

Instruction Manual

Tektronix

Profile[®]

RAID Storage

PRS 250

Printed in USA or United Kingdom

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General Safety Summary

Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it.

Only qualified personnel should perform service procedures.

While using this product, you may need to access other parts of the system. Read the *General Safety summary* in other system manuals for warnings and cautions related to operating the system.

Injury Precautions

- | | |
|--|--|
| Use Proper Power Cord | To avoid fire hazard, use only the power cord specified for this product. |
| Ground the Product | This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded. |
| Do Not Operate Without Covers | To avoid electric shock or fire hazard, do not operate this product with covers or panels removed. |
| Use Proper Fuse | To avoid fire hazard, use only the fuse type and rating specified for this product. |
| Do Not operate in Wet/Damp Conditions | To avoid electric shock, do not operate this product in wet or damp conditions. |
| Do Not Operate in an Explosive Atmosphere | To avoid injury or fire hazard, do not operate this product in an explosive atmosphere. |
| Avoid Exposed Circuitry | To avoid injury, remove jewelry such as rings, watches, and other metallic objects. Do not touch exposed connections and components when power is present. |

Product Damage Precautions

- | | |
|---|---|
| Use Proper Power Source | Do not operate this product from a power source that applies more than the voltage specified. |
| Use Proper Voltage Setting | Before applying power, ensure that the line selector is in the proper position for the power source being used. |
| Provide Proper Ventilation | To prevent product overheating, provide proper ventilation. |
| Do Not Operate With Suspected Failures | If you suspect there is damage to this product, have it inspected by qualified service personnel. |

Safety Terms and Symbols

Terms in This Manual

These terms may appear in this manual:



WARNING: Warning statements identify conditions or practices that can result in personal injury or loss of life.



CAUTION: Caution statements identify conditions or practices that can result in damage to the equipment or other property.

Terms on the Product

These terms may appear on the product:

DANGER indicates a personal injury hazard immediately accessible as one reads the marking.

WARNING indicates a personal injury hazard not immediately accessible as you read the marking.

CAUTION indicates a hazard to property including the product.

Symbols on the Product

The following symbols may appear on the product:



DANGER high voltage



Protective ground (earth) terminal



ATTENTION – refer to manual

Regulatory Information

Certifications and Compliances

Canadian Certified Power Cords

Canadian approval includes the products and power cords appropriate for use in the North America power network. All other power cords supplied are approved for the country of use.

Canadian Certified AC Adapter

Canadian approval includes the AC adapters appropriate for use in the North America power network. All other AC adapters supplied are approved for the country of use.

FCC Emission Control

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with this installation manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her own expense. Changes or modifications not expressly approved by Tektronix can affect emission compliance and could void the user's authority to operate this equipment.

Canadian EMC Notice of Compliance

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le ministère des Communications du Canada.

EN55022 Class A Warning

For products that comply with Class A. In a domestic environment, this product may cause radio interference, in which case the user may be required to take adequate measures.

Introduction

This manual explains how to install the rack-mounted RAID Storage chassis, how to configure and manage the system, and how to replace and/or add customer replaceable units (CRUs). The manual is for technical personnel who want to install and maintain the RAID Storage chassis. It assumes familiarity with Profile Professional Disk Recorders. For information on RAID usage, see the Profile User Guide.

***NOTE:** Using the PRS250 RAID Storage chassis requires Profile System Software V2.2 or higher. For optimum performance from your PRS250, you should use Profile System Software V2.4.*

Organization of the Manual

The manual is organized into chapters which are identified and briefly described below.

Chapter 1 - Introduction: Introduces the RAID Storage chassis and its components.

Chapter 2 - Installation: Describes how to install and configure the RAID Storage chassis.

Chapter 3 - Servicing the System: Describes how to monitor and service the RAID Storage chassis.

Appendix A: Lists the technical specifications of the RAID Storage chassis.

Appendix B: Provides ordering information for CRUs and Field Replaceable Units for the RAID Storage chassis.

About the RAID Storage Chassis

This RAID Storage provides a compact, high-capacity, high-availability source of disk storage for the Profile Professional Disk Recorder. A single RAID Storage chassis offers a large capacity of high-availability disk storage in as many as 20 disk modules that can individually be replaced while the system is powered up.

Two models are available, the PRS 250 and the PRS 250M. The PRS 250M offers two storage processors, which increase the bandwidth of the RAID chassis.

Approximate storage times^a

Video Compression Type	10 Disk Drives	15 Disk Drive	20 Disk Drives
M-JPEG	6 hours	9 hours	12 hours
MPEG	12 hours	18 hours	24 hours

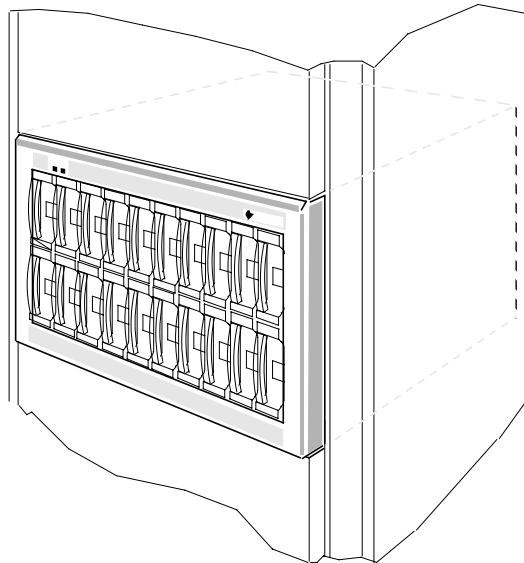
^a.At 24 Mb/sec for MJPEG, 8 Mb/sec for MPEG, 4 audio tracks per video

The following table lists the maximum number of RAIDs that can be connected to a Profile Professional Disk Recorder.

Maximum number of RAIDs per Profile system

Number Of Profile Channels	Maximum Number of RAID Chassis ^a
2	6
4	12

^a.Requires Profile System Software V2.4. To reach maximum capacity, connect no more than 3 RAID chassis per SCSI bus, with no other external SCSI devices connected.



RAID Storage Components

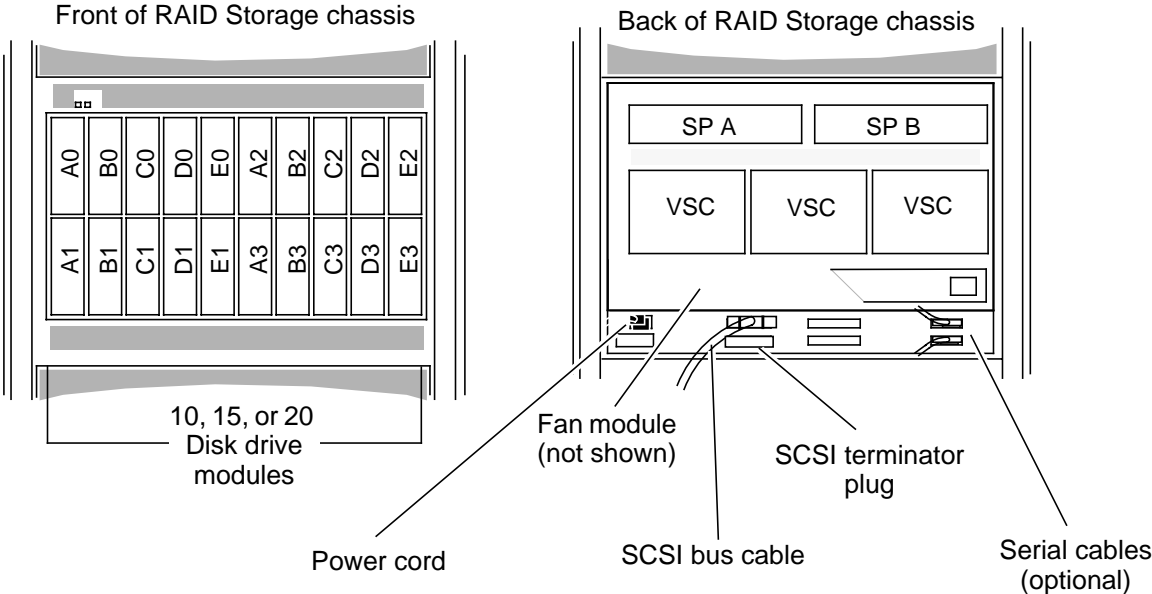
The RAID Storage chassis contains the components listed below.

- One (PRS250) or two (PRS250M) storage-control processors (SP).
- 10, 15, or 20 disk drive modules.
- One fan module.
- Three voltage semi-regulated converters (VSCs) power supplies

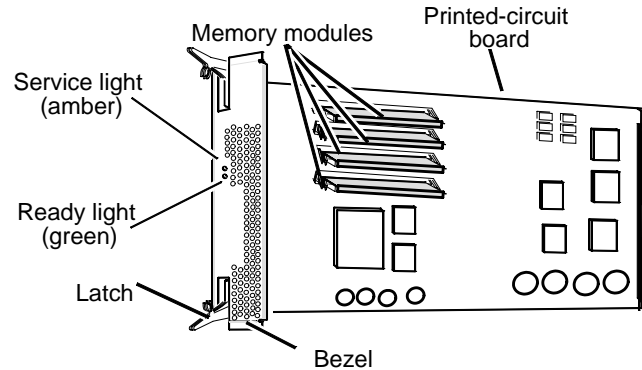
The SPs, disk modules, fan module, and VSCs in the RAID Storage chassis are *customer-replaceable units (CRUs)*, which you can install or replace yourself.

The following illustration shows the location of the RAID's CRUs, which also include the SCSI bus cable, SCSI terminator plug, power cord, and the optional asynchronous cables. In addition to the CRUs, the RAID Storage chassis contains field-replaceable units (FRUs). Only qualified service personnel should replace an FRU.

Location of the customer-replaceable units in the storage chassis



Storage-control Processor (SP)



The SP consists of a printed circuit board with two or four memory modules (DIMMs) and a bezel with status lights, and latches to secure the SP in place. The memory modules provide 32 Mbytes of SP memory. The SP uses 4Mbytes of this memory for system buffers. The remaining memory is available for system use.

Two status lights on the SP indicate the following:

Ready light (green) — Lights while the SP is powered on and operating normally.

Service light (amber) — Lights when the SP is not working properly.

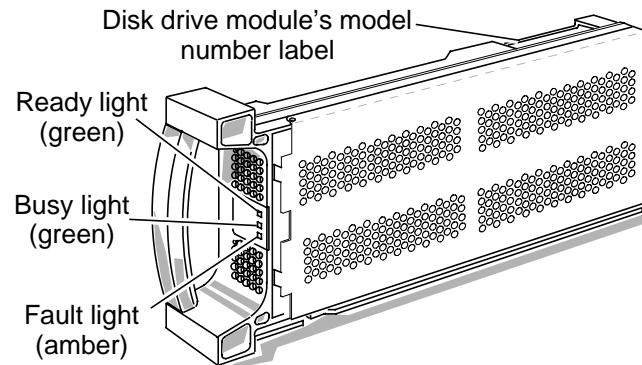
The SPs are visible when you swing the fan module down from the back of the RAID Storage chassis.

The SP processes data written to or read from the disk drive modules, and controls the disk modules in the storage chassis through a synchronous SCSI bus. It has five internal SCSI buses, each supporting four disk drive modules for a total of 20 disk drive modules. The Disk Array Storage System Manager (**dassmgr**) uses an RS-232 connection to the RAID Storage chassis to communicate with an SP. Using the **dassmgr**, you can set up RAID Storage memory, bind disk modules into logical units (LUNs), update the RAID Storage Licensed Internal Code, and check RAID Storage status.

A second SP increases the RAID chassis bandwidth for improved performance, provided the two SPs are connected to separate SCSI busses. Do not connect both SPs to the same SCSI bus.

IMPORTANT You should never attempt to replace any of the SP's components, except the memory modules.

Disk Drive Modules



A disk drive module, also called a disk module, consists of a disk drive, a power regulator board, internal cabling, and a plastic carrier. The carrier has a handle and guides for inserting and holding the module in the RAID Storage chassis. A label attached to the carrier's side shows the drive module's model number and capacity.

Three status lights on the module indicate the following:

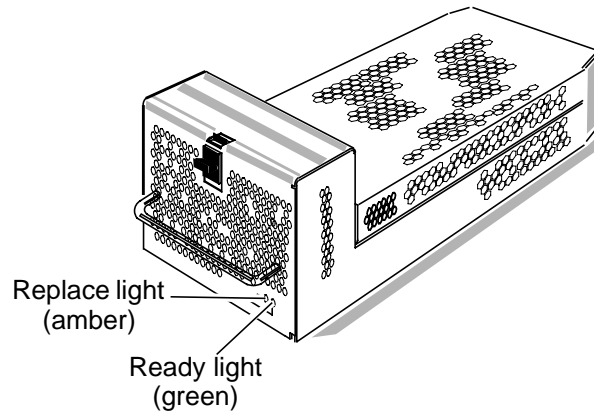
Ready light (green) — Lights while the disk drive module is powered up and ready for use.

Busy light (green) — Lights while the drive is in use; for example, during formatting or user I/O operations.

Fault light (amber) — Lights when the module is shut down by the SP because the module failed. Also lights after you replace the drive, while the replacement drive spins up to speed.

You can remove or install any one module at a time within a group of five drives either while the storage chassis is running or in the idle mode (not running). You should never open a disk drive module or attempt to replace any of its internal components.

Voltage Semi-regulated Converters (VSCs)



The VSCs are power supplies that convert the installation site's ac line voltage to the 48, 24, and 18 Vdc required to power the modules in the RAID Storage chassis. The chassis contains three VSCs for high-availability operation.

Two status lights on each VSC indicate the following:

Ready light (green) — Lights while VSC is operating normally.

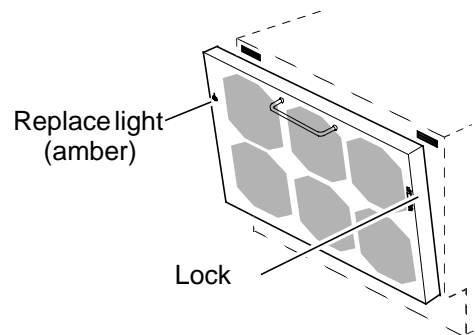
Replace light (amber) — Lights when the SP determines that the VSC has failed.

The VSCs are visible when you swing the fan module down on the back of the RAID Storage chassis.

You can remove or install a VSC while the storage chassis is running.

If a VSC fails, replace it as quickly as possible. With three VSCs, if one of them fails, the RAID Storage continues to operate but you still should replace the failed VSC as soon as possible to restore high-availability operation. Failure to replace the VSC could cause the RAID Storage chassis to shut down if either the fan module or another VSC fails. You should never open a VSC or attempt to replace any of its internal components.

Fan Module



The RAID Storage chassis uses a single fan module, also called a fan pack, that attaches to the back of the chassis. The fan module contains six high-capacity, multiple speed fans, and a control/monitor board.

One status light on the fan module indicates the following:

Replace light (amber) — Lights when a fan in the module is not working.

For high-availability operation, if a fan stops working, the remaining five fans speed up to maintain air flow. The Replace light turns on to indicate that you must replace the fan module as soon as possible.

The fan module is mounted on hinges so you can swing it down away from the chassis. A mechanical lock and magnetic catches hold the fan module closed.

NOTE: If the fan module remains open for more than approximately 2 minutes, the storage chassis automatically shuts down to prevent overheating.

You can remove a fan module while the storage chassis is running. You should never open the module or attempt to replace any of its internal components. If one of the fans in the module fails, replace the fan module as quickly as possible to maintain high-availability operation. Failure to replace the module could cause the RAID Storage to shut down if either a VSC module or another fan fails.

Installation

The procedures in this chapter assume the installation site meets the ac power requirements and operating limits listed in Appendix A.

Installing RAID in a Cabinet

Attaching the Slot Matrix Label

Three sticky-backed labels are shipped with the storage chassis: a rack slot matrix diagram showing the disk drive module locations, and two sheets of stickers for identifying disk modules. Attach the rack slot matrix to your storage chassis so it is visible. Save the two sheets of stickers for the person configuring the disk modules into physical disks.

Mounting RAID in a Cabinet

You can mount RAID in a standard 19-inch cabinet using the hardware mounting kit, which is supplied with the storage chassis.

WARNING: *Since the RAID chassis weighs a minimum of about 46 kg (101 lbs), installing it in the cabinet requires at least two people.*

WARNING: *Before opening the cabinet to install RAID, follow the cabinet manufacturer's recommendations for powering down the cabinet.*

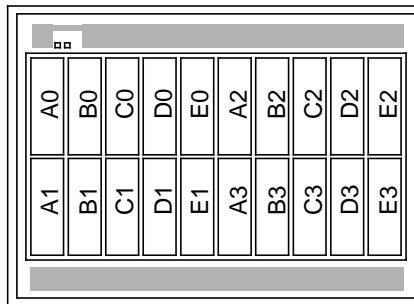
To install RAID in a cabinet

1. If you want to lessen the weight of the chassis, remove disk modules from the chassis (see Removing a Disk Module in Chapter 3), making sure that as you remove each module, you write on the module's label the ID number of the slot (A0, for example) from which you removed the module. Black out the lower ten slot positions on the slot matrix label, since these positions are not available on the PRS 250.

CAUTION: *If you remove disk modules from the RAID chassis, be sure to label each module and return all the modules to their original locations. Failure to correctly locate the disk modules will result in one or more inaccessible LUNs, and may even make the entire storage chassis inaccessible.*

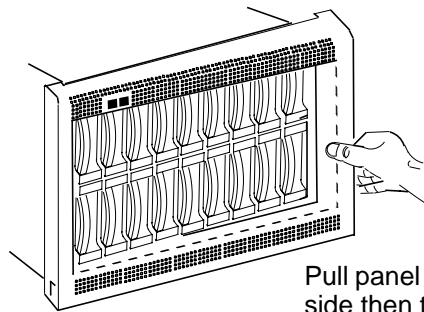
For the slot ID numbers, refer to the slot matrix label, which you should have just attached to the RAID chassis, or to the following illustration.

Disk module slot ID numbers



2. Remove the chassis front panel as shown below.

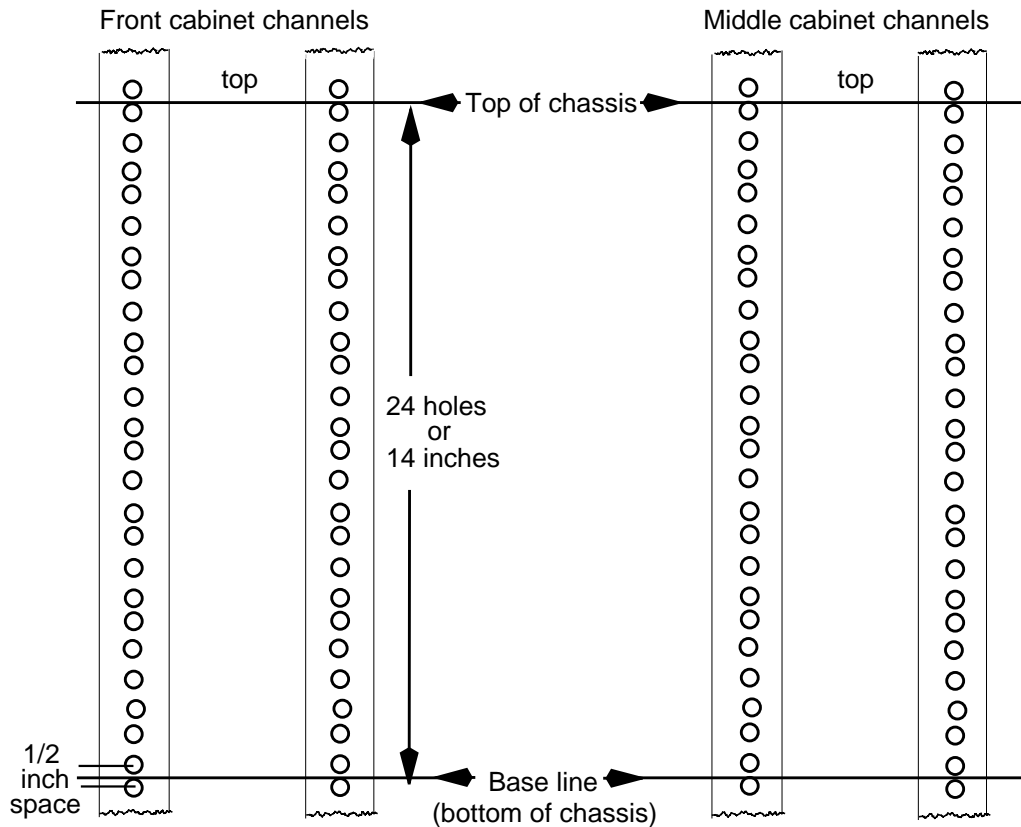
Removing the front panel



3. Remove any trim and/or open the doors of the cabinet in which you are installing the chassis. For information on opening the cabinet, refer to the documentation for the cabinet.

4. Attach the mounting rails to the cabinet according to the following instructions, using the rails and parts in the hardware mounting kit.
 - a. Make sure that you have 14-inch clearance in the cabinet in which you will install the storage chassis.
 - b. Mark and label a baseline in a $1/2$ -inch space (measured between the center of adjacent holes) on the front and middle cabinet channels, as shown in the following illustration. (**Do not position the baseline between two $5/8$ -inch spaced holes.**)

Chassis location in the cabinet

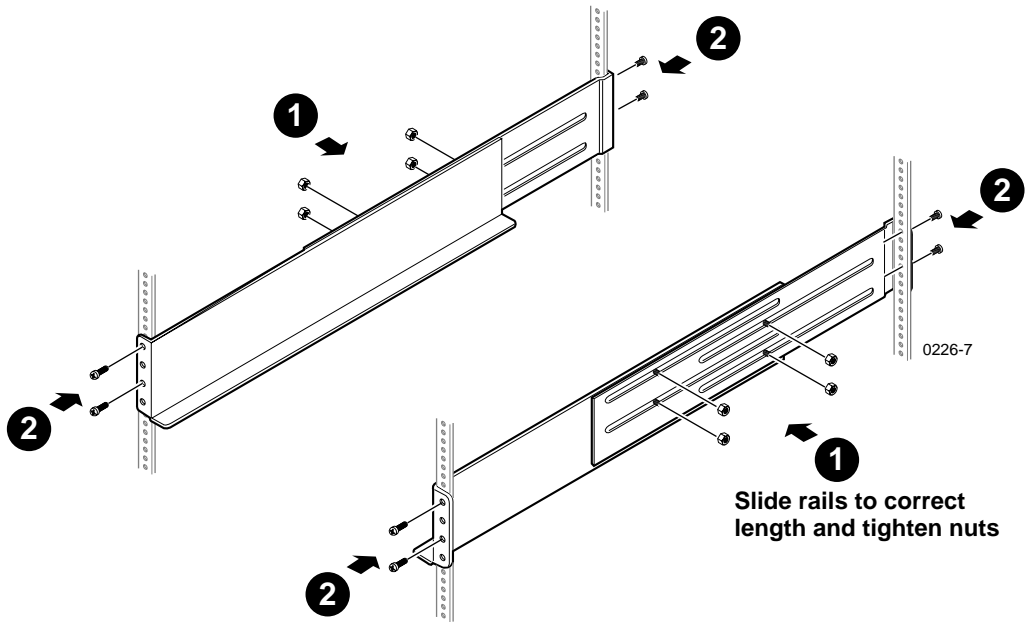


IMPORTANT You must mark a baseline in a $1/2$ -inch space or the chassis won't fit in the space where you plan to install it. The spaces on a channel, measured between the center of adjacent holes, are either $1/2$ inch or $5/8$ inch wide.

- c. From the baseline, count *up* 24 holes. Mark the top-of-chassis line *above* the top hole on the front and middle cabinet channels, as shown in the illustration.

- d. Loosen the securing nuts ❶ on the two mounting rails as shown in the following illustration.

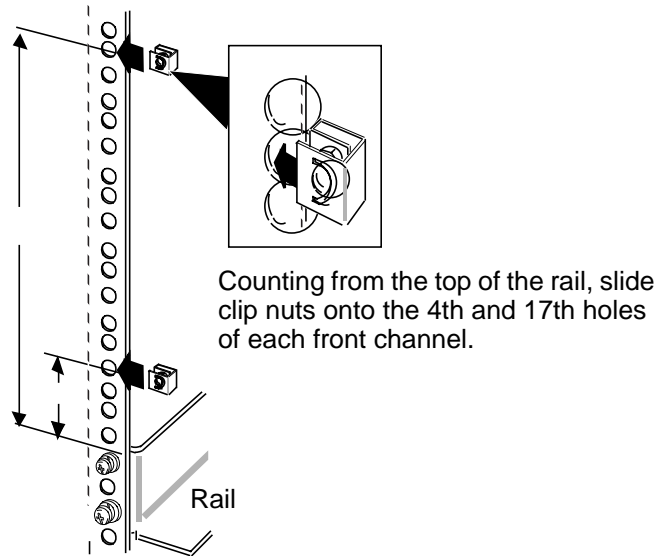
Attaching the rails



- e. If the front channel does not have threaded screw holes, attach clip nuts to the front channel.
- f. Align the bottom of the rail is aligned with the baseline mark on the cabinet's channel. Attach the mounting rails to the rack mount cabinet as shown (❷).

g. Slide the two clip nuts onto each front channel as shown below.

Attaching the clip nuts



You are now ready to install the chassis in the cabinet

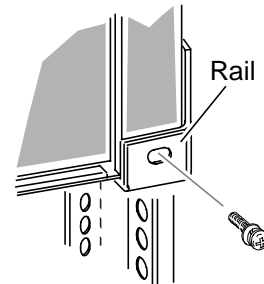
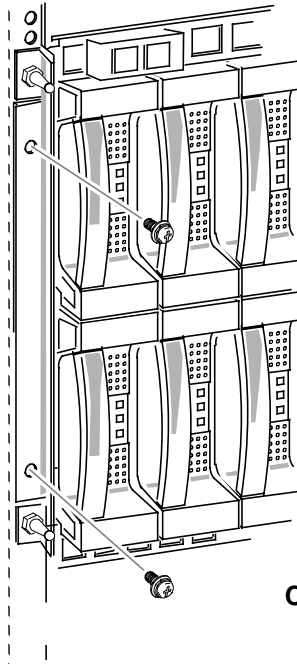
CAUTION: Do not lift the RAID chassis by the handle on the fan module at the back of the storage chassis or by the disk drive module handles.

5. Mount the storage chassis in the cabinet with the remaining parts in the hardware mounting kit as shown in the following illustration.

Attaching the storage chassis to the cabinet

- A. Slide chassis onto rails and into the cabinet.

- B. Fasten front of chassis to cabinet with four screws (2 per side).

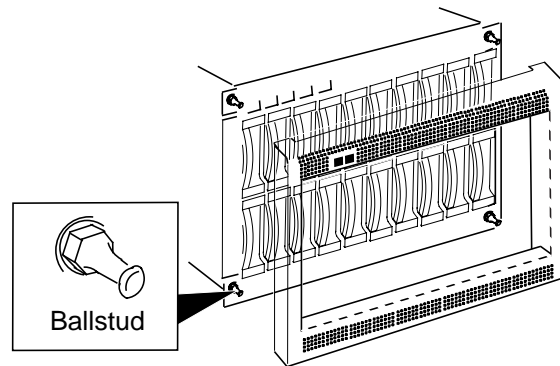


- C. Fasten back of chassis to left and right rails with two screws (1 per rail).

6. Reinstall any disk modules that you removed, **being sure to put each module back into its original slot.**

7. Reinstall the storage chassis's front panel as shown in the following illustration.

Installing the front panel



Press panel onto four ballstuds.
(one at each corner)

8. Reinstall any trim you removed from the cabinet, and close any cabinet doors you opened.

Configuring the Profile Disk Drives

The Profile disk recorder internal drives can not be used when a RAID unit is connected. To disable the Profile system's internal disk drives and enable the RAID Storage, refer to your Profile User Manual.

Removal of Profile Internal Disk Drives

NOTE: *Only qualified service personnel should perform the following procedure.*

If you want to use a Profile disk recorder with attached RAID Storage, **and are sure you will not be using that Profile without RAID Storage**, you can remove the Profile system's internal disk drives for use elsewhere. Two procedures follow, one for the PDR 100 and one for the PDR200.

Removing PDR 100 Internal Drives

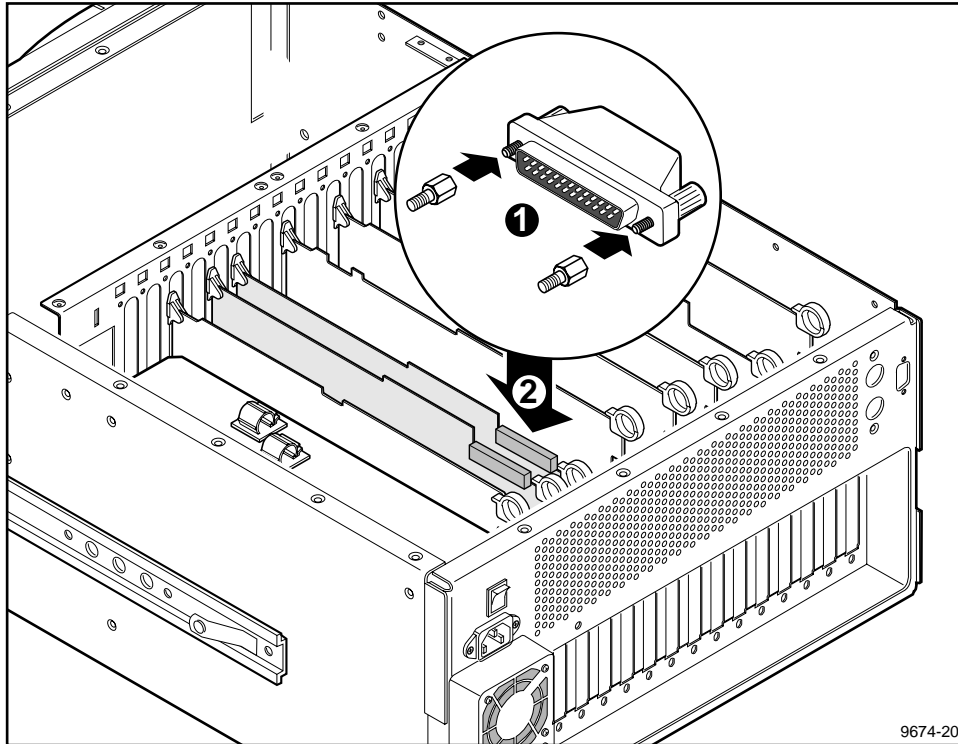
To remove the internal disk drives from the PDR 100, perform the following procedure:

1. Turn all power to the Profile Off.

NOTE: *You should NOT discard any hardware or cables.*

2. Refer to your Profile Service Manual to remove the top cover from the Profile chassis.
3. Refer to your Profile Service Manual to remove the SCSI cable(s). (If you have a 2-channel system there will be a SCSI A cable only. If you have a 4-channel system there will be both a SCSI A and a SCSI B cable.)
4. Refer to your Profile Service Manual to remove the Hard Disk Carrier Tray from the Profile chassis.
5. Refer to your Profile Service Manual to remove the hard disk drives from the tray. (There will be 4 hard disk drives if you have a 2-channel system and 8 hard disk drives if you have a 4-channel system.)
6. Refer to your Profile Service Manual to reinstall the empty Hard Disk Carrier Tray into the Profile chassis.
7. Use cable ties to anchor the loose hard disk drive cable(s) to the inner top edge of the Hard Disk Carrier Tray.
8. Attach jack screws (2 each, P/N 214-4689-00) to the bus terminator (P/N 011-0170-00), both of which came with your RAID Storage chassis. Refer to ❶ in the following illustration.
9. Attach the bus terminator(s) to the Disk Recorder board(s). (There will be one board if you have a 2-channel system and two if you have a 4-channel system.) Refer to ❷ in the following illustration

Installing the internal disk recorder terminator



10. Reinstall the Profile covers.

Removing PDR200 Internal Disk Drives

To remove the internal disk drives from the PDR200 perform the following procedure:

1. Turn all power to the Profile system off.

NOTE: *You should NOT discard any hardware or cables.*

2. Refer to your Profile Service Manual to remove the top covers from the Profile chassis.
3. Refer to your Profile Service Manual to remove the hard disks from the system. At the same time, remove the SCSI cable(s) connected between the disk recorder board(s) and the SCSI Distribution board.
4. Reinstall the Profile chassis covers.

Connection to the Profile System

The RAID Storage chassis connects to the Profile disk recorder through a wide SCSI-2 differential bus. This SCSI bus connection allows the Profile system to communicate with the disks in the RAID Storage chassis. Also, you can administer, configure, and monitor the RAID Storage chassis using **dassmgr** through an asynchronous communications connection between its asynchronous (console) port and the Profile system's RS-232 port.

The procedures in this chapter assume the following:

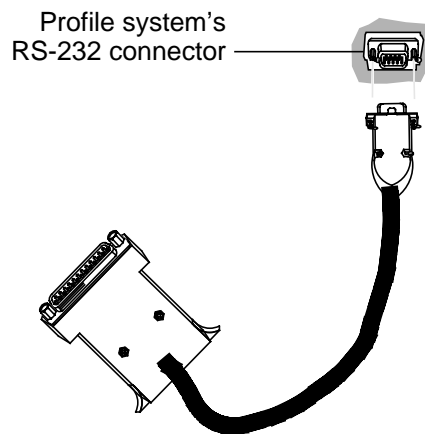
- You have all the cables and cable adapters that you need.
- If necessary, someone has installed and/or updated the Profile System Software.
- The Profile operating system is shutdown, and the Profile disk recorder is turned off.
- If the Profile system has a PDX Disk Expansion unit, it must be removed from the system. You can not connect both a RAID and a PDX Disk Expansion unit to the same Profile disk recorder.

Connecting Serial (console) Cables

To use **dassmgr** to bind disk modules into logical units, set up storage chassis caching, and monitor storage chassis operation, you must connect the console SP port for each SP in a storage chassis to an serial port of the Profile system.

1. Attach a 25-pin female-to-9-pin female null modem cable to the Profile system's RS-232 connector in the upper right corner on the Profile system's rear panel.

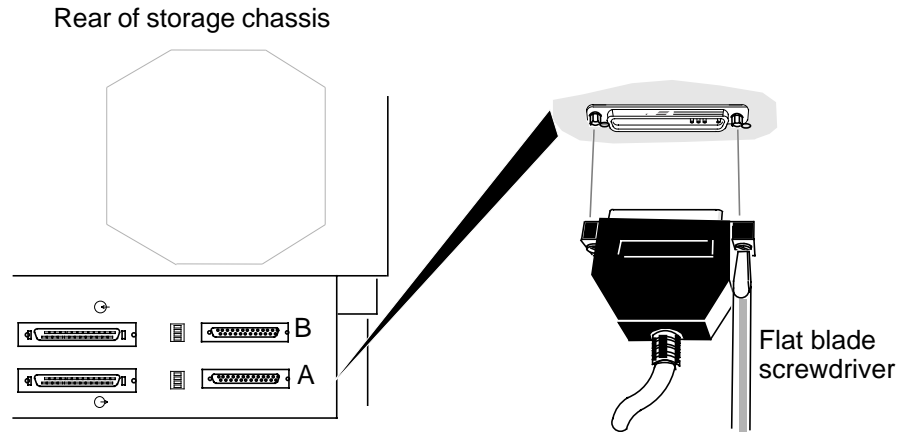
Attaching the 25-pin female-to-9-pin female null modem cable



2. Attach the male end of the serial (console) cable to the 25-pin connector on the adapter cable.

3. Attach the other end of the serial cable to the RAID CONSOLE SP-A connector. See the following illustration.

Attaching the cable to the SP's console A connector

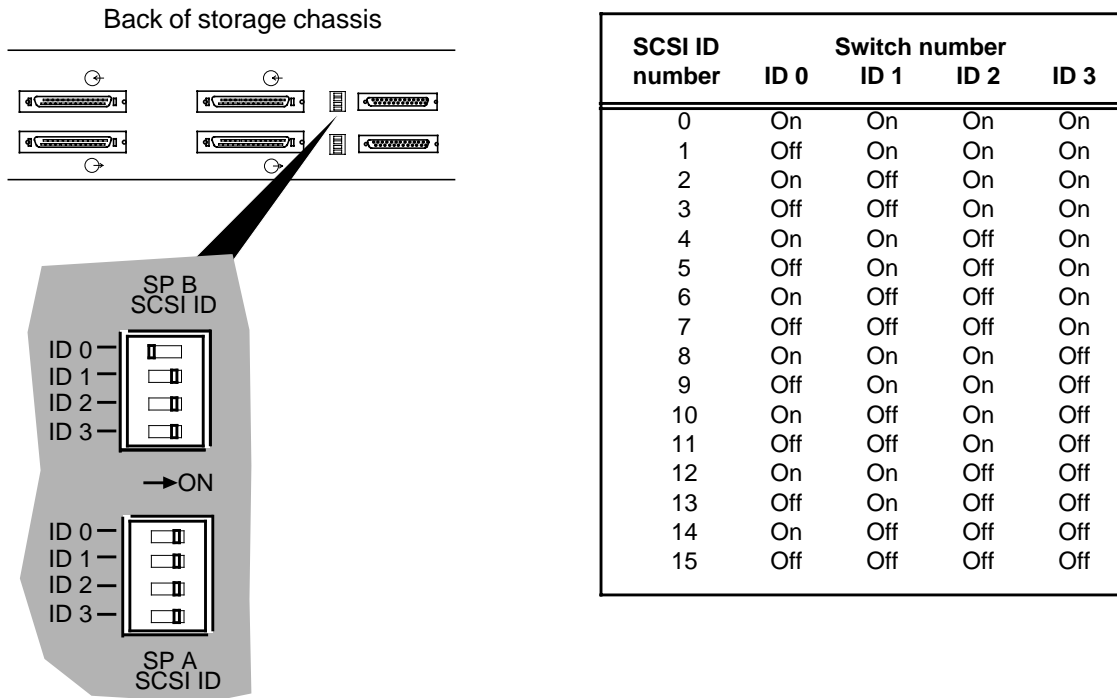


Setting SP SCSI IDs

Each SP connected to the same SCSI bus requires a unique SCSI ID number (that is, a number that is not used by any other device on the bus). The back of the storage chassis, see the following illustration, has two SCSI ID switch packs. Each switch pack has four switches (ID0-ID3). One switch pack sets the SCSI ID for SP A, and the other sets the SCSI ID for SPB. Set the SCSI ID switches for both SP A and SPB to 8, if this ID is unused. If it is used, set their SCSI IDs to the next highest unused ID number.

NOTE: *If you wish to configure your RAID Storage units as two external file systems, the RAID Storage units in the second file system must be set to SCSI ID s 12 and higher. Refer to the Disk Utility section of the Profile User manual for information on how to create file systems.*

Setting an SP's SCSI ID



The Profile will support two separate external file systems. The RAID Storage chassis is an external attachment which can be assigned SCSI IDs 8 through 15.

If the RAID units are configured as two external file systems, the first unit or pair of units of the second file system must be set to SCSI ID 12. If only a single RAID is to be used, it should be assigned the lowest SCSI ID available. See the following two examples.

EXAMPLE 1: Two RAIDs daisy-chained to a Profile with a single external SCSI bus would have SCSI IDs 8 & 9.

EXAMPLE 2: Six RAIDs attached to a Profile with two external SCSI buses (three daisy-chained RAIDs to each bus) would have SCSI IDs 8, 9, & 10 *on each bus*.

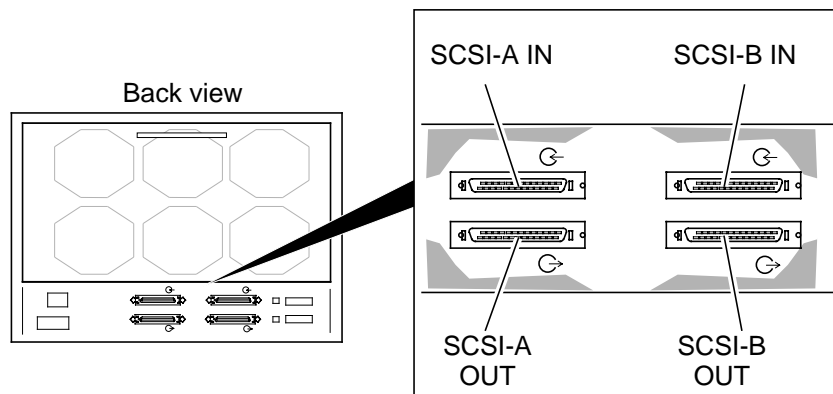
NOTE: RAID units should be attached symmetrically to the two buses (that is, the same number of RAIDs on each bus with the same number of disk modules in each chain).

Configurations and Cabling

You can connect your PRS250/M in a variety of ways, depending on your Profile Disk Recorder model and the whether your RAID chassis has one (PRS250) or two (PRS250M) SPs. Choose the procedure on the following pages that most closely matches your needs. As stated earlier in this chapter, if the Profile has a PDX disk expansion unit it must be removed. For installations involving multiple RAID units keep in mind the maximum number of RAIDs that can be used with your Profile disk recorder. Refer to *About the RAID Storage Chassis* on page 1-2 for more information.

The following illustration shows SCSI connectors on the rear panel of a RAID unit.

RAID SCSI connectors

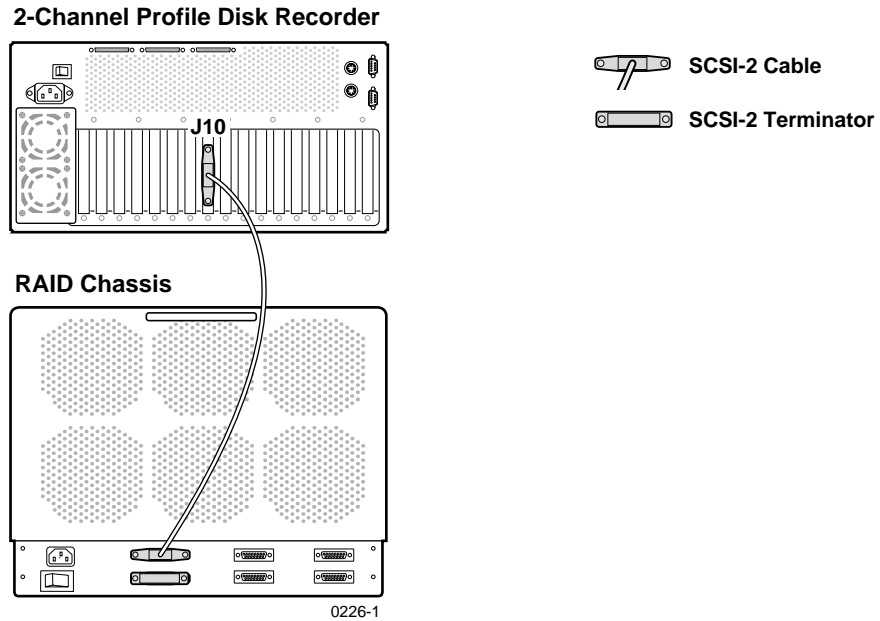


NOTE: SCSI-B connectors are used on a PRS250 only (two SPs).

Two-Channel Profile/Single-SP RAID

This configuration, see the following illustration, consists of a two-channel Profile disk recorder (one Master Disk Recorder - MDR) connected to a single RAID chassis with one SP.

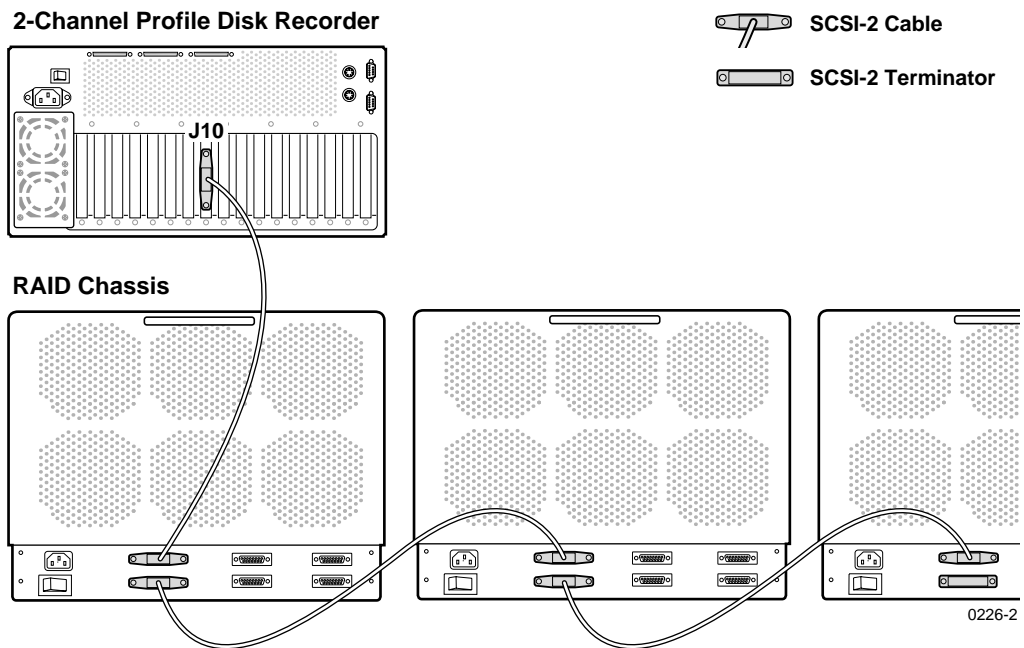
1. Connect a SCSI-2 cable from the Profile MDR rear panel connector to the RAID chassis SCSI A IN connector.
2. Connect a SCSI terminator plug to the RAID chassis SCSI A OUT connector.



Two-Channel Profile/X Single-SP RAIDs

This configuration, see the following illustration, consists of a two-channel Profile disk recorder (one MDR) connected to multiple RAID chassis, daisy-chained together.

1. Connect a SCSI-2 cable from the Profile MDR rear panel connector to the first RAID chassis SCSI A IN connector.
2. Connect a second SCSI-2 cable from the first RAID chassis SCSI A OUT connector to the second RAID chassis SCSI A IN connector.
3. Connect a third SCSI-2 cable from the second RAID chassis SCSI A OUT connector to the third SCSI A IN connector.
4. Repeat Steps 2 and 3 for the remaining number of RAIDs. See page 2-13 to determine the maximum number of RAIDs that can be connected to your Profile disk recorder.
5. Connect a SCSI terminator to the SCSI A OUT connector of the last RAID chassis in the chain.

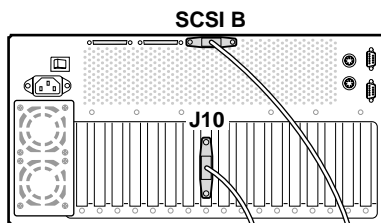


Two-Channel PDR200/One Dual-SP RAID

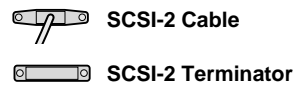
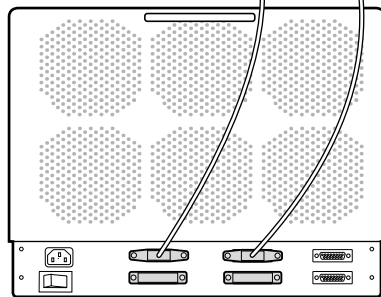
This configuration, see the following illustration, consists of a two-channel PDR200 (one Master Disk Recorder - MDR) connected to a single RAID chassis with two SPs.

1. Connect a SCSI-2 cable from the Profile MDR rear panel connector (SCSI-A) to the RAID chassis SCSI A IN connector.
2. Connect a SCSI-2 cable from the PDR200 SCSI-B rear panel connector to the RAID chassis SCSI B IN connector.
3. Connect a SCSI terminator plug to the RAID chassis SCSI A OUT connector.
4. Connect a SCSI terminator plug to the RAID chassis SCSI B OUT connector.

2-Channel Profile Disk Recorder



RAID Chassis



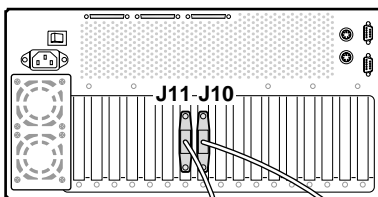
0226-3

Four Channel Profile/2 RAIDs

This configuration, see the following illustration, consists of a 4-channel Profile (one MDR and one Slave Disk Recorder - SDR) and two symmetrical RAID Storage chassis (*each RAID chain with the same number of disk modules*).

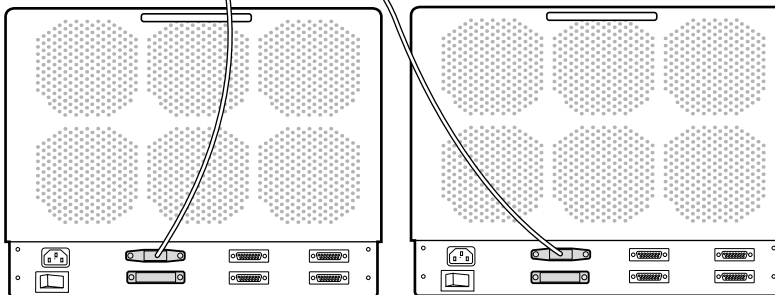
1. Connect a SCSI-2 cable from the Profile MDR rear panel connector to the RAID chassis SCSI A IN connector
2. Connect a second SCSI-2 cable from the SDR rear panel connector to a second RAID SCSI A IN connector.
3. Connect a SCSI terminator plug to each RAID chassis SCSI A OUT connector.

4-Channel Profile Disk Recorder



Note:
Each RAID chassis must have the same number of drives.

RAID Chassis



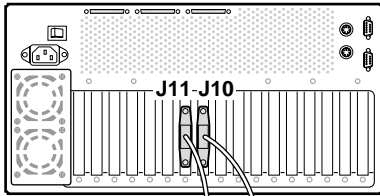
0226-6

Four-Channel Profile/Multiple RAIDs


This configuration, see the following illustration, has a four-channel Profile (one MDR and one SDR) and two symmetrical RAID Storage chassis chains (*the RAID chain attached to the MDR matches, in number of disk modules, the chain attached to the SDR*).

1. Connect a SCSI-2 cable from the Profile MDR rear panel connector to the first RAID chassis SCSI A IN connector in the MDR chain.
2. Connect a SCSI-2 cable from the first RAID chassis SCSI A OUT connector to the next RAID chassis SCSI A IN connector in the MDR chain.
3. Connect a SCSI-2 cable from the second RAID chassis SCSI A OUT connector to the next RAID chassis SCSI IN connector in the MDR chain.
4. Repeat Steps 2 and 3 for the remaining RAIDs in the MDR chain. See page 2-13 to determine the maximum number of RAIDs that can be connected to your Profile.
5. Connect a SCSI-2 cable from the Profile SDR rear panel connector to the first RAID chassis SCSI A IN connector in the SDR chain.
6. Connect a SCSI-2 cable from the first RAID chassis SCSI A OUT connector to the second RAID chassis SCSI A IN connector in the SDR chain.
7. Connect a SCSI-2 cable from the second RAID chassis SCSI A OUT connector to the next RAID chassis SCSI IN connector in the SDR chain.
8. Repeat Steps 6 and 7 for the remaining RAIDs in the SDR chain. Remember to not exceed the maximum number of RAIDs that can be attached to your Profile.
9. Connect a SCSI terminator plug to the SCSI A OUT connector of the last RAID chassis in each chain.

4-Channel Profile Disk Recorder

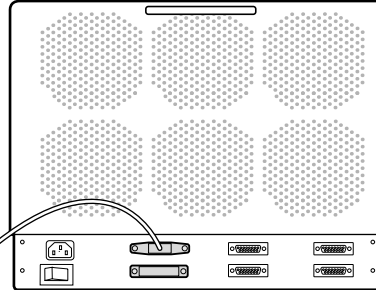
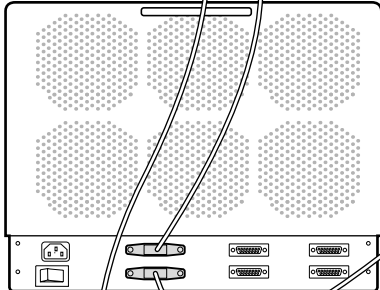


 SCSI-2 Cable

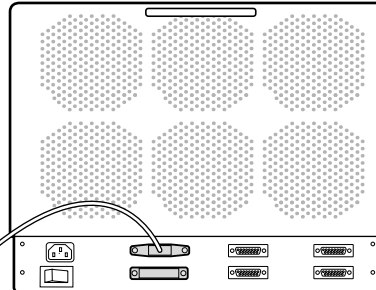
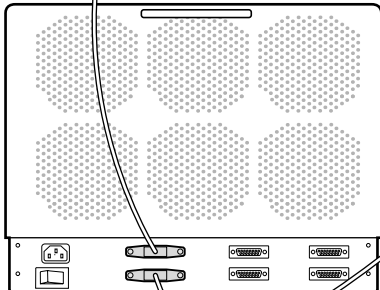
 SCSI-2 Terminator

Note:
Each RAID chassis chain must have the same number of drives.

RAID Chassis Chain



RAID Chassis Chain

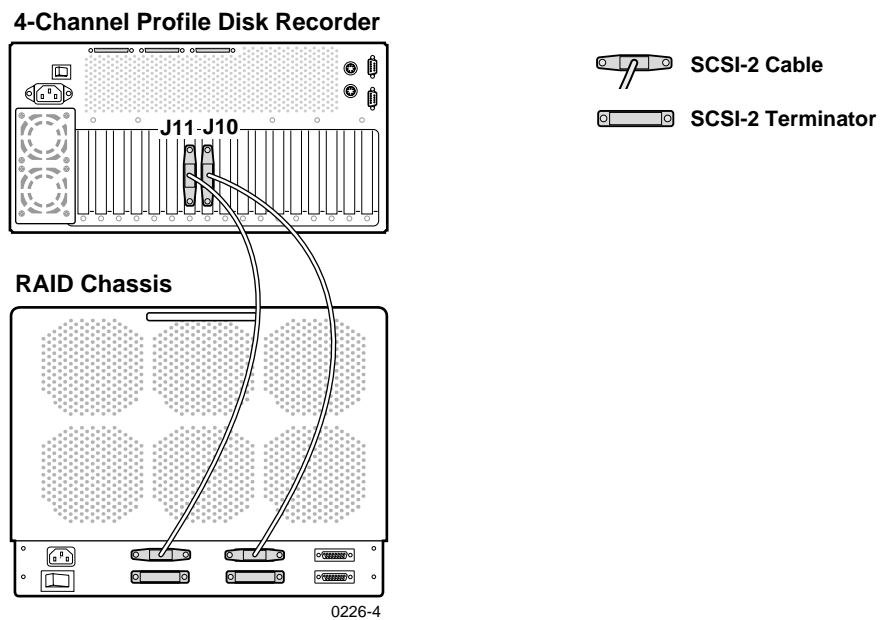


0226-5

Four-Channel PDR200/One Dual-SP RAID

This configuration, see the following illustration, consists of a four-channel PDR200 (one Master Enhanced Disk Recorder - MEDR, one Slave Enhanced Disk Recorder - SEDR) connected to a single RAID chassis with two SPs.

1. Connect a SCSI-2 cable from the PDR200 MEDR rear panel connector (SCSI-A) to the RAID chassis SCSI A IN connector.
2. Connect a SCSI-2 cable from the PDR200 SEDR rear panel connector to the RAID chassis SCSI B IN connector.
3. Connect a SCSI terminator plug to the RAID chassis SCSI A OUT connector.
4. Connect a SCSI terminator plug to the RAID chassis SCSI B OUT connector.



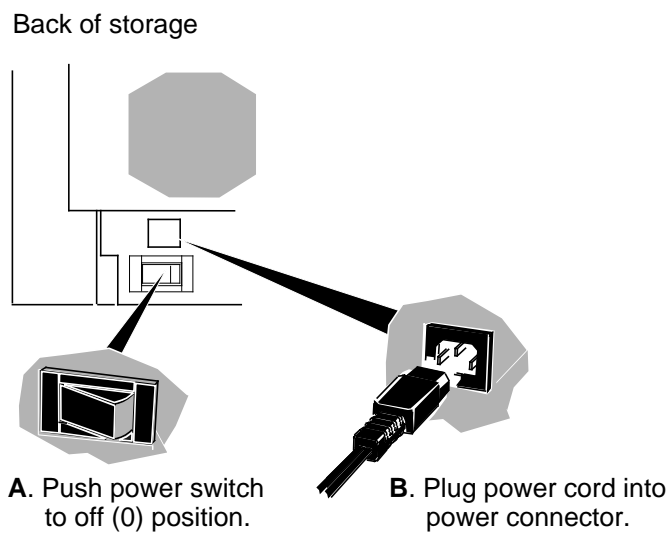
Connecting the Power Cord

1. Make sure that the storage chassis power switch is off, then connect the power cord to the storage chassis.

NOTE: Several types of power cord are supplied with the product. Use the power cord that is appropriate to your installation.

2. Plug the other end of the power cord into an ac power outlet.

Plugging in the ac power cord



You are ready to power up the storage chassis as described in the following section, **Powering Up the Storage Chassis**.

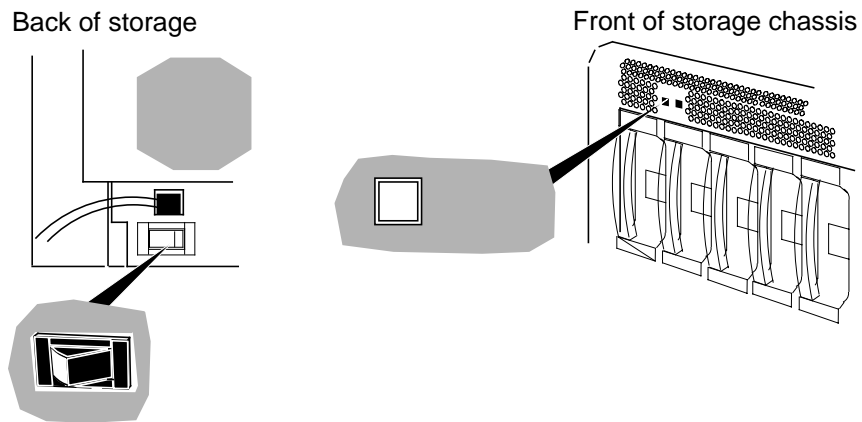
Powering Up the Storage Chassis

NOTE: When powering up a Profile with RAID system, the RAID unit must be turned on at least two minutes before power is applied to the Profile.

1. Turn on the storage chassis's power and wait two minutes.

The green power light on the front of the storage chassis turns on and the fans rotate.

Turning on storage chassis power



2. Power up the Profile. (See Profile's Installation manual for information on how to power up the Profile.)

Configuring and Managing the RAID

To set up the RAID Storage chassis, you need to set the storage chassis date, time, and optional password protection.

You perform these tasks using the Disk Array Storage System Manager (**DASSMGR**).

Running DASSMGR

You can run **DASSMGR** from a bootable diskette, or install it on the Profile system hard disk and run it from that disk.

Before You Begin

Before you can run **DASSMGR**, someone must have performed these tasks:

- Connected the storage chassis to the Profile.
- Connected the RS-232 port on the storage chassis to a spare COM port on the Profile. See “Connecting Serial (console) Cables” on page 2-10.

Starting DASSMGR

To start **DASSMGR**:

1. Power up the storage chassis.

IMPORTANT Make sure you specify the correct communications port when you issue the **DASSMGR** command in the next step. Specifying the wrong port may cause problems with the device connected to that port.

2. Run **DASSMGR** using the command **DASSMGR x**, where x represents the communication port. For example, to run **DASSMGR** with communication port 2, at the MS-DOS command prompt enter

```
DASSMGR 2 ↵
```

The Disk Array Storage System Manager Main Menu appears. Use the up, down, and Enter keys on your keyboard to move around in the menus.

```

Disk Array Storage System Manager Main Menu
-----
Grid Management (monitor, bind & unbind arrays)
Update Licensed Internal Code
Update Drive Code
Change COM port (present port set to COM1)
Exit
  
```

Setting Password Protection

Password protection lets you restrict access to functions that can destroy all data on logical units. To enable password protection, you enable password mode and specify a password. This password is then required to access the GridMgr Main Menu.

To specify a password:

1. From the DASSMGR Main Menu, select the Grid Management option.
2. From the GridMgr Main Menu, follow this menu path:

Change Parameters → Change Storage System Parameters

The Change Storage System Parameters Menu appears, similar to the following.

```
SP A
SP SCSI ID 1      Change Storage System Parameters Menu

1. View System Memory Configuration
2. Change Main Menu Password
3. Change System Date and Time

At any prompt enter ^ to GO BACK TO PREVIOUS MENU, ? for HELP
Enter Choice:
```

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3. From the Change Storage System Parameters Menu, choose the Change Main Menu Password option.

The Password Utility screen appears, similar to the following.

```
                Password Utility

Enter ? for HELP, ^ to GO BACK TO PREVIOUS MENU

Set password:(Y/N/?/^)?[N]
Enable password mode:(Y/N) ?[N]
Enter new password:(CR/NL for none)
Verify new password:
```

4. At the `Set password` prompt, enter **Y**.
5. At the `Enable password mode` prompt, enter **Y**.
6. At the `Enter new password` prompt, enter the password.

The password can be up to 15 characters, and can consist of any characters except the null character and defined control characters. The password is case sensitive, so you must specify your password exactly as you have defined it.

7. At the `Verify new password` prompt, enter the same password again.

Once you have set and enabled a password, you are prompted for the password at the Presentation Utility screen. See “Checking Status with the Presentation Utility” in Chapter 3. After you enter the correct password, you can access the GridMgr Main Menu. If password mode is disabled, you are not prompted for the password.

Changing the Password

If you have specified a password, **DASSMGR** asks for that password when you select the Change Main Menu Password option from the Change Storage System Parameters Menu. The Password Utility screen appears.

```
                Password Utility

Enter ? for HELP, ^ to GO BACK TO PREVIOUS MENU

Enter old password:(password/?/^)?
```

To change the password

1. At the `Enter old password` prompt, enter the password that you had originally specified.
2. At the `Change password` prompt, enter **Y**.
3. At the `Enable password mode` prompt, enter **Y**.
4. At the `Enter new password` prompt, enter the new password.
5. At the `Verify new password` prompt, enter the new password again.

Setting Storage System Date and Time

The storage chassis clock controls the date and time displayed on the Presentation Utility screen and with events recorded in an SP's unsolicited event log. This clock is local to the storage chassis, and has no relation to the Profile's system or boot clock.

To set the storage chassis date and time:

1. From the GridMgr Main Menu, follow this menu path:

Change Parameters → Change Storage System Parameters

The Change Storage System Parameters Menu appears, similar to the following.

```
SP A
SP SCSI ID 1      Change Storage System Parameters Menu

1. View System Memory Configuration
2. Change Main Menu Password
3. Change System Date and Time

At any prompt enter ^ to GO BACK TO PREVIOUS MENU, ? for HELP
Enter Choice:
```

9613-1

2. From the Change Storage System Parameters Menu, choose the Change System Date and Time option.

The Change System Date and Time screen appears, similar to the following.

```
SP A                Change System Date and Time
SP SCSI ID 1

Current system time is: 10/12/1995 (Monday) 22:44:06

Enter the new system time in the format: MM/DD/YYYY HH:MM:SS. HH
is the number of hours that have elapsed since midnight (0-23).
Enter a ^ if you do not want to change the system time.

New time:
```

At the New time prompt, enter the new date and time, or type ^ if you want to leave the time unchanged.

The format for the date and time is

MM/DD/YYYY HH:MM:SS

For example, 06/01/1996 01:23:55.

Servicing the System

This chapter describes how to service the RAID Storage chassis.

Checking Status with the Presentation Utility

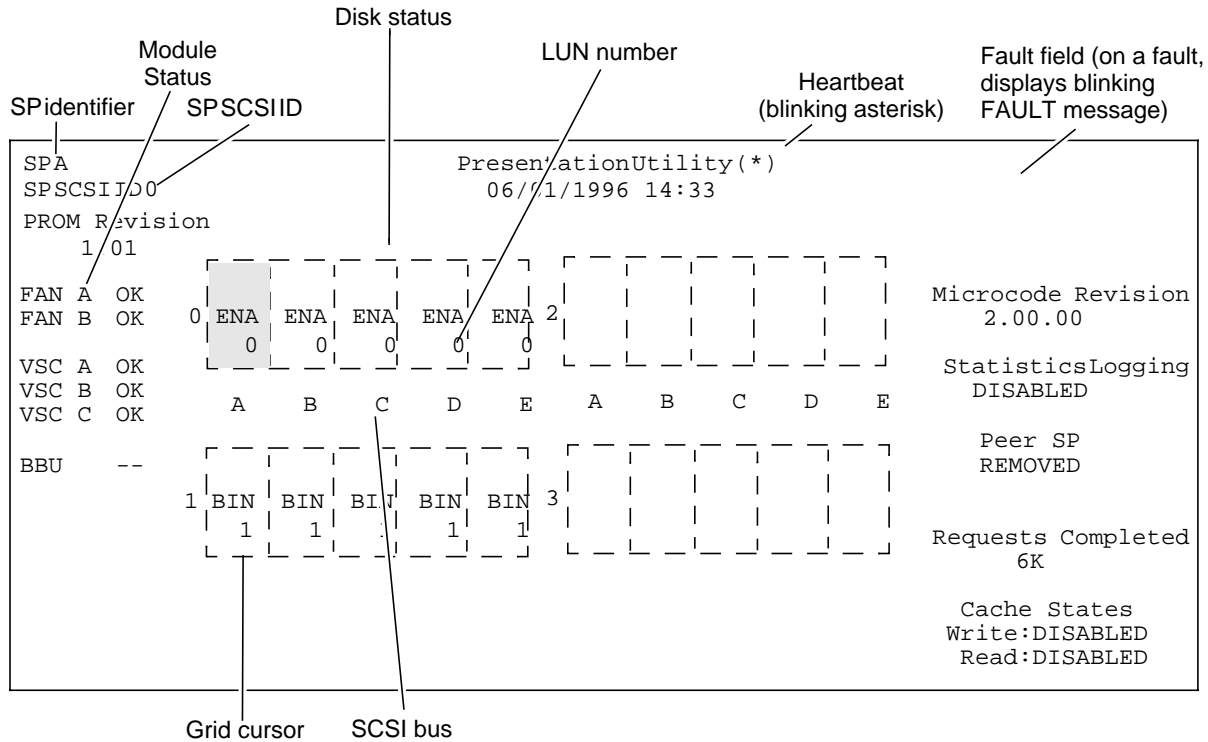
You can check storage-system status using the Presentation Utility. Perform the following steps to display the **DASSMGR** Presentation Utility screen:

1. Start **DASSMGR**.
2. From the Disk Array Storage System Manager Main Menu, select the appropriate COM port.
3. From the Disk Array Storage System Manager Main Menu, select Grid Management.
4. From the Grid Main Menu, select the Presentation Utility option.

NOTE: If the Presentation Utility screen does not appear, enter carets (^) until the GridMgr Main Menu appears, and then choose the Presentation Utility option.

A Presentation Utility screen appears similar to the following:

Sample Presentation Utility screen



The grid above shows a 20 slot storage system configured as follows:

- * Two five-disk RAID-3 groups (LUN 0 and LUN 1). LUN 0 includes modules A0, B0, C0, D0, and E0. LUN 1 includes modules A1, B1, C1, D1, and E1. The status of each disk module in LUN 0 is ENA, and in LUN 1 is BIN (binding).
- * Ten empty slots are also shown. The empty module slots include modules A2, B2, C2, D2, E2, A3, B3, C3, D3, and E3.

Heartbeat — Following the screen title (Presentation Utility) is an asterisk in parentheses (*). This asterisk indicates the heartbeat status of the SP. It should blink every several seconds to indicate that the SP is functioning. If it does not appear to blink, the SP may not be working. Try pressing Ctrl-Q. If the asterisk still does not blink, the SP requires service.

Storage System date and time — The date and time of the storage chassis, which is controlled by the storage chassis’s clock, appears under the screen title (Presentation Utility). This date and time is also displayed with the storage chassis log events. You can set the date and time as described in **Setting the Storage-system Date and Time** later in this chapter.

SP identifier — Specifies the SP (SP A or SP B) connected to the asynchronous RS-232 port you are using.

Module status — The first column shows the status of the fan modules and VSC (voltage semi-regulated controller) modules.

FAN x - Fan module status codes are as follows:

Code	Fan module status
OK	Operating normally.
--	Failed.

VSC x - VSC module status codes are as follows:

Code	Fan module status
OK	Operating normally.
--	Failed or not present. If you do not know whether a VSC has failed, examine the fault light on the VSC.

BBU - Holds up the RAID-3 buffer while the SP attempt to write the contents of the buffer to disk in the event of a power failure.

BBU status codes are as follows:

Code	Fan module status
OK	Operating normally.
NRR	Not ready, charging. After a power outage, a BBU takes 15 minutes or less to recharge. From total depletion, recharging takes an hour less.
TE	Weekly BBU test is in progress.
--	Failed or not present.

Disk status — In the grid itself, the blocks of boxes identify slots for disk modules in the chassis. Associated with each slot is an identifier (ID) based on the slot's position in the chassis. You identify a disk module by its disk ID, which is the ID of the slot containing it. A disk ID is made up of a letter indicating the SCSI bus for the slot and a number indicating the slot's position on the SCSI bus. The disk IDs for the storage chassis are

SCSI bus Positions Disk IDs

- A0, B0, C0, D0, E0
- A1, B1, C1, D1, E1
- A2, B2, C2, D2, E2
- A3, B3, C3, D3, E3

For each slot that contains a disk module, the box shows a three letter status code. The table on the next page lists the status codes. If a disk module is not bound, the displayed code is UNB with two asterisks (**). For a bound module, the box shows the code and logical unit number (of the RAID group, individual unit, or hot spare) to which the module is bound. A box without text indicates an empty slot, that is, one not containing a disk module.

Moving the Grid Cursor

You can move the grid cursor from box to box using the keys listed in the following table.

Dassmgr control keys

H or ←	Moves cursor left one box.
J or ↓	Moves cursor down one box.
K or ↑	Moves cursor up one box.
L or →	Moves cursor right one box.
Space bar	Moves the cursor down a box, or in some menus, from the bottom box to the top of the next column. From the last box, returns the cursor to the top left. Also moves cursor from one unbound unit to the next unbound unit when you are binding or from one bound unit to the next bound unit when you are unbinding.

¹ If the arrow keys do not work, use the corresponding letter keys.

Disk module status codes

BIN	Presentation Utility screen Binding; module is being bound into a LUN.
ENA	Enabled; module is part of a bound logical unit that is assigned to (owned by) the SP whose display you are viewing. If the storage chassis has another SP, this module's status is RDY on that SP's display.
FMT	Formatting; module is being hardware formatted. Generally, modules do not need hardware formatting.
OFF	Module has been powered off by SP, which can happen if you insert the wrong size module; a message also appears in the unsolicited event log.
POW	Powering up; power is being applied to the disk module.
RDY	Ready; module is part of a broken logical unit or a unit that is bound and unassigned, which can mean that the disk module is part of a unit that is <i>not</i> owned by the SP whose display you are viewing. If the disk module is part of a unit assigned to the other SP, the module's status is ENA on the other SP's display.
REB	Rebuilding; module is either a hot spare or replacement disk that replaced a failed module in a logical unit.
UNB	Unbound; module is ready to be bound into a logical unit.
<i>blank</i>	No disk module is in the slot.
UNS	Disk module not supported.

Reconfiguring a Storage System

The following explains how to reconfigure a storage chassis in these ways:

- Changing physical disk configurations
- Changing physical disk unit parameters
- Updating Licensed Internal Code

The procedures below assume you are using **DASSMGR** to reconfigure the storage chassis.

Changing Physical Disk Configurations

As your organization's needs change, you may want to add disk modules to any unused compartments (slots).

Adding Disk Modules and Creating New Logical Units

If the storage chassis has unused disk module slots, you can increase the available storage capacity by installing additional disk modules, as described in “Replacing or Adding a Disk Module” on page 18. Normal processing can continue while you install disk modules.

IMPORTANT All disk modules in any one storage chassis *and* in any storage chassis in chains must be of the same capacity.

We recommend that you add disk modules in groups of five to the slots in the following order:

**A0, B0, C0, D0, E0,
A1, B1, C1, D1, E1,
A2, B2, C2, D2, E2,
A3, B3, C3, D3, E3**

To add a physical disk unit:

1. Update the worksheets that define your configuration.
2. Remove the disk filler modules and install the additional disk modules. Refer to “Upgrade and Repair of a Storage System” on page 14 for instructions.
3. Bind the newly installed disk modules into the desired logical unit. See “Binding Disk Modules as a Logical Unit” on page 6.
4. Refer to your Profile User Manual to make the newly created physical disks available to the Profile operating system.

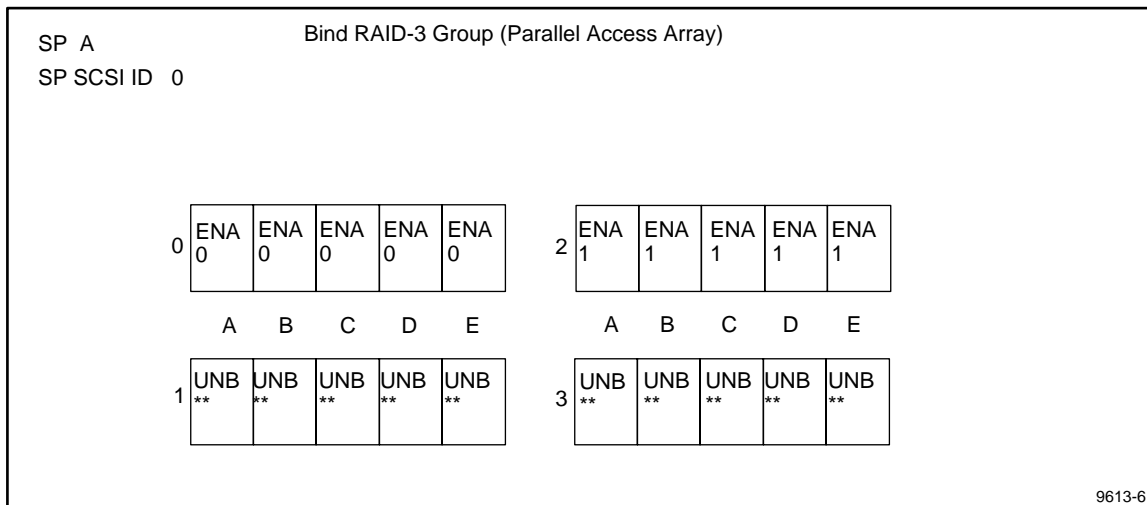
Binding Disk Modules as a Logical Unit

You must bind *exactly* five disk modules. You can bind one less module per group than you will eventually use by selecting a box representing an *empty* slot. However, the group operates in a degraded mode until a module is installed in the empty slot, and the storage chassis integrates it into the group. You can select the modules in any order.

To bind disk modules into a logical unit:

1. From the GridMgr Main Menu, choose the Bind Logical Units option.

The program displays the grid for the RAID-3 option. The grid depicts the drive modules in the storage chassis, and highlights the first group of disk modules available to be bound (UNB). The figure below shows a sample grid.



2. Use the direction arrows keys (\uparrow , \leftarrow , \downarrow , \rightarrow) to move the cursor to the group of disk modules you want to bind (the module becomes highlighted) and press the Enter key to select that group. The modules in the selected group appear in dimmed reverse video.

If you want to deselect a group, highlight the group and press the Del key.

3. When the screen shows the groups you want to bind, press **B** (for bind). The Bind Options screen appears with the first of two options. The currently selected or default value appears in brackets.

Sample Bind Options screen

```

                                Bind Options
Logical unit number (0-1F hex)? [default]

```

Logical unit number —The default logical unit number for the first disk unit you bind is 0, the second disk unit is 1, the third disk unit is 2; and the fourth is 3.

4. Enter 0, 1, 2, or 3 (hex) depending on which you are binding (see the sample grid above). (Note that for Profile systems, only LUNs 0 - 3 are valid).
5. Press Enter. The following option appears immediately below the first option.

Maximum rebuild time <hours> [default]

Maximum rebuild time — The maximum rebuild time is the approximate amount of time that the storage chassis allots to reconstruct the data on a new disk module that replaces a failed disk module in a logical unit. The actual rebuild time may be longer or shorter. You can change the rebuild time with **DASSMGR** later without damaging the information stored on the disk.

6. Press 24 hours and then press Enter.

```

                                Bind Options
Logical unit number (0-1F hex)? [1]
Maximum rebuild time <hours>? [24]

Confirm bind options <Y/N>? [N]

```

7. To accept, type **Y**, and press Enter. To reject, just press Enter.
If you confirm, you are asked whether or not to bind the modules. If you reject, the cursor returns to the Logical unit number prompt, so you can change any values you want.
8. In response to the question, type **Y** and press Enter if you want to bind the group as specified; otherwise, type **N** and press Enter.
If you type **N**, the original grid appears so you can return to Step 4 and start selecting modules again.
If you typed **Y**, the program changes the UNB to BIN for a RAID group or individual unit, and starts creating the logical unit you specified. The time the SP takes to complete the binding operation depends on the size and number of disk

modules being bound. Generally, binding takes about 30 minutes to initialize data on 4-Gbyte modules.

As soon as the binding operation starts, it changes the unbound module symbol (**) to logical unit number you specified for each module being bound.

While a unit is binding, you can proceed to bind another unit by repeating the procedure. After you have selected the last LUN and started it binding you will get an error message stating there are no more modules available to bind. This is normal. Press ^ to get back to Grid Manager and view the binding progress. When the binding is finished, the disk status changes from BIN to ENA.

IMPORTANT To determine the progress of the binding procedure, highlight one of the group's disk modules and press Enter. The Performance statistics screen displays a percentage complete figure. For more information, see Performance statistics screen later in this chapter.

9. Reboot the RAID Storage chassis.

Binding with Two SPs

If your RAID storage chassis is configured with two SPs, you should bind approximately half of your disk modules with each SP. This will ensure maximum transfer speeds to and from the RAID storage chassis.

For example, if you have ten disk modules, you should bind A0 through E0 into LUN 0 with SP A, and A1 through E1 into LUN 1 with SP B. If you have twenty disk modules, you should bind LUN 0 and LUN 2 with SP A, and LUN 1 and LUN 3 with SP B. If you have fifteen disk modules, bind ten with one SP, and five with the other.

There are two ways to bind disk modules with two SPs. The easiest is to use two Profile system COM ports to communicate with the two SPs individually.

1. Connect one Profile system COM port (COM1, for example) to the first SP with a serial cable.
2. Connect the second Profile system COM port (COM2, for example) to the second SP.
3. Start two instances of **DASSMGR**, specifying a different COM port for each instance.
4. Bind the appropriate disk modules in each instance of **DASSMGR**.

You can also use the same Profile system COM port to communicate with both SPs, one after the other.

1. Make the serial connection from one of the Profile system's RS 232 ports (COM2 for example) to the first SP.
2. Start **DASSMGR** on the appropriate COM port and perform the bindings for the first SP.
3. Exit **DASSMGR**.
4. Change the serial connection to the other SP.
5. Start **DASSMGR** on the same COM port and perform the remaining bindings with the second SP.

Unbinding a Physical Disk Unit

You use **DASSMGR** to unbind a physical disk unit. Unlike binding, unbinding takes only a few moments.

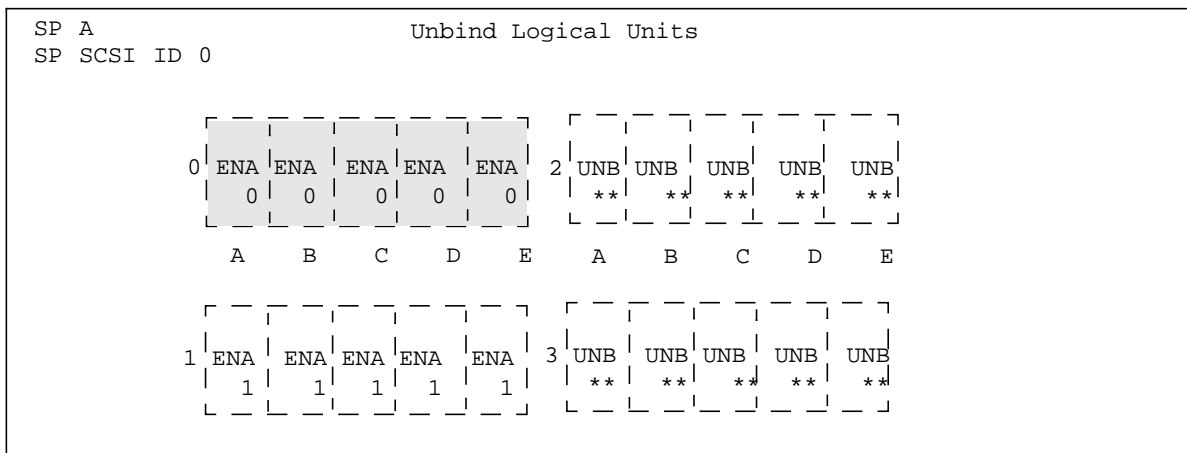
CAUTION: *Unbinding a physical disk unit effectively erases all information on the physical disk unit. You cannot use any unbound module until you bind it into a logical unit again, make the unit available to the operating system, and create a volume on the unit. Additionally, all information in the Profile partition is lost. The only time one would unbind is in the case of a double faulted LUN.*

To unbind a physical disk unit:

1. From the GridMgr Main Menu, choose the **Unbind Logical Units** option.
2. After reading the advisory screen that appears, press Enter.

The grid appears with all disk modules of the first-bound logical unit (unit 0) highlighted. The figure that follows shows a sample grid.

Sample grid for unbinding a logical unit



3. Use the direction arrows to highlight the physical disk unit you want to unbind. **GRIDMGR** highlights all modules in the logical unit when you select one of the modules.
4. Press the Enter key to select the highlighted physical disk unit for unbinding. A screen appears warning you that unbinding destroys all data on the physical disk unit, and then asks if you want to unbind this physical disk unit.
5. If you want to unbind the physical disk unit, type **Y** and press Enter; otherwise, cancel the unbind operation by typing **N**. The SP unbinds the physical disk. For each module, the status changes from ENA or RDY to UNB and the unit number changes to the unbound module symbol (**). If you want to unbind another physical disk, repeat the procedure.

Changing Physical Disk Unit Parameters

You can change the Rebuild time for a physical disk unit after it is bound:

Changing the Rebuild Time

The rebuild time is the amount of time that the storage chassis allots to reconstruct the data on a new disk module that replaces a failed disk module in a logical unit. It applies to all RAID physical disk units. The time you specify determines the amount of resource the SP devotes to rebuilding instead of to normal I/O activity.

The default time of 24 hours is adequate for most situations. A rebuild time of less than 24 hours rebuilds the disk more quickly, but degrades response time. A rebuild time of 0 hours rebuilds the disk module as quickly as possible, but degrades response time significantly. If your site requires fast response time and you want to minimize degradation to normal I/O activity, you can extend the rebuilding process over a longer period of time.

NOTE: *The actual rebuild time can differ significantly from the time you specify, especially between a 2-channel and a 4-channel Profile system.*

To change the rebuild time for a physical disk unit:

IMPORTANT You cannot change the rebuild time for a physical disk unit while the unit is rebuilding.

1. From the GridMgr Main Menu, follow this menu path:

Change Parameters → Change Physical Unit Parameters →
Change Unit Rebuild Time

The Change Unit Rebuild Time screen appears.

```
SP A                Change Unit Rebuild Time
SP SCSI ID 0

At any prompt, enter ^ to GO BACK TO PREVIOUS MENU or ? for HELP

Physical unit to change (hex)?
```

2. Enter the number of the physical disk unit whose rebuild time you want to change.

The program displays the current rebuild time and prompts you for a new time as follows:

Current rebuild time is 4 hours.
Enter new rebuild time <hours>:

3. Enter a new rebuild time. The new rebuild time is effective for the next rebuild operation.

The Change Logical Unit Parameters screen appears.

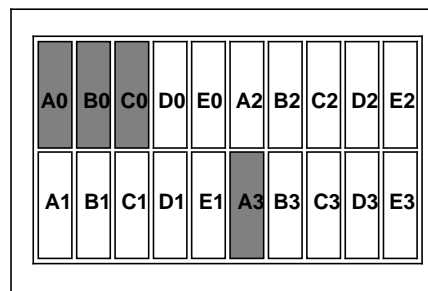
NOTE: Tektronix recommends a minimum rebuild time of 8 hours when using multiple video channels.


Updating Licensed Internal Code

The Licensed Internal Code (LIC) diskette may also include an update to the SP programmable read-only memory (PROM) code. When you install Licensed Internal Code, the SP tries to copy it to reserved areas outside operating system control on four disk modules, which are called the database disks. The database disk modules are A0, B0, C0, and A3. (See the figure below.)

For the LIC installation to succeed, at least two of the database disk modules must be on-line, and ideally, all of them should be on-line. A disk module is on-line if it is fully powered up and not faulted; that is, if it has a status code on the Presentation Utility screen and this code is *not* POW or OFF. Having multiple copies of code offers higher availability if a disk module fails.

Disk modules the SP uses to store Licensed Internal Code



 = Database disk module

Installing a New Revision of Licensed Internal Code

The following procedure assumes that you have loaded the files from the Licensed Internal Code (LIC) from the media onto the Profile. These files are the binaries for the different types of LIC, the release notices for the binaries, and a **README** file, which tells which binary to install for each type of storage chassis.

To install Licensed Internal Code (LIC):

IMPORTANT While you are installing new LIC, you must stop all I/O activity to and from the storage chassis.

1. If storage chassis read and/or write caching is enabled, disable it.
2. Start **DASSMGR**.
3. When the Disk Array Storage System Manager menu appears, choose the **Update Licensed Internal Code** option.

Two screens appear - an Operation Status screen in the upper right and the Update Licensed Internal Code screen.

```
Checksum Validity . . . . . -
Initializing SP . . . . . -
Downloading Microcode . . . . . -
Installing Microcode . . . . . -
Restarting SP with new microcode -
Downloading PROM image . . . . . -
Installing PROM image . . . . . -
Restarting SP with new PROM image -
```

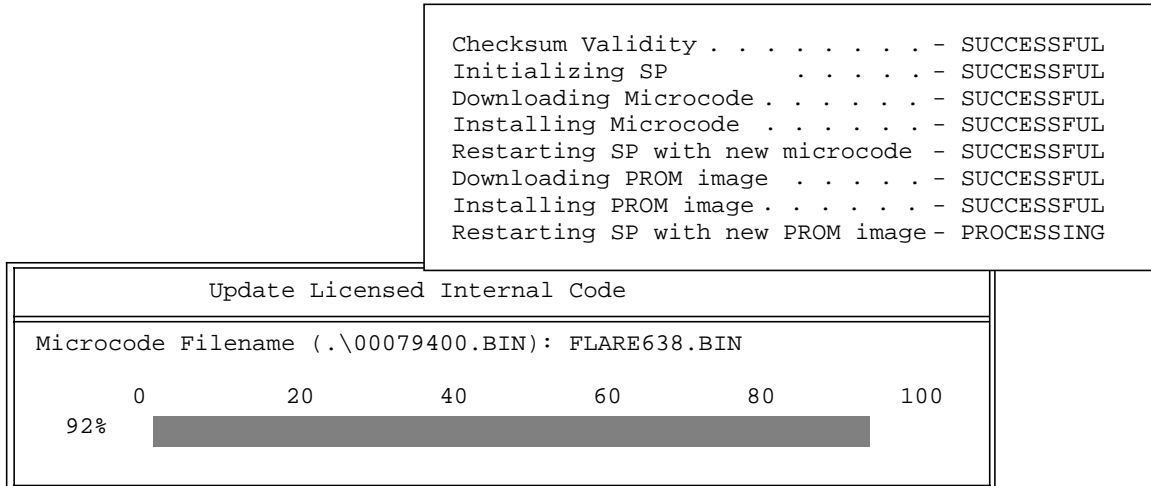

Update Licensed Internal Code						
Microcode Filename (.\00079400.BIN):						
0	20	40	60	80	100	
0%						

4. At the prompt for the Microcode File name in the Update Licensed Internal Code Screen, enter the path name to the LIC binary for the storage chassis, or press Enter to accept the default path name.

The **README** file on the LIC media tells which file to install for each type of storage chassis.

IMPORTANT If you must interrupt the installation procedure, press the Escape key.

When an operation listed in the status screen starts, PROCESSING appears on the screen beside the operation. As the operation proceeds, the bar graph in the other screen indicates the percentage of the operation that is completed. When the operation is completed, its status changes from PROCESSING to SUCCESSFUL. If the operation cannot be completed, its status changes from PROCESSING to FAILED. In such a case, you should restart the installation procedure. If the file you are loading does not contain SP PROM code, the status for the SP PROM operations is NOT AVAILABLE.



It takes about 25 minutes to down load microcode.

Meaning of error message from an SP PROM update

Bad PROM database	No valid PROM image exists on any database disk module. No change was made to the existing PROMs. Make sure you loaded the new code as explained in this section.
Buffer reservation failed	A microcode error occurred. No change was made to the existing PROM. Retry. If the error recurs, consult your service provider.
PROM Database Load Failed	A microcode error occurred. No change was made to the existing PROM. Retry. If the error recurs, consult your service provider.
PROM Erase Failure: PROM <i>n</i>	PROM <i>n</i> failed the erase procedure. The SP will not function properly until all the PROMs have been replaced. Consult your service provider.
PROM Program Failure: PROM <i>n</i>	PROM <i>n</i> failed the program procedure. The SP will not function properly until all the PROMs have been replaced. Consult your service provider.

Upgrade and Repair of a Storage System

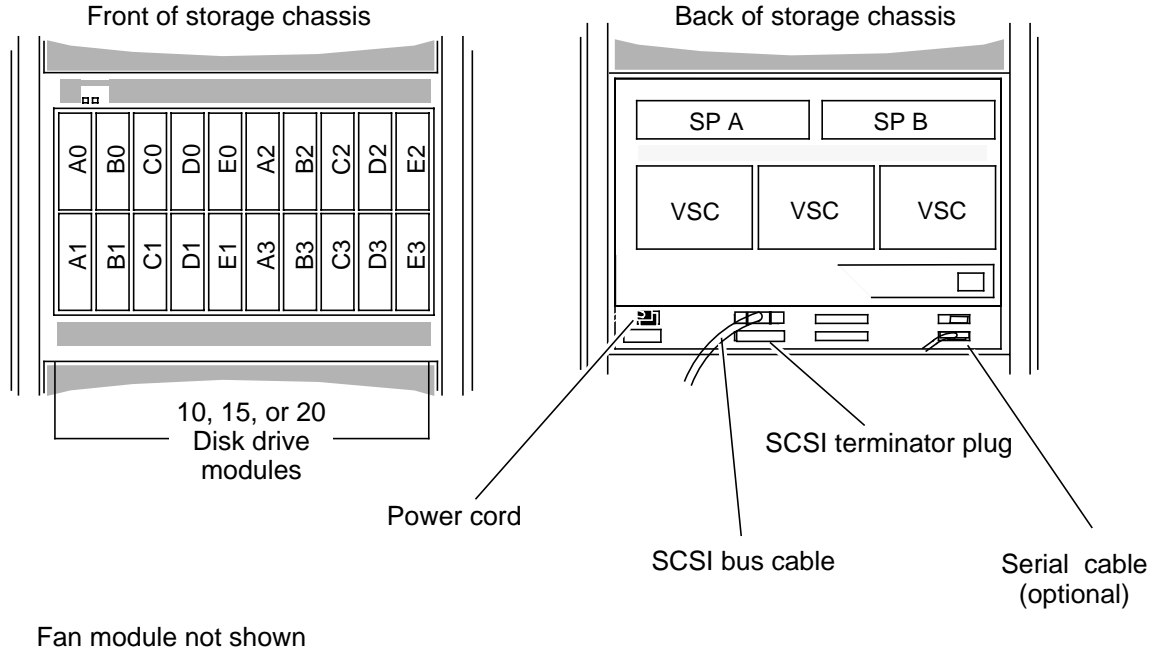
You can upgrade your storage chassis by adding optional modules that are customer-replaceable units (CRUs). You can repair a storage chassis by replacing faulty CRUs, and you can add or replace the following CRUs while the storage chassis is powered up:

- Disk modules
- Storage control processors (SPs) and their memory modules (DIMMs)
- Voltage semi-regulated converters (VSCs)
- Fan module

You can also replace the external SCSI bus cables, SCSI terminator plugs, power cord, and optional asynchronous cables. If you do not know how to connect the cables and terminator plugs, refer to Chapter 2, Installation, for information on where and how to connect them.

In addition to the CRUs, the disk-array storage chassis contains field-replaceable units (FRUs). Only qualified field personnel should replace a FRU. See Appendix B for ordering information.

Location of the customer-replaceable units in the storage chassis



Handling CRUs

The following describes the precautions that you must take and the general procedures you must follow when removing, installing, and storing CRUs.

Avoiding Electrostatic Discharge (ESD) Damage

The cover(s) and filler panel(s) installed on the equipment protect the electronic circuits inside the equipment from electrostatic discharge (ESD) damage. However, when you remove these covers and filler panels to replace or install subassemblies, you can inadvertently damage the sensitive electronic circuits in the equipment by simply touching them. Electrostatic charge that has accumulated on your body discharges through the circuits. If the air in the work area is very dry, running a humidifier in the work area will help decrease the risk of ESD damage. You must follow the procedures below to prevent damage to the equipment.

CAUTION: Read and understand the following instructions before you remove the cover(s) or panel(s) from the equipment.

- Provide enough room to work on the equipment. Clear the work site of any unnecessary materials or materials that naturally build up electrostatic charge, such as foam packaging, foam cups, cellophane wrappers, and similar materials.
- Do not remove replacement or upgrade subassemblies from their antistatic packaging until the exact moment that you are ready to install them.
- Gather the tools, manuals, an ESD kit, and all other materials you will need before you remove covers and panels from the equipment. Procedures for removing subassemblies usually list required materials at the beginning. After you remove a cover or panel, you should avoid moving away from the work site; otherwise, you may build up an electrostatic charge.
- The SCSI connectors on the disk drive modules are particularly sensitive to ESD damage. Disk drive modules should be transported and stored in the ESD bags they are shipped in.
- Use an ESD kit when handling circuit boards or when touching the electronic circuits inside the equipment. If an emergency arises and an ESD kit is not available, follow the procedures in **Emergency procedures (without an ESD kit)** which follows. An ESD wrist band (part no. 129-002319) is supplied with your storage chassis.
- Replace the cover(s) or panel(s) on the equipment as soon as possible so that the electronic circuits are protected.
- If the equipment has an opening for an optional device (such as a mass-storage drive), and the device is not installed, make sure a filler panel is installed in the opening before connecting the equipment to the ac power outlet.

Emergency Procedures (without an ESD kit)

In an *emergency* when an ESD kit is not available, use the following procedures to reduce the possibility of an electrostatic discharge by ensuring that your body and the subassembly are at the same electrostatic potential.

CAUTION: *These procedures are not a substitute for the use of an ESD kit. Follow them only in the event of an emergency.*

- Before touching any electronic circuits or boards inside the equipment, firmly touch a bare (unpainted) metal surface of the equipment.
- Before removing any replacement or upgrade subassembly from its antistatic bag, place one hand firmly on an unpainted metal surface of the chassis, and at the same time, pick up the replacement or upgrade subassembly while it is still sealed in the antistatic bag. Once you have done this, *do not* move around the room or contact other furnishings, personnel, or surfaces until you have installed and *secured* the subassembly in the equipment.
- Remove the subassembly from the antistatic bag, handling printed circuit boards by the edges. Avoid touching components and circuits on a printed circuit board.
- If you must move around the room or touch other surfaces before securing the subassembly in the equipment, first place the subassembly back in the antistatic bag. When you are ready again to install the subassembly repeat these procedures.

Precautions When Removing, Installing, or Storing CRUs

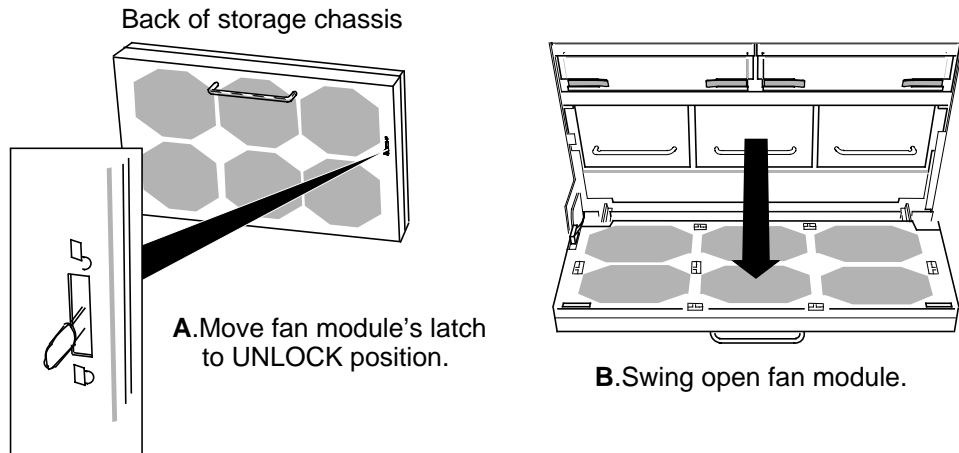
When removing or installing a CRU, never use excessive force. If you have difficulty removing or installing a CRU, read the procedures again. Once you have removed a CRU, handle it gently because a sudden jar or drop could permanently damage it.

Your replacement or add-on CRU is sent to you in a specially designed shipping container. Store the CRU in this container, and use this container if you need to return the CRU for repair. The storage location of a disk module, SP, VSC module, or fan module must be maintained within the non-operating limits specified in Appendix A

Opening and Closing the Fan Module

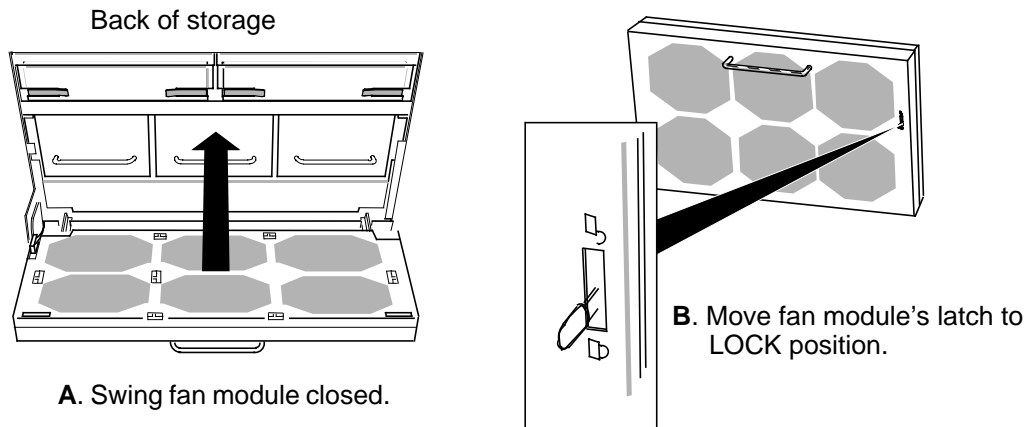
To remove or install an SP or VSC, you must unlock and swing the fan module down as shown below.

Opening the fan module



CAUTION: To prevent thermal shutdown of the storage chassis, never operate the storage chassis for more than two minutes with the fan module in the open position.

Closing the fan module



Replacing or Adding a Disk Module

If you are replacing a failed module, start below with **Removing a Disk Module**. If you are adding an optional group, skip to **Installing a Disk Module**.

Removing a Disk Module

You can replace a failed disk module while the storage chassis is powered up. If necessary, you can also replace a disk module that has not failed, such as a module that has reported many “soft” errors. When replacing a module that *has not* failed, you must replace the module while the storage chassis is powered up so that the SP knows the module is being replaced.

RAID storage will support full Profile Video Disk Recorder operation with up to one disk failure per LUN (Logical Unit Number, a grouping of 5 disks). If more than one disk failure occurs in a single RAID unit (but in different LUNs), you must completely repair one of the failures before starting the repair of the next failure. Repairing two failures at the same time will adversely affect RAID performance.

NOTE: *Never remove a disk module until you are ready to install a replacement. If you must remove the failed module when a replacement is not available, install a disk filler module in the empty slot to maintain proper cooling (see “Removing or Installing a Disk Filler Module”).*

CAUTION: *Disk modules are extremely sensitive to shock and vibration. Do not drop or set down hard. Do not store or transport unpackaged modules. A defective module must be returned to Tektronix in its original shipping container.*

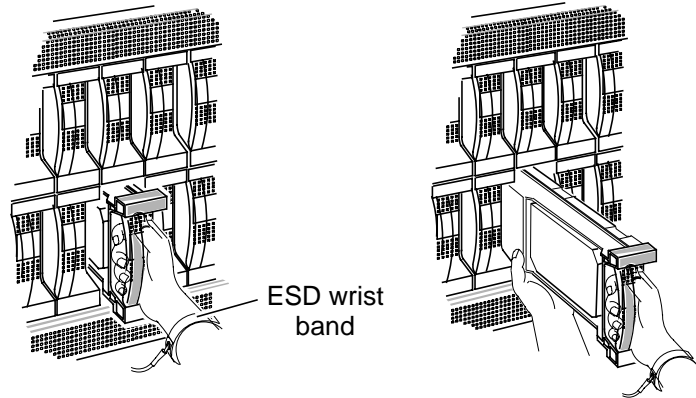
Before replacing a disk module, verify that the suspected module has actually failed. If you remove the **wrong** disk module, you introduce an additional fault that shuts down the physical disk containing the failed module. In this situation, the operating system software cannot access the physical disk until you initialize it again.

To remove a disk module:

1. Read **Avoiding Electrostatic Discharge (ESD) Damage**.
2. Attach the clip of the ESD wrist band (strap) to a grounded chassis, and put the wrist band around your wrist with the metal button against your skin.
3. Locate the disk module that you want to remove, and remove it as shown below.

Removing a disk module

CAUTION: When removed from the chassis, a disk module is extremely sensitive to shock and vibration. Even a slight jar can severely damage it.



A. Grasp the disk module handle and quickly and smoothly pull it part way out of chassis.

B. Support disk module with free hand and pull it free of chassis.

4. On the label on the top of the disk module, write the ID number for the slot (A3, for example) from which you removed the drive. For the slot ID numbers, refer to the figure below or the slot matrix, which you attached to the storage chassis when you installed it.

Disk module slot locations

A0	B0	C0	D0	E0	A2	B2	C2	D2	E2
A1	B1	C1	D1	E1	A3	B3	C3	D3	E3

If you are installing a replacement disk module immediately — Go to **Installing a Disk Module**.

If you are *not* installing a replacement disk module immediately — Remove and store the ESD wrist band, and skip to Removing or Installing a Disk Filler Module to install a disk filler module in the empty slot.

Installing a Disk Module

You can install a replacement disk module or add a RAID group (five disk modules) without powering down the storage chassis.

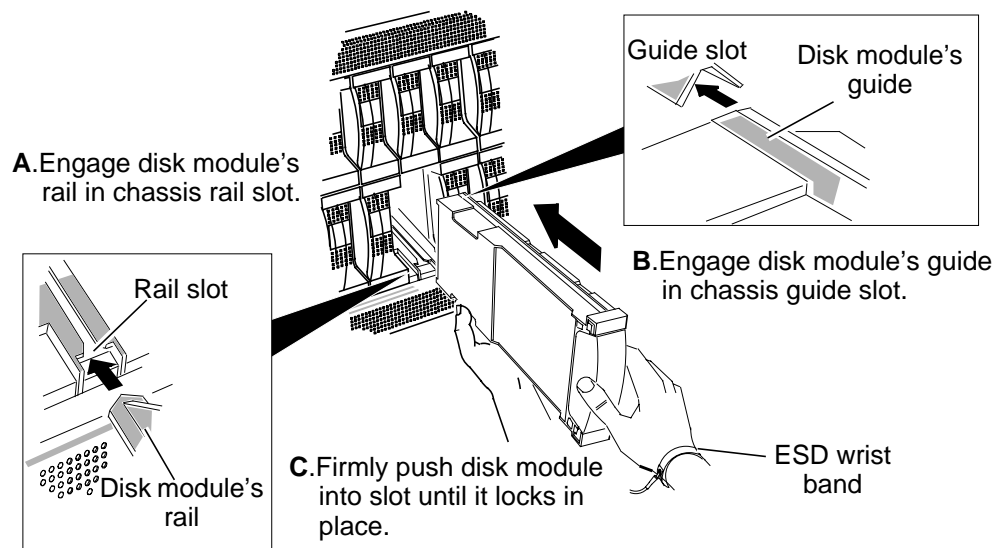
CAUTION: Before installing a replacement module, wait at least 15 seconds after removing the failed module to allow the SP time to recognize that the module has been removed. If you insert the replacement module too soon, the SP may report the replacement module as defective.

NOTE: Do not install a disk module from a PRS200/A in a PRS250/M. Optimum PRS250 performance requires Ultra-SCSI drives.

To install a disk module:

1. Read **Avoiding Electrostatic Discharge (ESD) Damage**.
2. Place the disk module in its antistatic packaging within reach of the storage chassis.
3. Attach the clip of the ESD wrist band (strap) to the grounded chassis, and put the wrist band around your wrist with the metal button against your skin.
4. If you are adding a RAID group, individually remove each disk filler module from the slot and immediately perform Step 5.
5. Locate the slot where you will install the disk module, and install the module as shown below.

Installing a disk module



CAUTION: When removed from the chassis, a disk module is extremely sensitive to shock and vibration. Even a slight jar can severely damage it.

NOTE: Make sure the disk module is firmly seated.

6. If you are adding a RAID group, repeat Steps 4 and 5 for the remaining disk modules.
7. Remove and store the ESD wrist band.

What you do next depends on whether the disk module that you just installed is a replacement disk module or part of an added RAID group.

For a replacement module in a logical unit (LUN) — The SP starts rebuilding the disk module immediately. You can determine or change the rebuild period using **dassmgr**. See “Binding Disk Modules as a Logical Unit” on page 6..

For an added RAID group — Bind each module of the group into a logical unit using **dassmgr**, and make the group accessible to the operating system. The **dassmgr** is documented earlier in this chapter.

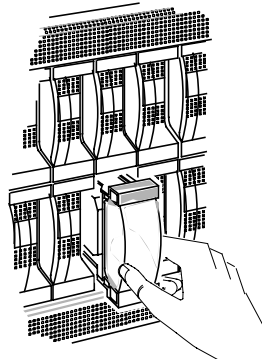
Removing or Installing a Disk Filler Module

When the storage chassis has an empty disk module slot, you must install a disk filler module to maintain the proper cooling air flow and to suppress the transmission of electromagnetic waves that could otherwise interfere with radio and communications equipment located nearby. (Refer to the Note and Warning in the front of this manual.) If you are adding a RAID group (five disk modules), you must remove the filler modules covering the empty slots.

CAUTION: *If you are replacing a failed disk module and you do not have a disk filler module, leave the failed module installed until a replacement module is available.*

To remove a disk filler module, grasp the module and pull it out of the chassis. If you cannot grasp the module, use a medium flat blade screwdriver to gently pry it out.

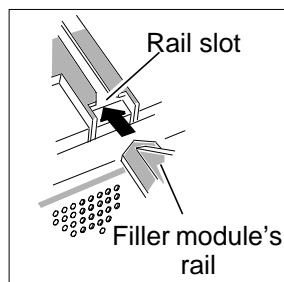
Removing a disk filler module



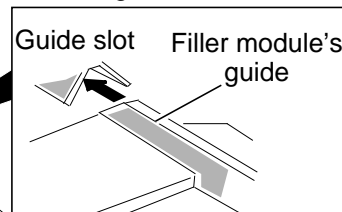
To install a disk filler module:

Installing a disk filler module

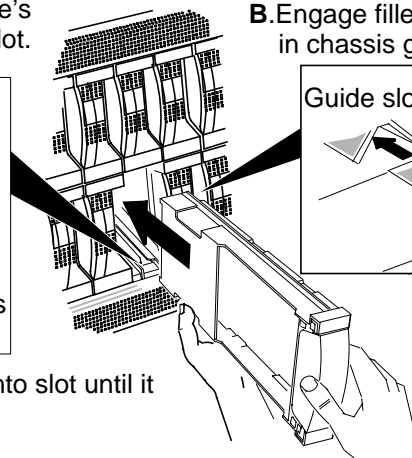
A. Engage filler module's rail in chassis rail slot.



B. Engage filler module's guide in chassis guide slot.



C. Push filler module into slot until it locks in place.



Installing or Removing SP Memory Modules

When you replace or add an SP, you must install the memory modules in the DIMM connectors on the replacement or add-on SP's printed circuit board. You should not ship an SP with its memory modules installed. If you want to return a failed SP, you must remove the memory modules from the printed circuit board and place the board and memory modules in separate shipping containers.

Installing SP Memory Modules

IMPORTANT The SP has one pair of memory modules (2 X 16Mb). They must be installed in the FIRST PAIR connectors, farthest away from the edge of the board.

To install SP memory modules:

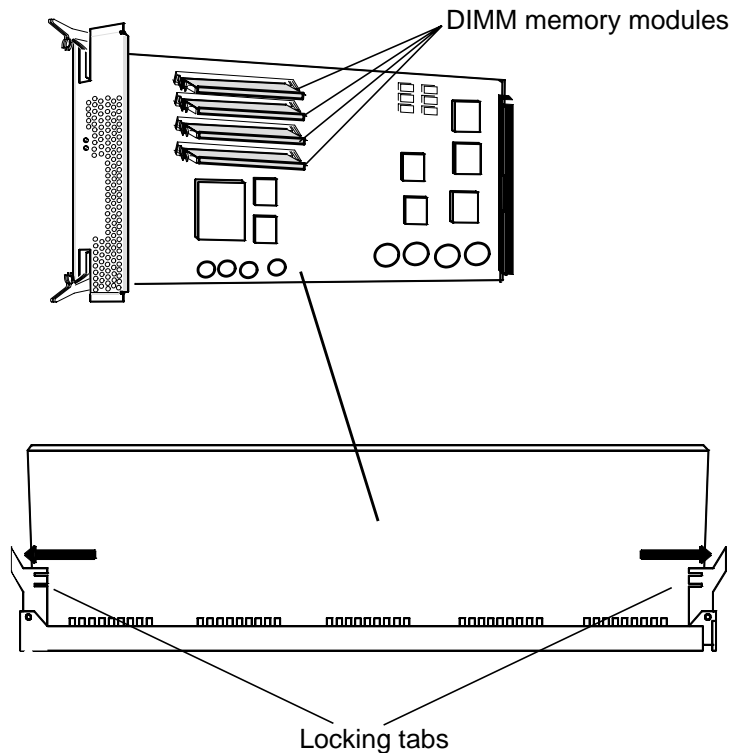
1. Read **Avoiding Electrostatic Discharge (ESD) Damage**.
2. Attach the clip of the ESD wrist band (strap) to the grounded chassis, and put the wrist band around your wrist with the metal button against your skin.
3. If you are installing memory modules, remove the SP you are upgrading and place it on a static-free work surface.
4. Remove either the SP board and memory modules or the additional memory modules from their packaging, and place them on a static-free work surface.

IMPORTANT A memory module has a notches on its edge connector so that you can insert it only one way.

5. Install each memory module in the appropriate connector, starting with the module in the connector farthest away from the edge of the board (FIRST PAIR).
 - a. Lower the locking tabs on the DIMM connector by pushing outwards from the connector.
 - b. Carefully place the memory module in the DIMM connector, then press down on the memory module until it snaps into place and the locking tabs latch into the notches on the sides of the DIMM.
3. Place the SP on a static-free work surface or on its antistatic packaging within easy reach of the storage chassis.

See **Installing an SP** later in this chapter to install an SP.

Location of memory modules on SP board



Removing SP Memory Modules

To ship an SP, you must remove the memory modules from the printed circuit board. To remove SP memory modules:

1. Read **Avoiding Electrostatic Discharge (ESD) Damage** at the beginning of this chapter.
2. Attach the clip of the ESD wrist band (strap) to the grounded chassis and put the wrist band around your wrist with the metal button against your skin.
3. Unlock the memory module from the DIMM connector pushing outward on the locking tabs.
4. Lift the memory module out of the connector and place it in its own antistatic packaging.
5. Remove and store the ESD wrist band.

Replacing an SP

You can replace a failed SP without powering down the storage chassis. However, you will need to re-boot the operating system software once you install the replacement SP.

Removing an SP

IMPORTANT If you must replace a failed SP and you do not have a replacement, leave the failed SP installed until the replacement is available. Do not operate the chassis with an open SP slot. Either leave the failed SP installed or install an SP filler board.

You can remove an SP while the storage chassis is powered up. However, to avoid automatic thermal shutdown of the storage chassis, you must complete Steps 2 through 5 within two minutes. Before you begin to remove an SP, make sure that you understand all the steps in the following procedure.

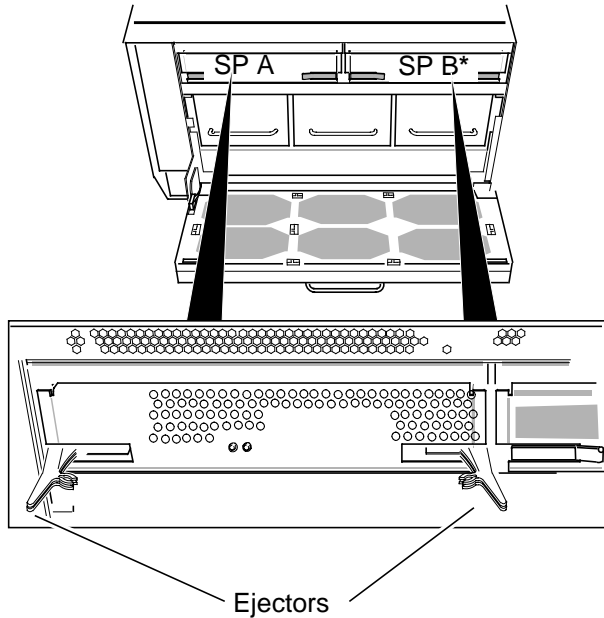
To remove an SP:

1. Read **Avoiding Electrostatic Discharge (ESD) Damage** at the beginning of this chapter.
2. Open the fan module.
3. Attach the clip of the ESD wrist band (strap) to the grounded chassis and put the wrist band around your wrist with the metal button against your skin.

WARNING: Some components on the SP become hot during operation. To prevent personal injury, make sure that you do not touch components on the SP when you remove it.

4. Remove the SP from the chassis as shown below.

Removing an SP



- A. Pull both ejectors until they unlock and SP starts coming out of chassis.
- B. Rest edge of SP on palm of hand, and with other hand pull it out of chassis, making sure not to touch any electronic components or circuits.
- C. Place SP component-side up on static-free work surface.

* The SP B location is occupied by a SP Filler Board.

5. Install a SP filler board. See “Removing or Installing an SP Filler Board” on page 28.
6. Immediately close and lock the fan module.
IMPORTANT Before shipping a failed SP, remove its memory modules. (See **Removing SP Memory Modules.**)
7. Remove and store the ESD wrist band.

Installing an SP

You can install an SP while the storage chassis is powered up. However, you must complete Steps 4 through 6 within two minutes to avoid automatic thermal shutdown of the storage chassis. Before you begin to install an SP, make sure that you understand all the steps in the following procedure.

NOTE: Do not install an SP from a PRS200/A in a PRS250/M. Optimum PRS250/M performance requires an Ultra-SCSI SP (labeled 118-028754).

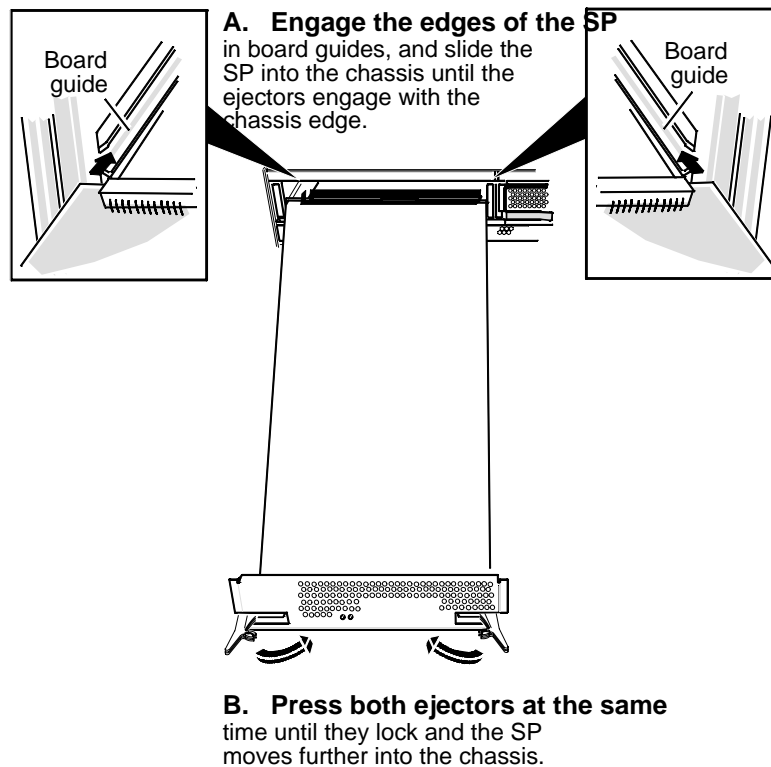
To install an SP:

1. Install the memory modules that shipped with the SP, and position the SP within easy reach of the storage chassis.
2. If you are installing an add-on SP, power down the storage chassis and the Profile.
3. Locate the slot where you want to install the SP.
4. Open the fan module.

CAUTION: To maintain proper cooling, never operate the storage chassis with an empty SP slot. Save the filler board to fill the slot in case you need to operate the storage chassis with an SP removed temporarily.

5. Install the SP as shown below.

Installing an SP



6. Immediately close and lock the fan module.

7. Remove and store the ESD wrist band.

If you installed a replacement SP — What you do next depends on whether the storage chassis contains one or two SPs, and whether you powered down the storage chassis and the Profile.

If you powered down the storage chassis and the Profile — Power up the storage chassis and the Profile, and re-boot the operating system. Refer to the manual for the operating system.

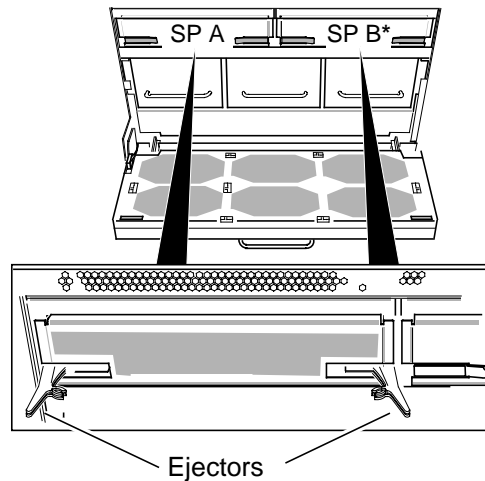
Removing or Installing an SP Filler Board

The SP filler board has a plain panel with no power switch or indicators. When the storage chassis has an available SP slot, you must install an SP filler board to maintain the proper cooling air flow. If you are installing a second SP, you must remove the filler board that occupies the empty slot.

CAUTION: *If you are replacing a failed SP and you do not have an SP filler board, leave the failed SP installed until a replacement SP is available.*

Remove an SP filler board as shown below.

Removing an SP filler board



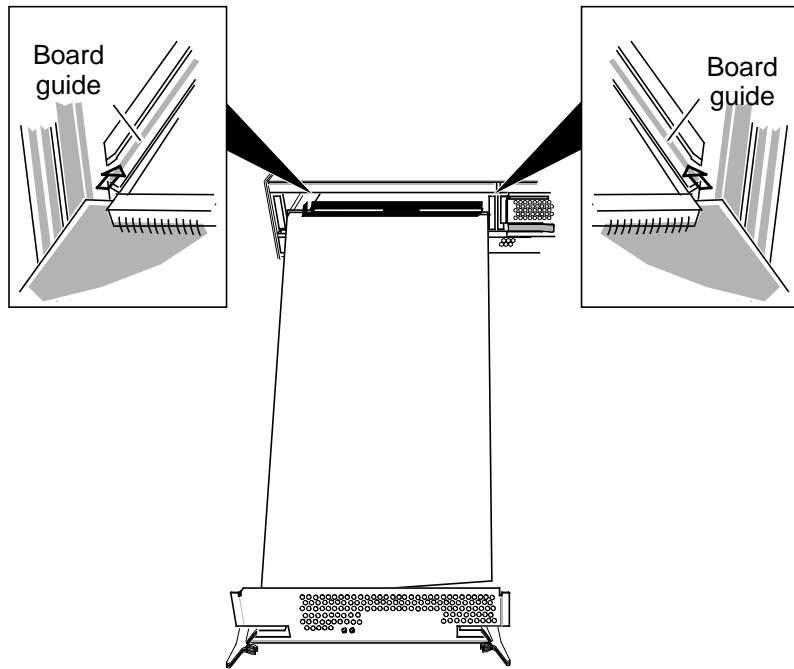
- A.** Pull both ejectors until they unlock and filler board starts coming out of chassis.
- B.** Pull filler board from chassis and store it.

* The SP B location is occupied by a SP Filler board.

Install an SP filler board as shown below.

Installing an SP filler board

A. Engage edges of filler board in board guides, and slide filler board into chassis until ejectors engage with chassis edge.



B. Press both ejectors at same time until they lock and filler board moves further into chassis.

Replacing or Adding a VSC

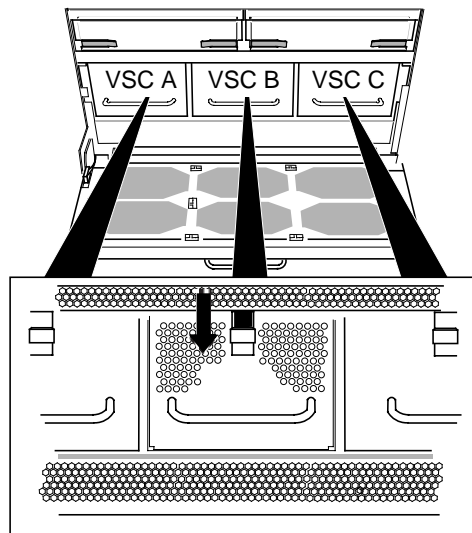
You can replace a failed VSC or add a new one while the storage chassis is powered up. However you must complete Steps 2 through 6 within two minutes to avoid automatic thermal shutdown of the storage chassis. Before you begin to replace or add a VSC, make sure that you understand all the steps in the following procedure.

NOTE: *In order for the RAID Storage chassis to operate, two VSCs must be functional at all times*

To replace or add a VSC:

1. Unpack the VSC module and place it within reach of the storage chassis.
2. Open the fan module.
3. If you are replacing a failed VSC, remove the VSC and then skip to Step 5.

Removing a VSC



Grasp VSC by handle, hold down latch, and pull VSC out of slot.

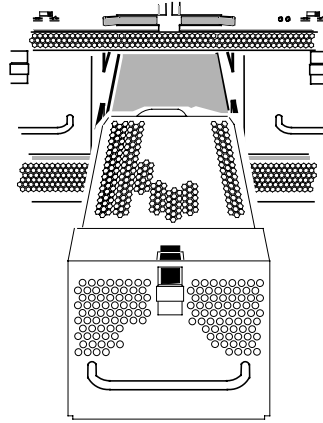
4. If you are adding a VSC, remove the VSC filler module by pushing down on its latch and pulling it out of the slot by its latch.

A VSC filler module looks similar to a VSC without its handle.

CAUTION: *To maintain proper cooling, never operate the storage chassis with an empty VSC slot. Save the filler module to fill the slot in case you need to operate the storage chassis with a VSC removed temporarily.*

5. Install the replacement or add-on VSC as shown below.

Installing a VSC



Grasp VSC by handle and push into slot until it latches in place.

6. Immediately close and lock the fan module.
7. If the storage chassis is not running, power it up.

Replacing a Fan Module

You can replace a failed fan module while the storage chassis is powered up. However, you must complete Steps 2 through 5 within two minutes to avoid thermal shutdown of the storage chassis. Before you remove the fan module, make sure that you understand all the steps in the following procedure.

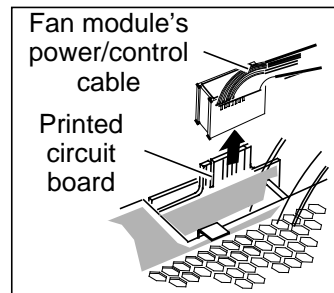
IMPORTANT To avoid thermal shutdown of the storage chassis, never operate it for more than two minutes with the fan module removed or in the open position.

To replace the fan module:

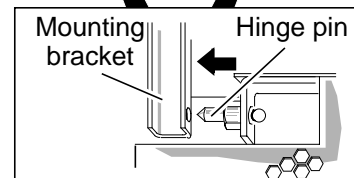
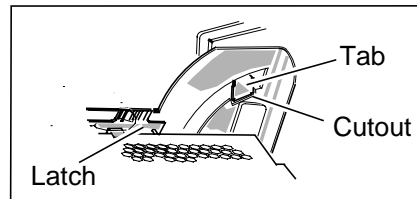
1. Unpack the replacement fan module and place it within reach of the storage chassis.
2. Open the fan module.
3. Remove the fan module as shown below.

Removing the fan module

A. Disconnect fan module's power/control cable.



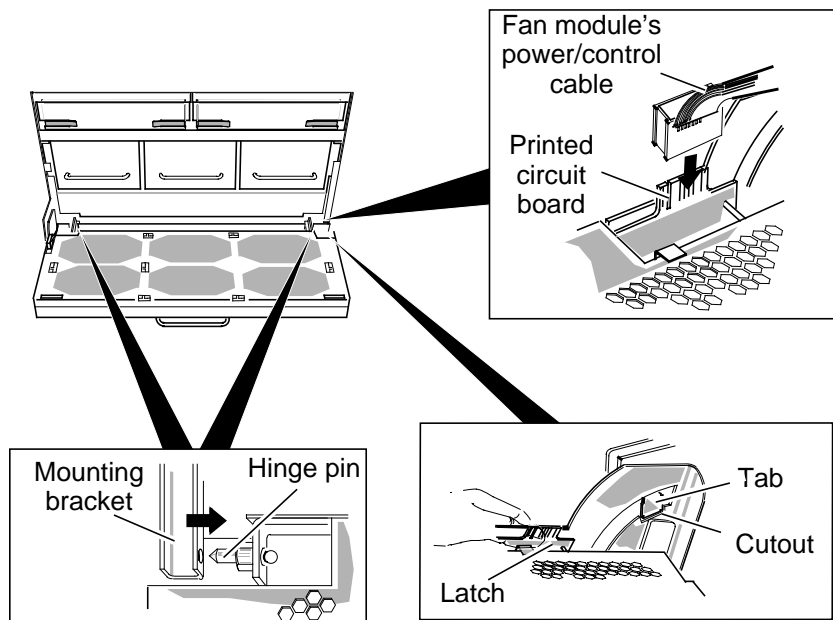
B. Press module's latch and guide tab through cutout.



C. Lift module free of hinge pins and release latch.

4. Install the replacement fan module as shown below.

Installing the fan module



- A.** Install module on hinge pins.
- B.** Press module's latch and guide tab through cutout.
- C.** Connect fan module's power/control cable.

Note that all six fans begin to rotate.

5. Immediately close and lock the fan module.

Appendix **A**

Technical Specifications

This appendix lists the technical specifications for the PRS 200 and PRS 200A RAID Storage chassis.

AC power requirements

Voltage	90 V ac to 264 V ac, single-phase, 47 Hz to 63 Hz; power supplies are auto-sensing and auto-ranging
Current draw	9.0 A max. at 100 V ac input
Power consumption	
Apparent power	900 VA max
True power	880 W max
Phase	1 inside USA; 2 or 3 outside USA

Power cables

USA primary power	1.8 m (6.0 ft.): NEMA L5-15P connection, L5-15R mating connection
Other locations	Local standard ac connection

Operating limits

Ambient temperature	10°C to 38°C (50°F to 100°F)
Relative humidity	20 to 80% non-condensing
Elevation	2439 m (8000 ft.)
Heat dissipation	3168x10 ³ J/hr (3000 Btu/hr.) max
Shock	3 g @ 11ms
Vibration	0.25 g peak @ 5 Hz to 500 Hz

Non-operating limits (shipping and storing)

Ambient temperature	-40°C to 65°C (-40°F to 149°F)
Gradient, maximum	24°C/hr (43.2°F/hr)
Relative humidity	10% to 90% non-condensing
Elevation	7625 m (25,000 ft.)

Physical

Dimensions

Height	35.6 cm (14 in)
Width	48.3 cm (19 in)
Depth	76.2 cm (30 in)

Weight

Minimum (chassis with 10 disk modules,
1 SP, 2 VSCs, without packaging) — 53.8 kg (118.4 lb)

Maximum (chassis with 20 disk modules,
2 SPs, 3 VSCs, without packaging) — 78 kg (173.2 lb)

Service clearance

Front	81.3 cm (32.0 in)
Rear	81.3 cm (32.0 in)

Cabling

Up to 25 meters total length

Miscellaneous

External host bus	Differential SCSI-2 (synchronous)
Internal storage-system	Five single-ended SCSI buses

Appendix **B**

Ordering Information

This appendix lists the Customer Replaceable Units (CRUs) and the Field Replaceable Units (FRUs) for the PRS 200 and PRS 200A RAID Storage chassis.

Customer Replaceable Units

The table below lists the CRUs for the RAID Storage chassis. Other than being qualified to service the RAID Storage chassis and being familiar with it, there are no specific skills required to replace these parts. To order parts, contact your Tektronix Service representative.

Part Number	Description (Nomenclature)
011-0171-00	SCSI Terminator
118-9956-XX	PRS250A: 9.0 GB Disk Module (PRS9GU)
119-5539-XX	Power Supply, 20-Drive (PRSPSA)
119-5552-XX	Fan Module, 20-Drive, Improved (PRSFANA)
119-9955-XX	Storage Processor, Ultra-SCSI, 20-Drive (PRSCTLU)
119-9954-XX	Cache Memory Kit, Single SP, 32 MB
119-5564-XX	20 Slot Chassis w/Fan Module
174-3679-XX	External SCSI Cable

Field Replaceable Units

The table below lists the FRUs for the RAID Storage chassis. It is recommended that except for items 1 - 4 in the table, only qualified personnel who have completed RAID Storage Chassis Service Training remove and replace FRUs. To order parts, contact your Tektronix Service representative.

Item No.	Part Number	Description
1	119-5558-XX	BBU Filler Panel
2	119-5559-XX	Disk Module Filler Panel
3	119-5560-XX	Storage Processor Filler Panel
4	119-5561-XX	Power Module Filler Panel
5	118-9418-XX	20-slot Midplane board
6	118-9419-XX	RIP PCB
7	118-9420-XX	SP ID PCB
8	119-5565-XX	Circuit Breaker
9	174-3658-XX	SP ID Cable
10	174-3659-XX	Internal SCSI Distribution Cable
11	174-3660-XX	Internal AC Wiring Harness
12	174-3661-XX	Fan DC Power Cable
13	174-3662-XX	Master Fault Cable
14	174-3663-XX	VSC Distribution Cable
15	690-1886-00	PRS250 Bezel, Front Panel, Custom

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