DSS-3 Hardware Description

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Scalable I/O Architecture
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Figures

Tables

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This revision changes the title of the document to match document contents; removes field replacement and installation procedures; adds references to *PC-10 Field Replacement Procedures* and *DSS-3 Hardware Migration Procedure*; and makes minor corrections.

Product Overview

The DSS-3 disk subsystem provides up to 99.2 Gbytes of data storage in a compact, rack-mounted peripheral enclosure. The enclosure contains a maximum of four 5.25-in. DD-501 disk drives with two separate, common power supplies. The disk drives and the power supplies may be replaced during normal system operation, which provides a high degree of equipment resiliency.

NOTE: In this document, the term “CRAY J90 series system” refers to any CRAY J90 system configuration except a CRAY J90se series system.

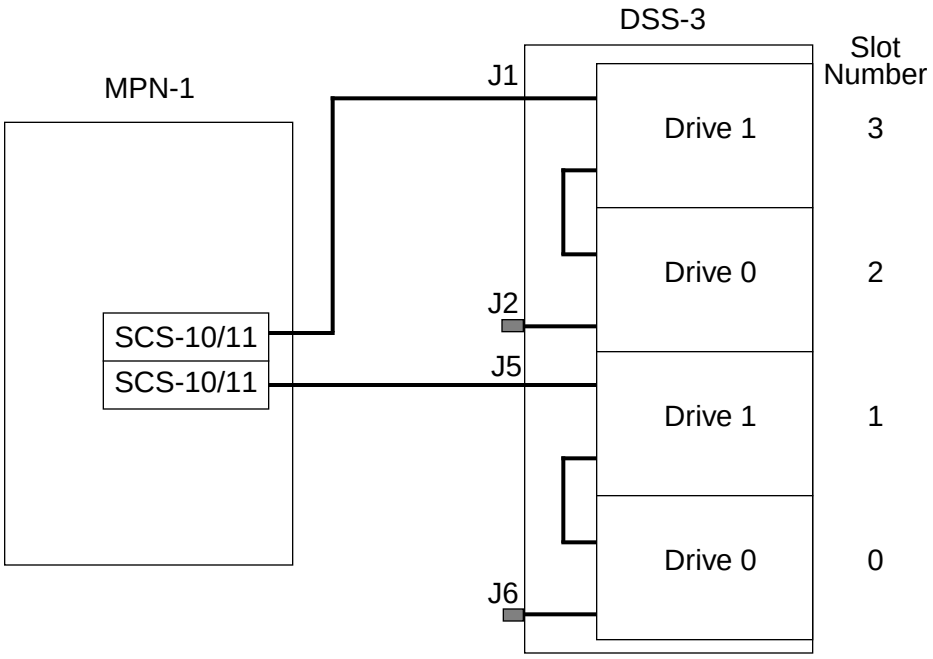
Functional Description

Figure 1 provides a functional block diagram of the DSS-3. An I/O cable connects each DSS-3 disk drive to an I/O channel connector, in either a CRAY J90 series system or a multipurpose node (MPN-1) interface on a Cray Research GigaRing I/O channel. The interface protocol is the small computer system interface (SCSI) standard protocol.

An SI-3 controller provides the interface from the DSS-3 to a CRAY J90 series system; an SCS-10 or SCS-11 controller in the MPN-1 provides the interface to a GigaRing channel in a CRAY J90se series system.

As shown in Figure 1, drives may be daisy chained for greater channel capacity (although this limits individual channel accessibility). A terminator must be plugged onto the back panel of the DSS-3 enclosure to terminate each channel.

Figure 1. DSS-3 Block Diagram



NOTE: Each SCSI channel requires termination, as shown on connectors J2 and J6.

Physical Description

The DSS-3 is 5 standard units (SU) high, which is 8.75 in. or 22.2 cm (1 SU equals 1.75 in. or 4.44 cm). This enclosure contains disk drives in removable canisters, redundant power supplies, and connectors for data cables and subsystem status cables.

DSS-3 Enclosure

The DSS-3 enclosure can contain up to four field replaceable SCSI disk drives. The enclosure also contains two power supplies, two cooling fans, internal SCSI cables, a warning and control system (WACS) interface printed circuit board (PCB), and a backplane PCB; all are field replaceable units (FRUs).

Figure 2 shows the DSS-3 front panel open for access to the disk drives. The front panel has two latches that release (when unlocked) to allow the front panel to open and swing down. (Figure 7 shows the rear panel of the DSS-3.)

Figure 2. Disk Drive Locations

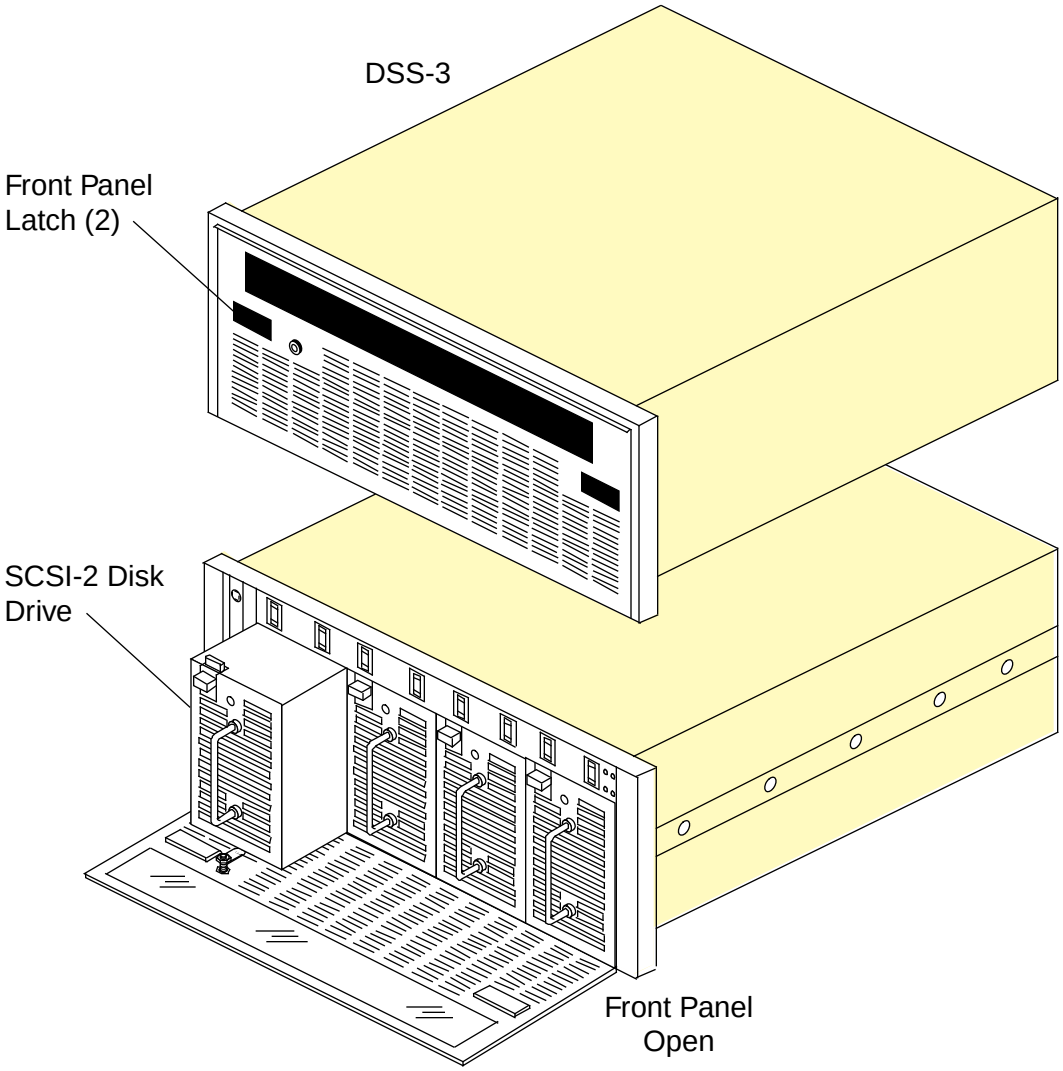
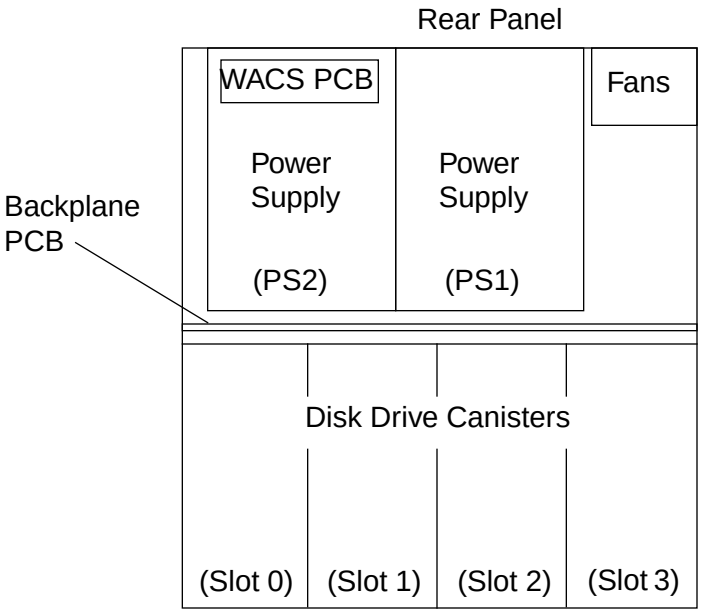


Figure 3 shows a top-down view of the contents of the DSS-3 enclosure with the top panel removed. The backplane PCB distributes DC power to all drives and to the two fans.

The WACS PCB in the DSS-3 provides power supply and fan status signals to the warning and control system (WACS) in the PC-10 cabinet. During power-up, the backplane sequences power to the drives to minimize surges in the power supply currents.

Figure 3. DSS-3 Layout

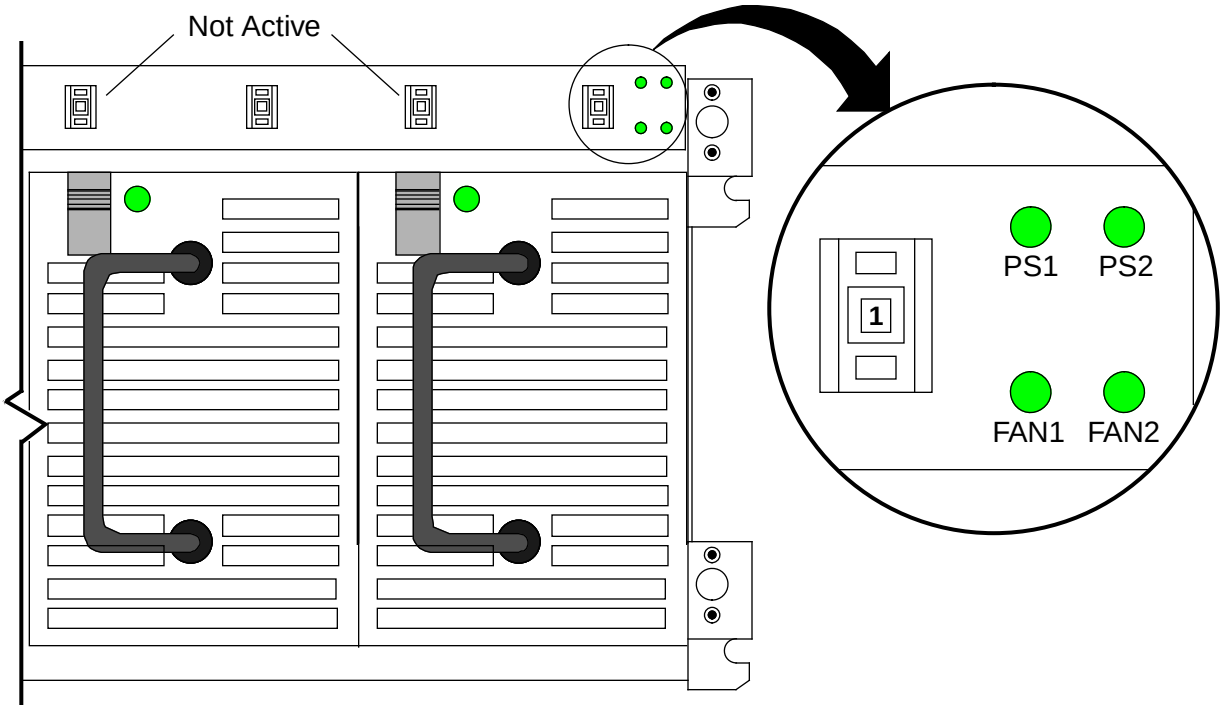


Enclosure Switches and Indicators

A device ID switch above each drive identifies the drive with a unique device number that ranges from 0 through 15 (IDs 7 and 15 are typically reserved for the SCS-10 controller). The switch displays the selected number, as shown in Figure 4.

NOTE: Of the two ID switches above each disk drive, the one to the right sets the device address. The one to the left sets the address for the device slot that does not have a disk drive plugged into it. (The backplane PCB contains 8 connectors for half-height disk drives; the DSS-3 holds only 4 full-height drives.)

Figure 4. Enclosure LEDs and Drive ID Switch



Two bicolor LEDs (PS1 and PS2), on the upper-right corner of the front panel, display the status of the two power supplies. Each indicator is green when its power supply is operating properly and red when a power supply fault occurs.

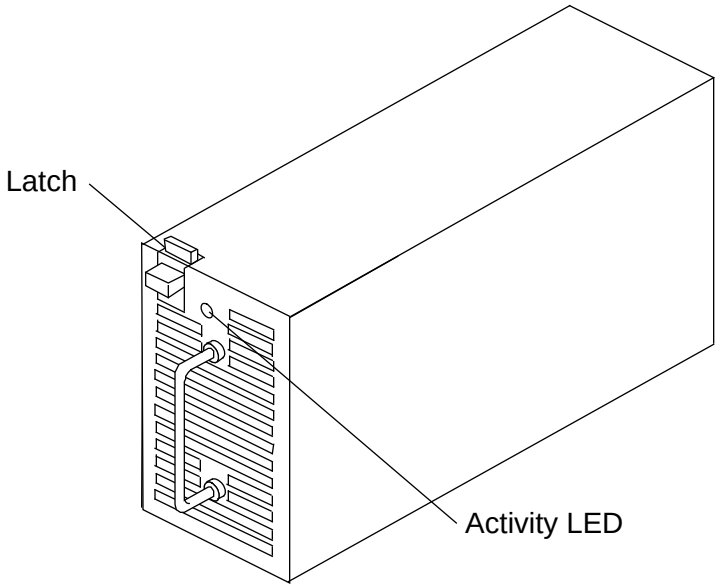
Two bicolor LEDs (FAN1 and FAN2), which are located below the power supply status indicators, display the status of the two cooling fans on the rear panel of the enclosure. Each indicator is green when its fan is operating properly and red when a fan fault occurs.

Disk Drive (DD-501)

Each DSS-3 disk drive (designated DD-501) is mounted in a canister that plugs into the enclosure. Figure 5 shows the front panel of the disk drive in its canister. DSS-3 drive storage capacity is 24.8 Gbytes.

DD-6S disk drives (DDS-30) may be migrated from a CRAY J90 series system to the DSS-3 enclosure as described in the *DSS-3 Hardware Migration Procedure*, CRI publication HMU-385-0.

Figure 5. DSS-3 Disk Drive Front Panel



CAUTION

The disk drive is susceptible to mechanical damage if improperly handled. Observe the handling and packing precautions that are provided with the DSS-3 and replacement disk drives.

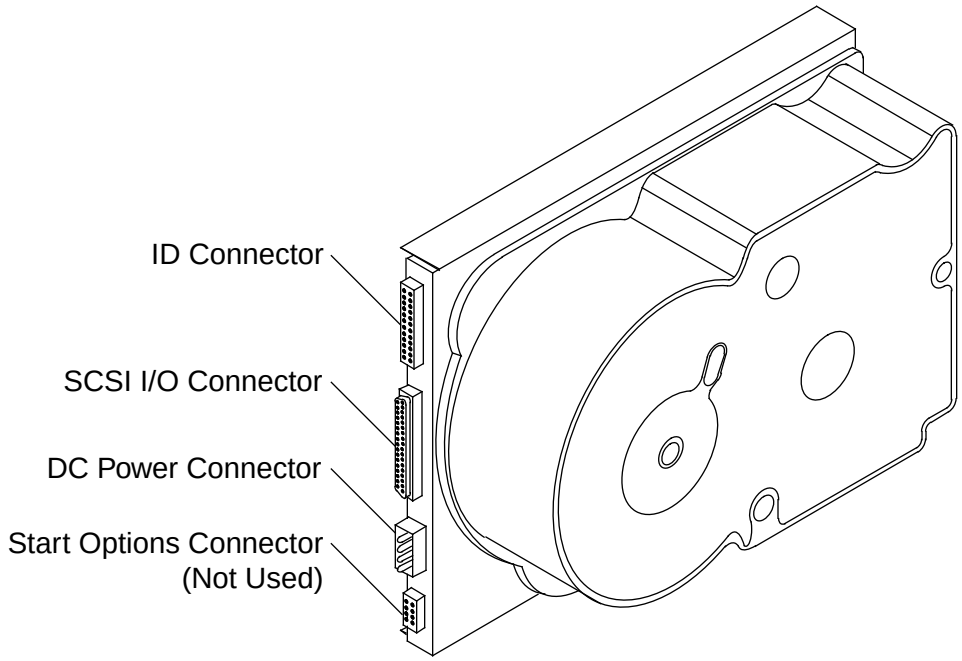
The front panel of the drive includes a swing-out, bail-style handle, a thumb-release latch, and a green activity status LED. The latch snaps into a slot in the enclosure and holds the drive securely. When you install the drive, be sure to push the drive firmly into the enclosure to seat the connector.

You must release the latch before you can pull the drive from the enclosure. During operation, the illuminated activity LED indicates that the drive is in the process of reading or writing data.

NOTE: You will lose data if you power down or unplug the drive while the activity LED is illuminated.

As shown in Figure 6, the drive has a DC power connector, a drive ID connector, and a SCSI I/O connector on the rear panel. Cables within the disk drive canister plug onto these connectors and carry data, control, and power between the drive and a 96-pin connector on the rear panel of the drive canister. This arrangement enables automatic signal, power, and control connections during insertion and removal of the drive (in its canister) from the front of the DSS-3 enclosure. The "Cabling Guidelines" section, which begins on page 14, lists connector pinouts of the SCSI I/O connector, the DC power connector, and the ID connector.

Figure 6. DSS-3 Disk Drive (Removed from Canister)



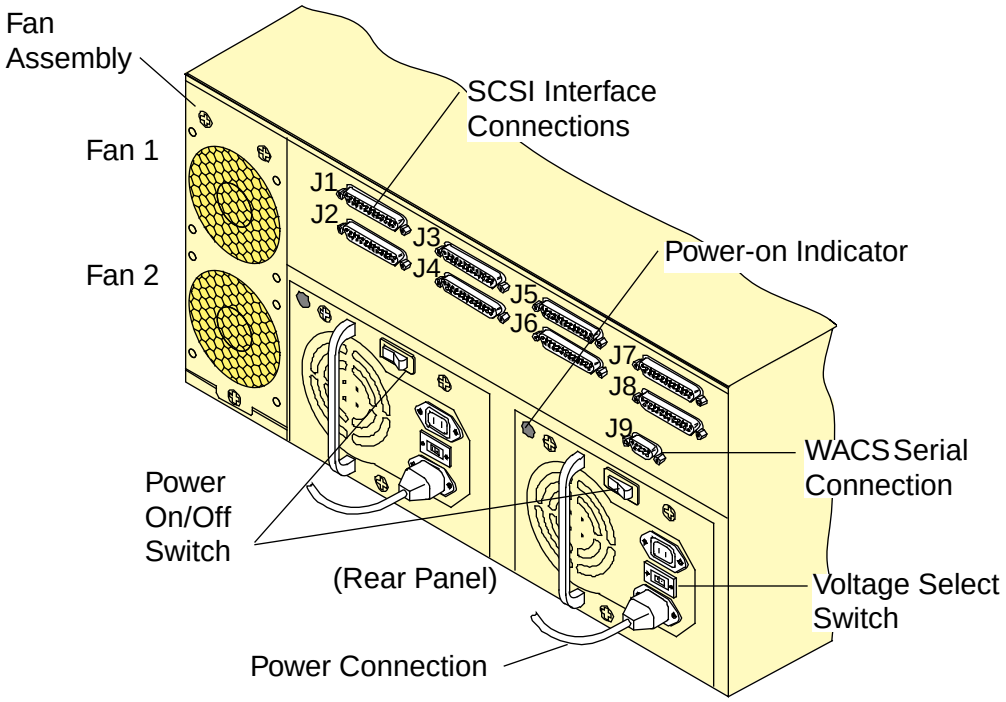
Air that is drawn in through the enclosure front panel cools the drive. Power supply fans and enclosure fans create this air movement.

NOTE: Proper drive cooling requires adequate airflow. Never operate the DSS-3 without the enclosure top panel in place. Always cover any open drive slots in the enclosure front panel to avoid loss of airflow through operating disk drive canisters. Never block airflow through the front panels of either the enclosure or the disk drives.

Power Supply

The two DSS-3 power supplies, shown in Figure 7, are connected in parallel; each is capable of providing power for all drives within the enclosure. This redundant (N+1) configuration enables the disk drive subsystem to continue operating if one of its two power supplies fails and needs to be replaced.

Figure 7. DSS-3 Power Supplies



Each power supply has a power on/off switch that is accessible from the rear of the enclosure. A green power-on indicator, which is part of the DSS-3 enclosure, indicates a functioning power supply.

NOTE: Each power supply may contain a voltage select switch (labeled 115/230) that is located just above the power cable connector. Make sure this switch is set for the proper line voltage (230) before you turn on the power supply.

Each power supply is *hot swappable*, which means that it may be turned off, unplugged, and replaced without affecting normal system operation. In order to hot swap a power supply, the remaining power supply must be functioning properly. In addition, the rear panel must not be open for more than a few seconds because of the constant airflow that is required for adequate drive cooling.

AC power flows to the power supplies through a Y-configuration cable, which enables either power supply to operate while the power cable is removed from the other. The upper, power-out daisy chain connector should not be used in the DSS-3.

Fan Assembly

The fan assembly is hot swappable. It may be unplugged and replaced without affecting normal system operation. The rear panel must not be open for more than a few seconds because of the constant airflow that is required for adequate drive cooling.

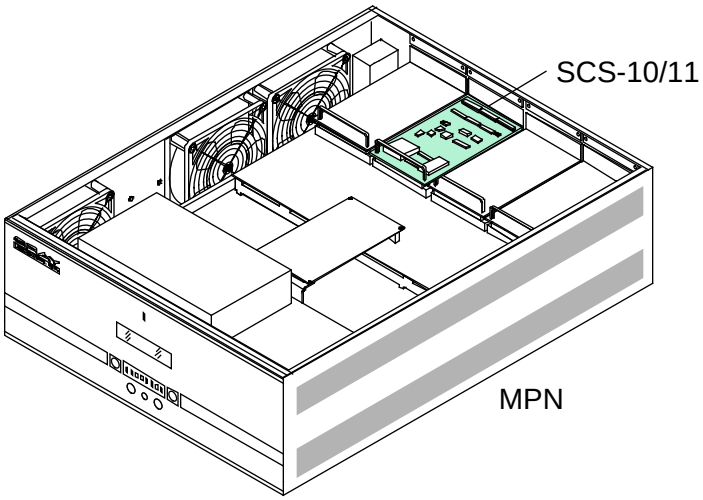
Controllers

The DSS-3 may be interfaced to either a computer system that uses a GigaRing channel for internal system communication or to a CRAY J90 series system. Each type of interface requires a different peripheral controller.

MPN Controller (SCS-10 or SCS-11)

The SCS-10 or SCS-11 peripheral controller that interfaces the DSS-3 to the GigaRing channel is an SBus-based controller that resides in the MPN as shown in Figure 8. The SCS-10 plugs into one of eight SBus slot connectors on the SBus peripheral interface (SPI) printed circuit board in the MPN. The SCS-10 provides a standard SCSI-2 protocol for transfer of 16-bit differential data to the disk drives; the SCS-11 provides a standard SCSI-3 protocol for transfer of 16-bit differential data to the disk drives. Each single-channel SCS-10 or SCS-11 controller has a single channel that provides an interface connection for a maximum of 15 SCSI devices.

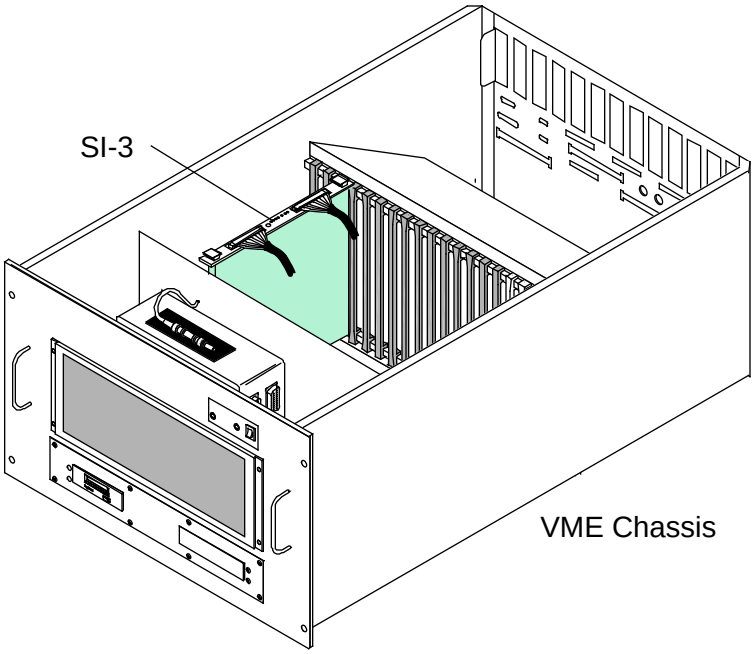
Figure 8. SCS-10 Controller in the MPN



CRAY J916 and CRAY J932 Controller (SI-3)

A VME-based peripheral controller (the SI-3) interfaces the DSS-3 to a CRAY J90 series system. The SI-3 is located in the VME chassis as shown in Figure 9. Each SI-3 supports two SCSI-2 channels. Each of these channels can provide an interface connection for a maximum of seven SCSI-2 devices.

Figure 9. SI-3 Controller in the VME Chassis



Equipment Specifications

Table 1 contains a list of physical, functional, and performance specifications for the disk subsystem and for each drive in the subsystem.

Table 1. DSS-3 Equipment Specifications

Parameter	Value
DSS-3 Specifications (installed in a PC-10 cabinet)	
Height	8.75 in. (22.2 cm) (5 SU)
Width	19.0 in. (48.3 cm)
Depth	27.5 in. (69.8 cm)
Weight	95 lb (43.2 kg) maximum
Power required	115 Vac, 1.0 Amp 230 Vac, 0.5 Amp 47 – 63 Hz
Cooling required	440 Btu/hr maximum
DD-501 Drive Specifications (installed in a DSS-3 enclosure)	
Capacity (formatted in 4096-byte sections)	24.6 Gbytes
Logical block size (sector size)	4096 bytes
Logical blocks	6,019,481
Read/write heads	28
Data cylinders	6,876
Tracks per surface	6,876
Bytes per surface	1,060 Mbytes (unformatted)
Sectors per track	24 - 36
Bytes per track	112,477 (minimum) 162,897 (maximum) 7 zones
Rotational speed	5,400 rpm
Rotational latency	5.56 ms (average)
Seek time (average)	13.0 ms (read) 14.0 ms (write)
Track-to-track seek time	1.1 ms (read) 2.1 ms (write)
Full-stroke seek time	28.0 ms
Sustained transfer rate	10.7 - 15.5 Mbytes/s
Data buffer (cashe-usable)	2,048 Kbytes (multisegmented)

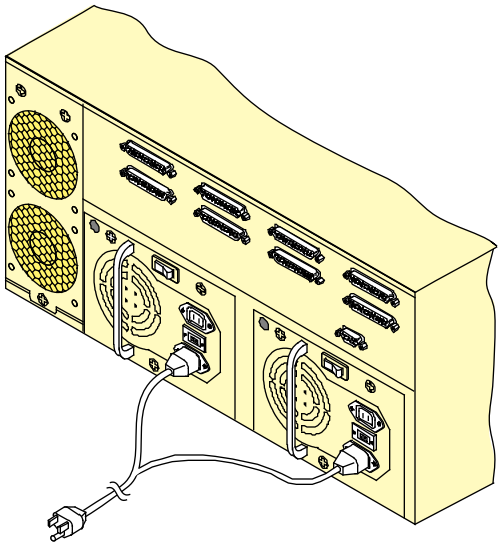
Cabling Guidelines

Power Cable

A Y-cable (refer to Figure 10) connects both power supplies to one power plug, which plugs into one of the outlets of the PC-10 power distribution strip.

NOTE: Do not use the second, daisy-chain power connector on either power supply to provide power to any other equipment; you cannot hot-swap the power supplies if you do so.

Figure 10. DSS-3 Power Cable



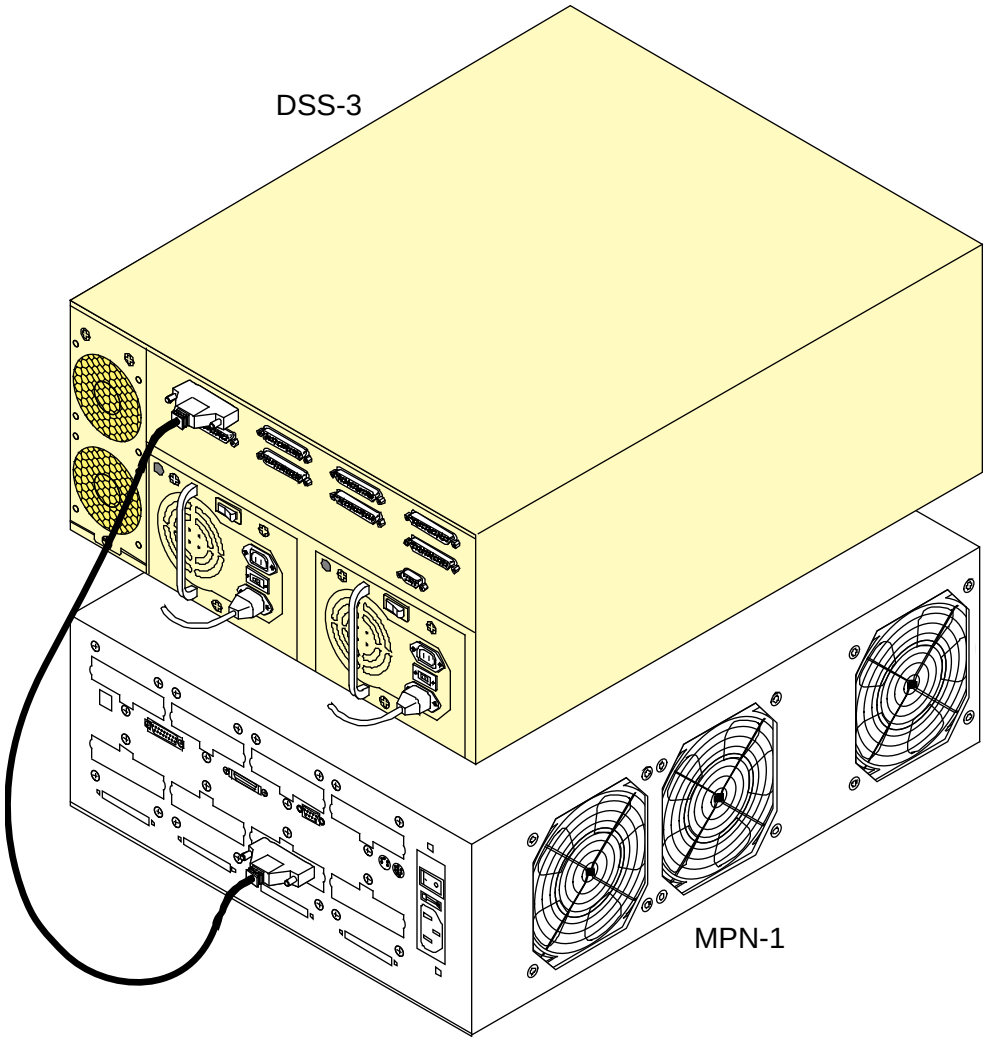
DSS-3 I/O Cable

The I/O cable between the computer system and the DSS-3 rear panel I/O (SCSI interface) connector (refer to Figure 11) has a micro-D style, 68-pin male connector. The connectors on the rear panel of the DSS-3 are labeled J1 through J8. Table 2 describes the signals that the connector carries.

Table 2. DSS-3 SCSI-2 Connector Pinout

Pin No.	Signal Name	Pin No.	Signal Name
1	+DB12	35	-DB12
2	+DB13	36	-DB13
3	+DB14	37	-DB14
4	+DB15	38	-DB15
5	+DBP1	39	-DBP1
6	Ground	40	Ground
7	+DB0	41	-DB0
8	+DB1	42	-DB1
9	+DB2	43	-DB2
10	+DB3	44	-DB3
11	+DB4	45	-DB4
12	+DB5	46	-DB5
13	+DB6	47	-DB6
14	+DB7	48	-DB7
15	+DBP	49	-DBP
16	DIFFSENS	50	Ground
17	TERMPWR	51	TERMPWR
18	TERMPWR	52	TERMPWR
19	(Reserved)	53	(Reserved)
20	+ATN	54	-ATN
21	Ground	55	Ground
22	+BSY	56	-BSY
23	+ACK	57	-ACK
24	+RST	58	-RST
25	+MSG	59	-MSG
26	+SEL	60	-SEL
27	+C/D	61	-C/D
28	+REQ	62	-REQ
29	+I/0	63	-I/O
30	Ground	64	Ground
31	+DB8	65	-DB8
32	+DB9	66	-DB9
33	+DB10	67	-DB10
34	+DB11	68	-DB11

Figure 11. DSS-3 I/O Cable



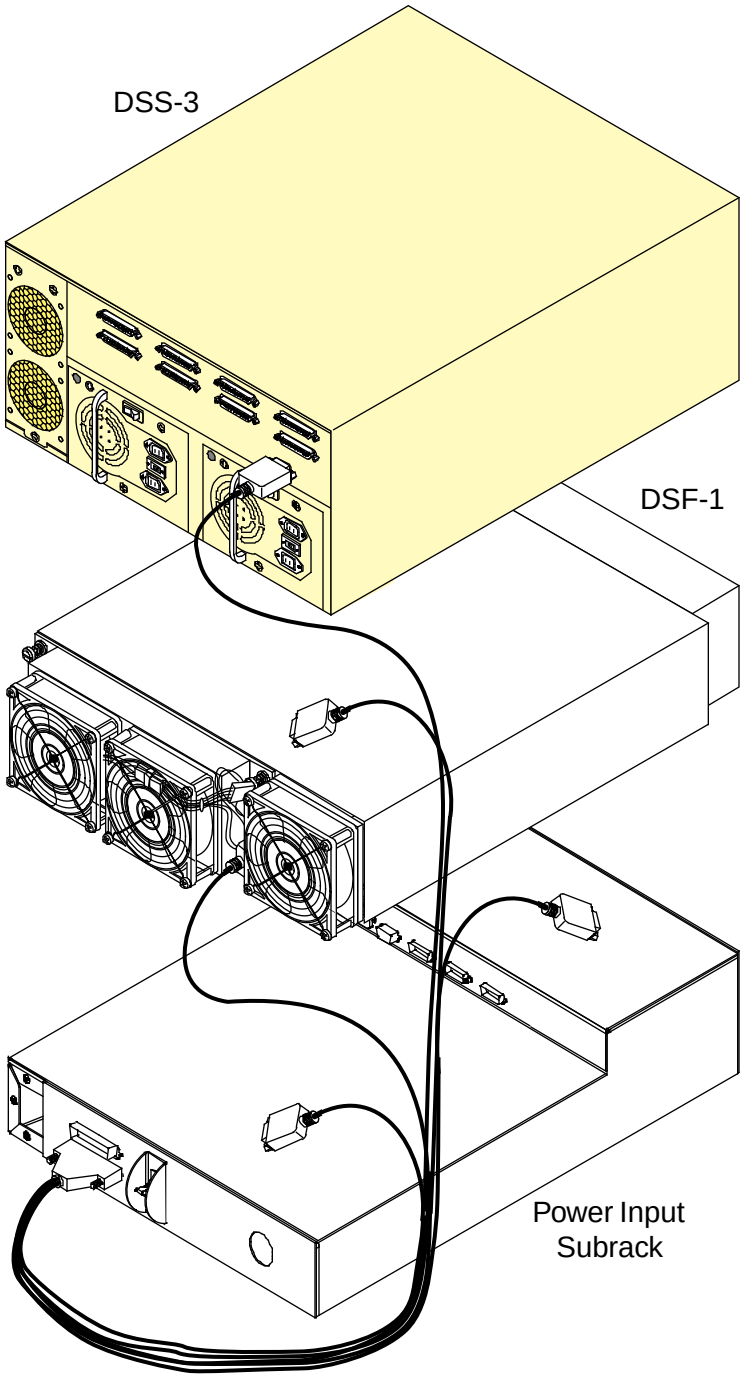
DSS-3 WACS Cable

The DSS-3 WACS cable (shown in Figure 12) carries the WACS signals that Table 3 lists.

Table 3. WACS Connector Pinout

Pin No.	Signal Name	Pin No.	Signal Name
1	PS1 Good	6	Fan Return (Ground)
2	PS1 Return (Ground)	7	Install
3	PS2 Good	8	Install Return (Ground)
4	PS2 Return (Ground)	9	+5 Vdc (Power from WACS)
5	Fan Fault		

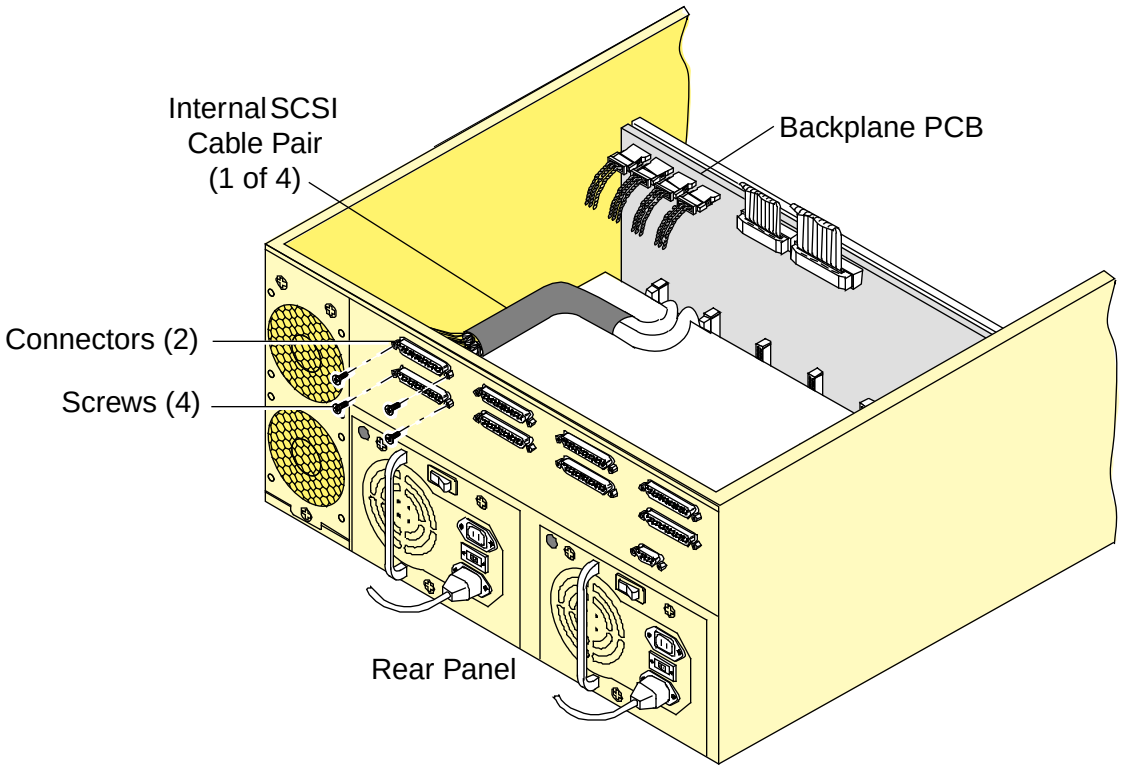
Figure 12. WACS Cable Connection



Internal I/O Cable

Each pair of disk drives has an I/O cable, as shown in Figure 13, that carries the signals from the backplane PCB to the rear panel. The rear panel connector pinout is listed in Table 2.

Figure 13. Internal I/O Cable



Disk Drive Power Connector

The 4-pin power connector on the rear panel of each disk drive, inside the drive canister, provides connections for the voltages that are listed in Table 4.

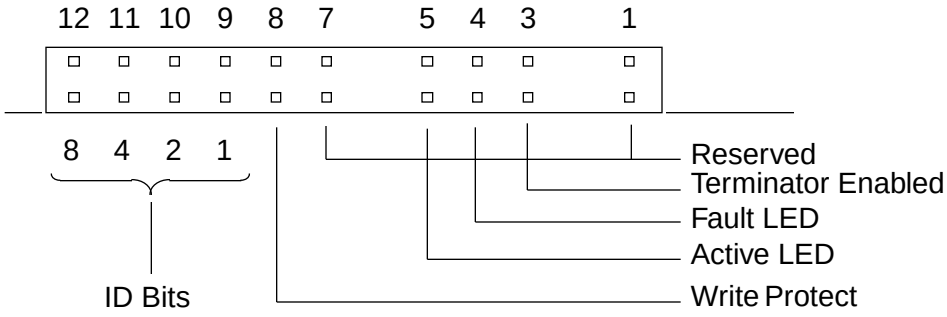
Table 4. Disk Drive Power Connector Pinout

Pin No.	Voltage
1 (nearest to I/O connector)	+12 Vdc
2	+12 Vdc return
3	+5 Vdc return
4	+5 Vdc

Disk Drive ID Connector

A 24-pin connector on the rear of the disk drive (inside the drive canister, as shown in Figure 6) carries identification (ID) address bits from the front-panel device ID switch. It also carries the drive active signal to the drive front-panel green LED. In positions 3, 4, and 5 of the connector, the pin closest to the drive PC board is the LED cathode. All other connector pins (positions 1, 7, and 8) are unused.

Figure 14. ID Connector Pinouts



Configuration Guidelines Reference

Each pair of drives operates independently. Consult the *Scalable I/O Product Configuration Guide*, EDS-1002, for further information about configurations.

Flaw Management Reference

Each disk drive contains its own SCSI controller, which automatically performs flaw management for errors that have recoverable error-correction codes (ECCs). Errors that have unrecoverable ECCs can be reallocated using the `xdms` command. Refer to the *SIO Concurrent Diagnostic Reference* (currently not a released document, but available in preliminary form at `http://servinfo.cray.com/sio/index.htm`) for details on using `xdms` to reallocate disk space.

Installation Reference

Refer to *DSS-3 Hardware Migration Procedure*, CRI publication HMU-385-0, for procedures for installing the DSS-3.

Troubleshooting Reference

SCSI Disk Error Information

You can obtain SCSI disk error information about the MPN by using the `errpt` command and the MPN command `sserrpt`. Refer to the *SIO Troubleshooting Guide*, publication HMM-204-A, for details on using `errpt` and `sserrpt`.

Diagnostic Descriptions

Refer to the *SIO Boot Diagnostics and Tests* document, publication HDM-301-0, for descriptions of tests that you can use to boot the multipurpose node.

Troubleshooting Procedures

Refer to the *SIO Troubleshooting Guide*, publication HMM-204-A, which contains troubleshooting procedures for diagnosing faults in the MPN and in the SCSI-2 disk drives that connect to it.

Refer to the CRAY J90 Series *System Troubleshooting* document, publication HMM-114-B, for troubleshooting information about diagnosing faults in the SI-3 interface and in the SCSI-2 disk drives that connect to it.

Field Replacement Procedures (FRPs) Reference

Refer to *PC-10 Field Replacement Procedures*, CRI publication HMM-236-F, for replacement procedures for the DSS-3.