slot** This feature contains a blind swap cassette for one, single width PCI Express adapter or PCI-X adapter that will be mounted in a Standard Length PCI slot. It includes the necessary hardware to mount various sizes of single width PCI adapters that might be less than standard size. Use FC #5646 for PCI adapters that are mounted in short PCI slots. Attributes provided: Mounting Hardware for a standard length PCI slot Attributes required: Empty PCI slot - Standard Length **For 9117-MMA (#5647)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 5) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No **Note**: A full set of blind swap cassettes are shipped with each Initial System Drawer order. Slots without I/O Adapters will contain an empty cassette. Order additional cassettes only as required for spares.

#5648	**5648 Service Interface Card**
	This feature is used to connect each CEC Enclosure to the active Service Processor through the external Service Interface Cable so the drawer content can be monitored for RAS purposes. This feature also includes 2X SPCN connectors (9-pin D-Shell, receptacle) and 2X HMC Ethernet connectors (RJ-45). All connectors are on the rear bulkhead of the CEC Enclosure.
	
	Attributes provided: connection to the active Service Processor
	Attributes required: CEC enclosure
	
	For 9117-MMA (#5648)
	▶ Minimum required: 1
	▶ Maximum allowed: 4 (Initial order maximum: 4)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No
	
	Note: One feature is required for each CEC enclosure.

#5650	**#5650 On/Off Processor Day Billing for Feature #5620**
	When an On/Off Processor Enablement feature is ordered and the associated enablement code is entered into the system, you must report your on/off usage to IBM at least monthly. This information, used to compute your billing data, is then provided to your sales channel. The sales channel will place an order for a quantity of On/Off Processor Day Billing features and bill you. One #5650 should be ordered for each billable processor day used by a supported AIX or Linux operating system.
	
	Attributes provided: One processor day usage for feature #5620 (AIX or Linux)
	Attributes required: On/Off Processor Enablement
	
	For 9117-MMA (#5650)
	▶ Minimum required: 0
	▶ Maximum allowed: no max (Initial order maximum: 0)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: Yes
	▶ Return parts MES: No

#5653	**#5653 On/Off Processor Day Billing for Feature #5621 or #5622**
	When an On/Off Processor Enablement feature is ordered and the associated enablement code is entered into the system, you must report your on/off usage to IBM at least monthly. This information, used to compute your billing data, is then provided to your sales channel. The sales channel will place an order for a quantity of On/Off Processor Day Billing features and bill you. One #5653 should be ordered for each billable processor day used by a supported AIX or Linux operating system.
	
	Attributes provided: One processor day usage for feature #5621 or #5622 (AIX or Linux)
	Attributes required: On/Off Processor Enablement
	
	For 9117-MMA (#5653)
	► Minimum required: 0
	► Maximum allowed: no max (Initial order maximum: 0)
	► OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	► Initial Order/MES/Both/Supported: MES
	► CSU: Yes
	► Return parts MES: No

#5656	**#5656 On/Off Processor Day Billing for Feature #7380**
	When an On/Off Processor Enablement feature is ordered and the associated enablement code is entered into the system, you must report your on/off usage to IBM at least monthly. This information, used to compute your billing data, is then provided to your sales channel. The sales channel will place an order for a quantity of On/Off Processor Day Billing features and bill you. One #5656 should be ordered for each billable processor day used by a supported AIX or Linux operating system.
	
	Attributes provided: One processor day usage for feature #7380 (AIX or Linux)
	Attributes required: On/Off Processor Enablement
	
	For 9117-MMA (#5656)
	► Minimum required: 0
	► Maximum allowed: no max (Initial order maximum: 0)
	► OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	► Initial Order/MES/Both/Supported: MES
	► CSU: Yes
	► Return parts MES: No

#5657	**#5657 Serv Interface Cable 2 Enclosure** Connects the components in each CEC enclosure to the active Service Processor for monitoring system functions. This cable connects at the rear of each CEC enclosure to the Service Interface Card. Attributes provided: Service Interface Attributes required: System with two CEC enclosures **For 9117-MMA (#5657)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No **Note**: For use on systems with two or less CEC enclosures. If the number of enclosures available is less than two, feature 7099 must be ordered.
#5658	**#5658 Serv Interface Cable 3 Enclosure** Connects the components in each CEC enclosure to the active Service Processor for monitoring system functions. This cable connects at the rear of each CEC enclosure to the Service Interface Card. Attributes provided: Service Interface Attributes required: System with three CEC enclosures **For 9117-MMA (#5658)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No **Note**: For use on systems with three or less CEC enclosures. If the number of enclosures available is less than three, feature 7099 must be ordered.
#5660	**#5660 Serv Interface Cable 4 Enclosure** Connects the components in each CEC enclosure to the active Service Processor for monitoring system functions. This cable connects at the rear of each CEC enclosure to the Service Interface Card. Attributes provided: Service Interface Attributes required: System with four CEC enclosures **For 9117-MMA (#5660)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No **Note**: For use on systems with four or less CEC enclosures. If the number of enclosures available is less than four, feature 7099 must be ordered.

#5663	**#5663 Proc Enclosure and Backplane**
	Provides the electrical interconnection and mechanical hardware to support up to two system processor cards.
	
	Attributes provided: Two processor card slots in a CEC enclosure.
	Attributes required: None
	
	For 9117-MMA (#5663)
	▶ Minimum required: 1
	▶ Maximum allowed: 4 (Initial order maximum: 4)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: No
	▶ Return parts MES: No
	
	Note: One feature is required for each CEC enclosure.

#5666	**#5666 I/O Backplane**
	This is the system I/O backplane and provides: Up to 6 PCI-X slots for adapters. 3 long, PCI Express (8X), slots P1-C1, P1-C2, P1-C3 1 short PCI Express (8X), slot P1-C6 - shares space with GX slot P1-C8 2 long PCI-X DDR 64 bit, 266 MHz, slots P1-C4, P1-C5 Up to 2 GX slots for adapters 2 short GX slots P1-C8 (shares space with PCI-X slot P1-C6), P1C9
	
	Attributes provided: PCI Slots, 4-PCIe, 2-PCI-X and 2-GX slots
	Attributes required: None
	
	For 9117-MMA (#5666)
	▶ Minimum required: 1
	▶ Maximum allowed: 4 (Initial order maximum: 4)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: No
	▶ Return parts MES: No
	
	Note: One feature is required for each CEC enclosure.

#5667	**#5667 System Midplane**
	Provides system interconnection within the CEC enclosure and 2 I/O Expansion slots that will accept GX Adapters. A system configured with 2 processors (one processor feature) will only support GX slot P1-C8. All other supported system configurations will support both GX slots P1-C8 and P1-C9 in each CEC enclosure. GX Slot P1-C8 shares space with PCI-X slot P1-C6
	
	Attributes provided: I/O Expansion slots for GX adapters
	Attributes required: None
	
	For 9117-MMA (#5667)
	▶ Minimum required: 1
	▶ Maximum allowed: 4 (Initial order maximum: 4)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
	  `http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument`
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: No
	▶ Return parts MES: No
	
	Note: One feature is required for each CEC enclosure.

#5668	**#5668 SAS Disk Backplane 6 slot**
	Provides six SAS DASD slots. These slots support Hot Pluggable SAS DASD drives.
	
	Attributes provided: 6 SAS DASD slots
	Attributes required: None
	
	For 9117-MMA (#5668)
	▶ Minimum required: 1
	▶ Maximum allowed: 4 (Initial order maximum: 4)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
	  `http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument`
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: No
	▶ Return parts MES: No
	
	Note: One feature is required for each CEC enclosure.

#5670	**#5670 One Processor Activation for Processor Feature #5620**
	Each occurrence of this feature will permanently activate one processor on Processor Card #5620
	
	Attributes provided: Activation of one processor on FC #5620
	Attributes required: FC #5620 with inactive processors
	
	For 9117-MMA (#5670)
	► Minimum required: 0
	► Maximum allowed: 16 (Initial order maximum: 16)
	► OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes
	► Return parts MES: No

#5671	**#5671 One Processor Activation for Processor Feature #5621**
	Each occurrence of this feature will permanently activate one processor on Processor Card #5621
	
	Attributes provided: Activation of one processor on FC #5621
	Attributes required: FC #5621 with inactive processors
	
	For 9117-MMA (#5671)
	► Minimum required: 0
	► Maximum allowed: 16 (Initial order maximum: 16)
	► OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes
	► Return parts MES: No

#5680	**#5680 Activation of 1 GB DDR2 POWER6 Memory**
	Each occurrence of this feature will permanently activate 1 GB of DDR2 - POWER6 memory.
	Attributes provided: Activation on 1 GB of DDR2 -POWER6 memory
	Attributes required: inactive POWER6-DDR2 memory
	For 9117-MMA (#5680)
	▶ Minimum required: 0
	▶ Maximum allowed: 768 (Initial order maximum: 768)
	▶ OS level required:
	– AIX 5.2 TL10 or later
	– AIX 5.3 TL6 or later
	– IBM i 5.4 with V5R4M5 machine code or later
	For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
	http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	For 9119-FHA (#5680)
	▶ Minimum required: 0
	▶ Maximum allowed: 255 (Initial order maximum: 255)
	▶ OS level required:
	– AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	– AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	– AIX Version 5.3 with the 5300-08 Technology Level or later
	– AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	– AIX Version 6.1 with the 6100-01 Technology Level or later
	– IBM i 5.4 with V5R4M5 machine code
	– IBM i 6.1 or later
	– SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	– Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	Not all AIX features operate with Linux. For systems and features that operate with Linux, visit:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
	Note: Intended for use with Memory Features #5692, #5693, #5694, #5695, and #5696. Cannot be used with feature #8129.

| #5681 | **#5681 Activation of 256 GB DDR2 POWER6 Memory**
Each occurrence of this feature will permanently activate 256 GB of DDR2 - POWER6 memory.

Attributes provided: Activation on 256 GB of DDR2 -POWER6 memory
Attributes required: 256 GB of inactive POWER6-DDR2 memory

For 9117-MMA (#5681)
► Minimum required: 0
► Maximum allowed: 3 (Initial order maximum: 3)
► OS level required:
  – AIX 5.2 TL10 or later
  – AIX 5.3 TL6 or later
  – IBM i 5.4 with V5R4M5 machine code or later

For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument

For 9119-FHA (#5681)
► Minimum required: 0
► Maximum allowed: 16 (Initial order maximum: 16)
► OS level required:
  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
  – AIX Version 5.3 with the 5300-08 Technology Level or later
  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
  – AIX Version 6.1 with the 6100-01 Technology Level or later
  – IBM i 5.4 with V5R4M5 machine code
  – IBM i 6.1 or later
  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later

Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

Initial Order/MES/Both/Supported: Both
CSU: Yes
Return parts MES: No

Note: Intended for use with Memory Features # 5695, 5696 and 8129. |
| #5686 | **#5686 Virtual Processor Power Regulator**
This feature is used only on a minimum configuration system when the customer chooses not to purchase the third Processor Power Regulator. The two Processor Power Regulators required in the minimum configuration system do not provide redundant processor power regulation.

Attributes provided: None
Attributes required: Minimum configuration system with 2 processor power regulators

For 9117-MMA (#5686)
► Minimum required: 0
► Maximum allowed: 1 (Initial order maximum: 1)
► OS level required: None
► Initial Order/MES/Both/Supported: Initial
► CSU: Not applicable
► Return parts MES: Does not apply |

#5689	**#5689 DAT160 Data Cartridge** 80 GB Native/160 GB Compressed Attributes provided: Five DAT160 Data Cartridges Attributes required: None **For 9119-FHA (#5689)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: Does not apply
#5691	**#5691 ON/OFF, 1 GB-1Day, Memory Billing- POWER6 Memory** After the On/Off Memory function is enabled in a system you must report your on/off usage to IBM at least monthly. This information, used to compute your billing data, is provided to your sales channel. The sales channel will place an order on your behalf for the quantity of this feature that matches your reported use. One #5691 feature should be ordered for each billable day for each 1 GB increment of POWER6 memory that was used. Attributes provided: Payment for 1 GB-DAY of ON/OFF memory use Attributes required: Inactive Memory available for temporary use. **For 9117-MMA (#5691 and 9119-FHA (#5691)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: MES ► CSU: Yes ► Return parts MES: No

#5692	**#569) 0/2 GB DDR2 Memory (4X0.5 GB) DIMMS 667 MHz POWER6**
	(No longer available as of 30 May 2008.)
	
	Memory This CoD memory feature makes available 4 DIMMS each with 0.5 GB of memory for a total feature size of 2 GB of DDR2, 667 MHz POWER6 system memory. None of the memory in this feature is active. Feature #5680 must be purchased to activate the memory in this feature.
	
	Attributes provided: 2 GB of memory available on 4 DIMMS
	Attributes required: 4 empty DIMM slots
	
	For 9117-MMA (#5692)
	► Minimum required: 0
	► Maximum allowed: 24 (Initial order maximum: 24)
	► OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	► Initial Order/MES/Both/Supported: Both
	► CSU: No
	► Return parts MES: No
	
	Note: Each memory feature (4 DIMMs) must be placed on a single processor card. Memory activation features must be purchased such that at least half the available memory on this feature is active. Each 9117-MMA system must have 2 GB of active memory within the system. This minimum system requirement might require this feature to be purchased fully active in a minimum configuration system.

#5693	**#5693 0/4 GB DDR2 Memory (4X1 GB) DIMMS 667 MHz POWER6 Memory**
	This CoD memory feature makes available 4 DIMMS each with 1 GB of memory for a total feature size of 4 GB of DDR2, 667 MHz POWER6 system memory. None of the memory in this feature is active. Feature #5680 must be purchased to activate the memory in this feature.
	
	Attributes provided: 4 GB of memory available on 4 DIMMS
	Attributes required: 4 empty DIMM slots
	
	For 9117-MMA (#5693)
	► Minimum required: 0
	► Maximum allowed: 24 (Initial order maximum: 24)
	► OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later, IBM i 5.4 with V5R4M5 machine code or later
	
	For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
	`http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument`
	
	For 9119-FHA (#5693)
	► Minimum required: 0
	► Maximum allowed: 64 (Initial order maximum: 64)
	► OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	`http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html`
	
	Initial Order/MES/Both/Supported: Both
	CSU: No
	Return parts MES: No
	
	Note: Each memory feature (4 DIMMs) must be placed on a single processor card. Memory activation features must be purchased such that at least half the available memory on this feature is active.

#5693 Continued	**#5693 0/4 GB DDR2 Memory (4X1 GB) DIMMS 667 MHz POWER6 Memory** Initial Order/MES/Both/Supported: Both CSU: No Return parts MES: Feature conversion only **Notes**: ► Initial Order minimum = 4 ► MES minimum order quantity = 2. ► 100% of the memory must be activated through memory activation feature #5680 or #5681 at the time of purchase. ► Within a processor book, this memory cannot be mixed with #5694, #5695, #5696 nor #5697. ► Within a processor book, this memory cannot be mixed with migrated memory using either #5605, #5611, or #5584 interposer features. ► If a DIMM card is removed from the machine, it is a 0/4 GB DIMM card, no memory is activated.

| #5694 | **#5694 0/8 GB DDR2 Memory (4X2 GB) DIMMS 667 MHz POWER6 Memory**
This CoD memory feature makes available 4 DIMMS each with 2 GB of memory for a total feature size of 8 GB of DDR2, 667 MHz POWER6 system memory. None of the memory in this feature is active. Feature #5680 must be purchased to activate the memory in this feature.

Attributes provided: 8 GB of memory available on 4 DIMMS
Attributes required: 4 empty DIMM slots

For 9117-MMA (#5694)
▶ Minimum required: 0
▶ Maximum allowed: 24 (Initial order maximum: 24)
▶ OS level required:
　– AIX 5.2 TL10 or later
　– AIX 5.3 TL6 or later
　– IBM i 5.4 with V5R4M5 machine code or later
　For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
　http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
▶ Initial Order/MES/Both/Supported: Both
▶ CSU: No
▶ Return parts MES: No

Note: Each memory feature (4 DIMMs) must be placed on a single processor card. Memory activation features must be purchased such that at least half the available memory on this feature is active.

For 9119-FHA (#5694)
▶ Minimum required: 0
▶ Maximum allowed: 64 (Initial order maximum: 64)
▶ OS level required:
　– AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
　– AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
　– AIX Version 5.3 with the 5300-08 Technology Level or later
　– AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
　– AIX Version 6.1 with the 6100-01 Technology Level or later
　– IBM i 5.4 with V5R4M5 machine code
　– IBM i 6.1 or later
　– SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
　– Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
　Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
　http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
▶ Initial Order/MES/Both/Supported: Both
▶ CSU: No
▶ Return parts MES: Feature conversion only

Notes:
▶ Initial Order minimum = 4
▶ MES minimum order quantity = 2.
▶ Minimum of 50% of the memory must be activated through memory activation feature #5680 or #5681 at the time of purchase.
▶ Within a processor book, this memory cannot be mixed with #5693, #5695, #5696, nor #5697.
▶ Within a processor book, this memory cannot be mixed with migrated memory using either #5605, #5611, or #5584 interposer features.
▶ If a DIMM card is removed from the machine, it is a 0/8 GB DIMM card, no memory is activated. |

#5695	**#5695 0/16 GB DDR2 Memory (4X4 GB) DIMMS 533 MHz POWER6 Memory** This CoD memory feature makes available 4 DIMMS each with 4 GB of memory for a total feature size of 16 GB of DDR2, 533 MHz POWER6 system memory. None of the memory in this feature is active. Feature #5680 or 5681 must be purchased to activate the memory in this feature. Attributes provided: 16 GB of memory available on 4 DIMMS Attributes required: 4 empty DIMM slots **For 9117-MMA (#5695)** ▶ Minimum required: 0 ▶ Maximum allowed: 24 (Initial order maximum: 24) ▶ OS level required: – AIX 5.2 TL10 or later – AIX 5.3 TL6 or later – IBM i 5.4 with V5R4M5 machine code or later For information about support on Red Hat Enterprise Linux and SUSE Linux, visit: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No **Note**: Each memory feature (4 DIMMs) must be placed on a single processor card. Memory activation features must be purchased such that at least half the available memory on this feature is active. **For 9119-FHA (#5695)** ▶ Minimum required: 0 ▶ Maximum allowed: 64 (Initial order maximum: 64) ▶ OS level required: – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later – AIX Version 5.3 with the 5300-08 Technology Level or later – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later – AIX Version 6.1 with the 6100-01 Technology Level or later – IBM i 5.4 with V5R4M5 machine code – IBM i 6.1 or later – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: Feature conversion only **Notes**: ▶ Initial Order minimum = 4 ▶ MES minimum order quantity = 2. ▶ Minimum of 50% of the memory must be activated through memory activation feature #5680 or #5681 at the time of purchase. ▶ Within a processor book, this memory cannot be mixed with #5693, #5694, #5696, nor #5697. ▶ Within a processor book, this memory cannot be mixed with migrated memory using either #5605, #5611, or #5584 interposer features. ▶ If a DIMM card is removed from the machine, it is a 0/16 GB DIMM card, no memory is activated.

| #5696 | **#5696 0/32 GB DDR2 Memory (4X8 GB) DIMMS 400 MHz POWER6 Memory**
This CoD memory feature makes available 4 DIMMS each with 8 GB of memory for a total feature size of 32 GB of DDR2, 400 MHz POWER6 system memory. None of the memory in this feature is active. Feature #5680 or 5681 must be purchased to activate the memory in this feature.

Attributes provided: 32 GB of memory available on 4 DIMMS
Attributes required: 4 empty DIMM slots

For 9117-MMA (#5696)
► Minimum required: 0
► Maximum allowed: 24 (Initial order maximum: 24)
► OS level required:
  – AIX 5.2 TL10 or later
  – AIX 5.3 TL6 or later
  – IBM i 5.4 with V5R4M5 machine code or later
  For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
► Initial Order/MES/Both/Supported: Both
► CSU: No
► Return parts MES: No

Note: Each memory feature (4 DIMMs) must be placed on a single processor card. Memory activation features must be purchased such that at least half the available memory on this feature is active. This memory feature (5696) requires System Firmware level EM320_030 or later. If ordering this feature for use on an existing system the firmware on that system must be updated to EM320_030 or later.

For 9119-FHA (#5696)
► Minimum required: 0
► Maximum allowed: 64 (Initial order maximum: 64)
► OS level required:
  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
  – AIX Version 5.3 with the 5300-08 Technology Level or later
  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
  – AIX Version 6.1 with the 6100-01 Technology Level or later
  – IBM i 5.4 with V5R4M5 machine code
  – IBM i 6.1 or later
  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
  Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
► Initial Order/MES/Both/Supported: Both
► CSU: No
► Return parts MES: Feature conversion only

Notes:
► Initial Order minimum = 4
► MES minimum order quantity = 2.
► Minimum of 50% of the memory must be activated through memory activation feature #5680 or #5681 at the time of purchase.
► Within a processor book, this memory cannot be mixed with #5693, #5694, #5695, nor #5697.
► Within a processor book, this memory cannot be mixed with migrated memory using either #5605, #5611, or #5584 interposer features.
► If a DIMM card is removed from the machine, it is a 0/32 GB DIMM card, no memory is activated. |

#5697	**#5697 0/64 GB DDR2 Memory (4X16 GB) DIMMS, 400 MHz, POWER6 CoD Memory**
	This CoD memory feature makes available 4 DIMMS each with 16 GB of memory for a total feature size of 64 GB of DDR2, 400 MHz POWER6 system memory. None of the memory in this feature is active. Feature 5680 or 5681 must be purchased to activate the memory in this feature.
	Attributes provided: 64 GB of memory available on 4 DIMMS Attributes required: 4 empty memory slots (4 slots per #5697)
	For 9119-FHA (#5697) ► Minimum required: 0 ► Maximum allowed: 64 (Initial order maximum: 64) ► OS level required: – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later – AIX Version 5.3 with the 5300-08 Technology Level or later – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later – AIX Version 6.1 with the 6100-01 Technology Level or later – IBM i 5.4 with V5R4M5 machine code – IBM i 6.1 or later – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html ► Initial Order/MES/Both/Supported: Both ► CSU: No ► Return parts MES: Feature conversion only
	Notes: ► The minimum quantity installed on a server must be 16. ► MES minimum order quantity = 8. ► Minimum of 100% of the memory must be activated through memory activation feature #5681 at the time of purchase (4 x #5681). ► Within a processor book, this memory cannot be mixed with #5693, #5694, #5695, nor #5696. ► Within a processor book, this memory cannot be mixed with migrated memory using either #5605, #5611, or #5584 interposer features. ► If a memory DIMM is removed from the machine, it is a 0/64 GB memory DIMM, no memory is activated. ► Can only be used with 5.0 GHz (#4695 or #7571).
#5699	**#5699 - System Ship Group** Miscellaneous one per system items that will ship with all initial order systems.
	Attributes provided: Ship Group Parts Attributes required: None
	For 9117-MMA (#5699) ► Minimum required: 1 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Both ► CSU: Not applicable ► Return parts MES: No

$5700	**#5700 - IBM Gigabit Ethernet-SX PCI-X Adapter** The IBM Gigabit Ethernet-SX PCI-X Adapter provides a 1 Gbps (1000 Base-SX) full-duplex Ethernet LAN connection with throughput on a standard shortwave multimode optical cable which conforms to the IEEE 802.3z standard. The adapter supports distances of 260m for 62.5 micron Multi Mode Fiber (MMF) and 550m for 50.0 micron MMF. AIX Network Install Manager (NIM) boot capability is supported with this adapter. **Notes**: ▶ For optimum performance, the adapter should be placed in a 64 bit PCI-X card slot. ▶ The IBM Gigabit Ethernet-SX PCI-X Adapter (#5700) incorporates an LC type connector on the card. This new, smaller form factor connector is being used by the industry for the next generation of fiber optic networks. If connecting into an older, existing SC type connector network, an LC-SC 62.5 Micron Fiber Converter Cable (#2459) or LC-SC 50 Micron Fiber Converter Cable (#2456) is required. Limitation: Half Duplex (HDX) mode is not supported. Attributes provided: One full-duplex 1000Base-SX fiber connection to a Gigabit Ethernet LAN. Attributes required: One available PCI or PCI-X card slot **For 9117-MMA (#5700)** ▶ Minimum required: 0 ▶ Maximum allowed: 344 (Initial order maximum: 250) ▶ OS level required: – AIX 5.2 TL10 or later – AIX 5.3 TL6 or later – IBM i 5.4 with V5R4M5 machine code or later For information about support on Red Hat Enterprise Linux and SUSE Linux, visit: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html **For 9119-FHA (#5700)** ▶ Minimum required: 0 ▶ Maximum allowed: 640 (Initial order maximum: 640) ▶ OS level required: – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later – AIX Version 5.3 with the 5300-08 Technology Level or later – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later – AIX Version 6.1 with the 6100-01 Technology Level or later – IBM i 5.4 with V5R4M5 machine code – IBM i 6.1 or later – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No **Note**: Two maximum in each CEC enclosure. The maximum allowed in all IBM i partitions combined is 128.

| #5701 | **#5701 IBM 10/100/1000 Base-TX Ethernet PCI-X Adapter**
The IBM 10/100/1000 Base-TX Ethernet PCI-X Adapter is a Full Duplex Gigabit Ethernet adapter designed with highly integrated components. This adapter can be configured to run at 10, 100, or 1000 Mbps data rates. The adapter interfaces to the system through the PCI-X bus and connects to the network using a 4-pair CAT-5 Unshielded Twisted Pair (UTP) cable for distances of up to 100m. AIX Network Install Manager (NIM) boot capability is supported with this adapter. The adapter conforms to the IEEE 802.3ab 1000Base-T standard. The adapter also supports jumbo frames when running at the 1000 Mbps speed.

Note: For optimum performance, adapter should be placed in a 64 bit PCI-X card slot.

Limitations: The 1000 Mbps speed is not supported in Half Duplex (HDX) mode.

Attributes provided:
▶ One full-duplex 10/100/1000Base-TX
▶ UTP connection to a Gigabit Ethernet LAN.
Attributes required: One available PCI or PCI-X card slot

For 9117-MMA (#5701)
▶ Minimum required: 0
▶ Maximum allowed: 344 (Initial order maximum: 250)
▶ OS level required:
  – AIX 5.2 TL10 or later
  – AIX 5.3 TL6 or later
  – IBM i 5.4 with V5R4M5 machine code or later

For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

For 9119-FHA (#5701)
▶ Minimum required: 0
▶ Maximum allowed: 640 (Initial order maximum: 640)
▶ OS level required:
  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
  – AIX Version 5.3 with the 5300-08 Technology Level or later
  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
  – AIX Version 6.1 with the 6100-01 Technology Level or later
  – IBM i 5.4 with V5R4M5 machine code
  – IBM i 6.1 or later
  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later

Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

Initial Order/MES/Both/Supported: Both
CSU: Yes
Return parts MES: No

Note: Two maximum in each CEC enclosure. The maximum allowed in all IBM i partitions combined is 128. |

#5702	**#5702 PCI-X Ultra Tape Controller**
	#5702 provides two SCSI busses for PCI-X attachment of external tape devices and external removable media devices. #5702 has two ports with VHDCI connectors.
	
	Attributes provided: Two SCSI VHDCI ports
	Attributes required: One PCI or PCI-X slot
	
	For 9117-MMA (#5702)
	▶ Minimum required: 0
	▶ Maximum allowed: 48 (Initial order maximum: 0)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5702)
	▶ Minimum required: 0
	▶ Maximum allowed: 150 (Initial order maximum: 0)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code or
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No
	
	Note: This adapter is not allowed in the CEC enclosures.

#5703	**#5703 PCI-X Dual Channel Ultra320 SCSI RAID Adapter**
	The PCI-X Dual Channel Ultra320 SCSI RAID Adapter (#5703) is a 64-bit 3.3 volt, bootable high performance Ultra320 SCSI RAID Adapter providing RAID 0,5, or 10 capability and can address up to thirty 16-bit SCSI physical disk drives on two independent SCSI buses.
	To increase the data writing performance, a 40 MByte non-volatile fast-write cache is provided as a resident part of this adapter. The 40 MByte fast-write cache can provide a significant improvement in data throughput and response time during certain sequence write operations compared to SCSI RAID adapters without the fast-write cache. The response time and data transfer improvement will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters.
	The Dual Channel Ultra320 SCSI RAID Adapter has two independent ultra320 SCSI buses. There are two internal ports and two external ports. The two internal ports are shared with the two external ports. The SCSI busses can drive either an internal port or an external port. The internal ports can be used to provide an internal RAID solution on certain supporting pSeries systems with internal multiple disk drives or packs of drives. Internally attached Ultra320 devices are designed to run at a data rate of up to 320 MBps on systems that have internal backplanes that are capable of supporting Ultra320 speeds.
	To achieve an Ultra320 SCSI bus data rate of up to 320 MBps and also maintain a reasonable drive distance, the adapter utilizes Low Voltage Differential (LVD) drivers and receivers. To fully utilize this 320 MBps performance, all attaching devices should also be Ultra320 LVD devices. But, if Ultra2, Ultra3, or Ultra320 devices coexist on the same bus, each device will operate at its rated speed. For lower speed single-ended (SE) devices, the SCSI bus will switch to single-ended (SE) performance and interface to all devices on that SCSI bus at the lower SE bus data rate of the device.
	When an array configuration is selected with the RAID Manager, the disk drives being designated as part of the array (attached to either the internal or external ports) are required to be formatted to 522 byte sectors. 522 byte sectors provide additional CRC error checking for improved data integrity. A menu option is provided in the AIX supporting software which will reformat these disk drives prior to their usage in an array. Conversely, when a disk drive is removed from an array, a similar menu option is also provided to re-format them back to 512 byte sectors.
	Note: Some disk drives require that their microcode be updated to the latest level before being formatted to 522 Byte Sectors. Also, there are some disk drives which do not support being formatted to 522 Byte Sectors. The PCI-X SCSI Disk Array Manager will inform the user of these known situations when they exist.
	For disk microcode updates, go to: http://techsupport.services.ibm.com/server/mdownload/
	Two industry-standard VHDCI 68-pin connectors are mounted on the adapter's end bracket allowing attachment of various LVD and SE external subsystems. A 0.3 meter converter cable, VHDCI to P, Mini-68-pin to 68-pin, (#2118) can be used with older external SE devices or subsystems to allow connection to the VHDCI connector on the PCI-X Dual Channel Ultra320 SCSI RAID Adapter.
	The two external ports provide connectivity to an IBM 2104-DS4 Expandable Storage Plus Drawer or 2104-TS4 Expandable Storage Plus Tower at up to 320 MBps SCSI bus data rate configured as either a non-array or an array of disks Also the two external ports provide non-array connectivity to numerous other SCSI external subsystems. Check the external subsystem sales or Web pages for verification of connectivity support with this adapter.
	Limitations: Supported on POWER6 unified MTMs running IBM i 5.4 with Licensed machine coder V5R4M5 or later. IBM i requires mirroring or RAID for attached disks.

#5703 Continued	**#5703 PCI-X Dual Channel Ultra320 SCSI RAID Adapter** The two external ports provide connectivity to an IBM 2104-DU3 Expandable Storage Plus Drawer or 2104-TU3 Expandable Storage Plus Tower at up to 160 MBps SCSI bus data rate as well as connectivity to an IBM 2104-DL1 Expandable Storage Plus Drawer or 2104-TL1 Expandable Storage Plus Tower at up to 80 MBps SCSI bus data rate, but is limited to only non-array configuration support. The two external ports do not support the connection to the IBM 7131-105 IBM Multi-Storage Tower Model 105. Even though the Dual Channel Ultra320 SCSI RAID Adapter has ports that run at ultra320 SCSI speeds (up to 320 MBps), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane. Disk drives internal to the pSeries system shipped prior to September 1, 2003 require a disk drive microcode update to run at Ultra320 speed. To obtain the appropriate microcode update, go to: http://techsupport.services.ibm.com/server/mdownload/ Attachment of internal and external SCSI devices Attributes required: One PCI or PCI-X bus slot **For 9117-MMA (#5703)** ► Not supported on POWER6.

#5704	**#5704 PCI-X Fibre Channel Tape Controller**
	Provides Fibre Channel attachment for external tape devices. #5704 supports point-to-point and arbitrated loop topologies and has an LC-type cable connector. Each #5704 is shipped with a wrap connector (P/N 05N6767).
	
	The following adapter kits are required when connecting SC type cables to the #5704:
	► #0371 - LC-SC Adapter Kit (50 um) (supported as #2456 on unified POWER6 MTMs)
	► #0372 - LC-SC Adapter Kit (62.5 um) supported as #24596 on unified POWER6 MTMs)
	
	An optics cleaning kit (P/N 46G6844) and instruction sheet (P/N 21P6238, SY27-2604) is shipped with the #5704. The customer supplies all Fibre Channel cables for this controller.
	
	Attributes provided: Attachment of external tape devices
	Attributes required: Primary OS indicator #2145 and partition indicator 0265 or 0266. Placement with a controlling IOP is required
	
	For 9117-MMA (#5704)
	► Minimum required: 0
	► Maximum allowed: 48 (Initial order maximum: 48)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5704)
	► Minimum required: 0
	► Maximum allowed: 640 (Initial order maximum: 0)
	► OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No
	
	Note: This adapter cannot be placed in a CEC enclosure.

#5706	**#5706 IBM 2-Port 10/100/1000 Base-TX Ethernet PCI-X Adapter**
	The IBM 2-Port 10/100/1000 Base-TX Ethernet PCI-X Adapter is a Full Duplex, dual ported, Gigabit Ethernet adapter designed with highly integrated components. This adapter can be configured to run each port at 10 Mbps, 100 Mbps, or 1000 Mbps data rates. The adapter interfaces to the system using a PCI or PCI-X bus and connects to a network using a 4-pair CAT-5 Unshielded Twisted Pair (UTP) cable for distances of up to 100 meters. AIX Network Install Manager (NIM) boot capability is supported with this adapter. The adapter conforms to the IEEE 802.3ab 1000Base-T standard. The adapter also supports jumbo frames when running at the 1000 Mbps speed.
	A function called *Large Send* or sometimes known as *TCP Segmentation* is also provided by this adapter. This function offloads the TCP segmentation operation from the AIX IP layer to the adapter for outgoing (transmit side) TCP segments. Another function known as *Checksum Offload* which offloads the TCP/UDP Checksum Operation or workload from the CPU to the adapter is also provided.
	The IBM 2-Port 10/100/1000 Base-TX Ethernet PCI-X Adapter (#5706) should be considered where maximum port density is required per I/O card slot. For a suggested maximum number of adapters taking performance into consideration, refer to the RS/6000 and pSeries PCI Adapter Placement Reference SA38-0538. If card slots are not the limiting factor and maximum throughput is required, the single port IBM 10/100/1000 Base-TX Ethernet PCI-X Adapter (#5701) is the preferred solution.
	Note: For optimum performance, the adapter should be placed in a 64 bit PCI-X card slot whenever possible.
	Limitations: The 1000 Mbps speed is not supported in Half Duplex (HDX) mode.
	Attributes provided: ▶ Two full-duplex 10/100/1000Base-TX ▶ UTP connections to Gigabit Ethernet LANs Attributes required: One available PCI or PCI-X card slot

	For 9117-MMA (#5706)
	▶ Minimum required: 0
	▶ Maximum allowed: 344 (Initial order maximum: 250)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – BM i 5.4 with V5R4M5 machine code or later

	For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

	For 9119-FHA (#5706)
	▶ Minimum required: 0
	▶ Maximum allowed: 640 (Initial order maximum: 640)
	▶ OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later

#5706 Continued	**#5706 IBM 2-Port 10/100/1000 Base-TX Ethernet PCI-X Adapter**
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
	Note: Two maximum in each CEC enclosure. The maximum allowed in all IBM i partitions combined is 64.

| #5707 | **#5707 IBM 2-Port Gigabit Ethernet-SX PCI-X Adapter**
The IBM 2-Port Gigabit Ethernet-SX PCI-X Adapter provides two 1 Gbps (1000 Base-SX) full-duplex Ethernet LAN connections with throughput on a standard shortwave multimode optical cable that conforms to the IEEE 802.3z standard. The adapter supports distances of 260m for 62.5 micron Multi Mode Fiber (MMF) and 550m for 50.0 micron MMF. AIX Network Install Manager (NIM) boot capability is supported with this adapter.

A function called *Large Send* or sometimes known as *TCP Segmentation* is also provided by this adapter. This function offloads the TCP segmentation operation from the AIX IP layer to the adapter for outgoing (transmit side) TCP segments. Another function known as *Checksum Offload* which offloads the TCP/UDP Checksum Operation or workload from the CPU to the adapter is also provided.

The IBM 2-Port Gigabit Ethernet-SX PCI-X Adapter (#5707) should be considered where maximum port density is required per I/O card slot. For a suggested maximum number of adapters taking performance into consideration, refer to the RS/6000 and pSeries PCI Adapter Placement Reference SA38-0538. If card slots are not the limiting factor and maximum throughput is required, the single port IBM Gigabit Ethernet-SX PCI-X Adapter (#5700) is the preferred solution.

Notes:
► For optimum performance, the adapter should be placed in a 64-bit PCI-X card slot whenever possible.
► The 2-Port IBM Gigabit Ethernet-SX PCI-X Adapter incorporates an LC type connector on the card. This new, smaller form factor connector is being used by the industry for the next generation of fiber optic networks. If connecting into an older, existing SC type connector network, an LC-SC 62.5 Micron Fiber Converter Cable (#2459) or LC-SC 50 Micron Fiber Converter Cable (#2456) is required.

Limitation: Half Duplex (HDX) mode is not supported.

Attributes provided: Two full-duplex 1000Base-SX fiber connections to a Gigabit Ethernet LANs.
Attributes required: One available PCI or PCI-X card slot

For 9117-MMA (#5707)
► Minimum required: 0
► Maximum allowed: 344 (Initial order maximum: 250)
► OS level required:
  – AIX 5.2 TL 10 or later
  – AIX 5.3 TL6 or later
  – IBM i 5.4 with V5R4M5 machine code or later

For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

For 9119-FHA (#5707)
► Minimum required: 0
► Maximum allowed: 640 (Initial order maximum: 640)
► OS level required:
  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
  – AIX Version 5.3 with the 5300-08 Technology Level or later
  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
  – AIX Version 6.1 with the 6100-01 Technology Level or later
  – IBM i 5.4 with V5R4M5 machine code
  – IBM i 6.1 or later
  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later |

#5707 Continued	**#5707 IBM 2-Port Gigabit Ethernet-SX PCI-X Adapter** Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No **Note**: Two maximum in each CEC enclosure. The maximum allowed in all IBM i partitions combined is 64.
#5709	**#5709 Dual Channel SCSI RAID Enablement Card** The Dual Channel SCSI RAID Enablement Card (#5709) is a bootable high performance SCSI RAID Enablement feature providing RAID 0,5, or 10 capability to select pSeries systems with the appropriate supporting integrated SCSI adapter and internal multiple disk drives or packs of drives. To increase the data writing performance, a 16 MByte non-volatile fast-write cache is provided as a resident part of this feature. The 16 MByte fast-write cache can provide an improvement in data throughput and response time during certain sequence write operations compared to SCSI RAID adapters without the fast-write cache. The response time and data transfer improvement will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters. When an array configuration is selected with the RAID Manager, the disk drives being designated as part of the array are required to be formatted to 522 byte sectors. 522 byte sectors provide additional CRC error checking for improved data integrity. A menu option is provided in the AIX supporting software which will reformat these disk drives prior to their usage in an array. Conversely, when a disk drive is removed from an array, a similar menu option is also provided to re-format them back to 512 byte sectors. **Note**: Some disk drives require that their microcode be updated to the latest level before being formatted to 522 Byte Sectors. Also, there are some disk drives which do not support being formatted to 522 Byte Sectors. The PCI-X SCSI Disk Array Manager will inform the user of these known situations when they exist. For disk microcode updates, go to: http://techsupport.services.ibm.com/server/mdownload/ Limitations: Not supported on POWER6 unified MTMs. Even though the supporting integrated adapter with the Dual Channel SCSI RAID Enablement Card has ports that run at ultra320 SCSI speeds (up to 320 MBps), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane. Disk drives internal to the pSeries system shipped prior to September 1, 2003 require a disk drive microcode update to run at Ultra320 speed. To obtain the appropriate microcode update, go to: http://techsupport.services.ibm.com/server/mdownload/ Attributes provided: Internal disk drives to be configured as an array. Attributes required: Systems with supporting integrated SCSI adapter.

#5710	**#5710 PCI-X Dual Channel Ultra320 SCSI Blind Swap Adapter** The PCI-X Dual Channel Ultra320 SCSI Blind Swap Adapter (#5710) is a 64-bit 3.3 volt adapter and is an excellent solution for high-performance SCSI applications. The PCI-X Dual Channel Ultra320 SCSI Blind Swap Adapter provides two SCSI channels (busses), each capable of running 320 MBps (maximum) and up to twice the maximum data transfer rate of the previous Dual Channel Ultra3 SCSI adapter (160 MBps). Each SCSI bus can either be internal (on systems that support internal SCSI device or backplane attachments) or external. Internally attached Ultra320 devices are designed to run at a data rate of up to 320 MBps on systems that have internal backplanes that are capable of supporting Ultra320 speeds. To achieve an Ultra320 SCSI bus data rate of up to 320 MBps and also to maintain a reasonable drive distance, the adapter uses Low Voltage Differential (LVD) drivers and receivers. To fully utilize this 320 MBps performance, all attaching devices must also be Ultra320 LVD devices. However, if Ultra2, Ultra3, or Ultra320 devices coexist on the same bus, each device operates at its rated speed. For lower speed single-ended (SE) devices, the SCSI bus switches to SE performance and interfaces with all devices on that SCSI bus at the lower SE bus data rate of the device. Two industry-standard VHDCI 68-pin connectors are mounted on the adapter's end bracket allowing attachment of various LVD and SE external subsystems. A .3-m converter cable, VHDCI to P, mini-68-pin to 68-pin, (#2118) can be used with older external SE devices or subsystems to allow connection to the VHDCI connector on the PCI-X Dual Channel Ultra320 SCSI Blind Swap Adapter. The two external ports provide connectivity to an IBM 2104-DS4 Expandable Storage Plus Drawer or 2104-TS4 Expandable Storage Plus Tower at up to 320 MBps SCSI bus data rate. The two external ports also provide connectivity to an IBM 2104-DU3 Expandable Storage Plus Drawer or 2104-TU3 Expandable Storage Plus Tower at up to 160 MBps SCSI bus data rate and to an IBM 2104-DL1 Expandable Storage Plus Drawer or 2104-TL1 Expandable Storage Plus Tower at up to 80 MBps SCSI bus data rate. Also the two external ports provide connectivity to numerous other SCSI external subsystems. Check the external subsystem sales or Web pages for verification of connectivity support with this adapter. The PCI-X Dual Channel Ultra320 SCSI Blind Swap Adapter (#5710) is a native boot adapter with AIX 5.1 or AIX 5.2 software in a supported pSeries or RS/6000 systems. The adapter also supports target mode. Limitations: ▶ The two external ports do not support the connection to the IBM 7131-105 IBM Multi-Storage Tower Model 105. ▶ Even though the Dual Channel Ultra320 SCSI RAID Blind Swap Adapter has ports that run at ultra320 SCSI speeds (up to 320 MBps), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane. ▶ Disk drives internal to the pSeries system shipped prior to 01 September 2003 require a disk drive microcode update to run at Ultra320 speed. To obtain the appropriate microcode update, go to: http://techsupport.services.ibm.com/server/mdownload/ Attributes provided: Attachment of internal SCSI devices (on systems that support an internal SCSI device or backplane attachment with this adapter) and external SCSI devices Attributes required: One available 3.3 volt PCI or PCI-X slot **For 9119-FHA (#5710)** ▶ Minimum required: 0 ▶ Maximum allowed: 150 (Initial order maximum: 0) ▶ OS level required: 　– AIX 5L for POWER version 5.3 with the 5300-08 Technology Level or later 　– AIX 5L for POWER version 5.3 with the 5300-07 Technology Level and Service Pack 4 or later 　– AIX 5L for POWER version 5.3 with the 5300-06 Technology Level and Service Pack 7 or later 　– AIX Version 6.1 with the 6100-01 Technology Level or later 　– AIX Version 6.1 with the 6100-00 Technology Level and Service Pack 5 or later 　– IBM i 5.4 with V5R4M5 machine code 　– IBM i 6.1 or later ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: No ▶ Return parts MES: Does not apply

#5711	**#5711 PCI-X Dual Channel Ultra320 SCSI RAID Blind Swap Adapter**
	The PCI-X Dual Channel Ultra320 SCSI RAID Blind Swap Adapter (#5711) is a 64-bit 3.3 volt, bootable high performance Ultra320 SCSI RAID Adapter providing RAID 0,5, or 10 capability and can address up to thirty 16-bit SCSI physical disk drives on two independent SCSI buses.
	To increase the data writing performance, a 40 MByte non-volatile fast-write cache is provided as a resident part of this adapter. The 40 MByte fast-write cache can provide a significant improvement in data throughput and response time during certain sequence write operations compared to SCSI RAID adapters without the fast-write cache. The response time and data transfer improvement will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters.
	The Dual Channel Ultra320 SCSI RAID Blind Swap Adapter has two independent ultra320 SCSI buses. There are two internal ports and two external ports. The two internal ports are shared with the two external ports. The SCSI busses can drive either an internal port or an external port. The internal ports can be used to provide an internal RAID solution on certain supporting pSeries systems with internal multiple disk drives or packs of drives. Internally attached Ultra320 devices are designed to run at a data rate of up to 320 MBps on systems that have internal backplanes that are capable of supporting Ultra320 speeds.
	To achieve an Ultra320 SCSI bus data rate of up to 320 MBps and also maintain a reasonable drive distance, the adapter utilizes Low Voltage Differential (LVD) drivers and receivers. To fully utilize this 320 MBps performance, all attaching devices should also be Ultra320 LVD devices. But, if Ultra2, Ultra3, or Ultra320 devices coexist on the same bus, each device will operate at its rated speed. For lower speed single-ended (SE) devices, the SCSI bus will switch to single-ended (SE) performance and interface to all devices on that SCSI bus at the lower SE bus data rate of the device.
	When an array configuration is selected with the RAID Manager, the disk drives being designated as part of the array (attached to either the internal or external ports) are required to be formatted to 522 byte sectors. 522 byte sectors provide additional CRC error checking for improved data integrity. A menu option is provided in the AIX supporting software which will reformat these disk drives prior to their usage in an array. Conversely, when a disk drive is removed from an array, a similar menu option is also provided to re-format them back to 512 byte sectors. Note: Some disk drives require that their microcode be updated to the latest level before being formatted to 522 Byte Sectors. Also, there are some disk drives which do not support being formatted to 522 Byte Sectors. The PCI-X SCSI Disk Array Manager will inform the user of these known situations when they exist.
	For disk microcode updates, go to: http://techsupport.services.ibm.com/server/mdownload/
	Two industry-standard VHDCI 68-pin connectors are mounted on the adapter's end bracket allowing attachment of various LVD and SE external subsystems. A .3 meter converter cable, VHDCI to P, Mini-68-pin to 68-pin, (#2118) can be used with older external SE devices or subsystems to allow connection to the VHDCI connector on the PCI-X Dual Channel Ultra320 SCSI RAID Blind Swap Adapter.
	The two external ports provide connectivity to an IBM 2104-DS4 Expandable Storage Plus Drawer or 2104-TS4 Expandable Storage Plus Tower at up to 320 MBps SCSI bus data rate configured as either a non-array or an array of disks Also the two external ports provide non-array connectivity to numerous other SCSI external subsystems. Check the external subsystem sales or Web pages for verification of connectivity support with this adapter.
	Limitations: Not supported on unified POWER6 MTMs.
	The two external ports provide connectivity to an IBM 2104-DU3 Expandable Storage Plus Drawer or 2104-TU3 Expandable Storage Plus Tower at up to 160 MBps SCSI bus data rate as well as connectivity to an IBM 2104-DL1 Expandable Storage Plus Drawer or 2104-TL1 Expandable Storage Plus Tower at up to 80 MBps SCSI bus data rate but is limited to only non-array configuration support.
	The two external ports do not support the connection to the IBM 7131-105 IBM Multi-Storage Tower Model 105.

#5711 Continued	**#5711 PCI-X Dual Channel Ultra320 SCSI RAID Blind Swap Adapter** Although the Dual Channel Ultra320 SCSI RAID Blind Swap Adapter has ports that run at ultra320 SCSI speeds (up to 320 MBps), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane. Disk drives internal to the pSeries system shipped prior to 01 September 2003 require a disk drive microcode update to run at Ultra320 speed. To obtain the appropriate microcode update, go to: http://techsupport.services.ibm.com/server/mdownload/ Attributes provided: Attachment of internal and external SCSI devices Attributes required: One PCI or PCI-X bus slot

#5712	**#5712 PCI-X Dual Channel Ultra320 SCSI Adapter**
	The PCI-X Dual Channel Ultra320 SCSI Adapter (#5712) is a 64-bit 3.3 volt adapter and is an excellent solution for high-performance SCSI applications. The PCI-X Dual Channel Ultra320 SCSI Adapter provides two SCSI channels (busses), each capable of running 320 MBps (maximum), up to twice the maximum data transfer rate of the previous Dual Channel Ultra3 SCSI adapter (160 MBps). Each SCSI bus can either be internal (on systems that support internal SCSI device or backplane attachments) or external. Internally attached Ultra320 devices are designed to run at a data rate of up to 320 MBps on systems that have internal backplanes that are capable of supporting Ultra320 speeds.
	To achieve an Ultra320 SCSI bus data rate of up to 320 MBps and also maintain a reasonable drive distance, the adapter utilizes Low Voltage Differential (LVD) drivers and receivers. To fully utilize this 320 MBps performance, all attaching devices should also be Ultra320 LVD devices. However, if Ultra2, Ultra3, or Ultra320 devices coexist on the same bus, each device will operate at its rated speed. For lower speed single-ended (SE) devices, the SCSI bus will switch to single-ended (SE) performance and interface to all devices on that SCSI bus at the lower SE bus data rate of the device.
	Two industry-standard VHDCI 68-pin connectors are mounted on the adapter's end bracket allowing attachment of various LVD and SE external subsystems. A 0.3 meter converter cable, VHDCI to P, Mini-68-pin to 68-pin, (#2118) can be used with older external SE devices or subsystems to allow connection to the VHDCI connector on the PCI-X Dual Channel Ultra320 SCSI Adapter. The two external ports provide connectivity to an IBM 2104-DS4 Expandable Storage Plus Drawer or 2104-TS4 Expandable Storage Plus Tower at up to 320 MBps SCSI bus data rate. The two external ports also provide connectivity to an IBM 2104-DU3 Expandable Storage Plus Drawer or 2104-TU3 Expandable Storage Plus Tower at up to 160 MBps SCSI bus data rate and to an IBM 2104-DL1 Expandable Storage Plus Drawer or 2104-TL1 Expandable Storage Plus Tower at up to 80 MBps SCSI bus data rate. Also the two external ports provide connectivity to numerous other SCSI external subsystems. Check the external subsystem sales or Web pages for verification of connectivity support with this adapter. The PCI-X Dual Channel Ultra320 SCSI Adapter (#5712) is a native boot adapter with AIX 5.1 or AIX 5.2 software in a supported pSeries or RS/6000 systems. The adapter also supports target mode.
	Limitations:
	▸ The two external ports do not support the connection to the IBM 7131-105 IBM Multi-Storage Tower Model 105.
	▸ Although the Dual Channel Ultra320 SCSI RAID Adapter has ports that run at ultra320 SCSI speeds (up to 320 MBps), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane.
	▸ Disk drives internal to the pSeries system shipped prior to September 1, 2003 require a disk drive microcode update to run at Ultra320 speed. To obtain the appropriate microcode update, go to: http://techsupport.services.ibm.com/server/mdownload/
	Attributes required: One available 3.3 volt PCI or PCI-X slot Attributes provided: Attachment of internal SCSI devices (on systems that support an internal SCSI device or backplane attachment with this adapter) and external SCSI devices
	For 9117-MMA (#5712)
	▸ Minimum required: 0
	▸ Maximum allowed: 62 (Initial order maximum: 0)
	▸ OS level required:
	– AIX 5.2 TL10 or later
	– AIX 5.3 TL6 or later
	– IBM i 5.4 with V5R4M5 machine code or later
	For information about support on Red Hat Enterprise Linux and SUSE Linux, visit: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

#5712 Continued	**#5712 PCI-X Dual Channel Ultra320 SCSI Adapter**
	For 9119-FHA (#5712)
	▶ Minimum required: 0
	▶ Maximum allowed: 150 (Initial order maximum: 0)
	▶ OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#5713	**#5713 1 Gigabit iSCSI TOE PCI-X on Copper Media Adapte**r
	The 1 Gigabit iSCSI TOE PCI-X adapter encapsulates SCSI Commands and data int TCP and transports them over the Ethernet through IP packets. The adapter operates as an iSCSI TOE (TCP/IP Offload Engine). This offload function eliminates host protocol processing and reduces CPU interrupts. Adapter uses RJ45 Gigabit Ethernet connector.
	Attributes provided: Offload of host protocol processing
	Attributes required: Available PCI-X Slot
	For 9117-MMA (#5713)
	► Minimum required: 0
	► Maximum allowed: 168 (Initial order maximum: 168)
	► OS level required:
	– AIX 5.2 TL10 or later
	– AIX 5.3 TL6 or later
	– IBM i 5.4 with V5R4M5 machine code or later
	– SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 1 or later
	– Red Hat Enterprise Linux 4.5 and Red Hat Enterprise Linux 5.1 or later
	For 9119-FHA (#5713)
	► Minimum required: 0
	► Maximum allowed: 48 (Initial order maximum: 48)
	► OS level required:
	– AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	– AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	– AIX Version 5.3 with the 5300-08 Technology Level or later
	– AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	– AIX Version 6.1 with the 6100-01 Technology Level or later
	– IBM i 5.4 with V5R4M5 machine code
	– IBM i 6.1 or later
	– SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 or later
	– Red Hat Enterprise Linux 4.7 and Red Hat Enterprise Linux 5.2 or later
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
	Note: Two maximum per CEC enclosure. The maximum allowed in all AIX partitions combined is 63. The maximum allowed in all Linux partitions combined is 63.

| #5714 | **#5714 1 Gigabit iSCSI TOE PCI-X on Optical Media Adapter**
(No longer available as of 29 August 2008.)

The 1 Gigabit iSCSI TOE PCI-X adapter encapsulates SCSI Commands and data in TCP and transports them over the Ethernet through IP packets. The adapter operates as an iSCSI TOE (TCP/IP Offload Engine). This offload function eliminates host protocol processing and reduces CPU interrupts. Adapter uses Small form factor LC type fiber optic connector.

Attributes provided: Offload of host protocol processing
Attributes required: Available PCI-X Slot

For 9117-MMA (#5714)
▸ Minimum required: 0
▸ Maximum allowed: 168 (Initial order maximum: 168)
▸ OS level required:
  – AIX 5.2 TL10 or later
  – AIX 5.3 TL6 or later
  – IBM i 5.4 with V5R4M5 machine code or later
  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 1 or later
  – Red Hat Enterprise Linux V4.5 for Power and Red Hat Enterprise Linux V5.1 for Power or later

For 9119-FHA (#5714)
▸ Minimum required: 0
▸ Maximum allowed: 48 (Initial order maximum: 48)
▸ OS level required:
  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
  – AIX Version 5.3 with the 5300-08 Technology Level or later
  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
  – AIX Version 6.1 with the 6100-01 Technology Level or later
  – IBM i 5.4 with V5R4M5 machine code
  – IBM i 6.1 or later
  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later

Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

Initial Order/MES/Both/Supported: Both
CSU: Yes
Return parts MES: No

Note: Two maximum per CEC enclosure. The maximum allowed in all AIX partitions combined is 63. The maximum allowed in all Linux partitions combined is 63. |

5715	**#5715 PCI-X Tape/DASD Controller** (No longer available as of 01 June 2006.) Provides one SCSI port for external removable media devices, and one SCSI port for up to six internal disk units. RAID protection is not supported. If two external removable media devices need to be supported, a #5712 should be ordered. Attributes provided: Support for up to six disk units and one external tape/CD/DVD device Attributes required: One 3V PCI card slot (either long or short) **For 9406-MMA (#5715)** ► Minimum required: 0 ► Maximum allowed: 108 (Initial order maximum: 0) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes

#5716	**#5716 2 Gigabit Fibre Channel PCI-X Adapter**
	The 2 Gigabit Fibre Channel PCI-X Adapter is a 64-bit address/data, short form factor PCI-X adapter with an LC type external fiber connector. With the use of appropriate optical fiber cabling, this adapter provides the capability for a network of high speed local and remote located storage. The 2 Gigabit Fibre Channel PCI-X Adapter will auto-negotiate for the highest data rate (either 1 Gbps or 2 Gbps) of which the device or switch is capable. Distances of up to 500 meters running at 1 Gbps data rate and up to 300 meters running at 2 Gbps data rate are supported between the adapter and an attaching device or switch. When used with IBM supported Fibre Channel storage switches supporting long-wave optics, distances of up to 10 kilometers are capable running at either 1 Gbps or 2 Gbps data rates. The 2 Gigabit Fibre Channel PCI-X Adapter can be used to attach devices either directly, or by means of Fibre Channel Switches. If attaching a device or switch with a SC type fiber connectors), use of an LC-SC 50 Micron Fiber Converter Cable (#2456) or a LC-SC 62.5 Micron Fiber Converter Cable (#2459) is required.

For additional supported server attachment information for IBM devices, refer to:
http://www.ibm.com/servers/storage/product/products_pseries.html

Consult with your IBM representative or Business Partner for additional information relative to any third-party attachment.

Attributes provided: 1 Fibre Channel/FC-AL interface
Attributes required: 1 empty PCI or PCI-X slot

For 9117-MMA (#5716)
► Minimum required: 0
► Maximum allowed: 344 (Initial order maximum: 0)
► OS level required:
  – AIX 5.2 TL10 or later
  – AIX 5.3 TL6 or later

For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument

For 9119-FHA (#5716)
► Minimum required: 0
► Maximum allowed: 640 (Initial order maximum: 0)
► OS level required:
  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
  – AIX Version 5.3 with the 5300-08 Technology Level or later
  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
  – AIX Version 6.1 with the 6100-01 Technology Level or later
  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later

Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

Initial Order/MES/Both/Supported: Supported
CSU: Yes
Return parts MES: Does not apply

Note: Two maximum per CEC enclosure.

#5717	**#5717 4-Port 10/100/1000 Base-TX PCI Express Adapter**
	The 4-Port 10/100/1000 Base-TX PCI Express Adapter is full duplex, four- ported Gigabit Ethernet adapter that can be configured to run any of the ports at 10 Mbps, 100 Mbps, and 1000 Mbps or data rate. This adapter interfaces to the system through a PCIe bus and connects to a network using a 4-pair CAT-5 Unshielded Twisted Pair (UTP) cable for distance of up to 100m. Each port is independent of one another and is boot capable under AIX Network install manager (NIM). The adapter conforms to the IEEE 802.3ab 1000Base-T standard. The #5717 supports jumbo frames when running at the 1000 Mbps speed. The 4-Port 10/100/1000 Base-TX PCI Express Adapter is a short/ low-profile capable adapter that can be configured to run any of the ports at 1000,100, or 10 Mbps data rate. This adapter interfaces to the system through a PCIe bus and connects to a network using a 4-pair CAT-5 Unshielded Twisted Pair (UTP) cable for distance of up to 100m. Each port is independent of one another and is boot capable under AIX Network install manager (NIM). The adapter conforms to the IEEE 802.3ab 1000Base-T standard. The #5717 supports jumbo frames when running at the 1000 Mbps speed.

The 4-Port 10/100/1000 Base-TX PCI Express adapter (#5717) should be considered where maximum port density is required per I/O card slot. For a suggested maximum number of adapters considering performance, see the IBM System p PCI placement guide (SA76-0090) for information about the PCIe slots on your system unit. Limitations: The 1000 Mbps speed is not supported in Half Duplex (HDX) mode.

Attributes provided: Four-ported Gigabit Ethernet
Attributes required: One available PCIe card slot

For 9117-MMA (#5717)
► Minimum required: 0
► Maximum allowed: 16 (Initial order maximum: 16)
► OS level required:
   – AIX 5.3 TL6 SP4 or later
   – AIX 5.3 TL7 or later
   – AIX 6.1 or later
   Linux - For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
   http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
► Initial Order/MES/Both/Supported: Both
► CSU: Yes
► Return parts MES: No

Note: Four maximum per CEC enclosure. |

#5718	**#5718 10 Gigabit Ethernet SR PCI-X Adapter**
	Provides 10 Gigabit Ethernet PCI-X based server connections. Supports distances of up to 33 m using 62.5 um multimode fiber or 300 m using 50 um multimode fiber with 2000 MHz km minimum model bandwidth at 850 nm. Adapter connector type is LC.
	
	Attributes provided: Provides high-end bandwidth for networking
	Attributes required: Supported on PCI-X slots only
	
	For 9117-MMA (#5718)
	▶ Minimum required: 0
	▶ Maximum allowed: 48 (Initial order maximum: 0)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – SLES 10 SP1 or later
	  – RHEL 4.5 and RHEL 5.1 or later
	
	For 9119-FHA (#5718)
	▶ Minimum required: 0
	▶ Maximum allowed: 192 (Initial order maximum: 0)
	▶ OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	  Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	▶ Initial Order/MES/Both/Supported: Supported
	▶ CSU: Yes
	▶ Return parts MES: Does not apply
	
	Note: Two maximum in each CEC enclosure. One maximum in a 2 core 9117 system.

| #5719 | **#5719 IBM 10 Gigabit Ethernet-LR PCI-X Adapter**
Offers 10 Gigabit Ethernet PCI-X based server connections over a maximum of 10 kilometers of 1310nm single-mode fiber optic cable. The adapter conforms to the IEEE 802.3ae standard. The adapter requires 9um single- mode fiber optic cables and uses a SC connector type for connecting into network infrastructure components like 10 Gigabit Ethernet switch/router with SC connectors.

Attributes provided: 10 Gigabit Ethernet connections
Attributes required: Available PCI-X slot

For 9117-MMA (#5719)
► Minimum required: 0
► Maximum allowed: 48 (Initial order maximum: 0)
► OS level required:
  – AIX 5.2 TL10 or later
  – AIX 5.3 TL6 or later
  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 1 or later
  – Red Hat Enterprise Linux V4.5 for Power and Red Hat Enterprise Linux V5.1 for Power or later

For 9119-FHA (#5719)
► Minimum required: 0
► Maximum allowed: 192 (Initial order maximum: 0)
► OS level required:
  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
  – AIX Version 5.3 with the 5300-08 Technology Level or later
  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
  – AIX Version 6.1 with the 6100-01 Technology Level or later
  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later

Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

Initial Order/MES/Both/Supported: Supported
CSU: Yes
Return parts MES: Does not apply

Note:
► Two maximum in each CEC enclosure. One maximum in a 2 core 9117 system.
► No longer marketed as of 2007. |

#5720	**#5720 DVD/Tape SAS External Storage Unit** The #5720 media drawer occupies 1U of rack space in either the 12U or 34U positions in the CEC rack. Feature #8449 specifies that it will be located in the 12U location, below the Processor Books. Otherwise, it will be positioned in the 34U location. When positioned in the 12U location, one I/O drawer in the CEC rack is eliminated. The media drawer provides the system with two bays for media devices. One SAS controller in either a #5797 or #5791 I/O drawer drives both bays. Only one of the two bays can be populated by a tape drive. which defines a maximum of one tape drive per media drawer. Only one of the two bays can be populated by DVD media. The DVD bay can contain either one or two DVD drives. When the DVD bay is populated by two DVD drives, one tape drive will be available in the other media bay. Both the tape and DVD drives are orderable as feature codes. Supported tape devices include the #5619 Half High 800 GB / 1.6 TB LTO4 SAS Tape Drive and #5746 Half High 800 GB / 1.6 TB LTO4 SAS Tape Drive. The media drawer is provided redundant power by a required #5791 or #5797 I/O drawer. Attributes provided: Rack mounted media drawer with two media bays. Attributes required: I/O Drawer #5797 or #5791 and SAS PCIX 2.0 Controller, #5900 or #5912. **For 9119-FHA (#5720)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later – AIX Version 5.3 with the 5300-08 Technology Level or later – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later – AIX Version 6.1 with the 6100-01 Technology Level or later – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No **Note**: The #5720 Media Drawer is not available when the #6331 Battery Backup is ordered.

#5721	**#5721 10 Gb Ethernet-SR PCI-X 2.0 DDR Adapter**
	The adapter supports distances of up to 33 m using 62.5 um multimode fiber or 300m using 50 um multimode fiber with 2000 MHz km minimum model bandwidth at 850 nm wavelength. The fiber cable connects to the adapter with LC type connector. The adapter conforms to the IEEE 802.3ae standard.
	
	Attributes provided: Provides high-end bandwidth for networking
	Attributes required: PCI-X slot or for improved bandwidth plug into PCI-X 2.0 DDR slot.
	
	For 9117-MMA (#5721)
	▶ Minimum required: 0
	▶ Maximum allowed: 48 (Initial order maximum: 48)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 1 or later
	  – Red Hat Enterprise Linux V4.5 for Power and Red Hat Enterprise Linux V5.1 for Power or later
	
	For 9119-FHA (#5721)
	▶ Minimum required: 0
	▶ Maximum allowed: 448 (Initial order maximum: 448)
	▶ OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	
	Initial Order/MES/Both/Supported: Both
	CSU: No
	Return parts MES: No
	
	Note: Two maximum in each CEC enclosure. One maximum in a 2 core 9117 system.

| #5722 | **#5722 10 Gb Ethernet-LR PCI-X 2.0 DDR Adapter**
(No longer available as of 28 November 2008.)

The adapter supports a maximum of 10 km of 1310 nm 9 um single-mode fiber optic cable. The adapter conforms to the IEEE 802.3ae standard. The adapter requires 9 um single-mode fiber optic cables and uses a SC connector to facilitate connecting into network infrastructure components like 10 Gigabit Ethernet switch/router with SC connectors.

Attributes provided: 10 Gigabit Ethernet connections
Attributes required: PCI-X slot or for improved bandwidth plug in PCI-X 2.0 DDR slot.

For 9117-MMA (#5722)
▶ Minimum required: 0
▶ Maximum allowed: 48 (Initial order maximum: 48)
▶ OS level required:
 – AIX 5.2 TL10 or later
 – AIX 5.3 TL6 or later
 – IBM i 5.4 with V5R4M5 machine code or later
 – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 1 or later
 – Red Hat Enterprise Linux V4.5 for Power and Red Hat Enterprise Linux V5.1 for Power or later

For 9119-FHA (#5722)
▶ Minimum required: 0
▶ Maximum allowed: 448 (Initial order maximum: 448)
▶ OS level required:
 – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
 – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
 – AIX Version 5.3 with the 5300-08 Technology Level or later
 – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
 – AIX Version 6.1 with the 6100-01 Technology Level or later
 – IBM i 5.4 with V5R4M5 machine code
 – IBM i 6.1 or later
 – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
 – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later

Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

Initial Order/MES/Both/Supported: Both
CSU: Yes
Return parts MES: No

Note: Two maximum in each CEC enclosure. One maximum in a 2 core 9117 system. |

#5723	**#5723 2-Port Asynchronous EIA-232 PCI Adapter**
	Connection for two Asynchronous EIA-232 devices. Ports are Programmable to support EIA-232 protocols, at a line speed of 128 Kbps.
	
	Attributes provided: 2 Asynchronous Ports
	Attributes required: One PCI Slot
	
	For 9117-MMA (#5723)
	▶ Minimum required: 0
	▶ Maximum allowed: 42 (Initial order maximum: 42)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	
	For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	
	For 9119-FHA (#5723)
	▶ Minimum required: 0
	▶ Maximum allowed: 18 (Initial order maximum: 18)
	▶ OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
	
	Notes:
	▶ Two maximum per each CEC enclosure.
	▶ This system uses blind swap hardware to manage the installation and removal of PCI Adapters. Therefore, the internal connectors on PCI adapters are not supported for use in this system.

#5726	**#5726 Dual Channel SCSI RAID Enablement Card**
	The Dual Channel SCSI RAID Enablement Card (#5726) is a bootable high performance SCSI RAID Enablement feature providing RAID 0,5, or 10 capability to select pSeries systems with the appropriate supporting integrated SCSI adapter and internal multiple disk drives or packs of drives. To increase the data writing performance, a 16 MByte non- volatile fast-write cache is provided as a resident part of this feature. The 16 MByte fast-write cache can provide an improvement in data throughput and response time during certain sequence write operations compared to SCSI RAID adapters without the fast-write cache. The response time and data transfer improvement will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters. When an array configuration is selected with the RAID Manager, the disk drives being designated as part of the array are required to be formatted to 522 byte sectors. 522 byte sectors provide additional CRC error checking for improved data integrity. A menu option is provided in the AIX supporting software which will reformat these disk drives prior to their usage in an array. Conversely, when a disk drive is removed from an array, a similar menu option is also provided to re-format them back to 512 byte sectors.
	Note: Some disk drives require that their microcode be updated to the latest level before being formatted to 522 Byte Sectors. Also, there are some disk drives which do not support being formatted to 522 Byte Sectors. The PCI-X SCSI Disk Array Manager will inform the user of these known situations when they exist.
	For disk microcode updates, go to: http://techsupport.services.ibm.com/server/mdownload/
	Limitation: Not supported on unified POWER6 MTMs.
	Even though the supporting integrated adapter with the Dual Channel SCSI RAID Enablement Card has ports that run at ultra320 SCSI speeds (up to 320 MBps), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane.
	Attributes provided: Internal disk drives to be configured as an array. Attributes required: System with supporting integrated SCSI adapter.

| #5728 | **#5728 Dual Channel SCSI RAID Enablement Card**
The Dual Channel SCSI RAID Enablement Card (#5728) is a bootable high performance SCSI RAID Enablement feature providing RAID 0,5, or 10 capability to select pSeries systems with the appropriate supporting integrated SCSI adapter and internal multiple disk drives or packs of drives.

To increase the data writing performance, a 40 MByte nonvolatile fast-write cache is provided as a resident part of this feature. The 40 MByte fast-write cache can provide an improvement in data throughput and response time during certain sequence write operations compared to SCSI RAID adapters without the fast-write cache. The response time and data transfer improvement will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters.

When an array configuration is selected with the RAID Manager, the disk drives being designated as part of the array are required to be formatted to 522 byte sectors. A menu option is provided in the AIX supporting software which will reformat these disk drives prior to their usage in an array. Conversely, when a disk drive is removed from an array, a similar menu option is also provided to re-format them back to 512 byte sectors.

Note: Some disk drives require that their microcode be updated to the latest level before being formatted to 522 Byte Sectors. Also, there are some disk drives which do not support being formatted to 522 byte sectors. The PCI-X SCSI Disk Array Manager will inform the user of these known situations when they exist.

For disk microcode updates, go to:
http://techsupport.services.ibm.com/server/mdownload/

Limitation: Not supported on unified POWER6 MTMs.

Even though the supporting integrated adapter with the Dual Channel SCSI RAID Enablement Card has ports that run at ultra320 SCSI speeds (up to 320 MBps), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane.

Note: When the optional Dual Channel SCSI RAID Enablement Card (#5728) is added to the drawer it will override the internal split backplane function and combine all 6 DASD files to one RAID controller.

Attributes provided: Internal disk drives can be configured as an array.
Attributes required: System with supporting integrated SCSI adapter and disk drives. |

| #5735 | **#5735 8 Gigabit PCI Express Dual Port Fibre Channel Adapter**
The 8 Gigabit PCI Express Dual Port Fibre Channel Adapter is a high-performance adapter based on the Emulex LPe12002 PCIe Host Bus Adapter (HBA). Each port provides single initiator capability over a fibre link. The ports have Lucent Connector or Local Connector (LC) type connectors and use shortwave laser optics. The adapter connects to fibre channel switches and operates at link speeds of 2, 4, and 8 Gbps. The adapter automatically negotiates with the switch to the highest speed of which the switch is capable. LEDs on each port provide information on the status and link speed of the port.

Cables are the responsibility of the customer. Use multimode fibre optic cables with short-wave lasers that adhere to the following specifications:
▸ OM3 - multimode 50/125 micron fibre, 2000 MHz km bandwidth
▸ OM2 - multimode 50/125 micron fibre, 500 MHz km bandwidth
▸ OM1 - multimode 62.5/125 micron fibre, 200 MHz km bandwidth

OM2 cables can only be connected to other OM1 cables. For best results, OM2 cables should not be connected to OM3 cables. However, if an OM2 cable is connected to an OM3 cable, the characteristics of the OM2 cable apply to the entire length of the cables.

The following shows the supported distances for the three different cable types at the three different link speeds.
▸ OM3: .5m - 500 m (2.125 Gbps); .5 m - 380 m (4.25 Gbps); .5 m - 150 m (8.5 Gbps)
▸ OM1: .5m - 150 m (2.125 Gbps); .5 m - 70 m (4.25 Gbps); .5 m - 121 m (8.5 Gbps)
▸ OM3: .5m - 300 m (2.125 Gbps); .5 m - 150 m (4.25 Gbps); .5 m - 50 m (8.5 Gbps)

Attributes provided: Dual Port Fibre Channel
Attributes required: 1 Empty PCIe slot

For 8203-E4A, 8204-E8A, 9117-MMA:
▸ Minimum required: 0
▸ Maximum allowed: 8203-E4A, 8204-E8A: 3 (Initial order maximum: 3); 9117-MMA: 4 per processor enclosure (Initial order maximum: 4 per enclosure)
▸ OS level required:
  – IBM i 6.1.
  – AIX 5L for POWER version 5.3 with the 5300-09 Technology Level
  – AIX Version 6.1 with the 6100-02 Technology Level
  – SUSE Linux Enterprise Server 10 SP2 for POWER Systems or later.
  – Red Hat Enterprise LInux for POWER version 4.7 or later.
  – Red Hat Enterprise Linux for POWER version 5.2 or later.

Initial Order/MES/Both/Supported: Both
CSU: Yes
Return parts MES: No

In this paper, refer to Chapter 10, "Tape and optical storage attachment summary" on page 827 for more information on IBM tape support. Also, refer to the following IBM storage subsystem Web page for additional supported server attachment information for IBM devices.
    http://www.ibm.com/servers/storage/product/products_pseries.html

The Prerequisite Web site can help identify fixes or firmware level updates required for support by each operating system:
    https://www-912.ibm.com/e_dir/eServerPrereq.nsf/ |

#5735 Continued	**Additional IBM i considerations** IBM i supports IBM DS8000 attachment, multipath, and an IBM i load source disk. A supported tape device can be used for alternate IPL.

Additional IBM i considerations

IBM i supports IBM DS8000 attachment, multipath, and an IBM i load source disk. A supported tape device can be used for alternate IPL.

Tape libraries supported by IBM i 6.1 on this adapter include:
► 3592 with 3592 J1A / 3592 E05 drives
► 3584 (TS3500) with LTO 2 or LTO 3 drives
► 3494 with 3592 J1A / 3592 E05
► 3573 (TS3100 and TS3200) with LTO 3 or LTO 4 drives after October 2008 with appropriate PTFs
► IBM i plans to support addititional tapes such as the IBM 3576 (TS3310), 3577 (TS3400), and 3580 (TS2340/TS2240). during 4Q 2008.
► Informational APAR II14355 will contain prerequisite PTF level information as support becomes available.

A summary of tape supported by IBM i is located in this publication in Chapter 10, "Tape and optical storage attachment summary" on page 827.

You can also refer to the following Web sites for the latest support information:
► IBM System Storage and TotalStorage products at:
http://www-03.ibm.com/systems/storage/product/index.html
► IBM Prerequisites at:
http://www-912.ibm.com/e_dir/eServerPrereq.nsf//

| #5736 | **#5736 PCI-X DDR Dual Channel Ultra320 SCSI Adapter**
The PCI-X DDR Dual Channel Ultra320 SCSI Adapter (#5736) is a 64-bit 3.3-volt adapter and is an excellent solution for high-performance SCSI applications. The PCI-X Dual Channel Ultra320 SCSI Adapter provides two SCSI channels (busses), each capable of running 320 MBps (maximum). Each SCSI bus can either be internal (on systems that support internal SCSI device or backplane attachments) or external. Internally attached Ultra320 devices are designed to run at a data rate of up to 320 MBps on systems that have internal backplanes that are capable of supporting Ultra320 speeds. In order to achieve an Ultra320 SCSI bus data rate of up to 320 MBps and maintain a reasonable drive distance, the adapter utilizes Low Voltage Differential (LVD) drivers and receivers. To utilize the 320 MBps performance, all attaching devices should also be Ultra320 LVD devices; however, if Ultra2, Ultra3, or Ultra320 devices coexist on the same bus, each device will operate at its rated speed. For lower speed single-ended (SE) devices, the SCSI bus will switch to single-ended (SE) performance and interface to all devices on that SCSI bus at the lower SE bus data rate of the device. Two VHDCI 68-pin connectors are mounted on the adapter's end bracket allowing attachment of various LVD and SE external subsystems. A 0.3-meter converter cable, VHDCI to P, Mini-68-pin to 68-pin, (#2118) can be used with older external SE devices or subsystems to allow connection to the VHDCI connector on the PCI-X DDR Dual Channel Ultra320 SCSI Adapter. Two external ports provide connectivity to numerous other SCSI external subsystems. Check the external subsystem sales or Web pages for verification of connectivity support with this adapter. The PCI-X Dual Channel Ultra320 SCSI Adapter (#5736) is a native boot adapter with AIX 5L for POWER Version 5.2 with the 5200-07 Recommended Maintenance package (APAR IY67914) or AIX 5L for POWER Version 5.3 with the 5300-03 Recommended Maintenance package (APAR IY71011) or later software in a supported pSeries or RS/6000 systems. The adapter also supports target mode.

Limitations:
▶ The two external ports do not support the connection to the IBM 7131-105 IBM Multi-Storage Tower Model 105.
▶ Even though the Dual Channel Ultra320 SCSI nonRAID Adapter has ports that run at ultra320 SCSI speeds (up to 320 MBps), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane.

Minimum system firmware required:
▶ System firmware level required is SF235_185 or greater.
▶ Firmware level SF235_185 adjusts the PCI slots to run in Single Data Rate (SDR) mode.
▶ Enablement of Double Data Rate (DDR) slots to run at DDR mode is planned to be provided in an upcoming firmware enhancement.

For DDR, check for firmware upgrade at:
http://techsupport.services.ibm.com/server/mdownload2/download.html

Running the adapter on a system with firmware level lower than SF235_185 is not supported.

Attributes provided: Attachment of internal SCSI devices (on systems that support an internal SCSI device or backplane attachment with this adapter) and external SCSI devices.
Attributes required: One available 3.3 volt PCI or PCI-X slot or PCI-X 2.0 DDR slot

For 9117-MMA (#5736)
▶ Minimum required: 0
▶ Maximum allowed: 344 (Initial order maximum: 250)
▶ OS level required:
  – AIX 5.2 TL10 or later
  – AIX 5.3 TL6 or later
  – IBM i 5.4 with V5R4M5 machine code or later

For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

Notes:
▶ Two maximum in each CEC enclosure. The maximum allowed in all IBM i partitions combined is 48.
▶ This system uses blind swap hardware to manage the installation and removal of PCI Adapters. Therefore, the internal connectors on PCI adapters are not supported for use in this system. |

#5736 Continued	**#5736 PCI-X DDR Dual Channel Ultra320 SCSI Adapter**
	For 9119-FHA (#5736)
	▶ Minimum required: 0
	▶ Maximum allowed: 128 (Initial order maximum: 128)
	▶ OS level required:
	   – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	   – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	   – AIX Version 5.3 with the 5300-08 Technology Level or later
	   – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	   – AIX Version 6.1 with the 6100-01 Technology Level or later
	   – IBM i 5.4 with V5R4M5 machine code
	   – IBM i 6.1 or later
	   – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	   – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No

#5737	**#5737 PCI-X DDR Dual Channel Ultra320 SCSI RAID Adapter**
	The PCI-X DDR Dual Channel Ultra320 SCSI RAID LVD only Adapter (#5737) is a 64-bit 3.3 volt, bootable high performance Ultra320 SCSI RAID Adapter providing RAID 0, 5, 6, or 10 capability, and can address up to thirty 16-bit SCSI physical disk drives on two independent SCSI buses. An IOP is required.
	To increase the data writing performance, a 90 MByte non-volatile fast-write cache is a resident part of this adapter. The 90 MByte fast- write cache can provide a significant improvement in data throughput and response time during certain sequence write operations compared to SCSI RAID adapters without the fast-write cache. The response time and data transfer improvement will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters.
	The Dual Channel Ultra320 SCSI RAID Adapter has two independent ultra320 SCSI buses. There are two internal ports and two external ports. The two internal ports are shared with the two external ports. The SCSI busses can drive either an internal port or an external port. The internal ports can be used to provide an internal RAID solution on certain supporting pSeries systems with internal multiple disk drives or packs of drives. Internally attached Ultra320 devices designed to run at 320 MB can run up to 320 MBps on systems that have internal backplanes that are capable of supporting Ultra320 speeds.
	In order to achieve an Ultra320 SCSI bus data rate of up to 320 MBps and maintain a reasonable drive distance, the adapter utilizes Low Voltage Differential (LVD) drivers and receivers. All attaching devices should be Ultra320 LVD devices to utilize the 320 MBps performance, however, if Ultra2, Ultra3, or Ultra320 devices coexist on the same bus, each device will operate at its rated speed. This card does not support single-ended (SE) devices.
	When an array configuration is selected with the RAID Manager, the disk drives being designated as part of the array (attached to either the internal or the external ports) are required to be formatted to 522-byte sectors. 522-byte sectors provide additional CRC error checking for improved data integrity. A menu option provide in the AIX supporting software, which will reformat these disk drives prior to their usage in an array. Conversely, when a disk drive is removed from an array, a similar menu option is also provided to re-format them back to 512-byte sectors.
	Note: Some disk drives require that their microcode be updated to the latest level before being formatted to 522 Byte Sectors. In addition, there are some disk drives that do not support 522 Byte Sectors format. The PCI-X SCSI Disk Array Manager informs you of these known situations when they exist.
	For disk microcode updates, go to: http://www14.software.ibm.com/webapp/set2/firmware/gjsn
	Two VHDCI 68-pin connectors are mounted on the adapter's end bracket allowing attachment of various LVD external subsystems.
	Limitations: Even though the Dual Channel Ultra320 SCSI RAID Adapter has ports that run at ultra320 SCSI speeds (up to 320 MBps), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane.
	Minimum system firmware required: ▶ System firmware level required is SF235_185 or greater. ▶ Firmware level SF235_185 adjusts the PCI slots to run in Single Data Rate (SDR) mode. ▶ Enablement of Double Data Rate (DDR) slots to run at DDR mode is planned to be provided in an upcoming firmware enhancement.
	For DDR, check for firmware upgrade at: http://techsupport.services.ibm.com/server/mdownload2/download.html

#5737 Continued	**#5737 PCI-X DDR Dual Channel Ultra320 SCSI RAID Adapter** Running the adapter on a system with firmware level lower than SF235_185 is not supported. Attributes provided: Attachment of internal and external SCSI devices Attributes required: One PCI or PCI-X DDR bus slot Supported on the 9406-MMA. **For 9117-MMA (#5737) and 9119-FHA (#5737)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: IBM i 5.4 with Licensed machine code V5R4M5 or later; IBM i requires RAID or mirroring for attached disks. ► Initial Order/MES/Both/Supported: Upgrade only ► CSU: Not applicable ► Return parts MES: Does not apply ##
#5738	**#5738 PCI-X Disk Ctlr-1.5 GB with IOP** Provides a high-performance PCI-X Ultra320 SCSI disk controller with a maximum compressed write cache of 1.5 GB and read cache of 1.6 GB. #5738 will support i5/OS mirroring protection for internal disk drives using its write cache but will not start RAID-5 or RAID-6 unless an auxiliary write cache IOA is attached. (When an auxiliary write cache IOA is attached, the pair of cards is denoted by feature code #5582.) Concurrent battery maintenance is supported. The controller also supports internal tape units, CD-ROM units, and DVD units. The #5738 has four internal Ultra320 SCSI buses. #5738 and #5777 are physically the same adapter card but have different feature numbers to denote to IBM configurator tools whether or not an IOP is required. #5738 indicates an IOP is used. Attributes provided: High-performance SCSI controller. Attributes required: IOP and a PCI-X long card slot **For 9406-MMA (#5738)** ► Minimum required: 0 ► Maximum allowed: 528 (Initial order maximum: 250) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes
#5739	**#5739 PCI-X EXP24 Ctlr-1.5 GB with IOP** Provides an EXP24 disk controller with PCI-X DDR technology, a maximum of 1.5 GB compressed write cache, and a maximum 1.6 GB compressed read cache. The controller supports RAID-5 and RAID-6 and mirroring is supported through i5/OS. Embedded auxiliary write cache and concurrent battery maintenance are provided. The controller is implemented using two physical cards that are firmly connected and requires two adjacent PCI slots. It provides three Ultra320 SCSI ports/buses for the attachment of disk drives located in a #5786/ #5787 TotalStorage EXP24 Disk Drawer/Tower. #5739 and #5778 are physically the same adapter cards but have different feature numbers to denote to IBM configuration tools whether or not an IOP is required. #5739 indicates an IOP is used. The #5781 or 5782 and #5799 or 5800 are also the same adapter cards, but the #5781 or 5782 indicates the adapter is placed in a double-wide blind swap cassette and #5799 or 5800 indicates the adapter is placed in a system unit and has a light pipe inserted into the feature. Attributes provided: High-performance SCSI RAID Controller Attributes required: Two adjacent PCI-X long card slots and an IOP. **For 9406-MMA (#5739)** ► Minimum required: 0 ► Maximum allowed: 528 (Initial order maximum: 250) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes

#5740	**#5740 4-Port 10/100/1000 Base-TX PCI-X Adapter**
	The 4-Port 10/100/1000 Base-TX PCI-X adapter is a full height PCI-X 1.0a Ethernet adapter that supports four Gigabit ports on a single adapter, delivers increased bandwidth for slot-constrained servers, and is designed to provide high connectivity and reliability using two integrated, dual-port Gigabit Ethernet controllers.
	
	Characteristics:
	▶ Four RJ-45 ports
	▶ 3.3 volts, 64-bit 133 MHz with 64-bit Bus Mastering on the PCI-X bus
	▶ IEEE 802.3ab 1000Base-T compliant
	▶ IEEE 802.3u 100Base-T compliant
	▶ IEEE 802.3 10Base-T compliant
	▶ 802.1q VLAN tagging
	▶ Interrupt Moderation
	▶ TCP Segmentation offload and encapsulation in hardware
	▶ Checksum offloading of IP, TCP, and UDP frame
	▶ Increased connectivity while significantly reducing CPU utilization
	▶ Two LED adapter status indicators per port for link activity and speed
	▶ NIM is supported on all 4 ports
	▶ RoHS compliant
	
	Limitations: Full bandwidth performance cannot be achieved with more than one adapter per PCI Host Bridge (PHB) or more than one CPU.
	
	Attributes provided: Four 10/100/1000 RJ-45 ports
	Attributes required: One available PCI-X card slot
	
	For 9117-MMA (#5740)
	▶ Minimum required: 0
	▶ Maximum allowed: 200 (Initial order maximum: 200)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	
	For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	
	For 9119-FHA (#5740)
	▶ Minimum required: 0
	▶ Maximum allowed: 144 (Initial order maximum: 144)
	▶ OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
	
	Note: Two adapters maximum in each CEC enclosure.

#5741	**#5741 IBM Single Bus Ultra 320 SCSI Repeater Card**
	The Single Bus Ultra 320 SCSI repeater card provides the paths to transmit the differential SCSI signal from a cable to the DASD backplanes contained in the IBM 7031 Model D24 Ultra 320 Expandable Disk Storage Drawer and in the #5786 TotalStorage EXP24 Disk Drawer.
	
	The Ultra 320 SCSI Repeater Card provides the following functions:
	▶ Provide SCSI enclosure services for all disk drives
	▶ Read power supply unit Vital Product Data (VPD)
	▶ Monitor power line voltage EPOW (Early Power Off Warning) signals from the power supplies and assert SCSI reset to prevent data corruption during power failures.
	▶ Detect hot plugged disk drives and power them on automatically
	▶ Separate power partitions to each individual drive preventing cage power faults for a single drive fault
	▶ Provide cage power on commands when any attached host adapter is active
	▶ Redrive the SCSI bus to allow SCSI cable lengths up to 20 meters
	▶ Provide SCSI bus terminations for host and drive busses
	
	Attributes provided: SCSI Bus connection
	Attributes required: IBM 7031 Model D24 SCSI Disk Storage Drawer or a #5786 TotalStorage EXP24 Disk Drawer.
	
	For 9117-MMA (#5741)
	▶ Minimum required: 0
	▶ Maximum allowed: 240 (Initial order maximum: 240)
	▶ OS level required:
	   – AIX 5.2 TL10 or later
	   – AIX 5.3 TL6 or later
	   – IBM i 5.4 with V5R4M5 machine code or later
	
	For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	
	For 9119-FHA (#5741)
	▶ Minimum required: 0
	▶ Maximum allowed: 40 (Initial order maximum: 40)
	▶ OS level required:
	   – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	   – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	   – AIX Version 5.3 with the 5300-08 Technology Level or later
	   – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	   – AIX Version 6.1 with the 6100-01 Technology Level or later
	   – IBM i 5.4 with V5R4M5 machine code
	   – IBM i 6.1 or later
	   – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	   – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
	
	Note: Maximum allowed in system is 40 in all AIX and Linux partitions combined.

#5742	**#5742 IBM Dual Bus Ultra 320 SCSI Repeater Card**
	The Dual Bus Ultra 320 SCSI repeater card provides the paths to transmit the differential SCSI signal from a cable to the DASD backplanes contained in the IBM 7031 Model D24 Ultra 320 Expandable Disk Storage Drawer or the #5786 TotalStorage EXP24 Disk Drawer. This high availability dual initiator feature allows the connection of two adapter cards to a SCSI group. The high availability SCSI connection feature can be used on any or all of the drive groups in the 7031 Model D24 and feature #5786 in conjunction with other drive groups in the enclosure using the standard IBM Single Bus Ultra 320 SCSI Repeater Card (FC #5741). The Dual repeater option can also be used to connect all 12 of the front drives or all 12 of the rear drives into a single SCSI bus of 12 drives.
	The Ultra 320 SCSI Repeater Card provides the following functions:
	▶ Provide SCSI enclosure services for all disk drives
	▶ Read power supply unit Vital Product Data (VPD)
	▶ Monitor power line voltage EPOW (Early Power Off Warning) signals from the power supplies and assert SCSI reset to prevent data corruption during power failures.
	▶ Detect hot plugged disk drives and power them on automatically
	▶ Separate power partitions to each individual drive preventing cage power faults for a single drive fault
	▶ Provide cage power on commands when any attached host adapter is active
	▶ Redrive the SCSI bus to allow SCSI cable lengths up to 20 meters
	▶ Provide SCSI bus terminations for host and drive busses
	Attributes provided: SCSI Bus connection
	Attributes required: IBM 7031 Model D24 SCSI Disk Storage Drawer or a #5786 TotalStorage EXP24 Disk Drawer.
	For 9117-MMA (#5742)
	▶ Minimum required: 0
	▶ Maximum allowed: 120 (Initial order maximum: 120)
	▶ OS level required:
	– AIX 5.2 TL10 or later
	– AIX 5.3 TL6 or later
	– IBM i 5.4 with V5R4M5 machine code or later
	For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	For 9119-FHA (#5742)
	▶ Minimum required: 0
	▶ Maximum allowed: 40 (Initial order maximum: 40)
	▶ OS level required:
	– AIX 5L for POWER version 5.3 with the 5300-08 Technology Level or later
	– AIX 5L for POWER version 5.3 with the 5300-07 Technology Level and Service Pack 4 or later
	– AIX 5L for POWER version 5.3 with the 5300-06 Technology Level and Service Pack 7 or later
	– AIX Version 6.1 with the 6100-01 Technology Level or later
	– AIX Version 6.1 with the 6100-00 Technology Level and Service Pack 5 or later
	– IBM i 5.4 with V5R4M5 machine code
	– IBM i 6.1 or later
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
	Note: Maximum allowed in system is 40 in all AIX and Linux partitions combined.

5746	**#5746 Half High 800 GB / 1.6 TB LTO4 SAS Tape Drive** The SAS Tape Drive uses industry standard Ultrium media. The Tape drive Write/Read Ultrium4 (LTO-4), Write/Read Ultrium3 (LTO-3), and Read Ultrium2 (LT02) formats. It has capacity of 800 GB native or 1.6 TB Compressed. Highlights ▶ Capacity: 800 GB native mode, 1.6 TB (typical) compression mode ▶ Form Factor: 5.25 inch half high ▶ Media: IBM Ultrium 4 ▶ Technology: Linear ▶ Operation: Streaming ▶ Data Transfer Rate: 120 MBps ▶ Speed matching down to 31 MBps with LTO-4 media ▶ Interface: SAS ▶ Compatibility: LTO4 (R/W), LTO3 (R/W) and LTO2 (R) Attributes provided: Feature includes one each of the following, HHLTO-4 SAS Tape Drive, LTO-4 Cleaning Cartridge, and LTO-4 Test Cartridge. Attributes required: One 1.6 inch (41 mm) half-high media bay is required. **For 9119-FHA (#5746)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later – AIX Version 5.3 with the 5300-08 Technology Level or later – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later – AIX Version 6.1 with the 6100-01 Technology Level or later – IBM i 5.4 with machine code V5R4M5 and Info APAR II14355 – IBM i 6.1 or later – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later – Red Hat Enterprise Linux version 4.5 or later – Red Hat Enterprise Linux version 5.1 or later Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No **Note**: DVD/Tape SAS External Storage Unit #5720 is required.
#5747	**#5747 IBM LTO Ultrium 4 800 GB Data Cartridge** The Data Cartridge provides storage physical capacity (1.6 TB with 2:1 compression). Each data cartridge is embedded with an LTO Cartridge Memory (LTO-CM) chip, which is designed to enable fast simultaneous transfer of cartridge-dependent data with IBM tape drives during media load and unload cycles. The green cartridge color distinguishes it from previous generations of IBM LTO Ultrium Media. Attributes provided: Five Data Cartridges Attributes required: None **For 9119-FHA (#5747)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: Does not apply

| #5748 | **#5748 POWER GXT145 PCI Express Graphics Accelerator**
The POWER GXT145 is a versatile, low-priced 2D graphics accelerator. It can be configured to operate in either 8-bit or 24-bit color modes. This adapter supports both analog and digital monitors. The adapter requires a PCI Express slot. If attaching a device that requires a 15-pin D-Shell receptacle for a VGA connection (e.g. when the graphic adapter output is routed directly to a 7316-TF3 display or indirectly through a KVM switch), order a VGA to DVI Connection Converter, feature number 4276 to accommodate the attaching device.

Hardware description:
▸ 128-bit graphics processor
▸ 8-bit indexed, 8-bit true color, or 24-bit true color
▸ 32 MB SDRAM
▸ x1 PCI Express interface
▸ 2 DVI-I (analog/digital video) connectors

Features supported:
▸ Up to approximately 16.7 million colors
▸ Rectangular clipping
▸ 1 monitor connected analog at up to 2048 x 1536 resolution
▸ 1 monitor connected digital at up to 1280 x 1024 resolution
▸ 2nd monitor supported on secondary connector at up to 1600 x 1200 analog or 1280 x 1024 digital
▸ 2nd monitor support in AIX is only in clone mode with an analog connection

APIs supported:
▸ X Window System and Motif
▸ AIX Version 5.2 with the 5200-10 Technology Level or later
▸ AIX Version 5.3 with the 5300-06 Technology Level or later
▸ SUSE Linux Enterprise Server 10 SP1 for POWER or later
▸ Red Hat Enterprise Linux AS 4.5 or 5.0 for POWER or later

Software requirement: The total number of graphics adapters in any one partition cannot exceed four.

Attributes provided: 2D Graphics Adapter
Attributes required: 1 PCI Express Slot

For 9117-MMA (#5748)
▸ Minimum required: 0
▸ Maximum allowed: 8 (Initial order maximum: 8)
▸ OS level required:
  – AIX 5.2 TL10 or later
  – AIX 5.3 TL6 or later
  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
▸ Initial Order/MES/Both/Supported: Both
▸ CSU: Yes
▸ Return parts MES: No

Note: Four maximum in each CEC enclosure. |

#5749	**#5749 4 Gbps Fibre Channel (2-Port)**
	The 4 Gigabit Dual-Port Fibre Channel PCI-X 2.0 DDR Adapter is a 64-bit address/data, short form factor PCI-X adapter with an LC type external fiber connector that provides single or dual initiator capability over an optical fiber link or loop. With the use of appropriate optical fiber cabling, this adapter provides the capability for a network of high-speed local and remote located storage. The adapter will auto-negotiate for the highest data rate between adapter and an attaching device at 1 Gbps, 2 Gbps, or 4 Gbps of which the device or switch is capable. Distances of up to 500 meters running at 1 Gbps data rate, up to 300 meters running at 2 Gbps data rate, and 4 Gbps data rate up to 150 meters are supported between the adapter and an attaching device or switch. When used with IBM Fibre Channel storage switches supporting long-wave optics, distances up to 10 kilometers are capable running at either 1 Gbps, 2 Gbps, or 4 Gbps data rates.

The adapter can be used to attach devices either directly, or by means of Fibre Channel Switches. If attaching a device or switch with a SC type fiber connectors, use of an LC-SC 50 Micron Fiber Converter Cable (#2456) or a LC-SC 62.5 Micron Fiber Converter Cable (#2459) is required.

For additional supported server attachment information for IBM devices, refer to:
http://www.ibm.com/servers/storage/product/products_iseries.html

Consult with your IBM representative or Business Partner for additional information relative to any third-party attachment.

Attributes provided: 2 Fibre Channel Ports
Attributes required: 1 empty PCI or PCI-X 2.0 slot

For 9117-MMA (#5749)
► Minimum required: 0
► Maximum allowed: 200 (Initial order maximum: 200). Note: Two maximum in each processor (CEC) enclosure.
► OS level required: IBM i 6.1 or later

For 9119-FHA (#5749)
► Minimum required: 0
► Maximum allowed: 512 (Initial order maximum: 512)
► OS level required: IBM i 6.1 or later

Initial Order/MES/Both/Supported: Both
CSU: Yes
Return parts MES: No

Customers can mix tape and disk on the same Fibre Channel adapter, but there might be significant performance considerations with concurrent tape and disk operations in high I/Os per second rates. Consult with your IBM representative. |

#5749 Continued	**#5749 4 Gbps Fibre Channel (2-Port)**
	Additional IBM i considerations
	IBM i supports IBM DS8000 attachment, multipath, and an IBM i load source disk. A supported tape device can be used for alternate IPL.
	Tape libraries supported by IBM i 6.1 on this adapter include:
	► 3592 with 3592 J1A / 3592 E05 drives
	► 3583 with LTO 1, LTO 2, LTO 3 drives
	► 3584 (TS3500) with LTO 2 or LTO 3 drives
	► 3494 with 3592 J1A / 3592 E05
	► 3573 (TS3100 and TS3200) with LTO 3 or LTO 4 drives after October 2008 with appropriate PTFs
	► IBM i plans to support addititional tapes such as the IBM 3576 (TS3310), 3577 (TS3400), and 3580 (TS2340/TS2240). during 4Q 2008.
	► Informational APAR II14355 will contain prerequisite PTF level information as support becomes available.
	A summary of tape supported by IBM i is located in this publication in Chapter 10, "Tape and optical storage attachment summary" on page 827.
	You can also refer to the following Web sites for the latest support information:
	► IBM System Storage and TotalStorage products at: http://www-03.ibm.com/systems/storage/product/index.html
	► IBM Prerequisites at: http://www-912.ibm.com/e_dir/eServerPrereq.nsf//

#5751	**#5751 IBM 4.7 GB IDE Slimline DVD-RAM Drive** The IBM 4.7 GB IDE Slimline DVD-RAM Drive is an internal tray loading, multifunction storage device capable of reading and writing 4.7 GB DVD-RAM discs as well as reading a multitude of other optical media discs. This drive also reads Type II (removable from cartridge) DVD-RAM discs. It is a 12.7 mm high Slimline form factor, multi-session capable, DVD-RAM drive which provides state of the art performance. System boot and install functions are supported with CD-ROM and DVD-RAM media. Characteristics: ► Media Data Transfer Rate: 3600 KBps CD-ROM (24X) max at outer diameter; 10.8 MBps read (8X DVD-ROM); 2.7 MBps write (2X DVD-RAM) and 2.7 MBps read (2X DVD-RAM) ► Interface: Parallel IDE ► Average Random Access Time: 150 ms CD-ROM; 180 ms DVD-ROM; 229 ms DVD-RAM ► Buffer Memory: 2 MB ► High-speed burst rate of 16/16/33 MBps for PIO / MDMA / UDMA transfers respectively ► Loading tray accommodates both 8 cm discs and 12 cm discs. ► Operates in either vertical or horizontal position ► Reads multi-session discs ► Reads CD-ROM, CD-R, CD-RW, DVD-ROM, and DVD-RAM discs. ► Reads 2.6 GB DVD-RAM media; reads and writes 4.7 GB and 9.4 GB double sided) DVD-RAM media ► Supports all major CD-ROM formats including Mode 1, Mode 2, XA, CDDA and audio Limitations: ► DVD video is not supported. ► Drive only reads CD-type formatted media with AIX 5.1. Attributes provided: One 4.7 GB IDE Slimline DVD-RAM Drive Attributes required: One IDE 12.7 mm high media bay **For 9117-MMA (#5751)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not Supported ► CSU: Not applicable ► Return parts MES: Does not apply

#5752	**#5752 4.7 GB SCSI DVD-RAM Drive** The 4.7 GB SCSI DVD-RAM Drive is an internal tray loading, multifunction storage device capable of reading and writing 4.7 GB DVD- RAM discs as well as reading a multitude of other optical media discs. This drive also reads Type II (removable from cartridge) DVD-RAM discs. It is a half high form factor, multi-session capable, DVD-RAM drive which provides state of the art performance. System boot and install functions are supported with CD-ROM and DVD-RAM media. Characteristics: ▶ Media Data Transfer Rate: 4800 KBps CD-ROM (32X) max at outer diameter; 13.5 MBps read (10X DVD-ROM); 2.77 MBps write (2X DVD-RAM) and 2.77 MBps read (2X DVD-RAM) ▶ Average Random Access Time: 110 ms CD-ROM; 130 ms DVD-ROM; 150 ms DVD-RAM ▶ Buffer Memory: 2 MB ▶ Loading tray accommodates both 8 cm discs and 12 cm discs ▶ Operates in either vertical or horizontal position (8 cm discs in horizontal position only) ▶ Reads multi-session discs: CD-ROM, CD-R, CD-RW, DVD-ROM, and DVD-RAM discs; Reads 2.6 GB DVD-RAM media; reads and writes 4.7 GB and 9.4 GB double-sided DVD-RAM media ▶ Supports all major CD-ROM formats including Mode 1, Mode 2, XA, CDDA and audio. Limitations: ▶ DVD video is not supported. ▶ Drive only reads CD-type formatted media with AIX 5.1. Attributes provided: One 4.7 GB IDE DVD-RAM Drive Attributes required: One half high media bay **For 9119-FHA (#5752)** ▶ Minimum required: 0 ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not Supported ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
#5755	**#5755 200/400 GB Half High Ultrium 2 Tape Drive** The IBM 200/400 GB Half High Ultrium 2 Tape Drive is a 5.25 inch, half-high, Low Voltage Differential (LVD) 16-bit tape drive, which provides a high capacity for save/restore and archive functions. This tape drive uses IBM Ultrium 1 and Ultrium 2 data cartridges and is compression capable, providing a capacity of up to 400 GB. Characteristics: ▶ Capacity: 200 GB native, 400 GB compress ▶ Form Factor: 5.25 inch half high ▶ Media: Half High Ultrium 2 Tape Drive supports Ultrium 1 and Ultrium 2 data cartridges. ▶ Operation: Streaming ▶ Data Transfer Rate: 24 MBps native, 48 MBps 2:1 compress. The IBM 200/400 GB Half High Ultrium 2 Tape Drives can read and write original LTO Ultrium Data Cartridges at original Ultrium 1 capacities at up to 16 MBps native and 32 MBps compress. Interface: SCSI LVD Ultra-160, Ultra-80 or single ended. Compatibility: Ultrium 1 (Read/Write), Ultrium 2 (Read/Write). Attributes provided: Ultrium 1 and Ultrium 2 tape capability Attributes required: One 1.6 inch (41mm) half-high media bay and one SCSI-2 internal LVD 16-bit address **For 9119-FHA (#5755)** ▶ Minimum required: 0 ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not Supported ▶ CSU: Not applicable ▶ Return parts MES: Does not apply

| #5756 | **#5756 IDE Slimline DVD-ROM Drive**
The 8X/24X (max) Slimline IDE DVD-ROM Drive is an internal tray loading DVD-ROM drive providing up to 3600 KBps MAX (CD-ROM) and 10.3 MBps MAX (DVD-ROM) data transfer rates. It is a 12.7 mm Slimline form factor multi-session capable, DVD-ROM drive which provides state of the art performance and supports existing 650 MB CD-ROM, 4.7 GB DVD-ROM, and 9.4 GB DVD-ROM (double-sided) discs. This drive also reads Type II (removable from cartridge) DVD-RAM discs at DVD-ROM speeds. System boot and install functions are supported with CD-ROM and DVD-RAM media.

Characteristics:
▶ Media Data Transfer Rate: CD-ROM=3600 KBps (max):
▶ DVD-ROM=10.3 MBps (max)
▶ Read operations at outer diameter of disc.
▶ Interface: IDE/ATAPI
▶ Avg. Random Access Time: CD-ROM=95 ms (typical); DVD-ROM=150 ms (typical)
▶ Buffer Memory: 256 KB
▶ Media capacity: CD-ROM=650 MB; DVD-ROM= 4.7 GB (single sided); 9.4 GB (double-sided)
▶ Supports major CD-ROM formats including Mode 1, Mode 2, XA, CDDA and audio. +R and +RW not supported.
▶ Reads CD-ROM, CD-R, CD-RW, DVD-ROM, & DVD-RAM discs.
▶ +R and +RW not supported.
▶ Reads 2.6 GB, 4.7 GB and 9.4 GB doublesided) DVD-RAM media
▶ Multisession capable (Reads CD/R & CD-R/W media)
▶ 12.7 mm Slimline form factor
▶ Operates in either vertical or horizontal positions
▶ Interface supports standard and extended XA formats
▶ Loading tray supports 12cm and 8cm disks (Horizontal only) and 12cm

Limitations:
▶ DVD video is not supported.
▶ DVD-ROM only reads CD-type formatted media with AIX 5.1 or later.
▶ Attributes provided: 8X/24X(max) IDE DVD-ROM Drive
▶ Attributes required: 1 Slimline media bay

For 9117-MMA (#5756)
▶ Minimum required: 0
▶ Maximum allowed: 26 (Initial order maximum: 26)
▶ OS level required: AIX 5.2 TL10 or later, AIX 5.3 TL6 or later, IBM i 5.4 with V5R4M5 machine code or later

For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
`http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument`

For 9119-FHA (#5756)
▶ Minimum required: 0
▶ Maximum allowed: 2 (Initial order maximum: 2)
▶ OS level required:
  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
  – AIX Version 5.3 with the 5300-08 Technology Level or later
  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
  – AIX Version 6.1 with the 6100-01 Technology Level or later
  – IBM i 5.4 with V5R4M5 machine code
  – IBM i 6.1 or later
  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later |

#5756 Continued	**#5756 IDE Slimline DVD-ROM Drive** Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No **Note**: One in each CEC enclosure. Four maximum in all AIX partitions combined. Four maximum in all Linux partitions combined.

| #5757 | **#5757 IBM 4.7 GB IDE Slimline DVD-RAM Drive**
The IBM 4.7 GB IDE Slimline DVD-RAM Drive is an internal tray loading, multifunction storage device capable of reading and writing 4.7 GB DVD-RAM discs as well as reading a multitude of other optical media discs. This drive also reads Type II (removable from cartridge) DVD-RAM discs. It is a 12.7 mm high Slimline form factor, multi-session capable, DVD-RAM drive which provides state of the art performance. System boot and install functions are supported with CD-ROM and DVD-RAM media.

Characteristics:
▶ Media Data Transfer Rate: 3600 KBps CD-ROM (24X) MAX; 10.8 MBps read MAX (8X DVD-ROM); 2.7 MBps write MAX (2X DVD-RAM) and 2.7 MBps read MAX (2X DVD-RAM).
▶ Read/Write operations at outer diameter of disc.
▶ Interface: Parallel IDE
▶ Average Random Access Time: CD-ROM= 150 ms (typical);
▶ DVD-ROM= 180 ms (typical); DVD-RAM= 22 9 ms (typical)
▶ Buffer Memory: 2 MB
▶ Media capacity: CD-ROM=650 MB; DVD-ROM= 4.7 GB
▶ (single sided); 9.4 GB (double-sided)
▶ Supports major CD-ROM formats including Mode 1, Mode 2, XA, CDDA and audio. +R and +RW not supported.
▶ Reads CD-ROM, CD-R, CD-RW, DVD-ROM, & DVD-RAM discs.
▶ +R and +RW not supported.
▶ Multisession capable (Reads CD/R & CD-R/W media)
▶ Reads 2.6 GB DVD-RAM media; reads and writes 4.7 GB and 9.4 GB double sided)
▶ DVD-RAM media Loading tray accommodates both 8cm discs and 12cm discs.
▶ Operates in either vertical or horizontal position
▶ Reads CD-ROM, CD-R, CD-RW, DVD-ROM, & DVD-RAM discs.
▶ High-speed burst rate of 16/16/33 MBps for PIO / MDMA / UDMA
▶ Operates in either vertical or horizontal position.
▶ Loading tray accommodates both 8 cm discs
▶ (Horizontal Only) and 12 cm discs.
▶ 12.7 mm Slimline form factor

Limitations:
▶ DVD video is not supported.
▶ Drive only reads CD-type formatted media with AIX 5.1.
▶ Attributes provided: One 4.7 GB IDE Slimline DVD-RAM Drive
▶ Attributes required: One IDE 12.7 mm high media bay
▶ For 9117-MMA (#5757)
▶ Minimum required: 0
▶ Maximum allowed: 26 (Initial order maximum: 26)

OS level required:
▶ AIX 5.2 TL10 or later
▶ AIX 5.3 TL6 or later
▶ IBM i 5.4 with V5R4M5 machine code or later

For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument

Note: One maximum in each CEC enclosure. Four maximum in all AIX partitions combined. Four maximum in all Linux partitions combined. |

#5757 Continued	**#5757 IBM 4.7 GB IDE Slimline DVD-RAM Drive**
	For 9119-FHA (#5757)
	▸ Minimum required: 0
	▸ Maximum allowed: 2 (Initial order maximum: 2)
	▸ OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	  Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	▸ Initial Order/MES/Both/Supported: Both
	▸ CSU: Yes
	▸ Return parts MES: No

#5758	**#5758 4 Gb Single-Port Fibre Channel PCI-X 2.0 DDR Adapter**
	The 4 Gigabit Single-Port Fibre Channel PCI-X 2.0 DDR Adapter is a 64-bit address/data, short form factor PCI-X adapter with an LC type external fiber connector. It does not use an IOP. With the use of appropriate optical fiber cabling, this adapter provides the capability for a network of high-speed local and remote located storage. The 4 Gigabit Single-Port Fibre Channel PCI-X Adapter will auto-negotiate for the highest data rate between adapter and an attaching device at 1 Gbps, 2 Gbps, or 4 Gbps of which the device or switch is capable. Distances of up to 500 meters running at 1 Gbps data rate, up to 300 meters running at 2 Gbps data rate, and 4 Gbps data rate up to 150 meters are supported between the adapter and an attaching device or switch. When used with IBM Fibre Channel storage switches supporting long-wave optics, distances of up to 10 kilometers are capable running at either 1 Gbps, 2 Gbps, or 4 Gbps data rates. The 4 Gigabit Single-Port Fibre Channel PCI-X Adapter can be used to attach devices either directly, or by means of Fibre Channel Switches. If attaching a device or switch with a SC type fiber connectors, use of an LC-SC 50 Micron Fiber Converter Cable (#2456) or a LC-SC 62.5 Micron Fiber Converter Cable (#2459) is required. There are two maximum quantities for High Bandwidth adapters, one for performance and one for connectivity. Adapter performance can be limited by bandwidth constraints in a network. To maximize High Bandwidth adapter performance in the server the performance maximum quantity should not be exceeded. In applications where the end-to-end network cannot sustain high performance and or connectivity is more important than overall bandwidth performance the performance maximum quantity can be exceeded up to the connectivity maximum quantity.

For additional supported server attachment information for IBM devices, refer to:
http://www.ibm.com/servers/storage/product/products_pseries.html

Consult with your IBM representative or Business Partner for additional information relative to any third-party attachment.

Attributes provided: 1 Fibre Channel
Attributes required: 1 empty PCI or PCI-X 1.0 / 2.0 slot

For 9117-MMA (#5758)
► Minimum required: 0
► Maximum allowed: 200 (Initial order maximum: 200)
► OS level required:
  – AIX 5.2 TL10 or later
  – AIX 5.3 TL6 or later

For information about support on Red Hat Linux, refer to:
http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument

For 9119-FHA (#5758)
► Minimum required: 0
► Maximum allowed: 512 (Initial order maximum: 512)
► OS level required:
  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
  – AIX Version 5.3 with the 5300-08 Technology Level or later
  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
  – AIX Version 6.1 with the 6100-01 Technology Level or later
  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later

Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

Initial Order/MES/Both/Supported: Both
CSU: Yes
Return parts MES: No

Note: Two adapters maximum in each CEC enclosure. |

#5759	**#5759 4 Gb Dual-Port Fibre Channel PCI-X 2.0 DDR Adapter**

	The 4 Gigabit Dual-Port Fibre Channel PCI-X 2.0 DDR Adapter is a 64-bit address/data, short form factor PCI-X adapter with an LC type external fiber connector. With the use of appropriate optical fiber cabling, this adapter provides the capability for a network of high-speed local and remote located storage. The adapter will auto-negotiate for the highest data rate between adapter and an attaching device at 1 Gbps, 2 Gbps, or 4 Gbps of which the device or switch is capable. Distances of up to 500 meters running at 1 Gbps data rate, up to 300 meters running at 2 Gbps data rate, and 4 Gbps data rate up to 150 meters are supported between the adapter and an attaching device or switch. When used with IBM Fibre Channel storage switches supporting long-wave optics, distances up to 10 kilometers are capable running at either 1 Gbps, 2 Gbps, or 4 Gbps data rates. The adapter can be used to attach devices either directly, or by means of Fibre Channel Switches. If attaching a device or switch with a SC type fiber connectors, use of an LC-SC 50 Micron Fiber Converter Cable (#2456) or a LC-SC 62.5 Micron Fiber Converter Cable (#2459) is required. There are two maximum quantities for High Bandwidth adapters, one for performance, and one for connectivity. Adapter performance can be limited by bandwidth constraints in a network. To maximize High Bandwidth adapter performance in the server the performance maximum quantity should not be exceeded. In applications where the end-to-end network cannot sustain high performance and or connectivity is more important than overall bandwidth performance the performance maximum quantity can be exceeded up to the connectivity maximum quantity.
	
	For additional supported server attachment information for IBM devices, refer to:
	`http://www.ibm.com/servers/storage/product/products_pseries.html`
	
	Consult with your IBM representative or Business Partner for additional information relative to any third-party attachment.
	
	Note: Consider carefully the usage of this card. If placed in a PCI-X slot rated as SDR compatible or has the slot speed of 133 MHz, the AIX value of the max_xfer_size must be kept at the default setting of 0x100000 (1 megabyte) when both ports are in use. The architecture of the DMA buffer for these slots does not accommodate larger max_xfer_size settings.
	
	Attributes provided: 2 Fibre Channel
	Attributes required: 1 empty PCI or PCI-X 2.0 slot
	
	For 9117-MMA (#5759)
	► Minimum required: 0
	► Maximum allowed: 200 (Initial order maximum: 200)
	► OS level required:
	   – AIX 5.2 TL10 or later
	   – AIX 5.3 TL6 or later
	
	For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	`http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument`
	
	For 9119-FHA (#5759)
	► Minimum required: 0
	► Maximum allowed: 512 (Initial order maximum: 512)
	► OS level required:
	   – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	   – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	   – AIX Version 5.3 with the 5300-08 Technology Level or later
	   – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	   – AIX Version 6.1 with the 6100-01 Technology Level or later
	   – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	   – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later

#5759 Continued	**#5759 4 Gb Dual-Port Fibre Channel PCI-X 2.0 DDR Adapter** Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No **Note**: Two adapters maximum in each CEC enclosure for best performance.

#5760	**#5760 PCI-X Fibre Chan Disk Controller with an IOP**
	Provides a 4 Gbps Single Port Fibre Channel PCI-X 2.0 Adapter, which attaches external DASD devices. #5760 is a 64-bit address/ data, short form factor PCI-X adapter with an LC type external fiber connector that provides single initiator capability over an optical fiber link or loop. With the use of appropriate optical fiber cabling, this adapter provides the capability for a network of high-speed local and remote located storage.
	
	The #5760 will auto-negotiate for the highest data rate between adapter and an attaching device at 1 Gbps, 2 Gbps, or 4 Gbps of which the device or switch is capable. Distances of up to 500 meters running at 1 Gbps data rate, up to 300 meters running at 2 Gbps data rate, and 4 Gbps data rate up to 150 meters are supported between the adapter and an attaching device or switch. When used with IBM supported Fibre Channel storage switches supporting long-wave optics, distances of up to 10 kilometers are capable running at either 1 Gbps, 2 Gbps, or 4 Gbps data rates.
	
	The #5760 can be used to attach devices either directly, or by means of Fibre Channel Switches. If attaching a device or switch with a SC type fiber connector, use of a #2456-2M LC-SC 50 Micron Fiber Converter Cable or a #2459-2M LC-SC 62.5 Micron Fiber Converter Cable is required.
	
	The #5760 requires a PCI IOP.
	
	For additional supported server attachment information for IBM devices, refer to:
	http://www.ibm.com/servers/storage/product/products_iseries.html
	
	Consult with your IBM representative or Business Partner for additional information relative to any third-party attachment.
	
	Attributes provided: One Port Fibre Channel Adapter that attaches External DASD
	Attributes required: One empty PCI-X 1.0 / 2.0 slot and a PCI IOP
	
	For 9117-MMA (#5760)
	▸ Minimum required: 0
	▸ Maximum allowed: 200 (Initial order maximum: 200)
	▸ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5760)
	▸ Minimum required: 0
	▸ Maximum allowed: 512 (Initial order maximum: 512)
	▸ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code or
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
	
	Note: This adapter is not allowed in the CEC enclosures.

#5761	**#5761 PCI-X Fibre Chan Tape Controller with IOP**
	Provides a 4 Gbps Single Port Fibre Channel PCI-X 2.0 Adapter, which attaches external tape devices. #5761 is a 64-bit address/ data, short form factor PCI-X adapter with an LC type external fiber connector that provides single initiator capability over an optical fiber link or loop. With the use of appropriate optical fiber cabling, this adapter provides the capability for a network of high-speed local and remote located storage.

The #5761 will auto-negotiate for the highest data rate between adapter and an attaching device at 1 Gbps, 2 Gbps, or 4 Gbps of which the device or switch is capable. Distances of up to 500 meters running at 1 Gbps data rate, up to 300 meters running at 2 Gbps data rate, and 4 Gbps data rate up to 150 meters are supported between the adapter and an attaching device or switch. When used with IBM supported Fibre Channel storage switches supporting long-wave optics, distances of up to 10 kilometers are capable running at either 1 Gbps, 2 Gbps, or 4 Gbps data rates.

The #5761 can be used to attach devices either directly, or by means of Fibre Channel Switches. If attaching a device or switch with a SC type fiber connector, use of a #2456 LC-SC Adapter Kit (50um) or a #0372 LC-SC Adapter Kit (62.5um) is required.

Features #5761 and #5758 are physically the same card, but have different feature numbers that denote to IBM configurator tools whether or not an IOP is required.

For additional supported server attachment information for IBM devices, refer to:
http://www.ibm.com/servers/storage/product/products_iseries.html

Consult with your IBM representative or Business Partner for additional information relative to any third-party attachment.

Attributes provided: One Port Fibre Channel Adapter that attaches External Tape Devices
Attributes required: One empty PCI-X 1.0 / 2.0 slot and a PCI IOP

For 9117-MMA (#5761)
► Minimum required: 0
► Maximum allowed: 48 (Initial order maximum: 48)
► OS level required: IBM i 5.4 with V5R4M5 machine code or later

For 9119-FHA (#5761)
► Minimum required: 0
► Maximum allowed: 512 (Initial order maximum: 512)
► OS level required:
   – IBM i 5.4 with V5R4M5 machine code or
   – IBM i 6.1 or later

Initial Order/MES/Both/Supported: Both
CSU: Yes
Return parts MES: No |

| #5767 | **#5767 2-Port 10/100/1000 Base-TX Ethernet PCI Express Adapter**
The IBM 2-Port 10/100/1000 Base-TX Ethernet PCI Express (PCIe) Adapter is a Full Duplex, dual ported, Gigabit Ethernet adapter designed with highly integrated components. This adapter can be configured to run each port at 10, 100, or 1000 Mbps data rates. The adapter interfaces to the system through a PCIe bus. It is PCIe x4 capable and conforms to the PCIe 1.0a standard. The adapter connects to a network using a 4-pair CAT-5 Unshielded Twisted Pair (UTP) cable for distances of up to 100m. AIX Network Install Manager (NIM) boot capability is supported with this adapter. The adapter conforms to the IEEE 802.3ab 1000Base-T standard. The adapter also supports jumbo frames when running at the 1000 Mbps speed.

A function called *Large Send* or sometimes known as *TCP Segmentation* is also provided by this adapter. This function offloads the TCP segmentation operation from the AIX IP layer to the adapter for outgoing (transmit side) TCP segments. Another function known as *Checksum Offload* which offloads the TCP Checksum Operation or workload from the CPU to the adapter is also provided. The IBM 2-Port 10/100/1000 Base-TX Ethernet PCIe Adapter (#5767) should be considered where maximum port density is required per I/O card slot. For a suggested maximum number of adapters taking performance into consideration, see the IBM System p PCI placement guide (SA76-0090) for information about the PCIe slots on your system unit.

Limitations: The 1000 Mbps speed is not supported in Half Duplex (HDX) mode.

Attributes provided:
▶ Two full-duplex 10/100/1000Base-TX
▶ UTP connections to Gigabit Ethernet LANs.
Attributes required: One available PCIe card slot

For 9117-MMA (#5767)
▶ Minimum required: 0
▶ Maximum allowed: 16 (Initial order maximum: 16)
▶ OS level required:
  – AIX 5.2 TL10 or later
  – AIX 5.3 TL6 or later
  – IBM i 5.4 with V5R4M5 machine code or later
  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
▶ Initial Order/MES/Both/Supported: Both
▶ CSU: Yes
▶ Return parts MES: No

Note: Four maximum in each CEC enclosure. |

#5768	**#5768 2-Port Gigabit Ethernet-SX PCI Express Adapter**
	The IBM 2-Port Gigabit Ethernet-SX PCI Express (PCIe) Adapter provides two 1 Gbps (1000 Base-SX) full-duplex Ethernet LAN connections. The adapter interfaces to the system through a PCIe bus. It is PCIe x4 capable and conforms to the PCIe 1.0a standard. The adapter connects to a network using a 50/62.5 micron shortwave (850 nm) multimode optical cable that conforms to the IEEE 802.3z standard. The adapter supports distances of 260m for 62.5 micron Multi Mode Fiber (MMF) and 550m for 50.0 micron MMF. AIX Network Install Manager (NIM) boot capability is supported with this adapter. A function called *Large Send* or sometimes known as *TCP Segmentation* is also provided by this adapter. This function offloads the TCP segmentation operation from the AIX IP layer to the adapter for outgoing (transmit side) TCP segments. Another function known as *Checksum Offload* which offloads the TCP Checksum Operation or workload from the CPU to the adapter is also provided. The IBM 2-Port Gigabit Ethernet-SX PCIe Adapter (#5768) should be considered where maximum port density is required per I/O card slot. For a suggested maximum number of adapters taking performance into consideration, see the IBM System p PCI placement guide (SA76-0090) for information about the PCIe slots on your system unit. **Note**: The 2-Port IBM Gigabit Ethernet-SX PCIe Adapter incorporates an LC type connector on the card. This new, smaller form factor connector is being used by the industry for the next generation of fiber optic networks. If connecting into an older, existing SC type connector network, an LC-SC 62.5 Micron Fiber Converter Cable (#2459) or LC-SC 50 Micron Fiber Converter Cable (#2456) is required. Limitation: Half Duplex (HDX) mode is not supported. Attributes provided: Two full-duplex 1000Base-SX fiber connections to a Gigabit Ethernet LANs. Attributes required: One available PCIe card slot **For 9117-MMA (#5768)** ▸ Minimum required: 0 ▸ Maximum allowed: 16 (Initial order maximum: 16) ▸ OS level required: – AIX 5.2 TL10 or later – AIX 5.3 TL6 or later – IBM i 5.4 with V5R4M5 machine code or later For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to: `http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument` ▸ Initial Order/MES/Both/Supported: Both ▸ CSU: Yes ▸ Return parts MES: No **Note**: Four maximum in each CEC enclosure.

#5772	**#5772 10 Gigabit Ethernet-LR PCI Express Adapter**
	 The 10GbE Fiber Optic Server Adapter, is 10 Gigabit Ethernet (GbE) Fiber NIC for PCI Express (PCIe) capable systems. This Long Range adapter is a high- performance, highly integrated 10 Gigabit Ethernet LAN adapters with PCIe host interface and fiber LAN connectors on the optical modules.
	
	 Feature 5772 conforms to the 802.3ae 10GBASE-LR specification for Ethernet transmissions over 1310nm single-mode fiber optic cable for distances up to 10 kilometers.
	
	 Highlights:
	 ► 10GBASE-LR fiber optic LAN connections
	 ► Eight (8) lane PCIe Host Connector
	 ► PCIe Low-Profile add-in card dimensions (68.9 mm x 167.65 mm)
	 ► Uses Intel® 82598EB MAC
	 ► PCI Express bus interface v1.1 and v.2.0 (Gen 1 only)
	 ► PCIe Hot Plug/Active PCI
	 ► Controller EEPROM and FLASH ROM
	 ► Status LED (Link/Activity)
	 ► Low power PCIe Gen 1 MAC
	 ► MSI for multi-CPU and multi-core systems
	 ► Dynamic interrupt moderation for lower latency
	 ► Supports 10Gb, full duplex
	 ► Supports EtherChannel with the existing software
	 ► Supports IEEE 802.3ad (link aggregation control protocol)
	 ► IEEE 802.1Q VLANs
	 ► IEEE 802.3x
	 ► IEEE 802.1p
	 ► Transmission Control Protocol (TCP)/User Datagram Protocol (UDP) Checksum Offloading
	 ► Internet Protocol ver 4 (IPv4) Checksum Offloading
	 ► Transmit Checksum Offloading with TCP Segmentation Offload (TSO)/ Large Send Offload Attributes provided: One 10 Gigabit Ethernet port
	
	 Attributes required: One x8 lane or x16 PCI Express slot
	
	 Supported on 8203-E4A, 8204-E8A, 9117-MMA (#5772)
	 ► Minimum required: 0
	 ► Maximum allowed: 3 (8203-E4A), 3(8204-E8A), on 9117-MMA 8 (2 per processor enclosure. Initial order maximum: 8).
	 ► OS level required:
	   – AIX 5L for POWER version 5.3 with the 5300-08 Technology Level
	   – AIX Version 6.1 with the 6100-01 Technology Level
	   – AIX 5L for POWER version 5.3 with the 5300-07 Technology Level and Service Pack 4
	   – AIX Version 6.1 with the 6100-00 Technology Level and Service Pack 5
	   – SUSE Linux Enterprise Server 10 SP2 for POWER Systems or later
	   – Red Hat Enterprise Linux, version 4.7 or later
	   – Red Hat Enterprise Linux, version 5.2 or later
	 ► Initial Order/MES/Both/Supported: Both
	 ► CSU: Yes
	 ► Return parts MES: No

| #5773 | **#5773 4 Gigabit PCI Express Single Port Fibre Channel Adapter**
The 4 Gigabit Single Port Fibre Channel Adapter is a 64-bit address/data, short form factor PCIe adapter with an LC type external fiber connector. With the use of appropriate optical fiber cabling, this adapter provides the capability for a network of high-speed local and remote located storage. The adapter will auto-negotiate for the highest data rate between adapter and an attaching device at 1 Gbps, 2 Gbps, or 4 Gbps of which the device or switch is capable. Distances up to 500 meters running at 1 Gbps data rate, up to 300 meters running at 2 Gbps data rate, and 4 Gbps data rate up to 150 meters are supported between the adapter and an attaching device or switch. When used with IBM Fibre Channel storage switches supporting long-wave optics, distances up to 10 kilometers are capable running at either 1 Gbps, 2 Gbps, or 4 Gbps data rates. The 4 Gigabit PCIe Single Port Fibre Channel Adapter can be used to attach devices either directly, or by means of Fibre Channel Switches. If attaching a device or switch with a SC type fiber connectors, use of an LC-SC 50 Micron Fiber Converter Cable (#2456) or a LC-SC 62.5 Micron Fiber Converter Cable (#2459) is required.

For additional supported server attachment information for IBM devices, refer to:
http://www.ibm.com/servers/storage/product/products_pseries.html

Consult with your IBM representative or Business Partner for a additional information relative to any third-party attachment.

Attributes provided: 1 Fibre Channel
Attributes required: 1 Empty PCIe slot

For 9117-MMA (#5773)
► Minimum required: 0
► Maximum allowed: 16 (Initial order maximum: 16)
► OS level required:
– AIX 5.3 TL6 with SP4 or later
– AIX 5.3 TL7 or later
For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
► Initial Order/MES/Both/Supported: Both
► CSU: Yes
► Return parts MES: No

Note: Four in each 570 CEC enclosure. |

#5774	**#5774 4 Gigabit PCI Express Dual Port Fibre Channel Adapter**
	The 4 Gigabit Dual Port Fibre Channel Adapter is a 64-bit address/data, short form factor PCIe adapter with an LC type external fiber connector. With the use of appropriate optical fiber cabling, this adapter provides the capability for a network of high-speed local and remote located storage. The adapter will auto-negotiate for the highest data rate between adapter and an attaching device at 1 Gbps, 2 Gbps, or 4 Gbps of which the device or switch is capable. Between the adapter and an attaching device or switch, the distances supported are up to: 500 meters running at 1 Gbps data rate, 300 meters running at 2 Gbps data rate, and 150 meters running at 4 Gbps data rate. When used with IBM Fibre Channel storage switches supporting long-wave optics, distances of up to 10 kilometers are capable running at either 1 Gbps, 2 Gbps, or 4 Gbps data rates. The 4 Gigabit PCIe Dual Port Fibre Channel Adapter can be used to attach devices either directly, or by means of Fibre Channel Switches. If attaching a device or switch with a SC type fiber connectors, use of an LC-SC 50 Micron Fiber Converter Cable (#2456) or a LC-SC 62.5 Micron Fiber Converter Cable (#2459) is required.
	
	For additional supported server attachment information for IBM devices, refer to:
	http://www.ibm.com/servers/storage/product/products_pseries.html
	
	Consult with your IBM representative or Business Partner for additional information relative to any third-party attachment.
	
	Attributes provided: 2 Fibre Channel
	Attributes required: 1 Empty PCIe slot
	
	For 9117-MMA (#5774)
	▶ Minimum required: 0
	▶ Maximum allowed: 16 (Initial order maximum: 16 in all processor enclosures, 200 system-wide.)
	▶ OS level required:
	   – AIX 5.3 TL6 with SP4 or later
	   – AIX 5.3 TL7 or later
	   – IBM i 6.1 or later
	   For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	   http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No
	
	Note: Four maximum in each 9117-MMA or 9406-MMA processor (CEC) enclosure.
	
	Customers can mix tape and disk on the same Fibre Channel adapter, but there can be significant performance considerations with concurrent tape and disk operations in high I/Os per second rates. Consult with your IBM representative.

#5774 Continued	**#5774 4 Gigabit PCI Express Dual Port Fibre Channel Adapter** **Additional IBM i considerations** IBM i supports IBM DS8000 attachment, multipath, and an IBM i load source disk. A supported tape device can be used for alternate IPL. Tape libraries that are supported by IBM i 6.1 on this adapter include: ► 3592 with 3592 J1A / 3592 E05 drives ► 3584 (TS3500) with LTO 2 or LTO 3 drives ► 3494 with 3592 J1A / 3592 E05 ► 3573 (TS3100 and TS3200) with LTO 3 or LTO 4 drives after October 2008 with appropriate PTFs ► IBM i plans to support addititional tapes such as the IBM 3576 (TS3310), 3577 (TS3400), and 3580 (TS2340/TS2240). during 4Q 2008. ► Informational APAR II14355 will contain prerequisite PTF level information as support becomes available. You can find a summary of tape that is supported by IBM i in Chapter 10, "Tape and optical storage attachment summary" on page 827. You can also refer to the following Web sites for the latest support information: ► IBM System Storage and TotalStorage products at: http://www-03.ibm.com/systems/storage/product/index.html ► IBM Prerequisites at: http://www-912.ibm.com/e_dir/eServerPrereq.nsf//
#5775	**#5775 - PCI-X Disk/Tape Ctlr-No IOP** Provides a PCI-X Disk/Tape SCSI Controller with zero write cache and without RAID support. Disk mirroring is supported through i5/OS. A maximum of six disk drives are supported on the #5775. Removable media devices (tape, optical libraries, DVD-ROM, or DVD-RAM) are also supported on the #5775. The #5775 has two U320 buses each with a bus data rate of up to 320 MBps. Each SCSI bus can be either internal (using an internal port) or external (using an external port), but not both. There are four physical ports on the #5775, two internal and two external. Internal devices connect to the internal ports (1 or 2). External devices connect to the external ports (1 or 2) and use an LVD (Low Voltage Differential) interface and VHDCI connectors. A #2118 VHDCI to P Converter Cable is available to connect to external devices with type P connectors. A maximum of one external port per #5775 controller can be used for an EXP24 Disk Enclosure to attach one six pack of disk. The #0300 specify indicates to the IBM Configurator tool it is being used in this manner. #0647, #5736, #5766 and #5775 are physically the same adapter card but have different feature numbers to indicate to IBM configurator tools that an IOP is or is not being used in the configuration. #0647 should be the choice over #0624 or 0645 (#5702 or 5712 Direct Attach equivalent) and #5736 should be the choice over #5705 or 5715 controllers for systems running V5R3 or later. #5775 should be the choice for systems where IOPless support is provided. The 30 GB QIC, 50 GB QIC, 80 GB VXA, 160 GB VXA and 200 GB HH LTO-2 tape drives are supported with this feature (no IOP). Also supported are a DVD-ROM, DVD-RAM, CD-ROM and optical disk drives. Attributes provided: Two Ultra320 SCSI VHDCI ports that can be either internal or external but not both. Attributes required: One available 3.3 volt PCI or PCI-X slot **For 9406-MMA (#5775)** ► Minimum required: 0 ► Maximum allowed: 680 (Initial order maximum: 250) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes

#5776	**#5776 PCI-X Disk Controller-90 MB No IOP**
	Provides a PCI-X SCSI disk controller that has a 90 MB write cache and can provide RAID-5 or RAID-6 protection of disk units.
	The #5776 has two U320 SCSI buses each with a bus data rate of up to 320 MBps. A maximum of 12 or 24 disk drives and up to two internal removable media devices (tape, DVD-ROM, or DVD-RAM) are supported on the #5776. The maximum is 12 drives in a #0595 I/O drawer. The maximum is 10 drives in a #5094/5294. The maximum is 24 drives in an EXP24 Disk Enclosure. The #5776 can attach to disk drives within an expansion tower and also attach to disk units in an EXP24 Disk Enclosure. The #0301 specify indicates to the IBM Configurator tool that one port of the #5776 is attaching to disk units in an EXP24 Disk Enclosure.
	A minimum of three disk drives are required for RAID-5, providing protection against a single drive failure in an array. A minimum of four disk drives are required for RAID-6, providing protection against up to two drives failing in an array.
	Note the 757 MB write cache and 1.5 GB write cache disk controllers provide greater disk performance and have an auxiliary write cache IOA to protect the write cache contents.
	Attributes provided: Two Ultra320 SCSI VHDCI ports
	Attributes required: One available 3.3V long PCI or PCI-X slot
	For 9117-MMA (#5776)
	▶ Minimum required: 0
	▶ Maximum allowed: 60 (Initial order maximum: 60)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	For 9119-FHA (#5776)
	▶ Minimum required: 0
	▶ Maximum allowed: 192 (Initial order maximum: 192)
	▶ OS level required:
	– IBM i 5.4 with V5R4M5 machine code
	– IBM i 6.1 or later
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
	Note: Two maximum in each CEC enclosure.

#5777	**#5777 PCI-X Disk Controller-1.5 GB No IOP**
	Provides a high-performance PCI-X Ultra320 SCSI disk controller with a maximum compressed write cache of 1.5 GB and read cache of 1.6 GB. #5777 will support i5/OS mirroring protection for internal disk drives using the write cache, but will not use the write cache to run RAID-5 or RAID-6 unless an auxiliary write cache IOA is attached. Running RAID-5 or RAID-6 without write cache very significantly reduces its performance. (When an auxiliary write cache IOA is attached, the pair of cards is denoted by feature code #5583.) Concurrent battery maintenance is supported. The controller also supports internal tape units, CD-ROM units, and DVD units. The #5777 has four internal Ultra320 SCSI buses and does not require an IOP.
	
	Attributes provided: High performance disk controller
	Attributes required: A single long PCI-X slot
	
	For 9117-MMA (#5777)
	▶ Minimum required: 0
	▶ Maximum allowed: 144 (Initial order maximum: 144)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5777)
	▶ Minimum required: 0
	▶ Maximum allowed: 288 (Initial order maximum: 288)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
	
	Note: This adapter is not allowed in the CEC enclosures.

#5778	**#5778 PCI-X EXP24 Ctl-1.5 GB No IOP**
	Provides an EXP24 disk controller with PCI-X DDR technology, a maximum of 1.5 GB compressed write cache and a maximum 1.6 GB compressed read cache. The controller supports RAID-5 and RAID-6 and mirroring is supported through i5/OS. Embedded auxiliary write cache and concurrent battery maintenance are provided. The controller is implemented using two physical cards that are firmly connected and requires two adjacent PCI slots. It provides three Ultra320 SCSI ports/buses for the attachment of disk drives located in a #5786 TotalStorage EXP24 Disk Drawer. #5782 is the same adapter card, but with the #5782 the adapter is placed in a double-wide blind swap cassette.
	
	Attributes provided: High performance RAID disk controller
	Attributes required: Two adjacent long PCI-X slots
	
	For 9117-MMA (#5778)
	▶ Minimum required: 0
	▶ Maximum allowed: 96 (Initial order maximum: 96)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5778)
	▶ Minimum required: 0
	▶ Maximum allowed: 192 (Initial order maximum: 192)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
	
	Note: One maximum in each CEC enclosure

| #5780 | **#5780 PCI-X EXP24 Ctl 1.5 GB No IOP**
Provides an EXP24 disk controller with PCI-X DDR technology, a maximum of 1.5 GB compressed write cache and a maximum 1.6 GB compressed read cache. The controller supports RAID-5 and RAID-6 and mirroring is supported through i5/OS. Embedded auxiliary write cache and concurrent battery maintenance are provided. The controller is implemented using two physical cards that are firmly connected and requires two adjacent PCI slots. It provides three Ultra320 SCSI ports/buses for the attachment of disk drives located in a #5786/ #5787 TotalStorage EXP24 Disk Drawer/Tower.

#5780, #5778 and #5739 are physically the same adapter cards but have different feature numbers to denote to IBM configuration tools whether or not an IOP is required. #5780 and #5778 indicate an IOP is not used. #5780 and #5799 or 5800 are also the same adapter cards, but the #5780 indicates the adapter is placed in a Gen 2.5 double-wide blind swap cassette and #5799 or 5800 indicates the adapter is placed in a system unit and has a light pipe inserted into the feature.

This adapter is used in FC#5797 or 5798 I/O Drawer, 20 Slots, 16 Disk Bays.

IBM i formatted drives are not supported.

Attributes provided: High performance RAID disk controller
Attributes required: Two adjacent long PCI-X slots

For 9119-FHA (#5780)
▶ Minimum required: 0
▶ Maximum allowed: 256 (Initial order maximum: 256)
▶ OS level required:
  – IBM i 5.4 with V5R4M5 machine code
  – IBM i 6.1 or later
▶ Initial Order/MES/Both/Supported: Both
▶ CSU: No
▶ Return parts MES: No |
| #5781 | **#5781 PCI-X EXP24 Ctlr 1.5 GB with IOP**
Provides an EXP24 disk controller with PCI-X DDR technology, a maximum of 1.5 GB compressed write cache and a maximum 1.6 GB compressed read cache. The controller supports RAID-5 and RAID-6 and mirroring is supported through i5/OS. Embedded auxiliary write cache and concurrent battery maintenance are provided. The controller is implemented using two physical cards that are firmly connected and requires two adjacent PCI slots. It provides three Ultra320 SCSI ports/buses for the attachment of disk drives located in a #5786/ #5787 TotalStorage EXP24 Disk Drawer/Tower.

This feature includes a double-wide blind swap cassette in which the disk controller is placed. The cassette is required to locate the disk controller in a 570 system unit or #5790 I/O drawer.

#5781 and #5782 are physically the same adapter card but have different feature numbers to denote to IBM configuration tools whether or not an IOP is required. #5781 indicates an IOP is used. #5739 or 5778 and #5799 or 5800 are also the same adapter cards, but the #5781 or 5782 indicates the adapter is placed in a double-wide blind swap cassette and #5799 or 5800 indicates the adapter is placed in a system unit and has a light pipe inserted into the feature.

Attributes provided: High-performance SCSI RAID controller in a double wide blind swap cassette.
Attributes required: Two adjacent PCI-X long card slots, in a blind swap capable system unit or expansion unit, and an IOP.

For 9406-MMA (#5781)
▶ Minimum required: 0
▶ Maximum allowed: 680 (Initial order maximum: 250)
▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
▶ Initial Order/MES/Both/Supported: Both
▶ CSU: Yes |

#5782	**#5782 PCI-X EXP24 Ctl 1.5 GB No IOP**
	Provides an EXP24 disk controller with PCI-X DDR technology, a maximum of 1.5 GB compressed write cache and a maximum 1.6 GB compressed read cache. The controller supports RAID-5 and RAID-6 and mirroring is supported through i5/OS. Embedded auxiliary write cache and concurrent battery maintenance are provided. The controller is implemented using two physical cards that are firmly connected and requires two adjacent PCI slots. It provides three Ultra320 SCSI ports/buses for the attachment of disk drives located in a #5786 TotalStorage EXP24 Disk Drawer.
	
	This feature includes a double-wide blind swap cassette in which the disk controller is placed. The cassette is required to locate the disk controller in a Power 570 system unit or #5790 I/O drawer. #5782 indicates an IOP is not used.
	
	Attributes provided: High-performance SCSI RAID controller in a double wide blind swap cassette.
	Attributes required: Two adjacent PCI-X long card slots, in a blind swap capable system unit or expansion unit.
	
	For 9117-MMA (#5782)
	► Minimum required: 0
	► Maximum allowed: 96 (Initial order maximum: 96)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5782)
	► Minimum required: 0
	► Maximum allowed: 384 (Initial order maximum: 384)
	► OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	► Initial Order/MES/Both/Supported: Both CSU: Yes
	► Return parts MES: No

#5783	**#5783 - PCI-X iSCSI HBA Copper** Provides a 1 Gbps copper iSCSI target HBA, which is used to connect to iSCSI initiator HBAs installed in selected System x models or IBM BladeCenter blade servers. The iSCSI connection is used to provide System i systems management, networking, and disk consolidation features to attached System x or blade servers using a 1 Gbps Ethernet LAN. #5783 uses an RJ45 Gigabit Ethernet connector and provides 1000 Mbps connectivity over standard CAT-5e or CAT6 cables to support communications up to a distance of 100 m. #5783 conforms to the iEEE 802.3ab 1000Base-T standard. Attributes provided: Connection to target host bus adapter (HBA) Attributes required: Available 3.3 V slot **For 9406-MMA (#5783)** ► Minimum required: 0 ► Maximum allowed: 168 (Initial order maximum: 168) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes

#5784	**#5784 - PCI-X iSCSI HBA Fiber** Provides a 1 Gbps fiber iSCSI target HBA, which is used to connect to iSCSI initiator HBAs installed in selected System x models or IBM BladeCenter blade servers. The iSCSI connection provides System i systems management, networking, and disk consolidation features to attached System x or blade servers using a 1 Gbps Ethernet LAN. #5784 uses small form factor LC type fiber optic connector and provides 1000 Mbps connectivity on a standard shortwave (850nm) 50/ 62.5 micron multimode fiber optic cable. #5784 supports distances of up to 220 m for 62.5 u MMF and up to 500 m for 50.0 u MMF over single port. #5784 conforms to the IEEE 802.3z standard. Attributes provided: Connection to target host bus adapter (HBA) Attributes required: Available 3.3V PCI-X slot **For 9406-MMA (#5784)** ▶ Minimum required: 0 ▶ Maximum allowed: 168 (Initial order maximum: 168) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes

| #5786 | **#5786 TotalStorage EXP24 Disk Dwr**
Provides disk slots for up to 24 disk units in a 19 inch, 4 EIA high rack drawer. The #5786 provides redundant power, redundant cooling, and Ultra 320 SCSI interface connections for 24 Ultra 320 SCSI disk units that are organized in four independent groups of six disk units.

#5741 or #5742 EXP24 Disk Slot Enablers (SCSI repeaters) enable these groups of six disk unit slots. The enabled disk slots are driven by SCSI disk controllers located outside the #5786 and connected by a SCSI cable. One to four Disk Slot Enablers are required, depending on the number of disk unit groups populated with disk units.

One external port on a disk controller such as a #5736, #5776, #5778, or #5782 is required for each #5741 installed. Likewise, one external disk controller port is required for each #5742 installed and cabled to run one group of six disk slots. Alternately, two #5742s can be cabled such that a single disk controller can run two groups of six disk slots. Or, one #5741 plus one #5742 can also be cabled such that a single disk controller can run two groups of six disk slots.

The following SCSI cables are available:
▶ #2138 0.55 m SCSI Cable
▶ #2124 1 m SCSI Cable
▶ #2125 3 m SCSI Cable
▶ #2126 5 m SCSI Cable
▶ #2127 10 m SCSI Cable
▶ #2128 20 m SCSI Cable

Attributes provided: 24 Ultra 320 SCSI disk unit slots
Attributes required: Disk controller with external Ultra 320 SCSI port and 4 EIA units of space in a 19 inch rack

For 9117-MMA (#5786)
▶ Minimum required: 0
▶ Maximum allowed: 60 (Initial order maximum: 60)
▶ OS level required:
    – AIX supported only when migrated from M/T 9406
    – IBM i 5.4 with V5R4M5 machine code or later

For 9119-FHA (#5786)
▶ Minimum required: 0
▶ Maximum allowed: 110 (Initial order maximum: 110)
▶ OS level required:
    – IBM i 5.4 with V5R4M5 machine code
    – IBM i 6.1 or later

Initial Order/MES/Both/Supported: Both
CSU: Yes
Return parts MES: No

Note: Maximum of 40 drawers in all migrated AIX partitions combined. |

| #5787 | **#5787 - TotalStorage EXP24 Disk Twr**
Provides disk slots for up to 24 disk units in a stand-alone disk tower. The #5787 provides redundant power, redundant cooling, and Ultra 320 SCSI interface connections for 24 Ultra 320 SCSI disk units, which are organized in four independent groups of six disk units.

#5741 or #5742 EXP24 Disk Slot Enablers (SCSI repeaters) enable these groups of six disk unit slots. The enabled disk slots are driven by SCSI disk controllers located outside the #5787 and connected by a SCSI cable. One to four Disk Slot Enablers are required, depending on the number of disk unit groups populated with disk units.

One external port on a disk controller such as a #5736, #5737, #5739, #5775, #5776, #5778, #5781, #5782, #5799, or #5800 is required for each #5741 installed. Likewise, one external disk controller port is required for each #5742 installed and cabled to run one group of six disk slots. Alternately, two #5742's can be cabled such that a single disk controller can run two groups of six disk slots. Or, one #5741 plus one #5742 can also be cabled such that a single disk controller can run two groups of six disk slots.

The following SCSI cables are available:
▶ #2138 0.55 m SCSI Cable
▶ #2124 1 m SCSI Cable
▶ #2125 3 m SCSI Cable
▶ #2126 5 m SCSI Cable
▶ #2127 10 m SCSI Cable
▶ #2128 20 m SCSI Cable

Specific disk unit feature numbers are used to identify disk units that will be placed in the #5787. These disk units are physically the same disk units as used in other System i system units and I/O tower/drawers. Using separate feature numbers allows IBM configuration tools to better understand their placement. Feature numbers of #5787 disk units include:
▶ 9406-MMA #1266, #1267, #1268, #1269, #1292, #1293, #1294, #1295, #1296, #1297, #1298, #1299.
▶ Unified POWER6 MTMs: #3273, #3274, #3275, #3277, #3278, #3279

Attributes provided: 24 Ultra 320 SCSI disk slots
Attributes required: Disk controller with external Ultra 320 SCSI port

For 9406-MMA, 9117-MMA, 9119-FHA
▶ Minimum required: 0
▶ Maximum allowed: 57 (Initial order maximum: 57)
▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
▶ Initial Order/MES/Both/Supported: Both
▶ CSU: Yes |

#5790	**#5790 PCI Expansion Drawer**
	The #5790 is a four EIA unit I/O expansion drawer that provides six full length, 64-bit, 3.3-V, 133 MHz hot-plug PCI-X slots and can accommodate up to six blind swap I/O adapters. The I/O Expansion drawer is attached to the system using a RIO-2 bus interface adapter. The #5790 includes redundant concurrently maintainable power and cooling and the blind swap PCI mechanism allows for PCI card servicing without removing the I/O expansion drawer
	
	The #5790 mounts in a 19 inch rack using a #7307 Dual I/O Unit Enclosure or a #7311 Dual I/O Unit Enclosure. Two #5790 drawers can be mounted side by side in a single #7307 or #7311 and are not required to be attached to the same system
	
	Attributes provided: 6 PCI-X slots for blind swap I/O adapters
	Attributes required:
	▸ Rack space in a #7307 Dual I/O Unit Enclosure or a #7311 Dual I/ O Unit Enclosure.
	▸ One RIO-2 Remote I/O Loop Adapter, #6438
	▸ Two RIO-2 cables (#3168 recommended)
	▸ Two SPCN cables (#6006 recommended).
	▸ Two Power cable, drawer to IBM PDU (#6459 recommended)
	
	For 9117-MMA (#5790)
	▸ Minimum required: 0
	▸ Maximum allowed: 48 (Initial order maximum: 48)
	▸ OS level required:
	  – AIX supported only for migration from M/T 9406
	  – IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#5790)
	▸ Minimum required: 0
	▸ Maximum allowed: 96 (Initial order maximum: 96)
	▸ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No

#5791	**#5791 I/O Drawer, 20 Slots, 16 Disk Bays**
	Provides a 4U high I/O drawer containing twenty PCI-X slots and sixteen hot-swap disk bays. This drawer attaches to the central electronics complex using RIO-2 attachment cables.
	
	Attributes provided: 20 PCI-X slots, 16 disk bays
	Attributes required: Available RIO-2 attachment ports
	
	For 9119-FHA (#5791)
	► Minimum required: 0
	► Maximum allowed: 12 (Initial order maximum: 12)
	► OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – Novell SUSE Linux Enterprise Server 10 SP2 for POWER or later
	  – Red Hat Enterprise Linux version 4.7 and version 5.2 or later
	  For systems and features that operate with Linux, refer to:
	  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	► Initial Order/MES/Both/Supported: Both
	► CSU: No
	► Return parts MES: Feature conversion only
	
	Note: Total quantity of #5791 + #5797 + #5798 + #5808 must be less than or equal to 30.

#5792	**#5792 Expansion Rack, Powered**
	Provides a 24 inch, 42U powered expansion rack. The power subsystem resides in the upper 8U of the rack and utilizes the same power components provided in the CEC rack.
	
	Attributes provided: Powered expansion rack
	Attributes required: None
	
	For 9119-FHA (#5792)
	► Minimum required: 0
	► Maximum allowed: 1 (Initial order maximum: 0)
	► OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	  Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	► Initial Order/MES/Both/Supported: Supported
	► CSU: No
	► Return parts MES: Does not apply

#5794	**#5794 I/O Drawer, 20 Slots, 8 Disk Bays**
	Provides a 4U high I/O drawer containing 20 PCI-X slots and eight hot-swap disk bays. This drawer attaches to the central electronics complex using RIO-2 attachment cables.
	
	Attributes provided: 20 PCI-X slots, 8 disk bays
	Attributes required: Available RIO-2 attachment ports
	
	For 9119-FHA (#5794)
	► Minimum required: 0
	► Maximum allowed: 12 (Initial order maximum: 0)
	► OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – Novell SUSE Linux Enterprise Server 10 SP2 for POWER or later
	  – Red Hat Enterprise Linux version 4.7 and version 5.2 or later
	  For systems and features that operate with Linux, refer to:
	  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	► Initial Order/MES/Both/Supported: Supported
	► CSU: No
	► Return parts MES: Feature conversion only
	
	Note: Total quantity of #5791 + #5797 + #5798 + #5807 + #5808 must be less than or equal to 30.

#5795	**#5795 Media Drawer, Rack Mounted** The media drawer feature provides the system three bays for media devices. The media drawer is divided into front and rear sections. Each section of the media drawer is powered separately from the first system I/O drawer, either a #5791 or #5794, and must be cabled to separate ports of one or two SCSI PCI adapters. The front section contains two media bays and the rear section contains one media bay. The device in the rear is only accessible from the rear of the system. Attributes provided: Rack mounted media drawer with three media bays Attributes required: #5791 or #5794 I/O Drawer and SCSI PCI adapter #5736 or #5710. Limitations: Not supported on unified POWER6 MTMs.

| #5796 | **#5796 PCI-DDR 12X Expansion Drawer**
The #5796 is a four EIA unit I/O expansion drawer providing six full length, 64-bit, 3.3 volt, 266 MHz PCI-X DDR slots. Blind swap cassettes are used to insert or remove the PCI-X cards. The #5796 is attached to a system using a GX Dual Port 12X Channel Attach adapter in a 12X loop. Either a 12X Short Run adapter (6446) or 12X Long Run adapter (6457) must be selected on each #5796. Up to four #5796 can be attached on the same 12X loop using a mixture of Short Run and Long Run adapters.

The #5796 includes redundant hot-swap power and cooling. The blind swap PCI mechanism allows for PCI card concurrent maintenance without removing the I/O expansion drawer. The #5796 mounts in a 19 inch rack using a #7314 I/O Drawer Mounting Enclosure. Two #5796 drawers can be mounted side by side in a single #7314 using a total of four EIA units in a 7014 rack. The two #5796 that share a single 7314 enclosure can be attached to the same or different Host systems. Each #5796 uses two power cords, ordered separately.

When placed in an IBM i partition, these PCI-X DDR slots support only smart IOAs and do not support an IOP or an IOA which requires an IOP.

Attributes provided: 6 PCI-X DDR slots for blind swap I/O adapters
Attributes required: Rack space in a #7314 I/O Drawer Mounting Enclosure. 12X cables. 12X Short Run or Long Run card, and SPCN cables.

For 9117-MMA (#5796)
▶ Minimum required: 0
▶ Maximum allowed: 32 (Initial order maximum: 32)
▶ OS level required:
– AIX 5.2 TL10 or later
– AIX 5.3 TL6 or later
– IBM i 5.4 with V5R4M5 machine code or later
For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
▶ Initial Order/MES/Both/Supported: Both
▶ CSU: Yes
▶ Return parts MES: No |

#5797	**#5797 12X I/O Drawer PCI-X, with repeater**
	Provides a 4U high I/O drawer containing twenty PCI-X slots and sixteen hot-swap SCSI disk bays. This drawer attaches to the central electronics complex using 12X attachment cables and comes with a repeater card installed. The repeater card is designed to strengthen signal strength over the Longer 12X cables used with the Power Expansion Rack (#6954) and nonpowered, Bolt-on Expansion Rack (#6983).
	Note: Total quantity of #5791 + #5797 + #5798 + #5807 + #5808 + #5809 must be less than or equal to 30.
	Attributes provided:
	▶ 20 PCI-X Slots, 16 disk bays
	▶ 12X GX-Buss, with repeater
	Attributes required: Available 12X connection ports
	For 9119-FHA (#5797)
	▶ Minimum required: 0
	▶ Maximum allowed: 30 (Initial order maximum: 30)
	▶ OS level required:
	– AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	– AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	– AIX Version 5.3 with the 5300-08 Technology Level or later
	– AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	– AIX Version 6.1 with the 6100-01 Technology Level or later
	– IBM i 5.4 with V5R4M5 machine code
	– IBM i 6.1 or later
	– Novell SUSE Linux Enterprise Server 10 SP2 for POWER or later
	– Red Hat Enterprise Linux version 4.7 and version 5.2 or later
	For systems and features that operate with Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: No
	▶ Return parts MES: Does not apply
	Note: Total quantity of #5791 + #5797 + #5798 + #5807 + #5808 must be less than or equal to 30.

| #5798 | **#5798 12X I/O Drawer PCI-X, no repeater**
Provides a 4U high I/O drawer containing twenty PCI-X slots and sixteen hot-swap disk bays. This drawer attaches to the central electronics complex using 12X cables.

Attributes provided:
▶ 20 PCI-X Slots, 16 disk bays
▶ 12X GX-Buss, no repeater
Attributes required: Available 12X connection ports

For 9119-FHA (#5798)
▶ Minimum required: 0
▶ Maximum allowed: 3 (Initial order maximum: 3)
▶ OS level required:
– AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
– AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
– AIX Version 5.3 with the 5300-08 Technology Level or later
– AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
– AIX Version 6.1 with the 6100-01 Technology Level or later
– IBM i 5.4 with V5R4M5 machine code
– IBM i 6.1 or later
– Novell SUSE Linux Enterprise Server 10 SP2 for POWER or later
– Red Hat Enterprise Linux version 4.7 and version 5.2 or later
For systems and features that operate with Linux, refer to:
http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
▶ Initial Order/MES/Both/Supported: Both
▶ CSU: No
▶ Return parts MES: Does not apply

Notes:
▶ This drawer is configured without a repeater and can be used only in the System Rack. It is not intended for use in the Powered Expansion Rack (#6954) and Bolt-on Expansion Rack (#6983)
▶ Total quantity of #5791 + #5797 + #5798 + #5807 + #5808 + #5809 must be less than or equal to 30. |
| #5801 | **#5801 - 1/4-way Processor Enclosure**
The #5801 expansion drawer or expansion node is for a POWER6 570. This feature adds: one POWER6 570 expansion drawer including redundant power and cooling, 6 SAS disk slots, 4 PCIe slots, 2 PCI-X DDR slots, two 0/2-way processors (#7380), two GX slots for HSL or 12X loops adapters, IVE slot, and a DVD enclosure slot.

The #5801 is ordered as an MES after the initial POWER6 570 installation and does not impact the existing server or edition features. With the #5801 order, a minimum of one processor activation (#5403), plus an Integrated Virtual Ethernet (IVE) adapter, plus two memory features are required. Appropriate processor fabric cables and the appropriate service interface cable are also required.

Attributes provided: One expansion drawer, two #7380 processor cards and other additional I/ O expansion capability
Attributes required: 4 EIA slots contiguous and below the existing Model 570, Additional Processor fabric and service interface cables.

For 9406-MMA (#5801)
▶ Minimum required: 0
▶ Maximum allowed: 3 (Initial order maximum: 0)
▶ OS level required:
– IBM i 5.4 with V5R4M5 machine code or later
– AIX 5.3 or AIX 6.1 or later
– SUSE LINUX Enterprise Server 9 for POWER Systems
– SUSE LINUX Enterprise Server 10 for POWER Systems or later
– Red Hat Enterprise Linux AS 4 for POWER or later
▶ Initial Order/MES/Both/Supported: MES
▶ CSU: No |

| #5806 | **#5806 PCI-X DDR Dual Channel Ultra320 SCSI Adapter**
This feature is provided for driving a SCSI Tape Drive in an i5OS environment. An IOP is required when this feature is selected.

The PCI-X DDR Dual Channel Ultra320 SCSI Adapter (#5806) is a 64-bit 3.3-volt adapter and is an excellent solution for high-performance SCSI applications. The PCI-X Dual Channel Ultra320 SCSI Adapter provides two SCSI channels (busses), each capable of running 320 MBps (maximum). Each SCSI bus can either be internal (on systems that support internal SCSI device or backplane attachments) or external. Internally attached Ultra320 devices are designed to run at a data rate of up to 320 MBps on systems that have internal backplanes that are capable of supporting Ultra320 speeds.

To achieve an Ultra320 SCSI bus data rate of up to 320 MBps and maintain a reasonable drive distance, the adapter utilizes Low Voltage Differential (LVD) drivers and receivers. To utilize the 320 MBps performance, all attaching devices should also be Ultra320 LVD devices; however, if Ultra2, Ultra3, or Ultra320 devices coexist on the same bus, each device will operate at its rated speed. For lower speed single-ended (SE) devices, the SCSI bus will switch to single-ended (SE) performance and interface to all devices on that SCSI bus at the lower SE bus data rate of the device.

Two VHDCI 68-pin connectors are mounted on the adapter's end bracket allowing attachment of various LVD and SE external subsystems. A 0.3-meter converter cable, VHDCI to P, Mini-68-pin to 68-pin, (#2118) can be used with older external SE devices or subsystems to allow connection to the VHDCI connector on the PCI-X DDR Dual Channel Ultra320 SCSI Adapter.

Two external ports provide connectivity to numerous other SCSI external subsystems. Check the external subsystem sales or Web pages for verification of connectivity support with this adapter.

The PCI-X Dual Channel Ultra320 SCSI Adapter (#5806) is a native boot adapter. The adapter also supports target mode.

Limitations:
▸ The two external ports do not support the connection to the IBM 7131-105 IBM Multi-Storage Tower Model 105.
▸ Even though the Dual Channel Ultra320 SCSI nonRAID Adapter has ports that run at ultra320 SCSI speeds (up to 320 MBps), the internally attached disk drives will run at a maximum SCSI bus data rate specified by that supporting system disk backplane.

Attributes provided: Attachment of a SCSI Tape drive
Attributes required: One available 3.3 volt PCI or PCI-X slot or PCI-X 2.0 DDR slot and a PCI IOP.

For 9117-MMA (#5806)
▸ Minimum required: 0
▸ Maximum allowed: 348 (Initial order maximum: 250)
▸ OS level required: IBM i 5.4 with V5R4M5 machine code or later

For 9119-FHA (#5806)
▸ Minimum required: 0
▸ Maximum allowed: 168 (Initial order maximum: 168)
▸ OS level required:
  – IBM i 5.4 with V5R4M5 machine code or later
  – IBM i 6.1 or later

Initial Order/MES/Both/Supported: Both
CSU: Yes
Return parts MES: No

Note: This adapter is not allowed in the CEC enclosures |

#5807	**#5807 Model Upgrade Carry-Over Indicator for #5791**
	For 9119-FHA (#5807)
	▶ Minimum required: 0
	▶ Maximum allowed: 12 (Initial order maximum: 12)
	▶ OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – Novell SUSE Linux Enterprise Server 10 SP2 for POWER or later
	  – Red Hat Enterprise Linux version 4.7 and version 5.2 or later
	  For systems and features that operate with Linux, refer to:
	  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: No
	▶ Return parts MES: Feature conversion only
	
	Note: Total quantity of #5791 + #5797 + #5798 + #5807 + #5808 must be less than or equal to 30.

#5808	**#5808 Model Upgrade Carry-Over Indicator for #5794**
	For 9119-FHA (#5808)
	▶ Minimum required: 0
	▶ Maximum allowed: 12 (Initial order maximum: 12)
	▶ OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – Novell SUSE Linux Enterprise Server 10 SP2 for POWER or later
	  – Red Hat Enterprise Linux version 4.7 and version 5.2 or later
	  For systems and features that operate with Linux, refer to:
	  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: No
	▶ Return parts MES: Feature conversion only
	
	Note: Total quantity of #5791 + #5797 + #5798 + #5807 + #5808 must be less than or equal to 30.

#5809	**#5809 Model Upgrade Carry-Over Indicator for converted #4643 with DCA**
	Indicator of rack space utilization for converted #4643 with DCA, RIO-2 attached PCI-X I/O Drawer with 4 backplanes.
	
	Attributes provided: Indicator of rack space utilization
	Attributes required: 4U of rack space
	
	For 9119-FHA (#5809)
	▸ Minimum required: 0
	▸ Maximum allowed: 12 (Initial order maximum: 12)
	▸ OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – Novell SUSE Linux Enterprise Server 10 SP2 for POWER or later
	  – Red Hat Enterprise Linux version 4.7 and version 5.2 or later
	  For systems and features that operate with Linux, refer to:
	  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	▸ Initial Order/MES/Both/Supported: Both
	▸ CSU: No
	▸ Return parts MES: Feature conversion only
	
	Note: Total quantity of #5791 + #5797 + #5798 + #5807 + #5808 + #5809 must be less than or equal to 30

#5882	**#5882 Migrated Self-Powered rack** This is an indicator feature used when the #5792 Powered Expansion rack is migrated from a 9119-595. Attributes provided: 24-in Self Powered Expansion rack for RIO-2 I/O drawers #5791, #5807, #5808, #5809. Attributes required: 9119-FHA CEC Rack and #5792 with firmware level GA7SP7-23.11.6 or later **For 9119-FHA (#5882)** ▸ Minimum required: 0 ▸ Maximum allowed: 1 (Initial order maximum: 1) ▸ OS level required: None ▸ Initial Order/MES/Both/Supported: Both ▸ CSU: No ▸ Return parts MES: No

#5883	**#5883 1 GB Carry-Over Activation**
	This is a carry-over indicator used for migrating 1 GB DDR2 memory activation features 7669, 8471, and 8494. Memory activations are stored in the system, not on the memory card. If DDR2 memory is moved to a different system, the DDR2 activations remain with the original system.
	
	Attributes provided: 1 GB DDR2 memory activation for DDR2 memory migrated from either a i5-595 or a p5-590/595 server.
	Attributes required: DDR2 migrated memory DIMMs mounted on interposer cards #5584, #5605, or #5611.
	
	For 9119-FHA (#5883)
	▶ Minimum required: 0
	▶ Maximum allowed: 255 (Initial order maximum: 0)
	▶ OS level required:
	    – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	    – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	    – AIX Version 5.3 with the 5300-08 Technology Level or later
	    – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	    – AIX Version 6.1 with the 6100-01 Technology Level or later
	    – IBM i 5.4 with V5R4M5 machine code
	    – IBM i 6.1 or later
	    – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	    – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	    Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	    http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: Yes
	▶ Return parts MES: Does not apply
	
	Note: Quantity of #5883 = #7669 + #8471 + #8494 migrated from POWER5 System p 590/595 and System i 595.

#5884	**#5884 256 GB Carry-Over Activation**
	This is a carry-over indicator used for migrating 256 x 1 GB DDR2 memory activation features 7280, 8472, 8493, 8495. Memory activations are stored in the system, not on the memory card. If DDR2 memory is moved to a different system, the DDR2 activations remain with the original system.
	Attributes provided: 256 x 1 GB DDR2 memory activations for DDR2 memory migrated from either a i5-595 or a p5-590/595 server.
	Attributes required: DDR2 migrated memory DIMMs mounted on interposer cards #5584, #5605, or #5611.
	For 9119-FHA (#5884)
	► Minimum required: 0
	► Maximum allowed: 8 (Initial order maximum: 0)
	► OS level required:
	– AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	– AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	– AIX Version 5.3 with the 5300-08 Technology Level or later
	– AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	– AIX Version 6.1 with the 6100-01 Technology Level or later
	– IBM i 5.4 with V5R4M5 machine code
	– IBM i 6.1 or later
	– SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	– Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	► Initial Order/MES/Both/Supported: MES
	► CSU: Yes
	► Return parts MES: Does not apply
	Note: Quantity of #5883 = #7669 + #8471 + #8494 migrated from POWER5 System p 590/595 and System i 595.

| #5886 | **#5886 EXP 12S**
EXP 12S is an Expansion Drawer with 12 SAS Storage Slots. #5886 Supports up to 12 hot-swap SAS Disk Drives in mega-pack carriers. The drawer supports redundant hot-plug power and cooling and redundant hotswap.

SAS expanders (Enclosure Services Manager-ESM). Each ESM has an independent SCSI Enclosure Services (SES) diagnostic processor. Feature #5886 attaches to a host system processor enclosure or a remote I/O drawer with a SAS adapter in a PCI-X or PCIe slot using the appropriate external SAS cables and SAS controllers.

This SAS Enclosure takes up a 2 EIA space in a 19 inch rack.

Attributes provided: 12 disk bays and up to 11 slot filler panels.
Attributes required:
▶ Available SAS Port
▶ POWER6 Server
▶ Available 2U Rack Space
▶ At least one SAS drive must be ordered for each #5886 enclosure

Supported on 8203-E4A, 9407-M15, 8204-E8A, 9408-M25, 8204-E8A, 9409-M50, 9117-MMA, 9119-FFA
▶ Minimum required: 0
▶ Maximum allowed per MTM:
   – 8203-E4A, 9407-M15, 9408-M25, 8204-E8A, 9117-MMA processor enclosure: 3
   – 8203-E4A: system wide: 24
   – 9408-M25 system wide: 94
   – 8204-E8A system wide: 48
   – 9408-M50 system wide: 184
   – 9117-MMA system wide: 110
   – 9119-FFA system wide: 185

Note: System maximum is achievable with SAS adapters in loop attached I/O drawers. Up to four #5886 can be supported on a 5900, 5902, or 5912 adapter. Up to four #5886 can be supported on a pair of 5902 adapters. This means up to 24 disks through the same adapter and 48 over a single backplane. This many disks can result in performance issues in high I/Os per second rate environments. Do appropriate performance sizing, especially with more than 12 disks on the same adapter.

Processor enclosure attachment requires a specific MTM backplane feature with optional RAID and write cache feature numbers and cables. IBM i support requires either mirroring or RAID protection. For more information, see Chapter 6, "EXP 12S SAS Disk Enclosure" on page 755.

OS level required:
▶ AIX 5.3 TL6 with SP4 or later
▶ AIX 5.3 TL7 or later
▶ AIX 6.1 or later
▶ IBM i 5.4.5 or later
▶ Linux - SUSE Linux Enterprise Server 10 SP1 for Power Systems or later
▶ Red Hat Enterprise Linux, Version 4.6 or later
▶ Red Hat Enterprise Linux, Version 5.1 or later
   For systems and features that operate with Linux, refer to:
   http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
▶ Initial Order/MES/Both/Supported: Both
▶ CSU: Yes
▶ Return parts MES: No |

| #5900 | **5900 PCI-X DDR Dual -x4 SAS Adapter**
(No longer available as of 30 May 2008.)

The PCI-X DDR Dual Connector x4 SAS Adapter is a low-profile short form factor adapter and is an excellent solution for high-performance applications. The Adapter provides two SAS channels (busses), each supporting four ports (x4). In a wide configuration, providing redundant ports to the devices, 1 Gbps throughput is supported. In the non- redundant configuration up to 3 Gbps is supported. The adapter supports RAID level 0 (with mirroring) and 10.

Highlights:
▶ Wide Configuration supports addressing up to 512 SAS devices with eight ports. Non-redundant configuration supports addressing 128 SAS devices per port.
▶ SAS speed = 3 Gbps
▶ SATA speed = 1.5 Gbps
▶ SAS Serial SCSI Protocol (SSP), Serial ATA Tunneling Protocol (STP) and Serial
▶ Management Protocol (SMP)
▶ RAID 0 (with mirroring), 10
▶ Concurrent Firmware Update
▶ Removable Media Device Supported

Attributes provided: Eight SAS Ports through two x4 SAS channels.
Attributes required: One PCI-X 2.0 DDR slot

For 9117-MMA (#5900)
▶ Minimum required: 0
▶ Maximum allowed: 192 (Initial order maximum: 192)
▶ OS level required:
  – AIX 5.3 TL6 with SP4 or later
  – AIX 5.3 TL7 or later
  – AIX 6.1 or later

For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument

For 9119-FHA (#5900)
▶ Minimum required: 0
▶ Maximum allowed: 192 (Initial order maximum: 0)
▶ OS level required:
  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
  – AIX Version 5.3 with the 5300-08 Technology Level or later
  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
  – AIX Version 6.1 with the 6100-01 Technology Level or later
  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later

Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

Initial Order/MES/Both/Supported: Both
CSU: Yes
Return parts MES: No

Note: Two maximum in each CEC enclosure. |

#5902	**#5902 PCI-X DDR Dual - x4 3Gb SAS RAID Adapter**
	The PCI-X DDR Dual - x4 3Gb SAS RAID Adapter is a long form factor adapter and is an excellent solution for high-performance applications requiring two adapters. Two #5902 provides for mirrored write cache data and mirrored RAID parity footprints between the adapters for superior availability. With proper cabling, multiple wide ports are used to provide redundant paths to each dual port SAS disk. The adapter manages SAS path redundancy and path switching should a SAS failure occur. RAID levels 0, 5, 6, and 10 are supported. Primary use is with FC 5886 EXP 12S SAS disk expansion drawers. FC 5902 is always to be in used in a High Availability configuration using two adapters.
	
	Highlights:
	▶ Supports 48 SAS disks, when configured with four FC 5886 12S disk expansion drawers
	▶ SAS speed = 3 Gbps
	▶ SAS Serial SCSI Protocol (SSP) and Serial Management Protocol (SMP)
	▶ RAID 0, 5, 6, and 10
	▶ 175 MB of NV Fast Write Cache
	▶ Dual controller supports mirrored write cache data and mirrored RAID parity footprints
	▶ Concurrent Firmware Update
	
	Attributes provided: Eight physical links through two mini SAS 4x connectors.
	Attributes required: One PCI-X 2.0 DDR slot per #5902. Configuration always requires even pairs of #5902. SAS Media devices are not supported. When attaching #5886 EXP 12S use one of the following SAS (X) cables #3661, #3662, or #3663 must be used.
	
	For 9117-MMA (#5912) and 9119-FHA (#5912)
	▶ Minimum required: 0
	▶ Maximum allowed: 192 (Initial order maximum: 192)
	▶ OS level required:
	   – AIX 5L for POWER version 5.3 with the 5300-08 Technology Level
	   – AIX Version 6.1 with the 6100-01 Technology Level
	   – SUSE Linux Enterprise Server 10 SP2 for POWER Systems or later
	   – Red Hat Enterprise Linux, version 4.7 or later
	   – Red Hat Enterprise Linux, version 5.2 or later
	   Not all AIX features operate with Linux. For information about systems and features that operate with Linux, refer to:
	   www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No
	
	Note: Two maximum in each Power 520, Power 550, Power 570 CEC enclosure. Only supported when applied in pairs.

#5909	**#5909 Alternate SAS controller for 3 of 6 internal SAS Disk Slots**

	This feature allows 3 of the internal SAS disk slots (SAS disks slots 4, 5, and 6) in a processor (CEC) enclosure to be controlled by an alternate SAS controller. With this feature the connection to the 3 internal SAS disk slots is transferred from the internal controller to a Mini SAS 4x receptacle on the rear bulkhead of the CEC enclosure at adapter slot location P1-C3. This feature is contained entirely within slot location P1-C3. There are three port openings on the bulkhead delivered with this feature. The top port/connector (upper most) is linked to the 3 internal SAS disk slots. The middle port is covered with a label and is not supported for use. The bottom port/connector (lower most) is linked to the PCIe 4x SAS Controller included as part of this feature. An external cable, feature 3679 (or similar cable) is required to connect the Mini SAS 4x connector (top) linked to the internal slots with the Mini SAS 4x connector (bottom) linked to the PCIe 4x SAS Controller.
	
	Attributes provided: Alternate SAS controller for 3 of 6 internal SAS Disk slots.
	Attributes required: Slot P1-C3 in the CEC enclosure to which this feature is being added.
	
	For 9117-MMA (#5909)
	► Minimum required: 0
	► Maximum allowed: 4 (Initial order maximum: 4)
	► OS level required:
	► AIX 5L for POWER version 5.3 with the 5300-08 Technology Level
	   – AIX Version 6.1 with the 6100-01 Technology Level
	   – SUSE LINUX Enterprise Server 10 SP2 for POWER Systems or later
	   – Red Hat Enterprise Linux, version 4.7 or later
	   – Red Hat Enterprise Linux, version 5.2 or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes
	► Return parts MES: No

#5912	**#5912 PCI-X DDR Dual - x4 SAS Adapter**
	The PCI-X DDR Dual Connector x4 SAS Adapter is a low-profile short form factor adapter and is an excellent solution for high-performance applications. With proper cabling, multiple wide ports are used to provide redundant paths to each dual port SAS disk. The adapter manages SAS path redundancy and path switching should a SAS failure occur. RAID levels 0 (with mirroring) and 10 are supported. FC 5912 can also be used in a High Availability configuration using two adapters.
	Highlights
	▸ Supports 48 SAS disks, when configured with four FC 5886 12S disk expansion drawers. *Always do performance analysis to estimate disk read and write I/Os per second rates. The #5912 has zero write cache; for a high write I/O environment consider other options.*
	▸ Removable Media Device Supported
	▸ SAS speed = 3 Gbps
	▸ SATA speed = 1.5 Gbps
	▸ SAS Serial SCSI Protocol (SSP), Serial ATA Tunneling Protocol (STP) and Serial Management Protocol (SMP)
	▸ RAID 0 (with mirroring) and 10
	▸ Dual controller supports mirrored RAID parity footprints
	▸ Concurrent Firmware Update
	Attributes provided: Eight physical links through two mini SAS 4x connectors
	Attributes required: One PCI-X 2.0 DDR slot
	For 9117-MMA (#5902) and 9119-FHA (#5902)
	▸ Minimum required: 0
	▸ Maximum allowed: 192 (Initial order maximum: 192)
	▸ OS level required:
	– AIX 5L for POWER version 5.3 with the 5300-08 Technology Level
	– AIX Version 6.1 with the 6100-01 Technology Level
	– AIX 5L for POWER version 5.3 with the 5300-06 Technology Level and Service Pack 7
	– AIX 5L for POWER version 5.3 with the 5300-07 Technology Level and Service Pack 4
	– AIX Version 6.1 with the 6100-00 Technology Level and Service Pack 5
	– IBM i 5.4.5 or later (does not support dual controller or RAID 10); use IBM i defined mirroring
	– Red Hat Enterprise Linux, version 4.7 or later
	– Red Hat Enterprise Linux, version 5.2 or later
	– SUSE Linux Enterprise Server 10 SP2 for POWER Systems or later
	For systems and features that operate with Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	▸ Initial Order/MES/Both/Supported: Both
	▸ CSU: Yes
	▸ Return parts MES: No
	Note: Two maximum in each CEC enclosure.

#5941	**#5941 100 Processor Minutes for #4694**
	Utility billing for 100 processor minutes for 4.2 GHZ Processor, #4694.
	
	Attributes provided: Payment for temporary use of processor #4694
	Attributes required: At least one processor #4694 that is not permanently active
	
	For 9119-FHA (#5941)
	▶ Minimum required: 0
	▶ Maximum allowed: NO MAX (Initial order maximum: 255)
	▶ OS level required:
	   – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	   – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	   – AIX Version 5.3 with the 5300-08 Technology Level or later
	   – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	   – AIX Version 6.1 with the 6100-01 Technology Level or later
	   – IBM i 5.4 with V5R4M5 machine code
	   – IBM i 6.1 or later
	   – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	   – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	   Not all AIX features operate with Linux.For systems and features that operate with Linux, refer to:
	   http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: Yes
	▶ Return parts MES: Does not apply

#5942	**#5942 100 Processor Minutes for #4695**
	Utility billing for 100 processor minutes for 5.0 GHZ Processor, #4695.
	
	Attributes provided: Payment for temporary use of processor #4695
	Attributes required: At least one processor #4695 that is not permanently active
	
	For 9119-FHA (#5942)
	▶ Minimum required: 0
	▶ Maximum allowed: NO MAX (Initial order maximum: 255)
	▶ OS level required:
	   – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	   – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	   – AIX Version 5.3 with the 5300-08 Technology Level or later
	   – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	   – AIX Version 6.1 with the 6100-01 Technology Level or later
	   – IBM i 5.4 with V5R4M5 machine code
	   – IBM i 6.1 or later
	   – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	   – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	   Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	   http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: Yes
	▶ Return parts MES: Does not apply

#5943	**#5943 100 Processor Minutes for #4694, IBM i**
	Utility billing for 100 processor minutes for 4.2 GHZ Processor, #4694 with IBM i.
	
	Attributes provided: Payment for temporary use of processor #4694 with IBM i
	Attributes required: At least one processor #4694 that is not permanently active and IBM i
	
	For 9119-FHA (#5943)
	▶ Minimum required: 0
	▶ Maximum allowed: NO MAX (Initial order maximum: 255)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: Yes
	▶ Return parts MES: Does not apply

#5944	**#5944 100 Processor Minutes for #4695, IBM i**
	Utility billing for 100 processor minutes for 5.0 GHZ Processor, #4695 with IBM i.
	
	Attributes provided: Payment for temporary use of processor #4695 with IBM i
	Attributes required: At least one processor #4695 that is not permanently active and IBM i
	
	For 9119-FHA (#5944)
	▶ Minimum required: 0
	▶ Maximum allowed: NO MAX (Initial order maximum: 255)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: Yes
	▶ Return parts MES: Does not apply

#5945	**#5945 On/Off Processor CoD Billing, 1 Proc-Day for #4694, IBM i**
	Provides 1 day of on/off processor billing for 4.2 GHz Processor Book #4694 with IBM i
	
	Attributes provided: Payment for one processor day usage for feature #4694 with IBM i
	Attributes required: At least one processor #4694 that is not permanently active and IBM i
	
	For 9119-FHA (#5945)
	▶ Minimum required: 0
	▶ Maximum allowed: NO MAX (Initial order maximum: 255)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: Yes
	▶ Return parts MES: Does not apply

#5946	**#5946 On/Off Processor CoD Billing, 1 Proc-Day for #4695, IBM i**
	Provides 1 day of on/off processor billing for 5.0 GHz Processor Book #4695 with IBM i.
	
	Attributes provided: Payment for one processor day usage for feature #4695 with IBM i
	Attributes required: At least one processor #4695 that is not permanently active and IBM i
	
	For 9119-FHA (#5946)
	▶ Minimum required: 0
	▶ Maximum allowed: NO MAX (Initial order maximum: 255)
	▶ OS level required:
	    – IBM i 5.4 with V5R4M5 machine code
	    – IBM i 6.1 or later
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: Yes
	▶ Return parts MES: Does not apply

#5951	**#5951 Full Width Quiet Touch Keyboard -- USB, US English, #103P** Provides a USB attached US English #103P keyboard with a 3m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5951)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#5951)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#5952	**#5952 Full Width Quiet Touch Keyboard -- USB, French, #189** Provides a USB attached French #189 keyboard with a 3m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5952)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#5952)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#5953	**#5953 Full Width Quiet Touch Keyboard -- USB, Italian, #142** Provides a USB attached Italian #142 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5953)** ▸ Minimum required: 0 ▸ Maximum allowed: no max (Initial order maximum: no max) ▸ OS level required: None **For 9119-FHA (#5953)** ▸ Minimum required: 0 ▸ Maximum allowed: 99 (Initial order maximum: 1) ▸ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#5954	**#5954 Full Width Quiet Touch Keyboard -- USB, German/Austrian, #129** Provides a USB attached German/Austrian #129 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5954)** ▸ Minimum required: 0 ▸ Maximum allowed: no max (Initial order maximum: no max) ▸ OS level required: None **For 9119-FHA (#5954)** ▸ Minimum required: 0 ▸ Maximum allowed: 99 (Initial order maximum: 1) ▸ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#5955	**#5955 Full Width Quiet Touch Keyboard -- USB, UK English, #166P** Provides a USB attached UK English #166 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5955)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#5955)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#5956	**#5956 Full Width Quiet Touch Keyboard -- USB, Spanish, #172** Provides a USB attached Spanish #172 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5956)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#5956)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#5957	**#5957 Full Width Quiet Touch Keyboard -- USB, Japanese, #194** Provides a USB attached Japanese #194P keyboard. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5957)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#5957)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#5958	**#5958 Full Width Quiet Touch Keyboard -- USB, Brazilian Portuguese, #275** Provides a USB attached Brazilian Portuguese #275 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5958)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#5958)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#5959	**#5959 Full Width Quiet Touch Keyboard -- USB, Hungarian, #208** Provides a USB attached Hungarian #208 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5959)** ▸ Minimum required: 0 ▸ Maximum allowed: no max (Initial order maximum: no max) ▸ OS level required: None **For 9119-FHA (#5959)** ▸ Minimum required: 0 ▸ Maximum allowed: 99 (Initial order maximum: 1) ▸ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#5960	**#5960 Full Width Quiet Touch Keyboard -- USB, Korean, #413** Provides a USB attached Korean #413 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5960)** ▸ Minimum required: 0 ▸ Maximum allowed: no max (Initial order maximum: no max) ▸ OS level required: None **For 9119-FHA (#5960)** ▸ Minimum required: 0 ▸ Maximum allowed: 99 (Initial order maximum: 1) ▸ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#5961	**#5961 Full Width Quiet Touch Keyboard -- USB, Chinese, #467** Provides a USB attached Chinese #467 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5961)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None **For 9119-FHA (#5961)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum: 1) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#5962	**#5962)Full Width Quiet Touch Keyboard -- USB, French Canadian, #445** Provides a USB attached French Canadian #445 keyboard with a 3m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5962)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None **For 9119-FHA (#5962)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum: 1) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#5963	**#5963 Full Width Quiet Touch Keyboard -- USB, Canadian French, #058** (No longer available as of 29 August 2008.) Provides a USB attached Canadian French #058 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5963)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#5963)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#5964	**#5964 Full Width Quiet Touch Keyboard -- USB, Belgian/UK, #120** Provides a USB attached Belgian/UK #120 keyboard with a 3m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5964)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#5964)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#5965	**#5965 Full Width Quiet Touch Keyboard -- USB, Swedish/Finnish, #153** Provides a USB attached Swedish/Finnish #153 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5965)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#5965)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#5966	**#5966 Full Width Quiet Touch Keyboard -- USB, Danish, #159** Provides a USB attached Danish #159 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5966)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#5966)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#5967	**#5967 Full Width Quiet Touch Keyboard -- USB, Bulgarian, #442**
	Provides a USB attached Bulgarian #442 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black.
	Attributes provided: Keyboard Attributes required: USB Port
	For 9117-MMA (#5967) ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None
	For 9119-FHA (#5967) ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum: 1) ► OS level required: Not applicable
	Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#5968	**#5968 Full Width Quiet Touch Keyboard -- USB, Swiss/French/German, #150**
	Provides a USB attached Swiss, French/German #150 /F/G keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black.
	Attributes provided: Keyboard Attributes required: USB Port
	For 9117-MMA (#5968) ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None
	For 9119-FHA (#5968) ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum: 1) ► OS level required: Not applicable
	Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#5969	**#5969 Full Width Quiet Touch Keyboard -- USB, Norwegian, #155** Provides a USB attached Norwegian #155 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5969)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None **For 9119-FHA (#5969)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum: 1) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#5970	**#5970 Full Width Quiet Touch Keyboard -- USB, Dutch, #143** Provides a USB attached Dutch #143 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5970)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None **For 9119-FHA (#5970)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum: 1) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#5971	**#5971 Full Width Quiet Touch Keyboard -- USB, Portuguese, #163** Provides a USB attached Portuguese #163 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5971)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#5971)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#5972	**#5972 Full Width Quiet Touch Keyboard -- USB, Greek, #319** Provides a USB attached Greek #319 keyboard with a 3m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5972)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#5972)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#5973	**#5973 Full Width Quiet Touch Keyboard -- USB, Hebrew, #212** Provides a USB attached Hebrew #212 keyboard with a 3m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5973)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#5973)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#5974	**#5974 Full Width Quiet Touch Keyboard -- USB, Polish, #214** Provides a USB attached Polish #214 keyboard with a 3m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5974)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#5974)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#5975	**#5975)Full Width Quiet Touch Keyboard -- USB, Slovakian, #245** Provides a USB attached Slovakian #245 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5975)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None **For 9119-FHA (#5975)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum: 1) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#5976	**#5976 Full Width Quiet Touch Keyboard -- USB, Czech, #243** Provides a USB attached Czech #243 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5976)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None **For 9119-FHA (#5976)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum: 1) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#5977	**#5977 Full Width Quiet Touch Keyboard -- USB, Turkish, #179** Provides a USB attached Turkish #179 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5977)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#5977)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#5978	**#5978 Full Width Quiet Touch Keyboard -- USB, LA Spanish, #171** Provides a USB attached LA Spanish #171 keyboard with a 3m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5978)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#5978)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#5979	**#5979 Full Width Quiet Touch Keyboard -- USB, Arabic, #253** Provides a USB attached Arabic #253 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5979)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#5979)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#5980	**#5980 Full Width Quiet Touch Keyboard -- USB, Thai, #191** Provides a USB attached Thai #191 keyboard with a 3 m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5980)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#5980)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#5981	**#5981 Full Width Quiet Touch Keyboard -- USB, Russian, #443** Provides a USB attached Russian #443 keyboard with a 3m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5981)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None **For 9119-FHA (#5981)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum: 1) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No MES: No
#5982	**#5982 Full Width Quiet Touch Keyboard -- USB, Slovenian, #234** Provides a USB attached Slovenian #234 keyboard with a 3m cable. The two built-in USB ports conveniently provide for additional expansion. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5982)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None **For 9119-FHA (#5982)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum: 1) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts

#5983	**#5983 Full Width Quiet Touch Keyboard -- USB, US English Euro, #103P** Provides a USB attached US English EURO #103P keyboard with a 3m cable. The two built-in USB ports conveniently provide for additional expansion. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#5983)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#5983)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 1) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#6001	**#6001 Power Control Cable (SPCN) - 2 meter** Provides a two-meter power control cable. Attributes provided: 2M power control cable Attributes required: I/O drawer **For 9117-MMA (#6001) and 9119-FHA (#6001)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#6006	**#6006 Power Control Cable (SPCN) - 3 meter** Provides a three-meter power control cable. Attributes provided: 3M power control cable. Attributes required: two drawers in the same rack. **For 9117-MMA (#6006) and 9119-FHA (#6006)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No **Note**: Each system with two or more CEC enclosures requires one SPCN cable to connect the Service Interface Card in the first enclosure (uppermost enclosure in the stack) with the Service Interface Card in the second enclosure.

#6007	**#6007 Power Control Cable (SPCN) - 15 meter** Provides a 15 meter power control cable. Attributes provided: 15 m power control cable. Attributes required: I/O drawer **For 9117-MMA (#6007) and 9119-FHA (#6007)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No
#6008	**#6008 Power Control Cable (SPCN) - 6 meter** Provides a 6 meter power control cable. Attributes provided: 6 meter power control cable Attributes required: I/O drawer **For 9117-MMA (#6008) and 9119-FHA (#6008)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No
#6029	**#6029 Power Control Cable (SPCN) - 30 meter** (No longer available as of 29 August 2008.) Provides a 30 meter power control cable. Attributes provided: 30M power control cable. Attributes required: two drawers in the same rack. **For 9117-MMA (#6029) and 9119-FHA (#6029)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No
#6068	**#6068 Opt Front Door for 1.8m Rack** Provides an attractive black full height rack door on the #0551 19 Inch 1.8m Rack. The door is steel, with a perforated flat front surface. The perforation pattern extends from the bottom to the top of the door to enhance ventilation and provide some visibility into the rack. Additional option: #6580 Optional Rack Security Kit Attributes provided: Front Door Attributes required: #0551 19 inch 1.8m Rack **For 9117-MMA (#6068) and 9119-FHA (#6068)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No

#6069	**#6069 Opt Front Door for 2.0m Rack**
	#6069 provides an attractive black full height rack door on the #0553 19 inch 2.0m Rack. The door is steel, with a perforated flat front surface. The perforation pattern extends from the bottom to the top of the door to enhance ventilation and provide some visibility into the rack.
	Additional option: #6580 Optional Rack Security Kit
	Attributes provided: Front Door Attributes required: #0553 19 inch 2.0 meter Rack
	For 9117-MMA (#6069) and 9119-FHA (#6069) ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No
#6120	**#6120 IBM 80/160 GB Internal Tape Drive with VXA Technology**
	The IBM 80/160 GB Internal Tape Drive with VXA Technology is a 5.25 inch, half-high, Ultra2 LVD 16-bit tape drive, which provides a high capacity for save/restore and archive functions. This tape drive uses VX adapter data cartridges and is compression capable, providing a capacity of up to 160 GB—a significant increase in capacity over the previous internal tape drives.
	Characteristics ▶ Capacity: 80 GB native mode, 160 GB (typical) compression mode ▶ Form Factor: 5.25 inch half high ▶ Media: uses VXAtape* data cartridges ▶ Technology: Helical scan, rotating head ▶ Operation: Streaming ▶ Data Transfer Rate: 6 MBps native mode, 12 MBps (typical) compression ▶ Interface: SCSI-2 (LVD/SE) asynchronous/synchronous ▶ Compatibility: 80 GB mode (Read/Write), 160 GB compression (Read/Write)
	Attributes provided: One 80/160 GB internal tape drive Attributes required: One 1.6 inch (41 mm) half-high media bay and one SCSI-2 internal 16-bit address
	For 9119-FHA (#6120) ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not Supported ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
#6121	**#6121 I/O Drawer Cable Group, Primary Rack/9U**
	Provides redundant power cabling for an I/O drawer with the bottom of the drawer positioned at the 9U location of the primary system rack.
	Attributes provided: Redundant I/O Drawer Power Cables Attributes required: None
	For 9119-FHA (#6121) ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not Supported ▶ CSU: Not applicable ▶ Return parts MES: Does not apply

#6122	**#6122 I/O Drawer Cable Group, Primary Rack/5U**
	Provides redundant power cabling for an I/O drawer with the bottom of the drawer positioned at the 5U location of the primary system rack.
	Attributes provided: Redundant I/O Drawer Power Cables
	Attributes required: None
	For 9119-FHA (#6122)
	► Minimum required:
	► Maximum allowed: (Initial order maximum:)
	► OS level required:
	► Initial Order/MES/Both/Supported: Not supported
	► CSU: Not applicable
	► Return parts MES: Does not apply
#6123	**#6123 I/O Drawer Cable Group Primary Rack/1U**
	Provides redundant power cabling for an I/O drawer with the bottom of the drawer positioned at the 1U location of the primary system rack.
	Attributes provided: Redundant I/O Drawer Power Cables
	Attributes required: None
	For 9119-FHA (#6123)
	► Minimum required:
	► Maximum allowed: (Initial order maximum:)
	► OS level required:
	► Initial Order/MES/Both/Supported: Not supported
	► CSU: Not applicable
	► Return parts
#6124	**#6124 I/O Drawer Cable Group Primary Rack/13U**
	Provides redundant power cabling for an I/O drawer with the bottom of the drawer positioned at the 13U location of the primary system rack.
	Attributes provided: Redundant I/O Drawer Power Cables
	Attributes required: None
	For 9119-FHA (#6124)
	► Minimum required:
	► Maximum allowed: (Initial order maximum:)
	► OS level required:
	► Initial Order/MES/Both/Supported: Not supported
	► CSU: Not applicable
	► Return parts MES: Does not apply
#6125	**#6125 I/O Drawer Cable Group, #8691.Rack/1U**
	Provides redundant power cabling for an I/O drawer with the bottom of the drawer positioned at the 1U location of the expansion rack.
	Attributes provided: Redundant I/O Drawer Power Cables
	Attributes required: None
	For 9119-FHA (#6125)
	► Minimum required: 0
	► Maximum allowed: 1 (Initial order maximum: 0)
	► OS level required: Not applicable
	► Initial Order/MES/Both/Supported: MES
	► CSU: No
	► Return parts MES: No

#6126	**#6126 I/O Drawer Cable Group, #8691.Rack/5U** Provides redundant power cabling for an I/O drawer with the bottom of the drawer positioned at the 5U location of the expansion rack. Attributes provided: Redundant I/O Drawer Power Cables Attributes required: None **For 9119-FHA (#6126)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: MES ► CSU: No ► Return parts MES: No
#6127	**#6127 I/O Drawer Cable Group, #8691 Rack/9U** Provides redundant power cabling for an I/O drawer with the bottom of the drawer positioned at the 9U location of the expansion rack. Attributes provided: Redundant I/O Drawer Power Cables Attributes required: None **For 9119-FHA (#6127)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: MES ► CSU: No ► Return parts MES: No
#6128	**#6128 I/O Drawer Cable Group, #8691 Rack/13U** (No longer available as of 29 August 2008) Provides redundant power cabling for an I/O drawer with the bottom of the drawer positioned at the 13U location of the expansion rack. Attributes provided: Redundant I/O Drawer Power Cables Attributes required: None **For 9119-FHA (#6128)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: MES ► CSU: No ► Return parts MES: No

#6129	**#6129 I/O Drawer Cable Group, #8691 Rack/19U** (No longer available as of 29 August 2008.) Provides redundant power cabling for an I/O drawer with the bottom of the drawer positioned at the 19U location of the expansion rack. Attributes provided: Redundant I/O Drawer Power Cables Attributes required: None **For 9119-FHA (#6129)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: No ▶ Return parts MES: No
#6179	**#6179 Power Cable, I/O Drawer to Media Drawer** Provides power from an I/O drawer to run media devices mounted in the media drawer feature. Attributes provided: Power Cable Attributes required: I/O drawer and Media Drawer **For 9119-FHA (#6179)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported ▶ CSU: Not applicable ▶ Return parts MES: No
#6186	**#6186 Bulk Power Regulator** Bulk power regulators provide increments of power for use by the systems components such as fans, CEC components, and I/O drawers. Attributes provided: Regulated Power Attributes required: Bulk power assembly. **For 9119-FHA (#6186)** ▶ Minimum required: 2 ▶ Maximum allowed: 20 (Initial order maximum: 20) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: No ▶ Return parts MES: No **Note**: In order to balance three phase current load in the Bulk Power Assembly of the powered system racks, it is recommended that each powered rack have a minimum of 6 BPRs installed. For a system configured with one CEC and two Powered Expansion Racks, the minimum number of BPRs ordered is recommended to be 18. Each Powered Expansion Rack has a maximum of 6 BPRs. The CEC rack can contain a maximum of 8 BPRs, which results in a system maximum of 20 BPRs.

#6200	**#6200 Integrated Battery Backup, Primary or Redundant-Front Mounted** The Primary Integrated Battery Backup features provide batteries to be connected to the bulk power regulators of the front bulk power assembly. These batteries protect against power line disturbances as well as power failures involving both redundant power sources or the front power source and the rear bulk power assembly. The batteries provide sufficient backup power to allow an orderly system shutdown. #6200 is also used for the unique application of the redundant front mounted integrated battery backup feature connected to the rear bulk power regulators. Attributes provided: Integrated Battery Backup Attributes required: 2U Rack Space **For 9119-FHA (#6200)** ► Minimum required: 0 ► Maximum allowed: 4 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: MES ► CSU: No ► Return parts MES: No
#6201	**#6201 Integrated Battery Backup, Redundant Rear Mounted** The Redundant Integrated Battery Backup features provide batteries to be connected to the bulk power regulators of the rear bulk power assembly. These batteries protect against power line disturbances as well as power failures involving both redundant power sources. They also protect against failure of both power sources at the same time as a failure of the primary battery backup or the front bulk power assembly. The batteries provide sufficient backup power to allow an orderly system shutdown. Attributes provided: Rear Mounted Redundant Integrated Battery Backup Attributes required: Primary Integrated Battery Backup Feature **For 9119-FHA (#6201)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not Supported ► CSU: Not applicable ► Return parts MES: Does not apply

| #6203 | **#6203 PCI Dual Channel Ultra3 SCSI Adapter**
The PCI Dual Channel Ultra3 SCSI Adapter (#6203) is a 64-bit adapter and is an excellent solution for high-performance SCSI applications. The PCI Dual Channel Ultra3 SCSI Adapter provides two SCSI channels (busses). Each SCSI bus can either be internal (on systems that support internal SCSI device or backplane attachments) or external and will support a data rate of up to 160 MBps, up to twice the maximum data transfer rate of the previous Dual Channel Ultra2 SCSI adapter (80 MBps).

In order to achieve an Ultra3 SCSI bus data rate of up to 160 MBps and also maintain a reasonable drive distance, the adapter utilizes Low Voltage Differential (LVD) drivers and receivers. To fully utilize this Ultra3 160 MBps performance, all attaching devices or subsystems should also be Ultra3 LVD devices. But, if Ultra2 and Ultra3 devices coexist on the same bus, each device will operate at its rated speed. For lower speed single-ended (SE) devices, the SCSI bus will switch to single-ended (SE) performance and interface at the lower SE bus data rate of the device.

Two industry standard VHDCI 68-pin connectors are mounted on the adapter's end bracket allowing attachment of various LVD and SE external subsystems. A 0.3 meter converter cable, VHDCI to P, Mini-68-pin to 68-pin, (#2118) can be used with older external SE subsystems to allow connection to the VHDCI connector on the PCI Dual Channel Ultra3 SCSI Adapter.

Note: If any Single Ended (SE) SCSI subsystem is attached to an external port of this adapter, the SCSI port will auto-throttle to a Fast interface speed running no faster than 20 MBps maximum. This auto-throttle function is performed to ensure best signal quality between host adapter and attaching subsystem. The second external port is unaffected unless a SE subsystem is also attached to it. If so, it would also auto-throttle as described above.

The PCI Dual Channel Ultra3 SCSI Adapter (#6203) also is a native boot adapter with AIX 4.3.3 or AIX 5.1 (with appropriate updates) in the supported pSeries or RS/6000 systems.

Attributes provided: Attachment of internal SCSI devices (on systems that support an internal SCSI device or backplane attachment with this adapter) and external SCSI devices
Attributes required: One available PCI slot

Limitations: Not supported on unified POWER6 MTMs. |
| #6204 | **#6204 PCI Universal Differential Ultra SCSI Adapter**
The PCI Universal Differential Ultra SCSI Adapter is the latest technology advancement of an RS/6000 SCSI-2 differential adapter with a maximum data transfer rates of 40 MBps. This adapter has the capability to be plugged into the newer +3.3 volt PCI slots as well as the older +5 volt PCI slots. Feature code # 6204 allows connection to external differential SCSI-2 F/W or Ultra SCSI type devices up to 25 meters away. Feature code # 6204 will negotiate with each external device and transfer data at the fastest SCSI data transfer rate capable by the external device. Check system sales pages as to which external differential subsystems are supported.

The adapter conforms to SCSI-2 standard and the Fast-20 (Ultra) documentation. Industry standard 68-pin connectors are incorporated (SCSI P connector definition of X3T9.2/90-048).

Attributes provided: 15 external SCSI-2 addresses
Attributes required: 1 PCI slot

Limitations: Not supported on unified POWER6 MTMs. |

#6228	**#6228 2 Gigabit Fibre Channel Adapter for 64-bit PCI Bus**
	The 2 Gigabit Fibre Channel Adapter for 64-bit PCI Bus is a 64-bit address/data, short form factor PCI adapter with LC type external fiber connectors. With the use of appropriate optical fiber cabling, this adapter provides the capability for a network of high speed local and remote located storage. The 2 Gigabit Fibre Channel Adapter for 64-bit PCI Bus will auto-negotiate for the highest data rate (either 1Gps or 2Gps) of which the device or switch is capable. Distances of up to 500 meters running at 1 Gbps data rate and up to 300 meters running at 2 Gbps data rate are supported between the adapter and an attaching device or switch. When used with IBM supported Fibre Channel storage switches supporting long-wave optics, distances of up to 10 kilometers are capable running at either 1 Gbps or 2 Gbps data rates.
	The 2 Gigabit Fibre Channel Adapter for 64-bit PCI Bus can be used to attach devices either directly, or by means of Fibre Channel Switches. If attaching a device or switch with a SC type fiber connectors, use of an LC-SC Fibre Channel Conversion Cable (#2456) is required.
	For additional supported server attachment information for IBM devices, refer to: http://www.storage.ibm.com/hardsoft/disk/products.htm
	Consult with your IBM representative or Business Partner for additional information relative to any third-party attachment.
	Attributes provided: 1 FC/FC-AL interface Attributes required: 1 empty PCI slot Limitations: Not supported on unified POWER6 MTMs.

#6230	**#6230 Advanced SerialRAID Plus Adapter**
	The Advanced SerialRAID Plus Adapter (#6230) is a 4 port (2 loop) Serial Storage Architecture (SSA) adapter providing an instantaneous data transfer rate of up to 160 MByte/s per loop. It also provides eight- initiator, non-RAID capability, two-initiator RAID 1, two-initiator RAID 0 + 1, two-initiator RAID 5, or one-initiator RAID 0 capability. The adapter accepts a 32 MByte Fast-Write Cache Option Card (#6235) that improves write performance in RAID 0+1, RAID 5, and non-RAID applications. When the 32 MB Fast-Write Cache Option Card is used, the adapter can be configured in either single or dual initiator fast- write cache mode. In dual initiator fast-write cache mode, if one of the two adapters fail, the failing adapter is designed to transfer control over to the other. Also, in dual initiator Fast Write Cache mode, the 128 MB DRAM Option Card (#6231) is available and required to utilize the full 32 MB of fast-write cache on the adapters. If the 128 MB DRAM Option Card is not used in dual initiator fast-write cache mode, the effective fast-write cache capacity will be 16 MB on each adapter. See the 128 MByte DRAM Option Card (#6231) for information.

The Advanced SerialRAID Plus Adapter when operated in a RAID 5 configuration will support (2+P) to (15+P) arrays and up to 6 (15+P) arrays. When operated in a RAID 1 or RAID 0+1 configuration, will support up to eight disk drives mirrored. The adapter also supports Hot Spares in RAID 5 and RAID 0+1 mode. The Advanced SerialRAID Plus Adapter also supports connectivity to external disk enclosures and internal RS/6000 SSA configurations. Optional SSA Fiber-Optic Extender is also supported (Refer to IBM 7133 Sales literature for additional information)

Any supported RS/6000 system can be set up to boot from an Advanced SerialRAID Plus Adapter (#6230), provided a non-RAID SSA disk is included as part of the configuration. Other disks associated with the adapter can be RAID but at least one disk must be a non-RAID SSA disk. The non-RAID SSA disk can be located under the covers of a processor unit or in an external SSA storage unit. If your system is running with AIX 4.3.3 or later software, native boot capability is supported. For factory system orders with AIX preload requested, an internal SCSI disk drive will be preloaded as the native boot disk even if internal SSA disk drives are present. If your system is running with AIX 4.2.1 or AIX 4.3.2 software, the below procedure applies in order to boot using the Advanced SerialRAID Plus Adapter:

The non-RAID SSA disk can be located under the covers of a processor unit or in an external SSA storage unit.

A supported AIX version of software (with proper updates) must be loaded to the non-RAID SSA disk using AIX Network Install Manager (NIM) before booting from the non-RAID disk.

The system with a non-RAID SSA disk must have a network connection with another RS/6000 system performing the NIM Master function to perform the install. On RS/6000 SP systems, a similar network install is performed from a control workstation.

After AIX with updates is installed on the non-RAID SSA disk and the system is configured for booting, booting will take place from the boot disk without any support from the control processor or NIM Master and the system does not have to be connected to the network at boot time.

After 03 October 2000, a 3-Way Copy Function is available. This 3-Way Copy Function allows a user to create a third copy to an existing RAID-1 or RAID 0+1 array while mirrored operation continues. 3-Way Copy allows the user, at any time after the copy process has completed, to split the third copy off from the original RAID-1 or RAID 0+1 array to form an independent RAID copy. This third copy or snapshot copy could be typically used to perform a backup or to test some new application. The 3-Way Copy Function is available only through a code download and can only be gained by going to the SSA Web support pages. |

#6230 Continued	**#6230 Advanced SerialRAID Plus Adapter**
	When performing SSA device or subsystem planning, installation, upgrades, or preventive maintenance, refer to the following Web support pages. They provide access to the latest SSA publications and support code for the system, SSA adapters, and SSA subsystems. These sites should also be considered during system hardware or operating system upgrades if SSA devices are included in the system.
	For information about SSA publications and other SSA Web sites, refer to: http://www.storage.ibm.com/hardsoft/products/ssa/
	For information about the latest SSA support code and provides code download capability for the RS/6000 and AIX environments, refer to: http://www.storage.ibm.com/hardsoft/products/ssa/rs6k/index.html
	Limitations
	▶ Internal ports on the adapter are not supported. See machine/model specific information to determine if internal SSA disk drives and associated hardware/cables are supported.
	▶ Not supported on unified POWER6 MTMs.
	Attributes provided: Attachment of SSA devices
	Attributes required: One PCI bus slot
#6231	**#6231 128 MByte DRAM Option Card**
	The 128 MByte DRAM Option Card (#6231) is a field only optional feature to the Advanced SerialRAID Adapter (#6225) or a factory or field option for the Advanced SerialRAID Plus Adapter (#6230). This option is recommended for dual initiator fail-over Fast Write Cache (FWC) configurations. The option increases the existing DRAM on the adapter to 128 MBytes. In this type of dual initiator FWC configuration, the existing DRAM does not have enough capacity to completely contain a copy of each adapter's 32 MByte FWC and also provide additional working space. The 128 MByte DRAM Option Card provides this additional space needed to contain a full copy of each adapters 32 MByte FWC content and allows for full 32 MByte fail-over protection. If the 128 MByte DRAM Option Card (#6231) is not used with dual-initiator FWC configurations, the effective FWC capacity is reduced to 16 MBytes per adapter.
	If this feature is ordered as a field upgrade to an existing SerialRAID adapter (#6225 or 6230), a CD-ROM with appropriate software and publications are also provided.
	Attributes provided: 128 MByte DRAM memory
	Attributes required: Advanced SerialRAID Adapter (#6225) or Advanced SerialRAID Plus Adapter (#6230). A 32 MB Fast-Write Cache Option Card (#6235) is also recommended.
	For 9117-MMA (#6213) and 9119-FHA (#6213)
	▶ Minimum required: 0
	▶ Maximum allowed: 0 (Initial order maximum: 0)
	▶ OS level required: None
	▶ Initial Order/MES/Both/Supported: Not Supported on unified POWER6 MTMs
	▶ CSU: Not applicable
	▶ Return parts MES: Does not apply

| #6235 | **#6235 32 MB Fast-Write Cache Option Card**
The 32 MB Fast-Write Cache Option Card (#6235) is a 32 MB fast-write optional feature that plugs into the IBM RS/6000 Advanced SerialRAID Adapter (#6225) or the Advanced SerialRAID Adapter Plus (#6230). It utilizes non-volatile RAM. During the unlikely event of an Advanced SerialRAID Adapter failure, a replacement Advanced SerialRAID 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 MByte Fast-Write Cache Option Card can provide a significant improvement of data throughput and response time during certain sequence write operations compared to SSA RAID adapters without the fast-write cache. The response time and data transfer improvement using the optional card will vary depending upon the data block sizes, the percentage of sequential writes, machine type/model, and application parameters. The 32 MByte Fast-Write Cache Option Card plugged into the Advanced SerialRAID Adapter (# 6225) will operate in either non-RAID or RAID 5 mode, in single-initiator configurations. The 32 MByte Fast-Write Cache Option Card plugged into the Advanced SerialRAID Plus Adapter (#6230) will operate in non-RAID, RAID 5, or RAID 0+1 mode, in single-initiator or dual initiator configurations.

Attributes provided: None
Attributes required: One Advanced SerialRAID Adapter (#6225) or Advanced SerialRAID Plus Adapter (#6230).

For 9117-MMA (#6235) and 9119-FHA (#6235)
▶ Minimum required: 0
▶ Maximum allowed: 0 (Initial order maximum: 0)

Limitations: Not supported on unified POWER6 MTMs. |
| #6239 | **#6239 2 Gigabit Fibre Channel PCI-X Adapter**
The 2 Gigabit Fibre Channel PCI-X Adapter is a 64-bit address/data, short form factor PCI-X adapter with an LC type external fiber connector. With the use of appropriate optical fiber cabling, this adapter provides the capability for a network of high speed local and remote located storage. The 2 Gigabit Fibre Channel PCI-X Adapter will auto-negotiate for the highest data rate (either 1 Gbps or 2 Gbps) of which the device or switch is capable. Distances of up to 500 meters running at 1 Gbps data rate and up to 300 meters running at 2 Gbps data rate are supported between the adapter and an attaching device or switch. When used with IBM supported Fibre Channel storage switches supporting long-wave optics, distances of up to 10 kilometers are capable running at either 1 Gbps or 2 Gbps data rates.

The 2 Gigabit Fibre Channel PCI-X Adapter can be used to attach devices either directly, or by means of Fibre Channel Switches. If attaching a device or switch with a SC type fiber connectors, use of an LC-SC 50 Micron Fiber Converter Cable (#2456) or a LC-SC 62.5 Micron Fiber Converter Cable (#2459) is required.

For additional supported server attachment information for IBM devices, refer to:
http://www.ibm.com/servers/storage/product/products_pseries.html

Consult with your IBM representative or Business Partner for additional information relative to any third-party attachment.

Attributes provided: 1 Fibre Channel/FC-AL interface
Attributes required: 1 empty PCI or PCI-X slot

Limitations: Not supported on unified POWER6 MTMs. |

#6240	**#6240 Cable, Integrated Battery Backup to Bulk Power Regulator, Primary Rack** This cable provides a connection between the integrated battery backup features located in the primary rack and the bulk power regulators located in the front and rear bulk power assemblies. One cable is required for each primary and redundant integrated battery backup feature installed in the primary rack. Attributes provided: Battery Backup Attachment Cable Attributes required: Primary or Redundant Integrated Battery Backup Features. **For 9119-FHA (#6240)** ► Minimum required: 0 ► Maximum allowed: 2 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: MES ► CSU: No ► Return parts MES: No
#6241	**#6241 Cable, Integrated Battery to Bulk Power Regulator, Expansion Rack** (No longer available as of 29 August 2008.) This cable provides a connection between the integrated battery backup features located in the expansion rack and the bulk power regulators located in the front bulk power assemblies. One cable is required for each primary and redundant integrated battery backup feature installed in the expansion rack. Attributes provided: Battery Backup Attachment Cable Attributes required: Primary or Redundant Integrated Battery Backup Features. **For 9119-FHA (#6241)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES: Does not apply
#6242	**#6242 Cable, Front Mounted Integrated Battery Backup to rear BPR, Primary/Expansion Rack** (No longer available as of 29 August 2008.) This cable provides a connection between the front mounted integrated battery backup features located in the primary and expansion rack and the bulk power regulators located in the rear bulk power regulator assemblies. Attributes provided: Battery Backup Attachment Cable Attributes required: Front Mounted Integrated Battery Backup Feature connected to rear Bulk Power Regulator. **For 9119-FHA (#6242)** ► Minimum required: 0 ► Maximum allowed: 2 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: MES ► CSU: No ► Return parts MES: No

#6243	**#6243 EMC Skirts/Tailgate**
	#6243 is used when the High Performance Switch, 7045-SW4, is installed in the 9119-590 or 9119-595 rack. It is also used for rack configurations that have the server SNI feature #7817. This feature drives the rack level EMC skirts/tailgate parts. If there is an expansion rack, #8691 bolted to the CEC rack, the expansion rack also requires a #6243.
	Attributes provided: EMC Skirts/Tailgate Attributes required: 7045-SW4 or #7817
	For 9119-FHA (#6243) ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not Supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES: Does not apply
#6246	**#6246 1.8 m Rack Trim Kit**
	#6246 provides a decorative trim kit for the front of an #0551 19 inch 1.8 m Rack.
	Attributes provided: Decorative trim kit Attributes required: #0551 19 inch 1.8m Rack
	For 9117-MMA (#6246) and 9119-FHA (#6246) ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: MES ► CSU: Yes ► Return parts MES: No
#6247	**#6247 2.0m Rack Trim Kit**
	#6247 provides a decorative trim kit for the front of a #0553 19 inch 2.0m Rack.
	Attributes provided: Decorative trim kit Attributes required: #0553 19 inch 2.0 meter Rack
	For 9117-MMA (#6247) and 9119-FHA (#6247) ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: MES ► CSU: Yes ► Return parts MES: No
#6248	**#6248 1.8 m Rack Acoustic Doors**
	#6248 provides front and rear doors for use with the #0551 19 inch 1.8m Rack. This door kit provides additional acoustic dampening for use where a quieter environment is desired. #6248 results in a larger footprint and requires additional space.
	Attributes provided: Acoustic Door Kit Attributes required: #0551 19 inch 1.8m Rack
	For 9117-MMA (#6248) and 9119-FHA (#6248) ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: MES ► CSU: Yes ► Return parts MES: No

#6249	**#6249 2.0m Rack Acoustic Doors** #6249 provides front and rear doors for use with the #0553 19 inch 2.0m Rack. This door kit provides additional acoustic dampening for use where a quieter environment is desired. #6249 results in a larger footprint and requires additional space. Attributes provided: Acoustic Door Kit Attributes required: #0553 19 inch 2.0 meter Rack **For 9117-MMA (#6249) and 9119-FHA (#6249)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: MES ► CSU: Yes ► Return parts MES: No
#6251	**#6251 Slimline Doors** (No longer available as of 29 August 2008.) Provides front and rear doors for use with the 24 inch racks that have the power subsystem in the rack. This slim line door kit provides a minimized footprint for use where conservation of space is desired. Attributes provided: Slimline Door Kit Attributes required: 24 inch rack with power subsystem **For 9119-FHA (#6251)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: MES ► CSU: No ► Return parts MES: No
#6352	**#6252 Acoustic Doors** (No longer available as of 29 August 2008.) Provides front and rear doors for use with the 24 inch racks that have the power subsystem in the rack. This door kit provides acoustic dampening for use where a quieter environment is desired. Attributes provided: Acoustic Door Kit Attributes required: 24 inch rack with power subsystem **For 9119-FHA (#6252)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: MES ► CSU: No ► Return parts MES: No

#6253	**#6253 Slimline Doors, #8691 Expansion Rack** Provides front and rear doors for use with the #8691 bolt on expansion rack. This slimline door kit provides a minimized footprint for use where conservation of space is desired. Attributes provided: Slimline Door Kit Attributes required: #8691 expansion rack **For 9119-FHA (#6253)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: No ▶ Return parts MES: No
#6254	**#6254 Acoustic Doors, #8691 Expansion Rack** Provides front and rear doors for use with the #8691 bolt on expansion rack. This door kit provides additional acoustic dampening for use where a quieter environment is desired. Attributes provided: Acoustic Door Kit Attributes required: #8691 expansion rack **For 9119-FHA (#6254)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: No

#6258	**#6258 36/72 GB 4 mm Internal Tape Drive** The 36/72 GB 4 mm Internal Tape Drive is a 5.25 inch, half-high, LVD 16-bit tape drive, for save or restore and archive functions. This tape drive uses IBM 4-mm data cartridges and is compression capable, providing a capacity of up to 72 GB, which is significant increase in capacity over the previous 20/40 4 mm internal tape drives (when using DDS-4 media). Characteristics ► Capacity: 36 GB native mode, 72 GB (typical) compression mode ► Form Factor: 5.25 inch half high ► Media: IBM 4-mm supports new DAT72 media ► Technology: Helical scan, rotating head ► Operation: Streaming ► Data Transfer Rate: 3 MBps native mode, 6 MBps (typical) compression ► Interface: Low Voltage Differential (LVD) asynchronous/ synchronous Compatibility: ► DDS3 - 12 GB native (Read/Write), 24 GB compression (Read/Write) ► DDS4 - 20 GB native (Read/Write), 40 GB compression (Read/Write) ► DAT72 - 36 GB native (Read/Write), 72 GB compression (Read/Write) Attributes provided: 4 mm tape capability Attributes required: One 1.6 inch (41 mm) half-high media bay and one SCSI-2 LVD internal 16-bit address or SE **For 9119-FHA (#6258)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not Supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES: Does not apply ► Return parts MES: No

| #6279 | **#6279 VXA-320 160/320 GB Internal Tape Drive**
(No longer available as of 29 August 2008.)

The IBM 160/320 GB Internal Tape Drive with VXA Technology is a 5.25 inch, half-high, Ultra2 LVD 16-bit tape drive, which provides a high capacity for save/restore and archive functions. The tape drive uses X media VXAtape data cartridges and is compression capable, providing a capacity of up to 320 GB, which is a significant increase in capacity, and data transfer rate over the previous internal tape drives.

Characteristics
▶ Capacity: 160 GB native mode
▶ Capacity: 320 GB compress mode, typical
▶ Form Factor: 5.25 inch half high
▶ Media: uses VXAtape X media data cartridges
▶ Technology: Helical scan, rotating head
▶ Operation: Streaming
▶ Data Transfer Rate: 12 MBps native mode, 24 MBps (typical) compression
▶ Interface: SCSI-2,SCSI-3 Ultra 160 (LVD) asynchronous/ synchronous
▶ VXA-320 is read/write capable on X23, X10 and X6 media

Compatibility: VXA-2 format (Read/Write) on X6, X10, and X23, VXA-320 format (Read/Write) on X6, X10, and X23.

Attributes provided: One 160/320 GB internal tape drive
Attributes required: One 1.6 inch (41 mm) half-high media bay and one SCSI-2 internal 16-bit address

For 9119-FHA (#6279)
▶ Minimum required:
▶ Maximum allowed: (Initial order maximum:)
▶ OS level required:
▶ Initial Order/MES/Both/Supported: Not Supported on unified POWER6 MTMs.
▶ CSU: Not applicable
▶ Return parts MES: Does not apply |
| #6331 | **#6331 Integrated Battery Backup with cables**
The Integrated Battery Backup feature provides redundant battery power connected to the bulk power regulators of the Bulk Power Assembly. This battery protects against power line disturbances as well as power failures involving the Bulk Power Assembly or the power service. The battery provides sufficient backup power to allow an orderly system shutdown.

Attributes provided: Redundant battery backup power.
Attributes required: 2U Rack Space

For 9119-FHA (#6331)
▶ Minimum required: 0
▶ Maximum allowed: 6 (Initial order maximum: 6)
▶ OS level required: Not applicable
▶ Initial Order/MES/Both/Supported: Both
▶ CSU: No |

#6333	**#6333 Bulk Power Regulator** Bulk Power Regulators provide increments of power for use by the systems components such CEC components, I/O drawers and fans. Attributes provided: Regulated Power. Attributes required: Bulk Power Assembly **For 9119-FHA (#6333)** ▶ Minimum required: 0 ▶ Maximum allowed: 20 (Initial order maximum: 20) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#6334	**#6334 Bulk Power Distribution Assembly** This Power distribution assembly provides connector locations for cable attachment of I/O drawers and CEC dc power converters. Attributes provided: 10 Power Connectors Attributes required: BULK POWER DISTRIBUTION ASM **For 9119-FHA (#6334)** ▶ Minimum required: 2 ▶ Maximum allowed: 12 (Initial order maximum: 12) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No

#6417	**#6417 RIO-2 Bus Adapter**
	The #6417 feature allows existing HSL and optical HSL connected towers the option of switching to copper RIO-2 connectivity. The #6417 has two RIO-2 ports and provides connectivity for #0595, #5094, and #5294 PCI expansion towers and expansion units.
	
	Attributes provided: Two ports of RIO-2 connectivity
	Attributes required: Bus adapter slot in PCI expansion tower/unit
	
	For 9117-MMA (#6417)
	► Minimum required: 0
	► Maximum allowed: 48 (Initial order maximum: 0)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#6417)
	► Minimum required: 0
	► Maximum allowed: 12 (Initial order maximum: O)
	► OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

| #6438 | **#6438 RIO-2 Remote I/O Loop Adapter for #5790**
Provides two RIO-2 Remote I/O ports for attaching the I/O drawer to a server. Up to four I/O drawers can be included in a single loop.

Attributes provided: Two RIO-2 Remote I/O ports

For 9117-MMA (#6438)
▶ Minimum required: 0
▶ Maximum allowed: 48 (Initial order maximum: 48)
▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later

For 9119-FHA (#6438)
▶ Minimum required: 0
▶ Maximum allowed: 128 (Initial order maximum: 128)
▶ OS level required:
  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
  – AIX Version 5.3 with the 5300-08 Technology Level or later
  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
  – AIX Version 6.1 with the 6100-01 Technology Level or later
  – IBM i 5.4 with V5R4M5 machine code
  – IBM i 6.1 or later
  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later

Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

Initial Order/MES/Both/Supported: Both
CSU: Yes
Return parts MES: No |
| #6446 | **#6446 Dual-port 12X Channel Attach- Short Run**
This Adapter is the interface for attachment of the I/O Drawer to a 12X Channel loop. The adapter includes two 12X Channel connectors to support attachment of the I/O drawer into the loop. This adapter does not include the repeater function and is intended to support configurations where the Host system and the external I/O drawers in the loop are located in the same rack.

Cables attached to this adapter have the following restrictions. Cables between this adapter and a host system cannot exceed 3.0 meters in length. Cables between two I/O Drawers cannot exceed 1.5 meters if both I/O drawers include this Short Run adapter feature #6446. Cables between two I/O Drawers cannot exceed 3.0 meters if either of the I/O drawers includes this Short Run adapter feature #6446. The required 12X Cables are ordered under a separate feature number.

Attributes provided: 12X Channel Interface Connection
Attributes required: None

For 9117-MMA (#6446)
▶ Minimum required: 0
▶ Maximum allowed: 32 (Initial order maximum: 32)
▶ OS level required:
  – AIX 5.2 TL10 or later
  – AIX 5.3 TL6 or later
  – IBM i 5.4 with V5R4M5 machine code or later
  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
▶ Initial Order/MES/Both/Supported: Both
▶ CSU: Yes
▶ Return parts MES: No |

#6451	**#6451 4.3 m (14-ft) 250V/10A Power Cord** #6451 is a 14 foot 250V/10A power cord that distributes power from a wall outlet to a system unit. #6451 has a type 69 plug and a right-angle IEC320 C13 connector. Attributes provided: Power cord Attributes required: Not applicable **For 9117-MMA (#6451) and 9119-FHA (#6451)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#6454	(#6454) 14-Ft 250V/10A Power Cord #6454 is a 14-foot 250V/10A power cord that distributes power from a wall outlet to a system unit. #6454 has a type 66 plug and a right-angle IEC320 C13 connector. Attributes provided: Power cord Attributes required: Not applicable **For 9117-MMA (#6454) and 9119-FHA (#6454)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: No ▶ Return parts MES: No
#6455	**#6455 4.3m (14-Ft) 250V/10A Power Cord** #6455 is a 14-foot 250V/10A power cord that distributes power from a wall outlet to a system unit. #6455 has a type 5 plug and a right-angle IEC320 C13 connector. Attributes provided: Power cord Attributes required: Not applicable **For 9117-MMA (#6455) and 9119-FHA (#6455)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No

#6457	**#6457 Dual-port 12X Channel Attach- Long Run**
	This Adapter is the interface for attachment of the I/O Drawer to a 12X Channel loop. The adapter includes two 12X channel connectors to support attachment of the drawer into the loop. This adapter includes the repeater function and can support longer cable loops allowing drawers to be located in adjacent racks. 12X Cables up to 8 meters in length can be attached to this adapter. The required 12X Cables are ordered under a separate feature number.
	
	Attributes provided: 12X Channel Interface Connection
	Attributes required: None
	
	For 9117-MMA (#6457) and 9119-FHA (#6457)
	▶ Minimum required: 0
	▶ Maximum allowed: 32 (Initial order maximum: 32)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No

#6458	**#6458 Power Cable -- Drawer to IBM PDU, 14 foot, 250V/10A** Standard IBM rack power cable that goes from the system or I/O drawer to the rack power distribution unit (PDU). Attributes provided: Power cable Attributes required: None **For 9117-MMA (#6458) and 9119-FHA (#6458)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No
#6459	**#6459 3.7m (12-Ft) 250V/10A RA Pwr Cd** #6459 is a 12-foot 250V/10A power cord that distributes power from a Power Distribution Unit to a drawer in an expansion tower/ rack. #6459 has an IEC320 C14 plug and a right-angle IEC320 C13 connector. Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6459) and 9119-FHA (#6459)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 250) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No

6460	**#6460 Power Cord (14-foot), Drawer To OEM PDU (125V, 15A)** This power cord goes from the system or I/O drawer to the rack power distribution unit. Plug type #4 (NEMA 5-15). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. 14-foot length. The following countries/regions use the #6460 power cord to power the system or peripheral features requiring a power cord: United States, Antigua & Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Bonnaire, Calicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Curacao, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Mexico, Micronesia, Montserrat, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, St. Kitts/Nevis, St. Martin, Taiwan, Tortola (BVI), Trinidad/Tobago, Venezuela. Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6460) and 9119-FHA (#6460)** ▶ Minimum required: 0 ▶ Maximum allowed: 250 (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: No ▶ Return parts MES: No
#6461	**#6461 4.3 m (14-Ft) 250V/10A Power Cord** (No longer available as of 29 August 2008.) #6461 is a 14 foot 250V/10A power cord that distributes power from a wall outlet to a system unit. #6461 has a type 18 plug and a right-angle IEC320 C13 connector. Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6461) and 9119-FHA (#6461)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: No Max) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No
#6462	**#6462 4.3m (14-Ft) 250V/10A Power Cord** #6462 is a 14-foot 250V/10A power cord that distributes power from a wall outlet to a system unit. #6462 has a type 19 plug and a right-angle IEC320 C13 connector. Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6462) and 9119-FHA (#6462)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No

#6463	**#6463 4.3m (14-Ft) 250V/10A Power Cord** #6463 is a 14-foot 250V/10A power cord that distributes power from a wall outlet to a system unit. #6463 has a type 23 plug and a right-angle IEC320 C13 connector. Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6463) and 9119-FHA (#6463)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#6464	**#6464 4.3m (14-Ft) 250V/10A Power Cord** #6464 is a 14-foot 250V/10A power cord that distributes power from a wall outlet to a system unit. #6464 has a type 32 plug and a right-angle IEC320 C13 connector. Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6464) and 9119-FHA (#6464)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#6465	**#6465 4.3m (14-Ft) 250V/10A Power Cord** #6465 is a 14 foot 250V/10A power cord that distributes power from a wall outlet to a system unit. #6465 has a type 24 plug and a right-angle IEC320 C13 connector. Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6465) and 9119-FHA (#6465)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#6466	**#6466 4.3m (14-Ft) 250V/10A Power Cord** #6466 is a 14 foot 250V/10A power cord that distributes power from a wall outlet to a system unit. #6466 has a type 22 plug and a right-angle IEC320 C13 connector. Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6466) and 9119-FHA (#6466)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No

#6467	**#6467 4.3 m (14-ft) 250V/10A Power Cord** #6467 is a 14 foot 250V/10A power cord that distributes power from a wall outlet to a system unit. #6467 has a type 25 plug and a right-angle IEC320 C13 connector. Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6467) and 9119-FHA (#6467)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#6468	**#6468 14-Ft 250V/10A Power Cord** #6468 is a 14-foot 250V/10A power cord that distributes power from a wall outlet to a system unit. #6468 has a type 6 plug and a right-angle IEC320 C13 connector. Attributes provided: Power cord Attributes required: None **For 9119-FHA (#6468)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: No ► Return parts MES: No
#6469	**#6469 Power Cord (14-foot), Drawer to OEM PDU, (250V, 15A), United States, Plug Type #5** This power cord goes from the system or I/O drawer to the rack power distribution unit. Plug type #5 (NEMA 6-15). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. 14-foot length. The following countries/regions use the #6469 power cord to power the system or peripheral features requiring a power cord: United States, Anguilla, Antigua & Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Bonnaire, Caicos Is., Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Curacao, Dominican Republic, Ecuador, El Salvador, Guam, Guatamala, Haiti, Honduras, Jamaica, Japan, Micronesia, Montserrat, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, St. Marten NA, Taiwan, Tortola (BVI), Thailand, Venezuela. Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6469)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None **For 9119-FHA (#6469)** ► Minimum required: 0 ► Maximum allowed: 250 (Initial order maximum: 0) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#6470	**#6470 Power Cord (6-foot), To Wall (125V, 15A), Plug Type #4** This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #4 (NEMA 5-15). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. 6-foot length. The following countries/regions use the #6470 power cord to power the system or peripheral features requiring a power cord: United States, Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Bonnaire, Calicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Curacao, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Mexico, Micronesia, Montserrat, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, St. Kitts/Nevis, St. Martin, Taiwan, Tortola (BVI), Trinidad/Tobago, Venezuela. Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6470)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None **For 9119-FHA (#6470)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum:) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Supported CSU: Not applicable Return parts MES: Does not apply
#6471	**(#6471) Power Cord (9-foot), To Wall/OEM PDU, (125V, 15A),** Plug Type #70 This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #70 (iNMETRO NBR 6147, NEMA 5-15). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. The following countries/regions use the #6471 power cord to power the system or peripheral features requiring a power cord: Brazil Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6471)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None **For 9119-FHA (#6471)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum:) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Not applicable Return parts MES: Does not apply

#6472	**#6472 Power Cord (9-foot), To Wall/OEM PDU, (250V, 16A), Plug Type #18**
	This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #18 (CEE 7 VII). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. The following countries/regions use the #6472 power cord to power the system or peripheral features requiring a power cord: Afghanistan, Albania, Algeria, Andorra, Angola, Armenia, Austria, Belarus, Belgium, Benin, Bosnia/Herzegovina, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Conogo, Croatia, Czech Republic, Dahomey, Djibuouti, Egypt, Equatorial Guinea, Eritrea, Estonia, Etrhiopia, Finland, France, French Polynesia, French Guyana, Gabon, Georgia, Germany, Greece, Guadeloupe, Guinea, Guinea-Bissau, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Kazakhstan, Krygystan, Laos, Latvia, Lebanon, Lintunia, Luxembourg, Macau, Macedonia, Mali, Martinique, Mauritania, Mauritus, Mayotte, Moldova, Monaco, Mongolia, Morocco, Mozambique, Netherlands, New Caledonia, Niger, North Korea (C19 only), Norway, Poland, Portugal, Principe, Reunion, Romania, Russia, Rwanda, St. Thomas, Saudi Arabia, Senegal, Serbia, Slovenia, Somalia, South Korea (C19 only), Spain, Surinam, Sweden, Syria, Tahiti, Tajikistan, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Upper Volta, Uzbekistan, Vanuatu, Vietnam, Wallis and Futuna, Zaire, Zimbabwe. Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6472)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None **For 9119-FHA (#6472)** ► Minimum required: 0 ► Maximum allowed: 99 ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#6473	**#6473 Power Cord (9-foot), To Wall/OEM PDU, (250V, 10A), Plug Type #19**
	This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #19 (CEE). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. The following countries/regions use the #6473 power cord to power the system or peripheral features requiring a power cord: Denmark Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6473)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: Not applicable **For 9119-FHA (#6473)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum: 99) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#6474	**#6474 Power Cord (9-foot), To Wall/OEM PDU, (250V, 13A), Plug Type #23** This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #23 (BS 1364A). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. The following countries/regions use the #6474 power cord to power the system or peripheral features requiring a power cord: Abu Dhabi, Bahrain, Botswana, Brunei, Channel Islands, Cyprus, Dominica, Gambia, Grenada, Grenadines, Guyana, Hong Kong, Iraq, Ireland, Jordan, Kenya, Kuwait, Liberia, Malawi, Malaysia, Malta, Myanmar, Nigeria, Oman, Qatar, Sierra Leone, Singapore, St. Kitts, St. Lucia, Seychelles, Sudan, Tanzania, Trinidad & Tobago, United Arab Emirates, United Kingdom, Yemen, Zambia Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6474)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: Not applicable **For 9119-FHA (#6474)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum:) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#6475	**#6475 Power Cord (9-foot), To Wall/OEM PDU, (250V, 16A), Plug Type #32** This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #32 (SII 32-1971). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. The following countries/regions use the #6475 power cord to power the system or peripheral features requiring a power cord: Israel Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6475)** ▶ Minimum required: 0 ▶ Maximum allowed: No max (Initial order maximum: no max) ▶ OS level required: Not applicable **For 9119-FHA (#6475)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum: 99) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#6476	**#6476 Power Cord (9-foot), To Wall/OEM PDU, (250V, 10A), Plug Type #24** This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #24 (SEV 24507). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. The following countries/regions use the #6476 power cord to power the system or peripheral features requiring a power cord: Lichtenstein Switzerland Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6476)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: Not applicable **For 9119-FHA (#6476)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum: 99) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#6477	**#6477 Power Cord (9-foot), To Wall/OEM PDU, (250V, 16A), Plug Type #22** This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #22 (SABS 164). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. The following countries/regions use the #6477 power cord to power the system or peripheral features requiring a power cord: Bangladesh, LeSotho, Maceo, Maldives, Nambia, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland Uganda. Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6477)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: Not applicable **For 9119-FHA (#6477)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum: 99) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#6478	**#6478 Power Cord (9-foot), To Wall/OEM PDU, (250V, 16A), Plug Type #25**
	This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #25 (CEI 23-16). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. The following countries/regions use the #6478 power cord to power the system or peripheral features requiring a power cord: Chile, Italy, Libya.
	Attributes provided: Power cord Attributes required: None
	For 9117-MMA (#6478) ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: Not applicable
	For 9119-FHA (#6478) ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum: 99) ► OS level required: Not applicable
	Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#6479	**#6479 Power Cord (9-foot), To Wall/OEM PDU, (250V, 10A), Plug Type #6**
	This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #6 (AS 3112-1964 NZS 198). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. The following countries/regions use the #6479 power cord to power the system or peripheral features requiring a power cord: Australia, Fiji Islands, Kiribati, Nauru, New Zealand, Papua, New Guinea, W. Samoa.
	Attributes provided: Power cord Attributes required: None
	For 9117-MMA (#6479) ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None
	For 9119-FHA (#6479) ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum:) ► OS level required: Not applicable
	Initial Order/MES/Both/Supported: Supported CSU: Yes Return parts MES: No

#6487	**#6487 Power Cord (6-foot), To Wall, (250V, 15A), United States, Plug Type #5** This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #5 (NEMA 6-15). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. 6-foot length. The following countries/regions use the #6487 power cord to power the system or peripheral features requiring a power cord: United States, Anguilla, Antigua & Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Bonnaire, Caicos Is., Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Curacao, Dominican Republic, Ecuador, El Salvador, Guam, Guatamala, Haiti, Honduras, Jamaica, Japan, Micronesia, Montserrat, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, St. Marten NA, Taiwan, Tortola (BVI), Thailand, Venezuela. Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6487)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#6487)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum:) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#6488	**#6488 Power Cord (9-foot), To Wall/OEM PDU, (125V, 15A or 250V, 10A), Plug Type #2** This power cord goes from the system or peripheral features to a wall-type outlet. Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. The following countries/regions use the #6488 power cord to power the system or peripheral features requiring a power cord: Argentina, Paraguay, Uruguay. Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6488)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#6488)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum:) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#6489	**6489) 4.3 m (14-Ft) 3PH/24A Power Cord** #6489 is a 14-ft/4.3 m 3PH/24A power cable with a Type 46 plug which distributes power from a power source to a Power Distribution Unit. Attributes provided: power cord Attributes required: None **For 9117-MMA (#6489)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No
#6491	**#6491 4.3m (14-Ft) 1PH/48A Pwr Cord** #6491 is a 14-FT/4.3m 200-240V/48A power cord with a Type 46 plug which distributes power from a power source to a Power Distribution Unit. Attributes provided: power cord Attributes required: None **For 9117-MMA (#6491)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No
#6492	**#6492 4.3m (14-Ft) 1PH/48-60A Pwr Cord** #6492 is a 14-FT/4.3m 200-240V/48A power cord with a Type 46 plug which distributes power from a power source to a Power Distribution Unit. Attributes provided: power cord Attributes required: None **For 9117-MMA (#6492) and 9119-FHA (#6492)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No

#6493	**#6493 Power Cord (9-foot), To Wall/OEM PDU, (250V, 10A), Plug Type #62** This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #62 (GB 1053). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. The following countries/regions use the #6493 power cord to power the system or peripheral features requiring a power cord: People's Republic of China. Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6493)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#6493)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum:) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#6494	**#6494 Power Cord (9-foot), To Wall/OEM PDU, (250V, 10A), Plug Type #69** This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #69 (IS 6538). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. The following countries/regions use the #6494 power cord to power the system or peripheral features requiring a power cord: India Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6494)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#6494)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum:) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#6495	**#6495 Power Cord (9-ft), To Wall/OEM PDU, (250V, 10A), Plug Type #73** (No longer available as of 29 August 2008.) This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #73. Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. The following countries/regions use the #6495 power cord to power the system or peripheral features requiring a power cord: Brazil Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6495)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None **For 9119-FHA (#6495)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum:) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#6496	**#6496 Power Cord (9-foot), To Wall/OEM PDU, (250V, 10A), Plug Type #66** This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #66 (KETI). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. The following countries/regions use the #6496 power cord to power the system or peripheral features requiring a power cord: North Korea South Korea Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6496)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None **For 9119-FHA (#6496)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum:) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#6497	**#6497 Power Cord (6-foot), To Wall/OEM PDU, (250V, 10A)** This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #10 (NEMA L6-15). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. The following countries/regions use the #6497 power cord to power the system or peripheral features requiring a power cord. Canada Colombia Japan Mexico United States Attributes provided: Power cord Attributes required: None **For 9119-FHA (#6497)** ► Minimum required: 0 ► Maximum allowed: 6 (Initial order maximum: 6) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No
#6498	**#6498 Power Cord (6-foot), To Wall/OEM PDU, (250V, 15A)** This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #34 (RS 3720U-2). Refer to Corporate Bulletin C-B-2-43700-009 for a description of plug types. The following countries/regions use the #6498 power cord to power the system or peripheral features requiring a power cord: Canada Japan United States Attributes provided: Power cord Attributes required: None **For 9119-FHA (#6498)** ► Minimum required: 0 ► Maximum allowed: 4 (Initial order maximum: 4) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No
#6580	**#6580 Optional Rack Security Kit** Provides hardware that can be added to a rack to prevent unauthorized access. It includes keyed front and rear locks for the #0553 rack doors. It also includes two sliding bars that mount inside the left and right rack side panels. The sliding bars are accessible when the rack rear door is open. They can be moved to a position that disables the external latches on the rack side panels, and prevents removal of the side panels. Attributes provided: Locking hardware for rack doors and side panels Attributes required: #0553 19 inch Rack **For 9117-MMA (#6580) and 9119-FHA (#6580)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: MES ► CSU: Yes ► Return parts MES: No

6586	**#6586 Modem Tray for 19 inch Rack** Provides hardware for installing one or two modems in a 19 inch rack. The modem tray occupies 1U of rack space when it is mounted in the front of the rack. It provides a secure location in the rack for external modems such as the ones attached to the Hardware Management Console. Attributes provided: Hardware. to support two modems Attributes required: 19 inch rack with 1U rack space available **For 9117-MMA (#6586) and 9119-FHA (#6586)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No
#6598	**#6598 Disk Slot Fillers (Quantity 4)** This feature allows the customer to move disks from the system to another system or an IO drawer and to place a blank disk filler in the empty disk slot. Systems shipped from manufacturing have blank filler in the empty disk slots. Attributes provided: 4 disk slot fillers Attributes required: None **For 9117-MMA (#6598) and 9119-FHA (#6598)** ▶ Minimum required: 0 ▶ Maximum allowed: 0 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Not supported on 9117-MMA. ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
$6651	**#6651 Power Cord (9-foot), To Wall/OEM PDU, (125V, 15A), Plug Type #75** This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #75 (KETI). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. The following countries/regions use the #6651 power cord to power the system or peripheral features requiring a power cord: Taiwan Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6651)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#6651)** ▶ Minimum required: 0 ▶ Maximum allowed: 99 (Initial order maximum:) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#6654	**#6654 4.3m (14-Ft) 1PH/24-30A Pwr Cord** #6654 is a 14-FT/4.3m 200-240V/24A locking power cord with a Type 12 plug which distributes power from a power source to a Power Distribution Unit. Attributes provided: power cord Attributes required: None **For 9117-MMA (#6654)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No
#6655	**#6655 4.3m (14-Ft) 1PH/24-30A WR Pwr Cord** #6655 is a 14-FT/4.3m 200-240V/24A water-resistant power cord with a Type 40 plug which distributes power from a power source to a Power Distribution Unit. Attributes provided: power cord Attributes required: None **For 9117-MMA (#6655) and 9119-FHA (#6655)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No
#6656	**#6656 4.3m (14-Ft)1PH/24A Power Cord** #6656 is a 14-FT/4.3m 200-240V/24A power cord with a Type 46 plug which distributes power from a power source to a Power Distribution Unit. Attributes provided: power cord Attributes required: None **For 9117-MMA (#6656)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No
#6657	**#6657 4.3m (14-Ft) 1PH/24A Power Cord** #6657 is a 14-FT/4.3m 1PH/24A power cord with a Type PDL plug which distributes power from a power source to a Power Distribution Unit. Attributes provided: PDU power cable Attributes required: None **For 9117-MMA (#6657)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: Yes ▶ Return parts MES: No

#6658	**#6658 14-Ft 1PH/24A Pwr Cd-Korea** #6658 is a 14-FT/4.3m 200-240V/24A power cord with a Type KP plug which distributes power from a power source to a Power Distribution Unit. Attributes provided: PDU power cable Attributes required: None **For 9119-FHA (#6658)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No
#6659	**#6659 Power Cord (9-foot), To Wall/OEM PDU, (250V, 15A), Plug Type #76** This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #76 (KETI). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. The following countries/regions use the #6659 power cord to power the system or peripheral features requiring a power cord: Taiwan Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6659)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None **For 9119-FHA (#6659)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum:) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#6660	**#6660 Power Cord (14-foot), Drawer To OEM PDU (125V, 15A)** This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #59 (NEMA 5-15). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. 14-foot length. This power cord meets the DENAN marking requirement in Japan. Attributes provided: Power Cord Attributes required: None **For 9119-FHA (#6660)** ► Minimum required: 0 ► Maximum allowed: 250 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No

#6662	**#6662 4.3m (14-Ft) 240V/15A Power Cord** Distributes power from a wall outlet to a system unit. #6662 has a type-78 plug and a IEC320 C19 connector. Attributes provided: Power cable Attributes required: None **For 9117-MMA (#6662)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#6663	**#6663 4.3m (14-Ft) 240V/15A Power Cord** Distributes power from a wall outlet to a system unit. #6663 has a type 76 plug and a IEC320 C13 connector. Attributes provided: power cable Attributes required: None **For 9117-MMA (#6663)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#6664	**#6664 2.1m (7-Ft) 200V PDU Power Cable** (No longer available as of 29 August 2008.) Provides a power cord for connecting an I/O drawer to an IBM PDU within a rack. The power connector to the drawer is at a 90 degree angle to the power cord. The length of this cable (7 feet) cannot meet cabling requirements in all rack locations. Attributes provided: Right Angle power cable Attributes required: None **For 9117-MMA (#6664) and 9119-FHA (#6664)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: No Max) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No

#6669	**#6669 Power Cord (14-foot), Drawer to OEM PDU, (250V, 15A), Plug Type #57 (DENAN marking)**
	This power cord goes from the system or I/O drawer to the rack power distribution unit. Plug type #57 (NEMA 6-15). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. 14-foot length. This power cord meets the DENAN marking requirement in Japan.
	Attributes provided: Power Cord Attributes required: None
	For 9117-MMA (#6669) ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None
	For 9119-FHA (#6669) ▶ Minimum required: 0 ▶ Maximum allowed: 250 (Initial order maximum: 0) ▶ OS level required: Not applicable
	Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#6670	**#6670 Power Cord (6-ft), To Wall (125V, 15A), Plug Type #59 (DENAN marking)** (No longer available as of 29 August 2008.)
	This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #59 (NEMA 5-15). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. 6-foot length. This power cord meets the DENAN marking requirement in Japan.
	Attributes provided: Power cord Attributes required: None
	For 9117-MMA (#6670) ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None
	For 9119-FHA (#6670) ▶ Minimum required: 0 ▶ Maximum allowed: 99(Initial order maximum: 0) ▶ OS level required: Not applicable
	Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#6671	**#6671 Power Cord (9-ft), Drawer to IBM PDU, 250V/10A** Standard IBM rack power cable that goes from the system or I/O drawer to the rack power distribution unit (PDU). 9-foot length. Attributes provided: Power Cord Attributes required: None **For 9117-MMA (#6671)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#6671)** ▶ Minimum required: 0 ▶ Maximum allowed: 250 (Initial order maximum: 0) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#6672	**#6672 Power Cord (5-foot), Drawer to IBM PDU, 250V/10A** Standard rack power cable that goes from the system or I/O drawer to the rack power distribution unit (PDU). 5-foot length. Attributes provided: Power Cord Attributes required: None **For 9117-MMA (#6672)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None **For 9119-FHA (#6672)** ▶ Minimum required: 0 ▶ Maximum allowed: 250 (Initial order maximum: 0) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#6680	**#6680 Power Cord (9-foot), To Wall/OEM PDU, (250V, 10A), Plug Type #6, Insulated** This insulated power cord goes from the system or peripheral features to a wall-type outlet. Plug type #6 (AS 3112-1964 NZS 198). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. The following countries/regions use the #6680 power cord to power the system or peripheral features requiring a power cord: Australia, Fiji Islands, Kiribati, Nauru, New Zealand, Papua, New Guinea, W. Samoa. Attributes provided: Power cord Attributes required: None **For 9117-MMA (#6680)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None **For 9119-FHA (#6680)** ► Minimum required: 0 ► Maximum allowed: 99(Initial order maximum: 0) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#6681	**#6681 4.3m (14-Ft) 200-240V/10A Pwr Cord** Distributes power from a wall outlet to a system unit. #6681 has an insulated type 6 plug and a right-angle IEC320 C13 connector. Attributes provided: Power Cord Attributes required: None **For 9117-MMA (#6681) and 9119-FHA (#6681)** ► Minimum required: 0 ► Maximum allowed: No Max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No

#6687	**#6687 Power Cord (6-ft), To Wall, (250V, 15A), Plug Type #57 (DENAN marking)**
	(No longer available as of 29 August 2008.)
	This power cord goes from the system or peripheral features to a wall-type outlet. Plug type #57 (NEMA 6-15). Refer to Corporate Bulletin C-B-2-4700-009 for a description of plug types. 6-foot length. This power cord meets the DENAN marking requirement in Japan.
	Attributes provided: Power cord
	Attributes required: None
	For 9117-MMA (#6687)
	► Minimum required: 0
	► Maximum allowed: no max (Initial order maximum: no max)
	► OS level required: None
	For 9119-FHA (#6687)
	► Minimum required: 0
	► Maximum allowed: 99 (Initial order maximum:)
	► OS level required: Not applicable
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
#6690	**#6690 14-Ft 200-240V/15A Pwr Cord**
	Distributes power from a wall outlet to a system unit. #6690 has a type-74 plug and a IEC320 C19 connector.
	Attributes provided: Power cord
	Attributes required: None
	For 9119-FHA (#6690)
	► Minimum required: 0
	► Maximum allowed: No Max (Initial order maximum: 0)
	► OS level required: Not applicable
	► Initial Order/MES/Both/Supported: Supported
	► CSU: No
	► Return parts MES: No
#6699	**#6699 RIO-2 Bus Adapter**
	The #6699 feature allows RIO-2 connectivity for #0595. The #6699 has two RIO-2 ports and provides connectivity for #0595 PCI/SCSI Disk expansion drawers.
	Attributes provided: Two ports of RIO-2 connectivity
	Attributes required: Bus adapter slot in #0595 PCI/SCSI Disk expansion drawer
	For 9117-MMA (#6699) and 9119-FHA (#6699)
	► Minimum required: 0
	► Maximum allowed: 48 (Initial order maximum: 48)
	► OS level required:
	– This adapter is supported by AIX and Linux partitions on System i MTMs (for example, the POWER5 595). If that system is upgraded to a POWER6 MTM, this adapter is supported by AIX and Linux. It should not be ordered with new 05nn or 5nn I/O enclosures.
	– IBM i 5.4 with V5R4M5 machine code or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes
	► Return parts MES: No

#6800	**#6800 - PCI 1 Gbps Ethernet IOA** Provides a PCI-X IOA which does not require an IOP and allows a system running i5/OS to attach to IEEE standard 802.3Z high speed (1 Gbps) Ethernet LANs. The #6800 adapter supports a multimode fiber interface with a 62.5 micron or 50.0 micron cable requirement. The adapter has a duplex LC fiber-optic connector for attachment to customer-supplied cabling. The #6800 only supports TCP/IP and requires an intervening switch/ hub/router when connection to 100 Mbps or 10 Mbps networks. #6800, #0620, and #5700 are physically the same adapter card but have different feature numbers that denote to IBM configurator tools whether or not an IOP is required. Attributes provided: 1000/100/10 Ethernet LAN Interface Attributes required: One short or long, 3.3V or 5V PCI-X slot **For 9406-MMA (#6800)** ► Minimum required: 0 ► Maximum allowed: 124 (Initial order maximum: 124) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes
#6801	**#6801 - PCI 1 Gbps Ethernet UTP IOA** Provides a PCI-X IOA which does not require an IOP and allows a system running i5/OS to attach to IEEE standard 802.3ab high speed (1 Gbps) Ethernet LANs. The adapter supports a UTP CAT 5 media interface. The #6801 only supports TCP/IP and requires an intervening switch/ hub/router when connecting to 1 Gbps networks. It does not require a switch/hub/router for 100 Mbps or 10 Mbps networks. #6801, #0621, and #5701 are physically the same adapter card but have different feature numbers that denote to IBM configurator tools whether or not an IOP is required. Attributes provided: 1000/100/10 Ethernet LAN Interface Attributes required: One short or long, 3.3 V or 5 V PCI-X slot **For 9406-MMA (#6801)** ► Minimum required: 0 ► Maximum allowed: 124 (Initial order maximum: 124) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes

| #6803 | **#6803 - PCI WAN for ECS**
The #6803 is a WAN with modem adapter which provides connectivity for IBM Electronic Customer Support (ECS) only. This feature is the non-CIM (Complex Impedance Matching) version offered in all countries except Australia and New Zealand. #6803 is functionally equivalent to #0614, #2793, or #9793, but #6803 indicates to IBM configurator tools that the IOA is being used by i5/OS in an IOP-less mode. When in IOP-less mode the adapter function is restricted to communicating to IBM ECS on port 0 (modem port). Port 1 is the RVX port and is not supported in an IOP-less mode.

Port 0 supports V.92 56K PPP, V.92 data modem and V.44 data compression. Port 0 does not provide Synchronous modem capabilities (SDLC and Synchronous PPP).

IBM strongly encourages customers to move to the direct connection (which is HTTP/HTTPS and VPN).
http://www-912.ibm.com/s_dir/slkbase.NSF/643d2723f2907f0b8625661300765a2a/d3a4642013af49b5862571470061e36b?OpenDocument

Select one of the following cables to attach to port 0 (modem port):
▶ #1010 Modem Cable - Austria
▶ #1011 Modem Cable - Belgium
▶ #1012 Modem Cable - Africa
▶ #1013 Modem Cable - Israel
▶ #1014 Modem Cable - Italy
▶ #1015 Modem Cable - France
▶ #1016 Modem Cable - Germany
▶ #1017 Modem Cable - UK
▶ #1018 Modem Cable - Iceland/Sweden
▶ #1020 Modem Cable - HK/NZ
▶ #1021 Modem Cable - Fin/Nor
▶ #1022 Modem Cable - Netherlands
▶ #1023 Modem Cable - Swiss
▶ #1024 Modem Cable - Denmark
▶ #1025 Modem Cable - US/Canada

The #6803 does not support the remote ring indicate function. This feature has country specific usage.

Attributes provided: One integrated modem port for communication with IBM ECS
Attributes required: One PCI slot (3 volt)

For 9406-MMA (#6803)
▶ Minimum required: 0
▶ Maximum allowed: 240 (Initial order maximum: 240)
▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
▶ Initial Order/MES/Both/Supported: Both
▶ CSU: Yes |

#6805	**#6805 PCI 2-Line WAN IOA No IOP**
	#6805 is a WAN IOA that supports up to two multiple protocol communications (RVX) ports when one or two of the following cables are attached:
	▶ #0348 - V.24/EIA232 20-ft PCI Cable
	▶ #0349 - V.24/EIA232 50-ft PCI Cable (support only, not orderable)
	▶ #0353 - V.35 20-ft PCI Cable
	▶ #0354 - V.35 50-ft PCI Cable (support only, not orderable)
	▶ #0356 - V.36 20-ft PCI Cable
	▶ #0358 - V.36 80-ft PCI Cable (support only, not orderable)
	▶ #0359 - X.21 20-ft PCI Cable
	▶ #0360 - X.21 50-ft PCI Cable (support only, not orderable)
	▶ #0365 - V.24/EIA232 80-ft PCI Cable (support only, not orderable)
	▶ #0367 - Operations Console PCI Cable
	When #6805 is selected to support ECS, one of following cables must be specified:
	▶ #0348 V.24/EIA232 20-Ft PCI Cable
	▶ #0349 V.24/EIA232 50-Ft PCI Cable (support only, not orderable)
	▶ #0365 V.24/EIA232 80-Ft PCI Cable (support only, not orderable)
	IBM strongly encourages customers to move to the direct connection (which is HTTP/HTTPS and VPN): http://www-912.ibm.com/s_dir/slkbase.NSF/643d2723f2907f0b8625661300765a2a/d3a4642013af49b5862571470061e36b?OpenDocumenttret
	Note: The #0367 cable ships with a 25-pin to 9-pin adapter. Multiple #0367 cables can be ordered (but only one per #6805) to serve as consoles for secondary partitions when Logical Partitioning is utilized. The #2742 (IOP-required) PCI 2-Line WAN IOA cannot be ordered new on the unified POWER6 MTMs but is supported on upgrades. The IOP-less feature #6805 adapter can be ordered. Both adapters report the same hardware resources type (CCIN) 2742.
	Minimum operating system level for IOP-less protocols supported with IBM i 5.4 with V5R4M5 machine code and CUM C7282540 (or later) plus PTFs: MF43444, MF43437, and MF43892 (or supersedes) and later releases.
	IOP-less is supported on all POWER6 models.
	When running IOP-less, the following protocols are supported:
	▶ Async SLIP/PPP
	▶ Bisync
	▶ Fax
	▶ PPP
	▶ SNA communications through the IBM i 5.4 or later Enterprise Extender function
	▶ X.21
	When the #6805 is placed in an expansion frame or I/O drawer and is supported by an IOP card (for example, #2843 or #2844), then the IBM i supports the following protocols over the line description:
	▶ Async SLIP/PPP
	▶ Bisync
	▶ Fax
	▶ PPP
	▶ SDLC
	▶ IBM i SNA direct or 5.4 or later Enterprise Extender function
	▶ X.25
	Restriction: #6805 does not support remote power-on.
	The IBM i SNA Planning Statement can be found at: http://www-304.ibm.com/systems/support/i/planning/upgrade/futuresftwr.html
	Attributes provided: two RVX comm ports
	Attributes required: one 3V PCI/PCI-X

#6808	**#6808 PCI 4-Modem WAN IOA No IOP**
	A four-line WAN modem adapter, with four RJ-11 ports, that supports V.92 56 k Async SLIP/PPP and V.34 Fax applications at data rates up to 33.6 k through integrated modems. Connection to the V.92 ports is through telephone cable. The V.92 functions offer increased upload throughput, improved V.44 data compression, and shortened modem synchronization periods.
	Notes:
	► The call waiting and modem on hold functions associated with V.92 are not supported.
	► Remote power on through ring-indicator and SDLC are not supported.
	► #6808 does not support SNA communications except through the i5/ OS V5R4 Enterprise Extender function.
	► #6808 does not have complex impedance matching (CIM).
	► This version of the four-line WAN modem adapter does not require an I/O processor.
	► #6808 does not make use of an IOP.
	A minimum of one modem cable must be ordered for each #6808. All modem cables installed on a system must be the same feature number.
	► #1010 Modem Cable - Austria
	► #1011 Modem Cable - Belgium
	► #1012 Modem Cable - Africa
	► #1013 Modem Cable - Israel (supported only, not orderable)
	► #1014 Modem Cable - Italy
	► #1015 Modem Cable - France
	► #1016 Modem Cable - Germany
	► #1017 Modem Cable - UK
	► #1018 Modem Cable - Iceland/Sweden
	► #1020 Modem Cable - HK/NZ
	► #1021 Modem Cable - Fin/Nor
	► #1022 Modem Cable - Netherlands
	► #1023 Modem Cable - Swiss
	► #1024 Modem Cable - Denmark
	► #1025 Modem Cable - US/Canada
	Attributes provided: four WAN ports
	Attributes required: one PCI slot
	For 9117-MMA (#6808)
	► Minimum required: 0
	► Maximum allowed: 120 (Initial order maximum: 120)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	For 9119-FHA (#6808)
	► Minimum required: 0
	► Maximum allowed: 99 (Initial order maximum: 99)
	► OS level required:
	– IBM i 5.4 with V5R4M5 machine code
	– IBM i 6.1 or later
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
	Note: Two maximum in each CEC enclosure.

#6833	**#6833 PCI 2-Line WAN with Modem NoIOP**
	The #6833 is a 2-line/port WAN with modem adapter. This feature is the non-Complex Impedance Matching (CIM) version offered in all countries except Australia and New Zealand.
	Port 0 is the modem port and supports V.92 56K Async PPP, V.92 data modem, V.44 data compression, V.34 FAX modem and FAX functions, such as ECM and 2D/1D conversion. Port 0 does not provide Sync modem capabilities (SDLC and Sync PPP).
	Port 1 is the RVX port and supports multiple communications protocols, including synchronous operations.
	Select one of the following cables to attach to port 0(modem port):
	► #1010 Modem Cable - Austria
	► #1011 Modem Cable - Belgium
	► #1012 Modem Cable - Africa
	► #1013 Modem Cable - Israel
	► #1014 Modem Cable - Italy
	► #1015 Modem Cable - France
	► #1016 Modem Cable - Germany
	► #1017 Modem Cable - UK
	► #1018 Modem Cable - Iceland/Sweden
	► #1020 Modem Cable - HK/NZ
	► #1021 Modem Cable - Fin/Nor
	► #1022 Modem Cable - Netherlands
	► #1023 Modem Cable - Swiss
	► #1024 Modem Cable - Denmark
	► #1025 Modem Cable - US/Canada
	Select one of the following cables to attach to port 1 (RVX port):
	► #0348 - V.24/EIA232 20-ft PCI Cable
	► #0353 - V.35 20-ft PCI Cable
	► #0356 - V.36 20-ft PCI Cable (supported only, not orderable)
	► #0359 - X.21 20-ft PCI Cable
	► #0367 - Operations Console PCI Cable (ships with a 25-pin to 9-pin adapter)
	Multiple #0367 cables can be ordered (but only one per #6833) to serve as consoles for secondary partitions when Logical Partitioning is utilized.
	ECS is supported from both the modem port, and the RVX port. The following cable is required to support ECS from the RVX port:
	► #0348 - V.24/EIA232 20-Ft PCI Cable
	IBM strongly encourages customers to move to the direct connection (which is HTTP/HTTPS and VPN). `http://www-912.ibm.com/s_dir/slkbase.NSF/643d2723f2907f0b8625661300765a2a/d3a4642013af49b5862571470061e36b?OpenDocument`
	The #6833 does not support the remote ring indicate function.
	#6833 does not support SNA communications except through the i5/ OS V5R4 Enterprise Extender function.
	Attributes provided: One RVX port and one integrated modem port
	Attributes required: One PCI slot (3 volt)

#6833 Continued	**#6833 PCI 2-Line WAN with Modem NoIOP**
	For 9117-MMA (#6833)
	► Minimum required: 0
	► Maximum allowed: 220 (Initial order maximum: 220)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	For 9119-FHA (#6833)
	► Minimum required: 0
	► Maximum allowed: 239 (Initial order maximum: 239)
	► OS level required:
	– IBM i 5.4 with V5R4M5 machine code
	– IBM i 6.1 or later
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
	Note: Two maximum in each CEC enclosure.
#6850	**#6850 Weight Reduction Option**
	This feature allows the System Rack to utilize elevators that have a 2500 pound weight limitation. This feature can also be ordered for any shipping application where the weight needs to be reduced on the rack to below 2500 pounds.
	Attributes provided: Shipping weight reduction
	Attributes required: None
	For 9119-FHA (#6850)
	► Minimum required: 0
	► Maximum allowed: 1 (Initial order maximum: 1)
	► OS level required: Not applicable
	► Initial Order/MES/Both/Supported: Initial
	► CSU: Not applicable
	► Return parts MES:
#6851	**#6851 Slimline Doors OEM, System and #5792 Racks**
	Provides OEM front and rear doors for use with the primary system rack or the #5792 Powered Expansion Rack. This slimline door kit provides a minimized footprint for use where conservation of space is desired.
	Attributes provided: OEM Slimline Door Kit
	Attributes required: System rack or #5792 expansion rack
	For 9119-FHA (#6851)
	► Minimum required: 0
	► Maximum allowed: (Initial order maximum: 0)
	► OS level required: Not applicable
	► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMS.
	► CSU: Not applicable
	► Return parts MES: No

#6852	**#6852 Acoustic Doors OEM, System and #5792 Racks** Provides OEM front and rear doors for use with the primary system rack or the #5792 Powered Expansion Rack. This door kit provides acoustic dampening for use where a quieter environment is desired. Attributes provided: OEM Acoustic Door Kit Attributes required: System rack or #5792 expansion rack **For 9119-FHA (#6852)** ▶ Minimum required: 0 ▶ Maximum allowed: (Initial order maximum: 0) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMS. ▶ CSU: Not applicable ▶ Return parts MES: No
#6853	**#6853 Slimline Doors, OEM, #8691 Expansion Rack** Provides OEM front and rear doors for use with the #8691 bolt on expansion rack. This slimline door kit provides a minimized footprint for use where conservation of space is desired. Attributes provided: OEM Slimline Door Kit Attributes required: #8691 expansion rack **For 9119-FHA (#6853)** ▶ Minimum required: 0 ▶ Maximum allowed: (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMS. ▶ CSU: Not applicable ▶ Return parts MES: No
#6854	**#6854 Acoustic Doors, OEM, #8691 Expansion Rack** Provides OEM front and rear doors for use with the #8691 bolt on expansion rack. This door kit provides additional acoustic dampening for use where a quieter environment is desired. Attributes provided: OEM Acoustic Door Kit Attributes required: #8691 expansion rack **For 9119-FHA (#6854)** ▶ Minimum required: 0 ▶ Maximum allowed: (Initial order maximum: 0) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMS. ▶ CSU: Not applicable ▶ Return parts MES: No
#6855	**#6855 Weight Distribution Plate** This feature delivers the weight distribution plate for rack. Attributes provided: Weight Distribution Plate Attributes required: None **For 9119-FHA (#6855)** ▶ Minimum required: 0 ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No

#6856	**#6856 Doors with Rear Heat Exchanger OEM**
	Provides an OEM front door and a rear door with heat exchanger for use with the 24 inch racks that have the power subsystem in the rack.
	Attributes provided: OEM Door Kit with Rear Door Heat Exchanger
	Attributes required: 24 inch rack with power subsystem
	For 9119-FHA (#6856)
	► Minimum required: 0
	► Maximum allowed: (Initial order maximum: 0)
	► OS level required:
	► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMS.
	► CSU: Not applicable
	► Return parts MES: No
#6857	**#6857 Heat Exchanger Door Kit for System Rack, Blue Stripe**
	Provides a slim line front door (with blue accent stripe) and a rear door with heat exchanger for use with the 24 inch racks that have the power subsystem in the rack.
	Attributes provided: Slim line Door Kit with Blue stripe and Rear Door Heat Exchanger
	Attributes required: 24 inch rack with power subsystem
	For 9119-FHA (#6857)
	► Minimum required: 0
	► Maximum allowed: 1 (Initial order maximum: 0)
	► OS level required: Not applicable
	► Initial Order/MES/Both/Supported: MES
	► CSU: No
	► Return parts MES: No
#6859	**#6859 Heat Exchanger Door Kit for System Rack, Cu Stripe**
	(No longer available as of 29 August 2008.)
	Provides a slim line front door (with copper accent stripe) and a rear door with heat exchanger for use with the 24 inch racks that have the power subsystem in the rack.
	Attributes provided: Slim line Door Kit with Cu stripe with Rear Door Heat Exchanger
	Attributes required: 9119-595 CEC rack only
	For 9119-FHA (#6859)
	► Minimum required: 0
	► Maximum allowed: 1 (Initial order maximum: 0)
	► OS level required: Not applicable
	► Initial Order/MES/Both/Supported: MES
	► CSU: No
	► Return parts MES: No

#6861	**#6861 Slimline Doors for System Rack, Blue Stripe**
	Provides front (with blue accent stripe) and rear doors for use with the 24 inch racks that have the power subsystem in the rack. This slim line door kit provides a minimized footprint for use where conservation of space is desired.
	Attributes provided: Slimline Door Kit with Blue stripe
	Attributes required: 24 inch rack with power subsystem
	For 9119-FHA (#6861)
	▶ Minimum required: 0
	▶ Maximum allowed: 1 (Initial order maximum: 0)
	▶ OS level required: Not applicable
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: No
	▶ Return parts MES: No
$6862	**#6862 Acoustic Doors for System Rack, Blue Stripe**
	Provides front (with blue accent stripe) and rear doors for use with the 24 inch racks that have the power subsystem in the rack. This door kit provides acoustic dampening for use where a quieter environment is desired.
	Attributes provided: Acoustic Door Kit with Blue stripe
	Attributes required: 24 inch rack with power subsystem
	For 9119-FHA (#6862)
	▶ Minimum required: 0
	▶ Maximum allowed: 1 (Initial order maximum: 0)
	▶ OS level required: Not applicable
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: No
	▶ Return parts MES: No
#6865	**#6865 Acoustic Doors (F&R), H CEC Rack**
	Provides front and rear acoustical doors for use with the CEC Rack. Provides specially-designed front and rear acoustical doors that greatly reduce the noise emissions from the system and thereby lower the noise levels in the data center. The doors include acoustically absorptive foam and unique air inlet and exhaust ducts to attenuate the noise.
	Attributes provided: Acoustic Doors
	Attributes required: 24 inch rack with power subsystem
	For 9119-FHA (#6865)
	▶ Minimum required: 0
	▶ Maximum allowed: 1 (Initial order maximum: 1)
	▶ OS level required: Not applicable
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: No
	▶ Return parts MES: No
	Note: Adds 9 inch depth beyond that of non-acoustic door set.

#6866	**#6866 Acoustic/heat Exchanger Doors (F/R), H CEC Rack**
	Provides for the CEC rack a specially-designed front acoustical door and an acoustical attachment to the Rear Door Heat Exchanger door that reduce the noise emissions from the system and thereby lower the noise levels in the data center. Acoustically absorptive foam and unique air inlet and exhaust ducts are employed to attenuate the noise.
	Attributes provided: Acoustic doors with rear heat exchanger Attributes required: 24 inch rack with power subsystem
	For 9119-FHA (#6866) ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: No ► Return parts MES: No
	Note: Adds 9 inch depth beyond that of non-acoustic door set.
#6869	**#6869 Slimline Doors (F&R), H CEC AND I/O Expansion Racks**
	Provides front and rear Slimline, (non-acoustical) doors for use with the CEC rack and I/O expansion rack. These Slimeline doors provide a smaller-footprint alternative to the acoustical doors for those customers who might be more concerned with floor space than noise levels. The doors are slimmer because they do not contain acoustical treatment to attenuate the noise.
	Attributes provided: Slimline doors Attributes required: 24 inch rack with power subsystem
	For 9119-FHA (#6869) Minimum required: 0 ► Maximum allowed: 3 (Initial order maximum: 3) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: No ► Return parts MES: No
#6870	**#6870 Acoustic Doors (F&R), H I/O Expansion Rack**
	Provides front and rear acoustical doors for use with 24 inch racks hat have the power subsystem in the rack. Provides specially-designed front and rear acoustical doors that greatly reduce the noise emissions from the system and thereby lower the noise levels in the data center. The doors include acoustically absorptive foam and unique air inlet and exhaust ducts to attenuate the noise.
	Attributes provided: Acoustic Doors Attributes required: 24 inch rack
	For 9119-FHA (#6870) ► Minimum required: 0 ► Maximum allowed: 2 (Initial order maximum: 2) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: No ► Return parts MES: No
	Note: Adds 9 inch depth beyond that of non-acoustic door set.

#6878	**#6878 Acoustic Doors (F&R), H I/O Expansion Rack Bolt-On** Provides front and rear acoustical doors for use with 24 inch, nonpowered racks. Provides specially-designed front and rear acoustical doors that greatly reduce the noise emissions from the system and thereby lower the noise levels in the data center. The doors include acoustically absorptive foam and unique air inlet and exhaust ducts to attenuate the noise. Attributes provided: Acoustic Doors Attributes required: 24 inch rack **For 9119-FHA (#6878)** ► Minimum required: 0 ► Maximum allowed: 2 (Initial order maximum: 2) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: No ► Return parts MES: No **Note**: Adds 9 inch depth beyond that of non-acoustic door set.
#6880	**#6880 Non-Acoustic Doors (F&R), H I/O Expansion Rack Bolt-On** Provides front and rear Slimline, (non-acoustical) doors for use with 24 inch, nonpowered racks. These Slimline doors provide a smaller-footprint alternative to the acoustical doors for those customers who might be more concerned with floor space than noise levels. The doors are slimmer because they do not contain acoustical treatment to attenuate the noise. Attributes provided: Slimline doors Attributes required: 24 inch rack **For 9119-FHA (#6880)** ► Minimum required: 0 ► Maximum allowed: 2 (Initial order maximum: 2) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: No ► Return parts MES: No
#6941	**#6941 UPIC Cable Group, BPD1 to I/O Drawer at A01 UPIC CBL GRP, BPD1 TO I/O DRWR AT A01** Cable group specify for connecting I/O drawer to power supply. Connection points specified in description. Attributes provided: Connectivity to power. Attributes required: I/O drawer. **For 9119-FHA (#6941)** ► Minimum required: 0 ► Maximum allowed: 3 (Initial order maximum: 3) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: No ► Return parts MES: No

#6942	**#6942 UPIC Cable Group, BPD1 to I/O Drawer at A05 UPIC CBL GRP, BPD1 TO I/O DRWR AT A05** Cable group specify for connecting I/O drawer to power supply. Connection points specified in description. Attributes provided: Connectivity to power. Attributes required: I/O drawer. **For 9119-FHA (#6942)** ▶ Minimum required: 0 ▶ Maximum allowed: 3 (Initial order maximum: 3) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#6943	**#6943 UPIC Cable Group, BPD1 to I/O Drawer at A09 UPIC CBL GRP, BPD1 TO I/O DRWR AT A09** Cable group specify for connecting I/O drawer to power supply. Connection points specified in description. Attributes provided: Connectivity to power. Attributes required: I/O drawer. **For 9119-FHA (#6943)** ▶ Minimum required: 0 ▶ Maximum allowed: 3 (Initial order maximum: 3) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#6944	**#6944 UPIC Cable Group, BPD2 to I/O Drawer at Z01 UPIC CBL GRP, BPD2 TO I/O DRWR AT Z01** Cable group specify for connecting I/O drawer to power supply. Connection points specified in description. Attributes provided: Connectivity to power Attributes required: I/O drawer **For 9119-FHA (#6944)** ▶ Minimum required: 0 ▶ Maximum allowed: 2 (Initial order maximum: 2) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#6945	**#6945 UPIC Cable Group, BPD2 to I/O Drawer at Z05 UPIC CBL GRP, BPD2 TO I/O DRWR AT Z05** Cable group specify for connecting I/O drawer to power supply. Connection points specified in description. Attributes provided: Connectivity to power Attributes required: I/O drawer **For 9119-FHA (#6945)** ▶ Minimum required: 0 ▶ Maximum allowed: 2 (Initial order maximum: 2) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No

#6946	**#6946 UPIC Cable Group, BPD2 to I/O Drawer at Z09 UPIC CBL GRP, BPD2 TO I/O DRWR AT Z09** Cable group specify for connecting I/O drawer to power supply. Connection points specified in description. Attributes provided: Connectivity to power Attributes required: I/O drawer **For 9119-FHA (#6946)** ► Minimum required: 0 ► Maximum allowed: 2 (Initial order maximum: 2) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: No ► Return parts MES: No
#6947	**#6947 UPIC Y-Cable Group, BPD2 to I/O Drawer at Z13 UPIC Y-CBL GRP, BPD2 TO I/O DRWR AT Z13** Cable group specify for connecting I/O drawer to power supply. Connection points specified in description. Attributes provided: Connectivity to power Attributes required: I/O drawer **For 9119-FHA (#6947)** ► Minimum required: 0 ► Maximum allowed: 2 (Initial order maximum: 2) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: No ► Return parts MES: No
#6948	**#6948 UPIC Y-Cable Group, BPD2 to I/O Draw at Z17 UPIC Y-CBL GRP, BPD2 TO I/O DRWR AT Z17** Cable group specify for connecting I/O drawer to power supply. Connection points specified in description. Attributes provided: Connectivity to power. Attributes required: I/O drawer. **For 9119-FHA (#6948)** ► Minimum required: 0 ► Maximum allowed: 2 (Initial order maximum: 2) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: No ► Return parts MES: No
#6949	**#6949 UPIC Y-Cable Group, BPD2 to I/O Draw at Z21 UPIC Y-CBL GRP, BPD2 TO I/O DRWR AT Z21** Cable group specify for connecting I/O drawer to power supply. Connection points specified in description. Attributes provided: Connectivity to power Attributes required: I/O drawer **For 9119-FHA (#6949)** ► Minimum required: 0 ► Maximum allowed: 2 (Initial order maximum: 2) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: No ► Return parts MES: No

#6950	**#6950 UPIC Y-Cable Group, BPD2 to I/O Drawer at Z25 UPIC Y-CBL GRP, BPD2 TO I/O DRWR AT Z25** Cable group specify for connecting I/O drawer to power supply. Connection points specified in description. Attributes provided: Connectivity to power Attributes required: I/O drawer **For 9119-FHA (#6950)** ▶ Minimum required: 0 ▶ Maximum allowed: 2 (Initial order maximum: 2) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#6952	**#6952 3rd & 4th AMDs + UPIC Y-Cable Group (BPC TO Fans)** Cable group specify for connecting Bulk Power Controller to Fans. Attributes provided: Connectivity to power. Attributes required: Fan Assembly. **For 9119-FHA (#6952)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#6953	**#6953 Nonpowered, Bolt-on Expansion Rack, 24-in** Provides a 24 inch, 42 U nonpowered expansion rack that bolts onto the Powered Expansion Rack, #6954. Attributes provided: Bolt-on, nonpowered Expansion Rack Attributes required: None **For 9119-FHA (#6953)** ▶ Minimum required: 0 ▶ Maximum allowed: 2 (Initial order maximum: 2) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#6954	**#6954 Powered Expansion Rack, 24-in** Provides a 24 inch, 42U powered expansion rack. The power subsystem resides in the upper 8U of the rack and utilizes the same power components provided in the CEC rack. Attributes provided: Powered Expansion Rack Attributes required: None **For 9119-FHA (#6954)** ▶ Minimum required: 0 ▶ Maximum allowed: 2 (Initial order maximum: 2) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No

#6961	**#6961 UPIC Y-Cable Group, BPD1 to 1st Processor Node (P9)** Cable group specify for connecting processor node to power supply. Attributes provided: Connectivity to power. Attributes required: Processor Book **For 9119-FHA (#6961)** ▸ Minimum required: 0 ▸ Maximum allowed: 1 (Initial order maximum: 1) ▸ OS level required: Not applicable ▸ Initial Order/MES/Both/Supported: Both ▸ CSU: No ▸ Return parts MES: No
#6962	**6962 UPIC Y-Cable Group, BPD1 to 2nd Processor Node (P5)** Cable group specify for processor node to power supply. Attributes provided: Connectivity to power. Attributes required: Processor Book **For 9119-FHA (#6962)** ▸ Minimum required: 0 ▸ Maximum allowed: 1 (Initial order maximum: 1) ▸ OS level required: Not applicable ▸ Initial Order/MES/Both/Supported: Both ▸ CSU: No ▸ Return parts MES: No
#6963	**#6963 UPIC Y-Cable Group, BPD1 to 3rd Processor Node (P6)** Cable group specify for connecting processor node to power supply. Attributes provided: Connectivity to power. Attributes required: Processor Book **For 9119-FHA (#6963)** ▸ Minimum required: 0 ▸ Maximum allowed: 1 (Initial order maximum: 1) ▸ OS level required: Not applicable ▸ Initial Order/MES/Both/Supported: Both ▸ CSU: No ▸ Return parts MES: No
#6964	**#6964 UPIC Y-Cable Group, BPD1 to 4th Processor Node (P2)** Cable group specify for connecting processor node to power supply. Attributes provided: Connectivity to power. Attributes required: Processor Book **For 9119-FHA (#6964)** ▸ Minimum required: 0 ▸ Maximum allowed: 1 (Initial order maximum: 1) ▸ OS level required: Not applicable ▸ Initial Order/MES/Both/Supported: Both ▸ CSU: No ▸ Return parts MES: No

#6965	**#6965 UPIC Y-Cable Group, BPD2 to 5th Processor Node (P7)** Cable group specify for connecting processor node to power supply. Attributes provided: Connectivity to power. Attributes required: Processor Book **For 9119-FHA (#6965)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#6966	**6966 UPIC Y-Cable Group, BPD2 to 6th Processor Node (P8)** Cable group specify for connecting processor node to power supply. Attributes provided: Connectivity to power. Attributes required: Processor Book **For 9119-FHA (#6966)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#6967	**#6967 UPIC Y-Cable Group, BPD2 to 7th Processor Node (P3)** Cable group specify for connecting processor node to power supply. Attributes provided: Connectivity to power. Attributes required: Processor Book **For 9119-FHA (#6967)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#6968	**#6968 UPIC Y-Cable Group, BPD2 to 8th Processor Node (P4)** Cable group specify for connecting processor node to power supply. Attributes provided: Connectivity to power. Attributes required: Processor Book **For 9119-FHA (#6968)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No

#6969	**#6969 UPIC Y-Cable Group, BPD1 to I/O Drawer at A13** Cable group specify for connecting I/O drawer to power supply. Connection points specified in description. Attributes provided: Connectivity to power. Attributes required: I/O Drawer **For 9119-FHA (#6969)** ▶ Minimum required: 0 ▶ Maximum allowed: 2 (Initial order maximum: 2) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#6970	**#6970 UPIC Y-Cable Group, BPD1 to I/O Drawer at A17** Cable group specify for connecting I/O drawer to power supply. Connection points specified in description. Attributes provided: Connectivity to power. Attributes required: I/O Drawer **For 9119-FHA (#6970)** ▶ Minimum required: 0 ▶ Maximum allowed: 2 (Initial order maximum: 2) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#6971	**#6971 UPIC Y-Cable Group, BPD1 to I/O Drawer at A21** Cable group specify for connecting I/O drawer to power supply. Connection points specified in description. Attributes provided: Connectivity to power. Attributes required: I/O Drawer **For 9119-FHA (#6971)** ▶ Minimum required: 0 ▶ Maximum allowed: 2 (Initial order maximum: 2) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#6972	**#6972 UPIC Y-Cable Group, BPD1 to I/O Drawer at A25** Cable group specify for connecting I/O drawer to power supply. Connection points specified in description. Attributes provided: Connectivity to power. Attributes required: I/O Drawer **For 9119-FHA (#6972)** ▶ Minimum required: 0 ▶ Maximum allowed: 2 (Initial order maximum: 2) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No

#7049	**#7049 8/16 GB (4 x 4 GB) DIMMs, CUoD, 8 GB Active, 200 MHz DDR1** (No longer available as of 21 March 2008.) Provides 16384 MB of system memory with four 4096 MB DIMMs. 8192 MB of the memory is active. It is used to provide memory Capacity Upgrade on Demand. Attributes provided: 16384 MB of memory, with 8192 MB active Attributes required: Four empty DDR1 memory DIMM positions **For 9117-MMA (#7049)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see converted to feature number in Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES: Does not apply
#7053	**#7053 - CBU Edition for #4922** Provides a Capacity BackUp Edition for a POWER6 570 with server feature #4922 (1/4-way). Attributes provided: Model 570 Capacity BackUp Edition Attributes required: Server Feature #4922 **For 9406-MMA (#7053)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: No
#7058	**#7058 - CBU Edition for #4923** Provides a Capacity BackUp Edition for a POWER6 570 with server feature #4923 (1/8-way). Attributes provided: Model 570 Capacity BackUp Edition Attributes required: Server Feature #4923 **For 9406-MMA (#7058)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: No
#7063	**#7063 - CBU Edition for #4924** Provides a Capacity BackUp Edition for a POWER6 570 with server feature #4924 (2/16-way). Attributes provided: Model 570 Capacity BackUp Edition Attributes required: Server Feature #4924 **For 9406-MMA (#7063)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: No

#7099	**#7099 Cable Restraint Hardware - excess Service Interface Cable** Provides the hardware necessary to secure the Service Interface Cable connectors that are not attached to a CEC enclosure. This feature is required when a system is ordered with a Service Interface Cable that is larger than the system configuration that is being ordered. On Initial system orders with a 7014 rack, an equal quantity of feature #9570 must be ordered with this feature to secure space to mount t he cable restraint hardware. If this feature is ordered on a system order without a rack, 4 EIA of space must be reserved in the customers rack to mount this feature. Attributes provided: Service Interface Cable restraint hardware Attributes required: Service Interface Cable larger than the System Configuration **For 9117-MMA (#7099)** ▸ Minimum required: 0 ▸ Maximum allowed: 3 (Initial order maximum: 3) ▸ OS level required: None ▸ Initial Order/MES/Both/Supported: Both ▸ CSU: Yes ▸ Return parts MES: No **Note**: This feature does not have a minimum firmware requirement. However, it will be necessary to upgrade the system firmware to EM320_051 or later before adding a CEC enclosure without first powering the system down.
#7109	**#7109 Intelligent PDU+, 1 EIA Unit, Universal UTG0247 Connector** This feature is for an intelligent ac power distribution unit (PDU+) that will allow the user to monitor the amount of power being used by the devices that are plugged in to this PDU+. This ac power distribution unit provides twelve C13 power outlets. It receives power through a UTG0247 connector. It can be used for many different countries and applications by varying the PDU to Wall Power Cord, which must be ordered separately. Each PDU requires one PDU to Wall Power Cord. Supported power cords include the following features: #6489, #6491, #6492, #6653, #6654, #6655, #6656, #6657, and #6658. Attributes provided: Twelve C13 outlets with Power Monitoring Capability Attributes required: PDU to Wall power cord **For 9117-MMA (#7109)** ▸ Minimum required: 0 ▸ Maximum allowed: no max (Initial order maximum: 0) ▸ OS level required: None **For 9119-FHA (#7109)** ▸ Minimum required: 0 ▸ Maximum allowed: 4 (Initial order maximum: 4) ▸ OS level required: Not applicable Initial Order/MES/Both/Supported: MES CSU: Yes Return parts MES: No **Note**: When purchased on an MES order with a feature code rack. This PDU will be mounted in the rear side pockets until all 4 side pockets on the rack have been filled. Any additional PDUs on the order will be mounted in 1 unit of EIA rack space. When purchased as an MES order for addition to a rack in the field. This PDU might not fit in the side pockets of your rack due to a hardware interference with the rack and might require mounting in 1 unit of rack EIA space. Insure rack space is available before placing the MES order for this PDU when it is being ordered for field installation.

#7164	**#7164 IBM/OEM Rack-mount Drawer Rail Kit - Adjustable Depth** Provides a rack rail kit used to install a rack-mount system in an IBM 19 inch rack or some OEM 19 inch racks. Adjustable mounting range of the rail is 20.5 inches (521 mm) to 30 inches (762 mm). Attributes provided: Rack rail kit Attributes required: Rack mountable system **For 9117-MMA (#7164)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: no max) ► OS level required: None ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No **Note**: One maximum for each CEC enclosure.
#7165	**#7165 OEM Rack-mount Drawer Rail Kit** Provides a adjustable depth rack rail kit used to install a rack-mount system in an OEM 19 inch rack. Attributes provided: Rack rail kit Attributes required: Rack-mountable system **For 9117-MMA (#7165)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No

#7188	**#7188 Power Distribution Unit** An ac Power Distribution Unit (PDU) which mounts in a 19 inch rack and provides twelve C13 power outlets. The #7188 has six 16A circuit breakers, with two power outlets per circuit breaker. System units or expansion units must use a power cord with a C14 plug to connect to the #7188. One of the following line cords must be used to distribute power from a wall outlet to the #7188; ▶ #6489 - 14-ft 3PH/24A Power Cord ▶ #6491 - 14-ft 1PH/63A Pwr Cord ▶ #6492 - 14-ft 1PH/48-60A Pwr Cord ▶ #6653 - 14-ft 3PH/16A Power Cord ▶ #6654 - 14-ft 1PH/24-30A Pwr Cord ▶ #6655 - 14-ft 1PH/24-30A WR Pwr Cord ▶ #6656 - 14-ft 1PH/32A Power Cord ▶ #6657 - 14-ft 1PH/24A Power Cord ▶ #6658 - 14-ft 1PH/24A Pwr Cd-Korea Attributes provided: Power Distribution Unit with 12 C13 power outlets. Attributes required: 19 inch Rack **For 9117-MMA (#7188)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: no max) ▶ OS level required: Not applicable **For 9119-FHA (#7188)** ▶ Minimum required: 0 ▶ Maximum allowed: 4 (Initial order maximum: 4) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: MES CSU: Yes Return parts MES: No
#7204	**#7204 Quantity 150 of #2124** Ships a quantity of 150 #2124 1m SCSI Cables. The configurator can either generate this feature or allow users to select this feature as they would any other single SCSI cable feature. This feature remains on the inventory records. Attributes provided: Quantity 150 of #2124 1m SCSI Cable Attributes required: Appropriate number of SCSI disk adapters and DASD expansion units **For 9117-MMA (#7204)** ▶ Minimum required: 0 ▶ Maximum allowed: 57 (Initial order maximum: 57) ▶ OS level required: Not applicable **For 9119-FHA (#7204)** ▶ Minimum required: 0 ▶ Maximum allowed: No max (Initial order maximum: No max) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#7205	**#7205 Quantity 150 of #2125** Ships a quantity of 150 #2125 3m SCSI Cables. The configurator can either generate this feature or allow users to select this feature as they would any other single SCSI cable feature. This feature remains on the inventory records. Attributes provided: Quantity 150 of #2125 3m SCSI Cable Attributes required: Appropriate number of SCSI disk adapters and DASD expansion units **For 9117-MMA (#7205)** ▶ Minimum required: 0 ▶ Maximum allowed: 57 (Initial order maximum: 57) ▶ OS level required: Not applicable **For 9119-FHA (#7205)** ▶ Minimum required: 0 ▶ Maximum allowed: No max (Initial order maximum: No max) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#7206	**#7206 Quantity 150 of #2126** Ships a quantity of 150 #2126 5 m SCSI Cables. The configurator can either generate this feature or allow users to select this feature as they would any other single SCSI cable feature. This feature remains on the inventory records. Attributes provided: Quantity 150 of #2126 5 m SCSI Cable Attributes required: Appropriate number of SCSI disk adapters and DASD expansion units **For 9117-MMA (#7206)** ▶ Minimum required: 0 ▶ Maximum allowed: 57 (Initial order maximum: 57) ▶ OS level required: Not applicable **For 9119-FHA (#7206)** ▶ Minimum required: 0 ▶ Maximum allowed: No max (Initial order maximum: No max) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No

#7207	**#7207 Quantity 150 of #2127** Ships a quantity of 150 #2127 10 m SCSI Cables. The configurator can either generate this feature or allow users to select this feature as they would any other single SCSI cable feature. This feature remains on the inventory records. Attributes provided: Quantity 150 of #2127 10 m SCSI Cable Attributes required: Appropriate number of SCSI disk adapters and DASD expansion units **For 9117-MMA (#7207)** ► Minimum required: 0 ► Maximum allowed: 57 (Initial order maximum: 57) ► OS level required: Not applicable **For 9119-FHA (#7207)** ► Minimum required: 0 ► Maximum allowed: No max (Initial order maximum: No max) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No
#7208	**#7208 Quantity 150 of #2128** Ships a quantity of 150 #2128 20 m SCSI Cables. The configurator can either generate this feature or allow users to select this feature as they would any other single SCSI cable feature. This feature remains on the inventory records. Attributes provided: Quantity 150 of #2128 20 m SCSI Cable Attributes required: Appropriate number of SCSI disk adapters and DASD expansion units **For 9117-MMA (#7208)** ► Minimum required: 0 ► Maximum allowed: 57 (Initial order maximum: 57) ► OS level required: Not applicable **For 9119-FHA (#72058** ► Minimum required: 0 ► Maximum allowed: No max (Initial order maximum: No max) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Both CSU: Yes Return parts MES: No

#7213	**#7213 Quantity 150 of #2138**
	Ships a quantity of 150 #2138 0.55m SCSI Cables. The configurator can either generate this feature or allow users to select this feature as they would any other single SCSI cable feature. This feature remains on the inventory records.
	Attributes provided: Quantity 150 of #2138 0.55m SCSI Cable
	Attributes required: Appropriate number of SCSI disk adapters and DASD expansion units
	For 9117-MMA (#7213)
	▶ Minimum required: 0
	▶ Maximum allowed: 57 (Initial order maximum: 57)
	▶ OS level required: Not applicable
	For 9119-FHA (#7213
	▶ Minimum required: 0
	▶ Maximum allowed: No max (Initial order maximum: No max)
	▶ OS level required: Not applicable
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No
#7234	**#7234 On/Off Proc CoD Billing, 1 Proc-Day, for #4694**
	Provides 1 day of on/off processor billing for 4.2 GHz Processor Book #4694.
	Attributes provided: Payment for temporary use of processor #4694
	Attributes required: At least one processor #4694 that is not permanently active
	For 9119-FHA (#7234)
	▶ Minimum required: 0
	▶ Maximum allowed: NO MAX (Initial order maximum: 255)
	▶ OS level required:
	– AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	– AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	– AIX Version 5.3 with the 5300-08 Technology Level or later
	– AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	– AIX Version 6.1 with the 6100-01 Technology Level or later
	– IBM i 5.4 with V5R4M5 machine code
	– IBM i 6.1 or later
	– SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	– Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: Yes
	▶ Return parts MES: Does not apply

| #7244 | **#7244 On/Off Proc CoD Billing, 1 Proc-Day, for #4695**
Provides 1 day of on/off processes billing for 5.0 GHz Processor Book #4695.

Attributes provided: Payment for temporary use of processor #4695
Attributes required: At least one processor #4695 that is not permanently active

For 9119-FHA (#7244)
► Minimum required: 0
► Maximum allowed: NO MAX (Initial order maximum: 255)
► OS level required:
  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
  – AIX Version 5.3 with the 5300-08 Technology Level or later
  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
  – AIX Version 6.1 with the 6100-01 Technology Level or later
  – IBM i 5.4 with V5R4M5 machine code
  – IBM i 6.1 or later
  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 or later
  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 or later
  Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
► Initial Order/MES/Both/Supported: MES
► CSU: Yes
► Return parts MES: Does not apply |
| #7262 | **#7262 Quantity 150 of #1292**
Ships a quantity of 150 #1292 300 GB disk units. The configurator can either generate this feature or allow users to select this feature as they would any other single disk unit feature. This feature remains on the inventory records.

Attributes provided: Quantity of 150 #1292 300 GB disk units
Attributes required: See feature #1292

For 9406-MMA (#7262)
► Minimum required: 0
► Maximum allowed: 57 (Initial order maximum: 57)
► OS level required:
  – AIX 5L for POWER V5.2 for IBM eServer or later
  – Red Hat Enterprise Linux AS for POWER Version 4, with quarterly update 3 or later
  – SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later
► Initial Order/MES/Both/Supported: Both
► CSU: Yes |

#7272	**#7272 2 GB CUoD Memory Activation**
	Provides 2 GB permanent memory activations for POWER6 DDR2 memory on a Power 570. Memory activations are stored in the system, not on the memory card providing system configuration flexibility. If memory is moved to a different system, the activations remain with the original system.
	
	Attributes provided: 2 GB memory activation
	Attributes required: inactive DDR2 POWER6 Memory.
	
	For 9117-MMA (#7272)
	► Minimum required: 0
	► Maximum allowed: 384 (Initial order maximum: 250)
	► OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes
	► Return parts MES: No

#7273	**#7273 4 GB CUoD Memory Activation**
	Provides 4 GB permanent memory activations for POWER6 DDR2 memory on a Power 570. Memory activations are stored in the system, not on the memory card providing system configuration flexibility. If memory is moved to a different system, the activations remain with the original system.
	
	Attributes provided: 4 GB memory activation
	Attributes required: inactive DDR2 POWER6 Memory.
	
	For 9117-MMA (#7273)
	► Minimum required: 0
	► Maximum allowed: 192 (Initial order maximum: 192)
	► OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes
	► Return parts MES: No

#7274	**#7274 8 GB CUoD Memory Activation**
	Provides 8 GB permanent memory activations for POWER6 DDR2 memory on a Power 570. Memory activations are stored in the system, not on the memory card providing system configuration flexibility. If memory is moved to a different system, the activations remain with the original system.
	Attributes provided: 8 GB memory activation Attributes required: inactive DDR2 POWER6 Memory.
	For 9117-MMA (#7274) ▶ Minimum required: 0 ▶ Maximum allowed: 96 (Initial order maximum: 96) ▶ OS level required: – AIX 5.2 TL10 or later – AIX 5.3 TL6 or later – IBM i 5.4 with V5R4M5 machine code or later For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to: http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No
#7275	**#7275 16 GB CUoD Memory Activation**
	Provides 16 GB permanent memory activations for POWER6 DDR2 memory on a Power 570. Memory activations are stored in the system, not on the memory card providing system configuration flexibility. If memory is moved to a different system, the activations remain with the original system.
	Attributes provided: 16 GB memory activation Attributes required: inactive DDR2 POWER6 Memory.
	For 9117-MMA (#7275) ▶ Minimum required: 0 ▶ Maximum allowed: 48 (Initial order maximum: 48) ▶ OS level required: – AIX 5.2 TL10 or later – AIX 5.3 TL6 or later – IBM i 5.4 with V5R4M5 machine code or later For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to: http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No

#7276	**#7276 32 GB CUoD Memory Activation**
	Provides 32 GB permanent memory activations for POWER6 DDR2 memory on a Power 570. Memory activations are stored in the system, not on the memory card providing system configuration flexibility. If memory is moved to a different system, the activations remain with the original system.
	
	Attributes provided: 32 GB memory activation
	Attributes required: inactive DDR2 POWER6 Memory.
	
	For 9117-MMA (#7276)
	▶ Minimum required: 0
	▶ Maximum allowed: 24 (Initial order maximum: 24)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No

#7280	**#7280 256 GB Memory Activations for #4500, #4501, #4502 and #4503 Memory Cards**
	This feature permanently activates 256 GB of DDR2 memory. Memory activations are stored in the system, not on the memory card. If DDR2 memory is moved to a different server, the DDR2 activations remain with the original system.
	
	Attributes provided: 256 GB memory activations for #4500, #4501, #4502, and #4503 DDR2 memory cards
	Attributes required: Unactivated DDR2 memory
	
	For 9119-FHA (#7280)
	▶ Minimum required: 0
	▶ Maximum allowed: 64 (Initial order maximum: 0)
	▶ OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	  Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	▶ Initial Order/MES/Both/Supported: Supported
	▶ CSU: Yes
	▶ Return parts MES: Does not apply

#7300	**#7300 System Drawer Enclosure with Bezel**
	Provides the chassis and IBM Bezel for a single drawer of the system.
	Attributes provided: Chassis for one system drawer
	Attributes required: None
	For 9117-MMA (#7300)
	▶ Minimum required: 0
	▶ Maximum allowed: 0 (Initial order maximum: 0)
	▶ OS level required: None
	▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see converted to feature number in Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909.
	▶ CSU: Not applicable
	▶ Return parts MES: Does not apply
#7305	**#7305 SDI Software Pre-Install Indicator**
	Software pre-install indicator for SDI.
	Attributes provided: Software Preinstall
	Attributes required: SDI Order
	For 9117-MMA (#7305)
	▶ Minimum required: 0
	▶ Maximum allowed: 1 (Initial order maximum: 1)
	▶ OS level required:
	– AIX 5.2 TL10 or later
	– AIX 5.3 TL6 or later
	– SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 1 or later
	– Red Hat Enterprise Linux V4.5 and Red Hat Enterprise Linux V 5.1 or later
	▶ Initial Order/MES/Both/Supported: Initial
	▶ CSU: Not applicable
	▶ Return parts MES: No
#7307	**#7307 Dual I/O Unit Enclosure**
	The #7307 enclosure provides the mounting hardware, with adjustable rails, required to install a #5790 I/O drawer in a #0551, #0553, #0554, or #0555 rack. The enclosure can accommodate two #5790 drawers, side by side, but it can also be used with only one #5790 drawer installed.
	The #7307 and #7311 are functionally equivalent except the #7307 can be used in the #0554 and #0555 racks and has rails adjustable to 29.25 inches depth.
	Attributes provided: Rack mounting for two #5790 drawers
	Attributes required: Four EIA units of rack space in a #0551, #0553, #0554 or #0555 rack
	For 9117-MMA (#7307)
	▶ Minimum required: 0
	▶ Maximum allowed: 24 (Initial order maximum: 24)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	For 9119-FHA (#7307)
	▶ Minimum required: 0
	▶ Maximum allowed: 128 (Initial order maximum: 128)
	▶ OS level required: Not applicable
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No

#7311-D11	**#7311-D11 Dual I/O Unit Enclosure**
	(No Longer orderable as of June 1, 2006)
	
	The #7311 enclosure provides the mounting hardware required to install a #5790 I/O drawer in a #0551 or #0553 rack. The enclosure can accommodate two #5790 drawers, side by side, but it can also be used with only one #5790 drawer installed.
	
	Attributes provided: Rack mounting for two #5790 drawers
	Attributes required: Four EIA units of rack space in a #0551or #0553 rack
	
	For 9117-MMA (#7311)
	► Minimum required: 0
	► Maximum allowed: 24 (Initial order maximum: 0)
	► OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	
	For information about support on Red Hat Enterprise, Linux, and SUSE Linux, refer to:
	http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	
	For 9119-FHA (#7311)
	► Minimum required: 0
	► Maximum allowed: 128 (Initial order maximum: 128)
	► OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	
	For information about support on Red Hat Enterprise, Linux, and SUSE Linux refer to:
	http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#7311-D20	**7311-D20 Rack Mounted High Density Expansion Drawer** The 7311-D20 Expansion Drawer is a 4 EIA unit (4U) drawer and mounts in a 19-in rack. It is 24 inches long and can weigh up to 101 lb. The high density expansion drawer provides additional adapter slots and SCSI disk slots as remote I/O. There are seven hot-swap PCI-X 64-bit, 133 MHz, 3.3 volt I/O slots and twelve optional hot-swap disk drive bays. The drawer includes redundant power and cooling. The fans, power supplies, and PCI adapters, are top-accessible while the disk drives are front-accessible for easy service and maintenance. The D20 attaches to a host system processor (CEC) enclosure with a RIO-2 adapter. Operating System Support: ► AIX 5.2 TL10 or later ► AIX 5.3 TL6 or later For information about support on Red Hat Enterprise, Linux, and SUSE Linux, refer to: http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument

#7314-G30	**#7314-G30 I/O Drawer Mounting Enclosure**
	This enclosure is required to mount the 7314-G30 I/O drawer in a 19 inch rack. It will accommodate one or two 7314-G30 I/O drawer side by side in the same 4 EIA space in the rack. This feature contains the hardware required for mounting in a 7014 rack.
	
	Attributes provided: 19 inch rack mounting hardware and I/O module enclosure.
	Attributes required: 4 EIA of space in a 7014 rack.
	
	For 9117-MMA (#7314)
	► Minimum required: 0
	► Maximum allowed: 16 (Initial order maximum: 16)
	► OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	► Initial Order/MES/Both/Supported: Both
	► CSU: Yes
	► Return parts MES: No

#7380	**#7380 4.7 GHz Proc Card, 0/2 Core POWER6, 12 DDR2 Memory Slots**
	Dual-core 4.7 GHz POWER6 CUoD processor card. The two processors in this feature each have 4 MB of L2 cache and share 32 MB of L3 cache. There are 12 DDR2 DIMM slots on the processor card which can be used without activating the processors. Permanent activation of the processors requires purchase of the activation FC 5403.
	
	Attributes provided: Two 4.7 GHz Processors (inactive) on 1 Card
	Attributes required: Available processor slot
	
	For 9117-MMA (#7380)
	► Minimum required: 0
	► Maximum allowed: 8 (Initial order maximum: 8)
	► OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – AIX 6.1 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 1 or later
	  – Red Hat Enterprise Linux V4.5 and Red Hat Enterprise Linux V5.1 or later
	► Initial Order/MES/Both/Supported: Both
	► CSU: No
	► Return parts MES: No
	
	Note: Two maximum in each CEC enclosure

#7504	**#7504 Quantity 150 of #4319**
	(No longer available as of 30 August 2005.)
	
	This feature ships a quantity of 150 #4319 disk units. The configurator can either generate this feature or allow users to select this feature as they would any other single disk unit feature. This feature remains on the inventory records.
	
	Attributes provided: see feature #4319
	Attributes required: see feature #4319
	
	For 9117-MMA (#7504)
	► Minimum required: 0
	► Maximum allowed: 9 (Initial order maximum: 0)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#7504)
	► Minimum required: 0
	► Maximum allowed: 3 (Initial order maximum: 0)
	► OS level required:
	   – IBM i 5.4 with V5R4M5 machine code
	   – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#7508	**#7508 Quantity 150 of #4326**
	(No longer available as of 08 May 2007.)
	
	This feature ships a quantity of 150 #4326 disk units. The configurator can either generate this feature or allow users to select this feature as they would any other single disk unit feature. This feature remains on the inventory records.
	
	Attributes provided: see feature #4326
	Attributes required: see feature #4326
	
	For 9117-MMA (#7508)
	► Minimum required: 0
	► Maximum allowed: 9 (Initial order maximum: 0)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#7508)
	► Minimum required: 0
	► Maximum allowed: 3 (Initial order maximum: 0)
	► OS level required:
	   – IBM i 5.4 with V5R4M5 machine code
	   – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Supported
	CSU: Yes
	Return parts MES: No

#7509	**#7509 Quantity 150 of #4327**
	(No longer available as of 30 January 2009.)
	
	This feature ships a quantity of 150 #4327 disk units. The configurator can either generate this feature or allow users to select this feature as they would any other single disk unit feature. This feature remains on the inventory records.
	
	Attributes provided: see feature #4327
	Attributes required: see feature #4327
	
	For 9117-MMA (#7509)
	► Minimum required: 0
	► Maximum allowed: 9 (Initial order maximum: 9)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#7509)
	► Minimum required: 0
	► Maximum allowed: 3 (Initial order maximum: 3)
	► OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No

#7510	**#7510 Quantity 150 of #4328**
	Ships a quantity of 150 #4328 141.12 GB disk units. The configurator can either generate this feature or allow users to select this feature as they would any other single disk unit feature. This feature remains on the inventory records.
	
	Attributes provided: see feature #4328
	Attributes required: See feature #4328
	
	For 9117-MMA (#7510)
	► Minimum required: 0
	► Maximum allowed: 9 (Initial order maximum: 9)
	► OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#7510)
	► Minimum required: 0
	► Maximum allowed: 1 (Initial order maximum: 1)
	► OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No

#7511	**#7511 Quantity 150 of #4329**
	(No longer available as of 30 January 2009.)
	
	Ships a quantity of 150 #4329 280.25 GB disk units. The configurator can either generate this feature or allow users to select this feature as they would any other single disk unit feature. This feature remains on the inventory records.
	
	Attributes provided: see feature #4329
	Attributes required: See feature #4329
	
	For 9117-MMA (#7511)
	▶ Minimum required: 0
	▶ Maximum allowed: 9 (Initial order maximum: 9)
	▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later
	
	For 9119-FHA (#7511)
	▶ Minimum required: 0
	▶ Maximum allowed: 9 (Initial order maximum: 9)
	▶ OS level required:
	  – IBM 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No

#7512	**#7512 - Quantity 150 of #0300** Indicates a quantity of 150 #0300 connections. The marketing configurator can either generate this feature or allow users to select this feature. This feature remains on the inventory records. Attributes provided: Quantity 150 of #0300 Attributes required: See feature #0300 **For 9406-MMA (#7512)** ▶ Minimum required: 0 ▶ Maximum allowed: 229 (Initial order maximum: 229) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes
#7513	**#7513 - Quantity 150 of #0301** Indicates a quantity of 150 #0301 connections. The marketing configurator can either generate this feature or allow users to select this feature. This feature remains on the inventory records. Attributes provided: Quantity 150 of #0301 Attributes required: See feature #0301 **For 9406-MMA (#7513)** ▶ Minimum required: 0 ▶ Maximum allowed: 229 (Initial order maximum: 229) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes

#7514	**#7514 Quantity 150 of #5741**
	Ships a quantity 150 #5741 EXP24 6 Disk Slot Enabler. The configurator can either generate this feature or allow users to select this feature as they would select a single EXP24 6 Disk Slot Enabler feature. This feature remains on the inventory records.
	
	Attributes provided: Quantity 150 of #5741 EXP24 6 Disk Slot Enabler
	Attributes required: See feature #5741
	
	For 9117-MMA (#7514)
	▶ Minimum required: 0
	▶ Maximum allowed: 2 (Initial order maximum: 2)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	
	For information about support on Red Hat Enterprise, Linux, and SUSE Linux, refer to:
	http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	
	For 9119-FHA (#7514)
	▶ Minimum required: 0
	▶ Maximum allowed: 1 (Initial order maximum: 1)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	
	Initial Order/MES/Both/Supported: Both
	CSU: Yes
	Return parts MES: No

#7515	**#7515 Quantity 150 of #5742**
	Ships a quantity 150 #5742 EXP24 6/12 Disk Slot Enabler. The configurator can either generate this feature or allow users to select this feature as they would select a single EXP24 6/12 Disk Slot Enabler feature. This feature remains on the inventory records.
	
	Attributes provided: Quantity 150 of #5742 EXP24 6/12 Disk Slot Enabler
	Attributes required: See feature #5742
	
	For 9119-FHA (#7515)
	▶ Minimum required: 0
	▶ Maximum allowed: 1 (Initial order maximum: 1)
	▶ OS level required:
	  – IBM i 5.4 with V5R4M5 machine code
	  – IBM i 6.1 or later
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No

#7516	**#7516 - Quantity 150 of #1269** Ships a quantity of 150 #1269 282.25 GB disk units. The configurator can either generate this feature or allow users to select this feature as they would any other single disk unit feature. This feature remains on the inventory records. Attributes provided: Quantity 150 #1269 282.25GB disk units Attributes required: See feature #1269 **For 9406-MMA (#7516)** ▶ Minimum required: 0 ▶ Maximum allowed: 9 (Initial order maximum: 9) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes
#7517	**#7517 Quantity 150 of #3676** (No longer available as of 28 November 2008.) This feature ships a quantity of 150 #3676 disk units. The configurator can either generate this feature or allow users to select this feature as they would any other single disk unit feature. This feature remains on the inventory records. Attributes provided: see feature #3676 Attributes required: see feature #3676 **For 9117-MMA (#7517)** ▶ Minimum required: 0 ▶ Maximum allowed: 8 (Initial order maximum: 8) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No
#7518	**#7518)Quantity 150 of #3677** This feature ships a quantity of 150 #3677 disk units. The configurator can either generate this feature or allow users to select this feature as they would any other single disk unit feature. This feature remains on the inventory records. Attributes provided: see feature #3677 Attributes required: see feature #3677 **For 9117-MMA (#7518)** ▶ Minimum required: 0 ▶ Maximum allowed: 8 (Initial order maximum: 8) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No

#7519	**#7519 Quantity 150 of #3678** This feature ships a quantity of 150 #3678 disk units. The configurator can either generate this feature or allow users to select this feature as they would any other single disk unit feature. This feature remains on the inventory records. Attributes provided: see feature #3678 Attributes required: see feature #3678 **For 9117-MMA (#7519)** ► Minimum required: 0 ► Maximum allowed: 8 (Initial order maximum: 8) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes ► Return parts MES: No
#7520	**#7520 - Quantity 150 of #1266** (No longer available as of 08 May 2007.) Ships a quantity of 150 #1266 35.16 GB disk units. The configurator can either generate this feature or allow users to select this feature as they would any other single disk unit feature. This feature remains on the inventory records. Attributes provided: Quantity of 150 #1266 35.16 GB disk units Attributes required: See feature #1266 **For 9406-MMA (#7520)** ► Minimum required: 0 ► Maximum allowed: 9 (Initial order maximum: 0) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes
#5721	**#7521 Quantity 150 of #1267** Ships a quantity of 150 #1267 70.56 GB disk units. The configurator can either generate this feature or allow users to select this feature as they would any other single disk unit feature. This feature remains on the inventory records. Attributes provided: Quantity of 150 #1267 70.56 GB disk units Attributes required: See feature #1267 **For 9406-MMA (#7521)** ► Minimum required: 0 ► Maximum allowed: 9 (Initial order maximum: 9) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes

#7522	**#7522 Quantity 150 of #1268** Ships a quantity of 150 #1268 141.12 GB disk units. The configurator can either generate this feature or allow users to select this feature as they would any other single disk unit feature. This feature remains on the inventory records. Attributes provided: Quantity of 150 #1268 141.12 GB disk units Attributes required: See feature #1268 **For 9406-MMA (#7522)** ► Minimum required: 0 ► Maximum allowed: 9 (Initial order maximum: 9) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes

#7525	**(#7525) - Quantity 150 of #1294**
	(No longer available as of 08 May 2007.)
	
	Ships a quantity of 150 #1294 73.4 GB disk units. The configurator can either generate this feature or allow users to select this feature as they would any other single disk unit feature. This feature remains on the inventory records.
	
	Attributes provided: Quantity of 150 #1294 73.4 GB disk units
	Attributes required: See feature #1294
	
	For 9406-MMA (#7525)
	► Minimum required: 0
	► Maximum allowed: 9 (Initial order maximum: 0)
	► OS level required:
	  – AIX 5L for POWER V5.2 for IBM eServer or later
	  – Red Hat Enterprise Linux AS for POWER Version 4 with quarterly update 3 or later
	  – SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes

#7526	**#7526 - Quantity 150 of #1295**
	(No longer available as of 08 May 2007.)
	
	Ships a quantity of 150 #1295 146.8 GB disk units. The configurator can either generate this feature or allow users to select this feature as they would any other single disk unit feature. This feature remains on the inventory records.
	
	Attributes provided: Quantity of 150 #1295 146.8 GB disk units
	Attributes required: See feature #1295
	
	For 9406-MMA (#7526)
	► Minimum required: 0
	► Maximum allowed: 9 (Initial order maximum: 0)
	► OS level required:
	  – AIX 5L for POWER V5.2 for IBM eServer or later
	  – Red Hat Enterprise Linux AS Version 4 with quarterly update 3 or later
	  – SUSE Linux Enterprise Server 9 with service pack 3 or later
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes

#7527	**#7527 - Quantity 150 of #1296**
	(No longer available as of 08 May 2007.)
	
	Ships a quantity of 150 #1296 36.4 GB disk units. The configurator can either generate this feature or allow users to select this feature as they would any other single disk unit feature. This feature remains on the inventory records.
	
	Attributes provided: Quantity of 150 #1296 36.4 GB disk units
	Attributes required: See feature #1296
	
	For 9406-MMA (#7527)
	▶ Minimum required: 0
	▶ Maximum allowed: 9 (Initial order maximum: 0)
	▶ OS level required:
	  – AIX 5L for POWER V5.2 for IBM eServer or later
	  – Red Hat Enterprise Linux AS for POWER Version 4 with quarterly update 3 or later
	  – SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later
	▶ Initial Order/MES/Both/Supported: Supported
	▶ CSU: Yes

#7528	**#7528 - Quantity 150 of #1297**
	Ships a quantity of 150 #1297 73.4 GB disk units. The configurator can either generate this feature or allow users to select this feature as they would any other single disk unit feature. This feature remains on the inventory records.
	
	Attributes provided: Quantity of 150 #1297 73.4 GB disk units
	Attributes required: See feature #1297
	
	For 9406-MMA (#7528)
	▶ Minimum required: 0
	▶ Maximum allowed: 9 (Initial order maximum: 9)
	▶ OS level required:
	  – AIX 5L for POWER V5.2 for IBM eServer or later
	  – Red Hat Enterprise Linux AS for POWER Version 4 with quarterly update 3 or later
	  – SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes

#7529	**#7529 - Quantity 150 of #1298**
	Ships a quantity of 150 #1298 146.8 GB disk units. The configurator can either generate this feature or allow users to select this feature as they would any other single disk unit feature. This feature remains on the inventory records.
	
	Attributes provided: Quantity of 150 #1298 146.8 GB disk units
	Attributes required: See feature #1298
	
	For 9406-MMA (#7529)
	▶ Minimum required: 0
	▶ Maximum allowed: 9 (Initial order maximum: 9)
	▶ OS level required:
	  – AIX 5L for POWER V5.2 for IBM eServer or later
	  – Red Hat Enterprise Linux AS for POWER Version 4 with quarterly update 3 or later
	  – SUSE Linux Enterprise Server 9 for POWER with service pack 3 or later
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes

#7569	**#7569 Cap. BackUp Power 595 4.2 GHz Processor 450 On/Off CoD Credit Days**
	Provides a 4.2 GHz, 8-core POWER6 processor book for configuring a Capacity BackUp server and includes 450 days of On/Off CoD processor days. It is used to provide a backup server configuration with redundant capacity, which can be turned on at any time to protect against unplanned system outages. The processors are packaged on four dual-core Multi Chip Modules (MCMs). Each dual-core processor is supported by 4 MB of private L2 cache and 32 MB of L3 shared cache. Each 8-core processor book also provides 32 DIMM memory slots and four I/O loop adapter slots which can be either RIO-2 loop adapter slots or 12X, HDL loop adapter slots.

Feature #7569 is limited to the following configurations:
- 4/32: Four 0/8 4.2 GHz Processor Books (#4694 equivalent, Qty.=4). This configuration is Initial Order Only. Feature #4694 must be ordered with four single processor activations (#4754).
- 4/64: Eight 0/8 4.2 GHz Processor Books. This configuration is MES orderable given the above prerequisite 4/32, #4694 configuration. The MES order is limited to adding four equivalent #4694 0/8 4.2 GHz Processor books with no single processor activations (#4754).

Limitations:
- Use of Utility Billing (#5941, #5942, #5943, #5944) cannot be used with CBU #7569.
- The standby processors in these configurations cannot be permanently activated. They are configured to provide a total of either 28 (2 processor books) or 60 (4 processor books) standby processors that can be activated at any time to protect against unplanned system outages.

Attributes provided: 8-core processor book, 0-way active; 32 memory DIMM slots, 450 days of On/Off CoD processor days
Attributes required: One processor book slot.

For 9119-FHA (#7569)
- Minimum required: 0
- Maximum allowed: 8 (Initial order maximum: 8)
- OS level required:
  - AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
  - AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
  - AIX Version 5.3 with the 5300-08 Technology Level or later
  - AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
  - AIX Version 6.1 with the 6100-01 Technology Level or later
  - IBM i 5.4 with V5R4M5 machine code
  - IBM i 6.1 or later
- Initial Order/MES/Both/Supported: Both
- CSU: No
- Return parts MES: Does not apply

| #7571 | **#7571 Cap. BackUp Power 595 5.0 GHz Processor 450 On/Off CoD Credit Days**
Provides a 5.0 GHz, 8-core POWER6 processor book for configuring a Capacity BackUp server and includes 450 days of On/Off CoD processor days. It is used to provide a backup server configuration with redundant capacity, which can be turned on at any time to protect against unplanned system outages. The processors are packaged on four dual-core Multi Chip Modules (MCMs). Each dual-core processor is supported by 4 MB of private L2 cache and 32 MB of L3 shared cache. Each 8-core processor book also provides 32 DIMM memory slots and four I/O loop adapter slots which can be either RIO-2 loop adapter slots or 12X, HDL loop adapter slots.

Feature #7571 is limited to the following configurations:
▶ 4/32: Four 0/8 5.0 GHz Processor Books (#4695 equivalent, Qty.=4). This configuration is Initial Order Only. Feature #4695 must be ordered with four single processor activations (#4755).
▶ 4/64: Eight 0/8 5.0 GHz Processor Books. This configuration is MES orderable given the above prerequisite 4/32, #4695 configuration. The MES order is limited to adding four equivalent #4695 0/8 5.0 GHz Processor books with no single processor activations (#4755).
▶ 4/64: Eight 0/8 5.0 GHz Processor Books (#4695 equivalent, Qty.=8). This configuration is orderable with 8, equivalent #4695 0/ 8 5.0 GHz Processor Books as an Initial Order. As an Initial Order, 4/64 Feature #4695 must be ordered with four single processor activations (#4755).

Limitations:
▶ Use of Utility Billing (#5941, #5942, #5943, #5944) cannot be used with CBU #7571.
▶ The standby processors in these configurations cannot be permanently activated. They are configured to provide a total of either 28 (2 processor books) or 60 (4 processor books) standby processors that can be activated at any time to protect against unplanned system outages.

Attributes provided: 8-core processor book, 0-way active; 32 memory DIMM slots, 450 days of On/Off CoD processor days
Attributes required: One processor book slot.

For 9119-FHA (#7571)
▶ Minimum required: 0
▶ Maximum allowed: 8 (Initial order maximum: 8)
▶ OS level required:
 – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
 – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
 – AIX Version 5.3 with the 5300-08 Technology Level or later
 – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
 – AIX Version 6.1 with the 6100-01 Technology Level or later
 – IBM i 5.4 with V5R4M5 machine code
 – IBM i 6.1 or later
▶ Initial Order/MES/Both/Supported: Both
▶ CSU: No
▶ Return parts MES: Does not apply |

#7586	**#7586 New Cap. BackUp POWER5 Turbo Processor 450 On/Off CoD Credit Days** Provides a 16-way POWER5 Turbo processor book for configuring a Capacity BackUp server and includes 450 days of On/Off CoD processor days. It is used to provide a backup server configuration with redundant capacity, which can be turned on at any time to protect against unplanned system outages.The processors are packaged on two 8-way Multi Chip Modules (MCMs). Each pair of processors is supported by 1.9 MB of L2 cache and 36 MB of L3 cache. Each 16-way processor book also provides six RIO-2 loop adapter slots and 16 memory slots. Attributes provided: 16-way processor book, 0-way active; 16 memory DIMM slots, 450 days of On/Off CoD processor days. Attributes required: One processor book slot. **For 9119-FHA (#7586)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES:
#7587	**#7587 Capacity BackUp POWER5+ 2.1 GHz Standard Processor 450 On/Off CoD Credit Days** Provides a 16-way POWER5+ 2.1 GHz processor book for configuring a Capacity BackUp server and includes 450 days of On/Off CoD processor days. It is used to provide a backup server configuration with redundant capacity, which can be turned on at any time to protect against unplanned system outages. The processors are packaged on two 8-way Multi Chip Modules (MCMs). Each pair of processors is supported by 1.9 MB of L2 cache and 36 MB of L3 cache. Each 16-way processor book also provides six RIO-2 loop adapter slots and 16 memory slots. Attributes provided: 16-way processor book, 0-way active; 16 memory DIMM slots, 450 days On/Off CoD processor days. Attributes required: One processor book slot. **For 9119-FHA (#7587)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Not supported. For upgrades, see converted to feature number in Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES:
#7588	**#7588 On/Off Processor Billing for FCs 8970 and 7587** When an On/Off Processor Enablement feature is ordered and the associated enablement code is entered into the system, you must report your on/off usage to IBM at least monthly. This information, used to compute your billing data, is then provided to your sales channel. The sales channel will place an order for a quantity of On/ Off Processor Day Billing features and bill you. One #7588 should be ordered for each billable processor day. Attributes provided: One processor day usage for features #8970 or #7587 Attributes required: None **For 9119-FHA (#7588)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not Supported on unified POWER MTMs ► CSU: Not applicable ► Return parts MES:

#7592	**#7592 On/Off Processor Billing for FCs 8967 and 7704**
	When an On/Off Processor Enablement feature is ordered and the associated enablement code is entered into the system, you must report your on/off usage to IBM at least monthly. This information, used to compute your billing data, is then provided to your sales channel. The sales channel will place an order for a quantity of On/ Off Processor Day Billing features and bill you. One #7592 should be ordered for each billable processor day.
	Attributes provided: One processor day usage for features #8967 or #7704
	Attributes required: None
	For 9119-FHA (#7592)
	▶ Minimum required:
	▶ Maximum allowed: (Initial order maximum:)
	▶ OS level required:
	▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs
	▶ CSU: Not applicable
	▶ Return parts MES:
#7593	**#7593 On/Off Processor Billing for FCs 8968 and 7705**
	When an On/Off Processor Enablement feature is ordered and the associated enablement code is entered into the system, you must report your on/off usage to IBM at least monthly. This information, used to compute your billing data, is then provided to your sales channel. The sales channel will place an order for a quantity of On/ Off Processor Day Billing features and bill you. One #7593 should be ordered for each billable processor day.
	Attributes provided: One processor day usage for features #8968 or #7705
	Attributes required: None
	For 9119-FHA (#7593)
	▶ Minimum required:
	▶ Maximum allowed: (Initial order maximum:)
	▶ OS level required:
	▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs.
	▶ CSU: Not applicable
	▶ Return parts MES:
#7618	**#7618 One way Processor Activation for Processor FC 8338**
	Permanently activates the first or second processor on an 8338 CoD Processor card.
	Attributes provided: Activation for one 8338 processor
	Attributes required: Processor card 8338 with at least one inactive processor
	For 9117-MMA (#7618)
	▶ Minimum required: 0
	▶ Maximum allowed: 0 (Initial order maximum: 0)
	▶ OS level required: None
	▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909.
	▶ CSU: Not applicable
	▶ Return parts MES: Does not apply

#7624	**#7624 On/Off Processor Billing Day for FC 8338** When an On/Off Processor Enablement feature is ordered and the associated enablement code is entered into the system, you must report your on/off usage to IBM at least monthly. This information, used to compute your billing data, is then provided to your sales channel. The sales channel will place an order for a quantity of On/ Off Processor Day Billing features and bill you. One #7624 should be ordered for each billable processor day. Attributes provided: one processor day usage for FC 8338 Attributes required: processor FC 8338 with On/Off usage. **For 9117-MMA (#7624)** ▶ Minimum required: 0 ▶ Maximum allowed: 0 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs ▶ CSU: Not applicable ▶ Return parts MES: Does not apply

#7663	**#7663 1 GB DDR2 Memory Activation**
	This feature will permanently activate 1 GB of DDR2 CoD Memory.
	
	Attributes provided: 1 GB DDR2 Memory Activation
	Attributes required: 1 GB inactive DDR2 Memory
	
	For 9117-MMA (#7663)
	▶ Minimum required: 0
	▶ Maximum allowed: 128 (Initial order maximum: 0)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: Yes
	▶ Return parts MES: No
	
	Note: Can be used only on Systems that were upgraded from 9117-570. Can be used only with DDR2 Memory features 4495 and 4496.

#7665	**#7665 One way Processor Activation for Processor FC 7782** This feature number will permanently activate the first or second processor on a 7782 CoD Processor card. Attributes provided: Activation for one 7782 processor Attributes required: Processor card 7782 with at least one inactive processor **For 9117-MMA (#7665)** ▶ Minimum required: 0 ▶ Maximum allowed: 0 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES: Does not apply

#7666	**#7666 30 Days Prepaid Reserve Capacity for one 1.9GHz Processor on FC 7782** Provides 30 processor-days of prepaid reserve capacity usage for one of the 1.9GHz processors on FC 7782. This feature allows the use of inactive processors in the system on a one day use basis. To understand how to take advantage of the Reserve Capacity feature of the p570 through the shared processor pool, review the data at this Web site: http://www.ibm.com/servers/eserver/pseries/ondemand/cod Attributes provided: Allows the use of one of the 1.9GHz Processors on FC 7782 in one day increments Attributes required: An inactive 1.9 GHz processor on FC 7782. **For 9117-MMA (#7666)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES: Does not apply
#7667	**#7667 Activation, #8967 #7704 CUoD Processor Book, One Processor** This feature permanently activates one processor on CUoD processor features #8967 or #7704. Attributes provided: One processor activation Attributes required: Inactive CUoD processor **For 9119-FHA (#7667)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES:
#7669	**#7669 1 GB Memory Activation for #4500, #4501, #4502, and #4503 Memory Cards** This feature permanently activates 1 GB of DDR2 memory. Memory activations are stored in the system, not on the memory card. If DDR2 memory is moved to a different server, the DDR2 activations remain with the original system. Attributes provided: 1 GB memory activation for #4500, #4501, #4502 and #4503 DDR2 memory cards. Attributes required: 1 GB unactivated DDR2 memory **For 9119-FHA (#7669)** ► Minimum required: 0 ► Maximum allowed: 255 (Initial order maximum: 255) ► OS level required: ► Initial Order/MES/Both/Supported: MES Only ► CSU: Yes ► Return parts MES: Does not apply

#7718	**#7718 On/Off Processor day billing for FC 7782** When an On/Off Processor Enablement feature is ordered and the associated enablement code is entered into the system, you must report your on/off usage to IBM at least monthly. This information, used to compute your billing data, is then provided to your sales channel. The sales channel will place an order for a quantity of On/ Off Processor Day Billing features and bill you. One #7718 should be ordered for each billable processor day. Attributes provided: Payment for 1 days use of one processor on FC 7782. Attributes required: One inactive FC 7782 processor in the system. **For 9117-MMA (#7718)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES: Does not apply
#7693	**#7693 Activation, #8970 #7587 CUoD Processor Book, One Processor** Permanently activates one processor on CUoD processor features #8970 or #7587. Attributes provided: One processor activation Attributes required: Inactive CUoD processor **For 9119-FHA (#7693)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES:
#7694	**#7694 Reserve Capacity Prepaid for #8970** Provides 30 processor-days of prepaid reserve capacity for feature #8970 processor book. To establish reserve processor capacity on the server, select a quantity of inactive processors to be placed in the server's Shared Processor Pool as reserve processors. When the server recognizes that non-reserve processors (permanently activated processors) assigned or available to the uncapped partitions have been 100% utilized, use of additional processors will cause processor- days (good for a 24-hour period) to be subtracted from the prepaid number of processor-days. Attributes provided: 30 processor-days usage of inactive processors for features #8970 Attributes required: Advanced Power Virtualization #7992 **For 9119-FHA (#7694)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs ► CSU: Not applicable ► Return parts MES:

| #7704 | **#7704 Capacity BackUp POWER5+ 2.1 GHz Standard Processor 450 On/Off CoD Credit Days**
Provides a 16-way POWER5+ 2.1 GHz processor book for configuring a Capacity BackUp server and includes 450 days of On/Off CoD processor days. It is used to provide a backup server configuration with redundant capacity, which can be turned on at any time to protect against unplanned system outages. The processors are packaged on two 8-way Multi Chip Modules (MCMs). Each pair of processors is supported by 1.9 MB of L2 cache and 36 MB of L3 cache. Each 16-way processor book also provides six RIO-2 loop adapter slots and 16 memory slots.

Attributes provided:
▶ 16-way processor book, 0-way active
▶ 16 memory DIMM slots, 450 days On/Off CoD processor days
Attributes required: One processor book slot.

For 9119-FHA (#7704)
▶ Minimum required:
▶ Maximum allowed: (Initial order maximum:)
▶ OS level required:
   For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909.
▶ Initial Order/MES/Both/Supported: Not supported.
▶ CSU: Not applicable
▶ Return parts MES: |
| #7705 | **#7705 Capacity BackUp POWER5+ 2.3 GHz Turbo Processor 450 On/Off CoD Credit Days**
Provides a 16-way POWER5+ 2.3 GHz processor book for configuring a Capacity BackUp server and includes 450 days of On/Off CoD processor days. It is used to provide a backup server configuration with redundant capacity, which can be turned on at any time to protect against unplanned system outages. The processors are packaged on two 8-way Multi Chip Modules (MCMs). Each pair of processors is supported by 1.9 MB of L2 cache and 36 MB of L3 cache. Each 16-way processor book also provides six RIO-2 loop adapter slots and 16 memory slots.

Attributes provided:
▶ 16-way processor book, 0-way active
▶ 16 memory DIMM slots, 450 days On/Off CoD processor days
Attributes required: One processor book slot.

For 9119-FHA (#7705)
▶ Minimum required:
▶ Maximum allowed: (Initial order maximum:)
▶ OS level required:
   Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909.
▶ CSU: Not applicable
▶ Return parts MES: |

#7728	**#7728 30 Days Prepaid Reserve Capacity for one 2.2 GHz Processor on FC 8338** Provides 30 processor-days of prepaid reserve capacity usage for one of the 2.2GHz processors on FC 8338. This feature allows the use of inactive processors in the system on a one day use basis. To understand how to take advantage of the Reserve Capacity feature of the p570 through the shared processor pool, review the data at this Web site: http://www.ibm.com/servers/eserver/pseries/ondemand/cod Attributes provided: Allows the use of one of the 2.2GHz Processors on FC 8338 in one day increments Attributes required: An inactive 2.2 GHz processor on FC 8338. **For 9117-MMA (#7728)** ▶ Minimum required: 0 ▶ Maximum allowed: 0 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
#7730	**#7730 Cap. BackUp POWER5 Std. Processor 450 On/Off CoD Credit Days** Provides a 16-way POWER5 Standard processor book for configuring a Capacity BackUp server and includes 450 days of On/Off CoD processor days. It is used to provide a backup server configuration with redundant capacity, which can be turned on at any time to protect against unplanned system outages. The processors are packaged on two 8-way Multi Chip Modules (MCMs). Each pair of processors is supported by 1.9 MB of L2 cache and 36 MB of L3 cache. Each 16-way processor book also provides six RIO-2 loop adapter slots and 16 memory slots. Attributes provided: 16-way processor book, 0-way active; 16 memory DIMM slots, 450 days On/Off CoD processor days. Attributes required: One processor book slot. **For 9119-FHA (#7730)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES:
#7731	**#7731 Cap. BackUp POWER5 Turbo Processor 450 On/Off CoD Credit Days** Provides a 16-way POWER5 Turbo processor book for configuring a Capacity BackUp server and includes 450 days of On/Off CoD processor days. It is used to provide a backup server configuration with redundant capacity, which can be turned on at any time to protect against unplanned system outages.The processors are packaged on two 8-way Multi Chip Modules (MCMs). Each pair of processors is supported by 1.9 MB of L2 cache and 36 MB of L3 cache. Each 16-way processor book also provides six RIO-2 loop adapter slots and 16 memory slots. Attributes provided: 16-way processor book, 0-way active; 16 memory DIMM slots, 450 days of On/Off CoD processor days. Attributes required: One processor book slot. **For 9119-FHA (#7731)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES:

#7732	**#7732 Cap. BackUp POWER5 Std. Processor 450 On/Off CoD Credit Days** Provides a 16-way POWER5 Standard processor book for configuring a Capacity BackUp server and includes 450 days of On/Off CoD processor days. It is used to provide a backup server configuration with redundant capacity, which can be turned on at any time to protect against unplanned system outages. The processors are packaged on two 8-way Multi Chip Modules (MCMs). Each pair of processors is supported by 1.9 MB of L2 cache and 36 MB of L3 cache. Each 16-way processor book also provides six RIO-2 loop adapter slots and 16 memory slots. Attributes provided: 16-way processor book, 0-way active; 16 memory DIMM slots,450 days of On/Off CoD processor days. Attributes required: One processor book slot. **For 9119-FHA (#7732)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES:
#7768	**#7768 Processor Power Regulator** Provides the needed power/voltage to operate the processors. Each processor card requires one regulator. An extra regulator can be added for redundancy. Three power regulators in a single CEC enclosure drawer with two processor card features provides one power regulator for redundancy at the drawer level. Attributes provided: Processor power regulator. Attributes required: Empty power regulator slot. **For 9117-MMA (#7768) and 9119-FHA (#7768)** ▶ Minimum required: 0 ▶ Maximum allowed: 0 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
#7780	**#7780 2.0 m Rack Side Attach Kit** This feature allows a row of racks without side panels to be bolted together in a continuous suite, using the provided side-to-side rack connecting hardware. When multiple racks are joined in this way, cables can be easily run between racks without exiting the continuous rack enclosure. A small gap is maintained between the two adjacent racks, which is filled by three matching steel trim pieces that snap into place on the front, top, and rear, between each rack. The trim pieces cover the space between each rack for an enhanced appearance and for additional protection of the equipment inside the racks. Side panels are needed only for the two end racks of the suite. Attributes provided: Hardware and trim to attach two racks Attributes required: #0553 rack **For 9117-MMA (#7780) and 9119-FHA (#7780)** ▶ Minimum required: 0 ▶ Maximum allowed: No Max (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No

#7782	**#7782 2-Way 1.9 GHz POWER5+ Processor Card, 0-way active, 8 DDR2 Memory Slots** 2-way 1.9 GHz POWER5+ processor card with Capacity Upgrade on Demand. The two processors share 36 MB of L3 cache and 1.9 MB of L2 cache. There are 8 DDR2 DIMM slots on the processor card which can be used without activating the processors. Permanent activation of the processors requires purchase of the activation FC 7665. Attributes provided: 2-way processor card, 0-way active; 8 DDR2 DIMM slots Attributes required: One processor card slot **For 9117-MMA (#7782) and 9119-FHA (#7782)** ▸ Minimum required: 0 ▸ Maximum allowed: 0 (Initial order maximum: 0) ▸ OS level required: None Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▸ CSU: Not applicable ▸ Return parts MES: Does not apply
#7783	**#7783 - Base Proc Activation** Provides a no-charge activation code that can be used to permanently activate one 570 processor. One or more of these no-charge activation features can be ordered, depending on the configuration rules. Attributes provided: One permanently activated processor Attributes required: Capacity Upgrade on Demand system **For 9406-MMA (#7783)** ▸ Minimum required: 0 ▸ Maximum allowed: 4 (Initial order maximum: 4) ▸ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▸ Initial Order/MES/Both/Supported: Both ▸ CSU: Yes
#7801	**#7801 Ethernet Cable, 6M, Hardware Management Console to System Unit** Provides a six meter long Ethernet cable for attachment of a Hardware Management Console to the system unit. Attributes provided: 6M Ethernet Cable Attributes required: Ethernet port on Hardware Management Console **For 9117-MMA (#7801) and 9119-FHA (#7801)** ▸ Minimum required: 0 ▸ Maximum allowed: no max (Initial order maximum: no max) ▸ OS level required: None ▸ Initial Order/MES/Both/Supported: Both ▸ CSU: Yes ▸ Return parts MES: No
#7802	**#7802 Ethernet Cable, 15M, Hardware Management Console to System Unit** Provides a fifteen meter long Ethernet cable for attachment of a Hardware Management Console to the system unit. Attributes provided: 15M Ethernet Cable Attributes required: Ethernet port on Hardware Management Console **For 9117-MMA (#7802)** ▸ Minimum required: 0 ▸ Maximum allowed: no max (Initial order maximum: no max) ▸ OS level required: None ▸ Initial Order/MES/Both/Supported: Both ▸ CSU: Yes ▸ Return parts MES: No

#7803	**#7803 Bulk Power Controller Assembly** This power controller provides the base power connections for the internal power cables. Attributes provided: Base power connections for internal power cables. **For 9119-FHA (#7803)** ► Minimum required: 0 ► Maximum allowed: 2 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: No ► Return parts MES:
#7807	**#7807 Cooling Group** Provides two additional cooling fans. It is used when additional cooling is required for the Central Electronics Complex. Attributes provided: Two Additional Fans Attributes required: #7826 Power Cable Group **For 9119-FHA (#7807)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES:
#7809	**#7809 dc Power Converter, Processor Book** This feature converts power from the bulk power assembly to the voltage levels required for the components in the processor books for the Central Electronics Complex. Attributes provided: Processor book power converter Attributes required: Empty power converter location **For 9119-FHA (#7809)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES:
#7810	**#7810 Processor Clock Card, Programmable** Provides programmable processor and system clocking. Attributes provided: Programmable Clock Card Attributes required: Empty Clock Card Position **For 9119-FHA (#7810)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES:

#7811	**#7811 System Service Processor** Provides the service processor and associated cables required to control the server. Attributes provided: Service processor and cables Attributes required: Empty service processor position **For 9119-FHA (#7811)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES:
#7812	**#7812 Multiplexer Card** The multiplexer card provides communication between the individual processor books and the service processor. Attributes provided: Processor book to service processor communication Attributes required: Processor book **For 9119-FHA (#7812)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs ► CSU: Not applicable ► Return parts MES:
#7813	**#7813 16-Way POWER5 Turbo CUoD Processor Book, 0-Way Active** Provides a POWER5 Turbo processor book with capacity Upgrade on Demand. The processors are packaged on two 8-way Multi Chip Modules (MCMs). Each pair of processors is supported by 1.9 MB of L2 cache and 36 MB of L3 cache. Each 16-way processor book also provides six RIO-2 loop adapter slots and 16 memory slots. Attributes provided: ► 16-way processor book ► 0-way active; 16 memory DIMM slots Attributes required: ► One processor book slot ► #7807 Cooling Group **For 9119-FHA (#7813)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES:

#7814	**#7814 4 GB DDR2 Memory Card, 533 MHz** Provides one 4 GB DDR2, 533 MHz memory card. Attributes provided: 4 GB DDR2 Memory Attributes required: Empty Memory Slot **For 9119-FHA (#7814)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES:
#7815	**#7815 Activation #7813, #7731, #7586, or #8969 CUoD Processor Books, One Processor** This feature permanently activates one processor on CUoD processor features #7813, #7731, #7586, or #8969. Attributes provided: One processor activation Attributes required: Inactive CUoD processor **For 9119-FHA (#7815)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES:
#7816	**#7816 4 GB CUoD Memory Card 2 GB Active, DDR1** Provides one 4 GB 266 MHz DDR1 memory card with 2 GB active. It is used to provide memory Capacity Upgrade on Demand. Attributes provided: 4 GB CUoD memory with 2 GB active Attributes required: Empty memory slot **For 9119-FHA (#7816)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES:

#7817	**#7817 1 Link Switch Network Interface, optical (p5 590/595)** The 1 Link Switch Network Interface (SNI) for the p5 590/595 provides the attachment to the pSeries High Performance Switch (HPS). The 1 Link SNI plugs into the GX bus of the p5 590/595. Connection to the HPS is accomplished by using the optic switch cable features. Attributes provided: 1 Link SNI to attach to the HPS (7045-SW4) Attributes required: Available GX position in the p5 590/595 **For 9119-FHA (#7817)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ▶ CSU: Not applicable ▶ Return parts MES:
#7818	**#7818 Remote I/O-2 (RIO-2) Loop Adapter, Two Port** Provides two RIO-2 connections for the attachment of one RIO-2 loop. Attributes provided: Ports for one RIO-2 loop connection Attributes required: Empty loop adapter position **For 9119-FHA (#7818)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES:
#7820	**#7820 GX Dual-port 12x HCA** The #7820, GX Dual-port 12x Host Channel Adapter, provides two 12x connections for dual channel applications. Attributes provided: 2 ports of 12x HCA connectors Attributes required: Available adapter position **For 9119-FHA (#7820)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 9093. ▶ CSU: Not applicable ▶ Return parts MES:
#7821	**#7821 Power Cable Group, CEC Primary Fans** This cable assembly provides redundant power for the CEC, primary blower assembly. Cooling for CEC One or more nodes in CEC, Primary Node Cooling Group and BPC **For 9119-FHA (#7821)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs ▶ CSU: Not applicable

#7822	**#7822 Power Cable Group, 1st CEC Book** This cable group provides redundant power to CEC node 1. Attributes provided: Redundant power to CEC Node Attributes required: Processor Book 1 **For 9119-FHA (#7822)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs ▶ CSU: Not applicable ▶ Return parts MES:
#7823	**#7823 Power Cable Group, 2nd CEC Book** This cable group provides redundant power to CEC node 2. Attributes provided: Redundant power to CEC Node Attributes required: Processor Book 2 **For 9119-FHA (#7823)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs ▶ CSU: Not applicable ▶ Return parts MES:
#7824	**#7824 Power Cable Group, 3rd CEC Book** This cable group provides redundant power to CEC node 3. Attributes provided: Redundant power to CEC Node Attributes required: Processor Book 3 **For 9119-FHA (#7824)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs ▶ CSU: Not applicable ▶ Return parts MES:
#7825	**#7825 Power Cable Group, 4th CEC Book** This cable group provides redundant power to CEC node 4. Attributes provided: Redundant power to CEC Node Attributes required: Processor Book 4 **For 9119-FHA (#7825)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs ▶ CSU: Not applicable ▶ Return parts MES:

#7826	**#7826 Power Cable Group, 7807 Cooling Group** Provides redundant power for the CEC, secondary blower assembly. Attributes provided: Redundant power to CEC blower assembly. Attributes required: More than one Processor Book. **For 9119-FHA (#7826)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs ▶ CSU: Not applicable ▶ Return parts MES:
#7828	**#7828 16 GB DDR1 Memory Card, 266 MHz** Provides one 16 GB DDR1, 266 MHz memory card. Attributes provided: 4 GB DDR1 Memory Attributes required: Empty Memory Slot **For 9119-FHA (#7828)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 9093. ▶ CSU: Not applicable ▶ Return parts MES:
#7829	**#7829 32 GB DDR1 Memory Card, 200 MHz** Provides one 32 GB DDR1, 200 MHz memory card. Attributes provided: 32 GB DDR1 Memory Attributes required: Empty Memory Slot **For 9119-FHA (#7829)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES:

#7830	**#7830 2-Way 1.65 GHz POWER5 CUoD Processor Card, 0-Way Active, 8 DDR1 Memory DIMM Slots** (No longer available as of 21 March 2008.) 2-way 1.65 GHz processor card with Capacity Upgrade on Demand. The two processors share 36 MB of L3 cache and 1.9 MB of L2 cache. There are 8 DIMM slots on the processor card which can be used without activating the processors. Attributes provided: 2-way processor card, 0-way active; 8 DDR1 DIMM slots Attributes required: One processor card slot **For 9117-MMA (#7830)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES: Does not apply
#7832	**#7832 2-Way 1.9 GHz POWER5 CUoD Processor Card, 0-Way Active, 8 DDR1 Memory DIMM Slots** (No longer available as of 21 March 2008.) 2-way 1.9 GHz processor card with Capacity Upgrade on Demand. The two processors share 36 MB of L3 cache and 1.9 MB of L2 cache. There are 8 DIMM slots on the processor card which can be used without activating the processors. Attributes provided: 2-way processor card, 0-way active; 8 DDR1 DIMM slots Attributes required: One processor card slot **For 9117-MMA (#7832)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES: Does not apply
#7833	**#7833 2-Way 1.9 GHz POWER5 CUoD Processor Card, 0-Way Active, 8 DDR2 Memory DIMM Slots** (No longer available as of 21 March 2008.) 2-way 1.9 GHz processor card with Capacity Upgrade on Demand. The two processors share 36 MB of L3 cache and 1.9 MB of L2 cache. There are 8 DIMM slots on the processor card which can be used without activating the processors. Attributes provided: 2-way processor card, 0-way active; 8 DDR2 DIMM slots Attributes required: One processor card slot **For 9117-MMA (#7833)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES: Does not apply

#7834	**#7834 2-Way 1.5 GHz POWER5 Processor Card, 0-Way Entitled, 8 DDR1 Memory DIMM Slots** (No longer available as of 21 March 2008.) 2-way 1.5 GHz processor card with no processors entitled. The two processors share 36 MB of L3 cache and 1.9 MB of L2 cache. There are 8 DIMM slots on the processor card. Feature 7834 requires entitlement of both processors. Attributes provided: 2-way processor card with 8 DDR1 DIMM slots Attributes required: One processor card slot and two processor entitlements (#7929 or #8456) **For 9117-MMA (#7834)** ▶ Minimum required: 0 ▶ Maximum allowed: 0 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
#7835	**#7835 8 GB CUoD Memory Card 4 GB Active, DDR1** Provides one 8 GB 266 MHz DDR1 memory card with 4 GB active. It is used to provide memory Capacity Upgrade on Demand. Attributes provided: 8 GB CUoD memory with 4 GB active Attributes required: Empty memory slot **For 9119-FHA (#7835)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES:
#7837	**#7837 Bulk Power Distribution Assembly** This Power distribution assembly provides connector locations for cable attachment of I/O drawers and CEC dc power converters. Attributes provided: 10 power connectors Attributes required: None **For 9119-FHA (#7837)** ▶ Minimum required: 2 ▶ Maximum allowed: 4 (Initial order maximum: 4) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: No ▶ Return parts MES:

#7839	**#7839 On/Off Processor Enablement for #7981 or #7730** This feature can be ordered to enable your server for On/Off Capacity on Demand for processor book feature #7981 or #7730. When enabled, you can request processors on a temporary basis. You must sign an On/Off Capacity on Demand contract before you order this feature. Attributes provided: Processor On/Off Capacity on Demand Enablement Attributes required: None **For 9119-FHA (#7839)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ▶ CSU: Not applicable ▶ Return parts MES
#7840	**#7840 Side-by-Side for 1.8m Racks** This feature allows a row of racks without side panels to be bolted together in a continuous suite, using the provided side to side rack connecting hardware. When multiple racks are joined in this way, cables can be easily run between racks without having to exit the continuous rack enclosure. A small gap is maintained between the two adjacent racks, which is filled by three matching steel trim pieces that snap into place on the front, top, and rear, between each rack. The trim pieces cover the space between each rack for an enhanced appearance and for additional protection of the equipment inside the racks. Side panels are needed only for the two end racks of the suite. Attributes provided: Hardware and trim to attach two racks Attributes required: #0551 rack **For 9117-MMA (#7840)** ▶ Minimum required: 0 ▶ Maximum allowed: 48 (Initial order maximum: 0) ▶ OS level required: Not applicable **For 9119-FHA (#7840)** ▶ Minimum required: 0 ▶ Maximum allowed: 96 (Initial order maximum: 0) ▶ OS level required: Not applicable Initial Order/MES/Both/Supported: Supported CSU: Yes Return parts MES: No

#7841	**#7841 Ruggedize Rack Kit** For enhanced rigidity and stability of the rack, the optional Ruggedized Rack Kit provides additional hardware that reinforces the rack and anchors it to the floor. This hardware is designed primarily for use in locations where earthquakes are a concern. The feature includes a large steel brace or truss that bolts into the rear of the rack. It is hinged on the left side so it can swing out of the way for easy access to the rack drawers when necessary. The Ruggedize Rack Kit also includes hardware for bolting the rack to a concrete floor or a similar surface, and bolt-in steel filler panels for any unoccupied spaces in the rack. Attributes provided: Rear brace, bolt down hardware, bolt in front filler panels Attributes required: #0551 19 inch 1.8m Rack or #0553 19 inch 2.0MRack **For 9117-MMA (#7841)** ► Minimum required: 0 ► Maximum allowed: 49 (Initial order maximum: 0) ► OS level required: Not applicable **For 9119-FHA (#7841)** ► Minimum required: 0 ► Maximum allowed: 96 (Initial order maximum: 0) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Supported CSU: Yes Return parts MES: No
#7847	**#7847 I/O Drawer Cable Group, #8691 Rack/13U** (No longer available as of 29 August 2008.) Provides redundant power cabling for an I/O drawer with the bottom of the drawer positioned at the 13U location of the expansion rack. Attributes provided: Redundant I/O Drawer Power Cables Attributes required: None **For 9119-FHA (#7847)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES:
#7848	**#7848 I/O Drawer Cable Group, #8691 Rack/19U** (No longer available as of 29 August 2008.) Provides redundant power cabling for an I/O drawer with the bottom of the drawer positioned at the 19U location of the expansion rack. Attributes provided: Redundant I/O Drawer Power Cables Attributes required: None **For 9119-FHA (#7848)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES:

#7849	**#7849 I/O Drawer Cable Group, #8691 Rack/23U** (No longer available as of 29 August 2008.) Provides redundant power cabling for an I/O drawer with the bottom of the drawer positioned at the 13U location of the expansion rack. Attributes provided: Redundant I/O Drawer Power Cables Attributes required: None **For 9119-FHA (#7849)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES:
#7850	**#7850 I/O Drawer Cable Group, #8691 Rack/27U** (No longer available as of 29 August 2008.) Provides redundant power cabling for an I/O drawer with the bottom of the drawer positioned at the 27U location of the expansion rack. Attributes provided: Redundant I/O Drawer Power Cables Attributes required: None **For 9119-FHA (#7850)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported:Not supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES:
#7851	**#7851 I/O Drawer Cable Group, #8691 Rack/31U** (No longer available as of 29 August 2008.) Provides redundant power cabling for an I/O drawer with the bottom of the drawer positioned at the 31U location of the expansion rack. It connects the I/O drawer to an alternate power connection location when required for specific server configurations. Attributes provided: Redundant I/O Drawer Power Cables Attributes required: None **For 9119-FHA (#7851)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES:

#7853	**#7853 Power Cables, 4x, 1U** Provides redundant power cabling for a 4 EIA rack drawer with the bottom of the drawer positioned at the 1U location of the rack. Attributes provided: Redundant Drawer Power Cables Attributes required: None For 9119-FHA (#7853) Minimum required: 0 Maximum allowed: 1 (Initial order maximum: 0) OS level required: Not applicable Initial Order/MES/Both/Supported: MES CSU: No Return parts MES:
	#7854 Power Cables, 4x, 5U Provides redundant power cabling for a 4 EIA rack drawer with the bottom of the drawer positioned at the 5U location of the rack. Attributes provided: Redundant Drawer Power Cables Attributes required: None For 9119-FHA (#7854) Minimum required: 0 Maximum allowed: 1 (Initial order maximum: 0) OS level required: Not applicable Initial Order/MES/Both/Supported: MES CSU: No Return parts MES:
#7855	**#7855 I/O Drawer Cable Group, #5792 Rack/9U** Provides redundant power cabling for an I/O drawer with the bottom of the drawer positioned at the 9U location of the powered I/O rack. Attributes provided: Redundant I/O Drawer Power Cables Attributes required: None **For 9119-FHA (#7855)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: No ▶ Return parts MES:
#7856	**#7856 Power Cables, 4x, 13U** Provides redundant power cabling for a 4 EIA rack drawer with the bottom of the drawer positioned at the 13U location of the rack. Attributes provided: Redundant Drawer Power Cables Attributes required: None **For 9119-FHA (#7856)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: No ▶ Return parts MES:

#7857	**#7857 Power Cables, 4x, 19U** Provides redundant power cabling for a 4 EIA rack drawer with the bottom of the drawer positioned at the 19U location of the rack. Attributes provided: Redundant Drawer Power Cables Attributes required: None **For 9119-FHA (#7857)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: No ▶ Return parts MES:
#7858	**#7858 Power Cables, 4x, 23U** Provides redundant power cabling for a 4 EIA drawer with the bottom of the drawer positioned at the 23U location of the rack. Attributes provided: Redundant Drawer Power Cables Attributes required: None **For 9119-FHA (#7858)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: No ▶ Return parts MES:
#7859	**#7859 Power Cables, 4x, 27U** Provides redundant power cabling for a 4 EIA drawer with the bottom of the drawer positioned at the 27U location of the rack. Attributes provided: Redundant Drawer Power Cables Attributes required: None **For 9119-FHA (#7859)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: No ▶ Return parts MES:
#7860	**#7860 Power Cables, 4x, 31U** Provides redundant power cabling for a 4 EIA drawer with the bottom of the drawer positioned at the 31U location of the rack. Attributes provided: Redundant Drawer Power Cables Attributes required: None **For 9119-FHA (#7860)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: MES ▶ CSU: No ▶ Return parts MES:

#7861	**#7861 PCI Blind Swap Cassette Kit, Single Wide Short Adapters, Type II** This feature contains a blind swap cassette for single slot width PCI adapters installed in a 32-bit short PCI slot. Attributes provided: Blind swap PCI cassette Attributes required: Short PCI card and empty short PCI adapter location **For 9117-MMA (#7861)** ▸ Minimum required: 0 ▸ Maximum allowed: 0 (Initial order maximum: 0) ▸ OS level required: None ▸ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ▸ CSU: Not applicable ▸ Return parts MES: Does not apply
#7862	**#7862 PCI Blind Swap Cassette Kit, Single Wide Adapters, Type II** This feature contains a blind swap cassette for single slot width PCI adapters. It also includes the necessary hardware to adapt the cassette to mount various sizes of PCI cards. Attributes provided: Blind swap PCI cassette Attributes required: PCI card and empty PCI adapter location **For 9117-MMA (#7862)** ▸ Minimum required: 0 ▸ Maximum allowed: 8 (Initial order maximum: 0) ▸ OS level required: None **For 9119-FHA (#7862)** ▸ Minimum required: 0 ▸ Maximum allowed: No max (Initial order maximum: 0) ▸ OS level required: None Initial Order/MES/Both/Supported: Supported CSU: Yes Return parts MES: Does not apply
#7863	**#7863 PCI Blind Swap Cassette Kit, Double Wide Adapters,** Type II This feature contains a blind swap cassette for double slot width PCI adapters. It also includes the necessary hardware to adapt the cassette to mount various sizes of PCI cards. Attributes provided: Blind swap PCI cassette Attributes required: PCI card and two empty PCI adapter locations **For 9117-MMA (#7863) and 9119-FHA (#7863)** ▸ Minimum required: 0 ▸ Maximum allowed: No Max (Initial order maximum: 0) ▸ OS level required: None ▸ Initial Order/MES/Both/Supported: MES ▸ CSU: Not applicable ▸ Return parts MES: Does not apply

#7865	**(#7865) Processor Enclosure And Backplane** Provides an enclosure and a backplane for up to two processor cards. Attributes provided: Two processor card slots Attributes required: None **For 9117-MMA (#7865)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES: Does not apply
#7866	**#7866 I/O Backplane, 6 PCI-X Slots** Provides six PCI-X 64-bit, 3.3 volt, 133 MHz slots for I/O adapter cards. Attributes provided: Six PCI-X I/O slots Attributes required: None **For 9117-MMA (#7866)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES: Does not apply
#7867	**#7867 System Midplane** The System Midplane is a riser card that provides interconnections between the modular subsystems in the system drawer. Attributes provided: Internal connections within the drawer Attributes required: None **For 9117-MMA (#7867)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES: Does not apply
#7868	**#7868 Ultra320 SCSI 6-pack Backplane** Provides an enclosure and backplane connections for up to six Ultra320 SCSI disk drives. Attributes provided: Six disk drive bays Attributes required: None **For 9117-MMA (#7868)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES: Does not apply

7869	**#7869 Media Enclosure And Backplane** Provides an enclosure and backplane connections for up to two Slimline media devices. Attributes provided: Two media bays Attributes required: None **For 9117-MMA (#7869)** ▶ Minimum required: 0 ▶ Maximum allowed: 0 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
#7870	**#7870 Power Distribution Backplane** The power distribution backplane provides the internal power connections between the power supplies and the other components in the drawer. Attributes provided: Power distribution within a drawer Attributes required: None **For 9117-MMA (#7870)** ▶ Minimum required: 1 ▶ Maximum allowed: 4 (Initial order maximum: 4) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No **Note**: One maximum in each CEC enclosure.
#7875	**#7875 Processor Power Regulator** Provides the needed power/voltage to allow the processors to operate. Attributes provided: Processor power regulator Attributes required: None **For 9117-MMA (#7875)** ▶ Minimum required: 0 ▶ Maximum allowed: 0 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
#7878	**#7878 System Port Riser Card** Provides two 9-pin system ports (serial) at the rear of the chassis. Attributes provided: Two 9-pin system ports (serial). Attributes required: None **For 9117-MMA (#7878)** ▶ Minimum required: 0 ▶ Maximum allowed: 0 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES: Does not apply

#7879	**#7879 System Drawer Enclosure** Provides the chassis and covers for a single drawer of the system. Attributes provided: Chassis for one system drawer Attributes required: None **For 9117-MMA (#7879)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES: Does not apply
#7881	**#7881 Service Processor** Provides the service processor for the system. Attributes provided: One service processor Attributes required: None **For 9117-MMA (#7881)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES: Does not apply
#7888	**#7888 ac Power Supply, 1400 W** Provides one 1400 watt ac power supply for a server drawer. Attributes provided: One ac power supply Attributes required: None **For 9117-MMA (#7888)** ► Minimum required: 0 ► Maximum allowed: 8 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No **Note**: This feature #7888 can be used only with Processor #5621. Two are required in each CEC enclosure. Power Supply features #7888 and #5628 cannot be mixed in the same CEC enclosure but can be mixed in systems with two or more enclosures.

#7890	**#7890 4/8 GB (4 x 2 GB) DIMMs, CUoD, 4 GB Active, 266 MHz DDR1** Provides 8192 MB of system memory with 4 2048 MB DIMMs. 4096 MB of the memory is active. It is used to provide memory Capacity Upgrade on Demand. Attributes provided: 8192 MB of memory, with 4096 MB active Attributes required: Four empty DDR1 memory DIMM positions **For 9117-MMA (#7890)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES: Does not apply

#7892	**#7892 2 GB (4 x 512 MB) DIMMs, 276-pin, 533 MHz**
	DDR2 SDRAM Provides 2048 MB of DDR2 system memory with four 512 MB DIMMs.
	
	Attributes provided: 2048 MB of DDR2 system memory
	Attributes required: Four empty memory DDR2 memory DIMM positions
	
	For 9117-MMA (#7892)
	► Minimum required: 0
	► Maximum allowed: 16 (Initial order maximum: 0)
	► OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	► Initial Order/MES/Both/Supported: MES
	► CSU: Not applicable
	► Return parts MES: Does not apply
	
	Note: Can be used only with Processor FC 5621.

#7893	**#7893 4 GB (4 x 1 GB) DIMMs, 276-pin, 533 MHz DDR2 SDRAM**
	Provides 4096 MB of DDR2 system memory with four 1024 MB DIMMs.
	
	Attributes provided: 4096 MB of system memory
	Attributes required: Four empty memory DIMM positions
	
	For 9117-MMA (#7893)
	► Minimum required: 0
	► Maximum allowed: 16 (Initial order maximum: 0)
	► OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	► Initial Order/MES/Both/Supported: MES
	► CSU: No
	► Return parts MES: No
	
	Note: Can be used only with Processor FC 5621. Can be used only with a system upgraded from a 9117-570.

#7894	**#7894 8 GB (4x2 GB) DIMMs, 276-pin, 533 MHz DDR2 SDRAM** Provides 8192 MB of DDR2 system memory with 4 2048 MB DIMMs. Attributes provided: 8192 MB of system memory Attributes required: Four empty memory DIMM positions For 9117-MMA (#7894) Minimum required: 0 Maximum allowed: 16 (Initial order maximum: 0) OS level required: ▶ AIX 5.2 TL10 or later ▶ AIX 5.3 TL6 or later ▶ IBM i 5.4 with V5R4M5 machine code or later For information about support on Red Hat Enterprise Linux and SUSE Linux, visit: http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument Initial Order/MES/Both/Supported: MES CSU: No Return parts MES: No Note: Can be used only with Processor FC 5621. Can be used only with a system upgraded from a 9117-570.
#7897	**#7897 One Processor Activation for CUoD Processor Feature #7830** This feature number will permanently activate the first or second processor on a 7830 processor card. Attributes provided: Activation of processors for #7830 Attributes required: Feature number 7830 with unactivated processors **For 9117-MMA (#7897)** ▶ Minimum required: 0 ▶ Maximum allowed: 0 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
#7898	**#7898 One Processor Activation for CUoD Processor Feature #7832** This feature number will permanently activate the first or second processor on a 7832 processor card. Attributes provided: Activation of processors for #7832 Attributes required: Feature number 7832 with unactivated processors **For 9117-MMA (#7898)** ▶ Minimum required: 0 ▶ Maximum allowed: 0 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES: Does not apply

#7899	**#7899 One Processor Activation for CUoD Processor Feature #7833** This feature number will permanently activate the first or second processor on a 7833 processor card. Attributes provided: Activation of processors for #7833 Attributes required: Feature number 7833 with unactivated processors **For 9117-MMA (#7899)** ▶ Minimum required: 0 ▶ Maximum allowed: 0 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
#7923	**#7923 Switch Cbl (SNI) 3.5 m Optical** (No longer available as of 29 August 2008.) The Switch Cables, 3.5 meter Optical, are used within the pSeries High Performance Switch (HPS) network to enable optic connections between the switch network interface (SNI) features in the p5 590 and the p5 595 to the switch port connection card (optical) within the HPS. It is used when the switch is in the same rack as the CEC. #7923 delivers an optical cable pair consisting of a transmitter cable and receiver cable. Attributes provided: Switch Cables, 3.5 meter Optical Attributes required: None **For 9119-FHA (#7923)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ▶ CSU: Not applicable ▶ Return parts MES:
#7924	**#7924 RIO-2 (Remote I/O-2) Cbl, 0.6 m** This 0.6 meter Remote I/O cable is utilized to connect between the left and right sections of an I/O drawer. Attributes provided: RIO-2 Connection Attributes required: I/O drawer **For 9119-FHA (#7924)** ▶ Minimum required: 0 ▶ Maximum allowed: 12 (Initial order maximum: 12) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: Does not apply

#7925	**#7925 Activation, #7981 or # 7730 CUoD Processor Book, One** Processor This feature permanently activates one processor on CUoD processor feature #7981 or #7730. Attributes provided: One processor activation Attributes required: Inactive CUoD processor **For 9119-FHA (#7925)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES:
#7926	**#7926 30 Days Prepaid Reserve Capacity for #7981** Provides 30 processor-days of prepaid reserve capacity for feature #7981 processor book. To establish reserve processor capacity on the server, select a quantity of inactive processors to be placed in the server's Shared Processor Pool as reserve processors. When the server recognizes that non-reserve processors (permanently activated processors) assigned or available to the uncapped partitions have been 100% utilized, use of additional processors will cause processor- days (good for a 24-hour period) to be subtracted from the prepaid number of processor-days. Attributes provided: 30 processor-days usage of inactive processors Attributes required: Advanced Power Virtualization #7992 **For 9119-FHA (#7926)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES:
#7929	**#7929 One Processor Entitlement for Processor Feature #7834** Permanently entitles one processor on a 7834 processor card. Attributes provided: Entitlement of processors for #7834 Attributes required: Feature #7834 with non-entitled processors **For 9117-MMA (#7929)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES: Does not apply

#7937	**#7937 Bolt-Down Kit, Low-Raised Floor** Provides rack ruggedizing and bolt down hardware for securing rack to a concrete floor beneath a 9 inch to 13 inch (228 mm to 330 mm) raised floor. Installation of this feature will help to secure and protect the rack and its contents from damage when exposed to vibrations and shocks such as those in a seismic event. Attributes provided: Rack bolt down kit Attributes required: System or expansion rack **For 9119-FHA (#7937)** ▶ Minimum required: 0 ▶ Maximum allowed: 5 (Initial order maximum: 3) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES:
#7938	**#7938 Bolt-Down Kit, High-Raised Floor** Provides rack ruggedizing and bolt down hardware for securing rack to a concrete floor beneath a 12 inch to 22 inch (305 mm to 559 mm) raised floor. Installation of this feature will help to secure and protect the rack and its contents from damage when exposed to vibrations and shocks such as those in a seismic event. Attributes provided: Rack bolt down kit Attributes required: System or expansion rack **For 9119-FHA (#7938)** ▶ Minimum required: 0 ▶ Maximum allowed: 5 (Initial order maximum: 3) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES:
#7939	**#7939 Bolt-Down Kit, Non-Raised Floor** Provides rack ruggedizing and bolt down hardware for securing rack to a concrete floor. Installation of this feature will help to secure and protect the rack and it's contents from damage when exposed to vibrations and shocks such as those in a seismic event. Attributes provided: Rack bolt down kit Attributes required: System or expansion rack **For 9119-FHA (#7939)** ▶ Minimum required: 0 ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ▶ CSU: Not applicable ▶ Return parts MES: Does not apply

#7942	**#7942 PowerVM - Standard Edition** This feature (formerly Advanced Power Virtualization - Standard) allows the customer to create partitions that are in units of less than 1 CPU (sub-CPU LPARs) and allows the same system I/O to be virtually allocated to these partitions. The processors on the system can be partitioned into as many as 10 LPARs per processor. An encrypted key is supplied to the customer and installed on the system, authorizing the partitioning at the sub-processor level. Included with Feature 7942 is the IBM Virtual I/O Server (5765-G34) to provide additional virtualization function. Attributes provided: System virtualization Attributes required: None **For 9117-MMA (#7942)** ▶ Minimum required: 0 ▶ Maximum allowed: 16 (Initial order maximum: 16) ▶ OS level required: – AIX 5.3 TL6 or later – AIX 6.1 or later – IBM i 5.4 with V5R4M5 machine code or later For information about support on Red Hat Enterprise Linux and SUSE Linux, visit: http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No **Note**: If feature 7942 is ordered, the quantity must be equal to or greater than the number of active processors. When the Virtualization feature is installed in a system, it cannot be removed. Partition Load Manager (5765-G31) is not supported on model MMA. This feature was previously known as Advanced POWER Virtualization (APV) - Standard.
#7943	**#7943 PowerVM -Standard Edition** This feature allows the customer to create partitions that are in units of less than 1 CPU (sub-CPU LPARs) and allows the same system I/O to be virtually allocated to these partitions. The processors on the system can be partitioned into as many as 10 LPARs per processor. An encrypted key is supplied to the customer and installed on the system, authorizing the partitioning at the sub-processor level. Included with feature #7943 is the IBM Virtual I/O Server (5765-G34) to provide additional virtualization function. Attributes provided: System virtualization Attributes required: None **For 9119-FHA (#7943)** ▶ Minimum required: 0 ▶ Maximum allowed: 64 (Initial order maximum: 64) ▶ OS level required: – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later – AIX Version 5.3 with the 5300-08 Technology Level or later – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later – AIX Version 6.1 with the 6100-01 Technology Level or later – IBM i 6.1 or later – SUSE Linux Enterprise Server 10 Service Pack 2 for POWER or later – Red Hat Enterprise Linux 4.7 for POWER and Red Hat Enterprise Linux 5.2 for POWER or later Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: Does not apply

#7950	**#7950 1024 MB Activation for DDR1 Memory** This feature permanently activates 1024 MB of DDR1 memory. Attributes provided: Activation of 1024 MB DDR1 memory Attributes required: 1024 MB of unactivated DDR1 memory **For 9117-MMA (#7950)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES: Does not apply

#7951	**#7951 On/Off Processor Enablement**
	This feature can be ordered to enable your server for On/Off Capacity on Demand. When enabled, you can request processors on a temporary basis. You must sign an On/Off Capacity on Demand contract before you order this feature. To renew this feature after the allowed 360 Processor Days have been used, this feature must be removed from the system Configuration file and reordered by placing an MES order.
	
	Attributes provided: On/Off CoD Enablement - for up to 360 Processor Days
	Attributes required: Inactive processors in the system
	
	For 9117-MMA (#7951)
	► Minimum required: 0
	► Maximum allowed: 1 (Initial order maximum: 0)
	► OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	► Initial Order/MES/Both/Supported: MES
	► CSU: Yes
	► Return parts MES: No

#7952	**#7952 On/Off Processor Day Billing for Feature 7830** When an On/Off Processor Enablement feature is ordered and the associated enablement code is entered into the system, you must report your on/off usage to IBM at least monthly. This information, used to compute your billing data, is then provided to your sales channel. The sales channel will place an order for a quantity of On/Off Processor Day Billing features and bill you. One #7952 should be ordered for each billable processor day. Attributes provided: One processor day usage for feature 7830 Attributes required: None **For 9117-MMA (#7952)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES: Does not apply

#7953	**#7953 On/Off Processor Day Billing for Feature 7832** When an On/Off Processor Enablement feature is ordered and the associated enablement code is entered into the system, you must report your on/off usage to IBM at least monthly. This information, used to compute your billing data, is then provided to your sales channel. The sales channel will place an order for a quantity of On/Off Processor Day Billing features and bill you. One #7953 should be ordered for each billable processor day. Attributes provided: One processor day usage for feature 7832 Attributes required: None **For 9117-MMA (#7953)** ▶ Minimum required: 0 ▶ Maximum allowed: 0 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ▶ CSU: Not applicable ▶ Return parts MES: Does not apply

#7954	**#7954 On/Off Memory Enablement**
	This feature can be ordered to enable your server for On/Off Capacity on Demand. When enabled, you can request memory on a temporary basis. You must sign an On/Off Capacity on Demand contract before you order this feature. To renew this feature after the allowed 999 GB Days have been used, this feature must be removed from the system Configuration file and reordered by placing an MES order.
	
	Attributes provided: On/Off CoD Enablement for up to 999 GB Memory days
	Attributes required: Inactive CoD Memory in the system
	
	For 9117-MMA (#7954)
	▶ Minimum required: 0
	▶ Maximum allowed: 1 (Initial order maximum: 0)
	▶ OS level required:
	   – AIX 5.2 TL10 or later
	   – AIX 5.3 TL6 or later
	   – IBM i 5.4 with V5R4M5 machine code or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  `http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument`
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: Yes
	▶ Return parts MES: No

#7955	**#7955 On/Off Processor Day Billing for Feature 7833** When an On/Off Processor Enablement feature is ordered and the associated enablement code is entered into the system, you must report your on/off usage to IBM at least monthly. This information, used to compute your billing data, is then provided to your sales channel. The sales channel will place an order for a quantity of On/Off Processor Day Billing features and bill you. One #7955 should be ordered for each billable processor day. Attributes provided: One processor day usage for feature 7833 Attributes required: None **For 9117-MMA (#7955)** ▶ Minimum required: 0 ▶ Maximum allowed: 0 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ▶ CSU: Not applicable ▶ Return parts MES: Does not apply

#7956	**#7956 30 Days Prepaid Reserve Capacity for 1.65 GHz Processors** Provides 30 processor-days of prepaid reserve capacity for 1.65 GHz processors. To establish reserve processor capacity on the server, select a quantity of inactive processors to be placed in the server's Shared Processor Pool as reserve processors. When the server recognizes that non-reserve processors (permanently activated processors) assigned or available to the uncapped partitions have been 100% utilized, use of additional processors will cause processor-days (good for a 24-hour period) to be subtracted from the prepaid number of processor-days. Attributes provided: 30 processor-days usage of inactive 1.65 GHz processors Attributes required: Any quantity of inactive 1.65 GHz processors **For 9117-MMA (#7956)** ▶ Minimum required: 0 ▶ Maximum allowed: 0 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
#7957	**#7957 On/Off Memory 1 GB-Day Billing** When an On/Off Memory Enablement feature is ordered and the associated enablement code is entered into the system, you must report your on/off usage to IBM at least monthly. This information, used to compute your billing data, is then provided to your sales channel. The sales channel will place an order for a quantity of On/Off Memory Day Billing features and bill you. One #7957 should be ordered for each billable day for each 1 GB increment of memory. Attributes provided: One day usage of 1 GB of memory on a p570 Attributes required: Inactive CoD Memory in the system. **For 9117-MMA (#7957)** ▶ Minimum required: 0 ▶ Maximum allowed: 0 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
#7959	**#7959 30 Days Prepaid Reserve Capacity for 1.9 GHz Processors** Provides 30 processor-days of prepaid reserve capacity for 1.9 GHz processors. To establish reserve processor capacity on the server, select a quantity of inactive processors to be placed in the server's Shared Processor Pool as reserve processors. When the server recognizes that non-reserve processors (permanently activated processors) assigned or available to the uncapped partitions have been 100% utilized, use of additional processors will cause processor-days (good for a 24-hour period) to be subtracted from the prepaid number of processor-days. Attributes provided: 30 processor-days usage of inactive 1.9 GHz processors Attributes required: Any quantity of inactive 1.9 GHz processors **For 9117-MMA (#7959)** ▶ Minimum required: 0 ▶ Maximum allowed: 0 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ▶ CSU: Not applicable ▶ Return parts MES: Does not apply

#7960	**#7960 Compact Handling Option** This feature allows the System or expansion rack to pass through doors at the customer location which are less than the 2.02 m (79.5 inch) normally required. With this feature the top section of the rack (including the power subsystem) is removed at the factory and shipped separately for installation at the customer location. Attributes provided: Reduced height for shipping. Attributes required: None **For 9119-FHA (#7960)** ▶ Minimum required: 0 ▶ Maximum allowed: 5 (Initial order maximum: 5) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Not applicable ▶ Return parts MES:
#7962	**#7962 Switch Cbl. (SNI) 10 meter Optical** The Switch Cables, 10 meter Optical, are used within the pSeries High Performance Switch (HPS) network to enable optic connections between the switch network interface (SNI) features in the p5 590 and p5 595 to the switch port connection card (optical) within the HPS. It is used when the switch is in a different rack than the CEC. #7962 is also used for switch to switch applications. #7962 delivers an optical cable pair consisting of a transmitter cable and receiver cable. Attributes provided: Switch Cables, 10 meter Optical Attributes required: None **For 9119-FHA (#7962)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ▶ CSU: Not applicable ▶ Return parts MES:
#7963	**#7963 Switch Cbl (SNI) 30 m, Optical** (No longer available as of 29 August 2008.) The Switch Cables, 30 meter Optical, are used within the pSeries High Performance Switch (HPS) network to enable optic connections between the switch network interface (SNI) features in the p5 590 and p5 595 to the switch port connection card (optical) within the HPS. It is used when the switch is in a different rack than the CEC. #7963 is also used for switch to switch applications. #7963 delivers an optical cable pair consisting of a transmitter cable and receiver cable. Attributes provided: Switch Cables, 30 meter Optical Attributes required: None **For 9119-FHA (#7963)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ▶ CSU: Not applicable ▶ Return parts MES:

#7970	**#7970 1 GB Activation #7816 and #7835 Memory Features** This feature permanently activates 1024 MB of DDR1 memory for features #7816 or #7835. Attributes provided: 1024 MB memory activation for #7816 or #7835 Attributes required: 1024 MB of unactivated memory **For 9119-FHA (#7970)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES:
#7971	**#7971 On/Off Processor Enablement for features #7813, #7731, #7586, #7587, #7704, #7705, #8967, #8968, #8969, and #8970** Can be ordered to enable a server for On/Off Capacity on Demand for processor book features #7813, #7731, #7586, #7587, #7704, #7705, #8967, #8968, #8969, and #8970. When enabled, you can request processors on a temporary basis. You must sign an On/Off Capacity on Demand contract before you order this feature. Attributes provided: Processor On/Off Capacity on Demand Enablement Attributes required: None **For 9119-FHA (#7971)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: ► Initial Order/MES/Both/Supported: MES Only ► CSU: Yes ► Return parts MES:
#7972	**#7972 On/Off Processor Billing for Feature #7813, #7731, #8969, #7586** When an On/Off Processor Enablement feature is ordered and the associated enablement code is entered into the system, you must report your on/off usage to IBM at least monthly. This information, used to compute your billing data, is then provided to your sales channel. The sales channel will place an order for a quantity of On/ Off Processor Day Billing features and bill you. One #7972 should be ordered for each billable processor day. Attributes provided: One processor day usage for features #7813, #7731 or #8969 Attributes required: None **For 9119-FHA (#7972)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES:

#7973	**#7973 On/Off Memory Enablement** This feature can be ordered to enable your server for On/Off Capacity on Demand. When enabled, you can request memory on a temporary basis. You must sign an On/Off Capacity on Demand contract before you order this feature. Attributes provided: Memory On/Off Capacity on Demand Enablement Attributes required: None **For 9119-FHA (#7973)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: MES Only ▶ CSU: Yes ▶ Return parts MES:
#7974	**#7974 On/Off Memory Billing** When an On/Off Memory Enablement feature is ordered and the associated enablement code is entered into the system, you must report your on/off usage to IBM at least monthly. This information, used to compute your billing data, is then provided to your sales channel. The sales channel will place an order for a quantity of On/Off Memory Day Billing features and bill you. One #7974 should be ordered for each billable day for each 1 GB increment of memory. Attributes provided: One day usage of 1 GB memory Attributes required: None **For 9119-FHA (#7974)** ▶ Minimum required: 0 ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ▶ CSU: Not applicable ▶ Return parts MES:
#7975	**#7975 30 Days Prepaid Reserve Capacity for #7813 (MES orders only), #8969** Provides 30 processor-days of prepaid reserve capacity for feature #7813 or #8969 processor books. To establish reserve processor capacity on the server, select a quantity of inactive processors to be placed in the server's Shared Processor Pool as reserve processors. When the server recognizes that non-reserve processors (permanently activated processors) assigned or available to the uncapped partitions have been 100% utilized, use of additional processors will cause processor-days (good for a 24-hour period) to be subtracted from the prepaid number of processor-days. Attributes provided: 30 processor-days usage of inactive processors for features #7813 or #8969 Attributes required: Advanced Power Virtualization #7943 **For 9119-FHA (#7975)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ▶ CSU: Not applicable ▶ Return parts MES:

#7981	**#7981 16-Way POWER5 Standard CUoD Processor Book, 0-Way Active** Provides a 16-way POWER5 Standard processor book with capacity Upgrade on Demand. The processors are packaged on two 8-way Multi Chip Modules (MCMs). Each pair of processors is supported by 1.9 MB of L2 cache and 36 MB of L3 cache. Each 16-way processor book also provides six RIO-2 loop adapter slots and 16 memory slots. Attributes provided: 16-way processor book, 0-way active; 16 memory DIMM slots Attributes required: One processor book slot **For 9119-FHA (#7981)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES:
#7988	**#7988 16-Way POWER5 Standard CUoD Processor Book, 0-Way Active** Provides a 16-way POWER5 Standard processor book with capacity Upgrade on Demand. The processors are packaged on two 8-way Multi Chip Modules (MCMs). Each pair of processors is supported by 1.9 MB of L2 cache and 36 MB of L3 cache. Each 16-way processor book also provides six RIO-2 loop adapter slots and 16 memory slots. Attributes provided: 16-way processor book, 0-way active; 16 memory DIMM slots Attributes required: One processor book slot **For 9119-FHA (#7988)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES:
#7990	**#7990 Activation, #7988 or #7732 CUoD Processor Book, One Processor** This feature permanently activates one processor on CUoD processor feature #7988 or #7732. Attributes provided: One processor activation Attributes required: Inactive CUoD processor **For 9119-FHA (#7990)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES:

#7991	**#7991 30 Days Prepaid Reserve Capacity for #7988**
	Provides 30 processor-days of prepaid reserve capacity for feature #7988 processor book. To establish reserve processor capacity on the server, select a quantity of inactive processors to be placed in the server's Shared Processor Pool as reserve processors. When the server recognizes that non-reserve processors (permanently activated processors) assigned or available to the uncapped partitions have been 100% utilized, use of additional processors will cause processor- days (good for a 24-hour period) to be subtracted from the prepaid number of processor-days.
	Attributes provided: 30 processor-days usage of inactive processors Attributes required: Advanced Power Virtualization #7992
	For 9119-FHA (#7991) ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ▶ CSU: Not applicable ▶ Return parts MES:
#7992	**#7992 Advanced POWER Virtualization**
	This feature allows the customer to create partitions that are in units of less than 1 CPU (sub-CPU LPARs) and allows the same system I/O to be virtually allocated to these partitions. The processors on the system can be partitioned into as many as 10 LPARs per processor. Partition Load Manager is included to provide cross-partition workload management across the LPARs. An encrypted key is supplied to the customer and installed on the system, authorizing the partitioning at the sub-processor level.
	Attributes provided: System virtualization Attributes required: None
	For 9119-FHA (#7992) ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ▶ CSU: Not applicable ▶ Return parts MES:
#7993	**#7993 On/Off Processor Billing for Feature #7981 or #7730**
	When an On/Off Processor Enablement feature is ordered and the associated enablement code is entered into the system, you must report your on/off usage to IBM at least monthly. This information, used to compute your billing data, is then provided to your sales channel. The sales channel will place an order for a quantity of On/Off Processor Day Billing features and bill you. One #7993 should be ordered for each billable processor day.
	Attributes provided: One processor day usage for feature #7891 or #7730 Attributes required: None
	For 9119-FHA (#7993) ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ▶ CSU: Not applicable ▶ Return parts MES:

#7994	**#7994 On/Off Processor Enablement for #7988 or #7732** This feature can be ordered to enable your server for On/Off Capacity on Demand for processor book feature #7998 or #7732. When enabled, you can request processors on a temporary basis. You must sign an On/Off Capacity on Demand contract before you order this feature. Attributes provided: Processor On/Off Capacity on Demand Enablement Attributes required: None **For 9119-FHA (#7994)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ▶ CSU: Not applicable ▶ Return parts MES:

#7995	**#7995 PowerVM - Enterprise Edition**
	This feature (formerly known as Advanced POWER Virtualization - Enterprise) allows the customer to create partitions that are in units of less than 1 CPU (sub-CPU LPARs) and allows the same system I/O to be virtually allocated to these partitions. The processors on the system can be partitioned into as many as 10 LPARs per processor. An encrypted key is supplied to the customer and installed on the system, authorizing the partitioning at the sub-processor level. Included with Feature 7995 is the IBM Virtual I/O Server (5765-G34) and Live Partition Mobility, which allows for the movement of a logical partition from one POWER6 processor-based server to another with no application downtime. to provide additional virtualization function.
	
	Attributes provided: System virtualization with Partition Mobility
	Attributes required: None
	
	For 9117-MMA (#7995)
	▶ Minimum required: 0
	▶ Maximum allowed: 16 (Initial order maximum: 16)
	▶ OS level required:
	  – AIX 5.3 TL7 or later
	  – AIX 6.1 or later
	  For information about support on Red Hat Enterprise Linux and SUSE Linux, refer to:
	  `http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument`
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Yes
	▶ Return parts MES: No
	
	Note: If feature 7995 is ordered, the quantity must be equal to or greater than the number of active processors. When the Virtualization feature is installed in a system, it cannot be removed. This feature requires system firmware level EM320_074 or later

#7996	**#7996 On/Off Processor Billing for Feature #7988 or #7732**
	When an On/Off Processor Enablement feature is ordered and the associated enablement code is entered into the system, you must report your on/off usage to IBM at least monthly. This information, used to compute your billing data, is then provided to your sales channel. The sales channel will place an order for a quantity of On/Off Processor Day Billing features and bill you. One #7996 should be ordered for each billable processor day.
	Attributes provided: One processor day usage for feature #7988 or #7732 Attributes required: None
	For 9119-FHA (#7996) ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES:
#7997	**#7997 System Service Processor**
	Service Processor for the system. This feature includes two external 9-pin D-Shell SPCN ports and two external E-Net ports to support HMC attach. This feature cannot coexist in a system with Feature Code 7881.
	Attributes provided: one service processor Attributes required: None
	For 9117-MMA (#7997) ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES: Does not apply

#8002	**#8002 PowerVM (Enterprise Edition)**
	This feature allows the customer to create partitions that are in units of less than 1 CPU (sub-CPU LPARs) and allows the same system I/O to be virtually allocated to these partitions. The processors on the system can be partitioned into as many as 10 LPARs per processor. An encrypted key is supplied to the customer and installed on the system, authorizing the partitioning at the sub-processor level.
	
	Included with Feature 7995 is the IBM Virtual I/O Server (5765-G34) and Live Partition Mobility, which allows for the movement of a logical partition from one POWER6 processor-based server to another with no application downtime to provide additional virtualization function.
	
	Note: Feature 8002 requires system firmware level EH330_028 or later
	
	Attributes provided: System virtualization
	Attributes required: AIX 5.3, AIX 6.1, or i 6.1 or Linux
	
	For 9119-FHA (#8002)
	▶ Minimum required: 0
	▶ Maximum allowed: 64 (Initial order maximum: 64)
	▶ OS level required:
	  – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	  – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	  – AIX Version 5.3 with the 5300-08 Technology Level or later
	  – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	  – AIX Version 6.1 with the 6100-01 Technology Level or later
	  – IBM i 6.1 or later
	  – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	  – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	  Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	  http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: Not applicable
	▶ Return parts MES: Does not apply

#8017	**#8017 570 to MMA CoD Memory Activation Carry Over Indicator**
	Carry over indicator for permanent Memory Activation feature (#7663) when upgrading a 9117-570 to a 9117-MMA. Each occurrence of this feature (#8017) on a Model Conversion upgrade MES order will cause the activation of 1 GB of DDR2 Memory for CoD Memory features 4495 or 4496 in the new 9117-MMA system. This feature delivers the equivalent of feature #7663. This feature can only be used on upgrade MES orders during a model conversion. One occurrence of feature # 8017 can be added to the order for each occurrence of feature #7663 that has been previously purchased and appears on IBM's manufacturing configuration file for the serial number system being upgraded.
	
	Attributes provided: Activation of 1 GB of DDR2 memory-equivalent of feature #7663
	Attributes required: previous purchase of feature #7663 on a 9117-570 system
	
	For 9117-MMA (#8017)
	▶ Minimum required: 0
	▶ Maximum allowed: 128 (Initial order maximum: 0)
	▶ OS level required:
	  – AIX 5.2 TL10 or later
	  – AIX 5.3 TL6 or later
	  For information about support on Red Hat Enterprise, visit:
	  http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	▶ Initial Order/MES/Both/Supported: MES
	▶ CSU: Yes
	▶ Return parts MES: No
	
	Note: This carry over indicator is only valid on Model Conversion MES upgrade orders. The quantity of feature #8017 on the order cannot exceed the quantity of feature # 7663 previously purchased for the p5 570 and carried-over during the model conversion upgrade.

| #8018 | **#8018 570 to MMA Advanced POWER Virtualization Carry Over**
Indicator Carry over indicator for Advanced Power Virtualization (#7942) when upgrading a 9117-570 to a 9117-MMA. Each occurrence of this feature (#8018) on a Model Conversion upgrade MES order will cause the activation of Advance Power Virtualization on one processor core. This feature delivers the equivalent of feature 7942. This feature (#8018) can be used only on an upgrade MES order during a model conversion. One occurrence of feature #8018 can be added to the model conversion order for each occurrence of feature #7942 that has been previously obtained and appears on the configuration record on file with IBM for the serial number system being upgraded.

Attributes provided: Activation of Advanced POWER Virtualization on one processor core
Attributes required: previous purchase of feature # 7942 on the 9117-570 system being upgraded

For 9117-MMA (#8018)
▶ Minimum required: 0
▶ Maximum allowed: 16 (Initial order maximum: 0)
▶ OS level required:
  – AIX 5.3 TL6 with SP4 or later
  – AIX 5.3 TL7 or later
  – AIX 6.1 or later
  – IBM i 5.4 with V5R4M5 machine code or later
  For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
  `http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument`
▶ Initial Order/MES/Both/Supported: MES
▶ CSU: Yes
▶ Return parts MES: No

Note: If feature 8018 is ordered, the quantity cannot exceed the quantity of feature 7942 obtained for the system prior to the model conversion. Additional features 7942 can be ordered on the same Model Conversion order as needed to meet the requirement of one instance of a PowerVM feature for each active processor in the system. When the PowerVM feature is installed in a system, it cannot be removed. |
| #8052 | **#8052 4096 MB (4 x 1024 MB) DIMMs, Express Configuration, Factory Only**
Provides 4096 MB of system memory with four 1024 MB DIMMs for systems being included in Express Configurations. Equivalent to #4453.

Attributes provided: 4096 MB of system memory equivalent to #4453.
Attributes required: Four empty memory DIMM positions.

For 9117-MMA (#8052)
▶ Minimum required: 0
▶ Maximum allowed: 0 (Initial order maximum: 0)
▶ OS level required: None
▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs.
▶ CSU: Not applicable
▶ Return parts MES: Does not apply |

#8129	**#8129 0/256 GB DDR2 Memory (32X8 GB) DIMMS 400 MHz POWER6 Memory**
	This CoD memory feature makes available 32 DIMMS each with 8 GB of memory for a total feature size of 256 GB of DDR2, 400 MHz POWER6 system memory. None of the memory in this feature is active. Use of this feature requires the purchase of Memory Activation Feature #5681 on the same initial system order to provide 100% activation of the feature. Memory Activation Feature #5680 cannot be used to activate the memory on this feature (8129). The DIMMS purchased with this feature must all be used on a single system.
	Attributes provided: 256 GB of Memory available on 32 DIMMS
	Attributes required: 32 empty DIMM slots and requires feature #681 on the same order to provide 100% activation
	For 9117-MMA (#8129)
	▶ Minimum required: 0
	▶ Maximum allowed: 3 (Initial order maximum: 3)
	▶ OS level required:
	– AIX 5.2 TL10 or later
	– AIX 5.3 TL6 or later
	– IBM i 5.4 with V5R4M5 machine code or later
	For information about support on Red Hat Enterprise Linux and SUSE Linux, visit:
	http://www-912.ibm.com/e_dir/eserverprereq.nsf/UpgradeCategories/Hardware?opendocument
	▶ Initial Order/MES/Both/Supported: Initial
	▶ CSU: No
	▶ Return parts MES: No
	Note: DIMMs must be placed on processor cards in groups of four. Memory must be 100% active on this feature. This memory feature (8129) requires System Firmware level EM320_030 or later. If ordering this feature for use on an existing system, the firmware on that system must be updated to EM320_030 or later.
#8131	**#8131 128-Port Asynchronous Controller Cable, 4.5 Meter**
	This cable provides attachment between the 128-port Asynchronous Controller and the first RAN in a daisy chain, or attachment between RANs in the daisy chain.
	Attributes provided: Links 128-port Async Controller to RAN or RAN-to-RAN
	Attributes required: (1) 128-port Async Controller or RAN-to-RAN connection in a daisy chain.
	For 9117-MMA (#8131) and 9119-FHA (#8131)
	▶ Minimum required: 0
	▶ Maximum allowed: (Initial order maximum:)
	▶ OS level required: None
	▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs.
	▶ CSU: Not applicable
	▶ Return parts MES:
#8132	**#8132 128-Port Asynchronous Controller Cable, 23cm (9-in)**
	This cable can be substituted for the 4.5 meter (15 foot) async controller cable whenever a customer configuration requires stacked Remote Async Nodes.
	Attributes provided: Links 128-port Async Controller to RAN or RAN-to-RAN
	Attributes required: (1) 128-port Async Controller or RAN-to-RAN connection in a daisy chain.
	For 9117-MMA (#8132) and 9119-FHA (#8132)
	▶ Minimum required: 0
	▶ Maximum allowed: 0 (Initial order maximum: 0)
	▶ OS level required: None
	▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs.
	▶ CSU: Not applicable

#8133	**#8133 RJ-45 to DB-25 Converter Cable** This cable can be used to attach EIA-232 devices to the 16 port EIA 232 Remote Async Node (FC 8130 or FC 8134) for the 128-Port Async subsystem. This cable provides a 25-pin D shell connector for device attachment. Four cables are provided per each order. Attributes provided: 4 DB-25 EIA-232 ports Attributes required: 4 RJ-45 ports from a RAN (8130, 8134, 8136) **For 9117-MMA (#8133)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None **For 9119-FHA (#8133)** ► Minimum required: 0 ► Maximum allowed: 99 (Initial order maximum: 0) ► OS level required: Not applicable Initial Order/MES/Both/Supported: Supported CSU: Yes Return parts MES: No

| #8136 | **#8136 Rack Mountable Remote Asynchronous Node 16-Port EIA-232**
The Rack Mountable Remote Asynchronous Node 16-Port EIA-232 (RAN) is a modified version of the existing 16-port Remote Async Node (feature #8130 or 8134) in an industry-standard 19 inch rack mount chassis to allow simpler installation and ease-of-use. Like the existing RAN, it can also be configured as a desktop device.

As an additional benefit, the metal chassis meets FCC Class B/CISPR B when used with similarly rated RS/6000 host to meet the needs of customers with these requirements.

The RANs provide 16 ports of EIA-232 capability with full modem controls on each port and are connected to the 128-port Async Controller (Micro Channel® or ISA versions) residing in the host. RANs are connected in daisy-chain fashion up to 8 RANs per 128-port Async Controller (either version).

The rack-mountable RAN offers these enhanced features:
▶ Industry-standard 19 inch rack mountable chassis (can be configured for stacking on a desktop or mounted in a 19 inch rack).
▶ Meets FCC Class B/CISPR B when used with similarly rated RS/6000 host.
▶ All RJ-45 connectors are now on the front panel, greatly enhancing cable management.
▶ The DB-15 synchronous connectors (cabling from host to RAN and between RANs) and the power cord and switch are located on the rear panel.
▶ Power supply is self contained within the unit.

The rack-mountable RAN offers these same features as the existing RAN product:
▶ Identical function and support as existing 16-port Remote Async Node (RAN), feature #8130 or 8134.
▶ Operation of 16 to 128 ports by supporting up to 8 RANs (4 per synchronous line) with either a Micro Channel or ISA host adapter.
▶ Ability to monitor individual port operation, synchronous line station, and other diagnostics from front panel.
▶ Built-in diagnostics can test ports independent of RS/6000 host.
▶ Full modem control supports the following interface signals: TxD, RxD, RTS, CTS, DSR, DCD, DTR, RI.
▶ The same RJ-45 to DB-25 Converter Cable (feature #8133 -- quantity four per order) currently used on the existing RANs can be used to attach devices having a DB-25 connector to the Remote Async Nodes.
▶ Individual ports support a maximum EIA-232 distance of 62 meters (200 feet).
▶ Use of the same cabling from host to RAN and RAN to RAN: feature #8131 (4.5 meter), feature #8132 (23 cm) or customer-supplied cables.
▶ Location of RAN up to 330 meters from the host using standard shielded 8-wire twisted pair cabling.
▶ Remote operation using synchronous modems or CSU/DSU extends the distance and allows location of RANs at geographically distant location from the host.

Attributes provided: 16 RJ-45 EIA-232 ports AND 1 RAN-to-RAN connection
Attributes required: 1 RAN-to-128-port Controller connection OR 1 RAN-to-RAN connection

For 9117-MMA (#8136) and 9119-FHA (#8136)
▶ Minimum required: 0
▶ Maximum allowed: 0 (Initial order maximum: 0)
▶ OS level required: None
▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs.
▶ CSU: Not applicable
▶ Return parts MES: Does not apply |

| #8137 | **#8137 Enhanced Remote Asynchronous Node 16-Port EIA-232**
Provides remote connection of up to 16 EIA-232 devices to a 128-Port Asynchronous Controller.

Each port can be individually programmed to provide a asynchronous connection of 230 Kb aud, but a limited number of ports in a maximum configuration (128 ports) can be supported at this baud rate.

Operation of 16 to 128 ports by supporting up to 8 RANs (4 per synchronous line) with either a Micro Channel, ISA or PCI host adapter.

Characteristics:
▶ Ability to monitor individual port operation, synchronous line station, and other diagnostics from front panel.
▶ Built-in diagnostics can test ports independent of RS/6000 host.
▶ Full modem control supports the following interface signals: TxD, RxD, RTS, CTS, DSR, DCD, DTR, RI.
▶ The same RJ-45 to DB-25 Converter Cable (feature #8133 -- quantity four per order) currently used on the existing RANs can be used to attach devices having a DB-25 connector to the Remote Async Nodes.
▶ Individual ports support a maximum EIA-232 distance of up to 31 meters (100 feet), depending on the baud rate.
▶ Use of the same cabling from host to RAN and RAN to RAN: feature #8131 (4.5 meter), feature #8132 (23 cm) or customer supplied cables.
▶ Location of RAN up to 330 meters (sync data rate set at 1.2 Mbps) from host using standard shielded 8-wire twisted pair cabling.
▶ Remote operation through synchronous modems or CSU/DSU extends the distance and allows location of RANs at geographically distant location from the host.

Attributes provided: 16 EIA-232 Async ports
Attributes required: One 128-port adapter per eight (#8137s)

For 9117-MMA (#8137) and 9119-FHA (#8137)
▶ Minimum required: 0
▶ Maximum allowed: 0 (Initial order maximum: 0)
▶ OS level required: None
▶ Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs.
▶ CSU: Not applicable
▶ Return parts MES: Does not apply |
| #8150 | **#8151 0/512 GB 533 MHz DDR2 Memory Package**
This Capacity on Demand feature provides 512 GB of DDR2 memory (32 x 16 GB memory cards) with zero GB of the memory active. When purchasing FC #8151, 100% of the DDR2 memory is required to be activated (2 x #8493 DDR2 memory activations are required with every FC #8151 purchase). Memory activations are stored in the system, not on the memory card. If a DDR2 memory card is moved to a different system, that system will recognize zero GB as available on that memory card unless additional DDR2 memory activations are acquired or DDR2 memory activations are already present on that system. For the original system, the existing DDR2 memory activations remain and can be used for other DDR2 memory cards. For special situations, contact IBM CoD administration about transferring memory activations between systems.

Attributes provided: 32 x Sixteen GB memory cards with 0 GB active.
Attributes required: 32 empty memory slots.
100% of the memory must be activated through memory activation feature #8493 at time of purchase.

For 9119-FHA (#8151)
▶ Minimum required: 0
▶ Maximum allowed: 2 (Initial order maximum: 0)
▶ OS level required:
▶ Initial Order/MES/Both/Supported: Supported
▶ CSU: No
▶ Return parts MES: Does not apply |

#8153	**#8153 0/256 GB 533 MHz DDR2 Memory Package** This Capacity on Demand feature provides 256 GB of DDR2 memory (16 x 16 GB memory cards) with zero GB of the memory active. When purchasing feature number 8153, 100% of the DDR2 memory is required to be activated (one #8493 DDR2 memory activation is required with every #8153 purchased). Memory activations are stored in the system, not on the memory card. If a DDR2 memory card is moved to a different system, that system will recognize zero GB as available on that memory card unless additional DDR2 memory activations are acquired or DDR2 memory activations are already present on that system. For the original system, the existing DDR2 memory activations remain and can be used for other DDR2 memory cards. For special situations, contact IBM CoD administration about transferring memory activations between systems Attributes provided: 16 x 16 GB memory cards with 0 GB active. Attributes required: 16 empty memory slots. 100% of the memory must be activated through memory activation features #7669 or #8493 at time of purchase. **For 9119-FHA (#8153)** ▶ Minimum required: 0 ▶ Maximum allowed: 4 (Initial order maximum: 0) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: No ▶ Return parts MES: Does not apply
#8195	**#8195 256 GB DDR1 Memory (32 X 8 GB)** Provides a package of 32 fully activated #7835 memory cards for a total 256 GB of active DDR1 system memory. Attributes provided: 256 GB Active Memory Attributes required: 32 Empty Memory Slots **For 9119-FHA (#8195)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES:
#8197	**#8197 512 GB DDR1 Memory (32 X 16 GB Cards)** Provides a package of 32 #7828 16 GB memory cards for a total of 512 GB of active DDR1 system memory. Attributes provided: 512 GB Active Memory Attributes required: 32 Empty Memory Slots **For 9119-FHA (#8197)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES:

#8198	**#8198 512 GB DDR1 Memory (16 X 32 GB Cards)** Provides a package of 16 #7829 memory cards for a total 512 GB of active DDR1 system memory. Attributes provided: 512 GB DDR1 Active Memory Attributes required: 16 Empty Memory Slots **For 9119-FHA (#8198)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ► CSU: Not applicable ► Return parts MES:
#8200	**#8200 512 GB DDR2 Memory (16 X 32 GB Cards)** This Capacity on Demand feature provides 512 GB of active DDR2 memory (16 x 32 GB memory cards) with zero GB of the memory active. When purchasing FC #8200, 100% of the DDR2 memory is required to be activated (2 x #8493 DDR2 memory activations are required with every FC #8200 purchase). Memory activations are stored in the system, not on the memory card. If a DDR2 memory card is moved to a different system, that system will recognize zero GB as available on that memory card unless additional DDR2 memory activations are acquired or DDR2 memory activations are already present on that system. For the original system, the existing DDR2 memory activations remain and can be used for other DDR2 memory cards. For special situations, contact IBM CoD administration about transferring memory activations between systems. Attributes provided: 16 x Thirty two GB memory cards with 0 GB active. Attributes required: 16 empty memory slots. 100% of the memory must be activated through memory activation feature #8493 at time of purchase. **For 9119-FHA (#8200)** ► Minimum required: 0 ► Maximum allowed: 4 (Initial order maximum: 0) ► OS level required: ► Initial Order/MES/Both/Supported: MES ► CSU: No ► Return parts MES: Does not apply

#8201	**#8201 0/256 GB 667 MHz DDR2 Memory Package (32x#5694)**
	This Capacity on Demand feature provides 256 GB of DDR2 memory (32 x eight GB memory cards) with zero GB of the memory active. When purchasing feature number 8201, 100% of the DDR2 memory is required to be activated (one #5681 DDR2 memory activation is required with every #8201 purchased). Memory activations are stored in the system, not on the memory card. If a DDR2 memory card is moved to a different system, that system will recognize zero GB as available on that memory card unless additional DDR2 memory activations are acquired or DDR2 memory activations are already present on that system. For the original system, the existing DDR2 memory activations remain and can be used for other DDR2 memory cards. For special situations, contact IBM CoD administration about transferring memory activations between systems
	
	Attributes provided: 256 GB of memory available on 128 DIMMS
	Attributes required: 128 empty memory slots (4 slots per #5694)
	
	For 9119-FHA (#8201)
	▶ Minimum required: 0
	▶ Maximum allowed: 2 (Initial order maximum: 2)
	▶ OS level required:
	   – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	   – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	   – AIX Version 5.3 with the 5300-08 Technology Level or later
	   – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	   – AIX Version 6.1 with the 6100-01 Technology Level or later
	   – SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 for Power or later
	   – Red Hat Enterprise Linux V4.7 for Power and Red Hat Enterprise Linux V5.2 for Power or later
	   Not all AIX features operate with Linux. For systems and features that operate with Linux, refer to:
	   `http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html`
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: No
	▶ Return parts MES: Feature conversion only
	
	Note: Minimum of 100% of the memory must be activated through memory activation feature #5681 at the time of purchase (1 x #5681). DDR2 memory is not compatible with DDR1 memory. If a DIMM card is removed, it is a 0/16 GB DIMM card, and no memory is activated.

#8202	**#8202 0/256 GB 533 MHz DDR2 Memory Package (16x#5695)**
	This Capacity on Demand feature provides 256 GB of DDR2 memory (16 x sixteen GB memory cards) with zero GB of the memory active. When purchasing feature number 8202, 100% of the DDR2 memory is required to be activated (one #5681 DDR2 memory activation is required with every #8202 purchased). Memory activations are stored in the system, not on the memory card. If a DDR2 memory card is moved to a different system, that system will recognize zero GB as available on that memory card unless additional DDR2 memory activations are acquired or DDR2 memory activations are already present on that system. For the original system, the existing DDR2 memory activations remain and can be used for other DDR2 memory cards. For special situations, contact IBM CoD administration about transferring memory activations between systems
	Attributes provided: 256 GB of memory available on 64 DIMMS in two Processor Books (32 DIMMS per book). Attributes required: 64 empty memory slots (4 slots per #5695)
	For 9119-FHA (#8202) ▶ Minimum required: 0 ▶ Maximum allowed: 4 (Initial order maximum: 4) ▶ OS level required: – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later – AIX Version 5.3 with the 5300-08 Technology Level or later – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later – AIX Version 6.1 with the 6100-01 Technology Level or later – IBM i 5.4 with V5R4M5 machine code – IBM i 6.1 or later – Novell SUSE Linux Enterprise Server 10 SP2 for POWER or later – Red Hat Enterprise Linux version 4.7 and version 5.2 or later For systems and features that operate with Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: Feature conversion only
	Note: Minimum of 100% of the memory must be activated through memory activation feature #5681 at the time of purchase (1 x #5681). DDR2 memory is not compatible with DDR1 memory. If a DIMM card is removed, it is a 0/16 GB DIMM card, and no memory is activated.

#8203	**#8203 0/512 GB 533 MHz DDR2 Memory Package (32x#5695)**
	This Capacity on Demand feature provides 512 GB of DDR2 memory (32 x sixteen GB memory cards) with zero GB of the memory active. When purchasing feature number 8203, 100% of the DDR2 memory is required to be activated (two #5681 DDR2 memory activation is required with every #8203 purchased). Memory activations are stored in the system, not on the memory card. If a DDR2 memory card is moved to a different system, that system will recognize zero GB as available on that memory card unless additional DDR2 memory activations are acquired or DDR2 memory activations are already present on that system. For the original system, the existing DDR2 memory activations remain and can be used for other DDR2 memory cards. For special situations, contact IBM CoD administration about transferring memory activations between systems
	Attributes provided: 512 GB of memory available on 128 DIMMS 64 DIMMS in four Processor Books (32 DIMMS per book).
	Attributes required: 128 empty memory slots (4 slots per #5695)
	For 9119-FHA (#8203)
	▶ Minimum required: 0
	▶ Maximum allowed: 2 (Initial order maximum: 2)
	▶ OS level required:
	– AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	– AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	– AIX Version 5.3 with the 5300-08 Technology Level or later
	– AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	– AIX Version 6.1 with the 6100-01 Technology Level or later
	– IBM i 5.4 with V5R4M5 machine code
	– IBM i 6.1 or later
	– Novell SUSE Linux Enterprise Server 10 SP2 for POWER or later
	– Red Hat Enterprise Linux version 4.7 and version 5.2 or later
	For systems and features that operate with Linux, refer to:
	http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: No
	▶ Return parts MES: Feature conversion only
	Note: Minimum of 100% of the memory must be activated through memory activation feature #5681 at the time of purchase (2 x #5681). DDR2 memory is not compatible with DDR1 memory. If a DIMM card is removed, it is a 0/16 GB DIMM card, and no memory is activated.

#8204	**#8204 0/512 GB 400 MHz DDR2 Memory Package (16x#5696)** This Capacity on Demand feature provides 512 GB of DDR2 memory (16 x 32 GB memory cards) with zero GB of the memory active. When purchasing feature number 8204, 100% of the DDR2 memory is required to be activated (two #5681 DDR2 memory activation is required with every #8204 purchased). Memory activations are stored in the system, not on the memory card. If a DDR2 memory card is moved to a different system, that system will recognize zero GB as available on that memory card unless additional DDR2 memory activations are acquired or DDR2 memory activations are already present on that system. For the original system, the existing DDR2 memory activations remain and can be used for other DDR2 memory cards. For special situations, contact IBM CoD administration about Attributes provided: 512 GB of memory available on 64 DIMMS 64 DIMMS in two Processor Books (32 DIMMS per book). Attributes required: 64 empty memory slots (4 slots per #5696). **For 9119-FHA (#8204)** ► Minimum required: 0 ► Maximum allowed: 4 (Initial order maximum: 4) ► OS level required: – AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later – AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later – AIX Version 5.3 with the 5300-08 Technology Level or later – AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later – AIX Version 6.1 with the 6100-01 Technology Level or later – IBM i 5.4 with V5R4M5 machine code – IBM i 6.1 or later – Novell SUSE Linux Enterprise Server 10 SP2 for POWER or later – Red Hat Enterprise Linux version 4.7 and version 5.2 or later For systems and features that operate with Linux, refer to: http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html ► Initial Order/MES/Both/Supported: Both ► CSU: No ► Return parts MES: Feature conversion only **Note**: Minimum of 100% of the memory must be activated through memory activation feature #5681 at the time of purchase (2 x #5681). DDR2 memory is not compatible with DDR1 memory. If a DIM card is removed, it is a 0/32 GB DIMM card, and no memory is activated.

#8205	**#8205 0/2 TB 400 MHz DDR2 Memory Package (32x#5697)**
	This Capacity on Demand feature provides 2048 GB of DDR2 memory (32 x 64 GB memory cards) with zero GB of the memory active. When purchasing feature number 8205, 100% of the DDR2 memory is required to be activated (eight #5681 DDR2 memory activation is required with every #8205 purchased). Memory activations are stored in the system, not on the memory card. If a DDR2 memory card is moved to a different system, that system will recognize zero GB as available on that memory card unless additional DDR2 memory activations are acquired or DDR2 memory activations are already present on that system. For the original system, the existing DDR2 memory activations remain and can be used for other DDR2 memory cards. For special situations, contact IBM CoD administration about transferring memory activations between systems.
	Attributes provided: 2048 GB of memory available on 128 DIMMS in four Processor Books (32 DIMMS per book).
	Attributes required: 128 empty memory slots (4 slots per #5695)
	For 9119-FHA (#8205)
	► Minimum required: 0
	► Maximum allowed: 2 (Initial order maximum: 2)
	► OS level required:
	– AIX Version 5.3 with the 5300-06 Technology Level and SP7 or later
	– AIX Version 5.3 with the 5300-07 Technology Level and SP4 or later
	– AIX Version 5.3 with the 5300-08 Technology Level or later
	– AIX Version 6.1 with the 6100-00 Technology Level and SP5 or later
	– AIX Version 6.1 with the 6100-01 Technology Level or later
	– IBM i 5.4 with V5R4M5 machine code
	– IBM i 6.1 or later
	– Novell SUSE Linux Enterprise Server 10 SP2 for POWER or later
	– Red Hat Enterprise Linux version 4.7 and version 5.2 or later
	For systems and features that operate with Linux, refer to:
	`http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html`
	► Initial Order/MES/Both/Supported: Both
	► CSU: No
	► Return parts MES: Does not apply
	Note: Minimum of 100% of the memory must be activated through memory activation feature #5681 at the time of purchase (8 x #5681). DDR2 memory is not compatible with DDR1 memory. If a DIMM card is removed, it is a 0/64 GB DIMM card, and no memory is activated.
#8338	**#8338 2-Way 2.2 GHz POWER5+ Processor Card, 0-way active, 8 DDR2 Memory Slots**
	2-way 2.2 GHz POWER5+ processor card with Capacity Upgrade on Demand. The two processors share 36 MB of L3 cache and 1.9 MB of L2 cache. There are 8 DDR2 DIMM slots on the processor card which can be used without activating the processors. Permanent activation of the processors requires purchase of the activation FC 7618.
	Attributes provided: 2-way processor card, 0-way active; 8 DDR2 DIMM slots
	Attributes required: One processor card slot
	For 9117-MMA (#8338)
	► Minimum required: 0
	► Maximum allowed: 0 (Initial order maximum: 0)
	► OS level required: None
	► Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909.
	► CSU: Not applicable
	► Return parts MES: Does not apply

#8430	**#8430 Power Cord Carry Over Indicator, #9800, Model Conversion Only** This is an administrative feature that is valid only for model conversion orders. A quantity of one power cord carry over indicator should be ordered for each display or remote access node that will be transferred to the new model. The existing power cord is assigned the new feature code, which enables the ordering configurator to assure that the correct quantity of power cords is included in the order. Attributes provided: Power cord quantity tracking for #9800 specify feature Attributes required: None **For 9117-MMA (#8430)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#8431	**#8431 Power Cord Carry Over Indicator, #9802, Model Conversion Only** This is an administrative feature that is valid only for model conversion orders. A quantity of one power cord carry over indicator should be ordered for each display or remote access node that will be transferred to the new model. The existing power cord is assigned the new feature code, which enables the ordering configurator to assure that the correct quantity of power cords is included in the order. Attributes provided: Power cord quantity tracking for #9802 specify feature Attributes required: None **For 9117-MMA (#8431)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#8432	**#8432 Power Cord Carry Over Indicator, #9820, Model Conversion Only** This is an administrative feature that is valid only for model conversion orders. A quantity of one power cord carry over indicator should be ordered for each display or remote access node that will be transferred to the new model. The existing power cord is assigned the new feature code, which enables the ordering configurator to assure that the correct quantity of power cords is included in the order. Attributes provided: Power cord quantity tracking for #9820 specify feature Attributes required: None **For 9117-MMA (#8432)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No

#8433	**#8433 Power Cord Carry Over Indicator, #9821, Model Conversion Only**
	This is an administrative feature that is valid only for model conversion orders. A quantity of one power cord carry over indicator should be ordered for each display or remote access node that will be transferred to the new model. The existing power cord is assigned the new feature code, which enables the ordering configurator to assure that the correct quantity of power cords is included in the order.
	Attributes provided: Power cord quantity tracking for #9821 specify feature Attributes required: None
	For 9117-MMA (#8433) ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#8434	**#8434 Power Cord Carry Over Indicator, #9825, Model Conversion Only**
	This is an administrative feature that is valid only for model conversion orders. A quantity of one power cord carry over indicator should be ordered for each display or remote access node that will be transferred to the new model. The existing power cord is assigned the new feature code, which enables the ordering configurator to assure that the correct quantity of power cords is included in the order.
	Attributes provided: Power cord quantity tracking for #9825 specify feature Attributes required: None
	For 9117-MMA (#8434) ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#8435	**#8435 Power Cord Carry Over Indicator, #9827, Model Conversion Only**
	This is an administrative feature that is valid only for model conversion orders. A quantity of one power cord carry over indicator should be ordered for each display or remote access node that will be transferred to the new model. The existing power cord is assigned the new feature code, which enables the ordering configurator to assure that the correct quantity of power cords is included in the order.
	Attributes provided: Power cord quantity tracking for #9827 specify feature Attributes required: None
	For 9117-MMA (#8435) ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No

#8436	**#8436 Power Cord Carry Over Indicator, #9828, Model Conversion Only**
	This is an administrative feature that is valid only for model conversion orders. A quantity of one power cord carry over indicator should be ordered for each display or remote access node that will be transferred to the new model. The existing power cord is assigned the new feature code, which enables the ordering configurator to assure that the correct quantity of power cords is included in the order.
	Attributes provided: Power cord quantity tracking for #9828 specify feature
	Attributes required: None
	For 9117-MMA (#8436)
	► Minimum required: 0
	► Maximum allowed: no max (Initial order maximum: 0)
	► OS level required: None
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes
	► Return parts MES: No
#8437	**#8437 Power Cord Carry Over Indicator, #9829, Model Conversion Only**
	This is an administrative feature that is valid only for model conversion orders. A quantity of one power cord carry over indicator should be ordered for each display or remote access node that will be transferred to the new model. The existing power cord is assigned the new feature code, which enables the ordering configurator to assure that the correct quantity of power cords is included in the order.
	Attributes provided: Power cord quantity tracking for #9829 specify feature
	Attributes required: None
	For 9117-MMA (#8437)
	► Minimum required: 0
	► Maximum allowed: no max (Initial order maximum: 0)
	► OS level required: None
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes
	► Return parts MES: No
#8438	**#8438 Power Cord Carry Over Indicator, #9830, Model Conversion Only**
	This is an administrative feature that is valid only for model conversion orders. A quantity of one power cord carry over indicator should be ordered for each display or remote access node that will be transferred to the new model. The existing power cord is assigned the new feature code, which enables the ordering configurator to assure that the correct quantity of power cords is included in the order.
	Attributes provided: Power cord quantity tracking for #9830 specify feature
	Attributes required: None
	For 9117-MMA (#8438)
	► Minimum required: 0
	► Maximum allowed: no max (Initial order maximum: 0)
	► OS level required: None
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes
	► Return parts MES: No

#8439	**#8439 Power Cord Carry Over Indicator, #9831, Model Conversion Only** This is an administrative feature that is valid only for model conversion orders. A quantity of one power cord carry over indicator should be ordered for each display or remote access node that will be transferred to the new model. The existing power cord is assigned the new feature code, which enables the ordering configurator to assure that the correct quantity of power cords is included in the order. Attributes provided: Power cord quantity tracking for #9831 specify feature Attributes required: None **For 9117-MMA (#8439)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#8440	**#8440 Power Cord Carry Over Indicator, #9833, Model Conversion Only** This is an administrative feature that is valid only for model conversion orders. A quantity of one power cord carry over indicator should be ordered for each display or remote access node that will be transferred to the new model. The existing power cord is assigned the new feature code, which enables the ordering configurator to assure that the correct quantity of power cords is included in the order. Attributes provided: Power cord quantity tracking for #9833 specify feature Attributes required: None **For 9117-MMA (#8440)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#8441	**#8441 Power Cord Carry Over Indicator, #9834, Model Conversion Only** This is an administrative feature that is valid only for model conversion orders. A quantity of one power cord carry over indicator should be ordered for each display or remote access node that will be transferred to the new model. The existing power cord is assigned the new feature code, which enables the ordering configurator to assure that the correct quantity of power cords is included in the order. Attributes provided: Power cord quantity tracking for #9833 specify feature Attributes required: None **For 9117-MMA (#8441)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No

#8449	**#8449 Media Drawer Placement Indicator - U12** When ordered with Media Drawer, #5720, this feature specifies that the Media Drawer will be located at the 12U position in the CEC Rack. Attributes provided: Specifies location of the Media Drawer at the 12U location within the CEC Rack. Attributes required: #5720 Media Drawer **For 9119-FHA (#8449)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: Does not apply **Note**: The #8449 Media Drawer Placement Indicator is not available when the #6331 Battery Backup is ordered.
#8452	**#8452 Zero-priced Value Pak Processor Activation Code for #7830** Provides a customer with one processor activation at no additional charge. The system must be configured with a minimum of two disk drives of at least 73.4 GB each, and at least 2 GB of memory installed for each activated processor. For each paid processor activation or entitlement, the customer is entitled to one processor activation or entitlement at no additional charge. Attributes provided: One processor activation for #7830 Attributes required: Qualifying Model 570 Value Pak configuration **For 9117-MMA (#8452)** ▶ Minimum required: 0 ▶ Maximum allowed: 0 (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES: Does not apply

#8453	**#8453 Base Customer Spec Placement**
	Requests that IBM deliver the system to the customer according to the slot in drawer hardware placement defined by the account team.
	Eliminates the need to have these parts relocated in the customers environment as can happen if the order is placed without this feature code.
	Client placement specifications are collected using the System Planning Tool (SPT) and processed through the marketing configurator. (Use of the SPT is not required).
	Requires account team to submit the output of the marketing configurator into IBM manufacturing using the CSP Web site: http://www.ibm.com/eserver/power/csp (U.S. Business Partners and Distributors can bypass this step.)
	Requires account team to assure that the marketing configurator output submitted reflects the actual order placed. Attributes provided: I/O component placement Attributes required: Marketing Configurator output submitted to the CSP Web site (US Business Partners and Distributors can bypass this step.)
	For 9117-MMA (#8453) and 9119-FHA (#8453) ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES:
#8454	**#8454 Zero-priced Value Pak Processor Activation Code for #7832** Provides a customer with one processor activation at no additional charge. The system must be configured with a minimum of two disk drives of at least 73.4 GB each, and at least 2 GB of memory installed for each activated processor. For each paid processor activation or entitlement, the customer is entitled to one processor activation or entitlement at no additional charge.
	Attributes provided: One processor activation for #7832 Attributes required: Qualifying Model 570 Value Pak configuration
	For 9117-MMA (#8454) ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported on unified POWR6 MTMs. ► CSU: Not applicable ► Return parts MES: Does not apply

#8455	**#8455 Zero-priced Value Pak Processor Activation Code for #7833** Provides a customer with one processor activation at no additional charge. The system must be configured with a minimum of two disk drives of at least 73.4 GB each, and at least 2 GB of memory installed for each activated processor. For each paid processor activation or entitlement, the customer is entitled to one processor activation or entitlement at no additional charge. Attributes provided: One processor activation for #7833 Attributes required: Qualifying Model 570 Value Pak configuration **For 9117-MMA (#8455)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported on unified POWR6 MTMs. ► CSU: Not applicable ► Return parts MES: Does not apply.
#8456	**#8456 Zero-priced Value Pak Processor Entitlement for #7834** Provides a customer with one processor activation at no additional charge. The system must be configured with a minimum of two disk drives of at least 73.4 GB each, and at least 2 GB of memory installed for each activated processor. For each paid processor activation or entitlement, the customer is entitled to one processor activation or entitlement at no additional charge. Attributes provided: One processor entitlement for #7834 Attributes required: Qualifying Model 570 Value Pak configuration **For 9117-MMA (#8456)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported on unified POWR6 MTMs. ► CSU: Not applicable ► Return parts MES: Does not apply
#8467	**#8467 Reserve Capacity Prepaid for #8967** Provides 30 processor-days of prepaid reserve capacity for feature #8967 processor book. To establish reserve processor capacity on the server, select a quantity of inactive processors to be placed in the server's Shared Processor Pool as reserve processors. When the server recognizes that non-reserve processors (permanently activated processors) assigned or available to the uncapped partitions have been 100% utilized, use of additional processors will cause processor- days (good for a 24-hour period) to be subtracted from the prepaid number of processor-days. Attributes provided: 30 processor-days usage of inactive processors for features #8967 Attributes required: Advanced Power Virtualization #7992 **For 9119-FHA (#8467)** ► Minimum required: ► Maximum allowed: (Initial order maximum:) ► OS level required: ► Initial Order/MES/Both/Supported:Not supported on unified POWR6 MTMs. ► CSU: Not applicable ► Return parts MES:

#8468	**#8468 Reserve Capacity Prepaid for #8968** Provides 30 processor-days of prepaid reserve capacity for feature #8968 processor book. To establish reserve processor capacity on the server, select a quantity of inactive processors to be placed in the server's Shared Processor Pool as reserve processors. When the server recognizes that non-reserve processors (permanently activated processors) assigned or available to the uncapped partitions have been 100% utilized, use of additional processors will cause processor- days (good for a 24-hour period) to be subtracted from the prepaid number of processor-days. Attributes provided: 30 processor-days usage of inactive processors for features #8968 Attributes required: Advanced Power Virtualization #7992 **For 9119-FHA (#8468)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported on unified POWR6 MTMs. ▶ CSU: Not applicable ▶ Return parts MES:
#8469	**#8469 Base Custom Rack Placement** Provides a client the ability to specify the placement of drawers in racks. The client's input is collected and verified using the marketing configurator. This additional information must then be passed to IBM manufacturing using the following CSP Web site for use in building a system per the client's specifications: http://www.ibm.com/systems/power/support/csp/ #8469 is a no-charge feature, supported only on the POWER6 570, 570, and 595 new system builds. If #8469 is not on the initial order, rack placement can be provided at the client's site by IBM Global Services for a fee. Attributes provided: System with drawers placed in a racks per customer specifications Attributes required: System order with a racks and drawers **For 9406-MMA (#8469)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable
#8470	**#8470 570 Base 1 GB Memory Activation** Activates 1 GB of main storage on a model 570 system with Capacity on Demand memory. Depending on the on demand memory features ordered, several #8470s can also be ordered. Attributes provided: 1 GB main storage activated Attributes required: Model 570 with CoD memory **For 9406-MMA (#8470)** ▶ Minimum required: 0 ▶ Maximum allowed: 32 (Initial order maximum: 32) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes

#8470	**#8470 - 570 Base 1 GB Memory Activation** Activates 1 GB of main storage on a model 570 system with Capacity on Demand memory. Depending on the on demand memory features ordered, several #8470s can also be ordered. Attributes provided: 1 GB main storage activated Attributes required: Model 570 with CoD memory **For 9406-MMA (#8470)** ▶ Minimum required: 0 ▶ Maximum allowed: 32 (Initial order maximum: 32) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes
#8471	**#8471 1 GB Base Memory Activations for #4500, #4501, #4502, and #4503** This feature permanently activates 1 GB of DDR2 memory. Memory activations are stored in the system, not on the memory card. If DDR2 memory is moved to a different server, the DDR2 activations remain with the original system. Attributes provided: 1 GB memory activation for #4500, #4501, #4502, and #4503 DDR2 memory cards. Attributes required: Memory conversion from DDR1 to DDR2 memory **For 9119-FHA (#8471)** ▶ Minimum required: 0 ▶ Maximum allowed: 4096 (Initial order maximum: 0) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: No ▶ Return parts MES: No
#8472	**#8472 256 GB Base Memory Activations for #4500, #4501, #4502 and #4503 Memory Cards** This feature permanently activates 256 GB of DDR2 memory. Memory activations are stored in the system, not on the memory card. If DDR2 memory is moved to a different server, the DDR2 activations remain with the original system. Attributes provided: 256 GB memory activation for #4500, #4501, #4502, and #4503 DDR2 memory cards. Attributes required: Memory conversion from DDR1 to DDR2 memory **For 9119-FHA (#8472)** ▶ Minimum required: 0 ▶ Maximum allowed: 4 (Initial order maximum: 0) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: No ▶ Return parts MES: Does not apply

#8478	**#8478 256 GB CUoD Memory Activate** Provides 256 GB permanent memory activations for buffered DDR2 memory on a model 570. Depending on the memory features ordered, several #8478s can be ordered. Memory activations are stored in the system, not on the memory card providing system configuration flexibility. If memory is moved to a different system, the activations remain with the original system. Attributes provided: 256 GB main storage activated Attributes required: Model 570 with CoD memory **For 9406-MMA (#8478)** ▶ Minimum required: 0 ▶ Maximum allowed: 3 (Initial order maximum: 3) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes
#8493	**#8493 256 GB Memory Activations for #8151, #8153 and #8200 Memory Packages** This feature permanently activates 256 GB of DDR2 memory in memory packages 8151, 8153 and 8200. Memory activations are stored in the system, not on the memory card. If DDR2 memory is moved to a different server, the DDR2 activations remain with the original system. Attributes provided: 256 GB memory activations for DDR2 memory packages 8151, 8153 and 8200. Attributes required: Unactivated DDR2 memory in memory package 8151, 8153 or 8200. **For 9119-FHA (#8493)** ▶ Minimum required: 0 ▶ Maximum allowed: 64 (Initial order maximum: 0) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: No ▶ Return parts MES: Does not apply
#8494	**#8494 Base 1 GB DDR2 Memory Act** This feature permanently activates 1 GB of DDR2 memory. Memory activations are stored in the system, not on the memory card. If DDR2 memory is moved to a different system, the additional DDR2 activations remain with the original system. Attributes provided: 1 GB memory activation for #4500, #4501, #4502 and #4503 DDR2 memory cards. Attributes required: Used when smaller n-way 595 with DDR2 memory upgrading to larger n-way FHA to help preserve existing DDR2 memory activation information. **For 9119-FHA (#8494)** ▶ Minimum required: 0 ▶ Maximum allowed: 255 (Initial order maximum: 0) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: Does not apply

#8495	**#8495 Base 256 GB DDR2 Memory Act** This feature permanently activates 256 GB of DDR2 memory. Memory activations are stored in the system, not on the memory card. If DDR2 memory is moved to a different system, the DDR2 activations remain with the original system. Attributes provided: 256 GB memory activation for #4500, #4501, #4502 and #4503 DDR2 memory cards. Attributes required: Used when smaller n-way 595 with DDR2 memory upgrading to larger n-way FHA to help preserve existing DDR2 memory activation information. **For 9119-FHA (#8495)** ► Minimum required: 0 ► Maximum allowed: 8 (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: Does not apply
#8546	**#8546 - Opt Base 1 GB Server Memory** 1 GB DDR memory for an Integrated xSeries Server. #8546 must be installed in pairs. Attributes provided: 1 GB memory for Integrated xSeries Server Attributes required: One memory slot on Integrated xSeries Server **For 9406-MMA (#8546)** ► Minimum required: 0 ► Maximum allowed: 96 (Initial order maximum: 96) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both ► CSU: Yes
#8677	**#8677 Line Cord, 8AWG, 14-ft, No Plug** Provides a 14-ft 8AWG line cord with no plug. It can be utilized 200-415V circuits at loadings up to 40A. Attributes provided: 14 ft Line Cord with No Plug Attributes required: None **For 9119-FHA (#8677)** ► Minimum required: 0 ► Maximum allowed: 6 (Initial order maximum: 6) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: No ► Return parts MES: No
#8686	**#8686 Line Cord, 6AWG, 14ft, IEC309 100A Plug** Provides a 14 ft, 6AWG line cord equipped with an IEC309 100A plug. It provides connection to an 80 A, 240 V ac circuit. Attributes provided: 14 ft line cord with IEC309 100A plug Attributes required: None **For 9119-FHA (#8686)** ► Minimum required: 0 ► Maximum allowed: 6 (Initial order maximum: 6) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Both ► CSU: No ► Return parts MES: No

#8687	**#8687 Line Cord, 6AWG, 6-ft, IEC309 100A Plug** (No longer available as of 29 August 2008.) Provides a 6 foot, 6AWG line cord equipped with an IEC309 100A plug. It provides connection to an 80A, 240 V ac circuit. Attributes provided: 6 ft line cord with IEC309 100A plug Attributes required: None **For 9119-FHA (#8687)** ▶ Minimum required: 0 ▶ Maximum allowed: 4 (Initial order maximum: 6) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#8688	**#8688 Line Cord, 6AWG/Type W, 14ft, IEC309 60A Plug** Provides a 14 ft, 6AWG/Type W line cord equipped with a 60A IEC309 plug. It provides connection to a 60 A, 240 V ac circuit. Attributes provided: 14 ft line cord with 60A IEC309 plug Attributes required: None **For 9119-FHA (#8688)** ▶ Minimum required: 0 ▶ Maximum allowed: 4 (Initial order maximum: 6) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#8689	**#8689 Line Cord, 6AWG/Type W, 6-ft, IEC309 60A Plug** (No longer available as of 29 August 2008.) Provides a 6 foot, 6AWG/Type W line cord equipped with a 60A IEC 309 plug. It can be utilized for 60 A, 240 V ac circuits. Attributes provided: 6 ft Line Cord with 60A IEC309 Plug Attributes required: None **For 9119-FHA (#8689)** ▶ Minimum required: 0 ▶ Maximum allowed: 6 (Initial order maximum: 6) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No

#8691	**#8691 Expansion Rack, 24-in, 42U** This expansion rack feature provides an additional 42U of 24 inch rack space. When installed, one side cover of the system rack or #5792 powered expansion rack is removed. This expansion rack is bolted to the system rack or #5792 powered expansion rack, and the side cover is placed on the expansion rack. Devices mounted in this expansion rack feature utilize power provided by the base system rack or #5792 rack. Attributes provided: 42U of 24 inch Rack Space Attributes required: System rack or #5792 rack **For 9119-FHA (#8691)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Not applicable ▶ Return parts MES: No
8694	**#8694 Line Cord, 6AWG, 14-ft, No Plug** Provides a 14 foot 6AWG line cord with no plug. It can be utilized for 380-415V circuits at loadings up to 43A. Attributes provided: 14 foot Line Cord with No Plug Attributes required: None **For 9119-FHA (#8694)** ▶ Minimum required: 0 ▶ Maximum allowed: 6 (Initial order maximum: 6) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#8695	**#8695 Line Cord, 4AWG, 14ft, No Plug** Provides a 14 ft 4AWG line cord with no plug. It can be utilized for 200-240V circuits at loadings up to 80A. Attributes provided: Power Connection to service. Attributes required: None **For 9119-FHA (#8695)** ▶ Minimum required: 0 ▶ Maximum allowed: 6 (Initial order maximum: 6) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#8696	**#8696 Line Cord, 4AWG, 14ft, 100A Plug** Provides a 14 ft 4AWG line cord with a 100 A plug. It can be utilized for 200-240 V circuits at loadings up to 80 A. Attributes provided: Power Connection to service. Attributes required: None **For 9119-FHA (#8696)** ▶ Minimum required: 0 ▶ Maximum allowed: 6 (Initial order maximum: 6) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No

#8697	**#8697 Line Cord, 8AWG, 14ft, IEC309 30A Plug** Provides a 14 ft, 8AWG line cord equipped with an IEC309 30A plug. It provides connection to an 30 A, 480 V ac circuit. Attributes provided: 14 ft line cord with IEC309 30A plug Attributes required: None **For 9119-FHA (#8697)** ▶ Minimum required: 0 ▶ Maximum allowed: 6 (Initial order maximum: 6) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#8698	**#8698 Line Cord, 8AWG, 6-ft, IEC309 30A Plug** (No longer available as of 29 August 2008.) Provides a 6 foot, 8AWG line cord equipped with an IEC309 30A plug. It provides connection to an 30 A, 480 V ac circuit. Attributes provided: 6 ft line cord with IEC309 30A plug Attributes required: None **For 9119-FHA (#8698)** ▶ Minimum required: 0 ▶ Maximum allowed: 6 (Initial order maximum: 6) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#8699	**#8699 Line Cord, 6AWG, 14ft, 60A Plug** Provides a 14 ft 6AWG line cord with a 60 A plug. It can be utilized for 480 V circuits at loadings up to 34 A. Attributes provided: Power Connection to service. Attributes required: None **For 9119-FHA (#8699)** ▶ Minimum required: 0 ▶ Maximum allowed: 6 (Initial order maximum: 6) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No ▶ Return parts MES: No
#8800	**#8800 Quiet Touch Keyboard - USB, Business Black, US English, #103P** Provides a USB attached US English #103P keyboard. The two built-in USB ports conveniently provide for additional expansion. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8800) and 9119-FHA (#8800)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No

#8801	**#8801 Quiet Touch Keyboard - USB, Business Black, French, #189** Provides a USB attached French #189 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8801) and 9119-FHA (#8801)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#8802	**#8802 Quiet Touch Keyboard - USB, Business Black, Italian, #142** Provides a USB attached Italian #142 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8802) and 9119-FHA (#8802)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#8803	**#8803 Quiet Touch Keyboard - USB, Business Black, German/Austrian, #129** Provides a USB attached German/Austrian #129 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8803) and 9119-FHA (#8803)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#8804	**#8804 Quiet Touch Keyboard - USB, Business Black, UK English, #166** Provides a USB attached UK English #166 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8804) and 9119-FHA (#8804)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No

#8805	**#8805 Quiet Touch Keyboard - USB, Business Black, Spanish, #172** Provides a USB attached Spanish #172 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8805) and 9119-FHA (#8805)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#8806	**#8806 Quiet Touch Keyboard - USB, Business Black, Japanese, #194** Provides a USB attached Japanese #194 keyboard. The two built-in USB ports conveniently provide for additional expansion. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8806) and 9119-FHA (#8806)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#8807	**#8807 Quiet Touch Keyboard - USB, Business Black, Brazilian/Portuguese, #275** Provides a USB attached Brazilian Portuguese #275 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8807) and 9119-FHA (#8807)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#8808	**#8808 Quiet Touch Keyboard - USB, Business Black, Canadian French, #058** Provides a USB attached Canadian French #058 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8808) and 9119-FHA (#8808)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No

#8810	**#8810 Quiet Touch Keyboard - USB, Business Black, Belgium/UK, #120** Provides a USB attached Belgium/UK #120 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8810) and 9119-FHA (#8810)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#8811	**#8811 Quiet Touch Keyboard - USB, Business Black, Swedish/Finnish, #153** Provides a USB attached Swedish/Finnish #153 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8811) and 9119-FHA (#8811)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#8812	**#8812 Quiet Touch Keyboard - USB, Business Black, Danish, #159** Provides a USB attached Danish #159 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8812) and 9119-FHA (#8812)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#8813	**#8813 Quiet Touch Keyboard - USB, Business Black, Bulgarian, #442** Provides a USB attached Bulgarian #442 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8813) and 9119-FHA (#8813)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No

#8814	**#8814 Quiet Touch Keyboard - USB, Business Black, Swiss/French/German, #150F/G** Provides a USB attached Swiss/French/German #150F/G keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8814) and 9119-FHA (#8814)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#8816	**#8816 Quiet Touch Keyboard - USB, Business Black, Norwegian, #155** Provides a USB attached Norwegian #155 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8816) and 9119-FHA (#8816)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#8817	**#8817 Keyboard - USB, Dutch, #143** Provides a USB attached Dutch #143 Quiet Touch keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Color is Business Black. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8816) and 9119-FHA (#8816)** ► Minimum required: 0 ► Maximum allowed: No max (Initial order maximum: 0) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#8818	**#8818 Quiet Touch Keyboard - USB, Business Black, Portuguese, #163** Provides a USB attached Portuguese #163 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8818) and 9119-FHA (#8818)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No

#8819	**#8819 Quiet Touch Keyboard - USB, Business Black, Greek, #319** Provides a USB attached Greek #319 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8819) and 9119-FHA (#8819)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#8820	**#8820 Quiet Touch Keyboard - USB, Business Black, Hebrew, #212** Provides a USB attached Hebrew #212 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8820) and 9119-FHA (#8820)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES:
#8821	**#8821 Quiet Touch Keyboard - USB, Business Black, Hungarian, #208** Provides a USB attached Hungarian #208 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8821) and 9119-FHA (#8821)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#8823	**#8823 Quiet Touch Keyboard - USB, Business Black, Polish, #214** Provides a USB attached Polish #214 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8823) and 9119-FHA (#8823)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No

#8825	**#8825 Quiet Touch Keyboard - USB, Business Black, Slovakian, #245** Provides a USB attached Slovakian #245 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8825) and 9119-FHA (#8825)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#8826	**#8826 Quiet Touch Keyboard - USB, Business Black, Czech, #243** Provides a USB attached Czeck #243 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#882) and 9119-FHA (#8826)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No ▶ MES: No
#8827	**#8827 Quiet Touch Keyboard - USB, Business Black, Turkish, #179** Provides a USB attached Turkish #179 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8827) and 9119-FHA (#8827)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No
#8829	**#8829 Quiet Touch Keyboard - USB, Business Black, LA Spanish, #171** Provides a USB attached LA Spanish #171 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8829) and 9119-FHA (#8829)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: 0) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Supported ▶ CSU: Yes ▶ Return parts MES: No

#8830	**#8830 Quiet Touch Keyboard - USB, Business Black, Arabic, #253** Provides a USB attached Arabic #253 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8830) and 9119-FHA (#8830)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#8833	**#8833 Quiet Touch Keyboard - USB, Business Black, Korean, #413** Provides a USB attached Korean #413 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8833) and 9119-FHA (#8833)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#8834	**#8834 Quiet Touch Keyboard - USB, Business Black, Chinese/US, #467** Provides a USB attached Chinese/US #467 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8834) and 9119-FHA (#8834)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No
#8835	**#8835 Quiet Touch Keyboard - USB, Business Black, French Canadian, #445** Provides a USB attached French Canadian #445 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan. Attributes provided: Keyboard Attributes required: USB Port **For 9117-MMA (#8835) and 9119-FHA (#8835)** ► Minimum required: 0 ► Maximum allowed: no max (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes ► Return parts MES: No

#8836	**#8836 Quiet Touch Keyboard - USB, Business Black, Thai, #191**
	Provides a USB attached Thai #191 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan.
	Attributes provided: Keyboard
	Attributes required: USB Port
	For 9117-MMA (#8836) and 9119-FHA (#8836)
	► Minimum required: 0
	► Maximum allowed: no max (Initial order maximum: 0)
	► OS level required: None
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes
	► Return parts MES: No
#8838	**#8838 Quiet Touch Keyboard - USB, Business Black, Russian, #443**
	Provides a USB attached Russian #443 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan.
	Attributes provided: Keyboard
	Attributes required: USB Port
	For 9117-MMA (#8838) and 9119-FHA (#8838)
	► Minimum required: 0
	► Maximum allowed: no max (Initial order maximum: 0)
	► OS level required: None
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes
	► Return parts MES: No
#8839	**#8839 Quiet Touch Keyboard - USB, Business Black, Yugoslavian/Latin, #105**
	Provides a USB attached Yugoslavian/Latin #105 keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan.
	Attributes provided: Keyboard
	Attributes required: USB Port
	For 9117-MMA (#8839) and 9119-FHA (#8839)
	► Minimum required: 0
	► Maximum allowed: no max (Initial order maximum: 0)
	► OS level required: None
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes
	► Return parts MES: No
#8840	**#8840 Quiet Touch Keyboard - USB, Business Black, US English (EMEA), #103P**
	Provides a USB attached US English #103P (EMEA) keyboard. The two built-in USB ports conveniently provide for additional expansion. Not available in Japan.
	Attributes provided: Keyboard
	Attributes required: USB Port
	For 9117-MMA (#8840) and 9119-FHA (#8840)
	► Minimum required: 0
	► Maximum allowed: no max (Initial order maximum: 0)
	► OS level required: None
	► Initial Order/MES/Both/Supported: Supported
	► CSU: Yes
	► Return parts MES: No

#8841	**#8841) Mouse - USB, Business Black with Keyboard Attachment Cable** Provides a three button USB mouse and a cable for attachment to a keyboard. Attributes provided: 3-Button USB Mouse Attributes required: Keyboard with USB Mouse Attachment Port **For 9117-MMA (#8841) and 9119-FHA (#8841)** ▶ Minimum required: 0 ▶ Maximum allowed: no max (Initial order maximum: no max) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes ▶ Return parts MES: No
#8847	**#8847 - Base Serv Inface Cable-2 Drw** Connects the components in each processor enclosure or drawer to the active Service Processor for monitoring system functions. This cable connects to the Service Interface Cards at the rear of each processor enclosure of a two-drawer or 8-way system. #8847 and #5657 are identical cables, but #8847 is used with an initial order of a 1/8-way CBU Edition or 2/8-way Base Edition. Attributes provided: Service Interface Attributes required: System with two CEC enclosures **For 9406-MMA (#8847)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No
#8849	**#8849 - Base Serv Inface Cable-4 Drw** Connects the components in each processor enclosure or drawer to the active Service Processor for monitoring system functions. This cable connects to the Service Interface Cards at the rear of each processor enclosure of a four-drawer or 16-way system. **Note**: This feature is converted to #5560 on unified POWER6 MTMs. #8849 and #5660 are identical cables, but #8849 is used with an initial order of a 2/16-way CBU Edition or 4/16-way Base Edition. Attributes provided: Service Interface Attributes required: System with four CEC enclosures **For 9406-MMA (#8849)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No

#8877	**#8877 - Base Proc Fabric Cable-2 Drw** This cable is a modular component of the external Processor Fabric Bus which connects POWER6 570 processor enclosures or drawers together. This cable is placed on the front of the processor enclosures. One of these cables is required for each pair of adjacent processor enclosures. For example, one feature is required for a connection between the two drawers in an 8-way system. Or in a 16-way system, three features are required providing connections between drawers 1&2, 2&3 and 3&4. #8877 and #3660 are identical cables, but #8877 is used with an initial order of multi-enclosure systems. **For 9406-MMA (#8877)** ▶ Minimum required: 0 ▶ Maximum allowed: 3 (Initial order maximum: 3) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: No
#8967	**#8967 16-Way POWER5+ 2.1G Hz Standard CUoD Processor Book, 0-Way Active** Provides a POWER5+ 2.1 GHz processor book with capacity Upgrade on Demand. The processors are packaged on two 8-way Multi Chip Modules (MCMs). Each pair of processors is supported by 1.9 MB of L2 cache and 36 MB of L3 cache. Each 16-way processor book also provides six RIO-2 loop adapter slots and 16 memory slots. Attributes provided: ▶ 16-way processor book ▶ 0-way active ▶ 16 memory DIMM slots Attributes required: ▶ One processor book slot ▶ #7807 Cooling group on Initial Orders only **For 9119-FHA (#8967)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES:

#8968	**#8968 16-Way POWER5+ 2.3 GHz Turbo CUoD Processor Book, 0-Way Active** Provides a POWER5+ 2.3 GHz processor book with capacity Upgrade on Demand. The processors are packaged on two 8-way Multi Chip Modules (MCMs). Each pair of processors is supported by 1.9 MB of L2 cache and 36 MB of L3 cache. Each 16-way processor book also provides six RIO-2 loop adapter slots and 16 memory slots. Attributes provided: ▶ 16-way processor book ▶ 0-way active ▶ 16 memory DIMM slots Attributes required: ▶ One processor book slot ▶ #7807 Cooling Group **For 9119-FHA (#8968)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES:
#8969	**#8969 New 16-Way POWER5 Turbo CoD Processor Book, 0-Way Active** Provides a POWER5 Turbo processor book with capacity Upgrade on Demand. The processors are packaged on two 8-way Multi Chip Modules (MCMs). Each pair of processors is supported by 1.9 MB of L2 cache and 36 MB of L3 cache. Each 16-way processor book also provides six RIO-2 loop adapter slots and 16 memory slots. Attributes provided: ▶ 16-way processor book ▶ 0-way active ▶ 16 memory DIMM slots Attributes required: ▶ One processor book slot ▶ #7807 Cooling Group **For 9119-FHA (#8969)** ▶ Minimum required: ▶ Maximum allowed: (Initial order maximum:) ▶ OS level required: ▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909. ▶ CSU: Not applicable ▶ Return parts MES:

#8970	**#8970 16-Way POWER5+ 2.1GHz Standard CUoD Processor Book, 0-Way Active**
	Provides a POWER5+ 2.1GHz processor book with capacity Upgrade on Demand. The processors are packaged on two 8-way Multi Chip Modules (MCMs). Each pair of processors is supported by 1.9 MB of L2 cache and 36 MB of L3 cache. Each 16-way processor book also provides six RIO-2 loop adapter slots and 16 memory slots.
	Attributes provided: 16-way processor book, 0-way active; 16 memory DIMM slots
	Attributes required:
	One processor book slot
	#7807 Cooling Group on Initial Orders only
	For 9119-FHA (#8970)
	▶ Minimum required:
	▶ Maximum allowed: (Initial order maximum:)
	▶ OS level required:
	▶ Initial Order/MES/Both/Supported: Not supported. For upgrades, see Appendix D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909
	▶ CSU: Not applicable
	▶ Return parts MES:
#8977	**#8977 Base Proc Fabric Cable-3 Drw**
	This cable is a modular component of the external Processor Fabric Bus which connects POWER6 570 processor enclosures or drawers together. This cable is placed on the front of the processor enclosures. One of these cables is required for each three processor enclosure combination. For example, in a 16-way system, two features are required providing connections between drawers 1&3 and 2&4. #8977 and #3664 are identical cables, but #8977 is used with an initial order of a 2/16-way CBU Edition or 4/16-way Base Edition.
	For 9406-MMA (#8977)
	▶ Minimum required: 0
	▶ Maximum allowed: 2 (Initial order maximum: 2)
	▶ OS level required: Not applicable
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: No
#8979	**#8979 Base Proc Fabric Cable-4 Drw**
	This cable is a modular component of the external Processor Fabric Bus which connects POWER6 570 processor enclosures or drawers together. This cable is placed on the front of the processor enclosures. One of these cables is required for each four processor enclosure combination.
	One of these features is required for a connection between drawers 1 and 4.
	#8979 and #3665 are identical cables, but #8979 is used with an initial order of a 2/16-way CBU Edition or 4/16-way Base Edition.
	For 9406-MMA (#8979)
	▶ Minimum required: 0
	▶ Maximum allowed: 1 (Initial order maximum: 1)
	▶ OS level required: Not applicable
	▶ Initial Order/MES/Both/Supported: Both
	▶ CSU: No

#9004	**#9004 Southern Hemisphere Designator for Monitors** Specifies that southern hemisphere models are required for all CRT monitors on the initial plant order or on MES orders. Not required with TFT monitors. Attributes provided: None Attributes required: Monitor **For 9117-MMA (#9004) and 9119-FHA (#9004)** ► Minimum required: 0 ► Maximum allowed: 0 (Initial order maximum: 0) ► OS level required: None ► Initial Order/MES/Both/Supported: Not supported on unified POWER6 MTMs. ► CSU: Not applicable ► Return parts MES: Does not apply
#9169	**#9169 Order Routing Indicator - System Plant** Selected automatically by the Configurator Tool when required. Use of this feature will affect the routing of the order. Selection of this indicator directs the order to a system plant for fulfillment. Attributes provided: None Attributes required: None **For 9117-MMA (#9169) and 9119-FHA (#9169)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: No
#9299	**#9299 Base 5250 Enterprise Enable** Placed on an order of an Enterprise Edition server to enable one processor's worth of 5250 OLTP capability. Multiple #9299's can be on the order. Attributes provided: One processor's worth of 5250 OLTP capability Attributes required: Enterprise Edition server with 1.9 GHz or 2.2 GHz processor **For 9406-MMA (#9299)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 0) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: MES ► CSU: Yes
#9300	**#9300 Language Group Specify - US English** English language group for nomenclature and standard publications. Attributes provided: None Attributes required: None **For 9117-MMA (#9300) and 9119-FHA (#9300)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply

#9461	**#9461 Month Indicator** Administrative indicator used to enable configuration of orders with a total quantity greater than thirty to be processed. Attributes provided: None Attributes required: None **For 9117-MMA (#9461)** ▶ Minimum required: 0 ▶ Maximum allowed: 12 (Initial order maximum: 12) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
#9462	**#9462 Day Indicator** Administrative indicator used to enable configuration of orders with a total quantity greater than thirty to be processed. Attributes provided: None Attributes required: None **For 9117-MMA (#9462)** ▶ Minimum required: 0 ▶ Maximum allowed: 31 (Initial order maximum: 31) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
#9463	**#946) Hour Indicator** Administrative indicator used to enable configuration of orders with a total quantity greater than thirty to be processed. Attributes provided: None Attributes required: None **For 9117-MMA (#9463)** ▶ Minimum required: 0 ▶ Maximum allowed: 24 (Initial order maximum: 24) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: Does not apply ▶ urn parts MES: Does not apply
#9464	**#9464 Minute Indicator** Administrative indicator used to enable configuration of orders with a total quantity greater than thirty to be processed. Attributes provided: None Attributes required: None **For 9117-MMA (#9464)** ▶ Minimum required: 0 ▶ Maximum allowed: 60 (Initial order maximum: 60) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: Does not apply

#9465	**#9465 Qty Indicator** Administrative indicator used to enable configuration of orders with a total quantity greater than thirty to be processed. Attributes provided: None Attributes required: None **For 9117-MMA (#9465)** ► Minimum required: 0 ► Maximum allowed: 999 (Initial order maximum: 999) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply
#9466	**(#9466) Countable Member Indicator** Administrative indicator used to enable configuration of orders with a total quantity greater than thirty to be processed. Attributes provided: None Attributes required: None **For 9117-MMA (#9466)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: Not applicable ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply
#9470	**#9570 Reserved Rack Space Indicator - 4U** Informs IBM Manufacturing to leave a contiguous 4 EIA of rack space immediately under the installed system CEC enclosures. This space can then be used to later install an additional CEC Enclosure for expansion of this system at the customer site, minimizing movement of existing rack components. Attributes provided: Reserves 4 EIA of rack space Attributes required: None **For 9117-MMA (#9570)** ► Minimum required: 0 ► Maximum allowed: 3 (Initial order maximum: 3) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply

#9517	**#9517 - Base HSL-2/RIO-G Bus Adapter** The 9517, which provides two HSL-2/RIO-G ports, can be selected as base with a new order #0595, #5094, #5095, #5294 or #8294. Migration of existing #9517s to IBM eServer i5 servers is allowed. Existing #9517s would be installed in migrating expansion unit/ towers (#0595, #5094, #5095 and #5294). Attributes provided: HSL-2RIO-G connectivity Attributes required: HSL slot in expansion unit/tower **For 9406-MMA (#9517)** ▶ Minimum required: 0 ▶ Maximum allowed: 48 (Initial order maximum: 48) ▶ OS level required: IBM i 5.4 with V5R4M5 machine code or later ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes
#9531	**#9531 - Base HSL-2 Bus Adapter** #9531 provides two HSL-2 ports and is included as base on the #5790 PCI Expansion Drawer. Attributes provided: Two HSL-2 Ports Attributes required: #5790 PCI Expansion Drawer **For 9406-MMA (#9531)** ▶ Minimum required: 0 ▶ Maximum allowed: 48 (Initial order maximum: 48) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes
#9570	**#9570 - Reserved Rack Space** Informs IBM manufacturing to leave a contiguous 4 EIU empty region within a rack immediately below the installed processor enclosures. This space can then be used to later install an additional processor enclosure at the customer site, minimizing movement of existing rack components. Attributes provided: 4 EIU of reserved rack space Attributes required: #0551, #0553, #0554 or #0555 rack **For 9406-MMA (#9570)** ▶ Minimum required: 0 ▶ Maximum allowed: 9 (Initial order maximum: 9) ▶ OS level required: Not applicable ▶ Initial Order/MES/Both/Supported: Both ▶ CSU: Yes

| #9693 | **#9693 - PCIe 2-Line WAN with Modem**
The #9693 is a 2-line/port WAN with modem PCIe adapter. This feature is the non-CIM (Complex Impedance Matching) version offered in all countries except Australia and New Zealand.

Port 0 is the modem port and supports V.92 56K Async PPP, V.92 data modem, V.44 data compression, V.34 FAX modem and FAX functions, such as ECM and 2D/1D conversion. Port 0 does not provide Sync modem capabilities (SDLC and Sync PPP). Port 1 is the RVX port and supports multiple communications protocols, including synchronous operations.

Select one of the following cables to attach to port 0(modem port):
► #1010 Modem Cable - Austria
► #1011 Modem Cable - Belgium
► #1012 Modem Cable - Africa
► #1013 Modem Cable - Israel
► #1014 Modem Cable - Italy
► #1015 Modem Cable - France
► #1016 Modem Cable - Germany
► #1017 Modem Cable - UK
► #1018 Modem Cable - Iceland/Sweden
► #1020 Modem Cable - HK/NZ
► #1021 Modem Cable - Fin/Nor
► #1022 Modem Cable - Netherlands
► #1023 Modem Cable - Swiss
► #1024 Modem Cable - Denmark
► #1025 Modem Cable - US/Canada

Select one of the following cables to attach to port 1(RVX port):
► #0348 - V.24/EIA232 20-ft PCI Cable
► #0353 - V.35 20-ft PCI Cable
► #0356 - V.36 20-ft PCI Cable
► #0359 - X.21 20-ft PCI Cable
► #0367 - Operations Console PCI Cable (ships with a 25-pin to 9-pin adapter)

Multiple #0367 cables can be ordered but only one per #2893 to serve as consoles for secondary partitions when Logical Partitioning is utilized.

ECS is supported from both the modem port, and the RVX port. The following cable is required to support ECS from the RVX port:
► #0348 - V.24/EIA232 20-Ft PCI Cable

IBM strongly encourages customers to move to the direct connection (which is HTTP/HTTPS and VPN). `http://www-912.ibm.com/s_dir/slkbase.NSF/643d2723f2907f0b8625661300765a2a/d3a4642013af49b5862571470061e36b?OpenDocument`

The #2893 does not support the remote ring indicate function.

#2893 and #9693 are physically identical cards.

Attributes provided: One RVX port and one integrated modem port
Attributes required: One PCIe slot

For 9406-MMA (#9693)
► Minimum required: 0
► Maximum allowed: 1 (Initial order maximum: 1)
► OS level required: IBM i 5.4 with V5R4M5 machine code or later
► Initial Order/MES/Both/Supported: Both
► CSU: Yes |

#9700	**#9700 Language Group Specify - Dutch** Dutch language group for Nomenclature and Standard Publications. Attributes provided: None Attributes required: None **For 9117-MMA (#9700) and 9119-FHA (#9700)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply ► (MES: Does not apply
#9703	**#9703 Language Group Specify - French** French language group for Nomenclature and Standard Publications. Attributes provided: None Attributes required: None **For 9117-MMA (#97003 and 9119-FHA (#9703)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply
#9704	**#9704)Language Group Specify - German** German language group for Nomenclature and Standard Publications. Attributes provided: Language specify Attributes required: None **For 9117-MMA (#9704) and 9119-FHA (#9704)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply
#9705	**#9705 Language Group Specify - Polish** Polish language group for Nomenclature and Standard Publications. Attributes provided: Language specify Attributes required: None **For 9117-MMA (#9705) and 9119-FHA (#9705)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts

#9706	**#9706 Language Group Specify - Norwegian** Norwegian language group for Nomenclature and Standard Publications. Attributes provided: Language specify Attributes required: None **For 9117-MMA (#9706) and 9119-FHA (#9706)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply
#9707	**#9707 Language Group Specify - Portuguese** Portuguese language group for Nomenclature and Standard Publications. Attributes provided: None Attributes required: None **For 9117-MMA (#97007 and 9119-FHA (#9707)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply
#9708	**#9708 Language Group Specify - Spanish** Spanish language group for Nomenclature and Standard Publications. Attributes provided: None Attributes required: None **For 9117-MMA (#9708) and 9119-FHA (#9708)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply
#9711	**#9711 Language Group Specify - Italian** Italian language group for Nomenclature and Standard Publications. Attributes provided: None Attributes required: None **For 9117-MMA (#9711) and 9119-FHA (#9711)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply

#9712	**#9712 Language Group Specify - Canadian French** Canadian French language group for Nomenclature and Standard Publications. Attributes provided: None Attributes required: None **For 9117-MMA (#9712) and 9119-FHA (#9712)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply
#9714	**#9714 Language Group Specify - Japanese** Japanese language group for Nomenclature and Standard Publications. Attributes provided: None Attributes required: None **For 9117-MMA (#9714) and 9119-FHA (#9714)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply
#9715	**#9715 Language Group Specify - Traditional Chinese (Taiwan)** Traditional Chinese language group for Nomenclature and Standard Publications. Attributes provided: None Attributes required: None **For 9117-MMA (#9715) and 9119-FHA (#9715)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply
#9716	**#9716 Language Group Specify - Korean** Korean language group for Nomenclature and Standard Publications. Attributes provided: None Attributes required: None **For 9117-MMA (#9716) and 9119-FHA (#9716)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply

#9718	**#9718 Language Group Specify - Turkish** Turkish language group for nomenclature and publications. Attributes provided: None Attributes required: None **For 9117-MMA (#9718) and 9119-FHA (#9718)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
#9719	**#9719 Language Group Specify - Hungarian** Hungarian language group for Nomenclature and Standard Publications. Attributes provided: None Attributes required: None **For 9117-MMA (#9719) and 9119-FHA (#9719)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
#9720	**#9720 Language Group Specify - Slovakian** Slovakian language group for Nomenclature and Standard Publications. Attributes provided: None Attributes required: None **For 9117-MMA (#9720) and 9119-FHA (#9720)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: Does not apply
#9721	**#9721 Language Group Specify - Russian** Russian language group for nomenclature and standard publications. Attributes provided: None Attributes required: None **For 9117-MMA (#9721) and 9119-FHA (#9721)** ▶ Minimum required: 0 ▶ Maximum allowed: 1 (Initial order maximum: 1) ▶ OS level required: None ▶ Initial Order/MES/Both/Supported: Initial ▶ CSU: Not applicable ▶ Return parts MES: Does not apply

#9722	**#9722 Language Group Specify - Simplified Chinese (PRC)** Simplified Chinese language group for nomenclature and standard publications. Attributes provided: None Attributes required: None **For 9117-MMA (#9722) and 9119-FHA (#9722)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply
#9724	**#9724 Language Group Specify - Czech** Czech language group for nomenclature and standard publications. Attributes provided: None Attributes required: None **For 9117-MMA (#9724) and 9119-FHA (#9724)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply
#9725	**#9725 Language Group Specify - Romanian** Romanian language group for Nomenclature and Standard Publications. Attributes provided: None Attributes required: None **For 9117-MMA (#9725) and 9119-FHA (#9725)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply
#9726	**#9726 Language Group Specify - Croatian** Croatian language group for Nomenclature and Standard Publications. Attributes provided: Language specify Attributes required: None **For 9117-MMA (#9726) and 9119-FHA (#9726)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply

#9727	**#9727 Language Group Specify - Slovenian** Slovenian language group for Nomenclature and Standard Publications. Attributes provided: None Attributes required: None **For 9117-MMA (#9727) and 9119-FHA (#9727)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply
#9728	**#9728 Language Group Specify - Brazilian Portuguese** Brazilian Portuguese language group for Nomenclature and Standard Publications. Attributes provided: Language specify Attributes required: None **For 9117-MMA (#9728) and 9119-FHA (#9728)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply
#9729	**#9729 Language Group Specify - Thai** Thai language group for Nomenclature and Standard Publications. Attributes provided: Language specify Attributes required: None **For 9117-MMA (#9729) and 9119-FHA (#9729)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: None ► Initial Order/MES/Both/Supported: Initial ► CSU: Not applicable ► Return parts MES: Does not apply

#9933	**#9933 - PCI 2-Line WAN with Modem NoIOP** The #9933 is a 2-line/port WAN with modem adapter. This feature is the non-CIM (Complex Impedance Matching) version offered in all countries except Australia and New Zealand. #6833 or #9933 are physically the same card as #0614, #2793, or #9793, but #6833 or #9933 indicates to IBM configurator tools that the IOA is being used by i5/OS in an IOP-less mode. #6833 or #9933 are physically the same card as the IOP-less #6803 or #9493, but with IBM i 5.4 with V5R4M5 machine code, additional function is provided, including the use of the second communication port, and a separate feature code is used to denote this. Port 0 is the modem port and supports V.92 56K Async PPP, V.92 data modem, V.44 data compression, V.34 FAX modem and FAX functions such as ECM and 2D/1D conversion. Port 0 does not provide Sync modem capabilities (SDLC and Sync PPP). Port 1 is the RVX port and supports multiple communications protocols, including synchronous operations. Select one of the following cables to attach to port 0(modem port): ► #1010 Modem Cable - Austria ► #1011 Modem Cable - Belgium ► #1012 Modem Cable - Africa ► #1013 Modem Cable - Israel ► #1014 Modem Cable - Italy ► #1015 Modem Cable - France ► #1016 Modem Cable - Germany ► #1017 Modem Cable - UK ► #1018 Modem Cable - Iceland/Sweden ► #1020 Modem Cable - HK/NZ ► #1021 Modem Cable - Fin/Nor ► #1022 Modem Cable - Netherlands ► #1023 Modem Cable - Swiss ► #1024 Modem Cable - Denmark ► #1025 Modem Cable - US/Canada Select one of the following cables to attach to port 1 (RVX port): ► #0348 - V.24/EIA232 20-ft PCI Cable ► #0353 - V.35 20-ft PCI Cable ► #0356 - V.36 20-ft PCI Cable ► #0359 - X.21 20-ft PCI Cable ► #0367 - Operations Console PCI Cable (ships with a 25-pin to 9-pin adapter) Multiple #0367 cables can be ordered but only one per #2793 to serve as consoles for secondary partitions when Logical Partitioning is utilized. ECS is supported from both the modem port and the RVX port. The following cable is required to support ECS from the RVX port: ► #0348 - V.24/EIA232 20-Ft PCI Cable IBM strongly encourages customers to move to the direct connection (which is HTTP/HTTPS and VPN). http://www-912.ibm.com/s_dir/slkbase.NSF/643d2723f2907f0b8625661300765a2a/d3a4642013af49b5862571470061e36b?OpenDocument

#9933 Continued	**#9933 - PCI 2-Line WAN with Modem NoIOP** The #9933 does not support the remote ring indicate function. #9933 does not support SNA communications except through the i5/ OS V5R4 Enterprise Extender function. Attributes provided: One RVX port and one integrated modem port Attributes required: One PCI slot (3 volt) **For 9406-MMA (#9933)** ► Minimum required: 0 ► Maximum allowed: 1 (Initial order maximum: 1) ► OS level required: IBM i 5.4 with V5R4M5 machine code or later ► Initial Order/MES/Both/Supported: Both CSU: Yes
#9993	**#9993 Ship from Country Stock** **For 9406-MMA (#9993)** ► OS level required: ► Initial Order/MES/Both/Supported: Supported ► CSU: Yes

4.4.1 IOP-less IOAs and placement

Starting in 2006, the System i5® models started supporting IOAs, also referred to as *controllers*, that can operate with or without a controlling IOP. As a result, there are three classes or types of IOAs:

► IOP controlled IOAs

– Not supported in the POWER6 system unit enclosures.

– Supported in an I/O tower or drawer attached to the POWER6 models 9117-MMA and 9119-FHA with a RIO-2 loop.

► IOP-less

– *IOP-less* only IOAs, are supported in the POWER6 system unit enclosure and its I/O tower or drawer pluggable features.

– *Single mode IOP-less* IOAs that are not recognized by IOPs.

These IOAs can be placed virtually anywhere relative to installed IOPs without causing problems.

► *Dual mode IOAs (*also referred to as *smart IOAs*), such as the #5582, #5583, #5736, #5737, #5739, #5775, #5776, #5778, #5781, #5782, #5799, and #5800 disk controller and their auxiliary write cache feature SCSI adapters

If an IOP controls the IOA, order the IOA by the column A feature code. Place the IOA after an IOP on the same EADs boundary. To run in IOP-less mode, place the dual-mode IOA in front of (that is, in a lower) EADs address of any IOP in an EADs.

Dual-mode capability is dependent on IBM i release level. See the following information for details. If the dual-mode IOA is placed in a slot that is under IOP control, then the IOA runs as IOP-based. If the slot is not controlled by an IOP, then the adapter runs in IOP-less mode.

IOP control of a dual-mode adapter always takes precedence over IOP-less, except in specific load source situations.

Note: An IOP in one partition cannot control an IOA in a different partition.

For the latest information about IOAs without or with an IOP, refer to Power Systems PCI Adapter Placement Guide for Machine Type 940x SA76-0096, which is available at IBM Systems Hardware Information Center:

http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp

Select **Power Systems information**. Customer placement specifications are created using the LPAR Verification Tool (LVT) System Planning Tool (SPT) or alternative processes. They are then input into eConfig and submitted to IBM manufacturing using the following CSP Web site for use in building the system per your specifications:

http://www.ibm.com/servers/eserver/power/csp/

We discuss the following placement details in this paper:

► IOP-less requiring IBM i 5.4 or requiring IBM i 6.1
► Features supported with an IOP
► Dual-mode cards can run in IOP-less mode in attached I/O towers
► Dual-mode IOAs and controllers are supported running in IOP-less only mode in the system unit
► Conversions between direct-attach, IOP- required, and IOP-less features are available
► Controllers are auto-configured as IOP-less when possible
► Direct access IOAs run without an IOP when used in a System i AIX or Linux partition

4.5 Workstation controllers and console features

Each operating system requires some kind of *console* device, at least for key basic functions such as initiating loading of operating system software, microcode, recovering from abnormal failures, and, at least communicating with the operating system during system or partition start (also referred to as *IPL* or *boot* by the various operating systems). Some functions, while the partition is in normal operation, might also be supported only from the *system console device*.

This section provides some details regarding the IBM i operating system console device options and requirements.

4.5.1 Supported IBM i partition consoles summary

Table 4-1 summarizes the supported partition consoles.

Table 4-1   Supported IBM i partition consoles

Workstation controllers and console features	
#4746	**#4746 PCI Twinaxial IOA is not supported unless a HMC is present on the system.** The #4746 PCI Twinaxial IOA requires an IOP which provides support for up to 40 active twinaxial displays and printer addresses or up to 120 active shared sessions. A 20-foot (6.2 m) cable with an eight-port expansion (breakout) box is included with this adapter. Each port supports seven attached devices, allowing for 56 total attached devices, of which only 40 can be active. Twinaxial Console is supported on POWER6 models 9117-MMA and 9119-FHA when the IOP and IOA for the partition is located in an I/O tower or drawer with RIO-2 loop feature. The #4746 is a chargeable Customer Install Feature

#5544	**#5544 System Console on Operations Console** A system console specify code must be selected on each new order. When a #5544 is specified, the primary IBM i console is driven by an IOA WAN adapter. The system console can be connected to a #0367 Operations Console PCI Cable attached to 2-Line WAN with integrated modem: ► #2893 or #2894 PCIe 2-Line WAN with Modem IOA (country dependent) ► #or # 6834PCI-X 2-Line WAN with Modem IOA (country dependent) ► #2742 PCI Two-Line WAN IOA Supported on POWER6 models 9117-MMA and 9119-FHA.
#5548	**#5548 System Console on 100 Mbps Ethernet is not supported unless a HMC is present on the system.** The system console is LAN attached to a #2849 10/100 Mbps Ethernet Adapter. This LAN adapter must be dedicated to console functions and cannot be used for any other purpose. The #5548 is specifically used for IOP-based IOAs Supported on POWER6 models 9117-MMA and 9119-FHA as a #3709 with a RIO-2 loop.
#5550	**#5550 System Console on HMC** A system console specify code must be selected on each new order. When the #5550 is on the order, the system console function is driven by the HMC using an Ethernet connection to a dedicated HMC port on the system unit. The HMC is required for LPAR, Capacity Upgrade on Demand, Concurrent Maintenance and Upgrade and Redundant Service Processor (SP) operations. Supported on POWER6 models.
#5553	**#5553 System Console Ethernet w/o IOP** This specify indicates the use of an embedded CEC LAN port for the system console connection using Operations Console LAN.

Power systems support several operating system level consoles. The HMC provides console emulators for each supported operating system (AIX, IBM i, and Linux).

The following text applies to the IBM i operating system and specifies its console support options in addition to the HMC console. The additional IBM i partition console can be:

► Operations Console: PC workstation running System i Access for Windows Operations Console support.The workstation can be connected to the IBM i partition by either a supported LAN adapter or a supported WAN adapter.

► Twinax 5250 workstation: A 5250 workstation attached to the IBM i partition over a Twinax adapter can be that partition's console. The Twinax adapter requires a supporting IOP. The Power 520, 550, and 570 system units (processor enclosures) do not support an IOP card. Therefore, using a Twinax 5250 console requires a RIO-2 loop attached I/O enclosure that supports an IOP and the associated twinax adapter.

The following applies to Operations Console support that is supported as a console to IBM i on any of a specific set of LAN or WAN adapters, listed in this section.

► One of the LAN adapter ports supported for IBM i Operations Console support is one included with every POWER6 520, 550, or 570 (9406-MMA, 9117-MMA) processor enclosure.

This adapter with two or four ports is commonly referred to by two terms, meaning the same adapter, *Integrated Virtual Ethernet* (IVE) or *Host Ethernet Adapter* (HEA). You associate one of the physical ports of the IVE/HEA adapter with a corresponding Logical Host Ethernet Adapter (LHEA) definition (IBM i line description object "resource id"). This is done using the HMC and the IBM i Create Line Ethernet (CRTLINETH) description command.

► The partition operating system must define one Logical Host Ethernet Adapter (LHEA) that represents a logical port associated with one of the physical ports of the associated physical Host Ethernet Adapter (Integrated Virtual Ethernet (IVE) on the system.

Refer to the following publications to help you configure an LHEA as a partition console:

– *System i Operations Guide for i5/OS Consoles,* SA76-0128

https://www-01.ibm.com/servers/resourcelink/lib03030.nsf/pagesByDocid/55719E40DD8536A7852573500046E6EF?OpenDocument&pathID=36

– *System i and System p Logical Partitioning Guide,* SA76-0098

https://www-01.ibm.com/servers/resourcelink/lib03030.nsf/pagesByDocid/0E6125F89F8B8EF6852572E6007E884D?OpenDocument&pathID=36

► IOP-less LAN consoles

– #5706 or #5707
– #5767 or #5768

To learn about the procedure to enable or disable a specific IOA and port for a partition console, refer to the IBM Systems Hardware Information Center at:

http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp

When you reach the information center, navigate through the following topics:

a. Managing consoles, interfaces, and terminals
b. Managing i5/OS consoles
c. Managing Operations Console
d. Working with Operations Console
e. Working with the console service functions (65+21)
f. Using the console service functions (65+21)

► IOP-less Async (Direct cable #0367)

– #2893 or #2894
– #6803 or #6804
– #6805/2742
– #6833 or #6834

► IOP Consoles are not supported unless a HMC is present on the system.

– #2742 Async (Direct cable #0367)
– #4746/2746 PCI Twinaxial Workstation IOA

Table 4-2 summarizes operations console support on various IBM i adapter features, IBM i releases, and processor technologies.

Table 4-2   Adapters that support IBM i operations console PC workstation

Console Connection Type	Adapter Feature Number	Supported on 9117-MMA	Supported on 9119-FHA
LAN IOP-less	#5706 or #5707[a]	When HMC is present on the system.	When HMC is present on the system.
	#5767 or #5768[a]	When HMC is present on the system.	When HMC is present on the system.
	#5636 or #5639[a] IVE/HEA 2 or 4 port adapter	Yes (default)	No

Console Connection Type	Adapter Feature Number	Supported on 9117-MMA	Supported on 9119-FHA
Direct attach IOP-less	#2893 or #2894[b]	When HMC is present on the system.	When HMC is present on the system.
	#6803 or #6804[b]	When HMC is present on the system.	When HMC is present on the system.
	#6805/2742[b]	When HMC is present on the system.	When HMC is present on the system.
	##6833 or #6834[b]	When HMC is present on the system.	When HMC is present on the system.
IOP required	#2742[b]	When HMC is present on the system.	When HMC is present on the system.
	#2849 (Supported on unified 9117-MMA, 9119-FHA as #3709)	When HMC is present on the system.	When HMC is present on the system.
	#4746/2746	When HMC is present on the system.	When HMC is present on the system.

a. Supported PC workstation operating systems include Windows 2000 Professional, Windows XP Professional, and Windows Vista®.

b. Supported PC workstation operating systems include Windows 2000 Professional and Windows XP Professional. Windows Vista is not supported for direct attached OPS Console. You cannot use Windows Vista for a local console directly attached or for a remote console. The IBM System i Access for Windows versions, for both the local console and the remote console, must be at the same level. PC5250 or IBM Personal Communications V5.9 (V5.7 with CICS® system definition data set (CSD) 1 minimum) needs to be installed for the console only. It is not required for configurations that are used only for remote control panel.

All of these consoles provide a 5250 workstation interface. In 4.5, "Workstation controllers and console features" on page 722, we list the specify codes for the console offerings.

Refer to the following publications for more information about System i console support:

► *System i Operations Guide for i5/OS Consoles,* SA76-0128

https://www-01.ibm.com/servers/resourcelink/lib03030.nsf/pagesByDocid/55719E40D D8536A7852573500046E6EF?OpenDocument&pathID=36

#2849 and #4746 adapters: The #2849 (supported on unified systems as #3709) and #2742 adapters require an IOP and can only be located in an expansion unit.

For additional documentation, refer to "Related publications" on page 991.

4.6 LAN and WAN adapters

Table 4-3 lists information about LAN and WAN adapters.

Table 4-3   LAN and WAN adapters

LAN and WAN adapters	
Comm. Restrictions	Restrictions apply when using specific adapters and I/O processors. See "Comm. Restrictions" on page 727, for communications rules and restrictions. Also see Power Systems PCI Adapter Placement Guide for Machine Type 940x for further placement rules.
Networking Fault Tolerance	Starting with OS/400 (i5/OS) V5R2M0 networking fault tolerance configuration support enables elimination of a single point of an Ethernet LAN-attached network failure. Requirements: ▶ Two or more physical network adapters must be connected to a separate link partner (hub or switch). ▶ Each link partner has a physical connection to each router to ensure fault tolerance. This cabling configuration prevents a single hardware failure from interrupting transmissions to or from the System i environment. To get full fault tolerance in this configuration, you must also configure i5/OS Virtual IP; refer to IBM Software Technical Document 25191404, "Fault Tolerance Configuration for the IBM System i Server Using Virtual IP," which discusses fault tolerance configuration for the IBM System i products using RIP and Virtual IP: `http://www-912.ibm.com/s_dir/slkbase.NSF/1ac66549a21402188625680b0002037e/6f3c2d316d97cd9286256b140048c770?OpenDocument`

Comm. Restrictions	Basic communications restrictions when using the #2742, #2793 or #2794, #2893 or #2894, #6803 or #6804, #6805, #6833 or #6834 and other communications functions are identified and briefly summarized here:
	▶ Maximum protocol speeds on the EIA-232/ITU V.24 electrical interfaces:
	  – 64 Kbps for Synchronous PPP, BSC, SDLC, and X.25
	  – 115.2 Kbps for Asynchronous protocols (including Asynchronous PPP)
	▶ Maximum protocol speeds on the ITU V.35:
	  Permitted only on 20-ft (6.2 m) cable
	  – 2.048 Mbps for Synchronous PPP, SDLC, and Frame Relay
	  – 230.4 Kbps for Asynchronous PPP
	  – 640 Kbps for X.25
	  – 64 Kbps for BSC
	  Speeds faster than 512 Kbps can require either the "looped" or "inverted" clocking to be configured
	▶ Maximum protocol speeds on the EIA-449/ITU V.36:
	  – 2.048 Mbps for Synchronous PPP, SDLC, and Frame Relay
	  – 230.4 Kbps for Asynchronous PPP
	  – 640 Kbps for X.25
	  – 64 Kbps for BSC
	  "Looped" clocking is required on cables longer than 20 ft (6 m)
	  Speeds faster than 512 Kbps can require either the "looped" or "inverted" clocking to be configured
	▶ Maximum protocol speeds on the ITU X.21 electrical interfaces:
	  – Permitted only on 20-ft (6.2 m) cable
	  – 2.048 Mbps for Synchronous PPP, SDLC, and Frame Relay
	  – 640 Kbps for X.25
	  – Speeds faster than 512 Kbps can require either the "looped" or "inverted" clocking to be configured
	▶ Only one Frame Relay or one X.25 communication line is allowed per IOP
	▶ One high-speed line is permitted per IOP
	  – ASYNC and ASYNC PPP above 115.2 Kbps is a high-speed line
	  – Frame Relay, SDLC, SYNC PPP, and X.25 above 64 Kbps is a high-speed line
	  – High-speed lines are supported on ITU X.21, ITU V.35 20-ft (6 m) cables, or EIA-449/ITU V.36 electrical interfaces

| Comm. Restrictions (contd.) | ► Frame Relay restrictions:
   – Minimum line speed 56 Kbps
   – Frame Relay is not allowed on EIA-232/V.24 electrical interface
► SNA restrictions: None of the IOP-less WAN adapters or 1 Gbps LAN adapters directly support SNA. For the WAN adapters this means the Create Line SDLC (CRTLINSDLC) command is not supported. Some of these adapters can run with or without an IOP. To use an SDLC line description and thus run "direct SNA," the adapter must run associated with a supported IOP. Alternatively SNA protocol can run over these IOP-less adapters encapsulated in TCP/IP protocol using AnyNet or, starting with IBM i 5.4 or later, Enterprise Extenders (EE) support. EE is preferred. EE is preferred. See the iSeries Information Center for information about how to configure AnyNet and EE support:
http://publib.boulder.ibm.com/iseries/
► SDLC restrictions:
   – Maximum of 64 remote locations per IOP
► X.25 restrictions:
   – Limit of 16 virtual circuits (16 remote locations).
   – Limit of 64 virtual circuits (64 remote locations) in the #5065 Storage/PCI Expansion Tower.
   – Speeds faster than 512 Kbps can require either "looped" or "inverted" clocking to be configured.
   – The other port of the #2742 can be used as a low-speed communications line.
► Bisync is always limited to a maximum of 64 Kbps.
Additional restrictions include:
► V.25 autocall cable is not supported.
► Select standby mode is not supported.

Important:
► It is imperative that these restrictions be understood and followed. If they are not followed, it is possible that a hardware configuration can be built that marginally works and later quits working when the machine is upgraded to future software releases

Maximum High-Speed Communication lines Calculation Table

Quantity   **Factor CPW**
Number of lines operating at   64 Kbps or less   _____   x   0.92   = _____
Number of lines operating above 64 Kbps up to   128 Kbps   _____   x   1.84   = _____
Number of lines operating above 128 Kbps up to   256 Kbps   _____   x   3.68   = _____
Number of lines operating above 256 Kbps up to   512 Kbps   _____   x   7.36   = _____
Number of lines operating above 512 Kbps up to   1024 Kbps   _____   x   14.72 = _____
Number of lines operating above 1024 Kbps up to 2048 Kbps   _____   x   29.44 = _____
                                                         Total   _____

For more information, refer to *iSeries Performance Capabilities Reference*, SC41-0607. |

#4801	**#4801 PCI Cryptographic Coprocessor**
	The #4801 is a hardware cryptography solution. The #4801 is a half-length PC form-factor PCI card that offers rich cryptography function, secure storage of cryptographic keys, and 12 MBps performance (at the card level) for bulk data encryption and triple DES capability. The #4801 is available worldwide. The level of cryptographic function is determined by the Cryptographic Access Provider licensed program that is downloaded to the adapter.
	If your application requires a Federal Information Processing Standard (FIPS) 140-1 certified, tamper-resistant module for storing cryptographic keys, financial PIN processing, or both, then the #4801 PCI Cryptographic Coprocessor should be your choice. FIPS 140-1 is a U.S. Government National Institute of Standards and Technology (NIST) administered standard and certification program for cryptographic modules.
	Due to temperature requirements (card temperature must not drop below 5 degrees F (-15 degrees C)), the #4801 is shipped separately from the system in special packing.
	An IOP is required to support the #4801 on POWER6 models 9117-MMA and 9119-FHA with a RIO-2 loop.
	One PCI slot is required.The #4801 is a Customer Install Feature. The #4801 was withdrawn from marketing as of 1 June 2006. A #4806 PCI-X Cryptographic Coprocessor is the recommended replacement on System i POWER6 MTMs (for example 9406-MMA). #4806 is converted to #4764 on unified POWER6 MTMs. **Note**: The #4801 is the System i hardware feature code for the IBM 4758-023 PCI Cryptographic Coprocessor. Other features codes that are associated with the 4758 include: ▶ #4802: CCIN = 4758-023 ▶ #4803: CCIN = 4548-002 ▶ #4804: CCIN = 4758-002

4.7 Disk units protection codes

Table 4-4 lists the disk units protection codes.

Table 4-4   Disk units protection codes

Disk units	
Disk model identifier	The system configuration list (rack configuration) shows the disk type and model in the format XXXX-YYY, where *XXXX* identifies the CCIN of the disk and *YYY* identifies the potential or actual disk protection and compression. Refer to Chapter 7, "Feature code to CCIN cross-reference" on page 769, for a listing of the CCINs. The YYY identifiers are: **030**: Unprotected or mirrored unit attached to a non-RAID capable controller. **050**: Unprotected or mirrored unit attached to a RAID capable controller. **060**: Unprotected or mirrored unit attached to a RAID capable controller. Data compression is active. **070**: Non-parity member of a parity (RAID) set. Full capacity. Data compression is inactive. **071**: Parity member of a parity (RAID) set with sixteen parity members. Fifteen-sixteenths capacity. Data compression is inactive. **072**: Parity member of a parity (RAID) set with eight parity members. Seven-eighths capacity. Data compression is inactive. **074**: Parity member of a parity (RAID) set with four parity members. Three-fourths capacity. Data compression is inactive. **078**: Parity member of a parity (RAID) set with two parity members. Half capacity. Data compression is inactive. **080**: Non-parity member of a parity (RAID) set. Full capacity. Data compression is active. **082**: Parity member of a parity (RAID) set with eight parity members. Seven-eighths capacity. Data compression is active. **084**: Parity member of a parity (RAID) set with four parity members. Three-fourths capacity. Compression is active. **099**: Parity member of a parity (RAID) set. **090**: Non-parity member of a parity (RAID) set. Full capacity.
Disk data rate	IBM System i5 15 k rpm disk drives from January 2006 onward support data rates up to 320 MB with the proper disk controller. Disk controllers that support disk data rates up to 320 MB (U320 or Ultra4 SCSI) include the #0647, #0648, #2780, #5580, #5736, #5737, #5766, #5775, and #5776. The data rate is not a significant performance factor compared to other specifications such as the cache size and the disk rpm.

4.8 Tape units and CD-ROM

For information about supported media, see Chapter 10, "Tape and optical storage attachment summary" on page 827.

4.9 Summary: System i direct attach disks, disk controller features, CCINs

The following tables are provided for reference purposes. They summarize key disk device (arm) and disk controller identification numbers, RAID-level support, and performance-related information. Table 4-5 summarizes the supported disk devices.

Table 4-5   Supported disk devices

CCIN codes	Approx. size (GB)	Revolutions per minute (rpm)	Seek time (ms)		Latency (ms)	Maximum drive interface speed (MBps) when mounted in a given enclosure		
			Read	Write		5094/ 5294	5786/ 5787	9117-MMA 9119-FHA
4326	35	15 k	3.6	4.0	2	160	320	Not supported
4327	70	15 k	3.6	4.0	2	160	320	Not supported
4328	140	15 k	3.6	4.0	2	160	320	Not supported
433B	69.7	15 k	3.5	4.0	2	Not supported	Not supported	Supported
433C	139.5	15 k	3.5	4.0	2	Not supported	Not supported	Supported
433D	283.7	15 k	3.5	4.0	2	Not supported	Not supported	Supported
Note: The *actual drive interface speed* (MBps) is the minimum value of the maximum supported speeds of the drive, the enclosure and the disk controller (IOA).								

Table 4-6 summarizes the supported disk controllers (IOAs).

Table 4-6   The supported disk controllers (IOAs)

CCIN	Orderable Feature Codes	Cache size non-compressed/ up to compressed	Min./max. number of disks in a RAID set [a]	Max. disk interface speed supported (MBps)	Suggested ops per second guideline 10 k/15 k rpm[b]
5702	5705, 5712, 5715	Not applicable	Not applicable	160	46/69
2757	2757, 5581, 5591[c]	► 235 MB write/up to 757 MB ► 390 MB write/up to 1.5 GB aux write cache as #5591	3/18	160	84/127
2780	2780, 5580, 5590[c]	► 235 MB write/up to 757 MB ► 390 MB write/up to 1.5 GB aux write cache as #5590 ► 256 MB read/up to 1 GB	3/18	160	89/134
571A	5736 (IOP), 5775 (no IOP), 0647	Not applicable	Not applicable	320	50/76

CCIN	Orderable Feature Codes	Cache size non-compressed/ up to compressed	Min./max. number of disks in a RAID set [a]	Max. disk interface speed supported (MBps)	Suggested ops per second guideline 10 k/15 k rpm[b]
571B	5737 (IOP), 5776 (no IOP), 0648	90 MB	3/18 for RAID-5 4/18 for RAID-6	320	83/127
571E, 574F (aux write cache)	5738 (IOP), 5777 (no IOP), 5582 (IOP), 5583 (no IOP)	▶ 390 MB write/up to 1.5 GB ▶ 390 MB write/up to 1.5 GB aux write cache as #5582, #5583 ▶ 415 MB read/up to 1.6 GB	3/18 for RAID-5 4/18 for RAID-6	320	108/163
571F, 575B (auxiliary write cache) Support attachment of the EXP24 Disk Enclosure	5739 (IOP), 5778 (no IOP), 5781 (570 IOP), 5782 (570 no IOP), 5799 (520 IOP), 5800 (520 no IOP)	▶ 390 MB write/up to 1.5 GB ▶ 390 MB write/up to 1.5 GB aux write cache as #5581, #5582 ▶ 415 MB read/up to 1.6 GB	3/18 for RAID-5 4/18 for RAID-6	320	110/165

a. Not all disk enclosures support the maximum disks in a RAID set.
b. The suggested input and output operations per second values are shown here for each controller with all disk drives up to 18 (usually 15 maximum) attached or lower per the maximum supported by the disk controller and all disks running at either 10 k or 15 k revolutions per minute (rpm). The guideline values are taken from the IBM Systems Workload Estimator for System i, Disk Attachment Types help text information that is available from the System i user options.

The values are based upon assumptions of an average arm percent busy value of 40%, specific ratio of read and write percentages using RAID-5, and read or write cache hit percentages. The attached disk controller can also have a maximum "good performance" operations per second guideline value that is less when larger-than-assumed blocks of data are exchanged. Alternatively you might achieve excellent performance when the measured metric indicates an above guideline value. An example of this is when there is a high percentage of write cache hits. Some sizing experts advocate using a lower percentage of average disk arm busy, such as 25% or even 15%. Therefore there is a conservative-to-aggressive range of disk operations per second values that depend upon your workload environment. Guidelines are good "starting places" for any sizing effort. Use real-world experience if statistics are available. For detailed information about using the Workload Estimator for System i, go to: http://www.ibm.com/eserver/iseries/support/estimator

c. Attaching the larger auxiliary write cache controller to the #2757 (#5991) or to the #2780 (#5590) does not improve write performance compared to attaching the smaller #2757 auxiliary write cache (#5581) or compared to the smaller #2780 auxiliary write cache (#5580). You attach the #5591 or #5591 if you are considering replacing the #2757 or #2780 later with a #5738 or #5777 disk controller.

> **Important** Place the advanced technology disk controllers #5582, #5583, #5738, #5739, #5746, #5777, #5778, #5781, #5782, in a recommended card location within a supporting system unit, processor enclosure, or I/O tower. See Power Systems PCI Adapter Placement Guide for Machine Type 940x at:
>
> http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp

4.9.1 IBM POWER6 servers I/O enhancements

In this section, we summarize the new I/O loop attachment capabilities that are introduced with the POWER6 technology.

New I/O loop 12X I/O architecture support

The IBM POWER6 servers can attach I/O in multiple ways, allowing large, flexible growth options. A new option available on the IBM POWER6 servers 9117-MMA, 9119-HFHA is a 12X loop and an associated 12X I/O enclosure, also called a *12X channel*.

12X is a channel-based serial exchange I/O architecture that does not depend on the type of computers or connecting devices. It is designed to satisfy rapid interconnect in a large system environment. This architecture is used to connect computers to storages, network devices, and so on. 12X consist of 12 connections (wires), and the bandwidth of each connection is 2.5 Gbps. Therefore, the bandwidth of 12X is 30 Gbps. 12X supports a full-duplex communication.

Many HSL loop and HSL I/O enclosures that were previously supported on POWER5 systems are supported on the IBM POWER6 servers.

Each IBM POWER6 servers processor enclosure can attach up to two GX adapters. An HSL-2 GX adapter #1800 is supported on the 9117-MMA and #1814 is supported on the 9119-FHA that allows a loop to attach HSL-2 I/O enclosures. A 12X Channel CEC GX Adapter #1802 on the 9117-MMA and #1816 GX Dual-port 12x HCA Adapter allows a loop to attach up to four 12X I/O enclosures. RIO-2 I/O enclosures must be attached to an RIO-2 loops. 12X I/O enclosures must be attached to a 12X loops. RIO-2 and 12X enclosures cannot be mixed on the same loop. RIO-2 and 12X cables are not compatible.

12X I/O drawers cannot be switched between two IBM POWER6 servers.

The IBM POWER6 servers support the following 12X attachment I/O enclosures:

► #5796 PCI-DDR 12X Expansion Drawer
► #5797 12X I/O Drawer PCI-X (with repeater
► #5798 2X I/O Drawer PCI-X (without repeater)

IBM #5796 overview

The #5796 PCI-DDR 12X Expansion Drawercontains six full-length PCI-X DDR high-speed slots. Two #5796 features require only 4U or 4 EIA of 19 inch rack space. Each #5796 takes half the 19 inch rack width. Up to two #5796 features can be placed in a #7314 Dual 5796 Unit Enclosure each can be cabled to different 12X loops. The #5796 has a 12X Channel adapter with two ports.

The key characteristics of the #5796 include:

► Six high-speed, PCI-X DDR slots, no disk slots: All of the #5796 six I/O slots are PCI-X 2.0 (64-bit, 266 MHz) slots. For more information about PCI placement rules, see Power Systems PCI Adapter Placement Guide For Machine Type 820X and 91XX at:

  https://publib.boulder.ibm.com/infocenter/systems/scope/hw/topic/iphdx/sa76-0090.pdf

► Dual mode or IOP-less IOAs only (no IOP support)

The #5796 is similar to the RIO-2 #5790. The key differences include:

► The #5796 can support higher I/O workload levels.
► The #5790 has six PCI-X slots that can support IOPs.

The #5786 EXP24 Disk Drawer, introduced in February 2007, is supported in both an RIO-2 I/O enclosure and a 12X I/O enclosure.

Each #5796 takes one of four possible positions per 12X loop. The #5796 attaches to the 12X loop using one of two #5796 12X adapters, one for shorter distances or one for longer

distances. The short run (SR) adapter #6446/9533 can be used with 12X loops on which all units are contained in the same rack. The long run (LR) adapter #6457/8532 can be used for units spread across multiple racks. Short run and long run adapters can be mixed on the same loop.

In Table 4-7, *Yes* indicates that the 12X cable identified in that column can be used to connect the configuration identified in the first column. *No* means it cannot be used in the configuration.

Table 4-7   Available 5796 12X cables

Configuration	0.6 m (#1829)[a]	1.5 m (#1830)[b]	3.0 m (#1840)	8.0 m (#1834)[c]
#5796 to #5796 with Short Run adapter (#6446) in both drawers	Yes	Yes	No	No
#5796 with Short Run adapter (#6446) to #5796 with Long Run adapter (#6457)	Yes	Yes	Yes	No
#5796 to #5796 with Long Run adapter (#6457)in both drawers	Yes	Yes	Yes	Yes
#5796 with Short Run adapter (#6446) to 12X Channel CEC adapter (#1802)	No	Yes	Yes	No
#5796 with Long Run adapter (#6457) to 12X Channel CEC adapter (#1802)	No	Yes	Yes	Yes

a. The 0.6 m 12X cable (#1829) cannot be used to connect to a processor enclosure because of its short length. It is intended for use between two #5796 drawers mounted side-by-side in the same #7314 enclosure or to connect between two #5796 drawers located one beneath the other in a rack.
b. It is possible in some limited configurations to use the 3.0 M 12X cable (#1840) to locate #5796 drawers in adjacent racks. The cable length requires careful management of each drawer location within the rack. The best choice for connecting a #5796 drawer in an adjacent rack is the 8.0 M 12X cable (#1834).
c. The 12X cable (#1834) is intended for use when connecting between two modules that are located in adjacent racks. This cable cannot be connected to the 12X Short Run adapter (#6446). The #5796 supports only Dual mode (smart) IOAs and does not support an IOP or a card that requires an IOP.

The #5796 includes redundant concurrently maintainable power and cooling. The blind swap PCI mechanism allows for PCI card servicing without removing the I/O expansion drawer.

The front and back views of the #5796 PCI-DDR 12X Expansion Drawer are shown in 9.1.12, "#5796 PCI-DDR 12X expansion drawer" on page 814.

IBM #5797, #5798 overview

The #5797 and #5798 internal I/O drawers support 12X connectivity to the 9117-FHA CEC within 24 inch Expansion racks (#6954 powered or #6953 non-powered). The #5797 and #5798 are identical except the 5797 supports long run 12X cables (the #5797 has a repeater) and 5798 supports only short run cables of 2.5 meters or less. The #5798 is for the CEC frame only.

The key characteristics of the #5797 (with repeater) and #5798 (no repeater) include:

► High performance, compact 4U I/O drawer

► 20 PCI slots

  – 14 PCI-X 2.0 (266 MHz) slots: IOAs supported. IOPs, required by IBM i for certain support (such as tape library functions) are not supported

  – 6 PCI-X (133 MHz) slots: Support either IOPs or IOAs for all three operating systems

- ► 16 disk bays:

  - Disks driven by imbedded disk controllers - 1 controller per 4 disk bays
  - Zero write cache in each imbedded controller
  - AIX, Linux formatted disk drives. IBM i formatted drives not supported

- ► Each is composed of two 1/2 "sub drawers", each 1/2 drawer has:

  - 7 PCI-X DDR
  - 3 PCI-X
  - 8 SCSI disk bay

- ► Subdrawer packaging offers double or single loop attachments

  - Single loop attachment:

    - One loop with two ½ drawers attached to each other
    - Maximum number of PCI slots
    - Maximum of 30 12X drawers on 64-core 9117- FHA
    - 1 drawer per GX Adapter

  - Double loop attachment:

    - Two loops, each with ½ drawer
    - Maximum performance
    - Maximum of 16 12X drawers on 64-core 9119-FHA
    - ½ drawer per GX Adapter

- ► Blind-swap cassettes placed in each slot (with or without cards): Use #4599 to order additional blind-swap cassettes for #5791/94/97/98 (different from blind-swap cassettes on #5790/5796)

- ► Each half of the drawer has redundant power and cooling. Power is hot plug. Fan replacement requires removal of a disk cage

- ► Power is provided through bulk power supplies located in either the CEC frame or the expansion frame.

- ► UPIC cables provide both power and control information.   (SPCN cables are not used.)

- ► Three 12X cable lengths:

  - #1829 0.6 meter
  - #1831 2.5 meter
  - #1834 8.0 meter

Figure 4-1 illustrates both single loop and double loop connection of the 1/2 drawers of the #5797 and #5798. See the important notes box following the figure.

Figure 4-1   IBM #5797, #5798 loop connection options

Attention:

► Existing 5791/5794,7040-61D I/O drawers have same single/double loop option, but uses short 0.6m RIO cable #7924 to connect both sides of the 24 inch drawer. Maximum number of RIO drawers is 12.

► In this publication you can see Figure 3-35 on page 160 for an example of a dual loop connection to a Power 595 processor book. The section discussing this figure has additional information on loop connections.

► IBM Configurator uses the presence / absence of the short cable to assume single or double (dual) loop mode

► IBM Configurator can default to single loop mode where it could for the Power 595 because that is the lowest cost option (fewer GX adapters/cables)

As indicated earlier in this publication 12X loop attachment capabilities offer increased maximum I/O operations per second over RIO-2 loop attachment. Figure 4-2 illustrates this by comparing 12X #5797 or #5798 drawers attachment to previously available similar RIO-2 drawers attachment.

Figure 4-2   Comparison of RIO-2 and 12X using #5797, #5798 I/O drawers

Review the bullets shown in Figure 4-2 because they contain important details for each I/O drawer listed.

It is important to note:

► The IBM 7040-61D was a pre availability of the #5791 or #5794 way to order a 24 inch RIO-attached drawer. With #4693 on the POWER5 9119 590 and 595,he 7040-61D is upgraded to be physically equivalent to the #5791/5794.

► Starting approximately the end of November 2008, you can convert #5791 I/O drawers purchased with the 9119-FHA to the newer #5797 and #5798 at a modest charge

► Conversions from I/O drawers with #5807, #5808, and #5809 carry over feature has not been announced through September 2008.

► Conversion to the #5797 or #5798 allows easy transition to newer/faster technology and allows use by IBM i.

► You must schedule downtime for the affected operating system partitions using a resource in the #5791/5794.

► PCI cards and SCSI disk drives can be moved from #5791 and placed in #5797 and #5798.

POWER6 support of RIO-2 I/O loop attachment summary

The IBM POWER6 servers 9117-MMA and 9119-FHA also support a number of RIO-2 I/O enclosures providing PCI-X slots and potentially disk slots. These enclosures have been previously announced on POWER5 systems. The PCI slots provided are PCI-X slots, which support IOPs, not PCI-X DDR slots. These enclosures are:

► #0595/5095 (7 PCI-X slots and 12 SCSI disk slots)
► #5094/5294 (14 PCI-X slots and 15-45 SCSI disk slots)
► #5096/5296 (14 PCI-X slots and 0 disk slots)
► #0588/5088 (14 PCI-X slots and 0 disk slots)
► #5790 (6 PCI-X slots and 0 disk slots)

All of these HSL I/O enclosures are attached to the IBM POWER6 servers through RIO-2 physical ports and run over an RIO-2 interface. I/O units that were attached to earlier systems using the RIO-1interface (#9877, #9886, #9887, #2886, #2887) must be upgraded before being attached to the IBM POWER6 servers. This includes the #0588/5088, which previously had supported the HSL interface only with an RPQ on POWER5 and POWER5+ systems. You can order the RIO-2 interface as #6417 (MES) or #9517 (from factory with new I/O tower/drawer).

The #5786/5787 Disk Enclosure is supported. This I/O enclosure holds up to 24 internal 15k rpm SCSI disk drives, which are run by a disk controller in a PCI slot located in the IBM POWER6 servers processor, 12X, or RIO-2 enclosure.

4.9.2 IBM POWER6 servers and V5R4 with machine code V5R4M5 storage enhancements

Machine code level V5R4M5 enables IBM i 5.4 users to take advantage of SAS technology storage that is available on POWER6 servers.

Serial attached SCSI support

The IBM POWER6 server processor enclosure/system unit includes an IBM SAS controller, which supports up to six SAS disk drives. SAS architecture defines a serial device interconnection and transportation protocol that defines the rules for information exchange between devices. SAS is an evolution of the parallel SCSI device interface into a serial point-to-point interface.

SAS physical links (phys) are a set of four wires used as two differential signal pairs. One differential signal transmits in one direction while the other differential signal transmits in the opposite direction. Data can be transmitted in both directions simultaneously.

Phys are contained in ports. A *port* contains one or more phys. A port is a wide port if there is more than one phy in the port. A port is a narrow port if there is only one phy in the port. A port is identified by a unique SAS world- wide name (also called *SAS address*). A SAS controller contains one or more SAS ports.

A *path* is a logical point-to-point link between a SAS initiator port in the controller and a SAS target port in the I/O device (that is, a disk). A *connection* is a temporary association between a controller and an I/O device through a path. A connection enables communication to a device. The controller can communicate to the I/O device over this connection using either the SCSI command set or the Advanced Technology Attachment (ATA)/ Advanced Technology Attachment Packet Interface (ATAPI) command set depending on the device type.

An *expander* facilitates connections between a controller port and multiple I/O device ports. An expander routes connections between the expander ports. There can exist only a single

connection through an expander at any given time. Using expanders creates more nodes in the path from the controller to the I/O device. If an I/O device supports multiple ports, it is possible for more than one path to the device when there are expander devices on the path. *SAS fabric* refers to the summation of all paths between all controller ports and all I/O device ports in the SAS subsystem.

The benefits of IBM SAS controllers include:

► A robust SAS expandable architecture that incorporates fibre channel like functionality (that is, dual path)

► An improved signal quality because of a point-to-point connection between device and adapter, and or expander

► Improved availability and redundancy, with dual paths to each drive

► Reduced potential customer problems with point-to-point:

– There is no contention when accessing a drive.
– They minimize command time-outs.

► Performance growth capability

► An improved disk/adapter ratio, providing more addressability: parallel SCSI up to 36 and SAS up to 60

► Utilization of SCSI commands, providing:

– Minimal impacts to operating systems
– Compatibility for high-speed software (applications)

► Quick detection of failing devices

The IBM SAS controllers are optimized for SAS disk configuration that use dual paths through dual expanders for redundancy and reliability. They offer the following features:

A PCI-X 266 MHz system interface or PCI Express system interface

► A physical link speed of 3 Gbps supporting transfer rates of 300 MBps

► Support of SAS devices and non-disk Serial Advanced Technology Attachment (SATA) devices

► Manage path redundancy and path switching for multiported SAS devices

As stated previously, the IBM POWER6 server processor enclosure has six disk slots (driven by the embedded SAS disk controller). Up to six SAS 15 k rpm SAS disk drives are supported in a IBM POWER6 processor enclosure.

They are available for IBM i in the following capabilities (formatted for IBM i usage):

► 69.7 GB (#3676)
► 139.5 GB (#3677)
► 283.7 GB (#3678)

The following options are available for Linux or AIX partitions that own their own disk drives:

► 73.4 GB (#3646)
► 146.8 GB (#3647)
► 300 GB (#3648)

> **Important:** Use care when proposing the SAS disk drives in the 9406-MMA or 9117-MMA. You must be confident that you clearly understand the disk performance implications. The embedded IBM POWER6 server SAS disk controller that supports these drives has zero write cache. Where disk and disk controller performance is a consideration, use a SCSI disk with a SCSI disk controller with write cache.
>
> Note, the #5679 175 MB SAS RAID Enablement feature supports write cache and RAID protection on the 9407-M15, 9408-M25, 9409-M50, 9406-MMA, 8203-E4A, and 8204-E8A systems. At the time of this redpaper publication, this feature is not available on POWER6 570 (or 595) configurations.

The IBM POWER6 server processor enclosure supports only the new SAS DASD hard disks internally. The older SCSI disk drives can be attached to the IBM POWER6 server but must be located in a remote I/O drawer on the 9408-M25, 9409-M50, 9406-MMA, 8203-E4A, and 8204-E8A systems.

On IBM i systems, SAS and SCSI drives can mirror each other, given similar capacities. The smaller capacity is used by both drives, for example 69.7 GB to 70.56 GB.

SATA devices support

Because disk controllers of IBM POWER6 processor enclosure are SAS disk controllers and Integrated Drive Electronics devices cannot be attached directly to these controllers, the conversion mechanism between the SATA and Integrated Drive Electronics devices is supported within the IBM POWER6 server processor enclosure.

SATA is the interface specification that offers increased data rate performance over Parallel Advanced Technology Attachment (PATA). Developed by a group of leading technology vendors, SATA was designed to overcome the performance barriers of PATA technologies, while maintaining the benefits and cost-efficiency of PATA technology.

New features and benefits introduced with SATA include:

► Lower voltage

   SATA operates at 250 millivolts, and PATA is based on 5-volt signaling. This low voltage is compatible with upcoming circuitry, and the resulting low power consumption, meaning lower cooling needs, makes SATA attractive for multi-drive RAID arrays.

► Data transfer rates

   Parallel ATA is limited to data transfer rates of 133 MBps; Serial ATA has a data transfer rate of 150 MBps initially. This might look like a disappointing improvement and is still less than SCSI and Fibre Channel, but as mentioned earlier, the SATA road map calls for 300, and then 600 MBps data transfer capability.

► Point-to-point connectivity

   The master/slave shared connectivity approach is replaced with a point-to-point connection scheme supporting only one device per cable. This allows each drive to communicate directly with the system at anytime. Because there is no sharing on the bus, performance scales linearly: adding a disk on a SATA system gives you the additional maximum throughput of the added disk.

► Serial transmission

   Serial transmission is used in many recent technologies including Gigabit Ethernet, USB 2.0, IEEE 1394, and Fibre Channel. In fact, serial is used for most of the fastest data transfer technology and will enable SATA to rival SCSI and Fibre Channel in speed.

- Cyclic redundancy checking (CRC)

  CRC provides improved data protection and integrity over PATA and confers to SATA another feature already found in SCSI.

- Improved performance with hot-swappable drives

  SATA features greater performance and hot-swappable drives. This enables you to swap out a drive without taking the system offline or rebooting. This is an essential characteristic of SATA that makes it viable for enterprise solutions were system down time is usually not an option.

- Improved cabling and connector

  A simplified cabling scheme offers a narrow serial cable with compact connectors for improved connectivity and ventilation, facilitating improved product design and hardware assembly. Practically, the connector size is reduced from 40 pins with PATA to 7 pins with SATA. PATA uses 16 separate wires to send 16-bits of data and thus must use a bulky flat cable, which is the cause of electromagnetic interference that compromises data integrity.

- Backward compatibility with older ATA storage devices

  SATA is designed to be backward compatible with previous PATA devices. To system software, SATA is not different from PATA.

- Compatibility with SAS connector

  SATA is designed to be compatible with SAS. A SATA devices can connect to a SAS connector.

IBM POWER6 servers supports the #5756 DVD-ROM Drive IDE Slimline and the #5757 DVD-RAM Drive IDE Slimline. This drive can be attached to the IBM POWER6 server processor enclosure. In the IBM POWER6 processor enclosure, these drives are attached to the embedded SAS Disk Controller, which preforms the conversion mechanism.

Figure 4-3 depicts a logical representation of the connection between an embedded SAS Disk Controller and an IDE DVD Drive using a SATA-IDE converter.

Figure 4-3   SAS disk controller and DVD connection

9117-MMA enhanced disk storage configuration rules

IBM POWER6 servers implements enhanced disk storage configuration rules. IBM configuration tools and IBM technical support personnel do not support configurations unless

they can protect against possible single-disk-drive failure and protect disk-controller-write cache. IBM i internal and integrated disk drives must be protected by either mirroring or using RAID-5 or RAID-6 arrays. Disk controllers with write cache must protect the cache by either mirroring the disk controller (IOA-level mirroring or higher) or using an auxiliary write cache IOA. This is true for all partitions of all types running on the IBM i platform, including IBM i, AIX, and Linux.

External drives attached through Fibre Channel adapters are supported for both database and integrated file system. The IBM System Storage DS6000, DS8000 and Enterprise Storage Server® (ESS) products are supported. External drives can also be attached through Ethernet LAN adapters and used by the i5/OS integrated file system, but not the i5/OS database. The same IBM i protection rules apply here as for internal and integrated disk storage. Drives must be protected against a single drive failure, and write cache must be protected.

As an additional disk storage enhancement, load source drives can now be placed outside of the 9407-M15, 9408-M25, 9409-M50 and 9406-MMA processor enclosure. In addition to the SAN load source option, you can specify the i5/OS load source drives to be placed in an attached I/O tower or drawer. The choices include #0595/5095, #5094/5294, or #5786/5787.

> **Restriction:** The 9407-M15 SAN load source must be placed in the processor enclosure.

4.9.3 RAID hot spare

You can order one or more hot spare disk devices to be available for automated use (inclusion) in a defined RAID-5 or RAID-6 disk array set. This hot spare capability requires IBM i 5.4 with V5R4 with License Internal Code V5R4M5 running on the following IBM i models: 9407-M15, 9408-M25, 9409-M50, and 9406-MMA.

Hot spare is supported on the following disk controllers with write cache on models 9408-M25, 9409-M50, and 9406-MMA:

- ▶ 1.5 GB controllers: #5739, #5778, #5781, or #5782 and #5582, #5583, #5738, or #5777
- ▶ 757 MB controllers: #2757, #5581, or #5591 and #2780, #5580, or #5590
- ▶ 90 MB controllers: #5737 or #5776
- ▶ 40 MB controllers: #5703

You configure the RAID array with one or more hot spare disks using the normal IBM i interfaces to set up RAID-5 or RAID-6 protection as discussed later in this section.

Prior to hot spare, if a disk fails in a RAID-5 array, the array is not protected against a second disk failure until the failed disk is physically replaced and the data contents are rebuilt on the replacement disk. Similarly, if two disk drives fail on a RAID-6 array, the array is not protected against a third disk failure in the array.

With RAID hot spare, in the event of a disk drive failure, a spare disk is dynamically assigned to take over the failed disk's role, and the rebuilding operation is started. The time between problem occurrence and the time in which protection is re-established is reduced. The time reduction is the time it takes for the operator to recognize the error and for someone to respond and physically replace the failed drive.

Using the hot spare disk drive, disk drive failure is now handled in parallel to the automatic system response. With the system's existing hot plug or concurrent maintenance capability, the failed drive can be replaced without taking the system down. The replacement drive then takes over the role of standing by as the hot spare.

The RAID hot spare disk drive is plugged into the system and does not contain any data until it takes over for a failed disk drive. Therefore, it requires a disk slot. The hot spare disk drive is associated with a specific controller. Assuming all drives are the same capacity, one hot spare disk drive can stand by, protecting all the arrays managed by the disk controller.

Depending on the level of protection that is desired, you can have more than one hot spare disk drive per disk controller. This protects against the combined sequential failures of more than two (RAID-5) or three (RAID-6) disk failures. It does not protect against non-sequential failures where multiple drives fail at one time or if another failure occurs when the hot spare drive rebuilding was not yet completed in a RAID-5 array.

When ordering a new system from IBM, you can request that RAID hot spare be implemented by IBM manufacturing by specifying feature code #0347. This feature is assumed by IBM to be system-wide, unless you are defining protection by partition. One hot spare disk drive is assigned per disk controller except in the EXP24 Disk Enclosure. The EXP24 1.5 GB Disk Controller (#5739, #5778, #5781, # or 5782 or CCIN 571F) has one hot spare disk if there are 18 or fewer drives in the EXP24 or two hot spare disk drives if there are 19-24 drives.

> **#0347:** The hot spare function is supported on IBM i servers with i5/OS IBM i 5.4 with 5.4.5 machine code.

You can control the use of hot spare drives with more granularity than what the #0347 hot spare specify indicates. You can assign as many hot spare drives as desired to each specific IOA or controller. This can be useful if you have separate auxiliary storage pools (ASPs) for which you desire different levels of protection.

It is important to do proper planning for use of a hot spare disk. Here is an overview of how to set up hot spare disk units on your system:

► To start device parity protection with hot spare protection using IBM Systems Director Navigator for i5/OS:

   a. From the IBM Systems Director Navigator for i5/OS window, select **Configuration** and **Service**.
   b. Select **Show All Configuration** and **Service Tasks**.
   c. Select **Start Parity**.
   d. In the Hot Spare Protection list, select **Yes**.

► To start device parity protection with hot spare protection using System i Navigator:

   a. In System i Navigator, expand **My Connections** → *your System i* → **Configuration and Service** → **Hardware** → **Disk Units**.
   b. Right-click **Parity Sets** and select **Start Parity**.
   c. In the Hot Spare Protection list, select **Yes**.

► To start device parity protection with hot spare protection using a command line:

   a. Start System Service Tools (STRSST), and specify the user name and password.
   b. On the System Service Tools (SST) display, select **Work with disk units**.
   c. On the Work with Disk Units display, select **Work with disk configuration**.
   d. On the Work with Disk Configuration display, select **Work with device parity protection**.
   e. On the Work with Device Parity Protection display, select **Start device parity protection - RAID 5 with Hot Spare Protection** or **Start device parity protection - RAID 6 with Hot Spare Protection** depending on the level of parity protection that is desired.

For more information about the specification of this feature, see the #0347 in 4.7, "Disk units protection codes" on page 729.

4.9.4 Clustering considerations among IBM i servers

In this section, we summarize the clustering and switching of I/O devices among IBM System i model configurations considerations:

► IBM POWER6 servers 9408-M25, 9409-M50,9406-MMA, 9117-MMA, and 9119-FHA can be clustered, and RIO-2 attached I/O units can be switched. This requires all I/O enclosures to have the faster RIO-2 adapter feature numbers supported on the appropriate MTM.9406-MMA

► At this time, 12X I/O drawers cannot be switched between two IBM i systems.

In this publication we expand on AIX and IBM i clustering capabilities and the known IBM product offerings that can take advantage of these AIX and IBM i clustering facilities in "Cluster-based availability solutions" on page 983.

5

IBM TotalStorage EXP24 disk enclosures

In this chapter, we provide information about the #5786 TotalStorage Expansion 24 Disk Drawer and the #5787 TotalStorage Expansion 24 Disk Tower. We include diagrams that show the disk slots. We also address and provide recommendations for SCSI connections.

This I/O enclosure is physically identical to the System p 7031-D24/T24 EXP24 Disk Enclosure. Therefore, the disk positioning, SCSI repeater and enabler cards, and cable connection rules that we describe in this chapter apply to either the 7031-D24/T24 EXP24 Disk Enclosure or the #5786 TotalStorage Expansion 24 Disk Drawer and the #5787 TotalStorage Expansion 24 Disk Tower. IBM i and AIX low level device detection software specifically identifies and, thus, supports only the #5786 or #5787 (IBM i) or the 7031-D24/T24.

5.1 IBM TotalStorage EXP24 Disk Drawer overview

The IBM TotalStorage EXP24 Expandable Storage disk enclosure is known by different names and by MTM or feature numbers for those people experienced with System p and System i, as follows:

► System p: *7031 Model D24 (I/O Drawer) or T24 (I/O Tower)* or the *7031-D24* or *7031-T24*

   These enclosures are also commonly referred to as *7031-D24/T24 SCSI DASD drawer/tower*. This terminology is commonly used in POWER6 model documentation for the 8203-E4A, 8204-E8A, 9117-MMA, and 9119-FHA MTMs.

► System i: *#5786 TotalStorage EXP24 Disk Drawer* or *#5787 TotalStorage EXP24 Disk Towe*r

   This terminology is commonly used in POWER6 model documentation for the 9407-M15, 9408-M25, 9409-M50, 9117-MMA, and 9119-FHA MTMs.

These I/O enclosures are identical regardless of feature number differences. The enclosed Ultra320 (LVD) SCSI disk drives are physically the same but have different feature numbers because of different physical capacities based upon the formatting required by the using operating systems. This disk storage enclosure device provides more than 7 TB of disk storage in a 4U rack-mount (Model D24) or compact deskside (Model T24) unit. Whether high availability storage solutions or simply high capacity storage for a single server installation, the unit provides a cost-effective solution.

It provides 24 hot-swappable disk bays, 12 accessible from the front and 12 from the rear. Disk options that can be accommodated in any of the four six packs disk drive enclosures are 73.4 GB, 146.8 GB, or 300 GB 10 K rpm or 36.4 GB, 73.4 GB, or 146.8 GB 15 000 rpm drives. Each of the four six packs disk drive enclosure might be attached independently to an Ultra320 SCSI or Ultra320 SCSI RAID adapter.

For AIX environment high availability configurations, a dual bus repeater card (FC 5742) allows each six pack to be attached to two SCSI adapters, installed in one or multiple servers or logical partitions. Refer to the following Hardware Information Center site for connection configuration examples beyond what is presented at the end of this chapter.

http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp?topic=/iphal/configaixscsienclosure.htm&resultof=%22%35%37%38%36%22%20

Optionally, the two front or two rear six packs might be connected together to form a single Ultra320 SCSI bus of 12 drives by using a dual bus repeater card (FC 5742) and a Single Bus Ultra 320 SCSI repeater card (FC 5741).

For IBM i environments refer to the following Hardware Information Center site for connection configuration examples.

http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp?topic=/iphal/scsidiskdriveenclosurei5.htm&resultof=%22%35%37%38%36%22%20

These disk units can be packaged in up to four independent groups of six disk units. Each group of six disk units is referred to as a *six pack*.

Each six pack with one or more disks is enabled by either a #5741 Expansion 24 6 Disk Slot Enabler or a #5742 Expansion 24 6/12 Disk Slot Enabler. Each six pack must be driven by a port on a supporting SCSI disk controller located outside the #5786 or #5787 (7031-D24/7031-T24).

Disk slot enabler and SCSI repeater: Each disk slot enabler is also referred to as a *SCSI repeater* in IBM documentation. User documentation uses the terms *repeater* and *enabler* interchangeably. One repeater or enabler is required for each six pack regardless of the type of repeater.

The port on the disk controller is connected to either a #5741 or a #5742 using a SCSI cable. One to four disk slot enablers (repeaters) are required, depending on the number of six packs that are populated with disk units.

The #5741 Expansion 24 6 Disk Slot Enabler is termed a *single SCSI repeater* and the #5742 Expansion 24 6/12 Disk Slot Enabler is termed a *dual SCSI repeater*. The #5742 can support a single six pack or up to two six packs (up to 12 disks), when functioning as a dual repeater.

When functioning as a dual repeater, a #5742 must be connected to the supported disk controller port. It then can be daisy-chain connected, using a SCSI cable, to either another #5741 or #5742 (the second six pack). This second repeater must not be connected to any other repeater or disk controller port.

Notes: Keep in mind the following information when reading this chapter:

► The remainder of this chapter uses #5786 or #5787 and EXP24 terms.

► The #5786 and #5787 do not use RIO (HSL) cables and do not have SPCN connections.

The disk controller features supporting attachment of either a #5786 TotalStorage Expansion 24 Disk Drawer or a #5787 TotalStorage Expansion 24 Disk Tower include the #5736, #5737, #5739, #5775, #5776, #5778, #5781, or #5782.

Specific disk unit feature numbers are used to identify disk units that will be placed in the #5786 or #5787. These disk units are physically the same disk units as used in other System i system units and I/O towers or drawers. Using separate feature codes allows IBM configuration tools to better understand their placement. Feature code numbers of #5786 or #5787 disk units include the #1266, #1267, #1268, #1269, #1292, #1293, #1294, #1295, #1296, #1297, #1298, and #1299.

Important #5786/#5787 EXP24 disk configuration considerations: The #5786 or #5787 EXP24 disk configurations can support a larger number of disk drives with fewer disk controllers (IOAs) and therefore use fewer PCI slots than was previously required with older disk controllers. From an attachment standpoint, a single disk controller (IOA) and a single EXP24 allow up to 24 disks to be physically attached.

When one and a half EXP24 enclosures are attached to a single controller (three SCSI buses), up to 36 disks can be attached. However for performance reasons, 24 disks per high-speed controller are usually the practical limit and are inferred as the maximum in most EXP24-based documentation. By comparison, the previous maximum per disk controller was 20 disk drives (in a mirroring environment, where four SCSI buses could be used) or 15 to 18 disk drives in a RAID-5 environment with auxiliary write cache support.

Because the EXP24 enclosure is organized into four sets of up to six drives, each set of six disks can be attached to the same or a different disk controller IOAs. This flexibility can be of significant value when configuring small logical partitions (LPARs).

5.2 EXP24 Disk Drawer front and rear views

Figure 5-1 shows the front view of the #5786 TotalStorage Expansion 24 Disk Drawer.
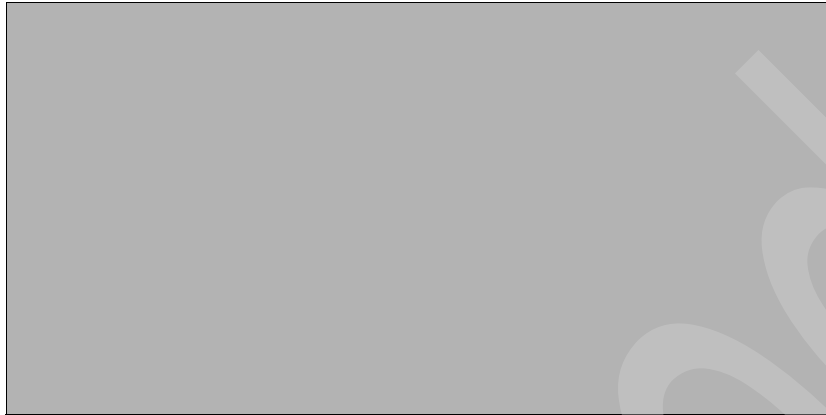
Figure 5-1   Front view of the #5786 TotalStorage Expansion 24 Disk Drawer

Figure 5-2 shows the back view of the #5786 TotalStorage Expansion 24 Disk Drawer. In the back view, the C2, C3, C4, and C5 are slots for the #5741 or #5742 SCSI repeaters.

Figure 5-2   Back view of the #5786 TotalStorage Expansion 24 Disk Drawer

Note: On tower models (#5787), the locations C3 and C5 are located on the top, and C2 and C4 are located on the bottom. This makes C3 the top left and C5 the top right, and it makes C2 the bottom left and C4 the bottom right when viewed from the rear. Follow the location codes when placing repeater cards.

5.2.1 Adapter cards for connecting EXP24 Disk Drawer

Table 5-1 lists the adapter cards to connect the EXP24 Disk Drawer. If you want more information about an adapter and its features, see 9.1.7, "#5786 TotalStorage Expansion 24 Disk Drawer and #5787 TotalStorage Expansion 24 Disk Tower" on page 808.

Table 5-1   Adapter cards for connecting EXP24 Disk Drawer

	Type	9117-MMA	9119-FHA
#5736	With IOP	✓	✓
#5737	With-IOP	✓	✓
#5776	IOP-less	✓	✓
#5777	IOP-less	✓	✓
#5778	IOP-less	✓	✓
#5780	IOP-less		✓
#5782	IOP-less	✓	✓
#5806	With IOP	✓	✓

5.2.2 5741 or 5742 Disk Slot Enabler placement and cabling recommendations

A repeater (also referred to as an *enabler*) is required whenever there are disk drives in the slots that are controlled by that repeater. The repeater slots can be populated in several ways:

► All #5741 single repeaters (allow up to six disks per disk controller port).

► All #5742 dual repeaters (not recommended as more expensive and unnecessary).

► For greatest flexibility, use two #5741 single repeaters and two #5742 dual repeaters.

   The #5741 or #5742 placement affects the disk device SCSI addressing and the number of potential LPAR load source disk units.

► A combination of #5741 single and #5742 dual repeaters (allows up to 12 disks per controller port).

   – When using a combination of #5742 dual and #5741 single repeaters, we recommend that you place the #5742 dual repeaters in C3 and C4. This placement keeps the disk device SCSI addressing consistent without change but limits the available LPAR load source disk units to two.

   – When connecting (daisy-chaining) repeaters, the SCSI cabling should go from the disk controller port to a #5742 dual repeater and then to a #5741 single repeater.

   – The repeaters should be connected (daisy-chained) so that a pair of repeaters controls the disk slots in either the front or rear half of the #5786 or #5787 (C3 to C2 and C4 to C5).

The SCSI ports on the #5741 or #5742 repeaters are *not* labelled. Figure 5-3 shows a representation of the repeaters as viewed from the rear. The figure shows only the cabling between SCSI repeaters. A complete working configuration for controlling up to 12 disks also requires a SCSI cable connection from a SCSI port on a disk controller to a port on the #5742 dual repeater. In this example, that port on the #5742 is labelled A.

5.2.3 IBM i load source drive considerations in #5786 or #5787 for logical partitions with 9117-MMA and 9119-FHA

Each IBM i partition (LPAR) requires a load source disk unit. The server uses the load source to start the LPAR. Each LPAR has specific supported slot placements for its load source disk depending on the type of system unit or expansion unit where the load source is installed. A specific connection to a disk IOA is then required to control the load source disk unit for each LPAR.

> **System Planning Tool:** The information that we provide here does not replace the System Planning Tool (SPT). Use this information as a resource with the SPT output to help you determine the load source placement for your IBM i LPARs.

The load source drive requires a SCSI device address of 1, 2, 3, or 4 and must be connected to SCSI port 0 of a disk controller. Under certain circumstances, the SCSI device addresses in the EXP24 are A, B, C, D, E and F. Therefore, take care to ensure addressing is correct when attempting to have more than two load sources contained in a single EXP24.

Figure 5-3 shows the SCSI device addressing and the effect of using a #5742 dual repeater or a #5741 single repeater and the effects of cabling between repeaters.

Figure 5-3   Card slot device addressing rules using #5741 single and #5742 dual repeaters

The SCSI addressing for DASD positions P1-D7 to P1-D12 and P2-D7 to P2-D12 does not change. The positions are always SCSI address 2, 3, 4, 5, 6 and 7. This means that the first three positions in the right six pack viewed from the front (P1-D7, D8, D9), and the first three positions in the right six pack viewed from the rear (P2-D7, D8, D9), can always be load source candidates.

P1-D1 to P1-D6 and P2-D1to P2-D6 device positions change to addresses A, B, C, D, E, and F in two cases. They change whenever a #5742 dual repeater controls them or if a #5741 single repeater controlling them is cabled to a #5742 dual repeater. Addresses A, B, C, D, E, and F are in hexadecimal format. These same addresses can be displayed in decimal format (10, 11, 12, 13, 14, 15) in some i5/OS displays such as Hardware Service Manager or error logs.

Consider the following load source rules for #5786 and #5787:

► The load source disk must be controlled by the SCSI bus port 0 of the load source disk unit controller.

► P1-D1, P1-D2, or P1-D3 can contain the load source disk only if slot C3 contains a #5741 single repeater card that is connected to SCSI port 0 of the disk controller.

► P1-D7, P1-D8, or P1-D9 can contain the load source if the #5741 in C2 is connected to SCSI port 0 on the disk controller or if the #5741 in C2 is cabled to the #5742 dual repeater in C3 and the #5742 in C3 is connected to SCSI port 0 on the disk controller.

► P2-D1, P2-D2, or P2-D3 can contain the load source disk only if slot C4 contains a #5741 single repeater card that is connected to SCSI port 0 of the disk controller.

► P2-D7, P2-D8, or P2-D9 can contain the load source if the #5741 in C5 is connected to SCSI port 0 on the disk controller or if the #5741 in C5 is cabled to the #5742 dual repeater in C4 and the #5742 in C4 is connected to SCSI port 0 on the disk controller.

#5741 and #5742 SCSI repeater card placement recommendations

Consider the following SCSI repeater card placement recommendations:

► To have four load source disks available in a single #5786 or #5787, the #5786 or #5787 must contain four #5741 single repeaters or #5742 dual repeaters in C2 and C5 and #5741 single repeaters in C3 and C4.

► To keep SCSI addressing consistent with no changes, but limit the available load source disks to two instead of four, then the #5786 or #5787 should have a #5741 single repeater in C2 and C5 and #5742 dual repeaters in C3 and C4.

► When daisy-chaining SCSI repeaters, connect C2 to C3 and connect C5 to C4. This way, the repeaters in C2 and C3 control the disks in the front of the #5786 or #5787 and the repeaters in C4 and C5 control the disks in the rear.

IBM i large write/read cache adapters that support the EXP24

IBM i supports several adapters that have a large write cache (390 MB up to 1.5 GB compressed) and read cache (415 MB up to 1.6 GB compressed). These have a second (auxiliary) write cache card which duplicates the primary write cache data for data recovery purposes.

These adapters all report to the system as a specific adapter card CCIN value and an associated CCIN value for the auxiliary write cache card. There are versions of these adapters specific to supporting the EXP24. The EXP24 support CCIN values are 571F (primary adapter and write cache card) and 575B (auxiliary write cache card).

These EXP24 adapter cards are two physical cards that are firmly connected to each other and require two adjacent PCI-X slots. The primary card provides three Ultra320 SCSI ports or buses for the attachment of disk drives located in a #5786 or #5787 TotalStorage EXP24 Disk Drawer/Tower.

The two cards, identified on the system by a single primary adapter card CCIN (571F) and the auxiliary write cache card CCIN 575B are ordered as a single feature number out of several orderable feature codes that include these same physical cards. Each of these orderable feature numbers (codes) indicate to the IBM ordering system a unique surrounding hardware configuration.

Orderable features #5739 and #5778 are physically the same adapter cards but have different feature numbers to denote to IBM configuration tools whether an IOP is required. The #5739 indicates that an IOP is used.

Orderable feature numbers #5781 or #5782 and #5799 or #5800 are also the same adapter cards. However, the #5781 (with IOP) or #5782 indicates that the adapter is placed in a double-wide blind swap cassette, and the #5799 (with IOP) or #5800 indicates that the adapter is placed in a system unit and has a light pipe inserted into the feature.

On a unified POWER6 MTM, new orders would specify the *without IOP* feature. In a configuration upgraded into a POWER6 system there is no need to continue using the associated IOP card. System or partition restart will detect the absence of an IOP card and adjust the microcode accordingly.

Figure 5-4 depicts the SCSI port addressing on the double-wide (two physical cards) disk controller (adapter) supporting the EXP24 enclosure.

Figure 5-4   Large write and read cache controller for the EXP24

The IBM Systems Hardware Information Center contains additional information about the EXP24 using both System i (#5786 or #5787) and System p (#7031-D24 or #7031-T24) disk enclosure feature numbers. Refer to the Hardware Information Center on the Web at:

`http://publib.boulder.ibm.com/infocenter/eserver/v1r3s/index.jsp`

Search the Information Center using the feature numbers #5786, #5787, #7031-D24, or #7031-T24. Add the word *repeaters* to the search to find line drawings and instructions in addition to the information that we provide in this paper.

5.2.4 SCSI Disk Drives on 12X and RIO-2 Loops

Figure 5-5 depicts the flexibility of a single EXP24 with disks attached to two different technology loops. Each six pack is shown connected to s supporting adapter within a 12X I/O enclosure and a RIO-2 I/O enclosure.

Figure 5-5   EXP24 connection

For complete cabling information, refer to Hardware Information Center site:

`http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp?topic=/iphal/s`
`csidiskdriveenclosure.htm&resultof=%22%35%37%38%36%22%20`

You can also refer to *A Look at System i Integrated DASD Configuration and Performance under i5/OS*, REDP-3919, which is available at:

`http://www.redbooks.ibm.com/redpapers/pdfs/redp3919.pdf`

EXP 12S SAS Disk Enclosure

In this chapter, we provide information about the 5886 EXP 12S SAS DASD Expansion Drawer. We include diagrams that show the disk slots. We also address and provide recommendations for Serial Attached SCSI (SAS) cabling to specific host systems. This SAS-based disk enclosure is also commonly referred to as simply the *5886* or the *EXP 12S*.

6.1 5886 EXP 12S SAS DASD Expansion Drawer

The 5886 is supported only on POWER6 systems.

The IBM System Storage EXP 12S is an expansion drawer with 12 SAS Storage Slots which can support a total of twelve 3.5 inch disk drives in mega-pack carriers. The SAS Enclosure includes redundant ac power supplies, redundant cooling with dual line cords, and two Service Managers (Expanders). All disks are hot-swappable.

The SAS disks are accessible from the front of the 5886. This EXP 12S takes up a 2 EIA units space in a 19 inch rack. The enclosure attaches to a host server using the appropriate external SAS cables connected to supporting controllers (adapters).

The following terms are commonly used when discussing this expansion drawer:

► *SAS Enclosure*

   The 19 inch EIA rack drawer that contains two expanders, two power supplies, a midplane, and up to 12 SAS disk drives.

► *Expander*

   A device that is a part of the SCSI service delivery subsystem and facilitates the communication between SAS devices and the controller. Within the 5886 SAS enclosure, the expander is called the Enclosure Service Manager (ESM)

► *SES Device*

   The SCSI Enclosure Service Device which is contained within the expander.

6.1.1 5886 EXP 12S SAS DASD Expansion Drawer physical description

Table 6-1 lists the 5886 EXP 12S SAS DASD Expansion Drawer attributes.

Table 6-1   5886 Attributes

Dimension	One CEC drawer
Height	45 mm (1.7 in)
Width	440 mm (17.3 in)
Depth (including front bezel)	735 mm (28.9 in)
Weight	17.7 kg (120 lb)

6.1.2 5886 EXP 12S SAS DASD Expansion Drawer Operating Environment

Table 6-2 lists the general system specifications of the system unit.

Table 6-2   5886 specifications

Description	Range (operating)
Operating temperature	10 to 38 degrees C (50 to 100.4 F)
Relative humidity	20% to 80% (allowable) 40% to 55% (recommended)
Maximum dew point (operating	21°C (69.8°F)
Noise level	6.5 bels idle / 6.6 bels operating

Description	Range (operating)
Operating voltage	100-240 V ac at 50-60 Hz
Maximum power consumption	700 watts (maximum)
Maximum power source loading	0.740 kVa (maximum)
Maximum thermal output	2,382 BTU[a]/hr (maximum)
Maximum altitude	2134 m (7000 ft)

a. British Thermal Unit (BTU)

6.2 5886 front and rear views

Figure 6-1 shows the front view of the 5886 EXP 12S SAS DASD Expansion Drawer.

Figure 6-1   Front View 5886

Figure 6-2 shows the rear view of the 5886 EXP 12S SAS DASD Expansion Drawer.

Figure 6-2   Rear View 5886

6.3 Host system specific information

The following sections provide more details on the EXP 12 support according to the machine types determined by the ordered primary operating system.

6.3.1 Attached to 9117-MMA and 9119-FHA

Note: New disk drives are announced continuously. In addition, older disk drives are removed from marketing. You need to periodically review recent announcement letters to determine the currently marketed and supported disk devices, in all supported I/O enclosures.

SAS disk drives formatted for IBM i are supported in three capacities:

► 69.7 GB (#3676)
► 139.5 GB (#3677)
► 283.7 GB (#3678)

SAS disk drives formatted for AIX and Linux are supported in three capacities:

► 73.4 GB (#3646)
► 146.8 GB (#3647)
► 300 GB (#3648)

The EXP 12S drawer must be mounted in a 19 inch rack.

Table 6-3 provides the current list of SAS adapters available for connecting the 5886 to the POWER6 systems.

Table 6-3   SAS adapters

Feature	Description
5900[a]	PCI-X DDR Dual -x4 SAS Adapter supports RAID 0(with mirroring) and 10.
5902[a]	PCI-X DDR Dual - x4 SAS Adapter supports RAID 0 (with mirroring) and 10
5909[b]	Alternate SAS controller for 3 of 6 internal SAS Disk Slots
5912[c]	PCI-X SAS controller supports RAID 0 (with mirroring) and 10

a. Supported on 8203-E4A, 8204-E8A, 9117-MMA, 9119-FHA. Operating system support: AIX, Linux.

b. Supported on 9117-MMA. Supported by AIX, Linux.

c. Supported on 8203-E4A, 9407-M15, 9408-M25,8204-E8A, 9409-M50, 9117-MMA, 9119-FHA. 8203-E4A 1-way and 9407-M15 (1-Way) support for tape only.
Operating system support: AIX, Linux, IBM i. AIX, Linux support RAID 0 (with mirroring) and 10. IBM i support requires IBM i provided mirroring protection as IBM i RAID support requires RAID5/6. RAID 5/6 is not supported directly with this adapter. IBM i does not support the dual adapter configuration available with #5912.
For more information about RAID levels, see Appendix C, "RAID history and definitions summary" on page 905. IBM i does not support the dual adapter configuration available with #5912.

In this section, we show some of the available cable connections for connecting the 5886 to a POWER6 system. You can find more complete 5886 cabling examples in *Power Systems Site and Hardware Planning Guide,* SA76-0091, in the Systems Hardware Information Center at:

http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp

The EXP 12S Drawer can be attached to an adapter in the system unit (processor enclosure) or to an adapter plugged into a supporting I/O enclosure, with several cabling options. The cabling options are dependent upon system unit attachment capabilities, I/O enclosure capabilities, and the operating system supporting the attachment.

Notes:

► SAS cabling is different from SCSI. Different connectors are used to minimize using cables improperly. However, attention to detail is important. There are different cable lengths with different labels to help identify function and usage. Placement of the cable on the correct side of the rack is very important.

Unique SAS Y and X cables help provide path redundancy, which allows dual connection to two expanders (conceptually like a mini-switch) in each EXP 12S.

► The #5912 has two ports and has no write cache. You can physically attach up to four EXP 12S drawers (48 disk) per #5912. This is not recommended in a medium to high performance required environment.

► On the Power 520 and Power 550 models you can optionally order and install #5679 SAS RAID Enablement along with backplane feature #8345. This configuration adds RAID 5 and RAID 6 to already available RAID 0 and RAID 10 support. When used together (#5712, #5679, and #8345) the associated daughter cards contain the RAID function and a 175 MB of write cache. The auxiliary daughter card (duplicate write cache) plugs into a special slot on the planar and provides battery power pack and redundant 175 MB write cache memory for the daughter card. In this configuration IBM i supports RAID5 or RAID 6 on the SAS disks.

► The SAS PCI-X adapters can be plugged into the Power 520, Power 550, and Power 570 system units (processor enclosures) or into any I/O enclosure supporting PCI-x card slots.

► IBM i does not support dual adapter configurations. AIX does.

► IBM i Load Source consideration: Feature #0727 specifies that the Load/Source DASD are placed within the #5886 EXP 12S Disk Drawer. There is no specific load source consideration and the load source can be put in any of the SAS disk drive bays or disk slots.

Figure 6-3 shows the 5886 and three embedded disks that are connected to a 9117-MMA processor enclosure SAS adapter using a YO SAS cable and either of the following cable cards:

► #3650 External connection for three of six internal SAS disk slots
► #3651 External connection for the six internal SAS disk slots
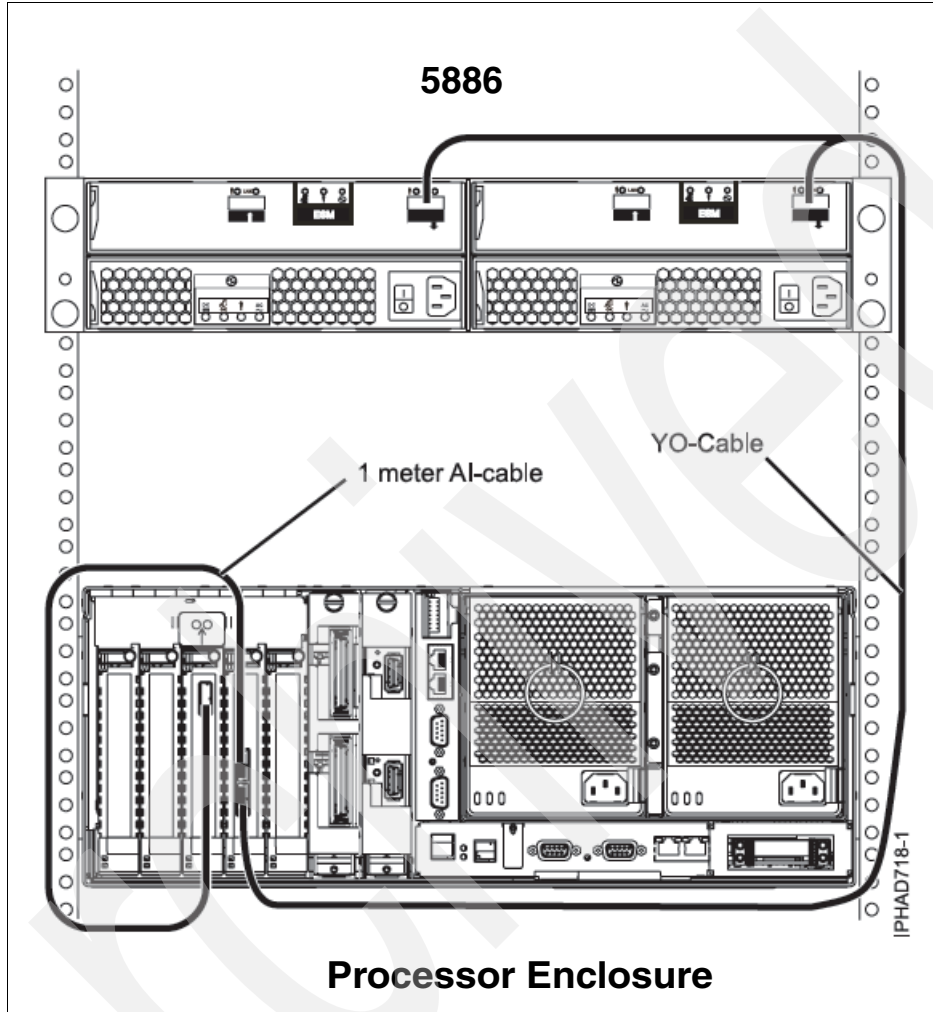
Figure 6-3   Processor enclosure internal SAS disk slots and 5886 connection to SAS adapter using a YO cable

Figure 6-4 shows a 5886 connection to a supporting SAS adapter, which can within a supporting I/O enclosure.

Figure 6-4   5886 to a system unit connection example using a YO cable

Depending on the required configuration a different set of cables is needed to connect the EXP 12S drawer to the system or drawer. Table 6-4 provides a list of cables.

Table 6-4   SAS connection cables

Feature	Description	E4A	M25	E8A	M50	MMA	FHA
3652[a]	SAS cable (EE) drawer to drawer 1 meter	✓	✓	✓	✓	✓	✓
3653[a]	SAS cable (EE) drawer to drawer 3 meter	✓	✓	✓	✓	✓	✓
3654[a]	SAS cable (EE) drawer to drawer 3 meter	✓	✓	✓	✓	✓	✓
3655	SAS HH Cable - Internal SAS only	✓	✓	✓	✓	✓	✓
3661	SAS Cable (X) Adapter to SAS Enclosure, Dual Controller/Dual Path 3 meter	✓	N	✓	N	✓	✓
3662	SAS Cable (X) Adapter to SAS Enclosure, Dual Controller/Dual Path 6 meter	✓	N	✓	N	✓	✓

Feature	Description	E4A	M25	E8A	M50	MMA	FHA
3663	SAS Cable (X) Adapter to SAS Enclosure, Dual Controller/Dual Path 15 meter	✓	N	✓	N	✓	✓
3667	SAS Cable (YR) -1 meter	N	N	N	N	✓	N
3668	SAS Cable, DASD Backplane to Rear Bulkhead (only for 8204-E8A)	N	N	✓	✓	N	N
3669	SAS Cable, DASD Backplane (Split) to Rear Bulkhead)	N	N	✓	N	N	N
3670	SAS Cable, DASD Backplane (Split) to Rear Bulkhead (only for 8203-E4A)	✓	N	N	N	N	N
3674	SAS Cable, DASD Backplane to Rear Bulkhead (only for 8203-E4A)	✓	✓	N	N	N	N
3679	SAS Cable (AI)- 1 meter	✓	N	✓	N	✓	✓
3684[a]	SAS Cable (AE) Adapter to Enclosure, single controller/single path 3 meter	✓	✓	✓	✓	✓	✓
3685[a]	SAS Cable (AE) Adapter to Enclosure, single controller/single path 6 meter	✓	✓	✓	✓	✓	✓
3686	SAS Cable (YI) System to SAS Enclosure, Single Controller/Dual Path 1.5 meter	✓	✓	✓	✓	N	N
3687[b]	SAS Cable (YI) System to SAS Enclosure, Single Controller/Dual Path 3 meter.	✓	✓	✓	✓	N	N
3691[a]	SAS cable (YO) adapter to SAS enclosure 1.5 meter	✓	✓	✓	✓	✓	✓
3692[a]	SAS cable (YO) adapter to SAS enclosure 3 meter	✓	✓	✓	✓	✓	✓
3693[a]	SAS cable (YO) adapter to SAS enclosure 6 meter	✓	✓	✓	✓	✓	✓
3694[a]	SAS cable (YO) adapter to SAS enclosure 15 meter	✓	N	✓	N	✓	✓

a. Can be used with #5912.
b. Note that the YI cable FC 3687 connects to the port on the FC 8345 backplane.

Figure 6-5 shows a maximum configuration using four EXP 12S drawers on one adapter feature.

Figure 6-5   Maximum attachment of EXP 12S on one adapter

Notes:

► You must understand the expected number of disk I/O operations per second in your working environment before considering the configuration shown in Figure 6-5. Spreading disk drives across multiple adapters and using other higher capacity (such as with large write caches) adapters might be required.

► Four #5886 can be supported per #5900 and 5912. Two #5886 per SAS Adapter is recommended for redundant configurations.

6.4 Multi-initiator and high availability

This section applies to AIX or Linux partitions.

The terms *multi-initiator* and *high availability* (HA) in the context of I/O enclosures (drawers) refer to connecting multiple controllers (adapters), typically two controllers, to a common set of disk expansion drawers for the purpose of increasing availability. This connection is commonly accomplished in either of the following configurations:

► HA two system configuration
► HA single system configuration

This section provides an overview of how to use the 5886 in an AIX or Linux-based environment using IBM HA product offerings.

6.4.1 HA two system configuration

An HA two system configuration provides a high availability environment for system storage by enabling two systems or partitions to have access to the same set of disks and disk arrays. This feature is typically used with the IBM High Availability Cluster Multiprocessing (HACMP™) product offerings. The IBM HACMP software provides a commercial computing environment that helps ensure that mission-critical applications can recover quickly from hardware and software failures.

> **Note:** IBM HACMP has several offerings under the HACMP support. In 2008, HACMP offerings are rebranded with the following names:
>
> ► PowerHA for AIX
> ► PowerHA XD for AIX
> ► PowerHA for Linux
>
> More information about these product offerings is available at:
>
> http://www-03.ibm.com/systems/power/software/availability/

The HA two system configuration is optimized for using disk arrays. The disks must be formatted to 528 bytes per sector. Any RAID level, or combination of RAID levels, can be used.

Use of disks without RAID (often referred to as "just basic old disks" (JBOD)) is also possible. These disks must be formatted to 512 bytes per sector. This JBOD alternative is supported only on particular controllers and requires unique setup and cabling.

6.4.2 HA single system configuration

An HA single system configuration provides for redundant controllers from a single system to the same set of disks and disk arrays. This feature is typically used with the Multi-Path I/O (MPIO). MPIO support is included as part of AIX and can be used to provide a redundant IBM SAS RAID Controller configuration with RAID protected disks.

When using an HA single system configuration, the disks must be formatted to 528 bytes per sector and used in one or more disk array. Any RAID level, or combination of RAID levels, can be used. Disks formatted to 512 bytes per sector are not supported in an HA single system configuration.

Table 6-5 shows a summary of possible configurations.

Table 6-5

Multi-Initiator configuration	HA two system (for example HACMP)	HA Single System (for example MPIO)
RAID (disks formatted 528 bytes per sector)	► Maximum of two controllers ► Both controllers must have same write cache capability and write cache sizes ► Both controllers must support HA Two System RAID ► Controllers are in different systems or partitions	► Maximum of two controllers ► Both controllers must have same write cache capability and write cache sizes ► Both controllers must support HA single system RAID ► Controllers are in the same system or partition
JBOD (disks formatted 512 bytes per sector)	► Maximum of two controllers ► Both controllers must support HA two system JBOD ► Controllers are in different systems or partitions ► Requires unique setup and cabling	Not supported

The figures in the following sections illustrate an example of each configuration.

HA one and two system RAID example

The two controllers can be different systems or partitions for the two system RAID configuration, or the two controllers can be in the system or partition for the one system RAID configuration, as shown in Figure 6-6.

Figure 6-6   HA one and two system RAID

HA two system JBOD example

The two controllers must be in two different systems or partitions for the two system JBOD configuration, as shown in Figure 6-7.

Figure 6-7   HA two system JBOD example, adapters in separate partition or system

Notes:

► Use of the Multi-initiator and HA functionality requires controller and AIX software support. Specific controllers are intended only to be used in either an HA two system RAID or HA single system RAID configuration.

► Controllers connected in a RAID configuration must have the same write cache size (given they support write cache). A configuration error will be logged if the controllers' write caches are not the same size.

► For additional information and to get assistance, refer to:

http://www-03.ibm.com/systems/power/software/availability/

7

Feature code to CCIN cross-reference

In this chapter, we list most of the orderable feature codes and the associated Customer Card Identification Number (CCIN) that is supported on POWER6 servers. Many, but not all, of these combinations also exist on POWER5 and earlier technology systems, but this chapter focuses on POWER6 configurations (all MTMs).

This chapter can assist IBM clients and personnel in configuring Miscellaneous Equipment Specifications (MES) and upgrades and in determining the installed hardware. You can use this information with the SPT and to verify an installed feature.

You can view the CCIN values on the system using any of the following methods:

► HMC Advanced System Management Interface (ASMI).

► IBM i Dedicated Services Tools (DST) and System Service Tools (SST) interfaces.

► IBM Work with Hardware Resources (WRKHDWRSC) command and Display Hardware Resource (DSPHDWRSC) command. The CCIN value displays under the Type heading.

► System i Access for Windows Operations Navigator and Systems Director Navigator for i5/OS (IBM i 6.1 or later) have graphical interfaces to hardware information.

► IBM System Planning Tool (SPT).

We include IBM supported features through September 2008 on all POWER6 MTMs. Not all orderable feature numbers have an associated CCIN value on the system. Some LPAR features have virtual CCIN values, such as for partition logical Ethernet.

Table 7-1 lists the CCIN to FC numbers for System i models.

Table 7-1   CCIN to FC listing (System i models)

CCIN	FC	Description
N/A	0367	Operations Console PCI Cable
N/A	1460	3 meter COPPER HSL Cable
N/A	0348	V.24/EIA232 20-ft PCI Cable
N/A	0349	V.24/EIA232 50-ft PCI Cable
N/A	0353	V.35 20-ft PCI Cable
N/A	0354	V.35 50-ft PCI Cable
N/A	0356	V.36 20-ft PCI Cable
N/A	0359	X.21 20-ft PCI Cable
N/A0	0360	X.21 50-ft PCI Cable
N/A	1461	6 m COPPER HSL Cable
N/A	0365	V.24/EIA232 80-ft PCI Cable
N/A	1462	15 meter COPPER HSL Cable
0383	0383	REMOTE CONTROL PANEL Cable
0446	0446	512 MB DDR SERVER MEMORY
	9726	BASE 512 MB SERVER MEMORY - IXS
0447	0447	1 GB DDR SERVER MEMORY - IXS
N/A	1010	Modem Cable - AUSTRIA
N/A	1011	Modem Cable - BELGIUM
N/A	1012	Modem Cable - AFRICA
N/A	1013	Modem Cable - ISRAEL
N/A	1014	Modem Cable - ITALY
N/A	1015	Modem Cable - FRANCE
N/A	1016	Modem Cable - GERMANY
N/A	1017	Modem Cable - UK
N/A	1018	Modem Cable - ICELAND/SWEDEN
N/A	1019	Modem Cable - AUSTRALIA
N/A	1020	Modem Cable - HK/NZ
N/A	1021	Modem Cable - FIN/NOR
N/A	1022	Modem Cable - NETHERLANDS
N/A	1023	Modem Cable - SWISS
N/A	1024	Modem Cable - DENMARK
N/A	1025	Modem Cable - US/CANADA

CCIN	FC	Description
N/A	1307	1.75 m HSL-2 Cable (HSL-2 (RIO-G))
N/A	1308	2.5 m HSL-2 Cable
N/A	1394	4.3 m 200 V/10A PWR CRD BRAZIL
N/A	1395	4.3 m 200 V/10A PWR CD CHINA
N/A	1396	4.3 m 200 V/16A PWR CD CHINA
N/A	1397	4.3 m 200 V/10A PWR CRD ARGENT
N/A	1398	4.3 m 100V/10A PWR CRD BRAZIL
N/A	1399	4.3 m 200 V/16A PWR CRD BRAZIL
N/A	1408	4.3 m 200 V/16A PWR CD ITALY
N/A	1409	4.3 m 200 V/16A PWR CD AU/NZ
N/A	1418	4.3 m 200 V/16A PWR CD S AFRIC
N/A	1419	4.3 m 200 V/16A PWR CD ISRAEL
N/A	1420	4.3 m 200 V/16A PWR CD EU/ASIA
N/A	1421	4.3 m 200 V/16A PWR CD CH/DK
N/A	1438	4.3 m 200 V/10A PWR CD AU/NZ
N/A	1439	4.3 m 200 V/10A PWR CD EU/ASIA
N/A	1440	4.3 m 200 V/10A PWR CD DENMARK
N/A	1441	4.3 m 200 V/10A PWR CD S AFRICA
N/A	1442	4.3 m 200 V/10A PWR CD SWISS
N/A	1443	4.3 m 200 V/10A PWR CD UK
N/A	1444	4.3 m 200 V/10A PWR CD ITALY
N/A	1445	4.3 m 200 V/10A PWR CD ISRAEL
N/A	1446	4.3 m 200 V/30A PWR CD KOREA
N/A	1447	4.3 m 200 V/30A PWR CD AU
N/A	1448	4.3 m 200 V/30A PWR CD NZ
N/A	1449	4.3 m 200 V/32A PWR CD EU 1-PH
N/A	1450	4.3 m 200 V/16A PWR CD EU 2-PH
N/A	1451	200 V 6-ft LINE CORD
N/A	1452	200 V 14-ft LINE CORD
N/A	1453	200 V 6-ft LOCKING LINE CORD
N/A	1454	200 V 12A 14-ft TL LINE CORD
N/A	1455	200 V 6-ft WTRTGHT LINE CORD
N/A	1456	200 V 14-ft WTRTGHT LINE CORD
N/A	1457	200 V 6-ft UPPER LINE CORD

CCIN	FC	Description
N/A	1458	200 V 6-ft UPPER LOCKING CORD
N/A	1459	200 V 6-ft UPPER WTRTGHT CORD
N/A	1474	6 m HSL TO HSL-2 CABLE (HSL-2 (RIO-G))
N/A	1475	10 m HSL TO HSL-2 CABLE (HSL-2 (RIO-G))
N/A	1476	4.3 m 200 V/12A PWR CD UK
N/A	1481	1.2 m HSL-2 CABLE (HSL-2 (RIO-G))
N/A	1482	3.5 m HSL-2 CABLE (HSL-2 (RIO-G))
N/A	1483	10 m HSL-2 CABLE (HSL-2 (RIO-G))
N/A	1485	15 m HSL-2/RIO-G CABLE
N/A	1487	3 m HSL TO HSL-2 CABLE (HSL-2 (RIO-G))
1725	1725	1725 IPLN Feature
1728	1728	1728 IPLN Feature
1750	1750	1750 IPLN Feature
1800	1800	HSL-2 PORTS - 2 COPPER
1802	1802	GX DUAL-PORT 12X IB HCA
1814	5614	GX Dual-Port HSL-2/RIO-2 loop card, 9408-M25, 9409-M50
1817	5616	Dual Port 12X IB, GX+ loop card, 9408-M25, 9409-M50
1818	5623	Dual Port 1 Gb Ethernet, Planar Daughter Card, Copper, 8203-E4A,9407-M15, 9408-M25,8204-E8A, 9409-M50
1819	5624	4-Port 1 Gb IVE Daughter Card, Copper Ethernet Ports, 8203-E4A,9407-M15, 9408-M25,8204-E8A, 9409-M50
181A	5636	Dual Port 1 Gb Ethernet, Planar Daughter Card, Copper 9117-MMA, 9406-MMA
181B	5637	Dual Port 10 Gb (Short Range) IVE Virtual Ethernet, 9117-MMA
181C	5639	4-port 1 Gb Ethernet, Planar Daughter Card, Copper 9117-MMA, 9406-MMA
181F	5694	0/8 GB (4x2 GB), DDR2, 667 MHz, Nebula DIMMs
N/A	1827	SERIAL TO SPCN CBL, 9-DSHELL/9-DSHELL, 0.14 m, 9407-M15, 9408-M25, 9409-M50, 9117-MMA
1830	5613	Dual Port 10 Gb (Short Range) IVE Virtual Ethernet, 8203-E4A
1881	1881	1881 -73.4 GB 10 k rpm SAS Short Form Factor (SFF) Disk Drive (8204-E8A)
1882	1882	1882 -146.8 GB 10 k rpm SAS Short Form Factor (SFF) Disk Drive (8204-E8A)
184D	1847	1847 IPLN Feature
184E	1848	1848 IPLN Feature

CCIN	FC	Description
184F	1849	1849 IPLN Feature
185D	1857	1857 IPLN Feature
185E	1858	1858 IPLN Feature
185F	1859	1859 IPLN Feature
198E	3649	50 GB 15 k rpm SAS Disk Drive (AIX, Linux)
	3658	450 GB 15 k rpm SAS Disk Drive (IBM i)
251F	4966	2-Core 4.2 GHz Processor 9409-M50
	4920	1/4W 550 Server Feature 4966 9409-M50
	4946	Base 1W Processor Activate for 4966, 9409-M50
	4986	1 Processor Activate for 4966, 9409-M50
253A	4967	0/2W 4.7 GHz PROC CD, P6 DCM(2GC), 8X DIMMS
253D	7298	0/32W 4.7 GHz P6/H2O NODE, 16XDCM(2GC), 8 MB L2/DCM, 32 MB L3/DCM, 64 DIMM Slots
254E	5565	0/2W 4.7 GHz P6CR processor, 8x DIMM slots, system planar
254F	5566	0/4W 4.7 GHz P6CR processor, 8x DIMM slots, system planar
255B	5620	0/2w, 3.5 GHz P6 SCM, 8 MB L2, 32 MB L3, 12x DDR2 Nebula DIMMs
255C	5621	0/2w, 4.2 GHz P6 SCM, 8 MB L2, 32 MB L3, 8x DDR2 SQ DIMMs
255E	6316	0/32W 3.5 GHz P6 NODE, 16xDCM(2gc), 8 MB L2/DCM, 32 MB L3/DCM, 64 DIMM SLOTS
255F	5564	0/1W 4.7 GHz P6CR processor, 8x DIMM slots, system planar
256A	4966	0/2W 4.2 GHz PROC CD, P6 DCM(2GC), 8X DIMMS
256B	4967	0/2W 4.7 GHz PROC CD, P6 DCM(2GC), 8X DIMMS
25B8	5633	0/1W 4.2 GHz P6CR processor, 4x RDIMM slots, system planar 9407-M15
	4925	1W Server Feat 1x5633 9407-M15
	5651	1W Permanent Processor Activation for 5633 9407-M15
	5676	1W Base Permanent Processor Activation for 5633 9407-M15
	6721	1W Entry Express Edition 9407-M15
	6725	1W Growth Express Edition 9407-M15
25F8	7878	7878 IPLN Feature
268C	NA	LPAR Virtual LAN Adapter
2738	2738	[S] HSL PORTS - 8 COPPER
2742	0613	LINUX DIR ATTACH-2742
	2742	PCI 2-LINE WAN IOA
	6805	PCI 2-LINE WAN IOA (IOP-less)

CCIN	FC	Description
2746	2746	PCI TWINAXIAL WORKSTN IOA
	4746	PCI TWINAXIAL WORKSTN IOA
2749	2749	PCI ULTRA MAG MEDIA CTLR
2757	2757	PCI-X ULTRA RAID DISK CTRL
2780	0627	LINUX DIR ATTACH-2780
	2780	PCI ULTRA 4 SCSI DISK CTRL
	5590	DISK Controller with AUX Write Cache
2847	2847	PCI IOP for SAN Load Source
2787	2787	PCI-X FIBRE Channel Disk Controller
2793	0614	LINUX DIR ATTACH-2793
	0615	LINUX DIR ATTACH-2794
	2793	PCI 2-Line WAN with modem
	2794	PCI 2-Line WAN with modem (CIM)
	6803	PCI 2-Line WAN with modem no IOP
	6804	PCI 2-Line WAN with modem no IOP CIM
	6833	PCI 2-Line WAN with modem no IOP
	6834	PCI 2-Line WAN with modem no IOP CIM
	9933	Base PCI 2-Line WAN with modem no IOP
	9934	Base PCI 2-Line WAN with modem no IOP CIM
27AE	7865	7865 IPLN Feature
27AF	7877	7877 IPLN Feature
2805	0616	LINUX DIR ATTACH-2805
	0617	LINUX DIR ATTACH-2806
	2805	PCI QUAD MODEM IOA
	2806	PCI QUAD MODEM IOA (CIM)
	6808	PCI QUAD MODEM IOA (IOP-less)
	6809	PCI QUAD MODEM IOA (CIM) (IOP-less)
280D	0629	FCAL (4 GB) 1 PORT (FLIPPER-4G, Direct Attach)
	5758	FCAL (4 GB) 1 PORT, (no longer available as of 01 October 2006)
	5761	FCAL (4 GB) 1 PORT, TAPE CNTRL, PCIX/SHORT/32 OR 64-bit/3.3 V
280E	5760	FCAL (4 GB) 1 PORT DISK CNTRL, PCIX/SHORT/32 OR 64-bit/3.3 V
2843	2843	PCI IOP
2844	2844	PCI IOP
2847	2847	FIBRE CHANNEL IOP (for SAN boot)

CCIN	FC	Description
2849	0623	LINUX DIR ATTACH - 2849
	2849	PCI 100/10 MBPS ETHERNET IOA
2861	2861	[S] 32 MB IOP MEMORY
2875	8345	DASD/MEDIA BP W EXT SAS, 6 x 3.5-in SAS DASD, 1x SLIMLINE IDE DVD, 1x HH SAS TAPE (Power 520 550 MTMs)
2876	8346	DASD/MEDIA BP W EXT SAS, 12 x 2.5-in SAS SFF DASD, 1x SLIMLINE IDE DVD, 1x HH SAS TAPE (Power 520 550 MTMs)
2887	2887	HSL-2 BUS ADAPTER
	9887	BASE HSL-2 BUS ADAPTER
2888	2888	GX+ RIO-2/HSL-2 ADAPTER FOR SF2+
2889	2889	GX DUAL-PORT 12X IB HCA
2893	8341	DASD/MEDIA BP without ext SAS, 6x3.5 inch DASD, 1x Slimline DVD, 1x HH Tape
28D4	1846	1846 IPLN Feature
28D9	7867	7867 IPLN Feature
28DA	7866	7866 IPLN Feature
28DB	7868	7868 IPLN Feature
28DD	7870	POWER DISTRIBUTION BACK PLANE
28E7	6417	HSL-2/RIOG BUS Adapter
	9517	BASE DUAL PORT I/O HUB, RIO-G
28FF	6438	RIO-2 Remote I/O Loop Adapter
2D02	4694	0/8w 4.2 GHz P6 NODE, 4 DCMs, 4 MB L2/Proc, 32 MB L3/DCM, 32 DIMM slots, 4 GX slots
2D08	4695	0/8w 5.0 GHz P6 NODE, 4 DCMs, 4 MB L2/Proc, 32 MB L3/DCM, 32 DIMM slots, 4 GX slots
30DC	7814	7814 IPLN Feature
30F0	7892	2 GB (4 x 512 MB), DIMMS, 276PIN DDR2, 533 MHZ SDRAM (1RX8)
30F2	7893	4 GB (4 x 1 GB), DIMMS, 276PIN DDR2, 533 MHZ SDRAM (2RX8)
30F3	7894	8 GB (4 x 2 GB), DIMMS, 276PIN DDR2, 533 MHZ SDRAM (2RX4)
312F	4497	16 GB (4 x 4 GB) DIMMS (533 MHZ) DDR2
3147	3147	[S] 32 MB MAIN STORAGE
314C	4498	32 GB (4 x 8 GB) DIMMS (400 MHZ) DDR2
314E	4496	8/16GB (4x 4 GB) DIMMS (533 MHz) DDR2
3165	3165	1024 MB MAIN STORAGE
316F	4495	4/8 GB (4 x 2 GB) DIMMS (533 MHZ) DDR2

CCIN	FC	Description
31A6	4523	8 GB RDIMM Memory, 667 MHz, (2 x 4 GB) DRAM 9407-M15, 9408-M25, 9409-M50
31A8	4524	16 GB RDIMM Memory, 667 MHz, (2 x 8 GB) DRAM 9408-M25, 9409-M50
31A9	4520	1 GB RDIMM Memory, 667 MHz, (2 x 512 MB) DRAM 9407-M15, 9408-M25, 9409-M50
31AA	4521	2 GB RDIMM Memory, 667 MHz, (2 x 1 GB) DRAM 9407-M15, 9408-M25, 9409-M50
31AB	4522	4 GB RDIMM Memory, 667 MHz, (2 x 2 GB) DRAM 9407-M15, 9408-M25, 9409-M50
31A6	4523	8 GB RDIMM Memory, 667 MHz, (2 x 4 GB) DRAM 9407-M15, 9408-M25, 9409-M50
31B3	5696	0/32 GB (4 x 8 GB), DDR2, 400 MHz, Tall/Stacked Nebula DIMMs
31B5	5692	0/2 GB (4 x 512 MB), DDR2, 667 MHz
31B6	5693	0/4 GB (4 x 1 GB), DDR2, 667 MHz
31B9	5695	0/16 GB (4 x 4 GB), DDR2, 533 MHz
31BB	5694	0/8 GB (4 x 2 GB), DDR2, 667 MHz
4326	1266	35.16 GB 15 k rpm DISK UNIT (4326 IN 5786/5787); no longer available as of 08 May 2007
	4326	35.16 GB 15 k rpm DISK UNIT
4327	1267	70.56 GB 15 k rpm DISK UNIT (4327 IN 5786/5787)
	4327	70.56 GB 15 k rpm DISK UNIT
4328	1268	141.12 GB 15 k rpm DISK UNIT (4328 IN 5786/5787)
	7522	Quantity 150 of 1268
	4328	141.12 GB 15 k rpm DISK UNIT
	7510	QUANTITY 150 OF 4328
4329	1269	282.25 GB 15 k rpm Disk Unit ULTRA320 SCSI
	4329	282.25 GB 15 k rpm Disk Unit ULTRA320 SCSI
4332	4332	4332 IPLN Feature
433B	3646	73.4 GB SAS DASD, 15 k rpm, in carrier, 9408-M25, 9409-M50
	3676	69.7 GB SAS DASD, 15 k rpm, in carrier, 9407-M15, 9408-M25, 9409-M50
433C	3647	146.8 GB SAS DASD, 15 k rpm, in carrier, 9408-M25, 9409-M50
	3677	139.5 GB SAS DASD, 15 k rpm, in carrier, 9407-M15, 9408-M25, 9409-M50
433D	3648	300 GB SAS DASD, 15 k rpm, in carrier
	3678	83.7 GB SAS DASD, 15 k rpm, in carrier, 9407-M15, 9408-M25, 9409-M50
4764	4806	PCI CRYPTO Coprocessor

CCIN	FC	Description
4812	4812	PCI INTEG XSERIES SERVER
	4813	PCI INTEG XSERIES SERVER IN SPECIAL BLIND SWAP CASSETTE
506D	5742	EXP24 6/12 Disk Slot Enabler
	7515	Quantity 150 of 5742
506E	5741	EXP24 6 Disk Slot Enabler
	7514	Quantity 150 of 5741
5088	0588	PCI-X Expansion Unit Rack
	5088	PCI-X Expansion Unit
5094	0694	0694 - 5094 Equivalent
	5094	PCI-X Expansion Unit
5096	0696	0696 - 5096 Equivalent
	5096	PCI-X Expansion Unit (no disk)
5095	0595	PCI-X Expansion Unit in Rack
515F	5138	Redundant Power and Cooling
51B7	7888	7888 IPLN Feature
51BF	7703	Optional 950W Power Supply, 200-240V, 9407-M15, 9408-M25
51C3	7707	100-240V, 1700W, Power Supply 8204-E8A,9409-M50
520A	6457	DUAL PORT InfiniBand Adapter with repeater, 9408-M25, 9409-M50
520B	6446	DUAL PORT InfiniBand Adapter without repeater, 9408-M25, 9409-M50
53CD	5621	0/2 W, 4.2 GHz P6 SCM, 8 MB L2, 32 MB L3, 8x DDR2 SQ DIMMs
	5622	0/2 W, 4.2 GHz P6 SCM, 8 MB L2, 32 MB L3, 12x DDR2 DIMMs
53D1	5633	0/1 W 4.2 GHz Power6 processor card, 4x RDIMM slots, system planar 9407-M15
53D2	5364	9408-M25 0/2 W 4.2 GHz P6CR processor, 4x RDIMM slots, system planar
	5654	1 W Permanent Processor Activation for 5634, 9408-M25
	5677	1 W Base Permanent Processor Activation for 5634, 9408-M25
53D7	5621	0/2 W, 4.2 GHz P6 SCM, 8 MB L2, 32 MB L3, 8x DDR2 SQ DIMMs
53DC	5634	0/2W 4.2 GHz Power6 processor card, 4x RDIMM slots, system planar, 9408-M25
	4930	1/2 W Server Feat 1x5634 9408-M25 with one processor activated.
53DD	7380	0/2 W 4.7 GHz P6 SCM (KIRK) eClipz L/ML, 9117-MMA 9406-MMA
53DE	5633	0/1 W 4.2 GHz P6CR processor, 4x RDIMM slots, system planar 9407-M15
53DF	5634	0/2 W 4.2 GHz P6CR processor, 4x RDIMM slots, system planar
53E0	5635	0/4 W 4.2 GHz P6CR processor, 8x RDIMM slots, system planar

CCIN	FC	Description
53E2	4967	0/2 W 4.7 GHz PROC CD, P6 DCM (2GC), 8X DIMMS
5600	0032	This specify is required if an external high speed modem is to be shipped with the system.
5700	0620	LINUX DIR ATTACH-5700
	5700	GIGABIT ENET(FIBER), PCIX/SHORT/32-64-bit/3.3 OR 5 V
	6800	GIGABIT ENET(FIBER), PCIX/SHORT/32-64-bit/3.3 OR 5 V, IOP-less)
5701	0621	LINUX DIR ATTACH-5701
	5701	GIGABIT ENET(UTP), PCIX/SHORT/32-64-bit/3.3 OR 5 V
	6801	GIGABIT ENET(UTP), PCIX/SHORT/32-64-bit/3.3 OR 5 V, IOP-less)
5702	0624	LINUX DIR ATTACH-5702
	0645	DIRECT ATTACH 5712
	5702	PCI-X Ultra Tape Controller
	5712	ULTRA320 SCSI, PCIX/SHORT/32-64-bit/3.3 V, 2EXT-VHDCI
	5715	ULTRA320 SCSI, PCIX/SHORT/32-64-bit/3.3 V, 1INT-P/1EXT-VHDCI
5703	5703	ULTRA320 SCSI RAID, PCIX/LONG/32-64-bit/3.3 V, 2INT-P/2EXT-VHDCI
5704	5704	PCI-X FIBRE Channel Tape Controller, PCIX/SHORT/32 OR 64-bit/3.3 V
5706	5706	DUAL PORT GIGABIT ENET(UTP), PCIX/SHORT/32-64-bit/3.3 or 5 V
5707	5707	DUAL PORT GIGABIT ENET(FIBER), PCIX/SHORT/32-64-bit/3.3 or 5 V
5708	5580	DISK CTLR with AUX WRITE CACHE
N/A	5719	PCI-X 10 Gbps Ethernet IOA (Long Range)
63A0	5619	Internal Tape Drive is a 5.25-in
571A	0647	ULTRA320 SCSI, PCIXDDR, 2INT-P/2EXT-VHDCI (DIRECT ATTACH)
	5736	ULTRA320 SCSI, PCIXDDR, 2INT-P/2EXT-VHDCI
	5775	ULTRA320 SCSI, PCIXDDR, 2INT-P/2EXT-VHDCI (IOP-LESS)
571B	0648	ULTRA320 SCSI, PCIXDDR, 2INT-P/2EXT-VHDCI (DIRECT ATTACH)
	5737	ULTRA320 SCSI RAID, PCIXDDR, 2 INT-P/2EXT-VHDCI
	5776	ULTRA320 SCSI RAID,PCIXDDR,2INT-P/2EXT-VHDCI (IOP-LESS)
57B7	5679	SAS RAID Enablement with 175 MB write cache (Power 520 550 MTMs)
57B8	5679	Auxiliary daughter card of 5679: provides battery power pack and redundant 175 MB write cache memory for the primary (daughter) 5679 card. (Power 520 550 MTMs)

CCIN	FC	Description
571E	0649	PCI-X ULTRA320 SCSI DISK CTRL DIRECT ATTACH)
	5582	DISK CTLR with AUX WRITE CACHE
	5583	DISK CTLR with AUX WRITE CACHE (IOP-less)
	5738	PCI-X ULTRA320 SCSI DISK CTRL
	5777	PCI-X ULTRA320 SCSI DISK CTRL (IOP-LESS)
571F	0310	EXP24 Attach through 5739/5778
	5739	PCI-X ULTRA320 SCSI EXTERNAL EXP24 DISK CTRL (IOP required)
	5778	PCI-X ULTRA320 SCSI RAID EXTERNAL EXP24 DISK CTRL (IOP-LESS)
	5781	PCI-X ULTRA320 SCSI EXTERNAL EXP24 DISK CTRL (IOP required in DW BSC)
	5782	PCI-X ULTRA320 SCSI RAID EXTERNAL EXP24 DISK CTRL (IOP-LESS in DW BSC)
572A	0664	SAS Controller, PCIX DDR, short/low profile capable/64 bit/3.3v, 2Ext (Direct Attach)
	5906	SAS Controller, PCIX DDR, short/low profile capable/64 bit/3.3v, 2Ext
	5912	PCI-X DDR Dual Connector x4 SAS Adapter.
572B	0661	SAS RAID Controller, PCIX-DDR/long/64-bit/3.3v, 2Ext, (Direct Attach)
	5902	SAS RAID Controller, PCIX-DDR/long/64-bit/3.3v, 2Ext
572F	5904	SAS RAID Controller, PCI-X 2.0/long double-wide/64-bit/3.3 V
	9534	Base SAS RAID Controller, PCI-X 2.0/long double-wide/64-bit/3.3 V
573A	5721	10 GIGABIT ENET(FIBER), PCIX 2.0, SHORT/32-64-bit/3.3 V
573B	0630	ISCSI TOE GIGABIT ENET (Copper - Direct Attach)
	5713	ISCSI TOE GIGABIT ENET (COPPER), PCIX/SHORT/64-bit/3.3 V, (Direct Attach)
	5783	ISCSI TOE GIGABIT ENET(COPPER) (for use with HBA only), PCIX/SHORT/64-bit/3.3 V
573C	0631	ISCSI TOE GIGABIT ENET (Fiber) Direct Attach)
	5714	ISCSI TOE GIGABIT ENET (FIBER), PCIX/SHORT/64-bit/3.3 V, (Direct Attach)
	5784	ISCSI TOE GIGABIT ENET (FIBER) (for use with HBA only), PCIX/SHORT/64-bit/3.3 V
52B4	5806	ULTRA 320 SCSI TAPE CONTROLLER, PCIX 2.0, SHORT/32-64-bit/3.3 V, 2INTP/2EXTVHDCI (HOBIE)
574E	5903	SAS RAID Controller, PCIE-8x/long, 2Ext
574F	5582	DISK CTLR with AUX WRITE CACHE
	5590	DISK CTLR with AUX WRITE CACHE
5759	5759	FCAL(4GBS) 2 PORT, PCIX/SHORT/32 OR 64-bit/3.3 V (Direct Attach)

CCIN	FC	Description
5767	5767	1 Gb Ethernet UTP 2-port Adapter, PCIE-4x/SHORT
5768	5768	1 Gb Ethernet Fiber 2-port Adapter, PCIE-4x/SHORT
576A	5722	PCI-X 10 Gbps Ethernet-LR IOA
576B	5749	PCIe 4 Gb Fibre Channel 2 Port Tape/Disk Controller, PCI-X 2.0 DDR Short
576C	2893	PCIE 2-Line WAN with modem
	2894	PCIE 2-Line WAN with modem (CIM)
	9693	Base PCIE 2-Line WAN with modem
	9694	Base PCIE 2-Line WAN with modem (CIM)
576E	5772	10 Gigabit Ethernet-LR PCI Express Adapter
5773	5773	PCIe 4 Gb Fibre Channel 1 Port Tape/Disk Controller, PCIE-4x/ Short
5774	5774	PCIe 4 Gb Fibre Channel 2 Port Tape/Disk Controller, PCIE-4x/ Short
577B	5789	ISCSI TOE GIGABIT ENET(COPPER) (for use with HBA only), PCIE-4X/SHORT
57B3	5901	SAS Controller, PCIE-8x/short/low-profile capable, 2Ext
6331	5757	DVD-RAM Drive IDE Slimline,
6337	5756	DVD-ROM Drive IDE Slimline, 9407-M15, 9408-M25, 9409-M50
6333	4633	DVD-RAM
63A0	4684	30 GB 1/4 inch Cartridge Tape (SLR60)
63A0	4687	50 GB 1/4 inch Cartridge Tape (SLR100)
63A0	5746	Half High 800 GB / 1.6 TB LTO4 SAS Tape Drive
	5747	LTO Ultrium4 800 GB Data Cartridge for 5746
63A0	5907	36/72 GB 4 mm DAT72 SAS Tape Drive,
6517	9517	BASE DUAL PORT I/O HUB, RIO-G (REGAL-G)
6719	4319	35.16 GB 10 k rpm DISK UNIT (no longer available as of 04 January 2008)
6B03	NA	Virtual Serial Client Adapter
6B01	NA	IXS Virtual Ethernet Port
N/A	1463	2 m SPCN Cable
N/A	6006	3 m SPCN Power Control Cable
N/A	1465	15 m SPCN Cable
	6007	15 m SPCN Power Control Cable
N/A	1466	30 m SPCN Cable
N/A	1464	6 m SPCN Cable
	6008	6 m SPCN Power Control Cable
N/A	0005	Bulk Order Indicator

CCIN	FC	Description
N/A	0006	Added to an initial order system when multiple System i partitions (0140) are requested.
N/A	0040	Mirrored System Disk Level
N/A	0041	Device Parity Protection-All
N/A	0042	Mirrored System IOP Level
N/A	0043	Mirrored System Bus Level
N/A	0047	Device Parity RAID-6 All
N/A	0092	External xSeries Attach
N/A	0140	0140 is used to specify that this system will be logically System i partitioned
N/A	0141	HSL OptiConnect Specify
N/A	0142	Linux Partition Specify
N/A	0145	AIX Partition Specify
N/A	0205	Used on initial orders to designate that the new server will replace (not upgrade) a server on which i5/OS or OS/400 is installed.
N/A	0272	Renovated by IBM is a specify code used to indicate that the system/MES will be built from new or refurbished parts.
N/A	0275	CSC Specify use by the IBM Custom Solution Center
N/A	0276	CSC Specify use by the IBM Custom Solution Center
N/A	0277	CSC Specify use by the IBM Custom Solution Center
N/A	0278	CSC Specify use by the IBM Custom Solution Center
N/A	0279	CSC Specify use by the IBM Custom Solution Center
N/A	0280	CSC Specify use by the IBM Custom Solution Center
N/A	0281	CSC Specify use by the IBM Custom Solution Center
N/A	0282	CSC Specify use by the IBM Custom Solution Center
N/A	0290	Ext Device Attach through 5736/5775
N/A	0296	Custom Data Protection
N/A	0300	EXP24 Attach through 5736/5775
	7512	Quantity 150 of 0300
N/A	0301	EXP24 Attach through 5737/5776
	7513	Quantity 150 of 0301
N/A	0302	EXP24 Attach through Existing disk controller
N/A	0308	Mirrored System-IOA Level
N/A	0347	RAID Hot Spare Specify
N/A	0371	LC-SC Adapter Kit (50 um)
N/A	0372	LC-SC Adapter Kit (62.5 um)

CCIN	FC	Description
N/A	0373	UPS Factory Integration
N/A	0374	HMC Factory Integration
N/A	0376	Reserve Rack Space - UPS
N/A	0377	Reserve Rack Space - HMC
N/A	0378	Reserve Rack Space - Display
N/A	0444	CBU Specify Capacity BackUp Transition indicator
N/A	0456	Customer Placement
N/A	0469	Custom Rack Placement
N/A	0533	IBM i 5.4 with 5.4.5 machine code
N/A	0534	IBM i 6.1
N/A	0551	19 inch 1.8 Meter Rack
N/A	0553	19 inch 2.0 Meter Rack
N/A	0554	19 inch 0.6 Meter Rack
N/A	0555	19 inch 1.3 Meter Rack
N/A	0599	Rack Filler Panel Kit
N/A	0719	Load Source Not in System Unit
N/A	0720	Load Source in 0595/5095
N/A	0721	Load Source in 5094/5294
N/A	0725	Load Source in 5786/5787
N/A	0727	Load Source in 5886
N/A	0835	4327/1267 Load Source
N/A	0836	4328/1268 Load Source Specify
N/A	0837	SAN Load Source Specify
N/A	0838	3676 Load Source Specify
N/A	0839	3677 Load Source Specify
N/A	0840	3678 Load Source Specify
N/A	0841	4329/1269 Load Source Specify
N/A	1829	0.6 Meter 12X Cable
N/A	1830	1.5 Meter 12X Cable
N/A	1834	8.0 Meter 12X Cable
N/A	1840	3.0 Meter 12X Cable
N/A	1843	Op Panel Cable for Deskside systems with 3.5 inch DASD, 9407-M15, 9408-M25, 9409-M50.

CCIN	FC	Description
N/A	1875	The 1875 cable converts the 9-pin serial port on the system to a 25-pin serial port.
N/A	1877	Op Panel Cable for Rack-mount, systems with 3.5 inch DASD, 9407-M15, 9408-M25, 9409-M50.
N/A	2124	1 m Ultra320 SCSI cable for attaching EXP24 Disk 5786/5787 TotalStorage Drawer/Tower
N/A	2125	3 m Ultra320 SCSI cable for attaching EXP24 Disk 5786/5787 TotalStorage Drawer/Tower
N/A	2126	5 m Ultra320 SCSI cable for attaching EXP24 Disk 5786/5787 TotalStorage Drawer/Tower
N/A	2127	20 m Ultra320 SCSI cable for attaching EXP24 Disk 5786/5787 TotalStorage Drawer/Tower
N/A	2128	10 m Ultra320 SCSI cable for attaching EXP24 Disk 5786/5787 TotalStorage Drawer/Tower
N/A	2138	.55 m Ultra320 SCSI cable for attaching EXP24 Disk 5786/5787 TotalStorage Drawer/Tower
N/A	2877	4-Position Int Bus Cable
N/A	2917	English U/L DBCS
N/A	2924	English
N/A	2958	Universal Japanese
N/A	3655	SAS Half-high tape device cables for Bolt-in SAS Tape Device Slot in the system unit. 9407-M15, 9408-M25, 9409-M50
N/A	3668	SAS Cable DASD Backplane to Bulkhd, 9409-M50
N/A	3674	SAS Cable DASD backplane (8345) with the external SAS port on the rear bulkhead 9408-M25
N/A	3686	SAS Cable1.5 m attaches a single SAS EXP 12S (5886) Disk Drawer to the integrated SAS controller connection on the back of a 9408-M25 or 9409-M50.
N/A	3687	SAS Cable 3 m attaches a single SAS EXP 12S (5886) Disk Drawer to the integrated SAS controller connection on the back of a 9408-M25 or 9409-M50.
N/A	4650	Rack Indicator- Not Factory Integrated
N/A	4993	IBM i Enablement Specify Enables the 9407-M15 and 9408-M25 to run System i.
N/A	4994	IBM i Enablement Specify, enables the 9409-M50 to run System i.
N/A	4998	Single 5250 Enterprise Enablement, 9409-M50
N/A	4999	Full 5250 Enterprise Enablement,9409-M50
N/A	5000	Software Preload Required
N/A	5001	Indicates that a machine is to be routed to the Customer Solution Center at time of manufacture.

CCIN	FC	Description
N/A	5002	System i CDSC-IBM Mfg
N/A	5108	30-Disk Expansion Feature
N/A	5115	Dual Line Cords - Tower
N/A	5116	Dual Line Cords - 5294 Tower
515F	5138	Redundant Power and Cooling - 0595/5095
N/A	5294	1.8 m I/O Tower
N/A	5296	1.8 m I/O Tower (no disk)
N/A	5544	System Console is driven by a WAN adapter with 0367 cable
N/A	5550	System Console is driven by the Hardware Management Console (HMC)
N/A	5553	System Console is driven by embedded CEC Ethernet LAN port
N/A	5717	1 Gb Ethrnet UTP 4-port Adapter
N/A	5790	PCI Expansion Drawer
N/A	5796	PCI-DDR 12X Expansion Drawer
n/a	5886	19 inch DASD 12S SAS Expansion Drawer, 9408-M25, 9409-M50.
N/A	6068	Optional Front Door for 1.8 m Rack
N/A	6069	Optional Front Door for 2.0 m Rack
N/A	6246	1.8 m Rack Trim Kit
N/A	6247	1.8 m Rack Acoustic Doors
N/A	6248	1.8 m Rack Acoustic Doors
N/A	6249	2.0 m Rack Acoustic Doors
N/A	6458	14-ft Int 250V/10A Power Cord
N/A	6459	12-ft 250V/10A RA Power Cord
N/A	6460	14-ft 125V/15A Power Cord
N/A	6469	14-ft 250V/15A Power Cord
N/A	6470	6-ft 125V/15A Power Cord
N/A	6471	9-ft 125V/15A Power Cord
N/A	6472	9-ft 250V/16A Power Cord
N/A	6473	9-ft 250V/10A Power Cord
N/A	6474	9-ft 250V/13A Power Cord
N/A	6475	9-ft 250V/16A Power Cord Type 32 plug and a IEC320 C13 connector
N/A	6476	9-ft 250V/10A Power Cord Type 24 plug and a IEC320 C13 connector
N/A	6477	9-ft 250V/10A Power Cord
N/A	6478	9-ft 250V/16A Power Cord
N/A	6487	6-ft 250V/15A Power Cord

CCIN	FC	Description
N/A	6488	9-ft Dual Voltage Power Cord
N/A	6489	14-ft 3PH/24A Power Cord
N/A	6491	14-ft 1PH/48A Power Cord
N/A	6492	14-ft 1PH/48-60A Power Cord
N/A	6493	9-ft 250V/10A Power Cord
N/A	6494	9-ft 250V/10A Power Cord Type 62 plug and a IEC320 C13 connector
N/A	6496	9-ft 250V/10A Power Cord Type 66 plug and a IEC320 C13 connector
N/A	6497	6-ft 250V/15A Power Cord
N/A	6580	Optional Rack Security Kit
N/A	6586	Modem Tray for 19 inch Rack
N/A	6598	Disk Slot Filler (Qty 4)
N/A	6651	9-ft 127V/15A Power Cord
N/A	6653	14-ft 3PH/16A Power Cord
N/A	6654	14-ft 1PH/24-30A Power Cord
N/A	6655	14-ft 1PH/24-30A Water-resistant Power Cord
N/A	6656	14-ft 1PH/24A Power Cord
N/A	6657	14-ft 1PH/24A Power Cord
N/A	6658	14-ft 1PH/24A Power Cord-Korea
N/A	6659	9-ft 240V/15A Power Cord
N/A	6660	14-ft 127V/15A Power Cord
N/A	6671	9Ft IEC 320 C13/14 PDU Cord
N/A	6672	5Ft IEC 320 C13/14 PDU Cord
N/A	6680	9-ft 250V/10A Power Cord
N/A	6699	RIO-2 Bus Adapter connectivity for 0595.
N/A	6721	1W Entry Express Edition 9407-M15
N/A	6761	9408-M25 1/2W 30 User Express Edition Server 4930 Proc 5634
N/A	6762	9408-M25 1/2W 150 User Express Edition Server 4930 Proc 5634
N/A	6763	9408-M25 1/2W Unlimited User Express Edition Server 4930 Proc 5634
N/A	6766	1/2W Solution Edition Provides an Express configuration for 9408-M25 with Server Feature 4930 and Processor Feature 4966.
N/A	7006	1/4-way IBM i Edition, 9409-M50
N/A	7046	2/4-way IBM i Solution Edition, 9409-M50
N/A	7048	4/4-way IBM i Solution Edition, 9409-M50
N/A	7109	Intelligent PDU Plus

CCIN	FC	Description
N/A	7188	Power Distribution Unit
N/A	7204	Quantity 150 of 2124
N/A	7205	Quantity 150 of 2125
N/A	7206	Quantity 150 of 2126
N/A	7207	Quantity 150 of 2127
N/A	7208	Quantity 150 of 2128
N/A	7213	Quantity 150 of 2138
N/A	7224	IBM Front Door, Model 9407-M15/9408-M25 Desk-side
N/A	7226	Model 550 Deskside Specify, 9409-M50
N/A	7227	IBM Front Door 550 Deskside, 9409-M50
N/A	7229	Model 550 Rack-mount Specify, 9409-M50
N/A	7250	Model 9407-M15, 9408-M25 Desk-side
N/A	7251	Model 9407-M15/9408-M25 rack-mounted system.
N/A	7267	Model 9407-M15, 9408-M25 Bezel/Rails/Hardware Rack Mount Drawer.
N/A	7268	Bezel/Hardware 550 Rack Mount Drawer, 9409-M50
N/A	7307	Dual I/O Unit Enclosure
N/A	7314	Dual 5796 Unit Enclosure
N/A	7780	2.0 m Rack Side Attach Kit
N/a	7801	6 m HMC Attachment Cable
N/a	7802	15 m HMC Attachment Cable
N/a	7840	Side-by-Side for 1.8 m Racks
N/a	7841	Ruggedize Rack Kit
N/a	7862	Blind Swap Cassette (Long)
N/a	7863	Blind Swap Cassette (Double)t
N/A	7982	PowerVM Standard Edition 9409-M50
N/A	7986	PowerVM Enterprise Edition 9409-M50
N/A	7986	PowerVM Enterprise Edition 9409-M50
N/A	8506	PowerVM Standard Edition, 9407-M15, 9408-M25
N/A	8507	PowerVM Enterprise Edition
N/A	8546	Optional Base 1 GB Server Memory
N/A	9298	Full 5250 Enterprise Enable 9409-M50
N/A	9299	Base 5250 Enterprise Enable, 9406-MMA, 9409-M50

Table 7-2 lists the CCIN to FC numbers for System p models.

Table 7-2   CCIN to FC listing (System p models)

CCIN	FC	Description
28EF	0632	USB 2.0 PCI Adapter, PCI/SHORT/32BIT/3.3 OR 5 V
53D3	5635	0/4W 4.2 GHz Power6 processor card, 8x RDIMM slots, system planar, 8203-E4A
53D8	5620	0/2w, 3.5 GHz P6 SCM, 8 MB L2, 32 MB L3, 12x DDR2 Nebula DIMMs
53E2	5620	0/2w, 3.5 GHz P6 SCM, 8 MB L2, 32 MB L3, 12x DDR2 DIMMs
N/A	0633	POWER GXT135P Graphics Accelerator with Digital Support
N/A	1298	146.8 GB 15 k rpm SCSI Disk Unit installed in a 5786/5787 TotalStorage EXP24 Disk Drawer. Used for AIX, Linux partitions on 9407-M15.9408-M25, and 9409-M50
	7529	Quantity 150 of 1298
N/A	1873	Drawer to Drawer Serial Cable
N/A	1874	Rack to Rack Serial Cable
N/A	1875	Serial Port Converter Cable
N/A	1898	146.8 GB Disk Unit for AIX 5L and Linux partitions
N/A	1860	ASYNC Terminal/Printer Cable is a 4 meter cable and transposer (2 parts)
N/A	2934	ASYNC Terminal/Printer Cable
N/A	2936	ASYNC Modem Cable
N/A	2943	8-Port ASYNC Adapter
N/A	5160	Power Dist Unit 1 Phase NEMA
N/A	5723	2-Port Async EIA-232 PCI IOA
N/A	5740	1 Gbps BaseT Ethernet (4-Port)
N/A	8133	RJ45 to DB25 Interposer
N/A	9300	Language Group Specify - US English
N/A	9700	Language Group Specify - Dutch
N/A	9703	Language Group Specify - French
N/A	9704	Language Group Specify - German
N/A	9705	Language Group Specify - Polish
N/A	9706	Language Group Specify - Norwegian
N/A	9707	Language Group Specify - Portuguese
N/A	9708	Language Group Specify - Spanish
N/A	9711	Language Group Specify - Italian
N/A	9712	Language Group Specify - Canadian French
N/A	9714	Language Group Specify - Japanese

CCIN	FC	Description
N/A	9715	Language Group Specify - Traditional Chinese (Taiwan)
N/A	9716	Language Group Specify - Korean
N/A	9718	Language Group Specify - Turkish
N/A	9719	Language Group Specify - Hungarian
N/A	9720	Language Group Specify - Slovakian
N/A	9721	Language Group Specify - Russian
N/A	9722	Language Group Specify - Simplified Chinese (PRC)
N/A	9724	Language Group Specify - Czech
N/A	9725	Language Group Specify - Romanian
N/A	9726	Language Group Specify - Croatian
N/A	9727	Language Group Specify -- Slovenian
N/A	9728	Language Group Specify - Brazilian Portuguese
N/A	9729	Language Group Specify - Thai

Integrated Virtual Ethernet

In this chapter, we provide summary level information about the Integrated Virtual Ethernet (IVE) adapter that is integrated within the system unit of the IBM POWER6 570 model.

Different feature number IVE adapters are also embedded within a POWER6 520 and POWER6 550 system enclosure. These adapter cards and the adapter cards that are embedded within each POWER6 570 enclosure are different.

8.1 Overview of IVE

The IBM Integrated Virtualization Ethernet (IVE) adapter was introduced first on the IBM POWER6 System p 570 (Machine Type 9117 Model MMA) and the System i570 (Machine Type 9406 Model MMA) in 2007. The IVE adapter offers a choice of 2- or 4-port 1 Gb virtual Ethernet or the 2-port 10 Gb virtual Ethernet adapter.

The IVE capabilities enable easy sharing of its integrated high-speed Ethernet adapter ports among partitions who see a logical representation of the IVE's physical ports. Each 570 processor (CEC) enclosure is shipped with one IVE integrated I/O port card (#5636, #5637, or #5639). IVE feature selection is available only when a CEC enclosure is first ordered from the factory and cannot be changed in the field.

The supported IVE adapters include the following characteristics:

► #5636 (standard), integrated 2-port 1 Gb, single controller, 10/100/1000 twisted pair

   – 16 MAC addresses, one port group
   – RJ-45 connector

► #5637 (optional), integrated 2-port 10 Gb short range, single controller, optical

   – 32 MAC addresses, two port groups
   – 62.5 micron multi-mode fiber cable type
      • LC physical connector type
      • 33 meters maximum range

10 Gb short range is designed to support short distances over deployed multi-mode fiber cabling. It has a range of between 26 m and 82 m, depending on cable type. It also supports 300 m operation over new, 50 µm 2000 MHz km multi-mode fiber (using 850 nm).

► #5639 (optional), integrated 4-port 1 Gb, single controller, 10/100/1000 twisted pair

   – 32 MAC addresses, two port groups
   – RJ-45 connector

For best performance, always use Ethernet cables that meet Cat 5e cabling standards or higher.[1]

Notes:

► Different feature #5636, #5637, and #5639 can be in each enclosure of a multiple enclosure 9117-MMA configuration. The CCIN for #5636 is 181A, for #5637 is 181B, and for #5639 is 181C.

► The IVE is also commonly referred to in IBM documentation as the *Host Ethernet Adapter (HEA)*.

► The following base operating system levels are required for use of the IVE:

   – AIX 5.2 TL10 or later
   – AIX 5.3 TL6 or later
   – IBM i V5R4 with V5R4M5 machine code or later
   – IBM i 6.1 or later

► Similar to other integrated ports, the feature is not hot-swappable or hot-pluggable and must be serviced by a trained IBM System Service Representative.

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[1] Category 5 cable, commonly known as *Cat 5*, is a twisted pair cable type that is designed for high signal integrity. Cat 5 is superseded by the Cat 5e specification.

To make the discussion in this chapter less complicated, we focus on features #5636 and #5639.

A single IVE can be shared by all partitions in the system without requiring the PowerVM feature and without being made part of a Virtual I/O Server (VIOS) partition. *Host Ethernet Adapter (HEA)* is the term that is used in most system documentation for IVE at the time this paper was written. It is also the term that the Hardware Management Console (HMC) interface uses to set up the IVE for use by a partition. The acronyms *IVE* or *HEA* each mean the same thing.

The following HEA capabilities or characteristics are most important:

► You cannot assign the HEA itself to a logical partition (LPAR), except in a single partition that owns all devices. In a multiple partition environment, multiple LPARs can connect directly to the same HEA and use its resources, which allows these LPARs to access external networks through the HEA without having to go through an Ethernet bridge on another LPAR. To connect an LPAR to an HEA, you must create a Logical Host Ethernet Adapter (LHEA) for the LPAR. Each LHEA looks to the operating system as either a two- or four-port hardware LAN adapter.

► The HEA enables the sharing of a single RJ-45 port across LPARs. Each partition defines a LHEA that links to the physical port on the IVE.

► Each partition operating system "thinks" it has a dedicated physical port or ports.

► Each partition works directly with HEA hardware structures.

► Transmit and receive of data is done independently of the hypervisor.

► The system hypervisor manages HEA resources.

► Logical ports are mapped to physical ports using the HMC for each partition.

► Up to 16 partitions can share a single two port IVE, and up to 32 partitions can share a four port IVE. Therefore, there is no need to buy 16 or 32 Ethernet adapters. Network traffic should be planned to determine the best number of partitions to share the IVE.

► HEA-LHEA offers improved performance over a VIOS partition (supporting client AIX or Linux partitions) where all traffic must go through that VIOS partition. A client partition to a VIOS partition must use the following software levels:

 – AIX 5L 5.3 (or later)
 – SUSE LINUX Enterprise Server 9 (or later)
 – Red Hat Enterprise Linux AS for POWER Version 3 (update 2 or later)
 – Red Hat Enterprise Linux AS for POWER Version 4 (or later)
 – IBM i 6.1 (or later)

► HEA-LHEA offers improved performance over Virtual LAN (VLAN).

► The #5636 HEA includes two serial ports of which port 2, location P1-C10-T3 (top port), is used by IBM i only when a uninterruptible power supply sense cable is connected with a feature code #1827 cable. The second serial port is not usable by IBM i

► The #5639 HEA includes one serial port used by IBM i only when an uninterruptible power supply sense cable is connected with a feature code #1827 cable.

Figure 8-1 illustrates an example configuration with three LPARs, each of which "thinks" it has a dedicated LAN port (defined using the HMC as LHEA port). There are two physical ports available with the #5636. If a #5639 is installed, there are two additional physical ports.

Figure 8-1   A 2-port (or 4-port) IVE adapter and operating systems example

8.2 Physical port control

The HMC is used to configure the LHEA port and to associate it with a specific HEA port. This configuration is similar to that which corresponds to the real adapter of a shared Ethernet adapter when using a VIOS partition. A VIOS partition is supported on all POWER6 systems. The VIOS partition can host client partition resources for a Linux or AIX partition or for IBM i with release 6.1 or later.

The following are key considerations regarding the physical ports of the IVE adapter:

► Generally, partitions are not allowed to alter the speed or duplex parameters or to start or shutdown the physical ports.

► Only the HMC is allowed to manipulate the physical ports.

► Partitions are not allowed to access the physical port counters. Only the HMC has access to these counters.

► Each partition can access the logical port counters for any logical port it owns.

► On a Manufacturing Default Configuration (MDC) system, the partition gets one logical port per physical port and is allowed to manipulate the physical ports. In MDC mode, the single partition can access the physical port counters.

- The Hypervisor HEA firmware at initialization brings up the physical ports if possible without any input from HMC. They are brought up in AUTO speed or duplex mode or 1 Gb full duplex per port when connected to a 1 Gbps network.
- The HEA does not support half duplex operation. Only full duplex connections can be made to HEA. If the switch is configured for half duplex only, the link to HEA will not activate.

8.3 Media Access Control address

Each port of the #5636 IVE adapter, #5637 IVE adapter, or a #5639 IVE has a Media Access Control (MAC) address or hardware address or adapter address with the following characteristics:

- Each logical port maps to one MAC address.
- The #5636 adapter card vital product data (VPD) contains 16 globally unique IEEE MAC addresses.
- The #5637 adapter card VPD contains 32 MAC addresses.
- The #5639 adapter card VPD contains 32 globally unique IEEE MAC addresses.
- Each IVE adapter (HEA) sorts received frames by MAC address to the correct logical port.

8.4 Multicast

A logical port can communicate with all other logical ports that are connected to the same physical port on the HEA. The physical port and its associated logical ports form a logical Ethernet network. Broadcast and multicast packets are distributed on this logical network as though it was a physical Ethernet network.

Key HEA capabilities associated with multicast support include:

- A multicast manager exists in the system Hypervisor that duplicates broadcast or multicast frames and sends them to all partitions that have registered to receive them.
- Partitions can register to receive broadcast/multicast addresses using Hcall instructions.
- Up to 16 logical ports can be connected to a physical port using this logical network. By extension, you can connect up to 16 logical partitions to each other and to an external network through this logical network. The actual number of logical ports that you can connect to a physical port depends upon the Multi-Core Scaling value of the physical port group and the number of logical ports that have been created for other physical ports within the physical port group.
- By default, the Multi-Core Scaling value of each physical port group is set to 4, which allows 4 logical ports to be connected to the physical ports in the physical port group. To allow up to 16 logical ports to be connected to the physical ports in the physical port group, you must change the Multi-Core Scaling value of the physical port group to 1 and restart the managed system.

8.5 Logical Host Ethernet Adapter

A Logical Host Ethernet Adapter (LHEA) is a representation of a physical HEA within a partition (an LPAR). An LHEA appears to the partition operating system as though it is a

physical Ethernet adapter, just as a virtual Ethernet adapter appears as though it is a physical Ethernet adapter.

When an LHEA is created for an LPAR, the resources that the LPAR can use on the actual physical HEA are specified as follows:

► One LHEA can exist per HEA per partition.

   A partition can have multiple LHEAs, but each must be associated with a separate HEA.

► Each LHEA can contain up to four logical ports—two on a #5636 IVE two port adapter or four on a #5639 IVE four port adapter.

Refer to the following publications to help you configure an LHEA and, optionally, an LHEA as a partition console:

► *Hardware Management Console V7 Handbook*, SG24-7491

► *Integrated Virtual Ethernet Adapter Technical Overview and Introduction*, REDP-4340

► *System i Operations Guide for i5/OS Consoles,* SA76-0128

   https://www-01.ibm.com/servers/resourcelink/lib03030.nsf/pagesByDocid/55719E40D
   D8536A7852573500046E6EF?OpenDocument&pathID=36

► *System i and System p Logical Partitioning Guide,* SA76-0098

   https://www-01.ibm.com/servers/resourcelink/lib03030.nsf/pagesByDocid/0E6125F89
   F8B8EF6852572E6007E884D?OpenDocument&pathID=36

You can also search for Host Ethernet Adapter in the IBM Systems Information Center at:

http://publib.boulder.ibm.com/infocenter/systems/index.jsp

We provide a compressed view of associating a partition LHEA to a physical HEA in the next section.

8.6 Configuring the HEA from the HMC

A physical port on an HEA is not usable by a partition unless an HEA resource is associated with an LHEA in that partition. The information that we present in this section is based upon and is a subset of the contents of the following sources:

► *System i and System p Logical Partitioning Guide*, SA76-0098

   https://www-01.ibm.com/servers/resourcelink/lib03030.nsf/pagesByDocid/0E6125F89
   F8B8EF6852572E6007E884D?OpenDocument&pathID=36

► *Integrated Virtual Ethernet Adapter Technical Overview and Introduction*, REDP-4340

Each LPAR can have one LHEA for each physical HEA on the managed system. Each LHEA can have one or more logical ports, and each logical port can connect to a physical port on the HEA. You can create an LHEA for an LPAR by using either of the following methods:

► You can add the LHEA to a partition profile, shut down the LPAR, and reactivate the LPAR using the partition profile with the LHEA.

► You can add the LHEA to a running LPAR using dynamic logical partitioning.

When you activate an LPAR, the LHEAs in the partition profile are considered to be required resources. If the physical HEA resources required by the LHEAs are not available, then the LPAR cannot be activated.

However, when the LPAR is active, you can remove any LHEAs you want from the LPAR. After you create an LHEA for an LPAR, a "network device" is created in the LPAR. This network device is named *entX* on AIX LPARs, *CMNXX* on IBM i LPARs, and *ethX* on Linux LPARs, where X represents sequentially assigned numbers.

The user can then set up TCP/IP configuration similar to a physical Ethernet device to communicate with other LPARs. A logical port can communicate with all other logical ports that are connected to the same physical port on the HEA. The physical port and its associated logical ports form a logical Ethernet network.

To create a usable LHEA using the dynamic LPAR method using the HMC V7R3 interface, follow these basic steps:

1. In the left navigation pane of the HMC, expand **Systems Management** → **Servers**, and select the partition for which you want to set up the HEA-LHEA configuration.

   In the right pane, click **Tasks**. In the Tasks pane, select **Dynamic Logical Partitioning** → **Host Ethernet** → **Add**, as shown in the example partition called *greenbee* in Figure 8-2.

Figure 8-2   Starting to add a Logical Host Ethernet adapter to a partition

2. In the Add Logical HEA Resources panel (Figure 8-3), select the HEA whose resources you want the LPAR to use.

> **Note**: The CCIN numbers are as follows:
>
> ► CCIN 1818 means feature #5623 2-port
> ► CCIN 1819 means feature #5624 4-port
> ► CCIN 181A means feature #5636 2-port
> ► CCIN 181C means feature #5639

In our example, we select the HEA (one per 9117-MMA processor enclosure) identified as U789D.001.DQDTTPM-P1 and its physical port C10-T1, physical port ID 1. This port is the physical port that we want the LPAR greenbee to use for the LHEA that we create.

Leave the LHEA Capability parameter as its default value of Base Minimum.

> **LHEA capability values**: A discussion of LHEA capability values is beyond the scope of this paper. We also do not discuss how to change the options values from the defaults that are shown.

Click **Configure**.

Figure 8-3   Selecting a physical HEA port to assign to a Logical HEA

3. In the Logical Host Ethernet Adapter (LHEA) Configuration window, shown in Figure 8-4, set the logical port to accept packets with any virtual LAN ID (VLAN ID) or to accept only packets with specific VLAN IDs:

   – If you want the logical port to accept packets with any VLAN ID, select **Allow all VLAN IDs**.

   – If you want the logical port to accept only packets with specific VLAN IDs, enter each VLAN ID in the VLAN to add field and click **Add**.

   You can repeat this step, to allow up to 20 VLAN IDs to be accepted on the logical port.

   Click **OK**.

Figure 8-4   Selecting a logical port and VLAN ID for an LHEA configuration

4. Repeat these steps for each additional physical port whose resources you want the LPAR to use.

5. When you are finished, you return to the Hardware Management Console window. You see a summary window from which you can make changes or indicate that you are done.

After you finish, one or more new Ethernet adapters are visible to the operating system of the LPAR. An adapter is displayed as *CMNnn* to an IBM i partition. The operating system must now perform its normal Ethernet configuration for that LHEA resource.

8.7 i5/OS communication resources and IBM i line description

Figure 8-5 shows an example of a #5636 LHEA adapter whose resources are presented to an i5/OS partition communication resource as #181A. As stated earlier, the #5639 communication resources are presented as type 181C.

```
                  Work with Communication Resources
                                              System:    xxxxxxx
 Type options, press Enter.
   5=Work with configuration descriptions   7=Display resource detail


 Opt   Resource         Type  Status              Text
       CMB05            1818 Operational         Comm Processor
         LIN06          1818 Operational         Comm Adapter
           CMN06        1818 Operational         Ethernet Port
           CMN07        1818 Operational         Ethernet Port
```

Figure 8-5   Example LHEA IBM i resource names for a #5636 HEA/IVE port

For the #5639, you see 181C and four CMNnn Ethernet ports. Figure 8-6 illustrates an example of an Ethernet line description for communication line (LHEA) resource CMN07.

```
              Display Line Description

 Line description . . . . . . . . . . :    HEACMN07
 Option . . . . . . . . . . . . . . . :    *BASIC
 Category of line . . . . . . . . . . :    *ELAN

 Resource name   . . . . . . . . . . :    CMN07
 Online at IPL  . . . . . . . . . . . :    *YES
 Vary on wait . . . . . . . . . . . . :    *NOWAIT
 Network controller . . . . . . . . . :    HEA07NET
 Local adapter address  . . . . . . . :    00145E5F0EC1
 Exchange identifier  . . . . . . . . :    05696C00
 Ethernet standard  . . . . . . . . . :    *ETHV2
 Line speed . . . . . . . . . . . . . :    *AUTO
 Current line speed . . . . . . . . . :    1G
 Duplex . . . . . . . . . . . . . . . :    *AUTO
 Current duplex . . . . . . . . . . . :    *FULL
 Maximum frame size . . . . . . . . . :    8996
 Maximum controllers  . . . . . . . . :    40
 Line description . . . . . . . . . . :    HEACMN07
 Option . . . . . . . . . . . . . . . :    *BASIC
 Category of line . . . . . . . . . . :    *ELAN
 Error threshold level  . . . . . . . :    *OFF
 Generate test frame  . . . . . . . . :    *YES
 Message queue  . . . . . . . . . . . :    *SYSVAL
 Current message queue  . . . . . . . :    QSYSOPR
   Library  . . . . . . . . . . . . . :      QSYS
 Text . . . . . . . . . . . . . . . . :    *BLANK
```

Figure 8-6   Example Ethernet line description

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IBM Power systems I/O enclosures schematics

In this chapter, we identify the system diagrams for the towers that are supported by all IBM POWER6 MTMs announced through September 2008, as well as the power and packaging features for those towers. IBM Power systems do not support System Products Division (SPD) towers and expansion units or migration towers. When upgrading from earlier models to these models, it is necessary to plan for the loss of towers and input/output processors (IOPs) and input/output adapters (IOAs) that are not supported on the later systems.

Not all POWER6 MTMs support all I/O enclosures described in this chapter. Review the Features description chapter for specifics. This chapter includes tower schematics might have a shaded card slot showing a base IOP. A base IOP might not be included in the tower. Refer to the model feature descriptions in Chapter 4, "Feature descriptions and related information" on page 187 to see where a base IOP might be included or allowed.

Refer to the following publications for an explanation RIO-2 and 12X configuration rules and PCI card placement considerations refer to the following PDFs:

► PCI card placement rules PDFs at:

http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp

For PCI placement information associated with the April 2008 POWER6-based IBM Power 520 A9407-M15, 9408-M25, Power 550 9409-M50, Power 570 9406-MMA model configurations, refer to the *Power Systems PCI Adapter Placement Guide for Machine Type 940x*, SA76-0096.

For PCI placement information associated with January 2008 and the April 2008 POWER6-based IBM Power 520 8203-E4A, IBM Power 550 8204-E8A, IBM Power 570 9117-MMA, and IBM Power 595 9119-FHA model configurations, refer to the *Power Systems PCI Adapter Placement Guide for Machine Type 820x and 91xx*, SA76-0090

► Power Systems Facts and Figures Web site at:

http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

► Additional hardware information at the IBM Systems Hardware Information Center at:

http://publib.boulder.ibm.com/infocenter/eserver/v1r2s/en_US/index.htm

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9.1 Power systems I/O enclosures and expansion unit schematics

This section shows the schematics of the enclosures, racks, and expansion units that are supported by the IBM POWER6 MTMs included in this paper.

9.1.1 #5088 or #0588 PCI-X expansion unit

The #5088 PCI-X expansion unit is attached to the top of a #5094 PCI-X expansion tower. The #0588 is mounted in a #0551 System i 36U 1.8 m Rack. The #5088 or #0588 is a System i enclosure.

Figure 9-1 shows the front and back of this expansion unit.
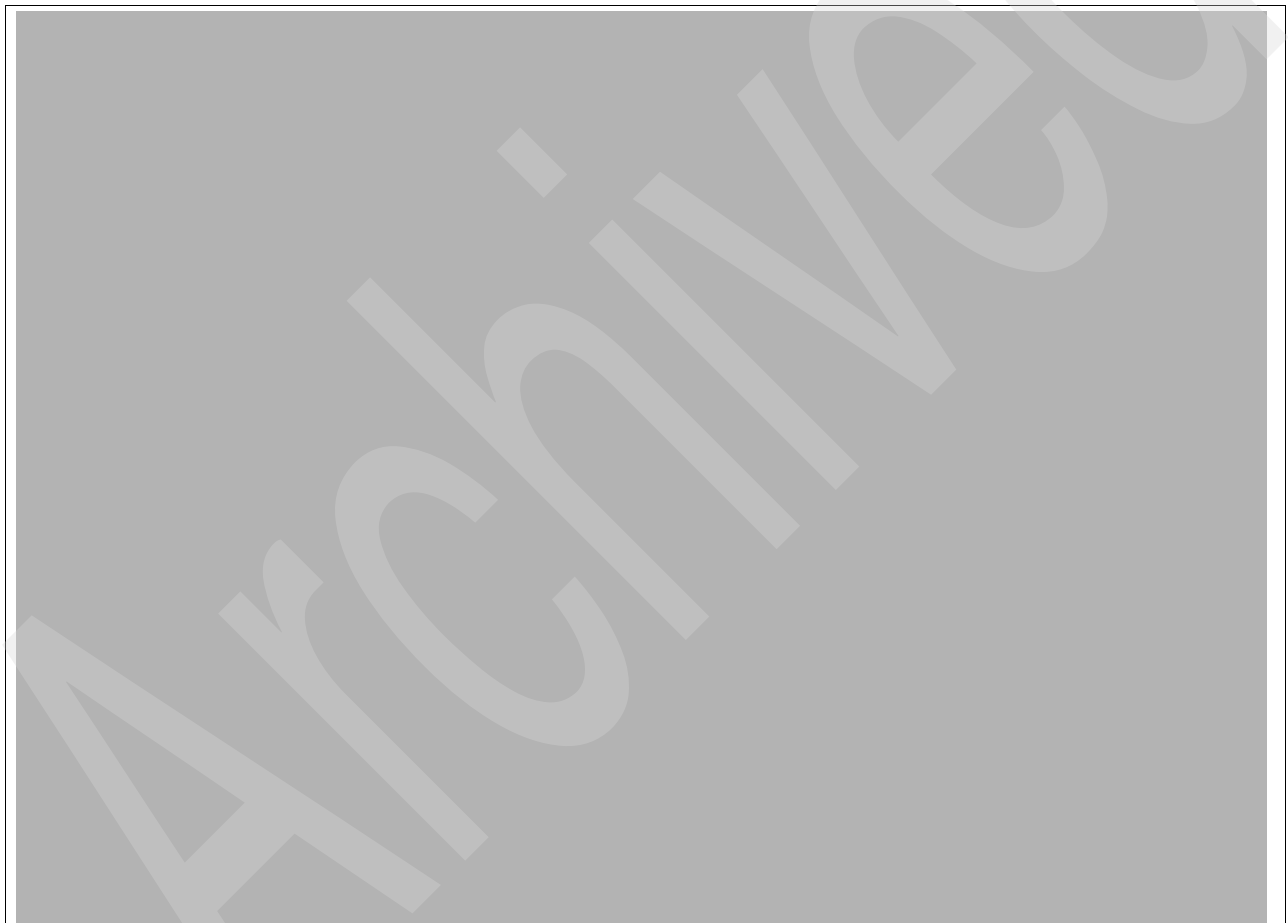
Figure 9-1   #5088/#0588 PCI-X expansion unit front and back view

9.1.2 #5094 PCI expansion tower

The #5094 PCI-X expansion tower is a System i enclosure. Figure 9-2 shows the front and back view of this expansion tower.

Figure 9-2   #5094 PCI-X expansion tower

9.1.3 #5095 or #0595 PCI-X expansion tower

Feature #0595 is a rack mounted remote I/O drawer. The #0595 has seven PCI-X IOP/IOA slots and supports up to 12 SCSI disk units. #0595 uses 5 EIA units of space in a 19 inch rack. Figure 9-3 shows this expansion tower.

The #5095 PCI-X Expansion Tower and #0595 PCI-X Expansion Unit in Rack are supported by Models 270, 520, 525, 550, 570, 9117-MMA, 800, 810, 820, 825, 830, 840, 870, and 890.

Figure 9-3   #5095/#0595 PCI-X Expansion Tower

9.1.4 #5096 PCI-X expansion tower (no disk)

The #5096 PCI-X expansion tower (no disk) is a System i enclosure. Figure 9-4 shows the front and back views of this expansion tower.

Figure 9-4   #5096 PCI-X expansion tower (no disk)

9.1.5 #5294 PCI-X expansion tower

The #5294 1.8 m I/O expansion tower is a System i enclosure. The #5294 consists of two #5094 PCI-X expansion towers with side covers and casters removed, as shown in Figure 9-5.

Figure 9-5   #5294 1.8 m I/O expansion tower

9.1.6 #5296 1.8 m I/O tower (no disk)

The #5296 1.8 m I/O tower (no disk) is a System i enclosure. The #5296 consists of two #5094 PCI-X expansion towers with side covers and casters removed, as shown in Figure 9-6.
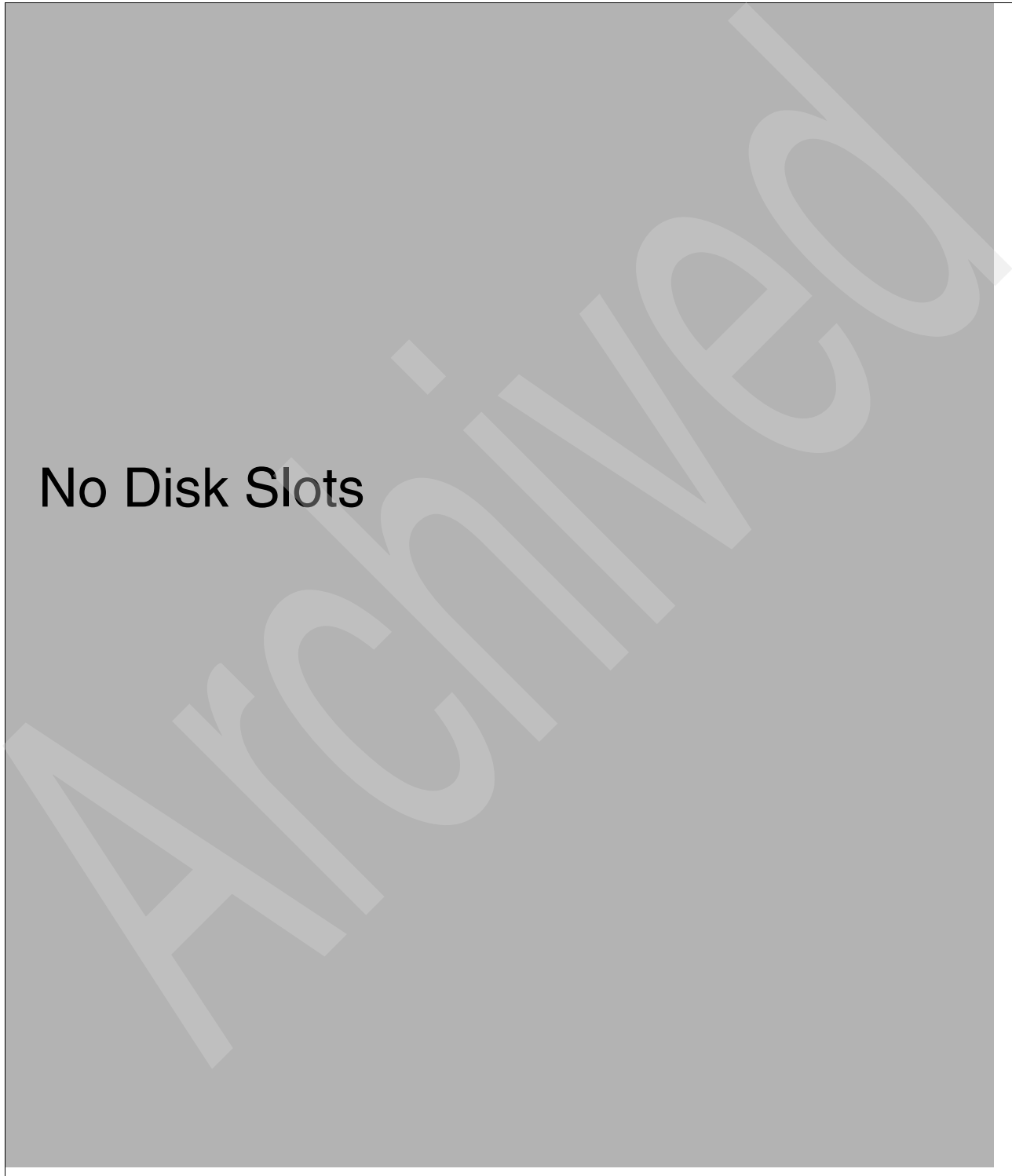
No Disk Slots

Figure 9-6   #5296 1.8 m I/O tower (no disk)

9.1.7 #5786 TotalStorage Expansion 24 Disk Drawer and #5787 TotalStorage Expansion 24 Disk Tower

The #5786 TotalStorage Expansion 24 Disk Drawer and #5787 TotalStorage Expansion 24 Disk Tower provide slots for up to 24 disk units in a 4 EIA unit high rack drawer or stand-alone tower. *7031-D24/T24* is a System p name for this enclosure.

Figure 9-7 shows the rear view of the #5786.
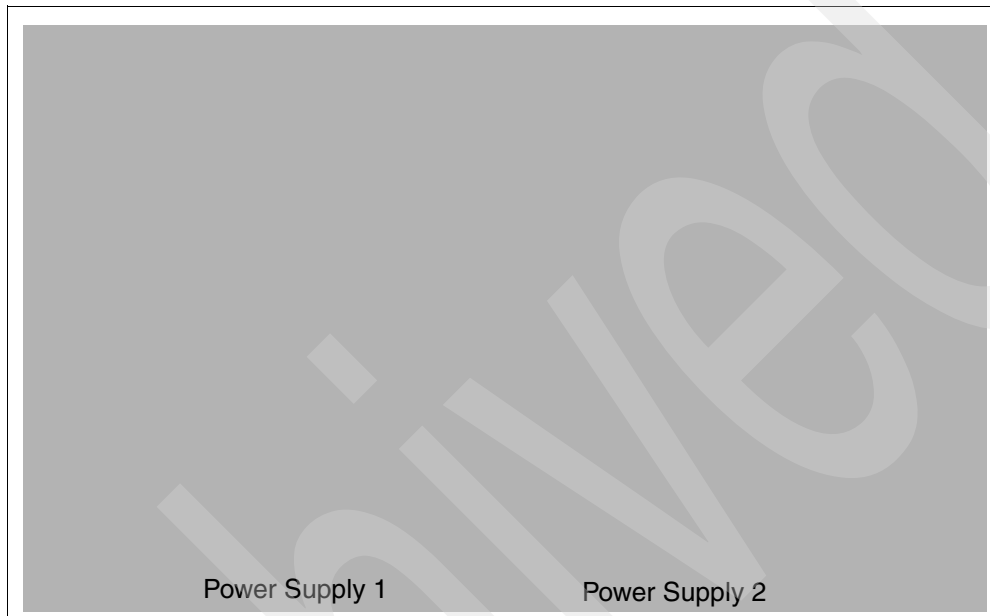
Figure 9-7   Rear view of the #5786

Figure 9-8 shows the front view of the #5786.

Figure 9-8   Front view of the #5786

Figure 9-9 shows the rear view of the #5787.
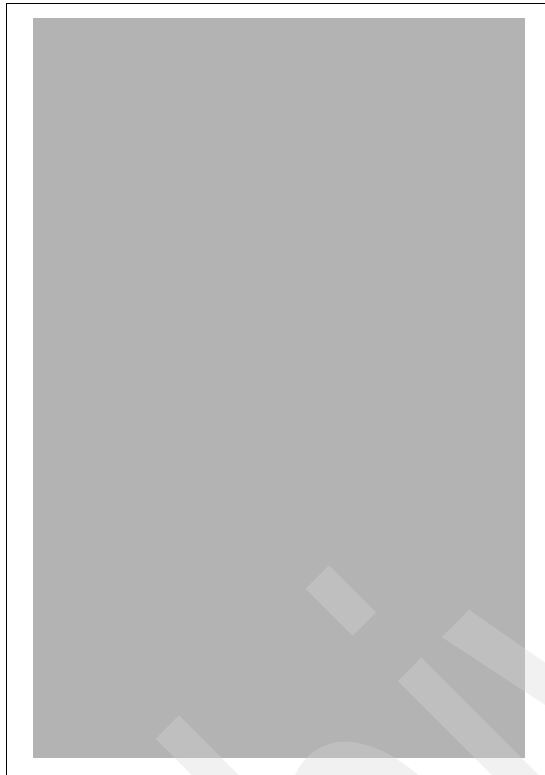
Figure 9-9   Rear view of the #5787

Table 9-1 lists the locations and descriptions for #5786 and #5787.

Table 9-1   Locations and descriptions for #5786 and #5787

Location	Description	Location	Description
Un-P1	Disk drive backplane 1	Un-C5	SCSI repeater card 4 (bottom right)
Un-P2	Disk drive backplane 2	Un-C6	Crossover card 1 (left)
Un-P3	Power distribution backplane	Un-C7	Crossover card 2 (right)
Un-A1	Fan 1 (left)	Un-E1	Power supply 1 (left)
Un-A2	Fan 2	Un-E1-T1	Rack indicator connector
Un-A3	Fan 3 (right)	Un-E2	Power supply 2 (right)
Un-C1	VPD card	Un-E2-T1	Rack indicator connector
Un-C2	SCSI repeater card 1 (top left)	P1-D1 to P1-D12	Front Disk Drives
Un-C3	SCSI repeater card 2 (top right)	P2-D1 to P2-D12	Rear Disk Drives
Un-C4	SCSI repeater card 3 (bottom left)		

9.1.8 #5790 PCI Expansion Drawer

The #5790 PCI Expansion Drawer is a System i enclosure, as shown in Figure 9-10.

Figure 9-10   #5790 PCI Expansion Drawer

Figure 9-11 shows the slot location descriptions for #5790.

Figure 9-11   Slot location descriptions for #5790

Note: A #4812 PCI Integrated xSeries Server consumes two slots. PHB is an acronym for PCI host bus.

9.1.9 FC#5790 and FC#5796 I/O Drawer comparison

The #5796 I/O drawer offers improved performance over the #5790. Table 9-2 compares the physical characteristics of the two I/O drawers.

Table 9-2   #5790 versus #5796 I/O drawers

Feature	#5790 (avail 2004)	#5796 (avail 2007)
Number of PCI slots	6 PCI-X	6 PCI-X DDR
PCI slot specifications	64-bit,133 MHz	64-bit, 266 MHz
Number of disk slots in drawer enclosure	0 (use EXP24)	0 (use EXP24)
Physical size	4U 1/2 wide	4U 1/2 wide
Can use IOP	Yes	No
Loop attachment	RIO-2 max 6/loop	12X max 4/loop
PCI-X blind swap cassette used	Yes (same)	Yes (same)
Redundant power/cooling	Yes	Yes
Hot plug PCI slots	Yes	Yes
Primary Host Bridge (chip to loop)	1 (1 for all 6 slots)	2 (1 per 3 slots)
EADS bridge chip (PCI slot to Host Bridge)	2 (1 per 3 slots)	0 (no delay)

Figure 9-12 shows the drawer for #5790 and #5796.
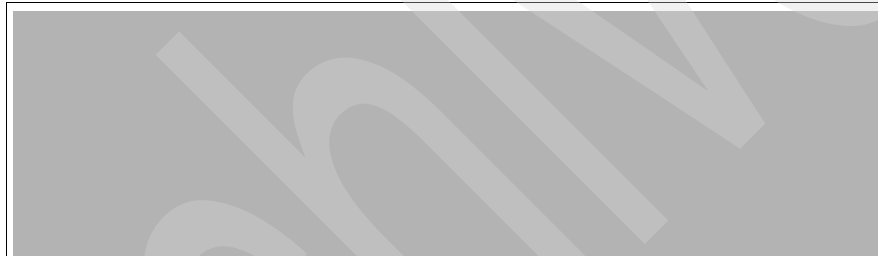
Figure 9-12   #5790 and #5796 drawer

9.1.10 #5791 I/O drawer, 20 slots, 16 disk bays

This feature provides a 4U high I/O drawer containing twenty PCI-X slots and 16 hot-swap disk bays. This drawer attaches to the central electronics complex using RIO-2 attachment cables.

> **Note:** Within the following figures, P*n* (for example P1 and P2) represents the planar board. PHB*n* represents the PCI Host Bridge grouping.

Figure 9-13 show the front view of the #5791 expansion unit.


Figure 9-13   Front view of #5791

Figure 9-14   Back view of #5791

Table 9-3 lists the locations and descriptions for #5791.

Table 9-3   Locations and descriptions for #5791

Location	Description	Location	Description
Un-P1	Backplane 1	Un-P1-00	RIO/HSL adapter card connector port 0 (bottom connector - P0)
Un-P2	Backplane 2	Un-P1-01	RIO/HSL adapter card connector port 1 (top connector - P1)
Un-P3 to Un-P6	Disk drive backplanes	Un-P2-00	RIO/HSL adapter card connector port 0 (bottom connector - P0)
P1-C01 to P2-C10	PCI Adapter Slots	Un-P2-01	RIO/HSL adapter card connector port 1 (top connector - P1)
PHB1 to PHB3	PCI Host bridge set	Un-P1-T3	Media subsystem power connector
Un-E1	Power supply 1 (left)	Un-P2-T3	Media subsystem power connector
Un-E1-T1	Super UPIC connector (left)	Un-P1-T5	Integrated SCSI controller port
Un-E1-T2	Super UPIC connector (right)	Un-P1-T6	Integrated SCSI controller port
Un-E2	Power supply 2 (right)	Un-P2-T5	Integrated SCSI controller port
Un-E2-T1	Super UPIC connector (left)	Un-P2-T6	Integrated SCSI controller port
Un-E2-T2	Super UPIC connector (right)	P3-D01 to P6-D16	Disk Drives

Figure 9-15 shows the PCI slot descriptions for #5791.

Figure 9-15   PCI slot descriptions #5791

9.1.11 #5794 I/O drawer, 20 slots, 8 disk bays

5794 provides a 4U high I/O drawer containing twenty PCI-X slots and eight hot-swap disk bays. This drawer attaches to the central electronics complex using RIO-2 attachment cables. For schematics and details refer to 9.1.10, "#5791 I/O drawer, 20 slots, 16 disk bays" on page 812

9.1.12 #5796 PCI-DDR 12X expansion drawer

The #5796 12X PCI Expansion Drawer is supported on the Models 8203-E4A, 8204-E8A, 9408-M25, 9409-M50, and 9117-MMA. The #5796 mounts in #0551, #0553, #0554, and #0555 power racks and uses four EIA units (half-width of the rack).

The #5796 is a four EIA unit I/O expansion drawer providing six full length, 266 MHz PCI-X DDR slots. These PCI-X DDR slots support only smart IOAs and do not support an IOP or an IOA which requires an IOP. Blind swap cassettes are used to insert or remove the PCI-X cards. The #5796 is attached to a system using a 12X loop. Either a 12X Short Run or 12X Long Run Attachment must be selected on each #5796. Up to four #5796 can be attached on the same 12X loop using a mixture of Short Run and Long Run Attachments.

The #5796 includes redundant hot-swap power and cooling with dual power cords. The blind swap PCI mechanism allows for PCI card concurrent maintenance without removing the I/O expansion drawer. The #5796 mounts in a 19 inch rack using a #7314 Dual #5796 Unit Enclosure. Two #5796 drawers can be mounted side by side in a single #7314 using a total of four EIA. The #5796 are not required to be attached to the same system.

The 12X I/O enclosure is the #5796 12X PCI-DDR expansion drawer that contains six full-length PCI-X DDR high-speed slots in a space-efficient package. Because each #5796 takes only half the 19 inch rack width, two #5796 features require only 4U of 19 inch rack space. Up to two #5796 features can be placed in a #7314 dual 5796 unit enclosure.

Each #5796 takes one of four possible positions per 12X loop. The #5796 attaches to the 12X loop using one of two #5796 12X adapters, one for shorter distances and one for longer distances. You can use the short run adapter #6446 with 12X loops on which all units are contained in the same rack. Use the long run adapter #6457 for units spread across multiple racks. Short run and long run adapters can be mixed on the same loop.

Figure 9-16 shows the front view of #5796.

Figure 9-16   Front view #5796

Figure 9-17 shows the rear view of #5796.

Figure 9-17   Rear view #5796

Figure 9-18 shows the location code descriptions for #5796.
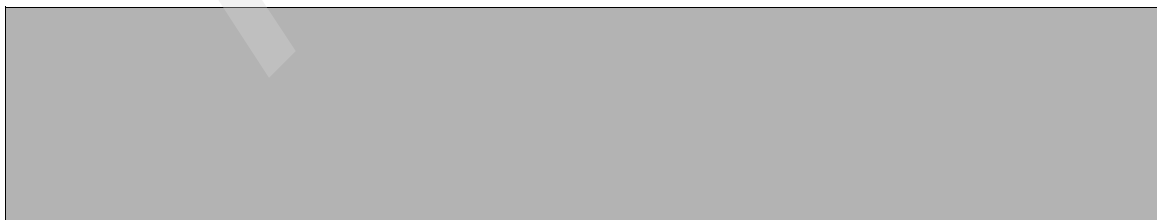
Figure 9-18   Location code descriptions #5796

Figure 9-19 shows PCI-X DDR slot properties for #5796.

Figure 9-19   PCI-X DDR slot properties for #5796

Notes:

- A #5796 PCI-DDR 12X Expansion Drawer supports only I/O adapters that can run without an IOP (IOP-less mode). There are no disk slots within this drawer.

- The #5796 includes redundant concurrently maintainable power and cooling. The blind swap PCI mechanism allows for PCI card servicing without removing the I/O expansion drawer. All of the #5796 six I/O slots are PCI-X 2.0 (64-bit, 266 MHz) slots. For more information about PCI placement rules, see *Power Systems PCI Adapter Placement Guide For Machine Type 820X and 91XX* PDF at:

  https://publib.boulder.ibm.com/infocenter/systems/scope/hw/topic/iphdx/sa76-0090.pdf

- For general information about additional 12X cabling information, see the following sections:

  - 9.1.13, "12X cables connection" on page 817
  - "New I/O loop 12X I/O architecture support" on page 732
  - 11.2.1, "RIO-2 12X cables and connectors summary" on page 859

Each #5796 takes one of four possible positions per 12X loop, as listed in Table 9-4. The #5796 attaches to the 12X loop using one of two #5796 12X adapters, one for shorter distances or one for longer distances. The short run (SR) adapter #6446/9533 can be used with 12X loops on which all units are contained in the same rack. The long run (LR) adapter #6457/8532 can be used for units spread across multiple racks. Short run and long run adapters can be mixed on the same loop.

In Table 9-4, *Yes* indicates that the 12X cable identified in that column can be used to connect the configuration identified in the first column. *No* means it cannot be used in the configuration.

Table 9-4   Possible cable connections for each #5796

Configuration	0.6 m (#1829)[a]	1.5 m (#1830)[b]	3.0 m (#1840)	8.0 m (#1834)[c]
#5796 to #5796 with Short Run adapter (#6446) in both drawers	Yes	Yes	No	No
#5796 with Short Run adapter (#6446) to #5796 with Long Run adapter (#6457)	Yes	Yes	Yes	No

Configuration	0.6 m (#1829)[a]	1.5 m (#1830)[b]	3.0 m (#1840)	8.0 m (#1834)[c]
#5796 to #5796 with Long Run adapter (#6457) in both drawers	Yes	Yes	Yes	Yes
#5796 with Short Run adapter (#6446) to 12X Channel CEC adapter (#1802)	No	Yes	Yes	No
#5796 with Long Run adapter (#6457) to 12X Channel CEC adapter (#1802)	No	Yes	Yes	Yes

a. The 0.6 m 12X cable (#1829) cannot be used to connect to a processor enclosure because of its short length. It is intended for use between two #5796 drawers mounted side-by-side in the same #7314 enclosure or to connect between two #5796 drawers located one beneath the other in a rack.

b. It is possible in some limited configurations to use the 3.0 M 12X cable (#1840) to locate #5796 drawers in adjacent racks. The cable length requires careful management of each drawer location within the rack. The best choice for connecting a #5796 drawer in an adjacent rack is the 8.0 M 12X cable (#1834).

c. The 12X cable (#1834) is intended for use when connecting between two modules that are located in adjacent racks. This cable cannot be connected to the 12X Short Run adapter (#6446). The #5796 supports only Dual mode (smart) IOAs and does not support an IOP or a card that requires an IOP.

9.1.13 12X cables connection

When using 12X cables, keep the following key considerations in mind:

► 12X cables are different from RIO-2 cables

► Must match cable length and #5796 adapter

 – #6446 Short run adapter
 – #6457 Long run adapter

► 4 cable lengths

 – #1829 0.6 meter

 • Connect adjacent 12x I/O drawers in a rack

 • Not for CEC (Needs more cable length to allow for processor enclosure to slide in/out of rack)

 – #1830 1.5 meter

 • Connect adjacent 12x I/O drawers in a rack

 • Not for CEC (Needs more cable length to allow for processor enclosure to slide in/out of rack)

 – #1840 3.0 meter

 • Need long run adapter

 • For CEC attachment

 – #1834 8.0 meter

You must determine when to need a long run adapter.

9.1.14 #5797 (with repeater), #5798 (no repeater) 12X I/O drawer PCI-X

This I/O drawer is supported on the 9119-FHA and provides a 4U high I/O drawer containing twenty PCI-X slots and sixteen hot-swap SCSI disk bays. This drawer attaches to the central electronics complex through 12X attachment cables. #5797 comes with a repeater card installed. The repeater card is designed to strengthen signal strength over the Longer 12X

cables used with the Power Expansion Rack (#6954) and nonpowered, Bolt-on Expansion Rack (#6983).

The #5798 12X I/O Drawer PCI-X is the same drawer without the repeater card and includes the following key characteristics:

► Six PCI-X and 14 PCI-X 266 per Drawer
► All adapter slots 64-bits
► GX Dual Port 12X Channel
► Supports 16 Hot-Plug disk drives
► Four 4-pack disk and Ultra3 SCSI
► Multiple cabling options are available
► Hot Drawer Add

Figure 9-20 depicts the 20 PCI-card slots from the rear.
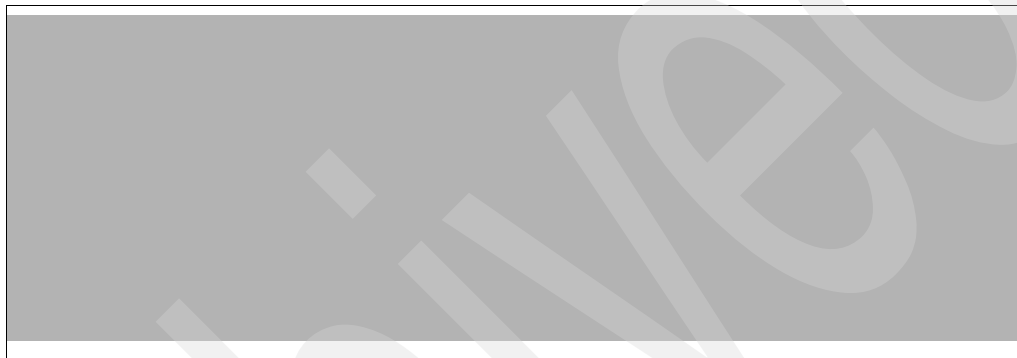
Figure 9-20   Rear view #5797 and #5798

Figure 9-21 shows the slot properties for this expansion unit. All slots are long. Slots 1-7 and 11-17 each have a dedicated PCI host bridge (PHB). Slots 8-10 share a PHB with each other and two SCSI buses (SCSI-1 and SCSI-2) on the same planar. Slots 18-20 share a PHB with each other and two SCSI buses (SCSI-3 and SCSI-4) on the same planar.

Figure 9-21   Slot descriptions for #5797 and #5798

9.1.15 #5886 EXP 12S expansion drawer

EXP 12S is an Expansion Drawer with 12 SAS storage slots, as shown in Figure 9-22. It supports up to 12 hot-swap SAS disk drives in mega-pack carriers. SAS Enclosure includes redundant ac power supplies and two Service Managers. EXP 12S takes up a 2 EIA space in a 19 inch rack. The enclosure attaches to a host server using the appropriate external SAS cables and SAS controllers.
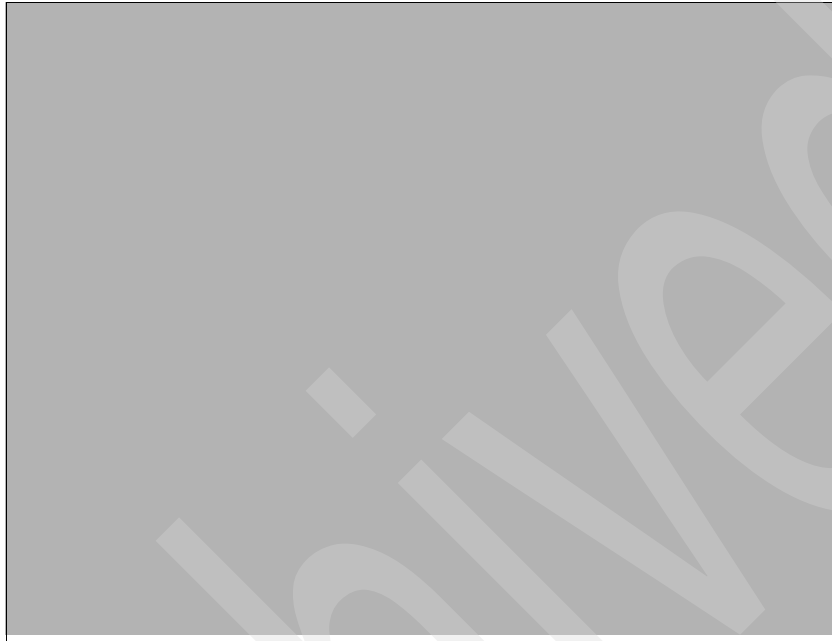
Figure 9-22   EXP 12S #5996 front and rear views

Table 9-5 lists the locations and descriptions for #5886.

Table 9-5   5886 Locations and descriptions

Location	Description
Un-C1	ESM A
Un-C2	ESM B
Un-E1	Power supply
Un-E2	Power supply
P1-D1 to P1-D12	Disk Drives

Note: *ESM* stands for Enclosure Services Manager.

9.1.16 #7040-61D expansion unit

7040-61D is a System p enclosure. 7040-61D I/O drawers only supported in the 9119-FHA server when #4643 in a 9119-590 or -595 is converted to a #5809. The IBM 7040 Model 61D I/O drawer provides PCI or PCI-X adapter slots and internal disk capabilities for use with 9119-FHA. The Model 61D is a 4U drawer which mounts in the 24 inch 7014 System Rack and connects to the system Central Electronics Complex using remote I/O cables.

Each model 61D I/O drawer provides 20 blind-swap PCI or PCI-X slots and 16 hot-swap disk bays. The Model 61D utilizes redundant power converters and power cabling to ensure high reliability and availability.

For schematics and details refer to 9.1.10, "#5791 I/O drawer, 20 slots, 16 disk bays" on page 812

9.1.17 #7311-D11 expansion unit

7311-D11 is a System p enclosure. The IBM 7311 Model D11 I/O Drawer is a rack-mountable expansion cabinet that can be attached to selected 9117-MMA. The D11 drawer is for customers who need more I/O slots than are available in the Host system. Each model D11 drawer gives you six full-length adapter slots. Up to 20 model D11 drawers are supported on the 9117-MMA. The Model D11 requires 4 U of vertical space in a 19 inch rack, such as the IBM 7014-T00, 7014-T42 or 7014-S25. Two D11 drawers can fit side by side within the enclosure (rack-mounting hardware provided).

For schematics and details refer to 9.1.8, "#5790 PCI Expansion Drawer" on page 810.

9.1.18 #7311-D20 expansion unit

7311-D20 is a System p enclosure. The 7311-D20 Expansion Drawer is a 4 EIA unit drawer and mounts in a 19-in rack. It is 24 inches long and can weigh up to 101 pounds. The high density expansion drawer provides additional adapter slots and SCSI disk slots as remote I/O. There are seven hot-swap PCI-X 64-bit, 133 MHz, 3.3 volt I/O slots and twelve optional hot-swap disk drive bays. The drawer includes redundant power and cooling. The fans, power supplies, and PCI adapters, are top-accessible while the disk drives are front-accessible for easy service and maintenance. The D20 attaches to a host system CEC enclosure with a RIO-2 adapter.

Figure 9-23 shows the front view of the #7311-D20.
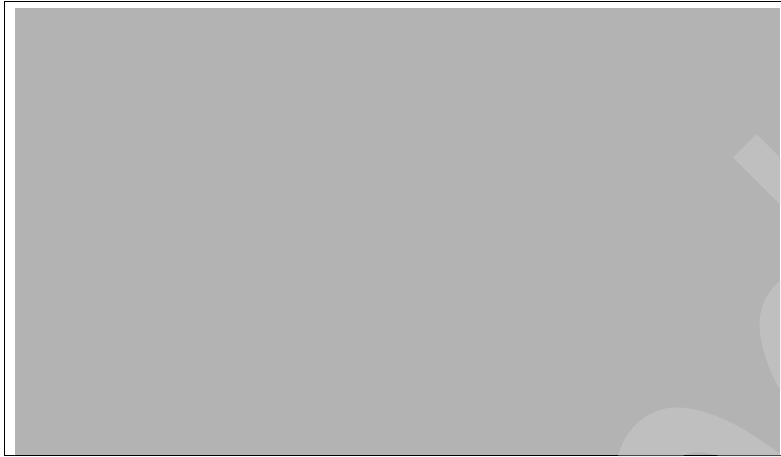
Figure 9-23   7311-D20 front view

Figure 9-24 shows the back view of the #7311-D20.

Figure 9-24   7311-D20 rear view

Figure 9-25 shows the slot descriptions for the #7311-D20.

Figure 9-25   7311-D20 slot descriptions

9.2 Required EIA units

The IBM marketing configurator does not manage rack space in IBM Power model racks. Table 9-6 lists the number of EIA units that are required for each Hardware Management Console (HMC), Power system unit, processor enclosure, or expansion tower installed in a IBM Power system rack.

Table 9-6   EIA units required for each HMC, Power system unit, processor enclosure, or expansion tower

IBM Power System and System i model or tower	#0551 System i 36U 1.8 m Rack (7014-T00)	#0553 System i 42U 2.0 m Rack (7014-T42)	#0554 System i 11U .6 m Rack	#0555 System i 25U 1.3 m Rack (7014-S25)
Model 270 system unit	16, includes two EIA for the #0133 and #0137			
Model 515 System Unit	4	N/A	N/A	4
Model 520 System Unit	4	4	4	4
Model 525 System Unit	4	4	N/A	4
Model 550 System Unit	4	4	4	4
Model 570 (POWER5 and POWER6) processor enclosure	4	0/4 - 4 5/8 - 8 9/12 - 12 13/16 - 16		
Model 595 processor enclosure	Not available in a #0551 System i 36U 1.8 m Rack			
Model 800 system unit	16 (includes two EIA for the #0133 and #0137)	16 (includes two EIA for the #0133 and #0137)		
Model 810 system unit	16 (includes two EIA for the #0133 and #0137)	16 (includes two EIA for the #0133 and #0137)		
Model 825 system unit	16 (includes two EIA for the #0134 and #0138)	16 (includes two EIA for the #0134 and #0138)		

IBM Power System and System i model or tower	#0551 System i 36U 1.8 m Rack (7014-T00)	#0553 System i 42U 2.0 m Rack (7014-T42)	#0554 System i 11U .6 m Rack	#0555 System i 25U 1.3 m Rack (7014-S25)
#0595 PCI-X Expansion Unit in Rack	5	5		
#0578 PCI Expansion Unit in Rack	8			
#0588 PCI-X Expansion Unit in Rack	8	8		
#5074 PCI Expansion Tower	18			
#5094 PCI-X expansion tower	18 (reference RPQ #847215)	18 (reference RPQ #847215)		
#5096 PCI-X expansion tower (no disk)	N/A	N/A	N/A	N/A
#5786 TotalStorage Expansion 24 Disk Drawer	4	4	4	4
#5790 PCI Expansion Drawer (half wide)		4		
#5796 12X PCI Expansion Drawer (half wide)		4		
#6586 Modem Tray for 19-Inch Rack	1U	1U	1U	1U
#7307 Dual I/O Unit Enclosure	4	4	4	4
#7311 Dual I/O Unit Enclosure	4	4	4	4
Model 7310-CR2 HMC rack mountable console		1		
#9079 Base I/O Tower	18			

9.3 Example RIO-2 loop I/O enclosure placement

This section discusses placement of I/O enclosures on a loop. It addresses situations where a very high I/Os per second rate requirement and multiple I/O enclosures are required on the same RIO-2 loop. This section assumes that you have analyzed other performance factors, such as sufficient processor capacity and main memory storage, and judged those to be as good as possible.

Placement of an I/O enclosure containing the high speed capacity adapters and devices, when actually receiving very high I/O rates, should be closest to the GX adapter on the system for that loop.

Figure 9-26 shows a three I/O enclosure RIO-2 loop as the example because more experience in this area exists than with the newer 12X loop attachment technology.

Figure 9-26   Placement of RIO-2 I/O enclosures on the same loop

RIO-2 technology, assuming no failing adapters within the RIO-2 loop, can deliver sustained high I/Os per second to enclosures 1 and 3. Note that I/O enclosure placement is important only in the highest numbers of I/Os per second rates.

10

Tape and optical storage attachment summary

In this chapter, we summarize Power System tape hardware-level support. We include specifications for internal tape devices, optical device and DVD device support, alternate installation device capabilities, and tape devices attached through Fibre Channel, SCSI, SAN, and SAS Adapters. This chapter also summarizes IBM i initial program load (IPL) support using tape as an alternate IPL device.

In this chapter, we provide summary descriptions of the tape devices and list the adapters (IOAs) that support tape and optical devices on POWER6 systems. Not all supported operating systems support all IOAs and tape devices, and not all IOAs support all tape devices.

There are many IBM Web sites and publications that provide information in addition to that which we include in this chapter. The purpose of this chapter is to minimize the search for information that is available for specific tape device support. Refer to Chapter 4, "Feature descriptions and related information" on page 187 for full descriptions of the adapters that we list here, which includes identification of the required operating system release levels required.

Consult the following very good sources of additional tape and optical device support information, some of which are updated more frequently than this paper:

► IBM Prerequisite Web site:

  https://www-912.ibm.com/e_dir/eserverprereq.nsfi

► IBM System Storage Web site, on which the following direct links to IBM tape and disk storage categories are available:

  – http://www-03.ibm.com/systems/storage/disk/
  – http://www-03.ibm.com/systems/storage/tape/index.html

► Recent IBM Redbooks publication about tape support:

  – *Implementing IBM Tape in UNIX Systems*, SG24-6502
  – *Implementing IBM Tape in i5/OS*, SG24-7440
  – *IBM System Storage Tape Encryption Solutions*, SG24-7320

10.1 Processor enclosure tape devices

This chapter focuses on tape and optical devices and libraries that attached to the system using a PCI-based adapter. In this section, however, we summarize tape devices that are supported within the processor enclosure on POWER6 MTMs.

The following devices are the processor enclosure tape device choices that are available on Power 520 and 550 MTMs, and where noted are available within a 9117-FHA rack using a #5720 DVD/Tape SAS External Storage Unit.

► #5746 Half High 800 GB 1.6 TB LTO4 SAS Tape Drive

The #5746 SAS Tape Drive uses industry standard Ultrium media. The Tape drive process the following LTO-formatted media with a capacity of up to 800 GB native or 1.6 TB compressed:

– Write/Read Ultrium4 (LTO-4)
– Write/Read Ultrium3 (LTO-3)
– Read Ultrium2 (LT02) formats. It has capacity of 800GB native or 1.6TB compressed.

The #5746 Half High 800 GB 1.6 TB LTO4 SAS Tape Drive is also supported on 9119-FHA within a DVD/Tape SAS External Storage Unit #5720.

► #5907 36/72 GB 4 mm DAT72 SAS Tape Drive

The 36/72 GB 4 mm Internal Tape Drive is a 5.25 inch, half-high, LVD 16-bit tape drive, for save/restore and archive functions. This DDS Gen5 tape drive uses IBM 4 mm data cartridges and is compression capable, providing a capacity of up to 36 GB native mode, 72 GB (typical) compression mode.

It uses a Serial Attached SCSI (SAS) interface and can process the following DAT formatted media:

– Read/Write DDS3 - 12 GB native, 24 GB compression
– Read/Write DDS4 - 20 GB native, 40 GB compression
– Read/Write DAT72 - 36 GB native, 72 GB compression

► #5619 80/160 GB DAT160 SAS tape drive

The #5619 Internal Tape Drive is a 5.25 inch, half-high device for save/ restore and archive functions. This DDS Gen6 tape drive uses the new larger IBM DAT160 and 4-mm data cartridges and is compression capable, providing a capacity of up 80GB native, 160 GB (typical) compression mode.

This is a significant increase in capacity over the previously available 36/72 GB 4-mm internal tape drives (when using a DAT160 Data Cartridge).

It uses a Serial Attached SCSI (SAS) interface and can process the following DAT formatted media:

– Read/Write DDS4 (R/W)
– Read/Write DAT72
– Read/Write DAT160

#5619 is also supported on 9119-FHA within a DVD/Tape SAS External Storage Unit #5720.

For other tape options, you must use an PCI-X or PCIe card slot IOA card within the enclosure or a PCI card within an I/O enclose on a GX adapter loop.

For more complete information, read the feature descriptions that are available in Chapter 4, "Feature descriptions and related information" on page 187.

Lower cost devices in this group include the IBM 7207-330 or IBM 7212-103 with feature #1107/1108 - external QIC tape drive, attaching through the #5775 dual mode IOA (with or without an IOP) or using a SCSI-attached IOP-IOA are available.

The next sections describe these external tape device options.

10.2 External tape and optical overview

Tape technology continues to figure significantly into IT infrastructures for high-capacity storage backup. Its unique attributes can help users manage storage requirements and contribute to the ever-present value of tape in the storage hierarchy.

IBM tape technology has the following benefits:

▶ Removable: You can store tape away to help protect it from viruses, sabotage, and other corruption.

▶ Scalable: With tape, you can add more cartridges, instead of drives.

▶ Portable: You can move tape to another site to avoid destruction in the event the first site suffers threat or damage.

▶ Fast: With tape, up to 160 Mbps (with 2:1 compression) for IBM Linear Tape Open and generation three systems.

▶ Reliable: IBM tape technology has demonstrated reliable servo mechanism characteristics, read after write verification, and advanced error correction systems.

Tape technology can help you address compliance requirements and Write Once Read Many (WORM) applications. It also has a low total cost of ownership, costing up to 10 times less than disk. Using today's disk-to-disk to tape methodology, tape technology is a key element.

> **Note:** IBM i supports the WORM function on 3592 J1A and 3592 E05 WORM cartridges. 3592 WORM support requires IOP-IOA configurations. IBM i does not formally support WORM on LTO tape technology through September 2008.
>
> WORM support on tape devices requires special I/O instructions and a tape media designed for WORM usage. IBM i plans to support LTO WORM support in the future on IOP-less IOAs, but availability has not been announced. If LTO WORM support is critical to an IBM i environment, explore the possibilities of submitting a Request for Price Quote (RPQ) proposal with an IBM representative.

Optical systems are designed for archival storage applications that require secure, long-term data retention.

10.3 External tape devices supported on IBM Power Systems

External tape drives, media auto loaders, tape library subsystems, optical systems offer an optional I/O attachment for data interchange or backup and recovery purposes. This section summarizes the external tape drives, media auto loaders, tape library subsystems, and optical systems that offer an optional I/O attachment for data interchange or backup and recovery purposes.

In 10.6, "Storage adapters and tape devices supported" on page 850, we provide tables that list the adapters and operating system levels that support these devices.

10.3.1 IBM System Storage TS2230 Tape Drive Express models

The IBM System Storage TS2230 Tape Drive Express models include:

► 3580S3E (SAS version)
► 3580L3E (LVD SCSI version)

The IBM System Storage TS2230 Tape Drive Express is the entry-level IBM System Storage tape product family offering that is the choice for growing storage requirements and shrinking backup windows. By taking advantage of advanced Linear Tape Open technology and the half-high format, the TS2230 Tape Drive is suited for handling the backup, save and restore, and archival data storage needs of a wide range of small systems.

The System Storage TS2230 Tape Drive Express, shown in Figure 10-1, is an excellent tape storage solution for businesses requiring backup or low-cost, real-time archival of their data within a small window of time. The TS2230 has a storage capacity of up to 800 GB (with 2:1 compression) in conjunction with the IBM TotalStorage LTO Ultrium 400 GB data cartridge, which is double the capacity of the Ultrium 2,technology. Along with its higher capacity, the performance of the TS2230 Tape Drive has more than doubled over the previous generation of half-high LTO drives in the market for a native data transfer rate of up to 60 MBps. The TS2230 Tape Drive provides an excellent alternative to slower and smaller capacity 1/4 inch, 4 mm and 8 mm DLT/SDLT tape drives.

Figure 10-1   TS2230 Tape Drive

10.3.2 IBM System Storage TS2240 Tape Drive Express model

The IBM System Storage TS2240 Tape Drive Express includes model 3580 H4S. It has one IBM Ultrium 4 Tape Drive, 3 Gbps SAS attach, PN3580S4E, PN 3580E4S, and Express Seller bundle with rack mount kit.

The IBM System Storage TS2240 Tape Drive Express is the entry-level IBM TotalStorage tape product family offering that provides the answer to growing storage requirements and shrinking backup windows. Incorporating the latest generation of advanced Linear Tape Open technology, the TS2240 Tape Drive is suited for handling the backup, save and restore, and archival data storage needs of a wide range of small systems. In addition, the TS2240 provides added security features by supporting encryption of data with 3 Gbps SAS connectivity.

The System Storage TS2240 Tape Drive, shown in Figure 10-2, is an excellent tape storage solution for businesses requiring backup or low-cost, real-time archival storage of their data. The TS2240, with a half-high form factor, offers the same high capacity of full-high LTO 4 tape drives. The TS2240 has a physical storage capacity of up to 1.6 TB (with a 2:1 compression) in conjunction with the new IBM System Storage LTO Ultrium, 800 GB data cartridge, which

provides up to double the capacity of Ultrium 3 cartridges. The native data transfer performance of the TS2240 Tape Drive has increased over the previous LTO half-high generation to up to 120 MBps. The TS2240 Tape Drive continues to provide an excellent alternative to slower and smaller capacity 1/4 inch, 4 mm and 8 mm DLT/SDLT tape drives.

Figure 10-2   TS2240 Tape Drive

10.3.3 IBM System Storage 3580 Tape Drive model L33 LVD attach Ultrium 3

The IBM TotalStorage 3580 model L33 Tape Drive, shown in Figure 10-3, is an external drive incorporating the third and latest generation of IBM LTO technology. This is an external stand-alone or rack-mountable unit, similar to previous models of the 3580 and is the entry point for the family of IBM Ultrium tape products. The 3580 Tape Drive provides an excellent migration path from digital linear tape (DLT or SDLT), 1/4 inch, 4 mm, or 8 mm tape drives. The 3580 model L33 can read and write LTO Ultrium 2 Data Cartridges and read LTO Ultrium 1 Data Cartridges.

Figure 10-3   3580 Tape Drive

IBM System Storage 3580 Tape Drive Express model 3580-L3H

The IBM TotalStorage 3580 Tape Drive Express, shown in Figure 10-4, is an external drive incorporating the third generation of IBM LTO technology. This is an external stand-alone or rack-mountable unit, similar to previous models of the 3580 and is the entry point for the family of IBM Ultrium tape products. By taking advantage of advanced LTO technology, the TotalStorage 3580 Express is suited for handling the backup, save and restore, and archival data storage needs of a wide range of small systems.

Figure 10-4   3580 Tape Drive Express

IBM System Storage TS2340 Tape Drive Express models

The IBM System Storage TS2340 Tape Drive Express includes the following models:

► 3580 Model L43 - One IBM Ultrium 4 Tape Drive, LVD Ultra160 SCSI attach
► 3580 Model S43 - One IBM Ultrium 4 Tape Drive, 3 Gbps SAS attach

The IBM System Storage TS2340 Tape Drive Express is the entry-level IBM System Storage tape product family offering. It provides an answer to growing storage requirements and shrinking backup windows. Incorporating the latest generation of advanced Linear Tape Open technology, the TS2340 Tape Drive is suited for handling the backup, save and restore, and archival data storage needs of a wide range of small systems. In addition, the TS2340 provides added security features by supporting encryption of data with 3 Gbps SAS connectivity.

The System Storage TS2340 Tape Drive, shown in Figure 10-5 on page 832, is an excellent tape storage solution for businesses requiring backup or low-cost, real-time archival storage of their data within a small window of time-it offers high-capacity and performance to help address the most demanding requirements. The TS2340 has a physical storage capacity of up to 1.6 TB (with a 2:1 compression) in conjunction with the new IBM Ultrium 800 GB data cartridge, which provides up to double the capacity of the Ultrium 3 technology. Along with its higher capacity, the data transfer performance of the TS2340 Tape Drive has increased over the previous generation for a native data transfer rate of up to 120 MBps. The TS2340 Tape Drive continues to provide an excellent alternative to slower and smaller capacity 1/4 inch, 4 mm and 8 mm DLT/SDLT tape drives.

Figure 10-5   TS2340 Tape Drive Express

IBM System Storage TS3100 Tape Library Express models

The IBM System Storage TS3100 Tape Library Express includes the following models:

► 3573 L2U, 3573L3S (Express model, PN), includes IBM LTO Ultrium 3 LVD Ultra160 attach, SCSI tape drive, and rack mount kit

► 3573F3S (Express model, PN), includes IBM LTO Ultrium 3 four Gbps Fibre Channel tape drive, and rack mount kit

► 3573L4S (High Volume, PN), includes IBM LTO Ultrium 4 LVD Ultra160 attach SCSI tape drive

► 3573F4S (High Volume, PN), includes IBM LTO Ultrium four 4 Gbps Fibre Channel tape drive

► 3573S4S (High Volume, PN), includes IBM LTO Ultrium four 3 Gbps SAS tape drive

The IBM System Storage TS3100 Tape Library Express is well-suited for handling backup, save and restore, and archival data-storage needs for small to medium-size environments. With its single Ultrium 4 or Ultrium 3 Tape Drive and 24 tape cartridge capacity, the IBM TS3100 model is designed to take advantage of LTO technology to handle growing storage requirements cost effectively. The TS3100 Tape Library is configured with two removable cartridge magazines, one on the left side and one on the right. Additionally, the left magazine includes a single mail slot to help support continuous library operation while importing/exporting media. A barcode reader is standard in the library, supporting the library's operation in sequential or random access mode. The TS3100 also comes standard with remote management capabilities to allow for remote administration of the tape library through a Web interface.

The IBM Ultrium 4 drive has more than double the drive throughput of the third-generation LTO Ultrium Tape Drives and up to nearly 10 times the throughput of the first-generation drive. The IBM LTO Ultrium 4 Tape Drives are designed to support up to 120 MBps native data-transfer rates. In addition, with the use of the new IBM TotalStorage LTO Ultrium 800 GB Data Cartridge, the IBM Ultrium 4 Tape Drive doubles tape-cartridge physical capacity up to 800 GB native physical capacity (1.6 TB with a 2:1 compression), providing an IBM TS3100 Tape Library capacity of up to 38.4 TB with a 2:1 compression or 19.2 TB native. The IBM Ultrium 4 Tape Drives are designed to read and write third-generation LTO Ultrium data cartridges and read LTO Ultrium 2 data cartridges with improved data rates. The new Ultrium 4 technology helps support the encryption of data when using either IBMLOT 4 four Gbps FC or 3 Gbps SAS tape drives. As storage needs grow, you can build on this storage investment by moving to higher capacity and performance automated libraries employing the new IBM Ultrium 4 Tape Drive technology.

Figure 10-6 shows the TS3100 Tape Library Express.

Figure 10-6   TS3100 Tape Library Express

TS3100 Tape Library Express models featuring half-high Ultrium

The IBM TS3100 Tape Library Express includes the following models:

► 3573L32: TS3100 with LTO-3 HH SCSI tape drive
► 3573S32: TS3100 with LTO-3 HH 3 Gbps SAS tape drive
► 3573S42: TS3100 with LTO-4 HH 3 Gbps SAS tape drive
► 3573E42: TS3100 with LTO-4 HH 3 Gbps SAS tape drive and rack mount kit (Express Seller)

The IBM TS3100 Tape Library Express featuring half-high Ultrium technology is well-suited for handling backup, save and restore and archival data-storage needs for small to medium-size environments. With the use of up to two LTO Half-High tape drives and 24 tape cartridge capacity, the IBM TS3100 HH model is designed to take advantage of LTO technology to cost-effectively handle growing storage requirements. The TS3100 Tape Library featuring half-high drive technology is configured with two removable cartridge magazines, one on the left side (12 data cartridge slots) and one on the right (12 data cartridge slots).

Additionally, the left magazine includes a single mail slot to help support continuous library operation while importing and exporting media. A barcode reader is standard in the library, supporting the library's operation in sequential or random access mode. The TS3100 HH also comes standard with remote management capabilities to allow for remote administration of the tape library through a Web interface.

IBM System Storage TS3200 Tape Library Express models

The IBM System Storage TS3200 Tape Library Express includes the following models:

► 3573 L4U, 3573L3H (Express model, PN), includes IBM LTO Ultrium 3 LVD Ultra160 attach, SCSI tape drive, and rack mount kit

► 3573F3H (Express model, PN), includes IBM LTO Ultrium 3 four Gbps Fibre Channel tape drive, and rack mount kit

► 3573L4H (Express PN), includes IBM LTO Ultrium 4 LVD Ultra160 attach, SCSI tape drive

► 3573S4H (Express PN), includes IBM LTO Ultrium four 3 Gbps SAS attach tape drive

► 3573F4H (Express PN) includes IBM LTO Ultrium four 4 Gbps Fibre Channel attach tape drive

The IBM System Storage TS3200 Tape Library Express Model is designed to offer high capacity and performance technology for the midrange open systems environments. The TS3200 Tape Library is an external 4U stand-alone or rack-mountable unit that incorporates up to two Linear Tape-Open (LTO), IBM TotalStorage's Ultrium 4 or 3 Tape. The new LTO Ultrium 4 tape drive has a native data rate of up to 120 Mbps, per drive.

The IBM System Storage TS3200 Tape Library Express Model is an excellent tape storage solution for organizations with existing digital linear tape or requiring high-performance automated tape backup. The TS3200 is also designed for organizations that have limited physical space in their IT environments. Operating in a rack environment allows organizations the advantage of placing the TS3200 in a standard 19 inch rack, which provides 76.8 TB of compressed tape storage in just a 4U space.

The TS3200 Tape Library, shown in Figure 10-7, can be ordered with up to two Ultrium 4 or Ultrium 3 LVD SCSI, 4 Gbps Fibre Channel 3 Gbps SAS (LTO4 only) drives, which allow connection to a wide spectrum of open systems servers. IBM Ultrium 4 tape drives can read and write LTO Ultrium 3 and read LTO Ultrium 2 data cartridges; in addition IBM Ultrium 4 tape drives in either 4 Gbps FC or 3 Gbps SAS attach help support encryption of data.

Figure 10-7   TS3200 Tape Library Express

10.3.4 TS3200 Tape Library Express models featuring half-high Ultrium

The IBM TS3200 Tape Library Express includes the following models:

► 3573L34: TS3200 with LTO-3 HH SCSI tape drive

► 3573S34: TS3200 with LTO-3 HH 3 Gbps SAS tape drive

► 3573S44: TS3200 with LTO-4 HH 3 Gbps SAS tape drive

► 3573E44: TS3200 with LTO-4 HH 3 Gbps SAS tape drive and rack mount kit (Express Seller)

The IBM TS3200 Tape Library Express featuring half-high Ultrium technology is well-suited for handling backup, save and restore and archival data-storage needs for small to medium-size environments. With the use of up to four LTO half-high tape drives and 48 tape cartridge capacity, the IBM TS3200 HH model is designed to use LTO technology to cost-effectively handle growing storage requirements. The TS3200 Tape Library is configured with four removable cartridge magazines, two on the left side (24 data cartridge slots) and two on the right (24 data cartridge slots). Additionally, the lower left magazine includes a three-slot I/O station to help support continuous library operation while importing and exporting media. A barcode reader is standard in the library, supporting the library's operation in sequential or random access mode. The TS3200 also comes standard with remote management capabilities to allow for remote administration of the tape library through a Web interface.

10.3.5 IBM System Storage TS1030 Tape Drive 3588 model F3B

The IBM System Storage TS1030 Tape Drive model F3B is an IBM LTO Ultrium 3 Tape Drive that combines IBM tape reliability and performance at open systems prices. The Ultrium 3 Tape Drive:

► More than doubles maximum data transfer rate, to up to 80 MBps native as compared to LTO Ultrium 2.

► Doubles maximum cartridge capacity, up to 400 GB native physical capacity per cartridge (800 GB with 2:1 compression).

► Includes a 4 Gbps Fibre Channel interface attachment,

► Offers enhanced features over Linear Tape Open Ultrium 2 in new dual-stage, 16-channel head actuator, new independent tape loader and threader motors, and internal buffer size.

► Adheres to LTO specifications.

► Mounts in TS3500 Tape Library Model L53 or D53, and in 3584 Tape Library Model L52, L32, D52, or D32.

Figure 10-8 shows the TS1030 Tape Drive.

Figure 10-8   TS1030 Tape Drive

10.3.6 IBM System Storage TS1040 Tape Drive (3588 model F4A)

The IBM System Storage TS1040 Tape Drive model F4A is an IBM LTO Ultrium 4 Tape Drive that combines IBM tape reliability and performance at open systems prices. The new Ultrium 4 Tape Drive provides the following capabilities:

► Increases maximum data transfer rate, providing to up to 120 MBps native as compared to LTO Ultrium 3.

► Provides up to 800 GB native physical capacity per cartridge (1,600 GB with 2:1 compression) with Ultrium 4 800 GB cartridge.

► Includes a 4 Gbps Fibre Channel interface attachment.

► Supports encryption capabilities designed to work with the IBM Encryption Key Manager Component.

► Adheres to LTO specifications.

► Mounts in TS3500 Tape Library Model L53 or D53 and in 3584 Tape Library Model L52, L32, D52, or D32.

Figure 10-9 shows the TS1040 Tape Drive.

Figure 10-9   TS1040 Tape Drive

10.3.7 IBM System Storage TS3310 Tape Library 3576 model L5B, E9U

The IBM System Storage TS3310 Tape Library is a modular, scalable tape library that is designed to address the tape storage needs of rapidly growing companies that have constrained space and resources with tape backup and other tape applications. Designed around a 5 EIA high modular base library unit, the TS3310 is designed to scale vertically with expansion for LTO tape cartridges, drives and redundant power supplies.

The base library module, model L5B, is the entry point for the product family. It contains all of the necessary robotics and intelligence to manage the 5U high library system, which houses

up to 36 cartridges (30 storage slots and 6 Input/Output slots) and two LTO generation 4 or generation 3 tape drives.

The TS3310 model L5B can be expanded with the addition of expansion units, the model E9U.

Each model E9U contains 92 physical LTO cartridge storage cells and space for up to four LTO 4 or LTO 3 tape drives. The TS3310 supports either the standard or WORM LTO data cartridge. Additionally, the E9U has space for up to two (one redundant) power supply modules. (At least one power supply module must be installed if a drive is present in the E9U.)

For organizations unsure of their short or long term tape capacity needs, the TS3310 Tape Library's Capacity on Demand (COD) built-in capability allows the system to scale as needs grow. In the initial shipped configuration, an E9U has half of its storage cells enabled. As your business grows, the purchase of a capacity on demand key allows you to enable the second half of the model E9U storage cells.

Building on the success of the patented multi-path architecture from IBM, the TS3310 can be divided into one logical library per installed tape drive. These logical libraries can be simultaneously connected to a wide variety of different servers, running different operating systems and tape applications.

Designed for the ultimate in system availability, optional data path and control path feature can help support ongoing host connectivity under a variety of adverse conditions.

Figure 10-10 shows the TS3310 Tape Library.

Figure 10-10   TS3310 Tape Library

10.3.8 IBM System Storage TS3500 Tape Library models

The IBM System Storage TS3500 Tape Library includes the following models:

- ► L23: Base frame for TS1120 or 3592
- ► D23: Expansion frame for TS1120 or 3592
- ► L53: Base frame for LTO
- ► D53: Expansion frame for LTO
- ► HA1: High Availability service bay frame for use with the dual accessor feature

The IBM System Storage TS3500 Tape Library (TS3500 tape library) provides a highly scalable, automated tape library for mainframe and open systems backup and archive in midrange to enterprise environments.

The TS3500 tape library, shown in Figure 10-11, can support up to four 3953 tape systems, allowing for up to eight IBM Virtualization Engine™ TS7700 subsystems per physical library.
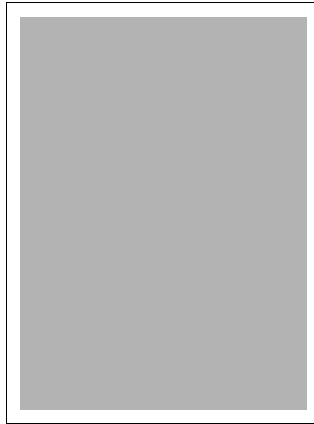
Figure 10-11   TS3500 Tape Library

10.3.9 IBM System Storage TS1120 Tape Drive 3592-E05, 3592-C06 tape controller

The IBM System Storage TS1120 Tape Drive (TS1120 tape drive) addresses applications that need high-capacity, fast access to data or long-term data retention. It is supported in IBM tape libraries, IBM frames that support stand-alone installation, and in an IBM 3592 Tape Frame Model C20 (3592 C20 frame) attached to a Sun™ StorageTek,9310 library.

The tape drive, shown in Figure 10-12, uses IBM 3592 Cartridges, which are available in limited capacity (100 GB) for fast access to data, and standard capacity (500 GB) or extended capacity (700 GB) that help to reduce resources to lower total cost. All three cartridges are available in re-writable or WORM format.

Figure 10-12   TS1120 Tape Drive

10.3.10 TS3400 Tape Library 3577-L5U

The IBM System Storage TS3400 Tape Library offers the high capacity and performance advantage of the IBM System Storage TS1120 Tape Drive in a smaller automation footprint for System i, System p, System x, System z®, and other open systems environments. The TS3400 tape library is an external 5U stand-alone or rack-mountable unit that supports up to two TS1120 tape drives with a data transfer rate of up to 104 MBps per drive.

The TS3400 tape library is an excellent tape storage solution for organizations already using TS1120 tape drives in their data centers who want to use the same technology in remote locations. The TS3400 is also designed for organizations that have limited physical space in

their IT environments. The TS3400 can be installed in a standard 19 inch rack, providing up to 37.8 TB of compressed tape storage in a 5U space.

The TS3400 tape library, shown in Figure 10-13, has two removable cartridge magazines, providing 18 data cartridge slots. Up to three slots can be used for I/O slots, and up to two slots can be used as cleaning cartridge slots. The TS3400 tape library provides a media capacity of up to 18 cartridges, allowing for up to 12.6 TB of storage (37.8 TB with 3:1 compression) when using 700 GB extended capacity cartridges.

Figure 10-13   TS3400 Tape Library

10.3.11 IBM TotalStorage TS3500 Tape Library models

The IBM System Storage TS3500 Tape Library includes the following models:

► L23: Base frame for TS1120 or 3592
► D23: Expansion frame for TS1120 or 3592
► L53: Base frame for LTO
► D53: Expansion frame for LTO
► HA1: High Availability service bay frame for use with the dual accessor feature

The IBM System Storage TS3500 Tape Library (TS3500 tape library) provides a highly scalable, automated tape library for mainframe and open systems backup and archive in midrange to enterprise environments.

The TS3500 tape library supports System z using the IBM 3953 Tape System (3953 tape system). The 3953 tape system enables System z hosts to access the TS3500 tape library cartridge inventory and allows connection to TS1120 and 3592 J1A tape drives.

Note: The TS3500 tape library can support up to four 3953 tape systems, allowing for up to eight IBM Virtualization Engine TS7700 subsystems per physical library.

The TS3500 Tape Library, shown in Figure 10-14, includes the following characteristics:

► Utilizes the IBM System Storage TS1040 Tape Drive, using LTO, Ultrium 4 technology for increased capacity, throughput, fast access performance and WORM data cartridges in open systems environments.

► Optional dual library accessor, with the IBM System Storage TS3500 Model HA1, designed to increase library performance, availability and reliability.

► Supports TS1120 and TS1040 tape drive encryption for data protection.

Figure 10-14   TS3500 Tape Library

10.3.12 TS7520 Virtualization Engine 3954 Model CV6 with 3955 Model SV6, 3955 Model SX6

The IBM Virtualization Engine TS7520 (TS7520 Virtualization Engine) combines hardware and software into an integrated tiered solution designed to provide tape virtualization for open systems servers connecting over Fibre Channel and iSCSI physical connections. When combined with physical tape resources for longer term data storage, the TS7520 Virtualization Engine is designed to provide an increased level of operational simplicity and energy efficiency, support a low cost of ownership and increase reliability to provide significant operational efficiencies.

One of the biggest issues with backup planning today is that the amount of data being backed up is growing, but the time allotted for a backup (the backup window) is shrinking or remaining static. With backup windows shrinking, tolerance for hardware failure has virtually disappeared. The TS7520 Virtualization Engine is designed to help address these issues by reducing tape mechanical delays and providing fault tolerant architecture options supporting high availability.

The following operating systems support the TS7520:

► AIX 5L V5.1, V5.2 and V5.3, V6.1 or later; POWER6 support requires AIX 5.3 or later

► IBM i 5.3, 5.4, 6.1 or later; POWER6 support requires IBM i 5.4 with LIC 5.4.5 or later

► Sun Solaris™ 8, 9, and 10

► Microsoft Windows 2003 (build 3790, or greater)

► 64-HP-UX 11iv1 and 11iv2

For Linux distributions, see the System Storage Web site TS7520 documentation for the range of LInux distributions support the TS7520.

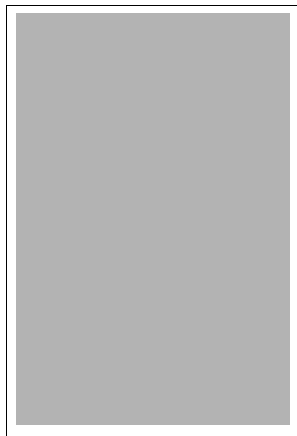Figure 10-15 shows the TS7520 Virtualization Engine.
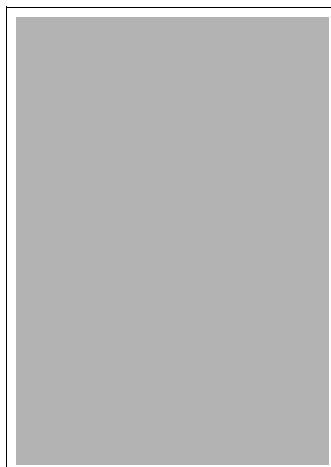
Figure 10-15   TS7520 Virtualization Engine

10.3.13 TS7530 VIrtualization Engine 3954 Model CV7 with 3955 Model SV6, 3955 Model SX6

The IBM Virtualization Engine TS7530 (TS7530 Server) combines hardware and software into an integrated tiered solution to help provide tape virtualization for open systems servers connecting over Fibre Channel and iSCSI physical connections. When combined with real tape resources for longer term data storage, the TS7530 Server can help provide an increased level of operational simplicity and energy efficiency, support a low cost of ownership and increase reliability to provide significant operational efficiencies.

The TS7530 helps reduce restore time by utilizing the data resident on disk. With support for up to 4,096 virtual tape drives and 512 virtual tape libraries, each backup server can be allocated its own virtual resources, allowing multiple and disparate backup applications to use the same physical resources. This offers the potential for infrastructure simplification. Various multiple tape libraries and tape drives can be aggregated to one or more TS7530s, helping centralize the backup resources and further reduce the operational cost.

A TS7530 dual-node high-availability configuration can have more virtual cartridges, virtual volumes and interface ports.

Each TS7530 Server supports up to 16 4 Gb Fibre Channel connections.

In a dual node system there are 24 Fibre Channel ports available for host server or tape attachment.

The TS7530 consists of three hardware machine types and a software program (5697-P19) Enterprise Edition. The 3952 Tape Frame Model F05 is an independent frame used to contain the other components of the TS7530.

The 3952 F05 Tape Frame can contain:

► Two TS7530 Servers (3954 Model CV7) in a base unit frame
► Two TS7520 Cache Controllers (3955 Model SV6)
► Up to 10 TS7520 Cache Modules (3955 Model SX6) in an expansion frame

Common features include:

► Heterogeneous server support
► Command Line Interface GUI

- ► Failover/failback
- ► Control Path Failover/Data Path Failover
- ► Supports TS1120 drive encryption
- ► Supports IBM LTO-4 drives and libraries

Hardware highlights include:

- ► Up to 2 base frames and 10 expansion frames
- ► One, two, or four 3954-CV7 servers
- ► Up to 3.4 PB capacity with 2:1 Compression
- ► Four FC ports per server
- ► Physical tape export
- ► Physical attach TS3500, TS3200, TS3310, 3494
- ► Hardware compression
- ► High availability configurations
- ► On demand allocation of disk

The following operating systems support the TS7530:

- ► AIX 5L V5.1, V5.2 and V5.3, V6.1 or later; POWER6 support requires AIX 5.3 or later
- ► IBM i 5.3, 5.4, 6.1 or later; POWER6 support requires IBM i 5.4 with LIC 5.4.5 or later
- ► Sun Solaris 8, 9, and 10
- ► Microsoft Windows 2003 (build 3790, or greater)
- ► 64-HP-UX 11iv1 and 11iv2

For Linux distributions, see the System Storage Web site TS7530 documentation for the range of LInux distributions support the TS7530.

The TS7530 is physically almost identical to the TS7520 as shown in Figure 10-15 on page 841.

10.3.14 IBM 7206 Model VX3 External VXA-320 Tape Drive

Effective 14 December 2007, IBM withdrew from marketing the 7206 Models VX2 and VX3 External VXA-2 or VXA-320 Tape Drives. On or after the effective dates of withdrawal, you can no longer order these products directly from IBM. You can obtain the products on an as-available basis through IBM Business Partners.

10.3.15 IBM 7206 Model 336 External DAT72 (DDS Gen 5) Tape Drive

The IBM 7206 Model 336 External DAT72 (DDS Gen 5) Tape Drive is designed to be a cost-effective tape drive featuring the popular DAT72 (DDS) tape technology. It is designed to offer improved data quality and performance and increased capacity compared to the IBM 7206 Model 220. The 7206 Model 336 supports a migration path to greater tape storage capacity at a price point similar to IBM 7206-220 DDS4 tape drives.

10.3.16 IBM 7207 External Tape Drive

The 7207 Model 330 SLR60 External Tape, shown in Figure 10-16, drive provides up to 37.5 GB of capacity and a data rate of 4 MBps. Media sizes of 30 GB and 37.5 GB are available. Assuming a compression of 2:1, typical of this tape drive, the tape drive reaches capacities of 60 GB and 75 GB respectively and a transfer rate of 8 MBps.

Figure 10-16   7207 External Tape Drive

10.3.17 IBM System Storage 7212 Storage Device Enclosure Express model

The IBM System Storage 7212 Storage Device Enclosure Express model, shown in Figure 10-17, features the latest technology options in tape drives and a DVD-RAM optical drive. The 7212 Express Model packaging is a low-profile, modular design that is an excellent choice for rack-mount or limited-space desktop applications.
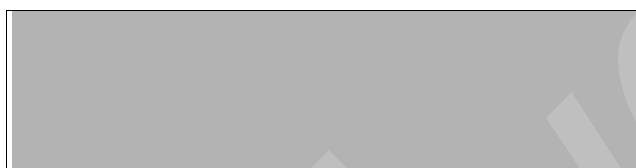
Figure 10-17   7271 Storage Device Enclosure Express

10.3.18 7214 Storage Device Enclosure

The 7214 storage enclosure is a 1U design that features two drive bays that can hold one tape drive, a slim design DVD-RAM drive and a DVD-ROM optical drive for a total of up to three drives. The 7214 storage device enclosure may also feature two tape drives. No more than two DVD drives may be featured in a single enclosure.

Connection of the 7214 enclosure to System p requires the PCI-X DDR Dual-x4 SAS Adapter (Feature # 5900 and 5912). Up to two 7214 enclosures may be attached to this adapter.

The new SAS electronic bus featured in the 7214 helps potentially provide higher through-put of drive data exchange on your System p server.

Figure 10-18 shows this enclosure.
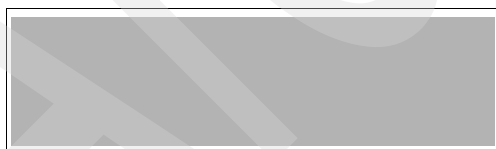
Figure 10-18   7214 Storage Device Enclosure

10.3.19 3995-Cxx IBM Optical Library Dataserver

The IBM 3995 C-Series family was withdrawn from marketing on 30 December 2005.

The IBM 3995 C-Series family is based upon 5.2 GB (8x) 5.25 inch Extended Multifunction optical drive technology, which enables support for magneto-optical (MO) rewritable, Permanent WORM, and Continuous Composite WORM (CCW) recording technologies in a single library. The latest generation of the 3995 C-Series family features 5.25 inch, industry-standard 5.2 GB (referred to as 8x) Extended Multifunction Optical Drives. This

family provides double the capacity over the previous 2.6 GB technology, allowing twice as much data to be stored on an optical cartridge.

Five SCSI-attached models are available, ranging from 104 GB to 1.341 TB (unformatted capacity), to support solutions in the open systems environment. Five AS/400-attached models are available, ranging from 104 GB to 1.341 TB (unformatted capacity) to support solutions in the AS/400 environment. Five LAN-attached models are available, ranging from 104 GB to 1.341 TB (unformatted capacity) to support solutions in the token ring and Ethernet LAN environments. Four S/390®-attached models are available, ranging from 270 GB to 1.341 TB (unformatted capacity) to support solutions in the S/390 environment. Three expansion units are available to further increase S/390 storage capacity up to 2.682 TB (unformatted capacity) per optical library subsystem.

10.3.20 IBM 3996 Optical Library Model 32, Model 80, and Model 174

The IBM 3996 Optical Library is designed to be a large-scale, externally attached, optics storage library that uses 60 GB UDO-2 optical disc technology. The 3996 library is offered in three models and is available for attachment to most models of the IBM System i family of workstations and servers.

This 3996 Optical Library family of optical libraries is being enhanced with support of 5.25 inch, 60 GB Ultra Density Optical (UDO) Generation 2 technology, and the new UDO media provides up to 10 times the maximum capacity of media used in the previous generation 3995 optical libraries offered by IBM. The IBM 3996 Optical Library supports permanent WORM and rewritable recording technologies in a single library. The 3996 library offers two options in optical drives: UDO-1 and UDO-2. All model of the 3996 library offer the flexibility of mixing UDO-1 and UDO-2 drives and media in the same library. The IBM 3996 is available as a low voltage differential (LVD) SCSI interface connectivity and has an optional barcode scanner to facilitate library inventory.

The 3996 Optical Library is offered in three models; Model 032, Model 080, and the Model 174. Each model supports permanent Write Once / Read Many (WORM), and rewritable recording technologies in a single library. Model 32 has the ability to handle up to 32 disks, providing up to 1.92 TB of physical capacity. The Model 32 has one optical disc drive, and an option for adding a second drive. Model 80 has the ability to handle up to 80 disks, providing up to 4.8 TB of physical capacity. The Model 80 has two optical disc drives with an option of increasing to four drives. When additional drives are added, the Model 80 has the ability to handle up to 72 disks, providing up to 4.32 TB of physical capacity. Model 174 has a physical capacity of up to 10.4 TB; each of the 174 media slots holds a disk with up to 60 GB of optical storage. The Model 174 has two optical disc drives with an option of increasing to four drives. When the additional drives are added, the 3996 Model 174 has the ability to handle up to 166 disks, providing up to 9.96 TB of physical capacity.

The IBM 3996 features an optional barcode scanner in all three optical model offerings. The three main benefits of bar coding are out-of-library media management, faster media inventorying inside the library, and added security.

Figure 10-19 shows the IBM 3996 Optical Library.

Figure 10-19   IBM 3996 Optical Library

10.3.21 IBM POWER5 and earlier model information

Consult the following resources to find information about tape and optical device support for IBM models that are not POWER6 technology:

► For System i family of models

– For IBM System i family models, refer to *IBM System i Overview: Models 515, 525, 550, 570, 595, and More*, REDP-5052:

http://www.redbooks.ibm.com/abstracts/redp5052.html?Open

– For other System i models, refer to the IBM storage Web site:

http://www-03.ibm.com/systems/storage/product/i.html

– For all storage products:

http://www-03.ibm.com/systems/storage/?cm_re=masthead-_-products-_-stg-allst orage

► For System p family of models

– For IBM System p family models, refer to *IBM System Storage Tape Library Guide for Open Systems*, SG24-5946

http://www.redbooks.ibm.com/abstracts/sg245946.html?Open

– For other System p models, refer to the IBM storage Web site:

http://www-03.ibm.com/systems/storage/product/p.html

– For all storage product:

http://www-03.ibm.com/systems/storage/?cm_re=masthead-_-products-_-stg-allst orage

10.4 Tape and optical model specification summary

Table 10-1 contains a summary of tape and optical devices, their product number and machine type, cable interfaces supported, supporting operating system level and other

related information. Subsequent tables provide additional details that cannot be contained within a single table.

Table 10-1   Tape and optical storage model support summary

	Product Name	Machine Type	WORM/Encryption [a]	Interface	Supported Tape Libraries	Platform support
3573	TS3100	L2U, L3S, F3S, L4S, F4S, S4S	yes/yes	4 Gbps Fibre Channel, 3 Gbps SAS, LVD SCSI	Not applicable	IBM i, AIX, Linux
3573	TS3100	L32, S32, S42, E42	yes/yes	LVCD SCSI, 3 Gbps SAS	Not applicable	IBM i, AIX, Linux
3573	TS3200	L4U, L3H, F3H, L4H, S4H, F4H	yes/yes	4 Gbps Fibre Channel, 3 Gbps SAS, LVD SCSI	Not applicable	IBM i, AIX, Linux
3573	TS3200	L34, S34, S44, E44	yes/yes	3 Gbps SAS, LVD SCSI	Not applicable	IBM i, AIX, Linux
3576	TS3310	L5B, E9U	yes/yes	4 Gbps Fibre Channel, 3 Gbps SAS, LVD SCSI	Not applicable	IBM i, AIX, Linux
3577	TS3400	L5U	yes/yes	4 Gbps Fibre Channel	Not applicable	IBM i, AIX, Linux
3580	TS2230	S3E, L3E	yes/no	LVD SCSI, 3 Gbps SAS	Not applicable	IBM i, AIX, Linux
3580	TS2240	H4S, S4E, E4S	yes/yes	3 Gbps SAS	Not applicable	AIX
3580	TS2340	L43, S43	yes/yes	LVD SCSI, 3 Gbps SAS	Not applicable	IBM i, AIX, Linux
3580	TS3580	L33, L3H	yes/no	LVD SCSI	Not applicable	IBM i, AIX, Linux
3584	TS3500	L53, D53	yes/yes	4 Gbps Fibre Channel	Not applicable	IBM i, AIX, Linux
3584	TS3500	L23, D23	yes/yes	4 Gbps Fibre Channel	Not applicable	IBM i, AIX, Linux
3588	TS1030	F3B	yes/no	4 Gbps Fibre Channel	TS3500	IBM i, AIX, Linux
3588	TS1040	F4A	yes/yes	4 Gbps Fibre Channel	TS3500	IBM i, AIX, Linux
3954	TS7520	CV6	no/yes	4 Gbps Fibre Channel	TS3500,TS3400, TS3200,TS3100, TS3310, 3494 (withdrawn from marketing)	IBM i, AIX, Linux
3955	TS7520	SV6, SX6	no/yes	4 Gbps Fibre Channel	3494 (withdrawn from marketing)	IBM i, AIX, Linux
3954	TS7530	CV7	no/yes	4 Gbps Fibre Channel	TS3500,TS3400, TS3200,TS3100, TS3310, 3494 (withdrawn from marketing)	IBM i, AIX, Linux

	Product Name	Machine Type	WORM/Encryption [a]	Interface	Supported Tape Libraries	Platform support
3955	TS7530	SV6, SX6	no/yes	4 Gbps Fibre Channel	3494 (withdrawn from marketing)	IBM i, AIX, Linux
3592	TS1120	C06(Tape controller)	yes/yes	4 Gbps Fibre Channel	TS3400,TS3500, 3494 (withdrawn from marketing)	IBM i, AIX, Linux
3592	TS1120	E05	yes/yes	4 Gbps Fibre Channel	TS3400,TS3500, 3494 (withdrawn from marketing)	IBM i, AIX, Linux
3995	Library	Cxx, UDO-1 format	Not applicable	LVD SCSI, 160/320	Not applicable	IBM i, AIX
399F from Plasmon (Plasmon -G)	Library	30GB UDO1, 60GB UDO-2	Not applicable	LVD SCSI	Not applicable	IBM i. See: http://www.plasmon.com/archive_solutions/gseries.html
3996	Library	32, 80, 174, UDO-1,2 format	Not applicable	LVD SCSI, 160/320	Not applicable	IBM i, AIX
7206-336	DAT72 tape drive	336-DDS Gen5	Not applicable	SCSI-2 F/W SE, LVD/SE	Not applicable	AIX
7206-VXA	VXA-2 Tape Drive	VX2, VX3	Not applicable	SCSI-3 ULTRA, LVD/SE, 160/320	Not applicable	IBM i, AIX
7207	SLR60 Tape Drive	330	Not applicable	SCSI-2 SE ULTRA, LVD/SE, 160/320	Not applicable	IBM i, AIX
7212	Device Enclosure	103	Not applicable	SCSI-3 ULTRA, LVS/SE, 160/320	Not applicable	IBM i, AIX
7214	Device Enclosure	1U2	Not applicable	3 Gbps SAS	Not applicable	AIX

a. Yes in the Encryption columns means supports encryption of data.

10.5 Notes for tape storage and media support

This section provides additional operating system specific support details for all tables included in this chapter, including the tables that follow this section.

10.5.1 IBM i additonal considerations

POWER6 system support requires the following IBM i release levels:

- ► IBM i 5.4 (5722-SS1) with 5.4.5 machine code or later
- ► IBM i 6.1 (5761-SS1) or later

The following notes apply to many of the tape device and tape library products and features included in this chapter:

► The LTO Ultrium tape technologies can read and write to version n-1 and read only to version n-2. For instance, the LTO Ultrium 4 tape drives can read and write to LTO Ultrium 3 tapes, and can only read LTO Ultrium 2 tapes. An LTO Ultrium 4 tape drive cannot read or write an LTO Ultrium 1 tape.

► i5/OS V5R2 or later is required for LTO 3 support.

► i5/OS V5R3 or later is required for LTO 4 support.

► The TS3100, TS3200, TS3310, and TS3500 Tape Library products support LTO 3 and LTO 4 tape drives. The LTO Ultrium 4 Tape Drive has maximum rated native data rate of up to 120 MB. LTO Ultrium 3 Tape Drive has a maximum rated native data rate of up to 80 MBps.

► The IBM TS2340 is an Ultrium LTO 4 tape drive. It is supported within the IBM System Storage TS3100 Tape Library to the IBM System Storage TS3500 Tape Library.

► For tape support information, including System i support, refer to the following Web pages:

  – For assistance in identifying the Fibre Channel adapter feature numbers that support tape attachment to System i models, refer to the host bus adapters Web page at:

    http://www-01.ibm.com/systems/support/storage/config/hba/index.wss

    On this page, under Products, select the tape (or disk) storage product. Then, under Operating Systems, select **i5/OS** under the appropriate IBM System i servers section. Then click **Submit**.

  – For the latest marketing status of tape and disk storage related products, see the IBM System Storage and TotalStorage products Web page at:

    http://www.ibm.com/systems/storage/product/i.html
    http://www.ibm.com/systems/storage/product/p.html

► The #5775 PCI-X Disk/Tape Controller without IOP provides a PCI-X Disk/Tape SCSI Controller with zero write cache and without RAID support. Removable media devices (tape, optical libraries, DVD-ROM, or DVD-RAM) are also supported on the #5775.

  The #0647, #5736, #5766, and #5775 are physically the same adapter card. The #5775 should be the first choice over #0624 or #0645 (#5702 and #5712 IOP-less equivalent) or #5705 or #5715 controllers for systems running i5/OS V5R3 or later when attaching devices that do not require an IOP and IOA combination.

  The #5775 does not support 358x or 359x tape library devices (includes 3580). Use a #5702, #5705, #5712, #5715, #5736, or #5766 (IOP-based) to attach a 358x or 359x.

  Use the #5775 for attaching a 7210-030 DVD drive, 7212-103 with DVD, LTO-2, ¼ inch tape drive, or VXA-320 tape drive.

  Consider using the #5776 (IOP-less, disks only) controller for disks within a #5095 or #0595 I/O enclosure or an EXP24.

  Several older technology tape devices supporting QIC SLRnn, 8 mm, and early VXA-nn, data formats are not supported on IOP-less controllers (IOAs). See the IOP-less column in the two tables at the beginning of this chapter for supported tape devices on IOP-less controllers.

- If a tape or optical device is attached to an IOA or an IOP-IOA combination and that device is not supported by that hardware feature combination, you will see a System Reference Code in the Product Activity Log (PAL). A properly authorized user to the Start Service Tools command functions can view this log. SRC codes in the PAL that indicate "device not supported" include:

  – 63A03202 or 57xx3202: The attached device type is not supported in an IOP-less environment.

  – 63A09020 or 57xx9020: This error is reported when one of the following conditions occur:

    • An unsupported device type or model is attached to the system.

    • Both tape and disk drive devices are attached to an IOP or IOA card that does not support both tape and disk devices at the same time.

    • The tape library requires a resource, and no resource is reported.

    • Two tape library resources are attempting to allocate the same resource.

- For D-mode IPL, the device SCSI address must be set to zero (0).

- 3580 L33/L3H and H3L (Ultrium 3) support requires V5R2 or later. There is no HVD support for Ultrium 3.

- The maximum number of automated tape library drives supported depends on the adapter that is used to attach to the System i model.

- External optical storage for IBM i models includes the 3995 Optical Library Dataserver, the 3996 Optical Library, 399F Optical Library (Plasmon G-Series), 7210-020 External CD-ROM, the 7210-025 External DVD-RAM and the 7210-030 External DVD-RAM.

  For more information about 399F to the Plasmon Web site at:

  http://www.plasmon.com

- The following optical devices are supported on IOP-less IOAs:

  – 4.7 GB DVD-RAM: #6330, #6333, #7210-025 (#6330), #7210-030 (#6333), #7212-102 with FC #1103 (#6333), #7212-102 with FC #1102 (#6330)

  – 4.7 GB SLIM DVD-RAM: #6331

  – DVD-ROM: #6336, #7212-102 with FC #1106 (#6336)

  – SLIM DVD-ROM: #6337

- For information about optical devices supported under i5/OS, refer to:

  http://www-03.ibm.com/systems/i/hardware/storage/optical/index.html

Update Device Microcode API: The Update Device Microcode API (QTAUPDDV) allows tape device microcode to be updated using an image that is copied from the Web. This function is supported with Version 5 and later i5/OS systems and OS/400.

10.5.2 AIX additional details

AIX does not support IOPs and some IOAs supported only under IBM i. POWER6 system support requires AIX and Linux release levels:

- AIX Version 5.3 with the 5300-08 Technology Level or later
- AIX Version 6.1 with the 6100-01 Technology Level or later
- SUSE Linux Enterprise Server 10 (SLES 10) Service Pack 2 or later
- Red Hat Enterprise Linux V4.7 for POWER
- Red Hat Enterprise Linux V5.2 for POWER or later

Not all AIX features operate with Linux. For systems and features that operate with Linux refer to:

http://www.ibm.com/servers/eserver/pseries/hardware/factsfeatures.html

For the latest marketing status of tape and disk storage related products, see the IBM System Storage and TotalStorage products Web page at:

http://www.ibm.com/systems/storage/product/i.html
http://www.ibm.com/systems/storage/product/p.html

10.6 Storage adapters and tape devices supported

Table 10-2 lists the SCSI adapters and the tape devices that are supported.

Table 10-2   SCSI adapters: Devices supported

Adapter feature	Type	M15	M25	M50	E4A	E8A	MMA	FHA	Devices supported
0647	IOP-less		✓	✓			✓	✓	See Table 10-3
5775	IOP-less	✓	✓	✓			✓	✓	See Table 10-3
5776	IOP-less		✓	✓			✓	✓	See Table 10-3
5702	No longer available.		✓	✓			✓	✓	See Table 10-3
5712	No longer available.		✓	✓			✓	✓	See Table 10-3
5715	No longer available.		✓	✓			✓	✓	See Table 10-3
5736	With IOP		✓	✓			✓	✓	See Table 10-3
2749	IOP required. No longer available.		✓	✓			✓	✓	See Table 10-3
2757	IOP required. No longer available.		✓	✓			✓	✓	See Table 10-3
2780	IOP required. Internal Tape/CD/DVD.		✓	✓					See Table 10-3
5703	IOP required. No longer available.			✓					See Table 10-3
5737	Internal Tape/CD/DVD		✓	✓					See Table 10-3
5777	Internal Tape/CD/DVD			✓					See Table 10-3
5738	With IOP		✓	✓					See Table 10-3
5736	IOP-less				✓	✓	✓	✓	AIX, Linux support. IBM i support on 9117-MMA, 9119-FHA.[a]
5736	With IOP		✓	✓					For IBM i when IOP is required for specific tape device support.[a]
5806	With IOP								For IBM i when IOP is required for specific tape device support.[a]

Adapter feature	Type	M15	M25	M50	E4A	E8A	MMA	FHA	Devices supported
1912[a]	IOP-less				✓	✓			

Note 1: #0647, #5736, #5766 and #5775 are physically the same adapter card but have different feature numbers to indicate to IBM configurator tools that an IOP is or is not being used in the configuration. An #0647 indicates that the card is dedicated to an AIX 5L or Linux partition and an IOP is not being used. #0647 should be the choice over #0624 or #0645 (#5702 or #5712 Direct Attach equivalent) and #5736 should be the choice over #5705 or #5715 controllers for systems running V5R3 or later. #5775 should be the choice for systems where IOP-less support is provided.

Note 2: #0648, #5737, and #5776 are physically the same adapter card but have different feature numbers to indicate to IBM configurator tools that an IOP is or is not being used in the configuration.

a. Go to the following Web address:
http://www-03.ibm.com/systems/storage/tape/
Then, choose the model and click Interoperability matrix. In this matrix, you can find adapters that support that model and OS.

Table 10-3 lists the IBM removable media drives.

Table 10-3   IBM i removable media drives: IOP-less or IOP-required summary table

SCSI drives supported with no IOP	SCSI drives which always need IOP
IBM i supported SCSI Tape Drives (Fibre Channel attached not included here): ▶ #5753 30GB QIC (SLR60) ▶ #7207-330 #QIC (SLR60) ▶ #5754 50GB QIC (SLR100) ▶ #7206 80GB VXA-2 (On POWER5/POWER5+) ▶ #7206 -336 36GB DAT72 ▶ #6258 36GB DAT72 ▶ #6279 VXA-320 ▶ #7206 160GB VXA-320 (On POWER5/POWER5+) ▶ #5755 200GB LTO-2 (Half-High) ▶ 7212 10X	**IBM i supported SCSI Tape Drives** ▶ Older, smaller QIC drives (4 GB, 16 GB, 25 GB) ▶ Any drive attached using #2749 HVD SCSI adapter ▶ Any drive not listed includes SCSI attached 3580, 3581, 3582, 3583, 3584, 3576, 3590, and 3592 (does not apply to Fibre Channel attach tape drives) ▶ Any drive attached using older LVD SCSI adapter
IBM i supported SCSI CD/DVD Drives: ▶ 4.7 GB DVD-RAM: #6330, #6333, #7210-025 (#6330), #7210-030 (#6333), #7212-102 with FC #1103 (#6333), #7212-102 with FC #1102 (#6330) ▶ 4.7 GB SLIM DVD-RAM: #6331 ▶ DVD-ROM: #6336, #7212-102 with FC #1106 (#6336) ▶ SLIM DVD-ROM: #6337 For information about optical devices supported under i5/OS, refer to: http://www-03.ibm.com/systems/i/hardware/storage/optical/index.html Drives in #5074/5079/5094/5294 I/O enclosures are also supported as IOP-less (not all supported on POWER6 systems)	**IBM i supported SCSI CD/DVD Drives** Any drive not listed
IBM i supported SCSI Optical Libraries 3996	**IBM i supported SCSI Optical Libraries** 3995, 399F

Table 10-4 lists the Fibre Channel Tape Drive adapters.

Table 10-4   Fibre Channel Tape Drive adapters for M15, M25, M50, E4A, E8A, MMA, FHA

Adapter feature	M15 Ops Sys	M25 Ops Sys	M50 Ops Sys	E4A Op Sys	E8A Op Sys	MMA Op Sys	FHA Op Sys	Devices supported
1905	N	N	N	✓ A,L	✓ A,L	N	N	See Note 1
1910				✓ A,L	✓ A,L	N	N	See Note 1
1977	N	N	N	✓ A,L	✓ A,L	N	N	See Note 1
5704	N	✓ i	✓ i	N	N	✓ i	✓ i	See Note 1
5716	N	✓ A,L	✓ A,L	✓ A,L	✓ A,L	✓ A,L	✓ A,L	See Note 1
5749	✓ i	✓ i	✓ i	N	N	✓ i	✓ i	See Note 1
5735	✓ A,L,i	✓ A,L,i	✓ A,L,i	✓ A,L	✓ A,L	✓ A,L,i	✓ A,L,i	PCIe card. See Note 1 and Table 10-5
5758	N	N	N	✓ A,L	✓ A,L	✓ A,L	✓ A,L	See Note 1
5759	✓ A,L	✓ A,L	✓ A,L	✓ A,L	✓ A,L	✓ A,L	✓ A,L	See Note 1
5761	N	✓ i	✓ i	N	H	✓ i	✓ i	See Note 1
5773	✓ A,L	✓ A,L	✓ A,L	✓ A,L	✓ A,L	✓ A,L	N	PCIe card. See Note 1 nd Table 10-5

Adapter feature	M15 Ops Sys	M25 Ops Sys	M50 Ops Sys	E4A Op Sys	E8A Op Sys	MMA Op Sys	FHA Op Sys	Devices supported
5774	✓ A,L,i	✓ A,L,i	✓ A,L,i	✓ A,L	✓ A,L	✓ A,L, i	N	PCIe card. See Note 1nd Table 10-5
General Notes: ✓= Supported; N = Not supported. A = AIX; L = Linux; i = IBM i support See Chapter 4, "Feature descriptions and related information" on page 187 for release level requirements. **Note 1:** You can find Storage models at the following Web address: http://www-03.ibm.com/systems/support/storage/config/hba/index.wss You can also determine which adapters support that specific IBM System Storage model.								

Table 10-5 lists the IBM i Fibre Channel Tape IOP-less mode support.

Table 10-5   IBM i Fibre Channel Tape IOP-less mode support summary

Library/Drive	Media/Drives	Support Date
3592	3592 J1A and 3592 E05 rack mounted drive	March 2008 with IBM i 6.1, and adapters #5735, #5749, #5774
3584(TS3500)	LTO 2/3 3592 J1A / 3592 E05	March 2008 with IBM i 6.1, and adapters #5735, #5749, #5774
3494	3592 J1A / 3592 E05	March 2008 with IBM i 6.1, and adapters #5735, #5749, #5774
3573(TS3100, TS3200)	LTO 3 / 4	November 2008 support with appropriate PTF with IBM i 6.1, and adapters #5735, #5749, #5774[a]
3494	3592 E06 (TS1120)	Support planned December 2008 with appropriate PTF with IBM i 6.1, and adapters #5735, #5749, #5774[a]
3576(TS3310)	LTO 3 / 4	Support planned December 2008 with appropriate PTF with IBM i 6.1, and adapters #5735, #5749, #5774[a]
3577(TS3400)	3592 E05 (TS1120), 3592 E06 (TS1130)	Support planned December 2008 with appropriate PTF with IBM i 6.1, and adapters #5735, #5749, #5774[a]
3584(TS3500)	LTO 4 and 3592 E06 (TS1130)	Support planned December 2008 with appropriate PTF with IBM i 6.1, and adapters #5735, #5749, #5774[a]
3580 (TS2340/TS2240)	LTO 4	Support planned 4Q08 with appropriate PTF with IBM i 6.1, and adapters #5735, #5749, #5774[a]
3581 3582 3583 3590	LTO1, LTO2, LTO3	Not supported on IOP-less adapters. Use IOA with supporting IOP.
	LTO 1, LTO 2 other than listed above	Not supported on IOP-less adapters. Use IOA with supporting IOP.

Library/Drive	Media/Drives	Support Date
3592	3592 J1A and 3592 E05 rack mounted drive	March 2008 with IBM i 6.1, and adapters #5735, #5749, #5774

a. Informational APAR II14355 will contain prerequisite PTF level information as IBM i support becomes available.

Table 10-6 lists the SAS tape drives that are supported with no IOP.

Table 10-6   SAS tape drives supported with no IOP

Library/Drive	M15 Op Sys	M255 Op Sys	M50 Op Sys	E4A Op Sys	E8A Op Sys	MMA Op Sys	FHA Op Sys
5746 Half High 800 GB 1.6 TB LTO4 SAS Tape Drive	✓ A,L,i	✓ A,L,i	✓ A,L,i	✓ A,L	✓ A,L	N	✓ A,L,i
#5907 36/72 GB 4 mm DAT72 SAS Tape Drive	✓ A,L,i	✓ A,L,i	✓ A,L,i	✓ A,L	✓ A,L	N	N
#5619 80/160 GB DAT160 SAS tape drive	✓ A,L,i	✓ A,L,i	✓ A,L,i	✓ A,L	✓ A,L	N	✓ A,L,i
#7214-1U2 External SAS Storage Controller for DAT 72, Dat 16, HH LTO4 tape drives	✓ A,L,i[a]	✓ A,L,i[a]	✓ A,L,i[a]	✓ A,L,i[a]	✓ A,L,i[a]	✓ A,L,i[a]	✓ A,L,i[a]
TS2240 with HH SAS LTO4 tape drives	✓ A,L,i[a]	✓ A,L,i[a]	✓ A,L,i[a]	✓ A,L,i[a]	✓ A,L,i[a]	✓ A,L,i[a]	✓ A,L,i[a]
TS2340 with SAS LTO4 tape drives	✓ A,L,i[b]	✓ A,L,i[b]	✓ A,L,i[b]	✓ A,L,i[b]	✓ A,L,i[b]	✓ A,L,i[b]	✓ A,L,i[b]
TS3100, TS3200, TS3310 with Full Height (FH) or HH SAS LTO4 tape drives	✓ A,L,i[b]	✓ A,L,i[b]	✓ A,L,i[b]	✓ A,L,i[b]	✓ A,L,i[b]	✓ A,L,i[b]	✓ A,L,i[b]
TS2900 with HH SAS LTO4 tape drives	✓ A,L,i[b]	✓ A,L,i[b]	✓ A,L,i[b]	✓ A,L,i[b]	✓ A,L,i[b]	✓ A,L,i[b]	✓ A,L,i[b]

General Notes:
✓= Supported; N = Not supported.
A = AIX; L = Linux; i = IBM i support
See Chapter 4, "Feature descriptions and related information" on page 187 for release level requirements.

a. IBM i 5.4 with V5R4M5 machine code or later required. These devices are supported by the #5912 PCI SAS Adapter.

b. IBM i 6.1 or later. These devices are supported by the #5912 PCI SAS Adapter. TS2900 support delayed until December 2008. Informational APAR II14355 will contain prerequisite PTF level information as support becomes available.

Table 10-7 lists the SAS adapters.

Table 10-7   SAS adapters

Adapter feature	Type	M15 Op Sys	M25 Op Sys	M50 Op Sys	E4A Op Sys	E8A Op Sys	MMA Op Sys	FHA Op Sys
5900	SAS PCI-X 2.0	N	N	N	✓ A,L	✓ A,L	✓ A,L	✓ A,L
5902	SAS PCI-X 2.0	N	N	N	✓ A,L	✓ A,L	✓ A,L	✓ A,L
5912	SAS PCI-X 2.0	✓ A,L,i	✓ A,L,i	✓ A,L,i	✓ A,L	✓ A,L	✓ A,L,i	✓ A,L,i

Adapter feature	Type	M15 Op Sys	M25 Op Sys	M50 Op Sys	E4A Op Sys	E8A Op Sys	MMA Op Sys	FHA Op Sys

General Notes:
✓ = Supported; N = Not supported.
A = AIX; L = Linux; i = IBM i support
See Chapter 4, "Feature descriptions and related information" on page 187 for release level requirements.

11

RIO-2 12X SPCN line cord SAS and communication cables for IBM Power Systems models

In this chapter, we provide feature code descriptions for the high-speed link (HSL)/RIO 12X, System Power Connection Network (SPCN), dual line cords, SAS and communication cables that are used with the System i5, eServer i5, iSeries server, and IBM Power System.

You can find a detailed description of these cables in Chapter 4, "Feature descriptions and related information" on page 187.

Always check the latest feature code description and support in the IBM Sales Manual, which is available at:

http://www-01.ibm.com/common/ssi/index.wss?buttonpressed=DET002PT005&DET015PGL002=DET001PEF012&submit.x=15&submit.y=20

11.1 Key I/O cables summary

Use the tables in this chapter as a reference for the HSL/RIO GX adapters, 12X GX adapters, SAS and SPCN cables that are supported on the Power System, System i5, System p, eServer i5, and iSeries servers. Remember the following terminology definitions:

► *HSL* and *RIO* are, in general two terms for the same I/O loop attachment technology. HSL is familiar to user with System i experiences. RIO is familiar to user with System p experience.

► *HSL-1* and *RIO-1* are the same technology level.

► *HSL-2* and *RIO-2* are the same technology level. RIO-G is familiar to user with System p experience.

► *HSL-n/RIO-n* and *12X* are two completely different I/O technologies. Each HSL level and 12x adapter is unique and the associated cables are different

► I/O enclosures are either *RIO-n* or *12X* capable. They cannot be mixed on the same loop.

For more information, refer to the IBM System Hardware Information Center:

http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp

Refer to the following publications for an explanation of HSL configuration rules and placement considerations:

► *IBM eServer iSeries Migration: A Guide to Upgrades and Migrations to System i5*, SG24-7200

   This book includes configuration rules for eServer i5 Models and towers.

► *IBM eServer iSeries Migration: System Migration and Upgrades at V5R1 and V5R2*, SG24-6055

   This book includes configuration rules for iSeries models and towers.

► *IBM eServer i5 and iSeries System Handbook i5/OS Version 5 Release 3 October 2005 - Draft*, GA19-5486

► *High-speed Link Loop Architecture for the IBM eServer iSeries Server: OS/400 Version 5 Release 2*, REDP-3652

► *IBM System p 550 Technical Overview and Introduction*, REDP-4404

► *IBM Power Systems 520 Technical Overview and Introduction*, REDP-4403

11.2 Cable feature code conversion summary

Table 11-1 lists the System i 9406 system designation cable feature numbers and their corresponding unified POWER6 cable feature numbers.

Table 11-1   System i 9406 feature numbers and unified POWER6 cable feature numbers

9406 Feature Code	9406 Feature Code Name	Same physical product but with different 9117 and 9119 Feature Code
1850	VHDCI to P Converter Cable	2118
1851	0.6m SCSI P-P Cable	2424
1852	2.5m SCSI P-P Cable	2425
1855	4-port EIA 232 Cable	2861
1481	1.2m HSL-2/RIO-2 Cable	3146
1482	3.5m HSL-2/RIO-2 Cable	3147
1307	1.75m HSL-2/RIO-2 Cable	3156
1308	2.5m HSL-2/RIO-2 Cable	3168
1875	Serial Port Converter Cable	3925
1860	ASYNC Terminal/Prt Cable	3926
1307, 1308, 1481, 1482, 1483	HSL-2/RIO-2 cables	3156, 3168, 3146, 3147, 3148

11.2.1 RIO-2 12X cables and connectors summary

Figure 11-1 shows the different RIO-1, RIO-2, and 12X cable connections compared to each other. The colors help identify the connection technology of the cable.

Figure 11-1   12X, HSL-2/RIO-2, HSL-1/RIO-1 cables

The following tables list the RIO-1 (HSL-1), RIO-2) (HSL-2) and 12X cable features that are available. The notation X within a column means that the feature is supported.

Table 11-2 lists the cable features supported on the associated POWER6 MTM column heading.

Table 11-2   Cable features supported on the associated POWER6 MTM column heading

Cable feature	9117-MMA / 9406-MMA	9119-FHA
#1307 1.75 m Copper HSL-2 Cable	X	X
#1308 2.5 m Copper HSL-2 Cable	X	X
#1460 3 m Copper HSL Cable	X	X
#1461 6 m Copper HSL Cable	X	X
#1462 15 m Cooper HSL Cable	X	X
#1474 6 m HSL to HSL-2 Cable	X	X
#1475 10 m HSL to HSL-2 Cable	X	X
#1481 1 m HSL-2 Cable	X	X
#1482 3.5 m HSL-2 Cable	X	X
#1483 10 m HSL-2 Cable	X	X
#1485 15 m HSL-2 Cable[a]	X	X
#1485 15 m HSL-2 Cable[b]	X	X
#1487 3 m HSL to HSL2 Cable	X	X
#3146 1.2 m RIO-2(Remote I/O-2)	X	X
#3147 3.5 m RIO-2(Remote I/O-2)	X	X
#3148 10 m RIO-2(Remote I/O-2)	X	X
12X		
#1828 1.5 m 12X to 4X Channel Conversion Cable	X	X
#1829 0.6 m 12X Cable	X	X
#1830 1.5 m 12X Cable	X	
#1834 8.0 m 12X Cable	X	X
#1835 3 m 4x Cable	X	
#1836 8 m 4x Cable	X	
#1838 8 m 12x to three 4x Cable		X
#1839 1.5 m 4x Cable	X	
#1840 3.0 m 12X Cable	X	
#1841 3 m 12X to 4X Channel Conversion Cable	X	X
#1842 10 m 12X to 4X Channel Conversion Cable	X	X
SPCN		
#1463 2 m SPCN Cable	X	X
#1464 6 m SPCN Cable	X	X
#1465 15 m SPCN Cable	X	X

Cable feature	9117-MMA / 9406-MMA	9119-FHA
#1466 30 m SPCN Cable	X	X
#1466 30 m SPCN Cable	X	X
#6001 Power Control Cable 2 m	X	X
#6006 SPCN Power Cable 3 m	X	X
#6007 Power Control Cable 15 m	X	X
#6008 Power Control Cable 6 m	X	X
#6029 Power Control Cable 30 m	X	X
SAS		
#3652 SAS Cable (EE) Drawer to Drawer 1 m	X	X
#3653 SAS Cable (EE) Drawer to Drawer 3 m	X	X
#3654 SAS Cable (EE) Drawer to Drawer 6 m	X	X
#3661 SAS Cable (X) Adapter to SAS Enclosure, Dual Controller/Dual Path 3 m	X	X
#3662 SAS Cable (X) Adapter to SAS Enclosure, Dual Controller/Dual Path 6 m	X	X
#3663 SAS Cable (X) Adapter to SAS Enclosure, Dual Controller/Dual Path 15 m	X	X
#3667 SAS Cable (YR) -1 m	X	
#3679 SAS Cable (AI)- 1 m	X	X
#3684 SAS Cable (AE) Adapter to Enclosure, single controller/single path 3 m	X	X
#3685 SAS Cable (AE) Adapter to Enclosure, single controller/single path 6 m	X	X
#3691 SAS Cable (YO) Adapter to SAS Enclosure, Single Controller/Dual Path 1.5 m	X	X
#3692 SAS Cable (YO) Adapter to SAS Enclosure, Single Controller/Dual Path 3 m	X	X
#3693 SAS Cable (YO) Adapter to SAS Enclosure, Single Controller/Dual Path 6 m	X	X
#3694 SAS Cable (YO) Adapter to SAS Enclosure, Single Controller/Dual Path 15 m	X	X

a. Use when a greater distance is required. Performance can be degraded.
b. Use when a greater distance is required. Performance can be degraded.

Table 11-3 lists the cable features that supported on the associated I/O enclosure (tower, drawer, and so forth). The notation X means the feature is supported.

Table 11-3   Cable features supported on associated I/O enclosures

Cable feature	#5094 #9094	#5095 #0595	#5088 #0588	#5294 #8094	#5790	#5796	#5886
Copper							
#1460 3 m Copper HSL Cable							
#1461 6 m Copper HSL Cable							

Cable feature	#5094 #9094	#5095 #0595	#5088 #0588	#5294 #8094	#5790	#5796	#5886
#1462 15 m Copper HSL Cable							
#1474 6 m HSL to HSL-2 Cable	X	X	X	X	X		
#1475 10 m HSL to HSL-2 Cable	X	X	X	X	X		
#1485 15 m HSL-2 Cable	X	X	X	X	X		
12X							
#1828 1.5 m 12X to 4X Channel Conversion Cable							
#1829 0.6 m 12X Cable						X	
#1830 1.5 m 12X Cable						X	
#1834 8.0 m 12X Cable						X	
#1835 3 m 4x Cable						X	
#1836 8 m 4x Cable						X	
#1838 8 m 12x to three 4x Cable						X	
#1839 1.5 m 4x Cable						X	
#1840 3.0 m 12X Cable						X	
#1841 3 m 12X to 4X Channel Conversion Cable						X	
#1842 10 m 12X to 4X Channel Conversion Cable						X	
SAS							
#3652 SAS Cable (EE) Drawer to Drawer 1 m							X
#3653 SAS Cable (EE) Drawer to Drawer 3 m							X
#3654 SAS Cable (EE) Drawer to Drawer 6 m							X
#3661 SAS Cable (X) Adapter to SAS Enclosure, Dual Controller/Dual Path 3 m							X
#3662 SAS Cable (X) Adapter to SAS Enclosure, Dual Controller/Dual Path 6 m							X
#3663 SAS Cable (X) Adapter to SAS Enclosure, Dual Controller/Dual Path 15 m							X
#3667 SAS Cable (YR) -1 m							X
#3679 SAS Cable (AI)- 1 m							X
#3684 SAS Cable (AE) Adapter to Enclosure, single controller/single path 3 m							X
#3685 SAS Cable (AE) Adapter to Enclosure, single controller/single path 6 m							X
#3691 SAS Cable (YO) Adapter to SAS Enclosure, Single Controller/Dual Path 1.5 m							X
#3692 SAS Cable (YO) Adapter to SAS Enclosure, Single Controller/Dual Path 3 m							X
#3693 SAS Cable (YO) Adapter to SAS Enclosure, Single Controller/Dual Path 6 m							X
#3694 SAS Cable (YO) Adapter to SAS Enclosure, Single Controller/Dual Path 15 m							X

Cable feature	#5094 #9094	#5095 #0595	#5088 #0588	#5294 #8094	#5790	#5796	#5886
SPCN[a, b]2							
#1466 30 m SPCN Cable	X	X	X	X	X	X	
#6001 Power Control Cable 2 m	X[a]	X[a]	X[a]	X			
#6006 SPCN Power Cable 3 m	X	X	X	X	X	X	
#6007 Power Control Cable 15 m	X	X	X	X	X	X	
#6008 Power Control Cable 6 m	X	X	X	X	X	X	
#6029 Power Control Cable 30 m	X	X	X	X	X	X	

a. Fiber optic SPCN cables include two copper to fiber adapter, PN 90H6827.
b. On POWER5 and POWER6 520, 550, 570, and 595 models, SPCN cabling must be a single closed loop across all I/O towers or drawers.

11.3 SAS cable considerations

Figure 11-2 shows an example of cabling two #5796 enclosures to the POWER6 system.

Figure 11-2   Cabling example of two SAS enclosures to a POWER6 system

12X cables must match cable length and 5796 adapter (example adapter), as shown in Table 11-4.

Table 11-4   SAS Supported Cabling Chart

Supported Cabling	.06 m #1829	1.5 m #1830	3.0 m #1840	8.0 m #1834
#5796-SR to #5796-SR	Y	Y	N	N
#5796-SR to #5796-LR	Y	Y	Y	N
#5796-LR to #5796-LR	Y	Y	Y	Y
#5796-SR to CEC #1802	N[a]	Y	Y	N
#5796-LR to CEC #1802	N[a]	Y	Y	Y

Supported Cabling	.06 m #1829	1.5 m #1830	3.0 m #1840	8.0 m #1834
Notations: SR = Short Run, LR = Long Run				

a. Needs more cable length to allow for processor enclosure to slide in to and out of rack.

11.4 Communication cables

Use the part numbers listed in Table 11-5 to order cables for the System i5, eServer i5, and iSeries models. The part numbers might not be available in all countries or regions or on all models, and the part numbers can change.

Table 11-5   Communication cable part numbers

Description	Length	Part number	Feature code
Hardware Management Console to System Unit			
Ethernet Cable Ethernet Cable	6 m 15 m	41V0479 41V0143	#7801 #7802
PCI Communication Cables for Models 8203-E4A, 8204-E8A, 9407-M15, 9408-M25, and 9409-M50			
V.24 - 20 ft Cable V.24 - 20 ft Cable - Germany V.24 - 20 ft Cable - Japan V.24 - 20 ft Cable V.24 - 20 ft Cable - Germany V.24 - 20 ft Cable - Japan V.35 - 20 ft Cable V.36 - 20 ft Cable X.21 - 20 ft Cable Operations Console Cable	6.1 m (20 ft) 6.1 m (20 ft) 6.1 m (20 ft) 6.1 m (20 ft) 6.1 m (20 ft) 6.1 m (20 ft) 6.1 m (20 ft) 6.1 m (20 ft) 6.1 m (20 ft) 6.1 m (20 ft)	39J5825 39J5826 39J5827 44H7486 44H7489 44H7492 39J5828 39J5829 39J5830 39J5835	#0348 #0348 #0348 #0350 #0350 #0350 #0353 #0356 #0359 #0367
PCI Communication Cables for Models 8203-E4A, 8204-E8A, 9407-M15, 9408-M25, and 9409-M50			
RS232 Cable RS232 Cable - Germany RS232 Cable - Japan V.24 Cable V.24 Cable - Germany V.24 Cable - Japan V.24 Cable V.24 Cable - Germany V.24 Cable - Japan V.24 Cable V.24 Cable - Germany V.24 Cable - Japan V.35 Cable V.35 Cable V.36 Cable V.36 Cable X.21 Cable	15.2 m (50 ft) 15.2 m (50 ft) 15.2 m (50 ft) 15.2 m (50 ft) 15.2 m (50 ft) 15.2 m (50 ft) 24.4 m (80 ft) 24.4 m (80 ft) 24.4 m (80 ft) 24.4 m (80 ft) 24.4 m (80 ft) 24.4 m (80 ft) 15.2 m (50 ft) 24.4 m (80 ft) 15.2 m (50 ft) 45.7 m (150 ft) 15.2 m (50 ft)	44H7481 44H7483 44H7485 44H7487 44H7490 44H7493 44H7488 44H7491 44H7494 97H7386 97H7387 97H7388 44H7496 44H7497 44H7499 44H7500 44H7502	#0349 #0349 #0349 #0351 #0351 #0351 #0352 #0352 #0352 #0365 #0365 #0365 #0354 #0355 #0357 #0358 #0360
Modem (telephone) Cables for #2805 PCI Quad Modem IOA, #2806 PCI Quad Modem (CIM), #2893 PCIe 2-Line WAN w/Modem, #2894 PCIe 2-Line WAN w/Modem CIM, #6808 PCI 4-Modem WAN IOA No IOP, #6809 PCI 4-Modm WAN IOA NoIOP CIM, #6833 PCI 2-Line WAN w/Modem, No IOP, #6834 PCI 2-Ln WAN w/Mod, No IOP CIM,#2893 PCIe 2-Line WAN w/Modem			

Modem Cable - Africa	9.1 m (30 ft)	39J5808	#1012
Modem Cable - Australia	9.1 m (30 ft)	39J5813	#1019
Modem Cable - Austria	9.1 m (30 ft)	39J5818	#1010
Modem Cable - Belgium	9.1 m (30 ft)	39J5819	#1011
Modem Cable - Denmark	9.1 m (30 ft)	39J5807	#1024
Modem Cable - Finland/Norway	9.1 m (30 ft)	39J5815	#1021
Modem Cable - France	9.1 m (30 ft)	39J5810	#1015
Modem Cable - Germany	9.1 m (30 ft)	39J5811	#1016
Modem Cable - China (Hong Kong S.A.R.)/New Zealand	9.1 m (30 ft)	39J5817	#1020
Modem Cable - Iceland/Sweden	9.1 m (30 ft)	39J5812	#1018
Modem Cable - Israel	9.1 m (30 ft)	21H4905	#1013
Modem Cable - Italy	9.1 m (30 ft)	39J5809	#1014
Modem Cable - Netherlands	9.1 m (30 ft)	39J5816	#1022
Modem Cable - Switzerland	9.1 m (30 ft)	39J5806	#1023
Modem Cable - United Kingdom	9.1 m (30 ft)	39J5817	#1017
Modem Cable - U.S./Canada	9.1 m (30 ft)	42R5087	#1025

For a complete list of cables, refer to the following resources:

► For POWER6 technology systems

http://publib.boulder.ibm.com/infocenter/systems/index.jsp

Search for the term *cables*. Then, in the left navigation area, expand **Systems hardware** → **System i information** → **Planning** and select **Plan for cables**.

► For POWER5 technology systems

http://publib.boulder.ibm.com/infocenter/eserver/v1r3s/index.jsp

A *tree* expansion is used. Select **IBM Systems Hardware Information Center**. In the left navigation area expand **Planning** and select **Plan for cables**.

A

IBM AIX operating system and release level summary

The AIX operating system is an open standards-based, UNIX operating system that provides the enterprise-class IT infrastructure for thousands of clients around the world. IBM AIX V6 includes significant capabilities for virtualization, security features, availability features, and manageability. AIX V6.1 is the first generally available version of AIX V6. In this appendix, we cover the AIX V6.1 capabilities that were announced during 2007 up to this date at which this paper was published.

The tables in this appendix identify the software release of the minimum operating system that is required for IBM Power systems. The features that are supported in these processors might be supported by earlier releases of AIX than the processor itself. Many of the feature codes that are supported in these processors are also represented in this appendix.

Notes:

► Do not use this appendix to compare AIX functions with other operating systems such as IBM i or Linux distributions. Capabilities discussed here are relative to other AIX releases. Comparing the wide range of functions among operating systems is beyond the scope of this publication.

► AIX 5L for POWER V5.3 and AIX 6 for POWER V6.1 are currently supported for the Power Systems included in this paper:

   – As a primary and secondary operating systems on 9117-MMA and 9119-FHA.
   – AIX 5L V5.2 with Technology Level 5200-10 or later is supported on the 9117-MMA. AIX 5.2 does not have the breadth and scope of capabilities available with 5.3 or 6.1.

► This paper does not contain detailed ordering instructions or pricing information. For additional information, we recommend that you contact either an IBM representative or an authorized IBM Business Partner. You can go to the IBM System i "How to Buy" Web page at:

http://www.ibm.com/systems/i/buy/marketing/
From this page, you can choose to be put in contact with an IBM Business Partner or IBM Sales Representative. You can also request a price quote. To contact an IBM U.S. Sales Representative, call 1-888-SHOP-IBM.

Minimum AIX software level requirements

Table A-1 summarizes the AIX release levels, starting with 5.2, that are supported on the IBM Power Systems processor technologies.

Table A-1   AIX release levels supported on POWER6 systems

IBM Power System model	AIX 5.2	AIX 5.3	AXIX 6.1
9117-MMA[a]	Supported	Supported	Supported
9119-FHA[b]	NA	Supported	Supported

    a. AIX 5L V5.2 with the 5200-10 Technology Level or later
       AIX 5L V5.3 with the 5300-06 Technology Level or later
       AIX 6 V6.1 or later
    b. AIX 5L V5.3 with the 5300-06 Technology Level with Service Pack 7 or later
       AIX 5L V5.3 with the 5300-07 Technology Level with Service Pack 4 or later
       AIX 5L V5.3 with the 5300-08 Technology Level or later
       AIX 6 V6.1 with the 6100-00 Technology Level with Service Pack 5 or later
       AIX 6 V6.1 with the 6100-01 Technology Level or later

Existing systems supported

AIX V6.1 also runs on existing IBM hardware system models based on POWER4, POWER5, and POWER6 processors. In this section, we provide details on the hardware and software requirements.

Hardware requirements

AIX V6.1 supports the following systems:

► IBM systems that run on the POWER4, PPC970, POWER5, or POWER6 processors, including the IBM System p, System p5, IBM eServer p5, and System i, and System i5 servers with POWER5 or POWER6 processors

► IBM eServer pSeries server product lines based on POWER4 and POWER5 processors

► IBM BladeCenter JS2x blades and IntelliStation® POWER workstations

AIX V6.1 supports only the 64-bit kernel. Both 32-bit and 64-bit applications will continue to run unchanged on AIX V6.1, but 32-bit device drivers or kernel extensions are not supported on AIX V6.1.

Software requirements

Systems operating on AIX V6.1 are supported only when used within the system operating environments described in the appropriate hardware announcements and when used within the specified operating environment. When systems operating on AIX V6.1 are used with other software or software in later announcements, other limitations can be included.

AIX V6.1 supports systems and partitions with at least 256 MB of physical memory and a disk size of at least 2.2 GB.

Applications from earlier AIX releases

Applications created on previous versions of AIX should run on AIX V6.1 without recompilation as long as those programs do not use nonportable programming techniques. You can find additional information about binary compatibility at the following Web address:

http://www.ibm.com/servers/aix/os/compatibility/

AIX product features

This section provides details about the product features with AIX V6.

Virtualization features

This section discusses AIX V6 virtualization features.

Workload partitions

Workload partitions (WPARs) provide a virtualized operating system environment within a single instance of the AIX operating system. WPARs secure and isolate the environment for the processes and signals that are used by enterprise applications. WPARs complement other AIX virtualization technologies. WPARs can improve efficiency by reducing the number of system images to maintain, providing easy setup and management, and higher system utilization through server consolidation. WPARs provide good isolation and administrative separation.

Two types of WPARs are supported:

▶ System WPARs are autonomous virtual system environments with their own private file systems, users and groups, resource controls, login, network space, and administrative domain. A system WPAR shares the kernel with the global AIX environment on which it runs, and can share or have its own copies of the system /usr and /opt file systems.

▶ Application WPARs provide an environment for isolation of applications and their resources. The application WPAR inherits all resources and execution environments from the global environment.

Live Application Mobility

Live Application Mobility is a new capability that allows a client to relocate a running WPAR from one system to another, without requiring the workload running in the WPAR to be restarted. Live Application Mobility is intended for use within a data center and requires the use of the new Licensed Program Product, the IBM AIX Workload Partitions Manager (WPAR Manager). Both system and application WPARs can be relocated with the WPAR Manager.

Security features

AIX V6.1 also includes capabilities to enhance the already strong security features.

Role Based Access Control

Role Based Access Control (RBAC) is designed to improve security and manageability by allowing administrators to delegate system administrative duties to non-root users. RBAC in AIX has been enhanced to provide very fine granular authorizations, which, by name, identify the privileged operation that they control. These authorizations can be used to create the

required roles necessary and assign those roles to the users required to manage the system. Such non-root users can assume the role and perform the allowed privileged operations.

Trusted AIX

Trusted AIX extends the security capabilities of the AIX operating system by supplying integrated multi-level security. Trusted AIX is implemented as an installation option that can provide the highest levels of label-based security to meet critical government and private industry security requirements.

Encrypting file system

IBM Journaled File System Extended (JFS2) provides for even greater data security with the addition of a new capability to encrypt the data in a file system. Clients can select from a number of different encryption algorithms. The encrypted data can be backed up in encrypted format, reducing the risk of data being compromised if backup media is lost or stolen. The JFS2 encrypting file system can also prevent the compromise of data even to root-level users.

> **Note:** Whenever processing excessive amounts of encrypted data you need to analyze the performance aspects of processing the encrypted data.

The AIX Security Expert

The AIX Security Expert was introduced with Technology Level 5 update to the AIX V5.3 operating system and provides clients with the capability to manage more than 300 system security settings from a single interface and the ability to export and import those security settings between systems. AIX V6 includes an enhancement to the Security Expert to store security templates in a Lightweight Directory Protocol (LDAP) directory for use across a client's enterprise.

Trusted Execution

The Trusted Execution feature provides an advanced mechanism for checking and maintaining system integrity. A signature (SHA256/RSA) database for the important system files is created automatically as part of regular AIX installation. The Trusted Execution tool can be used to check the integrity of the system against the database. Also, administrators can define policies such that the loads of files listed in the database are monitored and execution/loads not allowed if hashes do not match. Additionally, administrators can lock the signature database or the files in the database from being modified by any one in the system, including root.

Secure by Default

The AIX V6.1 installation process offers Secure by Default, which installs only the minimal number of services to provide the maximum amount of security. The Secure by Default option works particularly well when used in conjunction with the AIX Security Expert to only enable the system services required for the system's intended purpose.

Availability features

Improved reliability, availability, and serviceability have become the most important requirements for many clients, particularly clients that have consolidated multiple workloads onto a single system. Over the past several years, IBM has included many availability features in the AIX operating system. This section discusses the many mainframe-inspired availability features that AIX V6.1 includes.

Concurrent AIX kernel updates

Concurrent AIX kernel updates will deliver some kernel updates as Interim Fixes that will not require a system reboot to be put into effect. This new capability will provide IBM with a tool to reduce the number of planned outages required to maintain a secure, reliable system.

POWER6 Storage Keys

POWER6 Storage Keys exploitation of the POWER6 processor storage key feature brings a mainframe-inspired reliability and capability to the UNIX market for the first time. Storage keys can reduce the number of intermittent outages associated with undetected memory overlays inside the kernel. Applications can also use the POWER6 Storage Key feature to increase the reliability of large, complex applications running under the AIX V5.3 or AIX V6.1 operating system.

Dynamic tracing with Probevue

AIX V6.1 provides a new dynamic tracing capability that is designed to simplify debugging complex system or application code without requiring code changes and recompilation. This dynamic tracing facility will be introduced using a tracing command, Probevue, that allows a developer or system administrator to insert trace break-points dynamically in existing code without having to recompile the code. A developer or system administrator can use Probevue to place probes dynamically in existing code and to specify the data to be captured at probe point.

Serviceability and Live Dump enhancements

AIX V6.1 continues to build upon the first failure data capture and nondisruptive service aid features introduced in prior AIX releases. A live dump feature allows selected subsystems to dump their memory state and traces to the file system for subsequent service analysis, without requiring a full system dump and outage. As for those problems that still require a partition restart in order to recover, AIX V6.1 provides a firmware assisted dump mode. In this new mode, AIX cooperates with system firmware to write the FFDC information to the dump device using the restarted AIX image, rather than writing to the dump device using the failed AIX image. The intended result is fewer dump failures and a more reliable system dump facility.

Manageability

AIX V6.1 includes many capabilities to improve the manageability of the AIX operating system, including NFSv4 support for the Network Installation Manager (NIM), a graphical installation tool, and a graphical systems console, the IBM Systems Director Console for AIX. The Systems Director Console for AIX provides a responsive Web access to common systems management tools such as the Systems Management Interface Tool (SMIT) and offers integration into the IBM Systems Director. The Systems Director Console for AIX is included with AIX V6.1.

Name resolver caching daemon

The network resolver caching daemon caches requests to resolve a host name, service, or netgroup to improve the efficiency of subsequent requests for the same information.

Support for long password phrases

The AIX V6.1 operating system and AIX V5.3 Technology Level 7 support greater than eight-character passwords for authentication of users. These releases provide for passwords using the SHA/256/512, MD5, and other encryption algorithms. System-wide controls can be configured by the administrator to choose the algorithm as well as the size of the password, which could be up to 255 characters.

AIX standards levels

AIX V6.1 is designed to conform to the following standards:

▶ Single UNIX Specification V3 (SUS V3) 2004 Edition.

▶ ISO/IEC 9899:1999 international standard for the C programming language, commonly referred to as *C99*.

▶ SUS V3 Realtime Option Group, which consists of the following options from within IEEE Standard 1003.1-2004:

   – POSIX_ASYNCHRONOUS_IO
   – POSIX_FSYNC
   – POSIX_MAPPED_FILES
   – POSIX_MEMLOCK
   – POSIX_MEMLOCK_RANGE
   – POSIX_MEMORY_PROTECTION
   – POSIX_MESSAGE_PASSING
   – POSIX_PRIORITY_SCHEDULING
   – POSIX_REALTIME_SIGNALS
   – POSIX_SEMAPHORES
   – POSIX_SHARED_MEMORY_OBJECTS
   – POSIX_SYNCHRONIZED_IO
   – POSIX_TIMERS

▶ SUS V3 Realtime Threads Option Group, which consists of the following options from within IEEE Standard 1003.1-2004:

   – POSIX_THREAD_PRIO_INHERIT
   – POSIX_THREAD_PRIO_PROTECT
   – POSIX_THREAD_PRIORITY_SCHEDULING

▶ SUS V3 Advanced Realtime options from within IEEE Standard 1003.1-2004:

   – POSIX_ADVISORY_INFO
   – POSIX_BARRIERS
   – POSIX_CLOCK_SELECTION
   – POSIX_CPUTIME
   – POSIX_MONOTONIC_CLOCK
   – POSIX_SPIN_LOCKS
   – POSIX_THREAD_CPUTIME
   – POSIX_TIMEOUTS

▶ Common Criteria Common Access Protection Profile (CAPP) at the Evaluation Assurance Level (EAL)4+, Labeled Security Protection Profile (LSPP) and Role Based Access Control Protection Profile (RBACPP).

AIX development and performance tools

IBM XL compilers are available for all major IBM operating systems and platforms. The latest compiler releases boast advanced compiler and optimization technologies for generation of highly optimized 32-bit or 64-bit applications code to run efficiently on a wide variety of processors and processor families. The generated code can also be tuned to run most efficiently on a specific processor or processor family. These XL compilers are built on a common code base allowing for easier porting of applications between platforms.

The following XL compilers introduce new functionality to exploit the capabilities of the POWER6 processors:

► IBM XL C/C++ Enterprise Edition for AIX, V9.0 - for additional information, visit:

  `http://www.ibm.com/software/awdtools/xlcpp/features/aix/xlcpp-aix.html`

► IBM XL Fortran Enterprise Edition for AIX, V11.1 - for additional information, visit:

  `http://www.ibm.com/software/awdtools/fortran/xlfortran/features/aix/xlf-aix.html`

AIX general availability and support

Table A-2 shows the availability, withdrawal, and end of support dates for each release of the AIX operating system. Note that IBM AIX V5.2, V5.3, and V6.1 are the supported levels of operating system for the IBM Power Systems that we discuss in this chapter. All earlier releases of AIX are withdrawn from IBM marketing and support.

Table A-2   AIX availability, withdrawal, and end of support dates

Release	General availability	Withdrawn from marketing	End of program support
5.1	04 May 2001	29 April 2005	01 April 2006
5.2	18 October 2002	08 July 2008	30 April 2009
5.3	13 August 2004	---	---
6.1	09 November 2007	---	---

AIX upgrade paths

Upgrades from previous versions of AIX to AIX V6.1 are only available through IBM Software Maintenance for AIX Operating Systems (5771-SWM, 5773-SM3, or 5773-SWM) or if entitled by contract. Clients with a current Software Maintenance Agreement (SWMA) can download software upgrades online without having to wait for an order to be processed or physical media to arrive. Electronic delivery is available only for upgrades or product refreshes. Refer to the appropriate software installation manual for instructions to upgrade software.

A SWMA now includes a renewal feature for both the IBM i (formerly i5/OS) and AIX Software Maintenance offerings. With this new renewal feature (2647), you can let IBM know your intention to extend SWMA through the ServiceElite contract suite when the initial SWMA coverage period expires.

ServiceElite offers standard IBM maintenance terms. For your convenience, this renewal feature is automatically added to all new orders. If you do not intend to extend SWMA through ServiceElite when your initial SWMA coverage period for the IBM i or AIX operating system

expires, ensure that your IBM sales representative removes this SWMA feature number before placing your order.

Software ordering terminology

The following standard terminology is used for all software versions:

► Product identifier (PID)

All IBM Licensed Programs including AIX have a product identifier. The format is 57*xx-yyy*. For example, AIX 6.1 is 5765-G62.

► System Program Orders (SPO)

New preload orders are defined with SPO numbers associated with the hardware product order. For example, SPO feature 5692-A6P is for new orders of AIX 6. The 5692-A6P contains features, with each feature indicating the software product to be loaded. For example, #2201 indicates Virtual I/O Server (5765-G34). It serves as an (administrative) software preload ordering vehicle.

Billing for the media is generated under the SPO. To prevent additional billing expenses, place only one SPO order per machine

AIX software

Table A-3 shows the AIX software products that are most commonly ordered. It is not a definitive list of all AIX software products that are now available.

Table A-3   Commonly ordered AIX software

Operating system and base products	Product identifier	SPO feature (5692-A6P)
AIX 6 Base Operating System	5765-G62	0967
AIX 6 Update CD	5765-G62	0970
AIX Expansion Pack	5765-G62	0968
AIX 6 Toolbox for Linux Source	5765-G62	0957
Firefox for AIX	5765-G62	1488
Upgrade Feature identifier	5765-G62	1431
TCB (preload only)	5765-G62	1400
Open GL (preload only)	5765-G62	1401
PHIGS (preload only)	5765-G62	1402
AIX Japan Kit (Japan Only)	5765-G62	0952
AIX Fast Connect	5765-E72	0923
AIX Link/X.25	5765-E85	0931
Performance Aide	5765-E68	0971
Performance Toolbox	5765-E74	0972

Operating system and base products	Product identifier	SPO feature (5692-A6P)
IBM Cluster Systems Management for AIX	5765-F67	2202
Virtual I/O Server	5765-G34	2201
Virtual I/O Server Expansion pack	5765-G34	1404
AIX Workload Partitions Manager	5765-WPM	1405
AIX Workload Partitions Agent	5765-WPM	1430
ITM Server	5765-ITM	1428
ITM Agents	5765-ITM	1429
Systems Director Virtual Image Mgr	5765-IMP	1481
ITUAM Virtualization Edition	5765-UAV	1482
IBM PowerHA Cluster Manager (HACMP) for AIX	5765-F62	1489
IBM PowerHA Cluster Manager (HACMP) Extended Distance Feature	5765-F62	1490
IBM PowerHA Cluster Manager (HACMP) Smart Assist for WebSphere	5765-F62	1491
IBM Engineering and Scientific Subroutine Library for AIX	5765-F82	1496

IBM i operating system and licensed program release level summary

In this chapter, we cover the IBM i 5.4 and IBM i 6.1 software licensed programs announced through August 2008. We do not cover any i5/OS associated telephony software products.

For related telephony information refer to:

http://www-03.ibm.com/systems/i/advantages/iptelephony/index.html

The tables in this chapter identify the software release of the minimum operating system that is required for IBM i family of systems. The features that are supported in these processors might be supported by earlier releases of i5/OS or OS/400 than the processor itself. Many of the feature codes that are supported in these processors are also represented in this appendix.

> **Note:** This appendix uses both i5/OS release terminology and IBM i release terminology interchangeably.

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IBM i release on processor technology summary

Table B-1 summarizes the i5/OS release levels, starting with V5R3, that are supported on the System i processor technologies.

Table B-1   Supported i5/OS release levels

Processor Technology	IBM i V5R3[a]	IBM i 5.4[a, b]	IBM i 6.1[a, c]	Future[d]
POWER6 models	Not supported	Supported, requires Machine Code 5.4.5	Supported	Supported
POWER5+ Models 515, 525	Not supported	Supported[e]	Supported	Supported
POWER5/5+ Models 520, 550, 570, and 595	Supported	Supported[e]	Supported	Supported
Models 800, 810, 825, 870, and 890	Supported	Supported[e]	Supported	Not planned
Models 270, 820, 830, and 840	Supported	Supported[e]	Not supported	Not planned

a. Minimum operating system memory storage required is 128 MB. 300 MB is a starting place for WebSphere Application Server. More memory is recommended for WebSphere Application Server environments doing productive work. Other products can have specific memory requirements.

b. IBM i 5.4 and later requires a load-source disk unit of 17 GB or larger.

c. IBM i 6.1 requires a minimum of two disk drives.

d. All statements regarding future direction and intent of IBM are subject to change or withdrawal without notice and represent goals and objectives only. For more information, refer to the Upgrade planning Web page for future software releases:

   http://www-304.ibm.com/jct01004c/systems/support/i/planning/upgrade/futuresftwr.html

e. This includes V5R4M0 and V5R4M5 Licensed Internal (Machine) Code on these models. Note that i5/OS V5R3 also has a V5R3M5 level Licensed Internal Code that is the minimum operating system release level and machine code level that runs on POWER5+ models. Always verify the latest IBM i release support status at the planning and upgrade Web site.

Notes:

► Do not use this appendix to compare IBM i functions or range of products with those of other operating systems such as AIX or IBM i releases. Comparing the wide range of functions among operating systems is beyond the scope of this publication.

► V5R4M5 and V6R1 of IBM i are currently supported for the Power Systems.

   – 9117-MMA
   – 9119-FHA

   For hardware information about processor technologies that we do not cover in this paper, see:

   – IBM eServer i5 and iSeries System Handbook: IBM i5/OS Version 5 Release 3 October 2004, GA19-5486-26

   – IBM System i5, eServer i5, and iSeries Systems Builder IBM i5/OS Version 5 Release 4 - January 2006, SG24-2155-12

   – *IBM eServer iSeries and AS/400e System Builder: IBM OS/400 Version 4 Release 3 - i5/OS Version 5 Release 2*, REDP-0542

   – *PCI Card Placement Rules for the IBM eServer iSeries Server OS/400 Version 5 Release 2: September 2003*, REDP-3638

► This paper does not contain detailed ordering instructions or pricing information. For additional information, we recommend that you contact either an IBM representative or an authorized IBM Business Partner. You can go to the IBM System i "How to Buy" Web page at:

   http://www.ibm.com/systems/i/buy/marketing/

   From this page, you can choose to be put in contact with an IBM Business Partner or IBM Sales Representative. You can also request a price quote. To contact an IBM U.S. Sales Representative, call 1-888-SHOP-IBM.

Minimum IBM i and IBM i software-level requirements for Power System 9117-MMA and 9119-FHA models

The following tables identify the software release of the minimum operating system that is required for IBM Power Systems. The features that are supported in these processors might be supported by earlier releases of i5/OS or OS/400 than the processor itself. Many of the feature codes that are supported in these processors are also represented in this appendix.

Table B-2 on page 880 summarizes the IBM i release levels, starting with 5.4 (V5R4), that are supported on the Power System processor technologies. The term *V5R4M5* refers to a release level of IBM licensed Machine Code (microcode) that became available after the initial release of IBM i V5R4 (operating system). At the operating system level this release continues to be identified as V5R4 or 5.4. There is no operating system level of V5R4M5.

Historically, the i5/OS (IBM i) licensed machine code has also be referred to as *LIC*. In this section, we use the terms *Machine Code* and *LIC* interchangeably.

Table B-2   Supported IBM i release levels

Power System model	V5R3	V5R4 with Machine Code level V5R4M5	V6R1
All POWER6 models	Not supported	Supported	Supported
Note 1: All statements regarding future direction and intent of IBM are subject to change or withdrawal without notice, and represent goals and objectives only. For more information, refer to the Upgrade planning Web page for future software releases: **Note 2:** You can get other informations about IBM i online at. ▶ http://www-304.ibm.com/jct01004c/systems/support/i/planning/upgrade/futuresftwr.html ▶ http://www-304.ibm.com/systems/support/i/planning/upgrade/osmapping.html ▶ http://www-912.ibm.com/s_dir/slkbase.NSF/1444e529a72ba96486256a6400681992/c69799b70a28578c8625712c004fe06b?OpenDocument&Highlight=0,master This Software Technical Document contains a wizard that can help you to determine the appropriate operating system, machine code, and system firmware levels that are required for specific POWER5 and POWER6 systems that are running IBM i.			

IBM i general availability and support

Table B-3 shows the availability, withdrawal, and end of support dates for each release of the operating system. Note that IBM i V6R1and i5/OS V5R4 are the supported levels of operating system for the Power System models.

Table B-3   IBM i general availability and support

Release	General availability	Withdrawn from marketing	End of program support
V5R3	3 June 2004	04 January 2008	30 April 2009
V5R4	14 February 2006	----	----
V6R1	21 March 2008	----	----

Note: Currently, IBM supports an i5/OS release until the next two releases are made available, plus 12 months. i5/OS V5R3 will be supported for 12 months beyond the release of IBM i 6.1. Exact dates vary according to a variety of factors, including development schedules and the broader software life cycle support cycles from IBM. For example, to simplify customer's software life cycle management, IBM currently coordinates end of support dates for i5/OS and other IBM software products in April or September.

The IBM i planning and upgrade Web site includes information about the software life cycle, which includes when an operating system release level can no longer be ordered (withdrawn from marketing) and when technical support is withdrawn. The direct link to this information is:

http://www-304.ibm.com/systems/support/i/planning/upgrade/suptschedule.html

Note that IBM plans are subject to change without prior notice.

IBM i upgrade paths

Table B-4 shows the valid upgrade paths for i5/OS and OS/400.

Table B-4   Valid upgrade paths

To: From:	i5/OS V5R3	i5/OS V5R4	IBM i V6R1
V5R3	✓	✓	✓
V5R4		✓	✓
V6R1			✓

Software ordering terminology

The following standard terminology is used for all software versions:

- ▶ Product identifier (PID)

  All IBM Licensed Programs including i5/OS and OS/400 have a product identifier. The format is 57*xx-yyy.* For example, i5/OS V5R4 is 5722-SS1.

- ▶ HIPO

  New preload orders of Version 5 are defined with HIPO numbers associated with the hardware product order. For example, HIPO feature 5372-IS5 is for new orders of Version 5. The 5372-IS5 contains features, with each feature indicating the software product to be loaded. For example, #1002 indicates BRMS (5722-BR1). It serves as an (administrative) software preload ordering vehicle. The term HIPO is not an acronym.

- ▶ Additional feature

  Additional features are product and associated HIPO features that relate to an optional feature of a licensed program. The additional feature provides the delivery mechanism for the licensed program.

- ▶ **Skip ship**

  For Version 5, some products have a "skip ship" from a previous release. They retain their original product identifiers, but can still be ordered.

- ▶ Electronic Proof Of Entitlement (ePoE)

  The ePoE record replaces the printed Proof of Entitlement.

Note: The planning and upgrade Web site has a set of hardware and software information that lists the IBM i release levels that are supported and the hardware technology levels and life cycle support statements for various licensed programs release levels. Information includes which licensed program levels are no longer supported and any announced dates for planned support withdrawal.

Consider reviewing the software life cycle information at:

http://www-01.ibm.com/software/support/systemsi/lifecycle/

In the remainder of this chapter, we summarize the licensed program products and the release levels supported.

i5/OS Application Server (5761-SSB)

A new i5/OS license for additional processors on System i models 550, 570, and 595 offers a reduced i5/OS entitlement charge for System i processors. The processors are assigned to logical partitions (LPARs). These LPARs host applications that access DB2 data residing and managed in other partitions as well as applications that do not execute DB2 function in i5/OS within the partition at all.

Using the new i5/OS Application Server processor entitlement offering, you can now take advantage of the benefits of i5/OS work management, security, and scalability in new applications even more affordably. Additionally, you can manage these applications with the same resources and skills that support their other i5/OS business applications.

The i5/OS Application Server license entitlement can support partitions that run products such as Lotus Domino and Sametime®, which do not require DB2 UDB to execute. License entitlement is also ideal for Web application serving workloads such as Java language business applications running under WebSphere Application Server or even PHP or Apache-based applications running on i5/OS. These applications typically access DB2 data only in other i5/OS partitions or servers.

This Application Server license entitlement is also offered as 5721-SSB for IBM i 5.4.

IBM i V6R1 software

The tables in this section show the IBM i based software products that are most commonly ordered. It is not a complete list of all software products running on IBM i 6.1.

Table B-5 lists the most commonly ordered OS and base IBM i products.

Table B-5   IBM i 6.1 commonly orderable operating system options and program products

Operating system and base products	Skip ship[2]	Product identifier	HIPO feature (5372-IS5)[2]	Keyed Stamped Media[9]	Software Maintenance delivery[8]
Operating System/400® [6,7]	---	5761-SS1	1000	5050	
i5/OS Application Server (5761-SSB)	---		1000	5050	
i5/OS Users	---		5052		
Block of 250 users	---		5053		
Unlimited users	---		5054		
Media and Storage Extensions	---	5761-SS1 Option 18	1500	5103	
OptiConnect for OS/400	---	5761-SS1 Option 23	1515		
DB2 Symmetric Multiprocessing	---	5761-SS1 Option 26			
DB2 MultiSystem	---	5761-SS1 Option 27			
Encrypted Backup Enablement	---	5761-SS1 Option 43			

Encrypted ASP enablement	---	5761-SS1 Option 45			
Print Services Facility™ (PSF/400) 1-45 IPM 1-100 IPM Any speed	---	5761-SS1 Option 36 Option 37 Option 38	1501 1502 1503	5112 5113 5114	
High Availability Switchable Resource	---	5761-SS1 Option 41	1505	5116	
High Availability Journal Performance	---	5761-SS1 Option 42	1545	5117	
S/38 Utilities for AS/400[6]	✓	5722-DB1	1021		
HTTP Server for iSeries		5761-DG1			
IBM Toolbox for Java		5761-JC1			
IBM Developer Kit for Java		5761-JC1			
DB2 Query Manager and SQL Development Kit for iSeries [6, 7]		5761-ST1	1011	5050	
iSeries Access for Windows		5761-XW1			

Table B-6 lists the most commonly ordered OS/400 complementary database software.

Table B-6   Commonly ordered OS/400 complementary database software

OS/400 complementary database software	Skip ship[2]	Product identifier	HIPO feature (5372-IS5)[2]	Keyed Stamped Media[9]	Software Maintenance delivery[8]
DB2 OLAP Server™ for iSeries V8.1[10]	----	5724-B78	----		
DB2 UDB Warehouse Manager Standard Edition V8	✓	5724-E66			
DB2 Universal Database™ Extenders for iSeries V7.2	----	5722-DE1	1004	5050	S
DB2 DataPropagator™ for iSeries Version 8.1	✓	5722-DP4	1035	5050	S
DB2 QMF™ Distributed Edition V8.1 for Multiplatforms	----	5724-E86			
i5/OS Integration for Linux on xSeries	----	5722-LSV	----		
Query for iSeries[6, 7]	----	5761-QU1	1009	5050	S
System Openness Includes	----	5761-SS1 Option 13	----		S
NetWare Enhanced Integration	----	5761-SS1 Option 25	----		S
Portable Application Solution Environment	----	5761-SS1 Option 33	----		S
TCP/IP Connectivity Utilities for iSeries	----	5761-TC1	----		S
iSeries Access for Linux	✓	5722-XL1			
iSeries Access for Web	✓	5722-XH2			

| iSeries Access for Wireless | ✓ | 5722-XP1 | | | S |
| iSeries Access Family[6,7] | ---- | 5761-XW1 | 1012 Client Processor - 1013 Client User | 5050 | S |

Table B-7 lists the most commonly order networking products.

Table B-7   Commonly ordered networking products

Networking products	Skip ship[2]	Product identifier	HIPO feature[2] (5372-IS5)	Keyed Stamped Media[9]	Software subscription or maintenance[8]
Host On-Demand Version 6.0	P	5733-A59	----		M
WebSphere MQ Version 5.3[6]	P	5733-B41	----	-	M
Communications Utilities for iSeries[6]	----	5722-CM1	1003	5050	S
Cryptographic Support for AS/400[6]	✓	5722-CR1	1020		S
iSeries Cryptographic Device Manager		5733-CY1			
Communications Server for Windows NT® Version 6.1	P	5639-F25	----		----
Network Authentication Enablement for i5/OS		5722-NAE			
NetView® FTP		5798-TBG			

Table B-8 lists the most commonly order WebSphere and On Demand business products.

Table B-8   Commonly ordered WebSphere and On Demand business products

WebSphere and On Demand business products	Skip ship[2]	Product identifier	HIPO features[2]	Keyed Stamped Media[9]	Software subscription or maintenance[8]
IBM Business Solutions	✓	5722-BZ1			M
WebSphere Application Server Version 6.0 Developer Edition for iSeries		5724-H89			M
WebSphere Application Server Express V5.1 iSeries	✓	5722-E51	6007		M
WebSphere Commerce for iSeries V5.6, Business Edition, Professional Edition, and Express		5724-I38 5724-I40 5724-I36	----		M
Software Integration Assistant for iSeries		5722-IA1			
WebSphere Application Server Version 5.1 for iSeries		5733-W51			M
WebSphere Application Server V 6.0 for i5/OS		5733-W60			
WebSphere Application Server 6.1 for i5/OS		5733-W61			
WebSphere Enablement	✓	5733-WE2			M

Table B-9 lists the most commonly ordered systems management products.

Table B-9   Commonly ordered systems management products

Systems management products	Skip ship[2]	Product identifier	HIPO feature[2]	Keyed Stamped Media[9]	Software subscription or maintenance[8]
Backup Recovery and Media Services for iSeries[6]	----	5761-BR1	1002 1506	5050 5101	S
IBM Secure Perspective	،	5733-PS1	6011		Product Code
IBM Director with VE Console for i5/OS V5.10	،	5733-DR1			Product Code
IBM Director V5.20 (replaces 5733-DR1 starting December 2006)	،	5722-DR1			Product Code
VE Enterprise Workload Manager™ for i5/OS V2.1	،	5733-EWA			Product Code
PATROL for iSeries – Predict	----	5620-FIF	----		S
Tivoli® Storage Manager Enterprise Edition V5.1	----	5698-ISE	----		----
Tivoli Storage Manager V5.1	----	5698-ISM	----		----
Advanced Job Scheduler for iSeries[6]	----	5761-JS1	1007	5050	S
Tivoli Management Agent	----	1TME-LCF	----		----
Managed System Services for iSeries[6]	----	5761-MG1	1030		S

Performance Tools for iSeries[6,7]
    Manager Feature
    Agent Feature
    ob Watcher
		5722-PT1
		Option 1
		Option2
			1008
			1508
			1509
				5050
				5101
				5102
					S

Content Manager OnDemand for iSeries[6] PDF Indexer Feature	----	5722-RD1 Option 12	1010 1510		M
VE Resource Dependency Service V2.1		5733-RDS			Product Code
System Manager for iSeries[6]	----	5722-SM1	1032		S

Table B-10 lists the most commonly ordered application development products.

Table B-10   Commonly ordered application development products

Application development products	Skip ship[2]	Product identifier	HIPO feature[2]	Keyed Stamped Media[9]	Software subscription or maintenance[8]
CICS Transaction Server for iSeries[6]	----	5722-DFH	1025		S
WebSphere Application Server Version 6.0 Developer Edition for iSeries		5724-H89			M
Portable Utilities		5733-SC1			
WebSphere Development Studio (Toolset)	----	5761-WDS	1015	5050	S
ILE compilers	---	5761-WDS			S
Heritage compilers	---	5761-WDS			
Application Development ToolSet --- Option 21 Application Development ToolSet	---				
XML Toolkit for iSeries	✓	5733-XT1	----		

Table B-11 lists the most commonly ordered office support and printing products.

Table B-11   Commonly ordered office support and printing products

Office support and printing products	Skip ship[2]	Product identifier	HIPO feature[2]	Keyed Stamped Media[9]	Software subscription or maintenance[8]
Advanced Function Printing Utilities for AS/400[6]	---	5761-AF1	1001	5050	S
Advanced DBCS Printer Support for AS/400[6]	---	5761-AP1	1014	5050	S
AFP Font Collect ion for Workstation and OS/400	✓	5648-B45	----		
Business Graphics Utility for AS/400[6]	✓	5722-DS1	1027		S
Facsimile Support for iSeries	✓	5798-FAX	----		S
Advanced Function Printing Fonts for AS/400[6] Font Options	✓	5769-FNT Options 1-15	---- ---- 1520-1534		S
Advanced Function Printing DBCS Fonts for AS/400[6][†] Font Options	✓	5769-FN1	---- 1535-1539		S
Domino Fax for iSeries	✓	5733-FXD	----		S
Infoprint Fonts for Multiplatform	✓	5648-E77			
Infoprint Designer for iSeries	✓	5733-ID1	6003		S
Infoprint Server for iSeries	----	5722-IP1	1006	5050	S
Lotus Domino for iSeries Version 6.0	P	5733-LD7	----		M
Lotus Domino 6.5 for iSeries	P	5733---L65	----		M
QuickPlace® for iSeries Version 2.0	P	5733-LQP	----		M

Content Manager for iSeries	P	5722-VI1	1034		M
Object Server		Option 1	----		
Advanced Workflow		Option 4	----		

Table B-12 lists the most commonly ordered additional database products.

Table B-12   Commonly ordered additional database products

Additional database products	Skip ship[2]	Product identifier	HIPO feature[2]	Keyed Stamped Media[9]	Software subscription or maintenance[8]
MySQL™ Enterprise for i5/OS		5639-MYS			
DB2 Web Query for System i		5733-QU2			

Table B-13 lists the most commonly ordered additional and packaged products.

Table B-13   Commonly ordered additional and packaged products

Additional and packaged products	Skip ship[2]	Product identifier	HIPO feature[2]	Keyed Stamped Media[9]	Software subscription or maintenance[8]
Host Access Client Package for iSeries, Version 5.0 Personal Communications V5.8 WebSphere Host On-Demand V9.0		5724-I21	----		

Host Access Client Package for Multiplatforms, Version 5.0
   Personal Communications V5.8
   WebSphere Host On-Demand V9.0
		5724-I20	----		

ValuPak for V5R3: 5722-SS1: 1-45 ipm feature 5722-XW1: iSeries Access 5722-QU1: Query 400 5722-ST1: DB2/400 Query Manager and SQL Development Kit 5722-PT1: Performance Tools (Manager feature)		5761-VP1	----		
DB2 Value Pack for i5/OS 5722-ST1: DB2 Query Manager and SQL Development Kit 5722-SS1, Option 26: DB2 Symmetric Multiprocessing (DB2 SMP) 5722-DE: DB2 UDB Extender 5733-XT1: XML Toolkit for IBM System i5 (XML Toolkit)		5761-DVP			
Operations Value Pack for i5/OS 5722-BR1: Backup Recovery and Media Services (BRMS) 5722-BR1, Option 1: BRMS Network Feature 5722-SS1, Option 18: Media and Storage Extensions 5722-PT1: Performance Tools for i5/OS 5722-PT1, Option 1: Performance Tools Manager		5761-SVP			

Table B-14 lists the most commonly ordered telephony products and packaging.

Table B-14   Commonly ordered telephone products and packaging

Telephony products and packaging	Skip ship[2]	Product identifier	HIPO feature[2]	Keyed Stamped Media[9]	Software subscription or maintenance[8]
System i IP Telephony Express offerings Telephony Express 100 (#7381) Telephony Express 250 (#7382 Telephony Express 500 (#7383) Telephony Express 1000 (#7384) Telephony Express HA100 (#0486) Telephony Express HA250 (#0487) Telephony Express HA500 (#0488 Telephony Express HA1000 (#0489)	----				
3Com IP Telephony Suite for IBM System i	---	5639-3CM			

i5/OS V5R4 software

The tables in this section show the IBM i 5.4 (V5R4 i5/OS) based software products that are most commonly ordered. It is not a definitive list of all IBM i software products that are now available. See "Notes for IBM i 5.4 with LIC 5.4.5 and 6.1software tables" on page 894 for Version 5 software group information.

Table B-15 lists the most commonly ordered operating system and base products.

Table B-15   Commonly ordered operating system and base products

Operating system and base products	Skip ship[2]	Product identifier	HIPO feature (5372-IS5)[2]	Keyed Stamped Media[9]	Software Maintenance delivery[8]
Operating System/400 [6],[7]	----	5722-SS1	1000	5050	S
i5/OS Users	----		5052		
Block of 250 users	----		5053		
Unlimited users	----		5054		
Media and Storage Extensions	----	5722-SS1 Option 18	1500	5103	S
OptiConnect for OS/400	----	5722-SS1 Option 23	1515		S
DB2 Symmetric Multiprocessing	----	5722-SS1 Option 26	1517		S
DB2 MultiSystem	----	5722-SS1 Option 27	1518		S
Print Services Facility (PSF/400) 1-45 IPM 1-100 IPM Any speed	----	5722-SS1 Option 36 Option 37 Option 38	 1501 1502 1503	 5112 5113 5114	S
High Availability Switchable Resource	----	5722-SS1 Option 41	1505	5116	S

High Availability Journal Performance	----	5722-SS1 Option 42	1545	5117	S
S/38 Utilities for AS/400[6]	✓	5722-DB1	1021		S
HTTP Server for iSeries	----	5722-DG1	----		S
IBM Toolbox for Java	----	5722-JC1	----		S
IBM Developer Kit for Java	----	5722-JV1	----		S
DB2 Query Manager and SQL Development Kit for iSeries [6, 7]	----	5722-ST1	1011	5050	S
iSeries Access for Windows	----	5722-XE1	----		S

Table B-16 lists the most commonly ordered OS/400 complementary database software.

Table B-16   Commonly ordered OS/400 complementary database software

OS/400 complementary database software	Skip ship[2]	Product identifier	HIPO feature (5372-IS5)[2]	Keyed Stamped Media[9]	Software Maintenance delivery[8]
DB2 OLAP Server for iSeries V8.1[10]	----	5724-B78	----		
DB2 UDB Warehouse Manager Standard Edition V8	✓	5724-E66			
DB2 Universal Database Extenders for iSeries V7.2	----	5722-DE1	1004	5050	S
DB2 DataPropagator for iSeries Version 8.1	✓	5722-DP4	1035	5050	S
DB2 QMF Distributed Edition V8.1 for Multiplatforms	----	5724-E86			
i5/OS Integration for Linux on xSeries	----	5722-LSV	----		
Query for iSeries[6, 7]	----	5722-QU1	1009	5050	S
System Openness Includes	----	5722-SS1 Option 13	----		S
NetWare Enhanced Integration	----	5722-SS1 Option 25	----		S
Portable Application Solution Environment	----	5722-SS1 Option 33	----		S
TCP/IP Connectivity Utilities for iSeries	----	5722-TC1	----		S
iSeries Access for Linux	✓	5722-XL1			
iSeries Access for Web	----	5722-XH2			
iSeries Access for Wireless	----	5722-XP1			S
iSeries Access Family[6,7]	----	5722-XW1	1012 Client Processor - 1013 Client User	5050	S

Table B-17 lists the most commonly ordered networking products.

Table B-17   Commonly ordered networking products

Networking products	Skip ship[2]	Product identifier	HIPO feature[2] (5372-IS5)	Keyed Stamped Media[9]	Software subscription or maintenance[8]
Host On-Demand Version 6.0	P	5733-A59	----		M
WebSphere MQ Version 5.3[6]	P	5733-B41	----	-	M
Communications Utilities for iSeries[6]	----	5722-CM1	1003	5050	S
Cryptographic Support for AS/400[6]	✓	5722-CR1	1020		S
iSeries Cryptographic Device Manager		5733-CY1			
Communications Server for Windows NT Version 6.1	P	5639-F25	----		----
Network Authentication Enablement for i5/OS		5722-NAE			
NetView FTP		5798-TBG			

Table B-18 lists the most commonly ordered WebSphere and On Demand business products.

Table B-18   Commonly ordered WebSphere and On Demand business products

WebSphere and On Demand business products	Skip ship[2]	Product identifier	HIPO features[2]	Keyed Stamped Media[9]	Software subscription or maintenance[8]
IBM Business Solutions	✓	5722-BZ1			M
WebSphere Application Server Version 6.0 Developer Edition for iSeries		5724-H89			M
WebSphere Application Server Express V5.1 iSeries	✓	5722-E51	6007		M
WebSphere Commerce for iSeries V5.6, Business Edition, Professional Edition, and Express		5724-I38 5724-I40 5724-I36	----		M
Software Integration Assistant for iSeries		5722-IA1			
WebSphere Application Server Version 5.1 for iSeries		5733-W51			M
WebSphere Application Server V 6.0 for i5/OS		5733-W60			
WebSphere Application Server 6.1 for i5/OS		5733-W61			
WebSphere Enablement	✓	5733-WE2			M

Table B-19 lists the most commonly ordered systems management products.

Table B-19   Commonly ordered systems management products

Systems management products	Skip ship[2]	Product identifier	HIPO feature[2]	Keyed Stamped Media[9]	Software subscription or maintenance[8]
Backup Recovery and Media Services for iSeries[6]	----	5722-BR1	1002 1506	5050 5101	S
IBM Secure Perspective	----	5733-PS1	6011		Product Code
IBM Director with VE Console for i5/OS V5.10		5733-DR1			Product Code
IBM Director V5.20 (replaces 5733-DR1 starting December 2006)		5722-DR1			Product Code
VE Enterprise Workload Manager for i5/OS V2.1	New	5733-EWA			Product Code
PATROL for iSeries – Predict	----	5620-FIF	----		S
Tivoli Storage Manager Enterprise Edition V5.1	----	5698-ISE	----		----
Tivoli Storage Manager V5.1	----	5698-ISM	----		----
Advanced Job Scheduler for iSeries[6]	----	5722-JS1	1007	5050	S
Tivoli Management Agent	----	1TME-LCF	----		----
Managed System Services for iSeries[6]	----	5722-MG1	1030		S
Performance Tools for iSeries[6,7] Manager Feature Agent Feature	----	5722-PT1 Option 1 Option2	1008 1508 1509	5050 5101 5102	S
Content Manager OnDemand for iSeries[6] PDF Indexer Feature Web Enablement Kit Feature	----	5722-RD1 Option 12 Option 11		1010 1510 1511	M
VE Resource Dependency Service V2.1	New	5733-RDS			Product Code
System Manager for iSeries[6]	----	5722-SM1	1032		S

Table B-20 lists the most commonly ordered application development products.

Table B-20   Commonly ordered application development products

Application development products	Skip ship[2]	Product identifier	HIPO feature[2]	Keyed Stamped Media[9]	Software subscription or maintenance[8]
CICS Transaction Server for iSeries[6]	----	5722-DFH	1025		S
WebSphere Application Server Version 6.0 Developer Edition for iSeries		5724-H89			M
Portable Utilities		5733-SC1			
WebSphere Development Studio (Toolset)	----	5722-WDS	1015	5050	S
XML Toolkit for iSeries	✓	5733-XT1	----		S

Table B-21 lists the most commonly ordered office support and printing products.

Table B-21   Commonly ordered office support and printing products

Office support and printing products	Skip ship[2]	Product identifier	HIPO feature[2]	Keyed Stamped Media[9]	Software subscription or maintenance[8]
Advanced Function Printing Utilities for AS/400[6]	✓	5722-AF1	1001	5050	S
Advanced DBCS Printer Support for AS/400[6]	✓	5722-AP1	1014	5050	S
AFP Font Collect ion for Workstation and OS/400	✓	5648-B45	----		
Business Graphics Utility for AS/400[6]	✓	5722-DS1	1027		S
Facsimile Support for iSeries	✓	5798-FAX	----		S
Advanced Function Printing Fonts for AS/400[6] Font Options	✓	5769-FNT Options 1-15	---- ---- 1520-1534		S
Advanced Function Printing DBCS Fonts for AS/400[6][†] Font Options	✓	5769-FN1	---- 1535-1539		S
Domino Fax for iSeries	✓	5733-FXD	----		S
Infoprint Fonts for Multiplatform	✓	5648-E77			
Infoprint Designer for iSeries	✓	5733-ID1	6003		S
Infoprint Server for iSeries	----	5722-IP1	1006	5050	S
Lotus Domino for iSeries Version 6.0	P	5733-LD7	----		M
Lotus Domino 6.5 for iSeries	P	5733---L65	----		M
QuickPlace for iSeries Version 2.0	P	5733-LQP	----		M
Content Manager for iSeries Object Server Advanced Workflow	P	5722-VI1 Option 1 Option 4	1034 ---- ----		M

Table B-22 lists the most commonly ordered additional database products.

Table B-22   Commonly ordered additional database products

Additional database products	Skip ship[2]	Product identifier	HIPO feature[2]	Keyed Stamped Media[9]	Software subscription or maintenance[8]
MySQL Enterprise for i5/OS	----	5639-MYS			
DB2 Web Query for System i		5733-QU2			S

Table B-23 lists the most commonly ordered additional and packaged products.

Table B-23   Commonly ordered additional and packaged products

Additional and packaged products	Skip ship[2]	Product identifier	HIPO feature[2]	Keyed Stamped Media[9]	Software subscription or maintenance[8]
Host Access Client Package for iSeries, Version 5.0 Personal Communications V5.8 WebSphere Host On-Demand V9.0		5724-I21	----		

Host Access Client Package for Multiplatforms, Version 5.0
    Personal Communications V5.8
    WebSphere Host On-Demand V9.0
		5724-I20	----		

ValuPak for V5R3: 5722-SS1: 1-45 ipm feature 5722-XW1: iSeries Access 5722-QU1: Query 400 5722-ST1: DB2/400 Query Manager and SQL Development Kit 5722-PT1: Performance Tools (Manager feature)		5722-VP1	----		
DB2 Value Pack for i5/OS 5722-ST1: DB2 Query Manager and SQL Development Kit 5722-SS1, Option 26: DB2 Symmetric Multiprocessing (DB2 SMP) 5722-DE: DB2 UDB Extender 5733-XT1: XML Toolkit for IBM System i5 (XML Toolkit)		5722-DVP			
Operations Value Pack for i5/OS 5722-BR1: Backup Recovery and Media Services (BRMS) 5722-BR1, Option 1: BRMS Network Feature 5722-SS1, Option 18: Media and Storage Extensions 5722-PT1: Performance Tools for i5/OS 5722-PT1, Option 1: Performance Tools Manager		5722-SVP			

Table B-24 lists the most commonly ordered telephony products and packaging.

Table B-24   Commonly ordered telephony products and packaging

Telephony products and packaging	Skip ship[2]	Product identifier	HIPO feature[2]	Keyed Stamped Media[9]	Software subscription or maintenance[8]
System i IP Telephony Express offerings Telephony Express 100 (#7381) Telephony Express 250 (#7382 Telephony Express 500 (#7383) Telephony Express 1000 (#7384) Telephony Express HA100 (#0486) Telephony Express HA250 (#0487) Telephony Express HA500 (#0488 Telephony Express HA1000 (#0489)	----				
3Com IP Telephony Suite for IBM System i		5639-3CM			

Notes for IBM i 5.4 with LIC 5.4.5 and 6.1software tables

Note 1	V5 is supported on the following AS/400e™ RISC models *only*. See the overview table in the model chapters for the *minimum* OS/400 release to support each model. ► 9401-150 (V5R1 does not support 5649-*nnn* products. 5722-*nnn* programs in group P05 support the 9401-150.) 9402/4-4xx (V5R1 only) ► 9404/6-5xx (V5R1 only) ► 9402/4/6-620, 630, 640, S20, S30, S40 ► 9406-170 ► 9402/4/6-720, 730, 740 ► 9406-250 ► 9402/4/6-270 ► 9402/4/6-800, 810, 820, 825, 830, 840, 870, 890 ► 9406-SB2/SB3 ► 9405-520 (V5R3 or later) ► 9406-520, 550, 570, 595 (V5R3 or later) ► 9407 515, 9406 525 (V5R4 or later) V5 is *not* supported on any AS/400 CISC models.
Note 2	Products marked with a check mark (✓) in the Skip ship column are unchanged from a previous version or release and are referred to as being skip shipped. These products retain their original product identifiers. The HIPO feature column provides the feature codes that are included in the HIPO (5732-IS5) when a specific product or feature is ordered to be preloaded in the factory. If you order a software upgrade, or if the initial order does not include the #5000 software preload code, the order does not include the HIPO (5732-IS5). With the introduction of Keyed Stamped Media in V4R4, all products the client ordered are no longer "stacked" on a single set of CDs. The client receives a grouping of CDs. With V5R2, this includes: ► Licensed Internal Code (I_Base_01) ► OS/400 Base Operating System CD (B29xx_01) ► OS/400 No Charge Options (B29xx_02 to B29xx_06) ► No charge License Programs (B29xx_07 to B29xx_09) ► Set of Keyed Stamped Media CDs (L29xx_01 to L29xx_02) ► Individual CD for each product ordered that is not part of Keyed Stamped Media (F29xx_01 and higher) ► Cumulative PTF CDs (Cydddvrm_01) ► Secondary Languages if ordered (N29xx_01) ► iSeries Information Center (SK3T-4091)

Note 4	**Alternate IPL device feature codes**

The following feature codes are hardware features. They are used to specify which storage device is to be used as an alternate IPL device. They are not required when ordering Models 800, 810, 825, 870, and 890.

- ► #5502 840 MB Mini ¼ inch Cartridge Tape Unit (not 250, 270, 520, 550, 570, 595, 720, 730, 740, 800, 810, 820, 825, 830, 840, 870, 890)
- ► #5503 9347 Tape Unit (not 250, 270, 520, 550, 570, 595, 800, 810, 820, 825, 830, 840, 870, 890)
- ► #5504 3490 E01/E11 Tape Units*
- ► #5505 2440 Tape Unit (not 250, 270, 520, 550, 570, 595, 800, 810, 820, 825, 830, 840, 870, 890)
- ► #5506 4 GB ¼ inch Cartridge Tape Unit*
- ► #5507 9348 Tape Unit*
- ► #5508 3422 Tape Subsystem (not 250, 270, 520, 550, 570, 595, 800, 810, 820, 825, 830, 840, 870, 890)
- ► #5509 3430 Tape Subsystem (not 250, 270, 520, 550, 570, 595, 800, 810, 820, 825, 830, 840, 870, 890)
- ► #5511 3480 Tape Subsystem*
- ► #5512 3490 C10/C11/C22 Tape Unit*
- ► #5513 3490 Tape Subsystem*
- ► #5514 7208 8 mm Tape Drive and Internal 8 mm Tape Unit*
- ► #5515 3570 Tape Subsystem*
- ► #5516 1.2 GB ¼ inch Cartridge Tape Unit
- ► #5517 2.5 GB ¼ inch Cartridge Tape Unit*
- ► #5518 13 GB ¼ inch Cartridge Tape Unit
- ► #5519 3590 Tape System*
- ► #5521*
- ► #5531 16 GB or 30 GB ¼ inch Cartridge Tape Unit*
- ► #5536 25 GB or 50 GB ¼ inch Cartridge Tape Unit*
- ► #5537 358x Ultrium*
- ► #5538 DVD-RAM*
- ► #5599 No Save/Restore Device*

Refer to Chapter 10, "Tape and optical storage attachment summary" on page 827, and the internal tape unit sections of each processor's chapter to see which tapes are supported for that model.

* Those features marked with an asterisk (*)—#5504, #5506, #5507, #5511, #5512, #5513, #5514, #5515, #5517, #5519, #5521, #5531, #5536, #5537, #5538, and #5599—were withdrawn from marketing as of 01 December 2005.

Note 5	**Maximum number of chargeable users by product**

		Maximum number of users						
		P05	P10	P20	P30	P40	P50	P60
5722-DFH	CICS for iSeries	450	450	450	450	450	450	450
5722-RD1	OnDemand for iSeries concurrent user	---	---	No maximum limit ---			---	
5769-VI1	Content Manager for iSeries	---	---	No maximum limit ---			---	

The number of individual user licenses that, when priced, equate the tier (based on processor) pricing and are the maximum that can be used in a conversion for user based to tier (processor) pricing in that tier:

5722-XW1	iSeries Access Family	10	40	100	150	200	250	300

Note 6	These products are licensed using the International Program License Agreement (IPLA). These programs are licensed under the International Customer Agreement (ICA) or IBM Agreement for Programs (IAP) terms.

Three documents, *Proof of Entitlement (POE)*, *License Information Document (LID)*, and *International Program License Agreement*, are provided with IPLA software as proof of a valid license.

Important:
Starting with i5/OS V5R3, these programs are not transferable to another party outside of the enterprise and its subsidiaries (where a subsidiary is more than 50% owned by the enterprise).

When ordering upgrades to software licensed under the IPLA, such as IBM i (i5/OS, OS/400), a copy of the POE should be provided by the client to validate the license to the software.

Note 7	The following products are also offered in software packages: **5722-VP1 ValuPak for OS/400 (not available on OS/400 V4R5) includes:** 5722-SS1 Operating System/400 5722-PSF 1-45 ipm Option 36 of OS/400 Provides this number of users 5722-XW1 iSeries Access Family P05/10 P10/20 P20/50 P30/70 P40/125 P50/150 5722-QU1 Query/400 P60/175 5722-ST1 DB2/400 Query Manager and SQL Development Kit 57xx-PT1 Performance Tools (Option 1 Manager feature)
Note 8	New versions and updates to these products are covered by one of the following three methods: ► iSeries Software Maintenance (SWMA) ► Passport Advantage® (PA) Software Maintenance ► Product Code = Separate Maintenance by individual product codes SWMA indicates that the product is on the Eligible Products List for Software Subscription. Clients must purchase the Software Maintenance Subscription when they move to Version 4 or later to upgrade to new versions or releases. Software Subscription is available at prepaid options of one year or three years. For some products, Software Maintenance is covered by Passport Advantage. To register products using the Passport Advantage Web page and for more information, go to: http://www-142.ibm.com/software/sw-lotus/services/cwepassport.nsf/wdocs/softwaremaintenance The third method is to purchase an individual product code that covers an individual product. For example, clients who purchase VE Enterprise Workload Manager for i5/OS V2.1 (5733-EWA) must also purchase 5662-EWA to have a 3-year registration for the product. The price of Software Subscription is the same regardless of whether the software has been licensed to a system. Most iSeries software delivered by HIPO is covered by Software Subscription. Clients who do not have a valid Software Maintenance are not entitled to new versions or releases and must either re-license the software or purchase the After License For iSeries license to join if they want to upgrade to a new version or release. You can find a current list of program products covered by Software Subscription on the Web at: http://www-1.ibm.com/servers/eserver/iseries/sftsol/subscript2.htm Software Subscription is ordered as a unique product/model combination depending upon the method of payment: ► 5733-SW1 Software Subscription for AS/400 1-Year Prepay. *Withdrawn from marketing.* ► 5733-SW3 Software Subscription for AS/400 3-Year Prepay. *Withdrawn from marketing.* ► 5733-CA1 After License for iSeries For the prepayment options and the Subscription After License, specify the corresponding processor-based feature for 5733-SWx. "M" indicates Software Maintenance, which differs from Software Subscription. It requires maintenance to be purchased separately based on an individual product. Some products that were covered by Software Subscription are now covered by Software Maintenance. Clients who have these products covered under an existing Software Subscription are still eligible for upgrades under Software Subscription, but need to carefully plan their requirements when that Software Subscription expires. You can find a list of program products covered by Software Maintenance and their Maintenance product codes on the Web address listed previous in this note.

Note 9	A number (representing the Installation ID of the product) in the Keyed Stamped Media column indicates that the product is one of those provided in V5R1 on iSeries Keyed Stamped Media and shipped with OS/400. This number indicates on demand delivery of these products and features and allows a 70-day evaluation period for any of the provided products or features. To use the software distributed on the Keyed Stamped Media after the 70-day evaluation period, order a Software License Key. New Software License Keys are also required when the version, release, or modification level of the software changes. If the software is transferred to a different system, a new software key is required. Some software is keyed based on the Software group, and a new software key must be obtained when the Software group changes.
	When a Software License Key is ordered, retain the *Software License Key Sheet* that IBM provides.
	If a Keyed Stamped Media product or feature is to be upgraded, the current Software License Key Sheet for the product must be provided as proof of license.
Note 10	DB2 OLAP Server for iSeries V8.1 (5724-B78) was withdrawn from IBM marketing as of 09 November 2005. Connect for iSeries V2 (5733-CO2) was withdrawn from IBM marketing as of 13 December 2005. WebSphere Application Server Version 5.1 Developer Edition for iSeries (5724-D18) was withdrawn from IBM marketing as of 14 September 2005. The replacement product is WebSphere Application Server Version 6.0 Developer Edition for iSeries (5724-H89).

i5/OS and OS/400 software pricing groups

OS/400 software is priced by software groups. In this section, we show the software group for each iSeries and AS/400e processor for Version 5 and Version 4. Use the Work with License Information (WRKLICINF) command to display the software group of the installed AS/400e or iSeries server.

For information about software groups for earlier systems, refer to *IBM eServer AS/400e RISC System Builder Version 3 Release 6 - Version 5 Release 2*, REDP-0342.

IBM i 6.1 and IBM i 5.4 software groups

Table B-25 shows the software group for each IBM System i processor supported by IBM i 6.1.

Table B-25   IBM System i processor support

Hardware models	Processor feature	Server FC/ Edition FC / Enterprise Enablement	PowerVM standard / Enterprise	Software Group
M50	4966	4920 / 7006, 7046, 7048 / 4998, 4999	7982 / 7986	P20
M25	5634	4930 / 6761, 6762, 6763, 6766 / n/a	8506 / 8507	P10
M15	5633	4925 / 6721,6725 / n/a	8506 / 8507	P05

Licensed program release and size

The licensed programs listed in Table B-26 are available in IBM i 6.2 and are compatible with the i5/OS operating system. To help you plan for installing the release, use this information to find the release and current size of the licensed programs that are listed.

> **Note:** For IBM i 5.4, refer to *IBM System i5 Handbook IBM i5/OS Version 5 Release 4 January 2006*, SG24-7486.

Table B-26   Licensed program release and size

Product	Option	Version	Status	Storage (MB)	Description
5761	9999	V6R1M0	Refreshed	4080.0	Licensed Internal Code
5761	SS1 Base (QGPL, QUSRSYS, QSYS)	V6R1M0	Refreshed	3012.6	i5/OS
5761	SS1 option 1	V6R1M0	Refreshed	175.5	Extended Base Support
5761	SS1 option 2	V6R1M0	Refreshed	44.3	Online Information
5761	SS1 option 3	V6R1M0	Refreshed	2315.0	Extended Base Directory Support
5761	SS1 option 5	V6R1M0	Refreshed	25.5	System/36™ Environment
5761	SS1 option 6	V6R1M0	Refreshed	13.1	System/38™ Environment
5761	SS1 option 7	V6R1M0	Refreshed	10.2	Example Tools Library
5761	SS1 option 8	V6R1M0	Refreshed	18.5	AFP Compatibility Fonts
5761	SS1 option 9	V6R1M0	Refreshed	92.6	*PRV CL Compiler Support
5761	SS1 option 12	V6R1M0	Refreshed	18.6	Host Servers
5761	SS1 option 13	V6R1M0	Refreshed	424.8	System Openness Includes
5761	SS1 option 14	V6R1M0	Refreshed	15.6	GDDM®
5761	SS1 option 18	V6R1M0	Refreshed	1.9	Media and Storage Extensions
5761	SS1 option 21	V6R1M0	Refreshed	117.9	Extended G11N Support
5761	SS1 option 22	V6R1M0	Refreshed	3.4	ObjectConnect
5761	SS1 option 23	V6R1M0	Refreshed	10.9	OptiConnect
5761	SS1 option 26	V6R1M0	Refreshed	1.0	DB2 Symmetric Multiprocessing
5761	SS1 option 27	V6R1M0	Refreshed	1.2	DB2 Multisystem
5761	SS1 option 29	V6R1M0	Refreshed	111.5	Integrated Server Support
5761	SS1 option 30	V6R1M0	Refreshed	17.5	Qshell
5761	SS1 option 31	V6R1M0	Refreshed	38.2	Domain Name System
5761	SS1 option 33	V6R1M0	Refreshed	368.3	Portable App Solutions Environment

Product	Option	Version	Status	Storage (MB)	Description
5761	SS1 option 34	V6R1M0	Refreshed	36.0	Digital Certificate Manager
5761	SS1 option 35	V6R1M0	Refreshed	26.5	CCA Cryptographic Service Provider
5761	SS1 option 36	V6R1M0	Refreshed	1.1	PSF for i5/OS 1-55 IPM Printer Support
5761	SS1 option 37	V6R1M0	Refreshed	1.0	PSF for i5/OS 1-100 IPM Printer Support
5761	SS1 option 38	V6R1M0	Refreshed	1.0	PSF for i5/OS Any Speed Printer Support
5761	SS1 option 39	V6R1M0	Refreshed	488.8	International Components for Unicode
5761	SS1 option 41	V6R1M0	Refreshed	1.1	HA Switchable Resources
5761	SS1 option 42	V6R1M0	Refreshed	1.2	HA Journal Performance
5761	SS1 option 43	V6R1M0	Refreshed	644.4	Additional Fonts
5761	SS1 option 44	V6R1M0	New	1.1	Encrypted Backup Enablement
5761	SS1 option 45	V6R1M0	New	0.9	Encrypted ASP Enablement
5761	SS1 option 46	V6R1M0	New	9.6	Performance Viewer Open Source Components
5761	AF1 base	V6R1M0	Refreshed	19.8	IBM Advanced Function Printing Utilities
5761	AP1 base	V6R1M0	Refreshed	15.9	IBM Advanced DBCS Printer Support for iSeries
5761	AP1 option 1	V6R1M0	Refreshed	2.0	Adv DBCS Printer Support - IPDS¢,
5761	BR1 base	V6R1M0	Refreshed	240.2	IBM Backup Recovery and Media Services for i5/OS
5761	BR1 option 1	V6R1M0	Refreshed	1.1	BRMS - Network Feature
5761	BR1 option 2	V6R1M0	Refreshed	0.9	BRMS - Advanced Feature
5722	BZ1 base	V5R1M0	Ship level	8.6	IBM Business Solutions
5761	CM1 base	V6R1M0	Refreshed	14.4	IBM Communications Utilities for System i
5761	DB1 base	V6R1M0	Refreshed	82.5	IBM System/38 Utilities for System i
5761	DE1 base	V6R1M0	Refreshed	1.8	IBM DB2 Extenders,V 9.1 for i5/OS
5761	DE1 option 1	V6R1M0	Refreshed	29.5	DB2 Text Extender
5761	DE1 option 2	V6R1M0	Refreshed	30.2	DB2 XML Extender
5761	DE1 option 3	V6R1M0	Refreshed	115.6	Text Search Engine

Product	Option	Version	Status	Storage (MB)	Description
5761	DFH base	V6R1M0	Refreshed	52.5	IBM CICS¢Á Transaction Server for i5/OS
5761	DFH option 1	V6R1M0	Refreshed	8.5	CICS - Sample Applications
5761	DG1 base	V6R1M0	Refreshed	96.3	IBM HTTP Server for i5/OS
5761	DG1 option 1	V6R1M0	Refreshed	16.3	Triggered Cache Manager
5761	DP4 base	V6R1M0	Refreshed	21.9	IBM DB2 DataPropagator for iSeries, V8.1
5761	DS2 base	V6R1M0	Refreshed	8.7	IBM Business Graphics Utility for System i
5769	FN1 base	V4R2M0	Ship level	2.0	IBM Advanced Function Printing DBCS Fonts for AS/400
5769	FN1 option 1	V4R2M0	Ship level	100.2	AFP DBCS Fonts - Japanese
5769	FN1 option 2	V4R2M0	Ship level	35.3	AFP DBCS Fonts - Korean
5769	FN1 option 3	V4R2M0	Ship level	18.6	AFP DBCS Fonts - Traditional Chinese
5769	FN1 option 4	V4R2M0	Ship level	12.4	AFP DBCS Fonts - Simplified Chinese
5769	FN1 option 5	V4R2M0	Ship level	6.1	AFP DBCS Fonts - Thai
5769	FNT base	V4R2M0	Ship level	2.0	IBM Advanced Function Printing Fonts for AS/400
5769	FNT option 1	V4R2M0	Ship level	8.3	AFP Fonts - Sonoran Serif
5769	FNT option 2	V4R2M0	Ship level	6.8	AFP Fonts - Sonoran Serif Headliner
5769	FNT option 3	V4R2M0	Ship level	8.1	AFP Fonts - Sonoran Sans Serif
5769	FNT option 4	V4R2M0	Ship level	6.7	AFP Fonts - Sonoran Sans Serif Headliner
5769	FNT option 5	V4R2M0	Ship level	6.4	AFP Fonts - Sonoran Sans Serif Condensed
5769	FNT option 6	V4R2M0	Ship level	5.4	AFP Fonts - Sonoran Sans Serif Expanded
5769	FNT option 7	V4R2M0	Ship level	6.1	AFP Fonts - Monotype Garamond
5769	FNT option 8	V4R2M0	Ship level	6.5	AFP Fonts - Century Schoolbook
5769	FNT option 9	V4R2M0	Ship level	2.6	AFP Fonts - Pi and Specials
5769	FNT option 10	V4R2M0	Ship level	6.14	AFP Fonts - ITC Souvenir
5769	FNT option 11	V4R2M0	Ship level	6.3	AFP Fonts - ITC Avant Garde Gothic
5769	FNT option 12	V4R2M0	Ship level	5.7	AFP Fonts - Math and Science
5769	FNT option 13	V4R2M0	Ship level	1.7	AFP Fonts - DATA1

Product	Option	Version	Status	Storage (MB)	Description
5769	FNT option 14	V4R2M0	Ship level	2.4	AFP Fonts - APL2¢Á
5769	FNT option 15	V4R2M0	Ship level	1.6	AFP Fonts - OCR A and OCR B
5761	HAS base	V6R1M0	New	35.8	IBM System i High Availability Solutions Manager
5761	HAS option 1	V6R1M0	New	1.9	IBM System i HASM - Planning
5722	IP1 base	V5R3M0	Ship level	85.7	IBM Infoprint Server for iSeries
5722	IP1 option 1	V5R3M0	Ship level	1.4	PS to AFP Transform
5761	JC1 base	V6R1M0	Refreshed	41.1	IBM Toolbox for Java
5761	JS1 base	V6R1M0	Refreshed	105.6	IBM Advanced Job Scheduler for i5/OS
5761	JV1 base	V6R1M0	Refreshed	34.7	IBM Developer Kit for Java
5761	JV1 option 6	V6R1M0	Refreshed	176.6	Java Developer Kit 1.4
5761	JV1 option 7	V6R1M0	Refreshed	46.4	Java Developer Kit 5.0
5761	JV1 option 8	V6R1M0	Refreshed	250.0	J2SE™ 5.0 32 bit
5761	JV1 option 9	V6R1M0	New	256.7	J2SE 5.0 64 bit
5761	JV1 option 10	V6R1M0	New	266.8	Java SE Development Kit 6
5761	JV1 option 11	V6R1M0	New	411.5	Java SE 6 32 bit
5761	JV1 option 12	V6R1M0	New	408.5	Java SE 6 64 bit
5761	LSV base	V6R1M0	Refreshed	16.9	IBM Extended Integrated Server Support for i5/OS
5761	MG1 base	V6R1M0	Refreshed	40.8	IBM Managed System Services for i5/OS
5761	NAE base	V6R1M0	Refreshed	172.4	IBM Network Authentication Enablement for i5/OS
5761	PT1 base	V6R1M0	Refreshed	12.9	IBM Performance Tools for i5/OS
5761	PT1 option 1	V6R1M0	Refreshed	17.0	Performance Tools - Manager Feature
5761	PT1 option 2	V6R1M0	Refreshed	2.3	Performance Tools - Agent Feature
5761	PT1 option 3	V6R1M0	New	0.9	Performance Tools - Job Watcher
5761	PT1 option 4	V6R1M0	New	0.9	Performance Tools - Reserved
5761	PT1 option 5	V6R1M0	New	0.9	Performance Tools - Reserved
5761	QU1 base	V6R1M0	Refreshed	11.6	IBM Query for i5/OS
5761	RD1 base	V6R1M0	Refreshed	25.7	IBM DB2 Content Manager OnDemand for i5/OS
5761	RD1 option 10	V6R1M0	Refreshed	122.2	OnDemand Common Server Feature

Product	Option	Version	Status	Storage (MB)	Description
5761	RD1 option 11	V6R1M0	Refreshed	49.0	OnDemand Web Enablement Kit
5761	RD1 option 12	V6R1M0	Refreshed	0.3	OnDemand PDF Indexer Feature
5733	SC1 base	V6R1M0	Refreshed	3.2	IBM Portable Utilities for i5/OS
5733	SC1 option 1	V6R1M0	Refreshed	124.8	OpenSSH, OpenSSL, zlib functions
5761	SM1 base	V6R1M0	Refreshed	8.0	IBM System Manager for i5/OS
5761	ST1 base	V6R1M0	Refreshed	20.6	IBM DB2 Query Manager and SQL Development Kit for i5/OS
5761	TC1 base	V6R1M0	Refreshed	43.9	IBM TCP/IP Connectivity Utilities for i5/OS
5761	TS1 base	V6R1M0	New	4.4	IBM Transform Services for i5/OS
5761	TS1 option 1	V6R1M0	New	21.5	Transforms - AFP to PDF Transform
5722	UME base	V1R2M0	New	288.4	IBM Universal Manageability Enablement for i5/OS
5722	VI1 base	V5R3M0	Ship level	25.5	IBM Content Manager for iSeries
5722	VI1 option 1	V5R3M0	Ship level	85.0	Content Manager for iSeries
5722	VI1 option 2	V5R3M0	Ship level	46.5	Content Manager for iSeries
5722	VI1 option 3	V5R3M0	Ship level	See note1	Content Manager for iSeries Client for Windows
5722	VI1 option 4	V5R3M0	Ship level	See note1	Content Manager for iSeries Workflow Builder
5761	WDS base	V6R1M0	Refreshed	31.4	IBM WebSphere Development Studio for System i
5761	WDS option 21	V6R1M0	Refreshed	38.8	Application Development ToolSet
5761	WDS option 31	V6R1M0	Refreshed	16.5	ILE RPG
5761	WDS option 32	V6R1M0	Refreshed	7.4	System/36 Compatible RPG II
5761	WDS option 33	V6R1M0	Refreshed	7.2	System/38 Compatible RPG III
5761	WDS option 34	V6R1M0	Refreshed	7.7	RPG/400Á
5761	WDS option 35	V6R1M0	Refreshed	23.8	ILE RPG *PRV Compiler
5761	WDS option 41	V6R1M0	Refreshed	25.2	ILE COBOL
5761	WDS option 42	V6R1M0	Refreshed	8.3	System/36 Compatible COBOL
5761	WDS option 43	V6R1M0	Refreshed	7.4	System/38 Compatible COBOL
5761	WDS option 44	V6R1M0	Refreshed	9.1	OPM COBOL
5761	WDS option 45	V6R1M0	Refreshed	47.3	ILE COBOL *PRV Compiler
5761	WDS option 51	V6R1M0	Refreshed	13.0	ILE C
5761	WDS option 52	V6R1M0	Refreshed	41.1	ILE C++

Product	Option	Version	Status	Storage (MB)	Description
5761	WDS option 56	V6R1M0	Refreshed	2.0	IXLC for C/C++
5761	WDS option 60	V6R1M0	Refreshed	0.3	Workstation Tools - Base
5761	XE1 base	V6R1M0	Refreshed	497.9	IBM System i Access for Windows
5761	XH2 base	V6R1M0	Refreshed	354.9	IBM System i Access for Web
5722	XP1 base	V5R3M0	Ship level	2.6	IBM System i Access for Wireless
5761	XW1 base	V6R1M0	Refreshed	2.1	IBM System i Access Family
5761	XW1 option 1	V6R1M0	Refreshed	0.9	System i Access Enablement Support
Note 1: Storage size was not available at the time of publication.					

C

RAID history and definitions summary

This appendix discusses RAID protection levels from an industry viewpoint as well as from the viewpoint of IBM i, AIX, and Linux operating systems. RAID *n* can be provided by the operating system microcode or the specific RAID-capable adapter. Not all adapters support the same range of RAID levels.

Operating system interfaces determine which RAID level is performed by the operating system or by the adapter itself.

Operating system developers determine, based upon knowledge of their customer base which RAID level are supported and whether performed under the operating system or the adapter itself.

Within RAID levels, some levels, such as 0, do not actually provide data protection at all. Thus, RAID is technically not accurate in those cases.

RAID levels supported by IBM i, AIX, and Linux

In the context of these operating systems, the RAID level implementation for a particular configuration is determined by the following information:

► RAID levels supported by the hardware adapter (controller) itself (its driver level code)

The adapter's specific implementation is modified by the number of disks attached to the adapter at the time RAID level is specified by the operating system using the adapter.

For example, some adapters do not support RAID 5 or RAID 6. Older RAID adapters support RAID 5, but not RAID 6. Newer adapters support selecting either RAID5 or RAID6. The number of disks attached to the adapter determines the RAID 5 or RAID 6 parity data striping across the disks within the same parity set (array) and if more than one parity set is to be used per adapter.

► Operating system interface to the specific adapter

Not "all adapters" are supported by each operating system and not all RAID levels are supported by each operating system. Based upon well-researched investigation, each operating system can have determined to implement its own disk data protection, a RAID level supported by the adapter or only selected RAID levels provided by the adapter itself.

One example is using RAID 5 or 6 on an adapter with zero or a very small write cache. Choosing RAID 5, for example, would be acceptable in a primarily read-only environment (except for the first "write only environment" to write the data to disks). Developers of one operating system can determine it is the customer's responsibility to understand this and thus enable the user to specify RAID 5. The developers of a different operating system can determine the more typical environment would be at least 50% of I/Os are write I/Os and thus determine not to support RAID 5 on that adapter with zero or a very small write cache.

Assuming a RAID capable adapter that supports RAID 5 and RAID 6:

– IBM i can specify 5 and 6 at the adapter level. It does not allow the user to specify, 0, 1, or 10.

By default the licensed machine code under IBM i spreads object data writes across multiple disk devices, assuming more than one disk is available and a large enough of an object (such as records/rows written to a large database table) is being written. IBM i supports administrator-specified grouping physical disks "system wide" (system ASP) or into groups called Auxiliary Storage Pools (ASPs). Then spreading data is restricted to disks within the same ASP.

This occurs regardless of whether RAID 5, RAID 6, IBM i mirroring, or no protection has been specified. Effectively this is logically the industry's RAID 0, performed by the licensed machine code under the operating system.

IBM i supports a mirroring protection option when neither RAID 5 or RAID 6 is specified. This is logically "RAID 10," but done by the licensed machine code rather than an adapter itself. This IBM i mirroring, assuming the appropriate disk adapter configuration and disk attachments, can provide a higher level of protection than adapter-based RAID 10.

This mirroring can be across multiple adapters, which could be on the same I/O bus or separate buses. For example, if the configuration supports across adapter mirroring, an entire adapter could fail and the workload environment would continue to run as long as a failure on the mirrored adapter or disk on the second adapter does not occur during this time.

– AIX and Linux can specify 0, 5, 6, and 10 at the adapter level.

AIX and Linux can be set up to provide RAID 1. For example, AIX Logical Volume Manager (LVM) supports RAID 0, 1, and 10. When the adapter supports for example, 0 and 10, AIX or Linux enable the user to specify 0 or 10 at the adapter level. Level 1 would be supported only by the operating system. This enables mirroring over multiple adapters.

Additional RAID information

RAID stands for *Redundant Array of Inexpensive Disks*. RAID is an industry disk data protection scheme that minimizes the impact of a disk hardware failure. RAID was originally implemented in a basic level of capability which evolved over the years to additional levels of implementation and protection.

The following list of summary definitions describes most RAID levels that are defined and currently in use within the IT industry:

► RAID 0

RAID 0 is a performance-enhancing approach that does not provide any disk protection. The writing of data for the same object (for example, a database table) is spread across multiple disk arms, assuming more than one disk device is available.

A minimum of 2 disk devices is required. The failure of just one disk will result in all data in an array being lost from an operating system view.

► RAID 1

RAID 1 is disk level mirroring. In the most common industry implementations, a primary and secondary copy of data are kept on separate disk drives within the subsystem supported by a single disk adapter (controller). That is, a single operating system write is turned into two writes of the data - one write to at least one disk and the second write to a second disk.

► RAID 5

RAID 5 requires a set of disks within an array (also termed a parity set). When an operating system write operation is processed by the adapter, an associated set of parity data is also written to other disks within the same array. The parity data can be used to support continued operations if one of the disks within the array has an unrecoverable error.

Fault tolerance is maintained by ensuring that the parity information for any given block of data is placed on a drive separate from those used to store the data itself.

By using a distributed parity scheme, the application's write or update workload is balanced with good performance and protection from a single disk failure. The number of disks within the array is a minimum of 3. The specific disk configuration and operating system determines how many disks can be configured within a single RAID 5 parity set and on what disks the parity data is spread.

► RAID 6

RAID 6 is similar to RAID-5, but two sets of parity data are maintained, which protects against failures of up to 2 disks in a RAID array (parity set). Instead of using the capacity of 1 disk drive for parity, the capacity of 2 disks is used. Therefore, instead of each drive having both data and parity to address the capacity of 1 parity drive, each drive has 2 sets of parity data. 1 set equating to the spreading of data for the first parity drive (just like RAID-5), and a second set of parity to equate to a second parity drive. RAID 6 offers protection of up to 2 disk failures and reasonable performance (compared to RAID 5) up to

a very high number of operating system write operations per second, where the additional parity set writes can cause a performance bottleneck.

As the workload environment approaches a moderate level of write operations or is excessively skewed towards read operations, the RAID 5 compared to RAID 6 performance difference is negligible.

► RAID 10

RAID 10 (also referred to as RAID 1 + 0) uses the mirroring capability of RAID-1 with the data spreading provided by RAID-0.

This is mirroring within a single adapter.

D

Upgrades to Power 9117-MMA and Power 9119-FHA

That chapter summarizes the key considerations for upgrading to the POWER6 570 9117-MA and POWER6 595 9119-FHA from a prior technology system. Upgrades within the same MTM, for example, upgrading from a 4-way 9117-MMA to an 8-way 9117-MMA are not addressed.

A complete set of steps from planning the upgrade to implementing the upgrade is beyond the scope of this paper. We include references to relevant IBM Web sites for additional information where appropriate within this appendix. To understand the material in this appendix, you need to have read the following chapters within this paper first:

► The contents on System i and System p feature naming and numbering terminology included in Chapter 1, "Introduction to the POWER6 IBM Power System servers" on page 1

► The expanded feature descriptions in Chapter 4, "Feature descriptions and related information" on page 187. When needed, we review the information in this appendix.

► The summary of tape and optical device support in Chapter 10, "Tape and optical storage attachment summary" on page 827. When needed, we review the information in this appendix.

We always include the supporting IBM i, AIX, and Linux release levels and whether the device or adapter is supported by an operating system. However, always refer to the following Web pages for the latest information about hardware features and about what processor models the feature is supported:

► IBM Prerequisite Web page

http://www-912.ibm.com/e_dir/eServerPrereq.nsf

► IBM System i upgrade planning Web page

http://www-304.ibm.com/jct01004c/systems/support/i/planning/upgrade/

Supported model-to-model upgrade considerations

The 9117-MMA Sales Manual (U.S. title: *US - IBM Power 570 Model MMA*) and the 9119-FHA Sales Manual for each geography (U.S. title: *IBM Power 595 Server (9119-FHA)*) contain the most complete set of features upgraded *as is* or *converted t*o features. Examples of *converted to* features include:

▶ Both System i and System p configurations support a disk and tape controller identified by feature #5736. The System i feature code #5736 (I/O adapter for disk and tape) requires a controlling IOP. On System p systems, there is no such hardware feature as an IOP.

   When a System i model is upgraded to a 9117-MMA or 9119-FHA, #5736 indicates *no IOP*. Specific tape devices are supported on this adapter under IBM i only if this same physical card is controlled by a supporting IOP card. Therefore, on the POWER6 system IBM i support of these tape devices must use an IOP (for example #2844) for this adapter. To support these tape devices under IBM i, the IOA card gets a new feature code, #5806, that requires an IOP.

▶ The 7040-61D I/O drawer is not supported "as is" on the 9119-FHA. Use #5809 to upgrade to a physically equivalent #5791 or #5794, which is supported on the 9119-FHA.

▶ POWER5 GX (RIO-2 or 12X) adapters and cable feature codes can have different feature codes on the 9117-MMA and 9119-FHA.

In this appendix, we summarize many but not all of these kinds of considerations in several tables.

> **Note:** It is beyond the scope of this paper to provide the complete step-by-step upgrade process that can be developed using the following Web sites in conjunction with the appropriate IBM representative or IBM business partner certified to perform upgrades.

Consider the following key information as part of your upgrade planning. Ensure that you use these as part of your upgrade planning process:

▶ IBM prerequisites Web site (hardware and release level supporting selected hardware)

   http://www-912.ibm.com/e_dir/eServerPrereq.nsf/

▶ IBM planning Web site for System i

   http://www-304.ibm.com/systems/support/i/planning

▶ IBM planning - upgrades Web site for System i

   http://www-304.ibm.com/systems/support/i/planning/migrationupgrade.html

▶ IBM i release level and processor technology support cross-reference table

   http://www-304.ibm.com/systems/support/i/planning/upgrade/osmapping.html

▶ Power Systems Facts and Figures Web site that includes matrixes of hardware features and systems supported

   http://www-03.ibm.com/systems/p/hardware/reports/factsfeatures.html

Also, when planning an upgrade you must perform a thorough sizing or capacity planning exercise to ensure you select the appropriate processor core speed, number of processor cores, main memory size, and number of disk arms and disk arms per disk adapter.

You must always understand your possible workload and application and use a sizing or capacity planning tool, such as:

► IBM Systems Workload Estimator

   http://www.ibm.com/servers/eserver/iseries/perfmgmt/sizing.html

► Performance Navigator by Midrange Performance Group

   http://www.mpginc.com

► BMC Patrol for iSeries - Predict

   http://www.bmc.com/

You can upgrade the 9406-570, 9406-MMA or the 9117-MMA systems with IBM POWER5 or POWER5+ or POWER6processors to the IBM Power 570 with POWER6 processors.

You can upgrade POWER5 processor-based System p 590 or System p or System i 595 servers to the POWER6 Power 595. You can upgrade within the POWER6 Power 595.

For upgrades from POWER5 or POWER5+ processor based systems IBM will install new 570 processor enclosures (we call then CECs in this chapter) and 595 CEC within a rack. Your existing CEC enclosures are replaced with new ones. These current CEC enclosures are returned to IBM in exchange for the financial consideration that are identified under the applicable feature conversions that can be unique for each upgrade.

Several of the parts in the customer's current system can be moved to the new system after it is installed. Clients taking advantage of the Model Upgrade offer from a POWER5 or POWER5+ processor based system are required to return to IBM all processor and CEC enclosures, bezels, and internal planners from the processor and CEC enclosures that are part of the serial number system being upgraded. Any feature for which a Feature Conversion is used to obtain a new part must be returned to IBM also.

Clients can keep and reuse most PCI adapters, SCSI Disks, Memory, or Media Devices from the CEC enclosures that were not involved in a feature conversion transaction.

This section summarizes the key upgrade considerations. For more complete planning information than presented in this publication, see the Sales Manual pages and the planning Web site:

http://www.ibm.com/systems/support/i/planning/upgrade/index.html

> **Note:** Unless otherwise noted in the text, the term *POWER5* includes both POWER5 and POWER5+ processor technology systems.

The following key differences apply to upgrades into all POWER6 MTMs:

► IBM i system values QMODEL and QPRCFEAT change after an upgrade including when upgrading from a POWER6 to a unified POWER6 configuration. An example of this is when upgrading to a 9117-MMA from a System i 9406-MMA. The content of these system values is used by many IBM i Independent Software Vendors (ISVs) as part of their application licensing key algorithm. New values must be planned for.

   Within this publication the possible QMODEL and QPRCFEAT contents for all POWER6 models announced through September 2008 are included in tables shown in Appendix H, "Processor feature numbers, system performance and IBM i QPRCFEAT system value" on page 967.

- ► All POWER6 system units use SAS disk/tape devices for backup and recovery
    - – SCSI disk in the POWER5 system unit or CEC needs to be replaced or moved to another I/O drawer. A disk controller might also be needed.
    - – SCSI tape within the CEC needs to be replaced or an external tape drive obtained. A tape controller might also be needed.
- ► PCI slots are different within the processor enclosures. You might need to replace cards or move cards from an earlier technology system to an I/O drawer. The processor enclosures for the POWER6 520, 550, and 570 systems do not support System i heritage IOP cards whereas corresponding POWER5 enclosures support IOP cards.

    Therefore, if an IOP or an IOA requiring an IOP is used, the IOP-IOA cards must be placed within a supporting I/O enclosure on a supporting RIO-2 loop. Refer to Chapter 9, "IBM Power systems I/O enclosures schematics" on page 801 or Table D-2 on page 928.

    There are three PCIe and two PCI-X DDR slots in the POWER6 520 (includes 9407-M15) and 550 models.

    Each POWER6 570 processor enclosure has 2 PCI-X DDR slots and up to 4 PCIe slots (three if an optional HSL/12X GX card is used for a second loop in a processor enclosure).
- ► Disk and disk adapter (controller) protection rules differ for previous technologies and are different between IBM i and AIX. For example:
    - – For new orders using IBM i:
        - • Disk drives must be protected (SAS or SCSI) through RAID5/6 or mirroring
        - • Disk controllers with write cache must be protected through mirroring or auxiliary write cache
    - – For new orders using AIX and Linux:
        - • Highly recommend that disk drives (SAS or SCSI) be protected
        - • Disk controllers with write cache must be protected through mirroring

    Some adapters are not supported by all three operating systems: IBM i, AIX, or Linux. For disk adapters, not all RAID levels are supported and there can be operating system differences in the range of RAID levels supported.

    We provide a general discussion of RAID level protection in Appendix C, "RAID history and definitions summary" on page 905. See also the feature description in Chapter 4, "Feature descriptions and related information" on page 187, for adapter specifics.

    Updates after this paper is published will be published in updated sales manual pages.
- ► You need the latest firmware and IBM i, AIX, and Linux operating system levels listed 1.6, "Operating system levels required on POWER6 processors" on page 32. See also the specific feature description contained in Chapter 4, "Feature descriptions and related information" on page 187.
- ► Twinaxial workstation display and printer device attachment requires an IOP-IOA card placement. This impacts using the a twinaxial display as your system console though an IBM i partition could use a twinaxial console with the connecting IOP-IOA pair placed in a supporting RIO-2 I/O enclosure.

    Some OEM vendors offer alternative solutions in this area.

► As described here and at the planning Web site, some older technology I/O devices and adapters are not supported on POWER6 systems. Many, but not all of these are System i heritage I/O technology. I/O hardware not supported on POWER6 servers include:

– #5074/5079 I/O towers

– 7311-D10 I/O drawer

– Optical HSL (RIO) adapters.

– 8 GB 10 k rpm and 17 GB 10 k rpm disk drives

– 13 older PCI cards including:

  • #2763, #2782, #4748, and #4778 Disk Controllers and #2765, #2766 Fibre Channel Controllers

  • #2780 and #2757 running RAID-5 without an auxiliary write cache IOA

– Some LVD SCSI attached tape drives

– No HVD SCSI devices

– Several older tape drives/media including:

  • 9348 Tape Drive (½ inch reels)

  • 3570 and 3575 Tape Drives

  • 3490 Tape Drives when attached through #2749 HVD SCSI Tape Controller

  • 358x LTO-1 Tape Drives when attached through #2749

  • 4 GB, 16 GB, and 25 GB QIC tape drives

  • All VXA tape drives

– Some of the older IBM i Windows integration options are no longer supported. The following are supported:

  • Five oldest Integrated xSeries Servers (IXS) cards are not supported

  • The Integrated xSeries Adapter (IXA) and the newest IXS cards are supported, but cannot order new additional IXS/IXA for POWER6

  iSCSI is available for additional connectivity.

► Any support of SNA on "newer" LAN and WAN communications adapters and SDLC on "newer" WAN communications adapters needs to be investigated as part of the upgrade planning process. Most of the newer WAN and LAN adapters do not support SDLC or SNA.

The following information applies to IBM i applications running over SNA or SDLC. However, similar investigation should be considered for AIX applications that can run over SNA or use SDLC.

IBM i standard SDLC and SNA support requires an IOP to perform some of the low level SDLC and SNA "data frame" and protocol processing. If you need direct support SNA or SDLC, you must use a WAN or LAN adapter associated with a supported IOP.

The most commonly available (cannot be ordered new) LAN IOA supported by an IOP (#2843 or #2844) is the #2849 10/100 Mbps Ethernet Adapter.

Available, but no longer marketed WAN communications line IOAs supporting SDLC and SNA (supporting IOPs include #2809, #2843, #2844) include:

– #2793/#2893 2-Line WAN IOA with Modem, use port 1 (line 2)
– #2794/#2894 2-Line WAN IOA with Modem, use port 1 (line 2)
– #2772/#2773 PCI Dual WAN/Modem IOA
– #2742 2-Line WAN IOA

For the WAN adapters that do not support an IOP, this means the Create Line SDLC (CRTLINSDLC) command is not supported.

SNA is not supported over the 1 Gbps Ethernet adapters as they do not use IOPs.

Because an IOP and IOP-required IOA is required for direct SNA/SDLC support, note that these cards are not supported within the POWER6 520, 550, and 570 processor enclosures, Thus, IBM i standard SDLC and SNA support requires a supported IOP-IAO combination be placed within a RIO-2 attached I/O enclosure.

This needs to be planned for when upgrading from a System i POWER5 520, 550, and 570 configuration to a corresponding POWER6 configuration. This is especially important when considering a 9407-M15 single processor configuration which does not support any RIO-2 or 12X loop attachment.

Alternatives to standard IBM i SNA support includes converting the application environment to the use of TCP/IP configuration, protocol, associated hardware adapters, and a supporting IP network

Many applications are not impacted. Some might be. Regardless, any current network and communications across partitions or systems using SNA communications will be impacted.

Converting to a TCP/IP configuration and supporting network might require using IBM i provided SNA over IP using:

– IBM AnyNet support (SNA over TCP/IP but with more restrictions than SNA Enterprise Extender support) and hardware supporting TCP/IP

– SNA Enterprise Extender (SNA EE) support (became available with IBM i 5.4) and hardware supporting TCP/IP

  SNA EE is preferred over AnyNet as it offers several SNA functional advantages over IBM i supported AnyNet. SNA EE does require SNA EE support at both ends of the communications conversation.

  One consideration in this area would be IBM i and IBM i applications communicating with an older IBM 5250 remote workstation controller, for example a 5294, 5394, or 5494. These IBM controllers do not support SNA EE. OEM vendors provide solutions in this area.

If you are considering using the #5749, #5735, and #5774, Fibre Channel adapters under IBM i 6.1 is required.

Key information at the following Web sites should be considered as part of your upgrade planning. It is beyond the scope of this publication to provide the complete step by step upgrade process that can be developed using these Web sites in conjunction with the appropriate IBM representative or IBM business partner certified to perform upgrades.

► IBM pre-requisites Web site (hardware and release level supporting selected hardware)

  http://www-912.ibm.com/e_dir/eServerPrereq.nsf/

► IBM planning Web site for System i

  http://www-304.ibm.com/systems/support/i/planning

► IBM planning upgrades Web site for System i

  http://www-304.ibm.com/systems/support/i/planning/migrationupgrade.html

► Power Systems Facts and Figures Web site that includes matrixes of hardware features and systems that are supported

  http://www-03.ibm.com/systems/p/hardware/reports/factsfeatures.html

The following sections provide upgrade overview information from the MTM level and the operating system level.

Table D-1 shows an overview of the supported upgrades for System i and System p models to POWER6 IBM Power. Where appropriate, upgrades within a POWER6 MTM are supported. For example, you can upgrade a Power 570 1-4 way (single processor enclosure) to a 5- to 8-way (two processor enclosures). Within MTM upgrades are not addressed in this paper.

Table D-1   Supported upgrade

From model	To model								
	8203-E4A	9407-M15	9407-M25	8204-E8A	9409-M50	9117-MMA	9119-FHA	9406-MMA	FILLER
System i POWER5+ Model 515									
System i POWER5, POWER5+ 9406-520[1]: 1-core #8952, #8953, #8954	2-core #5634		✓						
System i POWER5, POWER5+ 9406-520[1]: 2-core #8955, #8327, #8330	2-core #5634		✓						
System i POWER5+ 9406-525 2-core #8330	2-core #5634		✓						
POWER6 9407-M15 1-core #5633	1-core #5633								
POWER6 9408-M25 2-core #5634	2-core #5634								
Model 550 POWER5, POWER5+ 9406-550: 4-core #8312, #8998				4-core #4966		✓		✓ w	
POWER5, POWER5+ 9406-570						✓	✓	✓	
Model 595 POWER5							✓		
Model 595 POWER5+							✓		

From model	To model								
	8203-E4A	9407-M15	9407-M25	8204-E8A	9409-M50	9117-MMA	9119-FHA	9406-MMA	FILLER
9406-MMA POWER6						✓			
System p POWER6 9117-MMA							✓		

1. Upgrade not supported for System i POWER5/5+ 520 Value, Express, Telephony or two Solution Editions (#7786 &7787)
W. Upgrades from 9406-550 to 9406-MMA not supported after July 2008.

*RPO means Record purpose only.

General note: Due to the size and complex nature of upgrades from System i 9406 570 into the Power System 9117-MMA or a 9406 595 into the 9119-FHA, a two MES process is required. The two MESs are configured in a single eConfig session and contained within the same eConfigurator Proposed Report. These MESs will be processed in sequence: 1) No charge RPO MES;p 2) Normal MES after 1st MES.

Figure D-1 depicts the supported upgrade paths between POWER5 and POWER6 models at the processor technology level. Memory cards and I/O device support have additional considerations.

Figure D-1   Upgrade path to 9117-MMA and 9119-FHA summary

Note: There is no upgrade path from a POWER6 570 to a POWER6 595. The 9406-550 upgrade to 9406-MMA was withdrawn starting July 2008.

Upgrade to 9117- MMA configuration considerations

The section discusses the primary considerations when planning an upgrade to a 9117-MMA.

See Figure D-1 for supported upgrade paths into the converged 9117-MMA. For upgrades from POWER5 or POWER5+ processor based systems IBM installs new processor (CEC) enclosures to replace the enclosures the customer currently has. The customer's current processor enclosures must be returned to IBM in exchange for the financial consideration that are identified under the applicable feature conversions for each upgrade. Several of the parts in the customer's current system can be moved to the new system after it is installed.

MES upgrade process

MES model upgrades form a 9406 to 9117 is one order but actually two parts.

Due to the size and complex nature of upgrades from System i 9406 into the Power System 9117 a two MES process is required. The two MESs are configured in a single eConfig session and contained within the same eConfigurator Proposed Report. These MESs are processed in sequence.

The initial MES is a Record Purpose Only (RPO) MES that positions the 9406 inventory record and conceptually redefines the installed product with Power System feature nomenclature. This MES contains a series of RPO feature adds/removes within the 9406 machine type/model as well as specify code 0396. This RPO MES serves several purposes. It keeps the customer's maintenance billing whole throughout the upgrade process, reduces the number of feature conversions on the normal MES, and reduces the overall size of the normal MES. This RPO MES should be stored in a separate eConfig file for reference prior to order forward.

The second MES is a normal machine/model upgrade MES from 9406 to 9117 with all the appropriate model/feature conversions and subject to the usual scheduling, manufacturing, and installation rules and processes.

Care must be taken that both MESs are processed completely through installation prior to configuration/placement of any subsequent MES orders. Due to the complexity of these upgrades, it is strongly suggested that only firm orders be place in the backlog.

In the event that the RPO MES is reported as installed and the normal MES is cancelled, Sales must submit an additional RPO MES reversing the transactions of the initial RPO MES to return the customer's inventory record to its original state. Failure to do so will prevent future MES activity for the customer's machine and might corrupt the customer's maintenance billing. The saved eConfig Proposed Report can be used as the basis for configuring this reversal RPO MES.

Clients taking advantage of the Model Upgrade offer from a POWER5 or POWER5+ processor based system are required to return to IBM all CEC enclosures, bezels, and internal planners from the processor enclosures that are part of the serial number system being upgraded. any feature for which a Feature Conversion is used to obtain a new part must be returned to IBM also. Clients can keep and reuse any PCI adapters, SCSI Disks Memory, or Media Devices from the CEC enclosures that were not involved in a feature conversion transaction.

There are some memory DIMMs used in the POWER5+ (p5-570) memory subsystem that might have incompatibility issues when used in a POWER6 (Power 570) memory subsystem.

IBM replaces these dimms when a system is upgraded from POWER5+ processors to POWER6 processor feature number 5621. If IBM determines some of the dimms need to be replaced, IBM will exchange those dimms at no additional charge for systems being upgraded to POWER6 processor feature 5621.

IBM Service can assist you in obtaining a snap file from your system and in submitting the snap file to IBM for analysis. This action is required to allow your Upgrade order to POWER6 processor feature 5621 to be scheduled for shipment from IBM. If your upgrading your POWER5+ system to processor feature 5622, your memory does not migrate and ECA840 is not required.

9117-570 systems with POWER5 processor feature numbers 7830, 7832, 7833 or 7834 can be upgraded to a 9117-MMA with processor feature number 5622.

9117-570 systems with POWER5+ processor feature numbers 7782, or 8338 can be upgraded to a 9117-MMA with processor feature numbers 5621 or 5622. Processor feature 5621 can only be ordered during the initial Upgrade MES order. Systems built initially with processor feature 5621 can be expanded with processor feature 5622. The minimum supported configuration when upgrading to processor feature 5621 is a 4 core system.

9406-570 systems with processor feature number 8961, 8971 or 8338 can be upgraded to a 9117-MMA with processor feature number 7380.

9406-MMA systems with processor feature number 7380 can be upgraded to a 9117-MMA with processor feature number 7380.

The following features, if present on the current system, can be moved to the new system.

► Operator Panel
► PCI adapters with cables

   The POWER5-based 570 models have six PCI-X adapter slots in each processor enclosure. The IBM Power 570 Model 9117-MMA has two PCI-X and four PCIe adapter slots for each processor enclosure. Additional PCI-X adapters must be moved to an attached in a supporting I/O enclosure attached to either a supporting RIO-2 or 12X loop. Alternatively the PCI adapter can be replaced with PCIe adapters with corresponding capabilities that are available for the 9117-MMA.

Additional upgrade to 9117-MMA considerations

The model MMA can support the 7413-G30 PCI-X (12X channel) I/O Drawer or the 7311-D11 or 7311-D20 (RIO-2) I/O drawers. In addition, the model MMA can support the following feature coded I/O drawers when upgrading from the 9406 machine type:

► 0588 PCI-X Expansion Unit in Rack
► 0595 PCI/SCSI Disk Expansion Drawer
► 5088 PCI-X Expansion Unit
► 5094 PCI-X Expansion Tower
► 5096 PCI-X Expansion Tower (no disk)
► 5294 1.8M I/O Tower
► 5296 1.8M I/O Tower (no disk)
► 5786 TotalStorage EXP24 Disk Drawer
► 5790 PCI Expansion Drawer
► 5796 PCI-DDR 12X Expansion Drawer

The POWER5 model 570 has two native GX RIO ports on each processor enclosure that supports one RIO-2 loop per enclosure. The model MMA does not have native RIO ports but

adds a second GX+ slot to each processor enclosure and can support two GX+ adapters per enclosure.

The 9117-MMA supports only the new SAS DASD hard disks internally. The older SCSI DASD hard disks can be attached to the model MMA but must be located in a remote I/O drawer. Feature 5786 or 7031-D24 or 7311-D20 are compatible with the DASD carriers used on the model 570 DASD files. The DASD files from the model 570 can be moved directly into these I/O drawers.

If there is a Machine Type 7310 HMC attached to the POWER5 570, it can be moved to the 9117-MMA, but the HMC firmware must be updated to licensed machine code Version 7.3, or later, to accommodate the model MMA improvements. The firmware upgrade must be completed before attaching the 7310 HMC to the 9117-MMA.

For processor feature number 5621, different memory size or frequency features cannot be mixed on the same processor card. All of the memory features on a single processor card must be the same size in GB when fully active and have the same frequency. Feature number 7894 and 4495 can be mixed on the same processor card because 4495 is 8 GB when fully active. Feature number 4497 and 4496 can be mixed on the same processor card because 4496 is 16 GB when fully active. The two processor cards in a single CEC enclosure can have different memory features installed. Processor cards in different enclosures in the same system can have different memory features installed.

For POWER5 or POWER5+ processor based systems that have the On/Off CoD function enabled, you must reorder the On/Off enablement features (#7951 and 7954) when placing the upgrade MES order for the new Power 570 system to keep the On/Off CoD function active. The On/Off enablement features should be removed from the configuration file before the MES order is started to initiate the model upgrade. Any temporary use of processors or memory owed to IBM on the existing system must be paid before installing the new Power 570 model MMA.

Reserve CoD features are not supported on the model MMA.

Feature code #8017 is available to support migration of Memory activation code #7663 during the initial order and build of the Upgrade MES MMA order. Customers ordering an upgrade with processor feature #5621 and migrating CoD memory activations from the p5-570 to the Power 570 should order feature #8017 in a quantity equal to the quantity of feature #7663 that is currently active on their p5-570 system.

Feature code #8018 is available to support migration of the Advanced Power Virtualization feature #7942 during the initial order and build of the Upgrade MES MMA order. Customers can add #8018 to their upgrade orders in a quantity not to exceed the quantity of feature 7942 obtained for the system being upgraded. The #7942 feature code should be migrated to the new configuration report in a quantity that equals 8018. Additional #7942 features can be ordered during the upgrade.

Machine Type 9406-570 contained processor Micro-Partitioning as part of the base product definition. To maintain this function on the 9117 Machine Type, order PowerVM feature #7942 or #7995 in a quantity at least equal to the number of active processors in the 9117 system. If feature 7942 or 7995 was ordered on the 9406 machine type the quantity obtained can be migrated to the 9117 machine type at no additional charge.

When upgrading from the 9406 machine type many of the features that will migrate during this upgrade will be renamed and given a new feature number. The function in the system will remain the same and there is no cost associated with the renaming or renumbering of the feature. The marketing configurator will identify and rename these features for you. It is

important that the configuration file imported to the marketing configurator be accurate with regard to the content of the system being upgraded.

When upgrading from the 9406 machine type it is important to place the order in the IBM order system only when you are ready to proceed with the upgrade. During the upgrade order process the complete order will be split into two parts a record purpose only (RPO) part, to rename many of the features in the system being upgraded and a hardware MES upgrade order part, to deliver the new hardware. There is no additional charge for the RPO part of this upgrade order and it will proceed quickly upon submission of the order. Once the upgrade order is placed, there can be no additional MES orders placed against this serial number until the upgrade system is installed. If the upgrade order is cancelled a follow- up RPO order must be placed to reverse the renaming that was done as part of the original RPO order. No additional MES orders can be placed against the serial number system until this follow-up RPO order is complete.

Customers upgrading to a 9117-MMA from a 9406-570 or 9406-MMA system that is still under warranty will continue to have the warranty service level of the 9406 for the remainder of the 9406 one year warranty period. Because the 9117 has 9x5 NBD base warranty coverage instead of the 9406 24x7 SD base warranty coverage, you will be required to sign a separate warranty service upgrade contract to continue 24x7 SD base warranty coverage. Contact your Business Partner or IBM Representative for more details.

You must always understand your possible workload and application and use a sizing or capacity planning tool, such as those listed here:

► IBM Systems Workload Estimator

   http://www.ibm.com/servers/eserver/iseries/perfmgmt/sizing.html
► Upgrade Planning.

   https://www-304.ibm.com/systems/support/i/planning/upgrade/osmapping.html
► Performance Navigator by Midrange Performance Group

   http://www.mpginc.com
► BMC Patrol for iSeries - Predict

   http://www.bmc.com/

To assist you in using these tools, refer to *Sizing IBM i5/OS Work on IBM System i5 Partitions*, SG24-6656, which contains examples of using these tools.

Refer to the Upgrade topic in the Find and Compare Tool (FACT) at the following Web page to determine the supported upgrade paths for a given processor:

http://www-919.ibm.com

For software considerations, refer to *IBM System i5 Handbook*, SG24-7486. Use the IBM Prerequisite tool, which you can find at the following Web address, for compatibility information about hardware and software features for supported System i processors:

http://www-912.ibm.com/e_dir/eServerPrereq.nsf

Upgrade to 9119- FHA configuration considerations

The section discusses the primary considerations when planning an upgrade to a 9119-FHA.

For upgrades from POWER5 or POWER5+ processor based systems IBM will install new processor (CEC) enclosures to replace the enclosures the customer currently has. The customer's current processor enclosures must be returned to IBM in exchange for the financial consideration that are identified under the applicable feature conversions for each upgrade. Several of the parts in the customer's current system can be moved to the new system after it is installed.

MES upgrade process

MES model upgrades to 9119-FHA special upgrade considerations due to the size and complex nature of MES model upgrades into the Power Systems technology. Upgrades into the converged 9119-FHA have additional considerations to those involved with upgrades into the converged 9117-MMA, though there is no "processor enclosure" set of considerations as there is for the 9117-MMA.

There are two MES processes required. The two MESs are configured in a single IBM configurator (eConfig) session and contained within the same eConfigurator Proposed Report. These MESs are processed in sequence.

The initial MES is a Record Purpose Only (RPO) MES that positions the inventory record and conceptually redefines the installed product with Power Systems feature nomenclature. This MES will contain a series of RPO feature adds/removes within the installed machine type/model as well as specify code 0396. This RPO MES serves several purposes. It keeps the customer's maintenance billing whole throughout the upgrade process, reduces the number of feature conversions on the normal MES, and reduces the overall size of the normal MES.

This RPO MES should be stored in a separate eConfig file for reference prior to order forward.

The second MES is a normal machine/model upgrade MES from 9406/9119 to 9119-FHA with all the appropriate model/feature conversions and subject to the usual scheduling, manufacturing, and installation rules and processes.

Care must be taken that both MESs are processed completely through installation prior to configuration/placement of any subsequent MES orders. Due to the complexity of these upgrades, it is strongly suggested that only firm orders be placed in the backlog.

In the event that the RPO MES is reported as installed and the normal MES is cancelled, Sales must submit an additional RPO MES reversing the transactions of the initial RPO MES to return the customer's inventory record to its original state. Failure to do so will prevent future MES activity for the customer's machine and might corrupt the customer's maintenance billing. The saved eConfig Proposed Report can be used as the basis for configuring this reversal RPO MES. Additional information will be included in the sales education.

Ordering model conversion provides:

► Change in model designation from p5-590, p5-595, i5-595, and i5-570 to 595 (9119-FHA)
► 595 labels with same serial number as existing server
► Any model-specific system documentation that ships with a new 595 server

Each model conversion order also requires feature conversions to:

▶ Update machine configuration records
▶ Ship system components as necessary

Feature conversions

The existing components being replaced during a model or feature conversion become the property of IBM and must be returned.

In general, feature conversions are always implemented on a "quantity of one for quantity of one" basis. However, this is not true for 16-core processor books. Each p590, p595, or i595, 16-core processor book conversion to one 595, 8-core processor book will actually result in two, 8-core 595 processor books. The duplicate 8-core book will be implemented through eConfig in a unique two-step, MES order process as part of a model conversion described in the model conversion section. Excluding p590, p595, and i595 processor books, single existing features cannot be converted to multiple new features.

Also, multiple existing features cannot be converted to a single new feature.

Feature conversions are always implemented on a "quantity of one for quantity of one" basis. Multiple existing features cannot be converted to a single new feature. Single existing features cannot be converted to multiple new features.

The 9119-FHA Sales Manual for each geography (US title: IBM Power 595 Server (9119-FHA)) contains the complete set of features upgraded "as is" or converted, such as System i feature code #5736 (I/O adapter for disk and tape) requires a controlling IOP. When a System i model is upgraded to a 9117-MMA or 9119-FHA, #5736 indicates "no IOP."

Specific tape support under IBM i requires this same physical card IOA to be connected to a supporting IOP. For those considerations, System i feature code #5736 is converted to #5806 on the 9119-FHA to indicate an IOP is required. If you do not require the IOP-based tape support, #5736 IOP-less IOA can be used by IBM i.

For more information about tape device support and supporting IOAs see Chapter 10, "Tape and optical storage attachment summary" on page 827.

The topics of this appendix highlight many of the sales manual upgrade items but not all. However, some information in addition to the sales manual content is also provided.i

Upgrades for IBM i processors

IBM eServer iSeries Migration: A Guide to Upgrades and Migrations to System i5, SG24-7200, provides guidance for upgrading to eServer i5 Models 520, 550, 570, and 595. Current plans do not call for this publication to be updated to provide guidance for upgrading to the latest IBM i models.

Processor upgrades within and to IBM i models are performed by IBM Service Representatives. A key upgrade to a IBM i POWER6 570 configuration requires consideration of the following points (some of the following information has been included in general upgrading to POWER6 information earlier in this appendix):

► When a Hardware Management Console (HMC) is being used, it must have Version 7 Release 3 or later installed.

► You must consider the processor enclosure (system unit) PCI card support.

Each POWER6 570 processor enclosure has few PCI-X slots and no IOP support. Consider moving PCI cards to I/O towers before you begin an upgrade process. This might require an additional I/O tower. Consider changing to use new PCIe cards.

► You must consider disk support for the processor enclosure (system unit).

The processor enclosure supports only Serially Attached SCSI (SAS) disk technology drives. SCSI disks are not supported. Currently the embedded disk controller supports either no protection or mirroring. RAID protection is not an option. Also note that the embedded SAS technology controller has no write cache.

Therefore, you must perform upgrade planning with the following points in mind:

– Only SAS disk technology can be placed within the processor enclosure.
– The processor enclosure disk controller has no RAID protection.
– Workload environments that perform a significant number of write operations per second to disks might experience a performance bottleneck when writing to SAS disks.

> **Note:** Optionally, you can order a IBM i POWER6 570 with a specify code (#0719) to not have any disk drives within the system unit (processor enclosure). You also can specify, on a new system order, a load source disk location in an I/O tower, I/O enclosure, or on a storage area network (SAN) device. See the feature #07*nn* and #0837 (SAN load source) descriptions in Chapter 2, "IBM Power 570 Model 9117-MMA" on page 41 and Chapter 3, "IBM Power 595 model 9119-FHA" on page 99for additional feature information.

► There are stronger disk and disk-controller protection rules for POWER6 570, in contrast to POWER5 technology-based models. If using RAID-5 or RAID 6 capable controllers, you must protect the controller's cache with auxiliary write cache IOA. For example, a #5775 must be replaced with a disk controller for which an auxiliary write cache IOA can be used (requires one more PCI slot). Alternatively, you can choose to mirror the disk controller and its disk drives, which might require the purchase of more disk.

► Each POWER6 570 processor enclosure comes with an embedded Integrated Virtual Ethernet (IVE) adapter. This adapter is also commonly called a Host Ethernet Adapter (HEA). You choose from either a 2 Ethernet port or 4 Ethernet port adapter. These new Ethernet adapters offer enhanced virtualization capabilities compared to the POWER5 embedded 2 port Ethernet adapter. Up to a supported maximum, each port of the new IVE adapter can be optionally shared by multiple partitions.

Refer to Chapter 8, "Integrated Virtual Ethernet" on page 789 for more information about IVE and HEA.

You must thoroughly review the planning (and upgrade) information that is available on the the IBM i Support Upgrade planning Web page at:

http://www.ibm.com/systems/support/i/planning/upgrade/index.html

IBM eServer iSeries Migration: System Migration and Upgrades at V5R1 and V5R2, SG24-6055 provides guidance for upgrading to Models 800, 810, 820, 830, 840, 825, 870, and 890.

Side-by-side upgrades

For some upgrades, a new serial numbered machine replaces another serial numbered machine, which provides for the transfer of licensed program products. See "Temporary software license" on page 925 for information about managing the software licensing for this kind of upgrade.

Side-by-side upgrades are miscellaneous equipment specification (MES) upgrades where a customer keeps the same serial number and returns the replaced machine to IBM. The side-by-side offering relates to the temporary use of hardware. It can be ordered in two-week increments, for a maximum of eight weeks (56 days). See RPQ 847208 (for Model 520), 847188 (for Model 550), 847212 (for Model 570) or 847213 (for Model 595) for more information.

5733-ITL license option

The 5733-ITL license option has replaced licensing option 5799-TLM as of July 2007.

If the replacement machine is ordered as a new machine from IBM and you specify transfer of software from the original machine to the replacement machine (5733-NKY ordered), then the customer is authorized for 15 days of concurrent use. If use of the licensed program products (LPPs) are required on both the original and the replacement machine for more than 15 days, a temporary license offering is available from IBM for up to 12 months.

Order 5733-ITL for the number of months required. This way you can have temporary entitlement to use the software during the migration and eliminate the need to purchase permanent OTC licenses. If more than 12 months of concurrent use is expected, purchase permanent OTC licenses.

RISC-to-RISC data migration

The #0205 RISC-to-RISC Data Migration specify code is used when a client orders a new (RISC) System i5 server to replace an existing iSeries or AS/400e RISC-based system. The #0205 is ordered on the initial order of a Model 515, 520, 550, 570, or 595.

Manufacturing loads only the system licensed internal code up through QSYS of i5/OS when the #0205 is ordered. Because of this limited loading of i5/OS by manufacturing, #5000 Software Preload Required is not allowed with the #0205. The #0205 RISC-to-RISC Data Migration and #5000 Software Preload Required are mutually exclusive.

> **Note:** The #0205 RISC-to-RISC Data Migration specify code was withdrawn *from marketing* as of 01 April 2005 for machine type 9405.

Temporary software license

IBM i Temporary Software License offers you the option to purchase a software license for temporary use of the IBM i (i5/OS) operating system on POWER6 systems as well as older System i models still supported by IBM. This IBM i license is a lower-cost option for clients who have a temporary requirement to license programs and options when operating a machine. You might require temporary licensing for the following reasons:

► You acquire a replacement machine and must run both the original and replacement machine concurrently for more than 15 days to facilitate the migration of your applications and test the replacement machine.

► You have a temporary need to operate a machine for 12 months or less and require licensing for licensed programs or options.

If the replacement machine was ordered as a new machine from IBM and you specified a transfer of software from the original machine to the replacement machine (5733-NKY ordered), then the customer is authorized for 15 days of concurrent use. If use of the LPPs are required on both the original and the replacement machine for more than 15 days, a temporary license offering is available from IBM for up to 12 months. Simply order the 5733-ITL for the number of months that are required. This provides temporary entitlement to use the software during the migration and eliminates the need to purchase permanent OTC licenses. If more than 12 months of concurrent use is expected, purchase permanent OTC licenses.

Temporary software keys are created for the products that require a key that is designated in the order for 5733-ITL. These keys must be installed on the machine, even if a permanent key for the program currently exists. You can obtain the keys by logging on the Entitled software support Web page at:

https://www.ibm.com/servers/eserver/ess

The questions and answers in this document apply to situations where a machine with a new serial number is replacing another machine with a serial number and provides for the transfer of LPPs. As mentioned earlier, side-by-side upgrades are MES upgrades where a customer keeps the same serial number and the replaced machine is being returned to IBM. The side-by-side offering relates to the temporary use of hardware. It can be ordered in two-week increments, for a maximum of eight weeks (56 days). See RPQ 847208 (for Model 520), 847188 (for Model 550), 847212 (for Model 570), or 847213 (for Model 595) for more information.

For additional information, refer to the following Web pages:

► IBM System i Systems Sales (internal)

http://w3-1.ibm.com/sales/systems/portal/_s.155/253

From this Web site you can access the document *System i Express i5/OS Licensing by User Frequently Asked Questions.* On the general System Sales Web page, follow these steps:

a. Select **System i** in the Product field. Click **GO**.

b. On the next Web page, under Featured content, click the **System i master sales kit** link.

c. On System i master sales kit page, scroll down to the Frequently Asked Question (FAQ) List section. Under that heading, click the link for **i5/OS Licensing by User Frequently Asked Questions**.

► IBM Business Partners (external)

From this Web page, you can also access the document *System i Express i5/OS Licensing by User Frequently Asked Questions*. After you log in with a registered ID, select **System i Announcement Sales Kit - October 24**. Then, click **Frequently Asked Questions**.

You can also contact your support representative for further information about Temporary Software License offerings.

Summary of upgrade steps, I/O enclosure, and rack support

We have already discussed many of the I/O device and I/O enclosure considerations for upgrading into a POWER6 configuration:

► Many but not all of the POWER5 and POWER4 technology I/O devices, IOPs, IOAs (controllers), and I/O enclosures (towers or drawers) are also supported on POWER6 technology systems. Some of the earlier I/O configuration products that are already installed can be included in the upgrade, but some cannot be ordered new for a POWER6 technology system.

► Only SAS disk drives in each POWER6 520, 550, 570 processor enclosure.

► The number of PCI-X DDR slots and PCIe slots in the POWER6 520, 550 570 processor enclosure:

  – Three PCIe and two PCI-X DDR slots in the POWER6 520 (includes 9407-M15) and 550 models.

  – Each POWER6 570 processor enclosure has two PCI-X DDR slots and up to four PCIe slots (three if an optional HSL/12X GX card is used for a second loop in a processor enclosure).

► Choice of 12X or HSL-2 loops (requires corresponding GX+ adapter features).

► Buffered DDR2 memory DIMMs.

You need to plan for the minimum operating system release level that is required to run on a POWER6 system. Update your system to the following release levels prior to upgrading to POWER6:

► AIX (one of these levels):

  – AIX 5L for POWER V5.2 with Technology Level 5200-10 or later
  – AIX 5L for POWER V5.3 with Technology Level 5300-06 or later
  – AIX 6 for POWER V6.1 or later

► IBM i (one of these levels):

  – IBM i 5.4, with V5R4M5 Machine Code or later
  – IBM i 6.1 or later

► Linux (one of these levels):

  – SUSE LINUX Enterprise Server 10 SP1 or later
  – Red Hat Enterprise Linux 4.5 or later
  – Red Hat Enterprise Linux 5.1 or later

Note: PowerVM features (#7942 and #7995) are not supported on AIX 5L for POWER V5.2.

Consider the following example of a recommended method to perform a conversion over a weekend:

1. Before the move, bring the existing system to i5/OS V5R4 and machine code V5R4M5 (or V6R1 in the future).

2. Bring HMC to firmware level V7R3 (new browser-based interface).

3. Move any SCSI disk drives out of the existing 570 processor enclosure into a I/O tower or drawer supported by POWER6.

4. On your current system, implement more stringent disk protection configuration rules of POWER6 (RAID or mirroring required).

5. Move any excess PCI-X adapters from the existing processor enclosure into an I/O tower or drawer.

6. Upgrade any 0588 enclosure to RIO-2 using RPQ #847204 and feature #6417.

7. Replace older hardware that is not supported on POWER6.

8. Back up your system software and microcode.

9. Perform the upgrade.

Consider RPQ #847212 side-by-side for a multi-weekend move. Take note of the temporary use software licensing announced in July 2007 and documented in "Temporary software license" on page 925.

The following summary of I/O considerations is based upon what can be included in an upgrade and can be ordered new for the 9117-MMA processor enclosure:

► Use SAS-technology disk drives only. Currently there is no RAID protection capability and essentially no write cache.

► Choose an RIO-2 loop adapter, 12X loop adapter, or a combination, for up to two maximum. You cannot mix 12X and RIO-2 drawers on the same loop.

► Select one of three available IVE (HEA) adapters. These adapters have significantly expanded virtualization capabilities. They must be configured through the HMC interface before they can be seen by and configured by the operating system that will use them. The operating system recognizes the logical host Ethernet adapter (on IBM i CMNnn). The hardware adapter itself is not owned by a partition as was true with previously available embedded LAN adapters within the enclosure.

► Review the I/O enclosure (tower and drawer) and rack migration rules for POWER5 570 to POWER6 570 as shown in the following table and succeeding text. Remember that additional tape support details that you can use in upgrade planning are included in Chapter 10, "Tape and optical storage attachment summary" on page 827.

> **Note:** We do not discuss every possible I/O enclosure that System i or System p supports prior to the availability of POWER6 systems that are also supported on POWER6. However, we do include new I/O enclosures as well as a few of the technology enclosures that are not supported on POWER6 configurations.

Table D-2 includes columns for the following POWER6 systems:

► Power 520 (8203-E4A, 9407-M15, 9408-M25)
► Power 550 (8204-E8A, 9409-M50)
► Power 570 (9117-MMA)
► Power 595 9119-FHA

Table D-2   I/O enclosures

Enclosure	DASD	PCI slots	System adapter requirements for POWER6 connection	EIU / Width (in.)	8203 - E4A	9408 - M25	8204 - E8A	9409 - M50	9117 - MMA	9119 - FHA
System i 5074/5079	15-90 10 k rpm disks	14	Not supported	4U / 19	N	N	N	N	N	N
System p 7311-D10	0	6	Not supported	4U / 19	N	N	N	N	N	N
System p 7311-D20 System i 0595 (rack) 5095 (tower)[6, 3]	12 SCSI 10 k[7], 15 k rpm	7 PCI-X	GX+ adapter card FC 5614 (RIO-2 loop)	4U / 19 5U / 19	✓ A L ✓ i	✓ A L ✓ i	✓ A L ✓ i	✓ A L ✓ i	✓ A L ✓ i	N ✓ i
System i 5094 5294 (2x 5094)[1]	SCSI 10 k[7], 15 k rpm up to 45 SCSI disk slots up to 90 SCSI disk slots	14 28	GX+ adapter card FC 5614 (RIO-2 loop)	19	✓ i	✓ i	✓ i	✓ i	✓ i	✓ i
System i 5096 5296 (2x 5096)[2]	0 0	14 / 28	GX+ adapter card FC 5614 (RIO-2 loop)	19	✓ i	✓ i	✓ i	✓ i	✓ i	✓ i
System p 7311-D11 System i 5790	0 0	6	GX+ adapter card FC 5614 (RIO-2 loop)	4U / 19	✓ A L ✓ i	✓ A L ✓ i	✓ A L ✓ i	✓ A L ✓ i	✓ A L ✓ ✓ ✓ i	✓ A L ✓ i
System i 0588 (rack) 5088 (tower)[1]	0	14	GX+ adapter card FC 5614 (RIO-2 loop) RPQ or #6417 (MES) or #9517 for RIO-2 adapter in 0588	8U /19	N	✓ i	N	✓ i	✓ i	✓ i
System p 7314-G30 System i 5796	0 0	6 PCI-X DDR 266 MHz	GX+ adapter card FC 5616 (12x loop)	4U / 19	✓ A L N	✓ A L ✓ i	✓ A L N	✓ A L ✓ i	✓ A L ✓ i	N N
System p 7031-T24/ D24 System i 5786	24 SCSI 10 k[7], 15 k rpm 24 SCSI 10 k[7], 15 k rpm	0	Any supported SCSI adapter	4U / 19	✓ A L N	✓ A L ✓ A L i	✓ A L N	A L ✓ A L i	✓ A L ✓ A L i	✓ A L ✓ A L i
#5886 EXP 12S SAS Disk Drawer	12 SAS 15k rpm	0	Any supported SAS adapter or the external port of the FC 8345 backplane	2U / 19	✓ A L i	✓ A L i	✓ A L i	✓ A L i	✓ A L i	✓ A L i

Enclosure	DASD	PCI slots	System adapter requirements for POWER6 connection	EIU / Width (in.)	8203 - E4A	9408 - M25	8204 - E8A	9409 - M50	9117 - MMA	9119 - FHA
#5791 24 inch RIO-2 I/O drawer	16 SCSI 10 k [7], 15 k rpm	20	GX+ adapter card FC 1814 (RIO-2 loop)	4U /24	N	N	N	N	N	✓ A L
#5807 24 inch RIO-2 I/O drawer (Model Upgrade Carry-Over Indicator for #5791)	16 SCSI 10k[7], 15k rpm	20	GX+ adapter card FC 1814 (RIO-2 loop)	4U / 24	N	N	N	N	N	✓ A L
#5794 I/O Drawer	8 SCSI 10 k[7], 15 k rpm	20	GX+ adapter card FC 1814 (RIO-2 loop)	4U / 24	N	N	N	N	N	✓ A L
#5808 24 inch RIO-2 I/O drawer (Model Upgrade Carry-Over Indicator for #5794)	8 SCSI 10 k[7], 15 k rpm	20	GX+ adapter card FC 1814 (RIO-2 loop)	4U / 24	N	N	N	N	N	✓ A L
#5809 24 inch RIO-2 I/O drawer (Model Upgrade Carry-Over Indicator for converted #4643 (7040-61D I/O Drawer [1]) with DCA	16 SCSI 10 k[7], 15 k rpm		GX+ adapter card FC 1814 (RIO-2 loop) Effectively becomes a #5791; see #5791 Enclosure column	4U / 24	N	N	N	N	N	✓ A L
#5797 12X I/O Drawer PCI-X, with repeater [4,5]	16 SCSI 15 k rpm	20	GX+ adapter card FC 1816 (12X loop)	4U / 24	N	N	N	N	N	✓ A L i
#5798 2X I/O Drawer PCI-X, no repeater[4,5]	16 SCSI 15 k rpm	20	GX+ adapter card FC 1816 (12X loop)	4U / 24	N	N	N	N	N	✓ A L i
#5720 DVD/Tape SAS External Storage Unit (1U)	0. This media drawer provides the system with two bays for media (DVD, SAS tape) devices. One SAS controller in either a #5797 or #5791 I/O drawer drives both bays.		Note: The #5720 Media Drawer is not available when the #6331 Battery Backup is ordered.	1U / 24 [8]	N	N	N	N	N	✓
#5791 Special conversion	Starting 21 November 2008, you can optionally convert #5791 I/O drawers purchased with the 9119-FHA to the newer #5797/5798 at a lowered cost than a new 5797/5798. PCI cards and SCSI disk drives can be moved from the #5791 and placed in #5797/5798. Important note: Conversions from I/O drawers with #5807/5808/5809 carry over feature not announced as of September 2008.				N	N	N	N	N	✓

Enclosure	DASD	PCI slots	System adapter requirements for POWER6 connection	EIU / Width (in.)	8203 - E4A	9408 - M25	8204 - E8A	9409 - M50	9117 - MMA	9119 - FHA

General Notes:

✓ = Supported and N = Not supported

A = Supported by AIX; L = Supported by Linux. i = Supported by IBM i. See the Features Description chapter for required release levels.

Note that although some almost identical System i and System p enclosures are listed together in the same table row, there are some technical detail differences. For example, the System i enclosure can support IOP cards while the System p enclosure does not. The AIX and IBM i operating system software is very specific to supporting hardware based upon a specific MTM or feature code value. This determines whether a similar hardware enclosure or card cannot be supported by an operating system.

The following chapters provide additional details about the I/O enclosures listed in this table. For example, the IBM i operating system does not support the #5791 and AIX and Linux do not support the #5790.

► Chapter 4, "Feature descriptions and related information" on page 187
  Note that most hardware features have specific cable requirements. In this paper, most cable descriptions are either in the individual MTM chapters or included in Chapter 11, "RIO-2 12X SPCN line cord SAS and communication cables for IBM Power Systems models" on page 857.
► Chapter 9, "IBM Power systems I/O enclosures schematics" on page 801
► Chapter D, "Upgrades to Power 9117-MMA and Power 9119-FHA" on page 909

GX adapters listed under the Requirements for POWER6 connection column are the Power System GX adapter card. The enclosure requires a corresponding loop adapter card that is not included in this table. See Chapter 4, "Feature descriptions and related information" on page 187.

Specific Notes;

1. Cannot order as new as of November 2008.
2. Order through RPQ 847230, 847231 as of November 2008
3. Order through RPQ 847232 as of November 2008
4. Available November 2008.
5. IBM i 5.4 and IBM i 6.1 releases do not support the disks attached to the embedded zero write cache disk controller within the enclosure. IBM i supports disks attached to the appropriate adapters that can use the PCI-X slots within the enclosure.
6. The 0595 and 7311-D20 are almost identical except 7311-D20 is 4 U high, 0595 is 5U high.
7. A notation of Z means that 10 k rpm is not recommended.
8. The #5720 media drawer occupies 1U of rack space in either the 12U or 34U positions in the 595 system.

Common racks from System i and System p configurations

The supported racks for the Power System technology systems are listed in two groups. The first group, unless an exception is noted, applies to all rack configured POWER6 systems. The second group applies only to the POWER6 595 model.

> **Notes:**
>
> ► Where appropriate, the System i feature is listed first, followed by the System p feature. In some cases, the separate features can be supported only in upgraded configurations (not new).
>
> ► In cases where a physical rack is the same for both a System i and a System p order number and that rack is supported on POWER6, the IBM configurator tool can list the System i or System p rack number, dependent upon the primary operating system specified on the order. While physically the same rack, some supported features within the rack can be listed by default based upon the primary operating system specified.
>
> Some features that are delivered as part a either a System p rack or a System i rack can be different. For example, you need to order the #0553 only when required to support rack integration of MES orders prior to shipment from IBM manufacturing.

The following groups list the supported racks for the Power System technology systems:

► Power 520, Power 550, Power 570, Power 595 servers:

   – #0551 / 7014-T00

     19 inch 1.8 meter 36U Rack. Feature #0551 is equivalent to the 7014-T00 rack.

   – #0553 / 7014-T42

     19 inch 2.0 meter 42U Rack. Feature #0553 is equivalent to the 7014-T42 rack.

   – #0554 / 7014-S11

     19 inch 0.6 meter 11 U Rack. Feature #0554 is equivalent to the 7014-S11 rack. Feature #0554 cannot be ordered new as of April 2008. The #0554 or #7014-S11 does not support the Power 570 processor enclosures.

   – #0555 / 7014-S25

     19 inch 1.3 meter (25U) Rack. Feature #0555 is equivalent to the 7014-S25 rack.

► Power 595 servers:

   – Power 595 System Rack

     The 42U-tall, 24 inch system rack that houses the central electronics complex (CEC), Bulk Power Assembly (BPA), and I/O drawers.

   – #5792 (not available for new orders) 9119-595 powered Expansion Rack

     Can be used for additional 24 inch I/O drawer expansion. The #5792 supports the RIO-2 I/O Drawers (#5791 and #5794). It does not support the 12X I/O Drawers (#5797 nor #5798). It can support a bolted on Expansion Rack #8691.

   – #8691 Expansion Rack, 24 inch, 42U, un-powered.

     Power can come from attachment to either the 595 system rack or a #5792.

   – #6954 Power Expansion Rack.

     24 inch, 42U powered expansion rack utilizes the same power components provided in the Power 595 system rack.

- #6953 24 inch Unpowered Expansion Rack

  Can be bolted to the side of a powered Expansion Rack.

- #5881 Migrated Bolt-on rack.

  An indicator feature used when the #8691 Bolt-on rack is migrated from a 9119-595. This is a 24-in Bolt-on Expansion rack for RIO-2 I/O drawers #5791, #5807, #5808, #5809.

- #5882 Migrated Self-Powered rack.

  An indicator feature used when the #5792 Powered Expansion rack is migrated from a 9119-595. This is a 24-in Self Powered Expansion rack for RIO-2 I/O drawers #5791, #5807, #5808, #5809.

9406 features codes converted to 9117-MMA and 9119-FHA equivalent

In this chapter, we provide most of the feature code conversions from POWER5 and POWER5+ 570, 590, and 595 models to POWER6 570 9117-MMA and 595 9119-FHA MTM conversions (upgrades). We show the *from system* feature code to the *changed to* feature code on the upgraded to system.

Table D-3 includes some specify code changes (no physically associated hardware), features that represent pluggable cards (for example, I/O devices, I/O adapters/controllers), and memory card DIMMs) and I/O enclosures ("drawers").

Table D-3   9406 feature codes converted

9406 features codes	9406 feature code description	Same physical product but with different 9117, 9119 FC - (converted to feature codes)
0002	Customer Install MES	Not used
0003	Notify CSO After Install	Not used
0005	Bulk Order Indicator	Not used
0006	LPAR Restrict Build Process	Not used
0092	External xSeries Attach	3704
2843	PCI IOP	3705
2793/9793	PCI 2-Line WAN with Modem	6833
2794/9794	PCI 2-Line WAN with Modem	6834
2742	PCI 2-Line WAN IOA No IOP	6805
2805, 2806	PCI 4-Modem WAN IOA	6808
2849	PCI 100/10 Mbps Ethernet IOA	3709
4631	DVD-ROM	3706
4684	30 GB 1/4-in Cartridge Tape	3707
4687	50 GB 1/4-in Cartridge Tape	3708

9406 features codes	9406 feature code description	Same physical product but with different 9117, 9119 FC - (converted to feature codes)
9726	Base 512 MB Server Memory	0446
1850	VHDCI to P Converter Cable	2118
1851	0.6 m SCSI P-P Cable	2424
1852	2.5m SCSI P-P Cable	2425
0371	LC-SC Adapter Kit (50um)	2456
0632	PCI USB 2.0 Adapter	2738
0633	Graphics adapter	2849
1855	4-port EIA 232 Cable	2861
0635	SDLC/X.25 - 2-port Adapter	2962
1481	1.2 m HSL-2/RIO-2 Cable	3146
1482	3.5 m HSL-2/RIO-2 Cable	3156
1307	1.75 m HSL-2/RIO-2 Cable	3168
1308	2.5 m HSL-2/RIO-2 Cable	3149
1293 / 1893	36.4 GB 10 k rpm Disk Unit	3273
1294 / 1894	73.4 GB 10 k rpm Disk Unit	3274
1295 / 1895	146.8 GB 10 k rpm Disk Unit	3275
1296 / 1896	36.4 GB 10 k rpm Disk Unit	3277
1297 / 1897	73.4 GB 10 k rpm Disk Unit	3278
1298 / 1898	146.8 GB 15 k rpm Disk Unit	3279
1875	Serial Port Converter Cable	3925
1860	ASYNC Terminal/Prt Cable	3926
8849	Base Serv Inface Cable-4 Drw	5560
1871	USB Keybd-Bulgarian	8813
1870	USB Keyboard-Dutch	8817
1872	USB Keyboard-Portuguese	8818
2915	Polish	9705
2919 / 2978	Portuguese MNCS	9707
2932 / 2942	Italian	9711
2935	French Canadian	9712
2918	Slovakian	9720
2916	Russian	9721
2962	Traditional Chinese	9715

9406 features codes	9406 feature code description	Same physical product but with different 9117, 9119 FC - (converted to feature codes)
2998	Chinese (PRC)	9722
2979	Brazilian Portuguese	9728
0272	Renovated by IBM	9993
4643	7040-61D I/O Drawer	5809
5736 (disk and tape), 5766 (tape only). Both require supporting IOP under IBM i.	System p: #5736 PCI-X Disk/Tape Controller (no IOP). System i: #5736 PCI-X Disk/Tape Controller with IOP. #5766 with IOP for tape only.	5736 (no IOP), 5806 (if IOP required for tape library support by IBM)
5737	PCI-X Disk Controller 90 MB	5776 (No IOP)
5738 with IOP, aux write cache card is 5582)	PCI-X Disk Controller 90 MB	5777 (No IOP), aux write cache card is 5583
5739, 5799 (POWER5 520), 5781 (POWER5 570) IOP required	PCI-X EXP24 Controller with 1.5 GB Write/1.6 GB Read caches	5778 (No IOP), 5780 (No IOP), 5782 (No IOP)
5704	PCI-X Fibre Channel adapter (IOP-based)	6329
5490,5491	5250 Enterprise Enablement	4990,4 991
4806	Crypto co-processor	4764
0371,0372	Fibre Channel attach kits	2456,2459
1307, 1308, 1481, 1482, 1483	HSL-2/RIO-2 cables	3156, 3168, 3146, 3147, 3148
Mostly 29xx features. Example: English 2924, French 2928, Japanese Kanji 2930, Italian 2932	Specify for language manuals should be shipped	Mostly 97xx features. Example: English 9300, French 9703, Japanese Kanji 9714, Italian 9711

Expanded System p 590, System p 595, and System i 595 and System i 9406-MMA 570 upgrade feature conversions on upgrade to the POWER6 595 9119-FHA

The tables in this section are reproduced from *IBM Power 595 Technical Overview and Introduction*, REDP-4440.

From type-model 9119-590

Table D-4 details newly announced features to support an upgrade process.

Table D-4   Feature conversions for 9119-590 to 9119-FHA

Description	Feature code
Model Upgrade Carry-Over Indicator for converted #4643 with DCA	#5809
Migrated Bolt-on rack	#5881
Migrated Self-Powered rack	#5882
1 GB Carry-Over Activation	#5883
256 GB Carry-Over Activation	#5884
Base 1 GB DDR2 Memory Act	#8494
Base 256 GB DDR2 Memory Act	#8495

For lists of features involved in the 9119-590 to 9119-FHA model conversion, see Table D-5 (processor) and Table D-6 (adapter).

Table D-5   Feature conversions for 9119-590 to 9119-FHA processor

From feature code	To feature code
#7981 - 16-core POWER5 Standard CUoD Processor Book, 0-core Active	#1630 - Transition Feature from 9119-590-7981 to 9119-FHA-4694/4695
#8967 - 16-core POWER5+ 2.1 GHz Standard CUoD Processor Book, 0-core Active	#1633 - Transition Feature from 9119-590-8967 to 9119-FHA-4694/4695
#7667 - Activation, #8967 #7704 CoD Processor Book, One Processor	#4754 - Processor Activation #4754
#7925 - Activation, #7981 or #7730 CoD Processor Book, One Processor	#4754 - Processor Activation #4754
#7667 - Activation, #8967 #7704 CUoD Processor Book, One Processor	#4755 - Processor Activation #4755
#7925 - Activation, #7981 or #7730 CUoD Processor Book, One Processor	#4755 - Processor Activation #4755

Table D-6   Feature conversions for 9119-590 to 9119-FHA adapters

From feature code	To feature code
#7818 - Remote I/O-2 (RIO-2) Loop Adapter, Two Port	#1814 - Remote I/O-2 (RIO-2) Loop Adapter, Two Port
#7820 - GX Dual-port 12x HCA	#1816 - GX Dual-port 12x HCA

Table D-7, Table D-8, and Table D-9 list features involved in the 9119-590 to 9119-FHA model conversion (rack-related, the specify-codes, and memory).

Table D-7   Feature conversions for 9119-590 to 9119-FHA rack-related

From feature code	To feature code
#5794 - I/O Drawer, 20 Slots, 8 Disk Bays	#5797 - 12X I/O Drawer PCI-X, with repeater
#5794 - I/O Drawer, 20 Slots, 8 Disk Bays	#5798 - 12X I/O Drawer PCI-X, no repeater

Table D-8   Feature conversions for 9119-590 to 9119-FHA specify codes feature

From feature code	To feature code
#4643- 7040-61D I/O Drawer Attachment Indicator	#5809 - Model Upgrade Carry-Over Indicator for converted #4643 with DCA

Table D-9   Feature conversions for 9119-590 to 9119-FHA memory

From feature code	To feature code
#7669 - 1 GB Memory Activation for #4500, #4501, #4502 and #4503 Memory Cards	#5680 - Activation of 1 GB DDR2 POWER6 Memory
#7970 - 1 GB Activation #7816 & #7835 Memory Features	#5680 - Activation of 1 GB DDR2 POWER6 Memory
#8471 - 1 GB Base Memory Activations for #4500, #4501, #4502 and #4503	#5680 - Activation of 1 GB DDR2 POWER6 Memory
#7280 - 256 GB Memory Activations for #4500, #4501, #4502 and #4503 Memory Cards	#5681 - Activation of 256 GB DDR2 POWER6 Memory
#8472 - 256 GB Base Memory Activations for #4500, #4501, #4502 and #4503 Memory Cards	#5681 - Activation of 256 GB DDR2 POWER6 Memory
#8493 - 256 GB Memory Activations for #8151, #8153 and #8200 Memory Packages	#5681 - Activation of 256 GB DDR2 POWER6 Memory
#4500 - 0/4 GB 533 MHz DDR2 CoD Memory Card	#5693 - 0/4 GB DDR2 Memory (4X1 GB) DIMMS- 667 MHz- POWER6 CoD Memory
#7814 - 4 GB DDR2 Memory Card, 533 MHz	#5693 - 0/4 GB DDR2 Memory (4X1 GB) DIMMS- 667 MHz- POWER6 CoD Memory
#7816 - 4 GB CUoD Memory Card 2 GB Active, DDR1	#5693 - 0/4 GB DDR2 Memory (4X1 GB) DIMMS- 667 MHz-POWER6 CoD Memory
#4500 - 0/4 GB 533 MHz DDR2 CoD Memory Card	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS- 667 MHz-POWER6 CoD Memory

From feature code	To feature code
#4501 - 0/8 GB 533 MHz DDR2 CoD Memory Card	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS- 667 MHz-POWER6 CoD Memory
#7814 - 4 GB DDR2 Memory Card, 533 MHz	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS- 667 MHz- POWER6 CoD Memory
#7816 - 4 GB CUoD Memory Card 2 GB Active, DDR1	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS- 667 MHz-POWER6 CoD Memory
#7835 - 8 GB CUoD Memory Card 4 GB Active, DDR1	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS- 667 MHz-POWER6 CoD Memory
#4501 - 0/8 GB 533 MHz DDR2 CoD Memory Card	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#4502 - 0/16 GB 533 MHz DDR2 CoD Memory Card	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#7828 - 16 GB DDR1 Memory Card, 266 MHz	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#7835 - 8 GB CUoD Memory Card 4 GB Active, DDR1	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#4502 - 0/16 GB 533 MHz DDR2 CoD Memory Card	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#4503 - 0/32 GB 400 MHz DDR2 CoD Memory Card	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#7828 - 16 GB DDR1 Memory Card, 266 MHz	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#7829 - 32 GB DDR1 Memory Card, 200 MHz	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#4503 - 0/32 GB 400 MHz DDR2 CoD Memory Card	#5697 - 0/64 GB DDR2 Memory(4X16 GB) DIMMS, 400 MHz, POWER6 CoD Memory
#7829 - 32 GB DDR1 Memory Card, 200 MHz	#5697 - 0/64 GB DDR2 Memory(4X16 GB) DIMMS, 400 MHz, POWER6 CoD Memory
#8195 - 256 GB DDR1 Memory32 X 8 GB)	#8201 - 0/256 GB 533 MHz DDR2 Memory Package (32x#5694)
#8153 - 0/256 GB 533 MHz DDR2 Memory Package	#8202 - 0/256 GB 533 MHz DDR2 Memory Package (16x#5695)
#8151 - 0/512 GB 533 MHz DDR2 Memory Package	#8203 - 0/512 GB 533 MHz DDR2 Memory Package (32x#5695)
#8197 - 512 GB DDR1 Memory (32 X 16 GB Cards)	#8203 - 0/512 GB 533 MHz DDR2 Memory Package (32x#5695)
#8198 - 512 GB DDR1 Memory(16 X 32 GB Cards)	#8204 - 0/512 GB 400 MHz DDR2 Memory Package (16x#5696)
#8200 - 512 GB DDR2 Memory (16 X 32 GB Cards)	#8204 - 0/512 GB 400 MHz DDR2 Memory Package (16x#5696)

From type-model 9119-595

Table D-10, Table D-11, and Table D-12 list features in a 9119-595 to 9119-FHA model conversion.

Table D-10   Processor feature conversions for 9119-595 to 9119-FHA

From feature code	To feature code
#7988 - 16-core POWER5 Standard CoD Processor Book, 0-core Active	#1631 - Transition Feature from 9119-595 #7988 to 9119-FHA #4694 or #4695
#7813 - 16-core POWER5 Turbo CoD Processor Book, 0-core Active	#1632 - Transition Feature from 9119-595 #7813 to 9119-FHA #4694 or #4695
#8970 - 16-core POWER5+ 2.1 GHz Standard CoD Processor Book, 0-core Active	#1634 - Transition Feature from 9119-595 #8970 to 9119-FHA #4694 or #4695
#8968 - 16-core POWER5+ 2.3 GHz Turbo CoD Processor Book, 0-core Active	#1635 - Transition Feature from 9119-595 #8968 to 9119-FHA #4694 or #4695
#8969 - New 16-core POWER5 Turbo CoD Processor Book, 0-core Active	#1636 - Transition Feature from 9119-595 #8969 to 9119-FHA #4694 or #4695
#7668 - Activation, #8968 or #7705 CoD Processor Book, One Processor	#4754 - Processor Activation #4754
#7693 - Activation, #8970 or #7587 CoD Processor Book, One Processor	#4754 - Processor Activation #4754
#7815 - Activation #7813, #7731, #7586, or #8969 CoD Processor Books, One Processor	#4754 - Processor Activation #4754
#7990 - Activation, #7988 or #7732 CoD Processor Book, One Processor	#4754 - Processor Activation #4754
#7668 - Activation, #8968 or #7705 CoD Processor Book, One Processor	#4755 - Processor Activation #4755
#7693 - Activation, #8970 or #7587 CoD Processor Book, One Processor	#4755 - Processor Activation #4755
#7815 - Activation #7813, #7731, #7586, or #8969 CoD Processor Books, One Processor	#4755 - Processor Activation #4755
#7990 - Activation, #7988 or #7732 CoD Processor Book, One Processor	#4755 - Processor Activation #4755

Table D-11   Adapter feature conversions for 9119-595 to 9119-FHA

From feature code	To feature code
#7818 - Remote I/O-2 (RIO-2) Loop Adapter, Two Port	#1814 - Remote I/O-2 (RIO-2) Loop Adapter, Two Port
#7820 - GX Dual-port 12x HCA	#1816 - GX Dual-port 12x HCA

> **Note:** Table D-12 lists just one feature because all other features are the same as in Table D-9.

Table D-12   Additional memory feature conversions for 9119-595 to 9119-FHA

From Feature Code	To Feature Code
#7799 - 256 1 GB Memory Activations for #7835 Memory Cards	#5681 - Activation of 256 GB DDR2 POWER6 Memory

Table D-13 and Table D-14 list features involved in the 9119-595 to 9119-FHA model conversion (rack-related, specify codes).

Table D-13   Feature conversions for 9119-595 to 9119-FHA rack-related

From feature code	To feature code
#5794 - I/O Drawer, 20 Slots, 8 Disk Bays	#5797 - 12X I/O Drawer PCI-X, with repeater
#5794 - I/O Drawer, 20 Slots, 8 Disk Bays	#5798 - 12X I/O Drawer PCI-X, no repeater

Table D-14   Feature conversions for 9119-595 to 9119-FHA specify codes

From feature code	To feature code
#4643 - 7040-61D I/O Drawer Attachment Indicator	#5809 - Model Upgrade Carry-Over Indicator for converted #4643 with DCA

Table D-15   Feature conversions for 9119-595 to 9119-FHA specify codes

From feature code	To feature code
#4643 - 7040-61D I/O Drawer Attachment Indicator	#5809 - Model Upgrade Carry-Over Indicator for converted #4643 with DCA

Conversion within 9119-FHA

Table D-16, Table D-17, and Table D-18 list features involved in model conversion within 9119-FHA.

Table D-16   Feature conversions for 9119-FHA adapters (within 9119-FHA)

From feature code	To feature code
#1814 - Remote I/O-2 (RIO-2) Loop Adapter, Two Port	#1816 - GX Dual-port 12x HCA
#5778 - PCI-X EXP24 Ctl - 1.5 GB No IOP	#5780 - PCI-X EXP24 Ctl-1.5 GB No IOP
#5778 - PCI-X EXP24 Ctl - 1.5 GB No IOP	#5782 - PCI-X EXP24 Ctl-1.5 GB No IOP

Table D-17   Processor feature conversions for 9119-FHA (within 9119-FHA)

From feature code	To feature code
#4694 - 0/8-core POWER6 4.2 GHz CoD, 0-core Active Processor Book	#4695 - 0/8-core POWER6 5.0 GHz CoD, 0-core Active Processor Book
#4754 - Processor Activation #4754	#4755 - Processor Activation #4755

Table D-18   I/O drawer feature conversions for 9119-FHA

From feature code	To feature code
#5791 - I/O Drawer, 20 Slots, 16 Disk Bays	#5797 - 12X I/O Drawer PCI-X, with repeater
#5791 - I/O Drawer, 20 Slots, 16 Disk Bays	#5798 - 12X I/O Drawer PCI-X, no repeater

From type-model 9406-570

Table D-19, Table D-20, Table D-21, Table D-22, and Table D-23 list the feature codes in a 9406-570 to 9119 FHA model conversion.

Table D-19   Processor feature conversions for 9406-570 to 9119-FHA processor

From feature code	To feature code
#7618 - 570 One Processor Activation	#4754 - Processor Activation #4754
#7738 - 570 Base Processor Activation	#4754 - Processor Activation #4754
#7618 - 570 One Processor Activation	#4755 - Processor Activation #4755
#7738 - 570 Base Processor Activation	#4755 - Processor Activation #4755
#7260 - 570 Enterprise Enablement	#4995 - Single #5250 Enterprise Enablement
#7577 - 570 Enterprise Enablement	#4995 - Single #5250 Enterprise Enablement
#9286 - Base Enterprise Enablement	#4995 - Single #5250 Enterprise Enablement
#9299 - Base 5250 Enterprise Enable	#4995 - Single #5250 Enterprise Enablement
#7597 - 570 Full Enterprise Enable	#4996 - Full #5250 Enterprise Enablement
#9298 - Full 5250 Enterprise Enable	#4996 - Full #5250 Enterprise Enablement
#7897 - 570 CUoD Processor Activation	#4754 - Processor Activation #4754
#8452 - 570 One Processor Activation	#4754 - Processor Activation #4754
#7897 - 570 CUoD Processor Activation	#4755 - Processor Activation #4755
#8452 - 570 One Processor Activation	#4755 - Processor Activation #4755

Table D-20   Administrative feature conversions for 9406-570 to 9119-FHA

From feature code	To feature code
#1654 - 2.2 GHz Processor	#4694 - 0/8-core POWER6 4.2 GHz CoD, 0-core Active Processor Book
#1655 - 2.2 GHz Processor	#4694 - 0/8-core POWER6 4.2 GHz CoD, 0-core Active Processor Book
#1656 - 2.2 GHz Processor	#4694 - 0/8-core POWER6 4.2 GHz CoD, 0-core Active Processor Book
#1654 - 2.2 GHz Processor	#4695 - 0/8-core POWER6 5.0 GHz CoD, 0-core Active Processor Book
#1655 - 2.2 GHz Processor	#4695 - 0/8-core POWER6 5.0 GHz CoD, 0-core Active Processor Book
#1656 - 2.2 GHz Processor	#4695 - 0/8-core POWER6 5.0 GHz CoD, 0-core Active Processor Book

Table D-21   Capacity on Demand feature conversions for 9406-570 to 9119-FHA

From feature code	To feature code
#7950 - 570 1 GB CoD Memory Activation	#5680 - Activation of 1 GB DDR2 POWER6 Memory
#8470 - 570 Base 1 GB Memory Activation	#5680 - Activation of 1 GB DDR2 POWER6 Memory
#7663 - 570 1 GB Memory Activation	#5680 - Activation of 1 GB DDR2 POWER6 Memory

Table D-22   Memory feature conversions for 9406-570 to 9119-FHA

From feature code	To feature code
#4452 - 2 GB DDR-1 Main Storage	#5693 - 0/4 GB DDR2 Memory (4X1 GB) DIMMS-667 MHz- POWER6 CoD Memory
#4453 - 4 GB DDR Main Storage	#5693 - 0/4 GB DDR2 Memory (4X1 GB) DIMMS-667 MHz- POWER6 CoD Memory
#4490 - 4 GB DDR-1 Main Storage	#5693 - 0/4 GB DDR2 Memory (4X1 GB) DIMMS-667 MHz- POWER6 CoD Memory
#4453 - 4 GB DDR Main Storage	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS-667 MHz- POWER6 CoD Memory
#4454 - 8 GB DDR-1 Main Storage	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS-667 MHz- POWER6 CoD Memory
#4490 - 4 GB DDR-1 Main Storage	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS-667 MHz- POWER6 CoD Memory
#7890 - 4/8 GB DDR-1 Main Storage	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS-667 MHz- POWER6 CoD Memory
#4454 - 8 GB DDR-1 Main Storage	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#4491 - 16 GB DDR-1 Main Storage	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#4494 - 16 GB DDR-1 Main Storage	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#7890 - 4/8 GB DDR-1 Main Storage	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#4491 - 16 GB DDR-1 Main Storage	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#4492 - 32 GB DDR-1 Main Storage	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#4494 - 16 GB DDR-1 Main Storage	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#4492 - 32 GB DDR-1 Main Storage	#5697 - 0/64 GB DDR2 Memory(4X16 GB) DIMMS, 400 MHz, POWER6 CoD Memory
#7892 - 2 GB DDR2 Main Storage	#5693 - 0/4 GB DDR2 Memory (4X1 GB) DIMMS- 667 MHz-POWER6 CoD Memory

From feature code	To feature code
#7893 - 4 GB DDR2 Main Storage	#5693 - 0/4 GB DDR2 Memory (4X1 GB) DIMMS- 667 MHz-POWER6 CoD Memory
#4495 - 4/8 GB DDR2 Main Storage	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS- 667 MHz-POWER6 CoD Memory
#7893 - 4 GB DDR2 Main Storage	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS- 667 MHz-POWER6 CoD Memory
#7894 - 8 GB DDR2 Main Storage	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS- 667 MHz-POWER6 CoD Memory
#4495 - 4/8 GB DDR2 Main Storage	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#4496 - 8/16 GB DDR2 Main Storage	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#4497 - 16 GB DDR2 Main Storage	#5695 - 0/16 GB DDR2 Memory (4X4GB) DIMMS- 533 MHz-POWER6 CoD Memory
#4499 - 16 GB DDR2 Main Storage	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#7894 - 8 GB DDR2 Main Storage	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#4496 - 8/16 GB DDR2 Main Storage	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#4497 - 16 GB DDR2 Main Storage	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#4498 - 32 GB DDR2 Main Storage	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#4499 - 16 GB DDR2 Main Storage	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#4498 - 32 GB DDR2 Main Storage	#5697 - 0/64 GB DDR2 Memory(4X16 GB) DIMMS, 400 MHz, POWER6 CoD Memory

From type-model 9406-595

Table D-23   Feature conversions for 9406-595 processor features

From feature code	To feature code
#7668 - 595 One Processor Activation	#4754 - Processor Activation #4754
#7815 - 595 One Processor Activation	#4754 - Processor Activation #4754
#7925 - 595 One Processor Activation	#4754 - Processor Activation #4754
#7668 - 595 One Processor Activation	#4755 - Processor Activation FC4755
#7815 - 595 One Processor Activation	#4755 - Processor Activation FC4755
#7925 - 595 One Processor Activation	#4755 - Processor Activation FC4755
#7261 - 595 Enterprise Enablement	#4995 - Single #5250 Enterprise Enablement

From feature code	To feature code
#7579 - 595 Enterprise Enablement	#4995 - Single #5250 Enterprise Enablement
#9286 - Base Enterprise Enablement	#4995 - Single #5250 Enterprise Enablement
#9299 - Base 5250 Enterprise Enable	#4995 - Single #5250 Enterprise Enablement
#7259 - 595 Full Enterprise Enable	#4996 - Full #5250 Enterprise Enablement
#7598 - 595 Full Enterprise Enable	#4996 - Full #5250 Enterprise Enablement
#9298 - Full 5250 Enterprise Enable	#4996 - Full #5250 Enterprise Enablement

Table D-24   Feature conversions for 9406-595 adapters

From feature code	To feature code
#7818 - HSL-2/RIO-G 2-Ports Copper	#1814 - Remote I/O-2 (RIO-2) Loop Adapter, Two Port

Table D-25   Feature conversions for 9406-595 to 9119-FHA Capacity on Demand

From feature code	To feature code
#7669 - 1 GB DDR2 Memory Activation	#5680 - Activation of 1 GB DDR2 POWER6 Memory
#7280 - 256 GB DDR2 Memory Activation	#5681 - Activation of 256 GB DDR2 POWER6 Memory
#7970 - 595 1 GB CUoD Memory Activation	#5680 - Activation of 1 GB DDR2 POWER6 Memory
#8460 - 595 Base 1 GB Memory Activation	#5680 - Activation of 1 GB DDR2 POWER6 Memory
#7663 - 595 256 GB Memory Activation	#5681 - Activation of 256 GB DDR2 POWER6 Memory

Table D-26   Feature conversions for 9406-595 to 9119-FHA memory features

From feature code	To feature code
#4500 - 0/4 GB DDR2 Main Storage	#5693 - 0/4 GB DDR2 Memory (4X1 GB) DIMMS- 667 MHz-POWER6 CoD Memory
#4500 - 0/4 GB DDR2 Main Storage	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS- 667 MHz-POWER6 CoD Memory
#4501 - 0/8 GB DDR2 Main Storage	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS- 667 MHz-POWER6 CoD Memory
#4501 - 0/8 GB DDR2 Main Storage	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz- POWER6 CoD Memory
#4502 - 0/16 GB DDR2 Main Storage	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#4502 - 0/16 GB DDR2 Main Storage	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#4503 - 0/32 GB DDR2 Main Storage	#5696 - 0/32 GB DDR2 Memory(4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory

From feature code	To feature code
#4503 - 0/32 GB DDR2 Main Storage	#5697 - 0/64 GB DDR2 Memory(4X16 GB) DIMMS, 400 MHz, POWER6 CoD Memory
#7816 - 2/4 GB CUoD Main Storage	#5693 - 0/4 GB DDR2 Memory (4X1 GB) DIMMS-667 MHz- POWER6 CoD Memory
#7816 - 2/4 GB CUoD Main Storage	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS- 667 MHz- POWER6 CoD Memory
#7835 - 4/8 GB CUoD Main Storage	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS- 667 MHz- POWER6 CoD Memory
#7828 - 16 GB Main Storage	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#7835 - 4/8 GB CUoD Main Storage	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#7828 - 16 GB Main Storage	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#7829 - 32 GB Main Storage	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#7829 - 32 GB Main Storage	#5697 - 0/64 GB DDR2 Memory(4X16 GB) DIMMS, 400 MHz, POWER6 CoD Memory

Table D-27   Feature conversions for 9406-595 to 9119-FHA miscellaneous

From feature code	To feature code
#8195 - 256 GB Main Storage (32x8)	#8201 - 0/256 GB 533 MHz DDR2 Memory Package (32x#5694)
#8197 - 512 GB Main Storage (32x16)	#8203 - 0/512 GB 533 MHz DDR2 Memory Package (32x#5695)
#8198 - 512 GB Main Storage (16x32)	#8204 - 0/512 GB 400 MHz DDR2 Memory Package (16x#5696)

Table D-28   Feature conversions for 9406-595to 9119-FHA specify codes

From feature code	To feature code
#4643 - 7040-61D I/O Drawer Attachment Indicator	#5809 - Model Upgrade Carry-Over Indicator for converted #4643 with DCA

Expanded System p, System i POWER5 570 and POWER6 570 conversions on upgrade to 9117-MMA

The tables in this section show the following feature conversions:

► 9117-570 features converted to the converged 9117-MMA corresponding features
► 9406-570 features converted to the converged 9117-MMA corresponding features

The table captions identify the grouping of the converged features.

From 9117-570 to 9117-MMA

Table D-29   Feature conversions for 9117-MMA miscellaneous features

From feature code	To feature code
7942 - Advanced POWER Virtualization - Standard	7995 - Advanced POWER Virtualization - Enterprise

Table D-30   Feature conversions for 9117-570 to 9117-MMA adapters features

From feature code	To feature code
7878 - System Port Riser Card	5639 - Integrated, 4X- 1 Gbps Integrated Virtual Ethernet
7997 - System Service Processor	#5648 - Service Interface Card

Table D-31   Feature conversions for 9117-570 to 9117-MMA cable features

From feature code	To feature code
1847 - Processor Cable, Two Drawer System	#3660 - Processor Fabric Cable, 2 enclosure
1848 - Processor Cable, Three Drawer System	#3664 - Processor Fabric Cable, 3 enclosure
1849 - Processor Cable, Four Drawer System	#3665 - Processor Fabric Cable, 4 enclosure
1857 - SP Flex Cable, Two Drawer System	5657 - Server Interface Cable, 2 enclosures
1858 - SP Flex Cable, Three Drawer System	5658 - Server Interface Cable, 3 enclosure
1859 - SP Flex Cable, Four Drawer System	5660 - Server Interface Cable, 4 enclosure

Table D-32   Feature conversions for 9117-570 to 9117-MMA media devices features

From feature code	To feature code
7869 - Media Enclosure And Backplane	#5629 - Media Enclosure and Backplane
2640 - IDE Slimline DVD-ROM device	5756 - IDE Slimline DVD-ROM device

Table D-33   Feature conversions for 9117-570 to 9117-MMA memory features

From feature code	To feature code
#7663 - 1 GB Memory DDR2 Memory Activation for #4500, #4501, #4502 and #4503 Memory Cards	#5680 - Activation of 1 GB DDR2 POWER6 Memory
#7950 - 1 GB Activation forDDR1 Memory	#5680 - Activation of 1 GB DDR2 POWER6 Memory
#4453 - 4 GB (4X1GB) DIMMS, 208-pin 266 MHz Stacked DDR1 Memory SDRAM	#5693 - 0/4 GB DDR2 Memory (4X1 GB) DIMMS- 667 MHz- POWER6 CoD Memory
#4490 - 4 GB (4X1GB) DIMMS, 208-pin 266 MHz Stacked DDR1 Memory SDRAM	#5693 - 0/4 GB DDR2 Memory (4X1 GB) DIMMS- 667 MHz-POWER6 CoD Memory

From feature code	To feature code
#7893 - 4 GB (4X1GB) DIMMS, 276-pin 533 MHz Stacked DDR1 Memory SDRAM	#5693 - 0/4 GB DDR2 Memory (4X1 GB) DIMMS- 667 MHz-POWER6 CoD Memory
#4453 - 4 GB (4X1GB) DIMMS, 208-pin 266 MHz Stacked DDR1 Memory SDRAM	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS- 667 MHz-POWER6 CoD Memory
#4454 - 8 GB (4X2GB) DIMMS, 208-pin 266 MHz Stacked DDR1 Memory SDRAM	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS- 667 MHz-POWER6 CoD Memory
#4490 - 4 GB (4X1GB) DIMMS, 208-pin 266 MHz Stacked DDR1 Memory SDRAM	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS- 667 MHz- POWER6 CoD Memory
#4495 - 4/8 GB (4X2GB) DIMMS, 276-pin 533 MHz Stacked DDR1 Memory SDRAM	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS- 667 MHz-POWER6 CoD Memory
#7893 - 4 GB (4X1GB) DIMMS, 276-pin 533 MHz DDR2 Memory SDRAM	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS- 667 MHz-POWER6 CoD Memory
#7894 - 8 GB (4X2GB) DIMMS, 276-pin 533 MHz DDR2 Memory SDRAM	#5694 - 0/8 GB DDR2 Memory (4X2 GB) DIMMS- 667 MHz-POWER6 CoD Memory
#4453 - 4 GB (4X1GB) DIMMS, 208-pin 266 MHz Stacked DDR1 Memory SDRAM	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#4454 - 8 GB (4X2GB) DIMMS, 208-pin 266 MHz Stacked DDR1 Memory SDRAM	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#4490 - 4 GB (4X4GB) DIMMS, 208-pin 266 MHz Stacked DDR1 Memory SDRAM	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#4491 - 16 GB (4X4GB) DIMMS, 208-pin 266 MHz Stacked DDR1 Memory SDRAM	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#4494 - 16 GB (4X4GB) DIMMS, 208-pin 200 MHz Stacked DDR1 Memory SDRAM	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#4495 - 4/8 GB (4X2GB) DIMMS, 276-pin 533 MHz Stacked DDR1 Memory SDRAM	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#4496 - 8/16 GB (4X4 GB) DIMMS, 276-pin 533 MHz DDR2 SDRAM	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#4497 - 16 GB (4X4 GB) DIMMS, 276-pin 533 MHz DDR2 SDRAM	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#7049 - 8/16 GB (4X4 GB) DIMMS, CUoD, 8 GB Active, 200 MHz DDR1	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#7893 - 4 GB (4X1 GB) DIMMS, 276-pin 533 MHz DDR2 SDRAM	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#7894 - 8 GB (4X2 GB) DIMMS, 276-pin 533 MHz DDR2 SDRAM	#5695 - 0/16 GB DDR2 Memory (4X4 GB) DIMMS- 533 MHz-POWER6 CoD Memory
#4453 - 4 GB (4X1GB) DIMMS, 208-pin 266 MHz Stacked DDR1 Memory SDRAM	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#4454 - 8 GB (4X2GB) DIMMS, 208-pin 266 MHz Stacked DDR1 Memory SDRAM	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#4490 - 4 GB (4X4GB) DIMMS, 208-pin 266 MHz Stacked DDR1 Memory SDRAM	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory

From feature code	To feature code
#4491 - 16 GB (4X4GB) DIMMS, 208-pin 266 MHz Stacked DDR1 Memory SDRAM	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#4494 - 16 GB (4X4GB) DIMMS, 208-pin 200 MHz Stacked DDR1 Memory SDRAM	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#4495 - 4/8 GB (4X2GB) DIMMS, 276-pin 533 MHz Stacked DDR1 Memory SDRAM	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#4496 - 8/16 GB (4X4 GB) DIMMS, 276-pin 533 MHz DDR2 SDRAM	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#4497 - 16 GB (4X4 GB) DIMMS, 276-pin 533 MHz DDR2 SDRAM	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#7049 - 8/16 GB (4X4 GB) DIMMS, CUoD, 8 GB Active, 200 MHz DDR1	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#7893 - 4 GB (4X1 GB) DIMMS, 276-pin 533 MHz DDR2 SDRAM	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory
#7894 - 8 GB (4X2 GB) DIMMS, 276-pin 533 MHz DDR2 SDRAM	#5696 - 0/32 GB DDR2 Memory (4X8 GB) DIMMS- 400 MHz-POWER6 CoD Memory

Table D-34   Feature conversions for 9117-570 to 9117-MMA miscellaneous feature

From feature code	To feature code
7865 - Processor Enclosure and Backplane	5663 - Proc Enclosure and Backplane
7866 - I/O Backplane, 6 PCI-X Slots	5666 - I/O Backplane
7867 - System Midplane	5667 System Midplane
7868 Ultra320 SCIS six pack Backplane	5668 - SAS Disk Backplane - 6 slots
7942 - Advanced POWER Virtualization - Standard	7995 - Advanced POWER Virtualization - Enterprise
#7768 - Processor Power Regulator	#5625 - Processor Power Regulator
#7990 - Activation, #7988 or #7732 CoD Processor Book, One Processor	#4755 - Processor Activation #4755

Table D-35   Feature conversions for 9117-570 to 9117-MMA processor features

From feature code	To feature code
7782 - 2-Way 1.9 GHz POWER5+ Processor Card, 0-way active, 8 DDR2 Memory Slots	5621 - 4.2 GHz Proc Card, 0/ 2 Core POWER6, 8 DDR2 Memory Slots
8338 - 2-Way 2.2 GHz POWER5+ Processor Card, 0-way active, 8 DDR2 Memory Slots	5621 - 4.2 GHz Proc Card, 0/ 2 Core POWER6, 8 DDR2 Memory Slots
7782 - 2-Way 1.9 GHz POWER5+ Processor Card, 0-way active, 8 DDR2 Memory Slots	5622 - 4.2 GHz Proc Card, 0/ 2 Core POWER6, 12 DDR2 Memory Slots
7830 - 2-Way 1.65 GHz POWER5 CUoD Processor Card, 0-way active, 8 DDR1 Memory DIMM Slots	5622 - 4.2 GHz Proc Card, 0/ 2 Core POWER6, 12 DDR2 Memory Slots

From feature code	To feature code
7832 - 2-Way 1.9 GHz POWER5 CUoD Processor Card, 0-way active, 8 DDR1 Memory DIMM Slots	5622 - 4.2 GHz Proc Card, 0/ 2 Core POWER6, 12 DDR2 Memory Slots
7833 - 2-Way 1.9 GHz POWER5 CUoD Processor Card, 0-way active, 8 DDR2 Memory DIMM Slots	#5622 - 4.2 GHz Proc Card, 0/ 2 Core POWER6, 12 DDR2 Memory Slots
7834 - 2-Way 1.5 GHz POWER5 Processor Card, 0-way entitled, 8 DDR1 Memory DIMM Slots	#5622 - 4.2 GHz Proc Card, 0/ 2 Core POWER6, 12 DDR2 Memory Slots
8338 - 2-Way 2.2 GHz POWER5+ Processor Card, 0-way active, 8 DDR2 Memory Slots	5622 - 4.2 GHz Proc Card, 0/ 2 Core POWER6, 12 DDR2 Memory Slots
#7618 - One Processor Activation, for Processor Feature #8338	#5671- One Processor Activation for Processor Feature #5621
#7665 - One Processor Activation, for Processor Feature #7782	#5671- One Processor Activation for Processor Feature #5622
#7618 - One Processor Activation, for Processor Feature #8338	#5672- One Processor Activation for Processor Feature #5622
#7665 - One Processor Activation, for Processor Feature #7782	#5672- One Processor Activation for Processor Feature #5622
#7897 - One Processor Activation, for CUoD Processor Feature #7830	#5672- One Processor Activation for Processor Feature #5622
#7898 - One Processor Activation, for CUoD Processor Feature #7832	#5672- One Processor Activation for Processor Feature #5622
#7899 - One Processor Activation, for CUoD Processor Feature #7833	#5672- One Processor Activation for Processor Feature #5622
#7929 - One Processor Enablement for Processor Feature #7834	#5672- One Processor Activation for Processor Feature #5622

Table D-36   Feature conversions for 9117-570 to 9117-MMA rack related features

From feature code	To feature code
7300 - System Drawer Enclosure with Bezel	5626 - System CEC Enclosure with Bezel
7879 - System Drawer Enclosure	5626 - System CEC Enclosure with Bezel
7301- System Drawer Enclosure, with OEM Bezel	5627- OEM System CEC Enclosure with Bezel
7969 - System Drawer Enclosure, OEM	5627- OEM System CEC Enclosure with Bezel

From 9406-MMA to 9117-MMA

Table D-37   Feature Conversions for 9406-570 to 9117-MMA Administrative features

From feature code	To feature code
1641 - 1.65 GHz Proc HW Upgrade Feature	7380 - 4.7 GHz Proc Card, 0/2 COre POWER6, 12 DDR2 Memory Slots
1651 - 2.2 GHz Proc HW Upgrade Feature	7380 - 4.7 GHz Proc Card, 0/2 COre POWER6, 12 DDR2 Memory Slots

Table D-38   Feature Conversions for 9406-570 TO 9117-MMA CoD Features

From feature code	To feature code
7897 - 570 CUoD Processor Activation	5403 - One Processor Activation for Processor Feature #7380

Table D-39   Feature Conversions for 9406-570 TO 9117-MMA Memory features:

From feature code	To feature code
7663 - 570 1 GB Memory Activation	5680 - Activation of 1 GB DDR2 POWER6 Memory
7892 2 GB DDR1 Main Storage	7272 - 2 GB CUoD Memory Activation
4495 - 4/8 GB DDR2 Main Storage	7273 - 4 GB CUoD Memory Activation
7893 4 GB DDR1 Main Storage	7273 - 4 GB CUoD Memory Activation
4496 - 8/16 GB DDR2 Main Storage	7274 - 8 GB CUoD Memory Activation
7894 - 8 GB DDR2 Main Storage	7274 - 8 GB CUoD Memory Activation
4497 - 16 GB DDR2 Main Storage	7275 - 16 GB CUoD Memory Activation
4499 - 16 GB DDR2 Main Storage	7275 - 16 GB CUoD Memory Activation
4498 - 32 GB DDR1 Main Storage	7276 - 32 GB CUoD Memory Activation

Table D-40   Feature Conversions for 9406-570 TO 9117-MMA Processor features

From feature code	To feature code
#7260 - 570 Enterprise Enablement	#4990 - Single 5250 Enterprise Enablement (per processor)
#7577 - 570 Enterprise Enablement	#4990 - Single 5250 Enterprise Enablement (per processor)
#9286 - 570 Base Enterprise Enablement	#4990 - Single 5250 Enterprise Enablement (per processor)
#9299 - 570 Base Enterprise Enablement	#4990 - Single 5250 Enterprise Enablement (per processor)
#7258 - 570 Full Enterprise Enablement	#4991 - Full 5250 Enterprise Enablement (all processors)
#7597 - 570 Full Enterprise Enablement	#4991 - Full 5250 Enterprise Enablement (all processors)
#9298 - Full 5250 Enterprise Enablement	#4991 - Full 5250 Enterprise Enablement (all processors)
#7618 - 570 One Processor Activation	5403 - One Processor activation for Processor Feature #7380

E

IBM PowerVM

This appendix summarizes the primary functions of the IBM PowerVM editions and primary PowerVM functions that are supported on each POWER5 and POWER6 IBM servers.

IBM PowerVM is a brand name that covers IBM hardware and software capabilities that deliver industry-leading virtualization on IBM POWER processor-based servers running IBM AIX, IBM i, and Linux operating systems. PowerVM includes the following Power Systems virtualization capabilities:

► Logical partitioning
► Micro-partitioning
► POWER Hypervisor
► Virtual I/O Server
► Lx86
► Live Partition Mobility

Summary of PowerVM technologies

PowerVM is the family of technologies, capabilities, and offerings that deliver industry-leading virtualization on IBM POWER processor-based systems. It is the umbrella branding term for Power Systems Virtualization (Logical Partitioning, Micro-partitioning, Hypervisor, Virtual I/O Server, Advanced POWER Virtualization, and so forth). PowerVM provides virtualization solutions for IBM i, AIX, and Linux and OS clients.

PowerVM software is a follow-on to IBM Advanced POWER Virtualization. Its capabilities are packaged with an Express Edition, Standard Edition, and Enterprise Edition.

All three PowerVM editions allow Linux partitions to run Linux x86 binary applications unmodified without recompilation in addition to UNIX and Linux servers.

Key components and technologies available under the PowerVM editions include:

► IBM POWER Hypervisor

The POWER Hypervisor is a component of the POWER5 and POWER6 based system's firmware that is activated when the system is turned on. It is the base abstraction layer that enables all logical partitions to use the system physical hardware, including processor cores and memory and I/O hardware and, where appropriate, to share hardware resources.

The Hypervisor allows you to perform the following functions:

– Enforce partition integrity by providing a security layer between logical partitions

– Control the dispatch of virtual processors to physical processors

– Control the movement of processor capacity and memory capacity among partitions

– Save and restore all processor state information during logical processor context switch

– Control hardware I/O interrupts management facilities for logical partitions

– Provide the base virtualization for SCSI and Ethernet "devices" among partitions

► Dynamic logical partitioning and micro-partitioning

Multiple operating systems can run concurrently on the same physical hardware configuration. Processor capacity, memory, and I/O resources can be used exclusively by a partition or resources can be shared across partitions with proper planning and resource management techniques.

Using logical partitioning allows you to:

– Reduce costs

  • Supports AIX, IBM i, and Linux operating system partitions on one server
  • Micro-partitioning supports up to 10 partitions per processor capacity

– Increase flexibility

  • Partitions can have capped or uncapped processor resources. Uncapped means if the currently assigned processor capacity is being over 100% utilized and there is available processor capacity within the physical configuration, additional processor capacity can be "loaned to" and utilized by the partition needing the additional resources.

  • Processor resources can automatically move between partitions

  • Shared processor pools enables capping of a group of partitions

Dynamic LPAR is included with all PowerVM Editions:

- Supports AIX, i and Linux partitions
- Managed by Hardware Management Console or Integrated Virtualization Manager

► Shared Dedicated Capacity

POWER6-based servers offer the capability of harvesting unused processor cycles from dedicated-processor partitions. These unused cycles are then donated to the physical shared-processor pool associated with micro-partitioning. This ensures the opportunity for maximum processor utilization throughout the system.

► Virtual I/O server

A Virtual I/O server (commonly referred to VIOS) is a specialized AIX partition that virtualizes resources for client partitions.

With a Virtual I/O server, you can:

– Reduce costs by sharing physical SCSI and Ethernet resources between partitions

– Increase flexibility by creating partitions on the fly with no requirement for additional hardware

For storage virtualization, these backing devices can be used:

– Direct-attached disks from the Virtual I/O Server
– SAN disks attached to the Virtual I/O Server
– Logical volumes defined on either of the previous disks
– File-backed storage, with the files residing on either of the first two disks
– Optical storage devices

Virtual I/O server is included with all PowerVM Editions. VIOS can support AIX, IBM i 6.1, and Linux client partitions. It can run in either a dedicated processor partition or in a micro-partition depending on how much functionality is used and other factors like how many partitions will be using them.

► Virtual Ethernet

The virtual Ethernet function is provided by the POWER Hypervisor. The POWER Hypervisor implements the Ethernet transport mechanism as well as an Ethernet switch that supports VLAN capability. Virtual LAN allows secure communication between logical partitions without the need for a physical I/O adapter or cabling. The ability to securely share Ethernet bandwidth across multiple partitions increases hardware utilization.

► Virtual SCSI

The functionality for virtual SCSI is provided by the POWER Hypervisor. Virtual SCSI allows secure communications between partitions and a Virtual I/O Server that provides storage backing devices.

The combination of virtual SCSI and the Virtual I/O Server capabilities allows you to share storage adapter bandwidth and (optionally) to subdivide single large disks into smaller segments. The adapters and disks can then be shared across multiple partitions, increasing utilization.

The virtual disk I/O capability offered by the combination of Virtual SCSI and the Virtual I/O Server provides the opportunity to share physical disk I/O adapters in a flexible and reliable manner. A single physical disk I/O adapter and associated disk subsystem can be used by many logical partitions on the same server. This facilitates the consolidation of disk I/O resources and minimizes the number of disk I/O adapters required.

► PowerVM Live Partition Mobility

Live Partition Mobility, licensed through PowerVM Enterprise Edition, is a feature that relies on a number of different components, including:

– POWER Hypervisor
– Virtual I/O Server (or IVM)
– Hardware Management Console (or IVM)

PowerVM Live Partition Mobility allows you to move a running logical partition, including its operating system and running applications, from one POWER6 system to another without any shutdown or without disrupting the operation of that logical partition. Inactive partition mobility allows you to move a powered off logical partition from one system to another.

With Live Partition Mobility, you can:

– Move partitions from servers to allow planned maintenance of the server without disruption to the service and users.

– Move heavily used partitions to larger machines without interruption to the service or disruption to users.

– Move partitions to appropriate servers depending on workload demands and adjust the utilization of the server-estate to maintain an optimal level of service to users at the optimal cost.

– Consolidate underutilized partitions out-of-hours to enable unused servers to be shut down, thus saving power and cooling expenses.

Live Partition Mobility is included with the PowerVM Enterprise Edition. It supports AIX and Linux partitions with VIOS on Power servers. IBM i does not support Live Partition Mobility.

Refer to *PowerVM Virtualization on IBM System p: Introduction and Configuration Fourth Edition*, SG24-7940 to learn how to set up the Live Partition Mobility:

For complete information, refer to the IBM Systems Hardware Information Center and search for *Live Partition Mobility*:

http://publib.boulder.ibm.com/infocenter/systems/scope/hw/index.jsp

► Lx86 support

With Lx86 support you can run x86 Linux applications on Power Systems along with your IBM i, AIX, and Linux applications.

The PowerVM Lx86 feature is included at no additional charge in all three PowerVM editions. This allows running Linux x86 binary applications unmodified and without recompilation greatly expanding the workloads available to be consolidated onto Power System servers. PowerVM Lx86 (originally introduced as System p Application Virtual Environment or pAVE) allows the creation of an x86 application virtual environment so users can easily install and run a wide range of x86 Linux applications on a Power Systems server with a Linux operating system. The Linux x86 application binaries are automatically detected at runtime and run seamlessly without additional configuration, allowing thousands of x86 Linux binaries to run easily on Power Systems servers, helping clients consolidate, maximize on the RAS features of Power Systems, while minimizing power and cooling costs and improving performance.

► Integrated Virtualization Manager (IVM)

IVM is intended to provide significant virtualization configuration and management capabilities for small and mid-size companies who do not require the POWER5 and POWER6-based capabilities available only through a Hardware Management Console (HMC) device.

Key characteristics include:

– IVM is a browser-based tool for creating and managing partitions.

– Its interface supports many logical partition configuration and management capabilities for a single system. Partition configuration and management details are not as extensive as those available when using the HMC's browser-based interface.

IVM is included with all PowerVM Editions and runs in a Virtual I/O Server partition.

PowerVM editions

PowerVM editions are the orderable packaging of the virtualization capabilities available under the PowerVM brand name. As previously described, the PowerVM edition capabilities are the follow-on to virtualization capabilities under the previously available IBM Advanced Power Virtualization features.

▶ PowerVM Express Edition (new in 2008)

This edition is offered on the Power 520 and Power 550 servers. It is designed for users looking for an introduction to more advanced virtualization features at a highly affordable price. PowerVM Express Edition, supports up to two partitions on the server - on top of the VIOS, leverage virtualized disk and optical devices provided by VIOS and try out a single Shared Processor Pool support.

▶ PowerVM Standard Edition

This edition is offered on the whole Power Systems family, particularly for users ready to get the full value out of their server, IBM offers PowerVM Standard Edition providing the most complete virtualization functionality for UNIX and Linux in the industry and provides the virtualization functions System i and IBM i customers have come to expect. PowerVM Standard Edition includes IBM Micro-Partitioning and Virtual I/O Server (VIOS) capabilities, which are designed to allow businesses to increase system utilization; while helping to ensure applications continue to get the resources they need.

Client partition support is provided for all supported operating system release levels except IBM i 5.4. IBM i client support requires IBM i 6.1.

Micro-Partitioning technology helps lower costs by allowing the system to be finely tuned to consolidate multiple independent workloads. Micro-partitions can be defined as small as 1/10th of a processor and be changed in increments as small as 1/100th of a processor. Up to 10 micro-partitions can be created per core on a Power Systems server.

VIOS allows for the sharing of expensive disk, optical devices (in some cases), communications and Fibre Channel adapters to help drive down complexity and systems/administrative expenses.

▶ PowerVM Enterprise Edition

This edition is offered exclusively on POWER6 processor-based servers and includes all the features of PowerVM Standard Edition plus a new capability called Live Partition Mobility. Live Partition Mobility allows for the movement of a running partition from one POWER6 processor-based server to another with no application downtime resulting in better system utilization, improved application availability and energy savings. With Live Partition Mobility, planned application downtime due to regular server maintenance can be a thing of the past.

Live Partition Mobility is not supported by IBM i at this time.

Upgrading from one PowerVM edition to another is done using an electronic virtualization key by keying in the machine type and serial number of the server. You can get this information at the IBM Capacity on Demand Web site:

http://www-912.ibm.com/pod/pod

Table E-1 summarizes the primary capabilities under each orderable IBM PowerVM edition.

Table E-1   IBM PowerVM Editions: Primary capabilities summary

	Express Edition	**Standard Edition**	**Enterprise Edition**
Servers supported	Power 520/550	p5, Power, and JS12, JS22	Power, JS12, JS22
Max LPARs	2+ 1 VIOS/server	10/core	10/core
Management	IVM	IVM and HMC	IVM and HMC
VIOS	Yes	Yes	Yes
Live Partition Mobility	No	No	Yes
Shared Processor Pools	No	Yes (HMC)	Yes (HMC)
Shared Dedicated Capacity	Yes	Yes	Yes
Operating Systems	AIX, Linux	AIX, Linux, IBM i	AIX, Linux, IBM i
PowerVM Lx86	Yes	Yes	Yes

Table E-2 summarizes the PowerVM edition capabilities that are available on the supported IBM processor technology servers.

Table E-2   PowerVM functions across IBM POWER6 and POWER5 systems

	7998-60X	7998-61X	8203- EA4	9407-M15	9408-M25	8204-EA8	9409-M50	9117-MMA	9406-MMA	9125-F2A	9119-FHA	System p POWER5/5+	System i POWER 5/5+
Express Edition			Y			Y							
Standard Edition	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Enterprise Edition	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y		
Micro-Partitioning	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
VIOS	Y	Y	Y		Y	Y	Y	Y	Y	Y	Y	Y	Y
IVM	Y	Y	Y			Y						Y	
Lx86	Y	Y	Y	Y	Y	Y	Y	Y		Y	Y	Y	
Live Partition Mobility	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y		
Multiple Shared Processor Pools			Y	Y	Y	Y	Y	Y	Y	Y	Y		
HMC			Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Figure E-1 Summarizes PowerVM orderable feature codes across supported systems.

Figure E-1   PowerVM Edition feature codes

Figure E-2 is a an example window of the Capacity on Demand and PowerVM activation code Web site.
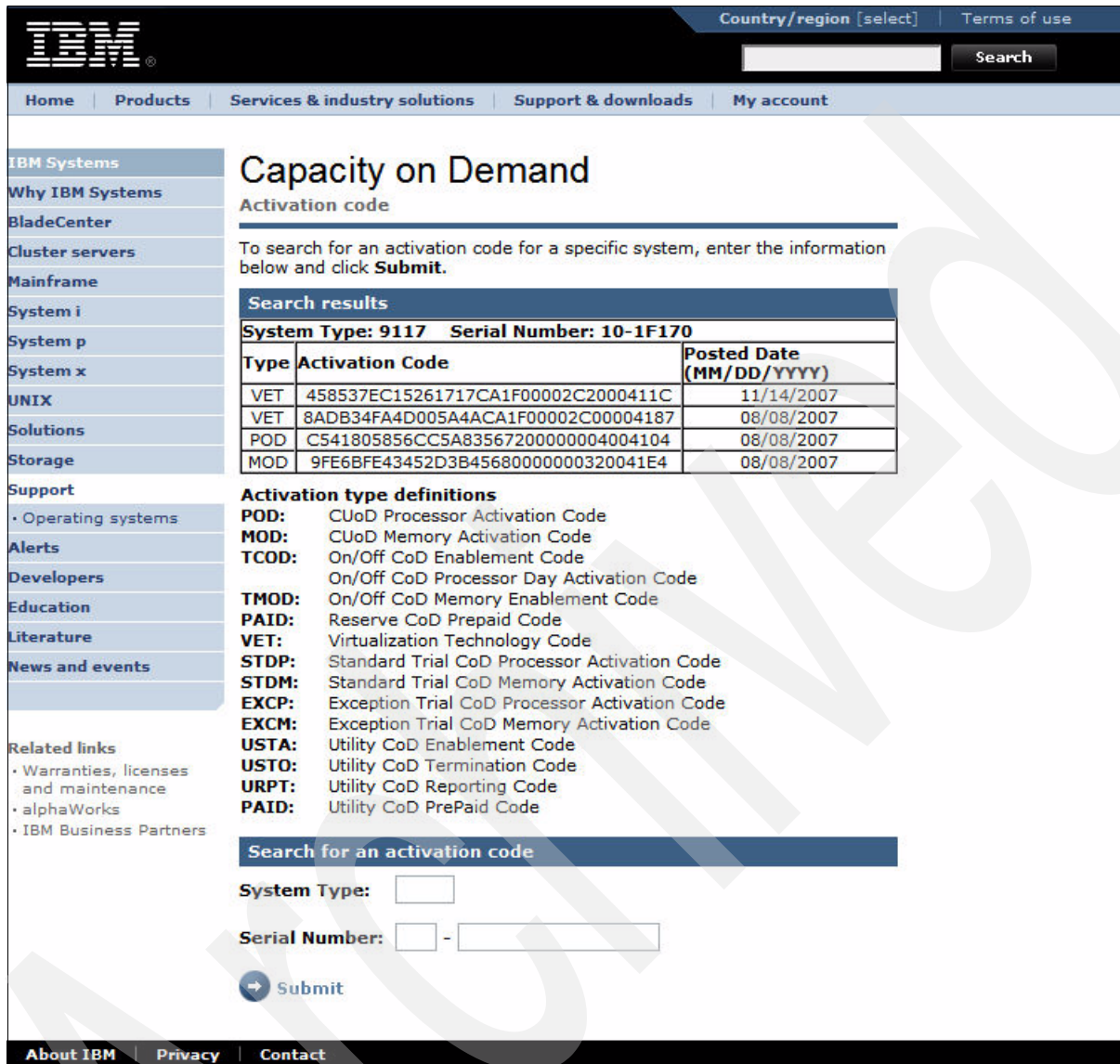
Figure E-2   Web site page where you can find the Capacity on Demand and PowerVM activation keys

Summary of PowerVM

PowerVM on Power Systems offers industry leading virtualization capabilities for AIX, IBM i, and Linux. With the Standard Edition, micro-partitioning allows businesses to increase the utilization of their servers, with partitions definitions being able to go down to 1/10th of a processor and the ability to allow partition size to flex with demand, which brings infrastructure deployment, management and utilization into a higher paradigm. In addition, there is the Virtual I/O Server, which allows the sharing of disk and network resources, maximizing storage capacity to optimize performance while minimizing management and maintenance costs.

With the introduction of PowerVM Enterprise edition, all of these features are joined by the ability to migrate running partitions and their applications from one server to another. Combining these PowerVM features, and possibly with the other availability tools of IBM - we can help today's businesses further transform their computing department into the agile, responsive and energy efficient organization demanded by today's enterprises.

Clearly, with the industry focus on infrastructure use improvement, to bring down costs and increase energy efficiency, PowerVM leads the way.

PowerVM: Additional resources

For additional PowerVM information consider the following sources:

► System Planning Tool

This tool is downloaded to your PC workstation. It is a browser-based tool for creating and managing partitions that can be ordered and later configured and deployed. It ca be used for configurations with and without an HMC console. SPT:

– Helps you design logical partitioned systems with hardware placement assistance

– Is integrated with the IBM Workload Estimator to plan a system based on existing performance data

– Integrated with IBM ordering system

– Plans generated can be deployed on the system by HMC or IVM

You can download the SPT from the following Web site:

http://www.ibm.com/systems/support/tools/systemplanningtool

► PowerVM Web site

You can find more PowerVM information at:

http://www-03.ibm.com/systems/power/software/virtualization/

F

IBM I/O adapters that require an IOP summary

In this appendix, we list the IBM System i adapters that require a controlling I/O processor (IOP).

Adapters that require an IOP summary

Table F-1 contains historically available System i I/O adapters (IOA) that require an IOP. In a POWER6 system environment, these IOAs can be supported only within a supported I/O enclosure attached to the system through a RIO-2 (HSL) loop. CCIN (as displayed by IBM i) values are shown. Where possible, corresponding IOAs that do not require an IOP are listed.

IBM i support for older technology devices might not work with newer IOP-less adapters. That is, IBM i support requires an adapter that supports a required IOP. For example, some tape devices are supported only through an adapter that is connected to a supporting IOP. This is also true for IBM i direct SNA support over a WAN adapter.

The latest technology for the 9117-MMA and 9119-FHA is the 3705. System i IOPs are the #2844. A slightly older IOP is #2843. These adapters support a long list of IOAs. Depending upon the IOA capacities a single IOP can support only one or two IOAs. For more complete information about System i IOP features see *IBM System i Overview: Models 515, 525, 550, 570, 595, and More*, REDP-5052.

The #2847 provides the specialized function required to attach IBM i operating system load source using a Fibre Channel adapter and boot from that load source. See *IBM i and IBM System Storage: A Guide to Implementing External Disks on IBM i*, SG24-7120 for more information.

Table F-1   IOP required IOAs summary table in POWER6 configurations

Adapter Class	Adapter feature order number (CCIN number) supported in RIO-2 I/O enclosure[a]	Recommended smart or IOP-less IOA (LIC 5.5.4 or later required)[b]
Fibre channel adapters for tape and disk	#2787 (2787), #5704 (5704), #5760 (280E), #5761 (280D)	#5749 (5749), #5774 (5774). IBM i 6.1 or later required.)
SCSI tape adapters	#2749 (2749), #5702 (5702), #5712 (5702), #5715 (5702), #5736 (571A), #5806(52B4)	No SCSI IOAs available. Upgrade to Fibre and use the following adapters: #5749 (5749), #5774 (5774). IBM i 6.1 or later required.)
Twinaxial adapters	#4746 (2746)	None Available
Disk controllers (old)	#2757 (2757), #2780 (2780), #5580 (5708) With aux write cache (5580b), #5581(5708) With aux write cache (5581b), #5590(574F) With aux write cache (5590b), #5591(574F) With aux write cache (5591b)	See next table row.
Disk controllers	► #5736# (571A)) ► #5737 (571B ► #5738 (571E) with aux write cache 5582 (574F) ► #5739 (571F) with embedded aux write cache (575B) ► #5781 (571F) with embedded aux write cache (575B)	► #5775 (571A ► #5776 (571B ► #5777 (571E) with aux write cache 5583 (574F) ► #5778 (571F) with embedded aux cache (575B) ► 5782 (571F) with embedded aux write cache (575B)

Adapter Class	Adapter feature order number (CCIN number) supported in RIO-2 I/O enclosure[a]	Recommended smart or IOP-less IOA (LIC 5.5.4 or later required)[b]
WAN/LAN/Ethernet ports usable by the i operating system with equivalent "no-IOP" feature order numbers	LAN adapters: ► token-ring #adapter: 2744 (2744). Ethernet LAN adapters: ► 4838/2838 (not supported on POWER6) ► Ethernet LAN #2849 (#2849) / #5701 (5701) WAN adapters: ► #2742 (2742) ► #2793 or #2794[c] (2793) ► #9793 or #9794[c](2793) ► #2805 or #2806[c]	LAN adapters: ► Any new Ethernet adapter ► Any new Ethernet adapter ► #6801 WAN adapters: ► #6805 ► #6833 or #6834[a] ► #9933 or #9934[a] ► #6808 or #6809[a]
PCI Integ xSeries Server	#4812 (4812), #4813 (4812)	► #5713(573B) with External xSeries or BladeCenter

a. In many cases a different feature number is used to distinguish whether an IOA is being ordered to run with or without an IOP. Once on the system, however, either ordered feature number will show the same CCIN value in IBM i hardware information displays, such as using the Work with Hardware Resources (WRKHDWRSC) command. You can use the displayed information to determine if the IOA is actually "connected to" a supporting IOP. See "Example showing IOA with and without an IOP" for an example.

b. IOP-less replacement adapters are recommended for most configurations. The following exceptions might apply to your configuration requirements:
   ► IBM i supports some older tape and optical devices only on an IOA attached to a supporting IOP.
   ► SNA support is provided on specific LAN or WAN adapters only when attached to a supporting IOP. This requires a loop-attached I/O enclosure as the POWER6 system unit does not support an IOP. Alternatively you can use IBM i provided SNA Enterprise Extenders support. If using Enterpise Extender support both the server and client must have Enterprise Extenders support active.

c. Indicates the CIM (Complex Impedance Matching - Australia/New Zealand) version of preceding non-CIM feature number.

Example showing IOA with and without an IOP

The following figures show IBM i Work with Hardware Resources (WRKHDWRSC TYPE(*cmn) command example output for the same capability communications adapter (IOA) - one showing #2742 ordered as requiring a supporting IOP (Figure F-1) and the second showing #6805 ordered as not requiring a supporting IOP (Figure F-2).

Both show the IOA as CCIN value #2742. Note the different CCIN values for the CMBnn entries. CMBnn with 2844 indicates the #2844 IOP is configured. The display showing the #2844 IOP indicates this IOP-IOA combination supports SNA/SDLC protocol over the attached communication lines (CMNnn) on the adapter (LINnn). This IOP-IOA card combination cannot be plugged into the POWER6 system

CMBnn showing #2742 indicates no IOP is attached. This could be ordered as feature number #6805 and the IOA only could be placed within the POWER6 system unit.

```
                   Work with Communication Resources
                                                       System:    RCHAS55
 Type options, press Enter.
   5=Work with configuration descriptions   7=Display resource detail


 Opt   Resource        Type  Status              Text
  __     CMBnn          2844  Operational         Combined function IOP
  __       LINnn        2742  Operational         Comm Adapter
  __         CMNnn      2742  Operational         Comm Port
  __         CMNnn      2742  Operational         V.24 Comm Port
```

Figure F-1   WRKHDWRSC for #2742 with IOP

```
                   Work with Communication Resources
                                                       System:    RCHAS55
 Type options, press Enter.
   5=Work with configuration descriptions   7=Display resource detail


 Opt   Resource        Type  Status              Text
  __     CMBnn          2742  Operational         Com Procesor
  __       LINnn        2742  Operational         Comm Adapter
  __         CMNnn      2742  Operational         Comm Port
  __         CMNnn      2742  Operational         V.24 Comm Port
```

Figure F-2   WRKHDWRSC for #6805 (2742 CCIN) without IOP

G

9407-M15, 9408-M25, 9409-M50, 9406-MMA direct attachment to AIX and Linux partition feature summary

This appendix summarizes the I/O adapters that can be specified as direct attach to an AIX or Linux partition when configured on a POWER6 520 systems 9407-M15 and 9408-M25, POWER6 550 system 9409-M50, and POWER6 570 9406-MMA where IBM i as the primary operating system. All I/O adapters supported and "owned" by a hosting IBM i 5.4 with LIC 5.4.5 or IBM i 6.1 host partition can share the adapter for virtual I/O to the AIX or Linux partitions and with IBM i 6.1 with a client IBM i 6.1 partition.

Specific I/O features that are supported by IBM i can also be directly (no IBM i hosting partition) attached to an AIX or Linux partition.

Direct attach feature numbers

The direct attach of I/O adapters to an AIX or Linux partition on an IBM System i models has been available, starting with POWER5 systems. Table G-1summarizes the I/O adapters that can be configured to be directly supported by an AIX or Linux partition on the M15, M25, and M50. Adapters requiring a supporting IOP are not supported in the system unit.

Table G-1   Direct Attach features and associated I/O adapter

Direct attach feature	I/O adapter feature
0603	Direct Attach-2744
0613	Direct Attach-2742
0614	Direct Attach-2793
0616	Direct Attach-2805
0620	Direct Attach-5700
0621	Direct Attach-5701
0624	Direct Attach-5702
0625	Direct Attach-5704
0626	Direct Attach-2787
0628	Direct Attach-5703
0645	Direct Attach-5712
0646	Direct Attach-5716
0649	Direct Attach-5583
0650	Direct Attach-5778
0651	Direct Attach-5782

H

Processor feature numbers, system performance and IBM i QPRCFEAT system value

This appendix contains a summary table of POWER6 processor feature numbers, system performance ratings (AIX rPerf and IBM i CPW) and associated IBM i and AIX software pricing tier, and corresponding values within IBM i for system values QMODEL and QPRCFEAT. System values QMODEL and QPRCFEAT are used some by IBM i Independent Software Vendors (ISVs) as part of their product license key algorithm.

Power 520, 550, 560, 570, and 595 MTMs are included.

> **Note:** In October and November of 2008:
>
> ► IBM formally announced the POWER6 560 (8234-EMA) and a 32-Way configuration POWER6 570 (9117-MMA). These announcements came to late for complete coverage in this publication. However, their processor feature numbers and supported n-Way configurations are included in this appendix.
>
> ► IBM informally announced in certain geographies, for example, India, availability of "IBM Smart Business" way of packaging and delivering a ready to run pre-packaged application and hardware configuration. IBM offers access to a Web-based community and marketplace to acquire new business applications, and web-delivered collaborative services immediately ready to support a business, such as access to remote (cloud-based) application services like managed security and hosted back-up and recovery. One of the application packaged solution hardware configurations is an 8204-E4A. Those configurations include the 1-Way, 2-Way, and 4-Way 8203-E4A table entries listed in this appendix.
>
> For more information on Smart Business see the Web sites listed under "Related publications" on page 991.

rPerf and CPW performance rating summary

Relative Performance (rPerf) is an estimate of commercial processing performance that is relative to other IBM UNIX systems. It is derived from an IBM analytical model that uses characteristics from IBM internal workloads, TPC and SPEC benchmarks. The rPerf model is not intended to represent any specific public benchmark results and should not be reasonably used in that way. The model simulates some of the system operations such as CPU, cache and memory. However, the model does not simulate disk or network I/O operations.

rPerf estimates are calculated based on systems with the latest levels of AIX and other pertinent software at the time of system announcement. Actual performance will vary based on application and configuration details. Although rPerf can be used to compare estimated IBM UNIX commercial processing performance, actual system performance can vary and is dependent upon many factors including system hardware configuration and software design and configuration. Note that the rPerf methodology used for the POWER6 processor-based systems is identical to that used for the POWER5 processor-based systems.

The CPW rating of a system is generated using measurements of a specific workload that is maintained internally within the Power Systems Performance group. CPW is designed to evaluate a computer system and associated software in the commercial environment. It is rigidly defined for function, performance metrics, and price/performance metrics. It is not representative of any specific environment but it is generally applicable to the commercial computing environment.

Use the table in this appendix as a reference when examining an installed system. Remember that CPW - Commercial Processing Workload and rPerf are IBM i and AIX processor performance rating used for comparing various processor technology configurations running the IBM i and AIX operating systems.

AIX rPerf can be compared to AIX rPerf and IBM i CPW can be compared to IBM i CPW on different processor technologies or different processor speed IBM Power Systems models.

Your unique application workloads should be used for any performance sizing when you have performance data collected from real environments with the use of a sizing tool. Always use a sizing or capacity planning tool that can take into account application implementation style, unique CPU, memory, and disk I/O resource utilization.

The recommended IBM sizing tool is the IBM System Workload Estimator, which can be accessed at:

http://www-912.ibm.com/estimator

All performance estimates are provided *as is* and no warranties or guarantees are expressed or implied by IBM. Buyers should consult other sources of information, including system benchmarks and application sizing tools to evaluate the performance of a system they are considering buying.

There are other, non-IBM capacity planning or sizing tools available. The following vendors provide commonly used products in this area:

► Midrange Performance Group Inc. (MPG) at:

http://www.mpginc.com

Sizing or capacity planning products include:

– Performance Navigator for eServer System i

– Power Navigator for AIX and Linux workloads on System p and System i LPARS

► BMC Software Corporation at:

http://www.bmc.com

Sizing or capacity planning products include:

– BMC PATROL for iSeries - Predict

IBM provides for IBM i and AIX a product and service offering called IBM Performance Management (PM) for the IBM i5 and IBM p5 family of processors. These are two service offerings delivered remotely via the Web. According to customer defined scheduled times they collect performance data, summarize it, and forward the summaries to IBM for resource utilization analysis and trending information. Depending upon the service level option chosen, different levels of performance reports and graphics are available

With this offering the possible need for increase hardware resources can be determined before a performance problem actually occurs. By a properly authorized IBM representative or business partner, performance data from PM can be input to the IBM Workload Estimator.

The prices, terms and conditions, and contact information for PM for System i and PM for System p vary by country (or region):

► For PM for System i pricing and contact information for your geography, go to:

http://www..ibm.com/systems/i/pmsystemi5/contact.html

► For PM for System p pricing and contact information for your geography, go to:

http://www.ibm.com/systems/p/pm/contact.html

POWER6 processor feature and performance summary table

Table H-1   POWER6 processor feature and performance summary table

Power Systems MTM	Processor feature	Processor core speed	L2/L3 cache per 2 core module	Processor range / Maximum GB memory	Performance ratings: AIX rPerf [9] / IBM i CPW [10] / IBM i MCU [11] / NA= Not Available	AIX processor group / IBM i SW pricing tier	IBM i QMODEL value	IBM i QPRCFEAT value
Power 520 8203-E4A[1]	5633, 9680	4.2 GHz	2x4MB / 0MB	1 / 16GB^{D4}	8.39 / 4300 / NA	D5 / P05	E4A	5633, 9680 (Smart Business)
	5634	4.2 GHz	2x4MB / 0MB	2 / 32GB^{D4}	15.95 / 8300 / NA	D5 / P10	E4A	5633, 9680 (Smart Business)
	5635	4.2 GHz	4-core. 2x4MB / 0MB	4 / 64GB^{D4}	31.48 / 15600 / NA	D5 / P10	E4A	5635
Power 520 9407-M15[1]	5633	4.2 GHz	2x4MB / 0MB	1 / 16GB^{D4}	NA / 4300/ NA	NA / P05	M15	5633, 9680 (Smart Business)
Power 520 9408-M25[1]	5634	4.2 GHz	2x4MB / 0MB	1-2 / 32GB^{D4}	NA / 4300-8300 / NA	NA / P10	M25	5634

Power Systems MTM	Processor feature	Processor core speed	L2/L3 cache per 2 core module	Processor range / Maximum GB memory	Performance ratings: AIX rPerf [9] / IBM i CPW [10] / IBM i MCU [11] / NA= Not Available	AIX processor group / IBM i SW pricing tier	IBM i QMODEL value	IBM i QPRCFEAT value
Power 550 8204-E8A[1]	4965	3.5 GHz	2x4MB / 32MB	2-2 / 32GB [D8]	15.85 / 7750 / NA	E5 / P20	E8A	4965
	4965	3.5 GHz	2x4MB / 32MB	4-4 / 64GB [D8]	31.27 / 15000 / NA	E5 / P20	E8A	4965
	4965	3.5 GHz	2x4MB / 32MB	6-6 / 96 GB [D8]	45.04 /20300 / NA	E5 / P20	E8A	4965
	4965	3.5 GHz	2x4MB / 32MB	8-8 / 128 GB [D8]	58.80 / 27600 / NA	E5 / P20	E8A	4965
	4966	4.2 GHz	2x4MB / 32MB	2-2 / 64 GB [D8]	18.38 / 9200 / NA	E5 / P20	E8A	4966
	4966	4.2 GHz	2x4MB / 32MB	4-4 / 128 GB [D8]	36.28 / 18000/ NA	E5 / P20	E8A	4966
	4966	4.2 GHz	2x4MB / 32MB	6-6 / 192 GB [D8]	52.24 / 23850 / NA	E5 / P20	E8A	4966
	4966	4.2 GHz	2x4MB / 32MB	8-8 / 256GB [D8]	68.20 / 32650 / NA	E5 / P20	E8A	4966
Power 550 9409-M50[1]	4966	4.2 GHz	2x4MB / 32MB	1-4 / 128 GB [D8]	2 cores: 18.38 / 9200 (1=4800) / NA	E5 / P20	M50	4966, 4998/4999[15]
					4 cores: 36.28 / 18000 / NA	E5 / P20	M50	4966, 4998/4999[15]
Power 560 8234-EMA[1,13]	7537	3.6 GHz	2x4MB / 32MB Two dual-core modules on one processor card feature (#7537)	4 (one feature, single enclosure (node)) / 96 GB[D12]	31.3 / 14100 / NA	E5 / P20	EMA	7537
	7537	3.6 GHz	2x4MB / 32MB Two dual-core modules on one processor card feature (#7537)	8 (two features, single enclosure (node)) / 192 GB[D12]	57.3 / 27600 /NA	E5 / P20	EMA	7537
	7537	3.6 GHz	2x4MB / 32MB Two dual-core modules on one processor card feature (#7537)	16 (four features) dual enclosure (node)) / 384 GB[D12]	100.3 / 48500/NA	E5 / P20	EMA	7537
Power 570 9406-MMA[1] Base	7380	4.7 GHz	2x4MB / 32MB	1-4 / 192 GB [D12]	4 cores: 40.26 / 5500-21200 / 12300-47500	NA / P30	MMA	5460, 7054[6]
	7380	4.7GHz	2x4MB / 32MB	2-8 / 384GB [D12]	8 cores: 74.89 /10800-40100 / 24200-89700	NA / P30	MMA	5461, 7051[6]
	7380	4.7 GHz	2x4MB / 32MB	2- or 3-12 (MES) / 576 GB [D12]	12 cores: 96.68 / 10800- or 15000-58,000 / NA	NA / P30	MMA	5470, 7018[6]
	7380	4.7 GHz	2x4MB / 32MB	4-16 / 768 GB [D12]	16 cores: 134.35 / 20100-76900 45000-173000	NA / P30	MMA	5462, 7056[6]

Power Systems MTM	Processor feature	Processor core speed	L2/L3 cache per 2 core module	Processor range / Maximum GB memory	Performance ratings: AIX rPerf [9] / IBM i CPW [10] / IBM i MCU [11] / NA= Not Available	AIX processor group / IBM i SW pricing tier	IBM i QMODEL value	IBM i QPRCFEAT value
Power 570 9406-MMA[1] CBU	7380	4.7 GHz	2x4MB / 32MB	1-4 / 192 GB D12	NA / 5500-21200 / 12300-47500	NA / P30	MMA	7053,7054[7]
	7380	4.7 GHz	2x4MB / 32MB	2-8 / 384GB D12	NA / 5500-40100 / 12300-89700	NA / P30	MMA	7058, 7059[7]
	7380	4.7 GHz	2x4MB / 32MB	2-12 (MES) / 576 GB D12	NA /10800- or 15000- 58,000 / NA	NA / P30	MMA	7047,7019[7]
	7380	4.7 GHz	2x4MB / 32MB	2-16 / 768 GB D12	NA / 10800-76900 / 24200-172000	NA / P30	MMA	7063, 7064[7]
Power 570 9117-MMA[1]	5620	3.5 GHz	2x4MB / 32MB	1-2 / 96 GB D12	2 cores: 15.85 / 8150 / NA	F5 / P30	MMA	5620
	5620	3.5 GHz	2x4MB / 32MB	1-4 / 192 GB D12	4 cores: 31.69 / 16100 / NA	F5 / P30	MMA	5620
	5620	3.5 GHz	2x4MB / 32MB	1-6 / 7288 GB D12	6 cores: 45.32 / NA / NA	F5 / P30	MMA	5620
	5620	3.5 GHz	2x4MB / 32MB	1-8 / 384GB D12	8 cores: 58.95 / 30100 / NA	F5 / P30	MMA	5620
	5620	3.5 GHz	2x4MB / 32MB	1-10 / 480GB D12	10 cores: 71.15 / NA / NA	F5 / P30	MMA	5620
	5620	3.5 GHz	2x4MB / 32MB	1-12 / 576GB D12	12 cores: 83.35 / NA / NA	F5 / P30	MMA	5620
	5620	3.5 GHz	2x4MB / 32MB	1-14 / 672GB D12	14 cores: 94.55 / NA / NA	F5 / P30	MMA	5620
	5620	3.5 GHz	2x4MB / 32MB	1-16 / 768GB D12	16 cores: 105.75 / 57600 / NA	F5 / P30	MMA	5620
	5622	4.2 GHz	2x4MB / 32MB	1-2 / 96 GB D12	2 cores: 18.38 / 9650 / NA	F5 / P30	MMA	5622, 5621[2]
	5622	4.2 GHz	2x4MB / 32MB	1-4 / 192 GB D12	4 cores: 36.76 / 19200 / NA	F5 / P30	MMA	5622, 5621[2]
	5622	4.2 GHz	2x4MB / 32MB	1-6 / 7288 GB D12	6 cores: 52.57 / NA / NA	F5 / P30	MMA	5622, 5621
	5622	4.2 GHz	2x4MB / 32MB	1-8 / 384GB D12	8 cores: 68.38 / 35500 / NA	F5 / P30	MMA	5622, 5621[2]
	5622	4.2 GHz	2x4MB / 32MB	1-10 / 480GB D12	10 cores: 82.53 / NA / NA	F5 / P30	MMA	5622, 5621

Power Systems MTM	Processor feature	Processor core speed	L2/L3 cache per 2 core module	Processor range / Maximum GB memory	Performance ratings: AIX rPerf [9] / IBM i CPW [10] / IBM i MCU [11] / NA= Not Available	AIX processor group / IBM i SW pricing tier	IBM i QMODEL value	IBM i QPRCFEAT value
	5622	4.2 GHz	2x4MB / 32MB	1-12 / 576GB D12	12 cores: 96.68 / NA / NA	F5 / P30	MMA	5622, 5621
	5622	4.2 GHz	2x4MB / 32MB	1-14 / 672GB D12	14 cores: 109.67 / NA	F5 / P30	MMA	5622, 5621
	5622	4.2 GHz	2x4MB / 32MB	1-16 / 768GB D12	16 cores: 122.67 / 68600 / NA	F5 / P30	MMA	5622, 5621[2]
	7540	4.2 GHz	2x4MB / 32MB Two dual-core modules on one processor card feature (#7540)	1-4 / 96GB D12	4 cores: 35.50/ 16200 / NA	F5 / P30	MMA	7540
	7540	4.2 GHz	2x4MB / 32MB Two dual-core modules on one processor card feature (#7540)	1-8 / 192GB D12	8 cores: 64.96 / 31900 / NA	F5 / P30	MMA	7540
	7540	4.2 GHz	2x4MB / 32MB Two dual-core modules on one processor card feature (#7540)	1-16 / 384GB D12	16 cores: 113.68/ 56400 / NA	F5 / P30	MMA	7540
	7540	4.2 GHz	2x4MB / 32MB Two dual-core modules on one processor card feature (#7540)	1-24 / 576GB D12	24 cores: 153.46 / 81600 / NA	F5 / P30	MMA	7540
	7540	4.2 GHz	2x4MB / 32MB Two dual-core modules on one processor card feature (#7540)	1-32 / 768GB D12	32 cores: 193.25 / 104800 / NA	F5 / P30	MMA	7540
	7387	4.4 GHz	2x4MB / 32MB	1-2 / 96GB D12	2 cores: 19.08 / 9850 / NA	F5 / P30	MMA	7387
	7387	4.4GHz	2x4MB / 32MB	1-4 / 192GB D12	4 cores: 38.16 / 19400 / NA	F5 / P30	MMA	7387
	7387	4.4 GHz	2x4MB / 32MB	1-8 / 384GB D12	8 cores: 70.97 / 36200 / NA	F5 / P30	MMA	7387
	57387	4.4 GHz	2x4MB / 32MB	1-12 / 576GB D12	12 cores: 100.35 / 51500 / NA	F5 / P30	MMA	7387
	7387	4.4 GHz	2x4MB / 32MB	1-16 / 768GB D12	16 cores: 127.32 / 70000 / NA	F5 / P30	MMA	7387
	7380	4.7 GHz	2x4MB / 32MB	1-2 / 96GB D12	2 cores: 20.13 / 10800 / NA	F5 / P30	MMA	7380
	7380	4.7 GHz	2x4MB / 32MB	1-4 / 192GB D12	4 cores: 40.26 / 21200 / NA	F5 / P30	MMA	7380
	7380	4.7 GHz	2x4MB / 32MB	1-6 / 288GB D12	6 cores: 57.58 / NA / NA	F5 / P30	MMA	7380

Power Systems MTM	Processor feature	Processor core speed	L2/L3 cache per 2 core module	Processor range / Maximum GB memory	Performance ratings: AIX rPerf [9] / IBM i CPW [10] / IBM i MCU [11] / NA= Not Available	AIX processor group / IBM i SW pricing tier	IBM i QMODEL value	IBM i QPRCFEAT value
	7380	4.7 GHz	2x4MB / 32MB	1-8 / 384GB[D12]	8 cores: 74.89 / 40100 / NA	F5 / P30	MMA	7380
	7380	4.7 GHz	2x4MB / 32MB	1-10 / 480GB[D12]	10 cores: 90.39 / NA / NA	F5 / P30	MMA	7380
	7380	4.7 GHz	2x4MB / 32MB	1-12 / 576GB[D12]	12 cores: 105.89 / NA / NA	F5 / P30	MMA	7380
	7380	4.7 GHz	2x4MB / 32MB	1-14 / 672GB[D12]	14 cores: 120.12 / NA / NA	F5 / P30	MMA	7380
	7380	4.7 GHz	2x4MB / 32MB	1-16 / 768GB[D12]	16 cores: 134.55 / 76900 / NA	F5 / P30	MMA	7380
	7388	5.0 GHz	2x4MB / 32MB	1-2 / 96GB[D12]	2 cores: 21.16 / 11000 / NA	F5 / P30	MMA	7388
	7388	5.0 GHz	2x4MB / 32MB	1-4 / 192GB[D12]	4 cores: 42.32 / 21600 / NA	F5 / P30	MMA	7388
	7388	5.0 GHz	2x4MB / 32MB	1-8 / 384GB[D12]	8 cores: 78.71 / 40300 / NA	F5 / P30	MMA	7388
	7388	5.0 GHz	2x4MB / 32MB	1-12 / 576GB[D12]	12 cores: 111.30 / 56800 / NA	F5 / P30	MMA	7388
	7388	5.0 GHz	2x4MB / 32MB	1-16 / 768GB[D12]	16 cores: 11.21 / 77600 / NA	F5 / P30	MMA	7388
Power 595 9119-FHA[1]	4694	4.2 GHz	2x4MB / 32MB	3-8 / 256 GB per book[D32]	8 cores: 75.58 / 35500 / NA	H5 / P50	FHA	4694
	4694	4.2 GHz	2x4MB / 32MB	6-10 / 512GB [D32]	10 cores: 92.41 / NA / NA	H5 / P50	FHA	4694
	4694	4.2 GHz	2x4MB / 32MB	6-12 / 512GB [D32]	12 cores: 109.24 / NA / NA	H5 / P50	FHA	4694
	4694	4.2 GHz	2x4MB / 32MB	6-14 / 512GB [D32]	14 cores: 126.07 / NA / NA	H5 / P50	FHA	4694
	4694	4.2 GHz	2x4MB / 32MB	6-16 / 512GB [D32]	16 cores: 142.90 / 66400 / NA	H5 / P50	FHA	4694
	4694	4.2 GHz	2x4MB / 32MB	9-18 / 768 GB [D32]	18 cores: 158.35 / NA / NA	H5 / P50	FHA	4694
	4694	4.2 GHz	2x4MB / 32MB	9-20 / 768GB [D32]	20 cores: 173.80 / NA / NA	H5 / P50	FHA	4694
	4694	4.2 GHz	2x4MB / 32MB	9-22 / 768GB [D32]	22 cores: 189.25 / NA / NA	H5 / P50	FHA	4694
	4694	4.2 GHz	2x4MB / 32MB	9-24 / 768 GB [D32]	24 cores: 204.70 / 93800 / NA	H5 / P50	FHA	4694
	4694	4.2 GHz	2x4MB / 32MB	12-26 / 1024GB [D32]	26 cores: 220.15 / NA / NA	H5 / P50	FHA	4694
	4694	4.2 GHz	2x4MB / 32MB	12-28 / 1024GB [D32]	28 cores: 235.60 / NA / NA	H5 / P50	FHA	4694

Power Systems MTM	Processor feature	Processor core speed	L2/L3 cache per 2 core module	Processor range / Maximum GB memory	Performance ratings: AIX rPerf [9] / IBM i CPW [10] / IBM i MCU [11] / NA= Not Available	AIX processor group / IBM i SW pricing tier	IBM i QMODEL value	IBM i QPRCFEAT value
	4694	4.2 GHz	2x4MB / 32MB	12-30 / 1024GB D32	30 cores: 251.06 / NA / NA	H5 / P50	FHA	4694
	4694	4.2 GHz	2x4MB / 32MB	12-32 / 1024GB D32	32 cores: 266.51 / 128000 / NA	H5 / P50	FHA	4694
	4694	4.2 GHz	2x4MB / 32MB	15-36 / 1280GB D32	36 cores: 293.28 / NA / NA	H5 / P50	FHA	4694
	4694	4.2 GHz	2x4MB / 32MB	15-40 / 1280GB D23	40 cores: 320.05 / NA / NA	H5 / P50	FHA	4694
	4694	4.2 GHz	2x4MB / 32MB	15-44 / 1536GB D32	44 cores: 346.83 / NA / NA	H5 / P50	FHA	4694
	4694	4.2 GHz	2x4MB / 32MB	18-48 / 1536GB D32	48 cores: 373.60 / NA / NA	H5 / P50	FHA	4694
	4694	4.2 GHz	2x4MB / 32MB	21-52 / 1792GB D32	52 cores: 400.17 / NA / NA	H5 / P50	FHA	4694
	4694	4.2 GHz	2x4MB / 32MB	21-56 / 1792GB D32	56 cores: 413.46/ NA / NA	H5 / P50	FHA	4694
	4694	4.2 GHz	2x4MB / 32MB	24-60 / 20486GB D32	60 cores: 453.32 / NA / NA	H5 / P50	FHA	4694
	4694	4.2 GHz	2x4MB / 32MB	24-64 / 2048GB D32	64 cores: 479.89 / 256200 / NA	H5 / P50	FHA	4694
Power 595 9119-FHA CBU	7569	4.2 GHz	2x4MB / 32MB	4-32 / 1024GB	32 cores: 266.51 / 128000 / NA	H5 / P50	FHA	4694
Power 595 9119-FHA CBU	7569	4.2 GHz	2x4MB / 32MB	4-64 / 2048GB	64 cores: 479.89 / 256200 / NA	H5 / P50	FHA	4694
Power 595 9119-FHA	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	3-8 / 512GB per book D32	8 cores: 87.10 / 41000 / NA	H5 / P50	FHA	4695
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	6-10 / 1024GB D32	10 cores: 106.49 / NA/ NA	H5 / P50	FHA	4695
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	6-12 / 1024GB D32	12 cores: 125.88 / NA / NA	H5 / P50	FHA	4695
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	6-14 / 1024GB D32	14 cores: 145.28 / NA / NA	H5 / P50	FHA	4695

Power Systems MTM	Processor feature	Processor core speed	L2/L3 cache per 2 core module	Processor range / Maximum GB memory	Performance ratings: AIX rPerf [9] / IBM i CPW [10] / IBM i MCU [11] / NA= Not Available	AIX processor group / IBM i SW pricing tier	IBM i QMODEL value	IBM i QPRCFEAT value
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	6-16 / 1024GB D32	16 cores: 164.67 / 77000 / NA	H5 / P50	FHA	4695
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	9-18 / 1536 GB D32	18 cores: 182.48 / NA / NA	H5 / P50	FHA	4695
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	9-20 / 1536GB D32	20 cores: 200.28 / NA / NA	H5 / P50	FHA	4695
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	9-22 / 1536 GB D32	22 cores: 218.09 / NA / NA	H5 / P50	FHA	4695
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	9-24 / 1536 GB D32	24 cores: 235.90 / 108100 / NA	H5 / P50	FHA	4695,
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	12-26 / 2048GB D32	26 cores: 253.70 / NA / NA	H5 / P50	FHA	4695
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	12-28 / 2048GB D32	28 cores: 271.51 / NA / NA	H5 / P50	FHA	4695
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	12-30 / 2048GB D32	30 cores: 289.31 / NA / NA	H5 / P50	FHA	4695
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	12-32 / 2048GB D32	32 cores: 307.12 / 147900 / NA	H5 / P50	FHA	4695
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	15-36 / 2560GB D32	36 cores: 337.97 / NA / NA	H5 / P50	FHA	4695
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	15-40 / 2560GB D23	40 cores: 368.82 / NA / NA	H5 / P50	FHA	4695,
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	15-44 / 3072GB D32	44 cores: 399.68 / NA / NA	H5 / P50	FHA	4695
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	18-48 / 3072GB D32	48 cores: 430.53 / NA / NA	H5 / P50	FHA	4695
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	21-52 / 3584GB D32	52 cores: 461.15 / NA / NA	H5 / P50	FHA	4695
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	21-56 / 3584GB D32	56 cores: 491.77 / NA / NA	H5 / P50	FHA	4695
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	24-60 / 4086GB D32	60 cores: 522.39 / NA / NA	H5 / P50	FHA	4695
	4695,4705 [14]	5.0 GHz	2x4MB / 32MB	24-64 / 4086GB D32	64 cores: 553.01 / 294700 / NA	H5 / P50	FHA	4695

Power Systems MTM	Processor feature	Processor core speed	L2/L3 cache per 2 core module	Processor range / Maximum GB memory	Performance ratings: AIX rPerf [9] / IBM i CPW [10] / IBM i MCU [11] / NA= Not Available	AIX processor group / IBM i SW pricing tier	IBM i QMODEL value	IBM i QPRCFEAT value
Power 595 9119-FHA CBU	7571 (4695)[14], 7556 (4705)[14]	5.0 GHz	2x4MB / 32MB	4-32 / 2048GB D32	32 cores: 307.12 / 147900 / NA	H5 / P50	FHA	4695
Power 595 9119-FHA CBU	7571 (4695[14]), 7556 (4705)[14]	5.0 GHz	2x4MB / 32MB	4-64 / 4086GB D32	64 cores: 553.01 / 294700 / NA	H5 / P50	FHA	4695

Power Systems MTM	Processor feature	Processor core speed	L2/L3 cache per 2 core module	Processor range	Performance ratings: AIX rPerf [9] IBM i CPW [10] IBM i MCU [11]	AIX processor group / IBM i SW pricing tier	IBM i QMODEL value	IBM i QPRCFEAT value
BladeCenter JS12 7998-60X	8442	3.8 GHz	2x4MB / 0 MB	2 cores: 1.8 of 2[3]	14.71 / 7100[3] / NA	C5 / P05	60X	52BF
BladeCenter JS22 7998-61X	8400	4.0 GHz	4x2x4MB / 32 MB[8]	4 cores: 3 of 4[4,a] 3.7 of 4[5,a]	30.26 / 11040[4,a] 13800[5,a] / NA	C5 / P10	61X	52BE

1. These models have a dedicated L2 cache per processor core, and share the L3 cache, where supported, between two processor cores.
2. Used only for POWER5 9117 upgrades to POWER6 9117. In this upgrade you can reuse POWER5+ memory DIMMs. You can also mix #5621 & 5622 processor cards as they are same GHz speed.
3. CPW is based upon active 1.8 processor IBM i partition with .2 processor VIOS partition
4. CPW value is for a 3-core dedicated partition and a 1-core VIOS
5. CPW value is for a 3.7-core partition with shared processors and a 0.3-core VIOS partition
6. Base with 5250 Enterprise Enablement
7. Capacity Backup (CBU) with 5250 Enterprise Enablement
8. One to eight POWER6 processor books. Each processor book contains eight processor cores that are packaged on four multi-chip modules (MCMs). Each MCM contains one dual-core POWER6 processor supported by 4 MB of on-chip L2 cache (per core = 2X) and 32 MB of shared L3 cache. Each processor book must have at least 3 activations for the Power595.
9. AIX rPerf ratings for the 9406 models pertain to the maximum number of processors per drawer. (ex. 9406 = 4 processors maximum per drawer = 4 processor AIX rPerf rating.)
10. For CPW ratings in between the published ratings, the following method can be used to estimate the unpublished CPW rating for the number of processor cores you are configuring. This method is similar to what is used by the IBM Systems Workload Estimator Tool (WLE), which should always be used to size your system.
► Identify the number of processor cores you want to estimate the CPW for. Call this number of processors cores eProc. Call the estimated CPW rating you want to derive eCPW.
► Find the highest published CPW rating for the number of processor cores, closest to, but less than the number of processor cores want to estimate the CPW for. Call this number of processors cores lpProc.
► Call this lpCPW. "p" indicates "published."
► Find the published CPW rating for the number of processor cores closest to, but higher than the number of processor cores you want to estimate (eProc) the CPW for (eCPW). Call this number of published processors cores hpProc and published CPW hpCPW.
► Subtract lpCPW from hpCPW. Call this epCPW.
► Subtract lpProc from hpProc. Call this epPROC.
► Divide epCPW by epPROC to get a per processor core estimated CPW rating to be used to add to lpCPW for each processor to reach your desired eProc (number of processors) you want to estimate the CPW for. Call the estimated per processor CPW ePROCCPW. You can multiply this per processor CPW value by the number of processors you have to add to the lpProc value to achieve your desired "eProc" (number of processors you want the CPW for) to arrive at the eCPW value you seek.
   For example, you have want an eCPW value for an ePRoc value for 12 processor cores for a 9117-MMA 4.2 GHz (processor feature #5622). The published values we start with are:
► lpPROC = 8
► lpCPW = 35500
► hpPROC = 16
► hpCPW = 68600
   Then:
► hpCPW - lpCPW: 68600 - 35500 = 33100 (epCPW)
► hpProc - lpProc: 16 - 8 = 8 (eProc)
► epCPW / eProc = 33100 / 8 = 4137.5 -> 4138 (ePROCCPW)
► For a 12-Way eCPW value: 35500 + (4 x 4138) = 35500 + 16552 = 50522 (eCPW)

   Important note. POWER5 and POWER6 systems support micro-partitioning. Using the above example, to estimating the rPerf and CPW capacity for a partition that has less than one full processor unit capacity assigned (for example, .5 processor unit) needs additional considerations. Given the definitions of the rPerf and CPW workloads, your own work within such a partition may differ greatly. As your workload's "CPU intensity" (for example a large number of multiply or divide operations) or your main memory size requirements increase, the simple rPerf or CPW estimation may set performance expectations that will not be satisfied with the less than one processor capacity partition. Further exploration of this topic is beyond the scope of this publication. This is why we emphasize using a sizing or capacity planning tool that uses your workload characteristics in the areas of "processor intensity," main memory size utilization, and any built in "waits" such as waiting for work requests to be received from another application.
   ----
11. Lotus Mail and Calendaring (MCU) workload ratings are projected based on the CPW ratings. MCU ratings are no longer provided starting with the POWER6 520, 550, 9117-MMA 570, and 9119-FHA 595 processor technology models. The IBM Systems Workload Estimator should be used for sizing Domino mail and application workloads. When sizing Domino on i, the latest maintenance release of the selected version is assumed.
12. 64 core CPW ratings measured with 2 x 32 partitions. The official maximum of 32 processors per IBM i partition remains. Customers who need a larger partition configuration, should work with the IBM Rochester Lab to ensure a smoothly functioning and supported configuration can be offered/used.
13. IBM i support requires 6.1 or later. Supported by IBM AIX 5.3 and later and AIX 6.1 or later with appropriate Technology Level updates.
14. 9117-FHA 5.0 GHz processor capacity is available as the following feature numbers: #4695 supports up to 32 GB (feature #5696 0/32GB DDR2 Memory (4X8GB) DIMMS- 400 MHz) memory cards; #4705 supports up to 64 GB (0/64GB DDR2 Memory(4X16GB) DIMMS, 400 MHz,) memory cards. 7556 is the CBU version of 4705. 7571 is the CBU version of 4695. #4705 can be upgraded to and will eventually replace #4695 in new orders.
15. Single (5250) Enterprise Enablement/ Full Enterprise Enablement

a. The value listed is unconstrained CPW (there is sufficient I/O such that the processor would be the first constrained resource). The I/O constrained CPW value for a 12-disk configuration is approximately 100 CPW per disk).b. NA = Not Available
Memory DIMMs
► D4. 4 memory DIMM slots per processor card, 8 GB memory card supported on 2 core, 4 core
► D8. 8 memory DIMM slots per processor card.
► D12. 12 DIMM slots per processor card
► D32. 32 DIMM slots per processor book. 0/64 GB (4x16GB) memory cards assumed.

Much of the summary information in this appendix has been excerpted from the *Power Systems facts and features* PDF that can be found at the Facts and features reports Web site at:
http://www-03.ibm.com/systems/p/hardware/reports/factsfeatures.html

Published CPW and MCU values can be seen in the CPW appendix of the IBM Power Systems Performance Capabilities Reference IBM i 6.1 manual that can be found at:
http://www.ibm.com/systems/i/advantages/perfmgmt/ (Select the Resources tab.)

Additional information and published rPerf values can be seen per model at the following URLs:
http://www.ibm.com/systems/power/hardware/ or http://www.ibm.com/systems/power/hardware/notices/rperf.html

I
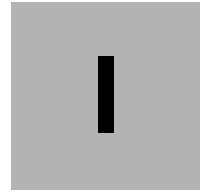
POWER6 reliability, availability and serviceability summary

This appendix provides information about IBM Power Systems reliability, availability, and service (RAS) ability technology features. With this technology, you have the potential to improve investment costs by reducing unplanned down time and business disruption.

This appendix also includes general details about software-based management and availability features that are based on the benefits available when using AIX and IBM i as the operating system. Support of these features when using Linux can vary.

IBM EnergyScale capabilities are summarized in 1.4.2, "IBM EnergyScale technology" on page 28.

Reliability

Highly reliable systems are built with highly reliable components. On IBM POWER6 processor-based systems, this basic principle is expanded upon with a clear design for reliability architecture and methodology. A concentrated, systematic, architecture-based approach is designed to improve overall system reliability with each successive generation of system offerings.

Designed for reliability

Systems designed with fewer components and interconnects have fewer opportunities to fail. Simple design choices such as integrating two processor cores on a single POWER chip can dramatically reduce the opportunity for system failures. In this case, a 4-core server will include half as many processor chips (and chip socket interfaces) as with a single-CPU-per-processor design. Not only does this reduce the total number of system components, it reduces the total amount of heat generated in the design, resulting in an additional reduction in required power and cooling components.

Parts selection also plays a critical role in overall system reliability. IBM uses three grades of components, with grade 3 defined as industry standard (off-the-shelf). As shown in Figure I-1, using stringent design criteria and an extensive testing program, the IBM manufacturing team can produce grade 1 components that are expected to be 10 times more reliable than industry standard. Engineers select grade 1 parts for the most critical system components. Newly introduced organic packaging technologies, rated grade 5, achieve the same reliability as grade 1 parts.

Figure I-1   Component failure rates

Placement of components

Packaging is designed to deliver both high performance and high reliability. For example, the reliability of electronic components is directly related to their thermal environment, that is, large decreases in component reliability are directly correlated with relatively small increases in temperature, POWER6 processor-based systems are carefully packaged to ensure adequate cooling. Critical system components such as the POWER6 processor chips are positioned on printed circuit cards so they receive fresh air during operation. In addition, POWER6 processor-based systems are built with redundant, variable-speed fans that can automatically increase output to compensate for increased heat in the central electronic complex.

Redundant components and concurrent repair

High-opportunity components, or those that most affect system availability, are protected with redundancy and the ability to be repaired concurrently.

The use of redundant part allows the system to remain operational:

► Redundant spare memory bits in cache, directories and main memory

► Redundant and hot-swap cooling

► Redundant and hot-swap power supplies (optional)

Express Product Offerings include two supplies and two power cords automatically with any new initial order. For maximum availability it is highly recommended to connect power cords from the same system to two separate Power Distribution Units (PDUs) in the rack and to connect each PDU to independent power sources.Deskside form factor power cords need to be plugged to two independent power sources in order to achieve maximum availability.

Availability

This section addresses software-based availability offerings available on IBM POWER5 and POWER6 systems. Many of these offerings operating system options or separately priced IBM software products. These products can take advantage of hardware availability capabilities.

Other vendors also have their own availability offerings running under the IBM operating systems. We do not address these offerings in this paper.

Management Edition for AIX

IBM Management Edition for AIX is designed to provide robust monitoring and quick time to value by incorporating best practice solutions created by AIX and PowerVM Virtual I/O Server developers. These best practice solutions include predefined thresholds for alerting on key metrics, Expert Advice that provides an explanation of the alert and recommends potential actions to take to resolve the issue, and the ability to take resolution actions directly from the Tivoli Enterprise Portal or set up automated actions. Users have the ability to visualize the monitoring data in the Tivoli Enterprise Portal determine the current state of the AIX, LPAR, CEC, HMC, and VIOS resources.

Management Edition for AIX is an integrated systems management offering created specifically for the system p platform that provides as primary functions:

► Monitoring of the health and availability of the system p.

► Discovery of configurations and relationships between system p service and application components.

► Usage and accounting of system p IT resources.

For information regarding the Management Edition for AIX, refer to:

http://www-03.ibm.com/systems/p/os/aix/sysmgmt/me/index.html

IBM Director

IBM Director is an integrated, easy-to-use suite of tools that provide you with flexible system management capabilities to help realize maximum systems availability and lower IT costs.

IBM Director provide below benefits:

► An easy-to-use, integrated suite of tools with consistent look-and-feel and single point of management simplifies IT tasks

► Automated, proactive capabilities that help reduce IT costs and maximize system availability

► Streamlined, intuitive user interface to get started faster and accomplish more in a shorter period of time

► Open, standards-based design and broad platform and operating support enable clients to manage heterogeneous environments from a central point

► Can be extended to provide more choice of tools from the same user interface

For information regarding the IBM Director, refer to:

http://www-03.ibm.com/systems/management/director/

Cluster-based availability solutions

Today's IT infrastructure requires that servers meet increasing demands, while offering the flexibility and manageability to rapidly develop and deploy new services. IBM clustering hardware and software provide the building blocks, with availability, scalability, security, and single-point-of-management control, to satisfy these needs. The advantages of clusters are:

► High processing capacity
► Resource consolidation
► Optimal use of resources
► Geographic server consolidation
► 24x7 availability with failover protection
► Disaster recovery
► Scale-out and scale-up without downtime
► Centralized system management

IBM augments the IBM hardware availability capabilities with a range of software availability functions under the supported operating systems and expanded availability functions available with IBM products built on top of the operating system support.

This topic focuses on the primary IBM higher availability software products that are built on topic of the operating systems.

The primary IBM availability Web site for Power Systems includes more detailed information than is summarized within this section. See:

http://www.ibm.com/systems/power/software/availability/

> **Note:** There are additional non-IBM higher availability products that run on these operating systems. Discussion of these non-IBM products is beyond the scope of this publication. You can link to some of these non-IBM products from this main Power System availability Web site.

AIX and Linux availability solutions

This section discusses two major categories of IBM products for providing availability and management of for multiple systems running AIX and Linux:

► IBM PowerHA suite of products and offerings
► IBM Cluster Systems Management software (CSM) offerings

IBM PowerHA suite of products and offerings

For several years IBM High Availability Clustered Multi Processing (HACMP) has provided reliable high availability services, monitoring clients' mission critical applications running on IBM servers—and now the IBM System p and System i servers. From the network server operating systems and applications, HACMP monitors the entire system and can automatically restart an application on backup hardware in the event of failure or service degradation. The combination of IBM AIX or Linux servers and HACMP provides the highest level of protection and availability.

PowerHA is the new name for HACMP for AIX and Linux offerings.

PowerHA for AIX

PowerHA for AIX (5765-F62), formerly IBM High Availability Cluster Multi-Processing (HACMP) is now at level V5.4.1. This release level offers robust high availability and disaster recovery for IBM System p and System i customers with mission-critical applications.

HACMP V5.4.1 features include:

► AIX Workload Partitions (WPAR)

► HACMP/XD support of IBM TotalStorage disk subsystem (PPRC) including Consistency Groups

► New GLVM monitoring. A new Geographical Logical Volume Manager (GLVM) Status Monitor provides the ability to monitor GLVM status and state. These monitors enable you to keep better track of the status of your application data when using the HACMP/XD GLVM option for data replication.

► Improved support for NFS V4, which includes additional configuration options, as well as improved recovery time. HACMP can support both NFS V4 and V2/V3 within the same high availability environment.

► NFSv4 support improvements

► HACMP usability and Reliability, Availability, Service (RAS) improvements

► New options for detecting and responding to a partitioned cluster

The optional features HACMP/XD and HACMP Smart Assist for AIX V6.1 provide high availability disaster recovery solutions for your business.

HACMP Smart Assists for DB2 and Oracle® simplify HACMP setup in these common database environments. Including the Smart Assist for WebSphere, these Smart Assists use application-specific knowledge to extend HACMP's standard auto-discovery features and provide all the necessary application monitors and start/stop scripts to streamline the configuration process. All three Smart Assists are included in one inexpensive, orderable package.

PowerHA XD for AIX (HACMP/XD)

PowerHA XD for AIX, formerly HACMP/XD (Extended Distance) extends HACMP's capabilities by replicating critical data and enabling failover to a remote site. HACMP/XD provides a portfolio of data mirroring and recovery options which let you build a disaster recovery solution with the backup site in a campus or metropolitan wide area, or even hundreds of miles away.

HACMP's Extended Distance option (HACMP/XD) extends the protection of HACMP for AIX to geographically remote sites to help ensure business continuity even if an entire site is disabled by catastrophe. HACMP/XD automatically manages the replication and synchronization of your Web site, databases and other critical data and applications to a separate location from your primary operations and keeps this replicated data updated in real-time. In the event of a power outage, flood or other disaster, your services are automatically transferred from the disabled site and restarted at the remote site; your data remains safe and your business keeps running. During operation at the backup site, data replicating will be reversed back to the primary site as soon as it is restored, providing protection for the backup site and enabling the primary site to resume production operations if desired.

PowerHA for Linux (HACMP for Linux)

The HACMP premiere high availability product from IBM is also available for use on the Linux operating system. HACMP V5.4 for Linux (5765-G71) supports Red Hat and SUSE Linux

systems. With HACMP for Linux, clients can have a common availability solution throughout their enterprise, from high-end servers running a large database to edge-tier applications on Linux. This extends HACMP's world-class protection software of your mission-critical applications running on all IBM System p servers. HACMP for Linux uses the same interface and configurations as HACMP for AIX providing a common multi-platform solution which protects your investment as you grow your cluster environments.

Cluster Systems Management software offerings

Cluster Systems Management (CSM) for AIX and Linux is designed for simple, low-cost management of distributed and clustered IBM systems and servers running AIX and System x servers in technical and commercial computing environments. CSM, included with the IBM System Cluster 1600 and IBM System Cluster 1350™ solutions, simplifies administration of a cluster by providing management from a single point-of-control. CSM is available for managing homogeneous clusters of IBM System x servers running Linux or IBM System p and Power Systems servers running AIX, or heterogeneous clusters which include both.

CSM is typically part of a prepackaged IBM Cluster 1350 solution (hardware and software) or prepackaged as part of the IBM Cluster 1600 hardware and software solution.

CSM software provides a distributed systems management solution that allows a system administrator to set up and maintain a cluster of nodes that run the AIX or Linux operating system. CSM simplifies cluster administration tasks by providing management from a single point-of-control. The CSM management server is the server designated to operate, monitor, and maintain the CSM cluster of managed nodes.

Managed nodes are instances of the operating system that you can manage in the cluster. Managed devices are the non-node devices for which CSM supports power control and remote console access.

CSM is packaged as three different offerings (V1.7 is the latest release):

▶ CSM for AIX 5L V1.7 (5765-F67)
▶ CSM for Linux V1.7 (5765-G16)
▶ CSM for Linux Multiplatform V1.7 (5765-D88)

CSM V1.7 highlights include:

▶ Support for AIX 6.1 TL1 and AIX 5.3 TL8
▶ Support for IBM BladeCenter JS22 and JS12
▶ Support for new IBM Blue Gene/P™ Solution
▶ Introduces support for IBM POWER6 processor-based IBM Power Systems 520, 525, 570, 575, 595 servers
▶ Introduces support for the IBM system x3350 with model type 4192, x3850(m2) with model type 7141, x3455 with model type 7940.
▶ Provides installation enhancements, including DVD support and enhanced support for
▶ Provides Linux diskless installation
▶ Provides enhancements for CSM administrative functions such as dsh utilities and CFM
▶ Provides enhancements to error and system monitoring and logging
▶ Provides support for HAMS for AIX6.1 TL1 working with TSA 2.3 Fix Pack 3
▶ Provides support for InfiniBand Qlogic Switch

IBM information center provides documentation on CSM support. For more information about CSM, consult the following Web sites:

► CMS Web site

  http://www-03.ibm.com/systems/p/support/techdocs/clusters_aix.html

► CSM Information center publications

  http://publib.boulder.ibm.com/infocenter/clresctr/vxrx/index.jsp?topic=/com.ibm
  .cluster.csm.doc/clusterbooks.html

IBM i availability solutions

IBM i in releases 5.4 and especially 6.1 itself provides many ways to backup important system and applications components and data. IBM i 6.1 provides further extensions to the "save while active" status of objects. High availability business partners have provided a rich set of high availability products and offerings in this area.

During January 2008 IBM introduced the System i High Availability Solutions Manager (HASM). This product builds upon IBM i 6.1 operation system's set of "base availability enhancements." During 2008 HASM has been renamed as IBM PowerHA for i.

PowerHA for i

PowerHA for i (5761-HAS) is the IBM high availability disk based clustering solution for the IBM i 6.1 operating system. PowerHA for i when combined with IBM i clustering technology delivers a complete high availability and disaster recovery solution for your business applications running in the IBM System i environment. PowerHA for i enables you to support high availability capabilities with either native disk storage or the IBM DS8000 or DS6000 storage servers.

PowerHA for i provides a complete high-availability solution based on:

► Integrated support from IBM i for independent auxiliary storage pools (IASPs)
► Using IBM i cross-site mirroring (XSM)
► IBM Storage Solutions Metro Mirror, Global Mirror, FlashCopy®
► IBM i system administrative domain capabilities

Both graphical browser-based and IBM i command level interfaces are supported:

► GUI to manage clusters, resource groups, and domains
► 5250 command interface for command-line management

Requirements include:

► Systems must be running IBM i 6.1
► Applications and data must be deployed using IASPs

PowerHA for i also includes integrated source and target side tracking for XSM and geographic mirroring. This means that when you detach a target system, the resynchronize operation, after reattaching, includes only the changed objects on the source and target system.

XSM enables you to perform role-swap operations using Metro Mirror, a synchronous replication product for the DS8000 server. You can readily perform both planned and unplanned switching operations with minimal impact on operational procedures. You should use Metro Mirror for best-case recovery point objective (RPO) and recovery time objective (RTO).

IBM iCluster for IBM i

iCluster is the IBM i HA/DR solution based on logical replication. iCluster is based upon IBM i journaling technology and is optimized for near real time replication and geographic dispersion. iCluster provides flexibility for those customers looking to use the second copy of the data on the backup system for read-only access. iCluster's MatchMerge technology and advanced synchronization check capabilities are designed to enhance data consistency.

The iCluster portfolio consists of the following products:

► iCluster

 This is a logical replication solution based on IBM i journaling, designed for large enterprises with more complex data availability and recoverability requirements.

► iBalance

 This is an additional functions chargeable feature of iCluster. The key additional functions are focused on bidirectional replication for workload balancing.

► iCluster

 This has a basic range of functions intended for small and medium business (SMB) organizations with a simpler set of requirements.

Serviceability

The IBM POWER6 Serviceability strategy evolves from, and improves upon, the service architecture deployed on the POWER5 processor-based systems. The IBM service team has enhanced the base service capabilities and continues to implement a strategy that incorporates best-of-breed service characteristics from the diverse System x, System i, System p and high-end System z offerings from IBM.

The goal of the IBM Serviceability Team is to design and provide the most efficient system service environment that incorporates:

► Easy access to service components

► On demand service education

► An automated guided repair strategy that uses common service interfaces for a converged service approach across multiple IBM server platforms

By delivering upon these goals, POWER6 processor-based systems enable faster and more accurate repair while reducing the possibility of human error.

Client control of the service environment extends to firmware maintenance on all of the POWER6 processor-based systems, including the 520. This strategy contributes to higher systems availability with reduced maintenance costs.

Summary of POWER6 hardware based RAS capabilities by operating system

Table I-1 provides a cross-reference summary of most of the POWER6 reliability, availability, and serviceability (RAS) capabilities supported by the IBM i, AIX, and Linux operating systems.

Table I-1   Operating system support for selected RAS features

RAS feature	AIX V5.3	AIX V6.1	IBM i 5.4 LIC 5.4.5	IBM i 6.1	RHEL V5.1	SLES V10
System Deallocation of Failing Components						
Dynamic processor deallocation	Y	Y	Y	Y	Y[1]	Y
Dynamic processor sparing	Y	Y	Y	Y	Y	Y
Processor instruction retry	Y	Y	Y	Y	Y	Y
Alternate processor recovery	Y	Y	Y	Y	Y	Y
Partition contained checkstop	Y	Y	Y	Y	Y	Y
Persistent processor deallocation	Y	Y	Y	Y	Y	Y
GX+ bus persistent deallocation	Y	Y	Y	Y	N	N
PCI bus extended error detection	Y	Y	Y	Y	Y	Y
PCI bus extended error recovery	Y	Y	Y	Y	Limited[a]	Limited
PCI-PCI bridge extended error handling	Y	Y	Y	Y	N	N
Redundant RIO Link	Y	Y	Y	Y	Y	Y
PCI card hot swap	Y	Y	Y	Y	Y[1]	Y
Dynamic SP failover at runtime	Y	Y	Y	Y	N	N
Clock failover at IPL	Y	Y	Y	Y	Y	Y
Memory Availability						
ECC Memory, L2 cache	Y	Y	Y	Y	Y	Y
Dynamic bit-steering (spare memory)	Y	Y	Y	Y	Y	Y
Memory scrubbing	Y	Y	Y	Y	Y	Y
Chipkill memory	Y	Y	Y	Y	Y	Y
Memory page deallocation	Y	Y	Y	Y	N	N
L1 parity check plus retry	Y	Y	Y	Y	Y	Y
L2 cache line delete	Y	Y	Y	Y	Y	Y
Array recovery & Array persistent deallocation (spare bits in L1 & L2 cache; L1, L2 directory)	Y	Y	Y	Y	Y	Y
Special uncorrectable error handling	Y	Y	Y	Y	Y	Y

RAS feature	AIX V5.3	AIX V6.1	IBM i 5.4 LIC 5.4.5	IBM i 6.1	RHEL V5.1	SLES V10
Fault Detection and Isolation						
Platform FFDC diagnostics	Y	Y	Y	Y	Y	Y
I/O FFDC diagnostics	Y	Y	Y	Y	N	Y
Runtime diagnostics	Y	Y	Y	Y	Limited	Limited
Storage protection keys	Y	Y	Y	Y	N	N
Dynamic trace	N	Y	Y	Y	N	N
Operating system FFDC	Y	Y	Y	Y	N	N
Error log analysis	Y	Y	Y	Y	Y	Y
Service processor support for BIST for logic & arrays, wire tests, and component initialization	Y	Y	Y	Y	Y	Y
Serviceability						
Boot time progress indicator	Y	Y	Y	Y	Limited	Limited
Firmware error codes	Y	Y	Y	Y	Y	Y
Operating system error codes	Y	Y	Y	Y	Limited	Limited
Inventory collection	Y	Y	Y	Y	Y	Y
Environmental and power warnings	Y	Y	Y	Y	Y	Y
Hot plug fans, power supplies	Y	Y	Y	Y	Y	Y
Extended error data collection	Y	Y	Y	Y	Y	Y
SP call home on non-HMC configurations	Y	Y	Y	Y	Y	Y
I/O drawer redundant connections	Y	Y	Y	Y	Y	Y
I/O drawer hot-add and concurrent repair	Y	Y	Y	Y	Y	Y
SP mutual surveillance with POWER Hypervisor	Y	Y	Y	Y	Y	Y
Dynamic firmware update with the HMC	Y	Y	Y	Y	Y	Y
Service agent call home application	Y	Y	Y	Y	Y	Y
Guiding light LEDs	Y	Y	Y	Y	Y	Y
System dump for memory, POWER Hypervisor, SP	Y	Y	Y	Y	Y	Y
Operating system error reporting to HMC SFP application	Y	Y	Y	Y	Y	Y
RMC secure error transmission subsystem	Y	Y	Y	Y	Y	Y
Health check scheduled operations with HMC	Y	Y	Y	Y	Y	Y
Operator panel (virtual or real)	Y	Y	Y	Y	Y	Y
Redundant HMCs	Y	Y	Y	Y	Y	Y

RAS feature	AIX V5.3	AIX V6.1	IBM i 5.4 LIC 5.4.5	IBM i 6.1	RHEL V5.1	SLES V10
Automated recovery/restart	Y	Y	Y	Y	Y	Y
Repair and verify guided maintenance	Y	Y	Y	Y	Limited	Limited
Concurrent kernel update	N	Y	Y	Y	N	N

a. Feature is not supported on Version 4 of RHEL.

Related publications

We consider the publications that we list in this section particularly suitable for a more detailed discussion of the topics that we cover in this paper.

IBM Redbooks publications

For information about ordering these publications, see "How to get IBM Redbooks publications" on page 993. Note that some of the documents that we reference here might be available in softcopy only.

- ► *PowerVM Virtualization on IBM System p: Introduction and Configuration Fourth Edition*, SG24-7940
- ► *PowerVM Virtualization on IBM System p: Managing and Monitoring*, SG24-7590
- ► *Getting Started with PowerVM Lx86*, REDP-4298
- ► *PowerVM Live Partition Mobility on IBM System p*, SG24-7460
- ► *Integrated Virtualization Manager on IBM System p5*, REDP-4061
- ► *Introduction to Workload Partition Management in IBM AIX Version 6.1*, SG24-7431
- ► *Hardware Management Console V7 Handbook*, SG24-7491
- ► *IBM System i and System p*, SG24-7487
- ► *IBM Power Systems 520 Technical Overview and Introduction*, REDP-4403
- ► *IBM System p 550 Technical Overview and Introduction*, REDP-4404
- ► *IBM System p 570 Technical Overview and Introduction*, REDP-4405
- ► *IBM Power 595 Technical Overview and Introduction*, REDP-4440
- ► *IBM System i Overview: Models 515, 525, 550, 570, 595, and More*, REDP-5052 (POWER5 and prior technologies)
- ► *Case Study: Architecting SOA Solutions for Changing Economic Environments*, REDP-4414
- ► *IBM BladeCenter JS12 and JS22 Implementation Guide,* SG24-7655

Other publications

The following publications are also relevant as further information sources for planning:

- ► *Logical Partitioning Guide*, SA76-0098
- ► *Site and Hardware Planning Guide*, SA76-0091
- ► *Site Preparation and Physical Planning Guide*, SA76-0103

The following publications are also relevant as further information sources for installing:

- ► *Installation and Configuration Guide for the HMC,* SA76-0084
- ► *Power Systems PCI Adapter Placement Guide for Machine Type 820x and 91xx,* SA76-0090

- *Power Systems PCI Adapter Placement Guide for Machine Type 940x,* SA76-0096
- *Power Systems Memory Modules,* SA76-0154

The following publications are also relevant as further information sources for using your system:

- *Introduction to Virtualization*, SA76-0145
- *Operations Guide for the ASMI and for Nonpartitioned Systems*, SA76-0094
- *Operations Guide for the HMC and Managed Systems*, SA76-0085
- *Virtual I/O Server Command Reference*, SA76-0101

The following publications are also relevant as further information sources for troubleshooting:

- *AIX Diagnostics and Service Aids*, SA76-0106
- *Managing Devices*, SA76-0107
- *Managing PCI Devices*, SA76-0092
- *SAS RAID Controller Reference Guide*, SA76-0112
- *Service Guide for HMC Models 7042-Cr4 and 7042-C06*, SA76-0120
- Performance information, including the *IBM Power Systems Performance Capabilities Reference IBM i operating system Version 6.1*, which is available at:

  http://www-03.ibm.com/systems/resources/pcrm.pdf

  or

  http://www-03.ibm.com/systems/i/advantages/perfmgmt/resource.html

Online resources

These Web sites are also relevant as further information sources:

- IBM Systems Information Center

  This is a very good starting place for information centers on IBM hardware, systems software (such as IBM Director), and the supported operating systems.

  http://publib.boulder.ibm.com/infocenter/systems
- Support for IBM System p

  http://www.ibm.com/systems/support/p
- Support for IBM System i

  http://www.ibm.com/systems/support/i
- IBM System Planning Tool

  http://www.ibm.com/systems/support/tools/systemplanningtool
- Fix Central for IBM operating systems, IBM hardware platforms, and IBM software maintenance packages downloads

  http://www.ibm.com/eserver/support/fixes
- Firmware and microcode downloads Web site

  http://www14.software.ibm.com/webapp/set2/firmware/gjsn
- Linux for IBM Power Systems, System p and System i

  http://www-03.ibm.com/systems/power/software/linux/

► IBM System Storage Interoperation Center (SSIC) Web site

http://www-03.ibm.com/systems/support/storage/config/ssic/displayesssearchwithoutjs.wss?start_over=yes

► Direct links to IBM tape and disk storage Web sites

http://www-03.ibm.com/systems/storage/disk/
http://www-03.ibm.com/systems/storage/tape/index.html

► IBM pre-requisites Web site (hardware and release level supporting selected hardware)

http://www-912.ibm.com/e_dir/eServerPrereq.nsf/

► IBM planning Web site for System i

http://www-304.ibm.com/systems/support/i/planning

► IBM planning, upgrades Web site for System i

http://www-304.ibm.com/systems/support/i/planning/migrationupgrade.html

► Power Systems Facts and Figures Web site that includes matrixes of hardware feature and systems supported

http://www-03.ibm.com/systems/p/hardware/reports/factsfeatures.html

► Performance management Web site information, starting at:

http://www-03.ibm.com/systems/i/advantages/perfmgmt/resource.html

► Relative performance (rPerf) for AIX information

http://www.ibm.com/systems/power/hardware/notices/rperf.html

► News on new computer technologies

http://www.ibm.com/chips/micronews

► IBM Smart Business pre-packaged solutions

► IBM Business Partner - PartnerWorld (ISV and IBM Blog)

https://www.ibm.com/communities/service/html/communityview?communityUuid=5c1dae47-e576-4601-9f01-6e13bb7ab027

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- ► POWER6 570 9117-MMA
- ► POWER6 595 9119-FFA

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