Model SCZ-6

Multifunction SCSI 2 Controller

Technical Manual

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Preface

This manual contains information regarding installation, testing, and operation of the ZETACO Model SCZ-6 Multifunction SCSI 2 Controller. The technical contents have 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 the following chapters:

Chapter 1 - Product Overview

SCZ-6 Multifunction SCSI 2 Controller features, capabilities, specifications, power and interface requirements.

Chapter 2 - Installation Procedures

Procedures required to install and test the SCZ-6 Multifunction SCSI 2 Controller.

Chapter 3 - Trouble-shooting

How to analyze problems; how to get help.

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Product Overview

1.0 Introduction

Zetaco's SCZ-6 Multifunction SCSI Controller is designed to interface a variety of SCSI peripherals to Data General MV series minicomputers.

At the system level, the SCZ-6 utilizes the capabilities of Data General's MTJ and DPJ (Argus) software drivers. System performance features of the Argus driver are supported: memory resident control blocks, mapping responsibility, execution of linked control blocks. The SCZ-6 executes all tape commands supported by the MTJ driver and disk commands supported by the DPJ driver.

The controller supports AOS/VS and AOS/VS-II operating systems unmodified. Since the differences between the two do not affect the operation of the SCZ-6 or the peripherals connected to it, references to AOS/VS are intended to apply to both operating systems.

Features

- Adherence to Common Command Set SCSI Protocol insures drive compatibility

- Supports magnetic disk, optical disk, and magnetic tape

- Command queuing for lower system overhead

- Large on-board memory for efficient data buffering

- Supports hardware disk mirroring

- Dual microprocessors with full parallel processing

- Automatic self-test and error/status LED display

1.1 Controller Functional Overview

Refer to Figure 1.1 to see the major functional sections of the SCZ-6 Controller. The following paragraphs briefly describe the functions of the various sections.

BMC Data and Control

This section handles transfer of data between the computer and the controller over the Burst Multiplexor Channel (BMC). The BMC handles transfer of disk and tape data as well as Control Block (CB) information. Data is stored temporarily on the controller in the Data Buffer. This section interfaces to the computer via two ribbon cables on the front edge of the controller.

Programmed I/O Data & Control

This section handles Programmed I/O (PIO) functions for the disk, tape and MPORT device codes. This section includes the six command and status registers, busy/done logic, interrupt control and other logic required to handle up to four device codes. This section interfaces to the computer via the A and B backplane connectors. Each Busy Flag register drives one of the four right-most green LEDs on the controller.

Data Buffer

This high-speed buffer is used to temporarily hold data transfers between the controller and computer memory over the BMC. Data is alternatley buffered here in two 256-word buffers. Data is filled into the first buffer at the same time that data is emptied out of the second. This ping-pong buffering method is used in conjunction with the variable BMC burst and break values to optimize overall system performance.

SCSI Controller IC and Paddleboard

A 53C720 SCSI controller IC is used to manage SCSI bus control and data flow functions. It handles all SCSI timing requirements and off-loads many other SCSI control functions from direct microprocessor control. The SCSI controller interfaces to the paddleboard via the **B backplane**. The internal cable connects between the paddleboard and chassis bulkhead, to which the external SCSI cabling connects.

Memory
Controller

The Memory Controller is incorporated in the 53C720, as well as a memory transfer counter and memory address generator. Its function is to control the high-speed flow of data between the Data Buffer, the 53C720 SCSI Controller and the 128KB Static RAM located on the SCSI control side of the controller.

BMC TERMINATOR

BMC DATA AND CONTROL

BURST MUX CHANNEL (BMC)

HSCBUS (DATA)

BMCHSADR (ADDRESS)

DATA BUFFER 1KB

2018

SCSI CONTROLLER 53C720

"B" BACKPLANE

PADDLEBOARD

TRANSCEIVER

MABUS

SCSI BUS

CABLING TO PERIPHERAL DEVICES

PORT 0 THRU PORT 3, BUSY LEDS (GREEN)

SDBUS

CNTLR LATCH

SCSI SELF-TEST LED (RED)

SCSI BUS FAULT LED (YELLOW)

SCSI BUS BUSY (GREEN)

FOUR PORT PROGRAMMED I/O DATA AND CONTROL

COMPUTER BACKPLANE

TRANSCEIVER

DEVICE CODE SWITCH

MPORT (PORT 3) DEVICE CODE SELECT

DUAL PORT RAM 1KB AM2130

EPROM 64KB 27C256

CNTRL LATCH

BMC ACTIVE LED (YELLOW)

HOST SELF-TEST LED (RED)

XCEIVER

ADDR LATCH

ADRBUS

HADBUS

TRANSCEIVER

ADDR LATCH

MABUS

HOST PROCESSOR 80C186

STATIC RAM 64KB 62256

EEPROM 4KB 28168

EPROM 64KB 27C256

STATIC RAM 128KB 62256

SCSI PROCESSOR 80C186

Figure 1.1
SCZ-6 Block Diagram

Dual Port RAM

This is a 1KB RAM which is used for communication between the Host and SCSI processors.

Host & SCSI 80C186 Processors & Associated Logic

These 16-bit microprocessors manage the various functions on their respective sides of the controller. The Host Processors responsibilities include Control Block management, PIO functions and BMC mapping. The Host Processor translates Control Blocks from the computer into a command structure that the SCSI Processor can interpret. The SCSI Processor translates these commands to the SCSI command protocol and sends them onto the disk and tape drives. The SCSI Processor is responsible for the management of the various commands for up to seven SCSI devices.

Each microprocessor has its own local memory devices. Each has 64KB of EPROM for firmware storage. The E^2PROM that holds configuration facts is accessible to the Host Processor. The SCSI Processor has 128KB of static RAM, which is used for large on-board data buffering tasks such as disk mirror synchronization. The processors communicate with each other via the Dual Port RAM.

1.2 Device Code Port Assignments

The SCZ-6 contains PIO control facilities, or ports, to handle up to four device codes. Two of these device codes are used for disk and tape control, while a third is reserved for future use for auxiliary device control. The fourth handles Maintenance Port (MPORT) control functions required by the controller utility programs.

The controller maintains a fixed interrupt priority structure between the four ports: Port 0 has highest interrupt priority, Port 1 the next highest, Port 2 the next, and MPORT the lowest priority. To achieve a variable interrupt priority structure within the controller, the devices (disk, tape, aux) are assigned ports at configuration time based on the interrupt priority specified.

The disk and tape control sections can be configured for higher/lower interrupt priority. The device configured to the higher interrupt priority will be assigned to Port 0, while the lower priority device will be assigned to Port 1.

The device with the higher priority will receive interrupt servicing by the computer first if two or more devices are requesting service at the same time.

1.3 LED Indicators

There are 9 LEDs located along the front edge of the controller, visible when the computer front cover is removed. This section describes the meaning of the LEDs as viewed from left to right (component side of controller up).

The left-most three LEDs indicate SCSI Processor status:

RED   SCSI Self-test

This LED turns ON to indicate SCSI Processor self-test is in progress. Upon successful completion of self-test at power-up, the LED should go OFF. If it does not go off within 30 seconds, or begins to flash along with the other 2 adjacent LEDs, self-test has failed. Refer to Chapter 3 of this manual for more information.

YELLOW   SCSI Bus Fault

Indicates an abnormal SCSI bus condition such as cable fault. Also used to flash self-test error codes.

GREEN   SCSI Bus Busy

When ON, this LED indicates that the SCSI bus is BUSY, i.e., a device has control of the bus. This LED will be OFF during BUS FREE or DISCONNECT SCSI conditions. This means that although the SCSI Busy LED may be OFF, the disk and tape drives may still be performing operations such as format or head positioning, but are temporarily "disconnected" from the controller.

The six right-most LEDs indicate Host Processor status:

RED   Host Self-test

This LED turns ON to indicate Host Processor self-test is in progress. Upon successful completion of self-test at power-up, the LED should go OFF. If it does not go off within 30 seconds, or begins to flash, self-test has failed. Refer to Chapter 3 of this manual for more information.

This will also be ON when the Host Processor is in DEBUG mode. Debug mode is only used while running the controller utilities such as the Configurator program.

YELLOW   BMC Active

Indicates that the BMC bus is actively transferring data between the controller and computer memory.

GREEN   Port 0 Busy (highest interrupt priority)_

GREEN   Port 1 Busy

GREEN   Port 2 Busy

GREEN   Maintenance Port (MPORT) Busy (lowest interrupt priority)

These four green LEDs show the status of the Busy flags for the four controller ports.

Observing the Busy flag provides a means of monitoring controller/computer activity. When ON, an LED indicates that the port is busy executing a PIO command. When an LED goes OFF, the ports Busy flag has been cleared and the port is ready to accept another command.

Note that this refers only to the processing of PIO commands, not Control Blocks. In other words, a port whose Busy flag is not set is ready to receive another PIO command but may still be in process of executing a control block command. Refer to your programmer's reference for more information.

The disk and tape control sections of the controller will be assigned to either Port 0 or Port 1, depending on the configured setting of "Disk/Tape Interrupt Priority." Refer to Section 1.2 for more information.

1.4 SCZ-6 Controller Specifications

Drives per Controller: Up to 7 SCSI targets

Data Transfer Rate: Up to 10 *MB/sec* (Synchronous)
                             Up to 4 *MB/sec* (Asynchronous)

Device Codes: Programmable

Interrupt Priority Mask Bit: Bit 10 for tape, Bit 7 for disk

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

Data Channel Interface: Not Supported

Burst Multiplexor Channel Interface:

. . . . Less than 1 STTL load
. . . . 64*ma* drive at 0.7*v*
. . . . Supports selectablity of any of the 8 priority
       requests
. . . . Selectable burst rates of 1 to 256,
       16 bit words/access
. . . . Selectable break count from 1 to 256 sync
       clock periods
. . . . Support BMC transfer rates equal to the fastest
       available BMC computers

Data Buffering: Two 256-word BMC buffers in a ping-pong
                       configuration. Also, buffering provided on the
                       drives.

Memory Address: 21 bits

The SCZ-6 is designed to operate only with the BMC and must be installed in an **I/O ONLY** slot of an MV computer. Its operating system must support the MTJ and DPJ drivers. Table 2.11 lists the Data General computers in which the SCZ-6 will function, along with corresponding I/O ONLY slot numbers.

BMC Bus Cables

To operate the SCZ-6 over the BMC channel, a physical connection between the SCZ-6 and the Data General BMC channel is required. This connection is made via two 40-conductor flat ribbon cables. Each has a single socket on one end (for the BMC controller) and multiple sockets (for multiple boards accessing the BMC) on the other.

Device Interface

The SCZ-6 communicates with the devices via the SCSI interface. It can operate in synchronous or asynchronous mode. The SCZ-6 is fully operational with either differential or single-ended drives. (Different paddleboards and cables are required for each type. They can never be mixed.)

Mechanical

Dimensions: 15" x 15" (37*cm* x 37*cm*)

Shipping Weight: 10 pounds (4.536 *kg*) (includes controller, paddleboard, internal cable, software tape and documentation)

Paddleboard: Active component design with one 50-pin cable connector (B-side of backplane)

Power
Requirements

+5 *v*DC (±5%) at 8 *amps* typical

Environmental

<u>*Operating Environment:*</u>

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

<u>*Non-Operating Environment:*</u>

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

Exceeds all MV temperature and humidity specifications.

1.5 Cabling

If you have not purchased your cables from Zetaco, you will need to provide cabling from your computer bulkhead to the SCSI peripherals you are using and to any additional drives you want to use.

Your drive(s) may be single-ended or differential. Cables with a characteristic impedance of 120 *ohms* or greater should be used with single-ended drives. A characteristic impedance of 100 *ohms* or greater is necessary for differential drives. **SCSI's maximum cumulative cable length is 82 feet for differential, and 19 feet for single-ended.**

Internal Cabling

Internal cables connect from paddleboard to bulkhead. An internal cable is shipped standard with each SCZ-6. Located inside the bulkhead:

Paddleboard: Active backplane paddleboard with one 50-pin connector

Cable: 28" standard 50-conductor flat ribbon cable

External Cabling

You will need an external cable to connect bulkhead-to-drive enclosure; and additional daisy-chain cables if you have multiple enclosures. External cables are not shipped with each SCZ-6, but can be optionally ordered. Contact Zetaco for information.

Standard cable information:

Bulkhead-to-Drive: Nine-foot, 50-conductor, shielded round cable connecting bulkhead to disk/tape drive enclosure

Drive-to-Drive: Two-foot, 50-conductor, shielded round cable (optional) for connecting more enclosures

NOTE The SCSI maximum cumulative cable length allowable for a fully populated subsystem is 82 feet for differential drives and 19 feet for single-ended SCSI drives.

Installation

2.0 Before You Begin Installation

The installation process consists of two parts: hardware and software. Hardware installation is covered first in the following sections. Every attempt has been made to cover the process sequentially. Read through this procedure before attempting installation and have on hand the tools and references suggested.

Overview of the Installation Process

The installation process described in the following sections is designed to proceed step by step and provide methods for you to verify results. After you have all hardware in place, the checklist and power-up sequence provides a partial confirmation of success.

In the software section, using the Support Package Tape programs and other optional system tests, you can further determine your success.
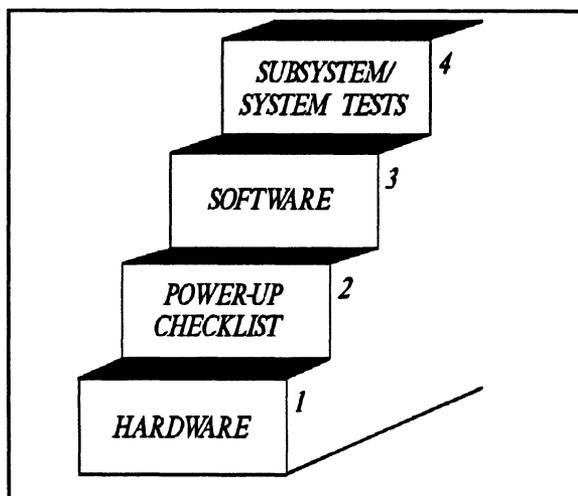
Diagram of Installation Process

SUBSYSTEM/ SYSTEM TESTS *4*

SOFTWARE *3*

POWER-UP CHECKLIST *2*

HARDWARE *1*

2.1 Hardware Installation Procedure

The hardware covered in this section includes the computer chassis, the SCZ-6 Multifunction SCSI Controller, disk or tape drive, and the cables. Any changes you may need to make to the hardware are described in the appropriate section.

Each of the following sections details one of these steps for installation of the SCZ-6:

1. Selecting a slot for the SCZ-6 in the computer chassis and making it functional.

2. What to do with the jumpers and switches on the SCZ-6 controller.

3. Installing the SCZ-6 and paddleboard into the chassis.

4. Setting up the peripheral.

5. Connecting all cables; SCSI and BMC.

Since so much of the installation depends on complying with Data General architecture, have reference material about the system hardware on hand. For example, in order to access the backplane to install the SCZ-6 paddleboard, it will be necessary to remove the backpanel bulkhead (if FCC compliant). It may not be clear how to do this by just looking at it.

There are a variety of ways Data General sets up its computers.

• Some have vertically mounted boards, some are horizontal.
• Some have one IOC, others have more.
• Bus repeaters may be installed on an expansion chassis.

The scope of these installation instructions is broad. You must have enough information about the system itself to fill in the details. **Tools you may need for installation:**

1. A Phillips screwdriver
2. A set of nut drivers
3. A small straight-blade screwdriver
4. A large straight-blade screwdriver
5. A set of needlenose pliers
6. A flashlight

**The SCZ-6 is a sensitive piece of electronic equipment.
Observe precautions to prevent damage by static; wear a
wrist band and strap while handling the controller.**

CAUTION
**OBSERVE PRECAUTIONS
FOR HANDLING**
**ELECTROSTATIC
SENSITIVE
DEVICES**

*What to do if
there is damage...*

Immediately after receiving it and before you unpack your
Zetaco shipment, inspect the shipping carton(s) for any evidence
of damage or mishandling in transit.

Zetaco's warranty does not cover shipping damages. Therefore,
if the shipping cartons are water stained or otherwise damaged,
contact the carrier or shipping agent, before opening, with
information on the damage. Request that a representative be
present during receiving inspection.

For repair or replacement of any Zetaco product damaged in
shipment, call Zetaco for return instructions and authorization.

2.11 Selecting a Slot & Making it Functional

The first thing to do is determine which slot of the computer can be used for the SCZ-6. Then, be sure the priority signals are available for that slot.

Slot Selected Must be I/O ONLY

The SCZ-6 must be installed in an **I/O ONLY** slot. Each type of Data General computer reserves different slots as **I/O ONLY**. Refer to Table 2.11 for this specific information. Examine the computer to determine which of the proper slots are available. It may be necessary to rearrange boards to accommodate the SCZ-6 in an **I/O ONLY** slot.

CAUTION   Component damage will result and Zetaco's warranty is VOID if anything other than an I/O ONLY slot is used.

Table 2.11

Identification of I/O ONLY Slots

CPU Model I/O ONLY Slot Numbers

MV/7800*	Chassis dependent
MV/9500*	Chassis dependent
MV/9600*	Chassis dependent
MV/10000	13 - 24, 26 - 36
MV/15000	6 - 12
MV/20000	19 - 38
MV/30000	Any Eclipse I/O Slot
MV/40000 . . .	Any Eclipse I/O Slot

* Since the MV/7800, MV/9500 and MV/9600 are upgrade vehicles for Data General machines, they can be installed in a variety of chassis types. Choose a slot defined as I/O ONLY for the type of chassis being used.

*Availability
to BMC*

Since the BMC is the high-speed data path on the MV class machines, an increasing number of devices need access to it. The SCZ-6 can only operate on the BMC. When planning slot location for the SCZ-6 controller, availability of a BMC connector to that slot is as important as finding one that is I/O ONLY.

*Priority Must be
Maintained*

There are two signals on the Data General backplane that aid the system in managing controller activity. These are: Data Channel (DCH) Priority, and Interrupt Priority. Even though the SCZ-6 does not operate on the DCH bus, the signal must be available to pass to the next controller. If any empty slots exist between the CPU board and the controller furthest from it, it will be necessary to add jumper wires from Priority Out of the controller before the gap to Priority In of the one after. Figure 2.11 demonstrates this.

*Pin-to-Pin
Connections*

Pin # A93 *(DCH OUT)* goes to Pin # A94 *(DCH IN)*

Pin # A95 *(INTERRUPT OUT)* goes to Pin # A96 *(INTERRUPT IN)*

The result of improper jumpering will be a non-functional subsystem.
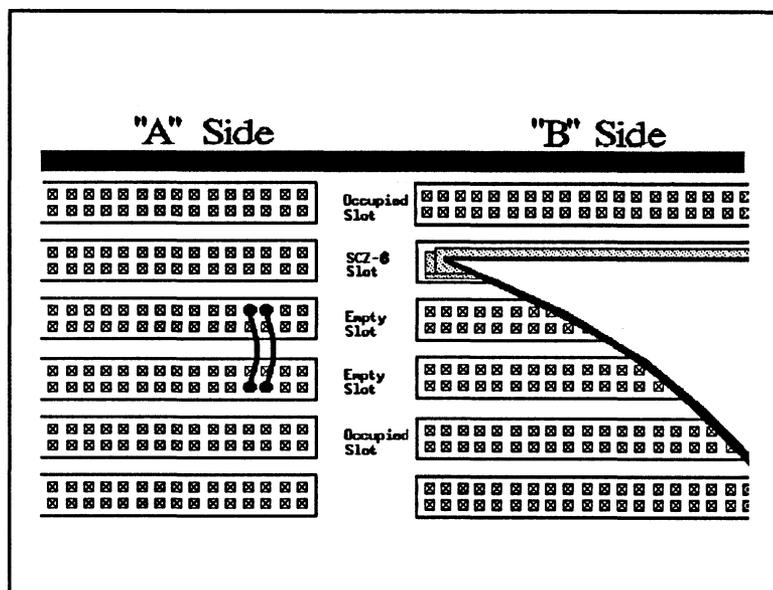
*Figure 2.11
Backplane Priority Jumpers*

2.12 Setting Switches

Most option setup for the SCZ-6 is handled by programming the E²PROM on the controller. The controller options handled in hardware are configured via the switchpack on the front of the board. They are: system device code, E²PROM write disable, and configuration over-ride. Also, the paddleboard has one jumper that determines the source of SCSI terminator power.

Choosing the Device Code Address

You must set the maintenance port (MPORT) device code switches to the proper address at controller installation time. It is this address through which the Configurator Program will later communicate with the SCZ-6, allowing you to set the controller's disk and tape device codes. Any device code not already in use may be used, but the standard ones are:

$$\text{MPORT} \ldots \text{ primary } 40_8$$
$$\ldots \ldots \text{ secondary } 41_8$$

The switchpack used to set the maintenance port device code is located on the front of the board. This fact makes changing the controller device code easy, even after installation into the computer chassis. Switches 3 - 8 of the switchpack are used to set the device code. Switch 1 either initiates a self-test loop or overrides the set configuration facts stored in E²PROM. Switch 2 is for enable/disable of the E²PROM write protect. See Figure 2.12 for complete instructions.

When to Use the E²PROM Write Disable

The E²PROM on the controller stores information necessary for proper subsystem functioning. To completely protect this data, the option to disable writes to the E²PROM is available. In future installation steps some of this information may need to be modified to tailor a subsystem to the system into which it's being installed. At this time, leave switch 2 in the DOWN position to disable *writes*, until you run the Configuration Program.

Using Configuration Over-ride

Although very rare, transient power problems in your computer could potentially corrupt the SCZ-6's E²PROM configuration data and cause a failure. Configuration override is provided to allow you to boot the SCZ-6 Software Support Package tape from the SCZ-6 controller in order to reconfigure the E²PROM data.

Configuration Override is controlled by the leftmost switch on the switchpack (S1) and can be used to set the controller options to the following known values:

- Tape device code is forced to the value set by the device code switchpack.
- Tape Logical Unit 0 is mapped to SCSI ID 5. (Your tape boot device must be set to SCSI ID 5 to use this feature.)
- The disk controller portion of the SCZ-6 becomes disabled until S1 is set back to the MPORT device code position.

To use the Configuration Over-ride switch:

1. Set the SCZ-6 device code switches to the tape controller device code (instead of the MPORT).
2. Power-up the system.
3. Wait 30 seconds for the SCZ-6 self-test to complete, as indicated when the LEDs are no longer lit.
4. Flip S1 UP.
5. After running the Configurator Program, flip S1 DOWN and S3-S8 back to the MPORT device code.

If you have this switch UP before power-up or during self-test, the controller will loop on self-test.

Note:
Switch Down = Binary 1
Switch Up = Binary 0
Switch 3 = Most Significant Bit
Device Code = 40$_8$ is Shown
Switch 2 = E^{2}PROM Write Disable (DOWN)

Device Code	S1 Over-ride	S2 E²PROM 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

Figure 2.12
Maintenance Port Device Code Switches
Located on Controller

2.13 Jumpers

Jumper W1-1 on the paddleboard is used to connect the controller's terminator power source to the SCSI bus. With jumper W1-1 installed, the controller will supply terminator power and maintain proper bus termination even if other terminator power sources, such as the second initiator in a dual-initiator configuration, are shut off. Zetaco recommends that you leave Jumper W1-1 installed. The paddleboard has an integral isolation diode that eliminates contention between multiple power sources.

2.14 Installing Controller and Paddleboard

The physical placement of the controller and paddleboard into the computer requires care and patience. You may find a flashlight to be helpful.

How to Properly Install the Controller into its Slot

1. Pull out the levers at the front corners of the controller until they stick out straight in front.

2. Carefully guide the controller into the chosen **I/O ONLY** slot until the levers snap around the front of the chassis frame.

3. Gently apply pressure to the levers. The pressure you apply is forcing the goldfingers of the controller into the backplane socket. DO NOT apply undue pressure. If you don't feel the controller "give" a little as you are pushing it in, you may have the board misaligned. Remove and try again.

4. The board is properly installed if the levers end up flat against the board.

If you are inserting the SCZ-6 into the middle of a group of boards, you may need to extend the adjacent boards to be even with the SCZ-6 and insert them as a group.

How to Properly Install the SCZ-6 Paddleboard

1. Determine the "B" side of the backplane. Viewed from the rear, the "B" side is on the right for a chassis with horizontal boards or on the bottom for a vertical board chassis.
2. Locate the two rows of pins on the "B" side that correspond to the slot in which the SCZ-6 is installed.

3. Check for and carefully straighten any bent pins. Use a different slot if any of the pins are broken off.

4. Position the paddleboard connector block to cover all 100 pins of the "B" backplane. **Be sure that the component side of the paddleboard is facing the same way as the components on the controller.**

5. Press the connector squarely over the pins, making sure all pins insert and do not bend, until the connector block is flush with the backplane. Although an amount of pressure is necessary, DO NOT FORCE.

CAUTION **Component damage may occur at power-up if paddleboard is misaligned.**

1. *Check BOTH ends for non-inserted pins.*
2. *Doublecheck that the block is positioned over the correct two rows of pins, and NOT between slots.*
3. *It may be necessary to count pairs of rows to determine correct positioning.*
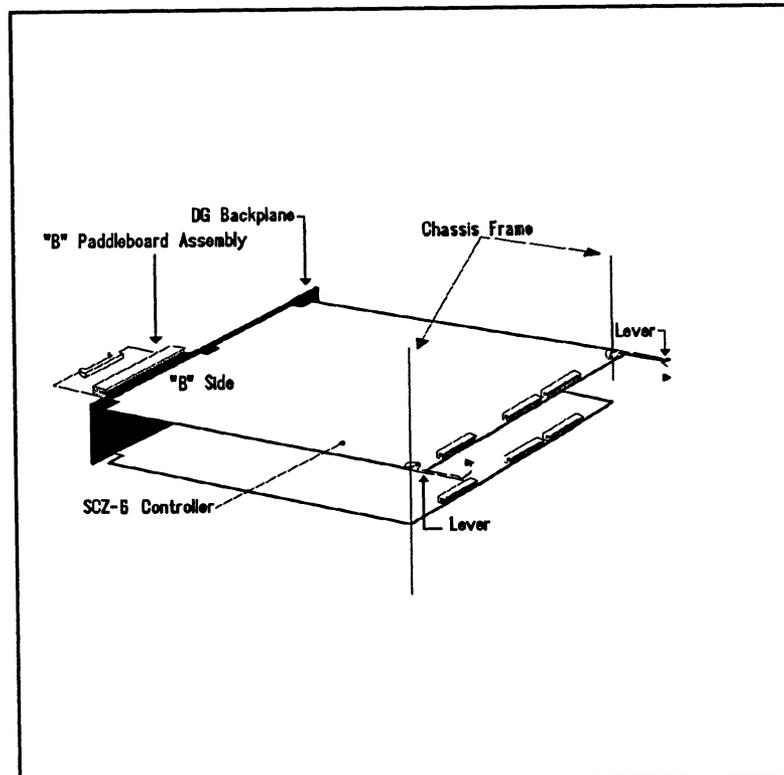
Figure 2.14
Installing the Paddleboard and Controller

2.15 Find out About Your Peripheral

Each peripheral manufacturer has a different way of setting the unit of a drive, indicating that power is on or that a self-test failure has occurred. These things, and others such as how to load/unload and write protect a tape or optical disk are all important points to know about.

You should have a copy of the manufacturer's manual for the disk or tape drive you are to use. It would be a good idea to research the following:

. . . . . . Where are unit select (SCSI ID) switches/jumpers?
. . . . . . Is there a self-test?
. . . . . . Are there LED status indicators?
. . . . . . If so, what do they mean?
. . . . . . How is a tape or removable media write-protected?
. . . . . . How is removable media loaded/unloaded?
. . . . . . Where can removable media be purchased?
. . . . . . Do the tape heads need periodic cleaning?
. . . . . . How should removable media be stored?
. . . . . . What environment constraints are there for the peripheral devices?

More to Find Out About

Check that the drive you want to use is in the SCZ-6 Configurator Program. To find out, boot the 9-track software support tape that is supplied with the SCZ-6, and select "Configurator" off the menu. If an unsupported drive is used with the SCZ-6 this means that it has not been evaluated at Zetaco. However, you may still be able to integrate your disk unit via the user defined path. See Section 2.32.

Another concern is what type of enclosure the drive will fit into. If it is a rack-mount unit, find out the installation instructions.

You may always contact your Zetaco Sales Representative for the most current information on qualified drives.

Note: Tape drives do not have a user defined path.

Table 2.15

Example of SCSI ID Switch Settings for Exabyte Tape Drive
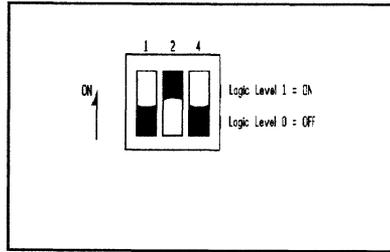
SW 1 SCSI ID Setting			
SW1-1	SW1-2	SW1-3	ID
OFF	OFF	OFF	0
ON	OFF	OFF	1
OFF	ON	OFF	2
ON	ON	OFF	3
OFF	OFF	ON	4
ON	OFF	ON	5
OFF	ON	ON	6
ON	ON	ON	7

Example of SCSI ID Settings for Seagate's Wren Disk Drive
Drive ID is binary coded jumper position (most significant bit on left). For example, the jumper in position 1 would be Drive ID 1. No jumpers means ID 0.
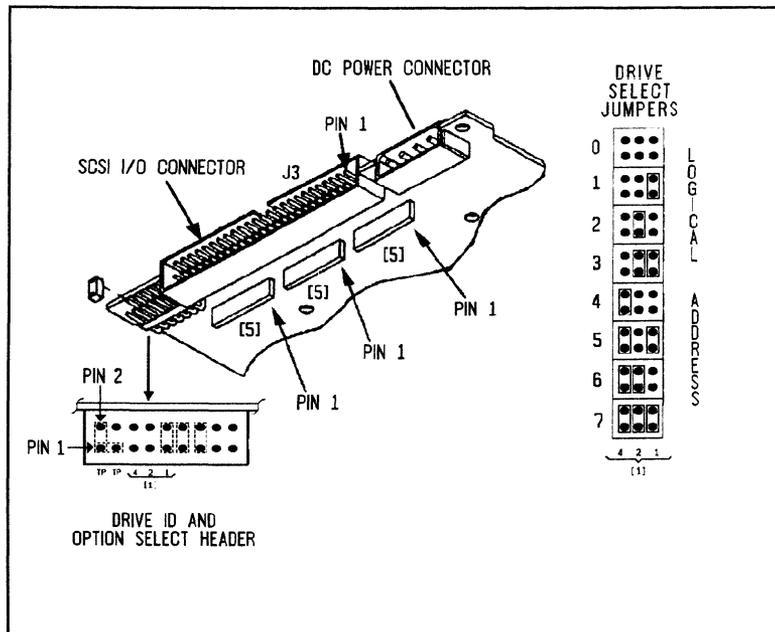
Figure 2.15
Example of Wren VII SCSI ID Switch Settings

2.16 Using More Than One Drive

You will probably want to control at least one tape and one disk with the SCZ-6. You can have up to seven devices on its SCSI bus. There is a limit to the cumulative length of the SCSI cables, and only the last drive can be terminated.

How Many Drives can be Added?

The SCZ-6 Multifunction SCSI Controller is designed to support up to seven devices on its SCSI bus. You can use any combination of disk, optical disk and tape, within these constraints:

- At this time the MTJ (tape) driver under AOS/VS can only recognize four logical units per device code.

- The DPJ (disk) driver under AOS/VS supports up to 8 logical disk units.

- Each drive, and the controller, must have a different SCSI ID.

- **The cumulative total cable lengths of all drives attached to one SCZ-6 must not exceed 25 meters (82 feet) for differential drives and 6 meters (19.6 feet) for single-ended.** If there is cabling inside a peripheral enclosure, the length must be included in the total.

Cabling Issues

To comply with FCC regulations, all external cables must be shielded. It is necessary to use shielded cables with a characteristic impedance of 120 *ohms* (or greater) for single-ended, and 100 *ohms* (or greater) for differential drives. It is best to use cables of the same characteristic impedance on the same bus to minimize signal reflections. Call a Zetaco representative for more information on available cables and lengths. **Do not exceed the maximum cumulative lengths.**

Figure 2.16 depicts a series of drives. Add the cable lengths using the following formula to determine whether you are over the limit. (To convert to feet, 39.37 inches are in one meter.)

n = number of devices on bus
L = length of cables between devices
d = length of drive internal cable

(.7 + L1 + L2 + ...Lx) + d must be ≤ 25 meters (differential)
must be ≤ 6 meters (single-ended)

1. Add together all the lengths of shielded cables for all drives including the cable from the computer chassis. Also include the seven tenths of a meter used inside the HOST chassis.

2. Multiply the number of drives (n) by d. This represents the cable length found inside each drive enclosure.

3. Add the two numbers. The total must be equal to or less than the 25 meter limit for differential or 6 meter limit for single-ended.

*Terminate
the Bus*

The SCSI interface requires termination at both ends of the bus. The paddleboard is terminated on the controller end and the last drive or enclosure must also receive termination. Install the terminator per manufacturer instruction for the last drive or enclosure on the bus. See Figure 2.16.
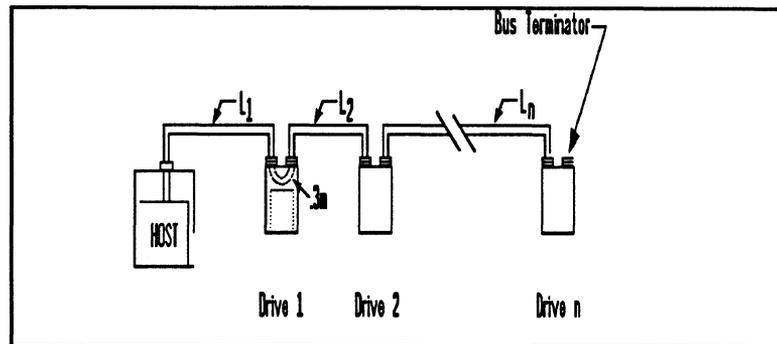
*Figure 2.16
Daisy-Chained Drives*

*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 SCZ-6 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.

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.

2.17 The Cable Connections

The FCC cabling going out to the drive comes in two parts: internal and external. The separation occurs at the chassis bulkhead. Extra external cables are needed to cable to more than one device. BMC cables connect the SCZ-6 to the host for data transfer.

The Paddleboard-to-Drive Connection

You will need to provide a cable that goes from your computer bulkhead to your peripheral.

The paddleboard pin-out follows the pin-out for the SCSI interface, single-ended or differential.

Contact your Zetaco representative if you wish to purchase cables.

Providing Access to the BMC Bus for the SCZ-6 Controller

Since the BMC is the high-speed data path on the MV generation of computers, an increasing number of devices require access to it. Chances are that BMC cables are already in place on the system. If so, insert the free connector of each cable into the SCZ-6.

If the SCZ-6 is the first BMC device to be installed in the system, you must use the provided cables. See Figure 2.17.

1. The end of the cables with a single connector goes to the system BMC controller. Pay attention to Pin 1 orientation as you insert.

2. The other end of each BMC bus cable will have a group of connectors designed to be inserted into different BMC accessing devices. Insert one connector from each cable into the sockets provided on the SCZ-6.

The standard Zetaco BMC bus cables have 4 connectors to access BMC devices; cables with 6 and 8 connectors are also available.

Providing
Termination for
the BMC Bus

Each SCZ-6 Controller is shipped with a BMC terminator installed. Figure 2.17 shows the location. **Only the last device on the BMC should be terminated.** Remove the terminator plug from the SCZ-6 if it is not the last device on the BMC.
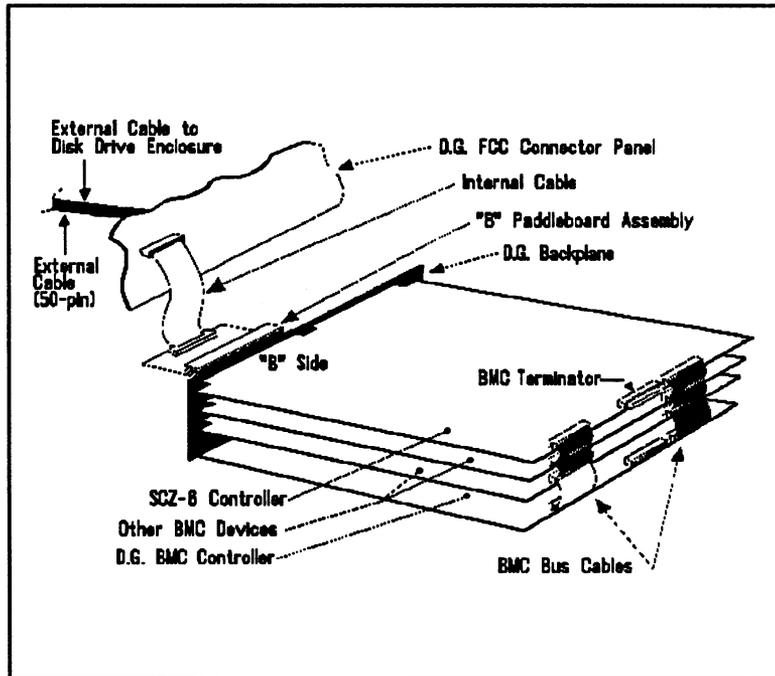
Figure 2.17
SCZ-6 Cabling Diagram

2.2 How to Check for Normal Power-Up

Before going on to the software part of the installation, you must make sure the hardware is working properly. The best way to test for initial problems is to turn on the power.

The SCZ-6 goes through a power-up self-test, and so may your drive(s). Other system devices, including the CPU, do this too.

When an SCZ-6 is functional, you should see:

- All SCZ-6 Controller LEDs will be out after 30 seconds.

- The paddleboard LED should be on signifying terminator power is present.

If your drive(s) are functional you should see:

- All power indicators lit and the status LEDs (if any) should indicate self-test passed on each drive.

When an MV system is ready, you should:

- Have a system prompt on your CRT screen.

- Be able to enter commands onto the screen and get system response.

- Be able to load system microcode to make the system functional.

As an installation aid, refer to the Checklist in Table 2.2. If your subsystem did not power-up correctly, look through the checklist for omissions, then go to the "Trouble-shooting" chapter of this manual. Be sure the SCZ-6 switches are set properly (refer to 2.12), especially the configuration over-ride and device code switches. If the system is acting strangely, refer to the proper Data General documentation.

Table 2.2   *Hardware Installation Checklist*

Check here: If:

	Slot is I/O ONLY
	Slot has DCH and Interrupt Priority to it
	Device Code switches are set
	Controller inserted tightly (levers flush)
	Paddleboard is installed on "B" Side *
	Paddleboard covers all 100 pins
	Paddleboard aligned to correct slot
	Paddleboard is cabled to drive
	BMC cables installed to correct devices
	BMC terminator installed on last BMC device
	BMC terminator removed from SCZ-6 if not last
	Power indicators for all drives are ON
	Media is loaded into drive(s)

*The paddleboard's green LED should be on when powered up (signifies the SCSI cable has terminator power applied).

2.3 The Software Installation Procedure

The software focused on here is the software necessary to complete the integration of the SCZ-6 into your system. You will need to configure the Controller, initialize the disk(s), run tests, and enable the drivers under the operating system.

The majority of the information in this chapter is about the programs written by Zetaco specifically for our product. The Data General system program, VSGEN must also be run. The Data General programs, CONTEST, MV/SYSTEMX, MLTT RELI and UDKV RELI are also tools for your use. Details on how to use these programs are <u>not</u> available here, only information on <u>when</u> their use is appropriate.

The following sections may be followed step-by-step in the order presented.

1. Using the Support Package Tape.

2. Using the Configurator program to set options.

3. Using the Initializer program for disk set-up.

4. Using the Reliability programs for test.

5. Preparation under the Operating System.

Have Enough Reference Material Ready

It is always appropriate to have Data General documentation on hand when installing something new. It would be especially valuable to have the Data General guide:

"How to Generate and Run AOS/VS."

The chapter on using VSGEN will be especially useful when performing the fifth step listed above.

If you have access to documentation on the Data General test programs available with the system, have that on hand also.

*System
Requirements for
Installation*

• An MV family CPU running AOS/VS with minimum 32K words of memory with MTJ and DPJ drivers available.

• Console at Device 10/11.

• Printer at Device 17 (if error log and configuration fact copies are desired).

2.31 Using the Support Package Tape

There are several important tools supplied on the Support Package Tape. With the Configurator program you may alter information stored in the E²PROM on the controller according to your needs. The Initializer program is used to format disks. The Reliability programs automatically perform a series of tests on the peripheral devices.

What the Files on the Tape are For

Files 0 and 1 on the Support Package tape contain special bootstrap programs that perform housekeeping tasks so that other programs can run. They also bring up the tape menu seen in Figure 2.31.

The programs on files two to five can be loaded and executed directly from the tape. These programs are used in the installation and maintenance of the controller and peripherals. Each is a stand-alone program; none can be run under the operating system.

File Six on the tape contains the following:

1) Copies of the Configurator, Disk Initializer, Tape Reliability and Disk Reliability programs, in .SV file format. These programs can be booted from the system disk instead of the tape. However, it does not mean that they can run under AOS/VS, only that they are bootable from disk. Booting the programs from disk eliminates the need to mount the tape each time you need to run one of these programs. Once the programs have been loaded onto your disk, they may be executed using the "Run A Specified Program" function in your technical maintenance menu. Complete instructions are provided later in this section.

2) Stand-among Disk Initializer program "SCZ6I.CLI". This macro calls a version of the Disk Initializer program which runs under the AOS/VS operating system. It is useful for performing the disk initialization functions without having to bring down the AOS/VS system. Complete instructions are provided later in this section for using the program.

*System
Administration
Tools on the
Support Tape*

Along with .SV format copies of the other programs and a stand-among Disk Initializer program, **File Six** on the SCZ-6 Software Support Package Tape includes (a) a handy diagnostic tool that displays the current status of all peripherals on the SCSI bus, (b) a program to automatically rewind and unload a specified tape, and (c) a program to format a tape in a dual density tape drive.

To accommodate these three programs, there are nine files, three of which are the programs themselves, while the other six are *help* and *cli* files used to run the programs. The files are:

SCZ6M.PR	SCZ-6 Monitor program
SCZ6M.CLI	Used to run SCZ6M.PR
SCZ6M.HELP	This file contains a copy of the help information from SCZ6M.PR
REWUL.PR	SCZ-6 Rewind Unload program
REWUL.CLI	Used to run REWUL.PR
REWUL.HELP	This file contains a copy of the help information from REWUL.PR
SCZ6TF.PR	SCZ-6 Tape Format program
SCZ6TF.CLI	Used to run SCZ6TF.PR
SCZ6TF.HELP	This file contains a copy of the help information from SCZ6TF.PR

*How to Access
the Tape*

All devices on the SCZ-6 SCSI bus and the computer should be powered on and ready, with no error conditions. The next step is to access the contents of the Support Package Tape.

The Support Package software has been shipped to you on a standard 9-track, ½" reel. If you have installed a ½" reel tape drive for use with your SCZ-6, you may boot the tape from this drive, assuming the SCZ-6 has been pre-configured to known settings (device code, tape drive model). The standard SCZ-6 tape device code is 23_8. Or, you can boot the software tape from any other ½" 1600 BPI tape subsystem you may already have installed on your system. The tapes come in either 800 BPI or 1600 BPI formats - see your tape's label to determine the format. To boot the tape, do the following:

1. Mount the tape on your ½" reel tape drive. Make sure you know what device code the ½" tape controller is set to.

2. Load the system microcode if you are just powering the system up. (System microcode is not necessary to run the Configurator program, but it is necessary for the Reliability programs and Initializer.)

3. When the SCP prompt appears, type B or BOOT and the device code of the controller being used.

   SCP> BOOT nn   <or>   B nn , where "nn" is the device code of your ½" tape controller.

After a time, the Support tape menu is displayed, as shown in Figure 2.31.

```
File              #Program

2                 SCZ-6 Configurator
3                 SCZ-6 Disk Initializer
4                 SCZ-6 Tape Reliability
5                 SCZ-6 Disk Reliability
6                 Standamong Disk Initializer SCZ6I
                  Standamong SCZ-6 monitor SCZ6M
                  Standamong SCZ-6 rewind unload REWUL
                  Standamong SCZ-6 tape formatter SCZ6TF and
                  previous ".SV" files in AOS/VS Dump format.
```

Figure 2.31
Support Tape Menu

4. Enter the file number (2-5) of the program you want to run, followed by a carriage return. The selected program will be loaded into CPU memory and executed.

2.32 Using the Configurator Program to Set Options

The performance of the SCZ-6 and the peripherials it controls depends on more than how fast the drives are.... it also relies on how well the other pieces of the system interact together. The Configurator program provides a dialogue, giving you choices on set-up, to allow you to easily change what is already stored.

The Zetaco Configurator program is designed to interact with you, help you decide what to do (if you need help), and then store your changes into the SCZ-6 E^{2}PROM.

The Configurator is an easy-to-use program. It provides a choice whether to use it in *novice* or *expert* mode. In *novice* mode, help screens are automatically displayed. The first full screen you see is the Configuration Facts. Figure 2.32a shows what it looks like. The command menu choices are shown in Figure 2.32b.

Examine the data in the Configuration Facts. It is important to make sure that the Burst Rate, Break Count, and BMC Priority values are what you want. Also verify that the correct peripheral units are specified. To change any of the information in the Configurator, enter a letter from the command menu. To display the command menu, enter a "?" at the command line.

Selection from the Command Menu depends on what you want to do. To change all configuration facts in sequential order, select:

"A" Change all facts. These facts can also be changed one at a time by selecting the appropriate letter.

To make a change to the disk or tape drive choices displayed, select either:

"D" Edit any or all DISK drives. This includes a user defined path. This allows possible integration of drives not evaluated at Zetaco. The disk drive manual is essential if this path is taken since information such as the number of blocks (512 bytes/sector) must be entered.

"T" Edit any or all TAPE drives.

If at any time you need help answering a question, enter an "H".

NOTE   While you are using the Configurator program, the controller's right-hand red LED will be on steadily. This indicates that you are communicating to the SCZ-6 Controller

on a hardware level. When you have finished making your changes and exit the program, the red LED will go out.

After you are done making your changes to the E²PROM configuration, be sure to update the SCZ-6. This is done by entering a "U" at the command line. To update the controller configuration, set the E²PROM write-disable switch (S2) to the UP position. When the update is complete, flip S2 DOWN to protect the E²PROM contents.

```
DISK and TAPE drive to logical unit assignment table.
-------------------------------------------------------------------------------
Logical | Disk drive assigned  | SCSI | Logical | Tape drive assigned  | SCSI |
unit #  | Manufacturer / model | ID   | UNIT #  | Manufacturer / model | ID   |
-------------------------------------------------------------------------------
0          Seagate ST82500N..(2.1GB)  0      0          Exabyte.......EXB-8200    1
1          No disk drive assigned            1          No tape drive assigned
2          No disk drive assigned            2          No tape drive assigned
3          No disk drive assigned            3          No tape drive assigned
4          No disk drive assigned            4          No tape drive assigned
5          No disk drive assigned            5          No tape drive assigned
6          No disk drive assigned            6          No tape drive assigned
7          No disk drive assigned            7          No tape drive assigned
-------------------------------------------------------------------------------
|                     Controller-specific configuration facts:
-------------------------------------------------------------------------------
Disk BMC burst rate..........:    32     Tape BMC burst rate..........:    32
Disk BMC break count.........:     4     Tape BMC break count.........:     4
Disk device code.............:    24     Tape device code.............:    23
                  BMC priority (tape & disk) . . :        0
                  Initiator (SCZ-6) SCSI ID. . . :        7
                  Interrupt Priority High/Low. . :     Disk/Tape


Enter command (? to see choice):
```

Figure 2.32a
Sample Configuration Overview Screen

```
                              Command Menu
                              *****************
     A - Change All Facts
     B - BMC Priority
     C - Edit device codes (TAPE or DISK)
     D - Edit any or all DISK Drives
     E - Controller SCSI ID
     F - Throttle burst rate (TAPE or DISK)
     G - Break Count (TAPE or DISK)
     H - Help - Operations
     J - Toggle TAPE\DISK Priority
     L - LIST all configuration facts
     P - Printer Control
     Q - Quit the Program
     T - Edit any or all TAPE Drives
     U - Update the EEPROM

Enter command (? to see choice):
```

Figure 2.32b
Sample Configurator Main Menu

2.33 More Information on Which Options to Change

Anytime you add to a system, you change the interaction of the parts. The transition can be painless by choosing the set-up options intelligently.

BMC Options

How you select the values for these options will affect how well the new Controller gets along with those already there. Base your decisions for these values on:

1. How much system-wide traffic the Controller will be asked to handle.

2. When the Subsystem will get the most use. After or before hours? During peak worktime?

BMC PRIORITY: Choose a number between zero and seven. (On the MV/4000 you must choose between zero and three.) The higher the number given to a Controller, the more weight the Data General BMC controller gives to its request for bus access. There can be no duplication or the system will get confused.

RECOMMENDATION FOR SCZ-6: Since the SCZ-6 controls your disk device, you will want as high a number as possible.

BMC BURST RATE: This value can be 2, 4, 8, 16, 32, 64, 128, or 256. This is the number of words that can be transferred by the Controller per BMC bus request. After the transfer limit has been reached, the Controller must relinquish the bus and wait to try again. A low value may make data transfers take a long time, decreasing performance. A high value may dominate the bus, causing data late problems with other controllers. You can choose separate and different parameters for disk and tape.

RECOMMENDATION FOR SCZ-6: Of course it depends on your system usage, but a good number to begin with is 32 for both disk and tape.

BMC BREAK COUNT: Choose a number between one and 255. This sets the amount of time the controller waits between data transfers, before trying to get access to the BMC bus again. Basically, this number tells the Controller how many BMC Sync Clock periods it must count before making another BMC request. You can choose separate and different parameters for disk and tape.

Try to balance this number with the BMC priority selected. A high priority device with a small Break Count will be on the bus a greater amount of time, possibly excluding others.

RECOMMENDATION FOR SCZ-6: BMC Break Count may be configured separately for disk and tape; a good number to begin with for both is four. They can be set at the same number despite the difference between disk and tape transfer speeds.

BMC OPTION:	WHAT TO REMEMBER:	RECOMMENDATION:
Priority	- Want highest numbers assigned to the most intensively used devices. - DO NOT DUPLICATE	Highest Number Possible
Burst Rate	- Low value on high traffic device could cause lowered performance. - High value can cause device to dominate BMC bus causing data late on others.	32
Break Count	- Balance this number with priority of the device. - Too high a value may degrade drive-to-controller performance.	4

Selecting SCSI ID for the SCZ-6

A SCSI bus can support up to eight devices. Communication on the SCSI bus is allowed between only two devices at a time; one acts as an initiator and the other acts as a target. The initiator (typically a controller such as the SCZ-6) originates an operation and the target performs the operation. Each device has its own SCSI ID. The SCZ-6 is counted as one of the eight possible devices. It is through the Configurator that you choose which ID to make it. The ID numbers are weighted, with more priority going to the higher number device during certain bus phases. **SCSI ID seven is recommended for the SCZ-6. Be sure that there are no duplicate ID's on the bus.**

Setting Interrupt Priority

Set this parameter from the controller-specific parameters menu on the Configurator. Choose which (either disk or tape) should get highest priority. Usually disk should have the higher priority.

2.34 Using the Disk Initializer Program

The Disk Initializer program is used to prepare disk drives for use with the SCZ-6. If you received the disk drives and controller together as a subsystem, the drives may have already been prepared for you; however, an understanding of this program is recommended for anyone who deals with the installation or maintenance of the controller or disk drives.

WARNING: **Use of this program may result in loss of all data on the disk drives. Please read the following sections carefully. If you choose to perform a** *format* **or** *write/read analyze***, all data on the specified disk drive will be destroyed.**

The Disk Initializer is used to format and perform a surface analysis on the disk drives and help manage media flaws on the disks, which are also known as "bad blocks." Most disk drive models have some degree of build-in bad block management of their own, which helps offload the effort required of the controller (and system maintenance personnel) in handling bad blocks. For a more detailed description of what *format* and *analyze* will do, refer to the section on Choosing Program Options.

Stand-alone and Stand-among Program Versions

Two versions of the Disk Initializer program are provided on the support tape; a stand-alone version that runs only when the AOS/VS operating system is not running, and a stand-among version that runs under the AOS/VS operating system. The stand-alone version must be used if the disk you wish to format or analyze is your system disk or is another disk that is currently INIT'd under the system. The stand-among version is useful for examining the disk soft error logs while the system is up, or for formatting optical platters without bringing down the system.

Running Stand-alone SCZ6I

To run the stand-alone Disk Initializer, either load the program from tape per the instructions in section 2.31, or from disk, per the instructions in section 2.40.

Running
Stand-among
SCZ6I

To run the stand-among Disk Initializer, you must first have loaded the program from tape onto disk per the instructions in section 2.40. You can then run it from any user console enabled by EXEC. To run the program, you must have both the SUPERUSER and CHANGE TYPE priviledges assigned to your username by the Profile Editor. Refer to the Generating and Running AOS/VS documentation for more information on user profiles.

When the SCZ6I.CLI macro is invoked, the environment is pushed, then the current directory is changed to :UTIL and SCZ6I.PR is executed. Upon program termination, the previous environment and directory are restored.

With the :UTIL directory in your searchlist, type

) **SUPERUSER ON** <cr>
 *) **SCZ6I** <cr>

The program will begin execution. The program will ask you for the controller Maintenance Port device code. This is the device code that the controller front switches are set to. DO NOT enter the controller disk device code. The program will then determine the disk controller device code, and confirm this before proceeding. One difference between the stand-alone and stand-among versions is the stand-among version requires that you enter each unit by its disk unit name, or "DPJxx". Also, stand-among SCZ6I restricts operations from being performed on disks currently INIT'd under the system. To perform those functions that access the user data area of the disk such as Format, Analyze or Relocate blocks, you must first RELEASE the disk unit.

*When to Use
This Program*

Use the Disk Initializer when you want to:

1. Completely re-initialize a disk drive for use with the system. The disk may be new and possibly unformatted, or you may simply want to perform a total re-initialization of the disk drive to ensure its format is good.

2. Examine and/or relocate the bad blocks in the SCZ-6 soft error log.

3. Perform other scheduled system maintenance, which may include one or more of the following operations. "Destructive" indicates that the operation will result in a loss of data on that disk.

    • Relocate the bad blocks in the controller soft error log
    • Relocate other bad blocks not found in the soft error log
    • Perform a *read-only* analysis of the entire disk
    • Perform a *write/read/verify* analysis of the entire disk (**destructive**)
    • Perform a format of the entire disk (**destructive**)

*The Program
Sequence to
Follow*

Basically, when you run the program, you:

1. Choose the disk drive units and the program options for each unit. Use the [E] command from the main menu. In response to "Device Code?", enter the device code of the disk controller.

2. Start the operations. Use the [S] command from the main menu.

3. To monitor program status, use the [L] command.

*Choosing
Program Options
for Each Unit*

Analyze Disk

This option performs a disk surface analysis to detect and then relocate any bad blocks to another area of the disk. The purpose of analyze is to detect and remove as many bad blocks as possible before using the disk under the system, reducing the risk of loss of data later if a defect worsens. This selection can also be used as disk initialization do-all since it allows you to perform all the options on the specified unit.

First, the program asks whether you wish to format the disk prior to it performing the surface analysis. Refer to the Format option description (following) for more information on formatting the disk and on the following question of whether or not to retain previously relocated sectors.

Next, the program asks whether or not you wish to run Read-Only Analyze.

* Read-Only Analyze performs a non-destructive, one-pass, sequential *read* over the entire disk to test for bad blocks. When the program finds a bad block, it relocates the block along with the data contained in it to a good "spare" block in a reserved area of the disk. The result of using this option is that it will eliminate as many "soft" errors as possible without losing or affecting any disk data. This option will also offer you the choice of whether or not to relocate the blocks listed in the controller soft error log. We recommend you answer YES to this question **only** if the specified disk drive is not configured with Auto-Relocation enabled. Refer to the Relocate Blocks option for more information on auto-relocation.

If you answer NO to the Read-Only Analyze question, the program will perform a full *write/read/verify* data analysis. This choice is recommended for any new installation before the disk is put into use with the operating system. If you choose this option, we also recommend you answered YES to "Format?" earlier to allow new sector headers to be written onto the disk.

- Write/Read/Verify Analyze performs a multiple-pattern sequential *write/read* data verification over the entire disk to detect and relocate as many bad blocks as possible. **USE OF THIS OPTION WILL RESULT IN THE LOSS OF ALL DISK DATA FOR THE SPECIFIED UNIT.** The program then asks how many data patterns are used to detect data-sensitive and intermittent media defects. Enter a number between 1 and 10. The more data patterns used, the longer the testing will take and the more thorough it will be. We recommend at least 3 patterns be used. If the controller soft error log contains any blocks, the program will ask if you want the blocks relocated. We recommend you answer YES to this question ONLY if the specified disk drive is not configured with Auto-Relocation enabled. Refer to the Relocate Blocks option for more information on auto-relocation.

Relocate Blocks

This option allows you to examine and/or relocate the blocks listed in the controller soft error log and/or any additional bad block addresses you wish to enter yourself. The soft error log contains a list of the blocks on the disk that the disk drive has reported as having "soft" errors, i.e., blocks that are still usable but require some amount of error correction.

By relocating these bad blocks, you move your disk data to good blocks on the disk and reduce the risk of losing data if the original bad blocks become completely unusable. You should ONLY relocate these blocks if the disk drive has not been configured with Auto-Relocation ENABLED using the controller Configurator utility. If Auto-Relocation is enabled, the disk drive has already relocated the bad blocks, and the log contains these blocks for reference only.

For those block addresses you wish to enter manually, you must enter in the disk physical block address format. If you wish to relocate a block listed in your system log that is in cylinder/head/sector format, you must convert it to the physical block address using the following formula:

$$\begin{array}{r} (\text{\# of heads/drive} * \text{\# of sectors/track} * \text{cylinder \#}) \\ + (\text{\# of sectors/track} * \text{head \#}) \\ + (\text{sector \#}) \\ \hline = \text{physical block address} \end{array}$$

Format Only

The Format Only option is the lowest level operation you can perform on a disk drive and is the first step in a full disk initialization. Normally, you would not use this option but would instead perform the format by answering YES to the "Format?" question in the Analyze option path, since you should normally follow a re-format with a surface analysis. The format operation erases and re-records block addresses on the disk surfaces, ensuring readable block headers and track alignment. **USE OF THE FORMAT OPTION WILL RESULT IN THE LOSS OF ALL DATA ON THE SPECIFIED DISK DRIVE.**

The program asks if you want to "Retain Previously Relocated Sectors?" This refers to whether or not the disk drive retains its internal "growth" list of relocated blocks, i.e., those blocks that have been detected as bad over time by either the Disk Initializer program or the drive itself, and have been relocated. This does NOT refer to the drives "primary" defect list written by the drive manufacturer — these relocated blocks are not affected.

We recommend that you answer YES to this question, unless some abnormal condition may have caused the disk drive to relocate an excessive amount of bad sectors that may not have been bad. If you answer NO, we recommend that you run at least a 5-pattern *write/read/verify* surface analysis on the drive.

INIT Soft Error Log

This option clears the controller soft error log without relocating the blocks listed in it. It should normally only be used when the selected drive is configured for Auto-Relocation mode, after the log has been examined and recorded. If Auto-Relocation is enabled, the log represents blocks that have already been relocated by the disk drive.

Rewriteable Optical Disk Users

If you are using the disk controller with rewriteable (magneto-optical) disk drives, keep the following in mind:

1. New cartridges can come either unformatted or in the wrong disk format type. Because of this you MUST FORMAT EACH SIDE of new rewriteable optical cartridges.

   Start by inserting the cartridge into the drive with side A up, and format the disk. When the format is complete (each side takes approximately 25 minutes), remove the cartridge, re-insert with side B up, and issue the Start command again. The cartridges are formatted to the ISO standard format type.

2. It is usually not necessary to perform surface analysis on the rewriteable disks because the disk drive has extensive built-in bad block management capabilities. Additionally, cartridges are factory-certified and media defects mapped out by the manufacturer. Because of this, the default option for an optical drive is Format Only. A 3-pattern *write/read/verify* surface analysis takes about 3 hours per side.

If You Are
Upgrading From
An SCZ-3
Controller

If you are upgrading a subsystem, from an SCZ-3.1 or SCZ-3.2 controller to an SCZ-6 Controller, you do not need to run the Disk Initializer program. The disks need no re-initialization to upgrade to the SCZ-6 Controller. All controller microcode is contained in EPROM on the controller, not on the disk drives. This applies to rewriteable optical disk subsystems as well.

2.35 Using SCZ6M Monitor Program

SCZ6M monitors all disk and tape activity on a SCZ-6 Multifunction Controller, reading this information from the controller's maintenance port. It can also be used to find out how much tape is still available for recording on a tape cartridge.

SCZ6M.PR, which is the Monitor Program, can be especially helpful as a diagnostic tool because it displays the status of all devices on the SCSI bus, so you can see what's going on at any given time.

A copy of what the help information for this program looks like is shown below. Note that you can exit the Monitor Program at any time by typing (cntl C) then (cntl B).

SCZ-6 Monitor Help

Description:

This program will display the current file number, record number, and active SCSI command for all configured tape units. It will also display the last block number accessed and active SCSI command for all configured disk units.

Requirements:
  The SCZ-6 monitor program requires an SCZ-6 controller board. You also must have the CHANGE TYPE privilege to execute this program.

Switches:
  These switches may be used in any combination or not at all.

/MODE=   (0 for OCTAL, 1 for DECIMAL, and 2 for HEXADECIMAL) default = 1

  This allows the numbers to be displayed in octal, decimal, or hexadecimal. Octal numbers are displayed with no leading zeros and no point afterwards. Decimal numbers are displayed with no leading zeros and followed by a decimal point. Hexadecimal numbers are displayed with leading zeros but no point afterwards.

/MPORT=   (maintenance port device code in OCTAL) default = 40

  This allows the device code of the SCZ-6 maintenance port (the switches on the front of the controller board) to be a nonstandard value.

/UPDATE=   (0-65 seconds) default = 3 seconds

This allows the delay time between screen updates to be set. The shorter this time is, the faster changes will show up on the screen and the more CPU and controller time the program will consume.

/TREM @MTJX

This displays the amount of tape remaining on the specified drive. This information is read directly from the tape drive.

/TTY

Use this switch if you have a TTY or hard copy type terminal.

/HELP   This displays this help information.

Exiting the program:
Exit the SCZ-6 monitor at any time by typing (cntl C) then (cntl B).

Status definitions:

Idle	There was no SCSI command active when the SCZ-6 was polled
Read	Read disk sectors or read tape records
Write	Write disk sectors or write tape records
Format	Format a disk unit
Recal	Return the disk read/write heads to cylinder zero
SpaceF	Space file marks
SpaceR	Space records
Rewind	Rewind the tape unit to the beginning of the tape (BOT)
Rew UL	Rewind and unload a tape
Load	Load a tape
WFMK	Write a file mark
Erase	Erase tape
T Rdy	Test unit ready
Mo Sel	Mode select
Mo Sen	Mode sense
Rq Sns	Request sense data from the drive

Example: X SCZ6M/MPORT=41/MODE=0/UPDATE=0
The maintenance port device code is 41 octal, numbers are printed in octal, and the screen is updated as fast as possible.

2.36 Using the REWUL Rewind/Unload Program

REWUL is used to rewind and unload a tape on the SCZ-6 Multifunction Controller, instead of the standard rewind command in AOS/VS or AOS/VS II.

REWUL is especially useful if you wish to remove the tape from the drive after rewinding, or if the system administrator wishes to prohibit anyone else from using a tape after a backup. One way the latter could be done is to do the backup from a .CLI file and have the last command in the .CLI file be REWUL @MTJX where X is the tape unit number.

Example:
DUMP_II/V @MTJ0:0 :UDD:#
DUMP_II/V @MTJ0:1 :UTIL:#
REWUL @MTJ0

This is a copy of the help information for this program:

SCZ-6 Rewind Unload Help

Description:
This program will rewind and unload the specified tape drive.

Requirements:
The SCZ-6 rewind and unload program requires an SCZ-6 controller board. You must have the CHANGE TYPE privilege to execute this program.

Switches:

/MPORT=   (maintenance port device code in OCTAL)
            default = 40

This allows the device code of the SCZ-6 maintenance port (the switches on the front of the controller) to be a nonstandard value.

/HELP   Displays this help information.

Example: REWUL/MPORT=41 @MTJ0
The maintenance port device code is 41 octal and @MTJ0 is rewound and unloaded.

2.37 Using the SCZ6TF Tape Formatter Program

SCZ6TF is used for formatting a tape in a dual density tape drive such as the WangDAT 2000.

SCZ6TF is used for initializing new tapes to the desired format, or for changing the format of an old tape. Most of the tape drives that require formatting default to the highest density format when a new blank tape is used.

If an old tape or a formatted tape is used, SCZ6TF determines the current format and uses it.

SCZ-6 Tape Format help

This is a copy of the help information for this program:

Description:
> This program formats a tape to the specified tape density.

Requirements:
> The SCZ-6 Tape Format program requires a SCZ-6 controller board. (You must have the CHANGE TYPE privilege to execute this program.)

Switches:

/MPORT=   (maintenance port device code in OCTAL) default = 40

> This allows the device code of the SCZ-6 maintenance port (the switches on the front of the controller board) to be a nonstandard value.

/HELP   This displays this help information.

/LOW   Use this to select the lowest density on multi-density drives:
> 4mm drives - standard DDS format.
> 8mm drives - EXB-8200 format.

/HIGH   Use this to select the highest density on multi-density drives:
> 4mm drives - data compression format.
> 8mm drives - EXB-8500 format.

Example: SCZ6TF/MPORT=41/LOW @MTJ0
The maintenance port device code is 41 octal and the tape
in @MTJ0 is formatted to the lowest density format.

Note that the tape format must be specified.

2.38 Using the Reliability Programs

The function of the Reliability programs is exactly what the name implies: they test that the drive and controller are operational, and that extended use with the combinations of commands does not make them fail. There are separate test programs for disk and tape, but they operate in the same fashion.

As a stand-alone program, each Reliability utility tests only the part of the subsystem that you are installing; disk or tape. No attempt is made to provide an exhaustive system level test. It does not, for example, tell you if you have duplicated BMC priorities. To test for system level functioning, run Data General's MVSYSTEMX.

```
RELIABILITY PROGRAM
Enable mapping (YES, [NO]):
Execution Mode:
    [R]andom Reliability      [S]equential Reliability
Enter your choice [R]:


                SCZ-6 RELIABILITY UTILITY
                        REV. XX
                COPYRIGHT 19XX, ZETACO, INC.

                      COMMAND LIST

    [E]NTER A DEVICE              [D]ELETE A DEVICE
    [S]TART A DEVICE              [H]ALT A DEVICE
    [C]OMMAND LIST               [L]IST ERROR TOTALS
    [F]LAGS                      [M]ODE OF DISPLAY
    [Q]UIT

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

Figure 2.35
Main Menu of Reliability Test Program

Choosing the Program Global Parameters

Before you get to the Main Menu, you are asked to choose several global operating parameters. These choices are asked only when the program is booted or restarted. The parameters are for: **Mapping** and **Program Execution Modes.**

Mapping

Enabling this feature allows the Reliability program to test some of the mapping features for which the SCZ-6 is responsible. These features are defined in the Data General Programmer's Reference series. It is not necessary to enable mapping in order to test controller-drive functionality. The default answer is no. **DO NOT enable this mode if running in an MV/7800 or MV/4000.**

Program Execution Modes

You may choose to run in sequential or random mode for both disk and tape.

Disk: In sequential mode, the entire disk is written once. The controller re-reads it to verify, then stops. In random mode, the controller writes a random number of sectors at random locations, then reads it all back to verify. Random mode will continue until stopped. The time it takes to run these processes varies, depending on the size and speed of the disk drive.

Tape: In sequential mode, continuous *writes* of a fixed size are performed to EOT, the tape is rewound, and, if the verify feature is enabled, a *read* to EOT ensues. In random modes, a variable number of records containing a various number of bytes is written to a file. It is immediately read and verified (if enabled), and the program continues. Random mode will continue until stopped.

The Program
Sequence
to Follow

Basically, when you run the program, you:

1. Select the global program parameters. Random Mode with no mapping is a good choice for first installation. Let the test run for 20 minutes.

2. Enter the devices you want to test and the test specifics for each of them. Use the [E] command from the main menu.

3. Run the tests. Use the [S] command.

4. Examine the status of each drive. Use the [L] command.

See Section 3.4 for information on error messages from this program.

2.39 Summary of Reliability Commands

Use this explanation of each Reliability command to better understand how to use the program. Commands are the same in both Reliability programs.

The Main Menu Options

1. **ENTER A DEVICE** – This command does several things:
   a) Initializes the Controller.

   b) Looks for READY units - You may operate on any drive that appears READY to the Controller. The program reports, starting with UNIT 0, that a drive is ready and allows a YES/NO choice for selection.

   c) Sets Disk & Tape Test Parameters - After accepting a READY unit for testing, the program asks for input about the records the test will write.

   DISK: The screen shows how many megabytes the disk has, then accepts YES/NO choices for *write* only, *read* only, to verify data, and then allows you to select one of nine data patterns to *write/read*.

   TAPE: For random mode, the program will ask the maximum number of records it can put in each file, and the maximum number of bytes each record can contain. For sequential mode, it requests only the fixed number of bytes to put in each record. Default value is given for each question. Next, the program accepts YES/NO choices for *write* only, *read* only, verify data, and then allows you to select one of nine data patterns to *write/read*.

   After each READY unit that you wish to run has its test parameters defined, the program returns to the command prompt. To actually begin the tests you have selected, use the START command.

2. **START A DEVICE** – This command gives you the option of starting the test on all entered devices, or on any combination of them. To verify that the program is running, observe the green LED's on the controller or issue a LIST command.

3. **LIST ERROR TOTALS** – This command lists status **and** error information. It can be used any time you wish to find out about the devices running. If you use the command before issuing a START, the disk information about mode will be accurate, but the runtime, blocks written and read, and error totals will not; and tape information about current file, current records, and EOTs reached will not be correct.

4. **COMMAND LIST** – This command displays the Command Menu.

5. **HALT A DEVICE** – Any device can be halted without affecting tests being performed on other devices.

6. **DELETE A DEVICE** – Once you HALT a test being run on a device, you can delete that device from the testing altogether, by using this command.

7. **PRINTER CONTROL** – This command enables or disables the printer. If the program is running unattended, enable the printer so you can capture error messages. Use of this command does not affect tests being run. Restarting the program will disable the printer.

8. **RESTART THE PROGRAM** – This command completely re-initializes the program. You must reselect mode, devices, and re-enable the printer.

9. **FLAGS** – The flag available in the Reliability program can be set to halt the program when an error is encountered or, the default, simply log the error and continue. If you choose to halt at an error condition, the program will log the error and jump to the Debugger resident in the program. To leave the Debugger, and restart the program, type RT. The flag may be changed while tests are running.

10. **QUIT** – This command gets you out of the program.

11. **MODIFY DISPLAY MODE** – You can choose to use hexadecimal, decimal or octal for program display and input.

2.40 Preparation Under the Operating System

Any controller and drive being added to a Data General system needs to be made recognizable to the system software. This is done using the VSGEN program provided with AOS/VS system software. Also, files from the Support Package Tape may be loaded onto an AOS/VS system disk for ease of future use.

Why Run VSGEN?

All hardware in a system needs to be unified in some way in order to work together. This is the job of the system software, or Operating System. There are several layers of complexity to this software. That software closest to the hardware is often said to DRIVE the hardware. It knows about the bit meanings of status returned and how to tell the hardware what to do. This software is referred to as a DRIVER. All pieces of hardware need a Driver to interpret and translate for it.

The purpose of the program VSGEN is to select the Driver compatible with the hardware you are installing.

What to Know Before You Run VSGEN

You need to know:

1. What device codes to which you have set the disk and tape ports.

2. The drivers to select are MTJ for tape, and DPJ for disk.

3. The name of the configuration file to edit for additions.

4. The unit number for which each device is configured.

For further assistance, consult system management documentation.

Loading Support Tape Files Onto Your AOS/VS System Disk

The last file on the Support Package tape is in DUMP format. This means that it is recognizable to the system LOAD program. When loaded onto disk as described below, the programs will be placed in the :UTIL directory on your system disk.

(Note: the stand-among Disk Initializer program and its macro MUST reside in :UTIL directory to function properly. Running the program in the same directory that LDU's reside may have adverse effects under the AOS/VS II operating system.)

Standard CLI Commands to Load File 6

To load the programs onto an AOS/VS system disk as described, execute the following commands:

) SUPERUSER ON
*) DIR :
*) LOAD/V @MTzx:6
*) REW @MTzx
*) SUPERUSER OFF

where:

z = the tape controller type (A, B, C, D, or J)
x = the tape unit number

The programs will be loaded into the :UTIL directory of your system disk.

Running Stand-alone Programs

To load and run a stand-alone program from disk, bring down your system and re-boot the system disk. From your Technical Maintenance Menu, choose the option "Run A Specified Program". Then, enter the full pathname of the file you wish to run, including the .SV extension. For example, if you want to run the Configurator, enter:

```
:UTIL:CFSCZ6.SV <cr>
```

The following are the full pathnames you would enter to run the stand-alone SCZ-6 programs from disk:

```
Configurator   . . . . :UTIL:CFSCZ6.SV
Disk Initializer  . . :UTIL:SCZ6I.SV
Tape Reliability  . . :UTIL:SCZ6TR.SV
Disk Reliability  . . :UTIL:SCZ6DR.SV
```

Running
Stand-among
Programs

To load and run a stand-among program under AOS/VS, first make sure your current searchlist includes the :UTIL directory. You must also have Superuser privilege on.

To run the stand-among Disk Initializer, enter:

```
) SUPERUSER ON <cr>
) SCZ6I <cr>
```

To run the SCZ-6 Monitor, Rewind/Unload, or Tape Formatter, Superuser privilege is not required. You can find out what switches are available by entering one of the following:

```
) SCZ6M/HELP <cr>
        or

) REWUL/HELP <cr>
        or

) SCZ6TF/HELP <cr>
```

3

Trouble-shooting

3.0 Trouble-shooting SCZ-6 Errors

Problems can occur during initial installation or after a period of time. Most installation difficulties are apparent at the first power-up or while performing installation set-up and test procedures using the Support Package Tape. Problems that occur after a time of successful usage are more likely to take the form of system error messages. Trouble-shooting under the operating system is difficult if not impossible. It is best to rely on stand alone test programs such as Zetaco Reliability or Data General MVSYSTEMX for help.

Power-up Problems

You must be aware of equipment failure messages at the crucial time of applying power to the subsystem. In this matter, the hardware is supported by:

• Microprocessor based controller self-tests performed each time power is applied

• Controller LED status indicators for self-test

Test Programs to Use

The SCZ-6 has its own easy-to-use test programs. They should be used during installation and may also be used at any time problems are suspected. Data General programs such as MVSYSTEMX, MLTT_RELI, UDKV_RELI and CONTEST may also be used on this Zetaco product and can be useful to diagnose unclear system errors.

Field Support

Zetaco provides support through authorized distributors with:

• Quick turnaround for factory repair/replacement
• Warranties on workmanship and materials

3.1 Interpreting Controller Self-test Errors at Power-Up

Self-test resides in ROM on the controller. It is designed to check the most critical functions of the hardware each time power is applied. Self-test is actually composed of two independent modules, each consisting of a series of tests and each associated with a group of three LEDs on the front of the board.

There are 9 LEDs on the controller, grouped as 3 and as 6. Each group is a series of red, yellow, and green. See Figure 3.1 to identify LED placement on the Controller board.

The entire test takes about 30 seconds to complete. While self-test is being performed, both red LEDs will be lit. If self-test is successful, all LEDs go out.

If the LEDs remain on for a time longer than self-test should take, the Controller may not be seated correctly. If a portion of the hardware is defective, an error sequence will flash on the LEDs.

Table 3.1 explains what can be done in each of these instances.

Table 3.1 *What the LEDs Mean*

SYMPTOM	WHAT TO TRY
Both RED steadily lit.	Re-seat controller or install in another slot.
A pattern is flashed on the LEDs.	Retry power-up. Record error code. Call for assistance.
All LEDs extinguished.	**No action required.** Selftest passed.
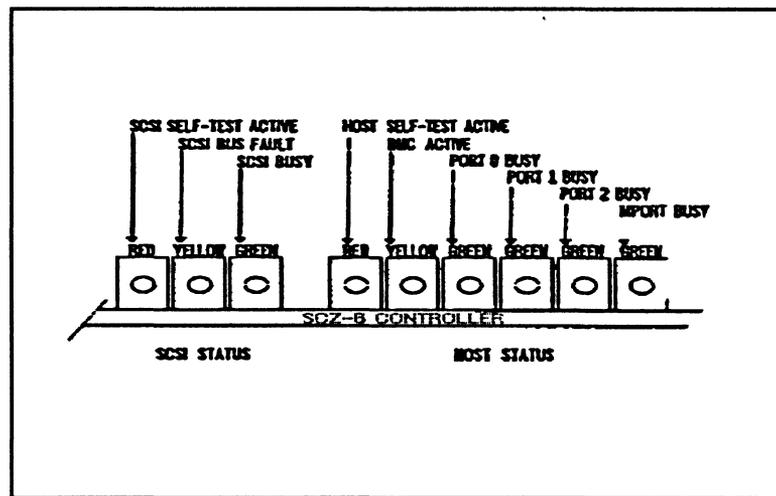
Figure 3.1
LED Status Indicators

3.11 Identifying the Self-test Failure

There are two sets of LEDs that reflect the status of the two parts of the board. The right-most six LEDs report the status of the tests performed on the Host logic, which is responsive to the Data General Argus drivers. The left-most three LEDs correlate to the tests performed on the logic controlling the SCSI device(s). Each side has a different way to report a test that fails.

Host Side Error Decoding

When the Host side logic errors during self-test, the red LED on the right flashes. The number of times it flashes between pauses corresponds to the number of the test that failed. Possible test failures are displayed as follows:

RED LED FLASHES:	TEST THAT FAILED:
1	High Speed Buffer Bank0
2	High Speed Buffer Bank1
3	Dual Port RAM
4	Combined Dual Port RAM
5	RAM Test
12	E^2PROM Checksum *(follow Reconfigure Instructions)*
13 - 25	Decimal Value of SCSI Side Failure

Reconfigure Instructions

All configurable SCZ-6 options are held in an E^2PROM, which stands for *Electrically Erasable Programmable Read Only Memory*. Since the chip can be erased electrically by design, it can be affected by transient pulses or by static. If the contents of the SCZ-6 E^2PROM are corrupt, its checksum will be wrong when checked during self-test and self-test will fail with an "E^2PROM Checksum" error. Do the following to remedy this:

1. Locate the switch pak on the front of the SCZ-6 and flip switch 1 UP to stop the LED from flashing, thus allowing self-test to complete.

2. After the LED has stopped flashing, leave switch 1 UP until after configuration. Flip switch 2 UP to enable **writes** to the E^2PROM.

3. Bring up the SCZ-6 Configurator program and re-input configuration facts. Update the E^2PROM.

4. **Be sure to put switches 1 and 2 DOWN again.** It is a good idea to keep a print-out of the correct configuration facts.

SCSI Side
Error Decoding

The numbering of the SCSI side tests are in octal. All three of the LEDs on the left are used to indicate the octal number of the test that failed, not just the red LED.

The octal number is displayed in binary format on the LEDs. Since the highest single digit in octal is seven, three LEDs are enough to transmit the code of the failing test, one digit at a time.

Figure 3.11 shows the octal value represented by the LEDs. Follow this procedure to decode them:

1. Watch for all three LEDs to light in sequence, right to left. This marks the beginning of the code sequence.

2. Observe which LED lights next and record its value as the Most Significant Digit of the code, determined from Figure 3.11.

3. After a blank pause, one or more LEDs will light, or none, representing the value of the Least Significant Digit. Record this value next to the first.

4. After another blank pause, the beginning sequence will reoccur, and the code will repeat. These are the possible SCSI side test failures that may occur:

DIGITS FLASHED:	TEST THAT FAILED:
04	Dual Port RAM
17	Static RAM test failed
20	BMC Buffer test failed
21	BMC Buffer parity error
22	Test of DMA Transfer Counter failed
23	Test of DMA Address Counter failed
24	Test of 80186 timer failed
25	53C720 register test failed
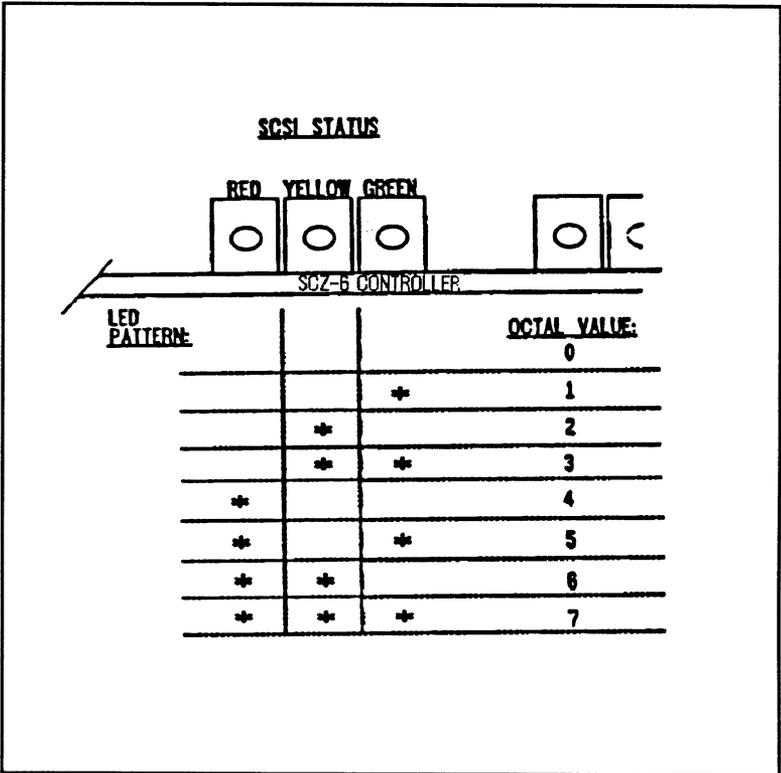
Figure 3.11
Getting an Octal Number from LEDs

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3.12 Decoding Non-self-test Errors

In addition to errors that occur during self-test, there are a few errors that can occur during normal system operation.

The SCZ-6 Multifunction Controller is designed to report several kinds of hardware failure that may occur after power-up. This aids you in verifying system reported faults.

SCSI Side LED Errors

Like the SCSI side self-test failure codes, the Operational Error codes are two digit octal values. (Both are under seven.) The Most Significant digit for Operational Error codes is always seven.

Follow this procedure:

1. Watch for the LEDs to light in sequence, right to left.

2. Watch for all three LEDs to light at once. (This represents a seven, indicating an operational error.)

3. After a pause, the LED display will change to indicate the Least Significant octal digit. Note which LEDs light.

4. After a pause, the LEDs will light in sequence again and the patter will repeat.

5. Find the meaning of the Least Significant octal digit by looking below. (The Most Significant octal digit will always be 7 for this type of error.) These are the errors that may occur:

OCTAL VALUE	MEANING
72	Illegal 80186 Interrupt
73	SCSI-to-Host Request queue overflow
74	SCSI CB Done queue overflow
75	SCSI CB queue overflow
76	Illegal Command
77	SCSI Side Memory Fault

If any of these error codes are flashed, record the code and call your distributor or maintenance provider for assistance.

*Host Side Red
LED Errors*

If the host side of the SCZ-6 receives an unexpected status from the SCSI controller side, this LED will flash one more than the unit number of the device associated with the command being executed. This type of error does not always indicate a problem with a peripheral. Try doing a reset to clear this condition.

*Meaning of a
Steadily Lit
SCSI-side
Yellow LED*

The error reported by this LED does not indicate a Controller hardware failure. Instead, it is most likely indicative of a failure that has occurred on the drive.

A steadily lit yellow LED on the left means a drive interface fault has occurred.

In order of most likely to least likely, the cause of this failure may be:

1. Drive Related — If possible, try a different drive.
2. Cabling — Check that all cable connections are solid. Try replacing them with known good ones.
3. Controller — Try replacing the controller.

3.3 Problems Running the Utility Programs

Sometimes difficulty running the utility programs is due to operator or installation error. Sometimes it is defective equipment. There are a few things to check on first that might lead to a simple solution to a problem.

It is valuable to use the Zetaco Utility Programs, Configurator, Initializer, and Reliability programs anytime you suspect trouble with the SCZ-6 Controller or your drives. During initial installation, they are most valuable in assessing any trouble before running under the operating system.

If you are having trouble getting the programs to run properly, there may be defective equipment, or just operator or installation error.

Assumptions About the Installation

The following information is based on the assumption that these things are true:

1. The controller is intalled in a good slot.

2. The backplane and BMC priorities are correct.

3. No problems exist with the computer, your disk or tape drive, or other peripherals.

If you cannot verify these assumptions for the system you are working on, start your investigation there.

Two Common Difficulties When Running the Programs

To eliminate operator or installation error from consideration when these errors occur, try the following suggestions.

1. Controller does not respond when selected

This can happen with any of the programs, but for various reasons. Most often you will see a *hang* condition after you enter the device code of the board when the program prompts for it. It is at this point that the program tries to communicate with the controller. Anything in the path of communication between board and program is suspect. This includes backplane priority and connection, device code settings, and system microcode corruption.

2. Drives appear not ready

You will only see this with the Initializer or Reliability programs because the Configurator only needs to communicate to the controller. You don't even need to hook up the drives to run the Configurator.
The Reliability program goes through an Initialization process when the [E]nter Device command is used. Part of this process is to try to access any drive for which it is configured and report back on its READY status. If a drive is not READY, the program cannot use it, and will not allow you to select it. Anything in the path of communication between the controller and drive is suspect. This includes cables, paddleboard, position of paddleboard, drive facts in Configurator, and SCSI drive ID settings. Whether the drive is powered down or improperly terminated could be a factor.

The same concerns and checks would be appropriate if it is the WRONG drive that appears ready.

Table 3.3

Common Problems & Solutions Using Utility Programs

IF THIS:	YOU'LL SEE THIS:	CHECK/TRY THIS:
Controller does not respond	Configurator will hang Reliability will error	1) Device code as used & as configured 2) Load/Reload system microcode 3) Re-seat controller & retry 4) Has controller self-test passed?
Drive(s) appear Not Ready	Reliability will report Not Ready Configurator doesn't care	1) Verify configuration facts 2) Replace cables to drive 3) Paddleboard installed at correct slot 4) Verify green paddleboard LED is on 5) Replace paddleboard 6) SCSI Drive ID switches are correct 7) Drive is turned on 8) Correct drive is terminated
Wrong drive appears Ready	Reliability reports wrong drive Ready Configurator doesn't care	1) Verify configuration facts 2) SCSI Drive ID switches are correct 3) Termination is on correct drive 4) ALL drives are turned on

3.4 Types of Error Messages From Reliability

Run a Reliability program anytime you need to verify the integrity of controller-drive communication. Using a test program such as Reliability can give more information about a problem condition existing with a controller or peripheral.

Description of PIO and CB Error Reporting

The Reliability programs use the same command protocol, Control Block (CB) and Programmed Input/Output (PIO), as the system does. An error can occur while the Reliability test program is executing either type of command. When a Control Block has a failure, you will see an error reported on your console. The disk and tape error reports look slightly different:

```
********************** ERROR REPORT **********************

RUN TIME  0. HRS.   0. MINS.  51. SECS.  2 TENTHS.
DEVICE CODE:   23      UNIT #:    0.
FILE #:         0      RECORD #:       0
REQUESTED # OF RECORDS:      1      BYTES/RECORD:     200
ACTUAL    # OF RECORDS:      0      BYTES/RECORD:       0
COMMAND: READ/ONE WORD/VERIFY          ACTIVE DATA TYPE: -ALLZ
PAGE ADDR:      0      XFER ADDR:   5072     ACTUAL ADDR:  5072
ASYNC STATUS   :            3
     CB EXECUTION ERROR: HARD ERRORS
CB STATUS      :            100001
     ANY CB HARD EXECUTION ERROR
     CB DONE BIT
CB ERROR       :            20
     VERIFY ERROR
CB UNIT STATUS :            0
SENSE KEY      :            0
     NO SENSE BEING REPORTED
ERROR BYTE     :            0
```

Figure 3.4a
CB Type Error Report - Tape

```
********************* ERROR REPORT *********************

RUN TIME   0. HRS.   20. MINS.   3. SECS.
DEVICE CODE:   24      UNIT #:    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
ACTIVE DATA TYPE:   -ALL0
ASYNC STATUS     :     3
    CB EXECUTION ERROR: HARD ERRORS
CB STATUS        :          100001
    ANY CB HARD EXECUTION ERROR
    CB DONE BIT
CB ERROR         :             20
    HEADER NONCOMPARE
CB UNIT STATUS   :          24000
    READY
    PORT RESERVED BIT 1
DISK ERROR       :           5000
```

Figure 3.4b

CB Type Error Report - Disk

A PIO Command can error or never complete, and the message
will take this form for tape and disk RELI:

```
********************* ERROR REPORT *********************

RUN TIME   0. HRS.   2. MINS.   2. SECS.   3 TENTHS.
DEVICE CODE:   23      UNIT #:    0.    MAPPING NOT ENABLED
CURRENT FILE:27936.  CURRENT RECORD:28277. EOTS REACHED:28021
STATE: HALTED   MODE: SEQUENTIAL, READ/WRITE, DATA CHECK-ADDR
                REG A        REG B          REG C
OPERATION        0          10707            73
STATUS           0          10707          142073
DEVICE STATE      :  FULLY INITIALIZED
CB BUFFER STATE   :  NOT FULL
EXECUTION STATUS  :  ILLEGAL COMMAND
COMMAND           :  GET UNIT INFO

ENTER A COMMAND (MENU TO LIST COMMANDS): L
```

Figure 3.4c

PIO Type Error Report - Tape

```
********************** ERROR REPORT **********************

RUN TIME   0. HRS.    4. MINS.   7. SECS.   4 TENTHS.
DEVICE CODE:   64      UNIT #:    0.    MAPPING NOT ENABLED
STATE:   **ACTIVE**
MODES:   RANDOM, READ/WRITE, DATA CHECK-ADDR
                   REG A        REG B        REG C
OPERATION            0          11554          73
STATUS               0             10        144073
DEVICE STATE      :   FULLY INITIALIZED
CB BUFFER STATE   :   NOT FULL
EXECUTION STATUS  :   EXECUTION ERROR
COMMAND           :   GET UNIT INFO
UNABLE TO GET UNIT INFORMATION.
```

Figure 3.4d
PIO Type Error Report - Disk

With the Reliability program it is never necessary to look up the bit meaning of status returned from the program because it is interpreted for you.

If a PIO command never completes, the controller will never issue an interrupt to report completion and a Timeout error message will be reported by the program in a PIO Type Error Report.

Tape Hard
Error Messages

As tapes are used, they develop bad spots. It is up to the tape drive to handle as much of the bad portion as possible and report an error when it cannot. For example, the Exabyte tape drive has excellent ECC and a generous retry algorithm. The ECC recovers read data on bad spots. The retries ensure a good write. Therefore, a Hard Error that occurs most often would mean you should clean the tape heads or use new media.

Data Compare
Errors Can
also Occur

When the VERIFY option of the Reliability program is selected, the program writes data, reads it back and compares the data read into memory with what should have been written. If the data doesn't agree, an error report is generated.

```
***************** DATA ERROR REPORT ********************

RUN TIME   0. HRS.    0. MINS.   31. SECS.    9.TENTHS
DEVICE CODE:  23     UNIT NUMBER 0.
FILE #:        0      RECORD #:        0
REQUESTED # OF RECORDS:        1     BYTES/RECORDS:   200
PAGE ADDR:  0       XFER ADDR:   42630    ACTUAL ADDR: 42630
ACTIVE DATA TYPE:  ALLZ
EXPECTED      RECEIVED      OFFSET
    0          177777         0
    0          177777         1
    0          177777         2
    0          177777         3
    0          177777         4
    0          177777         5
    0          177777         6
    0          177777         7
    0          177777        10
    0          177777        11

TOTAL ERROR COUNT:    64.
```

Figure 3.4e
RELI Data Compare Error - Tape

```
***************** DATA COMPARE REPORT ********************

DEVICE CODE:  24     UNIT NUMBER 0.     MAPPING NOT ENABLED
STATE:   **ACTIVE**
MODES:  RANDOM, R/W, DATA CHECK - ADDR
LOGICAL BLOCK          :  2345     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.
RUN TIME    0.HRS.    5.MINS.   12.SECS.    7.TENTHS.
```

Figure 3.4f
RELI Data Compare Error - Disk

When Data Compare errors occur, the Controller is the most probable cause. You could also try different BMC cables or replace the paddleboard and cables to the drive.

This type of error does not indicate bad media or dirty tape heads; those would cause a tape hard error or a disk ECC uncorrectable hard error.

3.5 Error Messages From the System

Errors that occur while running the operating system are sometimes an annoyance and sometimes a catastrophe. Depending on the problem, the system will either react gracefully by informing you and continuing, or it will crash in a PANIC state.

Recovering From a PANIC

It is difficult to know what causes a system crash. The software just gets to an operational dead-end and shuts down. A PANIC code is usually reported; it may or may not offer significant help. In this situation two things can be helpful:

1. Assuming your system once did work, look at what you have recently changed. You may have changed something significant when installing the new peripheral. It could be something in the new GEN or a serious BMC conflict. Have you modified user software? Has something in the computer environment changed: temperature/humidity or a new electrical system? Try to narrow down, focus your suspicions and eliminate possibilities.

2. If you suspect that one of the devices in the system has a hardware problem, it is beneficial to run diagnostic tests. Data General's MVSYSTEMX works on the system as a whole. Individual subsystems can be tested using a Reliability program such as Zetaco provides with its products.

Using MVSYSTEMX

This test is valuable to run because you don't need to involve your operating system (which may help to eliminate variables in trouble-shooting the problem) and it tests all the hardware. It is like a mini operating system. Refer to the system user documentation for instructions on how to run MVSYSTEMX and interpret its error messages.

Using CONTEST

The primary purpose of Data General's CONTEST, which is a diagnostic tool that runs under the operating system, is to test the disk drive. If you are dealing with a panic situation, you will have to bring up your operating system.

To test the disk portion of the controller using CONTEST, your current directory must reside on the disk unit to be tested. For example, if the SCZ-6 is a data disk whose LDU name is DATA1, "DIR" over to DATA1 and type CONTEST. Your searchlist must include :UTIL.

CONTEST also tests the primary tape device if the tape is an MTJ device. If you have an MTA, MTC, or an MTD drive enabled for your system, you will not be able to run an MTJ device under CONTEST.

Even if you have an MTJ as the primary tape device, you will not be able to run an MTJ secondary device. The only solution to this limitation would be to have a special version of the system, with only the driver of tape device you want to test enabled. This may be more bother than it is worth.

*System Error
Without
PANIC Crash*

When the system is able to read error status from a function it is performing, report it, and continue, you will have a better chance of determining what the problem is. For one thing, the device code of the device in an error state is reported.

Quite often the error can be the fault of another device. For example, if a high priority BMC device has a high burst rate configured with a low break count, other devices may have difficulty getting on the bus and will report errors. Changes may have to be made to both device configurations.

The error reported from the system may take a cryptic form. It may be a CB status or a PIO status taking the form of an octal number. Use Section 3.51 to help decipher these.

3.51 Interpreting MTJ CB and PIO Status

MTJ driver status returned from the system usually takes the form of an octal number that needs to be deciphered.

The Difference Between CB Status & PIO

The MTJ driver borrows from Argus its use of two kinds of command structures:

CONTROL BLOCK (CB): Formal structures built in memory containing command and address information.

PROGRAMMED INPUT/OUTPUT (PIO): Single word registers containing different information depending on when you read or write them.

The address of the CB to be executed is passed from system to controller via a PIO register command.

Once either type of command is completed, the SCZ-6 Multifunction Controller issues one of two types of interrupt to the system: asynchronous after a CB completes, and synchronous after a PIO command is done.

CB Status Meaning

Generally, if the completed command was a CB, you will get back: CB status, Error status or Unit status. These are written by the controller into a special part of the CB reserved for status, and are read by the system.

Table 3.51a

Meaning of CB Status Word

The CB status word is reported in word 11 of the CB status block:

BIT	
0	CB hard execution error
1	CB Interpretation error
2	Soft error executing CB
3	Not used
4	ECC correction used to recover
5	ECC correction tried but failed
6	Actual record count does not match request
7-14	Not used
15	CB done

Table 3.51b   *Meaning of Error & Unit Status Words from a CB*

The CB Error word is reported in word 14 of the CB status block:

BIT		
	0	Controller interrupt timeout
	1	Controller/unit interface fault
	2	Controller timeout
	3	Data late
	4	Not used
	5	Unit error
	6	BMC timeout
	7	BMC ending memory address error
	8	Bad spot on tape
	9	Write protection fault
	10	Density mismatch
	11	Read/verify error
	12	BMC address/data transfer parity
	13	Controller to unit transfer parity
	14	Unit to media transfer parity
	15	Bad tape preamble

Table 3.51c   *Meaning of CB Unit Status*

The Unit Status word is reported in word 15 of the CB status block:

BIT		
	0	Unit command failed
	1	Unit power fail
	2	Unit READY
	3	Not used
	4	Reserved by other port
	5	Reserved by this port
	6	Hard unit failure
	7,8,9	Not used
	10	Indecipherable dump format
	11	BOT
	12	EOF
	13	Logical EOT
	14	Physical EOT
	15	Not used

The Sense Key and Error Byte sense data returned from the drive. Refer to your drive manufacturer's SCSI specifications for detail.

PIO Status
Meaning

The PIO registers also get status written into them. When a CB completes, the PIO register C is used. When a PIO command, (which mostly has to do with getting a CB issued) completes in error, PIO register B is used.

Table 3.51d

Meaning of PIO Register C

Bits 6 through 15 of REGISTER C after an asynchronous interrupt:

ASYNC OCTAL CODE	INTERRUPT NAME
0	Null interrupt
1	Controller panic
2	Soft error
3	Hard error (restart required)
4	Ibit set
5	Completed without error
6	Cancel list
7	Sbit set (restart required)
10	Interpretation error; CB status word not 0
11	Interpretation error; Illegal command
12	Interpretation error; Range error
13	Interpretation error; Illegal unit
14	Interpretation error; Illegal Link address
15	Interpretation error; Illegal Page address
16	Interpretation error; Illegal Transfer address
17	Interpretation error; Illegal Trans byte count
20	Unreadable CB
21	Unwritable CB
22	Map slot load request
23	Unit status change
24	Position status (EOF, EOT, LEOT, PEOT) no restart
25	Interpretation error; Illegal transfer count

Table 3.51e   *Meaning of PIO Register B*

A PIO Get, Set or Program Load command error may set a bit in REGISTER B:

BIT	0-6	Not used
	7	Ending memory address error
	8-11	Not used
	12	BMC error
	13-15	Not used

3.52 Interpreting DPJ Commands, CB and PIO Status

DPJ driver status returned from the system usually takes the form of an octal number that needs to be deciphered.

DPJ Commands

There are some DPJ commands that are interpreted and executed differently than Argus by the SCZ-6 Multifunction Controller.

Table 3.52a

PIO Commands Implementation

The following list includes PIO commands implemented in a different manner than Data General protocol, and the result of executing the command.

PIO EXECUTION	RESULT OF COMMAND EXECUTION
Sysgen	NOP
Extended Status, Unit 0	Returns Zetaco microcode revision number in DIA and DIB.
Ext. Status Unit 1	NOP
Ext. Status Unit 2	NOP
Ext. Status Unit 3	NOP
Start List High Priority	Start List
Cancel List	NOP

Table 3.52b

Control Block Command Implementation

Some CB Commands that are redefined by the SCZ-6 are listed below with the result of execution.

CB COMMAND	RESULT OF EXECUTION
Read/Verify	NOP
Read Raw Data	Illegal CB
Read Headers	Illegal CB
Write/Verify	Write
Write/Verify/Single Word	NOP

Status
Information

At the conclusion of command processing, there are two types of interrupts to the host that can be generated by the SCZ-6 following Argus protocol: synchronous and asynchronous. An asynchronous interrupt occurs when the controller completes a CB or CB LIST, or when an error occurs during CB EXECUTION. A synchronous interrupt, when enabled, occurs after a PIO Command executes.

Synchronous interrupts have priority over asynchronous interrupts. If a synchronous interrupt occurs, synchronous return information will replace asynchronous return information in the status registers.

The status words produced by the various reporting mechanisms are:

• **Control Block** - CB status, error status, unit status.
• **Status Register** - Command status (execution state and Start List), command completion status, and asynchronous interrupt code.
• **Command Status** - Begin, Get and Set, Get List Status, Program Load, Reset and Unit Status.

Table 3.52c

PIO Register Status Implementation

Asynchronous interrupt codes are written into bits 6-15 of status register C. The codes and their meaning reported by the SCZ-6 are as follows:

OCTAL CODE	INTERRUPT NAME
0	Null interrupt
1	Not Used
2	CB Execution error; soft
3	CB Execution error; hard
4	CB Complete; Ibit set
5	CB Complete, no errors
6	Not Used
7	Soft error; Sbit set
10	Status word not zero
11	Illegal CB command
12	Not Used
13	Illegal page address
14	Not Used
15	Illegal page address
16	Illegal memory transfer address
17	Not Used
20	Unreadable CB
21	Unwritable CB
26	Soft error 0 mirrored pair

When a PIO command execution error occurs after issuing a Get
or Set or Program Load command, status register B will contain
a word with the following bit meanings from the
SCZ-6.

Table 3.52d   *PIO Register B Status*

DIB BIT	MEANING
0 - 6	Not Used
7	Ending Memory Address error
8 - 11	Not Used
12	BMC error
13 - 15	Not Used

*CB Status
Implementation*

There are two parts to a control block: Host-supplied
(command) information and Return/Error information. There are
three words in the controller Return/Error section of a CB
returned by the SCZ-6. They are: CB Status in word 11, Error
Status in word 14, and Unit Status in word 15.

Table 3.52e   *The CB Status Word*

The CB Status word provides an overall view of operation. Its
bit meanings can be interpreted as:

CB STATUS WORD BIT	MEANING
0	CB hard execution error
1	CB interpretation error
2	Soft error while execution CB
3	Not Used
4	ECC correction used to recover
5	ECC correction tried but failed
6	Sector relocated
7-14	Not Used
15	CB done

The Sense Key and Error Byte sense data are returned from the
drive. Refer to your drive manufacturer's SCSI specification for
detail.

Table 3.52f   *The CB Error Word*

The CB Error word describes the condition of the controller and drive interface. Its bit meanings are as follows:

CB ERROR WORD BIT	MEANING
0	Not Used
1	Drive Interface fault *
2-4	Not Used
5	Drive error **
6	BMC Timeout error
7	Ending Memory Address error
8-10	Not Used
11	Verify error
12	BMC error
13	Not Used
14	ECC detected
15	Header error

*   This error can be caused by:
- BMC error during sector transfer
- Illegal unit
- Illegal logical block
- Bad sector log not terminated by -1
- Any hard error on relocation log read
- Any hard error on read/write of a relocated sector

**   This error can be caused by:
- No unit response
- Seek error
- Cylinder address error
- No headers found
- Unit faulted
- Clock error (servo or read)

Table 3.52g   *The Unit Status Word*

The Unit Status word is used to report the condition of the drive. The bit meanings are:

UNIT STATUS WORD BITS	MEANING
0,1	Not Used
2	Drive Ready
3-5	Not Used
6,7	Unit Number
8-15	Not Used

3.6 Help is Available for Problem Situations

An 800 number is available to all Zetaco-direct customers for assistance.

You Can Use the Customer Support Hotline

Zetaco provides a Customer Support Hotline to answer technical questions and to assist with installation and help trouble-shoot problems. The Hotline technical team is available from 8:00 a.m. to 5:00 p.m. (CST), Monday through Friday.

Within the U.S. dial *1-800-537-5292*

Outside the U.S. dial *1-612-890-5138*

How to Get a Return Material Authorization (RMA)

A Return Material Authorization number is required before shipping anything back to Zetaco. It should be referenced on the package and in any correspondence about the return. To get an RMA number:

1. Fill out a copy of the Material Return Information form shown on the next page and be prepared to give some of this information on the phone if asked. A copy of the filled out form should also be sent with any return package.

2. Call the Customer Support Hotline to request an RMA number from them.

Each product being returned needs a separate RMA number and Material Return Information form. It should be shipped to Zetaco, 11400 Rupp Drive, Burnsville, MN, 55337, freight prepaid.

Upon Zetaco's verification of defect, defective parts shall be repaired or replaced, and returned surface freight prepaid to the customer.

To safeguard the product during shipment, please use packaging that is adequate to protect it from damage. It would be a good idea to keep the original packaging for this purpose. Mark the box: *Delicate Instrument.* Indicate the RMA number(s) on the shipping label.

Information
About Warranty

The SCZ-6 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 billable to the customer.

Material Return Information

The speed and accuracy of a product's repair is often dependent upon a complete understanding of the user's check-out 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/VS, AOS/VS-II) 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 NUMBER: _____

SERIAL NUMBER: _____

RMA NUMBER: _____ *(Call Zetaco to obtain an RMA number.)*

Returned by:

Your Name: _____ **Firm:** _____
Address: _____ **Phone:** _____

A

Appendix A

A.0 Introduction

This appendix details procedures the user will need to perform if implementing hardware mirroring of system or data disks. Hardware mirroring consists of creating and maintaining duplicate images of data on two drives. Data written to one drive is also written to the other drive in a mirrored pair. Data read from a mirror is read from that drive whose heads are closest to the data. Mirroring provides the user with increased performance during disk reads and improved data availability due to the protection that drive redundancy provides. This appendix addresses specific procedures:

A.1 How to mirror an existing data disk or replace a defective mirrored disk.

A.2 How to create a mirrored system disk using the AOS/VS build tapes.

A.3 How to mirror an existing system disk.

A.4 How to create a mirrored data disk.

A.5 Backing up data disks.

A.6 General information for mirrored disks.

A.7 Running fixup on mirrored disks.

A.1 How To Mirror An Existing Data Disk or Replace a Defective Mirrored Disk

Before performing any of the following actions, make sure you have a full backup of your disk drives. If you are unfamiliar with creating a mirrored disk, or have to remove or install a disk drive, halt all disk activity and write protect your disk drives. The write protect can be found on the front of the disk drives. The red LED will light up when the switch is activated. **Never** remove a disk drive while there is activity on any of the disks. Once you have installed a replacement disk, release the write protect on your system disks (this would include the primary and secondary images if your system disk is mirrored) and your two disk drives that are going to be your mirrored pair. Leave all other drives write protected to guard against accidental data corruption which could occur from operator error.

You will now need to run a full format (DFMTR) on your secondary image data disk. The secondary image is considered to be the empty disk drive.

> **NOTE:** *Any time you run a full format on a disk drive it destroys any previous data that was on that disk, therefore you MUST be certain which disk drive DFMTR will be run on.*

DFMTR requires the logical unit number of the drive, which is not necessarily the SCSI I.D. If you are not sure of the drive's logical unit number or it's device driver, check the following:

1. Get the disk device code from a printout of configuration facts (SCZ-6).

2. DIR into the SYSGEN directory *)DIR :SYSGEN.

3. Display the file of your SYSGEN'd system. Look for the disk device code from the printout of the SCZ-6 configurator *)TY CURRENT.CSF.

4. Once you find the disk device code, the device driver will be one line up and to the left.

```
                            CURRENT SPECIFICATION

                    VSGEN revision 7.XX.00.00   DATE    TIME

        System parameters:

                Model:                         MV/15000
                Swap:                          2147483647
                Page:                          2147483647
                Cache size:                             128
                Minimum number system pageable pages:   10
                Default file element size:     4
                Frequency:                              10
                Access enabled:                         YES
                Initial program for PID 2:     CLI:PR
                Initial IPC message for PID 2:
                Max program load pages -noncontention:  0
                Max program load pages -contention:     0
                Fault time prepaging maximum: 0
                Variable swapfiles enabled:    N
                Maximum swapfile size:                  126
                Default swapfile size:                  126
                Truncate swap files after use:          N
                Truncate page files after use:          Y
                Size above which truncation will occur: 2048
                Lowest priority for group 1 processes:  255
                Lowest priority for group 2 processes:  258
                Soft tape errors suppressed:   N
                System dump device:            MTB
                Maximum number of processes:   255
                System Management Interface:   N
                Kanji Translation Selected:    N
                Default GMT Offset:            0:00


        SYSTEM DEVICES:

        'CONO'          CONSOLE 0

                CONSOLE TYPE:                  CRT3
                DESCRIPTION:                   DGC D200 COMPATIBLE CONSOLE
                INPUT BUFFER BYTE
                LENGTH:          128
                OUTPUT BUFFER BYTE
                LENGTH:          128
                CHARACTERISTIC WORD 0:         STANDARD
                CHARACTERISTIC WORD 1:         STANDARD
                CHARACTERISTIC WORD 2
                  LINES PER PAGE:              STANDARD
                  CHARS PER LINE:              STANDARD
                CHARACTERISTIC WORD 3:         STANDARD

        'DPJ'           DGC 62<36,37> DISK

                DEVICE CODE:                   24

        'DPJ1'          DGC 62<36,37> DISK

                DEVICE CODE:                   64

        'MTB'           DGC 6026 MAGNETIC TAPE

                DEVICE CODE:                   22
                DEFAULT DENSITY:               ADM
                MAXIMUM BYTE TRANSFER:         SK
                DATA CHANNEL MAP SLOTS:        5B

        'MTJ'           DGC 6351 or 6352 Magnetic Tape

        DEVICE CODE:            23
        DEFAULT DENSITY:        ADM
        MAXIMUM BYTE TRANSFER:          32K
```

Figure A-0
System Build File

Typically if the disk device code is 24 you will use the DPJX
driver while 64 is normally the DPJ1X driver. Now you need to
find the unit number. To determine the unit number to insert
after the device driver represented by the "X", do the following:

1.   Look at the front of the replacement disk drive.
       You will see a number. This number should be
       unique to all the other disk drives and cannot be

"7", since the SCZ-6 is at "7". This is known as the SCSI I.D. of the disk drive.

2.   If you take the printout of the configuration facts from the SCZ-6 controller and find that same number under the SCSI I.D. of the disk drive assignment table, you can follow that to the left to get the logical unit number to run DFMTR on. See Figure A-1.

If You Replace a
Defective Disk

If you are replacing a defective disk drive from a mirrored pair, you can run the MIRRORINFO utility to verify which image is initialized into the system. This is considered to be the primary image. The MIRRORINFO utility will display the LDU name, unique I.D., and the physical disk unit name. The mirror state should be broken. At this point you should know what the secondary image is and replace the appropriate disk drive. If you are not sure which logical unit to replace, review the previous steps.

```
DISK and TAPE drive to logical unit assignment table.
-------------------------------------------------------------------------------
Logical | Disk drive assigned  | SCSI | Logical | Tape drive assigned  | SCSI |
unit #  | Manufacturer / model | ID   | UNIT #  | Manufacturer / model | ID   |
-------------------------------------------------------------------------------
0         Seagate ST12550N..(2.13GB) 0  |  0       No tape drive assigned
1         Seagate ST12550N..(2.13GB) 2  |  1       No tape drive assigned
2         Seagate ST12550N..(2.13GB) 4  |  2       No tape drive assigned
3         No disk drive assigned        |  3       No tape drive assigned
4         No disk drive assigned        |  4       No tape drive assigned
5         No disk drive assigned        |  5       No tape drive assigned
6         No disk drive assigned        |  6       No tape drive assigned
7         No disk drive assigned        |  7       No tape drive assigned
-------------------------------------------------------------------------------
|                     Controller-specific configuration facts:
-------------------------------------------------------------------------------
Disk BMC burst rate.........:    32      Tape BMC burst rate.........:    32
Disk BMC break count........:     4      Tape BMC break count........:     4
Disk device code............:    24      Tape device code............:   OFF
               BMC priority (tape & disk) . . :      0
               Initiator (SCZ-6) SCSI ID. . . :      7
               Interrupt Priority High/Low. . :   Disk/Tape


Enter command (? to see choice):
```

Figure A-1
Sample Configuration Overview Screen

Example: If the SCSI I.D. on the drive is 2, by following the example above you would need to run DFMTR on DPJ1. If the drive has a SCSI I.D. of 4, you would need to run DFMTR on DPJ2.

Full Format of a
Replacement Disk

The following is an example of the dialogue for performing full format under DFMTR on a blank disk. Your responses are shown in bold type.

```
*)XEQ DFMTR

AOS/VS Disk Formatter

Full format destroys any AOS/VS file structure,
Partial retains it.
Full (F) or Partial (P or NEW LINE)? F

Specify each disk in the LDU (press NEW LINE when
done).
Disk unit name? DPJX   (enter the disk unit name
obtained from the above steps).

Disk unit name?  <cr>

Do you want to allocate a diagnostic area?   (This
must be the same as the primary image).

For image 1
LDU unique ID (1 to 6 characters)? [ ]  DPJX

LDU name (1 to 31 characters)?  [ ]  XXXX

Access control list
User name or template (1 to 15 characters)?  (System
administrator's discretion.)
Access (O, W, A, R, E, or NEW LINE)?  (System
Administrator's discretion.)
User or template (1 to 15 characters)?

For image 1

Surface analysis? [N]  N
(Do not run surface analysis, this is handled on the
SCZ-6 during the 5 pattern analyze, which was done
before shipping.)

For disk #1
0 bad disk blocks
Additional bad block number (press NEW LINE when
done):  <cr>
0 bad disk blocks

Bit map size:  XXXXX
Bit map address:  XXXXXXX  <cr>
System LDU? [Y]  N
Disk number 1 remap area size? [XXXX]  <cr>
Disk number 1 remap area address? [XXXXXXX]  <cr>

--LDU created
```

The next step is to run a partial format to create the mirrored pair using your current data disk as the primary image (Image 1) of the mirror and the drive just formatted (Image 2) as the secondary image. When answering the question "Disk unit name?" under DFMTR it is **important** to specify the good image first (the disk drive with all the data). If you are not sure which unit number to enter after the device driver, go back and review the above steps on how to find the correct unit number. If DPJ1 is your current data disk and you are going to mirror it with DPJ2, this would be your response to the question:

```
DISK UNIT NAME?  DPJ1!DPJ2 <cr>
```

Partial Format To Create a Mirrored Pair

```
*)XEQ DFMTR

AOS/VS Disk Formatter

Full format destroys any AOS/VS file structure,
Partial retains it.
Full (F) or Partial (P or NEW LINE)? P

Specify each disk in the LDU (press NEW LINE when
done).
Disk unit name? DPJ1!DPJ2
(enter the primary image first, which is the good disk
followed by the replacement disk).

This LDU is not normally mirrored.  (This message will
appear if the primary image has never been mirrored.)
LDU image DPJ1 is the preferred image.
Do you want to continue. [Y]   <cr>

For image 1
LDU unique ID (1 to 6 characters)? [DPJ1]   <cr>

For image 2
LDU unique ID (1 to 6 characters)? [DPJ2]   <cr>

LDU name (1 to 31 characters)?  [UDD1]  <cr>

New access control list [N]  <cr>

For image 1

Read only surface analysis? [N]  N
(Do not run surface analysis, this is handled on the
SCZ-6 during the 5 pattern analyze).

For disk #1
0 bad disk blocks
Update bad block table? [N]:  <cr>
0 bad disk blocks

For image 2
```

```
Read only surface analysis? [N]   N

For disk #2
0 bad disk blocks

Update bad block table?: [N]   <cr>
0 bad disk blocks

Bit map size:  XXXXX
Bit map address:  XXXXXXXX  <cr>
Allocate a system bootstrap area? [N]   <cr>
New overlay area size?  [XXXXXX]  <cr>
Disk number 1 remap area size? [XXXX]  <cr>
Disk number 1 remap area address? [XXXXXXX]   <cr>

--LDU created

Done !
```

You can now INIT the preferred image, then mirror sync the drives.

```
*) INIT/NOMIRROR DPJ1
UDD1
*) MIRROR/SYNC UDD1 DPJ2
```

You can remove any write protects to the disk drives and enable the users back onto the system. At this point you should get a printout of the mirrored pair by using the MIRRORINFO utility. This will give you some information which could be helpful when replacing a defective disk drive.

```
XEQ mirrorinfo/st=:sysgen:current.st
```

MIRRORINFO displays the following information:

1.	Number of mirrored LDUs in the system.
2.	LDU name and unique ID of each mirrored pair.
3.	Mirror state for each mirrored LDU. Mirror states are synchronized, synchronization in progress, and broken.
4.	Physical disk unit names that are part of each mirrored pair.

For more help on the utility use the help function

```
*) help/v *mirror
```

A.2 How to Create a Mirrored System Disk Using the AOS/VS Build Tapes

When performing this procedure it is assumed that no drives contain valid data. If this is not the case, backup all of your data and write protect the disk drives that will not be in use. This will guard against accidental data corruption which could occur from operator error.

When creating a mirrored system disk with the AOS/VS build tapes, your primary image will be DPJ0, the secondary image can be any logical unit. Before starting this procedure you must decide which drives are going to be your mirrored system disks. If you look at a printout of the SCZ-6 configuration and find logical unit number 0 (left-most column) under the disk drive assignment table, you can follow that to the right to get the SCSI I.D. of the primary image of the mirrored pair. By looking at the front of the disk drives you can verify that the SCSI I.D. from the SCZ-6 configurator matches the drive's SCSI I.D. that you plan to build your system on. You need to do the same for the secondary image, except it can be any logical unit number found in the left-most column of the disk drive assignment table.

```
DISK and TAPE drive to logical unit assignment table.
------------------------------------------------------------------------------
Logical | Disk drive assigned  | SCSI | Logical | Tape drive assigned  | SCSI |
unit #  | Manufacturer / model | ID   | UNIT #  | Manufacturer / model | ID   |
------------------------------------------------------------------------------
0         Seagate ST12550N..(2.13GB) 1  |  0        No tape drive assigned
1         No disk drive assigned         |  1        No tape drive assigned
2         No disk drive assigned         |  2        No tape drive assigned
3         No disk drive assigned         |  3        No tape drive assigned
4         Seagate ST12550N..(2.13GB) 2  |  4        No tape drive assigned
5         No disk drive assigned         |  5        No tape drive assigned
6         No disk drive assigned         |  6        No tape drive assigned
7         No disk drive assigned         |  7        No tape drive assigned
------------------------------------------------------------------------------
|                 Controller-specific configuration facts:
------------------------------------------------------------------------------
Disk BMC burst rate..........:    32     Tape BMC burst rate..........:    32
Disk BMC break count.........:     4     Tape BMC break count.........:     4
Disk device code.............:    24     Tape device code.............:   OFF
               BMC priority (tape & disk) . . :      0
               Initiator (SCZ-6) SCSI ID. . . :      7
               Interrupt Priority High/Low. . :    Disk/Tape


Enter command (? to see choice):
```

Figure A-2
Sample Configuration Overview Screen

Example: DPJ0, which is logical unit 0 and has a SCSI
I.D. of 1, will be the primary image. If you
were to look at the front of the disk drives, the
drive with a 1 on the front will be your primary
image of your system disk. DPJ4, which is
logical unit 4 and has a SCSI I.D. of 2, will be
the secondary image.

Boot the AOS/VS build tape.

```
SCP-CLI) B 22
Tape file number?  2

AOS/VS Disk Formatter Rev 07.XX

Full format destroys any AOS/VS file structure,
Partial retains it.
Full (F) or Partial (P or NEW LINE)? F

Specify each disk in the LDU (press NEW LINE when
done).
Disk unit name? DPJ0!DPJ4
Device code? [24]  <cr>
Disk unit name?  <cr>

Do you want to allocate a diagnostic area? [Y]  N
(System administrator's discretion)

Disk number 1:  00000 through 0000XXXX

For image 1
LDU unique ID (1 to 6 characters)? [ ]  DPJ0
For image 2
LDU unique ID (1 to 6 characters)? [ ]  DPJ4
LDU name (1 to 31 characters)?  [ ]  UDD1

Access control list
User name or template (1 to 15 characters)?  +
Access (O, W, A, R, E, or NEW LINE)?  OWARE
(System administrator's discretion)

User or template (1 to 15 characters)?  <cr>

For image 1

Surface analysis? [N]  <cr>
(This is done at Zetaco prior to shipping)

For disk #1
0 bad disk blocks

Additional bad block number (press NEW LINE when
done):  <cr>
0 bad disk blocks

For image 2

Surface analysis? [N]  <cr>

For disk #1
```

```
0 bad disk blocks


Additional bad block number (press newline when done):
<cr>

Bit map size: 000XXX
Bit map address:  0000XXXX  <cr>
System LDU? [Y]   <cr>
Overlay area size? [000XXX]   <cr>
Overlay area address? [0000XXXX]   <cr>
Disk number 1 remap area size? [XXXX]   <cr>
Disk number 1 remap area address? [0000XXXX]   <cr>

--LDU created

Done !
CPU Halted
```

Now load file #3 and install the bootstrap.

```
SCP-CLI)   B 22
Tape file number?   3

AOS/VS Installer Rev 7.XX

Specify each disk in the LDU
Disk unit name?   DPJ0!DPJ4
Device code [24]?   <cr>
--Disk bootstrap installed

Do you want to install a system bootstrap [Y]?   <cr>
Install from which unit [MTC0]?   <cr>
Device code [22]?   <cr>
File number [4]?   <cr>

Do you want to install a system [Y]?   <cr>
Install from which unit [MTC0]?   <cr>
Device code [22]?   <cr>
File number [5}?   <cr>
--System installed

Done!
CPU Halted
```

Now bring up the system, and continue loading system files.

```
SCP-CLI) B 24
  1)          Continue immediately with operating
              system load
  2)          Enter the technical maintenance menu
Enter choice [1]:   <cr>

AOS/VS Rev. 7.XX

Master LDU:   UDD1

AOS/VS will continue with defaults automatically
unless you respond within 45 seconds
Override default specs [N]?   Y

Number of buffers in cache [128]?   <cr>
```

```
Swap directory definition [XXXX]?  <cr>
Page directory definition [XXXX]?  <cr>
Initial Load [N]:  Y
Filename [@MTCO:6]?  <cr>
Continue loading system files

AOS/VS CLI Rev 7.XX  Date  Time
) superuser on
*) Load_II/V @MTCO:7
```

The last of the system files are loaded. You now have a mirrored system disk. At this point you should get a printout of the mirror pair by using the MIRRORINFO utility. This will give you some information which could be helpful when replacing a defective disk drive.

```
XEQ mirrorinfo/st=:sysgen:current.st
```

MIRRORINFO displays the following information:

1.	Number of mirrored LDUs in the system.
2.	LDU name and unique ID of each mirrored pair.
3.	Mirror state for each mirrored LDU. Mirror states are synchronized, synchronization in progress, and broken.
4.	Physical disk unit names that are part of each mirrored pair.

For more help on the utility use the help function
```
*)help/v *mirror
```

A.3 How to Mirror An Existing System Disk

Before performing any of the following actions, make sure you have a full backup of your disk drives. You may want to get a printout of your SYSGEN'd system to make the following steps easier.

```
*)Dir :sysgen
*)Qprint current.csf
```

To mirror an existing system disk you have to bring the system down. Before typing "BYE" at the "*)" prompt verify that all drives have been released from the system. One way this can be accomplished is running DISCO.

```
*)XEQ DISCO
```

The only drive DISCO should see is unit 0, which would be your system disk. You can now bring the system down to the SCP-CLI) prompt. If you are unfamiliar with creating a mirrored system disk, you should write protect all your disk drives except for your system disk and what will be your secondary image disk drive. The write protect can be found on the front of the disk drives. The red LED will light when the switch is activated. This will help guard against accidental data corruption which could occur due to operator error.

You will now need to run a full format (DFMTR) on your secondary image system disk, The secondary image is considered to be the drive with no data on it.

NOTE: *Any time you run a full format on a disk drive it destroys any previous data that was on that disk, therefore you MUST be certain which disk drive DFMTR will be run on.*

DFMTR requires the logical unit number of the drive, which is not necessarily the SCSI I.D. If you are not sure of the drive's logical unit number or it's device driver, check the following:

1.   Get the disk device code from a printout of configuration facts (SCZ-6).

2.   Get the printout of your SYSGEN'd system.

Look for the disk device code from the printout of the SCZ-6 configurator.

3.   Once you find the disk device code, the device driver will be one line up and to the left. Reference Figure A-0.

Typically if the disk device code is 24 you will use the DPJX driver while 64 is normally the DPJ1X driver. Now you need to find the unit number. To determine the unit number to insert after the device driver represented by the "X", do the following:

1.   Look at the front of the disk drive you plan on using for the secondary image. You will see a number. This number should be unique to all the other disk drives and cannot be "7", since the SCZ-6 is at "7". This is known as the SCSI I.D. of the disk drive.

2.   If you take the printout of the configuration facts from the SCZ-6 controller and find that same number under the SCSI I.D. of the disk drive assignment table, you can follow that to the left to get the logical unit number to run DFMTR on.

```
DISK and TAPE drive to logical unit assignment table.
-----------------------------------------------------------------------------
Logical | Disk drive assigned  | SCSI | Logical | Tape drive assigned  | SCSI |
unit #  | Manufacturer / model | ID   | UNIT #  | Manufacturer / model | ID   |
-----------------------------------------------------------------------------
0         Seagate ST12550N..(2.13GB) 0 |  0        No tape drive assigned
1         Seagate ST12550N..(2.13GB) 2 |  1        No tape drive assigned
2         Seagate ST12550N..(2.13GB) 4 |  2        No tape drive assigned
3         No disk drive assigned        |  3        No tape drive assigned
4         No disk drive assigned        |  4        No tape drive assigned
5         No disk drive assigned        |  5        No tape drive assigned
6         No disk drive assigned        |  6        No tape drive assigned
7         No disk drive assigned        |  7        No tape drive assigned
-----------------------------------------------------------------------------
|                    Controller-specific configuration facts:
-----------------------------------------------------------------------------
Disk BMC burst rate.........:     32      Tape BMC burst rate.........:     32
Disk BMC break count........:      4      Tape BMC break count........:      4
Disk device code............:     24      Tape device code............:    OFF
               BMC priority (tape & disk) . . :       0
               Initiator (SCZ-6) SCSI ID. . . :       7
               Interrupt Priority High/Low. . :    Disk/Tape


Enter command (? to see choice):
```

Figure A-3
Sample Configuration Overview Screen

Example: If the SCSI I.D. on the drive is 2, by following
            the example above you would need to run
            DFMTR on DPJ1. If the drive has a SCSI I.D.
            of 4, you would need to run DFMTR on DPJ2.

Full Format of a
Replacement Disk   The following is an example of the dialogue for performing full
                               format under DFMTR on a blank disk. Your responses are
                               shown in bold type.

                               To load DFMTR from the SCP-CLI) prompt do the following:

```
SCP-CLI) B 24   (This would be your system disk)

              Operating System Load Menu

  1)            Continue immediately with operating
                system load
  2)            Enter the Technical Maintenance menu

Enter choice [1]:  2

              Technical Maintenance Menu

Enter choice [1]:  6  (Run a specified Program)

Pathname?  DFMTR


 AOS/VS Disk Formatter

 Full format destroys any AOS/VS file structure,
 Partial retains it.
 Full (F) or Partial (P or NEW LINE)?  F

 Specify each disk in the LDU (press NEW LINE when
 done).
 Disk unit name? DPJ1   (Enter the disk unit name
 obtained from the above steps.  Important:  You must
 make sure you enter the drive that contains no
 data.)
 Device code [24]?  <cr>

 Disk unit name?  <cr>

 Do you want to allocate a diagnostic area?   (This
 must be the same as the primary image).

 For image 1
 LDU unique ID (1 to 6 characters)? [ ]  DPJ1

 LDU name (1 to 31 characters)?  [ ]  XXXX
```

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```
Access control list
User name or template (1 to 15 characters)?  (System
administrator's discretion.)
Access (O, W, A, R, E, or NEW LINE)?  (System
Administrator's discretion.)
User or template (1 to 15 characters)?  <cr>

Surface analysis? [N]  N
(Do not run surface analysis, this is handled on the
SCZ-6 during the 5 pattern analyze, which was done
before shipping.)

For disk #1
0 bad disk blocks
Additional bad block number (press NEW LINE when
done):  <cr>
0 bad disk blocks

Bit map size:  XXXXX
Bit map address:  XXXXXXXX  <cr>
System LDU? [Y]  <cr>
Overlay area size? [000XXX]  <cr>
Overlay area address? [0000XXXX]  <cr>
Disk number 1 remap area size? [XXXX]  <cr>
Disk number 1 remap area address? [XXXXXXX]  <cr>

--LDU created

Done !
```

Now install the bootstrap. The best place to get the bootstrap
is from a system build tape.

```
SCP-CLI)  B 22
Tape file number?  3

AOS/VS Installer Rev 7.XX

Specify each disk in the LDU
Disk unit name?  DPJ0!DPJ4
Device code [24]?  <cr>
--Disk bootstrap installed

Do you want to install a system bootstrap [Y]?  <cr>
Install from which unit [MTC0]?  <cr>
Device code [22]?  <cr>
File number [4]?  <cr>

Do you want to install a system [Y]?  <cr>
Install from which unit [MTC0]?  <cr>
Device code [22]?  <cr>
File number [5]?  <cr>
--System installed

Done!
```

The next step is to run a partial format to create the mirrored
pair using your current data disk as the primary image (Image 1)
of the mirror and the drive just formatted (Image 2) as the
secondary image. When answering the question "Disk unit
name?" under DFMTR it is **important** to specify the good

image first (the disk drive with all the data). If you are not sure which unit number to enter after the device driver, go back and review the above steps on how to find the correct unit number.

Load DFMTR to perform a partial format to create the mirrored pair.

SCP-CLI) B 24 (This would be your system disk)

```
                    Operating System Load Menu

    1)              Continue immediately with operating
                    system load
    2)              Enter the Technical Maintenance menu

Enter choice [1]:  2

                    Technical Maintenance Menu

Enter choice [1]:  6   (Run a specified Program)

Pathname?  DFMTR

AOS/VS Disk Formatter

Full format destroys any AOS/VS file structure,
Partial retains it.
Full (F) or Partial (P or NEW LINE)? P

Specify each disk in the LDU (press NEW LINE when
done).
Disk unit name? DPJ0!DPJ1
(enter the primary image first, which is the good disk
followed by the replacement disk).
Device code [24]?  <cr>

This LDU is not normally mirrored.
LDU image DPJ1 is the preferred image.
Do you want to continue. [Y]  <cr>

For image 1
LDU unique ID (1 to 6 characters)? [DPJ0]  <cr>

For image 2
LDU unique ID (1 to 6 characters)? [DPJ1]  <cr>

LDU name (1 to 31 characters)?  [UDD1]  <cr>

New access control list [N]  <cr>

For image 1

Read only surface analysis? [N]  N
(Do not run surface analysis, this is handled on the
SCZ-6 during the 5 pattern analyze).

For disk #1
0 bad disk blocks
Update bad block table? [N]:  <cr>
0 bad disk blocks
```

```
For image 2

Read only surface analysis? [N]  N

For disk #1
0 bad disk blocks

Update bad block table?: [N]  <cr>
0 bad disk blocks

Bit map size:  XXXXX
Bit map address:  XXXXXXXX  <cr>
New overlay area size?  [XXXXXX]  <cr>
New overlay area address?  [XXXXX]  <cr>
Disk number 1 remap area size? [XXXX]  <cr>
Disk number 1 remap area address? [XXXXXXX]  <cr>

--Partial format complete

Done !
```

Your system disk is now mirrored but the secondary image has
to be synchronized to the primary image. At this point you can
release the write protects on the remaining disk drives, and
partially bring up the system.

```
SCP-CLI)  B 24


              Operating System Load Menu
1)  Continue immediately with operating system load
2)  Enter the Technical Maintenance Menu
    Enter choice [1]:  <cr>

    Warning - Master LDU mirror is not synchronized
```

AOS/VS will continue with defaults automatically unless you
respond within 45 seconds.

```
Override default specs [N]?  <cr>

AOS/VS CLI Rev 07.XX  Date  Time
```

Now you should mirror sync the secondary image to the
primary.

```
*)superuser on
*)mirror/sync : DPJ1
```

The secondary image is now in the process of synchronization.
You will get a message when it is complete.

From system:
LDU image "DPJ1" of the LDU named UDD1 is now
synchronized. You can now bring up the system.

At this point you should get a printout of the mirror pair by

using the MIRRORINFO utility. This will give you some information which could be helpful when replacing a defective disk drive.

```
XEQ mirrorinfo/st=:sysgen:current.st
```

MIRRORINFO displays the following information:

1. Number of mirrored LDUs in the system.
2. LDU name and unique ID of each mirrored pair.
3. Mirror state for each mirrored LDU. Mirror states are synchronized, synchronization in progress, and broken.

4. Physical disk unit names that are part of each mirrored pair.

For more help on the utility use the help function
```
*)help/v *mirror
```

A.4 How to Create a Mirrored Data Disk

Before performing any of the following actions, make sure you have a full backup of your disk drives. If you are unfamiliar with creating a mirrored disk, or have to remove or install a disk drive, halt all disk activity and write protect your disk drives. The write protect can be found on the front of the disk drives. The red LED will light up when the switch is activated. **Never** remove a disk drive while there is activity on any of the disks. Once you have installed a replacement disk, release the write protect on your system disk and your two disk drives that are going to be your mirrored pair. Leave all other drives write protected to guard against accidental data corruption which could occur from operator error.

You will now need to run a full format (DFMTR) on the drives that will become your mirrored data disks. At this time there should be **NO** data on these disks.

> **NOTE:** *Any time you run a full format on a disk drive it destroys any previous data that was on that disk, therefore you MUST be certain which disk drive DFMTR will be run on.*

DFMTR requires the logical unit number of the drive, which is not necessarily the SCSI I.D. If you are not sure of the drive's logical unit number or it's device driver, check the following:

1. Get the disk device code from a printout of configuration facts (SCZ-6).

2. DIR into the SYSGEN directory `*)DIR :SYSGEN.`

3. Display the file of your SYSGEN'd system. Look for the disk device code from the printout of the SCZ-6 configurator `*)TY CURRENT.CSF.`

4. Once you find the disk device code, the device driver will be one line up and to the left. Reference Figure A-0.

Typically if the disk device code is 24 you will use the DPJX

driver while 64 is normally the DPJ1X driver. Now you need to find the unit number. To determine the unit number to insert after the device driver represented by the "X", do the following:

1.   Look at the front of the replacement disk drive. You will see a number. This number should be unique to all the other disk drives and cannot be "7", since the SCZ-6 is at "7". This is known as the SCSI I.D. of the disk drive.

2.   If you take the printout of the configuration facts from the SCZ-6 controller and find that same number under the SCSI I.D. of the disk drive assignment table, you can follow that to the left to get the logical unit number to run DFMTR on. You should verify the logical unit number for the primary and secondary units.

```
DISK and TAPE drive to logical unit assignment table.
-------------------------------------------------------------------------------
Logical | Disk drive assigned   | SCSI | Logical | Tape drive assigned   | SCSI |
unit #  | Manufacturer / model  | ID   | UNIT #  | Manufacturer / model  | ID   |
-------------------------------------------------------------------------------
0         Seagate ST12550N..(2.13GB) 0  |   0        No tape drive assigned
1         Seagate ST12550N..(2.13GB) 2  |   1        No tape drive assigned
2         Seagate ST12550N..(2.13GB) 4  |   2        No tape drive assigned
3         No disk drive assigned        |   3        No tape drive assigned
4         No disk drive assigned        |   4        No tape drive assigned
5         No disk drive assigned        |   5        No tape drive assigned
6         No disk drive assigned        |   6        No tape drive assigned
7         No disk drive assigned        |   7        No tape drive assigned
-------------------------------------------------------------------------------
|                 Controller-specific configuration facts:
-------------------------------------------------------------------------------
Disk BMC burst rate..........:     32      Tape BMC burst rate..........:     32
Disk BMC break count.........:      4      Tape BMC break count.........:      4
Disk device code.............:     24      Tape device code.............:    OFF
                BMC priority (tape & disk) . . :       0
                Initiator (SCZ-6) SCSI ID. . . :       7
                Interrupt Priority High/Low. . :    Disk/Tape


Enter command (? to see choice):
```

Figure A-4
Sample Configuration Overview Screen

Example: If the SCSI I.D. on the primary drive is 2, this would give you logical unit number 1 or DPJ1. If the SCSI I.D. on the secondary is 4, this indicates logical unit number 2 or DPJ2. When DFMTR asks for the disk unit name, your

response would be DPJ1!DPJ2.

*Full Format of a
Replacement Disk*

The following is an example of the dialogue for performing full
format under DFMTR on a blank disk. Your responses are
shown in bold type.

*)XEQ DFMTR

```
AOS/VS Disk Formatter

Full format destroys any AOS/VS file structure,
Partial retains it.
Full (F) or Partial (P or NEW LINE)? F

Specify each disk in the LDU (press NEW LINE when
done).
Disk unit name? DPJ1!DPJ2  (enter the disk unit name
obtained from the above steps).

Disk unit name?  <cr>

Do you want to allocate a diagnostic area?  N
(System Administrator's discretion)

For image 1
LDU unique ID (1 to 6 characters)? [ ]  DPJ1
For image 2
LDU unique I.D. (1 to 6 characters)?  [ ]  DPJ2

LDU name (1 to 31 characters)?  [ ]  UDD2

Access control list
User name or template (1 to 15 characters)?  (System
administrator's discretion.)
Access (O, W, A, R, E, or NEW LINE)?  (System
Administrator's discretion.)
User or template (1 to 15 characters)?  <cr>

For image 1

Surface analysis? [N]  N
(Do not run surface analysis, this is handled on the
SCZ-6 during the 5 pattern analyze, which was done
before shipping.)

For disk #1
0 bad disk blocks
Additional bad block number (press NEW LINE when
done):  <cr>
0 bad disk blocks

For image 2

Surface analysis? [N]  <cr>

For disk #1
0 bad disk blocks

Additional bad block number (press newline when
done):  <cr>
0 bad disk blocks
```

```
Bit map size:  XXXXX
Bit map address:  XXXXXXXX  <cr>
System LDU? [Y]  N
Overlay area size [XXXX]  <cr>
Overlay area address? [XXXXXX]  <cr>
Disk number 1 remap area size? [XXXX]  <cr>
Disk number 1 remap area address? [XXXXXXX]  <cr>

--LDU created

Done !
```

The mirrored data disk is now completed. You can go ahead and initialize it into the system.

```
*)init DPJ1!DPJ2
```

At this point you should get a printout of the mirror pair by using the MIRRORINFO utility. This will give you some information which could be helpful when replacing a defective disk drive.

```
XEQ mirrorinfo/st=:sysgen:current.st
```

MIRRORINFO displays the following information:

1. Number of mirrored LDUs in the system.
2. LDU name and unique ID of each mirrored pair.
3. Mirror state for each mirrored LDU. Mirror states are synchronized, synchronization in progress, and broken.
4. Physical disk unit names that are part of each mirrored pair.

For more help on the utility use the help function
```
*)help/v *mirror
```

A.5 Backing Up Data Disks

This example uses DPJ2 and DPJ3 as a mirrored pair.

Insure that the system is inactive and all files are closed.

```
)   SUPERUSER ON
```

Turn on Superuser privilege and make root your working directory.

```
*)   DIRECTORY :
```

```
*)   RELEASE UDD1
```

Release the LDU.

```
*)   INITIALIZE/NOMIRROR @DPJ2
```

Initialize one of the UDD1 images.

NOTE: *At this point you can enable terminals, allowing users to work on the system again.*

```
*)   DIRECTORY :BACKUP
```

Move to a directory you have created for backup.

```
*)   INITIALIZE/NOMIRROR @DPJ3
```

Initialize the other UDD1 image.

Perform your backup

Upon completion of the backup, release DPJ3 from the backup directory.

NOTE: *Release drive in backup directory before resynchronizing your mirror.*

```
*)RELEASE UDD1
```

Resynchronizing Your Mirror

```
*)DIRECTORY :
```

Make root your working directory.

```
*)   MIRROR/SYNC UDD1 @DPJ3
```

This starts the process of resynchronizing the disks. LDU image DPJ3 of the LDU named UDD1 is now synchronized. System message.

A.6 General Information For Mirrored Disks

Initialize Command

Format:

Initialize unitname!unitname

An LDU is a directory, created with the Disk Formatter, that includes one or more physical disks.

For the command to work correctly, you need read access to the unitname(s) in the :PER directory and write access to the working directory or Superuser on.

To release an LDU, use its LDU filename, NOT its unitname(s). You can display the LDU name by typing FILESTATUS/TYPE=LDU <NL> in the working directory.

```
*) INIT @DPJ2!DPJ3
UDD1              (System returns the LDU filename)
```

Adds the mirrored LDU from DPJ2 and DPJ3 to the working directory.

```
*) INIT/NOMIRROR @DPJ2
UDD1              (System returns the LDU filename)
```

Initializes one image of the LDU mirrored pair.

Mirror Command

Format:

MIRROR [pathname of initialized image] unitname

IMPORTANT:
The "pathname of initialized image" refers to the LDU filename and NOT the unitname. This is a good reason to have a unique LDU filename. By having a LDU filename of DPJ1 it can become confusing when doing mirror/sync commands. Therefore, when specifying the "pathname of initialized image" you should NOT use the @ sign, since DPJ1 is now a directory and NOT a unitname.

Starts synchronizing (mirroring) an LDU image with another image. The LDU image you want to use as a source must be initialized (INIT/NOMIRROR command). It must also be the current image of the mirrored pair.

The unitname must contain an LDU image that has the same filename, same size, and same bitmap and bad block table address (created with the Disk Formatter program) as the initialized image. The "pathname of initialized image" uses a full pathname: EXAMPLE, if the LDU named UDD1 was initialized in the root, use pathname :UDD1.

Depending on the image size/type, synchronization may take a while.
Approximately 18 minutes for 1 mirrored pair with 2.1GB of data, 27 minutes for 2 mirrored pairs with 2.1GB of data per mirrored pair, or 39 minutes for 3 mirrored pairs with 2.1GB of data per mirrored pair. The system will display a Synchronization .... complete message when it is done.

You can learn which LDUs are mirrored with the MIRRORINFO utility.

```
*)   mirrorinfo/st=:sysgen:current.st
```

CAUTION: *Mirror/sync overwrites all information on the specified unitname.*

To synchronize based on the newer image, init the newer image, then use MIRROR with the /SYNC switch. EXAMPLE:

```
*) INIT/NOMIRROR @DPJ2        (Initialize the source image.)
UDD1                          (System echoes back the
                              LDU filename.)


*) MIRROR/SYNC UDD1 @DPJ3     (Start synchronizing newer
                              image onto the older image
                              of DPJ3.)
```

The next example shows initialization, de-synchronization and synchronization of mirrored LDU images. The images were released normally, therefore they are in synchronization when the example begins.

```
*) INIT @DPJ2!DPJ3  <cr>
```
(Initializes both images. For this to work, the images must have been synchronized when they were released.)

```
UDD1
```
(System displays LDU filename.)

```
....
```
(System runs with images synchronized.)

```
From system:
HARD error ...
LDU "UDD1", image DPJ3 has been removed
by the system
```
(Hard errors causes system to stop mirroring on second image.)

```
....
```
(System runs normally using first image only. Engineer fixes problem with second image.)

```
*) MIRROR/SYNC :UDD1 @DPJ3
```
(Starts synchronizing DPJ2 to DPJ3.)

For more information on these commands enter the following:

```
*) HELP/V INIT
   or
*) HELP/V MIRROR
```

IMPORTANT:
In the DOWN.CLI you should release any disks init'd into your system before going to the SCP-CLI) prompt. EXAMPLE at the end of the DOWN.CLI insert this statement RELEASE UDD1, this releases DPJ2!DPJ3 from the system. You have to execute this command in the directory that the drives are in.

IMPORTANT:
NEVER pull out a disk drive while there is ANY system activity. You must halt all users from running any system level activity. The only terminal that should have access is the master console. With the master console idle you then can replace any defective mirrored disk drive that has been removed by the system.

A.7 Running Fixup On Mirrored Disks

This section is an example on how to run fixup on a mirrored pair due to a system crash. Anytime fixup is run it will break the mirrored pair. You will have to re-synchronize the mirrored pair before executing the UP.CLI macro. Fixup can be run in a stand-alone (from the SCP-CLI prompt) or a stand-among (from the "*)" prompt) version. If fixup is run on DPJ0 you will have to run the stand-alone version. This can be accessed by booting the system disk, entering the Technical Maintenance Menu and selecting #7 (Fixup).

Fixup On a System Disk

```
AOS/VS Disk Fixer, Rev. 7.XX

Verbosity [1]?  <cr>
Error logfile [console]?  <cr>
Should I report closing files and deleting transients
[n]?  <cr>
May I fix it [n]?  Y
Would you like to select any options [n]?  <cr>

--REQUEST 1--

Specify each disk in the LDU
```

Note: *Enter the primary image first. If this is your system disk you must enter DPJ0 first.*

```
Enter disk unit name:  DPJ0!DPJ1
***Mirrored LDU is not synchronized***

The preferred image is (DPJ0)

Should I continue fixing [n]?  Y
Would you like to cancel this request [n]?  <cr>
Would you like to queue up another request [n]?  <cr>

REQUEST 1 (DPJ2), Fixing LDU 'UDD1' now...

DONE!

Fixup Terminating
```

Fixup will now repair the files on DPJ0 only. DPJ1 will have to be synchronized to DPJ0 when fixup is finished.

Once fixup is done you can bring up the system to the ")" prompt. Turn superuser on, and set the search list to include the UTIL directory.

```
)  superu on
*) SEA[!SEA] :UTIL
```

Now sync up the drives.

```
*)mirror/sync :  @DPJ1
```

Mirror sync command has started. It may take several minutes for it to complete, but you can start to bring up the system.

Fixup On a Data Disk

You can run fixup on a data disk from the stand-alone, or standard among versions. This example will use the stand-among version, and assumes you have not run the UP.CLI macro. You will need to run fixup if you get the following error message while trying to initialize a mirrored pair into the system.

Example:

```
*)  INIT DPJ2!DPJ3

Error:  Cannot initialize LDU; run fixup on it.
```

Anytime fixup is run it will break the mirrored pair. You will have to re-synchronize the disks before executing the UP.CLI macro. Before trying to run Fixup, turn the superuser on and set the searchlist to include the UTIL directory.

```
)  superu on
*)  SEA[!SEA] :UTIL
*)  Fixup


AOS/VS Disk Fixer, Rev. 7.XX

Verbosity [1]?  <cr>
Error logfile [console]?  <cr>
Should I report closing files and deleting transients
[n]?  <cr>
May I fix it [n]?  Y
Would you like to select any options [n]?  <cr>

--REQUEST 1--

Specify each disk in the LDU
```

Note: *Enter the primary image first.*

```
Enter disk unit name:  DPJ2!DPJ3
***Mirrored LDU is not synchronized***

The preferred image is (DPJ2)

Should I continue fixing [n]?  Y
Would you like to cancel this request [n]?  <cr>
Would you like to queue up another request [n]?  <cr>

REQUEST 1 (DPJ2), Fixing LDU 'UDD1' now...
```

```
REQUEST 1 (DPJ2), Fixing LDU 'UDD1' now...

DONE!

Fixup Terminating
```

Once fixup is completed, you can mirror sync the drives.
Initialize the primary image first, then synchronize the primary
drive to the secondary drive.

```
*)INIT/NOMIRROR @DPJ2
UDD1

*)MIRROR/SYNC :UDD1 @DPJ3
```

Wait for the mirrored pair to complete its synchronization.

```
LDU image DPJ3 of the LDU named UDD1 is now
synchronized.

Release the mirrored pair, and start the UP.CLI macro.

*)RELEASE UDD1
*)UP
```