

Model SKS

SCSI Disk Subsystem

Technical Manual

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REVISION HISTORY

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Technical Manual for the SKS Series SCSI Disk Subsystems.

PREFACE

This manual contains information regarding installation, testing, and operation of the ZETACO SKS Series SCSI Disk Subsystems. It has been written with the following assumptions in mind: 1) You have a working knowledge of Data General (DG) minicomputers, operating systems, and diagnostic and utility software; 2) you have access to full hardware and software documentation for your particular system; 3) you are familiar with standard installation, power, grounding, and peripheral cabling procedures.

The information in this manual is organized into three major sections:

- SECTION 1.0 PRODUCT OVERVIEW - Describes the SKS Subsystem features, capabilities, specifications, power, and interface requirements.
- SECTION 2.0 INSTALLATION PROCEDURES - Describes and illustrates the procedures required to install an SKS Subsystem.
- SECTION 3.0 TROUBLE-SHOOTING - Contains information useful in analyzing subsystem problems, and how to get help.

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1.0 PRODUCT OVERVIEW

1.1 GENERAL DESCRIPTION

The SKS Series Subsystems are high capacity digital data storage and retrieval systems, designed for interface with Data General's BMC-equipped minicomputers.

The Subsystem is composed of ZETACO's DG-emulating disk controller (Model SCZ-1), magnetic disk drive(s) with Small Computer Systems Interface (SCSI), and a rack-mountable enclosure for the drives and their power supplies. All components are connected by a shielded daisy-chain cabling system that is compatible with DG's shielding requirements, or its Non-FCC Compliant chassis.

The Controller pairs ZETACO's emulation of the DG Argus 6236/39 Disk Subsystem with the SCSI peripheral interface on a single 15" x 15", 10-layer printed circuit board. Data transfers take place over the BMC (Burst Multiplexor Channel) on DG's Eclipse and MV Series computers.

Note that your SKS Subsystem has been integrated at the factory as a complete unit. Its components have been designed and tested together, and none should be substituted with any other type or brand of component, however similar; if substitutions are made, ZETACO cannot guarantee the proper functioning of the Subsystem.

1.2 FEATURES AND ADVANTAGES

- * The Subsystem interfaces to DG's high speed BMC bus on Eclipse and MV Series processors running unmodified AOS or AOS/VS. Refer to SKS Integration Guide for tested CPUs.
- * The Controller supports simultaneous control of up to seven SCSI Disk Drives, for a total of 2.1 gigabytes of on-line data.
- * The Controller Device code is easily selected, even after installation, via switches accessible at the board edge.
- * The Subsystem contains a user-friendly software configuration.

1.3 SPECIFICATIONS

1.3.1 SCZ-1 CONTROLLER

1.3.1.1 FUNCTIONAL - GENERAL

Drives per Controller: Up to 7 SCSI drives

Maximum On-line Capacity: 2.1 GB

Transfer Rate: Maximum SCSI burst rate of 1.5 MB/second

Indicator Lights: Red (Left): Self-Test - SCSI Module
Red (Right): Self-Test - HOST Module
Green (Left): SCSI Busy
Green (Right): Host Busy

Device Code Selection: Switch-selectable

1.3.1.2 FUNCTIONAL - COMPUTER INTERFACE

DG Emulation: 6236/6239 Disk Subsystem

Bus Load: 1 unit load (any I/O slot)

Data Channel Interface: Not supported

Burst Multiplexor Channel (BMC) Interface:

- less than 1 STTL load
- 64ma drive at 0.7v
- supports selectability of any of the 8 priority requests
- selectable burst rates of 1 to 256, 16-bit words/access
- selectable break between access of 1-256 sync clock periods
- Maximum allowable BMC latency is 30ms. To achieve maximum performance, system overhead (including BMC latency) should not exceed one disk sector time.
- supports transfer rates equal to the fastest available BMC computers (16.16 Mbyte/sec)

1.3.1.3 FUNCTIONAL - DRIVE INTERFACE

Small Computer Systems Interface (SCSI):

- supports parity generation and checking
- supports disconnect/reconnect
- complies with "Common Command Set"
- Byte-wide parallel data bus

1.3.1.4 MECHANICAL

Controller Dimensions:

Width:	15 inches (38.1 cm)
Length:	15 inches (38.1 cm)
Height:	0.5 inches (1.3 cm)

Controller Shipping Weight: 10 pounds (4.5 kg) - includes controller, paddleboard, cables, Software Support Tape, and documentation

1.3.1.5 POWER REQUIREMENTS

+5 (+/- 5%) Volts DC @ 6.5 Amps typical

1.3.1.6 ENVIRONMENTAL

OPERATING ENVIRONMENT:

Temperature:	0 to +55 degrees C
Relative Humidity:	+10% to +90% (non-condensing)

NON-OPERATING ENVIRONMENT:

Temperature:	-45 to +115 degrees C
Relative Humidity	+10% to +90% (non-condensing)

Exceeds all Eclipse and Eclipse/MV temperature and humidity specifications.

1.3.2 DISK DRIVE MODULE

1.3.2.1 MECHANICAL

Module Dimensions:
Width: 19 inches (48.26 cm)
Height: 3.4 inches (8.6 cm)
Length: 18 inches (45.7 cm)

Module Shipping Weight: 48 pounds (21.6 kg)

1.3.2.2 POWER REQUIREMENTS

AC Input:	120 VAC	220 VAC	230/240 VAC
Frequency:	60 Hz	50 Hz	50 Hz
Max. AC Operating Current:	4 Amps	2 Amps	2 Amps
Fuse:	6 1/4 Amp Slo-Blo	3 Amp Slo-Blo	3 Amp Slo-Blo

1.3.2.3 ENVIRONMENTAL

OPERATING ENVIRONMENT:

Temperature:	+10 to +38 degrees C
Relative Humidity:	+10% to +80% (non-condensing)
Altitude:	-1000 to +10000 feet

NON-OPERATING ENVIRONMENT:

Temperature:	-34 to +60 degrees C
Relative Humidity:	5% to +95% (non-condensing)
Altitude:	-1000 to +40000 feet

1.3.3 CABLING

1.3.3.1 INTERNAL

Paddleboard: Passive backplane paddleboard with one 50-pin cable connector ("A" backplane)

Cable: 50-conductor flat ribbon cable

1.3.3.2 EXTERNAL

Cables:

- Five-foot, 50-conductor shielded round cable connecting backpanel to Drive Enclosure
- One-foot, Optional 50-conductor shielded round cable(s) connecting additional Drive Enclosures
- Non-bulkhead installation kit

The maximum cumulative cable length allowable for a fully populated subsystem is 6 meters (single-ended), or 19.68 feet.

2.0 INSTALLATION

2.1 BEFORE YOU BEGIN

This section contains the procedures necessary for proper installation of the SKS Subsystem. We recommend that you read through it once in its entirety before you begin.

The following sections, beginning with 2.2, are in order of execution. In Sections 2.2 through 2.4 you will select a slot and device code for the Controller, establish slot priority and BMC termination, and install the controller and paddleboard. Sections 2.5 and 2.6 cover rack-mounting of the enclosure and cable connections. Section 2.7 details the power-up sequence.

In Sections 2.8 through 2.15 you will use programs on the Software Support Tape (the 1/2" magnetic tape reel shipped with the SKS Subsystem) to complete the installation. You will first configure the Controller, then format the disk drives. Finally, you will run DFMTR on the subsystem and bring it into full system operation.

You will need the following tools to install the SKS Subsystem:

1. A Phillips screwdriver
2. A set of nut drivers
3. A small straight-blade screwdriver
4. A large straight-blade screwdriver

You may also find a flashlight and needlenose pliers helpful for installing jumpers and the paddleboard in the computer backplane.

2.1.1 UNPACKING AND INSPECTION

The SKS Subsystem consists of the following parts:

QTY	DESCRIPTION	ZETACO P/N
1	SCZ-1 Disk Controller	500-460-00
1	Disk Drive Module	850-01X-XX
1	'A' Paddleboard	500-411-00
1	Internal Cable	300-148-00
1	External SCSI Cable 5'	300-183-02
1	BMC Terminator Block	300-156-00
2	BMC Bus Cables	300-038-00
1	Software Support Package	400-472-00
1	SKS Technical Manual	600-461-00

In this procedure, we assume that you are installing an SKS Subsystem that has one drive module which contains two disk drives.

Upon receipt of the SKS Subsystem from the carrier, inspect the shipping cartons immediately for any evidence of damage or mishandling in transit.

If the shipping cartons are water stained or damaged, contact the carrier and shipper immediately, specify the nature and extent of the damage and request that the carrier's agent be present when the cartons are opened.

ZETACO'S warranty does not cover shipping damage.

For repair or replacement of any ZETACO product damaged in shipment, call ZETACO to obtain return authorization instructions. See Section 3.7.

2.1.2 SYSTEM HARDWARE REQUIREMENTS

- a) Eclipse or MV Family CPU with minimum 32K words memory
- b) Magnetic Tape Subsystem
- c) Console on Device 10/11
- d) Printer at Device 17, in order to print a copy of your configuration facts and log any errors

2.1.3 THE SOFTWARE SUPPORT TAPE

The programs on the Software Support Tape have been written by ZETACO specifically for the SKS Subsystem. You will use these programs to configure the SCZ-1 Controller, format the disk, install Controller microcode onto the disk, trouble-shoot the system if necessary, and manage its resources.

NOTE: THIS TAPE CONTAINS YOUR ONLY PERMANENT COPY OF THE CURRENT REVISION OF THE SCZ-1 MICROCODE.

The Software Support Tape is structured so that the programs on Files 2 through 4 can be loaded and executed directly from the tape. Each is a stand-alone program; this means that they do not need, and cannot have, an operating system running when they are executed.

Files 0 and 1 contain the software that enables you to boot from the tape and select the particular program you want to load into the system. The boot procedure is detailed in Section 2.9.

At several points in the installation procedure you will find sample dialogues for the programs. In these samples, the lines that the computer prints will be shown entirely in upper case letters. The sample user responses will be on the next line below, indented. The CARRIAGE RETURN response will be designated by "<cr>". Comments and suggestions, which do not appear in an actual session and are here provided for clarification, will be preceded and followed by the characters "***".

2.2 SELECT A SLOT FOR THE CONTROLLER

The Controller may be installed in any I/O or I/O-MEM slot. Consult the hardware manuals for your particular computer to identify the appropriate slots.

2.2.1 PRIORITY SELECTION

The Controller must receive two priority signals from the DG minicomputer backplane: DCH Priority In (Pin A94), and Interrupt Priority In (Pin A96). If there are vacant slots between the Controller and the processor, or between the Controller and another controller already installed in the chassis, jumper wires must be installed to obtain priority continuity. To "jumper across" unused slots, connect DCH Priority Out (Pin A93) to DCH Priority In (Pin A94) and Interrupt Priority Out (Pin A95) to Interrupt Priority (Pin A96). See Figure 2.2.

2.2.2 SCSI TERMINATOR POWER

Before installing the controller into the computer, make sure that the SCSI Terminator Power, jumper J30-1, is installed. See Figure 2.1 for the location of this jumper.

2.3 INSTALL THE CONTROLLER

FIRST, BE SURE THE COMPUTER IS TURNED OFF. Pull the lock tabs on the two front corners of the controller out as far as they will go. Next, carefully guide the controller into the I/O slot you selected in Section 2.2. When the board engages the backplane connectors, gently press the lock tabs in to provide insertion leverage. Use equal pressure on both lock tabs until the board seats firmly into the backplane connectors.

FIGURE 2.1 SCZ-1 Board Layout

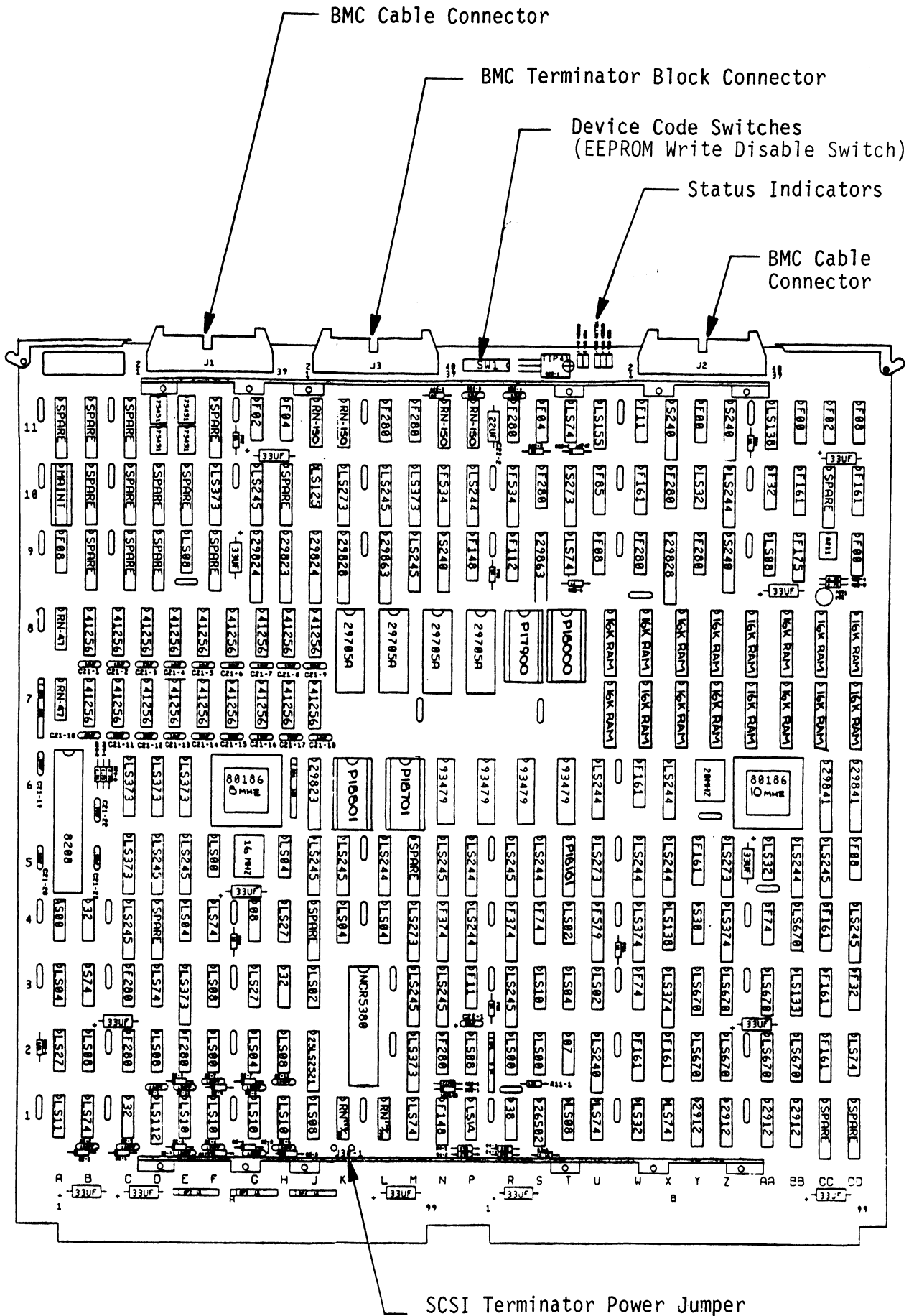
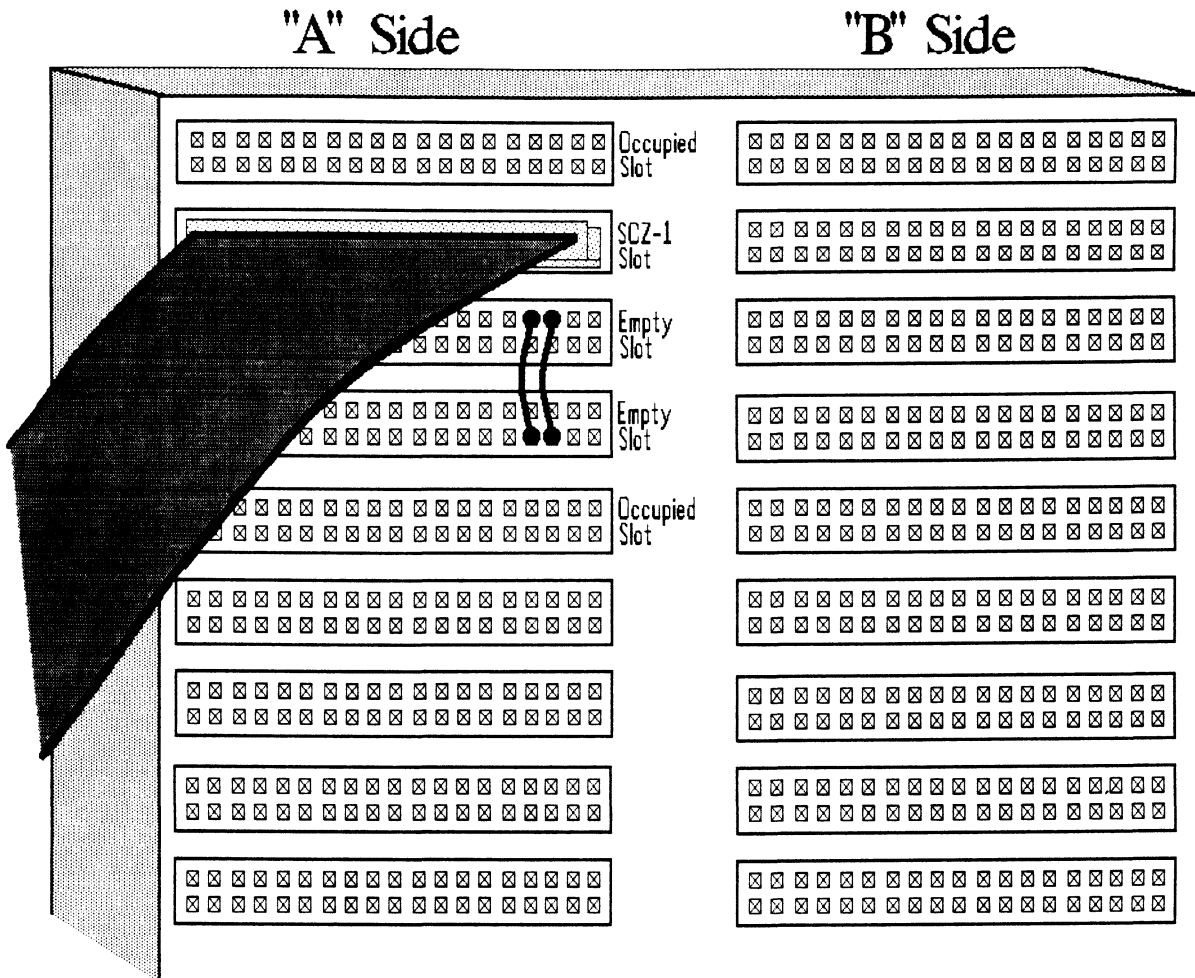


Figure 2.2 Backplane Priority Jumpers



2.3.1 DEVICE CODE SELECTION

The recommended device code for the SKS Subsystem Controller is 24 (octal). However, any usable device code can be selected, as long as there is not already a controller in the system with that code.

There is a set of switches on the edge of the board that allows you to easily set the device code. Switches 3 through 8 specify device code. Switches 1 and 2 are reserved and should be placed in the "Down" position. Refer to Figure 2.1 and 2.3 for switch location and proper selection.

If, at a later date, you wish to change the device code for the Controller, you need not remove the board from the computer chassis. Simply set the switches accordingly and press RESET on the computer. The new device code will then be operative.

2.3.2 EEPROM WRITE DISABLE

Switch position 2 (see Figure 2.3) is used to disable writing of the EEPROMs. This switch, in the DOWN position (closed), disables writing while the UP (open) position allows writing. To configure the EEPROMs this switch must be in the UP position.

Figure 2.3 Device Code Switches

Note:

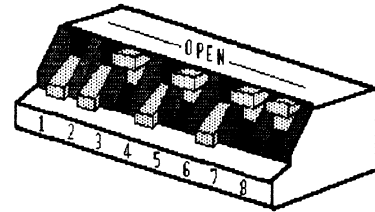
Switch Down = Binary 1

Switch Up = Binary 0

Switch 3 = Most Significant Bit

Device Code = 24 Octal is Shown

Switch 2 = EEPROM Write Disable (DOWN)



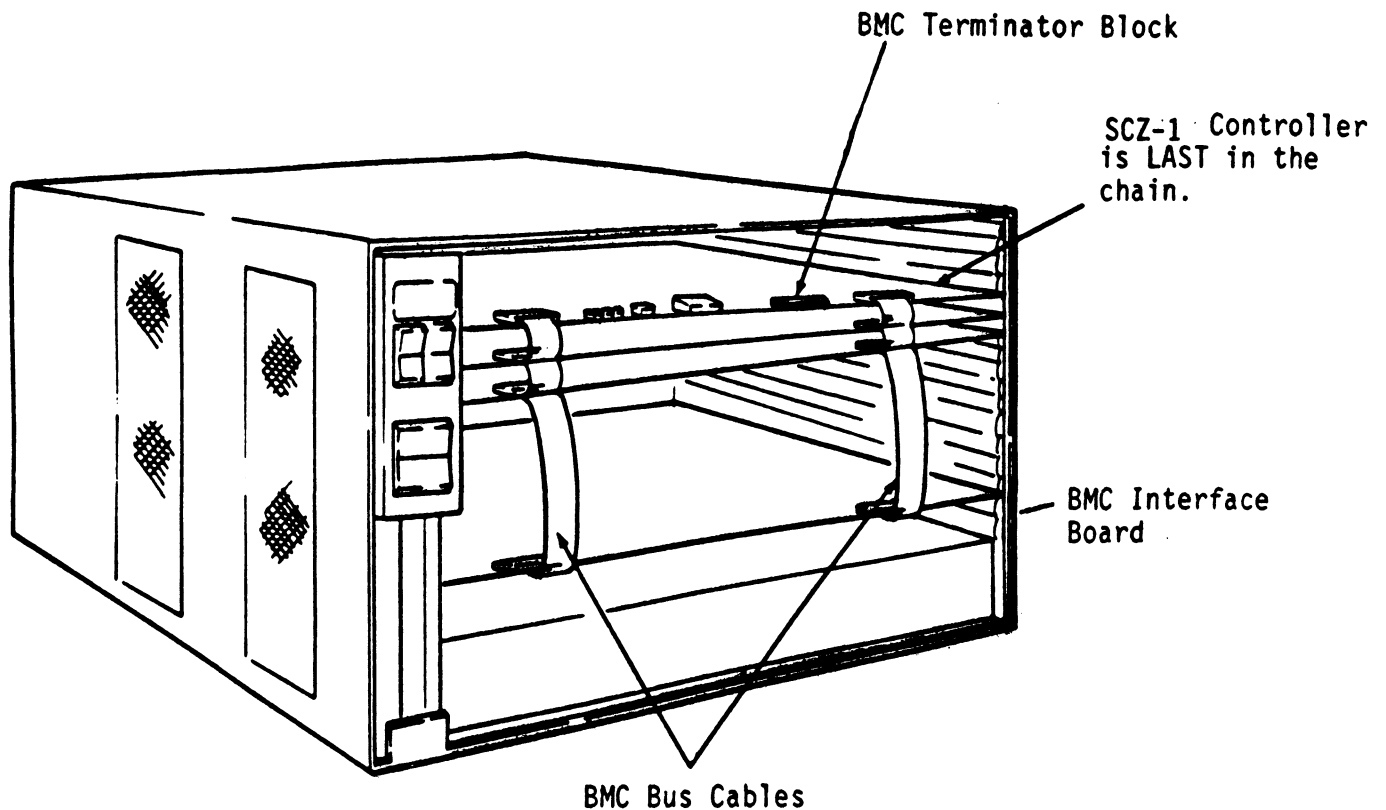
Device Code	S1 Reserved	S2 EEPROM Write Disable	S3 DS0	S4 DS1	S5 DS2	S6 DS3	S7 DS4	S8 DS5
0X			UP	UP	UP			
1X			UP	UP	DOWN			
2X			UP	DOWN	UP			
3X			UP	DOWN	DOWN			
4X			DOWN	UP	UP			
5X			DOWN	UP	DOWN			
6X			DOWN	DOWN	UP			
7X			DOWN	DOWN	DOWN			
X0						UP	UP	UP
X1						UP	UP	DOWN
X2						UP	DOWN	UP
X3						UP	DOWN	DOWN
X4						DOWN	UP	UP
X5						DOWN	UP	DOWN
X6						DOWN	DOWN	UP
X7						DOWN	DOWN	DOWN

2.3.3 BMC BUS CABLING AND TERMINATION

The two BMC bus cables provided with the SKS Subsystem are daisy-chained from the computer's BMC interface board to the various BMC peripheral controllers, as shown in Figure 2.4. The controller at the end of the chain must have a BMC terminator block installed; the others must not. If the SCZ-1 Controller is to be installed as the last (or only) BMC controller, then make sure the terminator block is installed in the appropriate header connector, located as shown in the figure. For another view of this connector, see Figure 2.1. The Controller is shipped from the factory with the terminator block installed.

Install the BMC bus cables as shown in the figure by plugging the single-plug end of the cables into the DG BMC interface board, and the multiple-plug end of the cables into the SCZ-1 Controller and other BMC peripheral controllers.

FIGURE 2.4 BMC Bus Cabling



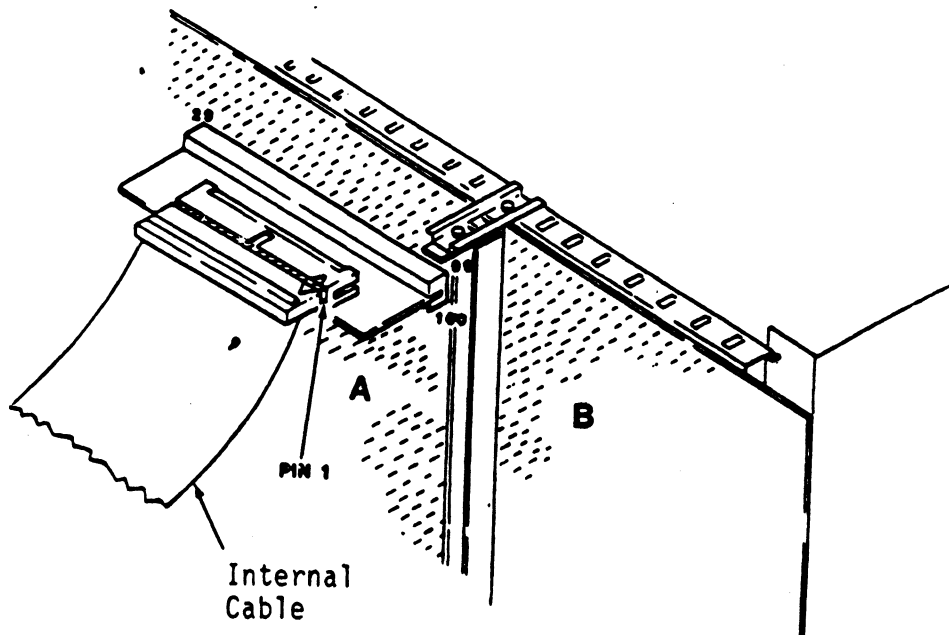
2.4 INSTALL THE PADDLEBOARD

The computer backplane, viewed from the rear, has the "A" side pins on the left. (On computers with vertically mounted circuit boards, the "A" side pins are on the top.)

Locate the two rows of pins on the "A" side of the backplane for the slot containing the Controller. Ensure that no pins are bent. Position the "A" paddleboard connector block so that it covers the pins on the right-most end of the rows (pins 29 through 100). Be sure that the header connector on the paddleboard is facing up. Press the connector securely over the pins, making sure all pins insert and do not bend, until the connector block is flush with the backplane. See Figure 2.5.

CAUTION: COMPONENT DAMAGE MAY OCCUR IF THE PADDLEBOARD IS MISALIGNED. MAKE SURE THE CONNECTOR BLOCK IS NOT SHIFTED RIGHT OR LEFT. ALSO ENSURE THAT THE BLOCK IS POSITIONED OVER THE CORRECT TWO ROWS OF PINS, AND NOT BETWEEN SLOTS. IT MAY BE NECESSARY TO COUNT PAIRS OF ROWS TO DETERMINE CORRECT POSITIONING.

FIGURE 2.5 Paddleboard and Internal Cable Installation

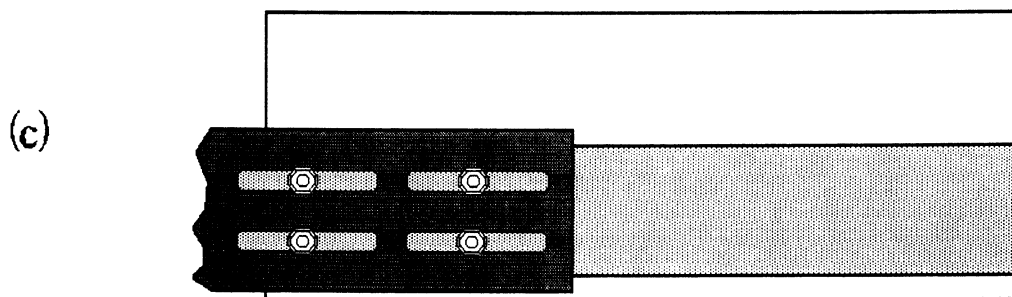
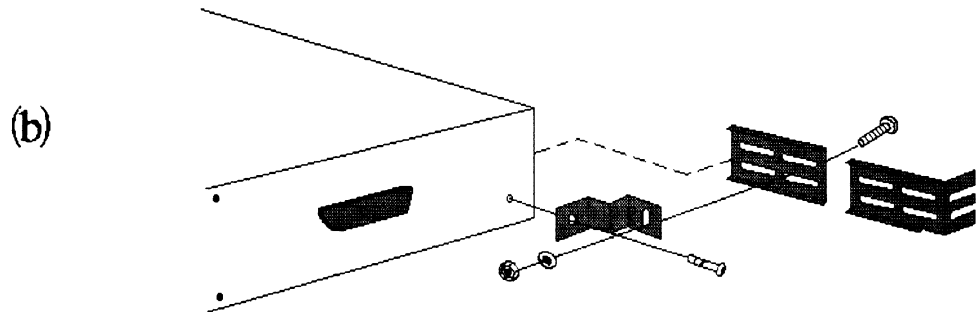
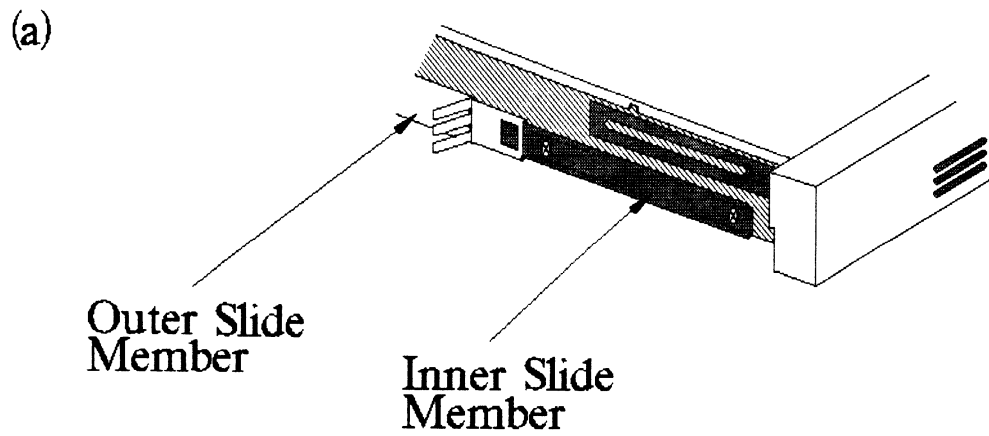


There are two slide assemblies for each Disk Drive Module (See Figure 2.6). Each slide assembly consists of an OUTER SLIDE MEMBER that attaches to the vertical mounting rails in the cabinet and an INNER SLIDE MEMBER that attaches to the module itself. See Figure 2.6a. For the Disk Drive Module, each slide assembly requires one L-shaped slotted-hole bracket for attaching the OUTER SLIDE MEMBER to the rear vertical rails. Mounting hardware is included.

The Disk Drive Module is shipped from the factory with the slide assemblies attached. To complete the installation of the module into a standard 19" RETMA rack:

1. Attach the L-bracket to the rear end of each OUTER SLIDE MEMBER. On the inside of each L-bracket there is a quarter-turn fastener that mates with a receptacle in the rear of the module. Insert this fastener and turn it so that the L-bracket is locked to the module. Then attach the L-bracket to the OUTER SLIDE MEMBER using the supplied hardware. See Figure 2.6b and c. At this point, the screws should only be "finger tight."
2. Unlock the fasteners at the rear of the module and disconnect the OUTER SLIDE MEMBER from the INNER SLIDE MEMBER of each slide assembly by fully extending the slides and then pressing the release clips.
3. Mount the OUTER SLIDE MEMBERS to the vertical rails on both sides of the cabinet, sliding the L-brackets forward or backward as necessary to span the distance between the front and rear rails. Leave the screws holding the OUTER SLIDE MEMBERS to the vertical rails "finger tight," but at this time fully tighten the screws attaching the L-brackets to the OUTER SLIDE MEMBERS.
4. Extend the slides of both OUTER SLIDE MEMBERS until they have reached their maximum position. Lift the module and carefully guide the INNER SLIDE MEMBERS into the OUTER SLIDE MEMBERS, adjusting the OUTER SLIDE MEMBERS towards or away from the module as required to obtain accurate alignment. Slowly slide the module into the cabinet a few inches, taking care that the slides travel smoothly. When satisfied, and while CONTINUING TO SUPPORT MOST OF THE WEIGHT OF THE MODULE, fully tighten the OUTER SLIDE MEMBERS to the vertical rails.
5. Slide the module fully into the cabinet and again be sure it travels smoothly. Finally, extend it fully, allowing its full weight to be supported by the slides. If all motion is free and easy, slide the module back into the cabinet and turn the fasteners in the back to lock the unit in place. The installation is now complete.

Figure 2.6 Disk Drive Module Slide Assembly



2.6 CONNECT THE CABLES

The inter-module cabling scheme for the SKS Subsystem consists of two parts: an internal cable, and a set of external cables.

2.6.1 INTERNAL CABLING

The Internal Cable is a flat 50-conductor cable with a socket connector on one end and a "D" connector on the other. As shown in Figure 2.5, the socket connector plugs into the "A" paddleboard. The other end of this cable (the "D" connector) mounts on the computer bulkhead.

To mount the "D" connector on the bulkhead, first remove the cover from the desired mounting hole, and the hex bolts, washers, and nuts from the connector. Then, insert the connector into the hole in the bulkhead from the inside, insert the hex bolts from the outside, and secure the connector to the bulkhead.

If the computer chassis is not FCC-compliant and therefore has no bulkhead, fasten the "D" connectors of the Internal and External cables together using the non-bulkhead installation kit. Attach non-bulkhead mounting bracket to nearest vertical rail.

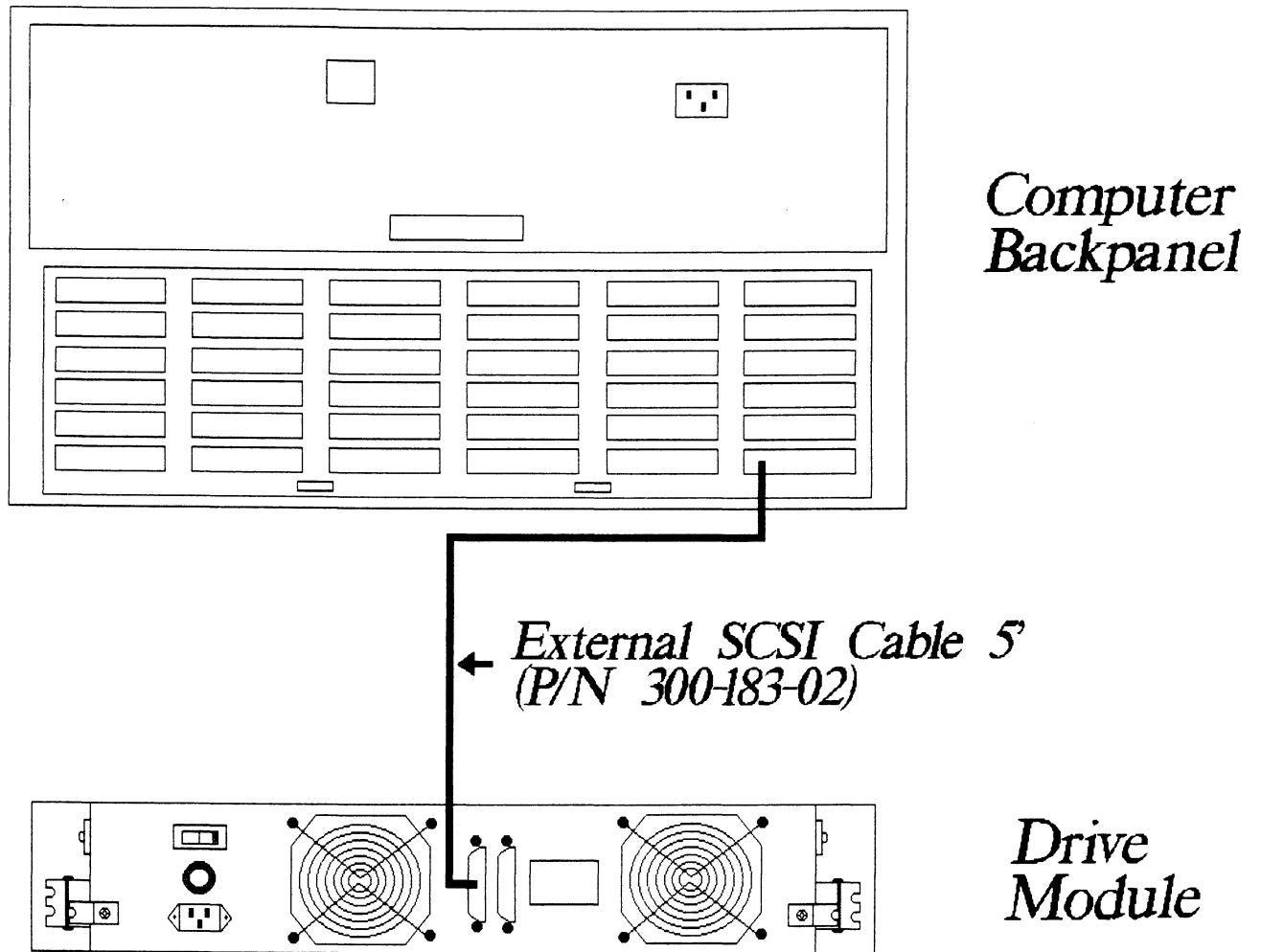
2.6.2 EXTERNAL CABLING

One external cable is required to operate the SKS Subsystem in its basic configuration. The External SCSI cable has at both ends, a 50-pin "D" connector. The "D" connector ends are interchangeable. The 5' cable is connected from the computer bulkhead to the connector labeled "SCSI IN" on the rear panel of the drive module.

Figure 2.7 illustrates this connection scheme.

If you are installing multiple drive modules at this time, see Appendix B for the expanded cabling scheme and additional drive preparations.

Figure 2.7 Cabling for SKS Subsystem
(One Drive Module; Rear View)



2.7 POWER UP THE SUBSYSTEM

2.7.1 DISK DRIVE MODULE OPERATION

Begin the power-up sequence by turning on the Disk Drive Module. You will find an ON/OFF rocker switch on the rear panel of the module; place it in the ON position. Observe that the indicator light imbedded in the switch and the READY LED on the front panel both become illuminated, and that the fans in the rear of the unit are turning.

The disk drives should now be spinning. It will take approximately 35 seconds for the disk to reach full rotational speed and become ready. At that time, the READY LED will go out.

If there are any problems at this point, see Section 4.1.1.

2.7.2 COMPUTER POWER-UP

Once your drive module(s) have been turned on and are ready for operation, you can power-up the computer. After you press the computer's power switch, you will notice that some of the LEDs on the front edge of the controller will be active. They are indicating the status of the board's automatic Self-tests.

At the end of the sequence all LEDs should be off. This indicates that the Controller has successfully passed its Self-tests and is ready to receive commands from the system.

2.8 BOOT THE SOFTWARE SUPPORT TAPE

The Bootstrap Procedure for the Software Support Tape is:

1. Mount the Software Support Tape on a tape drive and put it on-line. Be sure that the BPI setting matches that specified on the tape label.
2. Execute a "Program Load." The Program Load procedure is different for different computers. Consult the Operator's Manual for your computer to determine the correct one.
3. The Software Support Tape menu will be displayed:

FILE #	PROGRAM
2	CFSCZ1 CONFIGURATOR
3	SCZ1 INITIALIZER
4	SCZ1 RELIABILITY
5	DUMP FILES FOR SCZ1

FILE NUMBER?

2

You should enter the number of the program you wish to execute. At this point in the installation procedure, we entered "2" to load the Configurator Program.

2.9 CONFIGURE THE SCZ-1 CONTROLLER

The only parameter that may need to be altered is the BMC Priority. The factory default priority is set to zero. Continue reading this section to set the BMC Priority to something other than zero.

The Configurator program allows you to tailor some of the operating parameters of the Controller to suit your system without having to resort to cumbersome on-board switches or jumpers. The parameters are stored on the Controller in an EEPROM (Electrically Erasable Programmable Read-Only Memory). They are preserved even when power is removed from the board, and are changeable only through the Configurator program.

Once you have given the program the device code of the Controller (the octal number of the switch settings established in Section 2.3.1), the program will return with a request that you enter a command. This prompt indicates that the program has successfully communicated with the Controller at that device code, and the Controller is ready to be configured.

If the program does not return with this prompt, the system was unable to contact the Controller at that device code. If such is the case, turn everything off and double-check all of the preceding installation steps. If, after doing so, you still have problems, contact ZETACO's Customer Support Hotline. See Section 4.5.

As the program's opening message points out, help with all aspects of the program's operation is available on-screen. The "W" command (HELP-WHAT TO DO) gives an overview of the program's use. The "H" command (HELP-OPERATIONS) gives details on some of its operational characteristics. Brief explanations of most of the parameters themselves are available by selecting the parameters from the main menu and entering an "H" instead of the requested values. For further information, see Appendix A.

Most of the parameters are factory-preset with recommended values. The ones you will need to establish now are the BMC Bus Priority, Break Count Interval, and Throttle Burst Rate. The most efficient way to do this is to select the CHANGE ALL FACTS option from the menu. Explanations and configuration recommendations for the three are available on-screen or in Appendix A as noted above.

2.10 INITIALIZE THE DISK

Initialization of the disk is done at the factory and is not necessary at installation time, however, if soft errors are encountered during Reliability, initialization is recommended.

The Initializer Program (File #3) consists of five modules:

1. ANALYZE DISK
2. RELOCATE BLOCKS
3. MICROCODE INSTALL ONLY
4. FORMAT ONLY
5. ZDKINIT ONLY

In the opening menu there are selections to enter and start the devices. You will need to select the [E]nter device selection and then you will be given the menu listing the above choices.

We recommend at this point that you run the Analyze module. This will format the disk, analyze the surface and relocate any bad disk blocks, write out the microcode, and write out an empty soft error log for the microcode to use. Run Reliability (see Section 2.12, below) to verify that the media has been formatted and the subsystem is operational.

The following sample dialogue will guide you through this procedure.

To analyze the disk, boot the software support tape and load file #3. The sample dialogue below will guide you through the Analyze module of the Initializer Program.

SCZ1 DISK INITIALIZER
REV. X.XX

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COMMAND LIST

[E]NTER A DEVICE	[D]ELETE A DEVICE
[S]TART A DEVICE	[H]ALT A DEVICE
[R]ESTART THE PROGRAM	[L]IST ERROR TOTALS
[C]OMMAND LIST	[P]RINTER CONTROL
[F]LAGS	[M]ODE OF DISPLAY
[Q]UIT	

ENTER A COMMAND SELECTION (C=CMD LIST):

****We wish to enter the device that we want to analyze, so we type E.****

E
ENTER THE DEVICE CODE [24]:
<cr>

****24 is the primary device code. If you have your controller set up for the secondary device code of 64, you would enter that number here.****

START INITIALIZATION OF CONTROLLER
CONTROLLER MICROCODE REV: X.XX
END INITIALIZATION OF CONTROLLER

****This is just telling you that the program is loading microcode onto the SCZ-1, and what the revision number is.****

UNIT 0. IS READY; SELECT (YES, [NO]):
YES

****The Initializer Program has looked at the SCZ-1 and found that Unit 0 is ready. It then asks you if you want to use Unit 0. If you do then you would type YES. If not, then type <cr> and the Initializer Program would go on to the next ready unit.****

COMMAND CHOICES

[A]NALYZE DISK (ANALYZE, ZDKINIT, INST UCODE, INIT SOFT LOG)
[R]ELOCATE BLOCKS
[M]ICROCODE INSTALL ONLY
[F]ORMAT ONLY
[Z]DKINIT ONLY (ZDKINIT, INSTALL MICRO-CODE, INIT SOFT LOG)

ENTER YOUR SELECTION [A]:
A

****At this time we wish to Analyze the disk so we can run the Reliability Program and verify that the subsystem is operational.****

FORMAT ([YES] NO):
YES

****You should select to Format.****

RETAIN ANY PREVIOUSLY RELOCATED SECTORS? IF YOU DO NOT
RETAIN THE PREVIOUSLY RELOCATED SECTORS, IT IS RECOMMENDED
THAT A FULL FIVE PATTERN ANALYSIS BE DONE IN ORDER TO
RELOCATE ALL THE BAD SECTORS THAT WERE PREVIOUSLY BEING
HANDLED ([YES] NO):

YES

****You'll usually want to retain previous lists on formatting.****

THE DATA PATTERNS LISTED BELOW ARE USED IN THE ORDER LISTED.

AAAA	2525	5555	1F1F	FFFF
0000	F6F6	5252	F1F1	6F6F

ENTER THE NUMBER OF PATTERNS TO RUN [5]:
<cr>

****Use the default.****

UNIT 0. IS SELECTED
UNIT 1. IS NOT READY
UNIT 2. IS NOT READY
UNIT 3. IS NOT READY

****** NOTE **** YOU MUST ENTER [S]TART IN ORDER TO HAVE THE
SELECTED OPERATIONS ACTUALLY TAKE PLACE.**

SCZ1 DISK INITIALIZER
REV. X.XX

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COMMAND LIST

[E]NTER A DEVICE	[D]ELETE A DEVICE
[S]TART A DEVICE	[H]ALT A DEVICE
[R]ESTART THE PROGRAM	[L]IST ERROR TOTALS
[C]OMMAND LIST	[P]RINTER CONTROL
[F]LAGS	[M]ODE OF DISPLAY
[Q]UIT	

ENTER A COMMAND SELECTION (C=CMD LIST):
S

START ALL ENTERED DEVICES ([YES], NO):
<cr>

****This will start the program analyzing. Now you may enter
other commands such as [L]IST.****

SCZ1 DISK INITIALIZER
REV. X.XX

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COMMAND LIST

[E]NTER A DEVICE	[D]ELETE A DEVICE
[S]TART A DEVICE	[H]ALT A DEVICE
[R]ESTART THE PROGRAM	[L]IST ERROR TOTALS
[C]OMMAND LIST	[P]RINTER CONTROL
[F]LAGS	[M]ODE OF DISPLAY
[Q]UIT	

ENTER A COMMAND SELECTION (C=CMD LIST):

L

As the initializing moves along, you may want to see if it is still active. Use of the L command will show you the current state of each of the devices being initialized.

RUN TIME 0. HRS. 20. MINS. 3. SECS.
DEVICE CODE 24 UNIT NUMBER 0. STATE: **ACTIVE**
MODES: - FORMAT - ANALYZE - INSTL UCODE - INSTL MAP

This tells us that we are formatting and analyzing.

RUN TIME 0. HRS. 40. MINS. 3. SECS.
DEVICE CODE 24 UNIT NUMBER 0. DEVICE STATE: **ACTIVE**
MODES: - FORMAT - ANALYZE - INSTL UCODE - INSTL MAP
THIS UNIT IS COMPLETE WITH ITS ASSIGNED TASKS.

When this message is printed, the program has finished with the unit, and you may now enter the [Q]UIT key.

2.11 RUN RELIABILITY TO VERIFY THE INSTALLATION

At this point, run Reliability for several minutes, just to verify that the subsystem is operational after the initial format. To do so, boot the Software Support tape and load file #4. The Reliability program consists of two basic modules.

The first is the Random RELI. In this module the disk transfer addresses and size are selected at random. The data type will be selected by the user, but if ALL PATTERNS is selected the pattern will be selected at random as well. In Random RELI, sixteen device control blocks will be active and distributed randomly between the devices that are currently active.

SCZ1 RELIABILITY UTILITY

ENABLE MAPPING (YES,[NO]):
<cr>

EXECUTION MODE:
[R]ANDOM RELIABILITY [S]EQUENTIAL RELIABILITY
ENTER YOUR CHOICE [R]:
<cr>

This question refers to the order in which the disk will be accessed for all of the devices tested in the Reliability. We will choose the default, "R".

SCZ1 RELIABILITY UTILITY
REV. X.XX

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COMMAND LIST

[E]NTER A DEVICE	[D]ELETE A DEVICE
[S]TART A DEVICE	[H]ALT A DEVICE
[R]ESTART THE PROGRAM	[L]IST ERROR TOTALS
[C]OMMAND LIST	[P]RINTER CONTROL
[F]LAGS	[M]ODE OF DISPLAY
[Q]UIT	

ENTER A COMMAND SELECTION (C=CMD LIST):

E

ENTER THE DEVICE CODE [24]:

<cr>

24 is the primary device code. If you have your controller set up for the secondary device code of 64, you would enter that number here.

START INITIALIZATION OF CONTROLLER
CONTROLLER MICROCODE REV: X.XX
END INITIALIAZATION OF CONTROLLER

This is just telling you that the Reliability Program is loading the microcode onto the SCZ-1 from the disk. The revision number is also displayed.

UNIT 0. IS READY; SELECT (YES,[NO]):

<cr>

The Reliability Program has looked at the SCZ-1 and found that UNIT 0 is ready. It then asks you if you want to use UNIT 0. If you do then you would type "YES". If you do not, then type <cr> and the Program will go on to the next ready unit.

THE DISK SIZE IS XXX. MB

WRITE ONLY (YES,[NO]):

<cr>

READ ONLY (YES,[NO]):

<cr>

VERIFY DATA ([YES],NO):

<cr>

SELECT DATA TYPE:

0 - LOGICAL BLOCK ADDRESS

2 - FLOATING ONE

4 - ALTERNATE ONES (125252)

6 - ALL ONES

8 - ROTATING (125252)

SELECT DATA TYPE [0.]:

<cr>

1 - FLOATING ZERO

3 - ALTERNATE ZEROS (52525)

5 - ALL ZEROS

7 - RANDOM

9 - DO ALL PATTERNS

UNIT 0. IS SELECTED

UNIT 1. IS NOT READY

UNIT 2. IS NOT READY

UNIT 3. IS NOT READY

SCZ1 RELIABILITY UTILITY

REV. X.XX

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COMMAND LIST

[E]NTER A DEVICE

[S]TART A DEVICE

[R]ESTART THE PROGRAM

[C]OMMAND LIST

[F]LAGS

[Q]UIT

[D]ELETE A DEVICE

[H]ALT A DEVICE

[L]IST ERROR TOTALS

[P]RINTER CONTROL

[M]ODE OF DISPLAY

ENTER A COMMAND CHOICE (C=CMD LIST):

S

START ALL ENTERED DEVICES ([YES],NO):

<cr>

At this point you are finished Entering your device and have commanded the program to start running. The green LEDs on the front of the controller board should now be ON (they are actually flashing very rapidly), signifying that the controller is active. You may at any time initiate another command from the list simply by typing its letter.

L

RUN TIME 0. HRS. 20. MIN. 3. SECS.
DEVICE CODE 24 UNIT NUMBER 0. MAPPING NOT ENABLED DEVICE STATE:
MODES: RANDOM, R/W, DATA CHECK-ADDRESS
SECTORS WRITTEN 451. # OF SECTORS READ 451.
TOTAL ERRORS : 0.

ENTER A COMMAND SELECTION (C=CMD LIST):

**We selected List to get a printout of the system's activity. In this case, there are no errors logged. If you select List again, you should see that the number of sectors written and read has increased; this confirms that the subsystem is operational. Data compare errors will require further trouble-shooting. For trouble-shooting help, see Section 3.0. We recommend that you run this for at least five minutes.

2.12 AUTOMATIC SOFT ERROR LOGGING

The SCZ-1 will log certain soft errors, and can log up to 80 erroring blocks per unit.

These logged blocks can, at a convenient time for the user, be relocated on the disk drive. To do this, the user must run the SCZ-1 Initializer and choose the "R" option for Relocating Blocks. The Initializer will then READ the blocks that were logged and relocate them on the disk drive.

The second module is the Sequential RELI. In this module the disk is first written sequentially and then is read sequentially. After the READ is finished the device halts and is finished. If ALL PATTERNS is selected, each of these patterns is completed in the order that they are listed. In both of these modules, device control blocks will be stacked on the controller for multiple units. Multiple controllers will also be active simultaneously. The sample dialogue below will guide you in getting the program started.

2.13 "GEN" IN THE NEW DEVICE

Before going on-line, you must introduce the new device into your operating system configuration. To do this, start up your operating system and run the AOSGEN program (or VSGEN for AOS/VS). Specify the device name as "DPJx", where x is the number of the device. At the device code of 24 recommended in Section 2.3.1, this number can be 0 (for Unit 0 at that device code) through 3 (for Unit 3 at that device code).

If you need assistance running the GEN programs, consult your system management documentation.

AOS:
SUPERUSER ON
DIR :
LOAD/R/V @MTA0:5
REW @MTA0
SUPERUSER OFF

AOS/VS:
SUPERUSER ON
DIR :
LOAD/R/V @MTC0:5
REW @MTC0
SUPERUSER OFF

NOTE: ALTHOUGH YOU NOW HAVE YOUR UTILITY PROGRAMS SAVED ON DISK, IT IS IMPORTANT TO RETAIN THE SOFTWARE SUPPORT TAPE. THIS CONTAINS YOUR ONLY COPY OF THE CONTROLLER MICROCODE.

2.16 AOS, AOS/VS ON-LINE UTILITIES

After following the procedure in Section 2.15, two directories will be loaded onto your disk. These are called AOS and AOS/VS. Delete the one that does not pertain to your system. DIR into the one you have kept. Inside you will find the PR files. SCZORI.PR is an install program for the SCZOR.PR Program.

This program will allow examination of the soft error log from your disks. In order to use them, you must first run the installation program. This program will create a file called SCZORL.TX, which will contain all of the legal disk names for use in the display program (SCZOR.PR). Type X SCZORI.

Enter all the DPJ device names that are SCZ1 devices.

NOTE: THEY MUST CONTAIN MICROCODE FROM 400-472-00 A OR LATER.

Enter a <cr> when you are finished. Now type X SCZOR. Enter the DPJ name that you want to examine. The program will only allow the names that were entered in with the install program (SCZORI.PR).

This program can be run at any time on any SCZ-1 disk that is running microcode REV. 3.00 or later.

NOTE: IT IS IMPORTANT NOT TO ENTER ANY DG ARGUS DEVICE IN THE INSTALL PROGRAM. RUNNING THE DISPLAY PROGRAM CAN CRASH THE SYSTEM IF RUN ON AN ARGUS DEVICE.

3.0 TROUBLE-SHOOTING

The SKS Subsystem is supported by ZETACO in the following ways:

- Microprocessor-based Self-test of over 90% of the Controller each time it is powered up, with an LED status report.
- Utility programs on 9-track tape for use during installation and trouble-shooting.
- Customer Support Hotline, manned from 8:00 a.m. to 5:00 p.m. (Central Time) to answer your questions.
- Quick turnaround on subsystem components returned to the factory for repair or replacement.
- Warranties on workmanship and materials

3.1 POWER/SPIN-UP PROBLEMS

3.1.1 DISK DRIVE MODULE POWER-UP

-- The indicator imbedded in the ON/OFF switch on the back panel does not illuminate.

1. Ensure the AC power cord is firmly seated in the power receptacle on the module.
2. Check the fuse. If replacement is necessary, use ONLY a 6 1/4 Amp Slo-Blo for 120 VAC or 3 Amp Slo Blo for 220-240 VAC.
3. Ensure the AC wall receptacle is "live."
4. Call the ZETACO Hotline, or your maintenance organization.

-- The READY LED on the front panel flashes.

1. Turn the module off and repeat the power-up sequence.
2. Call the ZETACO Hotline, or your maintenance organization.

-- The fans do not turn, turn slowly, or make excessive noise.

1. Call the ZETACO Hotline, or your maintenance organization.
2. Operation with one fan is permissible until a replacement fan has been installed, but operation over and extended period of time with one fan is not recommended.

WARNING: DO NOT OPERATE THE UNIT WITH BOTH FANS DEFECTIVE.

3.1.2 CONTROLLER SELF-TEST ON POWER-UP

SELF-TEST checks out 90% of all the internal functions of the Controller once every time power is applied. SELF-TEST is actually composed of 2 independent modules, each of which is associated with an LED on the front of the board. The LEDs are grouped (three on the left, two on the right) according to which "side" of the board they are reporting on. See Figure 2.1.

SCSI Module	Red LED (Left)
HOST Module	Red LED (Right)

The entire test takes approximately 10 seconds to execute. Once SELF-TEST has passed, all LEDs will go out.

If a failure is detected in either the SCSI or HOST module, one or both red LEDs will flash a repeating numerical series; the number of flashes in the series corresponds to the specific subtest that failed. Tables E.1 and E.2 in Appendix E identify the subtests for the SCSI and HOST modules.

-- Both red LEDs remain steadily lit.

1. TURN OFF THE COMPUTER, remove the Controller, and re-install it. Be sure it is firmly seated in the backplane connectors.
2. TURN OFF THE COMPUTER, remove the Controller, and install it in a different slot. To do so, you will need to rearrange your priority jumpers. See Section 2.3.
3. Call the ZETACO Hotline, or your maintenance organization.

-- Either or both red LEDs flash an error code.

1. TURN OFF THE COMPUTER, clean the gold fingers on the edge connector, and re-install the controller.
2. Record the error code and call the ZETACO Hotline, or your maintenance organization.

3.2 ERRORS DURING SYSTEM OPERATION

When an error is displayed during system operation, write down the message that appears on the screen. If either red LED is flashing an error code, make note of it and consult Appendix E for a description of the error code. Then call the ZETACO Customer Support Hotline or contact your Maintenance Organization.

3.2.1 BASIC TROUBLE-SHOOTING USING THE UTILITY PROGRAMS

The programs you will be using are the Configurator, the Initializer Utility, and the Reliability Utility.

CAUTION: Running anything but MICROCODE INSTALL, READ ONLY ANALYZE, or RELOCATE BLOCKS in the Initializer will alter disk data. Running anything but READ ONLY Reliability will also alter disk data. See Section 3.4 for running Reliability on a disk with data on it.

These programs are originally supplied with the SKS Subsystem on the Software Support Tape (see Section 2.1.3). The programs can be loaded from either the Software Support Tape or the system disk (if you previously saved them there, as described in Section 2.14). The loading procedure for each is given below.

Note that, in order to run properly, the Reliability and Initializer programs require that CPU microcode (for MV-family computers) be already resident in the CPU. Also note that these are stand-alone programs. Therefore, if you are running at the system level, you must first shut down the operating system (according to standard AOS or AOS/VS practice) before loading them.

In the test sequence described in Section 3.2.1.3, the Configurator and Initializer Utility are used minimally to test very specific operations. The Reliability Utility, on the other hand, will be used more extensively. In the test sequence we will outline a test strategy using it; in Section 3.3 the program is discussed in more detail.

3.2.1.1 LOADING THE PROGRAMS FROM THE SYSTEM DISK

Do a "Program Load" to your system disk. This procedure differs for the various DG computers; if you are unsure of the procedure for your system, consult your DG system documentation.

When the system prompts for a system pathname, enter:

:SKS:<program name>

The program names are:

CFSCZ1S -- Configurator
SCZ1I -- Initializer
SCZ1R -- Reliability Utility

3.2.1.2 LOADING THE PROGRAMS FROM THE SOFTWARE SUPPORT TAPE

1. Mount the Software Support Tape on a tape drive and put the drive on-line. Be sure that the BPI setting matches that specified on the tape label.
2. Execute a "Program Load." The Program Load procedure is different for different computers. Consult the Operator's Manual for your computer to determine the correct one.
3. The Software Support Tape menu will be displayed. You should enter the number of the program you wish to execute.

3.2.1.3 TEST SEQUENCE

First, load the Configurator. Enter the device code of the Controller (the octal number of the switch settings established in Section 2.3.2).

Does the program respond with a request that you enter a command?

- NO
1. Verify that the entered device code matches the switch settings.
 2. TURN OFF THE COMPUTER, remove the Controller, and re-install it. Be sure it is firmly seated in the backplane connectors.
 3. Call the ZETACO Hotline, or your maintenance organization.

YES Do an "L" command. Does the program list your configuration facts?

- NO
1. TURN OFF THE COMPUTER, remove the Controller, and re-install it. Be sure it is firmly seated in the backplane connectors.
 2. Call the ZETACO Hotline, or your maintenance organization.

YES Do the facts displayed accurately reflect your system configuration?

- NO
1. Reconfigure the Controller. Be sure to do a "U" command before you leave the program in order to store the new facts.
 2. Call the ZETACO Hotline, or your maintenance organization.

YES 1. Leave the Configurator and proceed to the Off-Line Utilities.

Load the Initializer Utility. Choose the "E" function to enter a device. Answer NO to the select questions.

Does the program report a successful completion of the initialization function?

- NO
1. Verify that the BMC cables are correctly and securely installed. If the BMC is terminated on the SCZ-1 Controller, be sure the terminator block is correctly installed. Refer to Section 2.3.2.
 2. Call the ZETACO Hotline, or your maintenance organization.

- YES
1. Proceed to Reliability Utility.

Your first step in using the Reliability program to trouble-shoot a problem will be to run tests on the Magnetic Disk Drive. Use the following test parameters:

1. Execution Mode: Random
2. Read/Write/Verify: All
3. Data Pattern: Random

After running the Reliability tests, call the ZETACO Hotline and report your findings.

3.3 THE RELIABILITY UTILITY

This program is useful both as a subsystem exerciser, and as a trouble-shooting program. In Section 2.11 we used it as an exerciser, to verify that the installation was successful. In this section we will discuss the program operation in more detail, some ways to use its various options in trouble-shooting, and the ways it reports errors.

In order to run the program, the magnetic disk drive must have been previously formatted, and the Controller microcode must have been loaded onto the drive.

The Reliability Utility is a Stand-Alone program, which means that it does not need, and cannot have, an operating system running when it is executed. It has been written by ZETACO specifically for the SKS Subsystem. DG RELIABILITY, DIAGNOSTIC, AND MVSYSTEMX PROGRAMS WILL NOT WORK ON THIS SUBSYSTEM.

All of ZETACO's software has been designed to be as "user-friendly" as possible. Messages about many of the options and program features are displayed on-line, expected or possible responses are suggested, commands are shortened for quick entry. The discussion of the Reliability program that follows is intended as a companion to your on-screen display.

At several points you will find sample dialogues. In these samples, the lines that the computer prints will be entirely in upper case letters. The sample user responses will be on the next line below, indented. The CARRIAGE RETURN response will be designated by "<cr>". Comments and suggestions, which do not appear in an actual session and are here provided for clarification, will be preceded and followed by the characters "***".

3.3.1 GLOBAL PARAMETERS

These are the over-all operating conditions of the program under which the specific tests for each device must run. They are the display mode, timeout enable, mapping enable, program execution mode, and controller mode.

1. The DISPLAY MODE option allows you to select the numbering system in which some of your on-screen information will be displayed. Decimal numbers will be followed by a "." (eg., 5.). Octal numbers will not. Hex numbers will be either 4 or 8 digits long, and will include any required leading zeroes. However, when entering any number, you need not enter leading zeroes; when entering decimal numbers, you need not enter the ".".

Note that whenever the program asks for a numeric response, the required numbering system is displayed in parentheses.

Wherever the program asks for an input, it displays a possible response in brackets []. This is the default response, and is selected simply by entering a carriage-return or new-line.

2. The MAPPING features are defined in the DG Programmer's Reference Series: Models 6236/6237 and 6239/6240 Disk Subsystems.
3. The two PROGRAM EXECUTION MODES are Random and Sequential. In Random Mode the program issues random disk addresses for reading and writing data, while in Sequential Mode the addresses increment serially. Note that you cannot run random data patterns in your tests if you choose Sequential Mode.

Random Mode is primarily intended for exercising the subsystem. It is difficult to use for trouble-shooting because it involves many variables. For example, CB commands are stacked and continue to execute even after the program halts to report an error. Therefore, if you were to enter the Debugger and examine the register contents, the reported values might not reflect the current state of the Controller. Sequential Mode, on the other hand, offers a more tightly controlled environment.

3.3.2 THE COMMAND LIST

Basically, when you run the program, you:

1. Select some global program parameters,
2. Enter the devices you want to test and the test specifics for each of them,
3. Run the tests, and
4. Examine the status of each device.

The following is a complete list of available program commands, with comments where they are pertinent.

1. ENTER A DEVICE

For each device the program will display the drive size in Megabytes.

If, after running, you want to enter another device, you will have to re-enter the devices you currently have along with the new one.

2. START A DEVICE

This command gives you the option of starting the test on all entered devices, or on any combination of them. The program does not verify that the tests are running, but simply returns to the command list. You can verify that they are running by 1) monitoring the drives and the Green LEDs on the Controller, and 2) doing a List command. This command will return a status report for each entered device (see below).

3. LIST ERROR TOTALS

The resulting display actually gives status information on the device as well as error totals. You can list a device at any time, whether it is running or not. This is useful if you wish to be sure you've entered only what you want entered. However, if you list a newly entered device before it has been run, the mode information displayed will be valid, but the run time, blocks written and read, and number of errors will not.

4. COMMAND LIST

This command allows you to display the program's menu of commands.

5. HALT A DEVICE

You can halt any device or combination of devices without affecting testing on the other ones.

6. DELETE A DEVICE

Once a device is halted, you can delete it, even while other devices are running. Deleting one device does not affect testing on the other entered devices.

7. PRINTER CONTROL

This command allows you to enable or disable your printer during program operation. For example, if you are going to let the program run unattended, you may wish to enable the printer to record error messages.

You can use the command at any time without affecting tests in progress. However, note that the Restart command (see below) will override this command and automatically disable the printer.

8. RESTART THE PROGRAM

The important point to note about this command is that it completely re-initializes the program. You will have to select your operating mode, enter devices, and, if you want a printout, re-enable your printer.

9. FLAGS

Flags are, in effect, "switches" that allow you to alter the flow of the program depending on specific conditions encountered during execution. There are presently no flags in the Reliability.

The flag can be changed while the program is running.

10. QUIT

This command allows you to leave the Reliability program.

3.4 TESTING A DISK WITH DATA ON IT

Occasionally you may wish to run off-line tests on your disk, even though you have current data stored on it. In this section we will briefly describe the way to do this using the Reliability program.

We will test the whole disk, but in a READ-ONLY mode. Although it does not test write capability, it can be useful for testing the Controller's ability to seek, read data from the disk, and transfer data on the BMC.

Boot the program and respond to its questions as outlined in Section 2.13, with two exceptions: 1) When it asks, "READ ONLY (YES/[NO]):", answer YES. 2) When it asks, "VERIFY DATA ([YES]/NO):", answer NO. Now start the Reliability program with the "S" command.

3.5 CUSTOMER SUPPORT HOTLINE

ZETACO, Inc. provides a Customer Support Hotline 612-890-5135 to answer technical questions and to assist with installation and trouble-shooting problems. The Hotline is manned by a technical team from 8:00 a.m. to 5:00 p.m. (Central Time) Monday through Friday.

3.6 WARRANTY INFORMATION

The SKS Disk Drive Modules are warranted free from manufacturing and material defects, when used in a normal and proper manner, for a period of six months from date of shipment.

The SCZ-1 Controller is warranted free from manufacturing and material defects, when used in a normal and proper manner, for a period of two years from date of shipment.

EXCEPT FOR THE EXPRESS WARRANTIES STATED ABOVE, ZETACO DISCLAIMS ALL WARRANTIES INCLUDING ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS. THE STATED EXPRESS WARRANTIES ARE IN LIEU OF ALL OBLIGATIONS OF LIABILITIES ON THE PART OF ZETACO FOR DAMAGES, INCLUDING BUT NOT LIMITED TO, SPECIAL, INDIRECT OR CONSEQUENTIAL ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF ZETACO'S PRODUCTS.

If a part is no longer under warranty, or if the problem is not warranted (as set forth above), then repair will be on a time-and-material basis.

3.7 PRODUCT RETURN AUTHORIZATION

All possible effort to test a suspected malfunctioning component of the SKS Subsystem should be made before returning it to ZETACO for repair. However, if controller or module malfunction has been confirmed using the tests outlined in Sections 3.1 through 3.4, you should return the part to ZETACO, Eden Prairie, MN., freight prepaid.

A Return Material Authorization (RMA) number is required before shipment and should be referenced in all future correspondence about the part in question. RMA numbers are obtained by calling the Customer Support Hotline (see Section 3.5). To ensure prompt response, the information outlined in the Material Return Information form on the following page should be gathered before calling the ZETACO Hotline for the RMA number. Please include a completed copy of the Material Return Information form with the product. Each product to be returned requires a separate RMA number and Material Return Information Form.

Upon ZETACO's verification of defect, defective parts shall be repaired or replaced, and returned surface freight prepaid to the customer. In most cases, Disk Drive Modules will be returned within thirty working days, and the Controller within two working days.

To safeguard the product during shipment, please use packaging that is adequate to protect it from damage. Mark the box "Delicate Instrument" and indicate the RMA number(s) on the shipping label. We recommend you retain the original ZETACO packaging for this purpose.

MATERIAL RETURN INFORMATION

The speed and accuracy of a product's repair is often dependent upon a complete understanding of the user's checkout test results, problem characteristics, and the user system configuration. Use the form below to record the results of your trouble-shooting procedures. If more space is needed, use additional paper.

TEST

RESULT

Power-up Self-test

Other tests performed (system operation, errors, etc.)

Please allow our service department to do the best job possible by answering the following questions thoroughly and returning this information with the malfunctioning board.

1. Does the problem appear to be intermittent or heat sensitive? (If yes, explain.)
2. Under which operating system are you running? (AOS, AOS/VS) Include revision number.
3. Describe the system configuration (i.e.; peripherals, controllers, model of computer, etc.)
4. Has the unit been returned before? Same problem?

To be filled out by CUSTOMER:

Model # : _____

Serial # : _____

RMA # : _____ (Call ZETACO to obtain an RMA number.)

Returned by:

Your name: _____

Firm: _____

Address: _____

Phone: _____

APPENDIX A

A.0 UTILITY PROGRAMS

A.1 THE CONFIGURATOR

A.1.1 RUNNING THE PROGRAM

In Section 2.14 you loaded SCZ-1 software onto your system disk. Therefore, you will probably want to load the program from your system disk, rather than from the Software Support Tape. To do so, you must first shut down the operating system according to standard AOS or AOS/VS practice.

Once this has been accomplished, do a "Program Load" to your system disk. This procedure differs for the various DG computers; if you are unsure of the procedure for your system, consult your DG system documentation. When the system finally prompts for a filename, enter "CFSCZ1S."

If you do wish to load from tape, mount the Software Support Tape on your magnetic tape drive and do your "Program Load" to that device instead of the system disk. When the Software Support Tape menu appears on your screen, enter the number of the CFSCZ1S program.

A.1.2 THE PROGRAM OPTIONS

The following is a complete list of available program options, with comments where they are pertinent.

1. CHANGE ALL FACTS

This option automatically presents all of the configurable features available in the main menu for modification. These are the BMC Priority (#2), Throttle Burst Rate (#3) and Break Count (#4). After all values have been entered, a List (#7) is run so that you can verify the configuration.

2. BMC PRIORITY

This value determines the level of BMC bus priority given to this Controller for data transfer. Each controller in the system MUST have a different priority. The controller in the system with the highest priority will be serviced first; the one with the lowest will be serviced last. Usually, the controller communicating with the system disk is assigned the highest priority.

3. THROTTLE BURST RATE

This term describes the number of words transferred to/from system memory to the Controller on each bus access. If the value is set too low, subsystem performance may be slow. If it is set too high, you may see "data late" errors reported from other peripherals on the system. The recommended value is 16.

4. BREAK COUNT

The Break Count interval is defined as the period of time that the Controller is off the BMC bus. This period is a multiple of the BMC Sync Clock period, which in turn varies from computer to computer. A Break Count interval setting of 0 is equal to one Sync Clock period.. The maximum setting is 256. A setting of 4 is recommended.

If there are other BMC devices present, it may be desirable to increase this count to allow more time for the other devices to access the bus. If the Break Count is set too large, slow disk performance may result. A larger Break Count also allows the CPU more memory time.

5. CONTROLLER SCSI ID

The SCSI bus supports up to 8 devices (targets or initiators) and each must have a unique SCSI ID code. The possible values are 0-7, with device 0 having the lowest priority and device 7 the highest. Since it is desirable for the controller to have higher priority than the drives, the Configurator allows the choice of ID 6 or 7 for the Controller. If 2 controllers are to be on the same bus, make sure they are configured for different ID codes.

6. HELP - OPERATIONS

This option provides on-screen help with operational details of the program such as default entries, exiting from a question, how to get help with a specific question, and how the EEPROM (Electrically Erasable Programmable Read-Only Memory) works.

7. HELP - WHAT TO DO

This option briefly illustrates a sample session with the Configurator program.

8. LIST ALL CONFIGURATION FACTS

This selection presents on-screen information about the drives in the system, and shows the configured values of the BMC Priority, Throttle Burst Rate, and the Break Count. Once you are satisfied with your configuration, print a hard copy (see below) and retain it for future reference.

9. START LOGGING TO PRINTER

This option sends information on the screen to the system printer. The printer must be on-line and ready to receive data.

10. STOP LOGGING TO PRINTER

This option stops sending information to the printer.

11. UPDATE EEPROM

This command stores the configuration information in the EEPROM on the Controller. You must execute it before you exit from the program in order to preserve your configured values.

12. QUIT THE PROGRAM

This option provides for an orderly termination of the program. If you have changed the configuration but forgotten to update the EEPROM, you will be reminded to do so at this point. You will also be reminded that you must press the RESET switch on the computer Operator Panel in order to actually re-initialize the Controller with the new configuration.

APPENDIX B

B.0 ADDING MORE DRIVE MODULES

Since the controller is capable of controlling up to 7 SCSI disk drives, you may at some point wish to add more drive modules to your subsystem. This Appendix will provide you with the details to do so.

B.1 CONNECT THE CABLES

Install the additional drive modules and cable from SCSI OUT of the first module to SCSI IN of the second module. (Remove terminators in the module, see Section B.2.)

B.2 SCSI INTERFACE TERMINATION

Each drive module has SCSI Interface terminators. These terminators are located at the rear of the drive module on DIP sockets and must be removed for all but the last module. See Figure B.2.

B.3 CHECK CURRENT CONTROLLER CONFIGURATION

Unless, during original installation you configured for a number of drives equal to or greater than the number you now have, you will need to change that configuration fact to reflect your new drives.

B.4 ADDING A SECOND DRIVE TO A SINGLE-DRIVE MODULE

The disk drive upgrade kit includes a disk drive, power supply, 4-inch interface cable and mounting hardware. See Figure B.3 for installation location. Install the disk drive, power supply and cables per the following:

- Step 1 Install the disk drive using the hardware provided.
- Step 2 Connect the Ready LED cables as shown.
- Step 3 Connect the 4-inch interface cable as shown.
- Step 4 Install the power supply using the hardware provided.
- Step 5 Connect the DC power cable to the disk drive as shown.
- Step 6 Connect AC power to the power supply as shown.

Step 7 Remove identification label and replace with the one provided in the kit.

Step 8 Re-configure the controller to reflect the added disk drive.

NOTE: UPGRADED DISK DRIVE UNIT ADDRESS HAS BEEN PRE-SET AT THE FACTORY ACCORDING TO CONFIGURATION INFORMATION OBTAINED AT TIME OF ORDERING. IF ADDRESS MUST BE CHANGED, REFER TO APPENDIX D FOR UNIT ADDRESSING INFORMATION.

Figure B1 Multiple Drive Enclosure (Rear View)

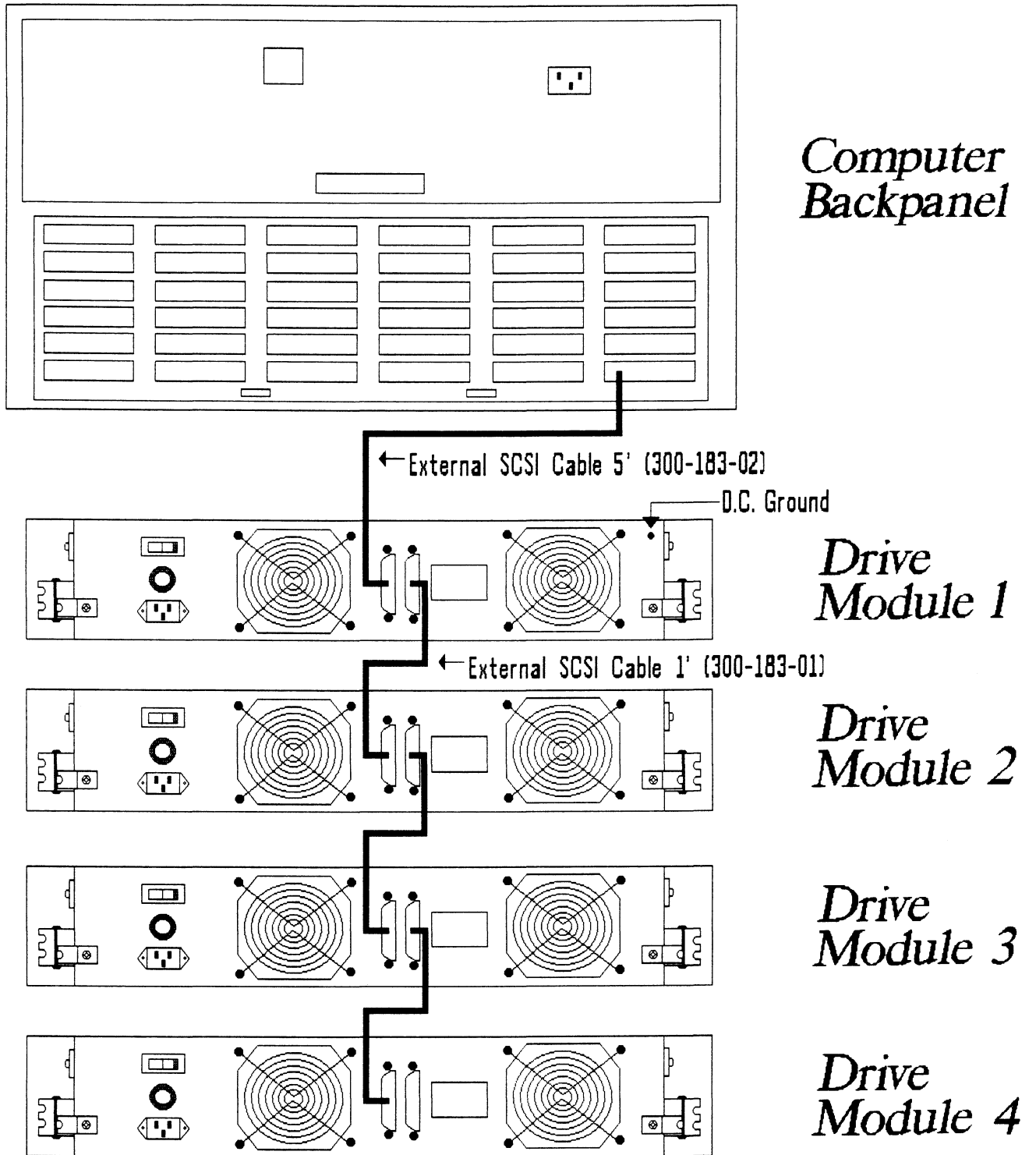


Figure B.2 SCSI Interface Terminators

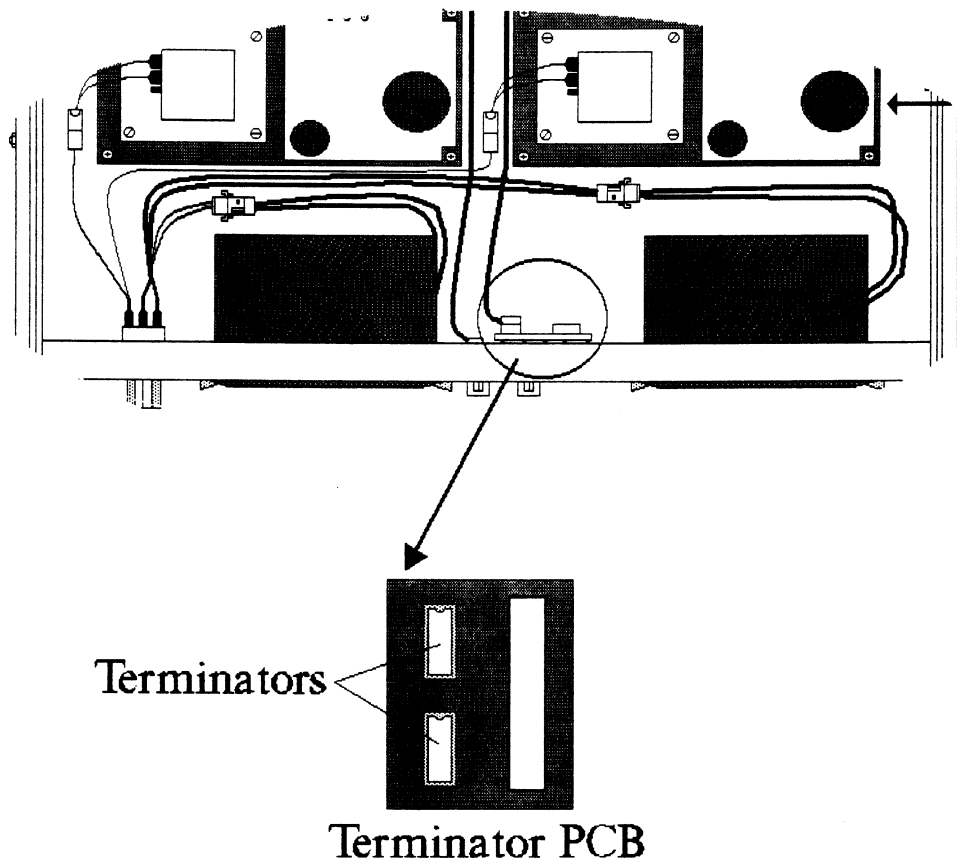
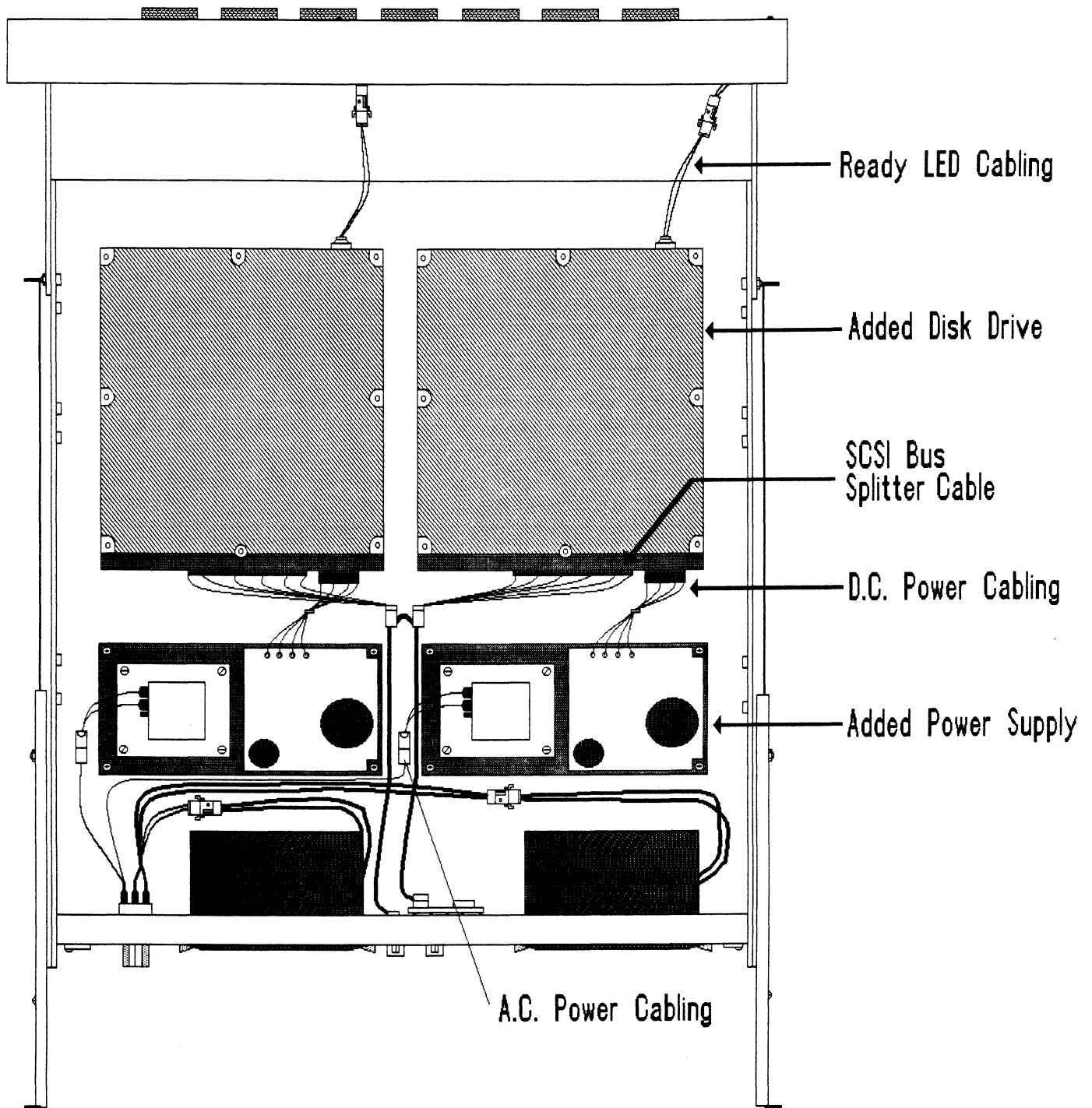


Figure B.3 Upgrade Kit Installation



APPENDIX C

C.0 PREVENTIVE MAINTENANCE

C.1 INSPECT THE DISK DRIVE MODULE FANS

This should be done at least every month. The fans are located in the rear panel of the unit. If the fans are not turning, are turning very slowly, or making noise, you will need to replace the bad fan module(s). See Sections 4.5, 4.6, and 4.7.

WARNING: DO NOT OPERATE THE UNIT IF THE FANS ARE NOT WORKING
PROPERLY. SEVERE COMPONENT DAMAGE MAY RESULT.

APPENDIX D

D.0 SCSI UNIT ADDRESSING

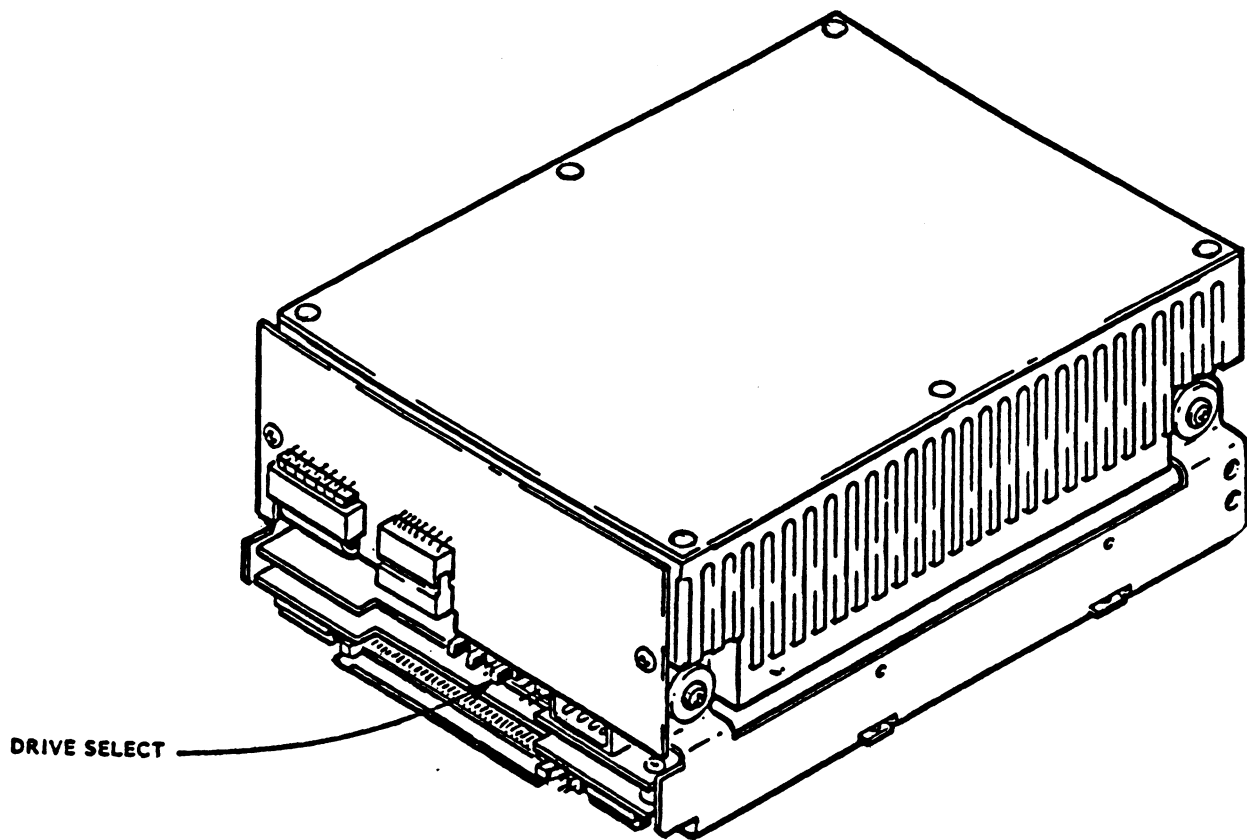
The factory default SCSI Unit Addressing has been set as follows unless otherwise specified:

LOGICAL UNIT	SCSI ADDRESS
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7

See Figure D.1 for information on how to physically change and/or set the Unit Address.

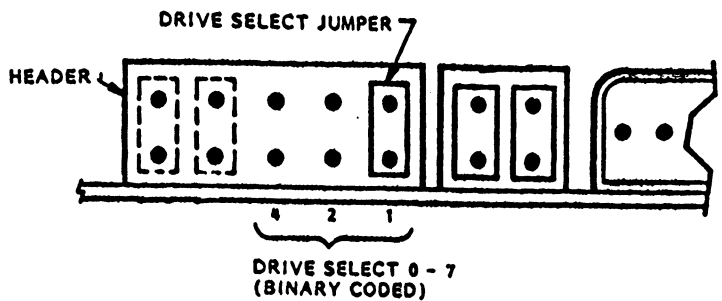
FIGURE D.1 SCSI Unit Addressing

SCSI Unit Addressing is accomplished through the use of binary coded jumper positions (most significant bit on left), i.e., jumper in position 0 would signify drive unit address 1, no jumpers would signify address 0.



LOGICAL ADDRESS	DRIVE SELECT JUMPERS
0	[][][][]
1	[][][] []
2	[][] [] []
3	[][] [][]
4	[] [][][]
5	[][] [][]
6	[][] [][]
7	[][][][]

4 2 1



APPENDIX E

E.0 LED ERROR CODES

A complete discussion of the LEDs and their role in basic subsystem trouble-shooting is presented in Sections 3.1.2 and 3.2 of this manual. The tables below identify the specific test or error associated with each error code.

TABLE E.1 HOST Module Error Codes

CODE	TEST
1	RAM TEST
2	HI-SPEED BUFFER 1
3	HI-SPEED BUFFER 2
4	DONE
5	BURST COUNTER
6	BREAK COUNTER
7	BMC CB TEST
8	SECTOR TRANSFER SIMULATION
9	EEPROM CHECKSUM
10	DUAL PORT RAM
11	RESERVED
12	RESERVED
13	RESERVED
14	ERROR CONDITION

TABLE E.2 SCSI Module Error Codes

CODE	TEST
1	RESERVED
2	DYNAMIC RAM TEST
3	BMC DATA BUFFER
4	DUAL PORT RAM
5	5380 SCSI IC
6	DYNAMIC RAM PARITY
7	NOT USED
8	NOT USED

TABLE E.3 Operational Error Codes

CODE	ERROR
9	BMC DATA BUFFER PARITY ERROR
10	DYNAMIC RAM PARITY
11	ILLEGAL INTERRUPT FROM HOST SIDE