Part Number 2120-0186

MODEL SQ703A

TAPE CONTROLLER

(HOST ADAPTER)

FOR

SINGLE-ENDED

SCSI INTERFACE

REVISION A

INSTALLATION AND OPERATION MANUAL

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SECTION 1

DESCRIPTION

This manual describes the installation and operation of Distributed Logic Corporation (DILOG) Model SQ703A Tape Controller. This controller is a host adapter which may communicate with either an embedded controller in the drive or a bridge controller, which is a controller that communicates with more than one drive. The controller is a dual-module board that interfaces up to four SCSI tape drives with DEC* LSI-11/23, -11/23 PLUS, 11/73, MicroVAX II and Micro/PDP-11 computer systems. The controller is soft-ware compatible with DEC MU drivers in RT-11, RSX-11M+, RSTS/E, MICRO/VMS, ULTRIX, UNIX, and MUMPS.

The controller supports both block mode and non-block mode memory.

Figure 1-1 is a simplified diagram of a SCSI tape system.

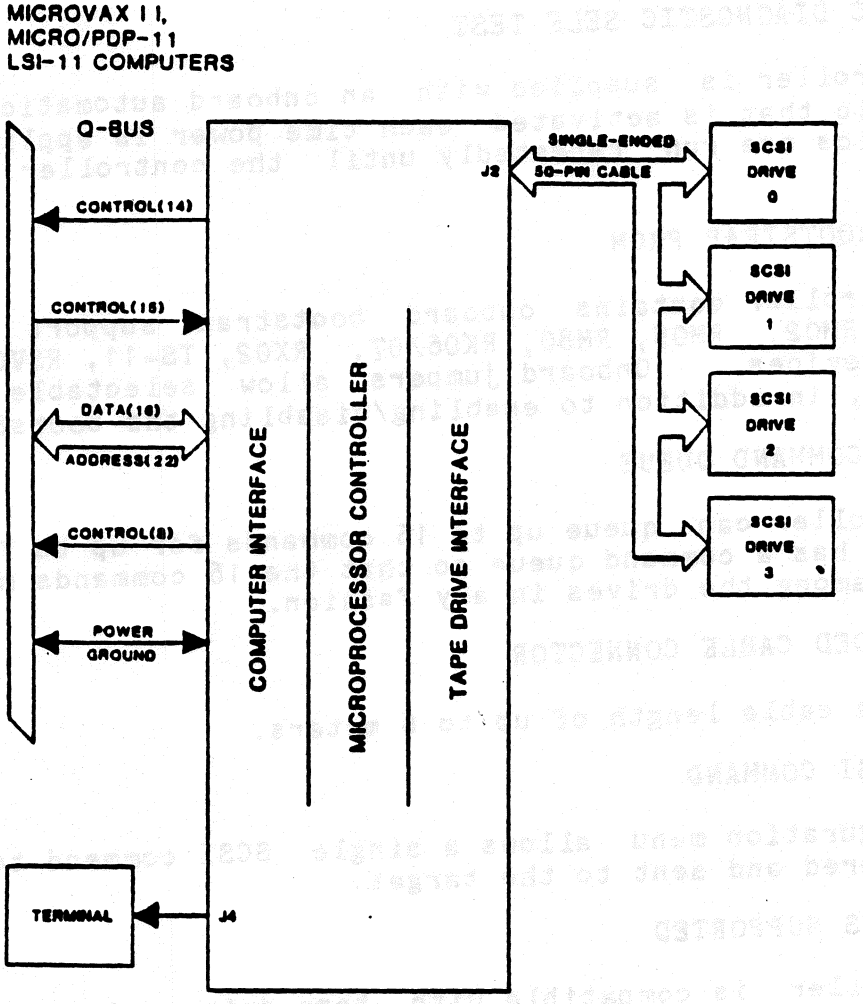

Figure 1-1. Tape System, Simplified

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*DEC LSI-11, MICRO/PDP-11, MicroVAX II, RT-11, RSX, RSTS/E, MicroVMS, and DU Driver are registered trademarks of Digital Equipment Corp.

UNIVERSAL FORMATTING is a trademark of Distributed Logic Corp.

CHARACTERISTICS

Characteristics of the controller are as follows:

- o SUPPORTS 22-BIT ADDRESSING

  The controller supports 16-, 18-, and 22-bit Q-bus addressing.

- o FULL SCSI IMPLEMENTATION

  The controller offers a full SCSI implementation. The controller is compatible with ANSI SCSI spec X3T9.2/85-52 Rev 4B for sequential access devices. Arbitration and Disconnection/ Reselection are supported. Synchronous and Asynchronous SCSI Data transfers are also supported. (Synchronous data transfers will automatically be performed if target device supports it.)

- o AUTOMATIC DIAGNOSTIC SELF TEST

  The controller is supplied with an onboard automatic self-test diagnostic that is activated each time power is applied. These diagnostics are run repeatedly until the controller is brought online.

- o ONBOARD BOOTSTRAP PROM

  The controller contains onboard bootstrap support for RP02, RL01/02, RM02, RM05, RM80, RK06/07, RX02, TS-11, RSV05, and DU driver devices. Onboard jumpers allow selectable bootstrap addresses, in addition to enabling/disabling the bootstrap.

- o 16-ENTRY COMMAND QUEUE

  The controller can queue up to 16 commands for up to four units. Each unit has a command queue so that the 16 commands may be distributed among the drives in any fashion.

- o SINGLE-ENDED CABLE CONNECTOR

  Supports a cable length of up to 6 meters.

- o SINGLE SCSI COMMAND

  The configuration menu allows a single SCSI command to be manually entered and sent to the target.

- o TAPE DRIVES SUPPORTED

  The controller is compatible with tape drives from such manufacturers as:

  EXABYTE 8200

  For additional drive support, contact the factory.

- TK50 OR TU81 EMULATION

The following SCSI commands must be supported by the target:

ERASE	REQUEST SENSE
INQUIRY	REWIND
LOAD/UNLOAD	SPACE
MODE SELECT	TEST UNIT READY
READ	WRITE
READ BLOCK LIMITS	WRITE FILEMARKS

NOTE

Cartridge tape units used within the Host Adapter may not allow the same features as a reel-to-reel unit. For example, writes may be restricted to BOT and at tape marks. This would prevent individual record updating in the middle of a group of blocks. Consult the drive manual for more details.

Table 1-1 lists the Controller/Q-Bus Interface Signals, Table 1-2 lists the Controller/Drive Interface. Table 1-3 lists the 10-Pin Connector Signals to the terminal.

Table 1-1. Controller/Q-Bus Interface Lines (Dual Module)

BUS PIN	MNEMONIC	INPUT/ OUTPUT	DESCRIPTION
AJ1, AM1, BJ1, BM1, BT1, BC2	GND	O	Signal Ground and DC return.
AN1	BDMR L	O	Direct Memory Access (DMA) request from controller; active low.
AP1	BHALT L	N/A	Stops program execution. Refresh and DMA is enabled. Console operation is enabled.
AR1	BREF L	N/A	Memory Refresh. Used for Block Mode DMA.
BA1	BDCOK H	I	DC power OK. All DC voltages are normal.
BB1	BPOK H	I	Primary power OK. When low activates power fail trap sequence.
BN1	BSACK L	O	Select Acknowledge. Interlocked with BDMGO indicating controller is bus master in a DMA sequence.
BR1	BEVNT L	N/A	External Event Interrupt Request.
BV1, AA2, BA2	+5	I	+5 volt system power.
AD2, BD2	+12	N/A	+12 volt system power.
AE2	BDOUT L	I/O	Data Out. Valid data from bus master is on the bus. Interlocked with BRPLY.
AF2	BRPLY L	I/O	Reply from slave to BDOUT or BDIN and during IAK.
AH2	BDIN L	I/O	Data Input. Input transfer to master (states master is ready for data). Interlocked with BRPLY.
AJ2	BSYNC L	I/O	Synchronize: becomes active when master places address on bus; stays active during transfer.
AK2	BWTBT L	I/O	Write Byte: Indicates output sequence to follow (DATO or DATOB) or marks byte address time during a DATOB.
AL2, A1, AB1, BP1	BIRQ4-7 L	O	Interrupt Request 4-7.
AM2 AN2	BIAK1I L BIAK1O L	I O	Serial Interrupt Acknowledge Input and output lines routed from Q Bus, through devices, and back to processor to establish an interrupt priority chain.
AT2	BINIT L	I	Initialize. Clears devices on I/O bus.
AU2, AV2, BE2, BF2, BH2, BJ2, BK2, BL2, BM2, BN2, BP2, BR2, BS2, BT2, BU2, BV2	BDAL0 L through BDAL15 L	I/O	Data/address lines, 0-15
AR2 AS2	BDMG1I L BDMG1O L	I O	DMA Grant Input and Output. Serial DMA priority line from computer, through devices and back to computer.
AP2	BBS7 L	I/O	Bank 7 Select. Asserted by bus master when address in upper 4K bank is placed on the bus. Also asserted for Block Mode DMA.
AC1, AD1, BC1, BD1, BE1, BF1	BDAL16 L -BDAL21 L	O	Extended Address Bits 16-21

Table 1-2. Controller to Drive - J2

SIGNAL	PIN NUMBER	DESCRIPTION
D0 L	2	Data Bus 0 (LSB)
D1 L	4	Data Bus 1
D2 L	6	Data Bus 2
D3 L	8	Data Bus 3
D5 L	12	Data Bus 5
D6 L	14	Data Bus 6
D7 L	16	Data Bus 7 (MSB)
DP L	18	Data Bus Parity
GROUND	20	-
QIC2-RST L	22	Factory Use Only
GROUND	24	-
PWR H	26	Power OK. Green LED on controller is on
GROUND	28	-
GROUND	30	-
ATN L	32	Attention
GROUND	34	-
BSY L	36	Busy - bus is being used
ACK L	38	Acknowledge for request data transfer handshake
RST L	40	Reset
MSG L	42	Message being transferred
SEL L	44	Select - selects drive or reselects controller
C/D	46	Control/Data - low indicates control; high indicates data
REQ L	48	Request - request for a request acknowledge data transfer handshake
I/O	50	Input/Output - indicates direction of data movement; low to controller; high to drive

All odd pins are ground except pin 25, which is open.

Table 1-3. Controller to Terminal - J4

Signal	Dir	Pin	Definition
UARTCLK_L	O	1	(TTL) UART clock out. Normally inactive (0) output if not in TMODE. A positive transition shifts out LED display information on TXD* and shift in switch status on RXD*. Open if not used.
SGND	O	2	Signal Ground and logic Ground.
TXD*_L	O	3	(RS232) Transmit data in TMODE. Active (0) in Status MODE for ACTIVITY indication or front panel display shift data when DTR is inactive (0). Normally inactive (1).
DSR_H	I	4	(RS232) Data Set Ready if used in TMODE. Active (1) to indicate a switch has changed in Status MODE while DTR is inactive. Open if not used.
DTR_H	O	5	(RS232) Data Terminal Ready if used in TMODE. Active in Status MODE to load input shift register, inactive to shift data in on RXD* or to enable ACTIVITY LED.
NOT USED		6	Indexing Key - No Pin
TMODE*_L	I	7	(TTL) Terminal MODE when grounded. Enables terminal, diagnostic and formatter functions. Status/Activity MODE when open. Onboard 1K ohm or greater pullup.
RXD* L	I	8	(RS232) Receive Data in TMODE. Active (0) in Status MODE for front panel input shift data when DTR is active. Normally inactive (1).
SGND	O	9	Signal Ground and logic Ground
+5V	O	10	+5 Volt for DLV11-KA/front panel with 1 Amp Fuse F1; Fused +5 Volt on products which do not have +12 Volt.

CONTROLLER SPECIFICATIONS*

MECHANICAL

The controller is completely contained on one dual height module 5.22 inches (13.2 cm) wide by 8.88 inches (22.6 cm) high and plugs into one dual slot in a Q-bus backplane.

BASE ADDRESS - Factory set at 174500

User selectable address range 160000 - 177774

RECOMMENDED ADDRESSES

IP -	160404	160410	160414	160444	160450	160454
SA -	160406	160412	160416	160446	160452	160456

Consult the factory for additional address requirements.

INTERRUPT VECTOR ADDRESS

Host programmable 0-774.

NUMBER OF DRIVES SUPPORTED - 4 units

ADDRESS RANGE - Q-bus memory to 4 Mbytes

DRIVE TRANSFER RATE - Up to 2.0 Mbytes per second

PRIORITY LEVEL - Factory set at BR4, user selectable BR5, 6 and 7.

CONNECTOR

A 50-pin ribbon cable type mounted on outer edge of controller module. Mate is 3M 3452-5000 or equivalent.

POWER - +5 Volts at 2.5 Amps

EMULATION

This controller emulates a TU81 tape or a TK50 cartridge. The controller is factory set for TK50.

ENVIRONMENT

Operating temperature 50 deg. F to 104 deg. F, humidity 10%-90% non-condensing.

SHIPPING WEIGHT - 5 pounds, including documentation

* Specifications subject to change without notice.

SECTION 2

INSTALLATION

The padded shipping carton contains the controller board, and if specified on the sales order, a 50-pin control and data cable to the first drive, optional data cables to other drives. Inspect the controller board and its components and the cables for damage.

NOTE

If damage to the board, components on the board, or cables is noted, do not install. Immediately inform the carrier and DILOG.

HARDWARE BOOTSTRAP JUMPERS

The enabling or disabling of the hardware bootstrap and the selection of the bootstrap address are parameters that need to be configured before the controller is installed in the computer backplane. The controller contains a bootstrap PROM that can be enabled or disabled by jumper JP2. If enabled, the bootstrap address can be changed by jumper JP1.

NOTES

1. Installation in MicroVAX II systems requires disabling the bootstrap; remove JP2.

2. With JP2 removed, the JP1 jumper has no effect on controller operation.

3. If jumper(s) are removed, it is recommended that they be rotated 90 degrees for storage to prevent loss, i.e., install with one jumper pin inserted over only one pin of the jumper location.

Figure 2-1 illustrates the locations of the jumpers. Table 2-1 describes the jumper position possibilities. The controller is shipped with jumpers installed with the bootstrap PROM enabled and bootstrap address 175000 (octal) selected. Some jumper connections may be etched or cut on the board and are referred to in the table as installed or removed.

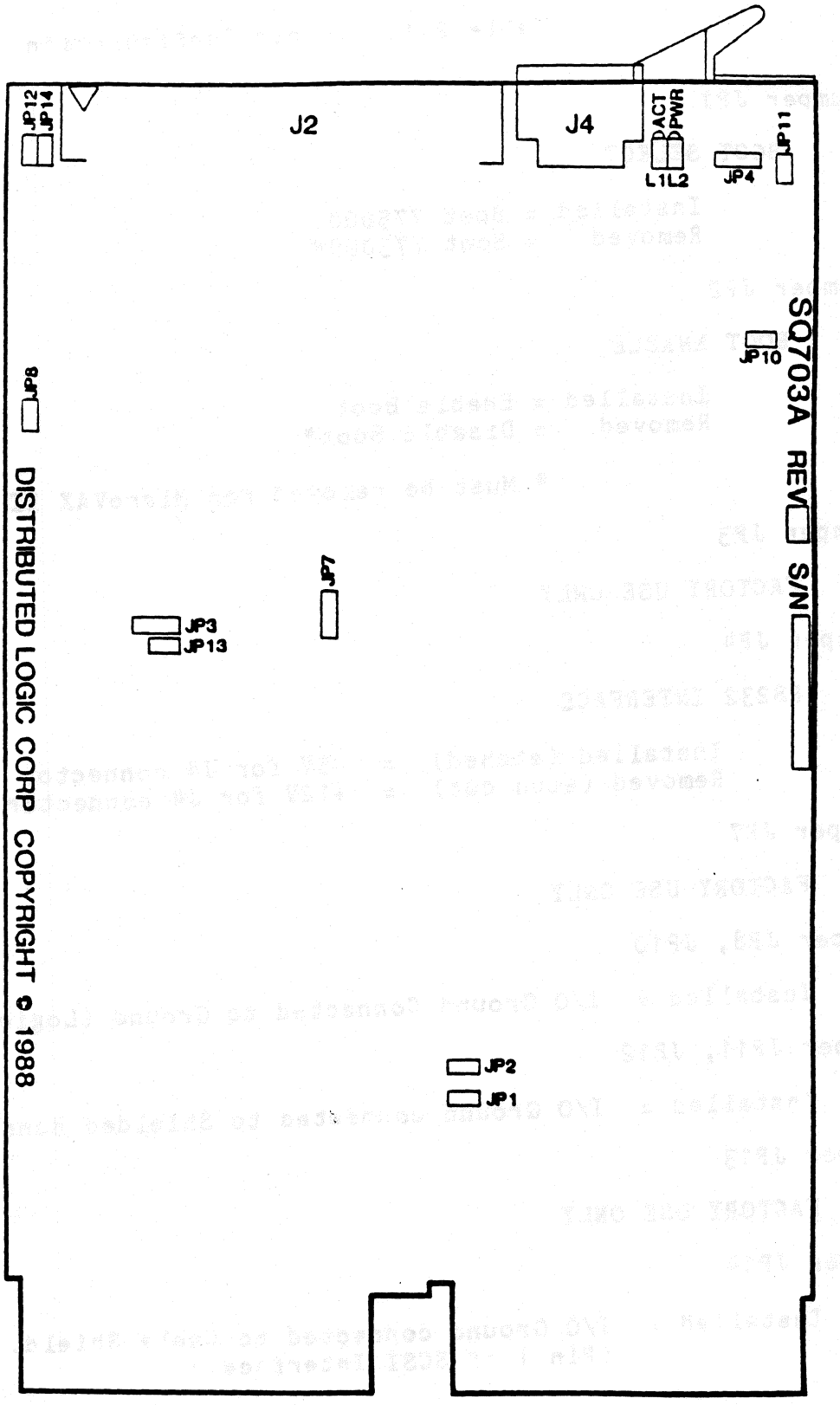


Figure 2-1. Controller Configuration

Table 2-1. Jumper Configuration

Jumper JP1

BOOT SELECT

Installed = Boot 775000
Removed = Boot 773000*

Jumper JP2

BOOT ENABLE

Installed = Enable Boot
Removed = Disable Boot*

* Must be removed for MicroVAX II systems.

Jumper JP3

FACTORY USE ONLY

Jumper JP4

RS232 INTERFACE

Installed (etched) = +5V for J4 connector
Removed (etch cut) = +12V for J4 connector

Jumper JP7

FACTORY USE ONLY

Jumper JP8, JP10

Installed = I/O Ground Connected to Ground (Logic)

Jumper JP11, JP12

Installed = I/O Ground connected to Shielded Handle

Jumper JP13

FACTORY USE ONLY

Jumper JP14

Installed = I/O Ground connected to Cable Shield.
(Pin 1 of SCSI Interface.)

CONTROLLER INSTALLATION

After the jumpers have been positioned, install the controller as follows:

CAUTION

ENSURE ALL POWER IS OFF BEFORE INSTALLING CONTROLLER OR CABLES.

DAMAGE TO THE BACKPLANE ASSEMBLY AND THE CONTROLLER WILL OCCUR IF THE CONTROLLER IS PLUGGED IN BACKWARDS!

1. Select the backplane location into which the controller is to be inserted. There are several backplane assemblies available from DEC and other manufacturers. Figures 2-2 and 2-3 illustrate typical backplane configurations.

   All slots of the backplane of Q-bus based computers are not wired the same. With the introduction of the Micro/PDP-11 and the MicroVAX II, the first three, and sometimes four (depending on the packplane), slots of the backplane make the C and D rows available for customer-defined signals or for the Private Memory Interconnect (PMI) bus in MicroVAX II systems. These first few slots are termed Q/CD slots. In most older Q-bus based systems, the A/B and C/D slots were all wired the same so that two dual-height modules could be installed in a quad-height bus slot (these are called Q/Q backplanes). If the controller is installed in one of the Q/CD slots, it must be installed in the A/B rows--no grant continuity card is required. If the controller is installed in one of the Q/Q slots, it can be installed in either another dual-height module or the approprate DEC grant continuity module (M9047 for the MicroVAX II; G7272 for the Micro/PDP-11).

   NOTE

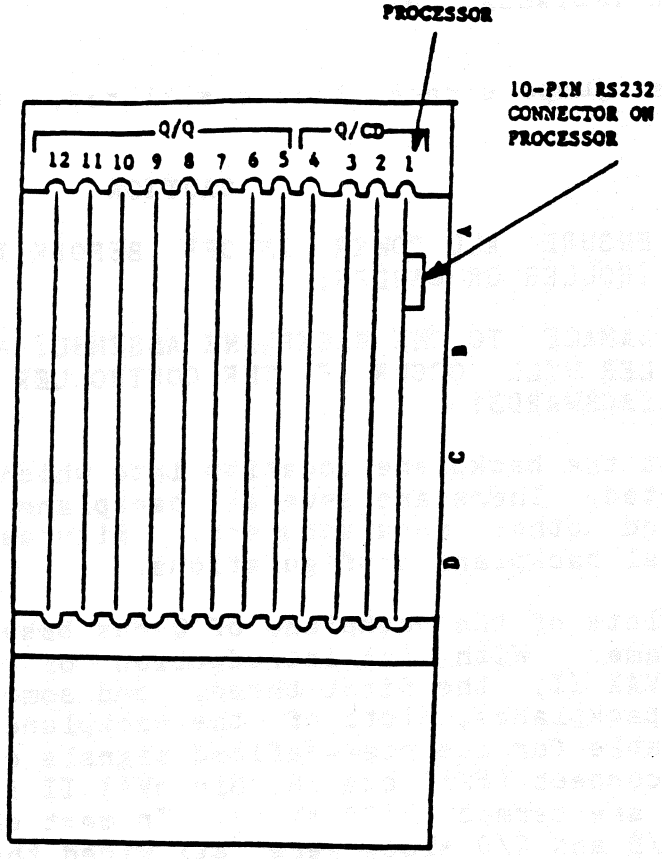
   The type of slot--Q/Q or Q/CD in the Micro/PDP-11 MicroVAX II chassis--is identified by labels adjacent to the backplane slots in the chassis.

2. Perform this step if the serial port is to be connected. Connect the cable from J4 on the controller to the terminal. Refer to Table 1-3 for pinouts and descriptions.

3. Install the J1 cable into the connector on the controller. Ensure pin 1 on each cable is matched with the triangle on each connector as indicated on Figure 2-1.

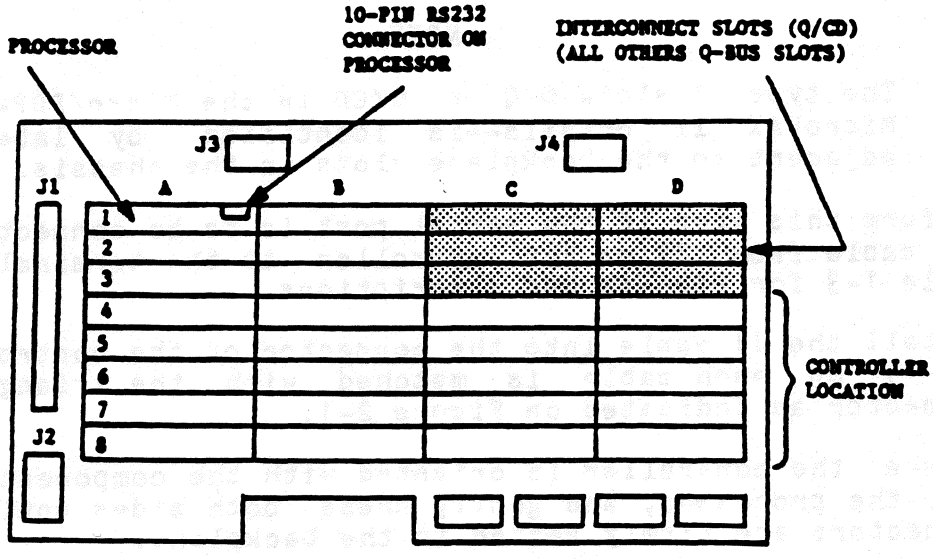
4. Ensure the controller is oriented with the components facing row one, the processor, and gently press both sides until the module connectors are firmly seated in the backplane.

5. Connect J1 to the drive or the first in a series of drives if daisy-chained. Ensure the terminator is installed in the last drive.



NOTE: Components on the board must be facing towards the Processor.

Figure 2-2. MicroVAX II Backplane (Typical)



NOTE: Components on the board must be facing towards the Processor.

Figure 2-3. MicroVAX II H9278 Backplane

6. Refer to the tape drive manual for operating instructions, and apply power to the drive(s) and the computer.

7. Power-up the system. Note that there are two green LEDs. The leftmost LED is the POWER LED; the rightmost LED is the ACTIVITY LED. If the POWER LED lights, power to the SCSI bus terminators has been properly applied; if the POWER LED does not light, the SCSI bus terminators have not received power. If this should happen, check either the system power supply or the fuse on the controller. The user should note that the POWER LED will turn ON if either a SCSI device with power applied is connected to the controller or power is applied to the controller. This is in accordance with the SCSI specification, which allows bus terminator power to be supplied by either the SCSI device or host adapter.

8. Upon a good power-up (i.e., the POWER LED lights), the ACTIVITY LED should turn on for 10 seconds and turn off for 10 seconds. Each 10-second transition (ON/OFF or OFF/ON) of the ACTIVITY LED indicates a successful pass of the controller self tests. The controller will continue to perform its onboard self tests upon power-up until brought online by the system (i.e., the ACTIVITY LED will continue to flash on and off every 10 seconds). After it is brought online, the controller will turn on its ACTIVITY LED only during read and write activity between the controller and the SCSI device.

9. If an error is encountered at any point during the self tests, a 5-bit binary error code will be flashed on the ACTIVITY LED, signifying which error has occurred. (See ERROR CODES for details.) The most significant bit of the error code is flashed first. A long flash indicates a binary "1", while a short flash indicates a binary "0." This error code will continue to flash until the board is either powered down or reinitialized.

10. The system is now ready to operate.

SECTION 3

OPERATION

This section covers the operation of the system, including establishing communication with the computer, the controller (host adapter), and the drives; and bootstrapping for MSCP as well as other emulations and formatting.

Diagnostics are in Section 4. Error codes from the error logs and their formats are listed in Section 5.

INITIATING COMMUNICATION

VIA CONTROLLER SERIAL PORT

In order to bring up communication via the serial port, a terminal must be connected to the 10-pin connector (J4) located on the controller board. Serial communications will then begin automatically upon power up of the controller or re-boot of the host system. Serial communications take place at a rate of 9600 baud; therefore, the terminal must be set to both transmit and receive at this rate. The serial communication protocol is 1 start bit, 1 stop bit, 8 data bits with no parity.

VIA VIRTUAL TERMINAL

Procedure for Bringing Up the Virtual Terminal Via LSI-11 With Host Adapter Boot Enabled

In order to bring up communication via the virtual terminal, the system console is used as the terminal for serial communication. The system console must be placed in the ODT (Online Debugging Technique) mode. A boot must be initiated by typing on the system console either 77775000G or 77773000G, depending on which boot address is selected on the controller (see Section 2 on hardware jumpers for details on boot address). The system console will respond with an "@" as a prompt. At this point, the user can type an "FT" which will bring up the Configuration Menu.

NOTE

In the following examples, all characters underlined are OUTPUT by the system; characters not underlined are INPUT by the operator.

EXAMPLE:

If the bootstrap is enabled and the boot address is 175000, enter the following:

@ 77775000G
(If the boot address is 173000, enter 77773000G.)

@

Procedure for Bringing Up the Virtual Terminal Via LSI-11 With Host Adapter Boot Disabled

If the boot on the controller is disabled, communication via the virtual terminal can be brought up by typing 77777 (octal) to the SA address (SA default address = 174502) followed by a carriage return. The user must then type 2000G. The system console will respond with an "*" as a prompt. The user should then type "FT" to bring up the Configuration Menu. In the following example underlined characters are output by the computer:

NOTE

This procedure will work regardless of whether the boot address of the controller is enabled or disabled.

EXAMPLE:

@ 174500/0 <CR>

@ 174502/005400 77777 <CR>

@ 2000G

Boot for the device as described below.

The controller not only supports standard DEC devices, but also allows the use of the onboard formatter. When DU is used, the standard DEC emulation is called. When FT is used, the onboard formatter is enabled for use through the system console.

* Enter one of the following: DM0, DP0, DL0, DR0, MS0, MU0, MT0, DY0, DU, or FT <CR>

NOTE

When making a selection, capital letters MUST be used.

Definitions are as follows:

DM = RK06/07 Disk
DP = RP02/03 Disk
DL = RL01/02 Disk
DR = RM03/05/80
MS = TS11 Tape
MU = (TMSCP) Tape
DY = RX02 Floppy Disk
DU = DU emulation (will only boot DU device at primary address = 172150 octal)
FT = Enable onboard Configuration Menu through system console

Booting can be executed from logical units other than "0" shown above by entering the desired logical unit number, i.e., 1, 2, 3, ... or 7.

Procedure to Bring Up the Virtual Terminal Via MicroVAX II

In order to bring up communication via the virtual terminal, the system console is used as the terminal for serial communication. Note that the bootstrap PROM must be disabled. (See Section 2 for jumper placement.)

Upon powering up the MicroVAX II and allowing the self-test to complete, the user must set up the MicroVAX II I/O map via the system console, type 3FFF hex to the SA address (SA default address = 174502) and start executing code at location 200 hex. All this can be done by the user as shown below. After executing this procedure, the Configuration Menu comes up on the system console. Note that the bootstrap PROM must be disabled.

EXAMPLE:

>>>D/P/L 20088004 80000001 <CR>	<---	Setup MicroVAX II I/O Map
>>>D/P/W 20001F40 20 <CR>	<---	Setup MicroVAX II I/O Map
>>>D/P/W XXXXXXXX 3FFF <CR>	<---	Deposit the 3FFF hex in SA address. The values of xxxxxxxx are hex values of the controller address of the SA reister and are listed in Table 3-1.
>>>S 200 <CR>	<---	Start executing code at 200 hex

(At this point the Configuration Menu should appear.)

NOTE

When a GPX (Graphics Work Station) is used, enter >>>S 218 <CR> instead of 200.

CONFIGURATION MENU

Upon entering the controller's onboard Configuration Menu, the following will be displayed:

```
ARE YOU USING A (P)RINTER OR (C)RT ?
```

Enter either a "P" or a "C". Then the main Configuration Menu will appear as follows:

```
        CONFIGURATION MENU
--------------------------
1 - STANDARD DIAGNOSTICS
2 - DISPLAY CONTROLLER CHARACTERISTICS
3 - SET CONTROLLER CHARACTERISTICS
4 - SCSI DIRECT COMMAND
5 - SCSI UNIT MAPPING

ENTER A SELECTION:
```

Any of the five selections may be entered at the prompt simply by typing the number that corresponds to the desired selection followed by a carriage return.

NOTE

A CTRL C (^C) entered during any of the selections will return to the Configuration Menu.

STANDARD DIAGNOSTICS

Selection 1 of the Configuration Menu enables the controller to run its onboard diagnostics. Each time a diagnostic test is successfully passed, a "." will be printed onto the screen. It takes approximately 10 seconds for the controller to make one pass through all the diagnostic tests. The controller will continue to loop on the diagnostic tests until a CTRL C (^C) is typed on the terminal. (Notice that the controller does not respond immediately to the ^C when in the virtual terminal mode. It takes several seconds for the controller to respond, so please be patient.)

Upon recognizing the ^C, the controller will return to the configuration menu. If an error is encountered during the execution of a diagnostic test, an "E" will be printed onto the screen and the onboard LED will flash the appropriate error code. (See documentation on error code flashing for details.) The controller will conduct a loop on error process until either a ^C is detected or power on reset is conducted.

DISPLAY CONTROLLER CHARACTERISTICS

Selection 2 of the Configuration Menu allows the user to display on the terminal the current controller characteristics as determined by what is currently set in the controller's NOVRAM. Selection 2 displays the following:

```
DISPLAY CONTROLLER CHARACTERISTICS
----------------------------------
EMULATION:                                              [XXXX]
IP/SA ADDRESS (in octal):                               [XXXXXX]
DWELL COUNT (Count * 800 nsec = Dwell Time):            [XXX]
BURST SIZE (# of words):                                [XXX]
INTERRUPT PRIORITY:                                     [XX]

** ** **  PRESS <CR> TO CONTINUE  ** ** **
```

As seen above, the controller emulation, the IP/SA address, the dwell time and burst size for DMAs, and the controller's interrupt priority to the host are displayed. The x's in the table above represent the current value of each controller characteristic. After displaying the controller characteristics, a carriage return, <CR>, will display the Configuration Menu again.

Below is a list of the default values of the controller configuration characteristics:

	DEFAULT VALUE
EMULATION:	[TK50]
IP/SA ADDRESS (in octal):	[174500]
DWELL COUNT (Count * 800 nsec = Dwell Time):	[02]
BURST SIZE (# of words):	[08]
INTERRUPT PRIORITY:	[04]

SET CONTROLLER CHARACTERISTICS

Selection 3 of the Configuration Menu allows the user to set the controller characteristics (i.e., set up the NOVRAM). Selection 3 displays the following:

```
SET CONTROLLER CHARACTERISTICS
------------------------------
[ ] = current configuration, <CR> = defaults to current setting

EMULATION:                              [xxxx](U/K)     {user response}
IP/SA ADDRESS:                          [xxxxxx]        {user response}
DWELL COUNT:                            [xxx]           {user response}
  (Count * 800 nsec=Dwell Time)
BURST SIZE (# of words):                [xxx]           {user response}
INTERRUPT PRIORITY:                     [xx]            {user response}

     SAVE NEW CONFIGURATION (Y/N)?
```

In order to set the controller characteristics, the user is prompted for all the information. The user is first prompted for the controller emulation. The current setting is displayed along with the "Emulation" message. A prompt then appears and waits for user response. The user response in the above table is indicated by the message "{user response}." The user now has the option of changing the current controller emulation. He can do this simply by typing a "U", for TU81 emulation, or a "K", for TK50 emulation. If the user does not wish to change the emulation, he need simply type a carriage return and it will remain unchanged. In either case, the user will then be prompted for the IP/SA address. He will again have the same option as before; he can either change the value or leave it at its current setting. He will then be prompted for the next piece of information, and this process will continue until all the information on the controller characteristics has been prompted for. The controller will then prompt the user as to whether or not the new configuration is to be saved in the controller's NOVRAM. If the user chooses not to save the new configuration, the controller will simply display a message saying that the new configuration was not saved. A <CR> at this time will simply take the user back to the configuration menu. If the user chooses to save the new configuration, the controller will respond with the following:

```
NEW CONFIGURATION SAVED IN NOVRAM...
REBOOT SYSTEM TO CONFIGURE CONTROLLER HARDWARE!
```

The host system only needs to be rebooted if the IP/SA address or emulation was changed; otherwise, the user need only type a <CR> to go back to the Configuration Menu.

During the prompting of the controller characteristics, the controller will respond with an "Invalid Response" message if the user response is considered invalid. The controller expects all user responses to be in decimal except for the IP/SA address which it expects to see in octal (for appropriate octal IP/SA addresses see Table 3-1).

The following lists the valid options for each of the controller configuration characteristics.

EMULATION:	[TU81(U) or TK50(K)]
IP/SA ADDRESS (in octal):	[160000 - 177774]
Suggested Addresses:	[See Table 3-1]
DWELL COUNT (Count * 800 nsec = Dwell Time:	[1-63]
BURST SIZE:	[2-16]
INTERRUPT PRIORITY:	[4-7]

How To Find Current Address

In case the user ever changes the controller slave address (IP/SA address) and forgets what value he has set it to, the following steps should be taken.

For LSI-11 Systems:

1. Enable the boot address on the controller and make sure no other controller is using the same boot address (see details on hardware jumpers).

   CAUTION

   MAKE SURE THE BOARD IS POWERED DOWN BEFORE CHANGING JUMPERS!!

2. Power up the board, and get into ODT mode. Conduct a boot by typing on the system console either 777750000G or 777730000G, depending on what boot address the user has enabled. (See section on INITIATING COMMUNICATION for details on boot procedure.)

3. Wait for the "@" prompt.

4. Halt the host system processor and look at address location 0. Location zero should contain the IP/SA address.

   How to examine address 0 using ODT:

   @ 0/ allows the user to examine location 0.

For MicroVAX II System:

1. Conduct a power on reset on the board (i.e., power down the board and power it back up).

2. Check all the possible SA addresses that can be selected on the controller via the system console. (See Table 3-1 for listing of suggested IP and SA addresses, refer to hex address only.)

   How to examine addresses on MicroVAX II:

   >>>E/P/W XXXXXXXX <CR> <--- Allows user to examine location xxxxxxxx, a hex address from Table 3-1.

   If required to check the range 160000Q-177774Q, a suggested method is to start examining at location 160000Q as shown above (corresponding hex address for MicroVAX II is 20000000 first address, the user can continue checking subsequent addresses by simply typing the following:

   >>>E <CR> <--- Allows user to examine subsequent hex addresses.

3. Once the user finds the address he suspects is the controller slave address, he should deposit a 0 in the corresponding IP address. If the controller responds with a 0B00H in the SA address, then the correct slave address has been found. Deposit a 0 in the IP address as shown below.

   How to deposit a 0 on MicroVAX II:

   >>>D/P/W XXXXXXXX 0 <CR> <--- Allows user to deposit a 0 at location xxxxxxxx, a hex address from Table 3-1.

4. If the slave address does not respond with 0B00H, then go back to step 2 of this procedure.

Table 3-1. IP and SA Hex Addresses *

IP REGISTER OCTAL ADDRESS	SA REGISTER OCTAL ADDRESS	IP REGISTER HEX ADDRESS MICROVAX II	SA REGISTER HEX ADDRESS MICROVAX II
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

* Suggested Addresses only; to be entered in place of xxxxxxxx for MicroVAX II.

NOTE

Alternate address for TMSCP devices. If there are two or more MSCP controllers installed in the MVAX, the address for MUBO is 160444. If there is only one MSCP controller installed the address for MUBO is 160404.

For addresses other than the above (address range 160000-177774) perform the following to calculate hex address for MicroVAX II:

A. Convert the 13 least significant bits of the address in octal to hexadecimal.

B. Add 200000000.

For example, if the octal address is 177774, the hex value is obtained as follows:

A. 177774 octal with 13 LS bits = 17774, converted to hex = 1FFC.

B. 1FFC + 200000000 = 20001FFC.

SCSI DIRECT COMMAND

Selection 4 of the Configuration Menu allows the user to input and execute SCSI commands. At this point, all user responses must be input in hex. All of the controller's responses will be displayed in hex.

Upon entering the SCSI DIRECT COMMAND mode the user is prompted for the SCSI device node number, logical unit number, and number of bytes in the Command Descriptor Block (CDB). The user is then asked to input the SCSI Command Descriptor Block (CDB) one byte at a time. The user is prompted as follows:

```
ENTER # OF COMMAND BYTES:                          {user response}
ENTER SCSI COMMAND DESCRIPTOR BLOCK (CDB):
     [e.g., for a READ command of 10 bytes, LUN = 00]

          Byte #0 = 08
          Byte #1 = 00
          Byte #2 = 00
          Byte #3 = 00
          Byte #4 = 0A
          Byte #5 = 00

DATA TRANSFERS LIMITED TO 1 SECTOR [512 BYTES]

          Enter Command Byte #0 = {user response}
          Enter Command Byte #1 = {user response}
          Enter Command Byte #2 = {user response}
          Enter Command Byte #3 = {user response}
          Enter Command Byte #4 = {user response}
          Enter Command Byte #5 = {user response}
                                  .
                                  .
                                  .
```

In order to input the command descriptor block, the user need simply type, in hex, each command byte when prompted for. An example of a READ command is given as part of the prompt message to demonstrate how the user is to enter the command properly. The prompting of the command bytes will continue until the specified number of command bytes have been received. Note that all user responses above are indicated by "{user response}." If the user ever inputs an invalid response, the controller will respond with an "## Invalid Setting" message. The user will then again be prompted for the appropriate information. Also, the user must note that all data transfer commands are limited to 512 bytes. An attempt to transfer more than 512 bytes of data will result in an error during the execution of the command.

Upon receiving the command descriptor block, the controller will display the command bytes entered. The user is then prompted as to whether or not the command bytes displayed are correct. If the command bytes are correct, the user need simply type "Y" for yes and the controller will continue on with its next prompt. If the command bytes are incorrect, the user must then type an "N" for no. At this point the controller will respond with a second prompt asking if the user wishes to go back to the configuration menu. If the user responds with a "Y" for yes, the controller will take him back to the configuration menu, otherwise an "N" for no will take the user back to re-enter a SCSI Command Descriptor Block (CDB).

Once the user has input a command correctly, the controller will prompt him as to whether or not he wishes to send data out during the execution of the command. The user need only send data out if the current command to be executed sends data to the target; otherwise, the user should respond to the prompt with an "N" for no. If data does need to be sent out to the SCSI device, the user should type a "Y" for yes, at which point the controller will prompt him for the number of data bytes to be entered. The user will then be asked to input the data bytes one byte at a time.

NOTE

The maximum number of data bytes that can be entered is 512 bytes.

```
ENTER # OF DATA BYTES:   {user response}

     Data Byte #0000 = {user response}
     Data Byte #0001 = {user response}
     Data Byte #0002 = {user response}
     Data Byte #0003 = {user response}
     Data Byte #0004 = {user response}
     Data Byte #0005 = {user response}
     Data Byte #0006 = {user response}
     Data Byte #0007 = {user response}
     Data Byte #0008 = {user response}
     Data Byte #0009 = {user response}
     Data Byte #000A = {user response}
                  .
                  .
                  .
```

In order to input the data bytes, the user need simply type, in hex, each data byte when prompted for. The prompting of the data bytes will continue until the specified number of data bytes have been received. Once all of the data has been input, the controller will display the data bytes. It will then prompt the user as to whether or not the data displayed is correct. If the data is correct, the user need simply type a "Y" for yes and the controller will continue on to the next prompt. If the data is incorrect, the user must type an "N" for no, at which point the controller will prompt the user to see if he wishes to go back to the configuration menu. If the user types a "Y" for yes, the controller will go back to the configuration menu. If the user types an "N" for no, then the controller will prompt the user for new data.

Upon inputting correct data or specifying that no data need be sent out, the user will be prompted as to whether or not the command entered is to be executed. The user is prompted as follows:

```
                    CAUTION

        COMMANDS WILL BE EXECUTED AS ENTERED.  CURRENT
        DATA ON THE DRIVE MAY BE OVERWRITTEN.


    EXECUTE COMMAND (Y/N)?
```

The caution indicates that the SCSI device will receive the command as entered by the user; therefore, the user should ensure that the command is correct before executing. Also, in case the user issues a write command, he should be aware that any data on the SCSI device at the location of the write command will be overwritten. If the user chooses not to execute the SCSI command, he should type an "N" at which point the controller will take him back to the configuration menu. If the user chooses to execute the command, he need simply type a "Y". At this point the controller will display the following message:

```
    EXECUTING SCSI COMMAND ...
```

Upon completion of the command a number of different messages may appear. The different messages and their meanings are as defined below:

```
>   SCSI COMMAND COMPLETED WITH NO ERRORS
```

This message indicates that the command was successful and no errors occurred during its execution. If this message is displayed after executing a read command, the controller will automatically display the read data from the SCSI device.

```
>   CHECK CONDITION ON SCSI COMMAND
```

This message indicates that a check condition occurred during the execution of the command. The controller will automatically request sense data from the SCSI device and display the sense data following this message.

```
>   SCSI BUS PARITY ERROR
```

This message indicates that a SCSI bus parity error was detected during the execution of the command and subsequent retries of the command also produced parity errors.

```
>   SCSI BUS PARITY ERROR
    RETRY WAS SUCCESSFUL
```

This message indicates that a SCSI bus parity error was detected during the execution of the command, but during a subsequent retry the command executed with no errors.

> QBUS PARITY ERROR

This message indicates that a QBUS parity error occurred during an access of QBUS memory.

> CONTROLLER PARITY ERROR DURING ACCESS OF DRAM

This message indicates that a controller parity error occurred during an access of the controller's Dynamic RAM.

> SCSI BUS RESET OCCURRED DURING COMMAND EXECUTION

This message indicates that a SCSI bus reset occurred during the execution of the command; therefore, the command was not completed.

> SCSI DEVICE NOT RESPONDING

This message indicates that the SCSI device is not responding to the command issued.

> TRANSFER TRUNCATED TO SINGLE SECTOR (512 BYTES)

This message indicates that a multi-sector data transfer command was attempted. The command was therefore truncated to a single sector command. If this message is displayed after a read command, only a single sector of data will be displayed.

> COMMAND TIMEOUT

This message indicates the requested command took over an hour without any activity on the SCSI bus.

Upon the completion of the command, the controller will prompt the user with the following:

ISSUE ANOTHER SCSI COMMAND (Y/N)?

At this point the user can either issue another SCSI command simply by typing a "Y" for yes, or he can go back to the configuration menu by typing an "N" for no.

SCSI UNIT MAPPING

Selection 5 of the configuration menu allows the user to select the SCSI unit map of the host adapter. The user can map up to 8 different host units, selecting each individual node and logical unit number (LUN) for each SCSI device. The user can also select the node at which the host adapter is to reside. The user should note that at this point, the controller expects inputs in decimal.

NOTE

> Logical mapping of units must be done for all possible devices. If it has not been mapped, a device cannot be used by the system. If another unit must be added, the map must be changed offline and then the system rebooted.

Upon entering the SCSI UNIT MAPPING mode, the current SCSI unit map table is displayed, as determined by the contents of the NOVRAM. The display is as shown below:

SCSI UNIT MAPPING - Host Adapter is at Node xx

SETUP #	HOST UNIT	NODE / LOGICAL UNIT # (LUN)	BYTE SWAP
01	xx	xx xx	xx
02	xx	xx xx	xx
03	xx	xx xx	xx
04	xx	xx xx	xx
05	xx	xx xx	xx
06	xx	xx xx	xx
07	xx	xx xx	xx
08	xx	xx xx	xx

The Host unit is the MSCP address of this device. For example, Host Unit 0 would be recognized by VMS as DUA0, DUB0, etc., depending on the controller address. The node is the SCSI node address for the device. The logical unit number is SCSI node LUN for the mapped node.

As seen above, the SCSI unit map displays the host unit, node, logical unit number, and the byte swap configuration of the 8 different setups available on the Host Adapter. In addition, it specifies the node that the host adapter occupies. The xx's in the table above represent the current configuration numbers for each setup. The default SCSI unit map as set by the factory is shown below.

SCSI UNIT MAPPING - Host Adapter is at Node 07

SETUP #	HOST UNIT	NODE/LOGICAL UNIT # (LUN)	BYTE SWAP
01	00	00 00	[Disabled]
02	No current setup		
03	No current setup		
04	No current setup		
05	No current setup		
06	No current setup		
07	No current setup		
08	No current setup		

The default setting of the host adapter does not setup the last seven available SCSI units. As seen above, when a SCSI unit has not been setup, the "No current setup" message will appear.

Following the display of the SCSI unit map, a menu of the available options for SCSI UNIT MAPPING mode is displayed.

```
0 - RETURN TO CONFIGURATION MENU
1 - CHANGE UNIT MAPPING
2 - CHANGE HOST ADAPTER NODE
3 - SAVE UNIT MAPPING IN NOVRAM
4 - RESTORE DEFAULT UNIT MAPPING

ENTER A SELECTION:
```

In order to choose an option, the user need simply type the number of the option he wishes to perform followed by a <CR>.

OPTION 0 will simply return the user to the Configuration Menu.

OPTION 1 will allow the user to change any of the current setups on the SCSI unit map. Upon entering this option, the user will be prompted for the setup # he wishes to change. The user need simply type the number of the setup he wishes to modify at the prompt followed by a <CR>. At this point, if the setup the user wishes to modify currently occupies a valid setup (i.e., the "No current setup" is NOT displayed), he will be prompted as to whether or not he wishes to remove the setup. If the user chooses to remove the setup by typing a "Y" at the prompt, the SCSI unit map will be redisplayed and the setup removed will display the "No current setup" message. If the user chooses not to remove the setup by typing an "N" at the prompt, he will then be prompted for the new host unit, node, and logical unit number he wishes to set. If the setup the user wishes to modify has no valid setup (i.e., the "No current setup" message is displayed), he will simply be prompted for the new setup consisting of the host unit, node, logical unit number, and the byte swap configuration. In any case, at the completion of the prompting, the SCSI unit map will be redisplayed with the modifications made by the user.

NOTE

> The byte swap option (when enabled) allows the reading and writing of IBM* format tapes; however all records must consist of an even byte count.

OPTION 2 will allow the user to change the node occupied by the host adapter.

---

* IBM is a registered trademark of International Business Machines.

OPTION 3 will allow the user to save the currently displayed SCSI unit map in the NOVRAM. This will allow the particular map saved to remain as part of the configuration of the host adapter even when the board has no power applied. The map will be preserved for the life of the NOVRAM or until another map is saved in the NOVRAM. In order to save the map in the NOVRAM of the host adapter, the following specification must be met by the SCSI unit map.

The following specifications exclude those setups which are not valid.

1. All setups must occupy unique host unit numbers.

2. All setups must occupy a unique combination of node and logical unit number.

3. No setup can occupy the same node as the host adapter.

Unless the above specifications are met, the host adapter will not allow the SCSI unit map to be saved in the NOVRAM. If the SCSI map is not allowed to be saved, the following message will be displayed:

SCSI UNIT MAP NOT SAVED IN NOVRAM DUE TO OVERLAPPING OF HOST UNIT NUMBERS OR NODE/LOGICAL UNIT NUMBERS.

If the above specifications are met, the controller will then display a message saying that the map was saved in the NOVRAM. A <CR> at this point will redisplay the SCSI unit map.

OPTION 4 will allow the user to restore the default SCSI unit map as set by the factory. Upon entering this option, the user is prompted as to whether or not he wishes to save the default mapping in the NOVRAM. If he chooses to save the mapping in the NOVRAM, he need simply type a "Y" at the prompt followed by a <CR> at which point the default map will be saved and redisplayed. If the user chooses not to save the map in the NOVRAM, he need simply type an "N" at the prompt, at which point the default map will be displayed but not saved.

SECTION 4

DIAGNOSTICS

PDP-11 SYSTEM - XXDP+ DIAGNOSTICS FOR TU81

Two DEC TU81 diagnostics may be used to test the controller. They are ZTU2B0, Front End Test, and ZTU1A0, Data Reliability Test.

SETUP AND SELF TEST

Install the controller as described in Section 2 and apply power to the system. Make sure the TU81 emulation has been selected on the controller via the Configuration Menu as described in Section 3. Boot the XXDP+ diagnostic onto the system. When booting is completed, the XXDP+ sign-on message will appear along with the "." boot prompt.

FRONT END TEST - ZTU2B0

The controller will support TU81 Front End Tests 1 through 8. These tests will bring the controller through initialization several times and do extensive checks on the DMA capability. To load the test, type the following command line after the "." boot prompt:

```
.R ZTU2B0  <CR>
```

When the diagnostic has been loaded, the following message will be displayed on the console:

```
CZTU2B0 TU81 FUNCTIONAL DIAGNOSTIC
UNIT IS TU81
RSTRT ADR 145676

DR>
```

In order to run all tests error free, the following patch must be applied.

	ADDRESS	IS	SHOULD BE
PATCH 1	31402	4600	5600

NOTE

PATCH 1 - Applies to all tests. During Step 1 of TMSP Initialization, the diagnostic expects to see 4600 (octal) in the SA register. Instead the controller returns with 5600 (octal). The reason for the discrepancy between these two values is that the "QB" (Q-Bus) bit is set by the controller, but the diagnostics was written for the TU81, which is not a Q-Bus device.

The diagnostic can be started by typing the following command line:

```
DR>START/FLA:PNT/TEST:1-8  <CR>
```

The above command line instructs the diagnostic supervisor to start running test 1 through 8. The supervisor will then prompt the user for hardware and software changes. The user should respond as follows:

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

# UNITS (D)  ?  1  <CR>

UNIT 0
TUIP ADDRESS (0)  174500  ?  <CR>
TU VECTOR (0)  260  (0)  ?  <CR>
T/MSCP UNIT NUMBER (0)  0  ?  <CR>

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

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

```
TEST 1 -  REGISTER EXISTENCE TEST
TEST 2 -  STEP 1 POWER UP DIAGNOSTICS
TEST 3 -  STEP 1-3 INITIALIZATION TEST
TEST 4 -  DIAGNOSTIC WRAP TEST
TEST 5 -  VECTOR AND BR LEVEL TEST
TEST 6 -  PURGE AND POLL TEST
TEST 7 -  SMALL RING TEST
TEST 8 -  LARGE RING TEST
```

To stop execution of the diagnostic, type a CTRL-C. To exit the Front End Test, type the following:

```
DR>EXIT  <CR>
```

DATA RELIABILITY TEST - ZTU1A0

The controller will support TU81 Data Reliability Tests 1 through 6. These tests will check the data reliability of the controller by performing several read, write and repositioning functions. To load the test, type the following command line after the "." boot prompt.

```
.R ZTU1A0  <CR>
```

When the diagnostic has been loaded, the following message will be displayed on the console.

```
CZTU1A0 TU81 DATA RELIAB TEST
UNIT IS TU81
RSTRT ADR 145676

DR>
```

The diagnostic can be started by typing the following command line:

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

The above command line instructs the diagnostic supervisor to start running test 1 through 6. The supervisor will then prompt the user for hardware and software changes. The user should respond as follows:

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

# UNITS (D)  ?  1  <CR>

UNIT 0
TUIP ADDRESS (0)  174500  ?  <CR>
TU VECTOR (0)  260  (0)  ?  <CR>
T/MSCP UNIT NUMBER (0)  0  ?  <CR>

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

The diagnostic will print each test as it runs. Test 1-6 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 CTRL-C. To exit the Data Reliability Test, type the following:

```
DR>EXIT  <CR>
```

PDP-11 SYSTEM - XXDP+ DIAGNOSTICS FOR TK50

Two DEC TK50 diagnostics may be used to test the controller. They are ZTKACO, Front End Test, and ZTKBBO, Data Reliability Test.

SETUP AND SELF TEST

Install the controller as described in Section 2 and apply power to the system. Make sure the TK50 emulation has been selected on the controller via the Configuration Menu as described in Section 3. Boot the XXDP+ diagnostic onto the system. When booting is completed, the XXDP+ sign-on message will appear along with the "." boot prompt.

FRONT END TEST - ZTKACO

The controller will support TK50 Front End Tests 1 through 8. These tests will bring the controller through initiali several times and do extensive checks on the DMA capability. To load the test, type the following command line after the "." boot prompt:

```
.R ZTKACO  <CR>
```

In order to run Test 5 error free, the following patch must be applied.

	ADDRESS	IS	SHOULD BE
PATCH 2	44154	16537	12737
	44156	2260	0

NOTE

PATCH 2 - Applies only to Test 5. This diagnostic tests the interrupt priority break level to ensure that the controller appropriately interrupts the unibus. The test sets the host's interrupt priority to break level 7 (highest priority) and then asks the controller to interrupt the host via vector 260 (octal). Upon not receiving an interrupt, as expected, the diagnostic reads the SA register expecting to see the interrupt vector, 260 (octal), in its contents. However, the controller does not output the interrupt vector onto the SA register until the interrupt is recognized by the host. Therefore, this patch serves to compare the SA contents with a value of zero instead of 260 (octal).

The diagnostic can be started by typing the following command line:

```
DR>START/FLA:PNT/TEST:1-8  <CR>
```

The above command line instructs the diagnostic supervisor to start running test 1 through 8. The supervisor will then prompt the user for hardware and software changes. The user should respond as follows:

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

# UNITS (D)  ?  1  <CR>

UNIT 0
TKIP ADDRESS (0)  174500  ?  <CR>
TK VECTOR (0)  260  (0)  ?  <CR>
T/MSCP UNIT NUMBER (0)  0  ?  <CR>

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

The diagnostic will print each test as it runs. Test 1-8 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 execution of the diagnostic, type a CTRL-C. To exit the Front End Test, type the following:

```
DR>EXIT  <CR>
```

DATA RELIABILITY TEST - ZTKBB0

The controller will support TK50 Data Reliability Tests 1 through 6. These tests will check the data reliability of the controller by performing several read, write and repositioning functions. To load the test, type the following command line after the "." boot prompt.

```
.R ZTKBB0  <CR>
```

When the diagnostic has been loaded, the following message will be displayed on the console.

```
CZTKBB0 TK50 DATA RELIABILITY TEST
UNIT IS TK50
RSTRT ADR 145676

DR>
```

The diagnostic can be started by typing the following command line:

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

The above command line instructs the diagnostic supervisor to start running test 1 through 6. The supervisor will then prompt the user for hardware and software changes. The user should respond as follows:

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

# UNITS (D)  ?  1  <CR>

UNIT 0
TKIP ADDRESS (0)  174500  ?  <CR>
TK VECTOR (0)  260  (0)  ?  <CR>
T/MSCP UNIT NUMBER (0)  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 (0)  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 as it runs. Test 1-6 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 CTRL-C. To exit the Data Reliability Test, type the following:

```
DR>EXIT  <CR>
```

MICROVAX II SYSTEM DIAGNOSTICS

MDM DIAGNOSTIC FOR TU81

The controller is compatible with the MicroVAX II diagnostics listed.

Service Functional	(1-11)	-	Runs Test 1-8 and 10
Service Exerciser	(1 & 2)	-	Runs Test 1 and 2
Verify Functional	(1-11)	-	Runs Test 1-8 and 10
Verify Exerciser	(1)	-	Runs Test 1

MDM DIAGNOSTIC FOR TK50

The controller is compatible with the MicroVAX II diagnostics listed.

Service Functional	(1-11)	-	Runs Test 1-8
Service Exerciser	(1 & 2)	-	Not supported
Verify Functional	(1-11)	-	Runs Test 1-8
Verify Exerciser	(1)	-	Not supported

For additional information regarding the MDM, refer to the "MicroVAX Diagnostic Monitor User's Guide," Order No. AA-FM7SB-DN.

UETP DIAGNOSTIC

The following diagnostic description applies to both TU81 and TK50 emulation.

The controller will only support the UETP diagnostic on MicroVMS when running with the Kennedy 9612 or the CDC Keystone tape drives. UETP is not supported when running the Exabyte 8200 tape drive.

SECTION 5

ERRORS AND TROUBLESHOOTING

GENERAL

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 4 of the Configuration Menu allows a single SCSI command to be given directly to the drive. This is documented in Section 3, "SCSI Direct Command." 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 bus reset, the SCSI Test Unit Ready command will usually return an error indicating that the bus was reset. Execute the command again to clear the error.

Another example is a SCSI Read command. This is as follows:

6 BYTES - 8,0,0,0,0A,0

This will read ten bytes and display it on the screen. If not successful, the SCSI Request Sense command information may appear on the screen. Consult the drive manual to decode this information.

NOTE

Reading a ten byte record assumes a ten byte record was previously written to this location on tape. If this is not true, Request Sense information will be displayed.

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 as follows (called the Sense Key):

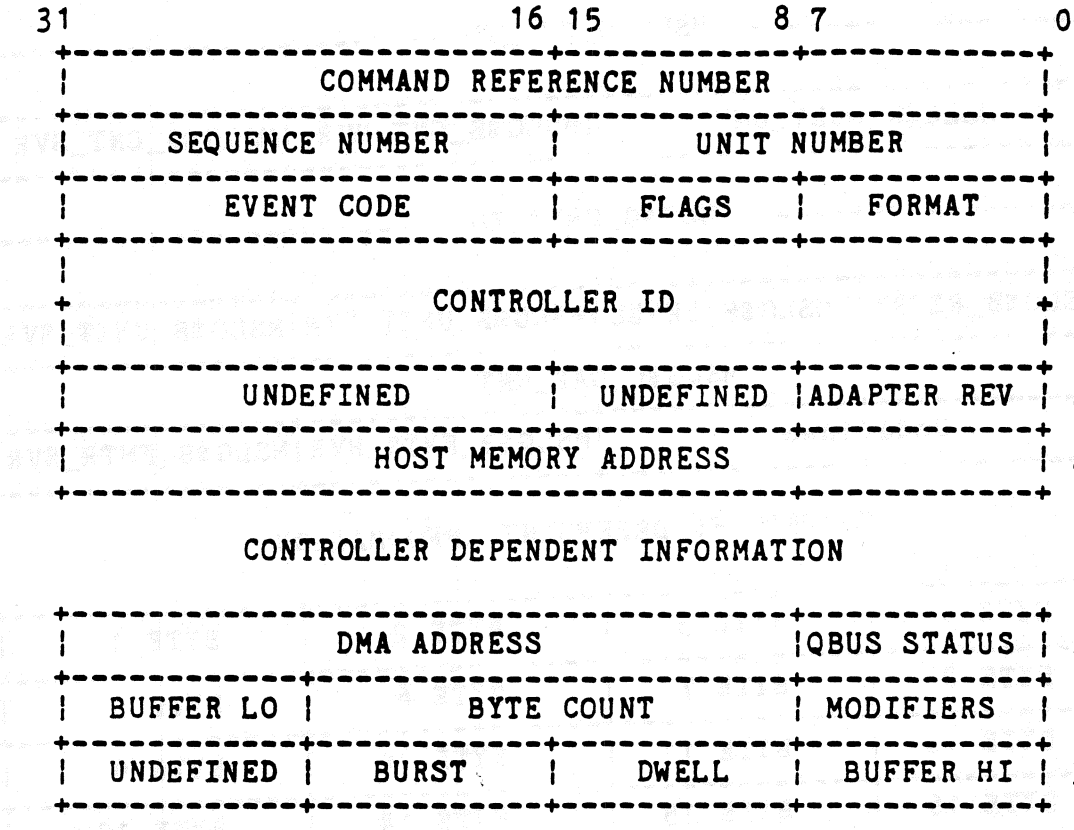
0 - NO SENSE. No specific information to return.
1 - RECOVERED ERROR. Last command completed successfully but with some drive recovery action.
2 - NOT READY. Drive not ready.
3 - MEDIUM ERROR. Media error.
4 - HARDWARE ERROR.
5 - ILLEGAL REQUEST.
6 - UNIT ATTENTION. Drive reset or media changed.
7 - DATA PROTECT.

Consult the drive manual for additional Request Sense information.

ERROR LOGS

Host Memory Access, Tape Transfer, and SDI error logs and their formats are listed below. Also listed are fatal errors as posted in the SA register.

SCSI HOST MEMORY ACCESS ERROR LOG



Flags = 0 (sequence number reset)
Format = 1 (host memory access error)
Event Code = 69H (nonexistent memory error)
89H (too large size request in MU command)

TMSCP TAPE TRANSFER ERROR LOG FOR VMS - TU81

31 24	23 16	15 8	7 0	H (O) D
MSLG$L_CMD_REF				00 (000) 0
MSLG$W_SEQ_NUM		MSLG$W_UNIT		04 (004) 4
MSLG$W_EVENT		MSLG$B_Flags	MSLG$B_Format	08 (010) 8
				0C (014) 12
MSLG$Q_CNT_ID				10 (020) 16
MSLG$W_MULT_UNT		MSLG$B_CNT_HVR	MSLG$B_CNT_SVR	14 (024) 20
				18 (030) 24
MSLG$Q_UNIT_ID				1C (034) 28
MSLG$B_RETRY	MSLG$B_LEVEL	MSLG$B_UNIT_HVR	MSLG$B_UNIT_SVR	20 (040) 32
MSLG$L_GAP_CNT				24 (044) 36
Undefined		MSLG$B_FMTR_HVR	MSLG$B_FMTR_SVR	28 (050) 40

CONTROLLER DEPENDENT INFORMATION

BYTE 4	BYTE 3	BYTE 2	BYTE 1	2C (054) 44
BYTE 8	BYTE 7	BYTE 6	BYTE 5	30 (060) 48
BYTE 12	BYTE 11	BYTE 10	BYTE 9	34 (064) 52
BYTE 16	BYTE 15	BYTE 14	BYTE 13	38 (070) 56

NOTE

Throughout this material, the column headings "H", "O", "D", represent "Hex", "Octal", and "Decimal" respectively.

TMSCP TAPE TRANSFER ERROR LOG FOR VMS - TK50

31 24	23 16	15 8	7 0	H (O)	D
MSLG$L_CMD_REF				00 (000)	0
MSLG$W_SEQ_NUM		MSLG$W_UNIT		04 (004)	4
MSLG$W_EVENT		MSLG$B_Flags	MSLG$B_Format	08 (010)	8
MSLG$Q_CNT_ID				0C (014)	12
				10 (020)	16
MSLG$W_MULT_UNT		MSLG$B_CNT_HVR	MSLG$B_CNT_SVR	14 (024)	20
MSLG$Q_UNIT_ID				18 (030)	24
				1C (034)	28
MSLG$B_RETRY	MSLG$B_LEVEL	MSLG$B_UNIT_HVR	MSLG$B_UNIT_SVR	20 (040)	32
MSLG$L_GAP_CNT				24 (044)	36
Undefined		MSLG$B_FMTR_HVR	MSLG$B_FMTR_SVR	28 (050)	40

CONTROLLER DEPENDENT INFORMATION

(High)PHYSICAL BLOCK#(Low)		TRK NUMBER	DRIVE FLAGS	2C (054)	44
(High) TAPE POSITION (Low)			LOGICAL BLK#	30 (060)	48
(High) RD/WR STATE (Low)		(High) DRIVE STATE (Low)		34 (064)	52
DRV ERR CODE	CNTRLR STATUS	(High) OPERATION FLGS (Low)		38 (070)	56

TAPE TRANSFER ERROR LOG

31 — 24	23 — 16	15 — 8	7 — 0	H (O)	D
COMMAND REFERENCE NUMBER				00 (000)	0
SEQUENCE NUMBER		UNIT NUMBER		04 (004)	4
EVENT CODE		FLAGS	FORMAT	08 (010)	8
				0C (014)	12
CONTROLLER ID				10 (020)	16
UNDEFINED		CTLR HVR	CTLR SVR	14 (024)	20
				18 (030)	24
UNIT ID				1C (034)	28
RETRY COUNT	UNDEFINED	UNIT HVR	UNIT SVR	20 (040)	32
CURRENT TAPE POSITION				24 (044)	36
UNDEFINED		FMTR HVR	FMTR SVR	28 (050)	40

REQUEST SENSE COMMAND INFORMATION

31 — 24	23 — 16	15 — 8	7 — 0	H (O)	D
CDB BYTE 2	CDB BYTE 1	CDB BYTE 0	CDB SIZE	2C (054)	44
SENSE KEY	CDB BYTE 5	CDB BYTE 4	CDB BYTE 3	30 (060)	48
BYTE 20	BYTE 19	BYTE 13	BYTE 12	34 (064)	52
RESERVED	RESERVED	RESERVED	BYTE 21	38 (070)	56

TAPE TRANSFER ERROR LOG (Continued)

Flags bits =
- 80 (200) Soft error (bit clear means Hard error)
- 40 (100) Continuing
- 20 (040) Error log generated
- 10 (020) Serious exception
- 08 (010) End of tape
- 04 (004) Tape position lost
- 02 (002) Cache data lost
- 01 (001) Sequence number reset

Format = 05 (005) Tape transfer error

Event Flag =
- 06 (006) Write protected
- 08 (010) Read error
- 11 (021) Illegal request or blank check
- 23 (043) Not ready -- no tape loaded or not online
- 68 (150) Write error
- 88 (210) Inconsistent internal control structure
- E8 (350) Media error
- 0B (013) Target not responding to selection
- 2B (053) Drive error
- 4B (113) Parity error -- retry successful
- 6B (153) Parity error -- retry unsuccessful
- CB (313) Not at BOT during online

EXABYTE TAPE TRANSFER ERROR LOG DEFINITION

	HEX	OCT	DEC	DESCRIPTION
Byte	24	044	36	** Current Tape Position
Byte	2C	054	44	** SCSI Command Buffer Size
Byte	2D	055	45	** SCSI Command Buffer Contents (refer to drive manual)
Byte	2D	055	45	SCSI Command Buffer Byte 00*
Byte	2E	056	46	SCSI Command Buffer Byte 01
Byte	2F	057	47	SCSI Command Buffer Byte 02
Byte	30	060	48	SCSI Command Buffer Byte 03
Byte	31	061	49	SCSI Command Buffer Byte 04
Byte	32	062	50	SCSI Command Buffer Byte 05
Byte	33	063	51	** SCSI Sense Key: Sense Data Byte 02
Byte	33	063	51	Bit 7 -- File Mark
				Bit 6 -- End of Media
				Bit 5 -- Incorrect Length Indicator
				Bit 3-0 --0 (00)-- No Sense 1 (01) -- Not Used 2 (02) -- Not Ready 3 (03) -- Medium Error 4 (04) -- Hardware Error 5 (05) -- Illegal Request 6 (06) -- Unit Attention 7 (07) -- Data Protect 8 (10) -- Blank Check 9 (11) -- Exabyte A (12) -- Copy Aborted B (13) -- Aborted Command C (14) -- Not Used D (15) -- Volume Overflow E (16) -- Not Used F (17) -- Reserved
Byte	34	064	52	** Additional Sense Code: Sense Data Byte 12
Byte	34	064	52	02 (002) -- Not Ready

EXABYTE TAPE TRANSFER ERROR LOG DEFINITION (Cont.)

HEX	OCT	DEC	DESCRIPTION
Byte 35	065	53	** Additional Sense Qualifier: Sense Data Byte 13
Byte 35	065	53	00 (000) -- Volume Not Mounted
Byte 35	065	53	01 (001) -- Currently Rewinding or Loading
Byte 36	066	54	** SCSI Status Bits: Sense Data Byte 19
Byte 36	066	54	Bit 7 -- PF (Power Fail)
			Bit 6 -- BPE (SCSI Bus Parity Error)
			Bit 5 -- FPE (Formatted Buffer Parity Error)
			Bit 4 -- ME (Media Error)
			Bit 3 -- ECO (Error Counter Overflow)
			Bit 2 -- TME (Tape Motion Error)
			Bit 1 -- TNP (Tape Not Present)
			Bit 0 -- BOT (Beginning Of Tape)
Byte 37	067	55	** SCSI Status Bits: Sense Data Byte 20
Byte 37	067	55	Bit 7 -- XFR (Transfer Abort Error)
			Bit 6 -- TMD (Tape Mark Detect Error)
			Bit 5 -- WP (Write Protect)
			Bit 4 -- FMKE(Write Filemark Error)
			Bit 3 -- URE (Under Run Error)
			Bit 2 -- WE1 (Write Error 1)
			Bit 1 -- SSE (Servo System Error)
			Bit 0 -- FE (Formatter Error)

EXABYTE TAPE TRANSFER ERROR LOG DEFINITION (Cont.)

HEX	OCT	DEC	DESCRIPTION
Byte 38	070	56	** SCSI Status Bits: Sense Data Byte 21
Byte 38	070	56	Bit 7 -- Reserved
			Bit 6 --Reserved
			Bit 5 -- Reserved
			Bit 4 -- Reserved
			Bit 3 -- Reserved
			Bit 2 -- Reserved
			Bit 1 -- WSEB (Write Splice Error)
			Bit 0 -- WSEO (Write Splice Error)

EXABYTE SCSI COMMAND DEFINITION

	HEX	OCT	DEC	DESCRIPTION
Byte	2D	055	45	** SCSI Command Buffer Byte 00
Byte	2D	055	45	00 (000) -- Test Unit Ready 01 (001) -- Rewind 03 (003) -- Request Sense 05 (005) -- Read Block Limits 08 (010) -- Read 0A (012) -- Write 10 (020) -- Write Filemark 11 (021) -- Space 12 (022) -- Inquiry 14 (024) -- Recover Buffered Data 15 (025) -- Mode Select 16 (026) -- Reserve Unit 17 (027) -- Release Unit 18 (030) -- Copy 19 (031) -- Erase 1A (032) -- Mode Sense 1B (033) -- Load/Unload 1C (034) -- Receive Diagnostic Results 1D (035) -- Send Diagnostic 1E (036) -- Prevent/Allow Medium Removal

STANDARD DIAGNOSTIC ERROR CODES

If an error occurs during STANDARD diagnostics, an error code will be flashed on the ACTIVITY LED. A "long" flash represents a "1" and a "short" flash represents a "0". The flashes are decoded with the first flash representing the most significant bit and the last flash representing the least significant bit. The code can be itentified by the following error code table:

```
MSB      x   |   x  x  x  x     LSB
         1       1  1  1  1              = Error 1F

         ^       \--   --/
         |           ^
         |           |
High Byte - - -      - - - Low Byte
```

HEX	OCT	DEC	DESCRIPTION
01	001	01	; [QBUS Command Packet Read]
02	002	02	; [QBUS Command Packet Write]
03	003	03	; [Buffer RAM parity error]
04	004	04	; [Buffer RAM data error]
05	005	05	; [EPROM Checksum]
06	006	06	; [QBUS Command/Response Ring Read]
07	007	07	; [QBUS Command/Response Ring Write]
08	010	08	; [QBUS Interrupt] (NOT USED)
09	011	09	RESERVED
0A	012	10	RESERVED
0B	013	11	; [QBUS DMA] (NOT USED)
0C	014	12	; [CPU Failure]
0D	015	13	; [Watchdog Timer]
0E	016	14	RESERVED
0F	017	15	; Interrupt Write (NOT USED)

STANDARD DIAGNOSTIC ERROR CODES (Cont.)

HEX	OCT	DEC	DESCRIPTION
10	020	16	; MAINTENANCE READ/WRITE Invalid Region; Identifier [DU Driver]
11	021	17	; MAINTENANCE WRITE Load to Non-Loadable; Controller [DU Driver]
12	022	18	; Controller RAM Error (non-parity)
13	023	19	; INIT Sequence Error [DU Driver Initialization]
14	024	20	RESERVED
15	025	21	; [DU Driver Initialization Diagnostic Failure]
16	026	22	; EEPROM Checksum Failure
17	027	23	; SBIC Register Error
18	030	24	; DMA Controller Error
19	031	25	; QBIC Error
1A	032	26	; QBUS DMA Error
1B	033	27	; QBUS Power Failure
1C	034	28	; Nonexistent Memory Detected during Host/ Controller DMA's
1D	035	29	; Parity Error Detected during Host/ Controller DMA's
1E	036	30	; QBIC Data Compare error during Host/ Controller DMA's
1F	037	31	; port b parity error detected
20	040	32	; port c parity error detected
21	041	33	RESERVED
22	042	34	; port a parity error detected
23 to FF	043 to 377	35 to 255	NOT USED

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