

AR1000 RAID Subsystem Hardware Reference Guide

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Contents

I. Introduction

1-1. How this Manual is Organized	7
Symbols	7
1-2. Component Checklist	8
Standard components	8
1-3. Features	9
1-4. Safeguards	11
Operation Safety	11
Tools Required	11
1-5. Electrical Safety	12
Static-Sensitive Devices	12

II. System Components

2-1. System Front Side	13
2-2. System Back Side	14
2-3. System Left Side	15
2-4. Opening the Chassis	16
Removing/Installing the Front Door	16
Side Panel Screws	16
Opening/Installing the Left Panel	16
2-5. Installation of DA3000 RAID Controller	17
Opening the Top Panel	17
Installing DRAM SIMM	17
Fixed Storage Device Tray	18
Fixed Device Spacer	18
2-6. Front Panel of DA3000 RAID Controller	19
Front View	19
2-7. Hot-Swap SCA Hard Drive Modules	20
Hot-Swap Tray	21
Hot-Swap Bay	21
2-8. Front Cooling Fans	22
Front Cooling Fan Control Board	23
Hard Disk Drive Message Board	23
2-9. SCSI Backplane	24

Contents

2-10. SCSI ID Setting	25
SCSI ID Dip Switches	25
2-11. SCSI Termination	26
2-12. SCSI Cabling-1 (Default)	27
2-13. SCSI Cabling-2	28
2-14. SCSI Cabling-3	29
2-15. Power Supply	30
Power Supply Placement.....	30
Replacing One Power Supply Module	30
Removing the Entire Power Supply Unit.....	30
Power Module Rating	31
Power Module Failure	31
2-16. Power Supply Information	32

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I. Introduction

You are reading the AR1000 RAID Subsystem Hardware Reference Guide. This guide provides information on the various components used in this system. This guide is intended for experienced users and integrators with hardware knowledge of personal computers. You should also read all documentation and manuals included with this system and with your separately purchased components.

• 1-1. How this Manual is Organized

There are only a few sections in this reference guide as follows:

I. Introduction

This section gives general and startup information and features for this system.

II. System Components

This section gives descriptions of each system component..

Symbols

To complete certain tasks safely and completely, you should be aware of a few symbols used throughout this guide.



WARNING: Information to prevent injury to yourself when trying to complete a task.



CAUTION: Information to prevent damage to the components when trying to complete a task.



IMPORTANT: Information that **MUST** be followed in order to complete a task.



NOTE: Tips and information to aid in completing a task.



PHILIP (CROSS) SCREW DRIVER: Tools required to install or remove the components in this system.



STANDARD (FLAT) SCREW DRIVER: Tools required to install or remove the components in this system.



STEP: Actions to complete a task.

I. Introduction

• 1-2. Component Checklist

If assembling this system by yourself, it is important to prepare all the components before starting. This will save a great deal of time by not having to hunt down components. The following checklist provides a guideline as to the necessary components for a RAID system.

Standard components

- ASUS DA3000 RAID Controller
- ASUS D-30 chassis
- Redundant AT Power Supply
- SCSI Cables and Terminators
- Hardware Reference Guide
- DA3000 User's Manual
- SIMM Memory Modules
- 80-pin SCSI Hard Disk Drives

I. Introduction

• 1-3. Features

AR1000 is a RAID subsystem configured on the DA3000 RAID controller, which supports up to 5 drive channels accommodating many hard drives configurations for optimal fault tolerance and performance. The following are highlights to this system's many features. For additional features and details, read the user's manual of the RAID controller included with this package.

DA3000 RAID Controller

- Uses AMD 5x86-133 CPU
- Supports Ultra2/Ultra-Wide SCSI device interface
- Up to 128 MB of intelligent Read-Ahead/Write-Back cache memory
- Six operating modes: Non-RAID, RAID-0, RAID-1, RAID-0+1, RAID-3, and RAID-5
- SAF-TE support
- Automatic bad sector reassignment
- Background rebuilding
- Global and local spare drive operation
- Provides up to 5 drive channels, each supporting 15 SCSI IDs
- Connects up to 8 logical drives, each with independent RAID modes
- Front panel LCD and RS-232 terminal interface for display and configuration

System Management Tools

- TEXT RAID Manager operating under DOS/NT/NetWare
- GUI RAID Manager

Chassis

- One 5.25" device tray for the DA3000 RAID controller; two hot-swap SCA hard disk drive modules
- Four foldable chassis stabilizers
- Metal door lock
- Front panel removable for rack mounting
- 19" rack compliant

Device Bay

- Holds up to six 1.6" or ten 1.0" hot-swap trays for Ultra2 SCSI SCA hard disk drives
- Power LEDs to indicate power and fan status

I. Introduction

Circulation System

- Two 3-inch (8 cm) ball bearing fans for the system
- Four 2-inch (6 cm) ball bearing fans for device trays
- Device trays made of aluminum to facilitate heat dissipation

Power Supply

- Redundant power supply
- Input voltage: 115/230V (autoranging)
- Output current: 5V, 40A; 12V, 12A; -5V, 0.5A; -12V, 0.5A
- Total output Watts: 350W

Size and Weight

- Chassis: 62.5cm (L) x 23cm (W) x 45.5cm (H)
- Carton: 76cm (L) x 36cm (W) x 62cm (H)
- Weight: 50kgs (including chassis, DA3000, power supply, hot-swap trays and 10 hard disk drives)

I. Introduction

• 1-4. Safeguards

Observe the following safety instructions any time you are connecting or disconnecting any devices.

Operation Safety



IMPORTANT

- Any operation on this system must be conducted by certified or experienced persons.
- Before operating your system, carefully read all the manuals included with the system package.
- Before using the system, make sure all cables are correctly connected and the power cables are not damaged. If any damage is detected, contact the vendor as soon as possible.
- To avoid short circuits, keep paper clips, screws, and staples away from connectors, sockets and circuitry.
- Before opening the chassis panels, make sure all power cables are unplugged.
- Avoid dust, humidity, and temperature extremes. Place the system on a stable surface.
- If the power supply is broken, do not try to fix it by yourself. Contact an authorized vendor.
- It is recommended that you wear gloves when assembling or disassembling the system to protect from cuts and scrapes.
- When the system is powered on, the surfaces of certain IC devices may be hot. Do not touch them. Check whether the fans are functioning properly.

Tools Required

A Phillips (cross) screwdriver and a standard (flat) screwdriver are needed to install or remove the components in this system.

I. Introduction

• 1-5. Electrical Safety



IMPORTANT

- Before installing or removing signal cables, ensure that the power cables for the system unit and all attached devices are unplugged.
- To prevent electrical shock hazard, disconnect the power cable from the electrical outlet before relocating the system.
- When adding or removing any additional devices to or from the system, ensure that the power cables for those devices are unplugged before the signal cables are connected. If possible, disconnect all power cables from the existing system before you add a device.
- Use one hand, when possible, to connect or disconnect signal cables to prevent a possible shock from touching two surfaces with different electrical potentials.



CAUTION

This product is equipped with a three-wire power cable and plug for the user's safety. Use the power cable in conjunction with a properly grounded electrical outlet to avoid electrical shock.

Static-Sensitive Devices



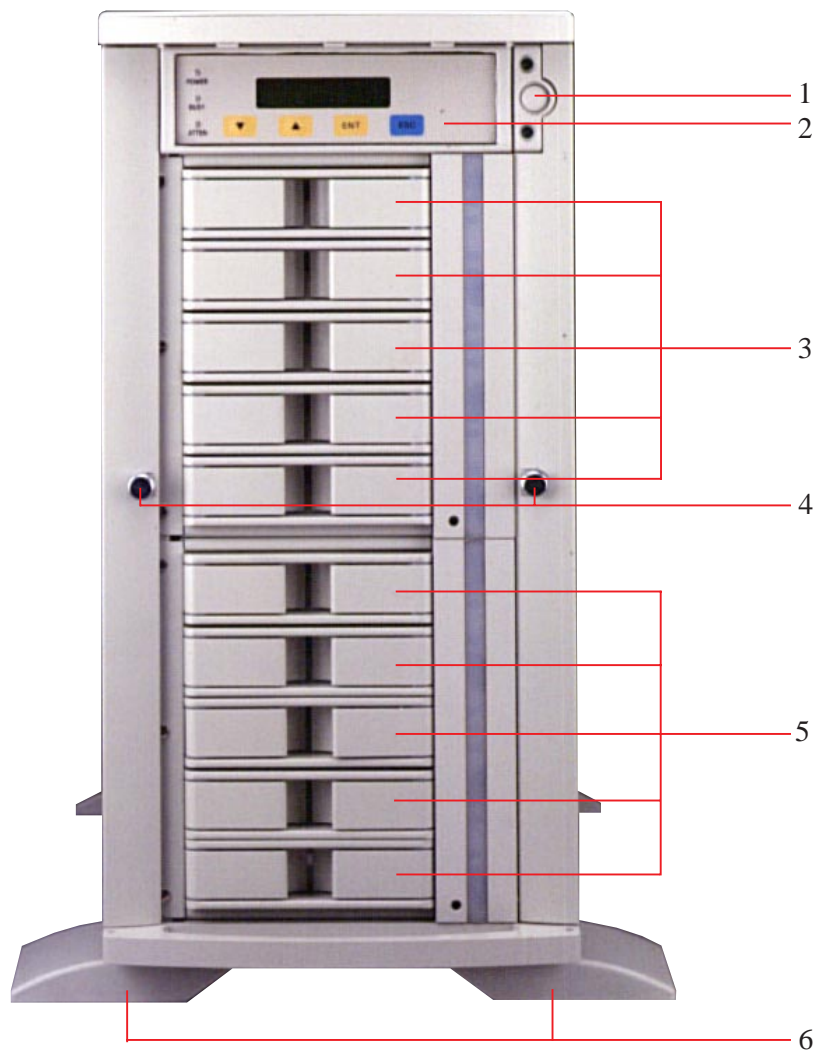
IMPORTANT

Adapters and disk drives are sensitive to static electricity discharge. These devices are wrapped in antistatic bags to prevent this damage. Take the following precautions:

- If you have an antistatic wrist strap available, use it while handling the device.
- Do not remove the device from the antistatic bag until you are ready to install the device in the system unit.
- With the device still in its antistatic bag, touch it to a metal frame of the system.
- Grasp cards and boards by the edges. Hold drives by the frame. Avoid touching the solder joints or pins.
- If you need to lay the device down while it is out of the antistatic bag, lay it on the antistatic bag. Before picking it up again, touch the antistatic bag and the metal frame of the system unit at the same time.
- Handle the devices carefully in order to prevent permanent damage.

II. System Components

• 2-1. System Front Side



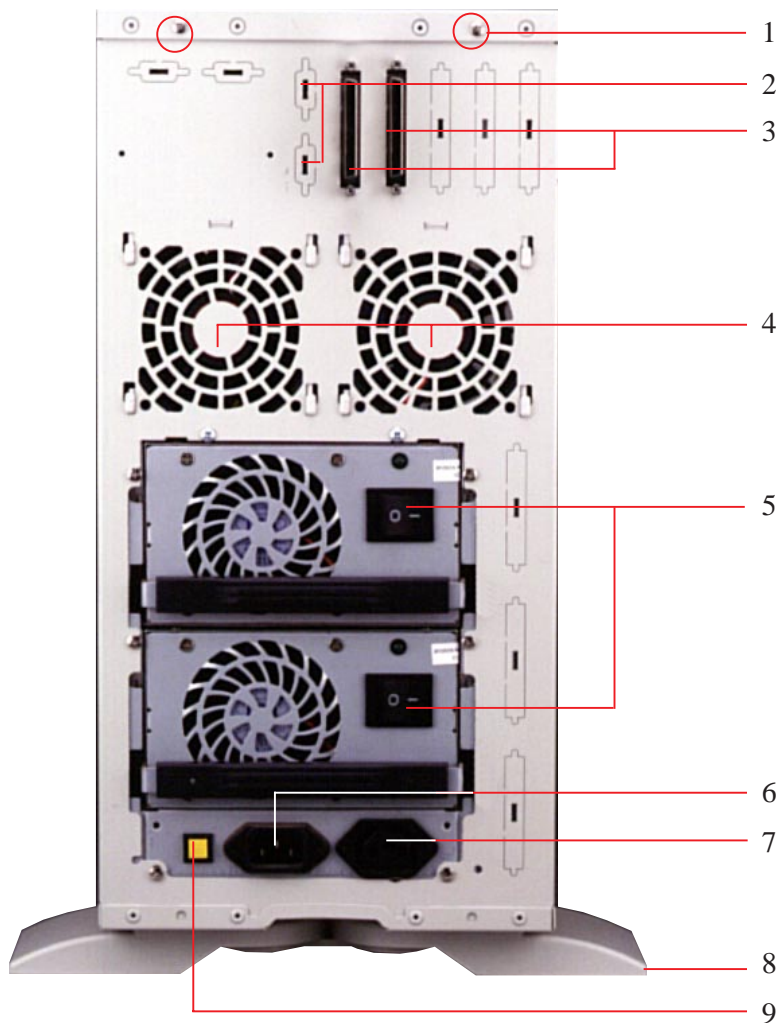
II. Components
Front Side

1. AT Power Button
2. DA3000 RAID Controller
3. Hot-Swap Trays for SCA Hard Disk Drives
4. Side Panel Thumb Screws
5. Hot-Swap Trays for SCA Hard Disk Drives
6. Chassis Stabilizers

System Front Side

II. System Components

• 2-2. System Back Side



1. Top Panel Screws
2. RS-232 Ports
3. SCSI Ports
4. System Fans
5. Power Supply Switches
6. AC Power In Connector
7. Monitor Power Connector
8. Chassis Stabilizer
9. Power Supply Alarm Reset Button

System Back Side

II. System Components

• 2-3. System Left Side



1. SCSI Cable
2. System Fan
3. Redundant Power Supply
4. Chassis Stabilizer

II. Components
Left Side

System Left Side

II. System Components

• 2-4. Opening the Chassis

This section and the following sections give descriptions on how to install and remove components. When setting up devices on the system, perform the following steps.



Removing/Installing the Front Door

To remove the front door, push down on the hinge spring as shown.

To install the front door, press the hinge spring, insert the door pins into the holes on the top and bottom panels, and then release the hinge spring.



Side Panel Screws

There are two identical side panels on the chassis, one on each side. The side panels are secured by two large thumb screws on the front of the system, which can be turned with your fingers.



Leaving some space for pushing the left panel in place

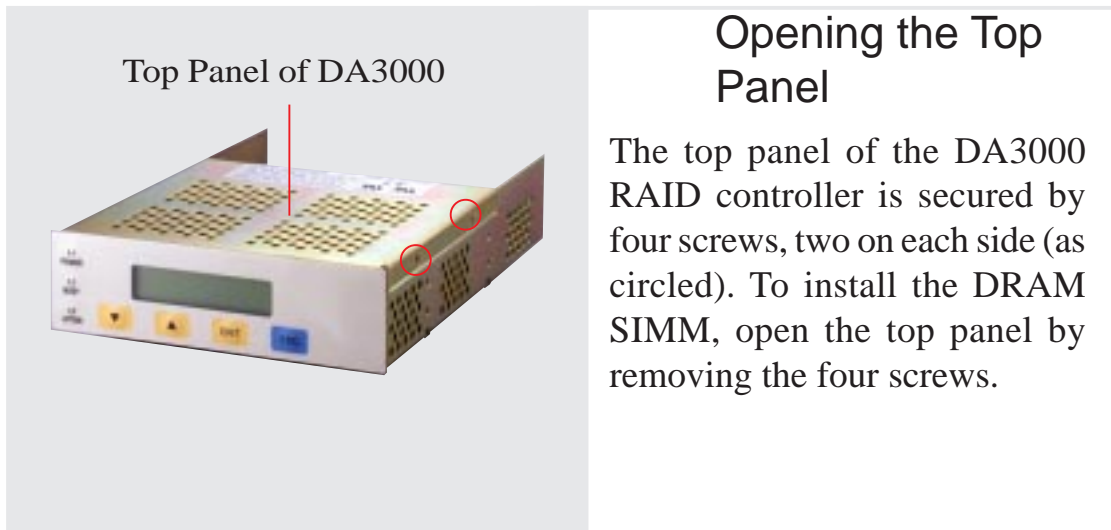
Opening/Installing the Left Panel

To open the left side of the panel, remove the side panel screw, and then pull the handle outward while pulling the panel forward.

To install the left panel, first place the back of the panel onto the chassis, leaving a gap of about 1 cm between the left and back panels. Push the panel front inward and then slide it backward.

II. System Components

• 2-5. Installation of DA3000 RAID Controller



Installing DRAM SIMM

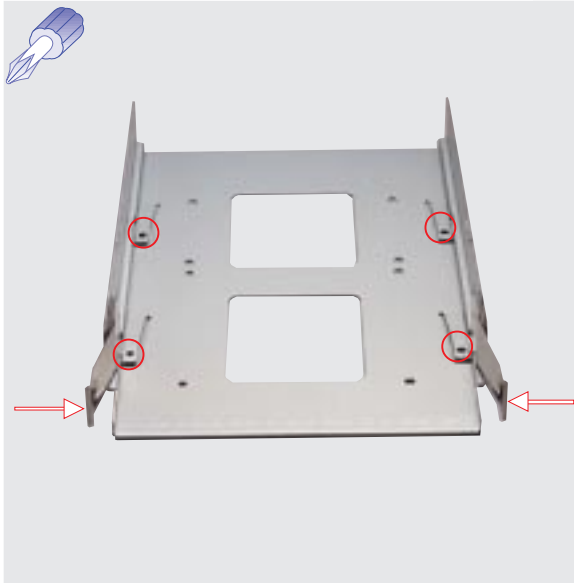
The DA3000 RAID controller is equipped with two SIMM sockets. A minimum of 8 MB of DRAM in one SIMM is required for it to operate.

SIMM Memory Installation Procedures:

1. The SIMM memory modules will fit in only one orientation as shown because the plastic safety tab on one end of the SIMM socket requires the notched end of the SIMM memory modules.
2. Press the memory module firmly into place starting from a 45-degree angle, making sure that all the contacts are aligned with the socket.
3. With your fingertips, rock the memory module into a vertical position so that it clicks into place. The plastic guides should go through the two mounting holes and the clips should snap.

To release the memory module, push both clips outward and rock the module out of the clips.

II. System Components



Fixed Storage Device Tray

The DA3000 is mounted on a removable tray, secured by four screws (as circled).

A metal clip on each side of the device tray (as pointed to) secures the tray in place. To release the tray, press these clips in with your fingers .

Fixed Device Spacer

Insert the device tray along with the DA3000 into the device bay. Cover it with a spacer to complete the installation.

Fixed Device Spacer



II. System Components

• 2-6. Front Panel of the DA3000 RAID Controller

The front panel of the DA3000 RAID controller consists of an LCD display, keypad and status LEDs, which allow you full access to status information and complete control of the RAID operation.

For configuration and operation on the DA3000 RAID controller, refer to its User's Manual.



Front View

LEDs/Keys Function Description

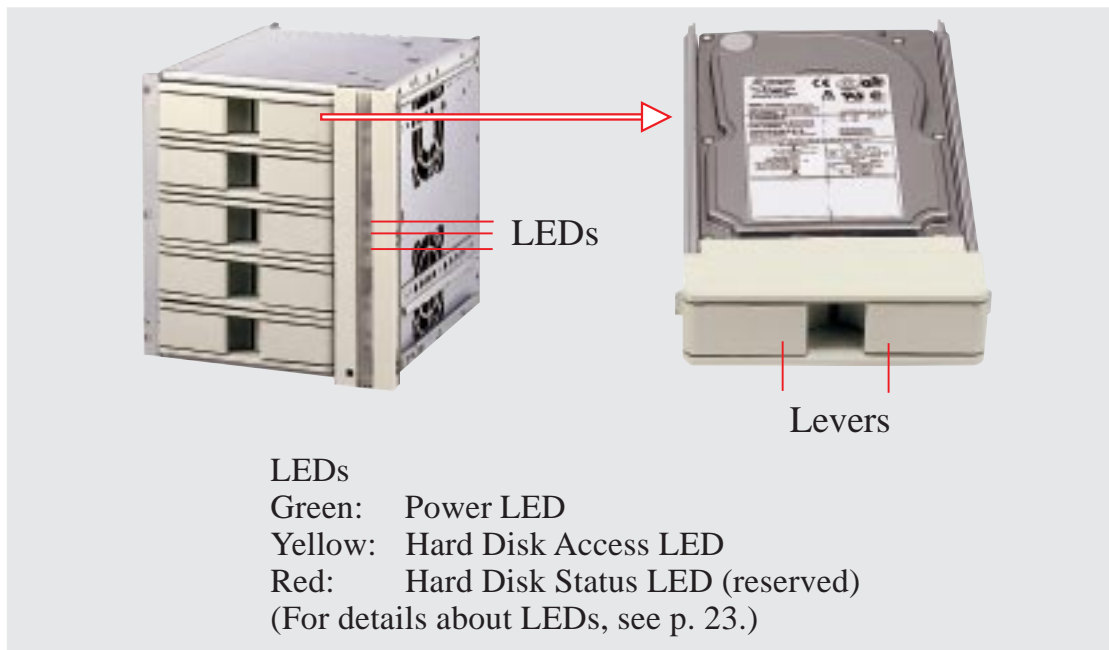
POWER	Lights when the controller receives power from the power supply
BUSY	Flashes when data is being accessed; dims when there is no activity; lights when there is unprocessed data stored in cache memory
ATTEN	Lights when an error occurs or the controller needs attention
▼▲	Scrolls upward or downward through available options
ENT	Brings up a selection or executes an option
ESC	Returns to the previous menu or cancels a selection

II. System Components

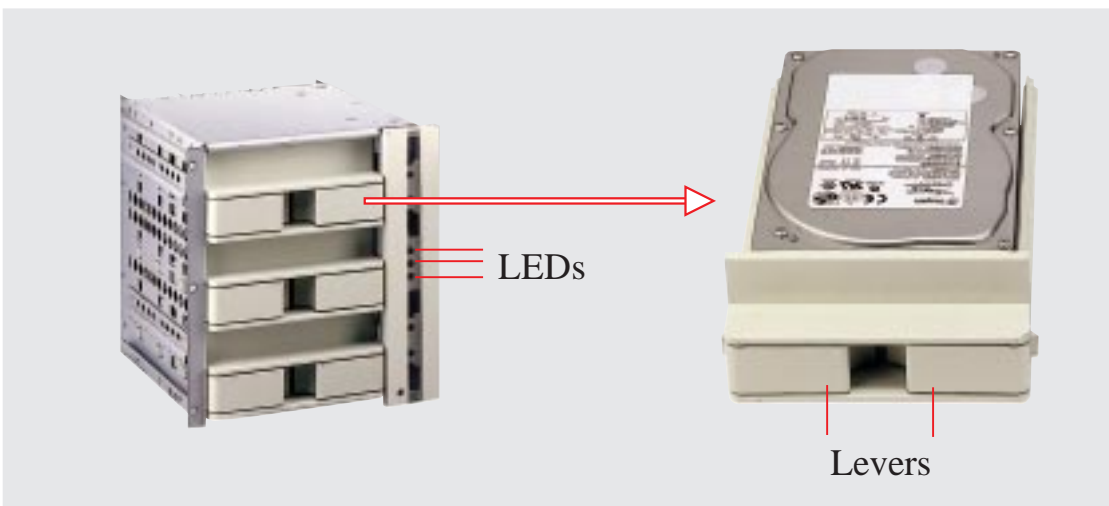
• 2-7. Hot-Swap SCA Hard Drive Modules

Maximum uptime in a system requires devices that can be easily replaced or “swapped.” The main hard drives are mounted in internal hot-swap trays for easy replacement. The AR1000 hot-swap bay has two different models: Five-tray hot-swap bay and three-tray hot-swap bay. The 1.0 inch SCA hot-swap bay can accommodate five 1.0 inch hard disk drives. The 1.6 inch SCA hot-swap bay can accommodate three 1.6 or 1.0 inch hard disk drives.

Five-Tray Hot-Swap Bay



Three-Tray Hot-Swap Bay

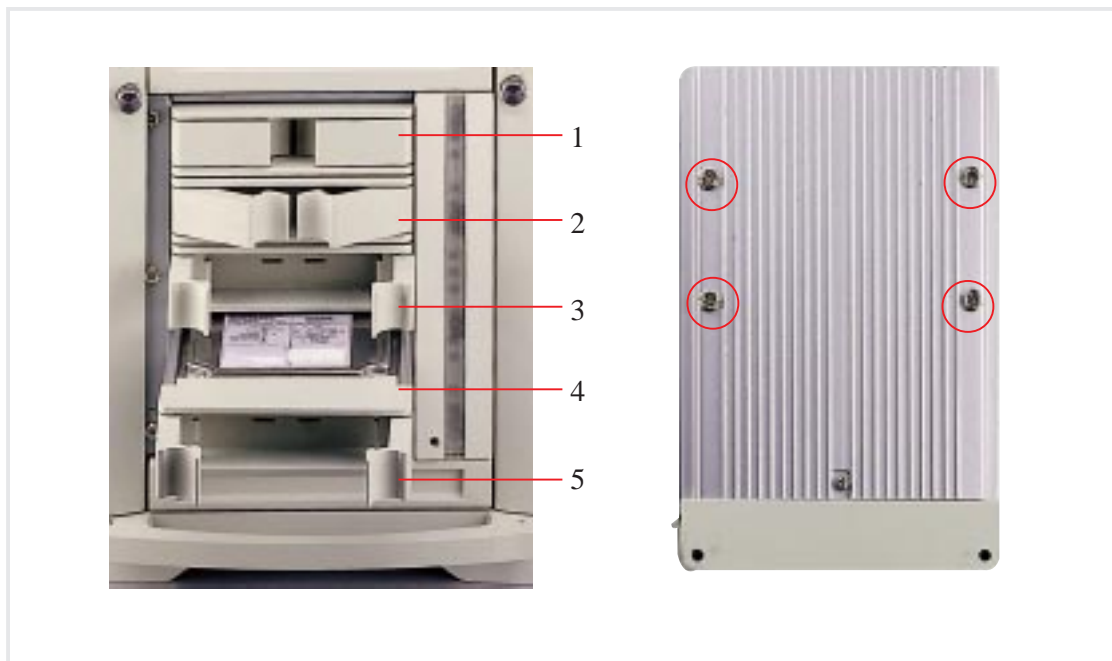


IMPORTANT



The SCA hot-swap tray only supports 80-pin SCA SCSI hard disk drives.

II. System Components



Hot-Swap Tray

There are two levers on the front of the hot-swap tray to help release or lock the tray. To remove the tray, extend both levers and pull on both levers. To install the tray, push the tray firmly into the bay with the levers extended, then close the levers.



Hot-Swap Bay

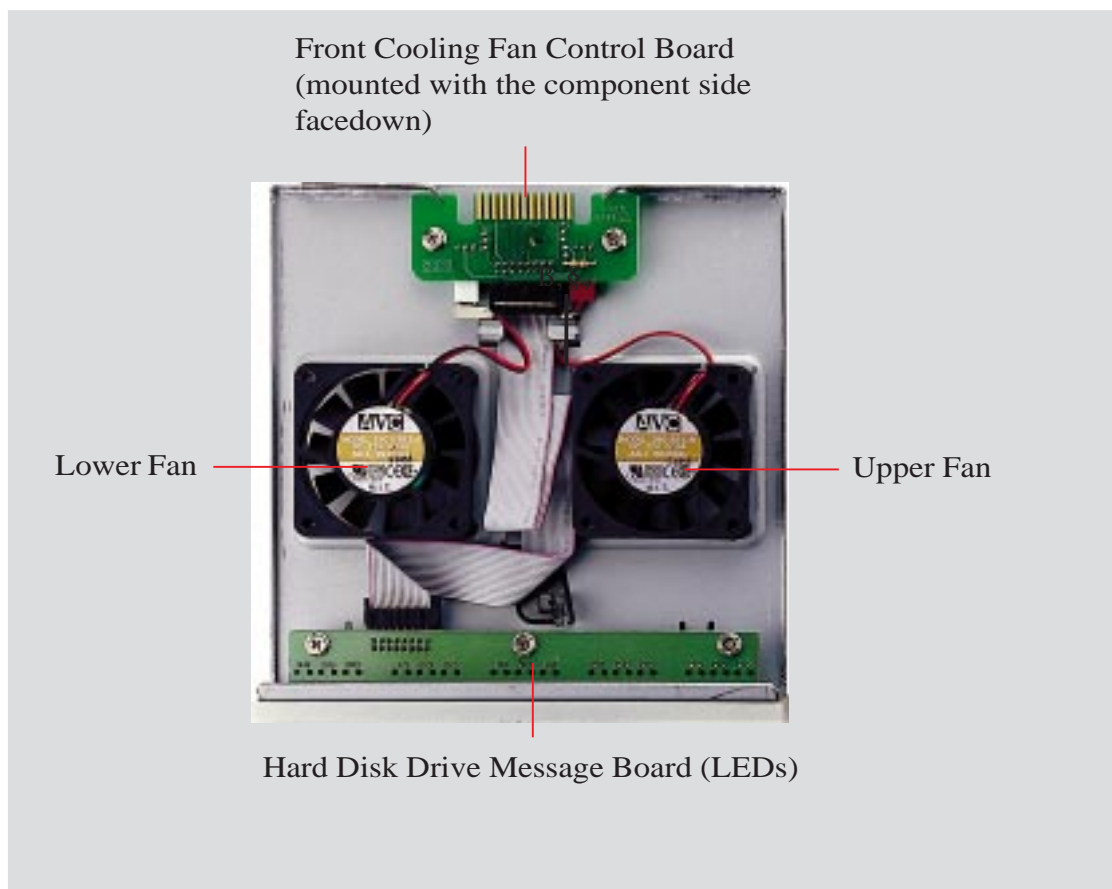
To remove the hot-swap bay, first release the front cooling fans first by pressing the eject mechanism with a small screwdriver. Remove the six retaining screws as circled above and then the entire hot-swap bay can be slid out of the chassis.

II. System Components

• 2-8. Front Cooling Fans

The front cooling fan module consists of a control board, a hard disk drive LED status board, and two cooling fans. The message LED board mounted in the front of the cooling fan module consists of five sets of LEDs to represent the status of up to five hard disk drives. Each set has three LEDs which can show the power, activity, and status of each hard disk drive.

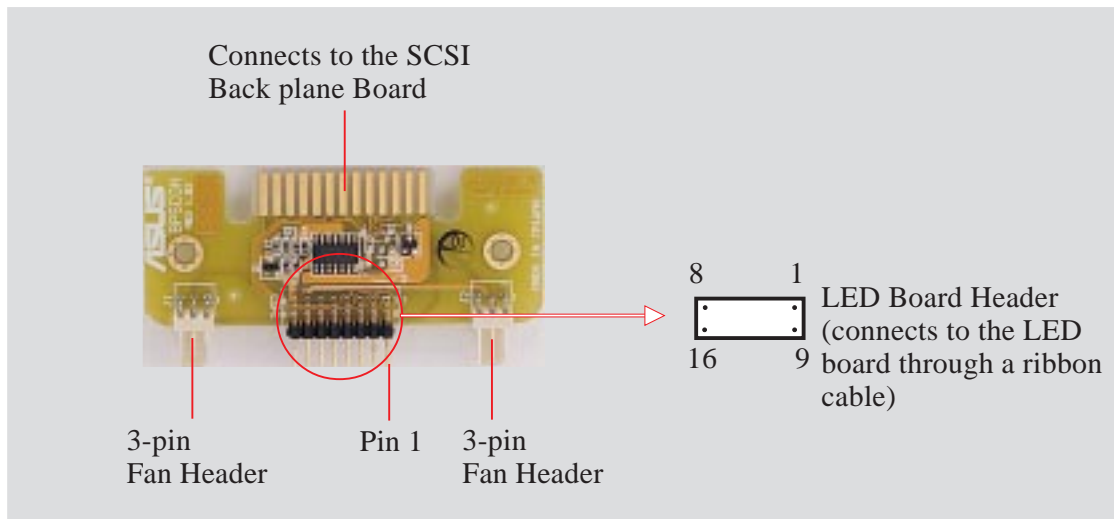
The front cooling fans' main purpose is to cool the hard disk drives. There are two individual 2 1/4 inch (6 cm) fans secured by four screws on each fan. These fans can be removed by using a small screwdriver to push the eject mechanism in the fan module. (See page 21.)



IMPORTANT

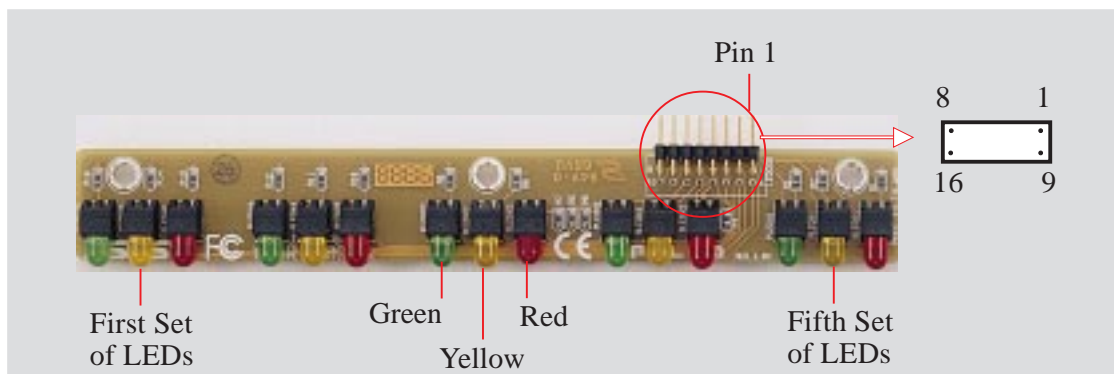
Usually, the rotation of the fan sends air toward the manufacturer's label on the center of the fan. If replacing the fans, be sure that the fans are orientated as shown.

II. System Components



Front Cooling Fan Control Board

A cable connects the front cooling fan control board and the hard disk drive message board. Orient the red markings on each end of the cable to pin 1.



Hard Disk Drive Message Board

Orient the red markings on the other end of the cable to pin 1. If the fifth set of LEDs fails, it may be indicating a faulty front cooling fan control board. If this is the case, remove the control board and send it back to the vendor.

Message LED Description

Green: Power LED

Yellow: Hard Disk Access LED

Red: Hard Disk Status LED

Power LED	Status LED	Description
off	off	Power subsystem OK and ready for hard drive insertion
on	off	Hard disk drive ready for operation
on	on	Hard disk drive failure (*)
on	fast flash	RAID rebuilding (*)
on	slow flash	Hot-spare hard disk drive ready (*)
fast flash	on	Hard disk drive failure/short circuits
fast flash	fast flash	Fan failure

* The function must be supported by the RAID controller's SAF-TE function.

II. System Components

• 2-9. SCSI Backplane

The SCSI backplane of this system is comprised of two SCSI backplane boards (DA-BP5) with 68-pin SCSI connectors (used by the system), 80-pin SCA connectors (used by the hard drives), power inputs, and SCSI ID dip switches. This configuration allows Ultra2 SCSI SCA hard disk drives to be docked into the system. The DA-BP5 SCSI board does not have built-in termination. Therefore, the included terminator block must be used on the end connector.

II. Components
SCSI Backplane

SCSI Backplane Board Front Side

SCSI ID Select DIP Switches


PWR3 Connector

PWR2 Connector

PWR1 Connector

SMB Out

SMB In



This connector either connects to the RAID controller through the Ultra2 cable or is terminated

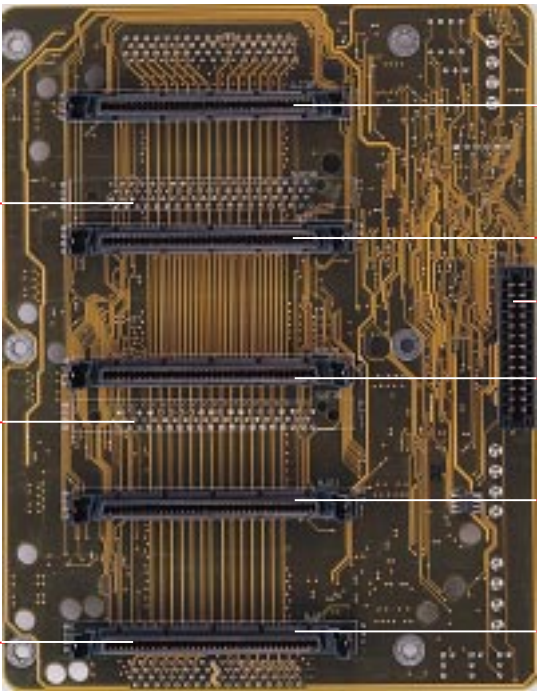
This connector must connect to a SCSI device or be terminated.

SCSI Backplane Board Back Side

1.6" Tray Connector #5B

1.6" Tray Connector #3B

1.6" Tray Connector #1



1" Tray Connector #5

1" Tray Connector #4

Fan Control Board Connector

1" Tray Connector #3

1" Tray Connector #2

1" Tray Connector #1

IV. Hardware Setup

• 2-10. SCSI ID Setting

SCSI ID settings are made through DIP switches located on the SCSI board. The SCSI board has four dip switches to set the hard drive's motor up delay time and SCSI ID.

SCSI ID Setting

IDSEL1	IDSEL0	Slot1	Slot2	Slot3A/3B	Slot4	Slot5A/5B
off	off	Reserved				
on	on	15	12	11	8	3
on	off	14	9	6	4	1
(*) off	on	13	10	5	2	0

(*) Default

Hard Disk Drive Motor Up Delay

RMT_START	DLY_START	Description
off	off	Motor (spin) up when powering on
on	off	Motor (spin) up after START UNIT command
(*) off	on	Motor (spin) up after 12xSCSI ID ms
on	on	Reserved

(*) Default

SCSI ID Dip Switches

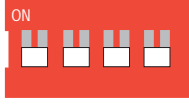





For Five-Tray SCA Hard Drive Model

	IDSEL1	IDSEL0	Slot1	Slot2	Slot3A	Slot4	Slot5A
 IDSEL 1=off IDSEL 0=off	off	off	Resv.				
 IDSEL 1=on IDSEL 0=on	on	on	15	12	11	8	3
 IDSEL 1=on IDSEL 0=off	on	off	14	9	6	4	1
 IDSEL 1=off IDSEL 0=on	off	on	13	10	5	2	0

IV. Hardware Setup

For Three-Tray SCA Hard Drive Model

	IDSEL1	IDSEL0	Slot1	Slot3B	Slot5B
 IDSEL 1=off IDSEL 0=off	off	off	Resv.		
 IDSEL 1=on IDSEL 0=on	on	on	15	11	3
 IDSEL 1=on IDSEL 0=off	on	off	14	6	1
 IDSEL 1=off IDSEL 0=on	off	on	13	5	0

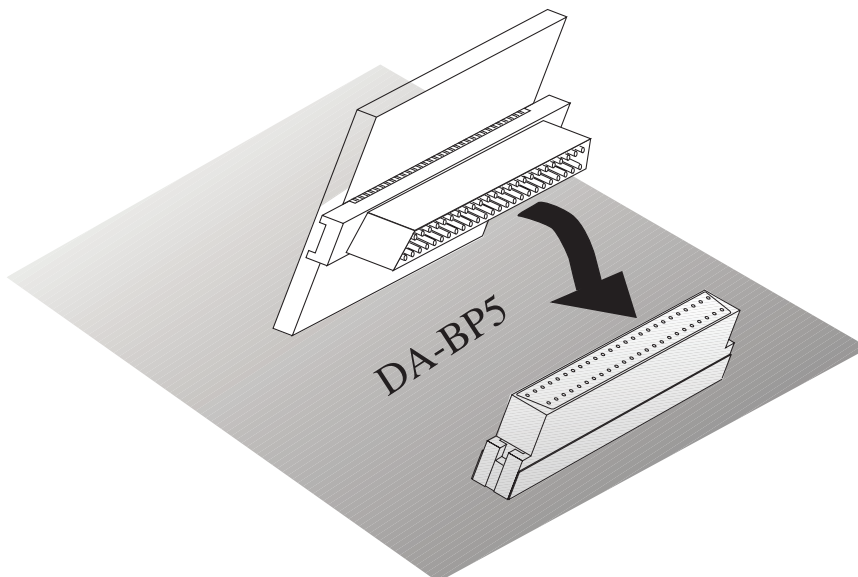
NOTE



Remove SCSI ID jumpers on the SCSI hard drive before placing it into the hot-swap tray. Read the user's manual of the hard drive for the location of the jumpers.

• 2-11. SCSI Termination

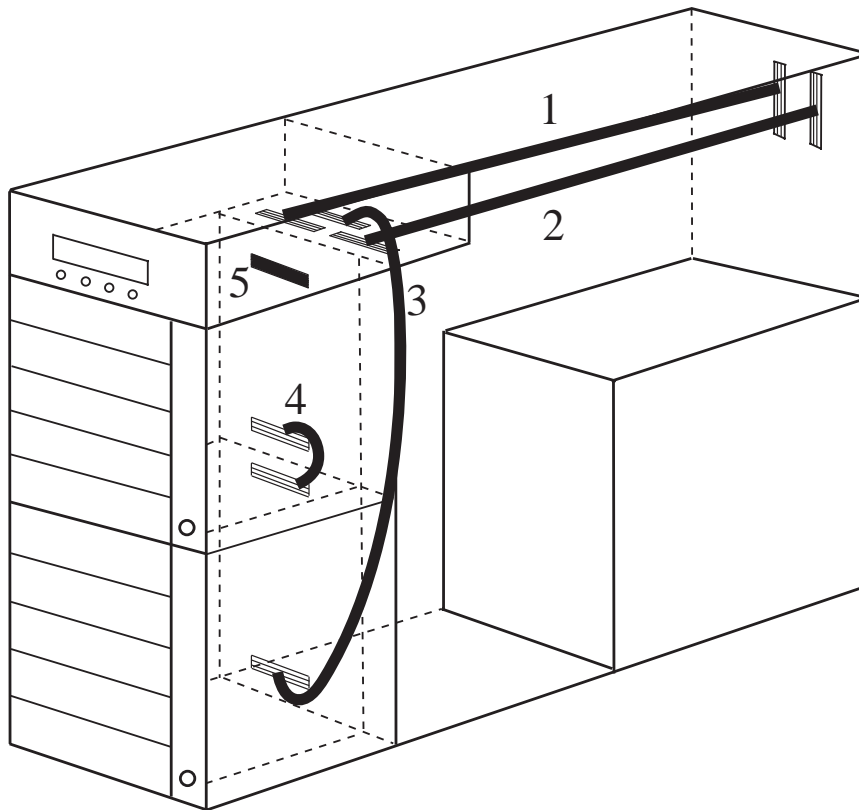
Terminating the SCSI bus "chain" is necessary for SCSI devices to work properly. Therefore, every SCSI connector on the DA-BP5 SCSI backplane should either connect to a SCSI device or be terminated with an Ultra2 SCSI terminator as shown below.



IV. Hardware Setup

• 2-12. SCSI Cabling-1 (Default)

Cabling the RAID Controller to Two Host Computers



1. Channel 1 connects to Host Computer 1.
2. Channel 2 connects to Host Computer 2.
3. Channel 0 connects to the SCSI backplane.
4. The two SCSI backplanes are linked together.
5. The top SCSI backplane is terminated.



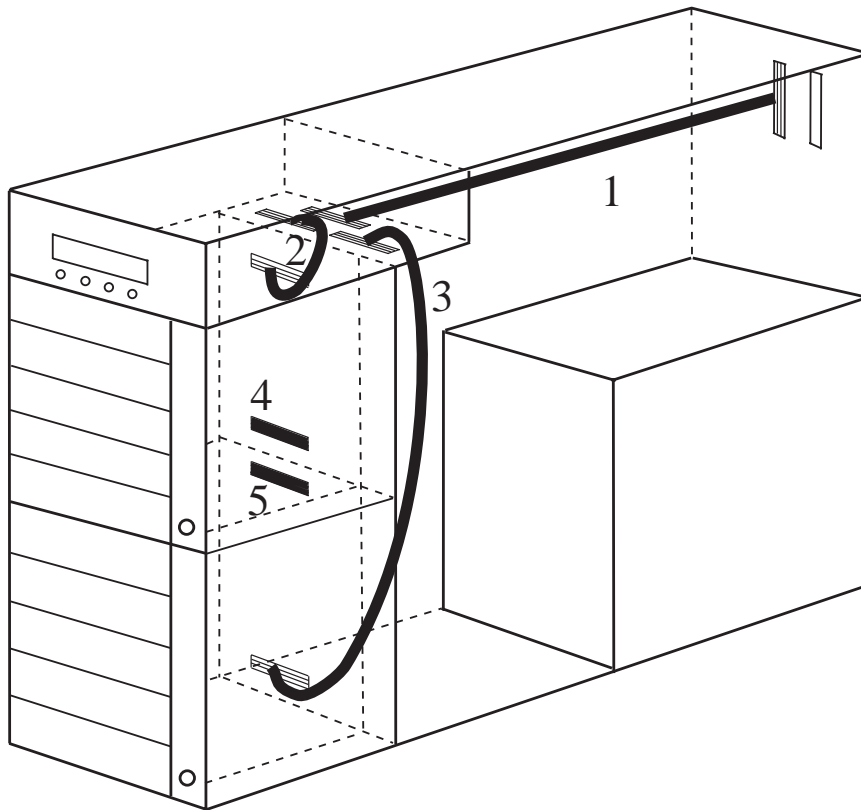
IMPORTANT

- This is the default setting of the DA3000 RAID controller: Channel 1 and Channel 2 are assigned to the host channels and Channel 0 is assigned to the drive channel.
- This configuration can be applied to the following conditions:
 1. Redundant host computers share the same disk array(s).
 2. Separate host computers use different disk arrays.
 3. Only one host computer uses the disk array(s) and Channel 2 is reserved.
- With this configuration, Channel 0 (the drive channel) can connect up to 10 physical drives.
- Disk drives connecting to the two DA-BP5 SCSI backplanes must have different SCSI IDs.

IV. Hardware Setup

• 2-13. SCSI Cabling-2

Cabling the RAID Controller to One Host Computer



1. Channel 0 connects to the Host Computer.
2. Channel 1 connects to the top SCSI backplane.
3. Channel 2 connects to the bottom SCSI backplane.
4. The top SCSI backplane is terminated.
5. The bottom SCSI backplane is terminated.

IMPORTANT

- This setting allows one host computer and two drive channels to be used. Channel 0 is assigned to the host channel while Channel 1 and Channel 2 are assigned to the drive channels.
- With this configuration, every drive channel supports up to 5 physical drives.
- Disk drives connecting to the two DA-BP5 SCSI backplanes may have identical or different SCSI IDs.

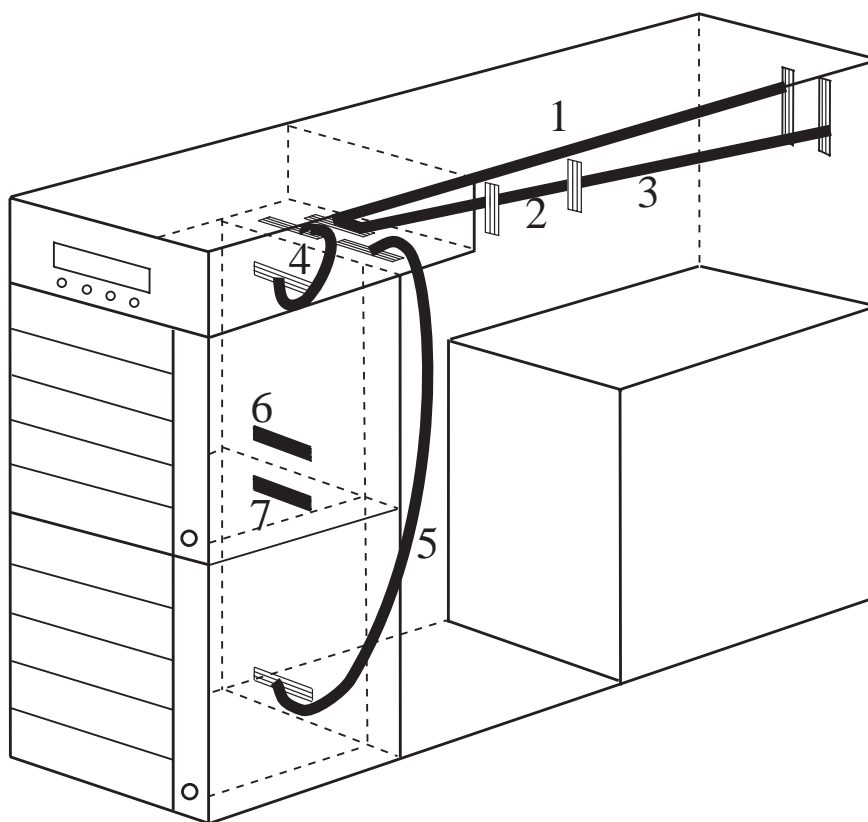
NOTE

Read the DA3000 User's Manual for how to switch a drive channel to a host channel.

IV. Hardware Setup

• 2-14. SCSI Cabling-3

Cabling the RAID Controller with Other SCSI Devices



1. Cable 1 connects the host computer to Channel 0.
2. A 5-cm SCSI cable with 2 female connectors connects Cable 1 and Cable 3.
3. Cable 3 connects to another AR1000 or SCSI device.
4. Channel 1 connects to the top SCSI backplane.
5. Channel 2 connects to the bottom SCSI backplane.
6. The top SCSI backplane is terminated.
7. The bottom SCSI backplane is terminated.

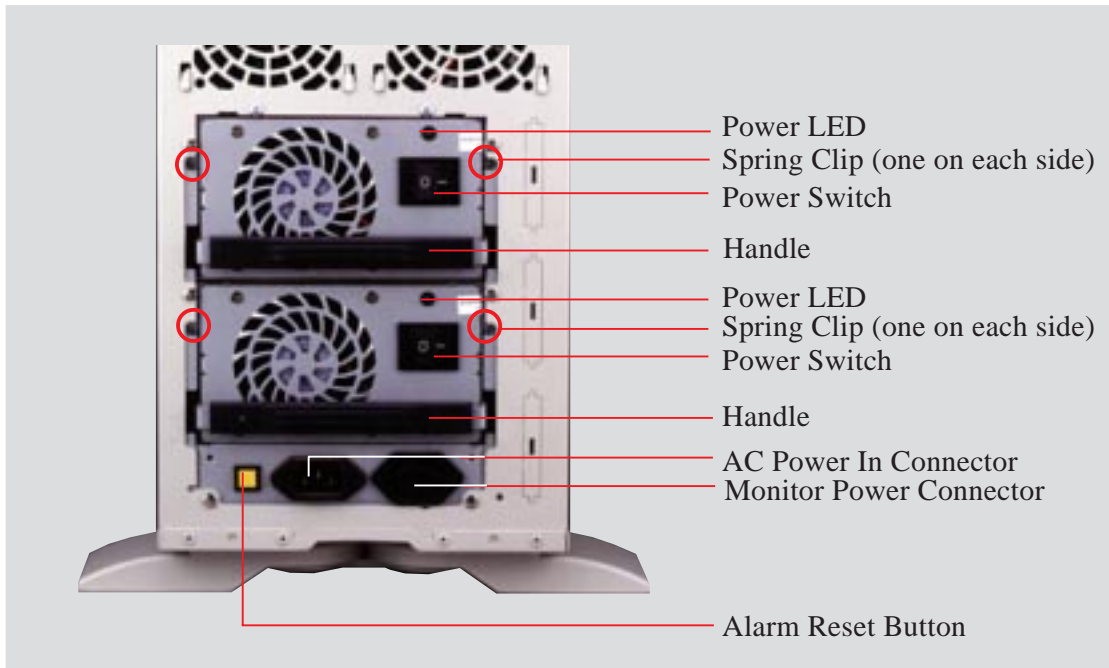


IMPORTANT

- This setting allows the connection of multiple AR1000 RAID systems or other SCSI devices. Channel 0 is assigned to the host channel while Channel 1 and Channel 2 are assigned to the drive channels.
- With this configuration, every drive channel supports up to 5 physical drives.
- Disk drives connecting to the two DA-BP5 SCSI backplanes may have identical or different SCSI IDs.
- All DA3000 RAID controllers on the SCSI chain must have different SCSI IDs.

IV. Hardware Setup

• 2-15. Power Supply



Power Supply Placement

The redundant power supply, located in the back of the chassis, consists of one frame and two identical AT power modules. The LED indicators light when both the input and output voltages are stable, and dim when either the input or output voltage fails. A button located on the bottom-left corner of the power supply disables the sounding of the audible alarm.



Replacing One Power Supply Module



Remove all cords connecting to the failed power module. The power supply module is secured by two spring clips (as circled above) and two hooks. To remove the power module, use a screwdriver to push in the clips and then slide the power module out. Insert a working power supply module.



Removing the Entire Power Supply Unit

Unplug all cords connecting to the power supply unit. Remove the eight screws securing the power unit. Remove the side panel and then push the power unit out of the chassis.

NOTE

The alarm will sound if any of the power supply unit is not turned on before the system is powered on.

IV. Hardware Setup

Power Module Rating

The power modules are rated at 350W each and have passive current sharing on all outputs. Each power module supplies up to 350W to share the load, but two modules combined do not provide 700W. If one power module fails, 350W load is supported by using the other power module.

NOTE

This product has autoranging input to accommodate 220V-240V or 110-120V. You do not have to set it manually.

Power Module Failure

If any of the power modules fails to provide a voltage on any of its outputs, an audible alarm (located in the frame) will sound and the failed power module's LED will turn OFF. The power module's status LED lights when both input and output voltages are stable and darkens if either the input or output voltages fail. If the alarm sounds, perform the following steps:

1. Remove the power cord to the failed power module (with unlit LED).
2. Remove the two screws and slide the failed power module out. The alarm should stop. If not, there may be a problem with the other module or with the redundant power supply frame (very unlikely).
3. Reinsert the failed power module and plug in the AC cord to confirm.
4. If the alarm sounds again, remove the failed power module and replace it with a good one as soon as possible.

IV. Hardware Setup

2-16. Power Supply Information

Output Voltage Regulation, Ripple, and Noise

Output Voltage Limits (Vdc)				Ripple/Noise
Output	Min	Nom	Max	Maximum
1	4.75V	5.00V	5.25V	50mV _{p-p}
2	11.40V	12.00V	12.60V	120mV _{p-p}
3	-4.50V	-5.00V	-5.50V	120mV _{p-p}
4	-10.92V	-12.00V	-13.20V	120mV _{p-p}

Output Current Capacity

Output	Nom (Vdc)	Max (A)	Min (A)
1	5.0V	40.0	3.0
2	12.0V	12.0	1.5
3	-5.0V	0.5	0.0
4	-12.0V	0.5	0.0

Input Voltage

Range	Min (V)	Nom (V)	Max (V)
Range 1	90	115	132
Range 2	180	230	264

Safety

The power system meets all applicable clauses for UL 1950 2nd edition without D3 deviations. The power system passes all tests for CUL and TUV safety.

EMI

The power system, operating with resistive load, meets FCC class B and CISPR 22 class B conducted limits.