
R23RZ

R23RZ Removable Storage Disk/System Technical Manual

Order Number EK-R23RZ-TM

digital equipment corporation

1st Edition, March 1991

The postpaid READER'S COMMENTS form on the last page of this document requests the user's critical evaluation to assist in preparing future documentation.

This document was prepared using VAX DOCUMENT, Version 1.2

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Preface

Document Structure

This guide, which explains how to maintain an R23RZ Removable Storage Disk System, is made up as follows:

- Chapter 1 System Description - a description of the R23RZ and its major components, including block diagrams, component layout diagrams and input/output signals.
- Chapter 2 Checks, Adjustments and Options - the preliminary checks carried out prior to repair.
- Chapter 3 Fault Diagnosis - how to diagnose and cure faults. This chapter also includes diagnostic display tables.
- Chapter 4 Corrective Maintenance - a list of FRUs and how to replace them.
- Appendix A Operational Procedures - a description of how to use the R23RZ.
- Appendix B R23RZ Specifications.
- Appendix C R23RZ Removable Storage Disk System Option Kits.
- Appendix D SCIS Rules and Conventions
- Index.

Intended Audience

This guide is intended for Digital Customer Services personnel only. Familiarity with the VMS operating system , UNIX operating system and MDM diagnostics is assumed.

WARNINGS, CAUTIONS and NOTES

Warnings, cautions and notes have the following meanings in this manual:

WARNING Contains information essential to your personal safety.

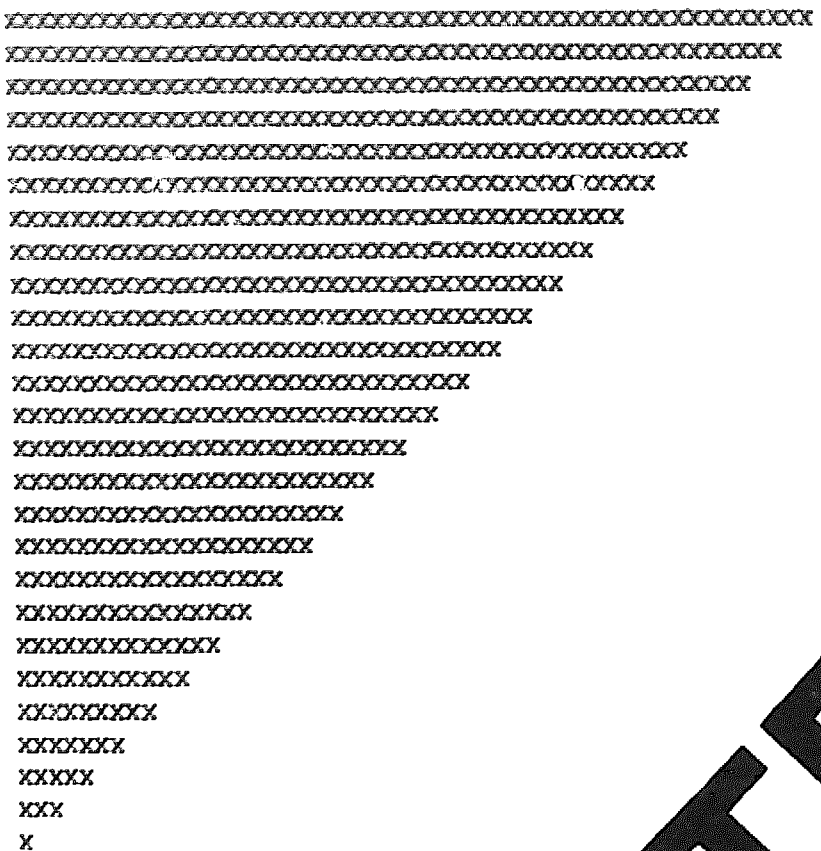
CAUTION Contains information essential to the safety of equipment and software.

NOTE Contains general information of which you should be aware.

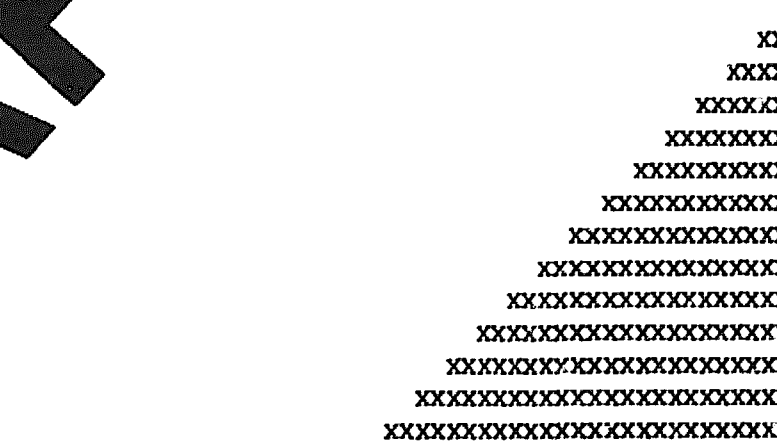
Associated Documents

The following publications provide supplementary information:

Document Title	Order No.
RZ55/RZ56/RZ57 Integrated Storage Disk Installation Manual	*EK-RZ55D-IM*
RZ55/RZ56/RZ57 Integrated Storage Disk User Guide	*EK-RZ55D-UG*
R23RZ Removable Storage Disk/System Installation and User Guide	*EK-R23RM-IN*
RZ55 I RZ56 I RZ57 Integrated Storage Disk Installation Manual	*EK-RZ55D-IM*
MicroVAX Systems Maintenance Guide	*EK-O01AA-MG*
MDM User Guide	*AA-FM7AE-DN*
VMS VAXcluster Manual	*AA-LA28A-TE*
Guide to VAXclusters	*AA-Y513A-TE*



CHAPTER 1



1
SYSTEM DESCRIPTION

1.1 Introduction

The R23RZ Removable Storage Disks System consists of a BA23-style enclosure (refer to Figure 1–1) into which can be inserted two Removable Storage Disks (RSDs). The BA23-style enclosure is either packaged in a standalone pedestal or is slid into a Rackmount slot. Each Removable Storage Disk (RSD) consists of one RZ Integrated Storage Disks (ISD) and one canister, that is (RSD = ISD + canister). Thus, the R23RZ allows RZ Integrated Storage Disk devices to be removed from the host computer system while still maintaining total data integrity.

The R23RZ Removable SCSI Disk System can be configured with systems with an embedded SCSI controller. This includes the Decstations 2100, 3100, and 5000, the DECsystems 3100, 5000, 5100, and the 5500, the VAXstation 3100, and the Microvax 3100.

The R23RZ system is quiet in operation and designed for an open office environment. One or more R23RZs can be linked together to provide increased on-line storage capacity. Extra RSDs can be ordered separately. (See Appendix C for a list of R23RZ and RSD Option Kits.)

1.2 The R23RZ System

The R23RZ system consists of:

- The pedestal (see Figure 1–1) which encloses the chassis
- RSD units (see Figure 1–2)

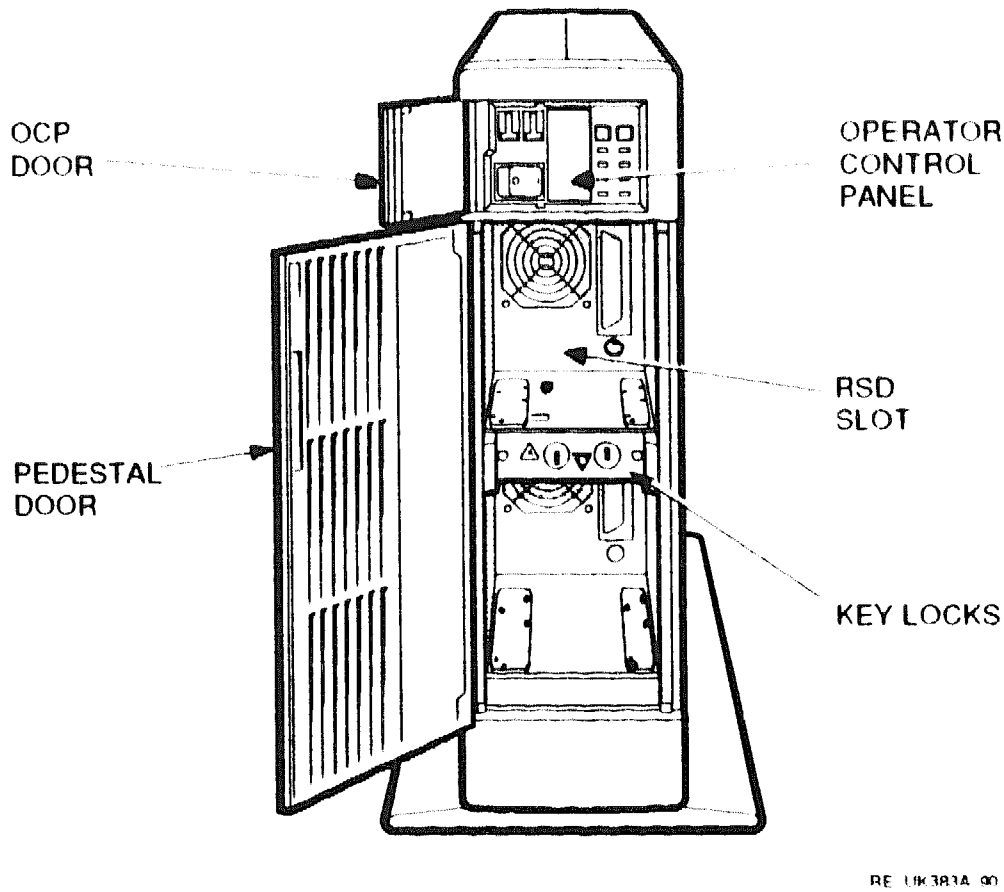


Figure 1–1 Front View of R23RZ Pedestal with Canisters Removed

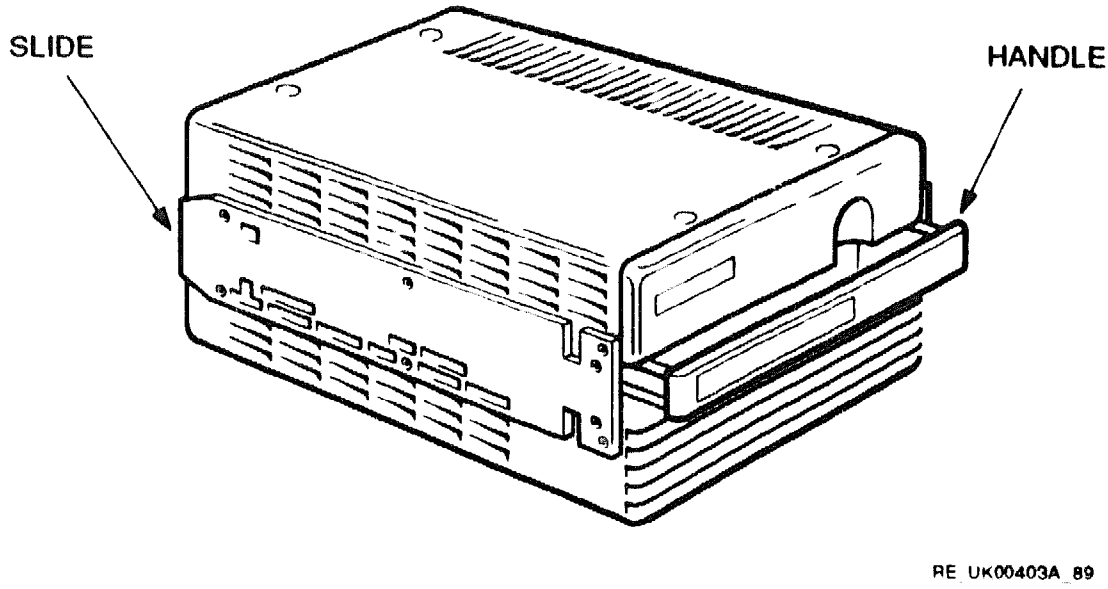


Figure 1–2 Front View of RSD

The major components in the chassis (see Figure 1–3) are:

- The ac power inlet with fuse
- The Power Supply Unit (PSU)
- Two logic boards (one per RSD slot)
- The solenoid assembly
- Key locks
- The Operator Control Panel (OCP) board assembly
- Fans
- Signal and power cables

The major components of an RSD (see Figure 1–4) are:

- The RZ winchester disk drive
- The RSD interconnect board
- Three cable assemblies
- The temperature sensor
- Drive shock mounts
- Shock detector

1.2.1 System Overview

This overview describes the general layout and function of the components in the chassis and RSDs. The chassis contains all the necessary components to allow two RSDs to be used and removed from the chassis and pedestal assembly.

AC power is input through the AC power socket, mounted on the chassis back-panel. From the PSU the AC is routed through the power loom to the two-pole OFF/ON switch situated on the Operator Control Panel (OCP).

The switched ac current is routed back through the power loom to the PSU ac power connector. The ac power connector is a five-pin MOLEX connector located on the PSU (see section 1.5.5).

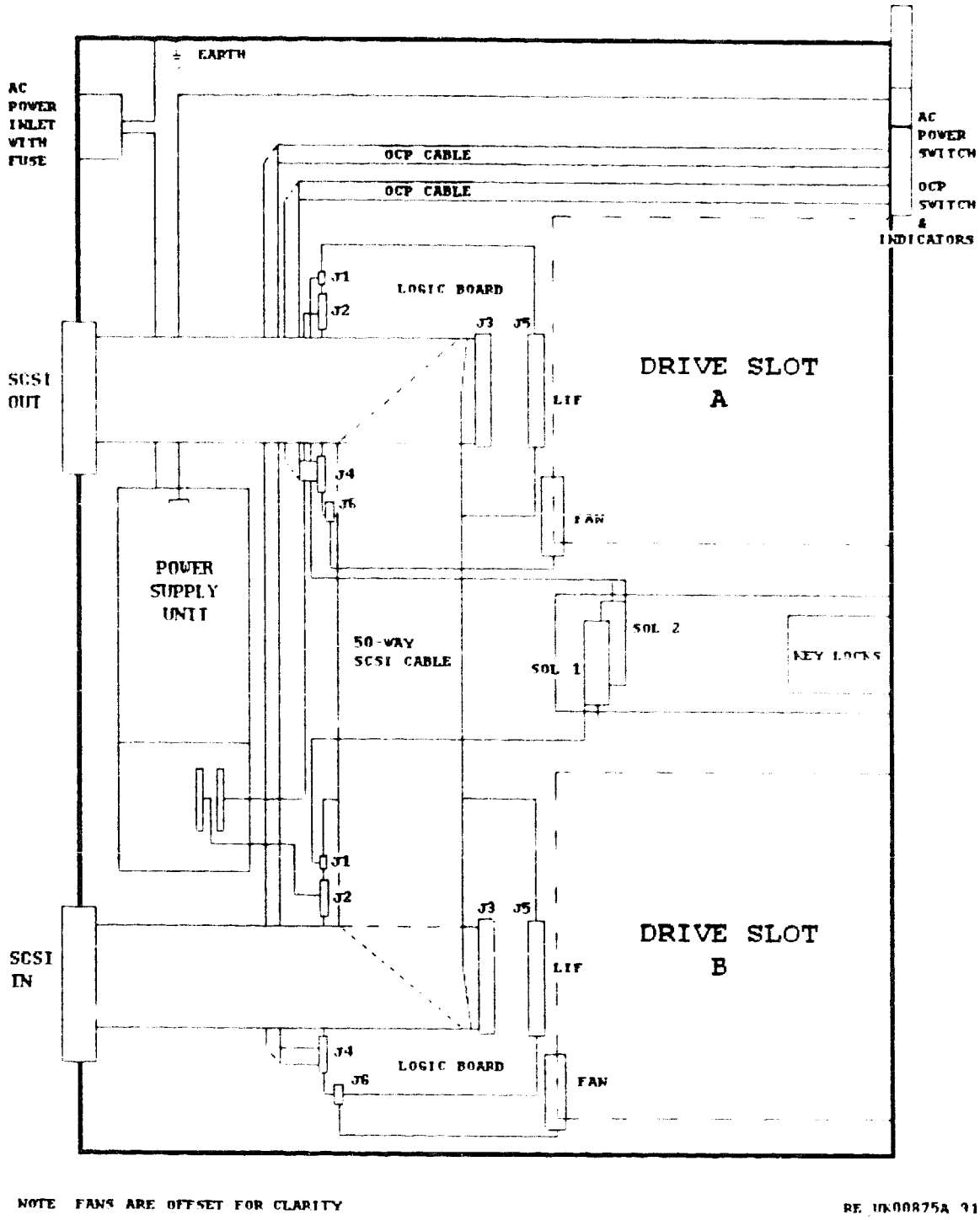


Figure 1–3 Chassis Block Diagram

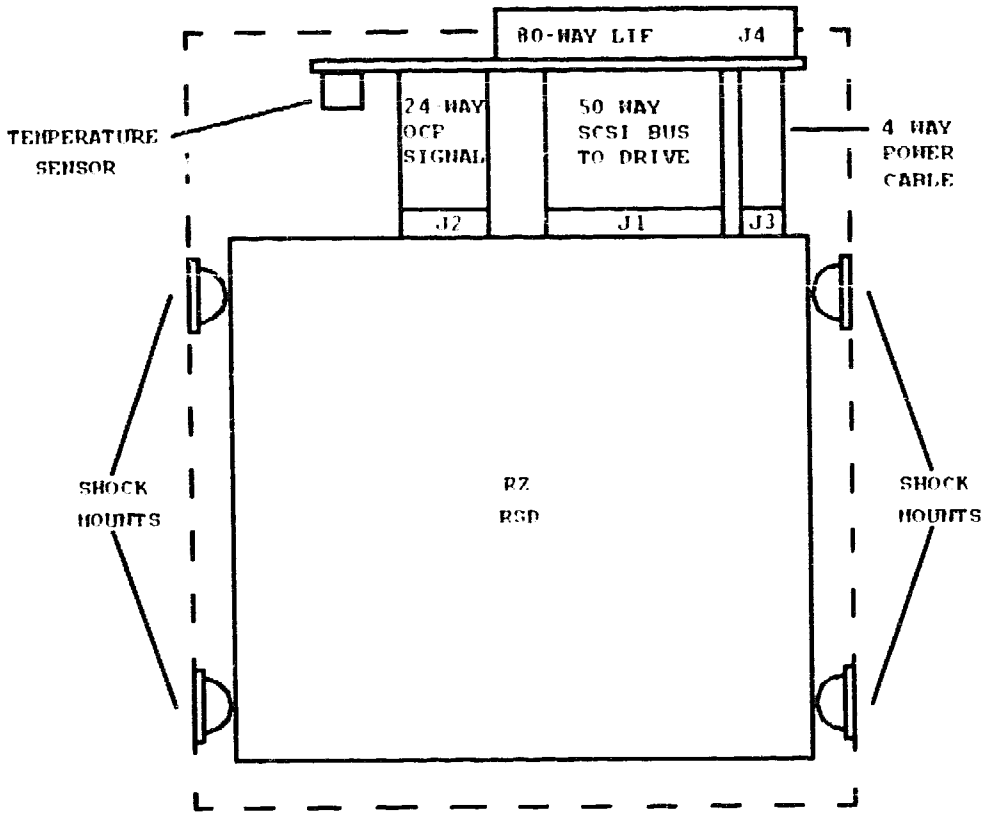


Figure 1–4 RSD Block Diagram

Voltages of +5V and +12V are available on a separate 10-way barrier strip and DCOK through a two-way Molex-type connector. These power rails are routed to the RSDs through the logic boards (+12V is also routed through the logic boards to the two cooling fans and the two solenoids)

On the logic boards, the +5V and +12V supplies are routed to the RSDs through two POWER MOSFETs to the Low Insertion Force (LIF) connector (which is the physical joining point of the RSD and the chassis).

1.2.2 The SCSI Bus

The SCSI Bus from the host is connected to the SCSI input connector which is located on the chassis back panel. From this connector the SCSI Bus is routed sequentially to the two logic boards and then to the SCSI output connector on the chassis back panel.

A SCSI bus terminator MUST be fitted to the SCSI output connector in the case where a number of chassis are linked together, there it MUST be fitted to the last SCSI output connector in the chain.

Where the SCSI bus cable is routed to the logic board, a 'stub' of the Bus is taken via the Logic Board LIF connector to the RSD.

1.2.3 The OCP

The OCP contains two identical electronic circuits, one per RSD. The majority of the signals on the OCP are generated by a logic board which gets the signals from the RSD.The signals are routed to the OCP via the OCP cables. These OCP signals consist of outputs from the RSDs (which light the OCP LEDs). The signals on the OCP that are NOT generated by the RSDs are the TEMPERATURE, UNLOCKED, POWER LEDs, and the output from the power switch.

1.2.4 The Logic Board

The logic board contains circuitry to drive the solenoid locks, provides a delay to enable safe spin-downs, and monitors the activity of the ISD so that the RSD cannot be powered down during a ISD transfer until all READ/WRITE activity ceases.

The logic board also contains circuitry to shut the RSD down in the event of an overtemperature condition, before it is passed onto the RSD via the LIF.

1.2.5 R23RZ System Internal Signals

For this section refer to Figure 1–5.

The figure shows the symbolic internal signal flow for the R23RZ system. Note that the system is composed of two identical halves (one half per RSD) and that in Figure 1–5, only one of these halves is shown.

Figure 1–5 shows the routing of +5V, +12V from the PSU to the ISD. The OCP control signals (OVERRTEMP, REMDRV, DRVREADY, PONREQ, FAULT OCP, PONDRV OCP) are routed from the logic board to the OCP via the OCP cables.

DRVPRES is an internal 'looped-back' signal which detects if an RSD is present in the slot. TEMPSENSE is an input to the logic board from the RSD temperature sensor, and is used to power the drive down in the event of an overtemperature condition. The dc power to the fans and solenoids are supplied from the logic board.

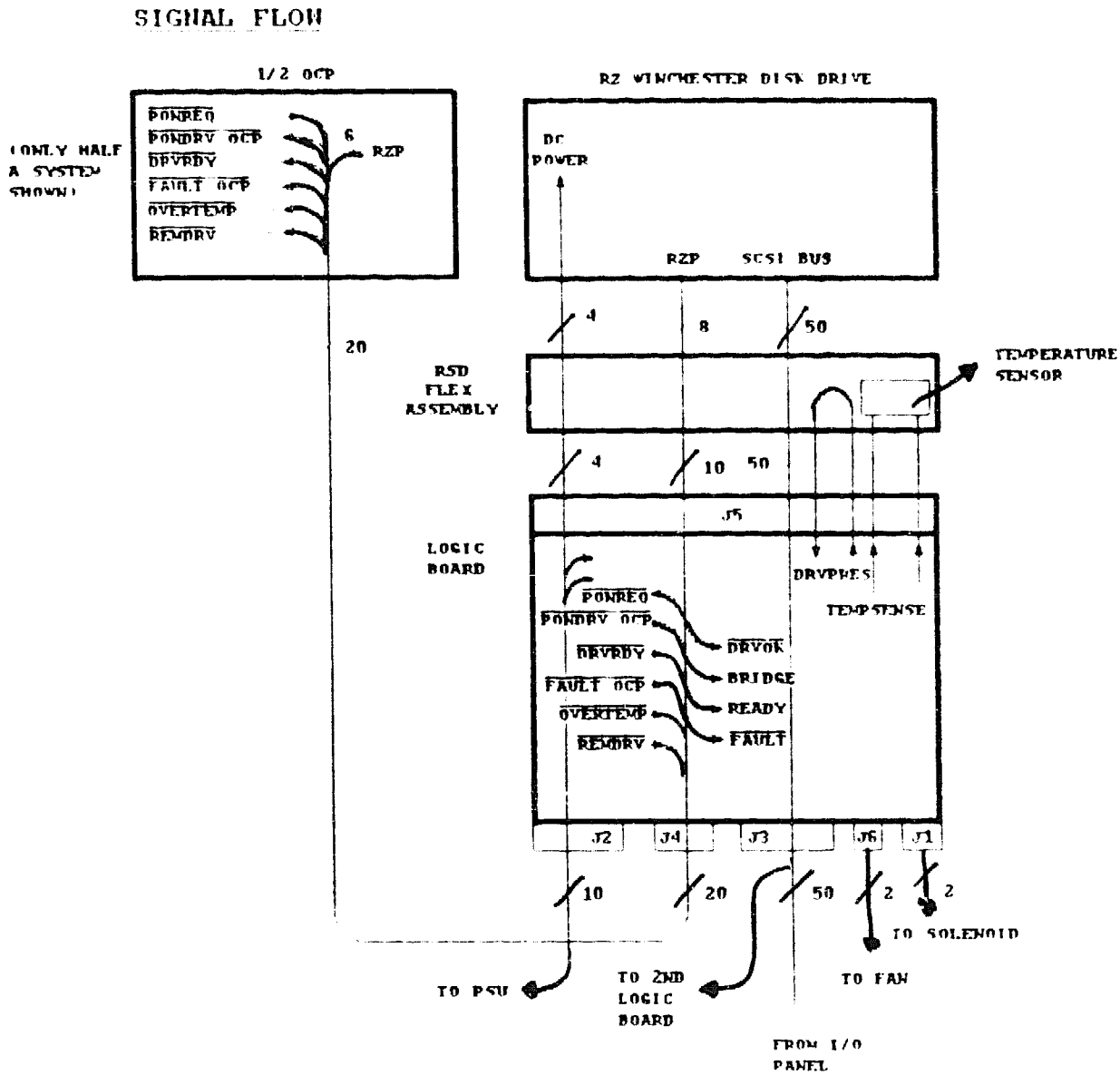


Figure 1–5 R23RZ System Internal Signal Flow

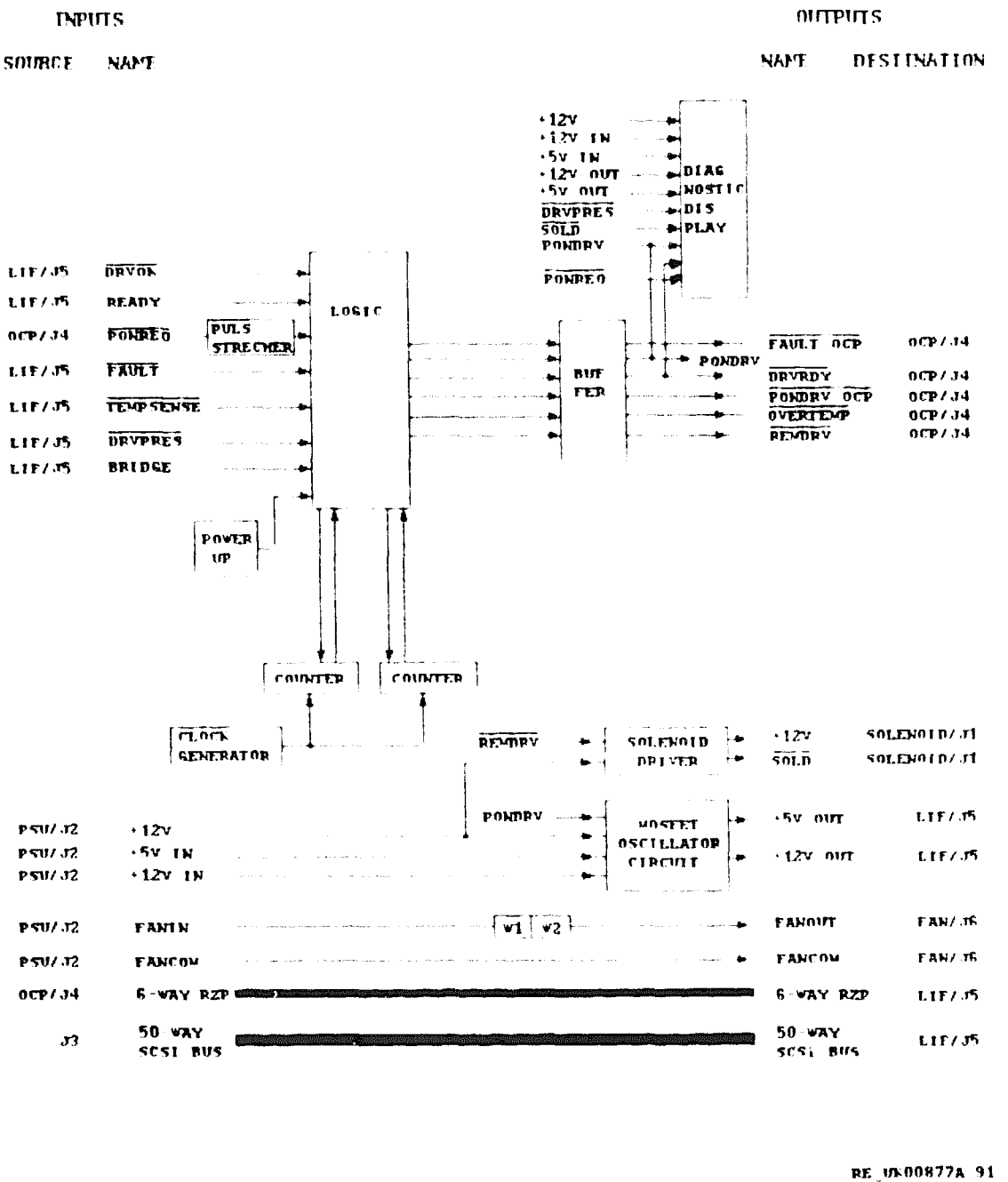


Figure 1–6 Logic Board Block Diagram

1.3 The Logic Board

The logic board (see Figure 1–6) contains most of the electronics and:

- Drive power switching
- Drive activity monitoring
- Diagnostic display
- Solenoid drive and delay circuits

Input from the OCP, such as OCP switch position, is received and implemented by the logic board. Outputs to the OCP indicators are generated on and routed via the logic board.

The SCSI bus is routed to the logic board from the rear I/O panel and then through to the drive via the logic board LIF. Fan power is also routed through from the logic board.

1.3.1 Circuit Description

The following text is a description of the operation of the logic board circuitry, from system power-up, to inserting and using the RSD the powering down and removing of the RSD is also covered. Note that operation is identical for each slot and generally they can be considered to be independent (with the exception of the PSU, which is common to both RSD slots). Please refer to Figure 1–6, or the circuit diagram in the Field Maintenance Print Set.

Consider an R23RZ system, powered down, with both RSD in their slots. Upon application of power to the system, DCOK is signalled by the PSU and is used to spin-up the RSDs present. If no RSDs are present, DRVPRES (Drive Present) will detect the empty slots and prevent the logic board from supplying +5V and +12V to an empty slot.

If an RSD is now inserted into an empty slot, DRVPRES will detect its presence, enabling the logic board for further operation. (As the RSD was not present upon power-up of the R23RZ the RSD will not power-up automatically and the operator is required to press the POWER button on the OCP to spin the RSD up.)

If the POWER button on the OCP is now pressed, the OCP will generate a PONREQ (Power On Request) signal, which will be routed to the logic board via the OCP cables. PONREQ is now gated with DRVPRES, and TEMPSENSE (Overtemperature Detect), to ensure correct conditions for power-up. If all is well, an internal signal PONDRV (Power On Drive) is generated and fed to the power switching circuitry and solenoid driver.

The power MOSFETs now feed +5V and +12V to the RSD via the LIF, and the solenoid locks the RSD into the chassis.

As the RSD comes up to speed it begins to run its internal diagnostics (shown by the FAULT and READY indicators on the OCP). At the end of these diagnostics, if all is well, the RSD comes on-line (as shown by the OCP READY indicator). It is now ready for MOUNTing and further use as a standard RZ drive.

To power down the RSD, the operator must DISMOUNT it before powering down and withdrawal from the chassis.

The logic board contains circuitry to sense activity on the RSD. This derived signal is DRVREADY (Drive Ready). If the operator accidentally attempts to power the RSD down during a data transfer, the logic board will sense the activity and 'hold off' the power-down sequence, until no activity has been detected for approximately one second. This makes sure that power will not be removed from the RSD during a data transfer. Note that the R23RZ cannot sense whether the RSD has been DISMOUNTed.

If a MOUNTed RSD is powered down accidentally, power the RSD up as soon as possible. The VMS MOUNT VERIFY sequence occurs and in general there will be no complications. DISMOUNT the RSD and power down as normal.

During normal operation, the RSD will have been dismounted before the operator attempts to power down the RSD and there will be no activity on the RSD. The logic board signals to the power MOSFETs and they open to remove the +5V and +12V from the RSD.

At this point, a timer is triggered to make sure that the RSD has spun down and is stationary before the solenoids are unlocked. A delay of 20 seconds is set on the logic board.

During this delay period, as the timer is counting down, the POWER indicator on the OCP is flashing. This flashing is controlled by the logic board signal PONDRV OCP (Power On Drive Indicator), which is toggling between "0" and "1" at the flash rate.

At the end of the delay period, the POWER indicator stops flashing and then goes out. The UNLOCKED indicator on the OCP lights. The UNLOCKED indicator is driven from the logic board by the signal REMDRV (Remove Drive).

The RSD may now be removed, which will be detected by DRVPRES and any further OCP operations will be disabled, as before.

Other circuitry on the logic board is for setting the logic in a predictable state at power-up and OVERTEMP (overtemperature), which is a conditioned version of TEMPSENSE.

The logic board automatically powers down the RSD when an overtemperature condition occurs and there has been no activity on the RSD for at least one second.

If a TEMPSENSE condition occurs (due to either a fan failure or the cooling slots being covered), the RSD will be powered down without operator intervention. This may mean that the drive was still MOUNTed on power down. When the overtemperature condition has been cured, the drive may be powered up and DISMOUNTed, or used as normal. During an overtemperature error you cannot transfer the RSD to a new slot and spin up until it has been dismounted.

1.3.2 Logic Board Components

Refer to Figure 1–7. Note: The default link positions are described in Section 2.1.

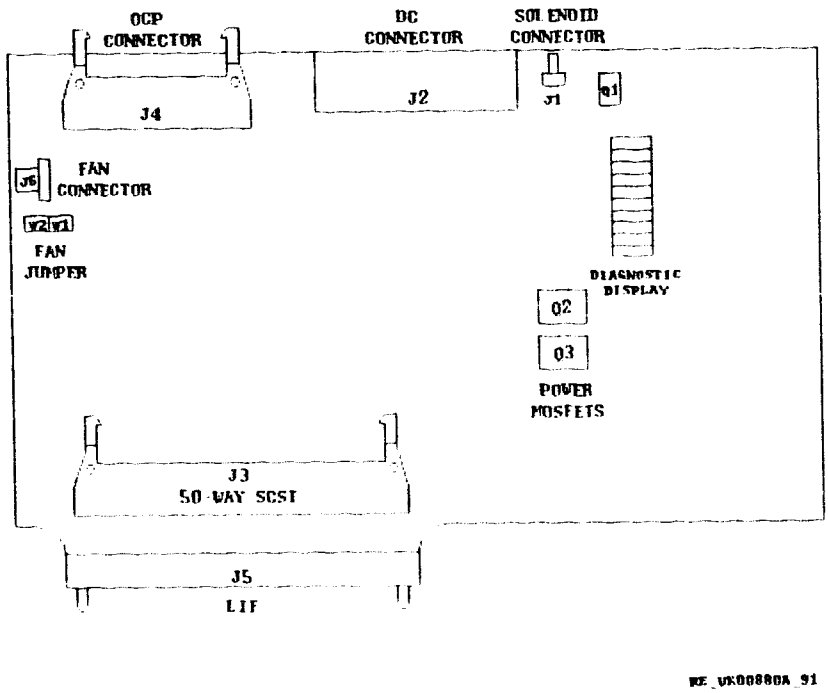


Figure 1–7 Logic Board Component Layout

1.3.3 Logic Board Input Signals

Table 1–1 Logic Board Input Signals

Signal	Source	Description
DC OK	Generated by the PSU when the PSU output signals are within specification	No use
$\overline{TEMPSENSE}$	Generated in the RSD by the temperature switch. Routed to the logic board via the LIF	When the RSD temperature rises above 50°C, $\overline{TEMPSENSE}$ goes active and powers down the RSD at the end of the data transfer. As the RSD cools, $\overline{TEMPSENSE}$ goes inactive (approx. 15°C hysteresis) and unlocks the power down state. $\overline{PONREQ}$ is then required to power up the RSD.
$\overline{DRVPRES}$	Generated on the logic board using a link on the LIF connector	When the RSD is inserted, $\overline{DRVPRES}$ is pulled low. When the RSD is removed, $\overline{DRVPRES}$ is pulled high by a pull-up resistor on the logic board. This signal locks out the power-up circuitry to ensure that an empty slot cannot be powered up.
$\overline{PONREQ}$	Generated on the OCP. The output from the RSD power switch	This pulse is stretched on the logic board to eliminate switch bounce and used to toggle the power-up/down circuitry.
$\overline{DRVREADY}$	Generated by the drive	Routed from the RSD over the logic board to the OCP READY LED. The $\overline{DRVACT}$ is conditioned with the *PONDRV* signal on the logic board to ensure that the RSD powers down one second after the end of drive activity.
12V	Generated by the PSU +12V DC power for the solenoid	PSU +12V DC output to the solenoid and the for the MOSFET oscilator circuit.

Table 1–1 (Cont.) Logic Board Input Signals

Signal	Source	Description
5V IN	Generated by the PSU +5V DC power for the RSD	PSU +5V DC output. *5V IN* passes through the logic board power MOSFET and is sent to the RSD via the LIF as *5V OUT*.
12V IN	Generated by the PSU +12V DC power for the RSD	PSU +12V DC output. *12V IN* passes through the logic board power MOSFET and is sent to the RSD via the LIF as *12V OUT*.

1.3.4 Logic Board Output Signals

Table 1–2 Logic Board Output Signals

Signal	Destination	Description
$\overline{OVERTEMP}$	TEMPERATURE LED on OCP	Conditioned version of $\overline{TEMPSENSE}$.
$\overline{REMDRV}$	UNLOCKED LED on OCP	Indicates that the solenoid is unlocked.
$\overline{PONDRVOCP}$	POWER LED on OCP	If this signal is low, the LED lights and the RSD is powered. If the signal is high, the LED goes out and the RSD is not powered. If the signal is toggling, the LED flashes and the RSD spins down.
12V	Solenoid	Feed to the solenoid.
$\overline{SOLD}$	Solenoid	If this signal is low, the solenoid is powered. If the signal is high, the solenoid is not powered.
5V OUT	RSD	DC power +5V. Fed from the logic board power MOSFET circuit to the RSD via the LIF.
12V OUT	RSD	DC power +12V. Fed from the logic board power MOSFET circuit to the RSD via the LIF.
12V OUT	FAN	DC power +12V. Fed from the logic board power MOSFET circuit to the FAN.

1.3.5 Logic Board Routed-Through Signals

Table 1–3 Logic Board Routed-Through Signals

Signal	Source	Destination
FANIN	J1	—
FANOUT	—	J6
2 x *FANCOM*	J1	J6
24-WAY RZP	OCP	RSD
50-WAY SCSI bus	I/O Panel	RSD

1.3.6 Logic Board Internal Signals

Table 1–4 Logic Board Internal Signals

Signal	Source	Destination
PONDRV	Internal to logic board	If active, commands RSD to power up. If inactive, commands RSD to power down

1.4 Operator Control Panel

The OCP (see Figure 1–8) has one electrical part:

- The control section

Signals to the OCP are generated by the logic board in response to drive signals and are routed via the LIF to the OCP.

The control section contains:

- The drive POWER switch
- The FAULT indicator
- The READY indicator
- The UNLOCKED indicator
- The TEMPERATURE indicator

1.4.1 OCP Circuit Operation

The following is a description of operation of the OCP. Please refer to Figure 1–8, or the circuit diagram in the Field Maintenance Print Set. The OCP is divided into two electrically identical parts, shown by the horizontal dividing line in Figure 1–8.

The Remote Front Panel Bus, which is generated by the OCP, is a low-speed duplex serial bus, which can read the position of the OCP switches and write the states of the OCP LEDs.

DRVREADY is used on the logic board to prevent the RSD from being powered-down during an data transfer.

When the RSD powered up, the RSD reads the state of the OCP DRIVE SELECT switch and sends this information on the RZP bus to the drive. This drive number is retained (unless reprogrammed by the DUP PARAMS utility) until the RSD is next powered down.

The circuit in Figure 1–8, is a simple switch with an integral LED and four further LEDs. The switch is the OCP POWER switch and provides the signal PONREQ (Power On Request) to the logic board and controls the power switching circuitry.

The following four input signals are generated on the logic board. The input signal PONDRV OCP (Power On Drive Indicator) controls the state of the OCP POWER LED. The input signal REMDRV (Remove Drive) controls the state of the OCP UNLOCKED LED. The input signal OVERTEMP (Overtemperature) controls the state of the OCP

TEMPERATURE LED. The input signal FAULT OCP controls the state
the OCP FAULT LED.

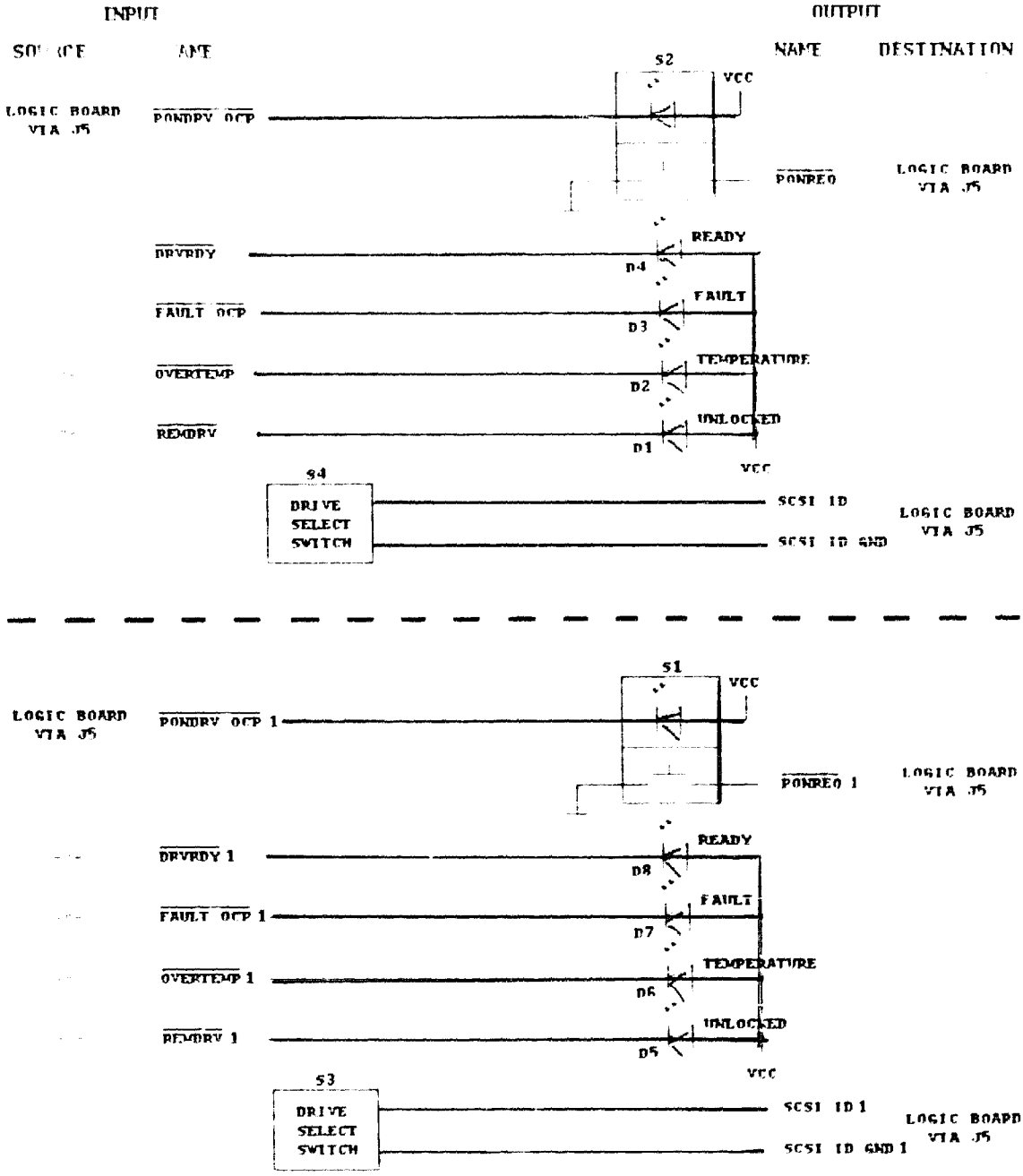


Figure 1–8 OCP Block Diagram

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1.4.2 OCP Components

Refer to Figure 1–9.

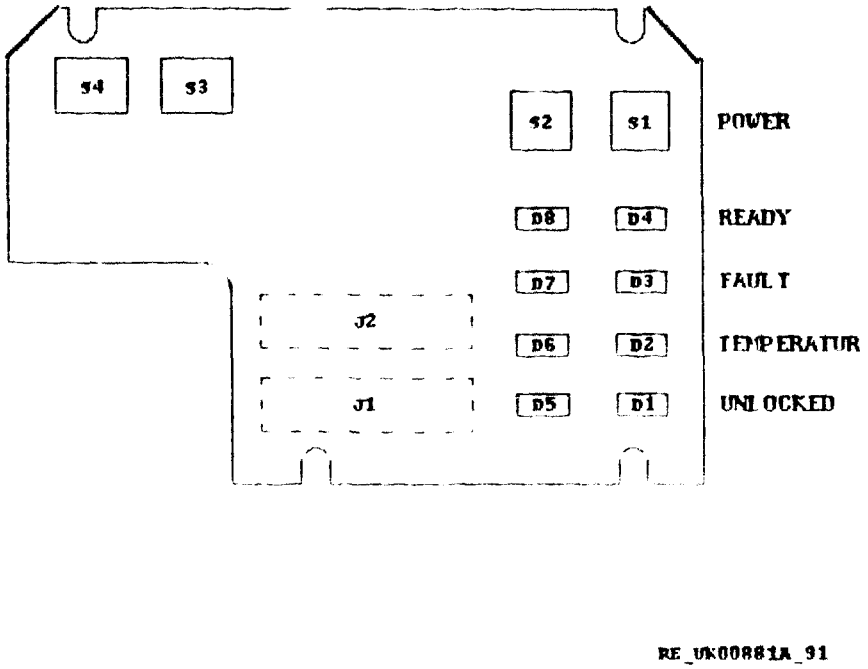


Figure 1–9 OCP Component Layout

1.4.3 OCP Input Signals

Table 1–5 OCP Input Signals

Name	Source	Description
$\overline{DRVREADY}$	Logic Board	Lights the READY indicator
$\overline{FAULTOCP}$	Logic Board	Lights the FAULT indicator
$\overline{PONDRVOCP}$	Logic Board	Lights the POWER indicator
$\overline{REMDRV}$	Logic Board	Lights the UNLOCKED indicator
$\overline{OVERTEMP}$	Logic Board	Lights the TEMPERATURE indicator

1.4.4 OCP Output Signals

Table 1–6 OCP Output Signals

Name	Destination	Description
24-WAY RZP	RSD	Remote Front Panel (RZP)
$\overline{PONREQ}$	Logic Board	Control signal from ac power switch

1.5 RSD Flex Circuit

The RSD Flex Circuit (see Figure 1–10) contains no active electronics and is used to route signals from the RSD LIF to the drive.

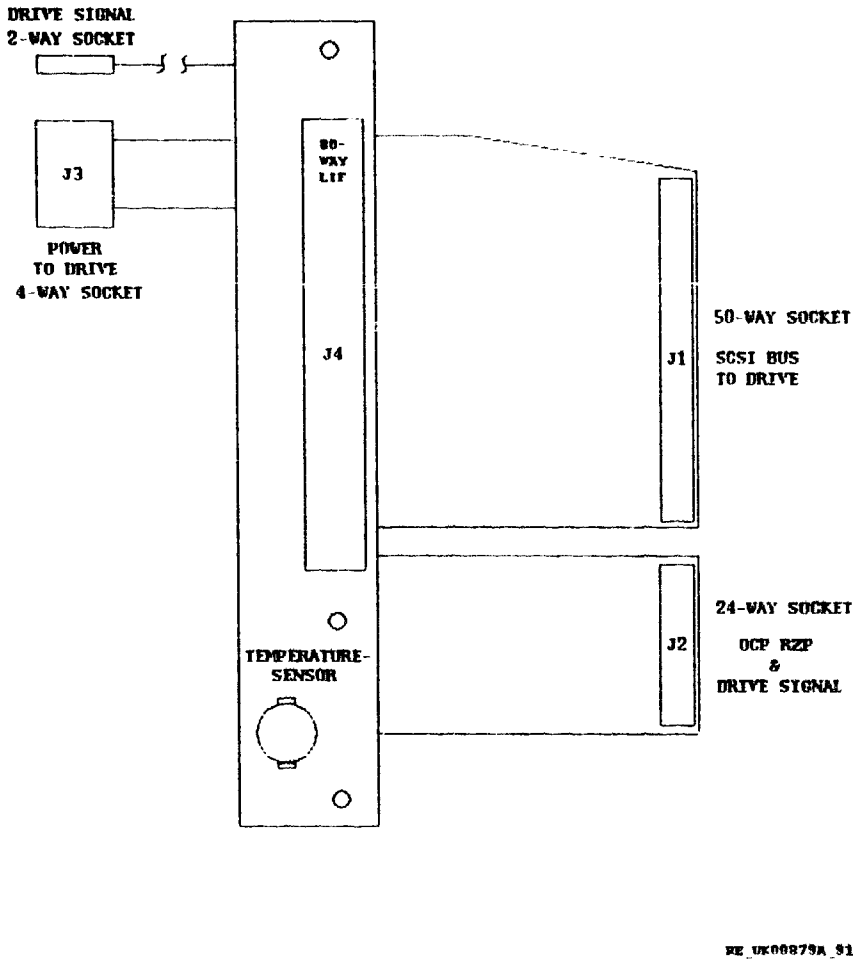


Figure 1–10 RSD Flex Circuit Block Diagram

1.5.1 RSD Flex Circuit Input Signals

Table 1–7 RSD Flex Circuit Input Signals

Name	Source	Description
$\overline{TEMPSENSE}$	Temperature sensor	Active Low over temperature signal, fed to the logic board via the LIF

1.5.2 RSD Flex Circuit Output Signals

There are no output signals from the RSD flex circuit.

1.5.3 RSD Flex Circuit Routed-Through Signals

Table 1–8 RSD Flex Circuit Routed-Through Signals

Signal	Source	Destination
50-WAY SCSI bus	Logic Board	RSD
24-WAY RZP	RSD	Logic Board
4-WAY Power	Logic Board	RSD

1.5.4 The Power Supply Unit (PSU)

The power supply is a 98W dual input voltage switching PSU. R23RZ systems are configured for 110V or 240V. A select switch is available on the PSU PCB to switch between 110V and 240V. The PSU supplies 5V @ 3A, 12V @ 7A.

A 'Power Good' output is available on the ten-pin Molex-type connector and is active high.

The PSU is short-circuit, overvoltage, overcurrent, and overtemperature protected. The overvoltage and overtemperature protections are reset by AC OFF/ON cycles. The overcurrent protection is autorecoverable. The PSU pinout is shown in Figure 1–11.

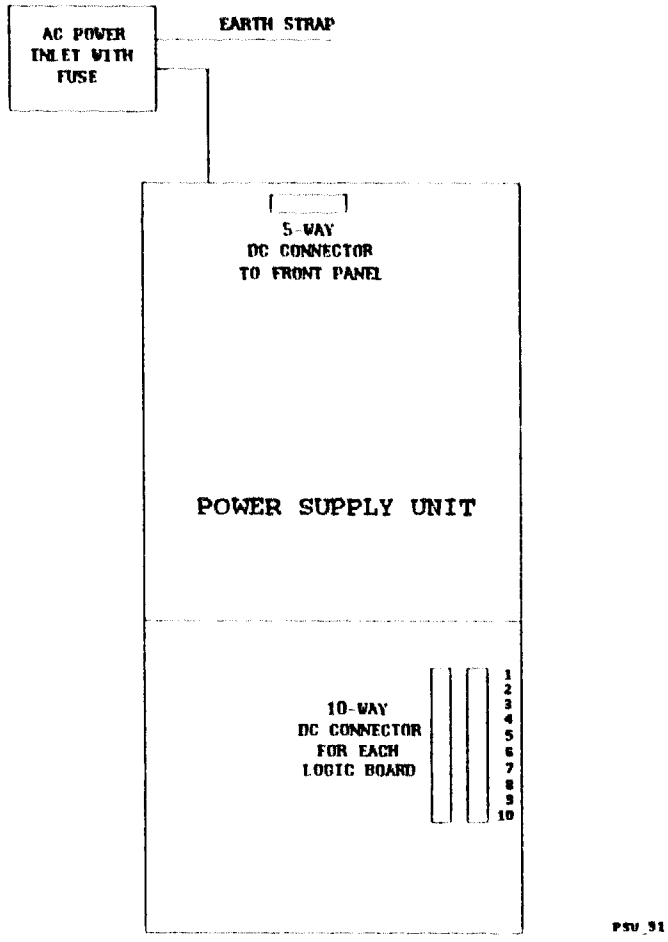
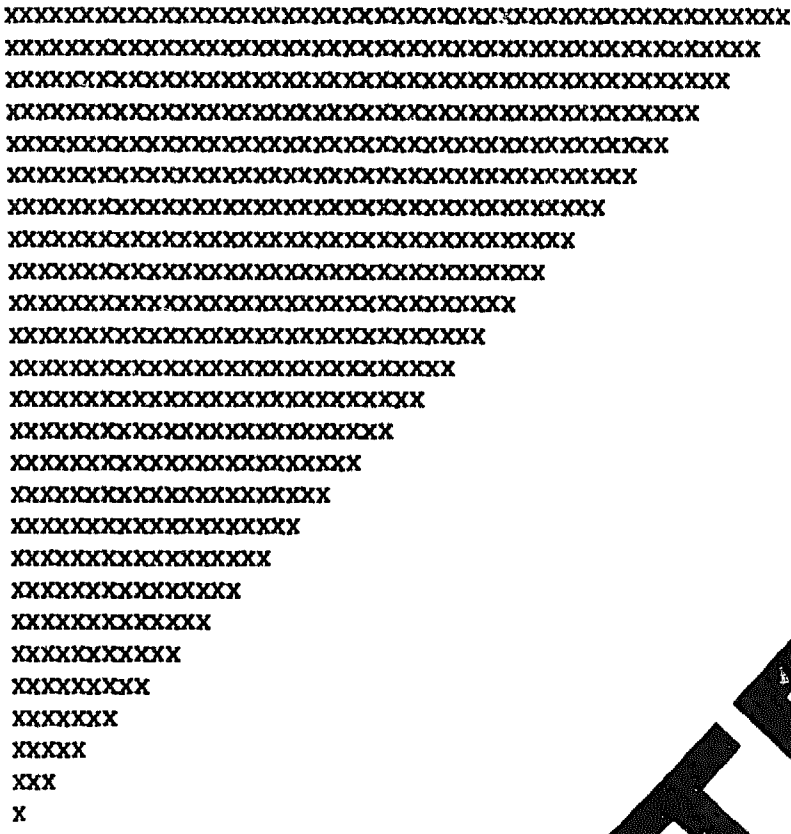


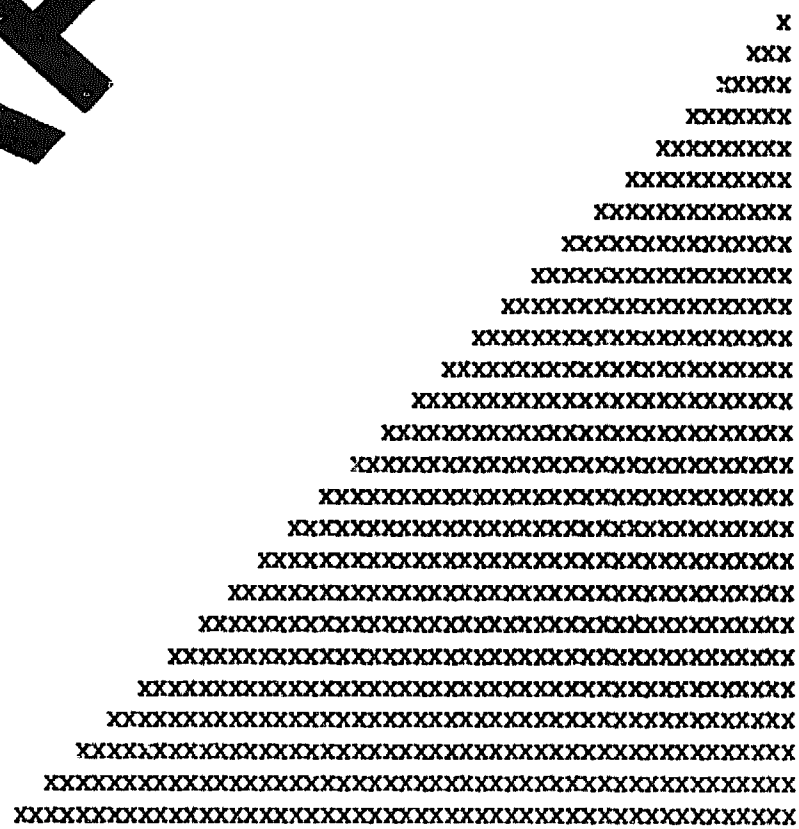
Figure 1-11 The Power Supply Unit

The PSU signals are listed below.

1. +12.0 VOLTS FAN
2. +12.0 VOLTS Board
3. +12.0 VOLTS Drive
4. +12.0 RETURN Drive
5. +12.0 RETURN FAN
6. +5.0/+12.0 RETURN Board
7. +5.0 RETURN Drive
8. +5.0 VOLTS Drive
9. +5.0 VOLTS Board
10. ACOK H



CHAPTER 2



2
CHECKS, ADJUSTMENTS, AND OPTIONS

This chapter describes the preliminary checks that can be performed before repair, and the function and location of the default links.

2.1 Fan Diodes

To prevent beating between fan vibrational interactions, the fans are set to run at slightly different voltages by using links on W1 or W2 (refer to Figure 1–7). Use different settings on each logic board, for example W1 on board 1 and W2 on board 2.

A link on:

- W2 provides the full 12V to the fan
- W1 provides one diode drop (a fan supply of 9.3V)

2.2 Check +5V DC

Note that the diagnostic display +5V LEDs are only go/no go indicators. Use a voltmeter to measure PSU outputs accurately.

2.3 Check +12V DC

Note that the diagnostic display +12V LEDs are only go/no go indicators. Use a voltmeter to measure PSU outputs accurately.

2.4 Diagnostic Display

The following table shows the correct diagnostic display and OCP indicator conditions through one cycle of operation, from inserting and powering up an RSD to removing it.

Table 2–1 Diagnostic Display

Condition	Diagnostic Display[1]	OCP Display[2]
	1 2 3 4 5 6 7 8 9 10	P R F T U
RSD out	0 0 0 0 0 0 0 1 1 1	0 0 0 0 0
RSD in, no power	0 0 0 0 1 0 0 1 1 1	0 0 0 0 1
RSD in, PONREQ in	1 0 0 0 1 0 0 1 1 1	1 0 0 0 1
RSD in, power, Idle	0 0 1 1 1 1 1 1 1 1	1 0 0 0 0
RSD in, power, Ready	0 1 1 1 1 1 1 1 1 1	
RSD in, power, PU diag	0 F 1 1 1 1 1 1 1 1	1 F 0 0 0
RSD in, power, no acc	0 1 1 1 1 1 1 1 1 1	
RSD in, power, PONREQ in	1 0 0 1 1 0 0 1 1 1	1 1 0 0 0
Power down, solenoid delayed	0 0 0 1 1 0 0 1 1 1	F 0 0 0 0[1]
Power down, solenoid unlocked	0 0 0 0 1 0 0 1 1 1	0 0 0 0 1
RSD out	0 0 0 0 0 0 0 1 1 1	0 0 0 0 0

[1] or F F 0 0 0

[2] 1=On, 0=Off, F=Flashing

Key to Diagnostic Display

1—PONREQ
2–DRVREADY
3—PONDRV
4–SOLD
5—DRVPRES
6–5V OUT
7—12V OUT
8–5V IN
9—12V IN
10–12V

Key to OCP Display

P—POWER
R—READY
F—FAULT
T—TEMPERATURE
U—UNLOCKED

CHAPTER 3

3
FAULT DIAGNOSIS

This chapter describes how to diagnose and fix faults on the R23RZ system. Diagnostic display tables are included.

Note: It is recommended that SCSI cables and terminators are not removed or inserted while the host and chassis are powered on, as the fuse on the SCSI host adapter may fail.

3.1 Fault Isolation

Since the chassis contains two identical sections (one per RSD slot), a quick comparison or swapping method can be used to isolate faults on the chassis. Note that only the PSU is common to both slots.

3.1.1 RSD Fault Isolation

To isolate a fault between an RSD and the chassis, swap the suspect RSD between slots in the chassis. If the RSD is faulty, the fault condition will follow the RSD; if the chassis is faulty, the fault will stay on the original slot.

3.1.2 Logic Board Fault Isolation

To isolate a fault on a logic board assembly, swap the logic board. This indicates whether the fault is on the logic board or the associated cables.

3.1.3 OCP Fault Isolation

Swap the OCP cables at the logic board. Note that, because one OCP cable is shorter than the other, both cables can only be swapped into the left hand logic board.

3.2 Diagnostic Display

The diagnostic display mounted on each logic board provides indications of the state of the major signals (see Table 2–1) allowing faults to be identified and isolated. Refer to the diagnostic display shown in Figure 1–7. The following table relates the numbered segments of the display to the signal name.

Table 3–1 Diagnostic Display

1	Power On Request
2	Drive Ready
3	Power On Drive
4	Solenoid On
5	Drive Present
6	+5V Out (Drive)
7	+12V Out (Drive)
8	+5V In (Drive)
9	+12V In (Drive)
10	+12V

3.2.1 R23RZ Status from VMS

The following table lists the replies to the VMS SHOW DEVICE DI: command.

Table 3–2 VMS Messages

VMS Message	Configuration
NO SUCH DEVICE	No adapter, host cable missing, or terminator missing
HOST UNAVAILABLE	Adapter present, no drive or drive powered down
ON-LINE or MOUNTED	Adapter present, drives present. The normal operating mode. Note: Due to polling in the SCSI adapter, there is a delay of a few seconds before the new drive is seen.

NOTE
If the RSD is used in a cluster environment and access problems are experienced, refer to the *R23RZ Removable Storage Disk/System Installation and User Guide.*

3.2.2 Diagnostics

Testing the SCSI adapter and R23RZ requires at least version 130 of MDM. To test the SCSI system you have to boot MDM from a CD ROM, TAPE or ETHERNET. UETP may be used to check the system after repair.

3.3 Fault Conditions

3.3.1 Diagnostic Display

The following table shows the diagnostic display state for various fault conditions.

Table 3–3 Diagnostic Display Fault Conditions

Condition	Diagnostic Display†										Action
	1	2	3	4	5	6	7	8	9	10	
No +5V	0	0	0	0	0	0	0	0	0	0	Investigate fuse, PSU, ac power cables, ac power switch
No +12V	X	X	X	X	X	X	X	1	0	0	Investigate PSU, logic board
+5V MOSFET fail open circuit	X	X	1	1	1	0	1	1	1	1	Investigate logic board
+12V MOSFET fail open circuit	X	X	1	1	1	1	0	1	1	1	Investigate logic board
Solenoid driver fail short circuit	X	X	1	0	1	X	X	1	X	X	Investigate logic board
Solenoid driver fail open circuit	X	X	1	0	1	X	X	1	X	1	Investigate logic board

†1=On,0=Off,X=Does not Care

3.3.2 OCP Display

The following table shows the OCP display state for various fault conditions.

Table 3–4 OCP Display Fault Conditions

Condition	OCP Display†					Likely Fault
	P	R	F	T	U	
After power-up diagnostics	1	0	F	X	X	RSD
On power-up or operating the OCP power button	0	X	X	X	X	OCP, logic board or PSU
After approx. 3 minutes	1	0	0	0	0	Drive not coming on-line. Check cabling. Check terminator present
At any time	X	X	X	1	X	Fan fail, temperature sensor fail, logic board fail, ventilation slots blocked

†1=On,0=Off,F=Flashing,X=Does not Care

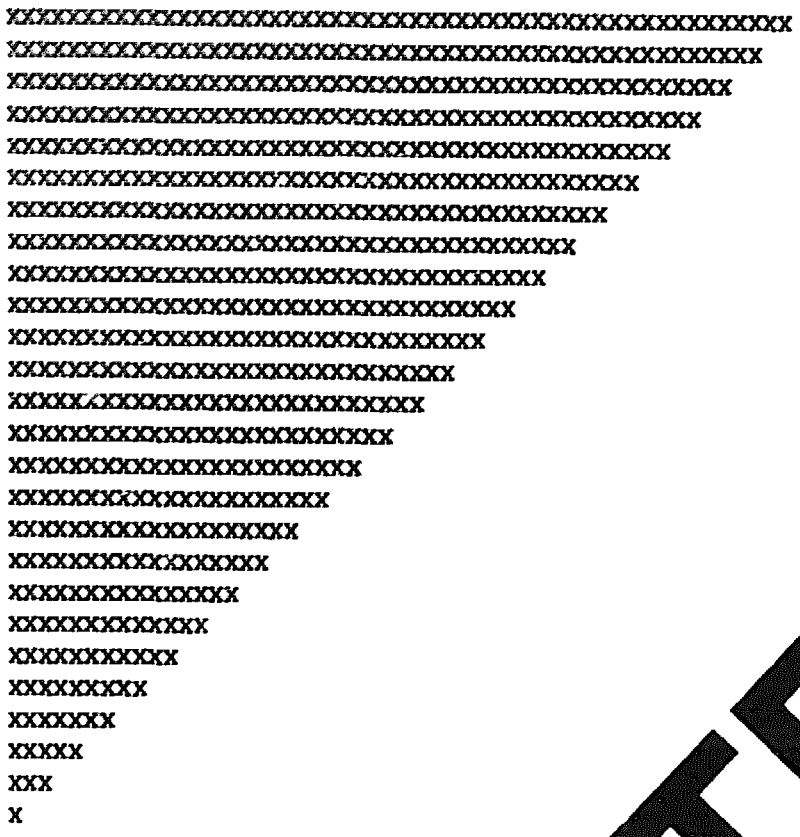
Key to OCP Display

P—POWER
R—READY
F—FAULT
T—TEMPERATURE
U—UNLOCKED

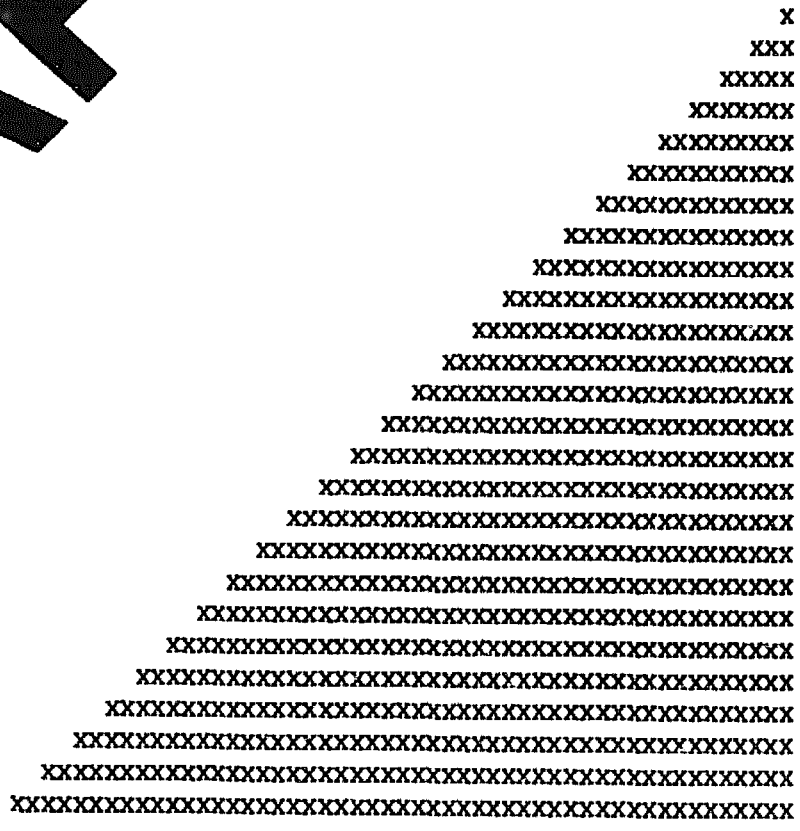
3.4 External Faults

The following typical faults, external to the R23RZ, may prevent its proper operation:

- No terminator fitted to SCSI bus.
- Bent pins on external plugs.
- External cable open circuit or short circuit.



CHAPTER 4



4
CORRECTIVE MAINTENANCE

4.1 Field Replaceable Units

This chapter lists the Field Replaceable Units (FRUs) and details how to remove the major FRUs for maintenance.

Table 4–1 Field Replaceable Units on the Chassis

Part Number	Description
30-34425-01	Power supply 110/240V
54-20906-01	Module, logic
54-20908-01	Panel, operator
70-26824-01	Solenoid assembly
70-26825-01	Cable, OCP RH assembly
70-26807-01	Cable, OCP LH assembly
70-29249-01	Harness, LV PWR assembly
70-29248-01	Harness, ac power assembly
74-38922-01	Door, front panel
12-21125-02	Fan
70-29250-01	Bus cable assembly
70-21320-01	Chassis assembly
70-25280-01	Moulding, front fascia
74-39055-02	Operator control panel
12-31974-01	Key lock assembly
12-22355-10	AC power switch

Table 4–2 Field Replaceable Units on the RSD

Part Number	Description
74-38425-01	RSD, front panel
54-20910-01	RSD, Flex assembly
74-38429-01	RSD, slide
12-31465-02	Anti-vibration mounting
70-27186-01	RSD, handle

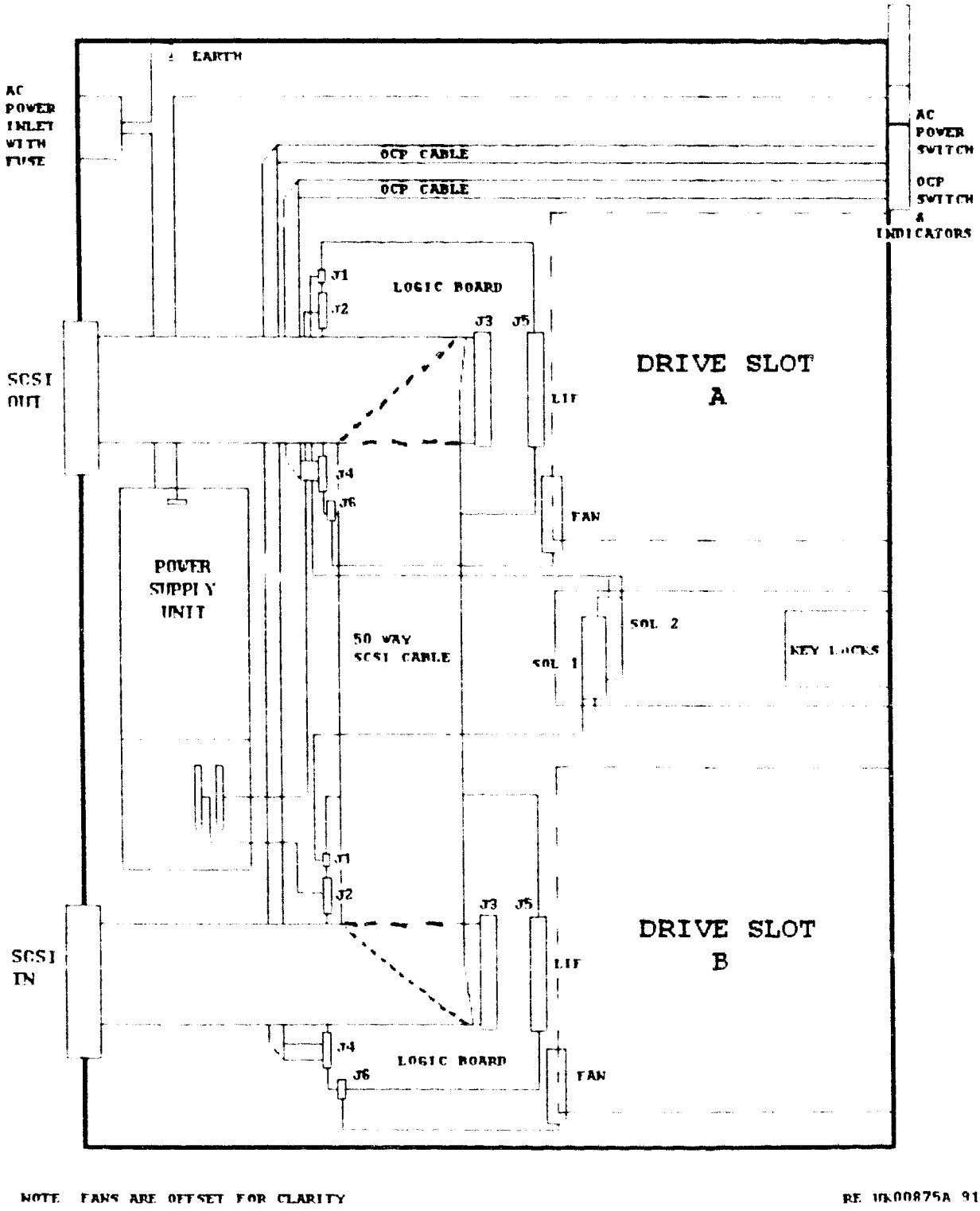


Figure 4–1 Physical Location Diagram

4.1.1 Removing the Chassis from the Pedestal

NOTE
Assembly is the reverse sequence to disassembly.

1. Dismount Drives.
2. Power down Pedestal.
3. Remove the RSDs.
4. Remove the rear pedestal cover.
5. Disconnect the ac power cable.
6. Disconnect the SCSI bus cables from the rear of the chassis.
7. Unscrew the clamp holding the chassis in the pedestal.
8. Slide the chassis out of the front of the pedestal and place on a work surface.

4.1.2 Removing the Access Panel

1. Unscrew the five screws holding the panel in place.
2. Lift the panel clear.
3. Remove the earthing strap.

4.1.3 Removing the Logic Board

1. Disconnect the SCSI cable from the logic board
2. Disconnect the OCP cable, power cable, solenoid cable, and fan cable from the logic board.
3. Unscrew the six screws and nuts holding the logic board in the chassis.
4. Remove the logic board from the chassis.
5. Note the position of the fan jumper. (Set the new board to this position on reassembly.)

NOTE
To replace the logic board, use the alignment tool supplied with each new board. Refer to the instructions for use that are repeated here for convenience.

4.1.4 Using the Logic Board Alignment Tool

Note that the tool is simply a sleeve, with one end tapered and the other flared. These in turn align the sleeve and prevent it from travelling too far down the dowel.

1. Place the tool on the left hand dowel, tapered end toward the canister.
2. Insert the six logic board retaining screws but do not tighten them at this stage.
3. Temporarily assemble the unit, carefully pushing the canister fully home on the dowel.
4. Complete the alignment and finally tighten the retaining screws.
5. Disassemble the unit and *remove the tool*.
6. Reassemble the unit.

4.1.5 Removing the PSU

1. Disconnect all output connectors on the PSU (three plugs).
2. Remove the ac power inlet box.
3. Remove the earth cable.
4. Remove the ac power connector.
5. Place the chassis on its side, to give access to the bottom of the chassis.
6. Unscrew four nuts and remove the PSU.
7. Remove the four studs from the bottom of the PSU and use them with the replacement PSU.

4.1.6 Removing the Solenoid Interlock

1. Disconnect the solenoid connectors from each drive and free the cable from the tie wraps. The tie wraps are reusable.
2. Remove the two screws holding the solenoid assembly using a stubby screwdriver. Loosen the cover screw and remove the top. Take care not to drop the screws or the washers into the chassis.
3. Remove the assembly from the chassis.

4.1.7 Removing the Fan

1. Disconnect the fan cable from the logic board
2. Remove the four screws holding the fan
3. Remove the fan and fan guards
4. Remove the fan guards from the fan

NOTE
You need to use a right-angle ratchet screwdriver for this.

4.1.8 Removing the Front Panel

1. Switch off the power and disconnect the pedestal from the mains supply.
2. Removing the front panel
   a. Remove two screws from the left-hand side of the rear of the Front Bezel.
   b. Remove three screws from the right-hand side of the rear of the Front Bezel which retain the OCP cover.
   c. Remove two screws from the lock area.
   d. Pull front panel forward at left-hand side and lift away.
   e. Undo the ribbon cables from the OCP.
3. Removing the ac power harness assembly
   a. Release the reusable tie wrap (Part No. 74-40855-01) and remove the switch boot (Part No. 74-40855-01).
   b. Remove the ac power harness assembly (Part No. 70-29248-01) from the ac power switch (four spade connectors).

   NOTE
   When the ac power harness assembly is replaced, fit the switch boot if necessary. Connect the ac power harness assembly, fit the boot over the power switch and secure it with the reusable tie wrap.
4. Removing the OCP:
   a. Remove the four screws holding the OCP to the front panel.

b. Remove the OCP and cover.

c. Remove the screws holding the ESD cover to the panel.

5. Removing the key lock:

a. Remove the front panel, disconnect the OCP data cables, lay the front panel down with the ac power cable connected.

b. Remove the single screw between the key locks.

c. Remove the key lock assembly from the chassis.

4.1.9 Disassembling the RSD

Remove the RSD from the unit and turn it up-side down.

1. Access panel

a. Remove the eight retaining screws (three each side, two at the front) and lift off the access panel.

2. Canister FLEX Assembly.

a. Disconnect the FLEX assembly 50-way SCSI bus connector and the 24-way RSD connector from the ISD.

b. Disconnect the power cable from the ISD.

c. Disconnect the READY cable form the ISD.

d. Disconnect the earth strape.

e. Lift out the canister FLEX assembly.

3. ISD PCB

a. The ISD PCB is now accessible, remove the four retaining screws to remove the board.

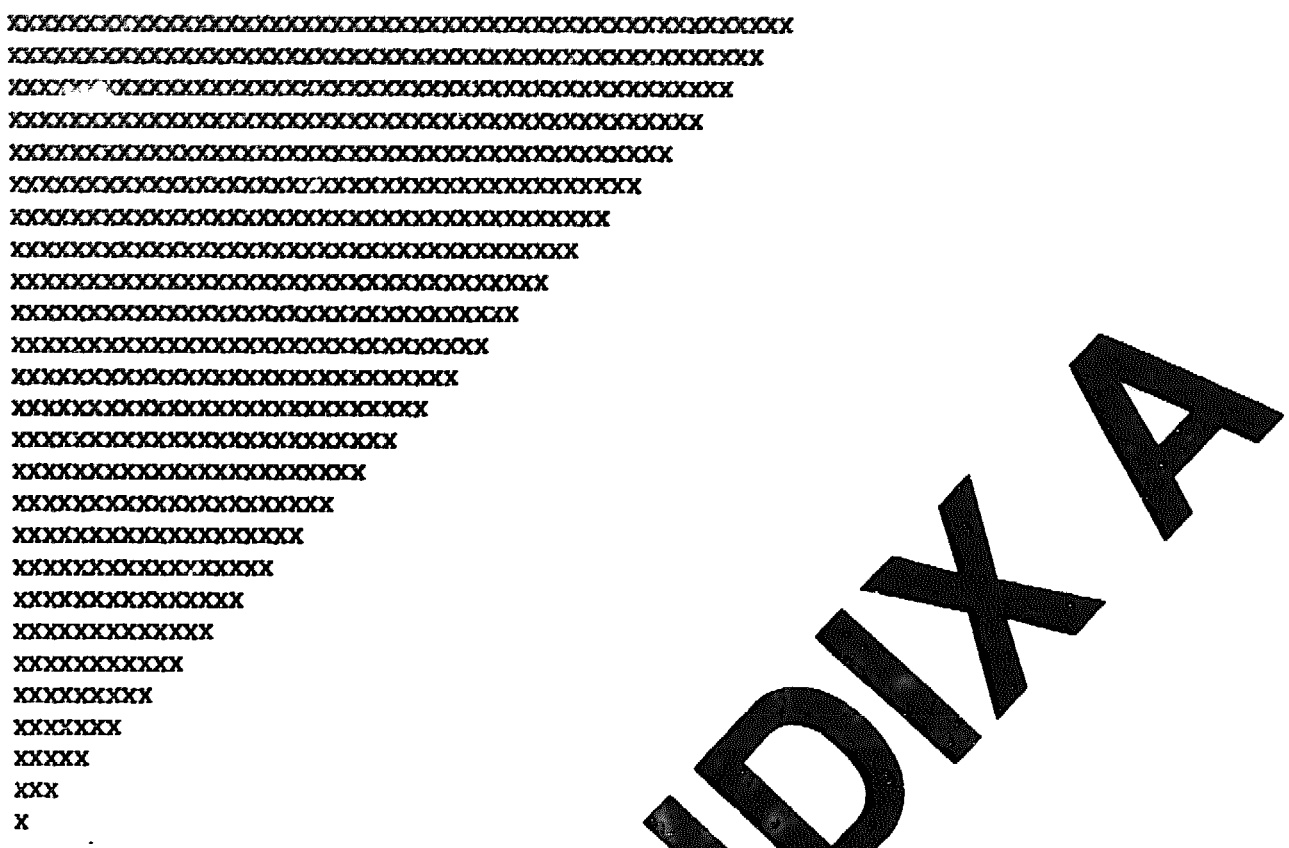
4. Change HDA.

a. Remove four retaining screws (access through holes in case sides and slides and through the vibration mounts) from each side of case.

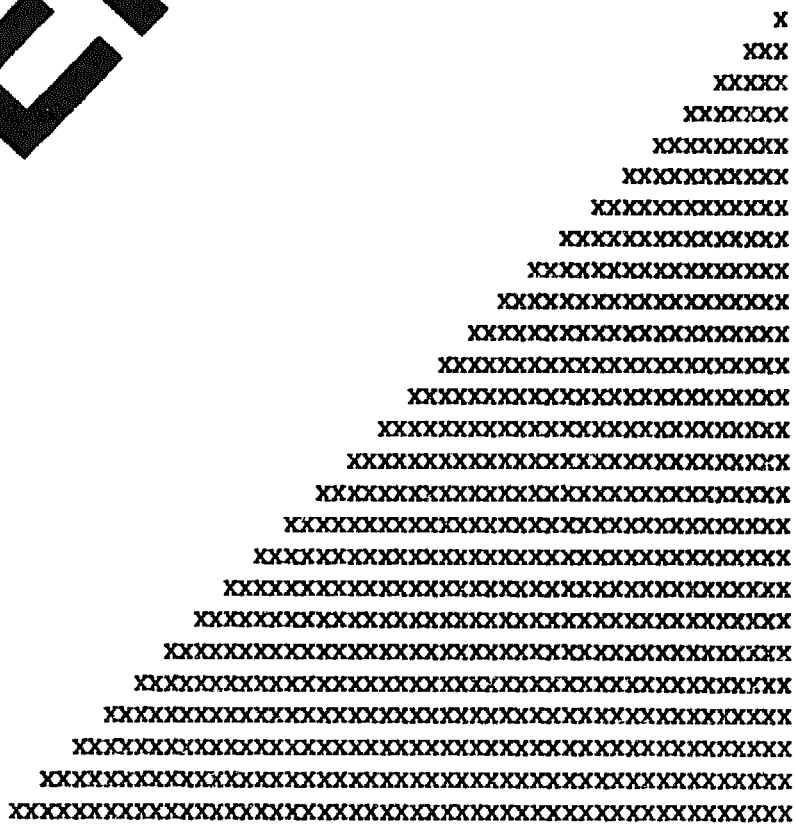
b. Remove earth straps as necessary.

NOTE
These must be replaced upon reassembly to ensure ESD (electrostatic discharge) integrity.

NOTE
Location of the ISD vibration mounts varies according to type. Note the position of these when changing enclosures and change the position of the mounts if necessary.



APPENDIX A



A
OPERATIONAL PROCEDURES

CAUTION

The Removable SCSI Disk contains precision equipment. Mishandling may cause damage and lead to the Warranty/Contract being invalidated.

All electronic equipment can be damaged by the static electricity present in most working environments. To prevent damage to the RSD's internal electronics, DO NOT TOUCH the socket at the rear of the RSD. Also, do not allow small objects to fall into the socket, as this may damage the pins on the pedestal or the RSD socket.

A.1 The Operator Control Panel (OCP)

The Operator Control Panel (refer to Figure A–1) contains all the switches and indicators required to use the R23RZ. The functions of the switches and indicators are as follows:

Behind the small door:

- The SCSI node select plugs. Each RSD must have a unique SCSI ID number. Node select plugs are provided with each R23RZ that give the user the option of identifying their RSD with SCSI ID numbers 0-5 and 7. See Appendix D for SCSI addressing rules and conventions.

  NOTE: The SCSI ID number allows the controller to identify individual drives. If two drives have the same ID number, the controller cannot distinguish either drive and will log several errors. The ID plugs are set up when the pedestal is installed and do not need to be changed unless more R23RZ systems are added to the bus.

- The ac power OFF/ON rocker switch, labeled O/ I . This switch connects/disconnects ac power to/from the R23RZ pedestal.

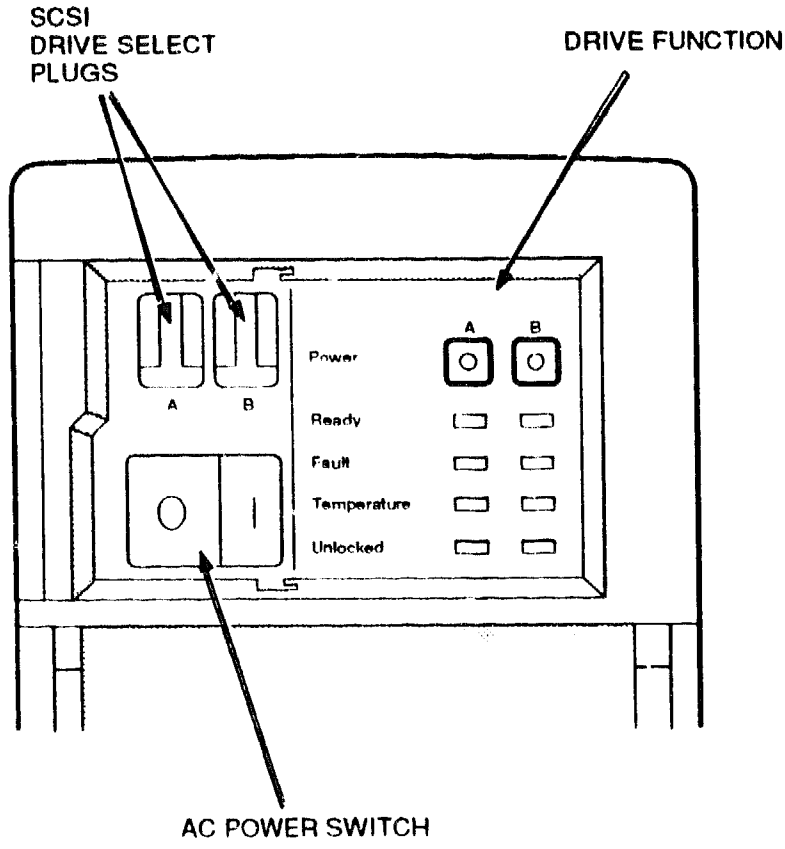


Figure A–1 Operator Control Panel (OCP)

On the right hand side of the OCP are two columns of switches and indicators, one column for each drive slot (A and B.) The switches and indicators are used as follows:

- The POWER switch is an operator-controlled pushbutton with an integral yellow indicator. When this button is pressed, the RSD interlock (an electromechanical drive lock) is engaged and power is applied to the appropriate RSD. The yellow indicator lights to signify that the RSD is powered.

  When the POWER switch is pressed again, power is removed from the RSD. The indicator flashes for about 15 seconds while the RSD is spinning down. When powering down is complete, the indicator goes out and the interlock disengages. Once the interlock is disengaged, the RSD can be withdrawn from its drive slot by turning the key in the appropriate drive key lock (see Section A.2).

  Do not power down the RSD until it has been dismounted from the system.

- The green READY indicator lights to indicate that the RSD is ready to be accessed by the operating system. After the drive is mounted, this indicator will remain lit except for brief flickering during seek operations (on certain versions of drives, this indicator will light BEFORE the drive is mounted.)

- The red FAULT indicator lights if a drive error is detected by the RSD's internal diagnostics. Note: The FAULT indicator lights briefly during Power-Up diagnostics and this does not indicate a fault. However, if the indicator remains lit, power down and remove the RSD, and call Digital Customer Services. You may still use other RSDs in the R23RZ.

- The red TEMPERATURE indicator lights if the temperature inside the RSD has risen above its maximum operating limit. If the TEMPERATURE indicator lights, remove the RSD from the drive slot and contact Digital Customer Services. *Do not* use the RSD or place another RSD in the drive slot until the problem has been rectified and the TEMPERATURE indicator is no longer lit.

  Should this over-temperature condition be detected, the RSD automatically powers down at the end of the data transfer. This indicator remains lit until the RSD cools to an acceptable temperature, when it goes out. However, the RSD does *not* power up again automatically: you must press the POWER button.

- When the green UNLOCKED indicator is lit, the drive interlock is disengaged and the RSD may be removed from the drive slot. When the indicator is not lit, the drive interlock is engaged and the RSD may not be removed from its slot. Note that this electromechanical locking is in addition to the drive key locks.

A.2 Drive Key Locks

In addition to the electromechanical drive lock, key locks (refer to Figure 1–1) provide extra security for the RSD since, without a key, the RSD cannot be removed from the drive slot. (However, it is not necessary to have a key to insert the RSD.)

A.3 Inserting an RSD into a Pedestal

The pedestal itself must be powered before an RSD is inserted. If the pedestal is not powered refer to Section A.5.

NOTE

Once the Pedestal is installed and powered up, it should be left on whenever possible and only the individual RSD slots should be turned on and off (as the drive is inserted and removed.)

1. Check that two SCSI node ID plugs have been installed on the Operator Control Panel. These plugs override the RSD's internal drive select switches so that the RSD requires no adjustment or configuration.
2. Check to make sure that the RSD slot power is off (refer to Figure A–1.) The indicator light will be off.
3. Open the pedestal door.
4. Insert the RSD as follows:
   - Pull the RSD handle out to its full extent.
   - Offer up the RSD to the empty slot as shown in Figure A–2. (The RSD has slides which are keyed to ensure that it can only be inserted in the correct orientation.)
   - Slide the RSD fully home, making sure that the canister is fully inserted after the lock mechanism clicks. **CAUTION: BEFORE POWERING UP AN INDIVIDUAL DRIVE, MAKE SURE THE CANISTER IS FULLY INSERTED AND THE LOCK MECHANISM CLICKS.**

- Push the RSD handle back in.

5. Close the pedestal door.
6. Press the POWER button to power up the RSD. The POWER button illuminates when the RSD is powered up.

A.4 Mounting and Dismounting a RSD

After Power-up, the RSD is ready to be accessed thus the drive must be brought on-line and mounted.

A.4.1 VMS Operating System

In VMS, the drive is mounted by using the mount command.
For example:

```
$ MOUNT DKB100: VOL_NAME
```

or, if the volume label is not known:

```
$ MOUNT/OVERRIDE=ID DKB100:
```

The RSD is now available for use as a standard disk, using all standard VMS commands. The SCSI ID is unique to the chassis, and the volume label is unique to the drive. When mounted, the system logs both the SCSI ID and the volume label. When another drive is plugged into the same chassis with a different volume label, it will not be recognized if the previous volume was not properly dismounted.

To remove an RSD, first DISMOUNT the drive, using the standard VMS command.
For example:

```
$ DISMOUNT DKB100:
```

CAUTION

Always dismount the disk prior to removing. Failure to do so will cause the drive to remain configured. The system will not permit access to another volume (disk) at that same SCSI ID. If the disk canisters were mistakenly swapped without dismounting, power down and remove the second disk. Replace it with the original disk, power up, and then dismount the volume.

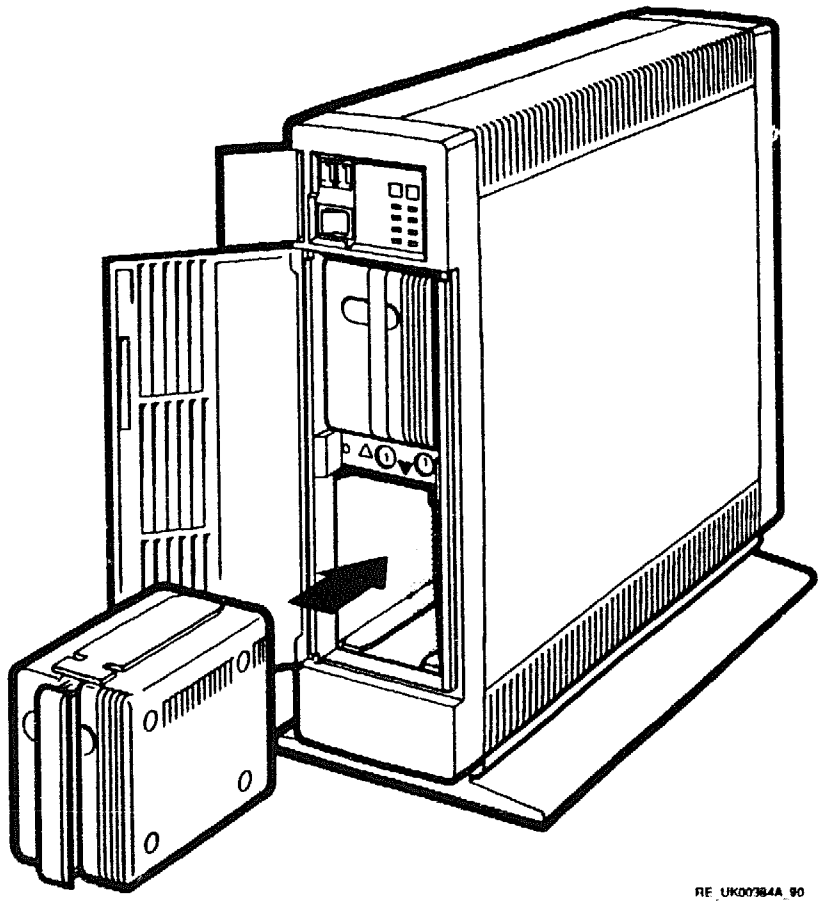


Figure A–2 Inserting an RSD

After dismounting, press the POWER button to power down the drive. The indicator flashes when the drive is spinning down, and goes out when the drive is powered down. When the green UNLOCKED indicator lights, the drive is unlocked. You can remove the RSD by turning the key in the key lock, and pulling the RSD from its slot.

A.4.2 ULTRIX Operating System

In ULTRIX, the drive is mounted by using the mount command.
For example:

```
# mount /dev/drive/vol_name
```

The RSD is now available for use as a standard disk, using all standard ULTRIX commands.

To remove an RSD, first DISMOUNT the drive, using the standard ULTRIX command.
For example:

```
# umount /vol_name
```

CAUTION

When running an ULTRIX operating system, always dismount the disk prior to removing. If the disk is not dismounted, the partition can be corrupted, information lost, and the disk cannot be remounted.

After dismounting, press the POWER button to power down the drive. The indicator flashes when the drive is spinning down, and goes out when the drive is powered down. When the green UNLOCKED indicator lights, the drive is unlocked. You can remove the RSD by turning the key in the key lock, and pulling the RSD from its slot.

A.5 Powering Up the System

When starting your system, set the ON/OFF switch to the ON position for all the devices in the order listed below. Note: Not all of these devices may be cabled to your system.

1. R23RZ System Pedestal/Rack with the Canisters installed.

If the system is initially configured with one RSD and then a second one is purchased, the bus must be reconfigured by following the system power up sequence (refer to Section A.5.) Once the SCSI bus has been configured, RSD's can be interchanged in the same slot AS LONG AS they are properly mounted and dismounted (refer to Section A.4.)

2. Any hard disk expansion box
3. Any tape expansion box
4. Any compact disc expansion box
5. Any printers or modems
6. Monitor
7. System

This procedure ensures that the external devices should be ready for use and will be included in the system's firmware configuration. Failure to apply power to any device on the SCSI bus will cause that device to not be seen on the SCSI bus.

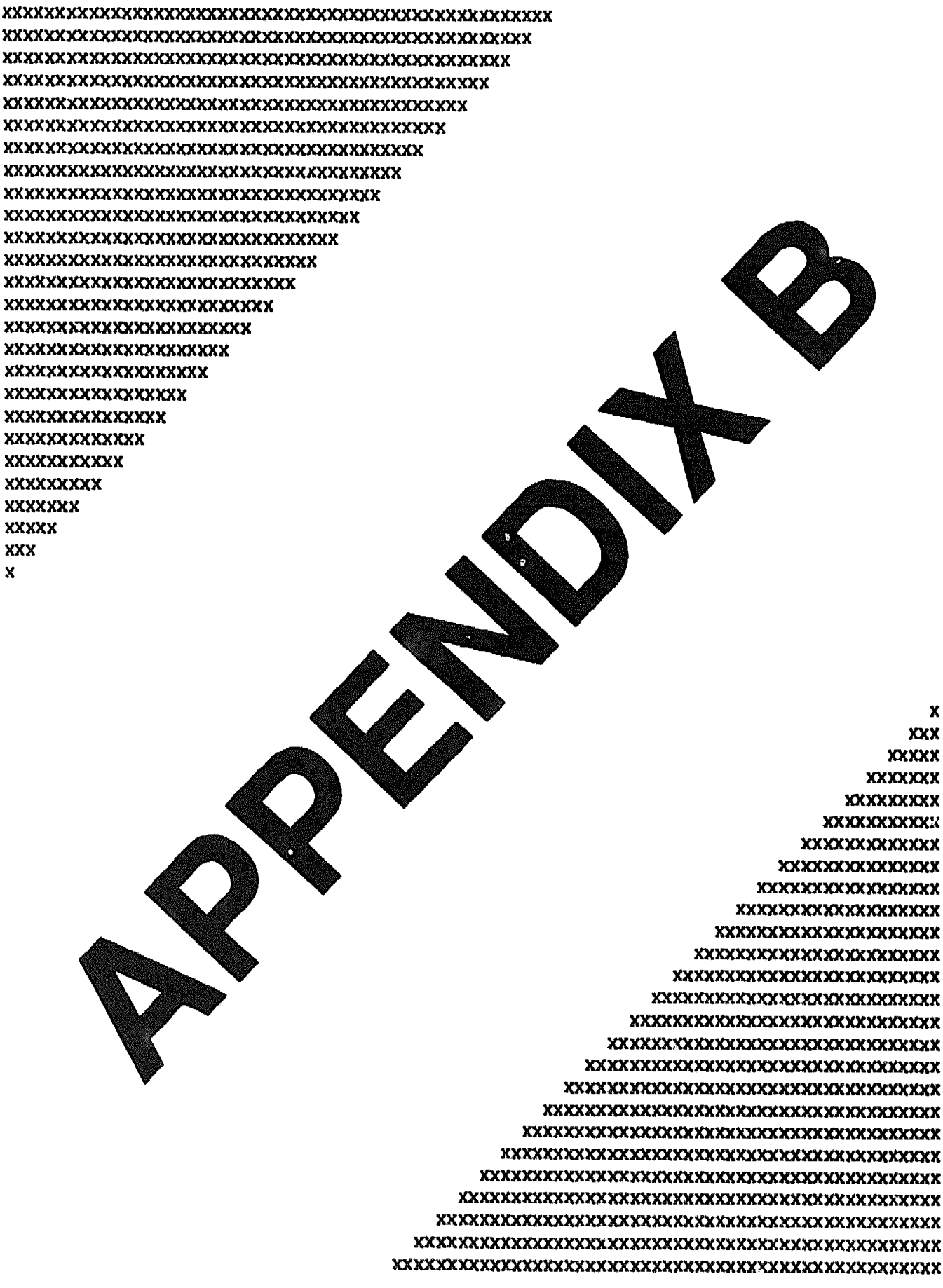
NOTE

On ULTRIX systems, all SCSI devices must be powered up and the SCSI Removable Disks must be on-line prior to booting up the operating system.

A.6 Switching off the Pedestal

The Pedestal should not be switched off unless one is prepared to go through the process described in Section A.5 to reconfigure the SCSI bus. If the pedestal must be switched off, the following steps should be followed.

- Dismount both drives.
- Switch off both drives.
- Remove the RSDs, if required, and store safely.
- Switch off the pedestal.


APPENDIX B

B
R23RZ SPECIFICATIONS

The following tables summarize the characteristics, environmental specification, electrical requirements, and space requirements of the R23RZ.

Table B–1 R23RZ Characteristics

Pedestal Height	24 in (61 cm)
Pedestal Width	10 in (25.5 cm)
Pedestal Depth	28.5 in (72.5 cm)
Pedestal Weight (including 2 RSDs)	74.2 lb (33.7 kg)
RSD Weight	
RZ55	11.5 lb (5.2 kg)
RZ56	11.5 lb (5.2 kg)
RZ57	11.5 lb (5.2 kg)

Table B–2 R23RZ Electrical Requirements

Voltage (V)	220–240	100–120
Power (W) (average)	88	86
Current (A)	0.7	1.3
Frequency (Hz)	50	60

Table B–3 R23RZ Space Requirements

Floor Space	25.5 x 81 cm (10 x 32 in)
Maintenance Space	30.5 x 188 cm (12 x 74 in)

Table B–4 R23RZ Environmental Specification

Temperature	
Operating	10 to 40°C (50 to 104°F)
Non-Operating	-40 to 66°C (-40 to 151°F)
Relative Humidity	
Operating	10 to 90% (non-condensing) maximum wet bulb temperature 28°C (82°F) minimum dew point 2°C (36°F)
Non-Operating	8 to 90% (non-condensing)
Altitude	
Operating	2,438 m (8,000 ft)
Non-Operating	4,876 m (16,000 ft)
Noise	5.0 Bels (Sound Power Level)
Agency Compliance	VDE 0878 Class A FCC Part 15J Class A

B.1 Supported Configurations

The supported SCSI configurations are shown in Figure B–1

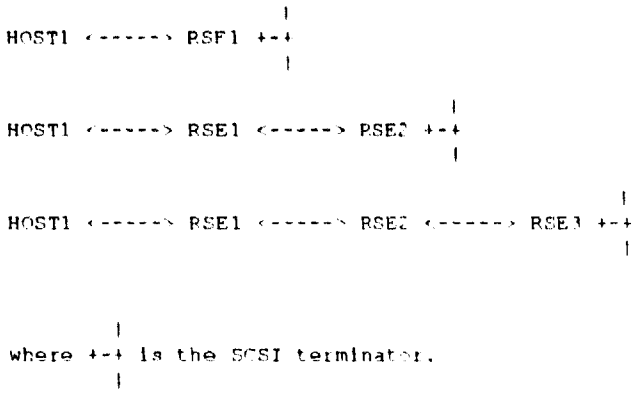


Figure B–1 Supported SCSI Configurations


APPENDIX C

C
OPTION KITS

The following options are available for the R23RZ-C Removable Rackmount SCSI Disk System, and for individual RSDs.

Table C–1 R23RZ-C Options

Options	Description
RZ55B-KA	One 120V/240V Rack (Part No. R23RZ-C2), One RZ55 Removable SCSI Disk with 332 MBF (Part No. RZ55 -RA), One SCSI cable (Part No. BC06P-06), One SCSI cable (Part No. BC56H-06), One SCSI terminator, Eight SCSI node ID plugs, One R23RZ-C Removable Rackmount SCSI Disk System Installation and User Guide (Part No. EK-R23RM-IN-001)
RZ56B-KA	One 120V/240V Rack (Part No. R23RZ-C2), One RZ56 Removable SCSI Disk with 665 MBF (Part No. RZ56 -RA), One SCSI cable (Part No. BC06P-06), One SCSI cable (Part No. BC56H-06), One SCSI terminator, Eight SCSI node ID plugs, One R23RZ-C Removable Rackmount SCSI Disk System Installation and User Guide (Part No. EK-R23RM-IN-001)
RZ57B-KA	One 120V/240V Rack (Part No. R23RZ-C2), One RZ57 Removable SCSI Disk with 1 GBF (Part No. RZ57 -RA), One SCSI cable (Part No. BC06P-06), One SCSI cable (Part No. BC56H-06), One SCSI terminator, Eight SCSI node ID plugs, One R23RZ-C Removable Rackmount SCSI Disk System Installation and User Guide (Part No. EK-R23RM-IN-001)

Table C–2 R23RZ-C Cable Options

Options	Description
BC06P-06	SCSI interpedestal or host to pedestal cable, IEEE to IEEE
BC06P-03	SCSI interrack cable or host to rack cable, IEEE to IEEE
BC09D-06	SCSI to host for DS5000, IEEE to MicroD
BC56H-06	SCSI to host cable, IEEE to MicroD
12-30552-01	Terminator

Table C–3 RSD Options

Options	Description
RZ55 -RA	RZ55 Removable SCSI Disk with 332 MBF
RZ56 -RA	RZ56 Removable SCSI Disk with 665 MBF
RZ57 -RA	RZ57 Removable SCSI Disk with 1 GBF
RFXX -CK	RSD carry case

Table C–4 R23RZ-C AC Power Cords

Options	Description	
BN19P-1K	120 VAC	U.S.A./Japan
BN24R-2E	220 VAC	Australia/New Zealand
BN19W-2E	220 VAC	Central Europe
BN26B-2E	240 VAC	U.K./Ireland
BN19E-2E	220 VAC	Switzerland
BN19K-2E	220 VAC	Denmark
BN19Z-2E	220 VAC	Italy
BN22Z-2E	240 VAC	India/South Africa
BN22P-2E	220 VAC	Israel


APPENDIX D

D

SCSI ADDRESSING RULES AND CONVENTIONS

D.1 Introduction

SCSI devices use identification numbers 0 through 7, with 7 being the highest priority ID. Address 7 is reserved and address 6 is used for the SCSI controller. Six device addresses (0-5) are available for custom configuring. Table A-1 lists the suggested addresses for each device connected to the bus.
Follow these rules when you are selecting the SCSI address:

- There can be up to eight SCSI devices (including the controller) on the bus.
- Each device must have a unique address. The same address cannot be used for two or more devices on the same SCSI bus.
- Each SCSI bus must be terminated at the last physical device on the bus.

Table D–1 Unit Select Addresses (Recommended)

Device Address	Device Type	Intended Use
0	Open	SCSI Removable Disk Subsystem (First Unit)
1	Open	SCSI Removable Disk Subsystem (Second Unit)
2	Disk Drive	User Disk
3	Disk Drive	System Disk
4	Disk Drive	RRD40
5	Tape Drive	TK50Z or TZ30
6	Reserved	SCSI Controller
7	Reserved	Reserved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