HP 3PAR T-Class Storage System Upgrade Guide

Abstract

This guide describes upgrade procedures for the HP 3PAR T-Class Storage System. The installation of HP 3PAR equipment is to be performed by qualified technicians who are authorized by HP to install storage systems and their hardware components. Authorized technicians include HP service engineers, Value Added Resellers (VARs), certified self-maintaining customers, and authorized third-party field technicians.

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Warranty

WARRANTY STATEMENT: To obtain a copy of the warranty for this product, see the warranty information website:

http://www.hp.com/go/storagewarranty

Documentation

For the latest version of this document, go to the Services Access Workbench at http://sawpro.atlanta.hp.com/km/saw/pmBrowse.do?oid=5044215.

Contents

1 Upgrading Controller Node and Drive Chassis Hardware

Read this chapter for instructions on performing internal upgrades to the controller nodes and drive chassis to increase the performance of a storage system.

Advisories

Before performing any of the procedures, read and observe the cautions and warnings in this guide. To avoid personal injury or damage to data and equipment, always be careful when handling any electrical equipment.

The following advisories appear throughout this guide:

⚠ **WARNING!** Warnings alert you to actions that can cause injury to people or irreversible damage to data or the operating system.

△ **CAUTION:** Cautions alert you to actions that can cause damage to equipment, software, or data.

NOTE: Notes are reminders, tips, or suggestions that supplement the procedures included in this guide.

Handling Controller Nodes

When handling controller nodes, observe the following precautions:

△ **CAUTION:** To avoid potential damage to equipment and loss of data, handle controller nodes carefully.

- Always wear a wrist grounding strap. A wrist grounding strap is provided with the storage system. Attach the grounding strap clip directly to an unpainted surface of the cabinet.
- Use both hands to carry controller nodes.
- Avoid contact between controller nodes and clothing that can carry an electrostatic charge.
- Ensure cables are correctly labeled and easily identifiable prior to halting the node.

NOTE: If your storage system is equipped with an optional locking fascia kit, see *Locking Fascia* for additional information on removal and replacement.

Removing a Controller Node

To remove a controller node from the storage system:

1. Start an SPMAINT session.
   a. Connect the maintenance PC to the SP using the serial connection. Refer to *Connecting the Maintenance PC* for additional information.
   b. Log on to the SP with your login name and password.
2. Select option **7, Interactive CLI for an StoreServ**.
3. Select the desired system.
4. Issue the `checkhealth -svc` command to verify the system is healthy.
5. Issue the `shownode` and `showsys` commands to capture the current configuration.
6. Type `exit` to end the CLI session and to return to the **3PAR Service Processor Menu**
7. Select option **4, InServ Product Maintenance**.
8. Select option **6, Halt an StoreServ cluster/node**.
9. Select the desired system.

10. Select the desired node.

11. Respond to the prompts to halt the node.

12. The duration of the halt process is approximately two minutes. At the front of the sytem, verify the node status LED is flashing green (3 blinks per second) and the node hot-plug LED is solid amber indicating the node has been halted ("The Hot-Plug and Status LEDs on a Controller Node" (page 6)).

△ **CAUTION:** To avoid damage to hardware and the loss of data, never remove a controller node from the storage system without confirming that the node status LED is flashing green and the hot-plug LED on the node appears amber.

Figure 1 The Hot-Plug and Status LEDs on a Controller Node
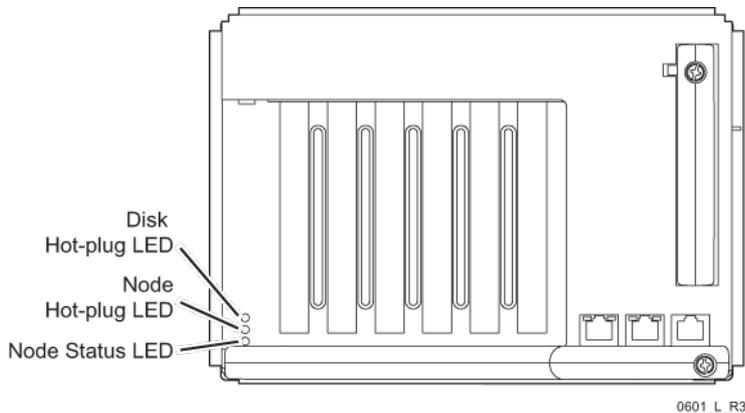
13. Disconnect the cables from the front of the controller node, noting the locations of all cables. If necessary, mark the cables that connect to the controller nodes before removing them. The drive-side Fibre Channel cables are marked to simplify this task.

14. Wearing a wrist grounding strap, use a #2 Phillips screwdriver to loosen the screw securing the locking handle at the bottom right of the controller node ("Loosening the Screw on a Controller Node" (page 6)).

Figure 2 Loosening the Screw on a Controller Node
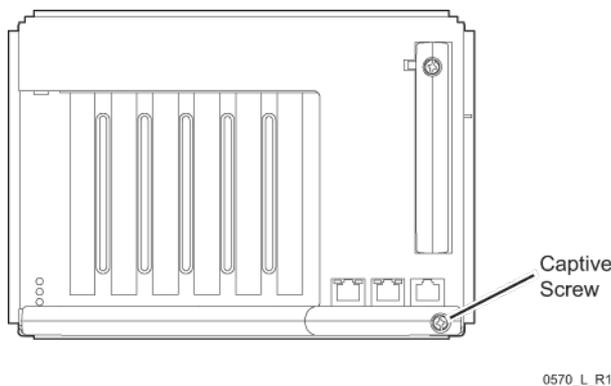
15. Pull the node insertion/removal lever (1) to unlatch the node and then pull the node handle (2) until the controller node disengages from the storage system midplane ("Pulling the Controller Node Handle" (page 7)).

Figure 3 Pulling the Controller Node Handle

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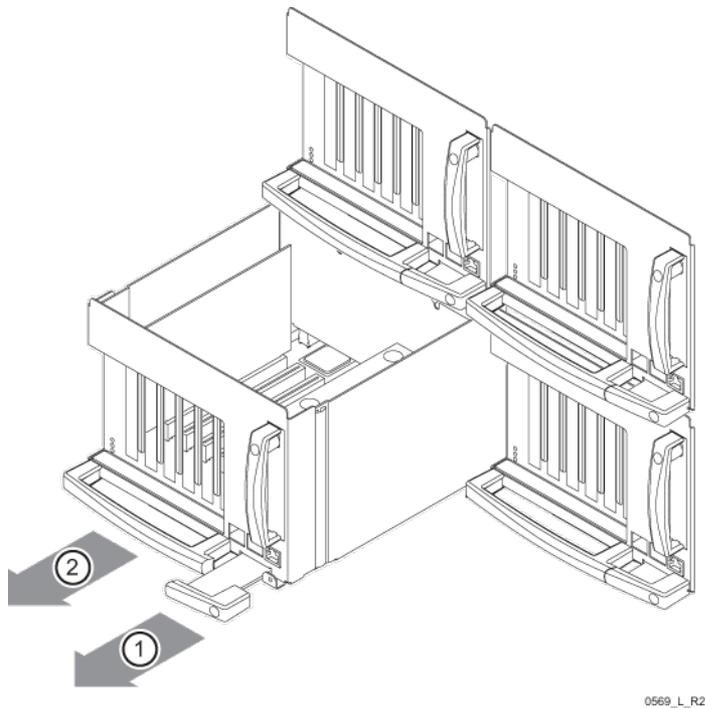
16. With one hand on the handle (2) of the controller node and the other hand supporting the controller node from the bottom, slide the node out of the chassis and place it on an Electrostatic Discharge-safe (ESD) work surface.

Reinstalling a Serviced Controller Node

To reinstall a controller node after upgrading or adding components:

1. Slide the node halfway into the chassis. Pull the insertion/extraction lever (2) out all the way. Using the larger handle (1) push the node into the chassis until it stops ("Replacing the Controller Node" (page 8)).

2. While applying mild pressure to handle (1) push the insertion lever (2) in quickly until it is flush with the node. The quick insertion of (2) helps to overcome the initial insertion force of the connector.

> **NOTE:** *Quick* does not mean pushing more forcefully or harder.

If the power supplies are ON, the PCI adapter LEDs and the node hot-plug LED should illuminate within a few seconds of when the node is inserted.

Figure 4 Replacing the Controller Node
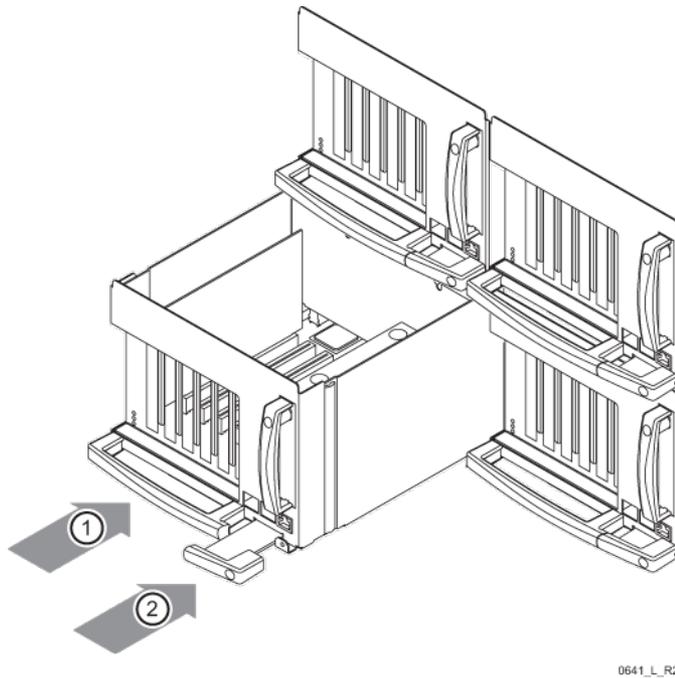
0641_L_R2

3. Use a #2 Phillips screwdriver to tighten the captive screw securing the lever of the controller node chassis. Do not overtighten the screw ("Tightening the Screw on a Controller Node" (page 8)).

Figure 5 Tightening the Screw on a Controller Node

Captive
Screw
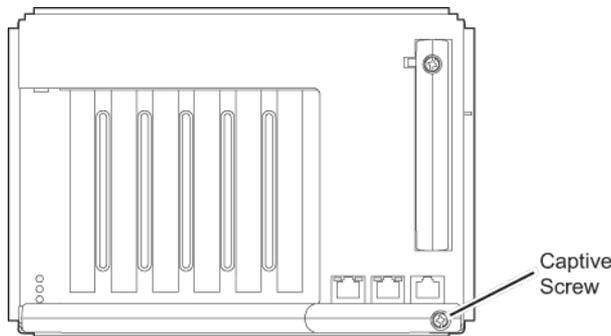
0570_L_R1

4. Verify the node LED is blinking green indicating the node has joined the cluster.
5. In the SP window, verify the node has joined the cluster by issuing the `shownode` command.

```
cli% shownode
                                            Control      Data        Cache
Node --Name--- -State- Master InCluster ---LED--- Mem(MB) Mem(MB) Available(%)
   0 1699750-0 OK       No     Yes        GreenBlnk    8192    8192          100
   1 1699750-1 OK       Yes    Yes        GreenBlnk    8192    8192          100
```

△   **CAUTION:**   Do not reconnect host cables until making sure the controller node is functioning properly.

6. Reconnect the customer Ethernet cable, if applicable, and all other cables to the node once the node has rebooted.

7. Issue the `checkhealth -svc` command to verify the system is healthy.
8. In the SP window, issue the `exit` command to stop the CLI session.
9. Log out of the SPMAINT session by selecting **X** to exit from the 3PAR Service Processor Menu.
10. Disconnect the serial cable from the maintenance PC and coil and place the cable behind the SP.
11. Remove the red crossover Ethernet cable from the laptop. Coil and place the cable behind the SP.
12. Close and lock the rear door of the storage system.
13. Reinstall the bezel that covers the front of the storage system.
14. Reinstall and secure the front fascias on the storage system frame if applicable.

Upgrading Controller Node Hardware

The following sections detail procedures for replacing and installing additional data cache, Fibre Channel adapters, PCI adapters, and iSCSI adapters within a controller node.

Upgrading Data Cache

Controller nodes contain three banks of data cache DIMMs, located on two data cache riser cards (one, two-DIMM riser card, and one, four-DIMM riser card) (Figure 6 (page 9)).

Figure 6 Data Cache DIMMs on the Riser Card
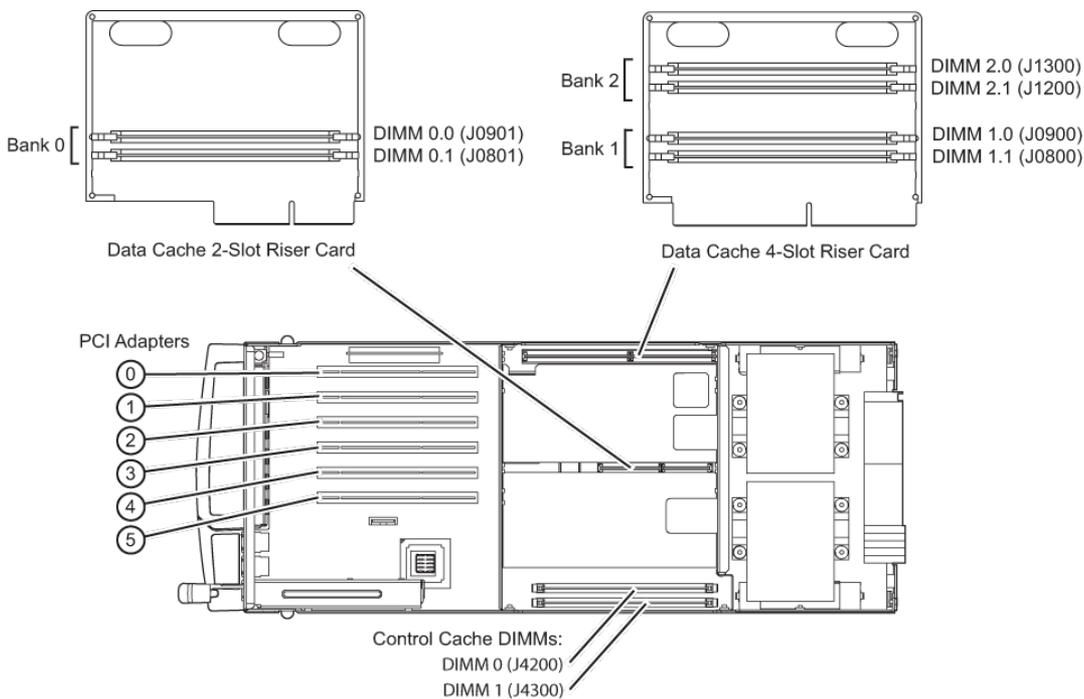
Each controller node supports 12 GB data cache (6 DIMMs). Data cache groups insert into slots in the order indicated in Table 1 (page 12).

To install additional data cache:

1. From the maintenance PC, connect to the SP. Refer to *Connecting the Maintenance PC* for additional information.
2. Remove the controller node by following the procedure for *Removing a Controller Node*, and then continue on to step 3.
3. Place the controller node on an ESD-safe, level work surface.
4. Remove the controller node lid ("Removing the Controller Node Lid" (page 10)).

Figure 7 Removing the Controller Node Lid

Lid Notch (2x)

Bulk Head
Notch Hole (2x)
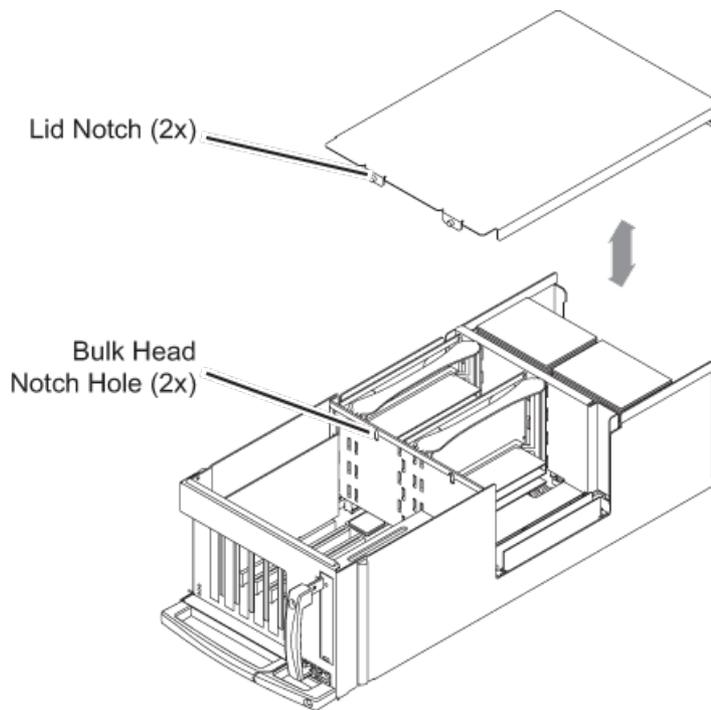
0568_L_R1

5. Remove the riser card retainer from the riser card chosen for removal ("Removing a Data Cache Riser Card and Retainer" (page 11)).
6. Grasp the finger holes of the riser card and pull upward ("Removing a Data Cache Riser Card and Retainer" (page 11)).

   Avoid touching the surface of the data cache DIMMs while handling the riser card.

Figure 8 Removing a Data Cache Riser Card and Retainer
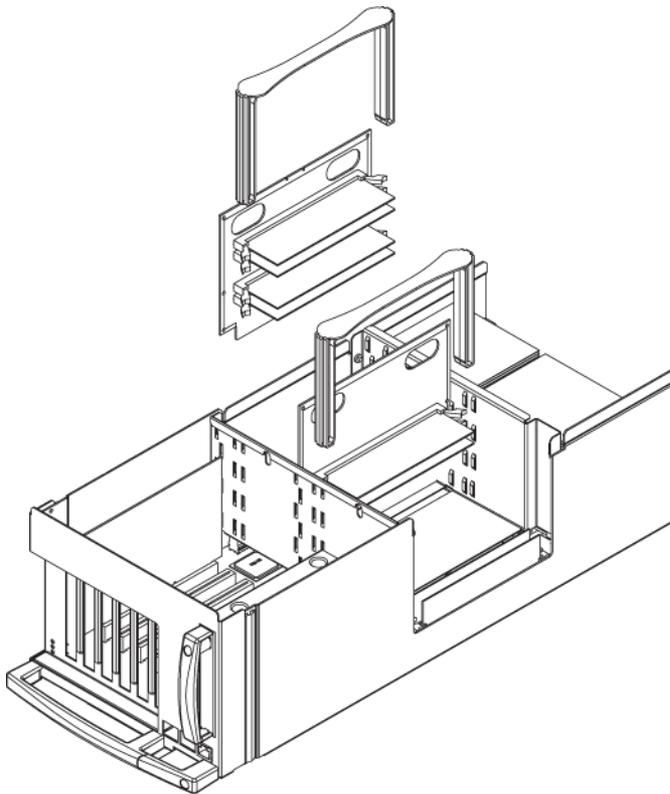
0507_L_R2

7. Place the riser card on an ESD-safe, level work surface .
8. Remove the additional data cache DIMMs from their protective packaging, avoiding touching the surface of the DIMMs while handling them.
9. Insert the additional data cache DIMMs in the order indicated by Table 1 (page 12) into the appropriate slots ("Data Cache DIMMs on the Riser Card" (page 11)).

Figure 9 Data Cache DIMMs on the Riser Card

Bank 0 [DIMM 0.0 (J0901) / DIMM 0.1 (J0801)

Bank 2 [DIMM 2.0 (J1300) / DIMM 2.1 (J1200)

Bank 1 [DIMM 1.0 (J0900) / DIMM 1.1 (J0800)

Data Cache 2-Slot Riser Card

Data Cache 4-Slot Riser Card

PCI Adapters
0
1
2
3
4
5

Control Cache DIMMs:
DIMM 0 (J4200)
DIMM 1 (J4300)
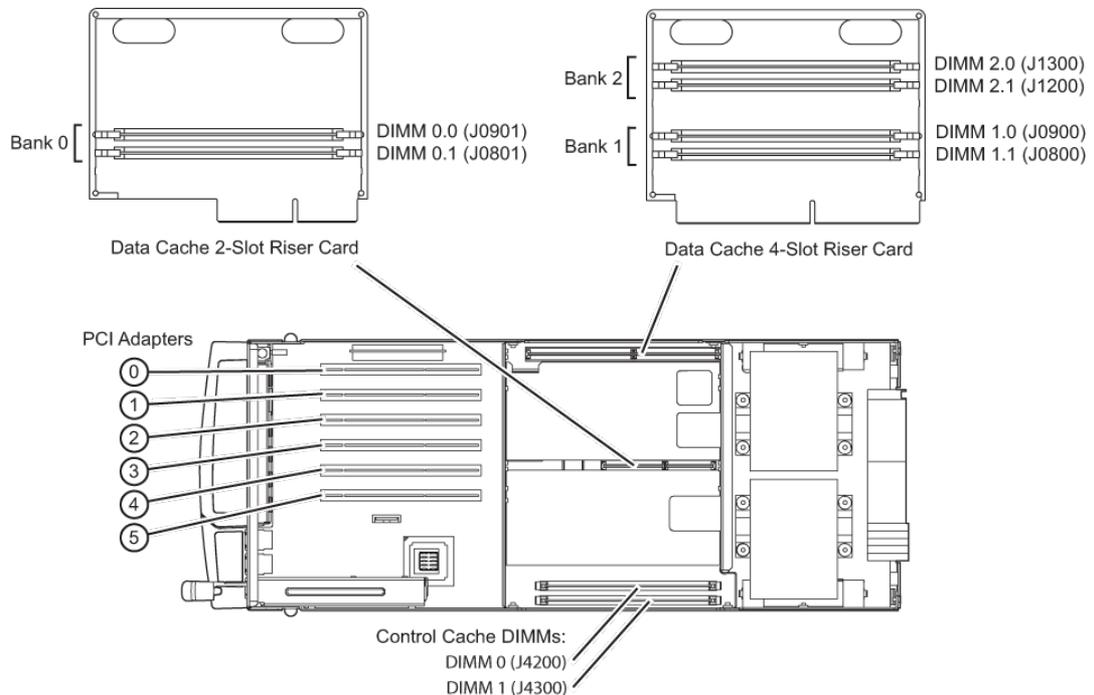
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Table 1 Order for Inserting Data Cache DIMM Groups

DIMM Group	Bank and Slot Numbers On Riser Cards
0	Bank 0, Slot 0 (J0901) Bank 1, Slot 0 (J0900) Bank 2, Slot 0 (J1300)
1	Bank 0, Slot 1 (J0801) Bank 1, Slot 1 (J0800) Bank 2, Slot 1 (J1200)

Insert the lower keyed edge of DIMM into the slot and push downward on the upper edge of the DIMM until the tabs on both sides snap into place ("Inserting a DIMM" (page 12)).

Figure 10 Inserting a DIMM

0027_L_R1
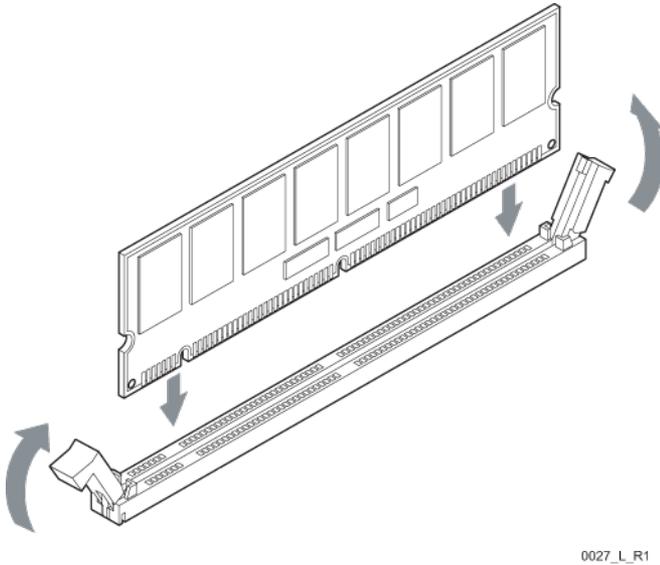
10. Reinstall the data cache riser card by aligning the riser card edges with the staggered guides on either side of the bulkhead and then pushing down until the card is fully seated ("Aligning and Inserting a Data Cache Riser Card" (page 12)).

Figure 11 Aligning and Inserting a Data Cache Riser Card

2-Slot Riser Card

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0565_L_R3
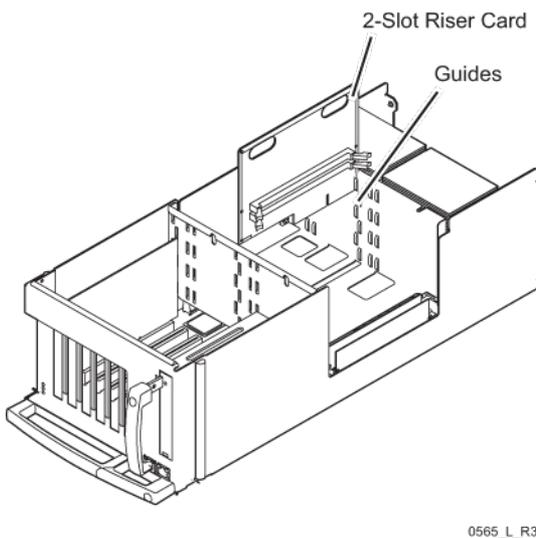
NOTE: Installing and seating the 4-slot riser card requires much more force than the 3-slot riser card. Two audible *pops* should be heard when seating the riser card, and the top of the riser card should be flush with the top of the sheet metal guide bracket.

4-Slot Data Cache Riser Card Guide   2-Slot Data Cache Riser Card Guide

0603_L_R3
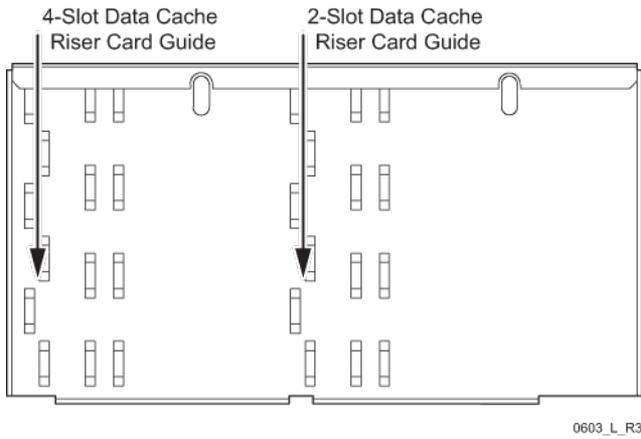
11. Reinstall the data cache riser card retainer by aligning the retainer edges with the parallel guides on either side of the bulkhead and then pushing down until the retainer is fully seated ("Aligning and Inserting a Riser Card Retainer" (page 13)).

Figure 12 Aligning and Inserting a Riser Card Retainer

Riser Card Retainers

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4-Slot Data Cache Riser Card Guide   2-Slot Data Cache Riser Card Guide

0603_L_R3
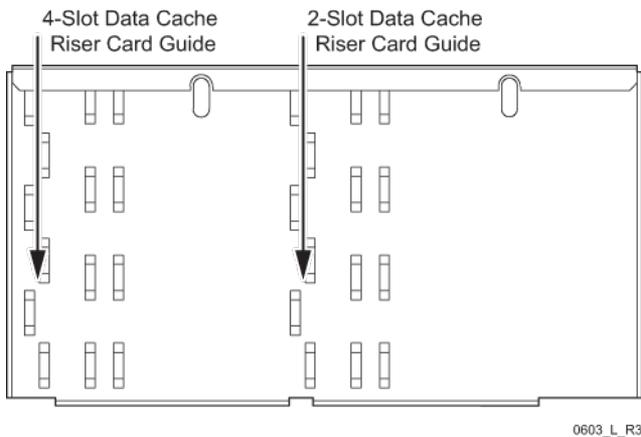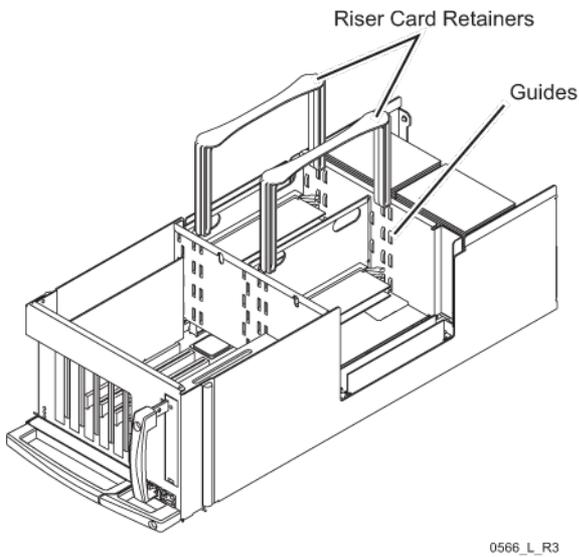
12. Reinstall the controller node lid by lining up the two notches on the lid with the two notch holes in the node bulk head and then pushing down until the lid is completely seated ("Replacing the Cover on the Controller Node" (page 14)).

Figure 13 Replacing the Cover on the Controller Node

0568_L_R2
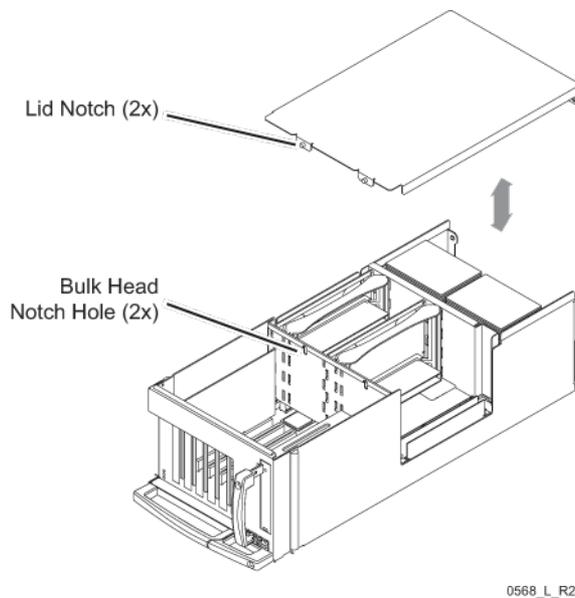
13. Reinsert the controller node by following the procedure for "Reinstalling a Serviced Controller Node" (page 7) and then continue on to step 14.

   NOTE: The node reboot duration is approximately five to seven minutes. Check the node LEDs to confirm the node has rebooted and has joined the cluster.

14. From the SPMAINT main menu, select option **7, Interactive CLI for an StoreServ** and press **ENTER**.

15. In the Interactive CLI window, verify the node has joined the cluster by issuing the shownode command.

```
cli% shownode
                                         Control    Data        Cache
Node --Name--- -State- Master InCluster ---LED--- Mem(MB) Mem(MB) Available(%)
   0 1000163-0 OK      Yes    Yes       GreenBlnk    4096    6144          100
   1 1000163-1 OK      No     Yes       GreenBlnk    4096    6144          100
```

16. Verify the data cache and control cache memory totals by issuing the shownode -mem command.

```
cli% shownode -mem
Node Riser  Slot SlotID -Name-- -Usage- --Type--- --Manufacturer--- -Serial-
-Latency- Size(MB)
   0 n/a       0 J4200  DIMM0   Control FB-DIMM   Micron Technology E20BC997
CL5.0/5.0 2048
   0 n/a       1 J4300  DIMM1   Control FB-DIMM   Micron Technology E20BC996
CL5.0/5.0 2048
   0 2-slot    0 J0901  DIMM0.0 Data    DDR_SDRAM Micron Technology E010DF65
CL2.0/2.5 2048
   0 4-slot    1 J0900  DIMM1.0 Data    DDR_SDRAM Micron Technology E010DF98
CL2.0/2.5 2048
   0 4-slot    2 J1300  DIMM2.0 Data    DDR_SDRAM Micron Technology E010DF64
CL2.0/2.5 2048
   1 n/a       0 J4200  DIMM0   Control FB-DIMM   Micron Technology E20BC995
CL5.0/5.0 2048
   1 n/a       1 J4300  DIMM1   Control FB-DIMM   Micron Technology E20BC992
CL5.0/5.0 2048
   1 2-slot    0 J0901  DIMM0.0 Data    DDR_SDRAM Micron Technology E010DF6A
```

```
CL2.0/2.5 2048
   1 4-slot    1 J0900  DIMM1.0 Data     DDR_SDRAM Micron Technology E010DF6F
CL2.0/2.5 2048
   1 4-slot    2 J1300  DIMM2.0 Data     DDR_SDRAM Micron Technology E010DF69
CL2.0/2.5 2048
```

17. To upgrade data cache in additional controller nodes, repeat step 1 through 16 for each additional node.
18. Issue the `admithw` command to create the preserved data LDs, based on the larger cache size.

```
cli% admithw
```

19. Inspect all fibre and Ethernet cables are properly connected and verify all Status LEDs are displayed green.
20. Issue the `checkhealth -svc` command to verify your system is healthy.
21. In the SP window issue the `exit` command to stop the CLI session.
22. Log off the SPMAINT session by selecting `x` to exit.
23. Disconnect the serial cable from the maintenance PC and coil and place the cable behind the SP.
24. Disconnect the red crossover Ethernet cable from the laptop. Coil and place the cable behind the SP. If applicable, reconnect the customer Ethernet cable and all other cables to the node.
25. Close and lock the rear door of the storage system.
26. Reinstall and secure the front fascia on the storage system if applicable.

Upgrading Fibre Channel Adapters

Each controller nodes contains a maximum of six PCI adapters, located in PCI slots 0 through 5 (Figure 14 (page 15)).

Figure 14 PCI Slots in the Controller Node
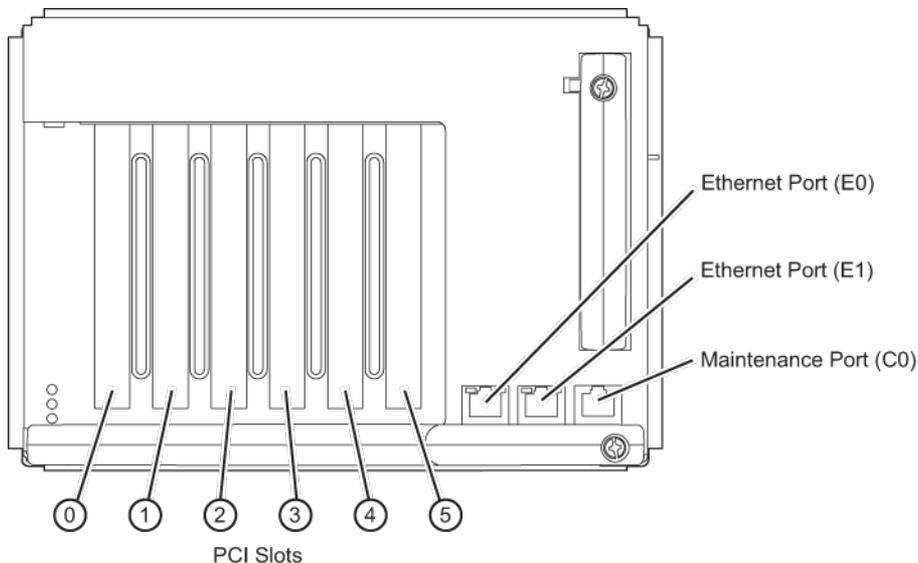
Fibre Channel adapters connect the controller nodes to host computers and to drive cages. Each Fibre Channel adapter contains four Fibre Channel ports.

Upgrading Fibre Channel adapters involves installing additional Fibre Channel adapters or replacing existing ones.

NOTE: For information on installing PCI adapters, see "Installing a PCI Adaptor or CNA" (page 19) and for iSCSI adapters, see "Installing iSCSI Adapters" (page 22).

To install additional Fibre Channel adapters:

1. From the maintenance PC, connect to the SP and start an SPMAINT session. Refer to *Connecting the Maintenance PC* for additional information.
2. Halt the appropriate controller node and then remove the node from the storage system by following the procedure for "Removing a Controller Node" (page 5), and then continue on to step 3.
3. Determine which PCI slots to use for installing the additional Fibre Channel adapters by referencing "PCI Adapter Installation Order" (page 79).
4. Use a #2 screwdriver to loosen the captive screw securing the PCI retention bar to the node and then remove the retention bar (Figure 15 (page 16)). If replacing or moving an adapter from an existing slot, remove the Fibre Channel adapter by grasping the handle at the top of the card and pulling upward. If the PCI slot is empty, remove the blank slot cover.

Figure 15 Removing the PCI Adapter Retention Bar
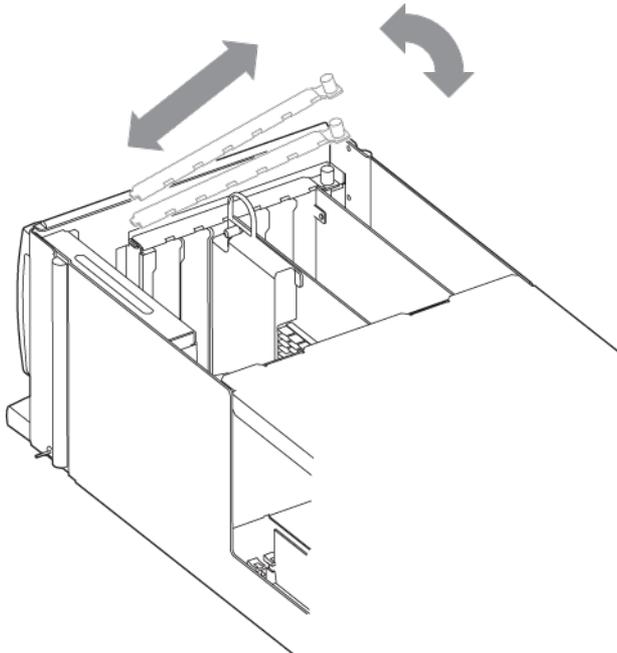
0644_L_R2

5. Remove the new Fibre Channel adapter from the protective packaging and insert it into the empty PCI slot by pushing down on the adapter until it is fully seated.

Figure 16 Inserting a Fibre Channel Adapter
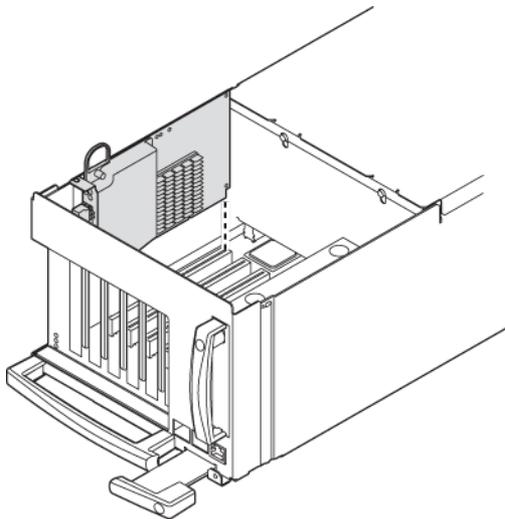
0647_L_R1

> **NOTE:** When installing PCI adapters, make sure the EMI gasket is aligned properly and does not cover the adapter LEDs at the front of the controller node.

6. Repeat step 3 and step 5 for each additional Fibre Channel adapter to be installed and continue on to step 7.

> **NOTE:** If the Fibre Channel adapter has Small Form-factor Pluggable transceivers (SFP), push on each SFP to ensure the SFP(s) are properly seated.

7. Attach the PCI card retention bar ("Reattaching the PCI Card Retention Bar" (page 17)) by carefully aligning the notches in the retention bar with the PCI cards.

Figure 17 Reattaching the PCI Card Retention Bar
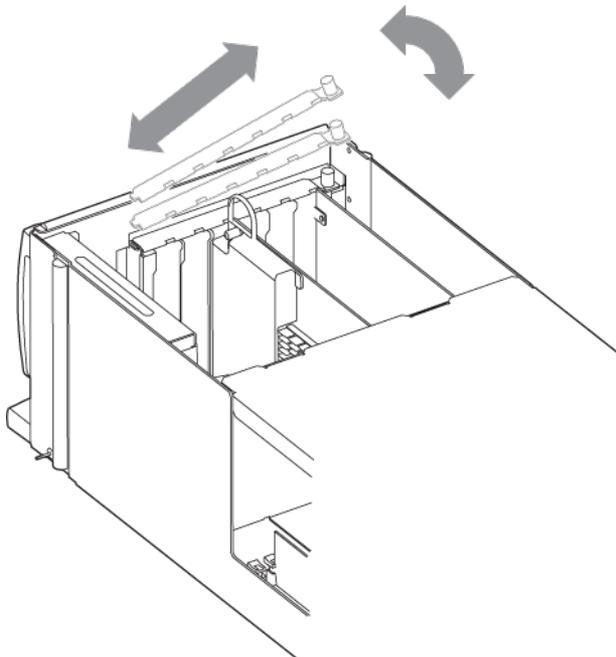
0644_L_R2

8. Insert the controller node by following the procedures described in "Reinstalling a Serviced Controller Node" (page 7) and then continue on to step 9.

NOTE: The node reboot duration is approximately five to seven minutes. Check the node LEDs to confirm the node has rebooted and has joined the cluster.

9. Wait until the status LED on the controller node appears flashing green and pulses at the same rate as the status LEDs (Figure 18 (page 18)) on the other controller nodes in the system.

   At this point, the node has joined the cluster.

   Figure 18 The Hot-Plug and Status LEDs on a Controller Node

10. In the SP window, verify the node has joined the cluster by issuing the `shownode` command:

```
cli% shownode
                                            Control   Data       Cache
Node --Name--- -State- Master InCluster ---LED--- Mem(MB) Mem(MB) Available(%)
   0 1000163-0 OK       Yes    Yes      GreenBlnk   4096    6144          100
   1 1000163-1 OK       No     Yes      GreenBlnk   4096    6144          100
```

11. Verify the correct card has been installed in the correct slot by issuing the `shownode -i` command.

```
cli% shownode -i
-----------------------Nodes-----------------------
Node --Name--- -Manufacturer- ----Model----- -Serial-
   0 1000163-0 FLH             920-1053-03.01 0017
   1 1000163-1 FLH             920-1053-03.01 0018
--------------------PCI Cards----------------------
Node Slot Type  -Manufacturer- -Model-     -----Serial-----
   0    0 FC     3PAR           FC044X      0ae2aa6800312262
   0    1 FC     3PAR           FC044X      00472060002182a4
   0    3 Eth    Intel          PRO/1000MT  --
   0    4 iSCSI  QLOGIC         4052C       GS10715A32842
...
```

12. Issue the `showport` command to verify each possible port is present to the system and working properly.

```
cli% showport
N:S:P       Mode         State ----Node_WWN---- -Port_WWN/HW_Addr- Type Protocol
1:5:3 initiator    loss_sync 2FF70002AC000167   21530002AC000167 free       FC
1:5:4 initiator        ready 2FF70002AC000167   21540002AC000167 free       FC
1:8:1 target           ready 2FF70002AC000167   21810002AC000167 host      FCoE
1:8:2 suspended config_wait 0000000000000000   0000000000000000 cna        -
1:9:1 peer             ready                -   0002AC800059      rcip       IP
```

13. To upgrade Fibre Channel adapters in additional controller nodes, repeat step 3 through 11 for each additional node.
14. Inspect all fibre and Ethernet cables are properly connected and verify all status LEDs are displayed green.
15. Issue the `checkhealth -svc` command to verify your system is healthy.
16. In the SP window issue the `exit` command to stop the CLI session.
17. Log out of the SPMAINT session by selecting `x` to exit.
18. Disconnect the serial cable from the maintenance PC and coil and place the cable behind the SP.
19. Disconnect the red crossover Ethernet cable from the laptop and coil and place the cable behind the SP. Iif applicable, reconnect the customer Ethernet cable and all other cables to the node.
20. Close and lock the rear door of the storage system.
21. Reinstall and secure the front fascia on the storage system if applicable.

Installing a PCI Adaptor or CNA

Each Controller node PCI slots can also hold PCI adapters (Figure 19 (page 19)) to enable the use of HP 3PAR Remote Copy.

Figure 19 PCI Slots in the Controller Node
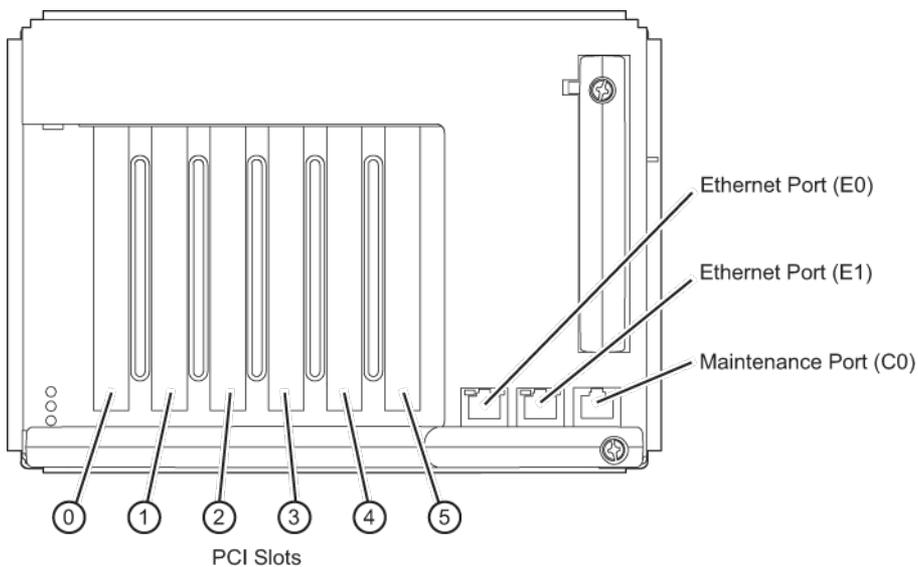
HP 3PAR Remote Copy for Fibre Channel requires one pair of PCI adapters in the primary storage system and another pair of PCI adapters in a secondary storage system. These storage systems do not have to be at the same operating site. All system must have the same OS level to support HP 3PAR Remote Copy.

To install a pair of PCI adapters into a controller node:

1. From the maintenance PC, connect to the SP and start an SPMAINT session. Refer to *Connecting the Maintenance PC* for additional information.
2. Shut down the appropriate controller node and remove it from the storage system by using the procedure described in "Removing a Controller Node" (page 5), and then continue on to step 3.
3. After placing the controller node on an ESD-safe, level work surface, use a #2 Phillips screwdriver to loosen the captive screw that holds the PCI retention bar, and then lift up to remove the bar (Figure 20 (page 20)).

Figure 20 Removing the PCI Retention Bar
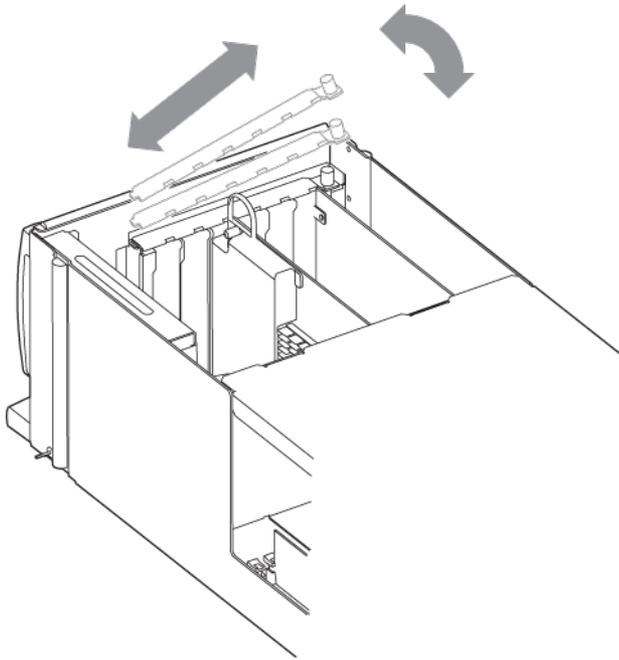
0644_L_R2

4. Remove the appropriate blank PCI slot cover.
5. Remove one PCI adapter from the protective packaging and insert it into the empty PCI slot. Push down on the adapter until it is fully seated.

> **NOTE:** Some PCI adapters are shorter than other PCI adapters (half-size). Use care when inserting the adapters into the slots and ensure the adapters are properly seated.

> **NOTE:** When installing PCI adapters, ensure the EMI gasket is aligned and does not cover the adapter LEDs at the front of the controller node.

Figure 21 Inserting an PCI Adapter
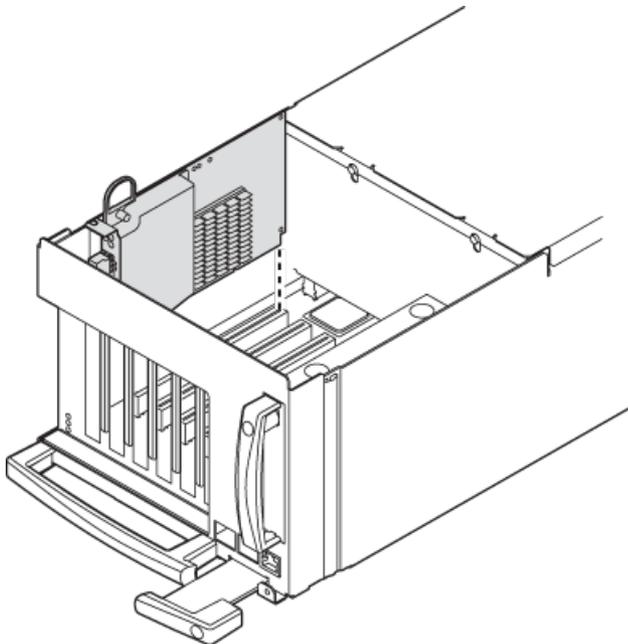
0647_L_R1

6. Attach the PCI card retention bar ("Removing the PCI Retention Bar" (page 20)) by carefully aligning the notches in the retention bar with the PCI cards.

7. Reinstall the controller node by following the procedure described in "Reinstalling a Serviced Controller Node" (page 7), and then continue on to step 8.

    NOTE: The node reboot duration is approximately five to seven minutes. Check the node LEDs to confirm the node has rebooted and has joined the cluster.

8. Monitor the status LED on the replaced controller node ("The Hot-Plug and Status LEDs on a Controller Node" (page 21)). When the status LED appears flashing green and pulses at the same rate as the status LEDs on the other controller nodes in the system, continue on to step 9.

    Figure 22 The Hot-Plug and Status LEDs on a Controller Node

9. In the SP window, verify the node has joined the cluster by issuing the `shownode` command.

```
cli% shownode
                                              Control    Data        Cache
Node --Name--- -State- Master InCluster ---LED--- Mem(MB) Mem(MB) Available(%)
   0 1000163-0 OK       Yes     Yes       GreenBlnk   4096    6144        100
   1 1000163-1 OK       No      Yes       GreenBlnk   4096    6144        100
```

10. Verify the correct card has been installed in the correct slot by issuing the `shownode -i` command.

```
cli% shownode -i
-----------------------Nodes----------------------
Node --Name--- -Manufacturer- ----Model----- -Serial-
   0 1000163-0 FLH            920-1053-03.01 0017
   1 1000163-1 FLH            920-1053-03.01 0018

--------------------PCI Cards--------------------
Node Slot Type  -Manufacturer- -Model-     -----Serial-----
   0    0 FC     3PAR          FC044X      0ae2aa6800312262
   0    1 FC     3PAR          FC044X      00472060002182a4
   0    3 Eth    Intel         PRO/1000MT  --
   0    4 iSCSI QLOGIC         4052C       GS10715A32842
...
```

11. Issue the `showport` command to verify that all the host and drive cage connections from this node are working properly before continuing to the next node.

```
cli% showport
N:S:P     Mode      State ----Node_WWN---- -Port_WWN/HW_Addr- Type
0:0:1 initiator      ready 2FF70002AC000537   20010002AC000537 disk
0:0:2 initiator      ready 2FF70002AC000537   20020002AC000537 disk
0:1:1      peer    offline                -       001B21008E18 rcip
0:2:1 initiator loss_sync 2FF70002AC000537   20210002AC000537 free
0:2:2 initiator loss_sync 2FF70002AC000537   20220002AC000537 free
0:3:1    target loss_sync 2FF70002AC000537   20310002AC000537 free
0:3:2    target      ready 28320002AC000537   20320002AC000537 host
1:0:1 initiator      ready 2FF70002AC000537   21010002AC000537 disk
1:0:2 initiator      ready 2FF70002AC000537   21020002AC000537 disk
1:1:1      peer    offline                -       001B210046E6 rcip
1:2:1 initiator loss_sync 2FF70002AC000537   21210002AC000537 free
1:2:2 initiator loss_sync 2FF70002AC000537   21220002AC000537 free
1:3:1    target loss_sync 2FF70002AC000537   21310002AC000537 free
1:3:2    target      ready 2FF70002AC000537   21320002AC000537 host
```

12. Remove the second controller node from the storage system by following the procedure described in "Removing a Controller Node" (page 5). When finished, repeat step 3 through 11 and then proceed to step 13.
13. Inspect all fibre and Ethernet cables are properly connected and verify all status LEDs are displayed green.
14. Issue the `checkhealth -svc` command to verify your system is healthy.
15. In the SP window issue the `exit` command to stop the CLI session.
16. Log out of the spmaint session by selecting `x` to exit.
17. Disconnect the serial cable from the maintenance PC and coil and place the cable behind the SP.
18. Disconnect the red crossover Ethernet cable from the laptop. Coil and place the cable behind the SP. If applicable, reconnect the customer Ethernet cable and all other cables to the node.
19. Close and lock the rear door of the storage system.
20. Reinstall and secure the front fascia on the storage system if applicable.

Installing iSCSI Adapters

Each controller node PCI slots can also hold iSCSI adapters (Figure 23 (page 23)).

Figure 23 PCI Slots in the Controller Node
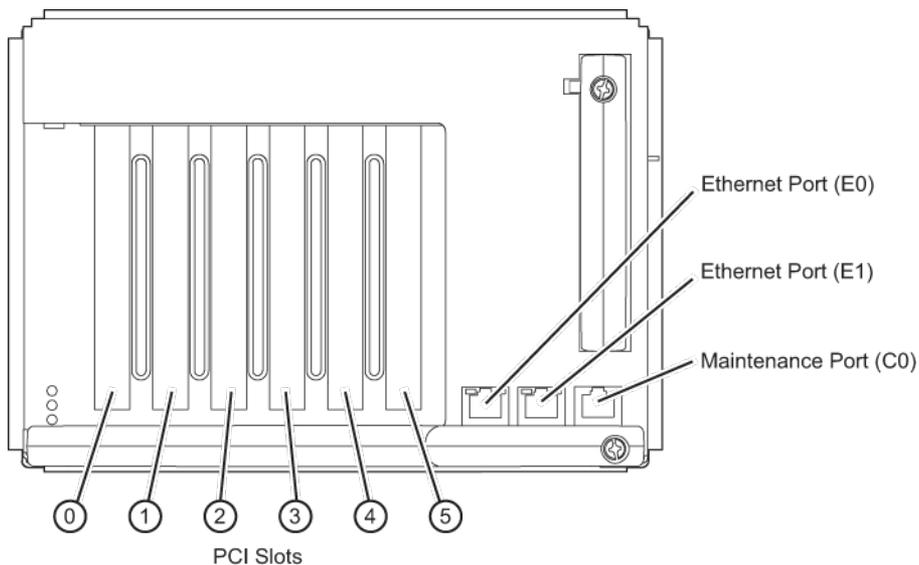
To install iSCSI adapters into a controller node:

1. From the maintenance PC, connection to the SP and establish a serial connection. Refer to *Connecting the Maintenance PC* for additional information.
2. Remove the controller node from the storage system by using the procedure describe in "Removing the PCI Retention Bar" (page 23).
3. After placing the controller node on an ESD-safe, level work surface, use a #2 Phillips screwdriver to loosen the captive screw that holds the PCI retention bar, and then lift up to remove the bar (Figure 24 (page 23)).

Figure 24 Removing the PCI Retention Bar
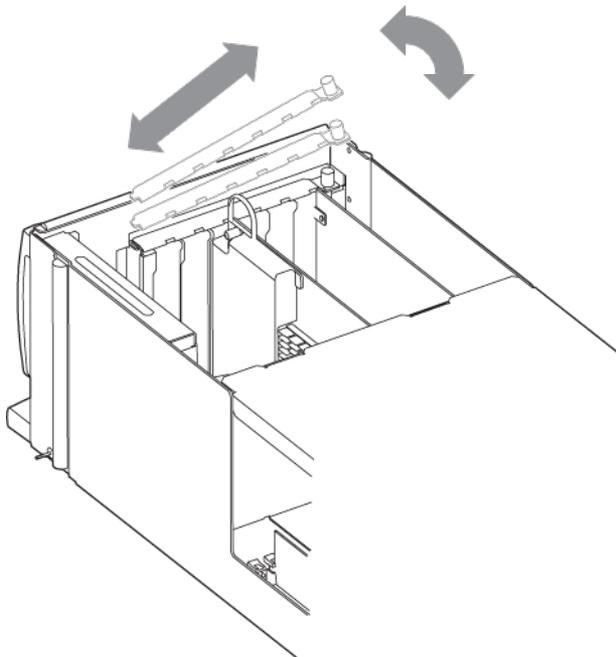
4. Remove the blank PCI slot cover (if applicable).
5. Remove one iSCSI adapter from the protective packaging and insert it into the PCI slot by pushing down on the adapter until it is fully seated.

NOTE: When installing PCI adapters, make sure the EMI gasket is aligned properly and does not obscure the adapter LEDs at the front of the controller node.

Figure 25 Installing an iSCSI Adapter
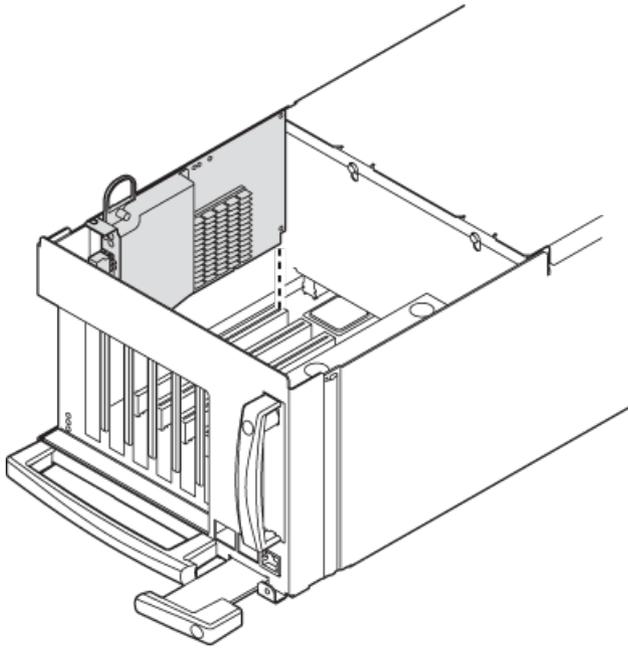
0647_L_R1

6. Reattach the PCI card retention bar (Figure 24 (page 23)) by carefully aligning the notches in the retention bar with the PCI cards.

7. Reinstall the controller node by following the procedure described in "Reinstalling a Serviced Controller Node" (page 7), and then continue on to step 8.

NOTE: The node reboot duration is approximately five to seven minutes. Check the node LEDs to confirm the node has rebooted and has joined the cluster.

8. Monitor the status LED on the controller node ("The Hot-Plug and Status LEDs on a Controller Node" (page 21)). When the status LED appears flashing green and pulses at the same rate as the status LEDs on the other controller nodes in the system, continue with step 9.

Figure 26 The Hot-Plug and Status LEDs on a Controller Node

Disk Hot-plug LED
Node Hot-plug LED
Node Status LED

0601_L_R3

9. In the SP window, verify the node has joined the cluster by issuing the `shownode` command.

```
cli% shownode
                                     Control   Data       Cache
Node --Name--- -State- Master InCluster ---LED--- Mem(MB) Mem(MB) Available(%)
   0 1000163-0 OK      Yes    Yes       GreenBlnk   4096    6144          100
   1 1000163-1 OK      No     Yes       GreenBlnk   4096    6144          100
```

10. Verify the correct card has been installed in the correct slot by issuing the `shownode -i` command.

```
cli% shownode -i
-----------------------Nodes----------------------
Node --Name--- -Manufacturer- ----Model----- -Serial-
   0 1000163-0 FLH            920-1053-03.01 0017
   1 1000163-1 FLH            920-1053-03.01 0018
--------------------PCI Cards---------------------
Node Slot Type  -Manufacturer- -Model-     -----Serial-----
   0    0 FC     3PAR           FC044X      0ae2aa6800312262
   0    1 FC     3PAR           FC044X      00472060002182a4
   0    3 Eth    Intel          PRO/1000MT  --
   0    4 iSCSI  QLOGIC         4052C       GS10715A32842
...
```

11. Issue the `showport` command to verify each possible port is present to the system and is working properly.

```
cli% showport

N:S:P      Mode       State ----Node_WWN---- -Port_WWN/HW_Addr- Type
0:0:1 initiator       ready 2FF70002AC000537   20010002AC000537 disk
0:0:2 initiator       ready 2FF70002AC000537   20020002AC000537 disk
0:1:1      peer     offline               -      001B21008E18 rcip
0:2:1 initiator loss_sync 2FF70002AC000537   20210002AC000537 free
0:2:2 initiator loss_sync 2FF70002AC000537   20220002AC000537 free
0:3:1    target loss_sync 2FF70002AC000537   20310002AC000537 free
0:3:2    target       ready 28320002AC000537   20320002AC000537 host
1:0:1 initiator       ready 2FF70002AC000537   21010002AC000537 disk
1:0:2 initiator       ready 2FF70002AC000537   21020002AC000537 disk
1:1:1      peer     offline               -      001B210046E6 rcip
1:2:1 initiator loss_sync 2FF70002AC000537   21210002AC000537 free
1:2:2 initiator loss_sync 2FF70002AC000537   21220002AC000537 free
1:3:1    target loss_sync 2FF70002AC000537   21310002AC000537 free
1:3:2    target       ready 2FF70002AC000537   21320002AC000537 host
```

12. Issue the `checkhealth -svc` command to verify your system is healthy.
13. In the SP window issue the `exit` command to stop the CLI session.
14. Log off from the SPMAINT session by selecting `x` to exit.
15. Disconnect the serial cable from the maintenance PC. Coil and place the cable behind the SP.
16. Disconnect the red crossover Ethernet cable from the laptop. Coil and place the cable behind the SP. If applicable, reconnect the customer Ethernet cable and all other cables to the node.
17. Close and lock the rear door of the storage system.
18. Reinstall and secure the front fascia on the storage system if applicable.

Installing Drive Magazines

The following sections explain how to install additional drive magazines into the drive cages.

⚠ **CAUTION:** To avoid potential damage to equipment and loss of data, handle disks and drive magazines carefully.

NOTE: For instructions on expanding a storage system with additional drive chassis, see "Installing Additional Drive Chassis" (page 31).

Handling Drive Magazines

When handling drive magazines, observe the following precautions:

- Always use a wrist grounding strap. A wrist grounding strap is provided with the storage system. Attach the grounding strap clip directly to an unpainted surface of the rack.

- Avoid contact between drive magazines and clothing that can carry electrostatic charge.

- When carrying a drive magazine, always support it with both hands as shown in Figure 27 (page 26).

Figure 27 Handling Drive Magazines

0030_L_R1
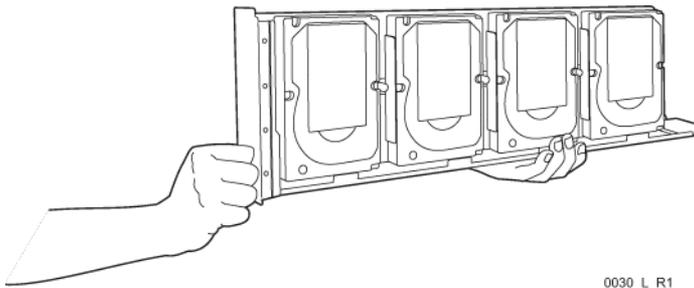
Installing Additional Drive Magazines

A Drive chassis may hold a maximum of 10 drive magazines. Install additional drive magazines to upgrade partially populated drive chassis.

When installing additional drive magazines, unless otherwise specified, install drive magazines from the outside in, beginning with the unpopulated drive bay with the lowest number (Figure 28 (page 26)).

Figure 28 Drive Magazine Installation

0670_L_R2
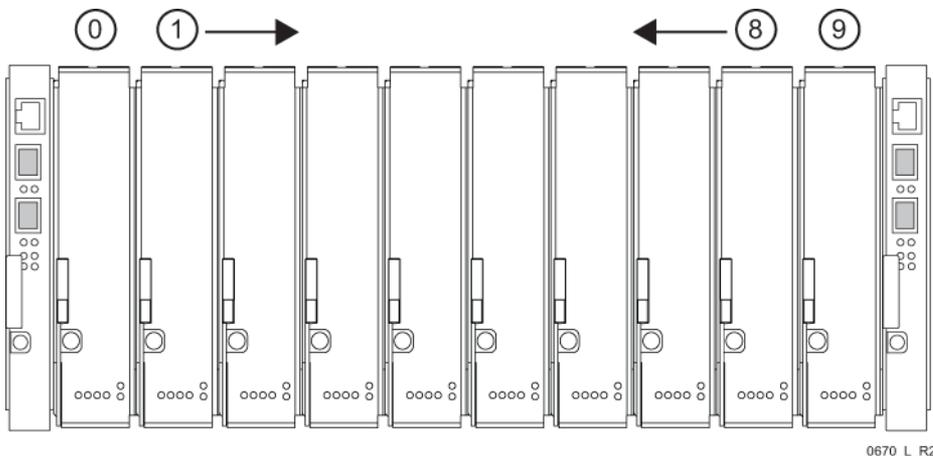
NOTE: For a detailed description of drive chassis and drive bay numbering, see *Drive Chassis Numbering* in of the *HP 3PAR T-Class Storage System Installation and Deinstallation Guide*.

To install additional drive magazines into a drive chassis:

1. Start a SPMAINT session:
   a. Connect the maintenance PC to the SP using the serial connection.
   b. Log on to the SP with your login name and password.
2. Select option **7, Interactive CLI for an StoreServ**.
3. Select the desired system.
4. Issue the `checkhealth -svc` command and verify the system is healthy.
5. Issue the `locatecage cage<x>` command to locate the cage(s) for upgrade, where `<x>` is the cage name.
6. Remove the bezels covering the drive chassis to be upgraded and attach the wrist grounding strap clip to any unpainted surface of the cabinet. Use the handle slots located on the sides of the bezel and pull with both hands to remove a bezel (Figure 29 (page 27)).

Figure 29 Removing the Bezel from the Storage System
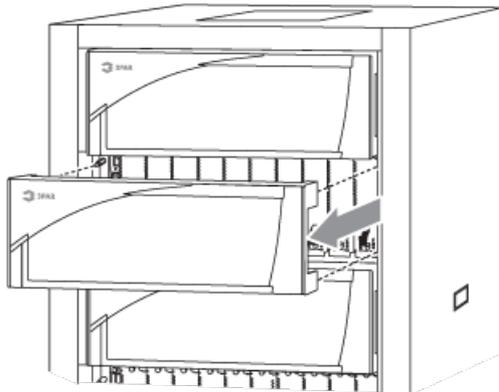
0581_T_R1

7. Place the drive magazine containers near the storage system.[1]
8. Locate the drive magazine filler panel/s covering the affected slot/s in the cage/s slated for the upgrade.

   Place a screwdriver into the filler panel hole, tilt upward, and gently pull the panel out (Figure 30 (page 28)).

---

1. For systems shipped internationally and systems with fewer than 15 drive magazines, the magazines are shipped in boxes. Each box contains 3 magazines.

Figure 30 Removing a Filler Panel from the Drive Cage

Filler Panel Hole

0602_L_R2
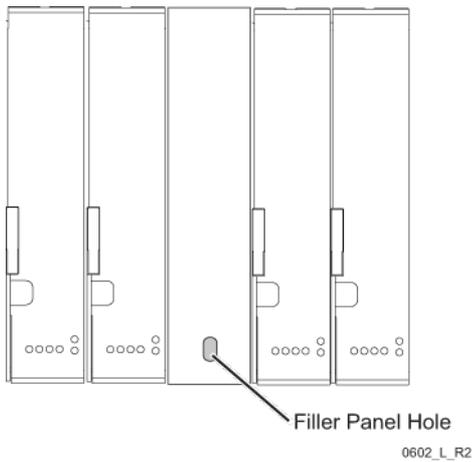
9. Remove a drive magazine from the transport container and unwrap any electrostatic preventative packing material protecting the magazine.
10. With the drive magazine handle in the open (down) position, insert the drive magazine into the drive bay and push until it stops. Lift the drive handle quickly to the closed (up) position to fully seat the drive magazine in the chassis. When fully seated, the handle of the magazine rests against the front of the drive chassis housing (Figure 31 (page 28)).

Figure 31 Inserting a Drive Magazine into a Drive Chassis

0599_L_R1
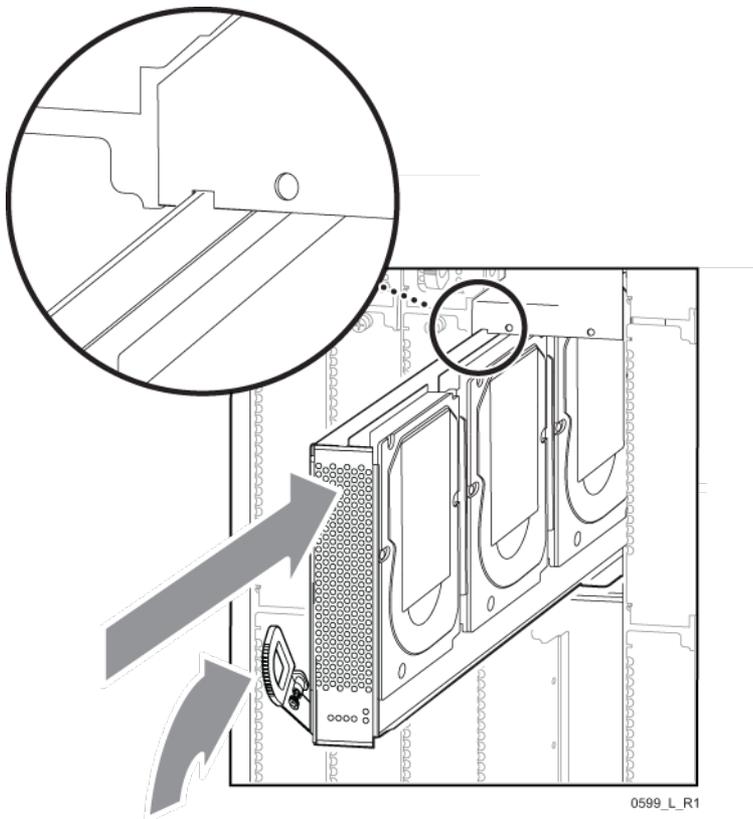
△ **CAUTION:** The drive magazines should glide in easily. If a drive magazine does not insert smoothly, do not force it. Ensure the magazine is properly aligned with the guide notch at the top of the drive bay and apply moderate pressure toward the left side of the magazine while inserting.

11. Inspect the new magazines to confirm all LEDs appear steady or flashing green, and the hot-plug LEDs are not lit.

    NOTE: Allow approximately one minute for the disks on the magazine to spin up before checking the magazine LEDs.

    For more information on drive spin-up issues, see the article *emr_na-3PAR_2BBQDN-4* in the HP Services Access Workbench located at http://www.hp.com/go/saw. (Login required).

12. Use a #2 Phillips screwdriver to tighten the captive screw of the drive magazine, as shown in "Securing the Magazine in the Drive Chassis" (page 39). Do not overtighten .

    Figure 32 Securing the Magazine in the Drive Chassis
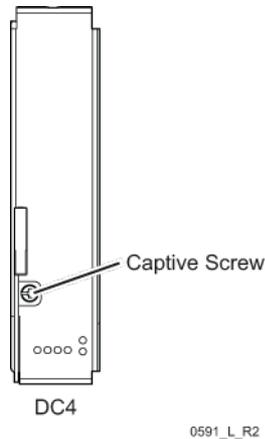
13. Repeat step 8 through 12 for each additional drive magazine to be added to the system.
14. After installing the drive magazines, ensure all empty drive bays are covered with filler panels. Place a drive magazine filler panel over the front opening of the drive bay. Carefully push the panel into place.

   △ **CAUTION:** To prevent overheating of the drive chassis, do not operate a storage system unless all bays in the drive chassis are filled with drive magazines or sealed with drive magazine filler panels.

15. Verify the new drive magazines are added successfully by issuing the `showpd` command. The disk `State` in the following example shows `new` .

```
cli% showpd
                                 ----Size(MB)----- ----Ports----
Id CagePos Type RPM State    Total    Free A        B       Cap(GB)
 0 0:0:0   FC    15 normal   278528   245760 0:6:1* 1:6:1       300
 1 0:0:1   FC    15 normal   278528   258048 0:6:1  1:6:1*      300
 2 0:0:2   FC    15 normal   278528   244736 0:6:1* 1:6:1       300
 3 0:0:3   FC    15 normal   278528   258048 0:6:1  1:6:1*      300
 4 0:9:0   FC    15 normal   278528   245760 0:6:1* 1:6:1       300
 5 0:9:1   FC    15 normal   278528   258048 0:6:1  1:6:1*      300
 6 0:9:2   FC    15 normal   278528   245760 0:6:1* 1:6:1       300
 7 0:9:3   FC    15 normal   278528   258048 0:6:1  1:6:1*      300
 8 1:0:0   FC    15 normal   278528   245760 0:6:2* 1:6:2       300
 9 1:0:1   FC    15 normal   278528   258048 0:6:2  1:6:2*      300
10 1:0:2   FC    15 normal   278528   245760 0:6:2* 1:6:2       300
11 1:0:3   FC    15 normal   278528   258048 0:6:2  1:6:2*      300
12 1:9:0   FC    15 normal   278528   245760 0:6:2* 1:6:2       300
13 1:9:1   FC    15 normal   278528   258048 0:6:2  1:6:2*      300
14 1:9:2   FC    15 normal   278528   245760 0:6:2* 1:6:2       300
15 1:9:3   FC    15 normal   278528   258048 0:6:2  1:6:2*      300
16 2:0:0   FC    15 normal   559104   514048 0:6:3* 1:6:3       600
```

```
17 2:0:1    FC     15 normal     559104    526336 0:6:3   1:6:3*      600
18 2:0:2    FC     15 normal     559104    516096 0:6:3*  1:6:3       600
19 2:0:3    FC     15 normal     559104    528384 0:6:3   1:6:3*      600
20 2:9:0    FC     15 normal     559104    515072 0:6:3*  1:6:3       600
          -----------------------------------------------------------------
```

16. Admit the new disks.

```
cli%
admithw
```

NOTE: CLI command `admithw` may prompt you to set a sparing schedule. Refer to "Storage System Sparing Schedule" (page 90) for additional information on sparing.

17. Verify the new disks have been admitted. The disk `State` in the following example should show `normal` .

```
cli% showpd
                            ----Size(MB)----- ----Ports----
Id CagePos Type RPM State     Total      Free A       B        Cap(GB)
 0 0:0:0   FC    15 normal    278528    245760 0:6:1*  1:6:1      300
 1 0:0:1   FC    15 normal    278528    258048 0:6:1   1:6:1*     300
 2 0:0:2   FC    15 normal    278528    244736 0:6:1*  1:6:1      300
 3 0:0:3   FC    15 normal    278528    258048 0:6:1   1:6:1*     300
 4 0:9:0   FC    15 normal    278528    245760 0:6:1*  1:6:1      300
 5 0:9:1   FC    15 normal    278528    258048 0:6:1   1:6:1*     300
 6 0:9:2   FC    15 normal    278528    245760 0:6:1*  1:6:1      300
 7 0:9:3   FC    15 normal    278528    258048 0:6:1   1:6:1*     300
 8 1:0:0   FC    15 normal    278528    245760 0:6:2*  1:6:2      300
 9 1:0:1   FC    15 normal    278528    258048 0:6:2   1:6:2*     300
10 1:0:2   FC    15 normal    278528    245760 0:6:2*  1:6:2      300
11 1:0:3   FC    15 normal    278528    258048 0:6:2   1:6:2*     300
12 1:9:0   FC    15 normal    278528    245760 0:6:2*  1:6:2      300
13 1:9:1   FC    15 normal    278528    258048 0:6:2   1:6:2*     300
14 1:9:2   FC    15 normal    278528    245760 0:6:2*  1:6:2      300
15 1:9:3   FC    15 normal    278528    258048 0:6:2   1:6:2*     300
16 2:0:0   FC    15 normal    559104    514048 0:6:3*  1:6:3      600
17 2:0:1   FC    15 normal    559104    526336 0:6:3   1:6:3*     600
18 2:0:2   FC    15 normal    559104    516096 0:6:3*  1:6:3      600
19 2:0:3   FC    15 normal    559104    528384 0:6:3   1:6:3*     600
20 2:9:0   FC    15 normal    559104    515072 0:6:3*  1:6:3      600
          -----------------------------------------------------------------
```

18. Inspect all fibre and Ethernet cables are properly connected and verify all Status LEDs are displaying green.
19. Issue the `checkhealth -svc` command to verify your system is healthy.
20. In the SP window issue the `exit` command to stop the CLI session.
21. Log off from the SPMAINT session by selecting `x` to exit.
22. Disconnect the serial cable from the maintenance PC. Coil and place the cable behind the SP.
23. Disconnect the red crossover Ethernet cable from the laptop. Coil and place the cable behind the SP. If applicable, reconnect the customer Ethernet cable and all other cables to the node.
24. Close and lock the rear door of the storage system.
25. Reinstall and secure the front fascia on the storage system if applicable.

2 Installing Additional Drive Chassis

This chapter provides information on expanding storage system with additional drive chassis.

## Preparing to Install Additional Drive Chassis

Expanding an HP 3PAR T-Class Storage System with additional drive chassis to existing cabinets does not require system downtime. As a precautionary measure, verify with the local system administrator if they performed a complete backup of all data on the storage system before installing additional hardware.

Handling Drive Magazines

When handling drive magazines, observe the following precautions:

⚠ **CAUTION:** To avoid potential damage to equipment and loss of data, handle disks and drive magazines carefully.

- Always use a wrist grounding strap. A wrist grounding strap is provided with the storage system. Attach the grounding strap clip directly to an unpainted surface of the cabinet.
- Avoid contact between drive magazines and clothing that can carry an electrostatic charge.
- When carrying a drive magazine, always support it with both hands as shown in "Handling Drive Magazines" (page 31).

Figure 33 Handling Drive Magazines
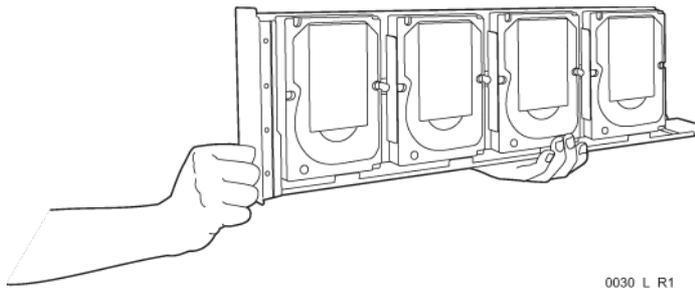
0030_L_R1

NOTE: If the storage system is equipped with an optional locking fascia kit, see "Locking Fascia" (page 91) for additional information on removal and replacement.

Adding Drive Chassis

The following sections describe how to install additional drive chassis into an existing cabinet, how to cable the expanded storage system, and how to set up the newly added drive chassis.

Installing Drive Chassis Hardware

To install additional drive chassis hardware into an existing cabinet:
1. Start an SPMAINT session.
   a. Connect the maintenance PC to the SP using the serial connection.
   b. Log on to the SP with your login name and password.
2. Remove the bezels covering the empty chassis bays in the cabinet.

Figure 34 Removing the Bezel from the Storage System
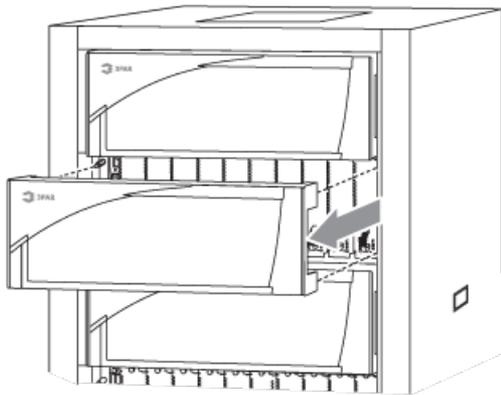
0581_T_R1

3. Remove the remaining bezels from the front of the storage system and remove the front fascias.
4. To remove a fascia, use a #2 Phillips screwdriver to loosen the three screws securing the fascia and pull to remove.
5. At the front of the cabinet, identify the lowest empty chassis bay in the cabinet. Locate the cable managers on each side of the empty chassis bay ("Cable Management System" (page 32)).

Figure 35 Cable Management System
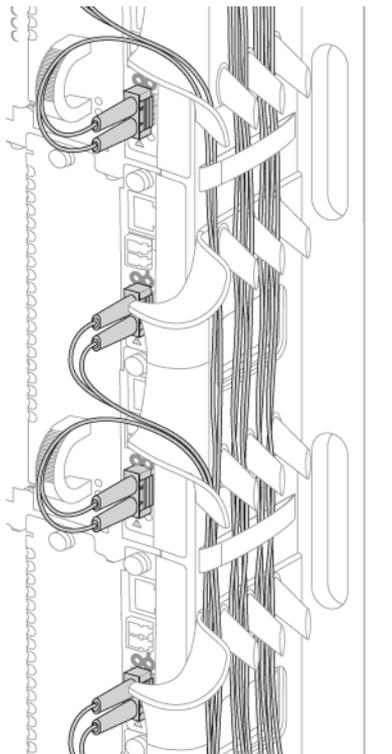
0018_L_R3

△ **CAUTION:** When removing the front half of the cable manager, avoid pulling the front half of the manager before pressing the locking tabs may damage the cable manager.

6. Press the locking tabs together on the front half of the cable manager and pull to remove the front half of the cable manager. Repeat on each side of the empty chassis bay ("Removing the Front Half of a Cable Manager" (page 33)).

Figure 36 Removing the Front Half of a Cable Manager

0308_L_R3
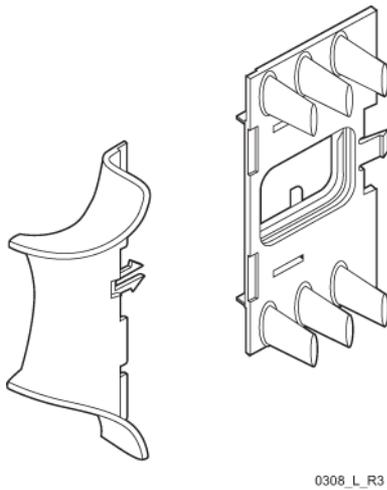
7. Use a #2 Phillips screwdriver to remove the filler panels covering the front and rear of the chassis bay.
8. Remove a new drive chassis from its protective packaging. Verify the drive chassis midplane assemblies and drive cage FC-AL modules are already installed.
9. Slide the drive chassis into the empty bay until it is fully seated ("Inserting the Drive Chassis Into the Empty Bay" (page 33)).

Figure 37 Inserting the Drive Chassis Into the Empty Bay

0442_L_R2
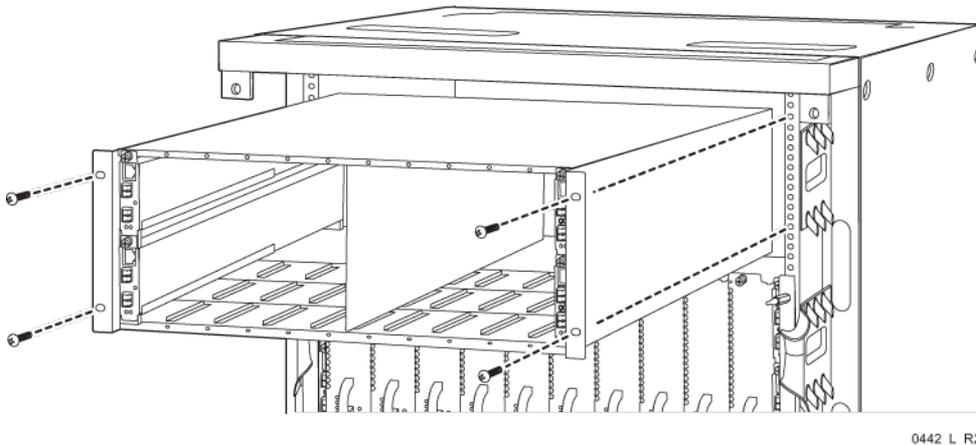
10. At the front of the storage system, use a #2 Phillips screwdriver to tighten the screws securing the drive chassis to the rack. Do not overtighten.
11. Reinstall the cable managers.
12. At the rear of the storage system, insert the drive chassis retaining bracket along the top of the drive chassis housing and use a #2 Phillips screwdriver to tighten the four screws securing the bracket.
13. Insert drive chassis power supplies into the empty slots at the rear of the new drive chassis. Insert each power supply until it is fully seated.

14. Verify the newly inserted power supplies are set to the OFF position ("Setting a Power Supply to the Off Position" (page 34)).

Figure 38 Setting a Power Supply to the Off Position
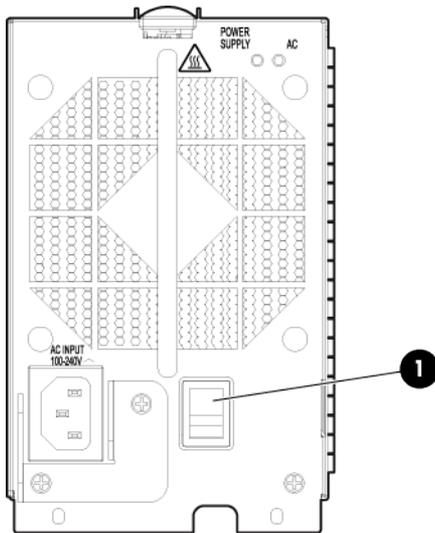
15. From most configurations, connect the AC cords in the cabinet to the power supplies.

Follow the conventions illustrated in Figure 39 (page 46) and Figure 40 (page 36) for connecting the AC cords.

Figure 39 AC Cord Connection Diagram (T400 Node Cabinet or Drive Expansion Cabinet)
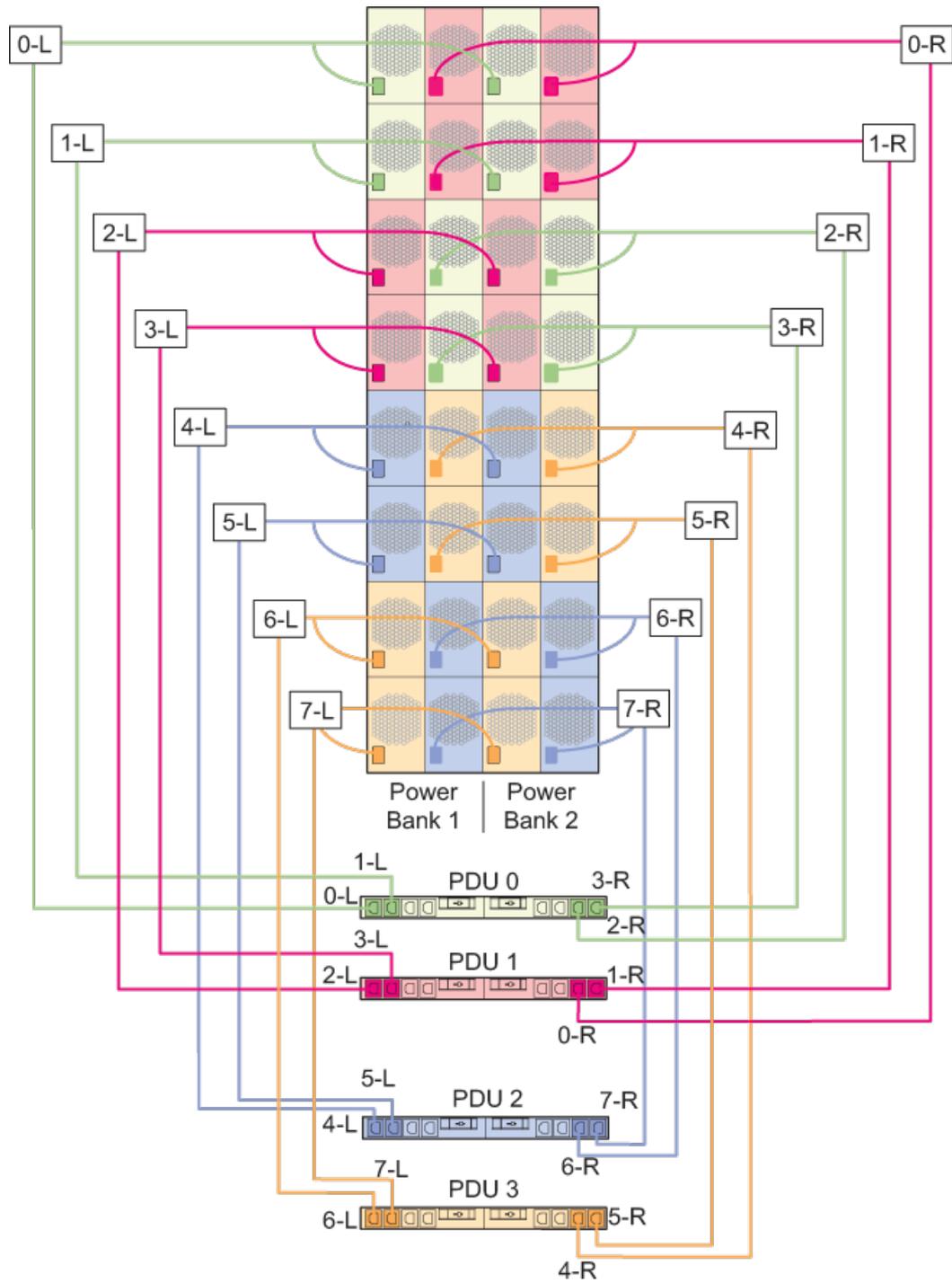
0202_L_R4

Figure 40 AC Cord Connection Diagram (T800 Node Cabinet)
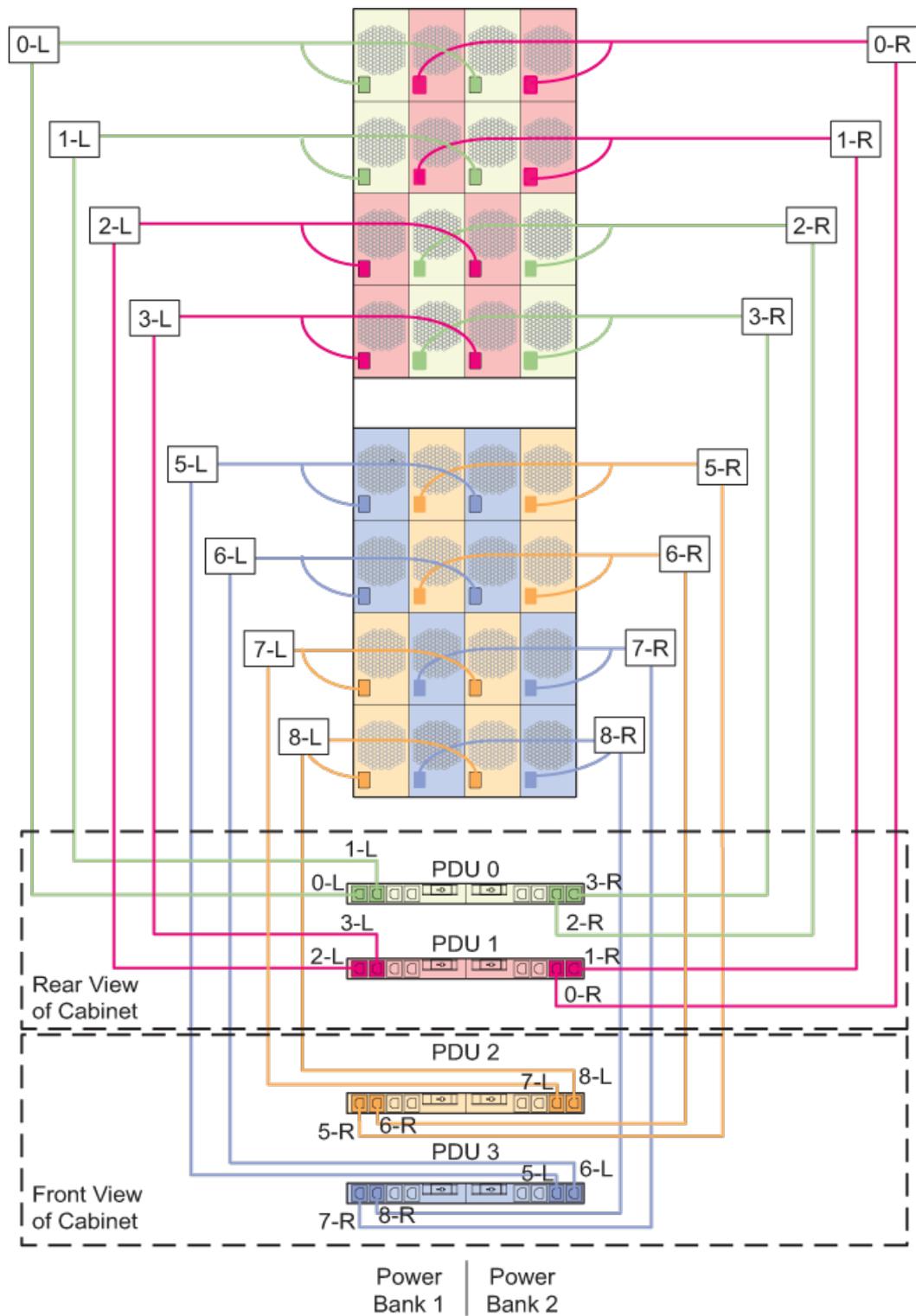
16. Use a #1 Phillips screwdriver to tighten the screws on the power supplies (Figure 41 (page 37)).

Figure 41 Tightening the Screws on a Power Supply
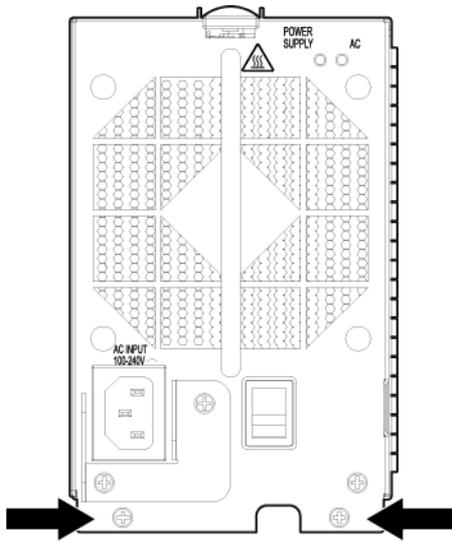
17. Loosen the cord lock screw and rotate the cord lock on the power supply AC cords to cover the end of the cord ("Tightening the Cord Lock Screw on a Power Supply" (page 48)). Secure the cord lock screw.

Figure 42 Tightening the Cord Lock Screw on a Power Supply
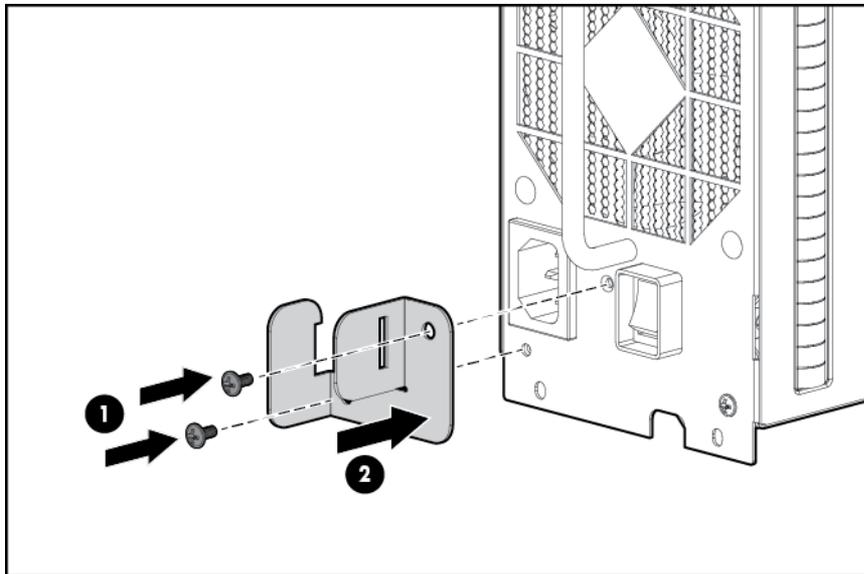
18. Repeat step 5 through 16 for each additional drive chassis.
19. Place the drive magazine transport container near the storage system.[2]
20. Install the new drive magazines into the drive chassis:

> **NOTE:** See the systems planning document or *HP 3PAR Systems Assurance Planning Guide* for details about drive magazine placement based on the specific storage system configuration.

   a. Remove the magazine from the protective sleeve of the shipping container.

---

2. For systems shipped internationally and systems with fewer than 15 drive magazines, the magazines are shipped in boxes. Each box contains 3 magazines.

b. Insert the magazine into the appropriate slot of the new drive chassis. Use the notch at the top of the drive bay as a guide while inserting the magazine (Figure 43 (page 38)).

Drive magazines are typically installed starting from the outside of the drive chassis, working inward. Install the drive magazines in slots 0 and 9 first, followed by 1 and 8, and so forth.

NOTE: See Drive Chassis Numbering in Chapter 3 of the *Storage System Installation, Deinstallation, and Upgrade Guide* for an explanation of the numbering system applied to drive chassis and their components.

**Figure 43 Inserting a Drive Magazine Into a Drive Chassis**
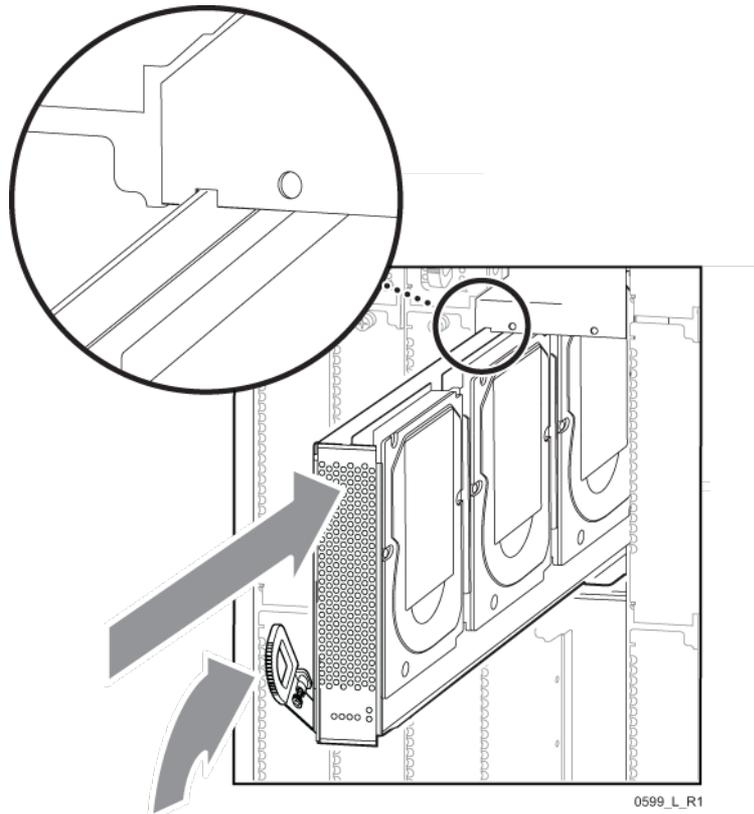
0599_L_R1

c. With he drive magazine handle in the open (down) position, insert the drive magazine into the drive bay and push until it stops. Lift the drive magazine handle quickly into the closed (up) position to fully seat the drive magazine in the chassis. When fully seated, the handle of the magazine should rest evenly against the front of the drive chassis housing.

△ **CAUTION:** Each drive magazine should glide in easily. If a drive magazine does not insert smoothly, do not force it. Ensure the magazine is properly aligned with the guide notch at the top of the drive bay and apply moderate pressure toward the left side of the magazine while inserting.

d. After the drive magazine is fully inserted, use a #2 Phillips screwdriver to tighten the captive screw below the magazine handle, as shown in "Securing the Magazine in the Drive Chassis" (page 39). Do not overtighten.

Figure 44 Securing a Drive Magazine

Captive Screw

DC4

0591_L_R2
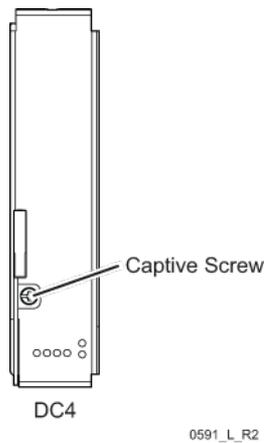
e.   Continue loading drive magazines into the appropriate drive bays until all magazines are installed.

21.   After installing the drive magazines, if there are any empty drive bays, install drive magazine filler panels. Place a drive magazine filler panel over the front opening of each empty drive bay in the system. Align the filler panel magazine hole and push the panel until it is securely seated ("Installing a Drive Magazine Filler Panel" (page 39)).

△   **CAUTION:**   To prevent overheating of the drive chassis, do not operate a storage system unless all bays in the drive chassis are filled with drive magazines or sealed with drive magazine filler panels.

Figure 45 Installing a Drive Magazine Filler Panel

Filler Panel Hole

0602_L_R2
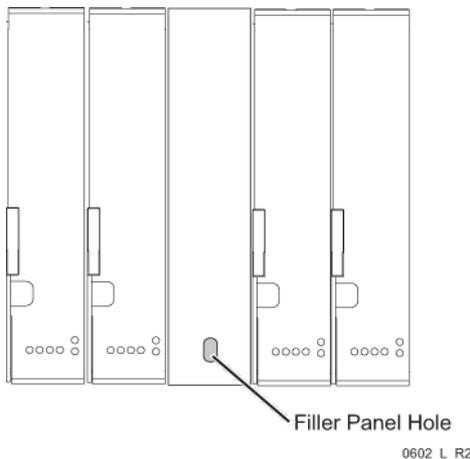
Cabling Drive Chassis

NOTE: If installing additional controller nodes or upgrading internal controller node hardware in addition to adding new drive chassis, follow the instructions in "Cabling New Hardware" (page 50) and "Setting Up New Controller Nodes" (page 52) to complete the upgrade. Otherwise, use the instructions that follow.

After installing all new drive cage hardware, cable the new drive chassis to the controller nodes.

△   **CAUTION:**   To prevent possible damage to Fibre Channel cables, maintain a bend radius greater than 1.4 inches (35 mm).

1. Verify all cables are labeled to help distinguish them from other cables. If necessary attach additional labels to Fibre Channel cables ("Fibre Channel Cable Labels" (page 40)).

Figure 46 Fibre Channel Cable Labels
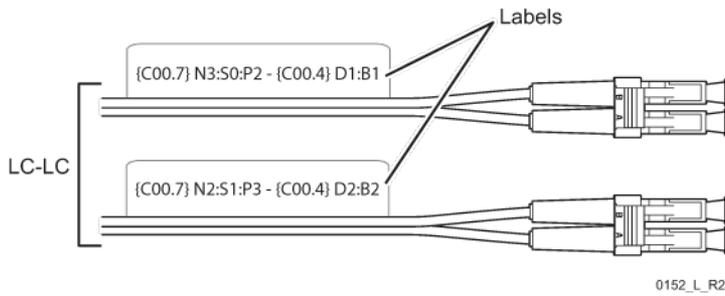
2. Route all Fibre Channel cables into the cabinet through the access openings ("Cabling Access Openings" (page 40)).

   - When connecting new drive chassis in the node cabinet, route the cables along the left or right side of the cabinet.
   - When connecting to a new drive chassis in an expansion cabinet, route the cables out of the node cabinet and into the expansion cabinet through the upper or lower access openings of the cabinet.

Figure 47 Cabling Access Openings
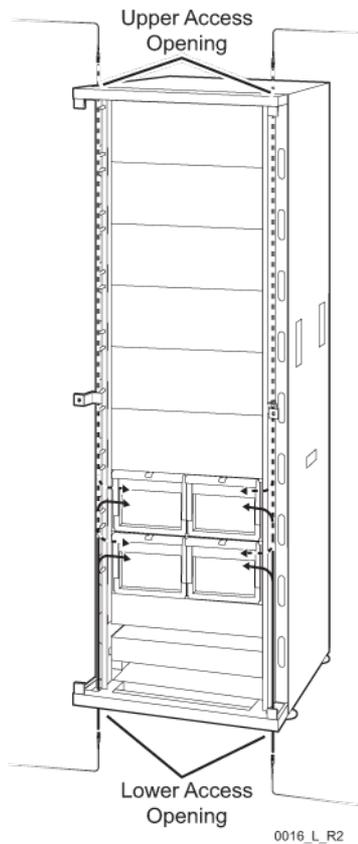
NOTE: You can use either the upper or lower access openings for cable routing. Avoid using the lower center opening at the front of the cabinet as cables routed through this opening may obstruct maintenance procedures.

3. Route the cables through the cabinet using the cable management system before connecting them to the system components.
4. Connect the Fibre Channel cables to the new drive chassis and the controller nodes using the cabling conventions described in *Controller Node to Drive Chassis Cabling*.

   Cable the new drive chassis in numerical order, from bottom to top, until each drive chassis connects to two controller nodes.
5. Inspect the storage system for unused Fibre Channel ports in both the controller nodes and drive chassis. Insert protective plugs into all unused ports to prevent environmental contamination.
6. Reinstall the cabinet fascias and tighten the screws to secure them to the cabinet.

Setting Up New Disks

After installing and cabling the new drive chassis, set up the new disks in the drive chassis as follows:

1. Set all power supplies at the rear of the newly installed drive chassis to the *on* position. It takes approximately one minute for the drives to spin up.
2. Verify the drive magazine LEDs display a steady green light.
3. Start an SPMAINT session.
   a. Connect the maintenance PC to the SP using the serial connection.
   b. Log on to the SP with your login name and password.
4. Select option **7, Interactive CLI for an StoreServ**.
5. Select the desired system.
6. Enter `showpd` to verify all the disks on the new drive magazines appear and the disk `State` is `new`, as shown in the following example:

```
cli% showpd
                            ----Size(MB)----- ----Ports----
Id CagePos Type RPM State    Total     Free A       B         Cap(GB)
 0 0:0:0   FC   15 normal   278528   245760 0:6:1* 1:6:1         300
 1 0:0:1   FC   15 normal   278528   258048 0:6:1  1:6:1*        300
 2 0:0:2   FC   15 normal   278528   244736 0:6:1* 1:6:1         300
 3 0:0:3   FC   15 normal   278528   258048 0:6:1  1:6:1*        300
 4 0:9:0   FC   15 normal   278528   245760 0:6:1* 1:6:1         300
 5 0:9:1   FC   15 normal   278528   258048 0:6:1  1:6:1*        300
 6 0:9:2   FC   15 normal   278528   245760 0:6:1* 1:6:1         300
 7 0:9:3   FC   15 new      278528   258048 0:6:1  1:6:1*        300
 8 1:0:0   FC   15 normal   278528   245760 0:6:2* 1:6:2         300
 9 1:0:1   FC   15 normal   278528   258048 0:6:2  1:6:2*        300
10 1:0:2   FC   15 normal   278528   245760 0:6:2* 1:6:2         300
11 1:0:3   FC   15 normal   278528   258048 0:6:2  1:6:2*        300
12 1:9:0   FC   15 normal   278528   245760 0:6:2* 1:6:2         300
13 1:9:1   FC   15 normal   278528   258048 0:6:2  1:6:2*        300
14 1:9:2   FC   15 normal   278528   245760 0:6:2* 1:6:2         300
15 1:9:3   FC   15 normal   278528   258048 0:6:2  1:6:2*        300
16 2:0:0   FC   15 normal   559104   514048 0:6:3* 1:6:3         600
17 2:0:1   FC   15 normal   559104   526336 0:6:3  1:6:3*        600
18 2:0:2   FC   15 normal   559104   516096 0:6:3* 1:6:3         600
19 2:0:3   FC   15 normal   559104   528384 0:6:3  1:6:3*        600
20 2:9:0   FC   15 normal   559104   515072 0:6:3* 1:6:3         600
-------------------------------------------------------------------------
```

7. Admit the new disks to the system by issuing the `admithw` command.

   If the drive firmware is old, the `admithw` command also performs the firmware upgrade.

   ```
   cli%
   admithw
   ```

8. Issue the `showpd` command to verify all the disks on the new drive magazine appear and the drive `State` is `normal`, as shown in the following example:

   ```
   cli% showpd
                                       ----Size(MB)----- ----Ports----
   Id CagePos Type RPM State     Total     Free A       B        Cap(GB)
    0 0:0:0   FC   15  normal    278528   245760 0:6:1* 1:6:1       300
    1 0:0:1   FC   15  normal    278528   258048 0:6:1  1:6:1*      300
    2 0:0:2   FC   15  normal    278528   244736 0:6:1* 1:6:1       300
    3 0:0:3   FC   15  normal    278528   258048 0:6:1  1:6:1*      300
    4 0:9:0   FC   15  normal    278528   245760 0:6:1* 1:6:1       300
    5 0:9:1   FC   15  normal    278528   258048 0:6:1  1:6:1*      300
    6 0:9:2   FC   15  normal    278528   245760 0:6:1* 1:6:1       300
    7 0:9:3   FC   15  normal    278528   258048 0:6:1  1:6:1*      300
    8 1:0:0   FC   15  normal    278528   245760 0:6:2* 1:6:2       300
    9 1:0:1   FC   15  normal    278528   258048 0:6:2  1:6:2*      300
   10 1:0:2   FC   15  normal    278528   245760 0:6:2* 1:6:2       300
   11 1:0:3   FC   15  normal    278528   258048 0:6:2  1:6:2*      300
   12 1:9:0   FC   15  normal    278528   245760 0:6:2* 1:6:2       300
   13 1:9:1   FC   15  normal    278528   258048 0:6:2  1:6:2*      300
   14 1:9:2   FC   15  normal    278528   245760 0:6:2* 1:6:2       300
   15 1:9:3   FC   15  normal    278528   258048 0:6:2  1:6:2*      300
   16 2:0:0   FC   15  normal    559104   514048 0:6:3* 1:6:3       600
   17 2:0:1   FC   15  normal    559104   526336 0:6:3  1:6:3*      600
   18 2:0:2   FC   15  normal    559104   516096 0:6:3* 1:6:3       600
   19 2:0:3   FC   15  normal    559104   528384 0:6:3  1:6:3*      600
   20 2:9:0   FC   15  normal    559104   515072 0:6:3* 1:6:3       600
   --------------------------------------------------------------------
   ```

9. Issue the `checkhealth -svc` command to verify the system is healthy.
10. In the SP window issue the `exit` command to stop the CLI session.
11. Log off the SPMAINT session by selecting `x` to exit.
12. Disconnect the serial cable from the maintenance PC. Coil and place the cable behind the SP.
13. Disconnect the red crossover Ethernet cable from the laptop. Coil and place the cable behind the SP. If applicable, reconnect the customer Ethernet cable and all other cables to the node.
14. Close and lock the rear door of the storage system.
15. Reinstall and secure the front fascia on the storage system if applicable.

3 Installing Additional Controller Nodes

This chapter explains how to upgrade an existing storage system configuration with additional controller nodes.

> **NOTE:** For instructions on installing controller nodes, see "Handling Controller Nodes" (page 43).

> **NOTE:** If the storage system is equipped with an optional locking fascia kit, see *Locking Fascia* for additional information on removal and replacement.

Preparing for Controller Node Upgrades

It is preferable to install controller nodes into a running system but the new controller nodes do not start and join the cluster immediately. Before a node can join the cluster, use the SP to load the proper OS version on to the controller node. This procedure is described in "Setting Up New Controller Nodes" (page 52).

Before performing any upgrade or expansion, verify with the system administrator if a complete backup of all data on the storage system has been performed.

> △ **CAUTION:** When performing any upgrade while the customer is concurrently using the system, exercise extreme caution because any incorrect action taken during an upgrade may cause the system to fail.

Handling Controller Nodes

When handling controller nodes, observe the following precautions:

- Always wear a wrist grounding strap. A wrist grounding strap is provided with the storage system. Attach the grounding strap clip directly to an unpainted surface of the rack.
- Use both hands when carrying controller nodes.
- Avoid contact between nodes and clothing that can carry electrostatic charge.
- Ensure all cables are properly labeled and easily identifiable prior to halting the node.

Adding Controller Nodes

For storage systems with available bays in the storage system, installing additional nodes enhances performance and increases the number of Fibre Channel ports in the storage system.

Nodes are added in pairs. The following sections describe how to upgrade an existing storage system by adding controller nodes. The procedures described here include installing node hardware, cabling the upgraded storage system, and setting up the new controller nodes in the storage system.

Installing Controller Node Hardware

Upgrading a controller node hardware involves installing controller nodes, power supplies, and battery backup units (BBU).

> **NOTE:** If the system does not recognize the battery serial number or expiration date, issue the `setbattery` command to set the battery information. For additional `setbattery` information, see the *HP 3PAR OS Command Line Interface Reference*.

To install additional controller node hardware:

1. At the front of the storage system, remove the bezels covering the storage system chassis. Use the handle slots located on the sides of the bezel and pull with both hands to remove the bezel.

2. At the front of the storage system, use a #2 Phillips screwdriver to remove the filler panels covering the empty node bays directly above the existing nodes in the storage system chassis.

   If you are installing more than one node pair, remove additional filler panels from the chassis as needed, working up from the bottom of the chassis.

3. Insert the additional nodes into the appropriate bays.
   a. Loosen the captive screw on the locking handle and fully extend it, then slide the node into the chassis slot on the storage system.

   Figure 48 Node Captive Screw

4. Use a #2 Phillips screwdriver to tighten the screw securing the locking handle to the node.
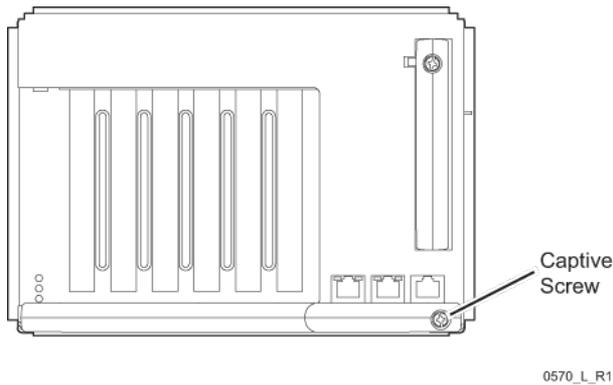
   b. When the controller node can no longer be pushed in, push in the locking handle to cam the node into its fully seated position ("Inserting the Controller Node" (page 44)).

   Figure 49 Inserting the Controller Node
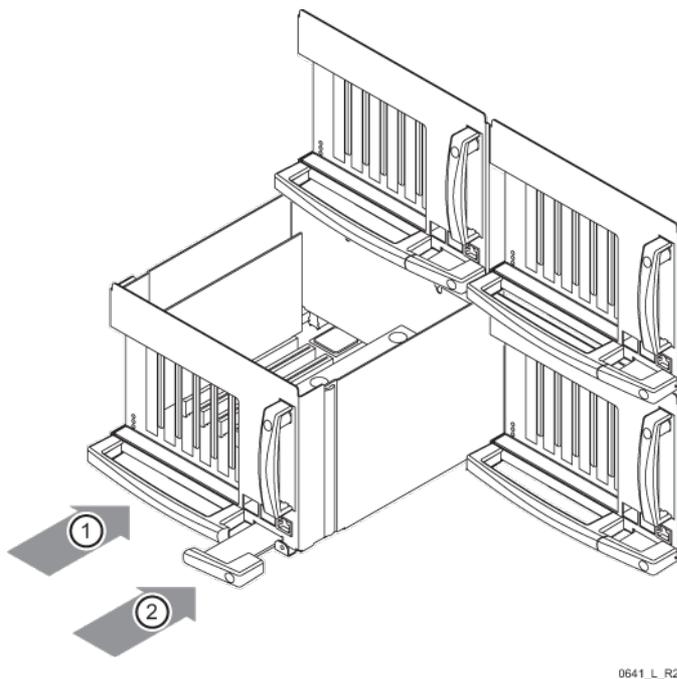
4. Use a #2 Phillips screwdriver to tighten the screw securing the locking handle to the node.
5. At the rear of the storage system, locate the filler panels covering the power supply bays directly behind the new nodes. Use a #2 Phillips screwdriver to remove the filler panels.
6. Insert controller node power supplies into the power supply bays. Insert each power supply until fully seated, aligning the screws holes in the power supplies with the holes in the storage system chassis.

7. Secure each power supply to the chassis by inserting the power supply screws (non-captive) into the two holes at the bottom of the power supply and tightening ("Tightening the Screws in a Power Supply (Typical)" (page 45)). Do not over tighten the screws.

Figure 50 Tightening the Screws in a Power Supply (Typical)
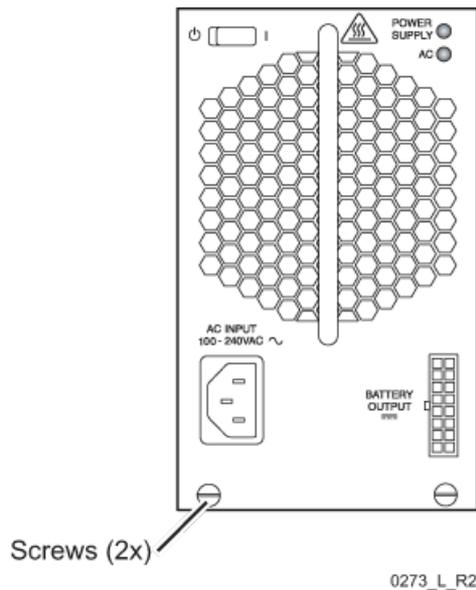
8. Verify the newly inserted power supplies are set to the OFF position. For most configurations, connect the AC cords in the cabinet to the power supplies following the conventions illustrated in Figure 39 (page 46) and/or Figure 52 (page 47). Make sure the AC cord connectors are fully seated.

    NOTE: In order to connect the AC cords, it may be necessary to loosen the cord lock screws with a #1 Phillips screwdriver and rotate the cord locks.

**Figure 51 AC Cord Connection Diagram (T400 Node Cabinet or Drive Expansion Cabinet)**
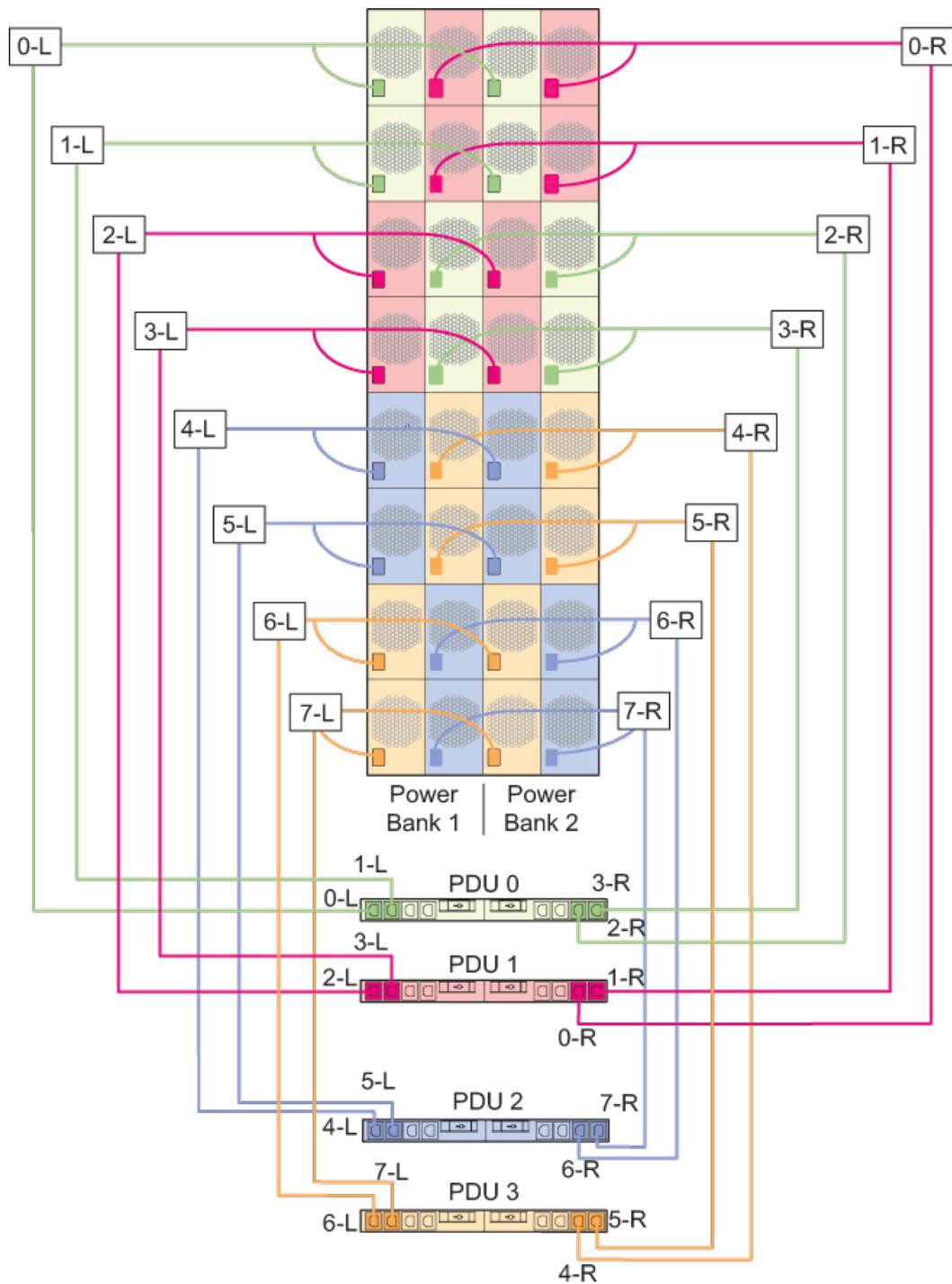
0202_L_R4

Figure 52 AC Cord Connection Diagram (T800 Node Cabinet)
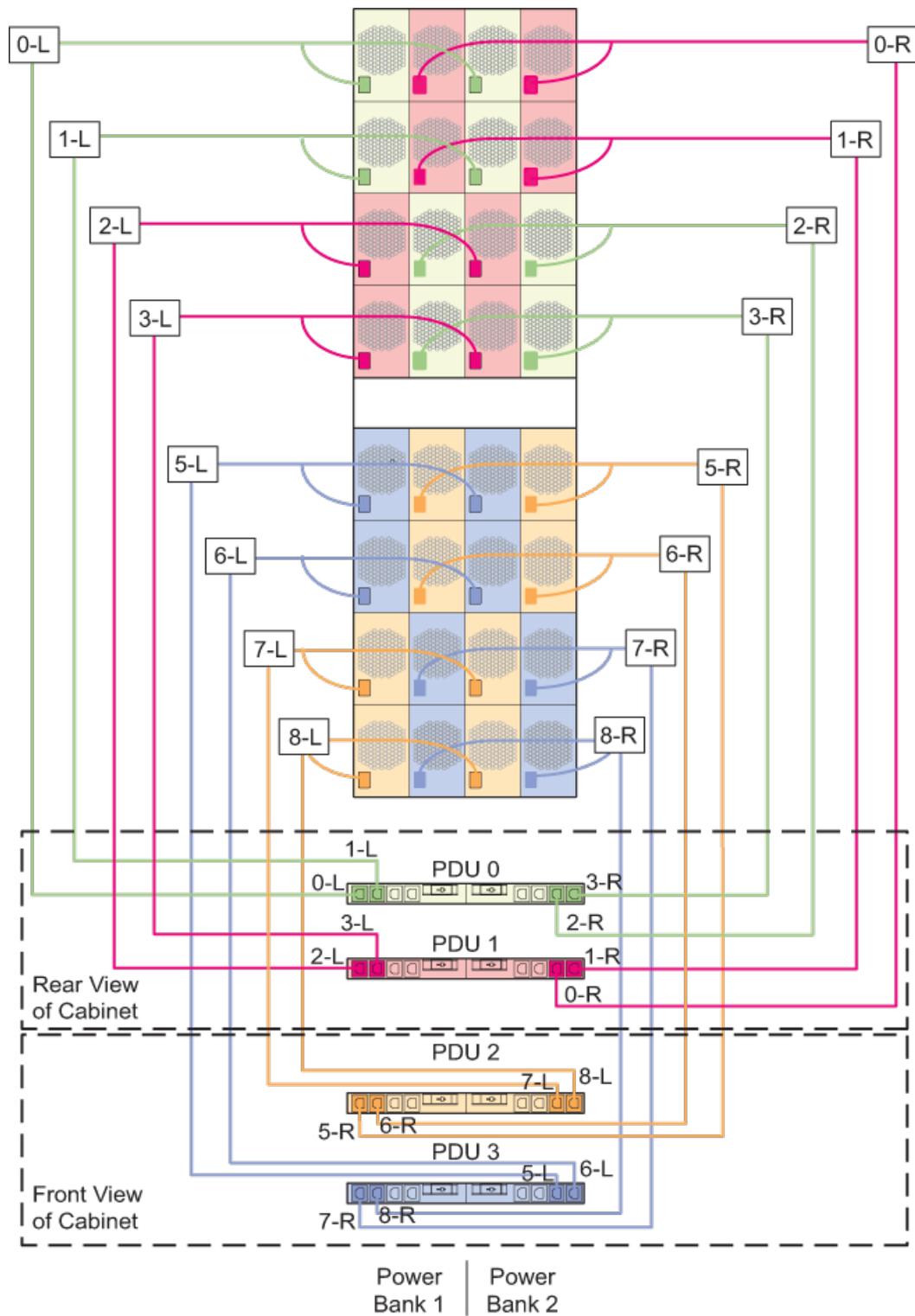
9. After connecting the AC cords, use a #1 Phillips screwdriver to tighten the cord lock screws (Figure 42 (page 48)).

Figure 53 Tightening the Cord Lock Screw on a Power Supply (Typical)
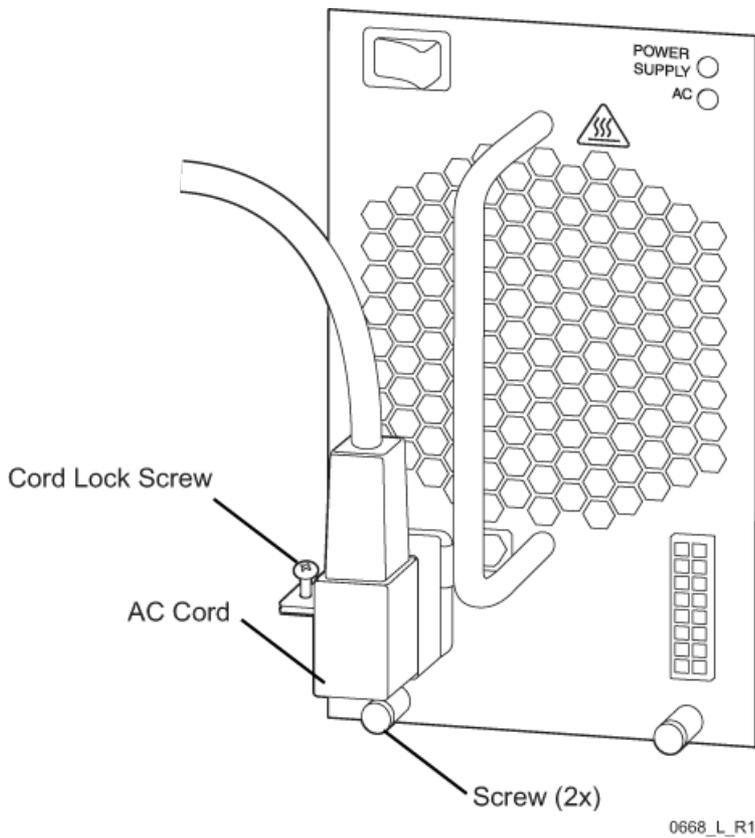
⚠ **CAUTION:**   Use caution when handling BBUs because they are heavy and contain hazardous materials.

10. For each new controller node, insert a BBU into the storage system battery tray. To determine how to place additional BBUs in the battery trays, see the BBU placement and cabling configuration diagram in "Battery Backup Unit Placement and Cabling (Rear View)" (page 49).

   NOTE: Insert the BBUs at the front of the storage system.

**Figure 54 Battery Backup Unit Placement and Cabling (Rear View)**
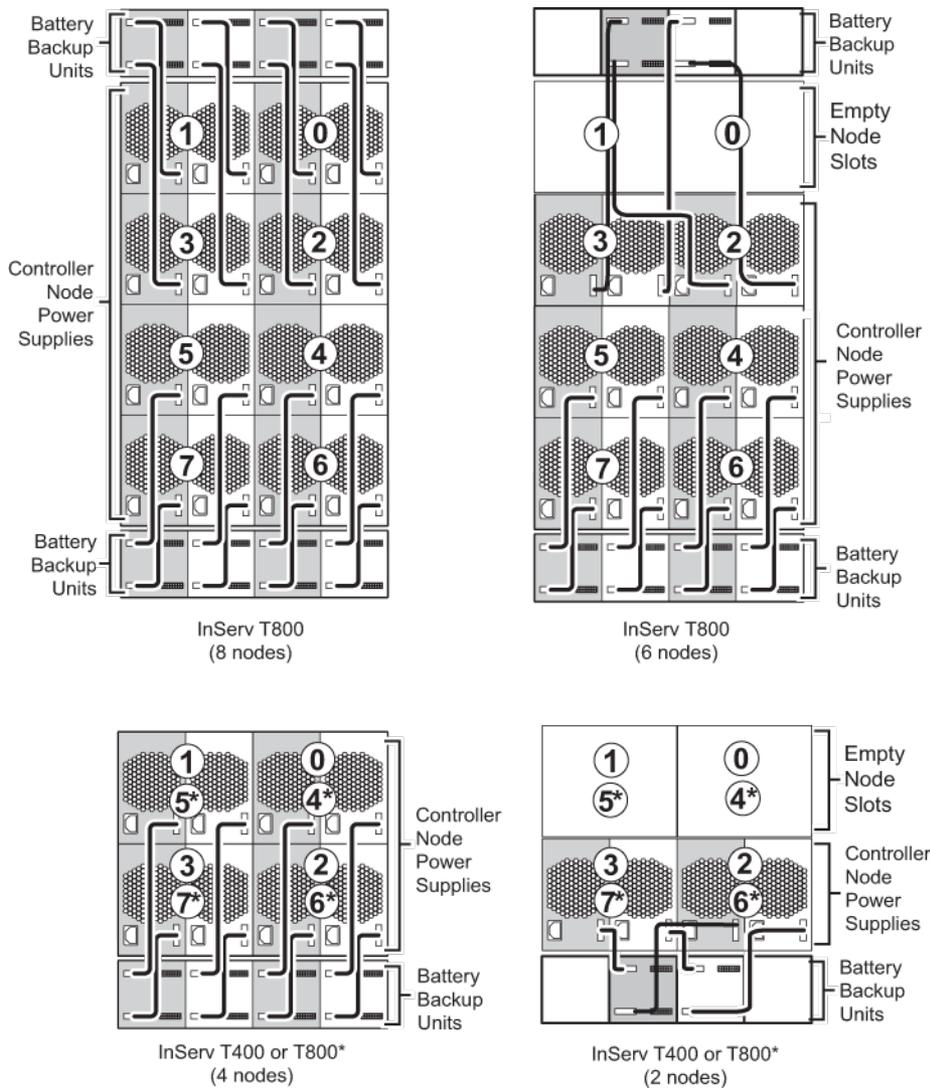
11. After inserting the BBUs, use a #1 Phillips screwdriver to tighten the two screws (provided with the BBU packaging) securing each BBU in the battery tray.

12. Verify the power switches of the newly installed BBUs for both *battery a* and *battery b* are set to the OFF position before proceeding with cabling.

13. See "Battery Backup Unit Placement and Cabling (Rear View)" (page 49) to determine whether it is necessary to recable existing BBUs. Each BBU contains two batteries. To disconnect a battery cable, set the power on the battery to the OFF position and then press the white tab on the cable connector.

△ **CAUTION:** Disconnecting existing BBUs during the installation of additional batteries may temporarily deprive one or more controller nodes of backup power.

△ **CAUTION:** Do not turn off more than one active battery half at a time. In order for write-caching to remain active, each node must have at least one operating battery attached.

14. Remove the new battery cable from the BBU packaging and connect the battery cable from the controller node power supply to the appropriate BBU by following the cable diagrams in "Battery Backup Unit Placement and Cabling (Rear View)" (page 49). To avoid leaving a node without backup power, use "Battery Backup Unit Cabling Sequence." (page 50).

Figure 55 Battery Backup Unit Cabling Sequence.
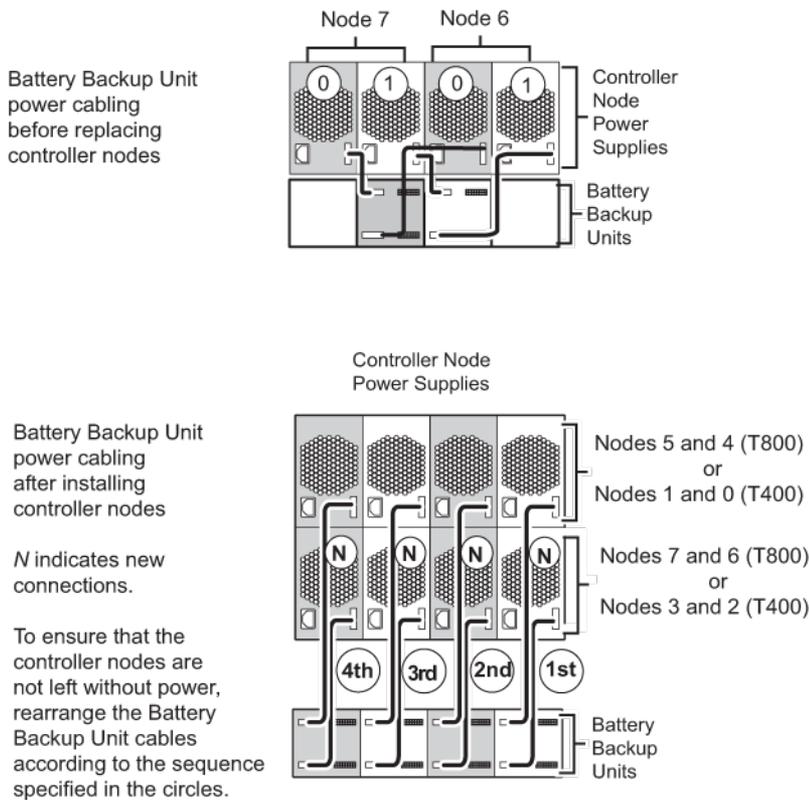
15. Set the power switches to the ON position on the BBUs. This minimizes the amount of time for existing nodes to operate without battery backup.
16. Repeat for each new power supply and battery.
17. On the CLI, enter `controlbattery skip_on`. The command prevents performance degradation.

Cabling New Hardware

After completing the physical installation of all new controller nodes, drive magazines, and drive chassis, cable the drive chassis and controller nodes.

△ **CAUTION:** To prevent possible damage to Fibre Channel cables, maintain a bend radius greater than 1.4 in. (35 mm).

NOTE: If you are installing additional drive chassis, perform the hardware installation procedures necessary for those upgrades before continuing with cabling and setting up the new controller nodes. Drive chassis upgrade procedures are described in "Installing Additional Drive Chassis" (page 31).

NOTE: When dressing the cables to the node ports, provide several inches of slack (a service loop) so the node disk can be serviced from the front of the system without disconnecting cables.

Cable the drive chassis and nodes as follows:

1. Verify all cables are labeled to help distinguish them from other cables. The Fibre Channel cables may contain labels to simplify this task ("Fibre Channel Cable Labels" (page 51)). If necessary, attach additional labels to Fibre Channel cables.

Figure 56 Fibre Channel Cable Labels
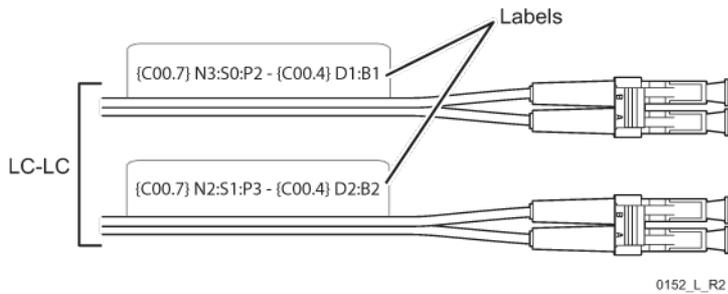
2. Remove the remaining bezels from the front of the storage system and remove the front fascias in order to route the cables.

   To remove a fascia, use a #2 Phillips screwdriver to loosen the three screws securing the fascia and then pull to remove.

   NOTE: If your cabinet is equipped with locking fascias, refer to "Locking Fascia" (page 91) for instructions on removing locking fascias.

3. Route the new Fibre Channel cables into the cabinet as shown in "Routing Cables Into the Cabinet" (page 51).

△ CAUTION: To prevent possible damage to Fibre Channel cables, maintain a bend radius greater than 1.4 in. (35 mm).

Figure 57 Routing Cables Into the Cabinet
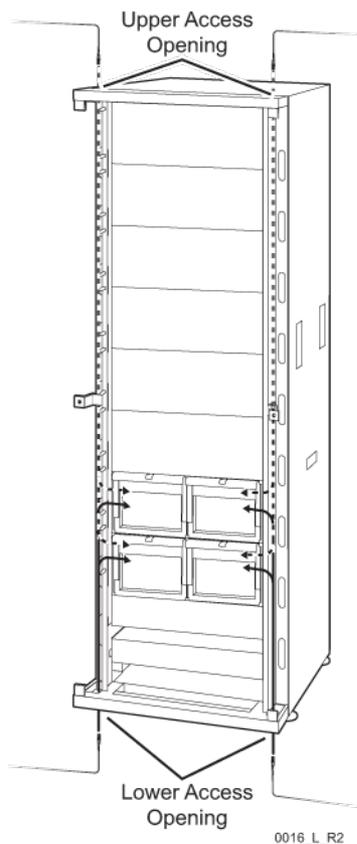
Route the cables through the cable management system before connecting them to the controller nodes ("Routing the Cables Through the Cable Management System" (page 52)).

Figure 58 Routing the Cables Through the Cable Management System


0018_L_R3
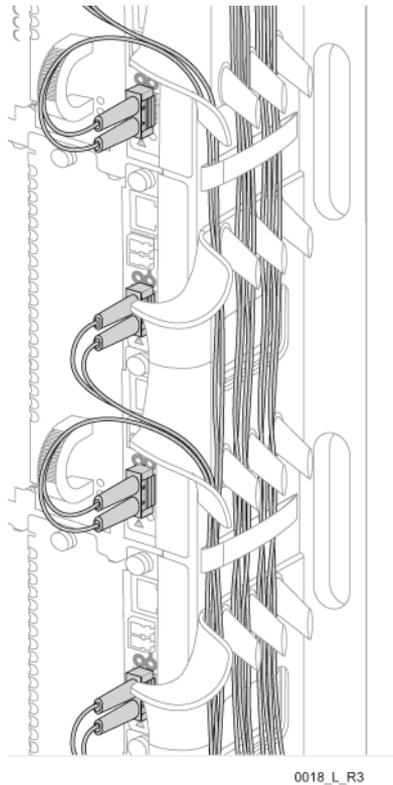
4. Connect Fibre Channel cables running between the new controller nodes and drive chassis. Use the cabling conventions described in "Controller Node to Drive Chassis Cabling" (page 75).

Setting Up New Controller Nodes

When installing additional controller nodes into a system, it is preferable to install the nodes into a running system. Before the nodes can join the cluster, you must load the current version of the OS:

- If using OS 3.1.1 or previous versions, use the following procedure ("Adding the Node to the Cluster using the SP" (page 52)) to add the node to the cluster.
- If using OS 3.1.2 or higher, see "Adding the Node to the Cluster " (page 57).

Adding the Node to the Cluster using the SP

NOTE: Only use this procedure when adding nodes to a system using OS 3.1.1 or previous versions.

To add the node to the cluster:

1. Connect the PC to the SP through a serial connection.

    NOTE: The Auto-Rescue utility of the SP requires a functional storage system cluster capable of processing CLI commands. Auto-Rescue builds the internal disk of the node to contain the proper software for the cluster.

    Figure 59 Front of the Controller Node
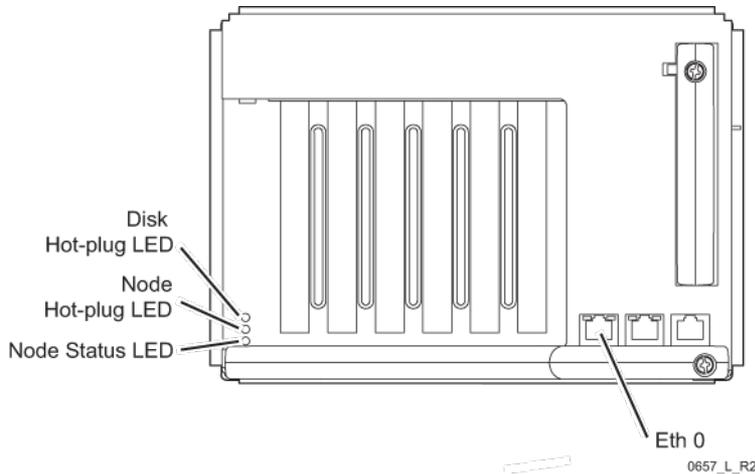
⚠   **WARNING!**   After installing the new controller node, do not turn on the node power supplies at this time. There is no node power switch.

2. At the rear of the storage system, uncoil the red crossover Ethernet cable connected to the HP private network connection (ETH1) of the SP.

    Figure 60 Connecting the Crossover Cable
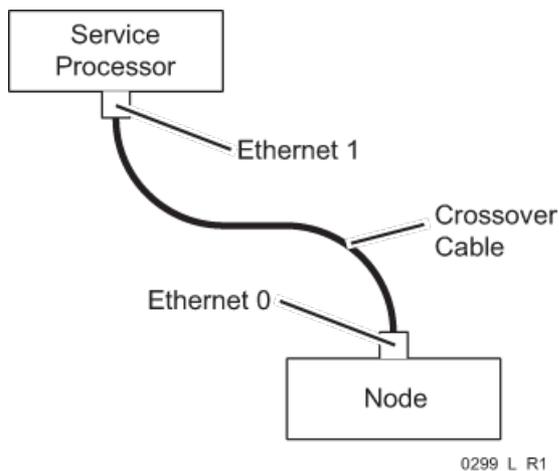
3. Return to the front of the storage system and connect ETH1 of the SP to the Ethernet port of the controller node being rescued through a crossover cable. Depending on the location of the SP and controller nodes, route the cable under or around the side of the cabinet.
4. From the SP, enter your login ID and password.
5. Select option **4**, **StoreServ Product Maintenance**.
6. Select option **11, Node Rescue**.
7. Select option **1, Configure Node Rescue**, select desired storage system.
8. A confirmation screen appears and prompts confirmation of current operating OS level.
9. Type `y` and press **ENTER**.

10. Select option **3, Automatic Node Rescue**, then enter the controller node number to rescue.
11. Type `y` and press **ENTER** to confirm the correct node number.
12. Type `y` and press **ENTER** to stop all SP tasks.
13. Set the power supplies at the rear of the node being rescued to the ON position.

△ **CAUTION:** Only turn on one controller node at this time. If you power on multiple nodes at the same time, the cluster may experience a failure.

Figure 61 Setting a Controller Node Power Supply to the ON Position
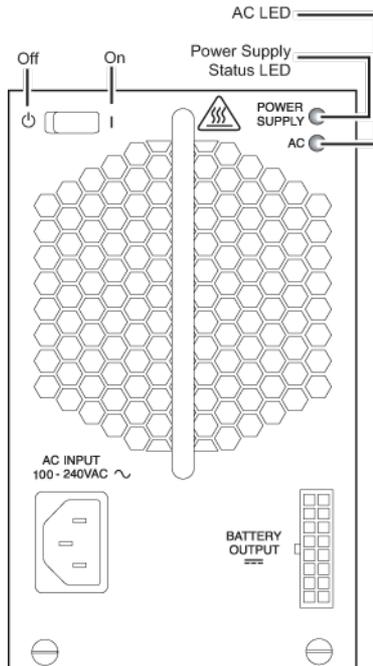
Result: The node performs a Power On Self Test (POST).

Result: When communication from the SP to the node is established, the following appears on the SP:

```
====+====+Interacting with CBIOS on the node...

The install kernel is loading...
Interacting with install Kernel...
Install kernel is running - please wait...
===============
Please wait...
```

NOTE: The duration of the process is approximately 10 to 20 minutes. When complete, the controller node restarts and joins the cluster.

NOTE: It is required to reboot a new Node a second time. So after the initial message indicating the Node has been rescued. Issue the CLI command, `shutdownnode reboot Node id` against the rescued node.

14. After the node joins the cluster, disconnect the red crossover cable from the node. Connect the cable to the next node to be rescued, or coil it behind the SP.
15. Repeat steps for the other new nodes before proceeding to the following step.

16. Select option **1, Deconfigure <StoreServnumber> Node Rescue**, then select **x** to exit.

```
         4.11     Node Rescue

         StoreServ Product Maintenance Menu

Transfer media: ethernet   Transfer status: Ok
Node Rescue Control

Enter Control-C at any time to abort this process
1  ==>  Deconfigure <StoreServnumber> Node Rescue
2  ==>  Manual Node Rescue
3  ==>  Automatic Node Rescue
X  ==>  exit to previous menu
1
```

17. Select option **7, Interactive CLI for an StoreServ**, then select the desired storage system.
18. Issue the `shownode` command to verify all nodes have joined the cluster.

```
cli% shownode
                                        Control    Data       Cache
Node --Name--- -State- Master InCluster ---LED--- Mem(MB) Mem(MB) Available(%)
   0 1000163-0 OK      Yes    Yes       GreenBlnk    4096    6144          100
   1 1000163-1 OK      No     Yes       GreenBlnk    4096    6144          100
   2 1000163-2 OK      No     Yes       GreenBlnk    4096    6144          100
   3 1000163-3 OK      No     Yes       GreenBlnk    4096    6144          100
```

NOTE: New drive cages and disks are powered in a separate procedure.

19. Verify all new disks are spun up and the `State` is set to `normal` or `new`, as shown in the
    following example:

```
cli% showpd
                                  ----Size(MB)----- ----Ports----
Id CagePos Type RPM State    Total    Free A       B       Cap(GB)
 0 0:0:0   FC   15  normal   278528   245760 0:6:1* 1:6:1      300
 1 0:0:1   FC   15  normal   278528   258048 0:6:1  1:6:1*     300
 2 0:0:2   FC   15  normal   278528   244736 0:6:1* 1:6:1      300
 3 0:0:3   FC   15  normal   278528   258048 0:6:1  1:6:1*     300
 4 0:9:0   FC   15  normal   278528   245760 0:6:1* 1:6:1      300
 5 0:9:1   FC   15  normal   278528   258048 0:6:1  1:6:1*     300
 6 0:9:2   FC   15  normal   278528   245760 0:6:1* 1:6:1      300
 7 0:9:3   FC   15  new      278528   258048 0:6:1  1:6:1*     300
 8 1:0:0   FC   15  normal   278528   245760 0:6:2* 1:6:2      300
 9 1:0:1   FC   15  normal   278528   258048 0:6:2  1:6:2*     300
10 1:0:2   FC   15  normal   278528   245760 0:6:2* 1:6:2      300
11 1:0:3   FC   15  normal   278528   258048 0:6:2  1:6:2*     300
12 1:9:0   FC   15  normal   278528   245760 0:6:2* 1:6:2      300
13 1:9:1   FC   15  normal   278528   258048 0:6:2  1:6:2*     300
14 1:9:2   FC   15  normal   278528   245760 0:6:2* 1:6:2      300
15 1:9:3   FC   15  normal   278528   258048 0:6:2  1:6:2*     300
16 2:0:0   FC   15  normal   559104   514048 0:6:3* 1:6:3      600
17 2:0:1   FC   15  normal   559104   526336 0:6:3  1:6:3*     600
18 2:0:2   FC   15  normal   559104   516096 0:6:3* 1:6:3      600
19 2:0:3   FC   15  normal   559104   528384 0:6:3  1:6:3*     600
20 2:9:0   FC   15  normal   559104   515072 0:6:3* 1:6:3      600
-------------------------------------------------------------------
```

20. Admit the newly installed hardware into the system by issuing the `admithw` command.

21. Verify the new disks have been admitted. The `State` should now be `normal`, as shown in the following example:

```
cli% showpd
                               ----Size(MB)----- ----Ports----
Id CagePos Type RPM State     Total    Free A        B        Cap(GB)
 0 0:0:0   FC   15  normal   278528  245760 0:6:1*   1:6:1         300
 1 0:0:1   FC   15  normal   278528  258048 0:6:1    1:6:1*        300
 2 0:0:2   FC   15  normal   278528  244736 0:6:1*   1:6:1         300
 3 0:0:3   FC   15  normal   278528  258048 0:6:1    1:6:1*        300
 4 0:9:0   FC   15  normal   278528  245760 0:6:1*   1:6:1         300
 5 0:9:1   FC   15  normal   278528  258048 0:6:1    1:6:1*        300
 6 0:9:2   FC   15  normal   278528  245760 0:6:1*   1:6:1         300
 7 0:9:3   FC   15  normal   278528  258048 0:6:1    1:6:1*        300
 8 1:0:0   FC   15  normal   278528  245760 0:6:2*   1:6:2         300
 9 1:0:1   FC   15  normal   278528  258048 0:6:2    1:6:2*        300
10 1:0:2   FC   15  normal   278528  245760 0:6:2*   1:6:2         300
11 1:0:3   FC   15  normal   278528  258048 0:6:2    1:6:2*        300
12 1:9:0   FC   15  normal   278528  245760 0:6:2*   1:6:2         300
13 1:9:1   FC   15  normal   278528  258048 0:6:2    1:6:2*        300
14 1:9:2   FC   15  normal   278528  245760 0:6:2*   1:6:2         300
15 1:9:3   FC   15  normal   278528  258048 0:6:2    1:6:2*        300
16 2:0:0   FC   15  normal   559104  514048 0:6:3*   1:6:3         600
17 2:0:1   FC   15  normal   559104  526336 0:6:3    1:6:3*        600
18 2:0:2   FC   15  normal   559104  516096 0:6:3*   1:6:3         600
19 2:0:3   FC   15  normal   559104  528384 0:6:3    1:6:3*        600
20 2:9:0   FC   15  normal   559104  515072 0:6:3*   1:6:3         600
-------------------------------------------------------------------
```

22. Issue the `showbattery` command to verify battery information.

```
cli% showbattery
Node PS Bat Serial   -State- ChrgLvl(%) -ExpDate-- Expired Testing
   0  0   0 12345011 OK            100 04/07/2011 No       No
   0  1   0 12345010 OK            100 04/07/2011 No       No
   1  0   0 12345100 OK            100 04/07/2011 No       No
   1  1   0 12345110 OK            100 04/07/2011 No       No
   2  0   0 12345012 OK            100 04/07/2011 No       No
   2  1   0 12345210 OK            100 04/07/2011 No       No
   3  0   0 12345300 OK            100 04/07/2011 No       No
   3  1   0 12345310 OK            100 04/07/2011 No       No
```

23. Set the port personas as directed in the *HP 3PAR OS Command Line Interface Reference* and then complete the Ethernet and Fibre Channel physical connections to the host and network as appropriate.

NOTE: Connections to hosts typically use Fibre Channel adapters in PCI slots 5, 3, and 1 but there are several exceptions. See "PCI Adapter Installation Order" (page 79) for specific information.

Table 2 (page 56) includes guidelines for completing these external connections.

Table 2 Controller Node Connections

Connection Type	Minimum Configuration	Recommended Configuration
Fibre Channel or iSCSI	Connection from a host computer to one controller node	Separate connections from a host computer to each node, with connections distributed evenly across all nodes

24. Inspect all fibre and Ethernet cables are properly connected and verify all Status LEDs are displayed green.
25. Issue the `checkhealth -svc` command to verify your system is healthy.
26. In the SP window issue the `exit` command to stop the CLI session, then select **X** to log out of the session and exit.
27. Disconnect the serial cable and the red crossover Ethernet cable from the maintenance PC. Coil and place the cable behind the SP.
28. Close and lock the rear door of the storage system.
29. Reinstall and secure the front fascia on the storage system if applicable.

Adding the Node to the Cluster

△ **CAUTION:** Do NOT use this procedure when adding a node to the cluster using OS 3.1.1 or previous versions.

NOTE: Only use this procedure when adding nodes to a system using OS 3.1.2 or higher.

To add the node to the cluster:
1. Set the node power supply to the ON position. (POST is performed.)
2. Connect an Ethernet cable to the new node then verify that the node added to the cluster has a public Ethernet connection (eth0 port is connected).
3. Issue the `startnoderescue -node <node_number_of_node_to_be_added_to_the_cluster>` command.
4. Issue the `showtask` command to monitor the node recovery process.

4 Connecting the Maintenance PC

The following describes how to connect the maintenance PC to a controller node or service processor.

NOTE: If your storage system is equipped with an optional locking fascia kit, see "Locking Fascia" (page 91) for additional information on removal and replacement.

Connecting to a Controller Node

The maintenance PC connects directly to a controller node using a serial cable.

To connect the maintenance PC to a node:

1. Remove the bezel that covers the controller node chassis.
2. Insert a standard Category 5 cable into the maintenance port of one of the controller nodes as shown in "Location of the Maintenance Port" (page 58).

Figure 62 Location of the Maintenance Port

Maintenance Port (C0)
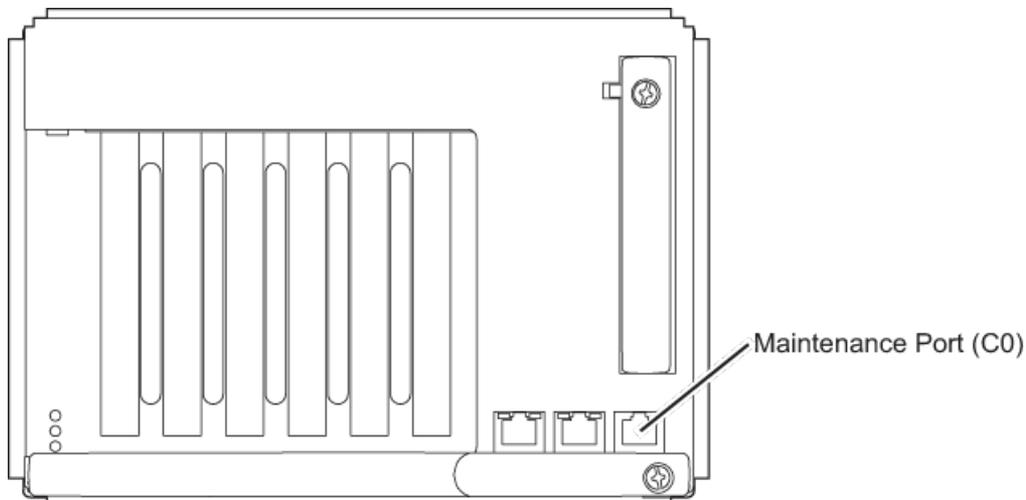
0589_L_R2

NOTE: A cable with adapter (P/N 180-0055) should be connected to the SP. Disconnect the Ethernet cable from the RJ-45 to DB-9 adapter attached to the SP (P/N 180-0059).

3. Attach a DB9 female to RJ45 serial adapter assembly (P/N 180–0055) to the free end of the Ethernet cable and then insert the adapter into the DB9 serial port (COM 1) of the maintenance PC, see "Connecting the Ethernet Cable" (page 59) or attach the RJ 45 adapter assembly (P/N 180-055) to the PC serial port or USB to serial adapter (Triplite USA-19HS is recommended).

Figure 63 Connecting the Ethernet Cable
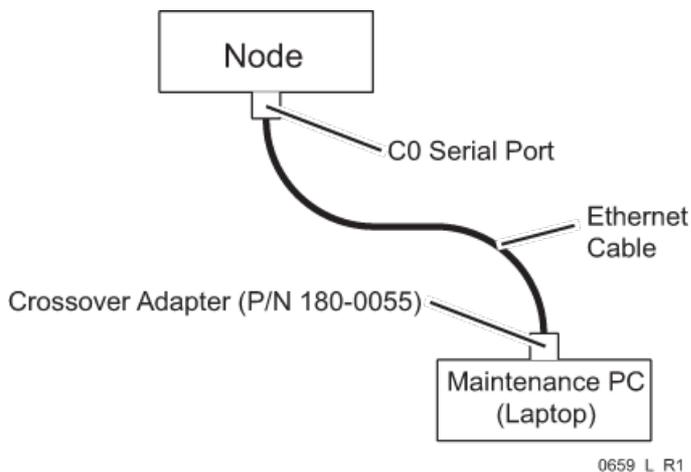
4. Power on the maintenance PC.
5. After you are connected, use a terminal emulator to communicate with the SP and perform various tasks to support the storage system and SP. See Serial Settings.

Connecting to the Service Processor

The maintenance PC can connect to the Service Processor (SP) either through a serial connection or an Ethernet connection (LAN).

Once you are connected to the SP using an serial or Ethernet connection, there are two SP user interfaces, SPOCC and SPMAINT, that you can use to perform various administrative and diagnostic tasks to support of both the storage system and the SP.

Refer to "Connecting to the CLI" (page 61) to start an SPMAINT session or "Logging into the SP Onsite Customer Care Interface (SPOCC)" (page 64).

NOTE: Connecting to the SP through the LAN (Ethernet) requires establishing a Secure Shell Session (SSH). Refer to "Using PuTTY" (page 64).

If you do not have SSH, connect to the serial port of the SP. Refer to "Serial Settings" (page 60).

Using a Serial Connection

To connect the maintenance PC to the SP using serial connection:

1. Unlock the rear door of the storage cabinet. Open the door by unlatching the three latches located at the top, center, and bottom of the door.
2. Locate the SP. Attach the DB9 crossover serial adapter (P/N 180–0055), that is at the free end of the blue Ethernet cable, to the Serial port on your maintenance PC. A standard Category 5 Ethernet cable with the appropriate RJ–45 to DB9 adapters at each end should already be connected to the SP's DB9 Serial port.
3. If necessary, insert a standard Category 5 Ethernet cable into the SP or serial port with the DB9 crossover to RJ45 adapter (P/N 180–0059). See "Wintec Service Processor Serial Port with Adapter" (page 60) or "Supermicro Service Processor Serial Port and Adapter" (page 60) for the location of the serial port on the SP.

NOTE: See "Serial Cable Pinouts" (page 65) for serial cable pinout diagram.

**Figure 64 Wintec Service Processor Serial Port with Adapter**

Serial Port with DB9 Female to
RJ45 Adapter (P/N 180-0059-01)

0165_L_R2
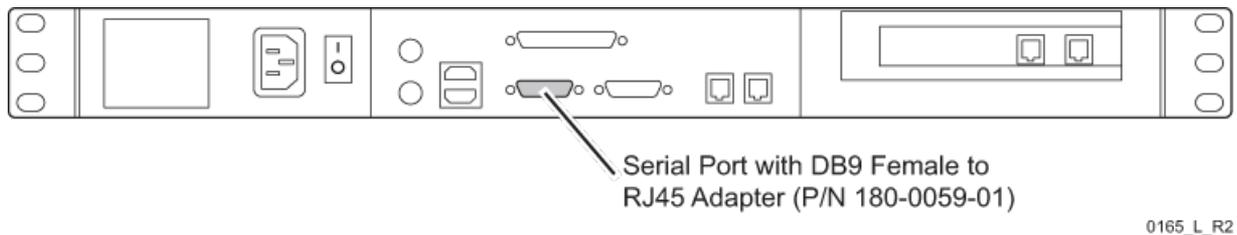
Figure 65 Supermicro Service Processor Serial Port and Adapter

Serial Port with DB9 Female to
RJ45 Adapter (P/N 180-0059-01)

0636_L_R1
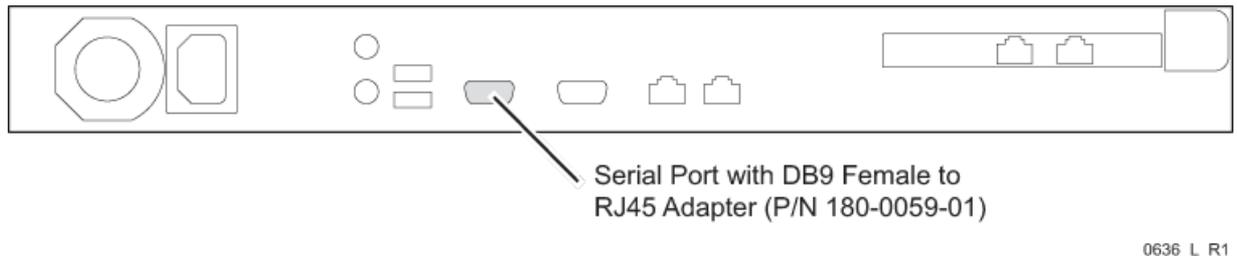
A standard Category 5 Ethernet cable may already be connected to the DB9 crossover to RJ45 adapter ("Attaching the Blue Ethernet Cable" (page 60)).

Figure 66 Attaching the Blue Ethernet Cable
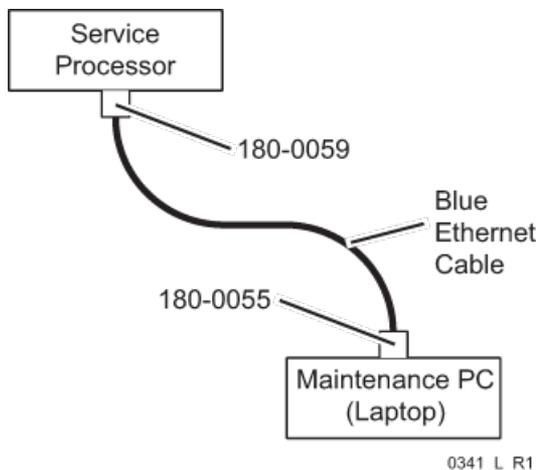
4. Power on the maintenance PC.
5. After you are connected, use a terminal emulator, such as HyperTerminal, Attachmate Reflection X, SecureCRT, or TeemTalk to communicate with the SP and perform various tasks to support the storage system. Refer to "Serial Settings" (page 60)or "Using PuTTY" (page 64).

Serial Settings

To connect to the SP using a terminal emulator, such as HyperTerminal, Attachmate Reflection X, SecureCRT, or TeemTalk:

1. Establish a serial connection to the SP. Refer to "Using a Serial Connection" (page 59).
2. Open HyperTerminal, Attachmate Reflection X, SecureCRT, or TeemTalk. For this example, Reflection X is used:
3. On the menu bar, select **Connection** and select from the Connection Setup drop-down list.
4. Click Configure Transport to set the serial connection:
    a. In the Communications Port field, select the port being used by the USB adapter (COMx).
    b. Select 38400 (for SP, 57600 for node) for the Baud Rate.

    c. Keep the default serial settings on the remaining fields

- Parity - None
- Word Length - 8
- Stop Bits - 1
- Flow Control - Both

    d. Click the More Settings button to open the More Settings window, then confirm the following settings:

- Transmit: Xon/Xoff
- Receive: Xon/Xoff
- Char transmit delay: 0
- Line transmit delay: 0

5. Click OK.
6. In the blank black screen, press ENTER, then enter your user name and password. Proceed to connect to the CLI.

Connecting to the CLI

1. Connect to the SP using a terminal emulator. Refer to "Serial Settings" (page 60).
2. The **3PAR Service Processor Menu** appears. Select option **7, Interactive CLI for an StoreServ**, then select the desired system.
3. Proceed to the drive and node chassis maintenance procedures in this document.

Using an Ethernet Connection

To connect the maintenance PC to the SP through the private Local Area Network using an Ethernet cable, you must first configure the LAN settings on the maintenance PC.

You can connect the maintenance to the SP using an Ethernet cable. When you use an Ethernet connection, you have to configure LAN settings on the maintenance PC (refer to Section (page 62)) and establish a Secure Shell Session (SSH) using PuTTY. Refer to Section (page 64).

To connect using an Ethernet connection:

1. Unlock and open the rear door of the storage system cabinet.

   If necessary, insert a red crossover Category 5 Ethernet cable (RJ45 to RJ45) into the proper Ethernet port of the SP (ETH1), refer to the following figures.

**Figure 67 Wintec Service Processor Ethernet Ports**

Eth-1 (Int)
Eth-0 (Ext)

0166_L_R2
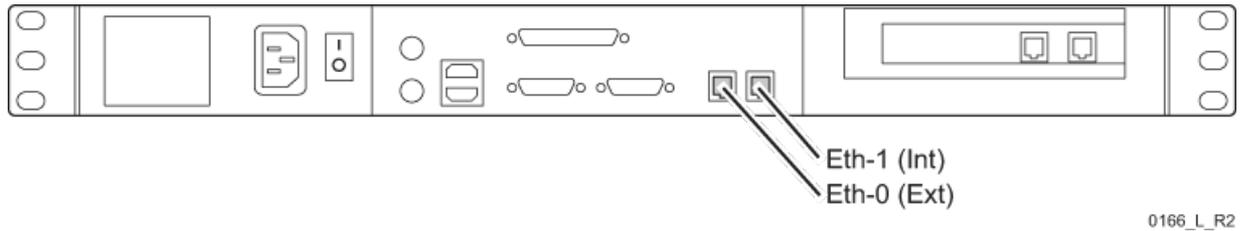
Figure 68 Supermicro Service Processor Ethernet Ports

Eth-1 (Int)
Eth-0 (Ext)

0638_L_R1
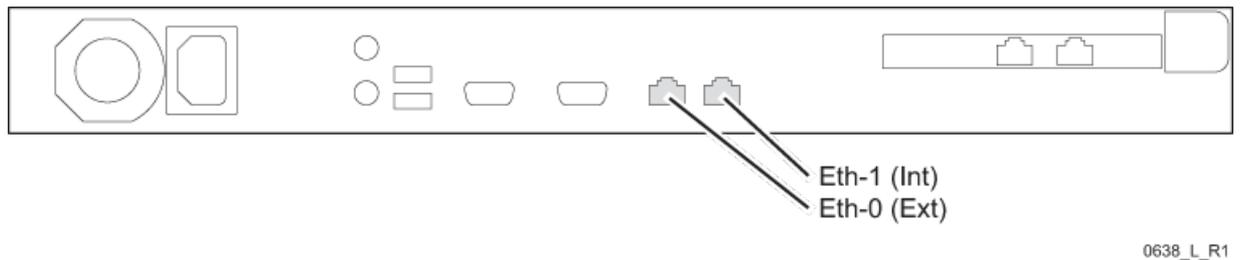
NOTE: The Supermicro and Wintec Service Processor Ethernet port (ETH0) corresponds with the front NIC Port LED 1 and Ethernet port (ETH1) corresponds with the front NIC Port LED 2.

2. Connect the free end of the crossover Ethernet cable to the Ethernet port in the maintenance PC.
3. Power on the maintenance PC.
4. Configure the LAN settings on the maintenance PC. See "Configuring the LAN Settings on the Maintenance PC" (page 62).

Configuring the LAN Settings on the Maintenance PC

NOTE: For Windows Vista users, go to Control Panel > Network and Internet > Network Connections and right-click on the **Local Area Connection** icon and select Properties. Once on the Networking tab, skip to step 4.

1. Right-click the **My Network Places** desktop icon to open the shortcut menu and select **Properties**.
2. In the **Network and Dial-up Connections** window, right-click the **Local Area Connection** icon to open the Local Area Connections Properties menu.
3. Click **Properties** to open the **Local Area Connection Properties** dialog box ("Local Area Connection Properties Dialog Box" (page 63)).

Figure 69 Local Area Connection Properties Dialog Box
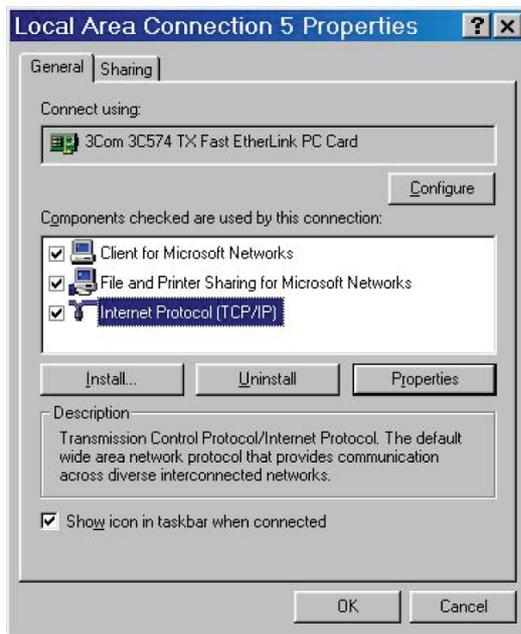
4. Double-click **Internet Protocol (TCP/IP)**.

    The **Internet Protocol (TCP/IP) Properties** dialog box appears ().

Figure 70 Internet Protocol (TCP/IP) Properties Box
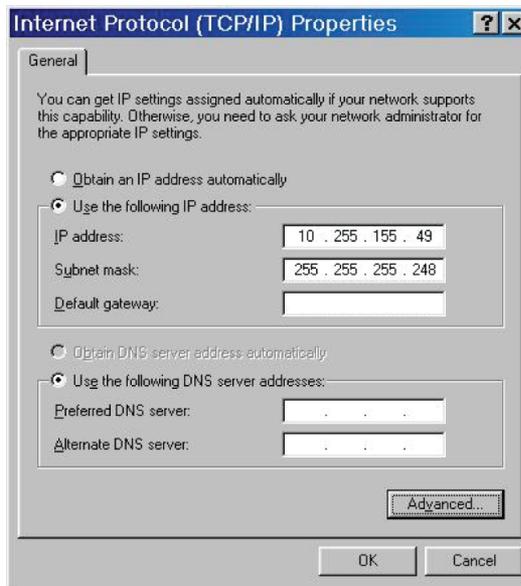
5. In the **Internet Protocol (TCP/IP) Properties** dialog box, click the **Use the following IP address** button, then type the following IP addresses:

Table 3 IP Addresses

IP address	10.255.155.49
Subnet mask	255.255.255.248
Default gateway	None.

6. Click **OK**.
7. Click **OK** in the **Advanced TCP/IP Settings** dialog box to finish configuring the LAN connection.
8. Initiate a SSH using PuTTy. Refer to "Using PuTTY" (page 64).

Using PuTTY

After you have configured LAN settings and established an Ethernet connection, use PuTTY to initiate a SSH between the maintenance PC and the SP.

1. Go to the permanent location where you extracted **putty.zip** and double-click the **putty.exe** file.
2. In the **PuTTY Configuration** dialog box that appears, type the SP IP address in the **Host Name** (or **IP address**) box, click the **SSH** protocol button, then click **Open** ("PuTTY Configuration Dialog Box" (page 64)).

Figure 71 PuTTY Configuration Dialog Box
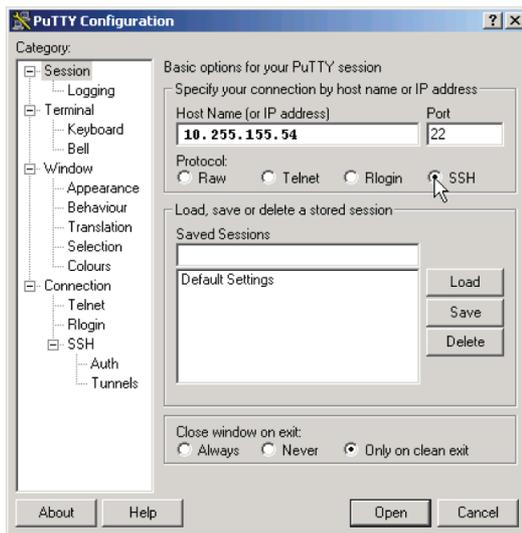
3. If you are connecting to the SP for the first time, the **PuTTY Security Alert** dialog box appears. Click **Yes**.
4. In the **PuTTY** main window, type your user ID and press ENTER then type your password and press ENTER.

Logging into the SP Onsite Customer Care Interface (SPOCC)

After the Ethernet connection is configured, log in to the SPOCC interface from the maintenance PC using a supported Web browser.

To log in to SPOCC using a Web browser:

1. Type the IP address of the SP in the Web browser and press ENTER.

    NOTE: If you are using the crossover cable to the SP's ETH1 (Int) port, use IP address 10.255.155.54.

    The Service Processor Login screen appears.

    Figure 72 Service Processor Login Screen
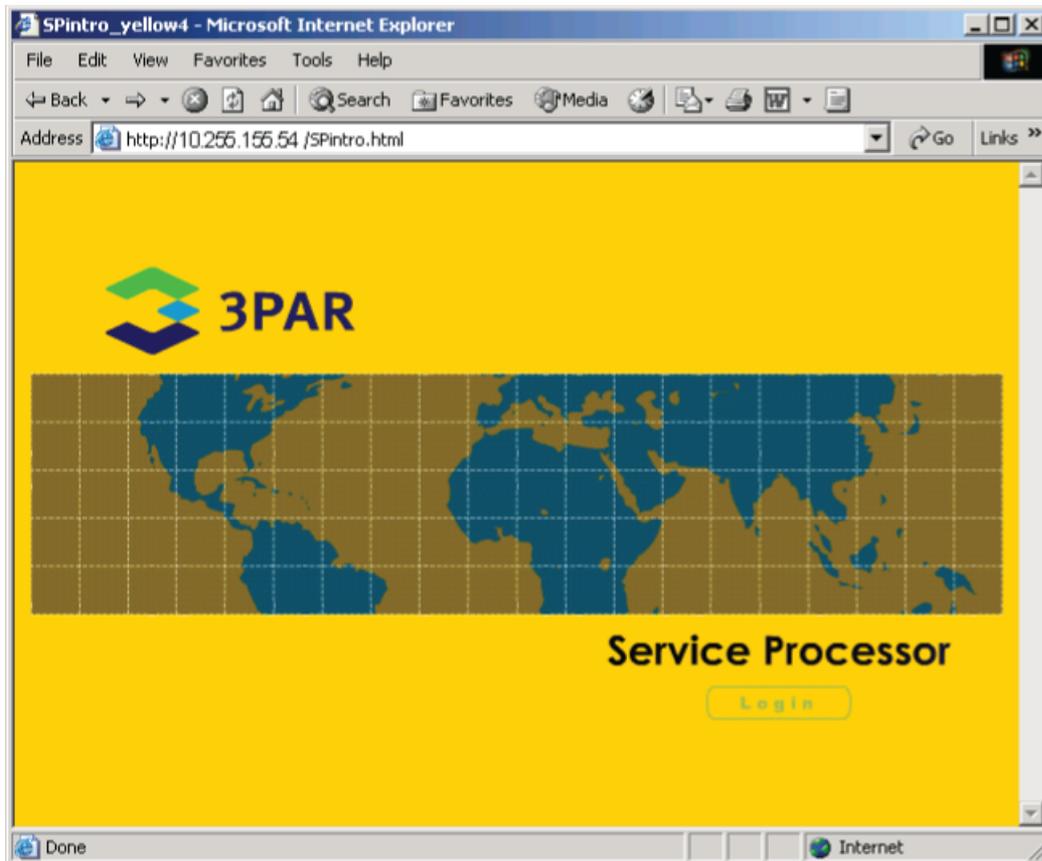
    0177_S_R1

2. On the **Service Processor Login** screen, click the **Login** button.
3. The **Enter Network Password** dialog box appears. Type your user name and password and click **OK**.

    NOTE: If you do not have a user name and password, contact your Authorized Service Provider.

Serial Cable Pinouts

The following tables and diagrams illustrate the serial cable pinouts for the crossover DB9 female serial to RJ45 adapter assembly (P/N 180–0055) and the straight-through DB9 to RJ45 serial adapter (P/N 180–0059).

Crossover Adapter Assembly

The following table lists cable pinouts for the crossover DB9 female serial to RJ45 adapter assembly (P/N 180–0055). This connector inserts into the COM port on the maintenance PC.

Table 4 Crossover DB9 Female Serial to RJ45 Serial Connector Pinouts

Color	DB9 (Female) Pin	RJ45 Pin
Black	2	3
Orange	3	2
Green	5	5

Figure 73 (page 66) illustrates the pin locations and connections for the crossover DB9 female serial to RJ45 adapter assembly (P/N 180–0055).

Figure 73 Crossover DB9 Female Serial to RJ45 Serial Connector Pinouts
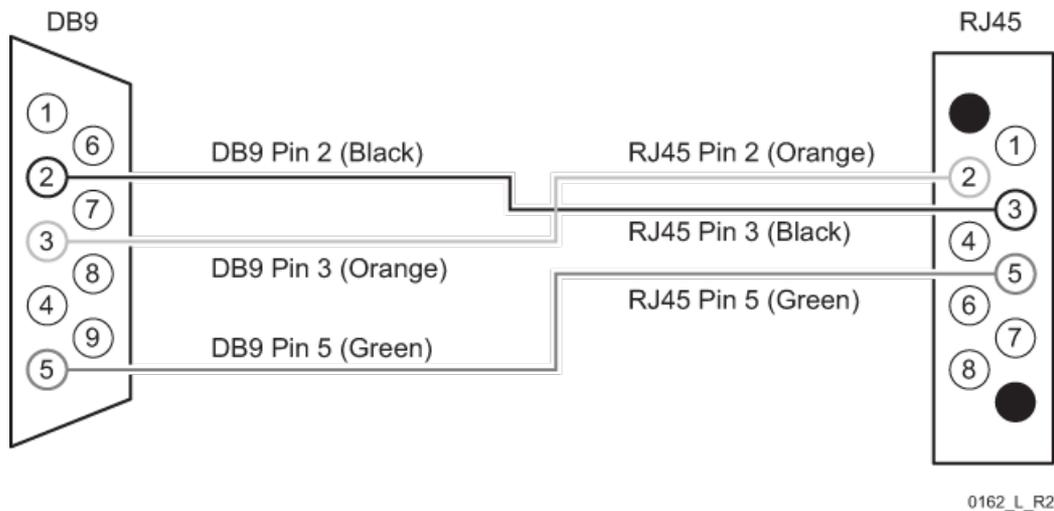

Straight-Through Adapter

The following table lists c onnector pinouts for the straight-through DB9 to RJ45 adapter (P/N 180–0059). This connector inserts into the COM port on the SP.

Table 5 Straight-Through DB9 to RJ45 Adapter Serial Cable Pinouts

Color	DB9 (Female) Pin	RJ45 Pin
Orange	2	2
Black	3	3
Green	5	5

Figure 74 (page 67) illustrates the pin locations and connections for the straight-through DB9 to RJ45 adapter (P/N 180–0059).

Figure 74 Straight-Through DB9 to RJ45 Serial Connector Pinouts

0163_L_R2
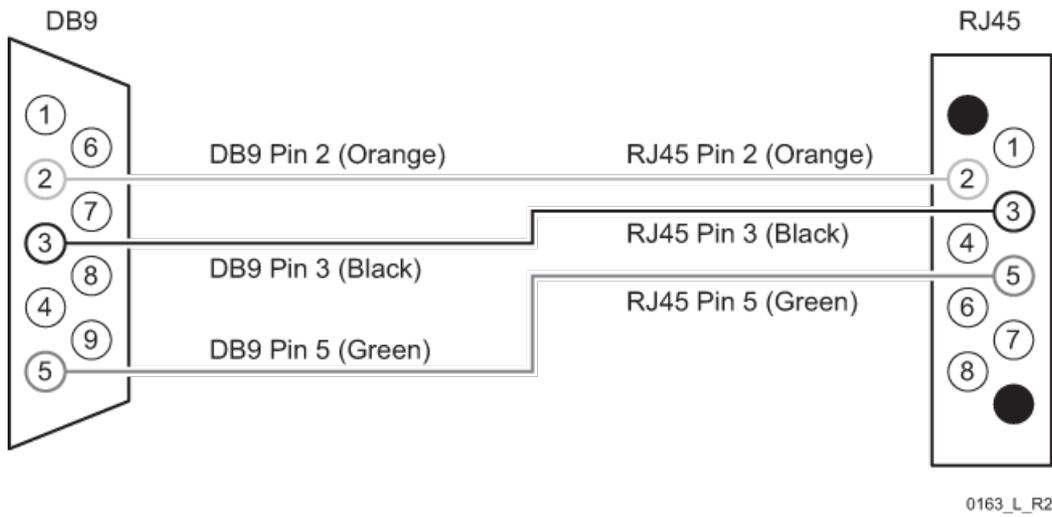
5 Support and Other Resources

Contacting HP

For worldwide technical support information, see the HP support website:

http://www.hp.com/support

Before contacting HP, collect the following information:

- Product model names and numbers
- Technical support registration number or Service Agreement ID (if applicable)
- Product serial numbers
- Error messages
- Operating system type and revision level
- Detailed questions

Specify the type of support you are requesting:

HP 3PAR storage system	Support request
HP 3PAR StoreServ 7200, 7400, and 7450 Storage systems	StoreServ 7000 Storage
HP 3PAR StoreServ 10000 Storage systems HP 3PAR T-Class storage systems HP 3PAR F-Class storage systems	3PAR or 3PAR Storage

HP 3PAR documentation

For information about:	See:
Supported hardware and software platforms	The Single Point of Connectivity Knowledge for HP Storage Products (SPOCK) website: http://www.hp.com/storage/spock
Locating HP 3PAR documents	The HP 3PAR StoreServ Storage site: http://www.hp.com/go/3par To access HP 3PAR documents, click the **Support** link for your product.
HP 3PAR storage system software	
Storage concepts and terminology	*HP 3PAR StoreServ Storage Concepts Guide*
Using the HP 3PAR Management Console (GUI) to configure and administer HP 3PAR storage systems	*HP 3PAR Management Console User's Guide*
Using the HP 3PAR CLI to configure and administer storage systems	*HP 3PAR Command Line Interface Administrator's Manual*
CLI commands	*HP 3PAR Command Line Interface Reference*
Analyzing system performance	*HP 3PAR System Reporter Software User's Guide*
Installing and maintaining the Host Explorer agent in order to manage host configuration and connectivity information	*HP 3PAR Host Explorer User's Guide*
Creating applications compliant with the Common Information Model (CIM) to manage HP 3PAR storage systems	*HP 3PAR CIM API Programming Reference*

For information about:	See:
Migrating data from one HP 3PAR storage system to another	*HP 3PAR-to-3PAR Storage Peer Motion Guide*
Configuring the Secure Service Custodian server in order to monitor and control HP 3PAR storage systems	*HP 3PAR Secure Service Custodian Configuration Utility Reference*
Using the CLI to configure and manage HP 3PAR Remote Copy	*HP 3PAR Remote Copy Software User's Guide*
Updating HP 3PAR operating systems	*HP 3PAR Upgrade Pre-Planning Guide*
Identifying storage system components, troubleshooting information, and detailed alert information	*HP 3PAR F-Class, T-Class, and StoreServ 10000 Storage Troubleshooting Guide*
Installing, configuring, and maintaining the HP 3PAR Policy Server	*HP 3PAR Policy Server Installation and Setup Guide* *HP 3PAR Policy Server Administration Guide*

For information about:	See:
Planning for HP 3PAR storage system setup	
Hardware specifications, installation considerations, power requirements, networking options, and cabling information for HP 3PAR storage systems	
HP 3PAR 7200, 7400, and 7450 storage systems	*HP 3PAR StoreServ 7000 Storage Site Planning Manual* *HP 3PAR StoreServ 7450 Storage Site Planning Manual*
HP 3PAR 10000 storage systems	*HP 3PAR StoreServ 10000 Storage Physical Planning Manual* *HP 3PAR StoreServ 10000 Storage Third-Party Rack Physical Planning Manual*
Installing and maintaining HP 3PAR 7200, 7400, and 7450 storage systems	
Installing 7200, 7400, and 7450 storage systems and initializing the Service Processor	*HP 3PAR StoreServ 7000 Storage Installation Guide* *HP 3PAR StoreServ 7450 Storage Installation Guide* *HP 3PAR StoreServ 7000 Storage SmartStart Software User's Guide*
Maintaining, servicing, and upgrading 7200, 7400, and 7450 storage systems	*HP 3PAR StoreServ 7000 Storage Service Guide* *HP 3PAR StoreServ 7450 Storage Service Guide*
Troubleshooting 7200, 7400, and 7450 storage systems	*HP 3PAR StoreServ 7000 Storage Troubleshooting Guide* *HP 3PAR StoreServ 7450 Storage Troubleshooting Guide*
Maintaining the Service Processor	*HP 3PAR Service Processor Software User Guide* *HP 3PAR Service Processor Onsite Customer Care (SPOCC) User's Guide*
HP 3PAR host application solutions	
Backing up Oracle databases and using backups for disaster recovery	*HP 3PAR Recovery Manager Software for Oracle User's Guide*
Backing up Exchange databases and using backups for disaster recovery	*HP 3PAR Recovery Manager Software for Microsoft Exchange 2007 and 2010 User's Guide*
Backing up SQL databases and using backups for disaster recovery	*HP 3PAR Recovery Manager Software for Microsoft SQL Server User's Guide*
Backing up VMware databases and using backups for disaster recovery	*HP 3PAR Management Plug-in and Recovery Manager Software for VMware vSphere User's Guide*
Installing and using the HP 3PAR VSS (Volume Shadow Copy Service) Provider software for Microsoft Windows	*HP 3PAR VSS Provider Software for Microsoft Windows User's Guide*
Best practices for setting up the Storage Replication Adapter for VMware vCenter	*HP 3PAR Storage Replication Adapter for VMware vCenter Site Recovery Manager Implementation Guide*
Troubleshooting the Storage Replication Adapter for VMware vCenter Site Recovery Manager	*HP 3PAR Storage Replication Adapter for VMware vCenter Site Recovery Manager Troubleshooting Guide*
Installing and using vSphere Storage APIs for Array Integration (VAAI) plug-in software for VMware vSphere	*HP 3PAR VAAI Plug-in Software for VMware vSphere User's Guide*

Servicing HP 3PAR storage systems

For information about:	See:
Maintaining the HP 3PAR Service Processor	

Initializing and using the Service Processor	*HP 3PAR Service Processor Software User Guide: Service Edition*
Upgrading the Service Processor	*HP 3PAR Service Processor Software Upgrade Instructions: Service Edition*
Troubleshooting the Service Processor	*HP 3PAR Service Processor Troubleshooting Guide: Service Edition*
Remotely servicing all storage systems	
Remotely servicing HP 3PAR storage systems	*HP 3PAR Secure Service Collector Remote Operations Guide*
Servicing 7200 and 7400 storage systems	
Maintaining, servicing, and upgrading 7200 and 7400 storage systems	*HP 3PAR StoreServ 7000 Storage Service Guide: Service Edition*
Troubleshooting 7200 and 7400 storage systems	*HP 3PAR StoreServ 7000 Storage Troubleshooting Guide: Service Edition*
Servicing 10000 storage systems	
Using the Installation Checklist	*HP 3PAR StoreServ 10000 Storage Installation Checklist (for HP 3PAR Cabinets): Service Edition*
Upgrading 10000 storage systems	*HP 3PAR StoreServ 10000 Storage Upgrade Guide: Service Edition*
Maintaining 10000 storage systems	*HP 3PAR StoreServ 10000 Storage Maintenance Manual: Service Edition*
Installing and uninstalling 10000 storage systems	*HP 3PAR StoreServ 10000 Storage Installation and Deinstallation Guide: Service Edition*
Servicing T-Class storage systems	
Using the Installation Checklist	*HP 3PAR T-Class Storage System Installation Checklist (for HP 3PAR Cabinets): Service Edition*
Upgrading T-Class storage systems	*HP 3PAR T-Class Storage System Upgrade Guide: Service Edition*
Maintaining T-Class storage systems	*HP 3PAR T-Class Storage System Maintenance Manual: Service Edition*
Installing and uninstalling the T-Class storage system	*HP 3PAR T-Class Installation and Deinstallation Guide: Service Edition*
Servicing F-Class storage systems	
Using the Installation Checklist	*HP 3PAR F-Class Storage System Installation Checklist (for HP 3PAR Cabinets): Service Edition*
Upgrading F-Class storage systems	*HP 3PAR F-Class Storage System Upgrades Guide: Service Edition*
Maintaining F-Class storage systems	*HP 3PAR F-Class Storage System Maintenance Manual: Service Edition*
Installing and uninstalling the F-Class storage system	*HP 3PAR F-Class Storage System Installation and Deinstallation Guide: Service Edition*

Typographic conventions

Table 6 Document conventions

Convention	Element
Bold text	- Keys that you press - Text you typed into a GUI element, such as a text box - GUI elements that you click or select, such as menu items, buttons, and so on
`Monospace text`	- File and directory names - System output - Code - Commands, their arguments, and argument values
`<Monospace text in angle brackets>`	- Code variables - Command variables
`Bold monospace text`	- Commands you enter into a command line interface - System output emphasized for scannability

⚠ **WARNING!** Indicates that failure to follow directions could result in bodily harm or death, or in irreversible damage to data or to the operating system.

△ **CAUTION:** Indicates that failure to follow directions could result in damage to equipment or data.

NOTE: Provides additional information.

Required

Indicates that a procedure must be followed as directed in order to achieve a functional and supported implementation based on testing at HP.

HP 3PAR branding information

- The server previously referred to as the "InServ" is now referred to as the "HP 3PAR StoreServ Storage system."
- The operating system previously referred to as the "InForm OS" is now referred to as the "HP 3PAR OS."
- The user interface previously referred to as the "InForm Management Console (IMC)" is now referred to as the "HP 3PAR Management Console."
- All products previously referred to as "3PAR" products are now referred to as "HP 3PAR" products.

6 Documentation feedback

HP is committed to providing documentation that meets your needs. To help us improve the documentation, send any errors, suggestions, or comments to Documentation Feedback (**docsfeedback@hp.com**). Include the document title and part number, version number, or the URL when submitting your feedback.

A Regulatory information

For important safety, environmental, and regulatory information, see *Safety and Compliance Information for Server, Storage, Power, Networking, and Rack Products*, available at http://www.hp.com/support/Safety-Compliance-EnterpriseProducts.

Turkey RoHS material content declaration

Türkiye Cumhuriyeti: EEE Yönetmeliğine Uygundur

Ukraine RoHS material content declaration

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Warranty information

HP ProLiant and X86 Servers and Options

http://www.hp.com/support/ProLiantServers-Warranties

HP Enterprise Servers

http://www.hp.com/support/EnterpriseServers-Warranties

HP Storage Products

http://www.hp.com/support/Storage-Warranties

HP Networking Products

http://www.hp.com/support/Networking-Warranties

B Controller Node to Drive Chassis Cabling

This appendix describes standard and split-mode node to drive cage cabling for two and four node systems. For systems with six or eight nodes, the same cabling pattern applies.

⚠ **WARNING!** HP does not support the use of patch panels. Using patch panels may deteriorate signal integrity and is not recommended for any methods of connection.

For information about node numbering and drive cage numbering, see the *HP 3PAR T-Class Storage System Installation and Deinstallation Guide*.

For information about PCI cards, their installation order, and their usage, see "PCI Adapter Installation Order" (page 79).

Standard Cabling

The following figures display standard cabling for two and four node systems. For six and eight node systems, continue the cabling pattern.

Figure 75 Standard Node to Drive Cage Cabling (2 Node System)
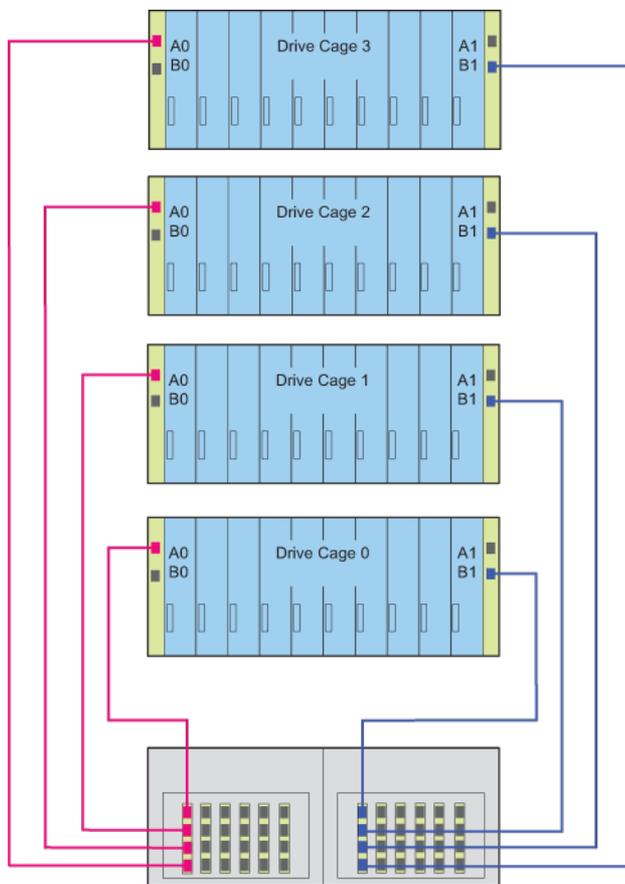
0663_L_R1

Figure 76 Standard Node to Drive Cage Cabling (4 Node System)

0664_L_R1
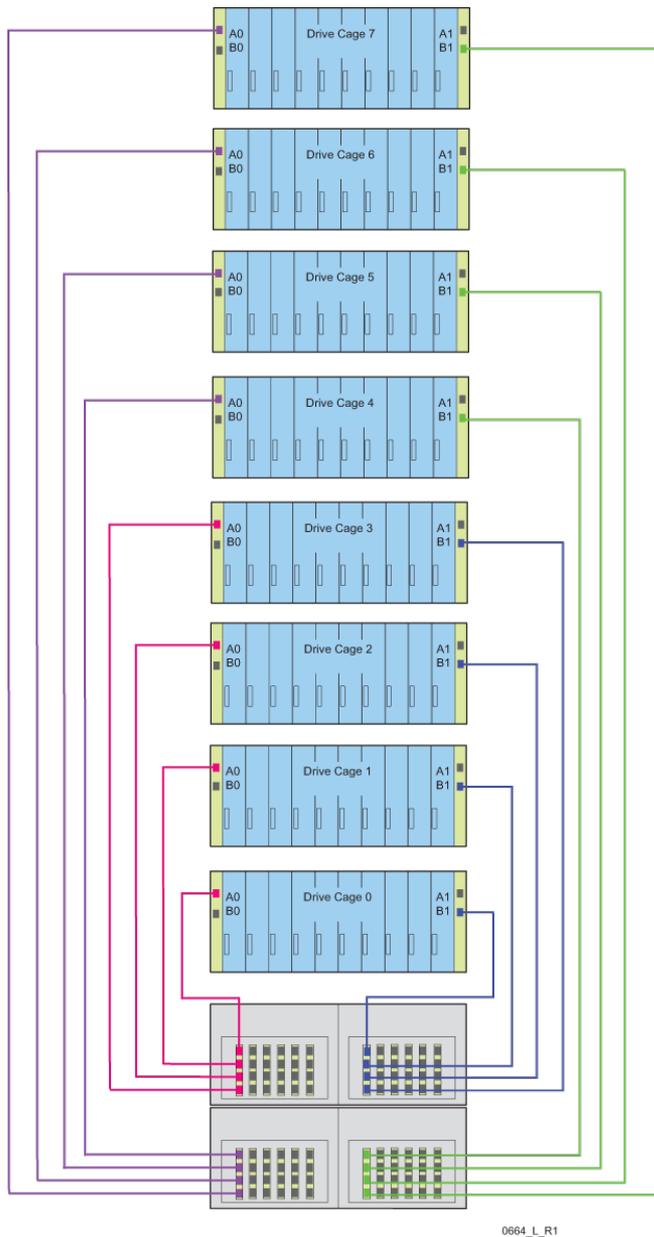
NOTE: "Standard Node to Drive Cage Cabling (4 Node System)" (page 76) represents a logical relationship. In practice, the lowest sitting node pair in the cabinet is connected to the lowest sitting drive cages.

Split-Mode Cabling

The following figures display split-mode cabling for two and four node systems. For six and eight node systems, continue the cabling pattern.

Figure 77 Split Mode to Drive Cage Cabling (2 Node System)
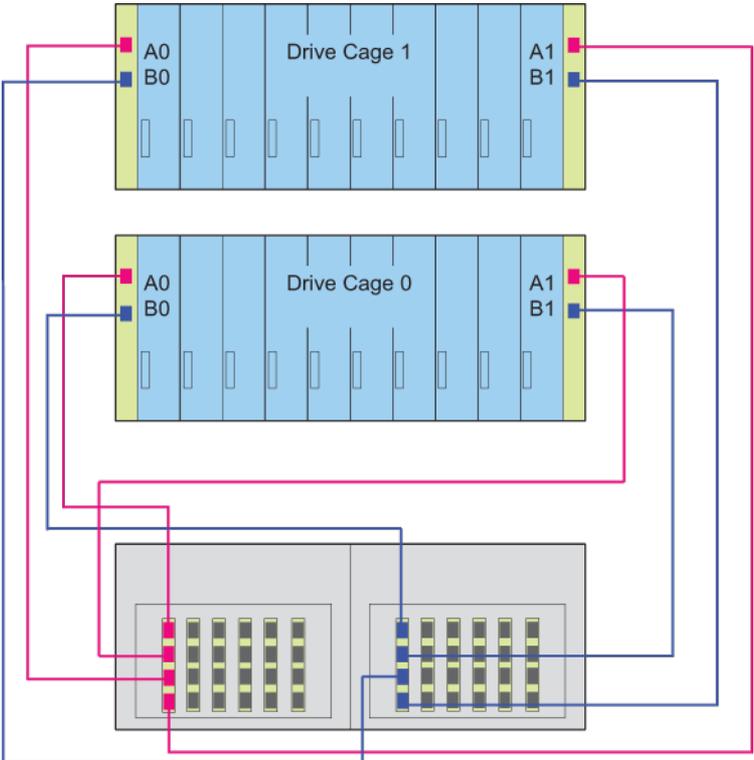
0665_L_R1

Figure 78 Split Mode to Drive Cage Cabling (4 Node System)
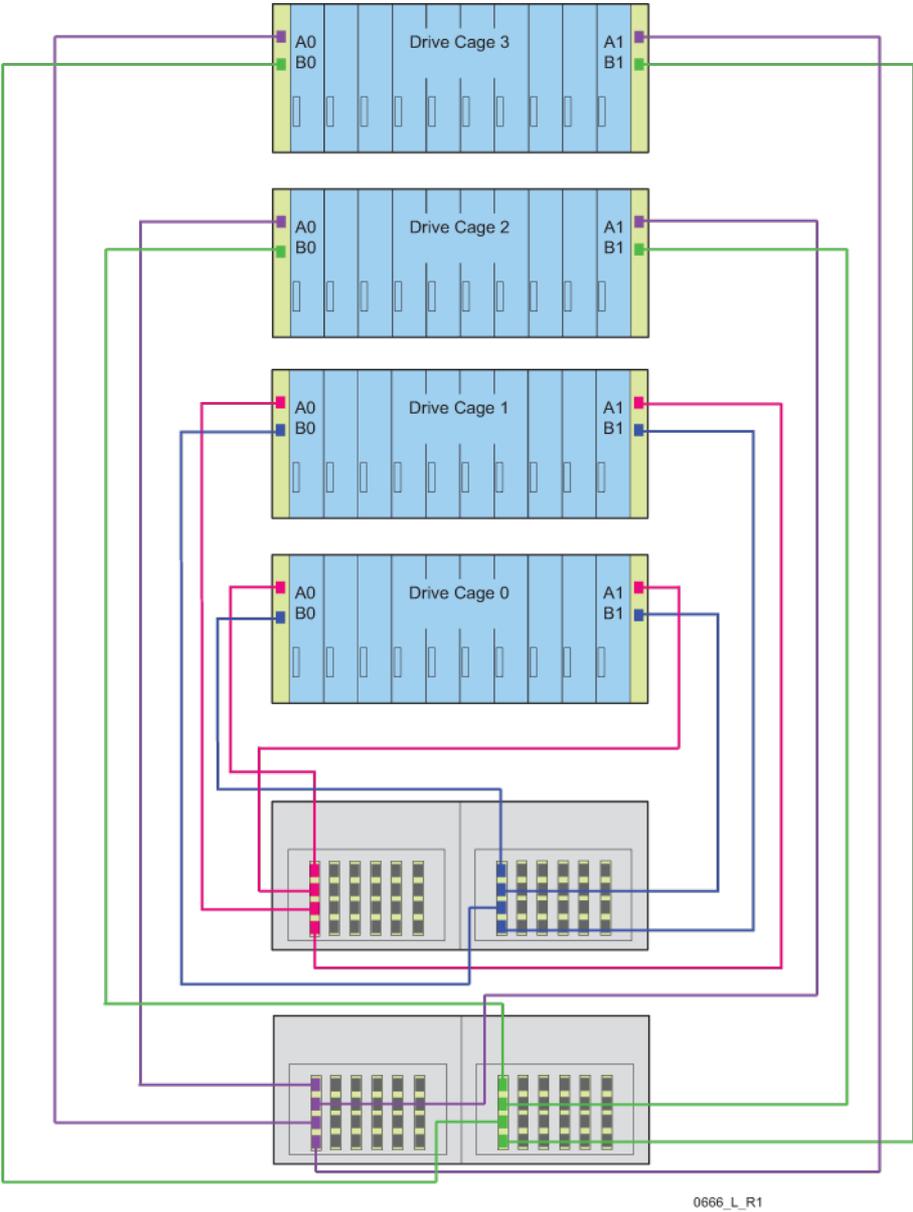
NOTE: "Split Mode to Drive Cage Cabling (4 Node System)" (page 78) represents a logical relationship. In practice, the lowest sitting node pair in the cabinet is connected to the lowest sitting drive cages.

C PCI Adapter Installation Order

This appendix describes the Fibre Channel adapter installation order for an HP 3PAR T-Class Storage System controller node hardware upgrades. Use this appendix to determine which PCI slots to use for installing additional Fibre Channel and iSCSI adapters.

Two types of adapters are used in a T-Class Storage System:

- *Fibre Channel adapters*. External connections to some hosts as well as all internal connections between controller nodes and drive chassis require the use of Fibre Channel adapters. Fibre Channel adapters have four ports (quad-port adapters).

- iSCSI adapters. T-Class controller nodes can optionally use iSCSI adapters for host connections.

There are six PCI slots to hold a maximum of six adapters (Figure 79 (page 79)).

Figure 79 Controller Node PCI Card Slots
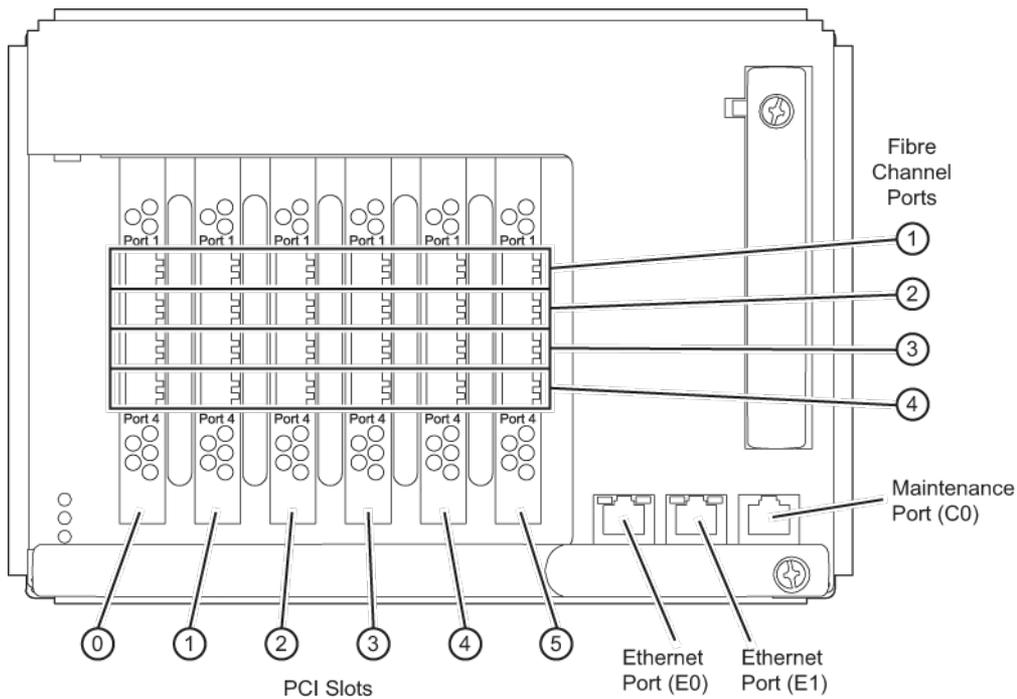
Table 7 (page 79) summarizes the adapter installation order for T-Class nodes. Numbers denote PCI slots..

Table 7 Adapter Installation Order and Usage Based on Controller Node Type

Usage Adapter Type	Installation Order by PCI Slot
Drive chassis connections (Fibre Channel adapters)	0, 2, 4
Hosts connections (Fibre Channel adapters, iSCSI adapters)	5, 3, 1, 4[1]

[1] If not used for Remote Copy connection.

PCI Slot Installation Order

The exact order for installing Fibre Channel adapters into the PCI slots of T-Class controller nodes depends on the number of adapters used and the types of connections required (*host* or *drive cage*). In addition, the presence of iSCSI and PCI adapters can impact the use of the remaining controller node PCI slots.

The following guidelines apply to T-Class nodes.

Fibre Channel Adapters

Fibre Channel adapters are used for drive chassis and host connections.

Drive Cage Connections

For T-Class controller nodes, the optimal Fibre Channel adapter loading order for drive cage connections are PCI slots 0, 2, and 4.

Host Connections

- For T-Class nodes, the optimal Fibre Channel adapter loading order for host connections is PCI slots 5, 3, 1, and then slot 4 (when available).
- Horizontal node pairs: when making more than one connection from a single host, you should connect to ports in Fibre Channel adapters installed in horizontal nodes pairs, such as such as nodes 0 and 1 or nodes 2 and 3, etc.

iSCSI Adapters

When present, iSCSI adapters should be installed in PCI slots 5, 3, and 4 of the controller node.

Node Connection Matrix

See Table 8 (page 80) to determine the correct adapter configuration for the controller nodes in your system. The diagrams in the right column of the table represent the PCI slots in each controller node. In these diagrams, an x represents a PCI slot not occupied by an adapter.

NOTE: The following diagrams may not be accurate when PCI or iSCSI adapters are installed.

Table 8 Adapter Installation Order

Adapters	Connection Types	Configuration Diagram
2	1 drive cage 1 host	Slot 0: Drive Cage, Slot 1: x, Slot 2: x, Slot 3: x, Slot 4: x, Slot 5: Host
3	1 drive cage 2 host	Slot 0: Drive Cage, Slot 1: x, Slot 2: x, Slot 3: Host, Slot 4: x, Slot 5: Host
	2 drive cage 1 host	Slot 0: Drive Cage, Slot 1: x, Slot 2: Drive Cage, Slot 3: x, Slot 4: x, Slot 5: Host
4	1 drive cage 3 host	Slot 0: Drive Cage, Slot 1: Host, Slot 2: x, Slot 3: Host, Slot 4: x, Slot 5: Host
	2 drive cage 2 host	Slot 0: Drive Cage, Slot 1: x, Slot 2: Drive Cage, Slot 3: Host, Slot 4: x, Slot 5: Host
	3 drive cage 1 host	Slot 0: Drive Cage, Slot 1: x, Slot 2: Drive Cage, Slot 3: x, Slot 4: Drive Cage, Slot 5: Host

Table 8 Adapter Installation Order *(continued)*

Adapters	Connection Types	Configuration Diagram
5	2 drive cage 3 host	Slot 0: Drive Cage / Slot 1: Host / Slot 2: Drive Cage / Slot 3: Host / Slot 4: X / Slot 5: Host
	3 drive cage 2 host	Slot 0: Drive Cage / Slot 1: X / Slot 2: Drive Cage / Slot 3: Host / Slot 4: Drive Cage / Slot 5: Host
	1 drive cage 4 host	Slot 0: Drive Cage / Slot 1: Host / Slot 2: X / Slot 3: Host / Slot 4: Host / Slot 5: Host
6	3 drive cage 3 host	Slot 0: Drive Cage / Slot 1: Host / Slot 2: Drive Cage / Slot 3: Host / Slot 4: Drive Cage / Slot 5: Host
	2 drive cage 4 host	Slot 0: Drive Cage / Slot 1: Host / Slot 2: Drive Cage / Slot 3: Host / Slot 4: Host / Slot 5: Host

There are three internal PCI busses in each controller node. As can be seen in , the preferred PCI card installation order spreads out on different PCI busses.

Figure 80 PCI Bus/PCI Slot Association

PCI 0		PCI 1		PCI 2	
SLOT 0	SLOT 1	SLOT 2	SLOT 3	SLOT 4	SLOT 5
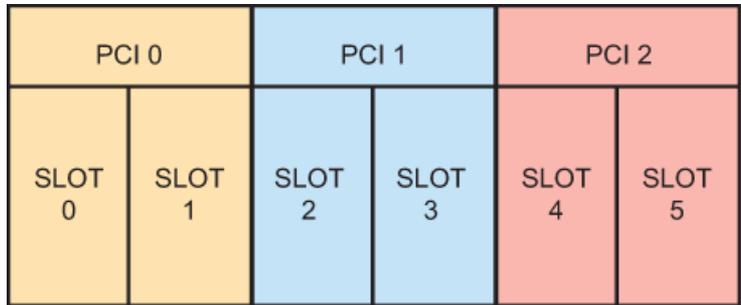
0669_L_R1

D Performing Node Rescue

This appendix describes the following methods for recovering a node that has been replaced or recently added to the system. It is possible to "rescue" a node with the following method:

- For OS 3.1.2 or higher, use node-to-node CLI rescue.
- For OS 3.1.1 or previous versions, use the service processor to connect to the nodes and perform node rescue. See "Service Processor Auto-Node Rescue" (page 83) and "Service Processor-to-Node Rescue" (page 86).

Node-to-Node CLI Rescue

The method enables you to rebuild a node disk (performing node-rescue) using a working node and the CLI command `startnoderescue`.

NOTE: This method is only supported by HP 3PAR OS 3.1.2 or higher.

Requirements include:

- Two Ethernet connections to the same network.
- One node in the storage system (the *rescuer* node) must have a functioning network connection and the system must be able to process HP 3PAR OS CLI commands.
- The node-to-be-rescued (the *target* node) must have an Ethernet cable connected to the Administrative network port (E0) and be connected to the same network as the *rescuer*-node in the storage system.

Figure 81 Node-to-Node Rescue Port Connections
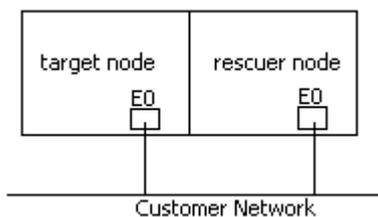
- The node to be rescued must be at the BIOS prompt. If the node is running it must be halted using `shutdownnode halt <node_ID>`.

To rescue a node using another functioning *rescuer* node, do the following:

1. Start an `spmaint` session.
2. From `SPMAINT`, enter the Interactive CLI shell for the storage system.
3. Enter the CLI command `shownet` to determine which node has the **ACTIVE** Ethernet connection.

   This is the *rescuer*. For example, **node-1** has the active network connection in the following output:

```
cli% shownet
IP Address         Netmask/PrefixLen   Nodes   Active
192.168.56.206     255.255.255.0         01       1
```

4. If necessary, remove the Ethernet cable from port E0 of another node in the system.
5. Connect an Ethernet cable (or the one temporarily removed in step 4) to port `E0` of the target-node.
6. Enter the CLI command `startnoderescue -node target_node`, where `target_node` is the Node ID (slot number) of the node being rescued.

7. Monitor the progress of *startnoderescue* by using the `showtask` CLI command.
   a. Look for the ID number of the most recent `node_rescue` task, which is usually at the bottom of the list. That task-ID will be used below. For example:

```
cli% showtask
Id   Type        Name           Status Phase Step ----StartTime------  FinishTime  Priority- ---User----
2488 node_rescue node_0_rescue active 1/1   0/1 2012-12-03 15:18 PST  -           n/a        sys:3parsy
```

NOTE: Depending on the number of adapters and amount of memory in the node, the node could take 10-20 minutes before it becomes part of the system.

   b. Enter `showtask -d task-ID` to see the current and detailed status of the *node_rescue* operation. For example:

```
cli% showtask -d 2488
Id   Type        Name           Status Phase Step  ------StartTime-----  -FinishTime-  -Priority-  ---User--
248  node_rescue node_0_rescue active 1/1   0/1   2012-12-03 15:18 PST  -            n/a          sys:3parsy

Detailed status:
2012-12-03 15:18:09 PST Created    task.
2012-12-03 15:18:09 PST Updated    Running node rescue for node 0 as 1:1474
2012-12-03 15:18:17 PST Updated    Using IP 169.254.194.207
2012-12-03 15:18:17 PST Updated    Informing system manager to not autoreset node 0.
2012-12-03 15:18:17 PST Updated    Resetting node 0.
2012-12-03 15:18:17 PST Updated    Attempting to contact node 0 via internal serial port.
2012-12-03 15:18:28 PST Updated    Waiting for node to respond (10 seconds elapsed)...
2012-12-03 15:18:38 PST Updated    Waiting for node to respond (20 seconds elapsed)...
2012-12-03 15:18:48 PST Updated    Waiting for node to respond (30 seconds elapsed)...
2012-12-03 15:18:55 PST Updated    Successfully started inter-node serial link communication
2012-12-03 15:18:56 PST Updated    Setting boot parameters.
2012-12-03 15:19:08 PST Updated    Waiting for node 0 to boot the node rescue kernel.
2012-12-03 15:20:50 PST Updated    Kernel on node 0 has started. Waiting for node to retrieve install details.
2012-12-03 15:21:08 PST Updated    Node 0 has retrieved the install details. Waiting for file sync to begin.
2012-12-03 15:23:12 PST Updated    File sync has begun. Estimated time to complete this step is 5 minutes on
 a lightly loaded system.
2012-12-03 15:25:53 PST Updated    Remote node has completed file sync, and will reboot.
2012-12-03 15:25:53 PST Updated    Waiting for node to rejoin cluster.
```

   c. When *startnoderescue* successfully completes the status of the task will be **done**. If it should fail, that status would be indicated. For the successful example:

```
cli% showtask -d 2488
Id   Type        Name           Status Phase Step ---StartTime---  --FinishTime---      Priority-
User---
2488 node_rescue node_0_rescue done   --   --  2012-12-03 15:18 PST 2012-12-03 15:32 PST n/a   sys:3parsy

Detailed status:
2012-12-03 15:18:09 PST Created    task.
2012-12-03 15:18:09 PST Updated    Running node rescue for node 0 as 1:1474
...
2012-12-03 15:25:53 PST Updated    Remote node has completed file sync, and will reboot.
2012-12-03 15:25:53 PST Updated    Waiting for node to rejoin cluster.
2012-12-03 15:32:04 PST Updated    Node 0 rescue complete.
2012-12-03 15:32:04 PST Completed scheduled task.
```

8. Enter the CLI command `shownode` to make sure the node is online (*InCluster*) to the storage system.
9. If necessary, move the administrative Ethernet cable to the node from which it was removed.
10. Exit from SPMAINT.
11. If you disconnected the I/O cables, reconnect them.

Service Processor Auto-Node Rescue

This method is only supported by HP 3PAR OS 3.1.1 or previous versions. Do not use this method if you are using OS 3.1.2.

To perform auto-node rescue:

1. Uncoil the red crossover Ethernet cable connected to the private network connection. Using the red crossover cable, connect ETH1 of the SP to the Ethernet port (E0) port of the node that is being rescued.
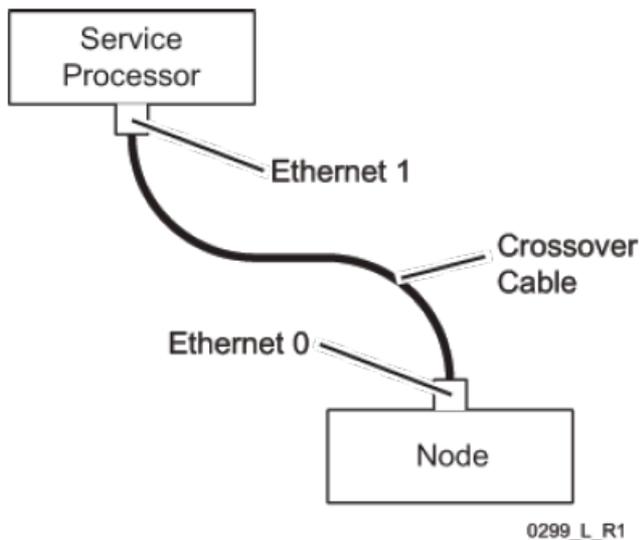
Service Processor — Ethernet 1 — Crossover Cable — Ethernet 0 — Node

0299_L_R1

2. Connect the maintenance PC to the SP using the serial connection and start an `spmaint` session.

3. In the **3PAR Service Processor Menu**, select the following:

   - **4 StoreServ Product Maintenance**
   - **11 Node Rescue**
   - **1 Configure Node Rescue**, then select the desired system
   - **3 Automatic Node Rescue**, then enter the node number

4. Gently slide the node into the chassis until it stops while keeping the insertion/removal lever fully extended.

   NOTE: Closing the insertion handle immediately supplies power to the controller node. Do NOT raise the lever or reconnect the cables at this time.

5. Push the node insertion/removal lever to cam the node into the midplane and close the handle quickly.

   NOTE: If you halted the node in "Replacing the Node Disk," it was put into Disk Hot-plug mode (LED=amber) and you can run node rescue without having to slide the node out and insert it again.

6. Select `y` to confirm the correct node number. When communication from the SP to the node is established, output similar to the following appears:

```
root@1200163-0 Tue Apr 01 16:53:19:~# beginning rescue function...
.255.248 -s 10.255.155.54155.53 -m 255.255
Informing system manager to not autoreset node1
Resetting node 1
Attempting to contact node 1 via internal serial port
Waiting for node to respond (10 seconds elapsed)...
Waiting for node to respond (20 seconds elapsed)...
Waiting for node to respond (30 seconds elapsed)...
=Successfully started inter-node serial link communication
Starting Whack, setting values, and loading image:
Interacting with CBIOS on the node...
.
Booting from net...
TFTP "install" from 10.255.155.54................................complete
mknbi-1.2-7/first32.c (GPL)
Top of ramdisk is 0X1FFFF000
Ramdisk at 0X00800000, size 0X00500000
.
Kernel on remote node has been started.
Waiting for node to join cluster. This usually takes around 10 minutes, but may
```

```
take 20 minutes or longer.
Install kernel is running - please wait...
Waiting for node to join cluster (0 minutes and 15 seconds elapsed)
=Waiting for node to join cluster (0 minutes and 30 seconds elapsed)
.
Waiting for node to join cluster (13 minutes and 15 seconds elapsed)
=Node 1 has joined the cluster; node rescue successful.
.
Please wait...
Starting SP tasks.....
```

NOTE: This process takes approximately 15 minutes. When complete, the node reboots and becomes part of the cluster. If this takes longer than twenty minutes, problems may exist and the node rescue process needs to be corrected.

7. After the node has booted, verify that the node status LED is blinking green in unison with the other node LEDs, indicating that the node has joined the cluster, then press ENTER to continue.
8. In the menu, select the following:

    - **1 Deconfigure <name of cluster> Node Rescue**

    - **x Return to previous menu** to return to the main menu

    - **7 Interactive CLI for an StoreServ,** then select the desired system

9. Issue the `shownode` command to verify that the nodes have joined the cluster:

```
cli% shownode
         Control Data Cache
Node --Name--- -State- Master InCluster ---LED--- Mem(MB) Mem(MB) Available(%)
2    1201553-2  OK      No     Yes       GreenBlnk 4096    12288   100
3    1201553-3  OK      Yes    Yes       GreenBlnk 4096    12288   100
```

10. Issue the `checkhealth -svc -detail` command to verify the system is healthy.
11. In the SP window, issue the `exit` command and select **X** to exit from the **3PAR Service Processor Menu** and to log out of the session.
12. Disconnect the serial cable from the maintenance PC and the red cross-over Ethernet cable from the node and coil and replace the cables behind the SP.
13. If applicable, reconnect the customer's network cable and any other cables that may have been disconnected.
14. Close and lock the rear door.

Service Processor-to-Node Rescue

⚠ **CAUTION:** Before proceeding with the controller node rescue, verify with the system administrator before disconnecting all host cables or shutting down the host.

NOTE: This SPMAINT node-rescue procedure should only be used if *all* nodes in the 3PAR system are down and needs to be rebuilt from the HP 3PAR OS image on Service Processor. The SP-to-node rescue procedure is supported with HP 3PAR OS version 3.1.2 or higher and HP 3PAR Service Processor 4.2 or higher.

To perform SP-to-node rescue:

1. At the rear of the storage system, uncoil the red crossover Ethernet cable connected to the SP (ETH) private network connection and connect this cross-over cable to the E0 port of the node that is being rescued.

    Figure 82 Connecting the Ethernet Cable
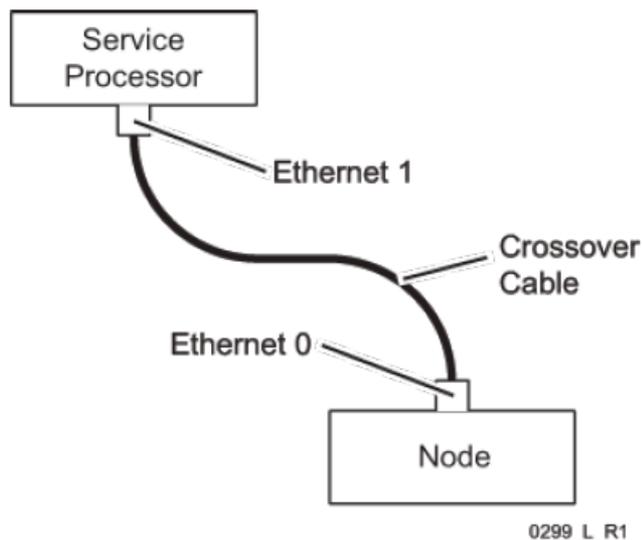
    NOTE: Connect the crossover cable to the following ETH port of a specific SP brand:
    *   HP 3PAR Service Processor DL320e: ETH port 2
    *   Supermicro II: ETH port 1

2. Connect the maintenance PC to the SP using the serial connection and start an `spmaint` session.
3. Go to **3 StoreServ Configuration Management > 1 Display StoreServ information** to perform the pre-rescue task of obtaining the following information:
    *   HP 3PAR OS Level on the StoreServ system
    *   StoreServ system network parameters including netmask and gateway information

    Return to the main menu.

    NOTE: Copy the network information on to a separate document for reference to complete the subsequent steps of configuring the system network.

4. In the **3PAR Service Processor Menu**, complete the following:
    a. Choose **4 ==> StoreServ Product Maintenance**.
    b. Choose **11 ==> Node Rescue**.
    c. Enter **y** to confirm to action before continuing with node rescue.

d. Choose **1 ==> Configure Node Rescue**, then select the desired system.

At this point, you will be prompted for the node rescue configuration information.

1. Verify the current HP 3PAR OS level and enter **y** to use the level.
2. Enter **y** to continue to setup node rescue.

   NOTE: The process may take a few minutes.

3. Press **Enter** to accept the default `[/dev/tpddev/vvb/0]`.
4. Enter **y** to specify the time zone. Continue to follow the time zone setup prompts.
5. Confirm the HP 3PAR OS level and enter **y** to continue.

5. Choose **2 ==> SP-to-Node Rescue**.

   NOTE: The process of establishing communication between the SP and StoreServ system may take several minutes.

6. Establish a serial connection to the node being rescued. If necessary, disconnect the serial cable from SP.
7. Connect a serial cable from the laptop to the serial port on the node being rescued (S0).
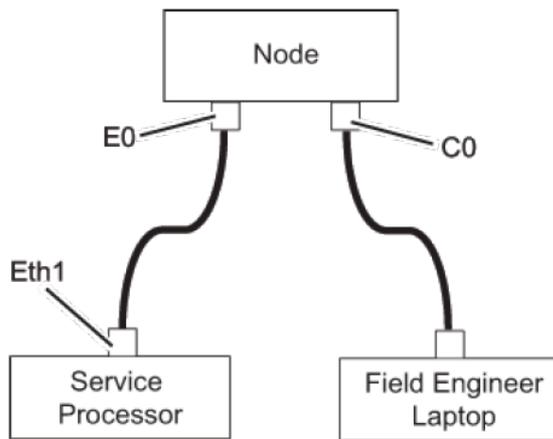
0661_L_R2

NOTE: Connect the crossover cable to the following ETH port of a specific SP brand:

- HP 3PAR Service Processor DL320e or DL360e: ETH port 2
- Supermicro II: ETH port 1

**NOTE:** If necessary, check the baud rate settings before establishing a connection.

8. Press **CTRL+W** to establish a `whack>` prompt.
   a. Type `nemoe cmd unset node_rescue_needed` and press **Enter**. The output will display the message `no output`.
   b. Type `boot rescue` and press **Enter**.
   c. Monitor the console output process. The node will continue to run POST then it will stop and display instructions for running node-rescue (see output on the following page). Enter **y** to continue.

   > **NOTE:** If **y** is not entered, you will need to redo step 8.

   The system installs the OS. This process takes approximately 10 to 15 minutes (rescue and rebuild of disk = 5 minutes) + (reboot = 5-10 minutes). When complete, the node restarts and becomes part of the cluster.

```
This is the procedure for manually rescuing a 3PAR StoreServ node (i.e.,
rebuilding the software on the node's internal disk).  The system will install
the base OS, BIOS, and InForm OS for the node before it joins the cluster.

You must first connect a Category 5 crossover Ethernet cable between the SP's
private/internal network (Eth-1) and the "E0" Ethernet port of the node to be
rescued.  Note that the diagram below does not represent the physical port
numbers or configuration of all node types.

                             New Node
    Service Processor    +------------+
  +-----------------+    ||||||||      |
  |                 |    ||||||||      |
  |Eth-0 Eth-1(Int) |    |||||||| E0 C0|
  +-----------------+    +------------+
          ^                 ^  ^
          |___Crossover Eth___|  |__Maintenance PC (serial connection)

This procedure will execute the following Whack commands:
    1. net addr 10.255.155.53
    2. net netmask 255.255.255.248
    3. net server 10.255.155.54
    4. boot net install ipaddr=10.255.155.53 nm=255.255.255.248 rp=10.255.155.54::rescueide

This operation will completely erase and reinstall the node's local disk.
Are you sure? (Y/N) No
```
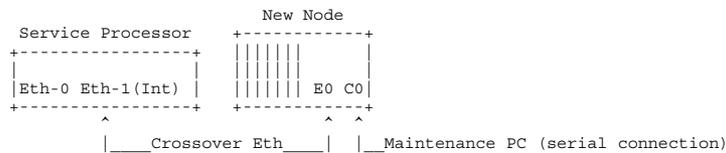
9. Verify the node status LED is slowly blinking green and provides a login prompt.
10. If applicable, remove the crossover cable from the recently saved node and connect it to the next node.

   > **NOTE:** Reconnect the public network (Ethernet) cable to recently saved node.

11. Repeat steps 7 through 10 for each node.
12. Log on to a node as a **console** user.
13. Choose option **2, Network Configuration** to set the network configuration for the system. Follow the prompts to complete the network configuration.

   > **NOTE:** The cluster must be active and the admin volume must be mounted before changing the network configuration.

   > **NOTE:** Access STATs to obtain the network information or request it from the system administrator.

14. Press **Enter**.
15. Before deconfiguring the node rescue, disconnect the crossover cables and reconnect the public network cable.
16. Return to the SP Main menu and perform the following:
    a. Choose **1 ==> Deconfigure Node Rescue**.
    b. Choose **X ==> Return to previous menu** to return to the main menu.
    c. Choose **7 ==> Interactive CLI for a StoreServ,**, then select the desired system.

17. Execute the `shownode` command to verify that all nodes have joined the cluster.

```
cli% shownode
             Control Data Cache
Node --Name--- -State- Master InCluster ---LED--- Mem(MB) Mem(MB) Available(%)
0    1000163-0  OK      No     Yes       GreenBlnk  4096    6144    100
1    1000163-1  OK      Yes    Yes       GreenBlnk  4096    6144    100
```

18. Execute the `shutdownsys reboot` command and enter **yes** to reboot the system.

    When the system reboot is complete, reestablish an SPMAINT session to perform additional CLI commands.

19. Reconnect the host and host cables if previously removed or shutdown.
20. Issue the `checkhealth -svc -detail` command to verify the system is healthy.
21. In the SP window, issue the `exit` command and select **X** to exit from the **3PAR Service Processor Menu** and to log out of the session.
22. Disconnect the serial cable from the maintenance PC and the red cross-over Ethernet cable from the node and coil and replace the cable behind the SP. If applicable, reconnect the customer's network cable and any other cables that may have been disconnected.
23. Close and lock the rear door.

E Storage System Sparing Schedule

This appendix provides information on choosing the necessary sparing options when setting up an HP 3PAR T-Class Storage System.

- To view the current system sparing algorithm settings, issue the `showsys -param` command.
- To set up or modify the system sparing algorithm, issue the `setsys SparingAlgorithm <sparing_option>` command, where `<sparing_option>` is an option listed in Table 9 (page 90).

Table 9 Options for CLI Command setsys Sparing Algorithm <sparing_option>

Sparing Option	Sparing Definitions
Default	Allocates one disk of spare chunklets for every 40 disks with a required minimum of four disks of spares.
Minimal	Allocates one disk of spare chunklets for every 40 disks without required minimum disks of spares.
Maximal	Allocates one disk worth of spare chunklets per drive cage of the largest size disk in the system to provide "cage" level high availability.
Custom	Allows the user to allocate a specific number of chunklets for spare space (customize the number of spare chunklets).

F Locking Fascia

This appendix provides instructions on converting a standard fascia into a locking fascia and removal and replacement of a locking fascia.

Locking Fascia

Converting a Cabinet from Standard to Locking Fascias

To convert a standard cabinet with standard fascias to one with locking fascias, complete the following steps:

1. Remove the standard fascias from the cabinet.
2. Remove the four mounting brackets located at each inner corner of the cabinet, setting the screws aside.

Figure 83 Removing Locking Brackets
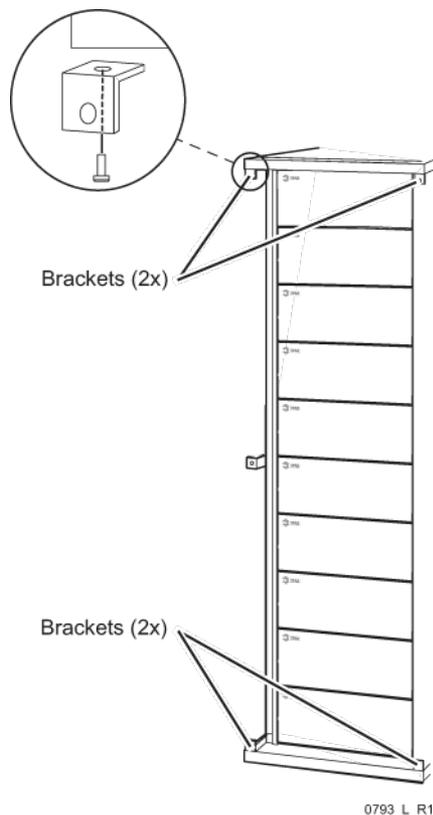
3. Using the old screws, attach the new mounting brackets in place by inserting the guiding pin to hold the bracket in place. Repeat for each bracket. Extra screws and PEM nuts are included if the old screws or nuts are damaged.

   NOTE: If the PEM nut is stripped, use the longer screws and washers accompanying the mounting brackets in the locking fascia kit.

4. Install the fascia and use the key to lock it in place.

Removing the Locking Fascia

To remove the locking fascias:

1. Unlock the bottom lock of the fascia.
2. With one hand supporting the fascia in place, unlock the top lock.

3. Carefully set the fascia aside so it does not interfere with the maintenance of the storage system.
4. Repeat the same procedure with the second fascia.

Figure 84 Removing the Locking Fascia
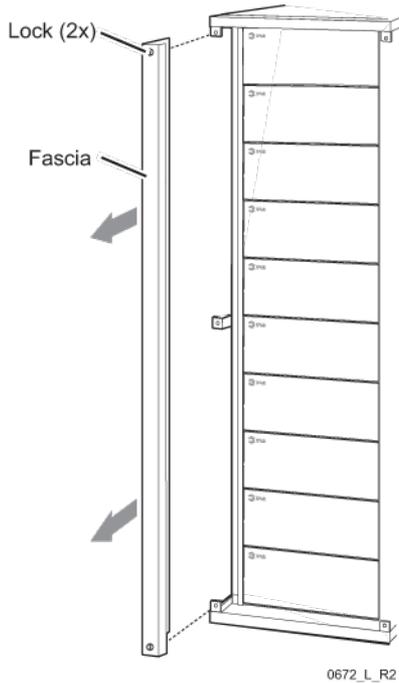
Replacing the Locking Fascia

To replace the locking fascias:
1. Set the fascia in place and support it with one hand while locking the upper lock.
2. Continue to support the fascia while locking the lower lock.

Figure 85 Replacing the Locking Fascia
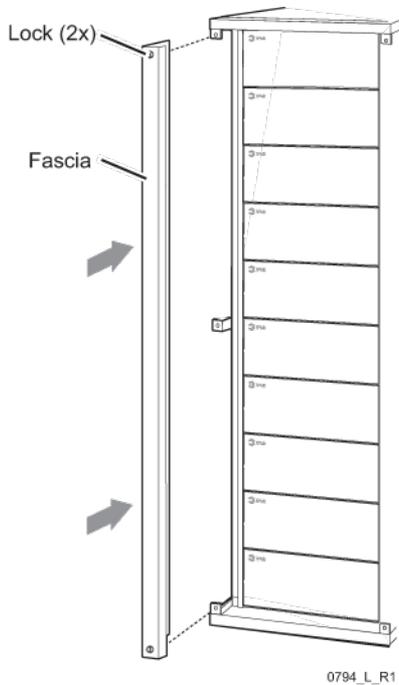
Locking Fascia II

Converting a Standard Cabinet to a Locking Fascia II

To convert a standard cabinet with standard fascias to one with locking fascias:

1. Remove the standard fascias from the cabinet.
2. Remove the four mounting brackets located at each inner corner of the cabinet, setting the screws aside.

Figure 86 Removing Locking Brackets
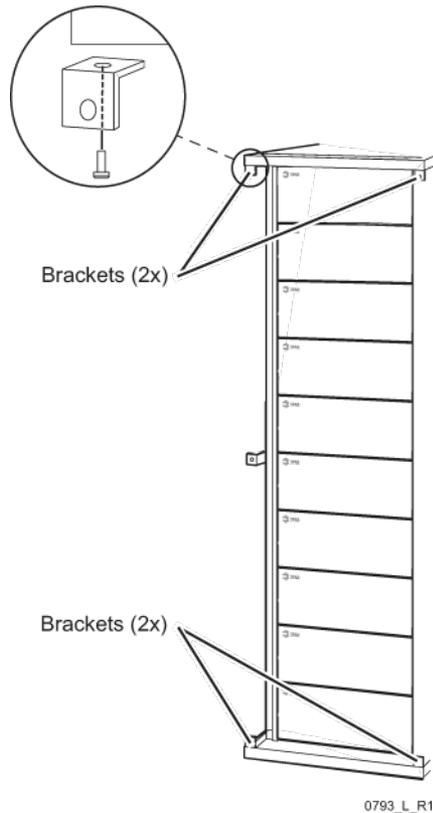
3. Use a #2 Phillips screw driver to install the universal cosmetic/mounting bracket to the upper and lower section of the cabinet. Screw the 10-32 x 1/2 screw and washer to the nut under the cabinet. Repeat on the other side of bracket.

Figure 87 Installing Universal Cosmetic/Mounting Brackets
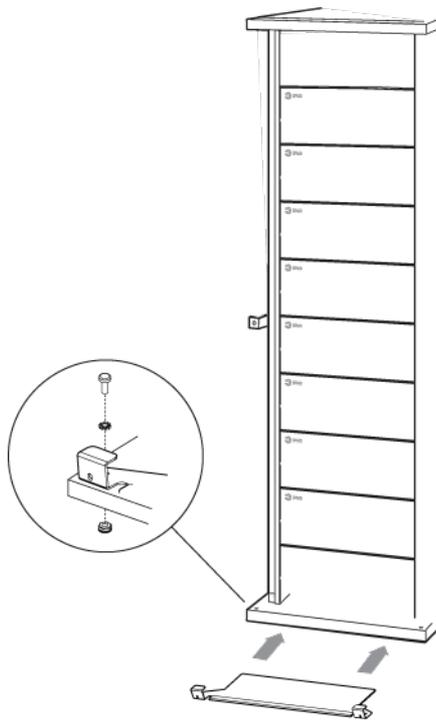
0810_L_R1

4. Install the locking fascia by holding the pocket handles and locking both locks to the brackets.

Figure 88 Installing the Locking Fascia

Lock (2)

Pocket Handles (2x)
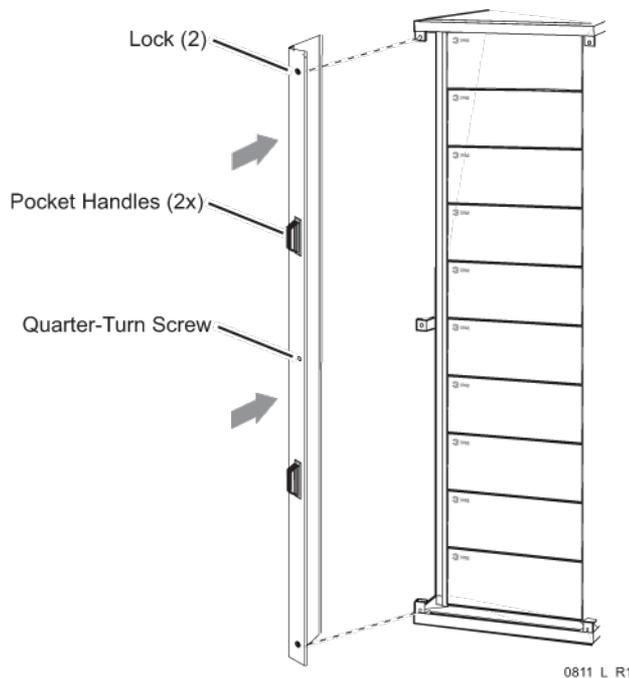
Quarter-Turn Screw

0811_L_R1

5. Use a #2 Phillips screwdriver to secure the Quarter-Turn screw.
6. Repeat for second fascia.

Removing the Locking Fascia

To remove the locking fascia:

1. Turn the pocket handles out.

2. Unlock the bottom lock of the fascia.
3. With one hand supporting the fascia in place, unlock the top lock.
4. Supporting the fascia by the pocket handles, set the fascia aside so it does not interfere with the maintenance of the storage system.
5. Repeat the same procedure with the second fascia.

**Figure 89 Removing the Locking Fascia**
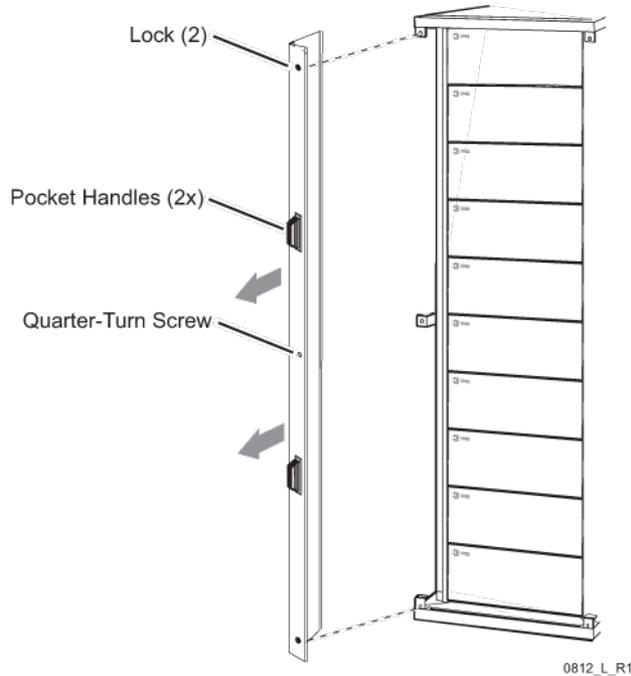
Replacing the Locking Fascia

To replace the locking fascias:
1. Turn the pocket handles out, while holding the handles set the fascia in place and support it with one hand while locking the upper lock.
2. Continue to support the fascia while locking the lower lock.
3. Use a #2 Phillips screwdriver to secure the screw on the center of the fascia.

Figure 90 Replacing the Locking Fascia
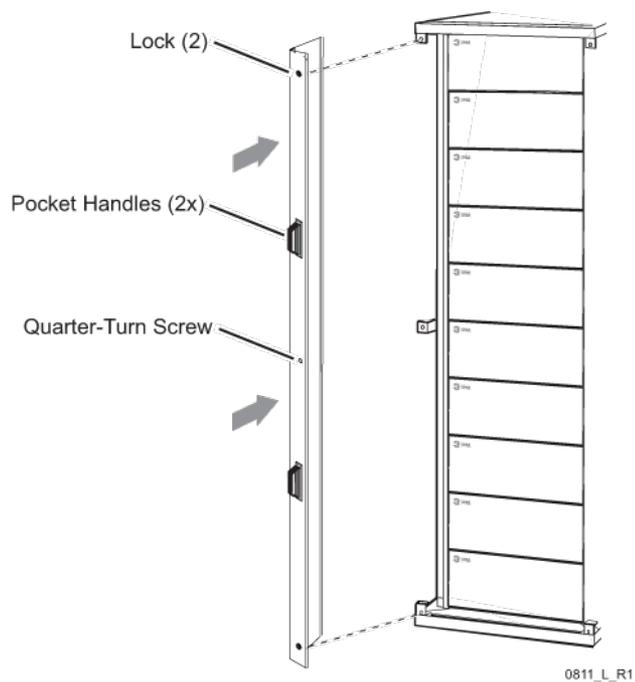
4. Turn the pocket handles in so they are flush with the fascia and out of the way.
5. Repeat with other fascia.