

I/O Upgrade Manual

**HP3000/9x9KS and HP9000 K-Class
Enterprise Servers**



A2375-90027

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New editions of this manual incorporate all material updated since the previous edition. The manual printing date and part number indicate its current edition. The printing date changes when a new edition is printed. (Minor corrections and updates which are incorporated at reprint do not cause the date to change.) The manual part number changes when extensive technical changes are incorporated.

February 1995.....	Edition 1
September 1995.....	Edition 2
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June 1996.....	Edition 4
July 1997.....	Edition 5
January 1998.....	Edition 6

Change Narrative

- Edition 6 technical changes include the addition of HP9000/K380/K580 information throughout the manual.
- Minor changes and updates were also incorporated.

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1 I/O Upgrade

This I/O Upgrade manual provides information for expanding the I/O capability of the HP 3000/9x9KS and HP 9000/K2x0, K3x0, K4x0, and K5x0 computer systems.

Introduction

The Upgrades available are shown in Table 1-1.

Table 1-1 Available Upgrades

Available Upgrades		Computer Systems		
Upgrade Type	Product No.	HP3000/ 9x9KS	HP9000/ K4x0	HP9000/ K3x0/K5x0
Add 4 HP-PB slots	A3185A	Yes	Yes	No
Add 2 Primary HP-HSC slots	A3186A	No	Yes	No
	A3696A	No	No	Yes
Add 4 Primary HP-HSC slots	A2990A	No	Yes	No
	A3695A	No	No	Yes ^a
Add 4 Secondary dual-bus HP-HSC slots	A3694A	No	No	Yes ^a

a. HP9000/K5x0 only

HP-HSC I/O upgrades are achieved by the addition of an expansion card with two or four slots. However, two and four slot Primary I/O expansion cards cannot be installed in the same computer. The HP9000/K5x0 systems allow the addition of a secondary I/O expansion.

Electrostatic Discharge**Backplane Card Slot Color Codes**

The following color bars appear above the slots on the system backplane:

Table 1-2 Color Codes

Color	Slot
Yellow	HP-PB0
Green	HP-PB1
Blue	Core/IO
Orange	HP-HSC Expansion I/O (primary)
Split Magenta/Purple ^a	Optional HP-HSC Secondary I/O ^b or additional Processor slots.
Purple	Processor slots.

a. HP9000/K3x0/K5x0 systems.

b. HP9000/K5x0 systems only.

I/O and processor cards have matching color codes to assist in correctly matching the cards to the right slots.

Electrostatic Discharge

Computer systems contain assemblies and components that are sensitive to electrostatic discharge (ESD). Carefully observe the precautions listed in this section and use the ESD wrist strap, ESD sheet, and ESD foam pad provided in the ESD kit (part number A3024-80004). The following precautions can significantly reduce the risk of system failure or component damage due to ESD.

- Always wear a grounded wrist strap when working around a system or handling any assembly, component, or card.
- Treat all assemblies, components, cards, and connections as sensitive.
- When unpacking cards or components to the system, keep the item in its conductive bag until it is ready to be installed.
- Keep body movement to a minimum, this generates static electricity that causes ESD.
- Avoid working in carpeted areas.
- Try to select a work area where potential static sources are minimized.

Anti-Static Wrist Strap

The anti-static wrist strap is a bracelet like strip that goes around either wrist. The other end of the strap connects to a convenient metal surface on the computer cabinet.

Anti-Static Mat

The anti-static mat can be either the conductive bag, the ESD sheet, or the ESD foam pad. The anti-static mat does not have to be connected to the cabinet. It should be placed close to the computer while performing the upgrade tasks.

Tools required

To accomplish the upgrade procedures to the computer the following tools are required:

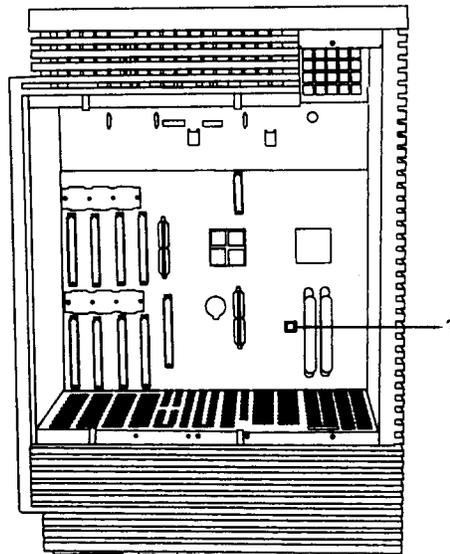
- A Torx #10 driver. (This is the preferred tool)
- A flat blade screw driver. (this can be used if a Torx driver is not available)
- A3204-80004 ESD Kit
- Chip extraction tool (HP part number 8710-1982)
- Flashlight or alternate light source (recommended but not required)

HP-PB Upgrade

CAUTION The procedures outlined in the HP-PB UPGRADE section are to be performed by trained and experienced Field Service personnel. If you have not received Hewlett Packard Service Training or do not have the equivalent hardware experience, DO NOT attempt these procedures.

To expand the HP-PB I/O capability of the computer, the Programmable Array Logic (PAL) chip on the system board has to be changed. The PAL chip is accessed from the back of the computer and is located in the same place for either the HP 3000 or the HP 9000 systems. Figure 1-1, item 1, shows the PAL location with all components removed from the back of the computer.

Figure 1-1 PAL Chip Location



HP-PB Upgrade Procedures

Be sure to observe all ESD precautions. The suggested time to perform the upgrade is at a non-peak usage for the computer. To accomplish the upgrade, perform the following steps:

1. Log Off all users and stop all active applications that may be running.
2. Perform a system backup of the entire Operating System and data base. If this is not feasible, perform a backup of the data base. (This should be done at a scheduled interval as common practice for protecting any new data or changes to the existing data base.)
3. Perform a system shutdown. Enter `"/etc/shutdown -h"` at the prompt.
4. Turn the computer key switch to the STANDBY position.
5. At the rear of the computer, unplug the power cord.
6. Loosen the four (two top and two bottom) captive screws on the power supply, then grasp the extractor levers and pull them out.

NOTE On HP9000/K250/K260/K450/K460/K370/K380/K570/K580 and 979KS systems, the power supply has six captive screws, three each on the top and bottom.

7. Grasp the handle on the power supply and pull it out of the computer.

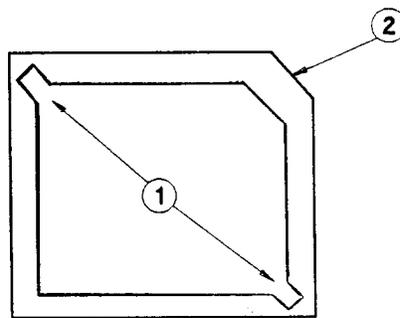
CAUTION The power supply may weigh as much as 26.5 lbs (12 kg). Be careful lifting it and be careful where you put it down.

8. Remove the back CPU cover plate by loosening the two (one top and one bottom) captive mounting screws and pulling the cover plate away.

9. Carefully remove the CPU cards (if they are present) and place them on the anti-static sheet.

10. Reach into the computer and insert the tapered end of the extraction tool (8710-1982) into one of the extraction slots (Figure 1-2, item 1) in the PAL socket (U30).

Figure 1-2 PAL Chip Socket



11. Gently pry up on the corner of the PAL chip (each side) until you can safely remove it. Be careful not drop the chip inside the computer cabinet, because it could fall into the fan compartment.

12. Match the beveled corner (Figure 1-2, item 2) of the PAL socket to the beveled corner of the PAL chip (A2375-81801).

13. Place the PAL chip into the socket and gently push until it fully seats.

14. Remove the HP-PB1 cover plate, and install the HP-PB card guides (5062-9367) and single high bulkheads (5062-3343).

15. Replace the power supply and CPU card(s) that were removed.

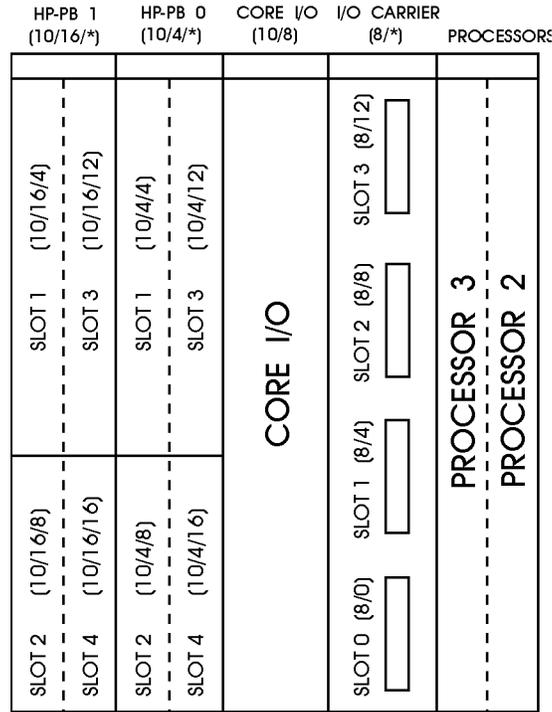
16. Connect the power cord to the rear of the computer.

17. Turn the computer key switch to the ON position.

18. Observe the Front Panel Display and Console for any error or fault (FLT) messages.

Figure 1-3 shows the added HP-PB I/O slots. The four slots under the HP-PB 1 title are the additional I/O slots. Any supported HP-PB I/O cards can now be installed into the computer.

Figure 1-3 HP-PB I/O Slot Locations - HP9000/K4x0 System



bh1c001

Although Figure 1-3 shows an HP 9000/K4x0 computer, the HP-PB locations are the same for the HP 3000/ 9x9KS computer. The Slot path addresses are also the same as shown in Table 1-3.

Table 1-3 HP-PB Address Path

Location	Device Type	Address Path
HP-PB 1, slot 1	HP-PB I/O card	10/16/4 (device addr.)
HP-PB 1, slot 2	HP-PB I/O card	10/16/8(device addr.)
HP-PB 1, slot 3	HP-PB I/O card	10/16/12(device addr.)
HP-PB 1, slot 4	HP-PB I/O card	10/16/16(device addr.)

HP-HSC Upgrade

HP-HSC I/O expansion is not supported on the HP 3000 computer system, or the HP 9000/K100/K2x0 computer systems. The procedures in this section only apply to the HP 9000/K3x0/K4x0, and K5x0 computers.

HP9000/K3x0 and K4x0 systems have a single (primary) HP-HSC Expansion I/O slot for upgrades. This slot is immediately to the right of the Core I/O card as viewed from the rear of the system. HP9000/K5x0 systems can optionally use the slot to the right of the primary expansion I/O slot for additional processors OR as a secondary HP-HSC Expansion I/O slot.

HP-HSC Configuration Rules

Before starting the upgrade procedures, there are a few configuration rules that need to be explained:

- If there is a 2-D Graphics Device Adapter (DA) card (A2636-66023 or A3519-60001) in the Optional I/O slot of the core I/O card, you must move that Graphics DA card to the primary HP-HSC expansion card.
- The Fast-Wide SCSI Card (A2969-60001) can be installed in the Optional I/O slot on the core I/O card (if available).

NOTE	It is recommended that Dual bus Secondary HP-HSC Expansion I/O cards be installed only in systems where a 2-slot or 4-slot HSC Expansion I/O card is resident in the primary HP-HSC Expansion I/O slot.
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NOTE	Configuration Guidelines
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1. Some system configurations can compete for I/O bus usage with the built-in 802.3 LAN interface on the standard multifunction I/O (CoreI/O). The result is a slow down in LAN performance due to an increase in CRC errors (LAN retries). An add-in 802.3 LAN card should be used as the primary LAN interface when using four or more Kx70 or Kx80 processors with less than 1.5GB of memory, or when using the VISUALIZE 2-D graphics card in the optional H-HSC I/O slot on the multifunction I/O.
 2. If a 100BT I/O card (NIO or GSC) is installed, DO NOT USE LASI LAN.
 3. A minimum of 1.5GB of main memory must be configured so that there are eight banks or greater in at least one memory interleave group. Memory module sizes should be limited to 32MB (64MB pair) of Double In-line Memory Modules (DIMMs) or larger. For best performance, it is recommended that memory be configured over two memory carriers.
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Primary Expansion I/O Upgrade Procedures

To accomplish the upgrade, perform the following steps. Be sure to observe all ESD precautions.

1. Log Off all users and stop all active applications that may be running.
2. Perform a system backup of the entire Operating System and data base. If this is not feasible, perform a backup of the data base. (Backups should be performed at a scheduled interval as common practice for protecting any new data or changes to the existing data base.)
3. Perform a system shutdown. Enter "/etc/shutdown -h" at the prompt.
4. Turn the computer key switch to the STANDBY position.
5. At the rear of the computer, unplug the power cord.
6. Remove the cover plate on the primary HP-HSC Expansion I/O slot (next to the Core I/O card) by loosening the two (one top and one bottom) captive mounting screws and pulling the cover plate away.
7. **K450/K460 only:** Loosen the six (three top and three bottom) captive screws on the power supply, then grasp the extractor levers and pull them out.

NOTE On HP9000/K250/K260/K450/K460 and 979KS systems, the power supply has six captive screws, three each on the top and bottom.

8. **K450/K460 only:** Grasp the handle on the power supply and pull it out of the computer.

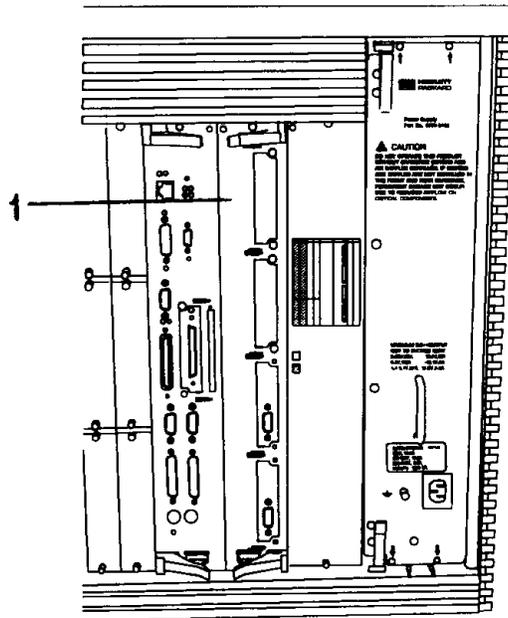
CAUTION The power supply may weigh as much as 26.5 lbs (12 kg). Be careful lifting it and be careful where you put it down.

9. **K3x0/K5x0 Only:** Remove the adjoining Secondary HSC expansion slot cover by loosening the two (one top and one bottom) captive mounting screws and pulling the cover plate away.
10. **K4x0 only:** Remove the adjoining processor slot cover plate by loosening the two (one top and one bottom) captive mounting screws and pulling the cover plate away (This is necessary to gain access to the system board.). Remove any processors that are present.
11. Reach into the computer cabinet and *remove the plastic dust cover* from the HP-HSC expansion connector on the system board.
12. *Remove the plastic dust cover* from the HP-HSC expansion card connector.

NOTE At this point you must determine which HP-HSC cards are going to be added to the computer. If a graphics card is in the Core I/O card, it needs to be moved to the HP-HSC expansion card. See "Moving HP-HSC Cards" on page 11 for those procedures.

13. Align the HP-HSC expansion card (HP-HSC cards and components to the left side and the extractor levers out) into the card slot (1) and slide it into the computer. See Figure 1-4 and Figure 1-5.

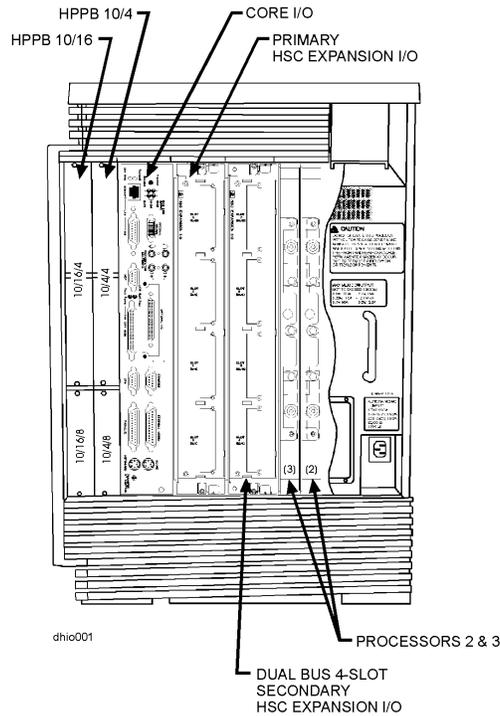
Figure 1-4 HP-HSC Expansion Card Locations - K4x0



NOTE

The rear view of the system shown in Figure 1-4 is representative of HP3000/9x9KS and HP9000/K400/410/420 systems. On HP9000/K3x0/K450/K460/K5x0 systems, the power supply bulkhead extends across the rear processor slots. The card locations, however, are the same.

Figure 1-5 HSC Expansion Slots - Kx70/Kx80



14. When the card makes contact with the system board connector, press the edge of the card to fully seat the card into the computer. Tighten the two captive screws to secure the expansion I/O card.
15. **K4x0 only:** Replace the processor slot cover plate and tighten the two captive mounting screws.
16. **K450/K460 Only:** Replace the power supply and secure the four captive screws.
17. **K3x0/K5x0 Only:** Replace the secondary HSC expansion slot cover and tighten the two captive mounting screws.

If this completes the upgrade, proceed to Upgrade Verification. If HP-HSC cards need to be moved or added, refer to *Moving HP-HSC Cards*.

Secondary Expansion I/O Upgrade (Dual Bus) Procedures (K5x0 Only)

Perform steps 1 through 5 described in the “Primary Expansion I/O Upgrade Procedures,” then:

1. Remove the cover plate on the optional Processor/Dual Bus HP-HSC Expansion I/O slot next to the primary HP-HSC Expansion I/O slot (see Figure 1-5) by loosening the two (one top and one bottom) captive mounting screws and pulling the cover plate away.
2. Remove the cover plate of the adjoining processor slot by loosening the two (one top and one bottom) captive mounting screws and pulling the cover plate away. (This is necessary to gain access to the system board.)
3. Reach into the computer cabinet and *remove the plastic dust cover* from the HP-HSC expansion connector on the system board.
4. *Remove the plastic dust cover* from the Dual bus Secondary HP-HSC Expansion I/O Card connector.
5. Align the Dual bus Secondary HP-HSC Expansion I/O Card into the card slot (See Figure 1-5) and slide it into the computer.
6. When the card makes contact with the system board connector, press the edge of the card to fully seat the card into the computer. Tighten the two captive screws to secure the expansion I/O card.
7. Replace the primary HSC extender cover plate and tighten the two captive mounting screws.
8. Reattach any cabling on the primary HSC extender.

If this completes the upgrade, proceed to Upgrade Verification. If additional HP-HSC cards need to be moved or added, refer to *Moving HP-HSC Cards*.

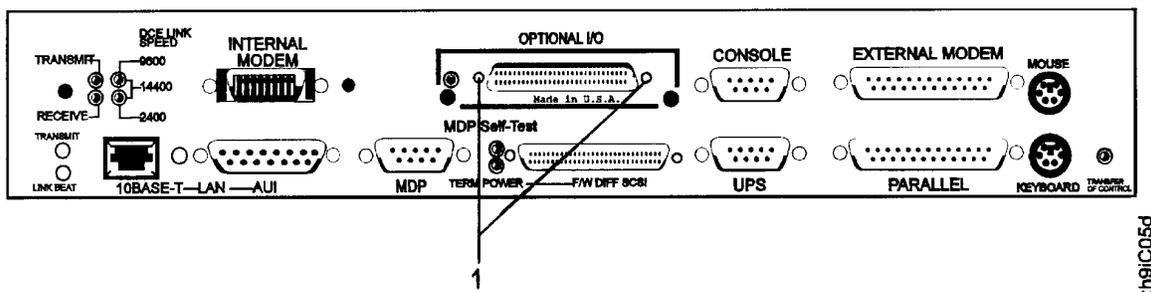
Moving HP-HSC Cards

The following steps describe the procedure for swapping HP-HSC cards between the Core I/O card Optional I/O slot and HP-HSC expansion card slots.

Perform steps 1 through 5 described in “Primary Expansion I/O Upgrade Procedures,” then:

1. Disconnect the interface cable from the bulkhead connectors.
2. Remove the Core I/O assembly (located next to the HP-PB card slots) by loosening the two captive screws at the top and bottom, and pulling the assembly straight out.
3. Loosen the two captive mounting screws (one on each side, Figure 1-6, item 1) next to the card connector (on the bulkhead).

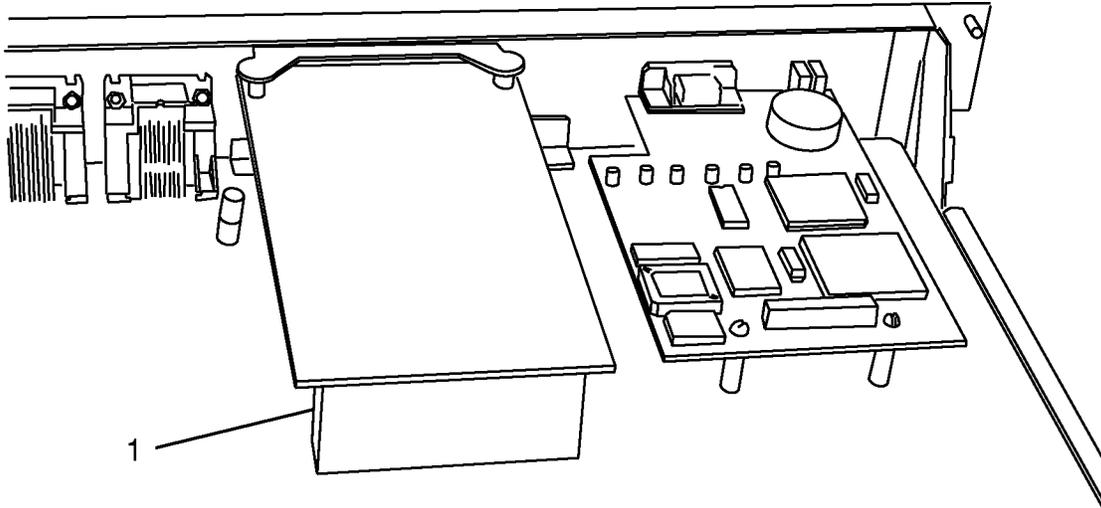
Figure 1-6 Mounting Screw Location



I/O Upgrade
HP-HSC Upgrade

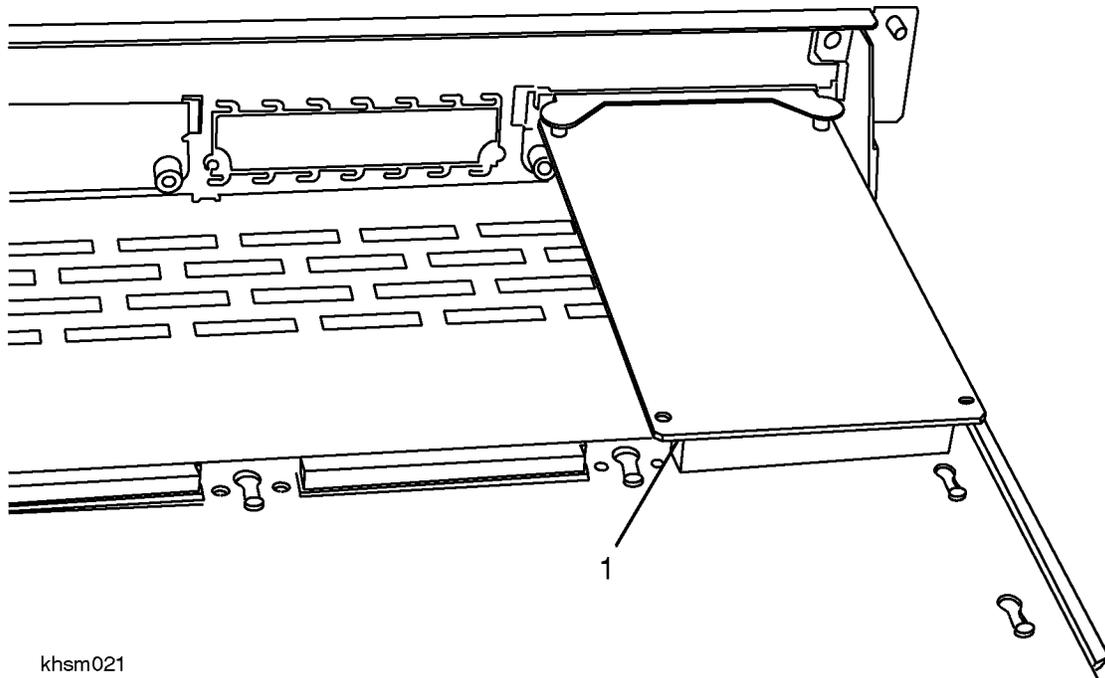
4. Grasp the back of the HP-HSC card and pull it up, disconnecting it from the core (or HP-HSC expansion) I/O card. See (Figure 1-7, item 1 (for core I/O) or Figure 1-8, item 1 (for expansion I/O).

Figure 1-7 HP-HSC Card Removal (core I/O)



khs020a

Figure 1-8 HP-HSC Card Removal (expansion I/O)



khs021

5. Continue to lift the back of the HP-HSC card until it is angled enough to disengage the hooked tabs from the mounting slots in the bulkhead.
6. If there is a cover plate in the slot position where an HP-HSC card is to be installed, loosen the two captive mounting screws and remove the cover plate.

NOTE Do not discard the cover plate. If a core I/O or expansion I/O HP-HSC slot is open, use the cover plate to close it.

7. Angle the HP-HSC card so that the hooked tabs of the card slide through the desired bulkhead tab slots.
8. Carefully align the extended pins to the HP-HSC card connector on the back of the card and gently press down to fully seat the card on the connector.
9. Tighten the two (one on each side) captive mounting screws to secure the HP-HSC card to the bulkhead.
10. Insert the core I/O and expansion I/O cards back into their appropriate slots.
11. Connect the interface cable to the bulkhead connectors.

Upgrade Verification

Before performing the procedures in this section, verify that all removed cover plates are reinstalled and secure.

1. Reconnect the power cord to the rear of the computer.
2. Turn the computer key to the ON position.
3. Observe the Front panel Display and console for any error or fault (FLT) messages.

When all procedures are complete with no errors or faults, reconfigure the system to add the new HP-HSC path addresses. Refer to the Owner's Guide for configuration instructions. HP-HSC Slot path addresses are shown in Table 1-4.

Table 1-4 HP-HSC Slot Addresses

Location	Device Type	Address Path
Core I/O card, Optional I/O connector	HP-HSC I/O card	10/8 (device addr.)
Primary Four Slot HP-HSC Expansion I/O		
HP-HSC I/O Expansion card, slot 0	HP-HSC I/O card	8/0 (device addr.)
HP-HSC I/O Expansion card, slot 1	HP-HSC I/O card	8/4 (device addr.)
HP-HSC I/O Expansion card, slot 2	HP-HSC I/O card	8/8 (device addr.)
HP-HSC I/O Expansion card, slot 3	HP-HSC I/O card	8/12 (device addr.)
Secondary Dual Bus HP-HSC Expansion I/O (K5x0 only)		
HP-HSC I/O Expansion card, slot 0	HP-HSC I/O card	12/0 (device addr.)
HP-HSC I/O Expansion card, slot 1	HP-HSC I/O card	12/12 (device addr.)
HP-HSC I/O Expansion card, slot 2	HP-HSC I/O card	14/8 (device addr.)
HP-HSC I/O Expansion card, slot 3	HP-HSC I/O card	14/12 (device addr.)

I/O Upgrade
HP-HSC Upgrade