

DISTRIBUTED LOGIC CORPORATION

MODEL SQ739

DISK AND TAPE CONTROLLER

INSTALLATION AND OPERATION MANUAL



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INSTALLATION AND OPERATION MANUAL

REVISION B

21-October-91

Update manual for firmware changes



Revisions

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DEC, LSI-11, Micro/PDP-11, PDP-11, MicroVAX II, MicroVAX III, RT-11, RSX, 11M, RSTS/E, DSM(Mumps), Ultrix, MicroVMS, MSCP, TMSCP, MU Driver, DU Driver are registered trademarks of Digital Equipment Corporation.

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1 - Introduction

The SQ739 is a high performance dual-wide Qbus Host Adapter which supports the SCSI interface. The host adapter is compatible with the DEC Mass Storage Control Protocol (MSCP) for disk and tape devices (TMSCP). The host adapter supports the DEC Qbus systems including the 11/23, 11/73, MicroVAX II, MicroVAX III and MicroPDP11 computers. It also supports the DU and MU driver of the associated DEC operating systems including; RT-11, RSX11M, RSX11M+ , RSTS/E, DSM(Mumps), Ultrix, Unix, MicroVMS, and VMS.

The SQ739 can support up to seven (7) SCSI disk or tape nodes with a maximum support of eight (8) mapped logical units. The SCSI implementation supports bus arbitration, disconnect/reconnect, synchronous and asynchronous data transfer with a maximum transfer rate of 4.0MB/sec. The SQ739 features a full 22 bit QBUS DMA addressing capability and supports non-block mode in addition to block mode DMA transfers with a maximum burst rate of 3.3MB/sec.

The host adapter has on-board diagnostic/configuration capability that includes utilities to configure the user defined parameters of the SQ739, format and test SCSI devices, and a mapping menu for selection of logical units. All user defined parameters are stored in non-volatile Electrically Erasable/Programmable ROM (EEPROM) and are retrieved upon power-up of the module. The host adapter also includes boot support of popular devices including DU, MU, MS, MT, DM, DR, DL. Also included is a special FT boot which configures the console device into a virtual terminal for support of the on-board diagnostics.

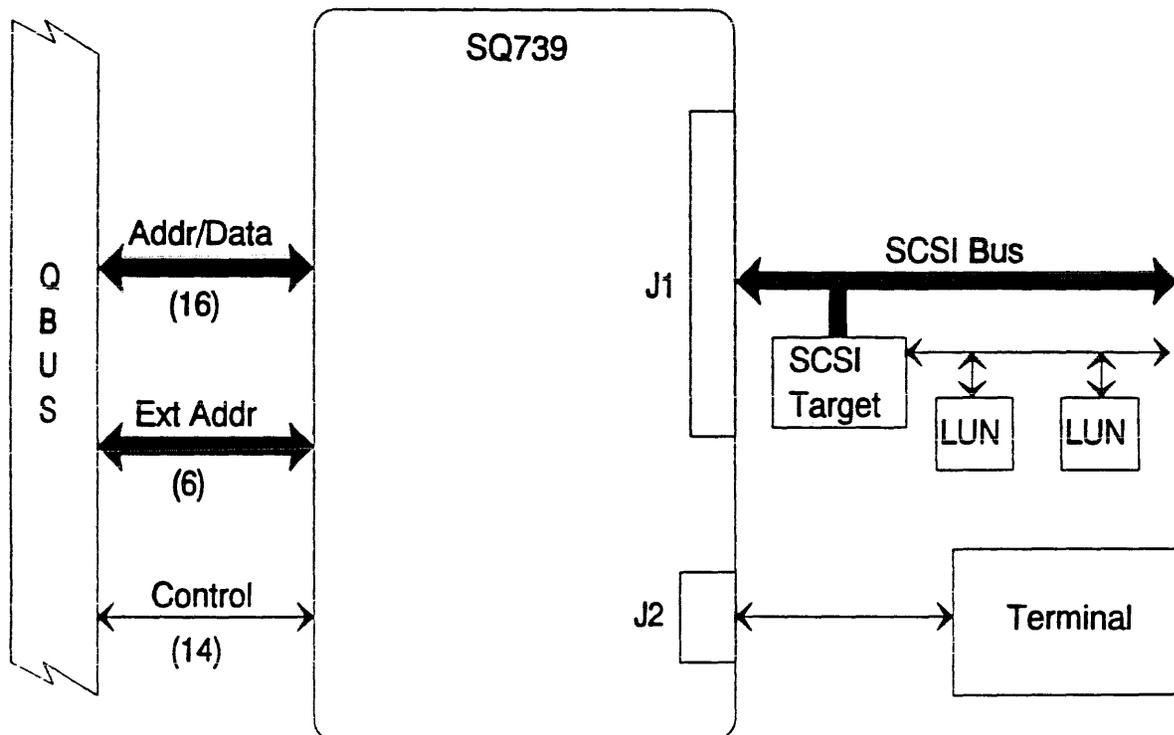


Figure 1 - SQ739 Simplified Diagram

2 - Specifications

Controller Specification

Mechanical:	Dual-Wide Module 5.22 x 8.88 inches
Bus Interface:	DEC Qbus
Addressing:	18 or 22-bit addressing support
IP/SA Address:	DU 172150, 160334, 160340, or user-defined MU 174500, 160404, 160410, or user-defined
Interrupt Vector:	Software Programmable 0 - 774
Interrupt Priority:	Jumper selectable BR4 to BR7
Qbus DMA Burst:	2 to 16 words user-defined, up to 3.3MB/sec
Qbus DMA Mode:	Block Mode or Non-Block Mode
Command Queue:	DU 16 entry command queue with elevator seek algorithm MU 8 entry command queue
Data Buffer:	2KB Fifo
Bootstrap Capability:	Disk DK,DL,DM,DR,DB,DU Tape MT,MS,MU Utility FT
Diagnostic Capability:	Full power-up self-test diagnostics including MicroProcessor, RAMFIFO,Qbus Interface and SCSI Interface. On-Board Configuration/Diagnostic menu supports, format and test of SCSI devices.
Emulation:	DEC MSCP and TMSCP.
Software Support:	Compatible with DU and MU drivers utilized in RT-11, RSX11M, RSX11M+, RSTS/E, DSM11, Unix, Ultrix, MicroVMS, and VMS operating systems. Also compatible with XXDP+ diagnostics ZRCF?? Front End Tests 1 - 8, ZRCD?? Disk Exerciser, ZTKA?? TK50 Front End Tests 1 - 8, and ZTKB?? Tests 1 - 6 TK50 Data Reliability Test.
LED Indicators:	Terminator Power and Self-Test/Activity
I/O Interface:	Single-Ended SCSI (Small Computer Systems Interface) compatible ANSI specification X3T9.2/85-52 Rev 4B for sequential and direct access devices.
Cable Requirements:	Maximum cable length of 6.0 meters with no more than 0.1 meters STUB to connecting devices. Characteristic impedance of 100 ohms +/-10%.
I/O Connectors:	Standard 50 pin flat ribbon connector for SCSI I/O, 10 pin connector for the on-board configuration/diagnostic (RS-232).

SCSI Device Support: Maximum of 7 SCSI NODES using 8 devices with any mix of disk or tape devices.

Multi-Initiator Support: Supports Multi-initiator configurations including TERM PWR support and removable termination.

SCSI Transfer Rate: 3.5 MB/sec Asynchronous, 4.0 MB/sec Synchronous

Operating Temperature:40 to 104 degrees Fahrenheit (5 to 50 degrees Celsius)

Relative Humidity: 10 to 90% Non-condensing

Power Requirements: + 5 Volts at 1.5 Amps
+ 12 Volts at .1 Amps

Controller Characteristics

Mechanical

The SQ739 is fully contained on a single DUAL height module 5.22 inches (13.2cm) wide by 8.88 (22.56) high. The controller utilizes a single dual slot in a Q-BUS backplane minimizing slot utilization.

Base Address

The SQ739 supports the full addressing range of 160000 - 177774 with a combination of switch settings and a user defined selection. The SQ739 has 2 switches with 4 combinations for each emulation. The first three (3) switch combinations selects a pre-defined base address while the last combination selects the user defined address stored in EEPROM.

MSCP Emulation IP/SA Address	172150, 160334, 160340, user-defined
TMSCP Emulation IP/SA Address	174500, 160404, 160410, user-defined

Controller Emulation

The controller emulates the DEC DU and MU devices. The disk emulation responds with RA80, RA81, RA82 RA90, and RA70 drive types depending upon the capacity of the unit selected. The tape emulation responds with TK50 drive type only.

interrupt Vector

The host interrupt vector is host programmable and supports the full range of 0 - 774.

DMA Address Range

The SQ739 supports a full 22-bit address for up to 4M Bytes of addressable memory.

Qbus DMA Burst Rate

The SQ739 supports a burst rate of up to 3.3MB/sec with a maximum allowable burst of 16 words. The burst rate is user defined and is stored in EEPROM.

Qbus DMA Dwell Rate

The SQ739 supports DMA dwell times of 200ns to 3.2us. The DMA dwell rate is user defined and stored in EEPROM.

QBUS Interrupt Priority Level

The interrupt priority level is jumper selectable on the module and supports BR4 to BR7.

SCSI Bus Transfer Rate

The SQ739 supports both asynchronous and synchronous data transfers on the SCSI bus with a maximum transfer rate of 4.0MB/sec. The synchronous transfer rate has been preset on the controller to maximize data throughput for the Qbus.

SCSI Drive Support

The SQ739 supports up to seven (7) nodes on the SCSI bus with up to eight (8) units. The controller supports up to four (4) logical units (LUN) on a single SCSI node and is user defined in EEPROM. The SQ739 supports any combination of disk and tape drives on the SCSI bus.

SCSI Multiple Initiator

The SQ739 supports multiple initiator applications. The host adapter SCSI node ID is user defined and stored in EEPROM.

SCSI I/O Interface

The SQ739 supports the SCSI single-ended interface and utilizes the driver/receiver capability of the NCR 53C90A SCSI Interface Chip. The SCSI bus must be terminated at each end of the cable with 220 ohms to +5 volts and 330 ohms to ground. The SQ739 supports the TERM PWR line (PIN 26) which is required for some applications where termination cannot be accomplished on the devices or host adapters. The termination can be removed on the SQ739 when the module is not a terminating node on the SCSI bus.

SCSI Specification Support

The module supports the ANSI X3T9.2/85-52 Rev 4B & the SCSI-II ANSI X3T9.2/86-109 Rev 10G X3T9/89-042 Command Sets for direct access devices and sequential access devices.

SCSI Single-Ended Cable Requirements

The host adapter supports the single-ended SCSI bus specification of up to 6.0 meters in length with no more than a 0.1 meter stub to any connected device. The ideal impedance match for single-ended SCSI is 132 ohms which, in general, is not available today. Therefore, it is recommended that a cable with a characteristic impedance of 100 ohm +/- 10% twisted-pair be utilized. To minimize impedance mismatch, cables of different impedances must not be mixed on the same SCSI bus. A minimum conductor size of 28 AWG should be used to minimize noise effects.

Suggested non-shielded flat cable: Spectra 455-248-50 Twist-n-Flat

SCSI Single-Ended Pin Assignments

Signal	Pin	Description	Signal	Pin	Description
DB0	2	Data Bus Bit 0	Ground	28	I/O Ground
DB1	4	Data Bus Bit 1	Ground	30	I/O Ground
DB2	6	Data Bus Bit 2	ATN	32	Attention
DB3	8	Data Bus Bit 3	Ground	34	I/O Ground
DB4	10	Data Bus Bit 4	BSY	36	Busy
DB5	12	Data Bus Bit 5	ACK	38	Acknowledge
DB6	14	Data Bus Bit 6	RST	40	Reset
DB7	16	Data Bus Bit 7	MSG	42	Message
DBP	18	Data Bus Parity	SEL	44	Select
Ground	20	I/O Ground	C/D	46	Command/Data
Ground	22	I/O Ground	REQ	48	Request
Ground	24	I/O Ground	I/O	50	Input/Output
TPWR	26	Termination Power			

All odd pins except pin 25 are connected to I/O ground.

I/O Connector

The SQ739 incorporates a single 50-pin flat ribbon connector located at the top of the module for connection to the SCSI peripherals. The mating connector is 3M 3452-5000 or equivalent.

Power Requirements

The SQ739 requires +5 volts +/- 5% at 1.5 amps and +12 volts +/-10% at .100 amps.

Environmental Requirements

Acceptable operating environment for the module is 50 to 104 degrees Fahrenheit with humidity 10 to 90 % non-condensing.

Shipping Weight

The SQ739 is shipped in anti-static packaging with a INSTALLATION AND OPERATION MANUAL. Shipping weight is 5 pounds.

3 - Host Adapter Installation

Refer to Page 11 to install the jumpers and configure the switches for the desired options. Once completed, continue with the following installation procedure.

Ensure that all power has been removed from the system, disks and tapes before installing the host adapter. Damage may result if the host adapter is installed while power is applied.

Select the backplane slot into which the SQ739 is to be installed. There are several backplane assemblies available from DEC and other manufacturers.

Some Qbus based systems utilize a serpentine backplane which has all the slots wired for Qbus in a serpentine fashion starting in the upper left slot and proceeding left to right, down, right to left, down and so on.

Some backplanes also incorporate a C/D bus or MEMORY bus in the C/D connector of the backplane. The host adapter can only be installed in the A/B Qbus Slot for proper operation. If the host adapter is installed in a Q/CD slot, no grant card is required in the CD connector.

Refer to the system manuals for clarification of the type of backplane incorporated in the system.

If the serial port on the adapter is to be connected, connect the serial cable to J2 on the host adapter.

Install the peripheral cable into J1 on the host adapter ensuring that pin 1 of the connector matches.

CAUTION - Damage may result to the peripheral and/or the host if the SCSI cable is installed backwards.

Ensure that the SQ739 is oriented with the components facing ROW 1 of the backplane and gently press both sides until the module connectors are firmly seated in the backplane.

CAUTION - Damage may result to the peripheral and/or the host if the controller is installed backwards.

Connect SCSI cable to the SCSI peripheral ensuring proper orientation of PIN1. Also, ensure that the SCSI bus has been properly terminated at both ends of the cable. Failure to properly terminate the bus can result in system failure or intermittent operation.

Refer to the peripheral manual for proper operating procedure before attempting to apply power to the peripheral and computer system.

Apply power to the system and peripherals. The ACTIVITY led will illuminate if SELF TEST has completed successfully. The SQ739 will continue with self test until the host adapter is initialized by the operating system at which time the led will blink with I/O ACTIVITY.

If a SELF TEST ERROR occurs the activity led will blink an error code (refer to Page 39). The error code will also be output to the RS232 port J2 and will be displayed if a terminal has been connected.

Host Adapter Configuration

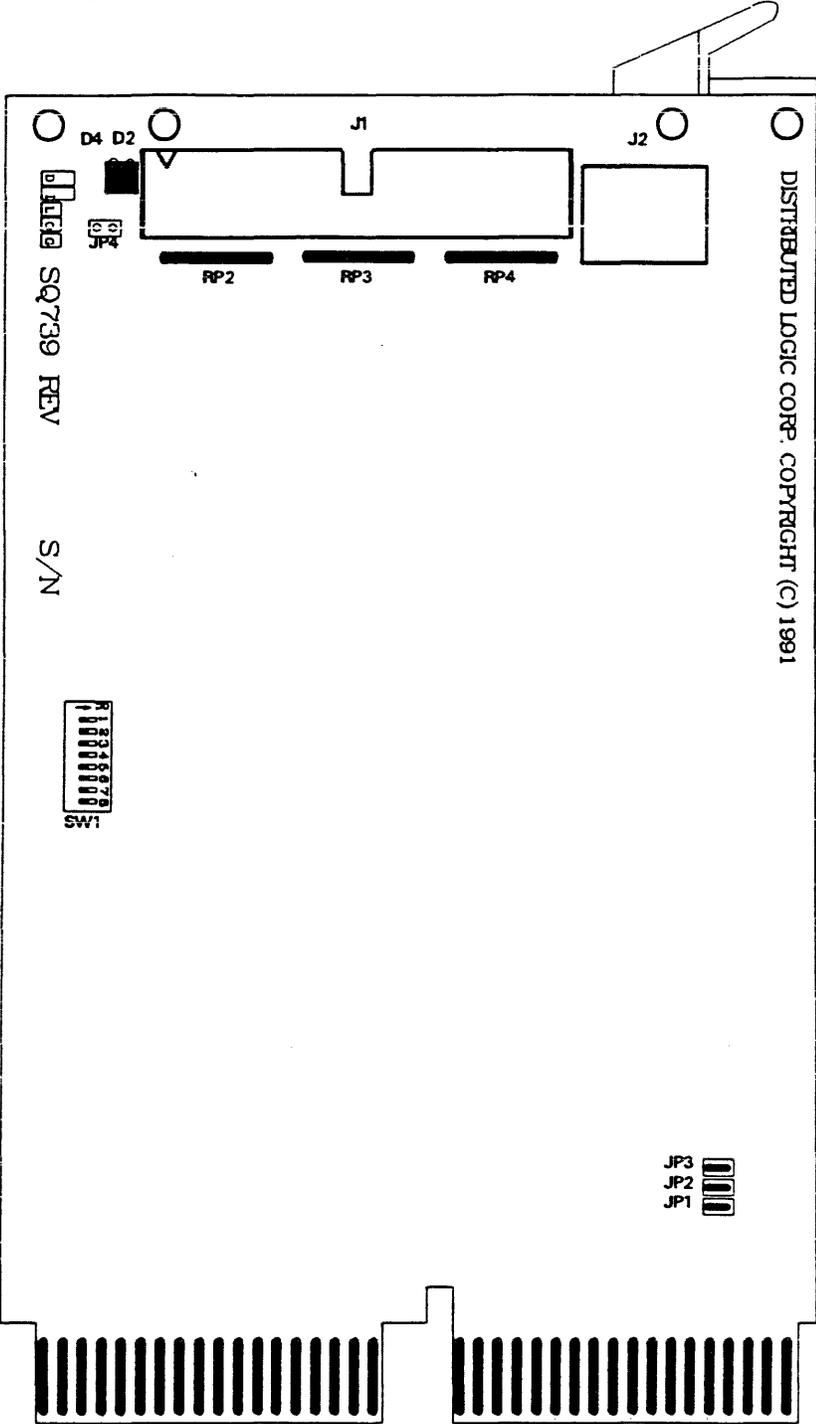


Figure 2 - SQ739 Host Adapter Configuration

Jumper Configuration

Jumper JP1-3

BR Level	JP1	JP2	JP3
BR4 *	IN	IN	IN
BR5	OUT	IN	IN
BR6	IN	OUT	IN
BR7	IN	IN	OUT

Jumper JP4

Shield Ground	JP4
Connected to LOGIC Ground	IN
Disconnected from LOGIC Ground *	OUT

Switch Configuration

IP/SA Base Address

MSCP Base Address	SW1-1	SW1-2
172150*	OFF	OFF
160334	ON	OFF
160340	OFF	ON
User Defined in EEPROM	ON	ON
TMSCP Base Address	SW1-3	SW1-4
174500*	OFF	OFF
160404	ON	OFF
160410	OFF	ON
User Defined in EEPROM	ON	ON

Bootstrap Address/Select

Bootstrap Address	SW1-5
Disabled *	OFF
Enabled	ON
Bootstrap Select	SW1-6
173000*	OFF
175000	ON

AutoBoot Select

Autoboot Select	SW1-7
Disabled *	OFF
Enabled	ON

SW1-8 Not Used

Note - * denotes default settings

4 - Operation

This section of the manual describes the operation of the system, including establishing communication with the host computer, the host adapter and connected peripherals, bootstrapping devices and configuring the host adapter.

Refer to Section 6 for a description of supported diagnostics.

Refer to Section 8 for error codes and description of error log formats.

The On-Board diagnostics can be started via the RS-232 serial port J2 or via the virtual terminal. This section describes the method for using either method.

Serial Port Initiation

Install a serial cable to J2 and connect to a terminal ensuring that the baud rate has been set to 9600 baud, 8 data bits, 1 stop bit and no parity. The serial communication will begin immediately upon power-up or a Qbus INIT. Please note that the system must be in console mode when activating the serial port. Also, upon resumption of normal operation, the serial cable must be removed for proper operation of the host adapter.

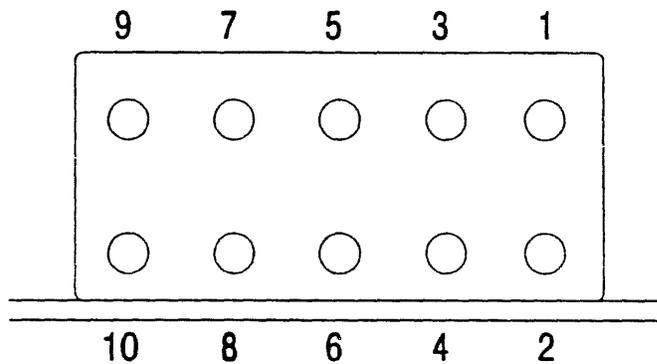


Figure 3 - Serial Port Connector

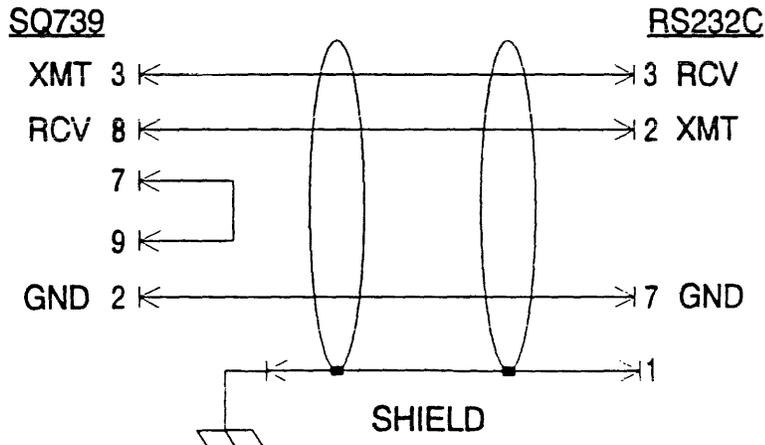


Figure 4 - Cable Pinout

Virtual Terminal Initiation

The virtual terminal is used to communicate between the console of the host computer and the on-board diagnostics via the computer console terminal. The virtual terminal is initiated differently depending upon the type of system. For LSI-11 based systems the virtual terminal can be started via the boot prompt '*'. The procedure for starting the virtual terminal on a MicroVAX system involves depositing keyword values in the SA register.

Virtual Terminal - LSI/11 Based Systems

The virtual terminal utilizes the system console as the terminal for serial communications. The system console must be placed on ODT (Online Debugging Technique) mode. The boot procedure is initiated at the console by entering 775000G or 773000G, depending on which boot address has been selected (see section 3 for details on enabling and selecting the boot address). At this point, the host adapter will respond to the boot attempt by transferring the bootstrap program on-board, to host memory. The system console will respond with a '*' as the boot prompt if the DMA transfer was successful (see section 7 for more information if the prompt does not appear). Once the '*' prompt has been output to the console, enter 'FT' which is the designation for the virtual terminal connection. Immediately, the on-board diagnostic will print the banner and prompt for (C)RT or (P)PRINTER.

Example:

```
@ 775000G          ; start boot procedure
*                  ; prompt is received
* FT<cr>           ; start virtual terminal
```

Dilog On-Board Diagnostic		Model	SQ739
Diagnostic Main Menu		Revision	B
MSCP IP/SA Address	172150	Boot Address	175000
TMSCP IP/SA Address	Disabled	Autoboot	Disabled

(P)printer or (C)RT ? :

An alternate method of starting the virtual terminal involves the deposit of 77777 octal in the host adapters SA register. This can be utilized if the bootstrap has not been enabled. Once the keyword (77777) has been entered, the host adapter will DMA the bootstrap program into host memory. The user must then start the bootstrap program by entering 2000G on the console terminal. The console will then respond with the '*' prompt as in the preceding example.

Example:

```
@ 77772150/000000 0 <cr>
@ 77772152/005400 77777 <cr>
@ 2000G
* FT <cr>
```

The console will respond with the banner as in the preceding example.

Virtual Terminal - MicroVAX II and MicroVAX III

The host adapter does not contain a bootstrap program for the MicroVAX systems. Therefore the user can only initiate the virtual terminal by the deposit of the keyword in the configured SA register. The on board bootstrap MUST be disabled for proper operation of the MicroVAX system.

Upon the power-up of the system, the MicroVAX will enter into self-test diagnostics. Upon successful completion of the diagnostics, the user must enable the I/O map before the on-board diagnostic program can be initiated. The I/O map can alternatively be enabled by booting a non-existent device. Once the I/O map has been enabled, the user must deposit 3FFF into the configured SA register. Once input, the host adapter will DMA the VAX virtual terminal driver to host memory. The user then initiates the virtual terminal by starting execution at location 200. Alternatively, the user can start the program at 218 for GPX (Graphics Workstation) support. If the on-board diagnostic banner does not appear, refer to section 7 for troubleshooting hints.

Example: with IP/SA address of 20001940

```
>>> D/P/L 20088004 80000001 <cr> ; setup I/O map
>>> D/P/W 20001F40 20 <cr> ; enable mapping
>>> D/P/W 20001940 0 <cr> ; write IP to reset host adapter
>>> D/P/W 20001942 3FFF <cr> ; write keyword to initiate DMA
>>> S 200 <cr> ; start virtual terminal driver

or

>>> S 218 <cr> ; start terminal driver for GPX
```

If the virtual terminal is successful, then the following screen will be displayed:

```
-----
Dilog On-Board Diagnostic          Model      SQ739
Diagnostic Main Menu              Revision   B
MSCP IP/SA Address                172150    Boot Address 175000
TMSCP IP/SA Address                Disabled   Autoboot    Disabled
-----
```

(P)printer or (C)RT ? :

Alternatively, the virtual terminal may be initiated by attempting to boot a nonexistent disk drive. This will automatically setup the I/O maps and reset the host adapter. Once the console returns with the 'NO SUCH DEVICE' error message, the user can initiate the virtual terminal by depositing the keyword in the SA register and starting the virtual terminal driver described above.

Example:

```
>>> B DUD0 <cr> ; boot nonexistent drive  
NO SUCH DEVICE  
>>> D/P/W 20001942 3FFF <cr> ; deposit keyword  
>>> S 200 <cr> ; start program
```

IP and SA Addresses

MSCP Emulation

IP REGISTER OCTAL ADDRESS	SA REGISTER OCTAL ADDRESS	IP REGISTER MICROVAX	SA REGISTER MICROVAX
172150	172152	20001468	2000146A
160334	160336	200000DC	200000DE
160340	160342	200000E0	200000E2
160344	160346	200000E4	200000E6
160354	160356	200000EC	200000EE
160360	160362	200000F0	200000F2
160364	160376	200000FC	200000FE

TMSCP Emulation

IP REGISTER OCTAL ADDRESS	SA REGISTER OCTAL ADDRESS	IP REGISTER MICROVAX	SA REGISTER MICROVAX
174500	174502	20001940	20001942
160404	160406	20000104	20000106
160410	160412	20000108	2000010A
160414	160416	2000010C	2000010E
160444	160446	20000124	20000126
160450	160452	20000128	2000012A
160454	160456	2000012C	2000012E

5 - Dialog On-Board Diagnostics

Once the On-Board Diagnostic Menu has been booted, the user must initially input the type of terminal the diagnostic is utilizing. If the (C)rt is entered, the banner will appear at the top of each page and the screen is formatted for appearance. A (P)printer selection will disable the screen formatting to minimize paper usage. There is no default for the terminal type, the user must input a variable to continue.

Upon terminal selection, the main menu will appear and the user must select an item from the menu. If the user inputs a <CR> at any selection prompt, the diagnostic will return to the previous menu. A <CR> input at other prompt times will either return to the previous menu or the default value is used. If at any time the user inputs a CTRL C (^C), the diagnostic will return to the Diagnostic Main menu.

Diagnostic Main Menu

The diagnostic main menu displays the current menus supported by the on-board diagnostics. The user must enter a selection at the prompt to access the lower level menus. A <CR> entered at the main menu prompt will cause a return to the initial (P)printer or (C)RT prompt.

Diagnostic Main Menu

-
- 1 - Controller Utility Menu
- 2 - Controller Configuration Menu
- 3 - Unit Mapping Menu

Enter Selection (CR to Exit) :

Controller Utility Menu

The Controller Utility Menu contains the SCSI I/O utilities currently supported by the diagnostic. The user must select the utility or enter a <CR> to exit and return to the main menu.

Controller Utility Menu

-
- 1 - SCSI Direct Command
- 2 - Write/Read SCSI Unit
- 3 - Format SCSI Unit
- 4 - SCSI Bus Scan

Enter a Selection (CR to Exit) :

Option #1

The SCSI Direct Command allows the user the ability to issue a single SCSI command. This is sometimes useful in troubleshooting or during system configuration to check on the status of the connections to all of the peripherals. The menu item will prompt the user for the NODE ID and the LUN. Once entered, a default 6 byte SCSI command is displayed and the user is prompted for any changes. Changes to the SCSI CDB (Command Data Block) are entered as HEX bytes ONLY. If the user inputs an INVALID character, the program will display an error message and prompt again. Once all bytes have been modified, the user will be prompted to enter any data that is to be written,

then Execute SCSI Command. A (Y)es answer will execute the SCSI command, a (N) will return the user to the NODE ID prompt.

Example:

```
SCSI Direct Command
-----
SCSI Node [00] : 0<CR>
SCSI LUN  [00] : 0<CR>

Bytes in CDB (hex) 06
SCSI CDB Byte 00-00,00,00,00,00,00

Any Changes (Y/N) ? N<CR>
Any Data to Write (Y/N) ? N<CR>
Execute SCSI Command (Y/N) ? Y<CR>

Completed with no Errors

More Commands (Y/N) ? N<CR>

*** <CR> to Continue ***
```

Option #2

The WRITE/READ SCSI UNIT menu item allows the user to test a SCSI unit. The utility supports both disk and tape units and determines unit type before testing. The utility will first prompt the user for NODE ID and the LUN of the required unit. Once the NODE ID and LUN have been input, the utility will select the unit and determine unit type (disk or tape) and select the proper test for the unit. The tape exerciser will write/read a 63K byte record to the unit. The disk exerciser will write/read a pattern across the disk surface sequentially. Either test is aborted by entering a CTRL C (^C) which returns to the Diagnostic Main menu.

Example:

```
Write/Read SCSI Unit
-----
SCSI Node [00] : 0<CR>
SCSI LUN  [00] : 0<CR>

Testing Unit: SEAGATE ST125N

Length of Test (Continuous/Long(1-5 minutes)/Quick) ? Q<CR>
Read Only Test (Y/N) ? N<CR>
Write/Read Test

WARNING - Data will be overwritten<beep>

Proceed (Y/N) ? Y<CR>

SEAGATE ST125N

Write Test Started
Press <Control-C> to abort
Write Test Completed
Read Test Started
Press <Control-C> to abort
Read Test Completed

**** CR to Continue ****
```

Option #3

The SCSI Format Unit menu item allows the user to select and format a specified SCSI unit. The user will enter the NODE ID and the LUN of the unit. Once the NODE ID and LUN have been entered, the utility will scan the device and display the type of device selected. The user will be prompted with a warning message. The utility will format the selected unit and display any errors that are encountered.

Example:

```
Format SCSI Unit
-----
SCSI Node [00] : 0<CR>
SCSI LUN  [00] : 0<CR>

Testing Unit: SEAGATE ST125N

WARNING - Data will be overwritten<beep>

Proceed (Y/N) ? Y<CR>

Format Started

Completed with no Errors

**** CR to Continue ****
```

Option #4

The SCSI Bus Scan menu item allows the user to scan the attached SCSI bus for all devices and display the manufacturer and model of each device found. The utility scans each node starting with 0 and cycles through each logical unit (0 thru 3) on each node. The utility will display each node/LUN combination that is present on the SCSI bus. The utility does not prompt the user for any input.

Example:

```
SCSI Bus Scan
-----
Node  LUN  Type  Current Device
-----
  0    0   Disk  SEAGATE ST125N
  1    0           Not Found
  2    0           Not Found
  3    0           Not Found
  4    0           Not Found
  5    0           Not Found
  6    0           Not Found
  7    0   Host  DILOG SQ739

**** CR to Continue ****
```

Controller Configuration Menu

The **Controller Configuration Menu** contains the utility to change the configuration of the host adapter pertaining mainly to the QBUS interface. The utility allows the enabling/disabling of emulations, user defined address, burst and dwell rate, etc.. The user will be prompted for any changes to the current setup. The user can respond with Y, N or D. The D input will cause the default values to be used. If a Y or D was input, the user will be prompted to save the changes. A (Y)es answer will write the values to the EEPROM for storage. A (N)o will return to the utility menu. Once the data has been saved to EEPROM, the diagnostic will return to the utility menu.

The **Emulation (E/D)** prompt is used to enable/disable the specific emulation. If disabled, the selected QBUS address will not respond to the host processor and all SCSI nodes mapped to the emulation will not be utilized. The **User Defined IP/SA Address** is used to select the address that will be used when the switches are selected for user defined(i.e. SW1-3 and SW1-4 ON). This allows any address to be specified in the range 160000 - 177774 while maintaining a quick method of setup for the first three(3) common address's.

The **DMA Burst Size** prompts the user for the number of words transferred during one DMA operation. The user can input from 2 to 16. It is recommended that the burst rate be limited to 8 with older controllers which may not have adequate buffering.

The **DMA Dwell Count** is used to set the time to wait between dma bursts. This time period allows other DMA devices on the QBUS to transfer data to host memory. The allowable values are from 1 to 16 which allows for a dwell of between 200ns and 3.2us. It is recommended that a larger dwell count be utilized if the QBUS contains many PIO or interrupt driven controllers.

The **Fast File Search** prompt is used to enable the fast file search capability of **8MM Helical Scan Devices**. With this feature enabled, the tape unit will space in high speed search mode between tape marks allowing for a x10 increase in throughput. **NOTE** - a correctly reported TMSCP tape position is not possible. As most stand-alone backup programs require correct tape position to be returned to the host, it is recommended that the feature be disabled. The microcode does include an automatic enable during operating system startup that will override the EEPROM variable. This allows the operating system to take full advantage of the increase in throughput while still maintaining compatibility with the stand-alone backup utilities.

Auto Configuration on the SCSI Bus into MSCP/TMSCP Units on Boot allows self-configuring of the SCSI bus devices. Note : All devices must be powered on and able to respond to a SCSI bus inquiry command at boot time. Any devices not found at that time cannot be added without rebooting the system.

(The default values for the controller configuration are outlined in the example below)

Example:

Controller Configuration Menu

```
-----  
MSCP Emulation (E/D)           [ Enabled ] :  
User Defined MSCP IP/SA Address [ 172150 ] : set in switch  
TMSCP Emulation (E/D)          [ Enabled ] :  
User Defined TMSCP IP/SA Address [ 174500 ] : set in switch  
Dma Burst Size                  [16] :  
Dma Dwell Count (x200ns)        [01] :  
Fast File Search (E/D)          [Disabled] :  
Auto Configure SCSI Bus into  
MSCP/TMSCP Units on Boot (E/D) [Disabled] :
```

Any Changes (Y/N/Default) ? D<CR>

Save Changes (Y/N) ? Y<CR>

Unit Mapping Menu

The Unit Mapping Menu is used to map the SCSI devices to MSCP and/or TMSCP unit numbers. The SQ739 supports mapping of any SCSI node to any (T)MSCP unit number in the range 0 to 252. The user can specify a SCSI NODE ID and LUN to be mapped along with the device type and the (T)MSCP unit number. This information is stored in EEPROM and used on power-up to configure the host adapter. The utility supports a default setup mode (D) at the Changes prompt which will map SCSI NODE 0 to MSCP unit 0 and set the host adapter NODE ID to 7. If the user enters a <CR> at the select item prompt, all entries have been completed and the diagnostic will then prompt to save the changes. The user must respond with a (Y)es or (N)o to continue. If a device is ready at the specified SCSI node, information about the drive will be displayed. Otherwise, "Not Found" will be displayed.

Note : If the Auto-configure option has been enabled, the current unit mapping is not displayed. Instead, the devices on the SCSI bus are polled and displayed as they will be mapped if the system is booted. If the Auto-Configure option is disabled, the current unit mapping will be used again.

Example:

Unit Mapping Menu

```
-----  
Item  Node  LUN   (T)MSCP   Type  Device Name  
-----  
1      0      0     DU000     Disk  SEAGATE ST125N  
2                      (Item not Mapped)  
3                      (Item not Mapped)  
4                      (Item not Mapped)  
5                      (Item not Mapped)  
6                      (Item not Mapped)  
7                      (Item not Mapped)  
8                      (Item not Mapped)  
9      7                      Host  DILOG SQ739
```

Any Changes (Y/N/Default/Remove/Scan) ? Y<CR>

Select Item : 1<CR>
Disk or Tape : D<CR>
SCSI Node [01] : 1<CR>
SCSI LUN [00] : 0<CR>
MSCP Unit Number [001] : 151<CR>

Select Item (CR to end) : <CR>

Unit Mapping Menu

Item	Node	LUN	(T)MSCP	Type	Device Name
1	0	0	DU000	Disk	SEAGATE ST125N
2	1	0	DU151	Disk	Not Found
3			(Item not Mapped)		
4			(Item not Mapped)		
5			(Item not Mapped)		
6			(Item not Mapped)		
7			(Item not Mapped)		
8			(Item not Mapped)		
9	7			Host	DILOG SQ739

Save Changes (Y/N) ? Y<CR>

Unit Mapping Menu

Item	Node	LUN	(T)MSCP	Type	Device Name
1	0	0	DU000	Disk	SEAGATE ST125N
2	1	0	DU151	Disk	Not Found
3			(Item not Mapped)		
4			(Item not Mapped)		
5			(Item not Mapped)		
6			(Item not Mapped)		
7			(Item not Mapped)		
8			(Item not Mapped)		
9	7			Host	DILOG SQ739

Any Changes (Y/N/Default/Remove/Scan) ? R<CR>

Select Item to Delete (CR to end) : 2<CR>

Select Item to Delete (CR to end) : <CR>

Unit Mapping Menu

Item	Node	LUN	(T)MSCP	Type	Device Name
1	0	0	DU000	Disk	SEAGATE ST125N
2			(Item not Mapped)		
3			(Item not Mapped)		
4			(Item not Mapped)		
5			(Item not Mapped)		
6			(Item not Mapped)		
7			(Item not Mapped)		
8			(Item not Mapped)		
9	7			Host	DILOG SQ739

Save Changes (Y/N) ? Y<CR>

Unit Mapping Menu

Item	Node	LUN	(T)MSCP	Type	Device Name
1	0	0	DU000	Disk	SEAGATE ST125N
2	1	0	MU000	Tape	EXABYTE EXB-8200

Auto Configure Option Enabled

**** CR to Continue ****

The proper selection of a SCSI NODE ID on a peripheral device is important to the overall performance of the system. Be advised that the SCSI bus has an arbitration priority scheme that gives the highest priority device to NODE 7 and the lowest to NODE 0. It is therefore recommended that the amount of activity on a SCSI device should be the determining factor when selecting the SCSI node ID. If the system is configured for 4 disk devices and a single tape device, place the SCSI tape device at a lower priority than the SCSI disk devices. The disks should also be configured dependent upon the I/O activity of the device. For example, the system disk should always be the highest priority SCSI peripheral to guarantee a minimum throughput under heavy I/O activity. With the flexibility of the SCSI Mapping Menu on the SQ739, maximum I/O throughput can be maintained for any given configuration.

6 - Host Based Diagnostics

The SQ739 supports a variety of DEC diagnostics to functionally test the host adapter. This section describes the procedure for the setup and execution of the supported diagnostics.

Startup - LSI/11 Systems

Install the host adapter as described in the Section 3. Apply power to the system and verify that both LED's on the SQ739 are ON (refer to section 7 for troubleshooting if either LED's fail to light). Install the XXDP+ diagnostic medium into the drive and boot the system. When booting has completed successfully, the XXDP+ sign-on message will appear.

```
XXDP-SM Small Monitor Version 2
Boot from XXX (where XXX is the boot device)
28kw Memory
Qbus System
```

```
Restart Addr: 152010
This is XXDP-SM Type "H" or "H/L" for Help
```

Disk Emulation Diagnostics

The MSCP emulation of the SQ739 supports two (2) DEC RC25 diagnostics including the ZRCF?? Front End Test and the ZRCD?? Disk Exerciser. The host adapter also supports a limited number of MDM diagnostics for the DEC KDA50-Q controller.

Front End Test - ZRCFB3

The host adapter supports tests 1 thru 8 of the ZRCFB3 diagnostic. These tests will initialize the host adapter and extensively test the interrupt and DMA capability. Once the XXDP+ prompt has appeared ".", start the diagnostic by entering:

```
.R ZRCFB3 <cr>
```

The system will echo the filename and load the file from the boot medium.

```
.R ZRCFB3
ZRCFB3.BIN
```

Once the diagnostic has been loaded, the diagnostic startup message will appear at the console device.

```
DRSSM-F0
CZRCF_A_0
RC25 Front End/Host Diagnostic
Unit is AZTEC RC25 Platter
RSTRT ADR 145676
```

```
DR>
```

The diagnostic is started by entering the following command line:

```
DR>STA/FLA:PNT:HOE/TES:1-8<CR>
```

The above command line instructs the diagnostic supervisor to run only tests 1 through 8, printing the total number of passes and halting in the case of an error. The supervisor will then prompt for hardware or software changes.

```
Change HW (L) ?
```

The diagnostic must be informed of the new hardware parameters of the system under test. Enter the following:

```
Change HW (L) ? Y<CR>
```

Enter the number of host adapters which are to be tested.

```
# Units (D) ? 1<CR>
```

The diagnostic will then prompt the user to enter the following for the number of units that have been selected:

```
Unit 0
IP Address (o) 172150 ? <CR>           ; or configured IP address
Vector (o) 154 ? <CR>
BR Level (o) 5 ? 4<CR>                 ; or selected BR level
Platter Address(es) (D) ? 0<CR>        ; always enter 0
```

The platter address is the unit number of the disk under test. Since the host adapter does not support the tests which require a disk, this question is irrelevant but must be answered before the diagnostic will start. Once the hardware questions have been answered, the supervisor will prompt for any software changes:

```
Change SW (L) ?
```

The software question will always be answered NO because the host adapter DOES NOT support the test which require a disk drive.

```
Change SW (L) ? N<CR>
```

The diagnostic will print each test as it runs and will inform the user of any errors encountered. The test can be stopped at any time by typing a CTRL C. For Example,

```
Testing Unit #: 0      IP_Register: 172150      Platter #: 0

Test 1      Register Existence Test
Test 2      Step 1 Read/Write Powerup Diagnostics
Test 3      Diagnostic Wrap Test
Test 4      Vector and BR Level Test
Test 5      Step 1-3 read/Write Diagnostic
Test 6      Purge Poll Test
Test 7      Small Ring Test
Test 8      Large Ring Test
```

When the diagnostic has completed all the tests, the end of pass message will be printed and the diagnostic will restart until a CTRL C is executed. The diagnostic supervisor can be exited by typing EXIT at the DR> prompt.

```
DZRCF EOP    1
           0  Total Errors
```

```
^C
DR>EXIT<CR>
```

Disk Exerciser - ZRCDA1

The host adapter is compatible with the DEC RC25 multi-drive exerciser ZRCD??. The diagnostic will initialize the host adapter and exercise the disk drives by issuing random LBN's with random byte counts. This diagnostic also supports up to four (4) host adapters and four (4) units on each host adapter.

Start the diagnostic when at the XXDP+ prompt "." by issuing the following command line:

```
.R ZRCDA1<CR>
```

The system will echo the filename during the loading process.

```
.R ZRCDA1<CR>
ZRCDA1.BIN
```

Once the diagnostic has been loaded, the startup message will appear at the console device:

```
DRSSM-F0
CZRCD_A_0
RC25 Disk Exerciser
Unit is Single RC25 Platter
RSTRT ADR 145676
```

```
DR>
```

The ZRCDA1 diagnostic requires a patch to load the proper unit size from the host adapter.

	<u>Address</u>	<u>Value</u>	<u>Change To</u>
Patch 1	26070	16237	12737
	26072	50	143326
Patch 2	30644	1003	1367
Patch 3	30704	1003	1367
Patch 4	37552	1416	240

Start the test after the diagnostic supervisor prompt DR> appears at the console device.

```
DR>STA/FLA:HOE<CR>
```

The above command line instructs the diagnostic supervisor to begin execution of the diagnostic. The supervisor will then prompt for hardware or software changes.

```
Change HW (L) ?
```

The diagnostic must be informed of the new hardware parameters of the system under test. Enter the following:

Change HW (L) ? Y <CR>

Enter the number of host adapters which are to be tested.

Units (D) ? 1 <CR>

The diagnostic will then prompt the user to enter the following for the number of units that have been selected:

Unit 0
IP Address (o) 172150 ? <CR> ; or configured IP address
Vector (o) 154 ? <CR>
BR Level (o) 5 ? 4 <cr> ; or selected BR level
Platter Address (Unit Plug) (D) 0 ? <CR>
Allow Writes To Customer Data Area on this Platter (L) ? Y <CR> ; enable writes

** WARNING - CUSTOMER AREA MAY BE OVERWRITTEN ! ...
CONFIRM (L) ? Y <CR>

The platter address is the unit number of the disk drive under test. The customer data area is the host data area of the disk drive and is used to test the controller. Backup any data on the disk drive, if necessary, before continuing with the diagnostic.

After the hardware questions are answered, the supervisor will prompt the user for any software changes:

CHANGE SW (L) ?

The user can take the default software values because the drives are larger than an RC25. If the tests are being run on a smaller unit, some of the software values may have to be changed to prevent errors from occurring.

If the selected unit is fully formatted, use the default values by typing NO to the software query:

CHANGE SW (L) ? N <CR>

To change the software default values, answer YES to the software query:

CHANGE SW (L) ? Y <CR>

The user will then be prompted by the supervisor to input the following information:

ERROR LIMIT (0 FOR NO LIMIT) (D) 32? <CR>

Enter the error limit that must be reached before a unit is deselected by the diagnostic. The default value of 32 is used.

TRANSFER LIMIT IN MEGABYTES (0 FOR NO LIMIT) (D) 2? <CR>

Enter the number of bytes to be transferred between the controller and the diagnostic. Effectively, this selects the time required to reach an END OF PASS.

SUPPRESS PRINTING ERROR LOG MESSAGES (L) ? <CR>

The default value should be used unless multiple errors occur and more information is required to resolve the problem.

RUN DM EXERCISER INSTEAD OF MULTI-DRIVE SUBTEST (L) N? <CR>

The default must always be taken because the controller does not support Diagnostic Mode (DM) of operation.

RANDOM SEEK MODE (L) Y ? <CR>

The best possible test is to seek randomly across the entire disk surface. Therefore, the default value should be used.

STARTING TRACK (L) Y ? <CR>

The starting track number is to be entered. Because the controller does not emulate the RC25, the questions regarding starting and ending track numbers do not apply. If the unit under test is fully formatted and is more than 40 megabytes, the diagnostic will not overflow the cylinder address.

ENDING TRACK (D) 1641? <CR>

Enter the ending track number. If the unit is larger than an RC25 unit (40 megabytes), the default can be used.

READ-COMPARES PERFORMED AT THE CONTROLLER (L) Y? <CR>

A "Yes" typed here will cause the controller to compare the data read with host memory.

THE REMAINING QUESTIONS APPLY ONLY TO UNPROTECTED PLATTERS.

The user can use the default values for the remaining questions.

WRITE ONLY (L) N? <CR>

The disk drive under test is never a write only disk; therefore, always take the default.

WRITE-COMPARES PERFORMED AT THE CONTROLLER (L) N? <CR>

The controller will perform write checks if the default is taken.

CHECK ALL WRITES AT HOST BY READING (L) Y? <CR>

The diagnostic will NOT issue read commands to check the data just written if the default is taken. Otherwise, the diagnostic software will perform the write check function.

USER DEFINED DATA PATTERN (L) N? <CR>

The data pattern used in the diagnostic is worst case. To ensure prompt testing, always use the default value.

SELECT PREDEFINED DATA PATTERN (0 FOR SEQUENTIAL SELECTION) (D) 0: <CR>

Always use the default value.

The test will begin after the hardware and software questions are answered.

INIT SUBTEST START

ABOUT TO VERIFY VECTOR 154(O) FOR DEVICE 172150(O) ... COMPLETED

The diagnostic will run until the transfer limit is reached. After the limit has been reached, the diagnostic will print status information about the unit under test and display the END OF PASS:

CZRCD EOP 1
0 TOTAL ERRORS

Tape Emulation Diagnostics

The TMSCP emulation of the SQ739 supports two(2) DEC TK50 diagnostics including the ZTKA?? Front End Test and the ZTKB?? Reliability Test. The host adapter also supports a limited number of MDM diagnostics for the DEC TK50 controller.

Front End Test for TK50 - ZTKAC0

Start the diagnostic when at the XXDP+ prompt "." by issuing the following command line:

```
.R ZTKAC0<CR>
```

The system will echo the filename during the loading process.

```
.R ZTKAC0<CR>  
ZTKAC0.BIN
```

Once the diagnostic has been loaded, the startup message will appear at the console device:

```
DRSSM-F0  
CZTKA_C_0  
TK50 Front End Test  
Unit is TK50Q  
RSTRT ADR 145676
```

```
DR>
```

The ZTKAC0 diagnostic requires a patch to load the proper unit size from the host adapter.

	<u>Address</u>	<u>Value</u>	<u>Change To</u>
Patch 1	44154	16537	12737
	44156	2260	0

Start the test after the diagnostic supervisor prompt DR> appears at the console device.

```
DR>STA/FLA:PNT:HOE/TES:1-8<CR>
```

The above command line instructs the diagnostic supervisor to begin execution of the diagnostic running tests 1 to 8 only, printing the total number of passes and halting in the case of an error. The supervisor will then prompt for hardware or software changes.

```
Change HW (L) ?
```

The diagnostic must be informed of the new hardware parameters of the system under test. Enter the following:

```
Change HW (L) ? Y<CR>
```

```
# UNITS (D) ? 1<CR>
```

```
UNIT 0
```

```
TKIP ADDRESS (O) 174500 ? <CR> ; or configured IP address.
```

```
TK VECTOR (O) 260 ? <CR>
```

T/MSCP UNIT NUMBER (O) 0 ? <CR>

CHANGE SW (L) ?

The diagnostic will then prompt for any software switch register changes to be entered. The diagnostic does not require any changes, enter NO.

CHANGE SW (L) ? N <CR>

The diagnostic will print each test as it runs. Tests 1 to 8 perform the functions described below.

- TEST 1 - REGISTER EXISTENCE TEST
- TEST 2 - DIAGNOSTIC WRAP TEST
- TEST 3 - STEP 1-3 INITIALIZATION TEST
- TEST 4 - VECTOR AND INTERRUPT TEST
- TEST 5 - BR LEVEL TEST
- TEST 6 - PURGE AND POLL TEST
- TEST 7 - LARGE RING TEST
- TEST 8 - EXTENDED ADDRESS TEST

To stop the execution of the diagnostic, type a CTRL-C (^C). To exit the diagnostic supervisor, enter EXIT at the DR prompt.

DR>EXIT<CR>

program will return to the XXDP+ prompt

TK50 Data Reliability Test - ZTKBB0

The SQ739 supports the TK50 Data Reliability diagnostic test 1 to 6 only. These tests will check the data reliability of the subsystem by performing several read, write and repositioning functions. Start the diagnostic when at the XXDP+ prompt "." by issuing the following command line:

.R ZTKBB0<CR>

The system will echo the filename during the loading process.

.R ZTBBC0<CR>
ZTKBB0.BIN

Once the diagnostic has been loaded, the startup message will appear at the console device:

CZTKBB0 TK50 Data Reliability Test
Unit is TK50
RSTRT ADR 145676

DR>

The diagnostic is started by entering the command line:

DR>START/FLAG:PNT/TEST:1-6<CR>

This command instructs the diagnostic supervisor to start the diagnostic and run test 1 through 6 only, printing the total number of passes and halting in the case of an error.. The supervisor will

then prompt for hardware and software changes. The user must enter the number of units under test.

CHANGE HW (L) ? Y<CR>

UNITS (D) ? 1<CR>

UNIT 0

TKIP ADDRESS (O) 174500 ?<CR>

TK VECTOR (O) 260 ? <CR>

T/MSCP UNIT NUMBER (O) 0 ?<CR>

CHANGE SW (L) ? Y<CR>

ENABLE TIME OF DAY CLOCK (L) N ? <CR>

CHANGE CONTROLLER PARAMETERS (L) N ?<CR>

CHANGE PRINTING PARAMETERS (L) N ? <CR>

CHANGE TEST PARAMETERS (L) N ? Y<CR>

DATA PATTERN (O) 0 ?<CR>

RUN TEST 3 ONLY (L) Y ? N<CR>

ENABLE DATA COMPARES IN TEST 5 (L) N ?<CR>

ENABLE PRINT READ BUFFER IN TEST 5 (L) N ?<CR>

CHANGE COMMAND SEQUENCE (L) N ?<CR>

The diagnostic will print each test header as it is run. Tests 1 through 6 perform the functions described below.

TEST 1 - BASIC FUNCTION TEST

TEST 2 - QUICK VERIFY READ/WRITE TEST

TEST 3 - COMPLEX READ/WRITE TEST

TEST 4 - WRITE INTERCHANGE TEST

TEST 5 - READ UNKNOWN TAPE

TEST 6 - START/STOP WRITE/READ TEST

To stop execution of the diagnostic, type a CTRL-C (^C) at the console.

To exit the Data Reliability test type EXIT at the DR prompt as shown below.

DR>EXIT<CR>

MicroVAX II System Diagnostics

MDM Diagnostic for Tape

The SQ739 host adapter does support and is compatible with the following MicroVAX II MDM diagnostics listed below.

Service Functional (1-11)	- Run tests 1-8 only
Verify Functional (1)	- Run tests 1-8 only

For additional information regarding MDM diagnostics, refer to the MicroVAX Diagnostic Monitor Users Guide, order number AA-FM7SB-DN.

MDM Diagnostics for Disk

NONE SUPPORTED

7 - Errors and Troubleshooting

The SCSI cable that connects the host adapter to the drives must be terminated at both ends. Since the host adapter is already terminated, this must be one end of the cable. If several drives are attached to the cable, the drive at the end of the cable must be the only drive with termination.

If you are experiencing problems, option 1 of the configuration menu allows a single SCSI command to be given directly to the drive. This is documented in Section 5.

For example, a SCSI Test Unit Ready command is as follows:

6 bytes - 0,0,0,0,0,0

Enter and execute this command. If it cannot be executed, the system may return SCSI Request Sense command information. Consult the drive manual to decode this information. NOTE: After a SCSI bus reset, the SCSI Test Unit Ready command will usually return an error indicating that the bus was reset. Execute the SCSI command again to clear this error.

The SCSI Request Sense command information returned from a SCSI command that failed is error status returned from the drive. This allows drive vendors to give general SCSI status and vendor unique information. General SCSI status is summarized in the four bits of word three of the returned information. This is called the SENSE KEY and is as follows:

- 0 - NO SENSE. No specific information to return
- 1 - RECOVERED ERROR. Last command completed successfully but with some drive recovery action.
- 2 - NOT READY. Drive not ready.
- 3 - MEDIUM ERROR. Media error.
- 4- HARDWARE ERROR. Drive has detected a hardware fault.
- 5 - ILLEGAL REQUEST. The SCSI command is incorrect for the drive.
- 6 - UNIT ATTENTION. SCSI bus was reset or drive media was changed.
- 7 - DATA PROTECT. Drive is write protected.

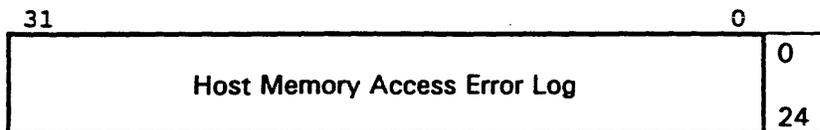
Consult the drive manual for additional Request Sense information to further isolate the problem.

Symptom	Check
Controller address not found	<ul style="list-style-type: none"> - Is emulation enabled in Diagnostic Main Menu ? - Is correct IP/SA address set in switch or Diagnostic Main Menu ? - Is self-test light on ?
SCSI device not found	<ul style="list-style-type: none"> - Is SCSI cable connected ? - Is SCSI cable connection inverted ? - Is device at a unique node address ? - Is the termination power LED on ? - Is device mapped into (T)MSCP unit in Diagnostic Main Menu ? - Is device found using SCSI bus Scan in Diagnostic Main Menu ?
Data errors	<ul style="list-style-type: none"> - Is SCSI cable terminated at both ends ? - Is SCSI cable length greater than 18 feet ? - Is SCSI drive power source adequate ?

8 - Error Logs

The error logs that are generated by the host adapter conform to the MSCP and TMSCP specification. The host/device dependent area contains information saved by the host adapter about the specific error. This information can then be used to aid the user in troubleshooting the problem. The format of the error log is consistent throughout the section. The error log outline contains the contents of the error log while the boxes at the far left are the BYTE OFFSET of the longword.

Host Memory Access Error Log



Controller Dependent Information

Host DMA Address		Q Status	28	
Buffer Low	Byte Count		Modifiers	32
Undefined	Burst	Dwell	Buffer Hi	36

Disk Transfer Error Log

MSCP Disk Transfer Error Log				0
				16
Undefined		CDB Size	Ucode Rev	20
CDB Byte 3	CDB Byte 2	CDB Byte 1	CDB Byte 0	24
Unit ID		CDB Byte 4	CDB Byte 3	28
CDB Byte 8	CDB Byte 7	CDB Byte 6	CDB Byte 5	32
SCSI Inquiry Byte 16 to 19				36
Logical Block Number				40

Controller Dependent Information Request Sense Command Information

				0
Byte 14	Byte 13	Byte 12	Sense Key	44
Byte 18	Byte 17	Byte 16	Byte 15	48
Byte 22	Byte 21	Byte 20	Byte 19	52
Not Used	Internal Error	Byte 24	Byte 23	56

- Internal Error = 01H SCSI Check Condition
 = 02H SCSI Parity Error
 = 03H QBUS NXM Error
 = 04H Reassign Bad Block Executed
 = 06H Odd Byte Count Error
 = 07H Odd Address Error
 = 08H Invalid Logical Block Number (LBN)
 = 09H SCSI Target did not respond
 = 0AH SBIC Fatal Error
 = 0BH SCSI Bus Reset Detected
 = 0DH SCSI Parity Error (Recoverable)
 = 13H Operation Timeout
 = 15H SCSI Device Busy Timeout
 = 16H Self Test Error
 = 19H Fatal Port Error
 = 1AH Fatal Controller Error

Disk SDI Error Log

MSCP Disk Transfer Error Log				0
				16
Undefined		CDB Size	Assy Rev	20
CDB Byte 3	CDB Byte 2	CDB Byte 1	CDB Byte 0	24
Unit Number		CDB Byte 4	CDB Byte 3	28
CDB Byte 8	CDB Byte 7	CDB Byte 6	CDB Byte 5	32
SCSI Inquiry Bytes 16 to 19				36
Logical Block Number				40

Controller Dependent Information Request Sense Command Information

Request Sense Command Information				0
Byte 14	Byte 13	Byte 12	Sense Key	44
Byte 18	Byte 17	Byte 16	Byte 15	48
Byte 22	Byte 21	Byte 20	Byte 19	52
Not Used	Internal Error	Byte 24	Byte 23	56

- Internal Error = 01H SCSI Check Condition
 = 02H SCSI Parity Error
 = 03H QBUS NXM Error
 = 04H Reassign Bad Block Executed
 = 06H Odd Byte Count Error
 = 07H Odd Address Error
 = 08H Invalid Logical Block Number (LBN)
 = 09H SCSI Target did not respond
 = 0AH SBIC Fatal Error
 = 0BH SCSI Bus Reset Detected
 = 0DH SCSI Parity Error (Recoverable)
 = 13H Operation Timeout
 = 15H SCSI Device Busy Timeout
 = 16H Self Test Error
 = 19H Fatal Port Error
 = 1AH Fatal Controller Error

Tape Transfer Error Log

31	0	
TMSCP Tape Transfer Error Log		0
		32
Current Tape Position		36
		40

CONTROLLER DEPENDENT INFORMATION

Request Sense Command Information

31				0
CDB Byte 2	CDB Byte 1	CDB Byte 0	CDB Size	44
Sense Key	CDB Byte 5	CDB Byte 4	CDB Byte 3	48
Byte 20	Byte 19	Byte 13	Byte 12	52
Byte 16	Internal Error	Op Code	Byte 21	56

- Internal Error = 01H SCSI Check Condition
 = 02H SCSI Parity Error
 = 03H QBUS NXM Error
 = 05H Transfer Request > 64KB
 = 09H SCSI Target did not respond
 = 0AH SBIC Fatal Error
 = 0BH SCSI Bus Reset Detected
 = 0EH SCSI Reservation Conflict
 = 10H Serious Exception Found
 = 13H Operation Timeout
 = 16H Self Test Error
 = 17H TMSCP Unit Available
 = 18H TMSCP No Volume
 = 19H Fatal Port Error
 = 1AH Fatal Controller Error

Exabyte EXB-8200 Error Log Definition

<u>Offset</u>	<u>Byte Definition</u>
36	Current Tape Position
44	SCSI Command Size Bit 7-0 06 Six (6) Byte Command 10 Ten (10) Byte Command 12 Twelve(12) Byte Command
45	SCSI Command Opcode Bit 7-0 00 Test Unit Ready 01 Rewind 03 Request Sense 05 Read Block Limits 08 Read 0A Write 10 Write Filemark 11 Space 12 Inquiry 15 Mode Select 19 Erase 1A Mode Sense 1B Load/Unload
46	SCSI CDB Byte 1
47	SCSI CDB Byte 2
48	SCSI CDB Byte 3
49	SCSI CDB Byte 4
50	SCSI CDB Byte 5
51	Sense Key Bit 7 File Mark Bit 6 End Of Media Bit 5 Incorrect Length Indicator Bit 4 Not Used Bit 3-0 0 No sense 1 Not Used 2 Not Ready 3 Medium Error 4 Hardware Error 5 Illegal request 6 Unit Attention 7 Data protect 8 Blank Check 9 Exabyte A Copy Aborted B Aborted Command C Not Used D Volume Overflow E Not Used F Reserved
52	Sense Code (Additional) Bit 7-0 02 Not Ready
53	Sense Qualifier (additional) Bit 7-0 00 Volume not Mounted 01 Busy Rewinding or Loading

54 SCSI Status
Bit 7 Power Fail
Bit 6 SCSI Bus Parity Error
Bit 5 Formatted Buffer Parity Error
Bit 4 Media Error
Bit 3 Error Counter Overflow
Bit 2 Tape Motion Error
Bit 1 Tape Not Present
Bit 0 Beginning of Tape

55 SCSI Status
Bit 7 Transfer Abort Error
Bit 6 Tape Mark Detect Error
Bit 5 Write Protect
Bit 4 Write Filemark Error
Bit 3 Underrun Error
Bit 2 Write Error 1
Bit 1 Servo System Error
Bit 0 Formatter Error

56 SCSI Status
Bit 7-2 Reserved
Bit 1 Write Splice Error
Bit 0 Write Splice Error

9 - Standard Error Codes

Self Test Error Codes

If an error occurs during self-test, an error code will be flashed on the activity LED (D2) and sent to the terminal port if enabled. A long flash represents a "1" while a short flash indicates a "0". The flashes are decoded starting with the most significant bit (MSB). The error code can be identified by the following error code table,

Error Code	Description
0	EEPROM Checksum Error
1	Ram Error
2	Disk QBIC Error
3	Tape QBIC Error
4	SBIC Error
5	Fifo Error
6	Serial Port Error
7	QBUS Interrupt Error
8	QBUS DMA Error
9	SCSI Term Power Error

Fatal SA Error Codes

The SA error codes will be posted in the SA register upon detection of a fatal error which prevents the proper operation of the host adapter. Bit 15 set in the SA register indicates a fatal error while the low byte indicates the type of failure.

Hex	Octal	Description
8001	100001	Envelope/Packet Read Error
8002	100002	Envelope/Packet Write Error
8006	100006	Ring Read Error
8007	100007	Ring Write Error
8009	100011	Host Access Timeout
800A	100012	Credit Limit Exceeded
8013	100023	Step 1 Init Error
801C	100034	Step 3 NXM Error
801x	1001xx	Fatal Firmware Error (see below)

Hex	Octal	Description
8041	100101	Out of range opcode in io_prep
8042	100102	Out of range opcode in io_busy
8043	100103	Out of range opcode in Q-bus interrupt
8044	100104	Out of range SCSI phase
8045	100105	Out of range opcode in SCSI reselect
8046	100106	QBIC interrupt w/hsi full set
8047	100107	QBIC interrupt w/hsi holding set
8048	100110	SCSI interrupt w/no status
8049	100111	QBIC interrupt twice on command
804A	100112	QBIC interrupt w/wrong ack
804B	100113	QBIC interrupt w/no status
804C	100114	SCSI interrupt interrupt w/wrong ack
804D	100115	SCSI reselect interrupt w/wrong ack
804E	100116	SCSI reselect interrupt w/wrong current command
804F	100117	SCSI chip illegal command
8050	100120	SCSI gross error
8051	100121	SCSI unexpected phase
8052	100122	execute routine is off
8053	100123	Q-bus timeout
8054	100124	SCSI timeout
8055	100125	SCSI unknown reselect
8056	100126	SCSI flush queue failed
8057	100127	SCSI bus reset will not work
8058	100130	other QBIC has error
8059	100131	write_ip during diagnostics
805A	100132	auto configure failure w/no nodes for host

VMS Error Codes

MSCP

MSCP error log sample. Only accurate system descriptions have been included along with special meanings in bold italics for the SQ739.

```
***** ENTRY                2. *****
ERROR SEQUENCE 14.          LOGGED ON:          SID 08000000
DATE/TIME 18-OCT-1991 09:53:07.60  SYS_TYPE 01010000
SYSTEM UPTIME: 0 DAYS 00:05:35
SCS NODE:                  VAX/VMS V5.4-2
```

ERL\$LOGMESSAGE ENTRY KA630

I/O SUB-SYSTEM, UNIT _DUA3:

MESSAGE TYPE	0001	SK MSCP MESSAGE
MSLG\$ <u>L</u> _CMD_REF	AD1A0002	
MSLG\$ <u>W</u> _UNIT	0003	UNIT #3.
MSLG\$ <u>W</u> _SEQ_NUM	0000	SEQUENCE #0.
MSLG\$ <u>B</u> _FORMAT	03	SDI ERROR
MSLG\$ <u>B</u> _FLAGS	01	SEQUENCE NUMBER RESET
		UNRECOVERABLE ERROR
MSLG\$ <u>W</u> _EVENT	0023	UNIT OFFLINE
		NO MEDIA LOADED/DISABLED VIA SWITCH
MSLG\$ <u>Q</u> _CNT_ID	33375153	SQ739 reversed in ascii code
	010D2039	MASS STORAGE CONTROLLER
		KDA50-Q
MSLG\$ <u>B</u> _CNT_SVR	F0	
MSLG\$ <u>B</u> _CNT_HVR	1F	
MSLG\$ <u>W</u> _MULT_UNIT	0000	
MSLG\$ <u>Q</u> _UNIT_ID	00000028	SCSI CDB bytes 3/2/1/0
	02010000	SCSI CDB bytes 4/5
	RA80	
MSLG\$ <u>B</u> _UNIT_SVR	00	SCSI CDB byte 6
MSLG\$ <u>B</u> _UNIT_HVR	00	SCSI CDB byte 7
MSLG\$ <u>L</u> _VOL_SER	2D4F4D53	SCSI inquiry bytes 16 to 19
MSLG\$ <u>L</u> _HDR_CODE	00000000	LOGICAL BLOCK #0.
		GOOD LOGICAL SECTOR.
MSLG\$ <u>Z</u> _SDI		
REQUEST	02	Sense key
MODE	0A	Sense byte 12
ERROR	00	Sense byte 13
CONTROLLER	00	Sense byte 14
RETRY	00	Sense byte 15

DEVICE DEPENDENT INFORMATION

LONGWORD 1.	3C000000	Sense bytes 20/19/18/17
LONGWORD 2.	07001000	Sense bytes 24/23/22/21
LONGWORD 3.	008D0122	NA/NA/internal error/Sense byte 25

This error log indicates a MSCP error of 23 which is no media. The SCSI command was a read (CDB 28,00,00,00,00,00,00,00). The SCSI read command had an internal error of 01 which is a SCSI check condition. The sense bytes from the SCSI request sense that was automatically done after the read had a sense key of 2, which is a NOT READY condition.

TMSCP

TMSCP error log sample. Only accurate system descriptions have been included along with special meanings in bold italics for the SQ739.

```
***** ENTRY 10. *****
ERROR SEQUENCE 22.          LOGGED ON:          SID 08000000
DATE/TIME 18-OCT-1991 10:02:14.22          SYS_TYPE 01010000
SYSTEM UPTIME: 0 DAYS 00:14:42
SCS NODE:          VAX/VMS V5.4-2
```

ERL\$LOGMESSAGE ENTRY KA630

I/O SUB-SYSTEM, UNIT _MUA0:, CURRENT LABEL ""

```
MESSAGE TYPE          0002          TAPE MSCP MESSAGE
MSLG$L_CMD_REF        AB6F0005
MSLG$W_UNIT           0000          UNIT #0.
MSLG$W_SEQ_NUM        0000          SEQUENCE #0.
MSLG$B_FORMAT         05           APE TRANSFER LOG
MSLG$B_FLAGS          01           SEQUENCE NUMBER RESET
                                UNRECOVERABLE ERROR
MSLG$W_EVENT          0023          UNIT OFFLINE
                                NO MEDIA LOADED/DISABLED VIA SWITCH
MSLG$Q_CNT_ID         33375153      SQ739 reversed in ascii code
                                3092039 TAPE CLASS DEVICE
                                TQK50
MSLG$B_CNT_SVR        05
MSLG$B_CNT_HVR        04
MSLG$W_MULT_UNT       0001
MSLG$Q_UNIT_ID        33377173      SQ739 reversed in ascii code
                                03032039 TAPE CLASS DEVICE
                                TK50
MSLG$B_UNIT_SVR       05
MSLG$B_UNI_HVR        04
MSLG$B_LEVEL          00
MSLG$B_RETRY          01
MSLG$L_GAP_CNT        00000000
MSLG$B_FMTR_SVR       05
MSLG$B_FMTR_HVR       04
```

TK50 DEVICE/CONTROLLER DEPENDENT INFORMATION

```
DRIVE FLAGS           08           CDB byte 0
TRK NUMBER            00           CDB byte 1
PHYSICAL BLK#         0000        CDB byte3/CDB byte 2
LOGICAL BLK#          5A          CDB byte 4
TAPE POSITION           020000      sense key/CDB byte 5/NA
DRIVE STATE           0004        sense byte 13/sense byte 12
RD/WRT STATE          3C02        sense byte 19/sense byte 20
OPERATION FLGS        2100        opcode/sense byte 21
CNTRLR STATUS         01          internal error
DRIVE ERR CODE        00          sense byte 16
```

This error log indicates a TMSCP error of 23 which is no media. The SCSI command was a read (CDB 08,00,00,00,5A,00). The SCSI read command had an internal error of 01 which is a SCSI check condition. The sense bytes from the SCSI request sense that was automatically done after the read had a sense key of 2, which is a NOT READY condition. The TMSCP opcode is 21 which is a read.