Model SCZ-1

Disk Controller

Technical Manual

ZETACO, Inc. has prepared this Technical Manual for use by ZETACO
personnel and its customers to assist in the installation, operation and
maintenance of the Model SCZ-1 Disk Controller. The information
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reliance on this material as presented. If installation problems arise
after you thoroughly review the manual, please contact the ZETACO Product
Support Hotline at (612) 941-9480.

REVISION HISTORY

ECO No.	Date	Description	Pages
0943	8/4/87	Advise that there is not standard cabling with this product.	1-2, 1-3 2-1

PREFACE

This manual contains information regarding installation, testing, and operation of the ZETACO Model SCZ-1 Disk Controller.

The technical contents have been written based on the assumptions that the reader 1) has a working knowledge of one of the applicable Data General mini-computers with associated AOS, or AOS/VS operating system; 2) is familiar with standard installation, power, grounding, and peripheral cabling procedures; and 3) has access to technical information describing the disk drive(s) to be installed with this controller.

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

SECTION 1.0   PRODUCT OVERVIEW - Describes the Model SCZ-1 Disk
                   Controller features, capabilities, specifications, power
                   and interface requirements.

SECTION 1.0   INSTALLATION PROCEDURES - Describes and illustrates the
                   procedures required to install the SCZ-1.

SECTION 3.0   TROUBLE-SHOOTING - Contains information useful in
                   analyzing subsystem problems, and how to get help.

SECTION 4.0   USAGE GUIDELINES - Describes how various features and
                   configuration are used and how they impact the
                   performance of the controller.

          NOTE: For Programming Notes and more detailed error
                   description, please refer to:

                   Data General's Programmer's Reference Series
                   Models 6236/6237 & 6239/6240
                   Disk Subsystems
                   DG Ordering Number: 014-701001

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1.0 PRODUCT OVERVIEW

1.1 GENERAL DESCRIPTION

The SCZ-1 Disk Controller is ZETACO's state-of-the-art bridge between DG's Eclipse and Eclipse/MV minicomputers, and high performance SCSI-interfaced disk drives. It fully emulates DG's Argus Disk Subsystem Controller in AOS, and AOS/VS environments.

The SCZ-1 allows integration of 5.25 inch Magnetic SCSI Disk Drives into systems where large storage capacity, small footprint, and high reliability are demanded.

The SCZ-1 has been implemented on a single 15" x 15" 10-layer printed circuit board, with a paddleboard to route signals to and from the disk drives. The SCZ-1 is compatible with FCC hardened chassis requirements, and interfaces DG's high speed bus, the Burst Multiplexor Channel (BMC).

1.2 SPECIFICATIONS

1.2.1 FUNCTIONAL

Drives per Controller:	Up to 7 SCSI targets.
Recording Format:	Media format is drive vendor unique.
Data Transfer Rate:	Up to 1.5 MB per second (Async.)
Maximum Capacity:	The theoretical maximum capacity supported by a single SCZ-1 is 67 gigabytes.
Device Code:	Switch selectable.
Interrupt Priority Mask Bit:	Bit 7
Bus Load:	1 unit load (any I/O slot).
Data Channel Interface:	Not supported.

Burst Multiplexor Change 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 count from 1 to 255
                                        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).

                                        Support BMC transfer rates equal to
                                        the fastest available BMC computers.

Sector Data Field: 256 - 16 bit words per sector

Data Buffering: Two 256-word BMC buffers in a
                                        ping-pong configuration

Memory Address: 21 bits

Indicator Lights: RED   Self-Test
                                        GREEN   Controller Busy
                                        YELLOW   BMC Transfer

1.2.2   COMPUTER INTERFACE

The SCZ-1 is designed to operate only with the BMC, in any I/O
slot of an MV or Eclipse computer.

1.2.2.1   BMC BUS CABLES

Two 40-conductor flat ribbon cables, with a single socket on
one end and multiple sockets (for multiple controllers), are
required for BMC operation.

1.2.3   DISK DRIVE INTERFACE

Functional: - SCSI Interface single-ended
                                        Asynchronous

Cabling: CHASSIS WITH BULKHEAD

                                        INTERNAL: Optional 50-conductor flat
                                        ribbon cable with D connector on one
                                        end that mounts in the computer
                                        EMI/RFI backpanel. The other end
                                        plugs into the A paddleboard. See
                                        Figure 2.4.

NON-BULKHEAD CHASSIS

EXTERNAL: Contact ZETACO with your
cabling requirments.

NOTE: The maximum cumulative length allowable for external
cables is 18 feet, for single-ended interface.

1.2.4 MECHANICAL

Dimensions: 15" x 15" x 1/2"

Shipping Weight: 10 pounds - includes controller,
                         paddleboards, cables (if ordered),
                         software tape and documentation.

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

1.2.5 POWER REQUIREMENTS

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

1.2.6 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/MV temperature and humidity specifications.

2.0 INSTALLATION

2.1 UNPACKING AND INSPECTION

The following items are shipped standard with each SCZ-1:

ITEM		P/N
A)	SCZ-1 Controller with Cover	500-445-00
B)	"A" Paddleboard	500-411-00
C)	Software Support Package (9-track magnetic tape)	400-445-00
D)	Technical Manual	600-445-00
E)	BMC Bus Cables (2)	300-038-00

In addition, the following optional disk cables may be ordered with the Controller:

1.	Internal Backplane-to-Bulkhead Cable Assembly	300-148-00

Contact ZETACO with your external bulkhead-to-drive requirements.

Upon receipt of the Model SCZ-1 from the carrier, inspect the shipping carton immediately for any evidence of damage or mishandling in transit.

If the shipping carton is 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 carton is opened.

ZETACO's warranty does not cover shipping damage. For repair or replacement of any ZETACO product damaged in shipment, call ZETACO, Inc. to obtain return authorization instructions.

2.2 BEFORE YOU BEGIN

This section contains the procedures necessary for proper installation of the SCZ-1 Disk Controller. We recommend that you read through it once in its entirety before you start the actual installation process.

The following subsections, beginning with 2.3, are in order of execution. Subsections 2.3 through 2.8 involve preparation and installation of the hardware components. Subsections 2.9 through 2.12 describe the programs used to complete the installation. These programs are on the Software Support Tape, the 1/2" magnetic tape reel shipped with the SCZ-1.

2.2.1 SYSTEM HARDWARE REQUIREMENTS

a) Eclipse or MV Family CPU with minimum 32K words memory.
b) Magnetic Tape Subsystem
c) SCZ-1 Controller Board(s)
d) Disk Drive(s)
e) Console at Device 10/11
f) Printer at Device 17, in order to log errors and print a copy of your configuration facts (optional).

You should have complete hardware documentation for your computer and disk drive available for reference during the installation.

2.2.2 THE SOFTWARE SUPPORT TAPE

Each of the programs on the Software Support Tape has been written by ZETACO specifically for the SCZ-1 controller. Use this tape for configuring the controller, Media Formatting, Disk Diagnostic and Reliability, and installation of controller microcode onto the disk. DG's CORRESPONDING PROGRAMS MAY NOT WORK ON THIS CONTROLLER. Also note that the SCZ-1 does NOT support MV SYSTEMX.

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 loaded into the system. The boot procedure is detailed in Section 2.8.

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 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 provided here for clarification, will be preceeded and followed by the characters '**'.

2.3 PREPARE THE COMPUTER CHASSIS

Before installing the SCZ-1, the computer chassis must be prepared. To do so, choose an available I/O slot and establish the correct priority.

FIGURE 2.1 SCZ-1 Board Layout

2.3.1   SLOT SELECTION

The SCZ-1 may be installed in any "I/O" slot. Consult the hardware manual for your particular computer to identify the appropriate available slots.

2.3.2   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 SCZ-1 and the processor, or between the SCZ-1 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 In (Pin A96). See Figure 2.2.

2.4   PREPARE THE CONTROLLER

To prepare the controller for installation you will need to establish proper BMC bus termination and select the Device Code.

2.4.1   BMC BUS TERMINATION

If there is more than one BMC device daisy-chained on the BMC bus, then the BMC controller at the end of the bus must have the bus terminators installed. If the SCZ-1 is to be installed as the last (or only) BMC controller, then make sure the bus terminator is installed in the middle cable header on the front edge of the SCZ-1. Refer to Figure 2.1.

NOTE: The SCZ-1 is shipped from the factory with the terminator installed unless otherwise specified.

2.4.2   DEVICE CODE SELECTION

The standard Primary device code for the SCZ-1 is 24 octal; the Secondary is 64 octal. However, any DG device code can be selected, as long as there is not already a controller in the system with that device code.

There is a set of Device Code switches on the edge of the board that allow 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 Figures 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 SCZ-1, 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.

2.5   INSTALL THE CONTROLLER AND PADDLEBOARDS

First, pull the lock tabs on the two front corners of the board out as far as they will go. Next, carefully guide the Controller board into the I/O slot you selected in Section 2.3. 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.

2.5.1   PADDLEBOARD INSTALLATION

The computer backplane, viewed from the rear, has the "A" side pins on the left. On computers with vertically mounted controller boards, think of the component side of the boards as up, then the "A" side pins are on the left.

Locate the two rows of pins on the "A" side of the backplane for the slot containing the SCZ-1 Controller. Ensure that no pins are bent. Position the "A" paddleboard block connector over the "A" backplane pins (29-100), with the header connectors facing up. Press the connector securely over the pins, making sure all pins insert and do not bend, until the guide block is flush with the backplane.

CAUTION: COMPONENT DAMAGE MAY OCCUR IF PADDLEBOARD IS MIS-
          ALIGNED. MAKE SURE THE BLOCK IS NOT SHIFTED RIGHT
          OR LEFT BY CHECKING FOR NON-INSERTED PINS ON BOTH
          ENDS. DOUBLECHECK 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 2.2   Backplane Priority Jumpers

A SIDE   B SIDE

OCCUPIED
SLOT

SCZ-1
SLOT

EMPTY
SLOT

EMPTY
SLOT

OCCUPIED
SLOT
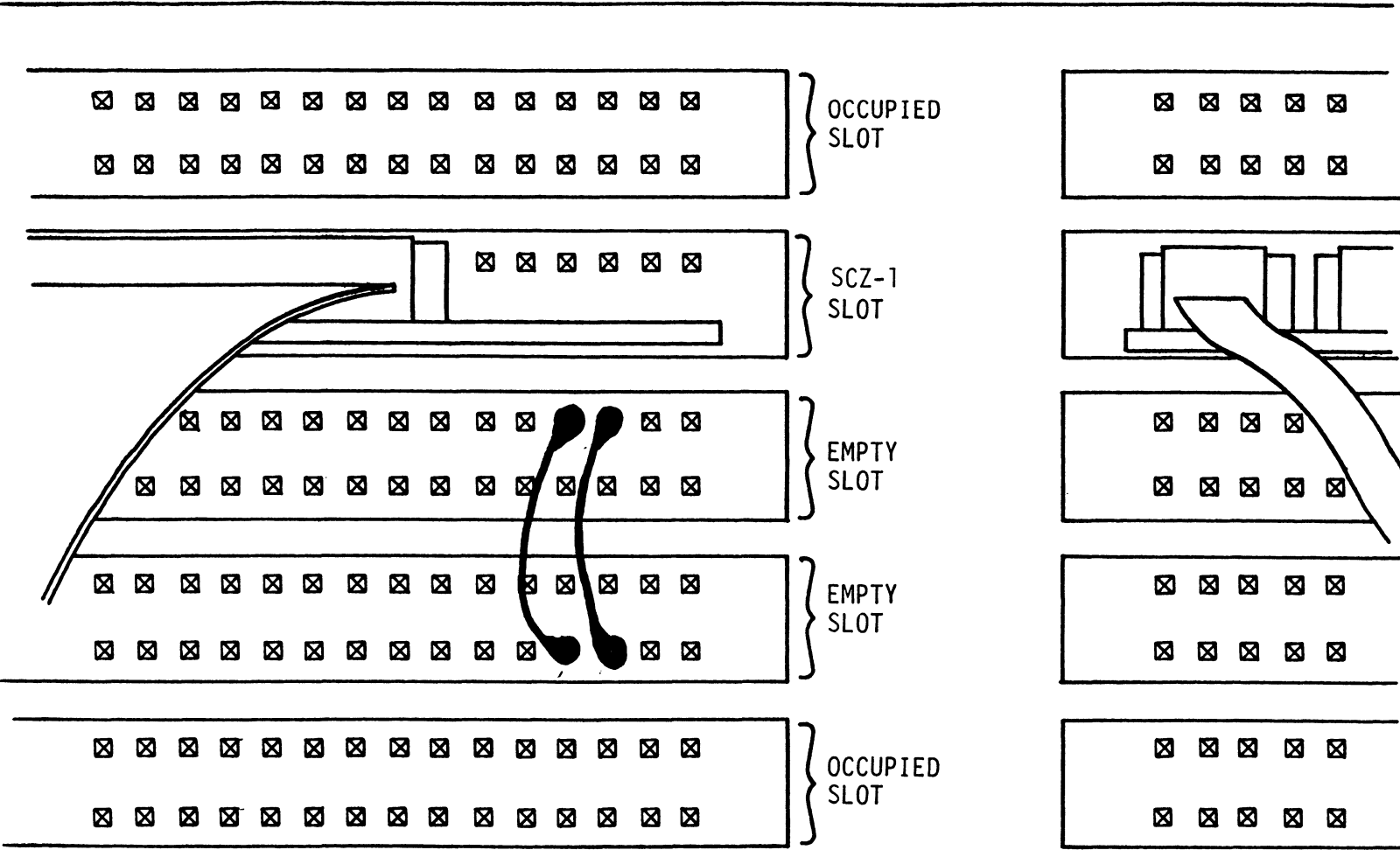
FIGURE 2.3 Device Code Switches
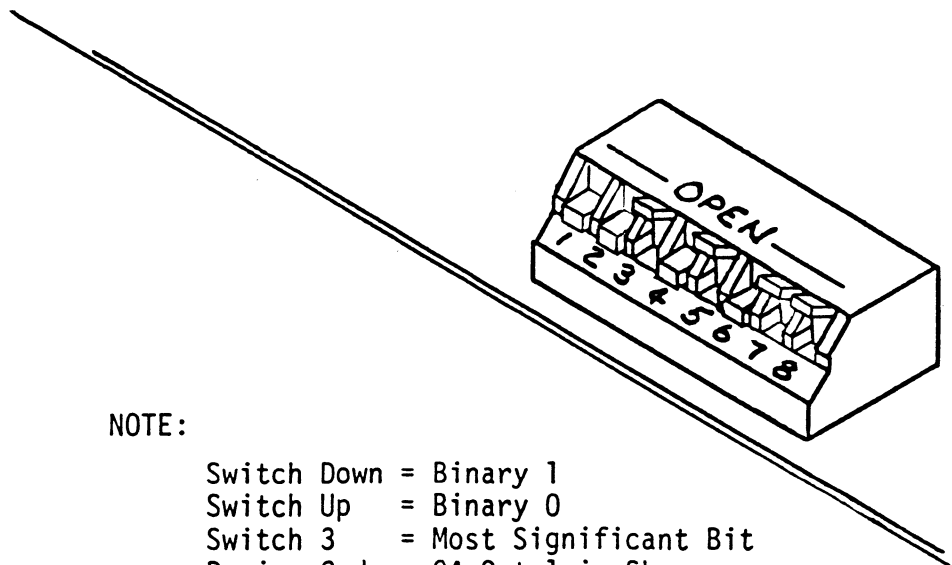
NOTE:

         Switch Down = Binary 1
         Switch Up   = Binary 0
         Switch 3   = Most Significant Bit
         Device Code = 24 Octal is Shown

DEVICE CODE	S1 RESERVED	S2 RESERVED	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

2.6   CONNECT ALL CABLES

Connect bulkhead cabling per the instructions in Section 2.6.1
and 2.6.2. For non-bulkhead CPUs, follow the instructions in
2.6.3.

2.6.1   INTERNAL CABLING FOR FCC-COMPLIANT CHASSIS

The internal cable (P/N 300-148-00) is a flat 50-conductor
cable terminated on one end with a socket connector and on the
other with a "D" connector. As shown in Figure 2.4, the socket
connector end plugs into the "A" paddleboard. The other end of
this cable (D connector) mounts on the computer backpanel.

To mount the "D" connectors to the backpanel, first remove the
covers from the desired mounting holes, and the hex bolts,
washers, and nuts from the connectors. Then, insert the
connector into the hole in the backpanel from the inside,
insert the hex bolts from the outside, and secure the connector
to the backpanel.

2.6.2   EXTERNAL CABLING FOR FCC-COMPLIANT CHASSIS

Contact ZETACO with your external bulkhead-to-disk drive
cabling requirements.

2.6.3   NON-BULKHEAD CABLING

Contact ZETACO with your non-bulkhead paddleboard-to-disk drive
requirements.

2.6.4   BMC BUS CABLING

The two BMC bus cables provided have a single 40-pin connector
on one end and a group of connectors on the other end
(4-connector P/N 300-038-00; 6-connector P/N 300-131-00; or
8-connector P/N 300-132-00).

This cable daisy-chains from the computer's BMC interface to
the multiple BMC peripheral controllers. The controller at the
end of the chain must have it's BMC terminators installed, the
others must have them removed. Refer to Section 2.4.1 for BMC
terminator installation.
Install the BMC bus cables as shown in Figure 2.4 by plugging
the single-plug end of the cables into the DG BMC board, and
the multiple-plug end of the cables into the SCZ-1 and other
BMC peripheral controllers.

2.6.5   SUBSYSTEM GROUNDING

Because the AC power system safety ground does not necessarily
satisfy all system grounding requirements, additional
connections are required to earth ground, referred to as system
ground. The Controller and its attached drive(s) must be
connected to a singlepoint ground system. Ground connections
are made via ground braids (5/8" minimum flat braid) that pass
from enclosure to enclosure, enclosure to computer chassis and
computer chassis to earth ground. Refer to Figure 2.5.

===
WARNING: To ensure proper ground return to earth, each
             component in the system must be connected using a
             daisy-chain ground system. The AC and DC grounds
             within each drive may need to be joined (consult
             your drive manual). The drives must then be joined
             by a daisy-chain grounding braid and connected to
             the grounding post at the rear of the computer
             cabinet.
===

2.7   TURN THE SYSTEM ON

To find out the basic status of the controller upon power-up,
observe the four LEDs at the front edge of the board. Their
meanings from right to left are as follows:

RED   SLFTS - Indicates disk controller is executing
             Self-test Diagnostics.

GREEN   BUSY - This LED indicates the controller is
             executing one of the READ/WRITE commands.

YELLOW   XFER - When on, this LED indicates that a BMC
             transfer is in progress.

Self-test takes one second to complete. At that point the red
LED should turn OFF and remain off. If it does not, or if it
blinks, this indicates a Self-test failure. See Section 3.0
for assistance.

The green LED should be OFF, since no READ/WRITE activity will
have been initiated immediately after power-up.

The yellow LED (XFER) should be off after Self-test finishes,
since no BMC activity will have been initiated immediately
after Self-test.

FIGURE 2.4   SCZ-1 Cabling Diagram

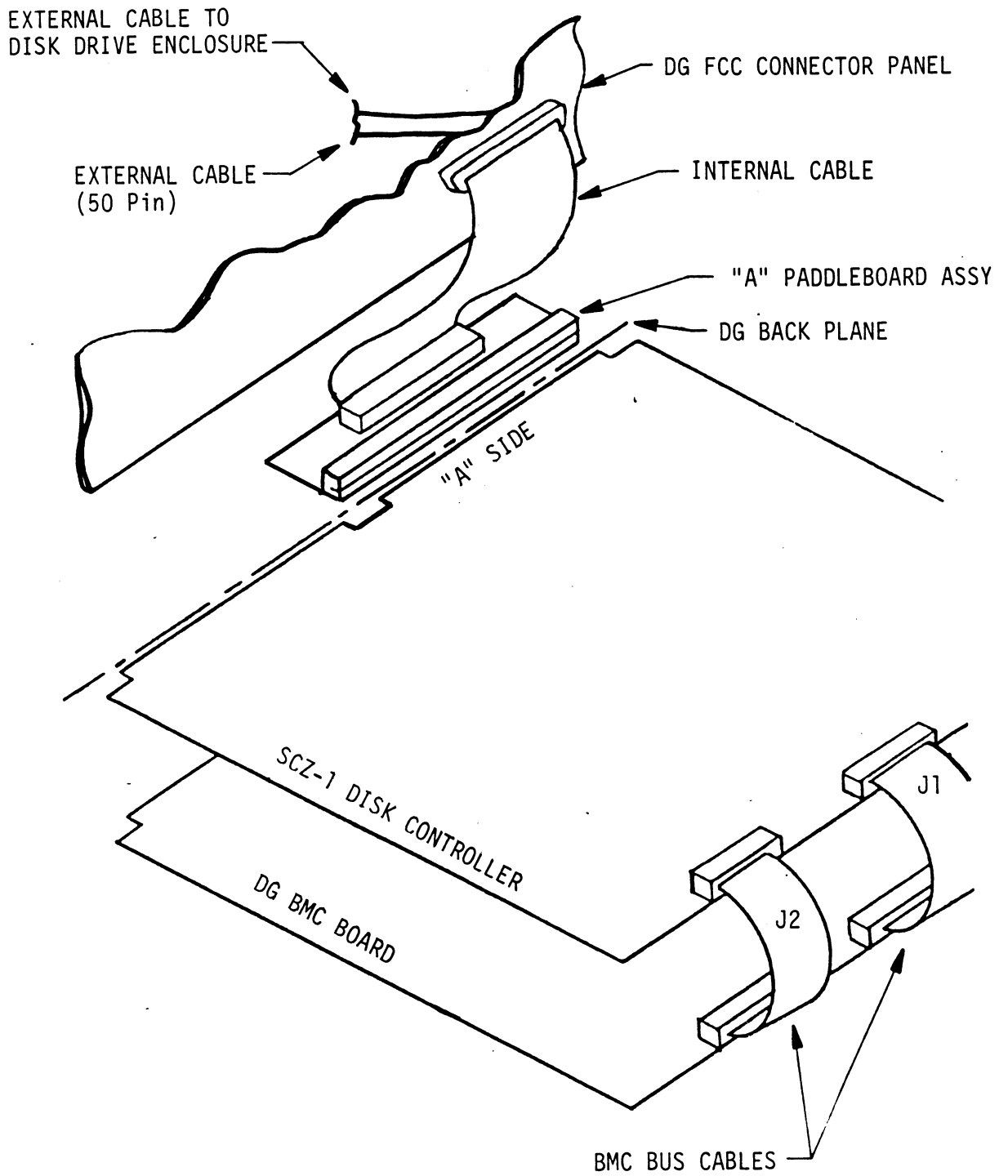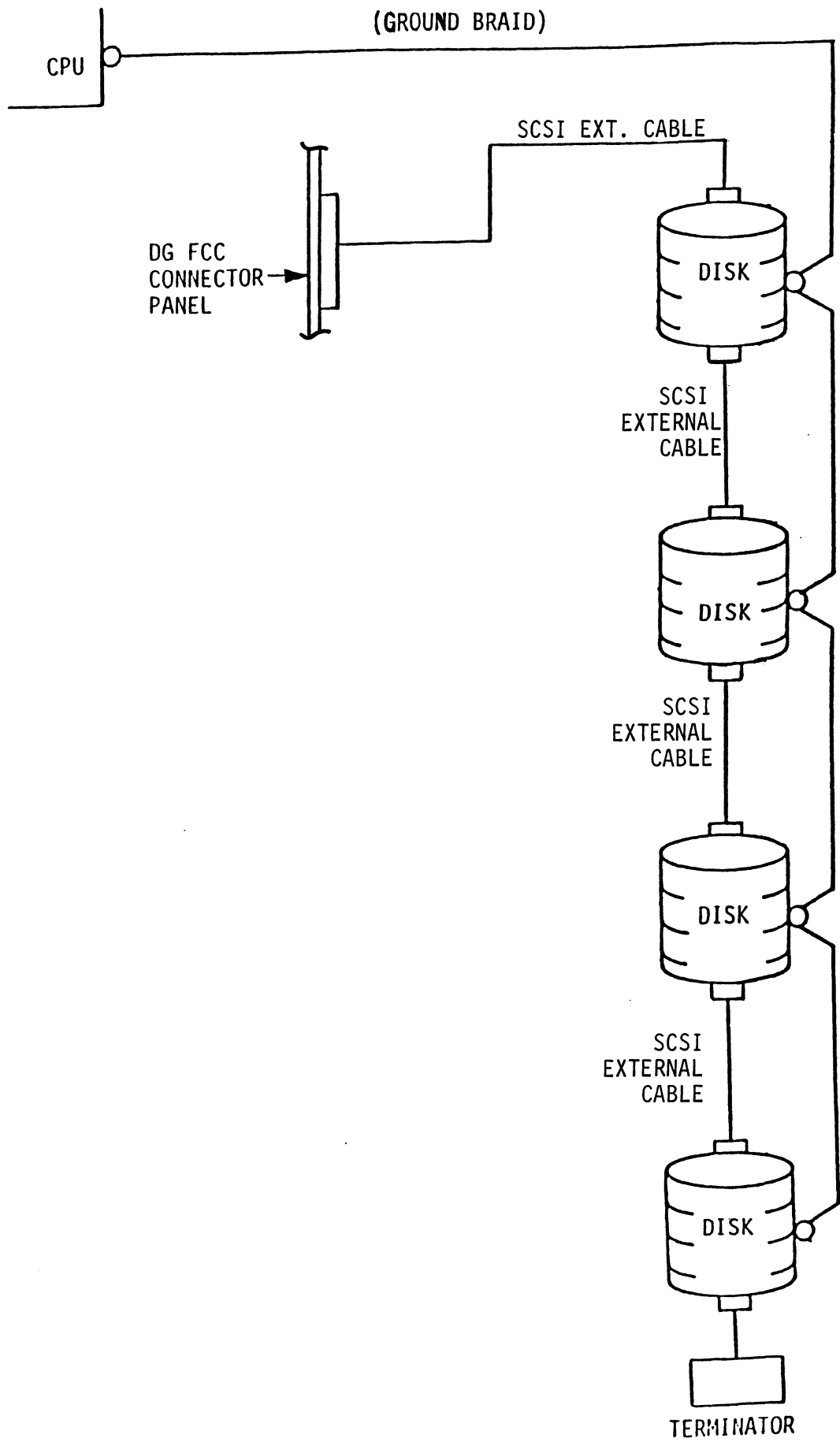EXTERNAL CABLE TO
DISK DRIVE ENCLOSURE

DG FCC CONNECTOR PANEL

EXTERNAL CABLE
(50 Pin)

INTERNAL CABLE

"A" PADDLEBOARD ASSY

DG BACK PLANE

"A" SIDE

SCZ-1 DISK CONTROLLER

DG BMC BOARD

J1

J2

BMC BUS CABLES

FIGURE 2.5 Subsystem Cabling

2-11

2.8 BOOT THE SOFTWARE TAPE

If you are using an MV class machine, you must load the MV's microcode before booting the software support tape.

The bootstrap procedure for the software support tape is as follows:

1. Mount the software support tape on the drive and put it "On-Line". Be sure that the BPI setting matches that specified on the tape label.

2. Program Load. Boot the tape in your normal fashion.

   For the S/140 virtual console, set 11A to 100022 (or 100062 for secondary tape drive). Then enter 100022L (or 100062L).

3. The software support package menu will be displayed:

FILE #	PROGRAM
2	SCZ-1 CONFIGURATOR
3	SCZ-1 INITIALIZER
4	SCZ-1 RELIABILITY
5	".SV & .LS" Files in AOS DUMP Format

   File Number?

You should enter the number of the program you wish to execute. At this point of the installation procedure, enter:

   2 <cr>

to load the Configurator Program.

2.9 CONFIGURE THE SCZ-1

After the Configurator Program has loaded, the following message will appear on your computer screen:

   CFSCZ1-CONFIGURATOR FOR SCZ-1 CONTROLLER
                     PRODUCT OF ZETACO

   THE PURPOSE OF THE CONFIGURATOR PROGRAM IS TO ALLOW YOU TO TAILOR THE SCZ-1 CONTROLLER TO YOUR PARTICULAR ENVIRONMENT. THE SCZ-1 CONTROLLER INCLUDES AN ELECTRICALLY ERASABLE PROM (EEPROM) THAT CONTAINS CERTAIN FACTS. THIS PROGRAM LETS YOU LIST THE CURRENT FACTS, MODIFY THOSE THAT YOU WANT CHANGED, AND RECORD THE NEW FACTS ONTO THE EEPROM.

THE HELP COMMAND ON THE MAIN MENU PROVIDES INFORMATION
BOTH ON WHAT TO DO AND HOW TO DO IT. IF THIS IS THE FIRST
TIME YOU HAVE RUN THIS PROGRAM, YOU MIGHT WANT TO START BY
SELECTING HELP.

YOU CAN GET AN EXPLANATION OF ANY QUESTION THE PROGRAM
ASKS BY RESPONDING TO THAT QUESTION WITH AN "H".

WHAT IS THE PRESENT SETTING OF THE DEVICE CODE (IN OCTAL)?

24

ENTER COMMAND (? TO SEE CHOICES):

**We have responded to the question about the device code
of the controller with the primary device code.
The program returned with a prompt for a Configurator
command. This indicates that the system has successfully
communicated with the controller at that device code, and
the controller is ready to be configured.

If the system had not returned with any prompt, that would
have indicated that the system was unable to contact the
controller at that device code. In such cases, turn the
computer off and double-check all of the preceeding
installation steps. If, after doing so, you still have
problems, contact ZETACO's Customer Support Hotline. See
Section 3.7.**

You may now continue on through the Configurator, using the
HELP command whenever you need help.

2.10   UNIT NUMBER AND MISCELLANEOUS PREPARATION

Set the drive(s) to the desired unit number(s). This is usally
done via jumpers in the drive. For two or more drives, unit
numbers assigned are usually consecutive, with unit "0" being
the primary unit.

2.11   INITIALIZE THE DISK

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

1.   INITIALIZE DISK
2.   MICROCODE INSTALL ONLY
3.   ZDKINIT ONLY (For RDOS, when supported.)

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 Initialize module.
This will format the disk, write out the micrcode, and write
out an empty bad block map 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 format the disk, boot the software support tape and load
file #3. The sample dialogue below will guide you through the
Initialize module of the Initializer Program.

        SCZ1 DISK INITIALIZER

        THE DISPLAY MODES ARE:

        0 - OCTAL
        1 - DECIMAL
        2 - HEXADECIMAL

        ENTER THE NUMBER OF YOUR CHOICE [0]:
        2

**This option allows you to select the numbering system in
which most of your on-screen information will be
displayed. Decimal numbers will be followed by a "."
(i.e., 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 hex numbers, you
need not enter leading zeroes; when entering decimal
numbers, you need not enter the ".".**

                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
        [B]SOFTWARE DEBUGGER   [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 format, 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

         [I]NITIALIZE
         [M]ICROCODE INSTALL ONLY
         [Z]DKINIT ONLY (For RDOS, when supported.)

         ENTER YOUR SELECTION [I]:
         I

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

         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
         [B]SOFTWARE DEBUGGER   [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 initializing. 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
            [B]SOFTWARE DEBUGGER   [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 intialized.

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

This tells us that we are formatting.

```
            RUN TIME 0. HRS.  40. MINS.  3. SECS.
            DEVICE CODE 24  UNIT NUMBER 0.   DEVICE STATE:  **ACTIVE**
            MODES: - FORMAT - 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.

2.12   RUN RELIABILITY TO VERIFY THE INSTALLATION

At this point, run Reliability for several minutes, just to verify that the subsystem is operating 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.

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.

SCZ1 RELIABILITY UTILITY

THE DISPLAY MODES ARE:

0 - OCTAL
1 - DECIMAL
2 - HEXADECIMAL

ENTER THE NUMBER OF YOUR CHOICE:
2

This option allows you to select the numbering system in which most of your on-screen information will be displayed. Decimal numbers will be followed be a "." (i.e., 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 hex numbers, you need not enter leading zeroes; when entering decimal numbers, you need not enter the ".".

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
     [B]SOFTWARE DEBUGGER      [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
     IS THIS A DUAL PORTED UNIT?  (YES,[NO]):
     <cr>
```

**This question should be answered no since dual porting is not
supported.**

```
     WRITE ONLY (YES,[NO]):
     <cr>
     READ ONLY (YES,[NO]):
     <cr>
     VERIFY DATA ([YES],NO):
     <cr>
     SELECT DATA TYPE:
```

2-18

```
        0 - LOGICAL BLOCK ADDRESS              1 - FLOATING ZERO
        2 - FLOATING ONE          3 - ALTERNATE ZEROS
        4 - ALTERNATE ONES (125252)                    (52525)
        6 - ALL ONES              5 - ALL ZEROS
        8 - ROTATING (125252)     7 - RANDOM
                                  9 - DO ALL PATTERNS
     SELECT DATA TYPE [0.]:
     <cr>
             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          [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
     [B]SOFTWARE DEBUGGER      [F]LAGS
     [M]ODE OF DISPLAY         [Q]UIT

     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.

3.0   TROUBLE-SHOOTING

The SCZ-1 is supported by ZETACO in the following ways:

- Microcprocessor-based Self-test of over 90% of the board each time it is powered up, with an LED status report.

- Reliability Program 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. (612-941-9480)

- 48-hour turnaround on most factory repairs or replacements.

- Up to a two year warranty on workmanship and materials.

3.1   SELF-TEST

Self-test checks out 90% of all the internal functions of the controller board once every time power is applied to the board. The test takes about one second to execute.

If Self-test has passed, the red LED will go out. If a failure was detected, the LED will blink a number of times, which corresponds to the subtest that failed. If you have an error code, please call ZETACO's Customer Support Hotline for help.

If the Self-test LED remains on, then the +5V supplied from the backplane is below 4.75V.

3.2   SOFTWARE SUPPORT PACKAGE

In addition to the diagnostic functions provided by the SCZ-1 Controller via on-board Self-test, ZETACO provides Reliability and Utility software. The Software Support Package on a magnetic tape included with the controller contains these programs.

Each of the programs on the Software Support Tape has been written by ZETACO specifically for the SCZ-1 Controller. You should use this tape for loading controller Microcode, Media Formatting, Disk Diagnostic and Reliability, and Configuration of the Controller. DG's CORRESPONDING PROGRAMS MAY NOT WORK ON THIS CONTROLLER. Also note that the SCZ-1 does not support MV SYSTEMX.

The Software Support Package 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 loaded into the system. The boot procedure is detailed in Section 2.8.

At several points during the installation procedure, you will find sample dialogue for the programs. 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 that do not appear in an actual session, and are here provided for clarification, will be preceeded and followed by the characters "**".

If you are using an MV class machine, you must load the MV's microcode before booting the software support tape.

The Bootstrap Procedure for the software support tape is:

1. Mount the Software Support tape on the drive and put in on-line. Be sure that the BPI setting matches that specified on the tape label.

2. Boot the tape in your normal fashion.

    For the S/140 virtual console, set 11A to 100022 (or 100062 for secondary tape drive). Then enter 100022L (or 100062L).

3. The Software Support Package menu will be displayed:

    FILE #   PROGRAM

    2   SCZ-1 CONFIGURATOR
    3   SCZ-1 FORMATTER
    4   SCZ-1 RELIABILITY
    5   ".SV & .LS" Files in AOS DUMP
                                       Format

    File Number?

    Enter the file number of the program you wish to execute.

3.3   SYSTEM ERRORS

If a system error occurs, refer to the DG User's Manual provided with the system to help determine what is wrong. For example, if a panic code is given, look up the code by referring to the DG User's Manual. This information should help determine how to solve the problem. Next, try to execute a similar function and see if the same results are obtained. If a BURST or a COPY is not working, try a DUMP. This could add vital information about the problem.

3.3.1　TEST PROGRAMS TO USE IF THE SYSTEM IS BUILT BUT PROBLEMS HAVE ARISEN

This section explains a test that can be done on a disk that has a system or system data on it without destroying that system or data. This provides an avenue for conditions requiring diagnostic testing, but where time does not permit for rebuilding the system.

This test requires that the Reliability program on the Software Support Package tape be loaded into system memory.

Go through the enter procedure as you would normally, except when it asks you "READ ONLY (YES,[NO]):" answer YES. Then when it asks you "VERIFY DATA ([YES],NO):" answer NO. Now start RELI with the S Command.

This will test the controller's ability to seek, read data from the disk and transfer data on the BMC without destroying the data on the disk.

3.4　RELIABILITY - ERROR DESCRIPTION

If Self-test was successful but there are still problems with the subsystem, run the Reliability program. Reliability will display PIO errors, CB errors and Data Compare errors.

PIO errors will be of the format:

```
        Timeout type errors
    RUN TIME 0. HRS. 20. MINS. 3. SECS.
    DEVICE CODE:  24   UNIT NUMBER:  0.         STATE: **ACTIVE**
    MODES:  RANDOM, R/W, DATA CHECK - ADDR
              REG A     REG B     REG C
    OPERATION       0     3400        201
    STATUS          0        0          0
    TIMEOUT WAITING FOR INTERRUPT.
```

Timeout errors are generally fatal and will likely cause other unrelated errors to occur.

```
        PIO status type errors
    RUN TIME 0. HRS. 20. MINS. 3. SECS.
    DEVICE CODE 24   UNIT NUMBER 0.          STATE: **ACTIVE**
    MODES:  RANDOM, R/W, DATA CHECK - ADDR
              REG A     REG B     REG C
    OPERATION       0     3400        201
    STATUS          0     3400     144201
```

CB errors will have the following format:

```
RUN TIME 0. HRS. 20. MINS. 3. SECS.
DEVICE CODE 24  UNIT NUMBER 0.  MAPPING NOT ENABLED
STATE: **ACTIVE**
MODES:  RANDOM, R/W, DATA CHECK - ADDR
LOGICAL BLOCK      124532      SECTOR COUNT     4
MEMORY ADDRESS      64321      COMMAND      WRITE
PAGE TABLE ADDRESS      0      RETURNED XFER COUNT  0
PHYSICAL BLOCK: 125452 = CYLINDER: 123 HEAD: 3 SECTOR: 34
ASYNC STATUS   :      3
        CB EXECUTION ERROR : HARD ERRORS
CB STATUS      : 100001
        ANY CB HARD EXECUTION ERROR
        CB DONE BIT
CB ERROR       :      1
        HEADER NONCOMPARE
CB UNIT STATUS :  24000
        READY
        PORT RESERVED BIT 1
DISK ERROR     :   5000
```

**The physical block shown above can be entered into the
initializer as a bad block address. The logical block is the
starting logical block address. If the returned transfer count
is added to the logical block, you will have the logical block
in error, but this block is not the ACTUAL block on the disk
due to controller features. The physical block is in fact the
actual block in error on the disk**

Data Compare errors will have the following format:

```
***** DATA COMPARE ERROR *****

DEVICE CODE 24  UNIT NUMBER 0.  MAPPING NOT ENABLED
STATE:  **ACTIVE**
MODES:  RANDOM, R/W, DATA CHECK - ADDR
LOGICAL BLOCK      :  12345     SECTOR COUNT      :      3
PAGE TABLE ADDRESS :      0     LOGICAL XFER ADDRESS:  56271
PHYSICAL XFER ADDRESS:  56271
EXPECTED      RECEIVED      OFFSET
165346        165347          1
165346        165347          3
165346        165347          5
TOTAL ERROR COUNT:  384.
```

For further description of the error status, refer to Data
General Programmer's Reference Series: Models 6236/6237 and
6239/6240 Disk Subsystems.

3.5 FORMATTER - ERROR DESCRIPTION

If Reliability fails, you can try reformatting the disk drive. This will destroy any data on the disk, but it may get the subsystem working again. You could then rebuild your system on the disk. The Initializer error display is as follows.

PIO errors will have the following format:

(Same as the Reliability in Section 3.4)

CB errors will have the following format:

```
RUN TIME 0. HRS. 20. MINS. 3. SECS.
DEVICE CODE 24   UNIT NUMBER 0. MAPPING NOT ENABLED
STATE: **ACTIVE**
MODES: - ANALYZE - INSTL UCODE - INSTL MAP - ZDKINIT (FOR
                                                   RDOS)
PHYSICAL BLOCK    124532    SECTOR COUNT   1240
MEMORY ADDRESS     64321    COMMAND        WRITE ONE/WORD
PAGE TABLE ADDRESS     0    RETURNED XFER COUNT 22
PHYSICAL BLOCK:   124554 = CYLINDER: 123 HEAD: 3 SECTOR: 34
ACTIVE DATA     AAAA        ACTIVE OFFSET  STROBE LATE; SERVO-
ASYNC STATUS : 3
      CB EXECUTION ERROR : HARD ERROR
CB  STATUS    : 100001
      ANY CB HARD EXECUTION ERROR
      CB DONE BIT
CB  ERROR     : 1
      HEADER NONCOMPARE
CB UNIT STATUS : 24000
      READY
      PORT RESERVED BIT 1
DISK ERROR    : 17000
```

The physical block shown at the top is the starting physical block and the erroring physical block is shown below with the cylinder, head, and sector.

For further description of the error status refer to Data General Programmer's Reference Series: Models 6236/6237 and 6239/6240 Disk Subsystems.

3.6 CUSTOMER SUPPORT HOTLINE

ZETACO, Inc. provides a Customer Support Hotline (612-941-9480) 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.

Please review the General Installation Checklist before calling the Hotline.

3.7 WARRANTY INFORMATION

All ZETACO products are warranted free from manufacturing and material defects, when used in a normal and proper manner, for a period of up to 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.

3.8 PRODUCT RETURN AUTHORIZATION

All possible effort to test a suspected malfunctioning controller should be made before returning the controller to ZETACO for repair. However, if controller or module malfunction has been confirmed using the tests outline in Sections 3.1 to 3.5, the board can be returned to ZETACO for warranty repair or for time-and-material repair if it is out of warranty. A Return Material Authorization (RMA) number is required before shipment and should be referenced on all packaging and correspondence.

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.

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.

GENERAL INSTALLATION CHECKLIST

CPU_____ Operating System and Rev._____

Is board replacing a previously installed subsystem?_____

Device Code of New Product:_____ Any similar subsystem in the CPU?

YES   NO   If yes, then its Device Code:_____

Configuration Facts_____

Problem Description_____

_____

Problem happens where (during DUMP, RELIABILITY, etc.)?_____

_____

Intermittent or consistent problem?_____

Does Self-test pass?_____

Priority of Board in CPU (slot)_____

BMC Priorities of other BMC Devices_____

Reviewed Interrupt and Priority Jumpers on vacant slots?_____

Tried different slot?_____

Cleaned gold-fingered contact points of board and reset board?_____

Supplied ZETACO 1/2" tape "BOOT" correctly?_____

Is disk drive set to correct unit number, and is terminator in?_____

What is sector switch setting on the disk drive?_____

Double checked PIN 1 of cable to PIN 1 of controller, backplane and

peripheral?_____

Result of ZETACO Reliability or Diagnostic?_____

_____

.

MATERIAL RETURN INFORMATION

All possible effort to test a suspected malfunctioning controller should be made before returning the controller to ZETACO, Inc. for repair. 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 sheets.

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 what operating system are you running? (AOS, AOS/VS, RDOS, etc.)

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: _____

4.0   CONTROLLER USAGE GUIDELINES

4.1   CONTROLLER FEATURES PROGRAMMED BY THE CONFIGURATOR

4.1.1   CONFIGURATOR AID (HELP)

The SCZ-1 Configurator Program includes two "HELP" commands:
one for OPERATIONAL questions and one that suggests WHAT you
might want to do. You can get an explanation for any item by
responding with an "H" to the question. Please use these
functions whenever you are uncertain as to what to do.

4.1.2   THROTTLE BURST RATE

This is defined as the number of word transfers that take place
over the BMC during a single bus access by the disk
controller. Throttle adjustment is dependent upon the type of
system configuration in which the controller is installed. Too
low a throttle setting could result in slow disk performance
and too high a setting could cause a data late on another BMC
device. The controller may be set to burst rates of 1, 2, 4,
8, 16, 32, 64, 128 and 256 words per access. A burst rate of
32 is recommended for most applications.

To maximize overall performance, the Burst Rate should be set
to the largest value that doesn't cause interference on other
controllers, such as "data lates".

4.1.3   DISK DRIVES SUPPORTED

The SCZ-1 is designed to support drives that meet the SCSI
Interface Specification and utilize the SCSI Common Command
Set. ZETACO has verified several drives with the SCZ-1 and
will continue to test additional drives for verification of
compatibility with the SCZ-1. If you don't find the drive you
want to interface in the Configurator Program, call us to
discuss your requirements.

The SCZ-1 may be configured to assign drives of varying
capacities and transfer rates to any of the 4 logical units.
Any combination of up to 7 physical drives may be configured to
any one of the 4 logical units.

4.1.4   BMC BUS PRIORITY

The SCZ-1 has the capability of functioning with up to seven
other BMC peripheral controllers. However, some DG computers,
such as the MV/4000 and S/280 only support up to four BMC
devices.

In this case you must select priorities 0 through 3, 3 being the highest priority. The lower the priority number the lower the priority level. If there is more than one BMC device, make sure you select a priority level that is different than the other BMC devices.

4.1.5   BREAK COUNT INTERVAL

The Break Count Interval is defined as the period of time that the SCZ-1 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 1 is equal to one Sync Clock period. The maximum setting is 255. 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.

ZETA O

Please give us your comments.

Please use this form to send us your comments regarding this Technical Manual. Your input is greatly appreciated! Problems will be promptly addressed and action taken as necessary. If you wish a written reply, please furnish your name and mailing address. Thank you.

Date_____

Name_____Title_____

Firm_____

Address_____

City/State/ZIP_____

TECHNICAL MANUAL TITLE_____

DOCUMENT NUMBER_____REVISION_____

ERRORS IN MANUAL:

SUGGESTIONS FOR IMPROVING EITHER THE MANUAL OR THE PRODUCT: