ESCALA Power7

PCI Adapter Placement for M6-700, M6-705, M7-700 or M7-705

ESCALA Power7

PCI Adapter Placement for M6-700, M6-705, M7-700 or M7-705

The ESCALA Power7 publications concern the following models:

 - Bull Escala E5-700 (Power 750 / 8233-E8B)
 - Bull Escala M6-700 (Power 770 / 9117-MMB)
 - Bull Escala M6-705 (Power 770 / 9117-MMC)
 - Bull Escala M7-700 (Power 780 / 9179-MHB)
 - Bull Escala M7-705 (Power 780 / 9179-MHC)
 - Bull Escala E1-700 (Power 710 / 8231-E2B)
 - Bull Escala E1-705 (Power 710 / 8231-E1C)
 - Bull Escala E2-700 / E2-700T (Power 720 / 8202-E4B)
 - Bull Escala E2-705 / E2-705T (Power 720 / 8202-E4C)
 - Bull Escala E3-700 (Power 730 / 8231-E2B)
 - Bull Escala E3-705 (Power 730 / 8231-E2C)
 - Bull Escala E4-700 / E4-700T (Power 740 / 8205-E6B)
 - Bull Escala E4-705 (Power 740 / 8205-E6C)

References to Power 755 / 8236-E8C models are irrelevant.

Hardware

Suggestions and criticisms concerning the form, content, and presentation of this book are invited. A form is provided at the end of this book for this purpose.

To order additional copies of this book or other Bull Technical Publications, you are invited to use the Ordering Form also provided at the end of this book.

Trademarks and Acknowledgements

We acknowledge the right of proprietors of trademarks mentioned in this book.

Contents

Safety notices

Safety notices may be printed throughout this guide.

- **DANGER** notices call attention to a situation that is potentially lethal or extremely hazardous to people.
- **CAUTION** notices call attention to a situation that is potentially hazardous to people because of some existing condition.
- **Attention** notices call attention to the possibility of damage to a program, device, system, or data.

World Trade safety information

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

Laser safety information

The servers can use I/O cards or features that are fiber-optic based and that utilize lasers or LEDs.

Laser compliance

The servers may be installed inside or outside of an IT equipment rack.

DANGER

When working on or around the system, observe the following precautions:

Electrical voltage and current from power, telephone, and communication cables are hazardous. To avoid a shock hazard:
- **Connect power to this unit only with the provided power cord. Do not use the provided power cord for any other product.**
- **Do not open or service any power supply assembly.**
- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **The product might be equipped with multiple power cords. To remove all hazardous voltages, disconnect all power cords.**
- **Connect all power cords to a properly wired and grounded electrical outlet. Ensure that the outlet supplies proper voltage and phase rotation according to the system rating plate.**
- **Connect any equipment that will be attached to this product to properly wired outlets.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following procedures when installing, moving, or opening covers on this product or attached devices.**

  To Disconnect:
  1. **Turn off everything (unless instructed otherwise).**
  2. **Remove the power cords from the outlets.**
  3. **Remove the signal cables from the connectors.**
  4. **Remove all cables from the devices**

  To Connect:
  1. **Turn off everything (unless instructed otherwise).**
  2. **Attach all cables to the devices.**
  3. **Attach the signal cables to the connectors.**
  4. **Attach the power cords to the outlets.**
  5. **Turn on the devices.**

  (D005a)

DANGER

Observe the following precautions when working on or around your IT rack system:

- Heavy equipment–personal injury or equipment damage might result if mishandled.
- Always lower the leveling pads on the rack cabinet.
- Always install stabilizer brackets on the rack cabinet.
- To avoid hazardous conditions due to uneven mechanical loading, always install the heaviest devices in the bottom of the rack cabinet. Always install servers and optional devices starting from the bottom of the rack cabinet.
- Rack-mounted devices are not to be used as shelves or work spaces. Do not place objects on top of rack-mounted devices.

- Each rack cabinet might have more than one power cord. Be sure to disconnect all power cords in the rack cabinet when directed to disconnect power during servicing.
- Connect all devices installed in a rack cabinet to power devices installed in the same rack cabinet. Do not plug a power cord from a device installed in one rack cabinet into a power device installed in a different rack cabinet.
- An electrical outlet that is not correctly wired could place hazardous voltage on the metal parts of the system or the devices that attach to the system. It is the responsibility of the customer to ensure that the outlet is correctly wired and grounded to prevent an electrical shock.

CAUTION

- Do not install a unit in a rack where the internal rack ambient temperatures will exceed the manufacturer's recommended ambient temperature for all your rack-mounted devices.
- Do not install a unit in a rack where the air flow is compromised. Ensure that air flow is not blocked or reduced on any side, front, or back of a unit used for air flow through the unit.
- Consideration should be given to the connection of the equipment to the supply circuit so that overloading of the circuits does not compromise the supply wiring or overcurrent protection. To provide the correct power connection to a rack, refer to the rating labels located on the equipment in the rack to determine the total power requirement of the supply circuit.
- *(For sliding drawers.)* Do not pull out or install any drawer or feature if the rack stabilizer brackets are not attached to the rack. Do not pull out more than one drawer at a time. The rack might become unstable if you pull out more than one drawer at a time.
- *(For fixed drawers.)* This drawer is a fixed drawer and must not be moved for servicing unless specified by the manufacturer. Attempting to move the drawer partially or completely out of the rack might cause the rack to become unstable or cause the drawer to fall out of the rack.

(R001)

CAUTION:
Removing components from the upper positions in the rack cabinet improves rack stability during relocation. Follow these general guidelines whenever you relocate a populated rack cabinet within a room or building:

- Reduce the weight of the rack cabinet by removing equipment starting at the top of the rack cabinet. When possible, restore the rack cabinet to the configuration of the rack cabinet as you received it. If this configuration is not known, you must observe the following precautions:
  – Remove all devices in the 32U position and above.
  – Ensure that the heaviest devices are installed in the bottom of the rack cabinet.
  – Ensure that there are no empty U-levels between devices installed in the rack cabinet below the 32U level.
- If the rack cabinet you are relocating is part of a suite of rack cabinets, detach the rack cabinet from the suite.
- Inspect the route that you plan to take to eliminate potential hazards.
- Verify that the route that you choose can support the weight of the loaded rack cabinet. Refer to the documentation that comes with your rack cabinet for the weight of a loaded rack cabinet.
- Verify that all door openings are at least 760 x 230 mm (30 x 80 in.).
- Ensure that all devices, shelves, drawers, doors, and cables are secure.
- Ensure that the four leveling pads are raised to their highest position.
- Ensure that there is no stabilizer bracket installed on the rack cabinet during movement.
- Do not use a ramp inclined at more than 10 degrees.
- When the rack cabinet is in the new location, complete the following steps:
  – Lower the four leveling pads.
  – Install stabilizer brackets on the rack cabinet.
  – If you removed any devices from the rack cabinet, repopulate the rack cabinet from the lowest position to the highest position.
- If a long-distance relocation is required, restore the rack cabinet to the configuration of the rack cabinet as you received it. Pack the rack cabinet in the original packaging material, or equivalent. Also lower the leveling pads to raise the casters off of the pallet and bolt the rack cabinet to the pallet.

(R002)

(L001)

(L002)

(L003)

or

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

CAUTION:
This product might contain one or more of the following devices: CD-ROM drive, DVD-ROM drive, DVD-RAM drive, or laser module, which are Class 1 laser products. Note the following information:
- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of the controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

(C026)

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

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

CAUTION:
Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following information: laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam. (C030)

CAUTION:
The battery contains lithium. To avoid possible explosion, do not burn or charge the battery.

Do Not:
* ___ **Throw or immerse into water**
* ___ **Heat to more than 100°C (212°F)**
* ___ **Repair or disassemble**

Exchange only with the approved part. Recycle or discard the battery as instructed by local regulations. (C003a)

Power and cabling information for NEBS (Network Equipment-Building System) GR-1089-CORE

The following comments apply to the servers that have been designated as conforming to NEBS (Network Equipment-Building System) GR-1089-CORE:

The equipment is suitable for installation in the following:
* Network telecommunications facilities
* Locations where the NEC (National Electrical Code) applies

The intrabuilding ports of this equipment are suitable for connection to intrabuilding or unexposed wiring or cabling only. The intrabuilding ports of this equipment *must not* be metallically connected to the interfaces that connect to the OSP (outside plant) or its wiring. These interfaces are designed for use as intrabuilding interfaces only (Type 2 or Type 4 ports as described in GR-1089-CORE) and require isolation from the exposed OSP cabling. The addition of primary protectors is not sufficient protection to connect these interfaces metallically to OSP wiring.

Note: All Ethernet cables must be shielded and grounded at both ends.

The ac-powered system does not require the use of an external surge protection device (SPD).

The dc-powered system employs an isolated DC return (DC-I) design. The DC battery return terminal *shall not* be connected to the chassis or frame ground.

PCI adapter placement for the 17M/MB, 17M/MC, 79M/HB, or 79M/HC

Find information about the peripheral component interconnect (PCI), PCI-X, and PCI Express (PCIe) adapters that are supported for the 7/70 (17M/MB and 17M/MC) and 7/80 (79M/HB and 79M/HC) systems that contain the POWER7® processor, and the associated I/O expansion units.

The following features are electromagnetic compatibility (EMC) Class B features. See the Class B Notices in the Hardware Notices area.

Table 1. Electromagnetic compatibility (EMC) Class B features

Feature	Description
1912, 5736	PCI-X DDR 2.0 Dual Channel Ultra320 SCSI Adapter
1983, 5706	Port 10/100/1000 Base-TX Ethernet PCI-X Adapter
1986, 5713	1 Gigabit iSCSI TOE PCI-X Adapter
2728	4-Port USB PCIe Adapter
4764	PCI-X Cryptographic Coprocessor
4807	PCIe Cryptographic Coprocessor
5717	4-Port 10/100/1000 Base-TX PCI Express Adapter
5732	10 Gigabit Ethernet-CX4 PCI Express Adapter
5748	POWER® GXT145 PCI Express Graphics Accelerator
5767	2-Port 10/100/1000 Base-TX Ethernet PCI Express Adapter
5768	2-Port Gigabit Ethernet-SX PCI Express Adapter
5769	10 Gigabit Ethernet-SR PCI Express Adapter
5772	10 Gigabit Ethernet-LR PCI Express Adapter
5785	4 Port Async EIA-232 PCIe Adapter

Supported PCI adapters for the 17M/MB, 17M/MC, 79M/HB, or 79M/HC

Find information about the placement rules and slot priorities for the peripheral component interconnect (PCI), PCI-X, and PCI Express (PCIe) adapters that are supported for the 7/70 (17M/MB and 17M/MC) and 7/80 (79M/HB and 79M/HC) systems that contain the POWER7 processor, and the associated I/O expansion units.

This section provides reference information that information technology (IT) personnel and service representatives can use in determining where to place PCI, PCI-X, and PCIe adapters.

Adapters supported on the AIX®, , or Linux operating system

Table 2 on page 2 and Table 3 on page 3 list adapters supported on the AIX or Linux operating systems. Not all adapters are supported on all operating systems. Exceptions are noted in the Description column.

PCI and PCI-X adapters

The following table lists Peripheral Component Interconnect (PCI) and Peripheral Component Interconnect-X (PCI-X) adapters.

Table 2. PCI and PCI-X adapters

Supported system	Feature code/CCIN	Description
17M/MB, 17M/MC, 79M/HB, and 79M/HC	4764/4764	PCI-X Cryptographic Coprocessor (FC 4764) • Short, 64-bit, 3.3 V • OS support: AIX and
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5706/5706	2-Port 10/100/1000 Base-TX Ethernet PCI-X Adapter (FC 5706) • Short, 32-bit or 64-bit 3.3 V or 5 V • High bandwidth • OS support: AIX, , and Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5713/573B	1 Gigabit-TX iSCSI TOE PCI-X Adapter (FC 5713) • Short, 32-bit or 64-bit 3.3 V or 5 V • High bandwidth • OS support: AIX, , and Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	1912	PCI-X DDR 2.0 Dual Channel Ultra320 SCSI Adapter (FC 1912)
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5736/571A	PCI-X DDR 2.0 Dual Channel Ultra320 SCSI Adapter (FC 5736) • Short, 32 bit or 64-bit, 3.3 V • High bandwidth • OS support: AIX, , and Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5759/5759	4 Gb Dual-Port Fibre Channel PCI-X 2.0 DDR Adapter (FC 5759) • Short, 64-bit, 3.3 V • Extra-high bandwidth • OS support: AIX, , and Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5902/572B	PCI-X DDR Ext Dual-x4 3Gb SAS RAID Adapter (FC 5902) • Long, 64-bit, 3.3 V • Extra-high bandwidth • The adapter must be connected and configured in a dual controller mode, multi-initiator configuration, and this configuration requires that the adapters are installed in pairs. • This adapter supports disk expansion units. This adapter does not support media expansion units. • OS support: AIX and Linux

Table 2. PCI and PCI-X adapters (continued)

Supported system	Feature code/CCIN	Description

17M/MB, 17M/MC, 79M/HB, and 79M/HC	5908/572F and 575C	PCI-X DDR 1.5GB cache SAS RAID Adapter (FC 5908)
		• Long, 64-bit, 3.3 V
		• Extra-high bandwidth
		• Double-wide adapter requires two adjacent slots:
		  – 572F is the CCIN number on the SAS controller side of the double-wide adapter.
		  – 575C is the CCIN number on the write-cache side of the double-wide adapter.
		• The different feature codes indicate whether a blind-swap cassette is used and its type:
		  – 5904 indicates no blind-swap cassette.
		  – 5906 indicates a generation-2.5 blind-swap cassette.
		  – 5908 indicates a generation-3 blind-swap cassette.
		• OS support: AIX, , and Linux

17M/MB, 17M/MC, 79M/HB, and 79M/HC	5912/572A	PCI-X DDR Dual-x4 3Gb SAS Adapter (FC 5912) • Short, 64-bit, 3.3 V • Extra-high bandwidth • Supports a dual controller mode, multi-initiator configuration • OS support: AIX, , and Linux

PCIe adapters

The following table lists PCIe adapters.

Table 3. PCIe adapters

	Feature code/CCIN	Description
17M/MB, 17M/MC, 79M/HB, and 79M/HC	4808	PCIe Cryptographic Coprocessor (FC 4808) • Generation-3 blind-swap cassette • PCIe x4, full-height, half-length • OS support: AIX and
17M/MB, 17M/MC, 79M/HB, and 79M/HC	4809	PCIe Cryptographic Coprocessor (FC 4809) • Generation-4 blind-swap cassette • PCIe x4, full-height, half-length • OS support: AIX and
17M/MB, 17M/MC, 79M/HB, and 79M/HC	2728/57D1	4-Port USB PCIe Adapter (FC 2728) • Low-profile adapter • Single-slot, half-length PCIe adapter • PCIe 1.1 • OS support: AIX and Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5708/2B3B	10Gb FCoE PCIe Dual Port Adapter (FC 5708) • Regular full-height • PCIe 2.0 adapter with x8 Generation-1 • Convergence enhanced Ethernet (CEE) supported • OS support: AIX, Linux, and with VIOS.

Table 3. PCIe adapters (continued)

	Feature code/CCIN	Description
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5717/5717	4-Port 10/100/1000 Base-TX PCI Express Adapter (FC 5717) • Short, x4 • High bandwidth • OS support: AIX and Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5732/5732	10 Gigabit Ethernet-CX4 PCI Express Adapter (FC 5732) • Short, x8 • Extra-high bandwidth • OS support: AIX and Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5735/577D	8-Gigabit PCI Express Dual Port Fibre Channel Adapter (FC 5735) • Short, x8 • Extra-high bandwidth: If only one port is planned to be active in normal operation, the adapter is counted as an extra-high bandwidth adapter. If both ports are planned to be active, the adapter must be treated as two extra-high bandwidth adapters. • OS support: AIX, , and Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5748/5748	POWER GXT145 PCI Express Graphics Accelerator (FC 5748) • Short, x1 • Not hot-pluggable • OS support: AIX and Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5767/5767	2-Port 10/100/1000 Base-TX Ethernet PCI Express Adapter (FC 5767) • Short, x4 • High bandwidth • OS support: AIX, , and Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5768/5768	2-Port Gigabit Ethernet-SX PCI Express Adapter (FC 5768) • Short, x4 • High bandwidth • OS support: AIX, , and Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5769/5769	10 Gigabit Ethernet-SR PCI Express Adapter (FC 5769) • Short, full-high, x8 • Low-profile capable • High bandwidth • OS support: AIX and Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5772/576E	10 Gigabit Ethernet-LR PCI Express Adapter (FC 5772) • Short, x8 • Low-profile capable • Extra-high bandwidth • OS support: AIX, , and Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5773/5773	4 Gigabit PCI Express Single Port Fibre Channel Adapter (FC 5773) • Short, x4 • High bandwidth • OS support: AIX and Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5774/5774	4 Gigabit PCI Express Dual Port Fibre Channel Adapter (FC 5774) • Short, x4 • Extra-high bandwidth • OS support: AIX, , and Linux

Table 3. PCIe adapters (continued)

	Feature code/CCIN	Description
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5785	4 Port Async EIA-232 PCIe Adapter (FC 5785) • Short, x1 • OS support: AIX and Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5901/57B3	PCIe Dual - x4 SAS Adapter (FC 5901) • Short, x8 • Extra-high bandwidth • OS support: AIX, , and Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5903/574E	PCIe 380 MB Cache Dual x4 3Gb SAS RAID Adapter (FC 5903) • Short, x8 • Extra-high bandwidth • Installed in pairs • OS support: AIX and Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5289	PCIe 2-port Async EIA-232 PCIe 1X LPC Adapter (FC 5289) • Short, x8, full-height adapter • PCIe 1.1 • 2 Ports through RJ45 by using the DB9 connector • EIA-232 Compatible • OS support: AIX and Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5913 and 5924	PCIe2 1.8-GB Cache RAID SAS Tri-port 6Gb Adapter (FC 5913) • Full-height, short, PCIe2 x8 • Transfer speed of 6 Gbps • Write cache backup of 1.8 GB • One PCIe x8 slot per adapter. • Adapters are installed in pairs • OS support: AIX, , and Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5729	PCIe2 FH 4-Port 8Gb Fibre Channel Adapter (FC 5729) • PCIe 2.1, x8 • Full-height, full length adapter with standard-size bracket • OS support: AIX
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5744	PCIe2 2x10GbE SR 2x1GbE UTP Adapter (FC 5744) • Short, x8 • PCIe 2 • OS support: Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5745	PCIe2 2x10GbE SFP+ Copper 2x1GbE UTP Adapter (FC 5745) • Short, x8 • PCIe 2 • OS support: Linux
17M/MB, 17M/MC, 79M/HB, and 79M/HC	5899/576F	PCIe2 4-port 1GbE Adapter (FC 5899) • Regular-height adapter • PCIe generation-1 or generation-2, x4 • High bandwidth • Four-port 1 Gb Ethernet • OS support: AIX, Linux, and

Table 3. PCIe adapters (continued)

	Feature code/CCIN	Description
17M/MC and 79M/HC	ESA1	PCIe2 RAID SAS Adapter Dual-port 6Gb (FC ESA1) • Regular-height adapter • PCIe generation-2, x8 • OS support: AIX, , and Linux
17M/MC and 79M/HC	EC28	PCIe2 2-Port 10GbE RoCE SFP+ adapter (FC EC28) • Regular-height adapter • PCIe generation-2, x8 • Extra-high bandwidth, low latency 10 Gb Ethernet • OS support: AIX

PCI adapter slot priorities for the 17M/MB or 17M/MC

Some adapters must be placed in specific Peripheral Component Interconnect (PCI), Peripheral Component Interconnect-X (PCI-X), or PCI Express (PCIe) slots to function correctly or to perform optimally. Use this information to determine where to install PCI adapters.

PCI slot descriptions

Figure 1 shows the rear view of the system unit with the location codes for the PCI and GX++ 12X Channel Adapter (FC 1808) slots. Table 4 describes the slots. Each PCI-X DDR or PCIe is a separate PCI host bridge (PHB).
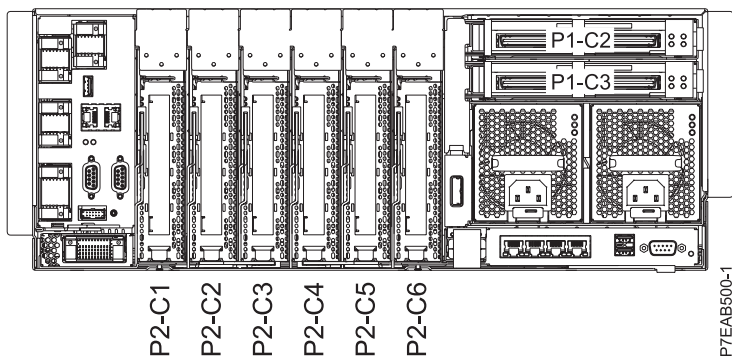
Figure 1. Rear view of enclosure with location codes

Table 4. PCI slot locations and descriptions

Slot	Location code	Description	PHB	Adapter size
Slot 1	P2-C1	PCIe 8x	PCIe PHB0 module A	Long
Slot 2	P2-C2	PCIe 8x	PCIe PHB1 module A	Long
Slot 3	P2-C3	PCIe 8x	PCIe PHB2 module A	Long
Slot 4	P2-C4	PCIe 8x	PCIe PHB3 module A	Long
Slot 5	P2-C5	PCIe 8x	PCIe PHB0 module B	Long
Slot 6	P2-C6	PCIe 8x	PCIe PHB1 module B	Long
GX++	P1-C2	Location for GX++ 12X Channel Adapter (FC 1808)	NA	NA

Table 4. PCI slot locations and descriptions (continued)

Slot	Location code	Description	PHB	Adapter size
GX++	P1-C3	Location for GX++ 12X Channel Adapter (FC 1808)	NA	NA
• All slots support enhanced error handling (EEH). • This system uses generation-4, blind-swap cassettes to manage the installation and removal of adapters. Cassettes can be installed and removed without removing the drawer from the rack.				

PCI and PCI-X expansion units

Each system unit supports up to eight I/O expansion units attached to 12X Channel Adapters. I/O expansion units are usually required to achieve the maximum number of adapters listed in Table 5 on page 8

Expansion unit 57/96 is supported on the systems running AIX or Linux operating systems.

The 57/96 attaches to a 12X Channel Adapter installed in one of the two GX slots available in each system unit. The limit is four 57/96 I/O drawers attached to each 12X Channel Adapter.

Note: For optimum performance, you might want to limit the total number of expansion units containing high bandwidth and extra-high bandwidth adapters. See "Performance notes" on page 13.

The maximum number of attached remote I/O drawers depends on the number processor features configured in the system for 12X Host Channel attached I/O drawers:
- Systems with one system unit support up to eight 57/96 expansion units, four per 12X Channel Adapter.
- Systems with two system units support up to sixteen 57/96 expansion units, four per 12X Channel Adapter.
- Systems with three system units support up to twenty-four 57/96 expansion units, four per 12X Channel Adapter.
- Systems with four system units support up to thirty-two 57/96 expansion units, four per 12X Channel Adapter.

PCIe expansion units

PCIe expansion unit 58/77 and 58/02 are supported on the system running AIX or Linux. The system can be configured to support up to two I/O expansion units per GX adapter.

Restriction: A 12X Channel Adapter that has one or two 58/77 or 58/02 expansion units or one of each 58/77 and 58/02 expansion units connected cannot have anything else connected to that adapter.

Note: For optimum performance, you might want to limit the total number of expansion units containing high bandwidth and extra-high bandwidth adapters. See "Performance notes" on page 13.

The expansion units attach to a 12X Channel Adapter installed in the GX slots available in the system unit.

The maximum number of attached remote I/O drawers depends on the number of system units in the system.
- Systems with one system unit support up to four 58/02 or 58/77 expansion units, two per 12X Channel Adapter.

- Systems with two system units support up to eight 58/02 or 58/77 expansion units, two per 12X Channel Adapter.
- Systems with three system units support up to twelve 58/02 or 58/77 expansion units, two per 12X Channel Adapter.
- Systems with four system units support up to sixteen 58/02 or 58/77 expansion units, two per 12X Channel Adapter.

Systems with a combination of PCI/PCI-X and PCIe expansion units

A system can have a combination of PCI/PCI-X expansion units (57/96) and PCIe expansion units (58/02 or 58/77). The expansion units can not be combined on the same 12X Channel Adapter. Following are the limits per each system unit:

- Up to eight 57/96 (PCI/PCI-X) expansion units
- Up to four 58/02 or 58/77 (PCIe) expansion units
- Up to four 57/96 (PCI/PCI-X) expansion units on one 12X Channel Adapter and two 58/02 or 58/77 (PCIe) expansion units on the second 12X Channel Adapter.

PCI and PCI-X adapters

Use this information to identify slot placement priorities and the maximum number of specified adapters allowed. In the following table, adapters are sorted in descending order by priority. The highest priority adapters are first in the table.

Table 5. Adapter slot priorities and maximums for PCI and PCI-X adapters

Feature code	Description	Maximum number of adapters supported

5908[2]	PCI-X DDR 1.5GB cache SAS RAID Adapter (FC 5908)
	• Long, 64-bit, 3.3 V
	• Extra-high bandwidth
	• Double-wide adapter requires two adjacent slots:
	  – 572F is the CCIN number on the SAS controller side of the double-wide adapter.
	  – 575C is the CCIN number on the write-cache side of the double-wide adapter.
	• The different feature codes indicate whether a blind-swap cassette is used and its type:
	  – 5904 indicates no blind-swap cassette.
	  – 5906 indicates a generation-2.5 blind-swap cassette.
	  – 5908 indicates a generation-3 blind-swap cassette.
	• OS support: AIX, , and Linux
		64 per system

Table 5. Adapter slot priorities and maximums for PCI and PCI-X adapters (continued)

Feature code	Description	Maximum number of adapters supported
5902[2]	PCI-X DDR Ext Dual-x4 3Gb SAS RAID Adapter (FC 5902) • Long, 64-bit, 3.3 V • Extra-high bandwidth • The adapter must be connected and configured in a dual controller mode, multi-initiator configuration, and this configuration requires that the adapters are installed in pairs. • This adapter supports disk expansion units. This adapter does not support media expansion units. • OS support: AIX and Linux	192 per system
5912[2]	PCI-X DDR Dual-x4 3Gb SAS Adapter (FC 5912) • Short, 64-bit, 3.3 V • Extra-high bandwidth • Supports a dual controller mode, multi-initiator configuration • OS support: AIX, , and Linux	192 per system
5759[2]	4 Gb Dual-Port Fibre Channel PCI-X 2.0 DDR Adapter (FC 5759) • Short, 64-bit, 3.3 V • Extra-high bandwidth • OS support: AIX, , and Linux	192 per system
5706[1]	2-Port 10/100/1000 Base-TX Ethernet PCI-X Adapter (FC 5706) • Short, 32-bit or 64-bit 3.3 V or 5 V • High bandwidth • OS support: AIX, , and Linux	192 per system
5713[1]	1 Gigabit-TX iSCSI TOE PCI-X Adapter (FC 5713) • Short, 32-bit or 64-bit 3.3 V or 5 V • High bandwidth • OS support: AIX, , and Linux	192 per system
1912	PCI-X DDR 2.0 Dual Channel Ultra320 SCSI Adapter (FC 1912)	192 per system
5736[1]	PCI-X DDR 2.0 Dual Channel Ultra320 SCSI Adapter (FC 5736) • Short, 32 bit or 64-bit, 3.3 V • High bandwidth • OS support: AIX, , and Linux	192 per system
4764	PCI-X Cryptographic Coprocessor (FC 4764) • Short, 64-bit, 3.3 V • OS support: AIX and	192 per system

Table 5. Adapter slot priorities and maximums for PCI and PCI-X adapters (continued)

Feature code	Description	Maximum number of adapters supported
[1]High bandwidth adapter. See the "Performance notes" on page 13 before installing this adapter.		
[2]Extra-high bandwidth adapter. See the "Performance notes" on page 13 before installing this adapter.		

PCIe adapters

Use this information to identify slot placement priorities and the maximum number of specified adapters allowed. In the following table, adapters are sorted in descending order by priority. The highest priority adapters are first in the table.

Table 6. Adapter slot priorities and maximums for PCIe adapters

Feature code	Description	System unit slot priority[3]	Maximum number of adapters supported
4808	PCIe Cryptographic Coprocessor (FC 4808) • Generation-3 blind-swap cassette • PCIe x4, full-height, half-length • OS support: AIX and	1, 5, 2, 6, 3, 4	10
4809	PCIe Cryptographic Coprocessor (FC 4809) • Generation-4 blind-swap cassette • PCIe x4, full-height, half-length • OS support: AIX and	1, 5, 2, 6, 3, 4	10
5732[2]	10 Gigabit Ethernet-CX4 PCI Express Adapter (FC 5732) • Short, x8 • Extra-high bandwidth • OS support: AIX and Linux	1, 5, 2, 6, 3, 4	128
5769[2]	10 Gigabit Ethernet-SR PCI Express Adapter (FC 5769) • Short, full-high, x8 • Low-profile capable • High bandwidth • OS support: AIX and Linux	1, 5, 2, 6, 3, 4	128
5772[2]	10 Gigabit Ethernet-LR PCI Express Adapter (FC 5772) • Short, x8 • Low-profile capable • Extra-high bandwidth • OS support: AIX, , and Linux	1, 5, 2, 6, 3, 4	48

Feature code	Description	System unit slot priority[3]	Maximum number of adapters supported
5708[2]	10Gb FCoE PCIe Dual Port Adapter (FC 5708) • Regular full-height • PCIe 2.0 adapter with x8 Generation-1 • Convergence enhanced Ethernet (CEE) supported • OS support: AIX, Linux, and with VIOS.	1, 5, 2, 6, 3, 4	• 184 • If only one port is planned to be active in normal operation, the adapter is counted as an extra-high bandwidth adapter. If both ports are planned to be active, the adapter needs to be treated as two extra-high bandwidth adapters.
5735[2]	8-Gigabit PCI Express Dual Port Fibre Channel Adapter (FC 5735) • Short, x8 • Extra-high bandwidth: If only one port is planned to be active in normal operation, the adapter is counted as an extra-high bandwidth adapter. If both ports are planned to be active, the adapter must be treated as two extra-high bandwidth adapters. • OS support: AIX, , and Linux	1, 5, 2, 6, 3, 4	• 184 • If only one port is planned to be active in normal operation, the adapter is counted as an extra-high bandwidth adapter. If both ports are planned to be active, the adapter needs to be treated as two extra-high bandwidth adapters.
5903[2]	PCIe 380 MB Cache Dual x4 3Gb SAS RAID Adapter (FC 5903) • Short, x8 • Extra-high bandwidth • Installed in pairs • OS support: AIX and Linux	1, 5, 2, 6, 3, 4	184
5901[2]	PCIe Dual - x4 SAS Adapter (FC 5901) • Short, x8 • Extra-high bandwidth • OS support: AIX, , and Linux	1, 5, 2, 6, 3, 4	184
5767[1]	2-Port 10/100/1000 Base-TX Ethernet PCI Express Adapter (FC 5767) • Short, x4 • High bandwidth • OS support: AIX, , and Linux	1, 5, 2, 6, 3, 4	• 184 • 64 for
5768[1]	2-Port Gigabit Ethernet-SX PCI Express Adapter	1, 5, 2, 6, 3, 4	• 184 • 64 for
5717[1]	4-Port 10/100/1000 Base-TX PCI Express Adapter (FC 5717) • Short, x4 • High bandwidth • OS support: AIX and Linux	1, 5, 2, 6, 3, 4	184

Table 6. Adapter slot priorities and maximums for PCIe adapters (continued)

Feature code	Description	System unit slot priority[3]	Maximum number of adapters supported
5773[1]	4 Gigabit PCI Express Single Port Fibre Channel Adapter (FC 5773) • Short, x4 • High bandwidth • OS support: AIX and Linux	1, 5, 2, 6, 3, 4	184
5774[2]	4 Gigabit PCI Express Dual Port Fibre Channel Adapter (FC 5774) • Short, x4 • Extra-high bandwidth • OS support: AIX, , and Linux	1, 5, 2, 6, 3, 4	184
5748	POWER GXT145 PCI Express Graphics Accelerator (FC 5748) • Short, x1 • Not hot-pluggable • OS support: AIX and Linux	1, 5, 2, 6, 3, 4	8
5785	4 Port Async EIA-232 PCIe Adapter (FC 5785) • Short, x1 • OS support: AIX and Linux	1, 5, 2, 6, 3, 4	184
2728	4-Port USB PCIe Adapter (FC 2728) • Low-profile adapter • Single-slot, half-length PCIe adapter • PCIe 1.1 • OS support: AIX and Linux	1, 5, 2, 6, 3, 4	8
5899/576F	PCIe2 4-port 1GbE Adapter (FC 5899) • Regular-height adapter • PCIe generation-1 or generation-2, x4 • High bandwidth • Four-port 1 Gb Ethernet • OS support: AIX, Linux, and	1, 5, 2, 6, 3, 4	184
ESA1	PCIe2 RAID SAS Adapter Dual-port 6Gb (FC ESA1) • Regular-height adapter • PCIe generation-2, x8 • OS support: AIX, , and Linux	1, 5, 2, 6, 3, 4	184

Table 6. Adapter slot priorities and maximums for PCIe adapters (continued)

Feature code	Description	System unit slot priority[3]	Maximum number of adapters supported
EC28	PCIe2 2-Port 10GbE RoCE SFP+ adapter (FC EC28) • Regular-height adapter • PCIe generation-2, x8 • Extra-high bandwidth, low latency 10 Gb Ethernet • OS support: AIX	1, 5, 2, 6, 3, 4	4
[1] High bandwidth adapter. See the "Performance notes" before installing this adapter.			
[2]Extra-high bandwidth adapter. See the "Performance notes" before installing this adapter.			
[3]The adapters are spread across the system unit and the slot in this order for the best performance.			

Performance notes

Use the information in this section to help determine the maximum number of adapters that can be placed in a system while still maintaining optimum performance.

Performance notes regarding GX++ Channel Adapters and I/O expansion units

When using extra-high bandwidth adapters, follow these guidelines:
- The I/O expansion units should be limited to one expansion unit per GX++ Channel Adapter (FC 1808) Do not connect multiple expansion units to the same GX++ Channel Adapter.
- When using multiple GX++ Channel Adapters on a system with multiple system units, spread the GX++ Channel Adapter (FC 1808) across the system units. For example, on a system with two system units and using two FC 5802 expansion units, use two FC 1808 GX++ Channel Adapters, and install one in the P1-C2 slot of system unit one and then place the second FC 1808 unit in P1-C2 slot in the second system unit (rather then installing both in the system unit 1 slots of P1-C2 and P1-C3). This will spread the I/O across the system units for best performance.

Table 5 on page 8 and Table 6 on page 10 identify the slot placement priorities and the maximum number of specified adapters allowed for connectivity. However, for optimum performance, you might want to further limit the total number of high bandwidth and extra-high bandwidth adapters. If you need to expand the I/O capacity of the system for extra-high bandwidth adapters, consider using high-performance I/O expansion units like the 57/96, 58/02, or 58/77.

The following four tables provide guidelines on the maximum number of high bandwidth and extra-high bandwidth adapters you can use and still maintain optimum performance.

Note: Because of the many types of application workloads, these guidelines cannot cover all cases. The numbers in the following tables are suggestions for single types of adapters that are running exclusively. For systems with mixed adapter types or that have high aggregate bandwidth requirements, consult a support representative for additional guidelines.

Extra-high bandwidth storage adapters

Table 7. Maximum number of extra-high bandwidth storage adapters for best performance

System configuration	PCIe adapters in system units	PCI, PCI-X adapters in I/O expansion unit FC 57/96[1]	Adapters in system units plus I/O expansion FC 57/96[1]	PCIe adapters in 58/02 or 58/77 I/O Expansion units [1]	System maximum [1]
One system unit	6	3	6	4	10
Two system units	12	6	12	8	20
Three system units	18	9	18	12	30
Four system units	24	12	24	16	40

[1]If 5708 or 5735 adapters are used in an application with both ports active, each adapter counts as two extra-high bandwidth adapters.

High bandwidth storage adapters

Table 8. Maximum number of high bandwidth storage adapters for best performance

System configuration	PCIe adapters in system units	PCI, PCI-X adapters in I/O expansion unit FC 57/96[1]	Adapters in system units plus I/O expansion FC 57/96[1]	PCIe adapters in 58/02 or 58/77 I/O Expansion units [1]	System maximum
One system unit	6	6	12	8	20
Two system units	12	12	24	16	40
Three system units	18	18	36	24	60
Four system units	24	24	48	32	80

Extra-high bandwidth Ethernet adapters

Table 9. Maximum number of extra-high bandwidth Ethernet adapters for best performance

System configuration	PCIe adapters in system units[2]	PCI, PCI-X adapters in I/O expansion unit FC 57/96[1]	Adapters in system units plus I/O expansion FC 57/96[1]	PCIe adapters in 58/02 or 58/77 I/O Expansion units [1]	System maximum
One system unit	2	2	2	2	2
Two system units	4	4	4	4	4
Three system units	6	6	6	6	6
Four system units	8	8	8	8	8

[1]

- For optimum performance, no more than one 10 Gb Ethernet port per two processors should be used in a system. If one 10 Gb Ethernet port is present per POWER7 processor, no other 10 Gb or 1 Gb ports should be used.
- If 5708 or 5735 adapters are used in an application with both ports active, each adapter counts as two extra-high bandwidth adapters.

[2]For best performance, Extra-high bandwidth Ethernet adapters should be installed in 5802 or 5877 expansion drawers when available, instead of using internal system unit slots.

High bandwidth Ethernet adapters

Table 10. Maximum number of high bandwidth Ethernet adapters for best performance

System configuration	PCIe adapters in system units	PCI, PCI-X adapters in I/O expansion unit FC 57/96[1]	Adapters in system units plus I/O expansion FC 57/96[1]	PCIe adapters in 58/02 or 58/77 I/O Expansion units [1]	System maximum
One system unit	6	6	6	6	8
Two system units	12	12	12	12	16
Three system units	18	18	18	18	24
Four system units	24	24	24	24	32
[1]For optimum performance, no more than one 10 Gb Ethernet port per two processors should be used in a system. If two 1 Gb Ethernet ports are present per processor, no other 1 Gb or 10 Gb ports should be used.					

PCI adapter slot priorities for the 79M/HB or 79M/HC

Some adapters must be placed in specific Peripheral Component Interconnect (PCI), Peripheral Component Interconnect-X (PCI-X), or PCI Express (PCIe) slots to function correctly or to perform optimally. Use this information to determine where to install PCI adapters.

PCI slot descriptions

Figure 2 shows the rear view of the system unit with the location codes for the PCI and GX++ 12X Channel Adapter (FC 1808) slots. Table 11 describes the slots. Each PCI-X DDR or PCIe is a separate PCI host bridge (PHB).
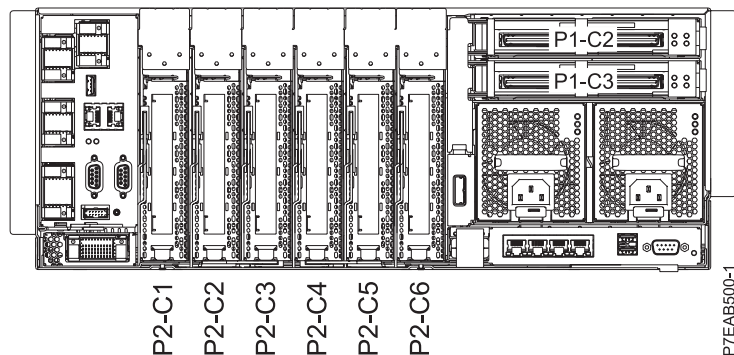
Figure 2. Rear view of enclosure with location codes

Table 11. PCI slot locations and descriptions

Slot	Location code	Description	PHB	Adapter size
Slot 1	P2-C1	PCIe 8x	PCIe PHB0 module A	Long
Slot 2	P2-C2	PCIe 8x	PCIe PHB1 module A	Long
Slot 3	P2-C3	PCIe 8x	PCIe PHB2 module A	Long
Slot 4	P2-C4	PCIe 8x	PCIe PHB3 module A	Long
Slot 5	P2-C5	PCIe 8x	PCIe PHB0 module B	Long
Slot 6	P2-C6	PCIe 8x	PCIe PHB1 module B	Long
GX++	P1-C2	Location for GX++ 12X Channel Adapter (FC 1808)	NA	NA

Table 11. PCI slot locations and descriptions (continued)

Slot	Location code	Description	PHB	Adapter size
GX++	P1-C3	Location for GX++ 12X Channel Adapter (FC 1808)	NA	NA
• All slots support enhanced error handling (EEH).				
• This system uses generation 4, blind swap cassettes to manage the installation and removal of adapters. Cassettes can be installed and removed without removing the drawer from the rack.				

PCI and PCI-X expansion units

Each system supports up to eight I/O expansion units attached to 12X Channel Adapters. I/O expansion units are usually required to achieve the maximum number of adapters listed in Table 12 on page 17

Expansion unit 57/96 is supported on the systems running AIX or Linux operating systems.

The 57/96 attaches to a 12X Channel Adapter installed in one of the two GX slots available in each system unit. The limit is four 57/96 I/O drawers attached to each 12X Channel Adapter.

Note: For optimum performance, you might want to limit the total number of expansion units containing high bandwidth and extra-high bandwidth adapters. See "Performance notes" on page 21.

The maximum number of attached remote I/O drawers depends on the number processor features configured in the system for 12X Host Channel attached I/O drawers:
- Systems with one system unit support up to eight 57/96 expansion units, four per 12X Channel Adapter.
- Systems with two system units support up to sixteen 57/96 expansion units, four per 12X Channel Adapter.
- Systems with three system units support up to twenty-four 57/96 expansion units, four per 12X Channel Adapter.
- Systems with four system units support up to thirty-two 57/96 expansion units, four per 12X Channel Adapter.

PCIe expansion units

PCIe expansion unit 58/77 and 58/02 are supported on the system running AIX or Linux. The system can be configured to support up to two I/O expansion units per GX adapter.

Restriction: A 12X Channel Adapter that has one or two 58/77 or 58/02 expansion units connected cannot have anything else connected to that adapter.

Note: For optimum performance, you might want to limit the total number of expansion units containing high bandwidth and extra-high bandwidth adapters. See "Performance notes" on page 21.

The expansion units attach to a 12X Channel Adapter installed in one or both of the two GX slots available in the system unit.

The maximum number of attached remote I/O drawers depends on the number of system units in the system.
- Systems with one system unit support up to four 58/02 or 58/77 expansion units, two per 12X Channel Adapter.
- Systems with two system units support up to eight 58/02 or 58/77 expansion units, two per 12X Channel Adapter.

- Systems with three system units support up to twelve 58/02 or 58/77 expansion units, two per 12X Channel Adapter.
- Systems with four system units support up to sixteen 58/02 or 58/77 expansion units, two per 12X Channel Adapter.

Systems with a combination of PCI/PCI-X and PCIe expansion units

A system can have a combination of PCI/PCI-X expansion units (57/96) and PCIe expansion units (58/02 or 58/77). The expansion units cannot be combined on the same 12X Channel Adapter. Following are the limits per each system unit:

- Up to eight 57/96 (PCI/PCI-X) expansion units
- Up to four 58/02 or 58/77 (PCIe) expansion units
- Up to four 57/96 (PCI/PCI-X) expansion units on one 12X channel adapter and two 58/02 or 58/77 (PCIe) expansion units on the second 12X Channel Adapter.

PCI and PCI-X adapters

Use this information to identify slot placement priorities and the maximum number of specified adapters allowed. In the following table, adapters are sorted in descending order by priority. The highest priority adapters are first in the table.

Table 12. Adapter slot priorities and maximums for PCI and PCI-X adapters

Feature	Description	Maximum number of adapters supported

5908[2]	PCI-X DDR 1.5GB cache SAS RAID Adapter (FC 5908)
	
	• Long, 64-bit, 3.3 V
	• Extra-high bandwidth
	• Double-wide adapter requires two adjacent slots:
	  – 572F is the CCIN number on the SAS controller side of the double-wide adapter.
	  – 575C is the CCIN number on the write-cache side of the double-wide adapter.
	• The different feature codes indicate whether a blind-swap cassette is used and its type:
	  – 5904 indicates no blind-swap cassette.
	  – 5906 indicates a generation-2.5 blind-swap cassette.
	  – 5908 indicates a generation-3 blind-swap cassette.
	• OS support: AIX, , and Linux
		64 per system

Table 12. Adapter slot priorities and maximums for PCI and PCI-X adapters (continued)

Feature	Description	Maximum number of adapters supported
5902[2]	PCI-X DDR Ext Dual-x4 3Gb SAS RAID Adapter (FC 5902) • Long, 64-bit, 3.3 V • Extra-high bandwidth • The adapter must be connected and configured in a dual controller mode, multi-initiator configuration, and this configuration requires that the adapters are installed in pairs. • This adapter supports disk expansion units. This adapter does not support media expansion units. • OS support: AIX and Linux	192 per system
5912[2]	PCI-X DDR Dual-x4 3Gb SAS Adapter (FC 5912) • Short, 64-bit, 3.3 V • Extra-high bandwidth • Supports a dual controller mode, multi-initiator configuration • OS support: AIX, , and Linux	192 per system
5759[2]	4 Gb Dual-Port Fibre Channel PCI-X 2.0 DDR Adapter (FC 5759) • Short, 64-bit, 3.3 V • Extra-high bandwidth • OS support: AIX, , and Linux	192 per system
5706[1]	2-Port 10/100/1000 Base-TX Ethernet PCI-X Adapter (FC 5706) • Short, 32-bit or 64-bit 3.3 V or 5 V • High bandwidth • OS support: AIX, , and Linux	192 per system
5713[1]	1 Gigabit-TX iSCSI TOE PCI-X Adapter (FC 5713) • Short, 32-bit or 64-bit 3.3 V or 5 V • High bandwidth • OS support: AIX, , and Linux	192 per system
1912	PCI-X DDR 2.0 Dual Channel Ultra320 SCSI Adapter (FC 1912)	192 per system
5736[1]	PCI-X DDR 2.0 Dual Channel Ultra320 SCSI Adapter (FC 5736) • Short, 32 bit or 64-bit, 3.3 V • High bandwidth • OS support: AIX, , and Linux	192 per system
4764	PCI-X Cryptographic Coprocessor (FC 4764) • Short, 64-bit, 3.3 V • OS support: AIX and	192 per system

Table 12. Adapter slot priorities and maximums for PCI and PCI-X adapters (continued)

Feature	Description	Maximum number of adapters supported
[1]High bandwidth adapter. See the "Performance notes" on page 21 before installing this adapter.		
[2]Extra-high bandwidth adapter. See the "Performance notes" on page 21 before installing this adapter.		

PCIe adapters

Use this information to identify slot placement priorities and the maximum number of specified adapters allowed. In the following table, adapters are sorted in descending order by priority. The highest priority adapters are first in the table.

Table 13. Adapter slot priorities and maximums for PCIe adapters

Feature	Description	System unit slot priority[3]	Maximum number of adapters supported
4808	PCIe Cryptographic Coprocessor (FC 4808) • Generation-3 blind-swap cassette • PCIe x4, full-height, half-length • OS support: AIX and	1, 5, 2, 6, 3, 4	10
4809	PCIe Cryptographic Coprocessor (FC 4809) • Generation-4 blind-swap cassette • PCIe x4, full-height, half-length • OS support: AIX and	1, 5, 2, 6, 3, 4	10
5732[2]	10 Gigabit Ethernet-CX4 PCI Express Adapter (FC 5732) • Short, x8 • Extra-high bandwidth • OS support: AIX and Linux	1, 5, 2, 6, 3, 4	128
5769[2]	10 Gigabit Ethernet-SR PCI Express Adapter (FC 5769) • Short, full-high, x8 • Low-profile capable • High bandwidth • OS support: AIX and Linux	1, 5, 2, 6, 3, 4	128
5772[2]	10 Gigabit Ethernet-LR PCI Express Adapter (FC 5772) • Short, x8 • Low-profile capable • Extra-high bandwidth • OS support: AIX, , and Linux	1, 5, 2, 6, 3, 4	48
5708[2]	10Gb FCoE PCIe Dual Port Adapter (FC 5708) • Regular full-height • PCIe 2.0 adapter with x8 Generation-1 • Convergence enhanced Ethernet (CEE) supported • OS support: AIX, Linux, and with VIOS.	1, 5, 2, 6, 3, 4	• 184 • If only one port is planned to be active in normal operation, the adapter is counted as an extra-high bandwidth adapter. If both ports are planned to be active, the adapter needs to be treated as two extra-high bandwidth adapters.

Table 13. Adapter slot priorities and maximums for PCIe adapters (continued)

Feature	Description	System unit slot priority[3]	Maximum number of adapters supported
5735[2]	8-Gigabit PCI Express Dual Port Fibre Channel Adapter (FC 5735) • Short, x8 • Extra-high bandwidth: If only one port is planned to be active in normal operation, the adapter is counted as an extra-high bandwidth adapter. If both ports are planned to be active, the adapter must be treated as two extra-high bandwidth adapters. • OS support: AIX, , and Linux	1, 5, 2, 6, 3, 4	• 184 • If only one port is planned to be active in normal operation, the adapter is counted as an extra-high bandwidth adapter. If both ports are planned to be active, the adapter needs to be treated as two extra-high bandwidth adapters.
5903[2]	PCIe 380 MB Cache Dual x4 3Gb SAS RAID Adapter (FC 5903) • Short, x8 • Extra-high bandwidth • Installed in pairs • OS support: AIX and Linux	1, 5, 2, 6, 3, 4	184
5901[2]	PCIe Dual - x4 SAS Adapter (FC 5901) • Short, x8 • Extra-high bandwidth • OS support: AIX, , and Linux	1, 5, 2, 6, 3, 4	184
5767[1]	2-Port 10/100/1000 Base-TX Ethernet PCI Express Adapter (FC 5767) • Short, x4 • High bandwidth • OS support: AIX, , and Linux	1, 5, 2, 6, 3, 4	• 184 • 64 for
5768[1]	2-Port Gigabit Ethernet-SX PCI Express Adapter	1, 5, 2, 6, 3, 4	• 184 • 64 for
5717[1]	4-Port 10/100/1000 Base-TX PCI Express Adapter (FC 5717) • Short, x4 • High bandwidth • OS support: AIX and Linux	1, 5, 2, 6, 3, 4	184
5773[1]	4 Gigabit PCI Express Single Port Fibre Channel Adapter (FC 5773) • Short, x4 • High bandwidth • OS support: AIX and Linux	1, 5, 2, 6, 3, 4	184
5774[2]	4 Gigabit PCI Express Dual Port Fibre Channel Adapter (FC 5774) • Short, x4 • Extra-high bandwidth • OS support: AIX, , and Linux	1, 5, 2, 6, 3, 4	184

Table 13. Adapter slot priorities and maximums for PCIe adapters (continued)

Feature	Description	System unit slot priority₃	Maximum number of adapters supported
5748	POWER GXT145 PCI Express Graphics Accelerator (FC 5748) • Short, x1 • Not hot-pluggable • OS support: AIX and Linux	1, 5, 2, 6, 3, 4	8
5785	4 Port Async EIA-232 PCIe Adapter (FC 5785) • Short, x1 • OS support: AIX and Linux	1, 5, 2, 6, 3, 4	184
2728	4-Port USB PCIe Adapter (FC 2728) • Low-profile adapter • Single-slot, half-length PCIe adapter • PCIe 1.1 • OS support: AIX and Linux	1, 5, 2, 6, 3, 4	8
5899/576F	PCIe2 4-port 1GbE Adapter (FC 5899) • Regular-height adapter • PCIe generation-1 or generation-2, x4 • High bandwidth • Four-port 1 Gb Ethernet • OS support: AIX, Linux, and	1, 5, 2, 6, 3, 4	184
ESA1	PCIe2 RAID SAS Adapter Dual-port 6Gb (FC ESA1) • Regular-height adapter • PCIe generation-2, x8 • OS support: AIX, , and Linux	1, 5, 2, 6, 3, 4	184
EC28	PCIe2 2-Port 10GbE RoCE SFP+ adapter (FC EC28) • Regular-height adapter • PCIe generation-2, x8 • Extra-high bandwidth, low latency 10 Gb Ethernet • OS support: AIX	1, 5, 2, 6, 3, 4	4

[1] High bandwidth adapter. See the "Performance notes" before installing this adapter.

[2] Extra-high bandwidth adapter. See the "Performance notes" before installing this adapter.

[3] The adapters are spread across the system unit and the slot in this order for the best performance.

Performance notes

Use the information in this section to help determine the maximum number of adapters that can be placed in a system while still maintaining optimum performance.

Performance notes regarding GX++ channel adapters and I/O expansion units

When using extra-high bandwidth adapters, follow these guidelines:
• The I/O expansion units should be limited to one expansion unit per GX++ Channel Adapter (FC 1808) Do not connect multiple expansion units to the same GX++ Channel Adapter.

- When using multiple GX++ Channel Adapters on a system with multiple system units, spread the GX++ Channel Adapter (FC 1808) across the system units. For example, on a system with two system units and using two FC 5802 expansion units, use two FC 1808 GX++ Channel Adapters, and install one in the P1-C2 slot of system unit one and then place the second FC 1808 unit in P1-C2 slot in the second system unit (rather then installing both in the system unit 1 slots of P1-C2 and P1-C3). This will spread the I/O across the system units for best performance.

Table 12 on page 17 and Table 13 on page 19 identify the slot placement priorities and the maximum number of specified adapters allowed for connectivity. However, for optimum performance, you might want to further limit the total number of high bandwidth and extra-high bandwidth adapters. If you need to expand the I/O capacity of the system for extra-high bandwidth adapters, consider using high-performance I/O expansion units like the 57/96, 58/02, or 58/77.

The following tables provide guidelines on the maximum number of high bandwidth and extra-high bandwidth adapters you can use and still maintain optimum performance.

Note: Because of the many types of application workloads, these guidelines cannot cover all cases. The numbers in the following tables are suggestions for single types of adapters that are running exclusively. For systems with mixed adapter types or that have high aggregate bandwidth requirements, consult a support representative for additional guidelines.

Extra-high bandwidth storage adapters

Table 14. Maximum number of extra-high bandwidth storage adapters for best performance

System configuration	PCIe adapters in system units[1]	PCI, PCI-X adapters in I/O expansion unit FC 57/96[2]	Adapters in system units plus I/O expansion FC 57/96[2]	PCIe adapters in 58/02 or 58/77 I/O Expansion units [2]	System maximum [2]
One system unit	6	3	6	4	10
Two system units	12	6	12	8	20
Three system units	18	9	18	12	30
Four system units	24	12	24	16	40

[1]For best performance, Extra-high bandwidth Ethernet adapters should be installed in 58/02 or 58/77 expansion drawers when available, instead of using internal system unit slots.

[2]If 5708 or 5735 adapters are used in an application with both ports active, each adapter counts as two extra-high bandwidth adapters.

High bandwidth storage adapters

Table 15. Maximum number of high bandwidth storage adapters for best performance

System configuration	PCIe adapters in system units	PCI, PCI-X adapters in I/O expansion unit FC 57/96[2]	Adapters in system units plus I/O expansion FC 57/96[2]	PCIe adapters in 58/02 or 58/77 I/O Expansion units [2]	System maximum
One system unit	6	6	12	8	20
Two system units	12	12	24	16	40
Three system units	18	18	36	24	60
Four system units	24	24	48	32	80

Extra-high bandwidth Ethernet adapters

Table 16. Maximum number of extra-high bandwidth Ethernet adapters for best performance

System configuration	PCIe adapters in system units	PCI, PCI-X adapters in I/O expansion unit FC 57/96[2]	Adapters in system units plus I/O expansion FC 57/96[2]	PCIe adapters in 58/02 or 58/77 I/O Expansion units [2]	System maximum
One system unit	2	2	2	2	2
Two system units	4	4	4	4	4
Three system units	6	6	6	6	6
Four system units	8	8	8	8	8

[2]
- For optimum performance, no more than one 10 Gb Ethernet port per two processors should be used in a system. If one 10 Gb Ethernet port is present per POWER7 processor, no other 10 Gb or 1 Gb ports should be used.
- If 5708 or 5735 adapters are used in an application with both ports active, each adapter counts as two extra-high bandwidth adapters.

High bandwidth Ethernet adapters

Table 17. Maximum number of high bandwidth Ethernet adapters for best performance

System configuration	PCIe adapters in system units	PCI, PCI-X adapters in I/O expansion unit FC 57/96[2]	Adapters in system units plus I/O expansion FC 57/96[2]	PCIe adapters in 58/02 or 58/77 I/O Expansion units [2]	System maximum
One system unit	6	6	6	6	8
Four processor features, two system units	12	12	12	12	16
Three system units	18	18	18	18	24
Four system units	24	24	24	24	32

[2]For optimum performance, no more than two 1 Gb Ethernet ports per processor should be used in a system. If two 1 Gb Ethernet ports are present per processor, no other 1 Gb or 10 Gb ports should be used.

I/O expansion units

Learn about I/O expansion units that are supported on the systems systems that contain the POWER7 processor.

PCI adapter slot priorities for the 5796 expansion unit

Find information about the PCI slots in the 5796 expansion unit.

System description

The 5796 expansion unit is a 19-inch, rack-mountable, I/O expansion drawer that is designed to be attached to the system unit using the 12X channel bus and 12X cables.

The 5796 can accommodate six generation-3 blind-swap adapter cassettes. Cassettes can be installed and removed without removing the drawer from the rack.

The following figure shows the rear view of the expansion unit.

Figure 3. Rear view

Table 18. Location code descriptions. This table describes the location codes that are shown in Figure 3.

Location code	Description
C1, C2, C3, C4, C5, and C6	PCI-X DDR slots. See also "PCI slot descriptions."
C7-T1 and C7-T2	12X Channel remote I/O ports.
C8-T1 and C8-T2	Dual port SPCN connectors.
E1 and E2	Power supply connectors.

PCI slot descriptions

Table 19. Slot properties. This table describes the PCI-X DDR slots.

PHB2 A	PHB3 A	PHB4 A	PHB1 B	PHB2 B	PHB3 B
Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6
Long	Long	Long	Long	Long	Long
64 bit 3.3V, 266 MHz	64 bit 3.3V, 266 MHz	64 bit 3.3V, 266 MHz	64 bit 3.3V, 266 MHz	64 bit 3.3V, 266 MHz	64 bit 3.3V, 266 MHz
C1	C2	C3	C4	C5	C6

- Each PCI-X DDR slot is a separate PCI host bridge (PHB).
- All slots are compatible with PCI and PCI-X DDR adapters.
- Short adapters can go in long slots.

Slot priorities

Slot priority for all adapters is 1, 4, 2, 5, 3, and 6. For a list of supported adapters, see the placement information for the base system unit to which the expansion unit is attached.

PCI adapters slot priorities for the 58/02 and 58/77 expansion units

Learn about the PCI Express (PCIe) slots in the 58/02 and 58/77 expansion units.

System description

The 58/02 and 58/77 expansion units are 19-inch, rack-mountable, I/O expansion drawers that are designed to be attached to the system using 12x double date rate (DDR) cables.

The expansion units can accommodate 10 generation-3 cassettes. These cassettes can be installed and removed without removing the drawer from the rack. The expansion units do not support I/O processor (IOP) adapters.
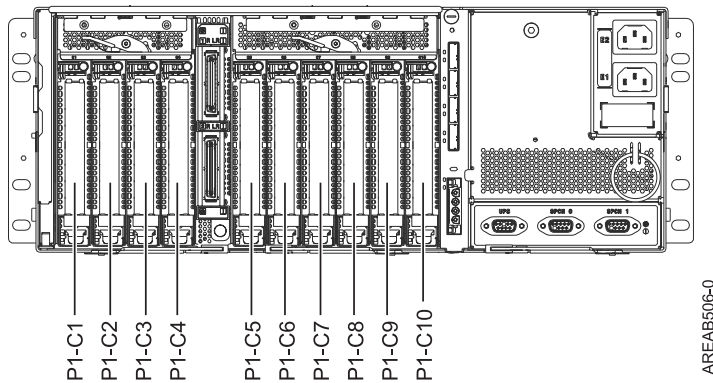
Figure 4. Rear view. This figure shows the rear view of the expansion unit.
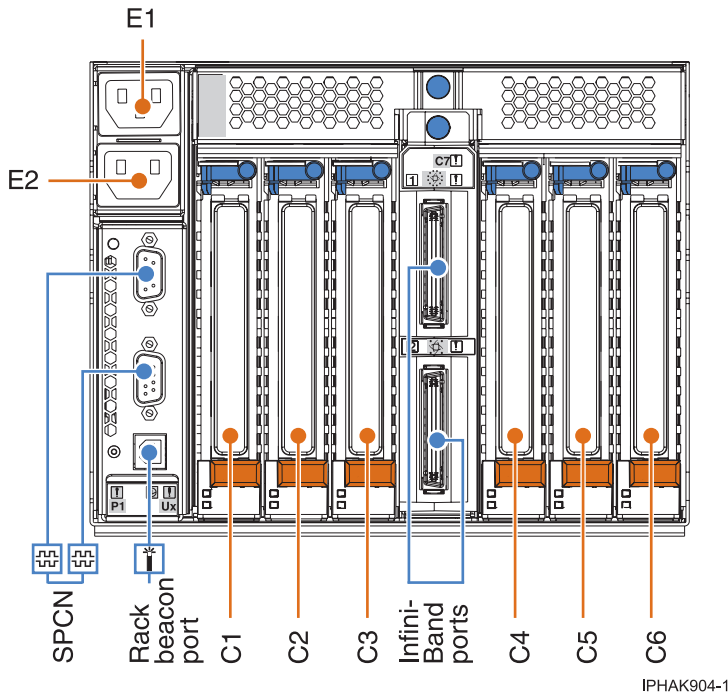
Table 20. Location code descriptions. This table describes the location codes that are shown in Figure 4.

Location code	I/O chip	PCI host bridge (PHB)	Description
P1-C1	I/O chip 1	PHB1	PCIe x8 slot
P1-C2		PHB2	
P1-C3		PHB3	
P1-C4	I/O chip 2	PHB4	
P1-C5		PHB5	
P1-C6		PHB6	
P1-C7	I/O chip 3	PHB7	
P1-C8		PHB8	
P1-C9		PHB9	
P1-C10		PHB10	

Slot priority

The slot priority for all adapters is P1-C1, P1-C4, P1-C2, P1-C5, P1-C3, P1-C6, P1-C7, P1-C8, P1-C9, and P1-C10.

There are three I/O chips. Each I/O chip controls three or 4 PCI host bridges (PHBs) and each PCIe slot connects directly to a PHB.
- One I/O chip controls slots P1-C1, P1-C2, and P1-C3.
- A second I/O chip controls slots P1-C4, P1-C5, and P1-C6.
- A third I/O chips controls slots P1-C7, P1-C8, P1-C9, and P1-C10.

For best performance, fill P1-C1, P1-C4, P1-C2, P1-C5, P1-C3, and P1-C6 first with the highest bandwidth adapters. Then fill the remaining slots.

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IBM-Allee 1, 71139 Ehningen, Germany
Tele: +49 7032 15-2937
email: tjahn@de.ibm.com

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