Model SCZ-6T

SCSI 2 Tape Controller

Technical Manual

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Preface

This manual contains information regarding installation, testing, and operation of the ZETACO Model SCZ-6T SCSI 2 Tape 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-6T SCSI 2 Tape Controller features, capabilities, specifications, power and interface requirements.

Chapter 2 - Installation Procedures

Procedures required to install and test the SCZ-6T SCSI 2 Tape 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-6T SCSI 2 Tape Controller is designed to interface a variety of SCSI peripherals to Data General MV series minicomputers.

At the system level, the SCZ-6T utilizes the capabilities of Data General's MTJ software driver. System performance features of the Argus driver are supported: memory resident control blocks, mapping responsibility, execution of linked control blocks. The SCZ-6T executes all tape commands supported by the MTJ 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-6T 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 tape
- Command queuing for lower system overhead
- Large on-board memory for efficient data buffering
- Dual microprocessors with full parallel processing

1.1 Controller Functional Overview

Refer to Figure 1.1 to see the major functional sections of the SCZ-6T 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 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 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 two device codes. This section interfaces to the computer via the A and B backplane connectors. Each Busy Flag register drives one of the two 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 alternately 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.

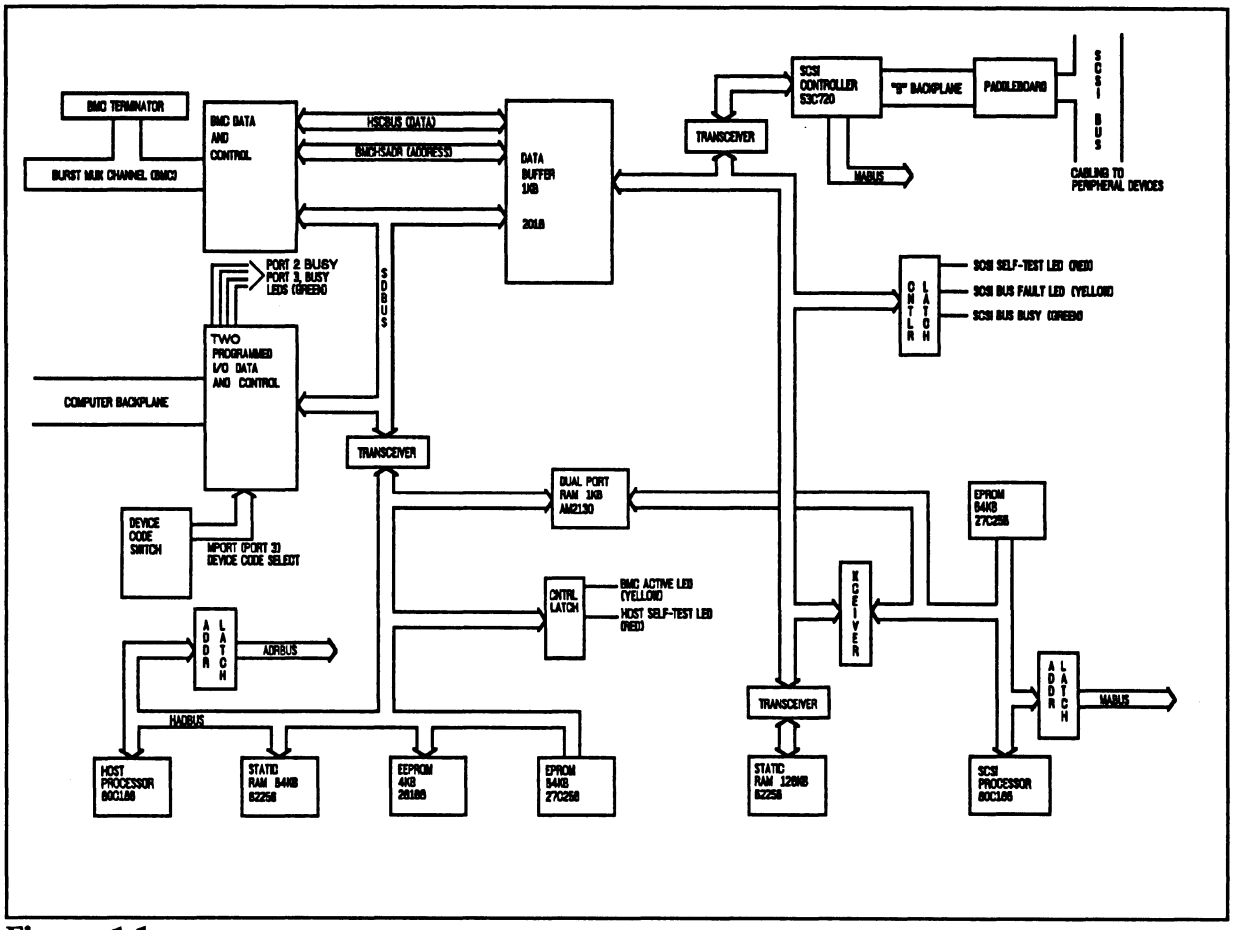


Figure 1.1
SCZ-6T Block Diagram

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 tape drives. The SCSI Processor is responsible for the management of the various commands for up to seven SCSI tape 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. The processors communicate with each other via the Dual Port RAM.

1.2 Device Code Port Assignments

The SCZ-6T contains PIO control facilities, or ports, to handle up to two device codes. One of these device codes is used for tape control. The second handles Maintenance Port (MPORT) control functions required by the controller utility programs.

The controller maintains a fixed interrupt priority structure between the two ports: Port 0 has highest interrupt priority, Port 1 (MPORT) the next highest.

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 7 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, tape drives may still be performing operations such as tape positioning, but are temporarily "disconnected" from the controller.

The four 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 Maintenance Port (MPORT) Busy (lowest interrupt priority)

These two green LEDs show the status of the Busy flags for the two 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 tape control sections of the controller will be assigned Port 0.

1.4 SCZ-6T 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

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-6T 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 driver. Table 2.11 lists the Data General computers in which the SCZ-6T will function, along with corresponding I/O ONLY slot numbers.

BMC Bus Cables

To operate the SCZ-6T over the BMC channel, a physical connection between the SCZ-6T 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-6T communicates with the devices via the SCSI interface. It can operate in synchronous or asynchronous mode. The SCZ-6T 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

Operating Environment:

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

Non-Operating Environment:

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-6T. 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-6T, 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 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.***

2

Installation

2.0 Before You Begin Installation

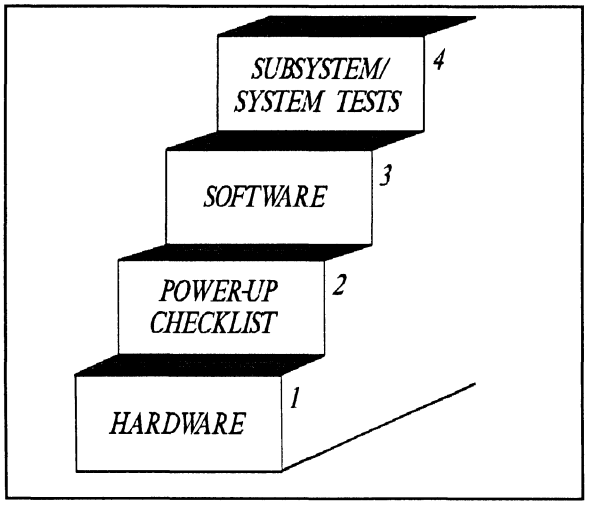
The installation process consists of two parts: hardware and software. Hardware installation is covered first in the following sections. Every attempt has been made to cover the process sequentially. Read through this procedure before attempting installation and have on hand the tools and references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



2.1 Hardware Installation Procedure

The hardware covered in this section includes the computer chassis, the SCZ-6T SCSI Tape Controller, 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-6T:

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

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

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

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-6T. Then, be sure the priority signals are available for that slot.

Slot Selected Must be I/O ONLY

The SCZ-6T 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-6T 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-6T can only operate on the BMC. When planning slot location for the SCZ-6T 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-6T 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.

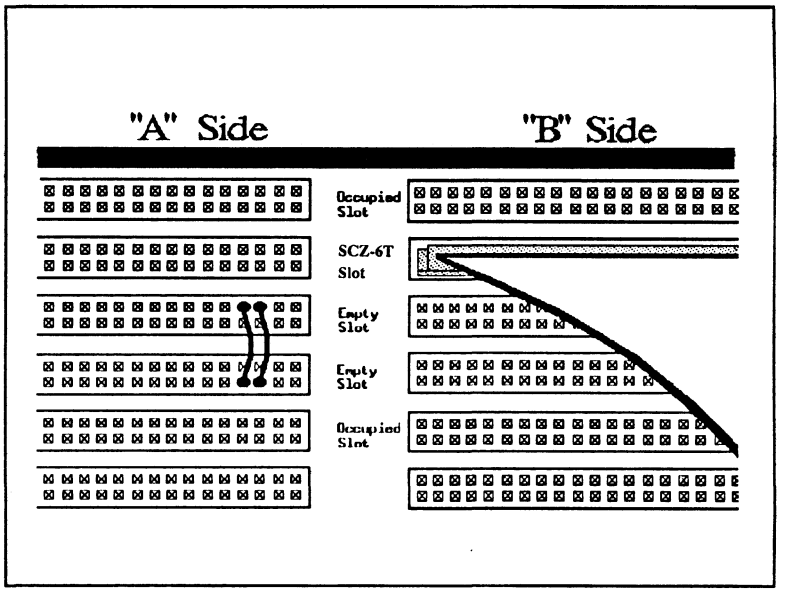


Figure 2.11
Backplane Priority Jumpers

2.12 Setting Switches

Most option setup for the SCZ-6T is handled by programming the E^2PROM 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, E^2PROM 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-6T, allowing you to set the controller's tape device code. Any device code not already in use may be used, but the standard ones are:

MPORT . . . primary 40_8
. . . . . 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 E^2PROM. Switch 2 is for enable/disable of the E^2PROM write protect. See Figure 2.12 for complete instructions.

When to Use the E^2PROM Write Disable

The E^2PROM on the controller stores information necessary for proper subsystem functioning. To completely protect this data, the option to disable writes to the E^2PROM 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-6T's E^2PROM configuration data and cause a failure. Configuration override is provided to allow you to boot the SCZ-6T Software Support Package tape from the SCZ-6T controller in order to reconfigure the E^2PROM data.

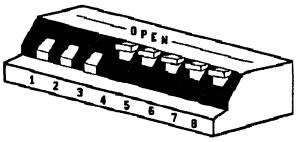
Configuration Override is controlled by the leftmost switch on the switchpack (S1) and can be used to set the controller options to the following known values:

- 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.)

To use the Configuration Over-ride switch:

1. Set the SCZ-6T 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-6T 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^2PROM Write Disable (DOWN)

Device Code	S1 Over-ride	S2 E^2PROM 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-6T into the middle of a group of boards, you may need to extend the adjacent boards to be even with the SCZ-6T and insert them as a group.

How to Properly Install the SCZ-6T 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-6T 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.*

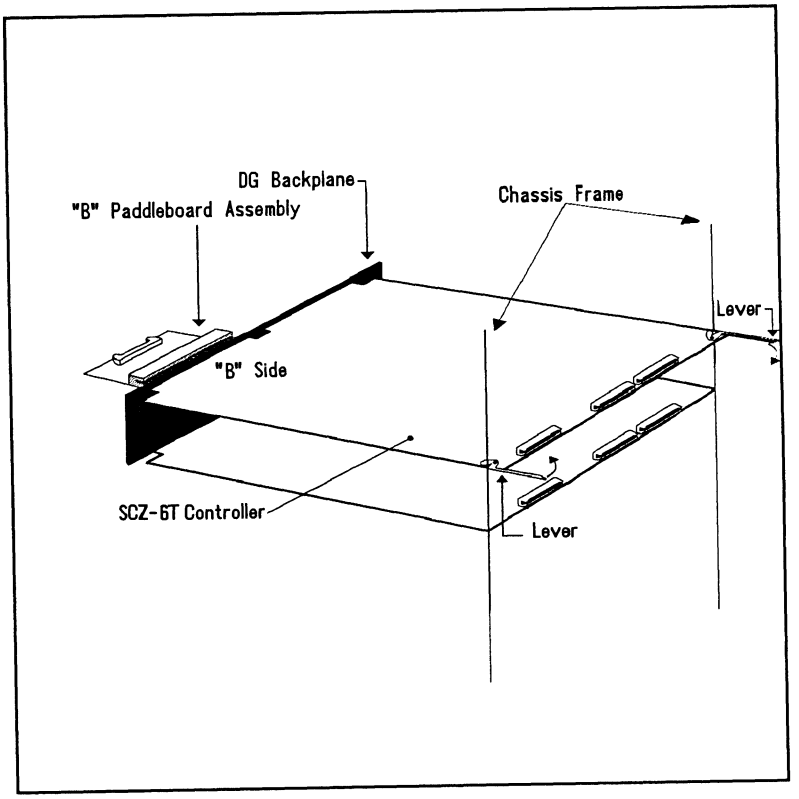


Figure 2.14
Installing the Paddleboard and Controller

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 are all important points to know about.

You should have a copy of the manufacturer's manual for the 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 write-protected?
. . . . . Do the tape heads need periodic cleaning?
. . . . . What environment constraints are there for the peripheral devices?

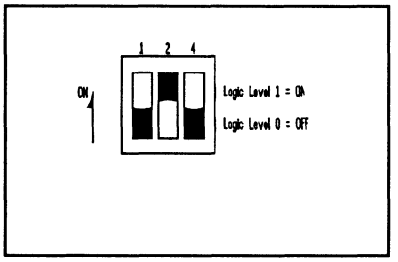
More to Find Out About

Make sure the drive you want to use is in the SCZ-6T Configurator Program. To find out, boot the 9-track software support tape that is supplied with the SCZ-6T, and select "Configurator" off the menu. If an unsupported drive is used with the SCZ-6T, chances are it will not operate properly.

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.

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

2.16 Using More Than One Drive

You will probably want to control at least one tape with the SCZ-6T. 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-6T SCSI Tape Controller is designed to support up to seven devices on its SCSI bus. You can use any combination of tape, within these constraints:

- At this time the MTJ (tape) driver under AOS/VS can only recognize four logical units per device code.
- Each drive, and the controller, must have a different SCSI ID.
- **The cumulative total cable lengths of all drives attached to one SCZ-6T 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.

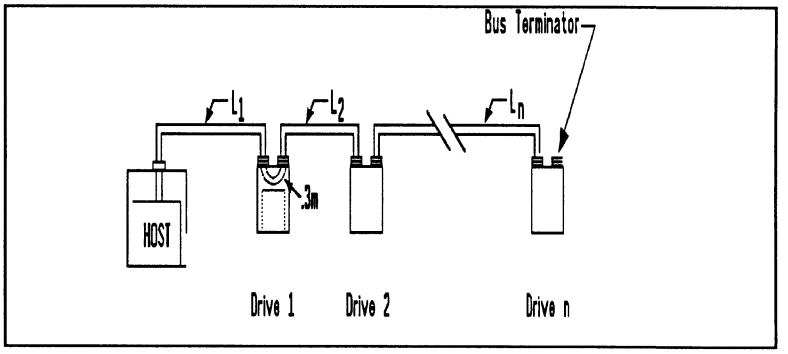


Figure 2.16
Daisy-Chained Drives

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-6T 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-6T 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-6T 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-6T.

If the SCZ-6T 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-6T.

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-6T 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-6T if it is not the last device on the BMC.

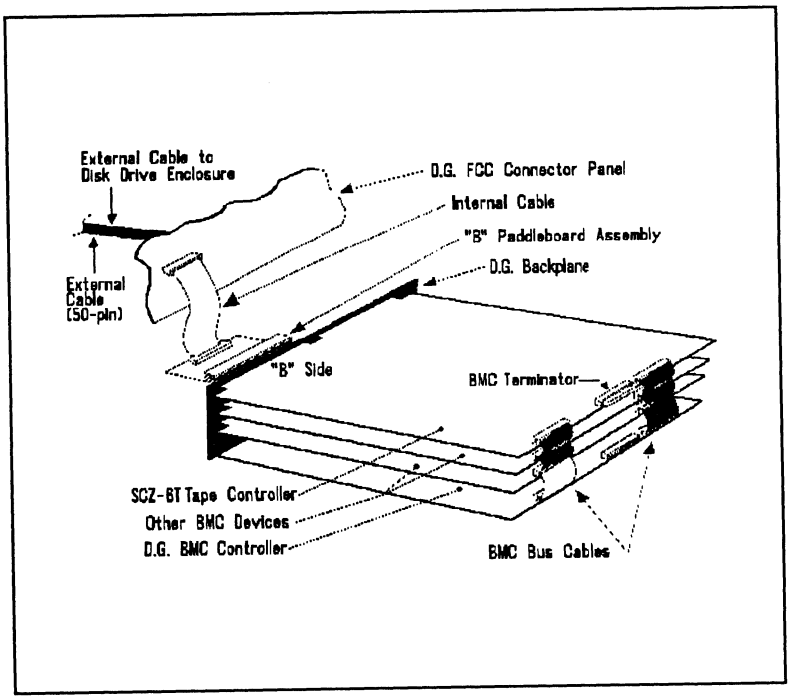


Figure 2.17
SCZ-6T Cabling Diagram

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-6T 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-6T is functional, you should see:

- All SCZ-6T 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-6T 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-6T 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-6T into your system. You will need to configure the Controller, 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, and MLTT RELI and are also tools for your use. Details on how to use these programs are not available here, only information on when 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 Reliability programs for test.

4. 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 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 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 and three 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 four on the tape contains the following:

1) Copies of the Configurator and Tape 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.

Administration Tools on the Support Tape

Along with .SV format copies of the other programs **File Four** 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-6T 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-6T 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-6T 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-6T 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-6T, you may boot the tape from this drive, assuming the SCZ-6T has been pre-configured to known settings (device code, tape drive model). The standard SCZ-6T 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 program.)

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.

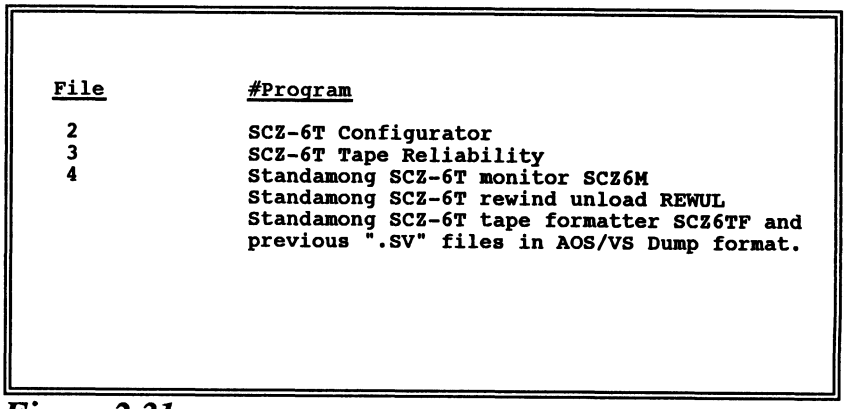


Figure 2.31
Support Tape Menu

4. Enter the file number (2 or 3) 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-6T 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-6T E^2PROM.

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 tape drive choices displayed, select:

"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-6T 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-6T. 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.

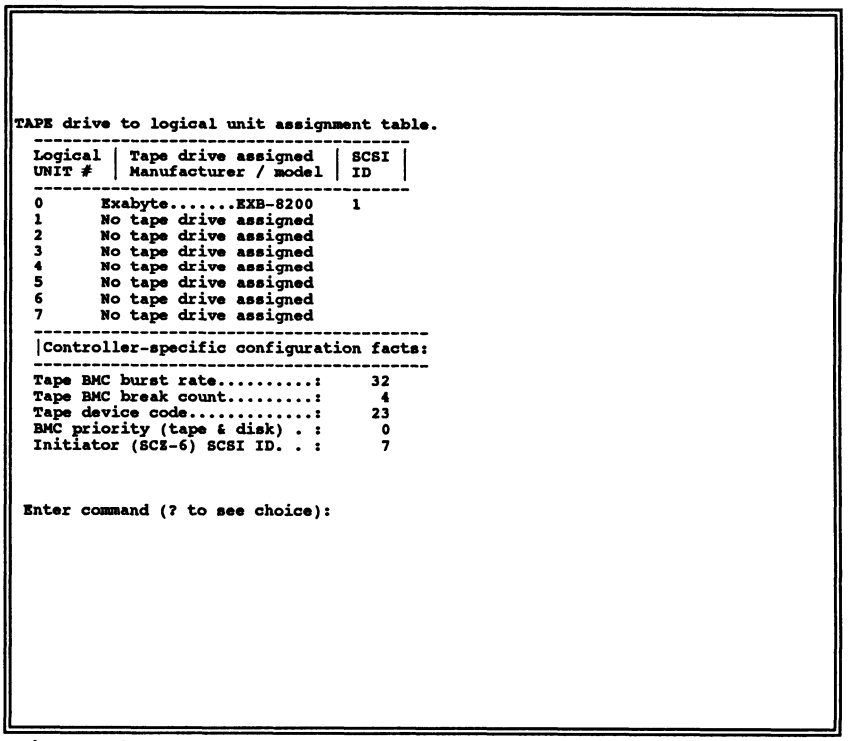


Figure 2.32a
Sample Configuration Overview Screen

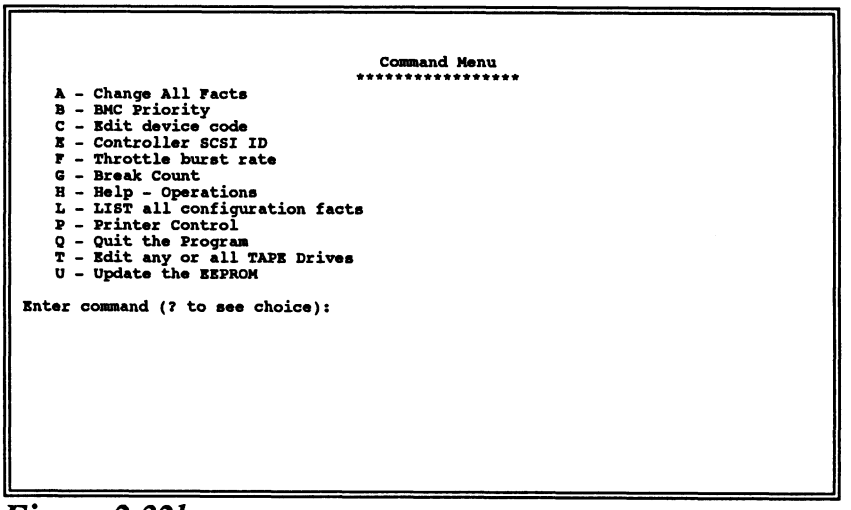


Figure 2.32b
Sample Configurator Main Menu

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-6T: Since the SCZ6T controls your tape device, you will want as low 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.

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

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.

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-6T: Here, a good number to begin with is four.

BMC OPTION:	WHAT TO REMEMBER:	RECOMMENDATION:
Priority	- Want highest numbers assigned to the most intensively used devices. - DO NOT DUPLICATE	Lowest 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-6T

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-6T) originates an operation and the target performs the operation. Each device has its own SCSI ID. The SCZ-6T 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-6T. Be sure that there are no duplicate ID's on the bus.**

2.34 Using SCZ6M Monitor Program

SCZ6M monitors all tape activity on a SCZ-6T Tape 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-6T Monitor Help

Description:

This program will display the current file number, record number, and active SCSI command for all configured tape units.

Requirements:

The SCZ-6T monitor program requires an SCZ-6T 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-6T 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-6T monitor at any time by typing (cntl C) then (cntl B).

Status definitions:

Idle	There was no SCSI command active when the SCZ-6T was polled
Read	Read tape records
Write	Write tape records
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.

2.35 Using the REWUL Rewind/Unload Program

REWUL is used to rewind and unload a tape on the SCZ-6T Tape 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-6T Rewind Unload Help

Description:

This program will rewind and unload the specified tape drive.

Requirements:

The SCZ-6T rewind and unload program requires an SCZ-6T 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-6T 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.

2.36 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-6T 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-6T Tape Format program requires a SCZ-6T 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-6T 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.

2.37 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.

As a stand-alone program, the Reliability utility tests only the subsystem that you are installing. 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-6T 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.

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.

2.38 Summary of Reliability Commands

Use this explanation of each Reliability command to better understand how to use the program.

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

   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, 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.

2.39 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 code to which you have set the tape port.
2. The driver to select is MTJ for tape.
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.

Standard CLI Commands to Load File 4

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

) SUPERUSER ON
***) DIR :**
***) LOAD/V @MTzx:4**
***) 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:CFSCZ6T.SV <cr>
```

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

```
Configurator  . . . . :UTIL:CFSCZ6T.SV
Tape Reliability  . . :UTIL:SCZ6TR.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 SCZ-6T 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-6T 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-6T 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, 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 7 LEDs on the controller, a red-yellow-green group, a red-yellow group, and a group of 2 green LEDs. 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.

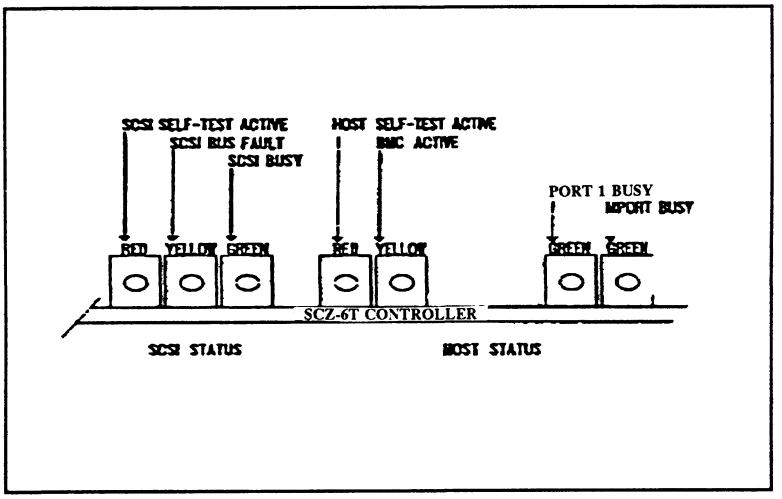


Figure 3.1
LED Status Indicators

3.11 Identifying the Self-test Failure

There are three sets of LEDs that reflect the status of the two parts of the board. The right-most two LEDs report the status of the tape and maintenance port. The middle two 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-6T 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-6T 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-6T 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-6T 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

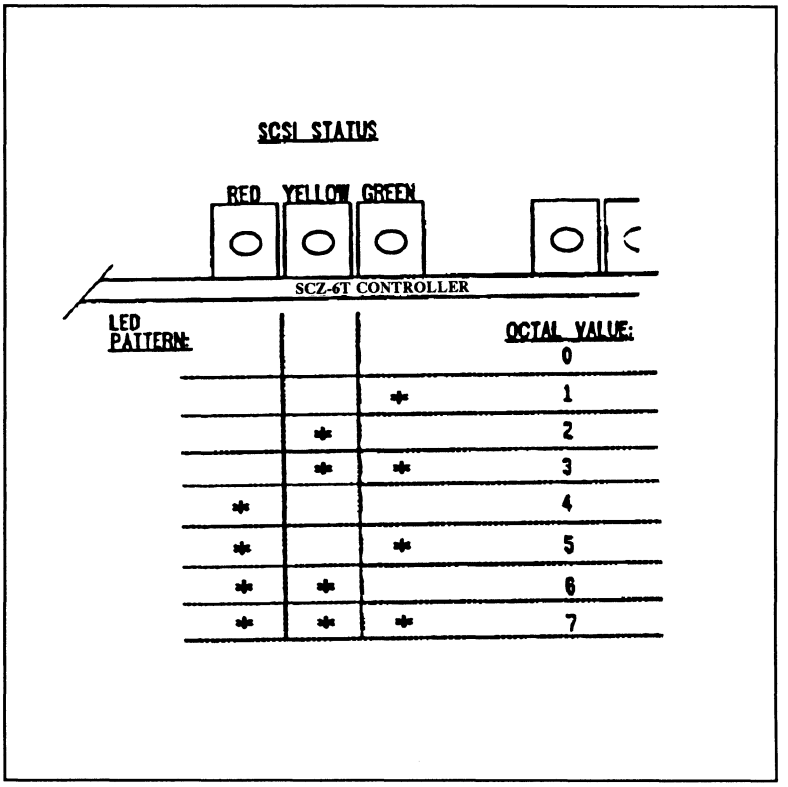


Figure 3.11
Getting an Octal Number from LEDs

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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-6T Tape 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-6T 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, and Reliability programs anytime you suspect trouble with the SCZ-6T 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 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 Reliability program 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 program uses 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 tape error formats are shown below:

```
********************** 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

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

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

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.

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. However, 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-6T Tape 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

3.6 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-6T 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:** _____