CQD-220
CQD-223

HIGH PERFORMANCE Q-BUS

SYNC/ASYNC SCSI HOST ADAPTER

USER'S MANUAL

CQD-220
CQD-223

HIGH PERFORMANCE Q-BUS

SYNC/ASYNC SCSI HOST ADAPTER

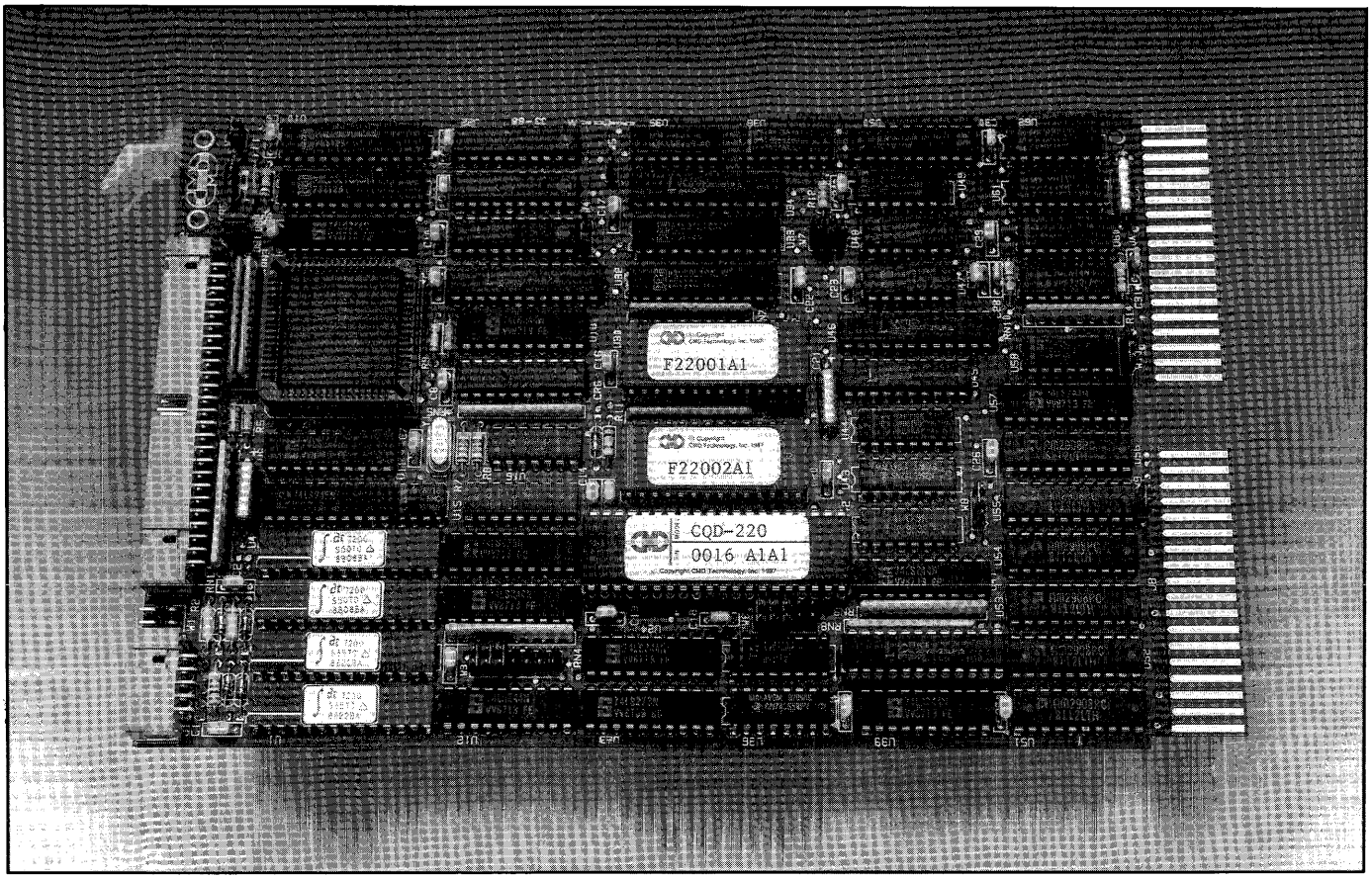
USER'S MANUAL

CMD TECHNOLOGY, INC.

3851 S. Main Street
Santa Ana, CA 92707
(714) 549-4422

CQD-220 Rev 2.5
Nov. 20, 1990

CQD
220 SERIES
Q-BUS SYNC/ASYNC SCSI HOST ADAPTER



The CMD's CQD-220 SCSI host adapter is the best solution to bridging DEC MSCP/TMSCP protocols and SCSI optical, magnetic disk and tape products.

- *16-bit microprocessor*
- *18- or 22-Bit Q-Bus MSCP compatible*
- *Block mode DMA*
- *Virtual data buffer*
- *Command queuing and seek optimization*
- *Support up to 7 SCSI devices*
- *SCSI bus transfer rate up to 4.8 MB/sec (SYNC) and 3.0 MB/sec (ASYNC)*
- *Support magnetic disk and tape*
- *ANSI compatible tape format*
- *Support disconnect reconnect capability*
- *On-board utility to format qualify drives*
- *Automatic drive configuration*
- *Dynamic defect management*

For more information or to order call:

1-800-4-CMD-TEC

(1-800-426-3832)

In California call: (714) 549-4422

CMD TECHNOLOGY INC.

3851 South Main Street
Santa Ana, California 92707
(714) 549-4422 • FAX: (714) 549-4468

CMD TECHNOLOGY, INC. ANNOUNCES:
CQD-220 DUAL WIDE Q-BUS SCSI HOST ADAPTER.

The CQD-220 is an intelligent dual-wide Q-bus SCSI host adapter which is fully compatible with the DEC Mass Storage Control Protocol (MSCP) and Tape Mass Storage Control Protocol (TMSCP).

The CQD-220 can be used with the LSI-11/23, LSI-11/23+, LSI-11/53, LSI-11/73, LSI-11/83, Micro/PDP-11, and the MicroVAX CPUs. It supports RT-11, TSX+, RSX, RSTS, ULTRIX, UNIX, MicroVMS and other operating systems which use the DU/MU drivers.

The CQD-220 supports 18-bit or 22-bit Q-bus addressing, block mode DMA transfer, command queuing, seek optimization, standard SCSI bus arbitration, disconnect/reconnect, and all required SCSI commands. Up to seven SCSI target devices (magnetic or optical) can be connected to CQD-220 with SCSI bus data transfer rate to 4.8M bytes per second.

The CQD-220 has an on-board utility for users to configure and format drives, scan bad blocks and replace them automatically.

The CQD-220 contains a user selectable automatic bootstrap option which can boot up the system on power up. It comes standard with an installation manual and a one year warranty.

CONTROLLER SPECIFICATIONS

Emulation: MSCP, TMSCP

Bus Interface: Standard LSI-11 or MicroVAX Q-Bus

Addressing: 18 or 22-bit addressing

CSR address: (Disk) 772150, 760334, 760354, 760374, 760340, 760344, 760350, 760360
(Tape) 774500, 760404, 760444, 760504, 760544, 760410, 760450, 760454
(Disk/Tape) 772150, 760334, 760354, 774500, 760404, 760444

Interrupt priority: Level 4 or 5

Interrupt vector: Software programmable

Transfer mode: Adaptive and block mode DMA

Command queuing: 10 commands with optimized seek

Data buffer capacity: Virtual data buffer

Bootstrap: On board auto bootstrap and utility bootstrap

Formatting: On board format and bad block replacement

Software supported: All standard DEC operating systems

LED Indicators: Self test, drive error

Peripheral interface: Small Computer System Interface (SCSI)

SCSI bus transfer rate: 4.8MB/sec (SYNC)
3.0MB/sec (ASYNC)

SCSI parity: Odd parity

Multiple device support: Up to 7 SCSI devices

System performance: Support disconnect/reconnect capability

Driver option: Single ended

SCSI cable length: Up to 20 ft. (6 m)

Operating temperature: 5°C to 50°C

Relative humidity: 10% to 90%, non-condensing

Power requirement: 5VDC, 2.8 A

★ MSCP, TMSCP, RT-11, RSX, ULTRIX, RSTS, MicroVMS, Q-Bus, Micro/PDP-11, LSI-11, MicroVAX are trademarks of Digital Equipment Corporation.

★ TSX + is a trademark of S & H Computer Systems, Inc.

★ UNIX is a trademark of AT&T

★ Specifications subject to change without notice.

MODEL	*DESCRIPTION*
CQD-220/M	Magnetic disk
CQD-220/T	Magnetic tape
CQD-220/TM	Magnetic disk and tape

DRIVES SUPPORTED:

DISK:

CDC, C.itoh, Fujitsu, Maxtor, Micropolis, Priam, Quantum, Rodime, Seagate, Siemens, Toshiba, etc.

TAPE:

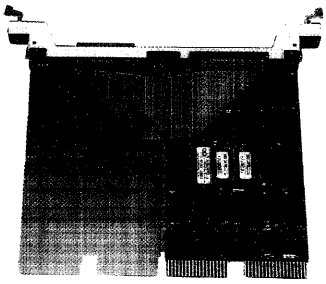
Cipher, Exabyte, Wangtek, Kennedy, Archive, Caliper, Tandberg, Fujitsu, CDC, DAT, ... etc.

ERASABLE OPTICAL:

Ricoh, Sony, . . . etc.

CD-ROM:

LMS, Phillips, Toshiba, ... etc.



CQD-223*

*CQD-223 consists of the CQD-220 and a MicroVAX III adapter kit. Available with the same functions as the CQD-220.

CMD TECHNOLOGY INC.™

3851 South Main Street • Santa Ana, California 92707
(714) 549-4422 • FAX: (714) 549-4468

FCC WARNING

This equipment generates, uses and can radiate radio frequency energy, and if not installed and used in accordance with the technical manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of Federal Communications Commission (FCC) Rules, which are designed to provide reasonable protection against such interference when operating in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

The information in this document is for information purpose and is subject to change without notice.

CMD Technology, Inc. assumes no responsiblilty for any error herein.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

CHAPTER 1 INTRODUCTION

CQD-220 DUAL WIDE Q-BUS SYNC/ASYNC SCSI HOST ADAPTER

The CQD-220 is an intelligent high performance dual-wide Q-bus SCSI host adapter which is fully compatible with the DEC Mass Storage Control Protocol (MSCP) and Tape Mass Storage Control protocol (TMSCP).

The CQD-220 can be used with the LSI-11/23, PDP-11/23+, Micro-PDP-11/53, 11/73, 11/83, 11/93 MicroVAX II, and MicroVAX III, VAX 4000 and DECsystem 5400 systems. It supports RT-11, TSX, DSM-11, ISM-11, RSX, RSTS, VMS, UNIX, ULTRIX, and other operating systems which use DU/TU drivers.

The CQD-220's built-in multi-host support allows DSSI-like sharing of SCSI MSCP/TMSCP drives between two or more VAX systems.

The CQD-220 features 18-bit or 22-bit Q-bus addressing , block mode and adaptive DMA transfer, virtual data buffer, command queuing, dynamic defect management, standard SCSI bus arbitration, disconnect and reconnect capability, multiple SCSI host capability and all required SCSI commands. Up to seven single-ended (synchronous, asynchronous or mixed) SCSI devices can be connected to the CQD-220 with SCSI bus data transfer rate up to 4.8 M bytes/sec in synchronous mode and 3 M bytes/sec in asynchronous mode.

The CQD-220 supports a variety of Sync/Async SCSI devices including magnetic disk, magnetic tape and optical disk drives. The CQD-220/M is the SCSI host adapter that supports disk drives only. The CQD-220/T is the SCSI host adapter that supports tape drives only. The CQD-220/TM supports both disk and tape drives simultaneously. The CQD-220/TM has four different variations in line - Standard CQD-220/TM, Jukebox version CQD-220/TMJ, Pass-thru version CQD-220/TMP and Shadow version CQD-220/TMS.

(Note: Unless otherwise specified, the CQD-220/TM will represent all of the four variations throught this manual.)

The CQD-220/M and CQD-220/TM have an on-board utility for users to format and configure the SCSI drives, scan bad blocks and replace them automatically. It also contains a user selectable bootstrap option which can boot up the system on power up or reset. The CQD-220/T and CQD-220/TM have an on-board utility for users to boot up the system or exercise the tape drives.

The CQD-220 has an on-board non-volatile RAM (NOVRAM) to store

the Logical Unit Number Offset and other important information of the controller.

The CQD-220 comes standard with a user's manual and one year warranty.

The CQD-223 consists of the CQD-220 and a MicroVAX III adapter kit. A shielded SCSI cable (with shielded connectors) is required to connect the CQD-223 to SCSI devices.

CHAPTER 2 CQD-220 SPECIFICATIONS

CONTROLLER SPECIFICATIONS:

Emulation:	MSCP (DU driver) / TMSCP (TU driver)
Bus Interface:	Standard MicroVAX or LSI-11 Q-Bus
Addressing:	18 or 22-bit addressing
CSR Address:	
CQD-220/M (Disk only) IC P22016A,B (U40)	772150, 760334, 760354, 760374 760340, 760344, 760350, 760360 and up to 29 CSR addresses
CQD-220/T (Tape only) IC P22017A (U40)	774500, 760404, 760444, 760504 760544, 760410, 760450, 760454 and up to 31 CSR addresses
CQD-220/TM (Disk and Tape) IC P22015A (U40)	772150, 760334, 760354, 760374 760340, 760344, 760350 (Disk) 774500, 760404, 760444, 760504 760544, 760410, 760450 (Tape)
Interrupt Priority:	Level 4 or 5
Interrupt Vector:	Software programmable
Transfer Mode:	Normal or block mode DMA
Command Queuing:	Commands with optimized seek
Data Buffer Capacity:	Virtual data buffer (infinite size)
Bootstrap:	Auto bootstrap or utility bootstrap
Defect Management:	Dynamic defect management
Software Supported:	All standard DEC operating systems
Multiple-Hosting:	Support multiple-hosting for disks, optical drives and tapes.
Formatting:	On board format and bad block replacement (ISO standard for optical erasable disk format)
Partitioning:	2 or 4 equally divided partitions for disk drives
Shadowing:	Any two disk drives on the bus can form a shadow set (for /TMS version only)

Optional Software:	Tape monitor utility (TMU) SCSIformat ON-LINE (FMT) SCSI Library Manager (SLM for /TMJ only) Generic SCSI Adapter (GSA for /TMP only)
LED Indicators:	Self test, error conditions
Front Panel Interface:	Write protect up to 2 disk drives
Peripheral Interface:	Small Computer System Interface (SCSI)
SCSI Transfer Rate:	4.8 M Bytes/sec in Synchronous mode 3.0 M Bytes/sec in Asynchronous mode
SCSI Bus Parity:	Odd parity
Devices Supported:	Up to 7 SCSI devices
	CQD-220/M 7 disk drives CQD-220/T 7 tape drives CQD-220/TM 7 disk/tape drives (Default = 4/3)
System Performance:	Support disconnect/reconnect capability ans multiple-host configuration
SCSI Driver/Receiver:	Single ended
SCSI Cable Length:	Up to 20 ft (6 meters)
Operating Temperature:	5 C to 50 C
Relative Humidity:	10% to 90% , Non-condensing
Power Requirement:	5V DC, 2.3A

CHAPTER 3 INSTALLATION

3.1 Installation Note Under VMS

The first step to install the CQD-220 SCSI host adapter under the VMS operating system is to determine the Control and Status Register (CSR) address of the CQD-220. For the CQD-220/M or CQD-220/T, only one CSR address is required. For the CQD-220/TM, two CSR addresses are required. The following procedure shows one method of determining the new CSR address of the CQD-220.

Do not install the new CQD-220 in the system.

First boot the VMS system and log into the system manager account

At the DCL $ prompt, enter MC SYSGEN

At the prompt SYSGEN>, enter SHOW/CONFIG. The SYSGEN utility will display all the device controllers installed in the system and their corresponding CSR addresses and vectors. Make a note of the list.

At the prompt SYSGEN>, enter CONFIG

At the prompt DEVICE>, for CQD-220/M, enter UDA X where X is the number of installed UDA type controllers plus 1 (for the new one being added) . For CQD-220/T, enter TU81 Y where Y is the number of installed TU81 type controllers plus 1 (for the new one being added). For CQD-220/TM, enter UDA X <CR> and TU81 Y <CR> where X and Y are the numbers defined above.

At the prompt DEVICE>, enter CONTROL Z. The SYSGEN utility will display the CSR addresses for all the controllers. The VMS mnemonic for the MSCP disk controllers are PUA, PUB, PUC, etc. The VMS mnemonic for the TMSCP tape controllers are PTA, PTB, PTC , etc. Please use the corresponding CSR address to configure the CSR jumper settings of the CQD-220. If the CSR address is not on the support list, please consult CMD.

At the prompt SYSGEN>, enter CONTROL Z to exit the SYSGEN utility.

Note that the CQD-220 will automatically program the on-board interrupt vector to match the vector assigned by the system. The vectors of DHV11 or other controllers might change when the CQD-220 is added to the system.

An example of the SYSGEN utility procedure is provided for installing the CQD-220/TM in VMS system.

```
$ MC SYSGEN

SYSGEN> SHOW/CONFIG

         System CSR and VECTOR on 2-JUN-1989 04:10:43.30

Name: PUA Units:1  Nexus:0 (UBA) CSR:772150 Vector:774  Vector2:0
Name: PTA Units:1  Nexus:0 (UBA) CSR:774500 Vector:260  Vector2:0
Name: PUB Units:1  Nexus:0 (UBA) CSR:760334 Vector:300  Vector2:0

SYSGEN> CONFIG
DEVICE> UDA 3
DEVICE> TU81 2
DEVICE> ^Z

Device: UDA  Name: PUA   CSR: 772150  Vector:154  Support: Y
Device: TU81 Name: PTA   CSR: 774500  Vector:260  Support: Y
Device: UDA  Name: PUB   CSR: 760334* Vector:300* Support: Y
Device: UDA  Name: PUC   CSR: 760340* Vector:304* Support: Y
Device: TU81 Name: PTB   CSR: 760444* Vector:310* Support: Y

SYSGEN> ^Z
$
```

In this example the CSR addresses of PUC and PTB should be used to configure the CSR jumpers of the CQD-220/TM.

3.2 CQD-220 Jumper Settings

Normally, user need not change the factory jumper settings of the CQD-220 except the CSR address jumper W6-2 to W6-7 and SCSI terminator power option jumper W2.

3.2.1 CSR Address Selection

The CQD-220 has jumpers to select different CSR addresses. Select the desired address by installing the jumper plugs. The standard CSR address for the CQD-220/M disk SCSI host adapter is 17772150. The standard CSR address for the CQD-220/T tape SCSI host adapter is 17774500. The standard CSR addresses for the CQD-220/TM disk and tape SCSI host adapter are 17772150 and 17774500. Please refer to Figure 1 for jumper locations.

The CQD-220/M (with the IC P22016A or P22016B in U40) supports 29 disk CSR addresses. Only 8 disk CSR jumper settings are shown in the following table. Please refer to the Table 1 for the other CSR jumper settings.

Address	LSI-11	MicroVAX	W6-2	W6-3	W6-4	W6-5	W6-6
1	17772150	20001468	IN	IN	IN	OUT	OUT
2	17760334	200000DC	IN	IN	OUT	OUT	OUT
3	17760354	200000EC	IN	OUT	IN	OUT	OUT
4	17760374	200000FC	IN	OUT	OUT	OUT	OUT
5	17760340	200000E0	OUT	IN	IN	OUT	OUT
6	17760344	200000E4	OUT	IN	OUT	OUT	OUT
7	17760350	200000E8	OUT	OUT	IN	OUT	OUT
8	17760360	200000F0	OUT	OUT	OUT	OUT	OUT

Please note that the CQD-220/M old hardware Rev. A (with the IC P20011A at location U40) only supports 8 CSR addresses. The CSR jumper setting is listed in Appendix 4.

The CQD-220/T (with the IC P22017A in U40) supports 31 tape CSR addresses. Only 8 tape CSR jumper settings are shown in the following table. Please refer to the Table 1 for the other CSR jumper settings.

Address	LSI-11	MicroVAX	W6-3	W6-4	W6-5	W6-6	W6-7
1	17774500	20001940	OUT	OUT	IN	IN	IN
2	17760404	20000104	OUT	OUT	IN	IN	OUT
3	17760444	20000124	OUT	OUT	IN	OUT	IN
4	17760504	20000144	OUT	OUT	IN	OUT	OUT
5	17760544	20000164	OUT	OUT	OUT	IN	IN
6	17760410	20000108	OUT	OUT	OUT	IN	OUT
7	17760450	20000128	OUT	OUT	OUT	OUT	IN
8	17760454	2000012C	OUT	OUT	OUT	OUT	OUT

Please note that the CQD-220/T old hardware Rev. A (with the IC P20012B at location U40) supports 30 tape CSR addresses. The CSR jumper setting is listed in Appendix 4.

The CQD-220/TM (with the IC P22015A in U40) supports 7 tape and 7 disk CSR addresses. The CSR jumper settings are shown in the following table.

CSR jumper setting for disk:

Address	LSI-11	MicroVAX	W6-2	W6-3	W6-4
Standard:	17772150	20001468	IN	IN	IN
Second:	17760334	200000DC	IN	IN	OUT
Third:	17760354	200000EC	IN	OUT	IN
Fourth:	17760374	200000FC	IN	OUT	OUT
Fifth:	17760340	200000E0	OUT	IN	IN
Sixth:	17760344	200000E4	OUT	IN	OUT
Seventh:	17760350	200000E8	OUT	OUT	IN
Disable disk :			OUT	OUT	OUT

CSR jumper setting for tape:

Address	LSI-11	MicroVAX	W6-5	W6-6	W6-7
Standard:	17774500	20001940	IN	IN	IN
Second:	17760404	20000104	IN	IN	OUT
Third:	17760444	20000124	IN	OUT	IN
Fourth:	17760504	20000144	IN	OUT	OUT
Fifth:	17760544	20000164	OUT	IN	IN
Sixth:	17760410	20000108	OUT	IN	OUT
Seventh:	17760450	20000128	OUT	OUT	IN
Disable tape:			OUT	OUT	OUT

Please note that the CQD-220/TM old hardware Rev. A (with the IC P20010A at location U40) supports 3 disk and 3 tape CSR addresses. The CSR jumper setting is listed in Appendix 4.

If users require other CSR addresses than listed, please consult CMD Technology.

3.2.2 18 or 22 Bit Address Selection

The CQD-220 is factory configured to 22 bit addressing which is used in systems with the MicroVAX , LSI-11/23/53/73/83/93 processors. Twenty-two bit addressing can cause problems if the CQD-220 is installed in a 22-bit backplane with the LSI-11/2 processor (which was not designed for a 22 bit backplane). The LSI-11/2 processor brings some of its test points out on the extra address lines.

If a LSI-11/2 processor is used with the CQD-220, configure the board to 18 bits by removing jumper W9. See Figure 1 for jumper block locations.

W9	IN	22-Bit addressing (factory)
	OUT	18-Bit addressing

3.2.3 Interrupt Level Selection

The CQD-220 is shipped with interrupt level 4 selected. This is the standard interrupt priority for MSCP devices. The CQD-220 may be jumper selected to interrupt at level 5.

See Figure 1 for jumper block locations.

W10	1-2 IN	Interrupt level 5	
	2-3 IN	Interrupt level 4	(factory)

3.2.4 Block Mode DMA

In a block mode Direct Memory Access (DMA) transfer, the starting memory address is assereted, followed by data for that address, and data for consecutive addresses. Because the assertion of the address for each data word is eliminated, higher data throughput can be achieved. The CQD-220 is shipped with block mode DMA enabled, with jumper shunt in W4 pin 1 and 2.

W4	1-2 IN	Block mode DMA enabled (factory)
	2-3 IN	Block mode DMA disabled

3.2.5 Adaptive DMA

When the adaptive DMA is enabled, the CQD-220 will release the Q-bus after 8 words transfer if other DMA devices assert DMA request. Otherwise, the CQD-220 will continue the DMA transfer for additional 8 words then release the Q-bus. The CQD-220 is shipped with adaptive DMA enabled.

W5	IN	Adaptive DMA enabled (factory)
	OUT	Adaptive DMA disabled

3.2.6 DMA Dwell Time

Normally, if multiple DMA data transfers are performed, consideration must be given to the use of the Q-bus for other system functions, such as communication multiplexer, network, etc. Therefore, the CQD-220 inserts DMA dwell time in between DMA data transfers. During the DMA dwell time, the CQD-220 will not arbitrate for the use of the Q-bus. User can select the period of the DMA dwell time by changing the jumper W7. The default setting is W7-3 IN (4.8 us dwell time).

W7-1	IN	1.2 us DMA dwell time
W7-2	IN	2.4 us DMA dwell time
W7-3	IN	4.8 us DMA dwell time (factory)

3.2.7 SCSI Host Adapter (Initiator) ID Selection

Each device (Initiator or Target) on the SCSI bus requires an unique SCSI Identification address (0-7). SCSI ID 7 has the highest priority on the bus and SCSI ID 0 has the lowest priority. The CQD-220 SCSI Host Adapter is factory configured to SCSI ID 7. To alter the Host Adapter SCSI ID, users need to change jumper setting of W3-1, W3-2 and W3-3.

W3-1	W3-2	W3-3	
IN	IN	IN	Host adapter ID = 7 highest priority (F)
IN	IN	OUT	Host adapter ID = 6
IN	OUT	IN	Host adapter ID = 5
IN	OUT	OUT	Host adapter ID = 4
OUT	IN	IN	Host adapter ID = 3
OUT	IN	OUT	Host adapter ID = 2
OUT	OUT	IN	Host adapter ID = 1
OUT	OUT	OUT	Host adapter ID = 0, lowest priority

3.2.8 SCSI Terminator Power Option

Important note: Anytime an external SCSI terminator (instead of the on-drive SCSI terminator) is used, the SCSI terminator power option of the CQD-220 has to be enabled, i.e. install jumper shunt at W2 location. Remember to turn off the power of the system and SCSI devices while installing the SCSI cable and terminator.

Any SCSI terminator (on-drive or external) need to be powered by at least one SCSI device, otherwise the SCSI signals will be pulled down. Typically an initiator (SCSI host adapter) provides the power to the on-board terminator , external SCSI terminator and on-drive terminator when the drive is powered off.

The CQD-220 supplies terminator power to the TERMPWR pin (pin 26) of SCSI connector (J2) through a fuse, a diode and jumper block W2. In order to prevent accidental grounding or misconnection of terminator power, please make sure that the pin 1 mark of SCSI cable matches with the pin 1 mark of SCSI device's connector before turning on the power.

W2	IN	SCSI terminator power enabled (factory)
	OUT	SCSI terminator power disabled

3.2.9 Tape Fast Search Option

This option is supported only by the CQD-220/T or CQD-220/TM. When set to the Tape Fast Search mode, the CQD-220/T or CQD-220/TM will enable high speed forward and reverse filemark search. VMS may use this mode if the user does not attempt a standalone boot or run other programs that require the controller to keep track of the number of data records between filemarks. In VMS standalone boot application, this option need to be disabled. For the ISM-11 operating system, this jmuper shunt has to be installed.

W3-4	IN	Enable tape fast search option
	OUT	Normal operation (factory)

3.2.10 Disk Auto Boot Selection

For the LSI-11 processors only, the CQD-220/M or CQD-220/TM may be set to provide an auto-bootstrap at 773000 or 771000 on power up or whenever the "Boot" switch is pressed. The auto-bootstrap may be enabled by installing a jumper shunt in jumper block W8 pin 1 and 2. The CQD-220/M will auto-boot only if the controller CSR is set to 772150. Disk drive 0 will be bootstrapped.

W6-1	IN	Auto-Bootstrap address = 773000 (factory)
	OUT	Auto-Bootstrap address = 771000
W8	1-2 IN	Auto-Bootstrap enabled
	2-3 IN	Auto-Bootstrap disabled (factory)

If there is an existing bootstrap ROM at 773000, the user may set the controller auto-bootstrap address at 771000 and type 771000G from ODT to bootstrap the software.

3.2.11 Sync/Async Mode Selection

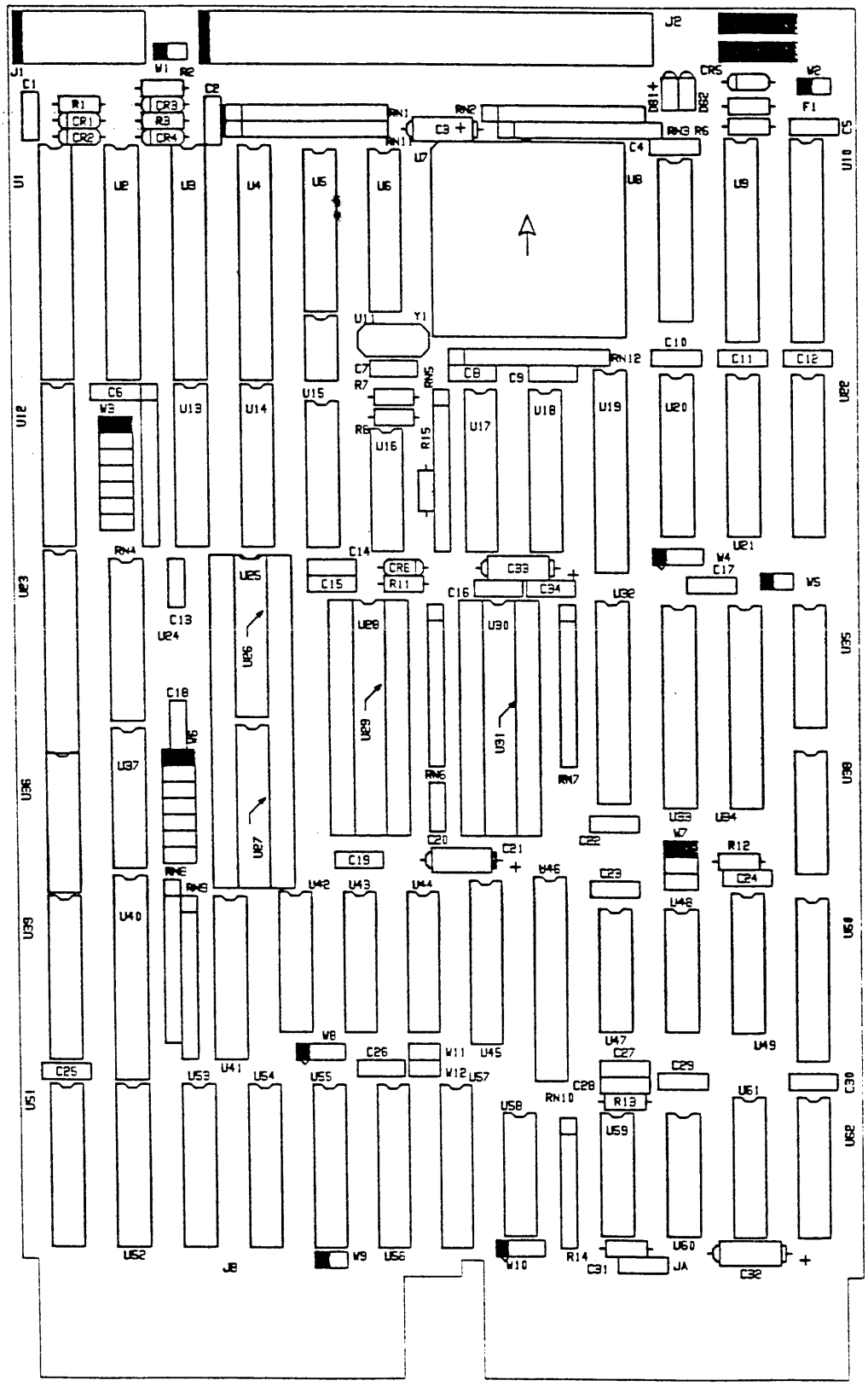
In general, the Sync/Async Mode for each individual drive can be selected through the on-board utility individually. The default setting is synchronous mode.

In sync mode, CQD-220 will automatically communicate with the SCSI device to find out the sync mode is possible or only the async mode is supported by the device, then it will switch mode automatically thereafter. For those devices which do not even support this communication, async mode should be used to insure proper operation, e.g. M4 data.

The following jumpers are controlling the overall Sync/Async mode selection and will override the on-board utility sync mode set-up.

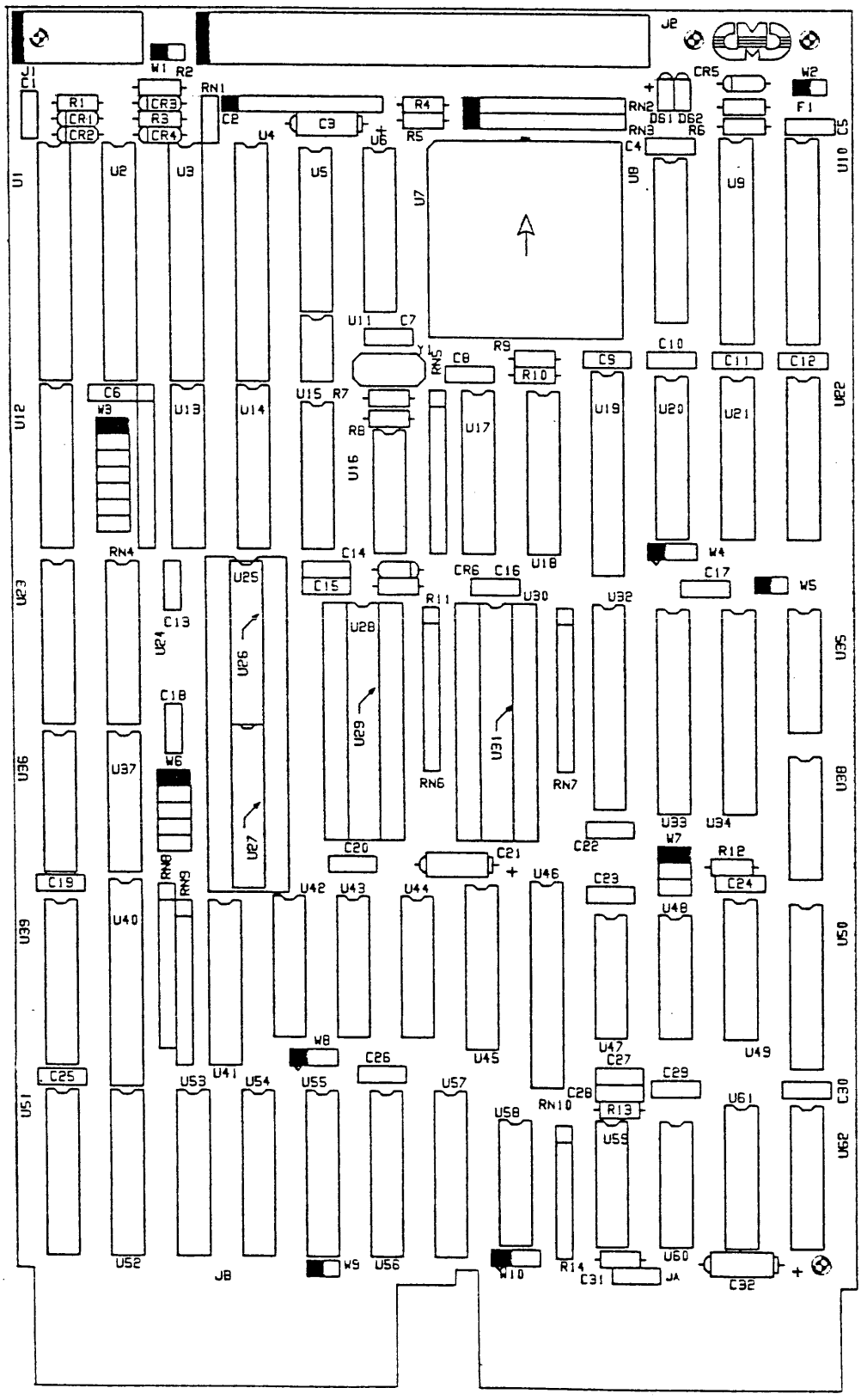
W3-6	IN	Tape sync mode disabled
	OUT	Tape sync mode enabled (factory)
W3-7	IN	Disk sync mode disabled
	OUT	Disk sync mode enabled (factory)

Figure 1 Jumper block location diagram hardware Rev. B



Note that dark square mark in the diagram indicates pin 1.

Figure 2 Jumper block location diagram hardware Rev. A



Note that dark square mark in the diagram indicates pin 1.

Table 1 Jumper Setting of the CQD-220

W1	OUT		Reserved (F)
W2	IN		SCSI terminator power enabled
	OUT		SCSI terminator power disabled (F)
W3-1	W3-2	W3-3	
IN	IN	IN	Host adapter ID = 7 highest Priority (F)
IN	IN	OUT	Host adapter ID = 6
IN	OUT	IN	Host adapter ID = 5
IN	OUT	OUT	Host adapter ID = 4
OUT	IN	IN	Host adapter ID = 3
OUT	IN	OUT	Host adapter ID = 2
OUT	OUT	IN	Host adapter ID = 1
OUT	OUT	OUT	Host adapter ID = 0 lowest Priority
W3-4	IN		Enable tape fast search option
	OUT		Normal operation (F)
W3-5	IN		Tape monitor utility enabled (/T, /TM) Disk SCSIformat ON-LINE enabled (/M, /TM)
	OUT		Tape monitor utility disabled (F) Disk SCSIformat ON-LINE disabled (F)
W3-6	IN		Tape sync mode disabled
	OUT		Tape sync mode enabled (F)
W3-7	IN		Disk sync mode disabled
	OUT		Disk sync mode enabled (F)
W4	1-2 IN		Block-mode DMA enabled (F)
	2-3 IN		Block-mode DMA disabled
W5	IN		Adaptive DMA enabled (F)
	OUT		Adaptive DMA disabled
W6-1	IN		Bootstrap address 773000 (F)
	OUT		Bootstrap address 771000

CQD-220/M with the IC P22016A or P22016B in U40:

Address	LSI-11	MicroVAX	W6-2	W6-3	W6-4	W6-5	W6-6
1	17772150	20001468	IN	IN	IN	OUT	OUT
2	17760334	200000DC	IN	IN	OUT	OUT	OUT
3	17760354	200000EC	IN	OUT	IN	OUT	OUT
4	17760374	200000FC	IN	OUT	OUT	OUT	OUT
5	17760340	200000E0	OUT	IN	IN	OUT	OUT
6	17760344	200000E4	OUT	IN	OUT	OUT	OUT
7	17760350	200000E8	OUT	OUT	IN	OUT	OUT
8	17760360	200000F0	OUT	OUT	OUT	OUT	OUT
9	17760364	200000F4	IN	IN	IN	IN	OUT
10	17760370	200000F8	IN	IN	OUT	IN	OUT
11	17760400	20000100	IN	OUT	IN	IN	OUT
12	17760404	20000104	IN	OUT	OUT	IN	OUT
13	17760410	20000108	OUT	IN	IN	IN	OUT
14	17760414	2000010C	OUT	IN	OUT	IN	OUT
15	17760420	20000110	OUT	OUT	IN	IN	OUT
16	17760424	20000114	OUT	OUT	OUT	IN	OUT
17	17760430	20000118	IN	IN	IN	OUT	IN
18	17760434	2000011C	IN	IN	OUT	OUT	IN
19	17760440	20000120	IN	OUT	IN	OUT	IN
20	17760444	20000124	IN	OUT	OUT	OUT	IN
21	17760450	20000128	OUT	IN	IN	OUT	IN
22	17760454	2000012C	OUT	IN	OUT	OUT	IN
23	17760460	20000130	OUT	OUT	IN	OUT	IN
24	17760464	20000134	OUT	OUT	OUT	OUT	IN
25	17760470	20000138	IN	IN	IN	IN	IN
26	17760474	2000013C	IN	IN	OUT	IN	IN
27	17760500	20000140	IN	OUT	IN	IN	IN
28	17760504	20000144	IN	OUT	OUT	IN	IN
29	17760510	20000148	OUT	IN	IN	IN	IN

W6-7 OUT Dont care (F)

For the CQD-220/M old hardware Rev. A with the IC P20011A in U40, please refer to Appendix 4 for CSR jumper setting.

CQD-220/T with the IC P22017A in U40:

Address	LSI-11	MicroVAX	W6-3	W6-4	W6-5	W6-6	W6-7
1	17774500	20001940	OUT	OUT	IN	IN	IN
2	17760404	20000104	OUT	OUT	IN	IN	OUT
3	17760444	20000124	OUT	OUT	IN	OUT	IN
4	17760504	20000144	OUT	OUT	IN	OUT	OUT
5	17760544	20000164	OUT	OUT	OUT	IN	IN
6	17760410	20000108	OUT	OUT	OUT	IN	OUT
7	17760450	20000128	OUT	OUT	OUT	OUT	IN
8	17760454	2000012C	OUT	OUT	OUT	OUT	OUT

Address	LSI-11	MicroVAX	W6-3	W6-4	W6-5	W6-6	W6-7
9	17760414	2000010C	OUT	IN	IN	IN	IN
10	17760420	20000110	OUT	IN	IN	IN	OUT
11	17760460	20000130	OUT	IN	IN	OUT	IN
12	17760510	20000148	OUT	IN	IN	OUT	OUT
13	17760514	2000014C	OUT	IN	OUT	IN	IN
14	17760520	20000150	OUT	IN	OUT	IN	OUT
15	17760550	20000168	OUT	IN	OUT	OUT	IN
16	17760554	2000016C	OUT	IN	OUT	OUT	OUT
17	17760560	20000170	IN	OUT	IN	IN	IN
18	17760604	20000184	IN	OUT	IN	IN	OUT
19	17760610	20000188	IN	OUT	IN	OUT	IN
20	17760614	2000018C	IN	OUT	IN	OUT	OUT
21	17760620	20000190	IN	OUT	OUT	IN	IN
22	17760644	200001A4	IN	OUT	OUT	IN	OUT
23	17760650	200001A8	IN	OUT	OUT	OUT	IN
24	17760654	200001AC	IN	OUT	OUT	OUT	OUT
25	17760660	200001B0	IN	IN	IN	IN	IN
26	17760704	200001C4	IN	IN	IN	IN	OUT
27	17760710	200001C8	IN	IN	IN	OUT	IN
28	17760714	200001CC	IN	IN	IN	OUT	OUT
29	17760744	200001E4	IN	IN	OUT	IN	IN
30	17760750	200001E8	IN	IN	OUT	IN	OUT
31	17760754	200001EC	IN	IN	OUT	OUT	IN

W6-2 OUT Dont care (F)

For the CQD-220/T old hardware Rev. A with the IC P20012B in U40, please refer to Appendix 4 for CSR jumper setting.

CQD-220/TM with the IC P22015A in U40:

CSR jumper setting for disk:

W6-2	W6-3	W6-4		LSI-11	MicroVAX	
IN	IN	IN	Standard CSR:	17772150	20001468	(F)
IN	IN	OUT	Second CSR:	17760334	200000DC	
IN	OUT	IN	Third CSR:	17760354	200000EC	
IN	OUT	OUT	Fourth CSR:	17760374	200000FC	
OUT	IN	IN	Fifth CSR:	17760340	200000E0	
OUT	IN	OUT	Sixth CSR:	17760344	200000E4	
OUT	OUT	IN	Seventh CSR:	17760350	200000E8	
OUT	OUT	OUT	Disable disk :			

CSR jumper setting for tape:

W6-5	W6-6	W6-7		LSI-11	MicroVAX
IN	IN	IN	Standard CSR:	17774500	20001940 (F)
IN	IN	OUT	Second CSR:	17760404	20000104
IN	OUT	IN	Third CSR:	17760444	20000124
IN	OUT	OUT	Fourth CSR:	17760504	20000144
OUT	IN	IN	Fifth CSR:	17760544	20000164
OUT	IN	OUT	Sixth CSR:	17760410	20000108
OUT	OUT	IN	Seventh CSR:	17760450	20000128
OUT	OUT	OUT	Disable tape:		

For the CQD-220/TM old hardware Rev. A with the IC P20010A in U40, please refer to Appendix 4 for CSR jumper setting.

W7-1	IN	1.2 uS DMA dwell time
W7-2	IN	2.4 uS DMA dwell time
W7-3	IN	4.8 uS DMA dwell time (F)
W8	1-2 IN	Auto-Boot enabled
	2-3 IN	Auto-Boot disabled (F)
W9	IN	22-Bit addressing (F)
	OUT	18-Bit addressing
W10	1-2 IN	Interrupt level 5
	2-3 IN	Interrupt level 4 (F)

Note: (F) means factory setting.

3.3 CQD-220 Mounting Slot Selection

The CQD-220 can be installed in any slot of the standard MicroVAX or LSI-11 Q-Bus backplane as long as the Q-Bus interrupt acknowledge/DMA grant daisy chain is not broken.

3.4 LED Indicators

The CQD-220 has two LED's in the front of the board (See Figure 1). The LED's are labeled DS1, DS2.

LED	COLOR	INDICATION
DS1	RED	Error condition occured.
DS2	GREEN	Power-up OK and activity indicator. On power up, this LED is turned on when the CQD-220 succeeds in the self-diagnostic testing. During normal controller operation, this LED is blinked to show controller activity.

3.5 SCSI Bus Cabling and Termination

The CQD-220 Host Adapter provides a 50-pin connector (J2), to interface with external SCSI devices.

When the CQD-220 and the SCSI devices are installed in the same cabinet which meets EMI/RFI shielding requirements, a 50-conductor flat cable or 25-signal twisted-pair cable can be used for connecting the CQD-220 (J2) and the SCSI devices. When the CQD-220 and the SCSI devices are installed in seperate cabinets, the shielded SCSI cable should be used to meet FCC requirements.

Note that a minimum conductor size of 28 AWG shall be employed to minimize noise effects and ensure proper distribution of optional terminator power. The maximum cable length is 6.0 meters or 20 feet in single ended mode.

The SCSI bus signals should be terminated with 220 ohms to +5 volts and 330 ohms to ground at each end of the cable. The CQD-220 provides on-board removable terminators (RN1,RN2,RN3), which are next to the SCSI connector J2. Therefore, the CQD-220 can be installed in any position of the SCSI cable. If the CQD-220 is installed in either end of SCSI cable, the on-board terminators should remain on the board. Otherwise, the on-board terminators should be removed.

3.6 SCSI Target ID Selection

Each SCSI device (Initiator or Target) on the SCSI bus requires a unique SCSI ID. Since the CQD-220 SCSI host adapter is factory configured to SCSI ID 7, the SCSI ID of the target devices (disk or tape) connected to the CQD-220 should be set from SCSI ID 0 to 6. Normally, the assignment of SCSI Target ID starts with ID 0. The CQD-220/M supports up to 7 disk drives. The disk drives' SCSI ID should be set from 0 to 6. The CQD-220/T supports up to 7 tape drives. The tape drives' SCSI ID should be set from 0 to 6. The CQD-220/TM supports up to 7 disk/tape drives combined totally. The disk and tape drives' SCSI ID can be set from 0 to 6 without overlapping. The factory default is 4 disk drives (ID=0 to 3) and 3 tape drives (ID=4 to 6).

One example is provided to show the default mapping of SCSI ID to the VMS system. Assuming the first disk CSR and tape CSR addresses are used and the disk and tape LUN offsets are 0.

CQD-220/M	SCSI ID	VMS device	
	0	DUA0	;SCSI ID + Disk LUN
	1	DUA1	;Offset
	2	DUA2	
	3	DUA3	
	4	DUA4	
	5	DUA5	
	6	DUA6	
	7	PUA0 (CQD-220/M)	

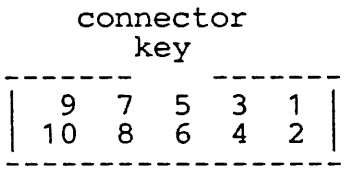
CQD-220/T	SCSI ID	VMS device	
	0	MUA0	;SCSI ID + Tape LUN
	1	MUA1	;Offset
	2	MUA2	
	3	MUA3	
	4	MUA4	
	5	MUA5	
	6	MUA6	
	7	PTA0 (CQD-220/T)	

CQD-220/TM	SCSI ID	VMS device	
	0	DUA0	;SCSI ID + Disk LUN
	1	DUA1	;Offset
	2	DUA2	
	3	DUA3	
	4	MUA0	;(SCSI ID -4) + Tape
	5	MUA1	;LUN Offset
	6	MUA2	
	7	PUA0 and PTA0 (CQD-220/TM)	

3.7 RS-232 Utility Interface

The CQD-220 SCSI host adapter provides users with a 10 pin connector (J1) for on-board RS-232 utility or system front panel interface. The physical pin number assignment and functions are described in the following. Please consult CMD Technology on the circuit necessary to implement the front panel interface.

Connector J1 pin definition when facing the 10 pin connector from the controller's top edge:



pin 1: Drive 1 on line, input/output signal, normally high.
pin 2: ground.
pin 3: TXD, for RS-232 application, transmit data.
pin 4: ground.
pin 5: Drive 0 access, output signal, active low.
pin 6: Drive 1 access, output signal, active low.
pin 7: Drive 1 write protect, input signal, active low.
pin 8: Drive 0 write protect, input signal, active low
or for RS-232 application, receive data.
pin 9: ground.
pin 10: Drive 0 on line, input/output signal, normally high.

Note that for CMD's on-board RS-232 utility, only pin 3 , 8 and grounds are used.

The CQD-223 provides user with DEC compatible RJ-11/Modified Module 423 Jack (MMJ) for accessing the on-board RS-232 utility.

3.8 Special Features

The CMD CQD-220 controller provides the following special features for the users, such as multi-hosting, partitioning, shadowing, tape monitor utility, on-line formatting, SCSI library Manager and generic SCSI adapter, etc. Call CMD's technical support hotline for additional information.

Table 2 CQD-220 Special Feature Support List

Model	Multi-Host	Partition	Shadow	TMU	FMT	SLM	GSA
/TM	Yes	Yes	No	Yes	Yes	No	No
/TMS	Yes	Yes	Yes	Yes	Yes	No	No
/TMJ	Yes	Yes	No	Yes	Yes	Yes	No
/TMP	Yes	Yes	No	Yes	No	No	Yes

3.8.1 Multi-Hosting

CQD-220 gives users the ability to completely share an array of disks and tapes between multiple DEC systems running Local Area Cluster (LAVC) software. CMD's multi-host solution has every feature found in DSSI, with the additional capability to support tape and optical devices including jukeboxes. The following integration notes are provided to insure a faster and more efficient installation.

Integration Notes:

1. Change to CMD's on-board utility: a. Disable SCSI reset on each CMD host adapter so that power up or power down the system will not interfere another running system. b. The CMD host adapter that you configure as ID#7 should not address the other CMD host adapters as target devices.
2. Use SCSI pass-thru type SCSI connector at junction to VAX back panel.
3. Use right angle Centronics SCSI connector/cable at junction to VAX on all Micro VAX III's, VAX 4000's.
4. Use external terminators at each end of the SCSI bus.
5. Remove all the on-board SCSI terminators and enable the SCSI terminator power jumper (W2) on the end units.
6. Limit total cable lengths (including internal subsystem loop cables) to 20 feet for single-ended applications.

7. CMD's multi-host feature has been tested out on the following disk and tape devices. (Call for specific peripherals not on this list):

Seagate disks (Elite, Wren V, Wren VI, Wren VII)
Hitachi disks (DK515C)
Fujitsu disks (M2263SA)
Micropolis disks (1588-15)
Sony erasable optical disks (Version 2.07 and up)
Exabyte 8mm tapes (8200)
4mm DAT tapes (all those supporting SCSI reserve and release commands)

The following diagram gives an overview on how to connect CMD Q-bus and Unibus SCSI host adapters and third party disk and tape arrays for true multi-hosting. CMD provides the cables and terminators shown below as a service to our users. Call CMD's technical support hotline for more detailed information.

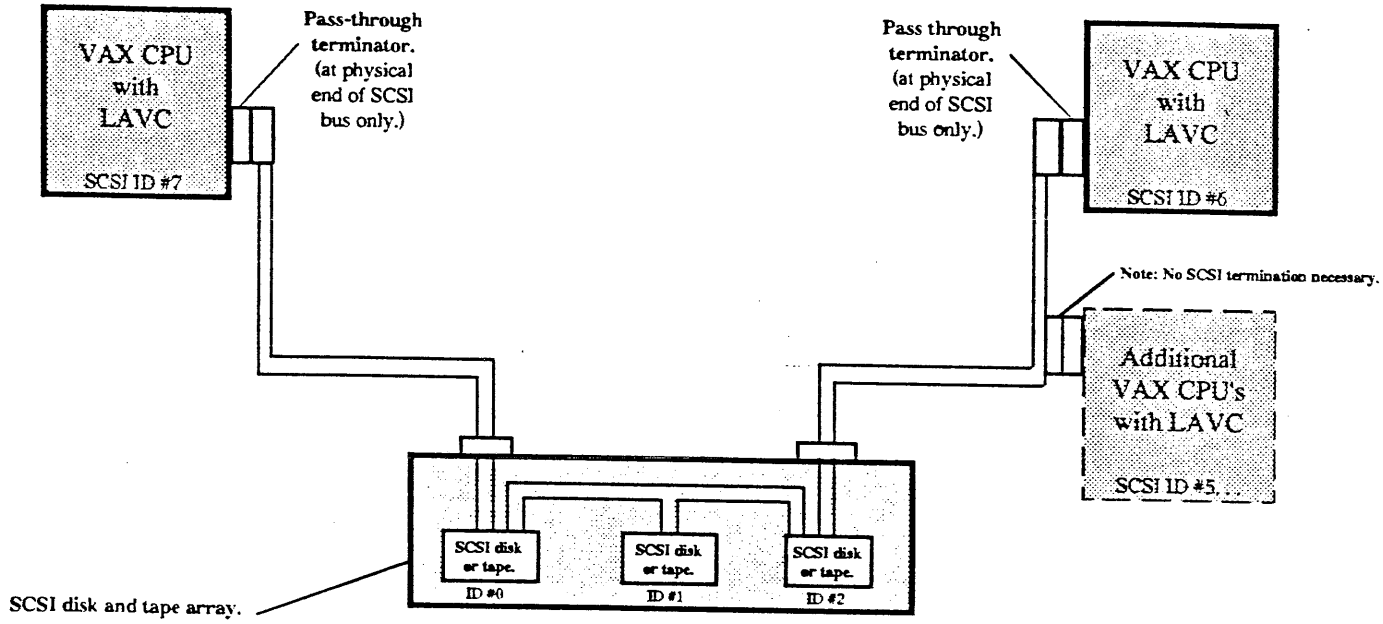


FIGURE 3 Multi-Hosting Connection Example Diagram

3.8.2 Partitioning

The Partition is an added feature for CQD-220/TM and CQD-220/M. User can set-up the partition of the disk drives through the CMD on-board utilities. Any disk drive can be partitioned into two or four equally divided partitions.

Please refer to section 4.3 RS232 Utilities for more details.

3.8.3 Shadowing

The Super Shadow CQD-220/TMS is a hardware variation of the CQD-220/TM.

Installation and set-up of CMD shadowing host adapters are simplifed with the CMD on-board utilities. This easy to use menu-driven utility allows users to quickly configure virtually any combination of disk shadow sets.

The hardware disk shadowing on DEC computers enables simultaneous writing of data to two shadow set members. This provides an exact real-time duplicate data set that can be later retrieved by the user if data on primary disk becomes unaccessable.

The access performance benefits are derived from the ability to read data from a particular disk in the shadow set that reponds faster. By adapting specific host adapter resident firmware algorithms, CQD-220/TMS provides incredible performance benefits with disk access time reduced 100% or more.

The hardware-based shadowing technique also results in far less VMS overhead than software solutions.

DEC users can now configure fault tolerant SCSI subsystems built around Super Shadow host adapters. When used in conjunction with other CMD exclusive features like Multi-Host capability, you can now achieve higher data availability in your SCSI disk arrays.

3.8.4 Tape Monitor Utility

The Tape Monitor Utility (TMU) is an application software developed by CMD Technology and works exclusively with CMD SCSI host adapters as an optional feature for VAX/VMS systems.

This Tape Monitor Utility runs under VMS and displays the tape drive vender identification, drive firmware revision, the remaining tape capacity, percentage of rewrite and ECC retry, and current tape operations such as read, write, write file mark, space, rewind etc. Users can install multiple tape subsystems in one site and observe the tape activity from any VAX terminal locally or across the network without any additional add-in hardware. Users can also open a file to log all the information for unattended backup.

Before installing the Tape Monitor Utility application software, a jumper shunt should be inserted in W3-5 location. For any operating system other than VMS, this jumper should not be installed. Do not insert this jumper shunt either if the TMU application software is not installed. The factory setting of W3-5 is in OUT position (TMU disabled).

W3-5	IN	TMU enabled
	OUT	TMU disabled (factory)

3.8.5 SCSIformat ON-LINE

The SCSIformat ON-LINE (FMT) is an application software developed by CMD Technology and works exclusively with CMD SCSI host adapters as an optional feature for VAX/VMS systems.

This SCSIformat ON-LINE runs under VMS and allows the user to format the disk drives without interferring with the other tasks on going.

Before installing the SCSIformat ON-LINE application software, a jumper shunt should be inserted in W3-5 location. For any operating system other than VMS, this jumper should not be installed. Do not insert this jumper shunt either if the application software is not installed. The factory setting of W3-5 is in OUT position (FMT disabled).

W3-5	IN	FMT enabled
	OUT	FMT disabled (factory)

Note: 1. W3-5 is also an enable/disable jumper for TMU.
2. /TMP do not have the SCSIformat ON-LINE option.

3.8.6 SCSI Library Manager Option

The SCSI Library Manager (SLM) is an application software developed by CMD Technology and works exclusively with CMD SCSI host adapter CQD-220/TMJ for VAX/VMS systems.

This SCSI Library Manager runs under VMS and was designed to work with multiple jukeboxes as well as a single jukebox with from one to five erasable optical or WORM drives installed. Just a few menu-driven keystrokes SLM controls all basic operations like inserting, removing and flipping erasable or WORM cartridges from the drive unit.

In addition to giving the user complete control of jukebox functions, SLM also has a build-in callable user interface allowing users to customize SLM to their needs. This is especially useful for applications to support file management.

3.8.7 Geniric SCSI Adapter Option

The Generic SCSI Adapter (GSA) is an application software developed by CMD Technology and works exclusively with CMD SCSI host adapter CQD-220/TMP for VAX/VMS systems.

This Generic SCSI Adapter runs under VMS and allows the user to send the generic SCSI commands to the disk or tape drives through the standard DEC DU driver.

The GSA itself is a simple and straightforward callable user interface providing an easier way for user to communicate with the device directly.

Note: The CQD-220/TMP do not support the jukebox operation.

CHAPTER 4 ON-BOARD UTILITY

The CQD-220 SCSI host adapter comes with four different on-board utilities which include the on-board utility for LSI-11 systems, the on-board utility for MicroVAX II, Micro 3X00, and VAX 4000 systems, the general purpose RS-232 utility for all systems, and the ODT utility. Because the formats and features of the on-board utilities for LSI-11 systems and MicroVAX systems are similar (except different start up procedures), section 4.1 and 4.2 will describe the MicroVAX utility only.

4.1 Disk Utility for CQD-220/M and CQD-220/TM

The CMD Technology Disk Utility Program provides a convenient means of formatting and configuring the drive. The utility program can be started by means of an ODT command. One example is shown with the SCSI host adapter set to the first disk CSR address.

LSI-11 SYSTEMS

1. Halt the processor.
2. Hit the Boot Switch.
3. 17772152/005400 123456 <CR> ;CSR BASE ADDRESS + 2
4. 17772152/001000 100 <CR> ;Load utility to system ;memory
5. 5000G ;5000 and a G ;The Utility program ;will begin executing.

Note that the address shown in step 3 is equal to the CSR address (selected by the jumper W6-2 to W6-6 of the CQD-220/M or W6-2 to W6-4 of the CQD-220/TM) plus 2.

VAX SYSTEMS

```
1.    Halt the CPU

2.>>> I <CR>                                  ;Initialize

3.>>> U <CR>                                  ;Unlock

4.>>> D/P/W 20001F40  20 <CR>                 ;Enable Q-bus memory access

5.>>> D/L   20088008  80000002 <CR>           ;Set up Q-bus map

6.>>> D/W   2000146A  A72E  <CR>              ;Deposit to base CSR+2

7.>>> D *   100 <CR>                          ;Load utility to system
                                              ;memory
8.>>> S     400 <CR>                          ;Start the utility
```

Note that the address shown in step 6 is equal to the CSR address (selected by the jumper W6-2 to W6-6 of the CQD-220/M or W6-2 to W6-4 of the CQD-220/TM) plus 2.

The utility will display:

```
SCSI UTILITY PROGRAM

     DISK           TAPE
1 = 772150      A = 774500
2 = 760334      B = 760404
3 = 760354      C = 760444
4 = 760374      D = 760504
5 = 760340      E = 760544
6 = 760344      F = 760410
7 = 760350      G = 760450
8 = 760360      H = 760454

SELECT CSR ADDRESS
```

The user then selects the number which matches with the CSR address of the CQD-220. The main menu will display

```
1 = BOOT DRIVE
2 = CONFIGURE LUN OFFSET
3 = FORMAT DRIVE
4 = QUALIFY DRIVE
5 = MANUAL REPLACE BAD SECTORS
6 = READ, WRITE AND VERIFY TEST
7 = ADDITIONAL UTILITIES

SELECT OPTION :
```

The operator now has 7 options to choose from. To modify or examine the LUN OFFSET, the operator types in a 2. If at any time the operator types in a ctrl C, the command is aborted and the utility program returns to the main menu. If the operator types in <CR> with no value, then the parameters will remain unchange.

4.1.1 Configure LUN Offset

LUN Offset: For LSI-11 systems only, each MSCP drive requires a different Logical Unit Number. If there are no other MSCP controllers in the system, then the LUN offset number is 0 (Drive 0 will be LUN 0, and Drive 1 will be LUN 1). If there exists another MSCP controller with 4 LUN units (0 to 3), then the LUN offset should be 4. In this case Drive 0 will be LUN 4 and Drive 1 will be LUN 5. When the CQD-220 is used in VAX/VMS operating system, the LUN Offset can remain as factory setting (LUN=0).

```
      1 = BOOT DRIVE
      2 = CONFIGURE LUN OFFSET
      3 = FORMAT DRIVE
      4 = QUALIFY DRIVE
      5 = MANUAL REPLACE BAD SECTORS
      6 = READ, WRITE AND VERIFY TEST
      7 = ADDITIONAL UTILITIES

SELECT OPTION :  2

PRESENT LUN OFFSET = 0, ENTER NEW VALUE:
SAVE NEW CONFIGURATION (Y or N)?   Y
COMPLETE.
```

4.1.2 Format Drive

Formatting a drive will rewrite all the sectors on the drive. In this option, the CQD-220 issues the Format Unit Command to the selected SCSI disk drive, and requests it to replace the defective sectors on the Manufacture Defect List (MDL). It is recommended to use qualify drive option after formatting the disk drive.

```
     1 = BOOT DRIVE
     2 = CONFIGURE LUN OFFSET
     3 = FORMAT  DRIVE
     4 = QUALIFY DRIVE
     5 = MANUAL REPLACE BAD SECTORS
     6 = READ, WRITE AND VERIFY TEST
     7 = ADDITIONAL UTILITIES

SELECT OPTION :  3

ENTER DRIVE NUMBER <0 TO 6> :  0

*** WILL DESTROY DATA ON DRIVE 0, ARE YOU SURE?  Y

WAIT.....

COMPLETE.
```

4.1.3 Qualify Drive

The qualify program will write different patterns into the drive and then verify the pattern. If there are any bad sectors, the sectors will be automatically replaced.

To ensure a defect free drive, the qualify program should be run at least 10 passes.

```
     1 = BOOT DRIVE
     2 = CONFIGURE LUN OFFSET
     3 = FORMAT DRIVE
     4 = QUALIFY DRIVE
     5 = MANUAL REPLACE BAD SECTORS
     6 = READ, WRITE AND VERIFY TEST
     7 = ADDITIONAL UTILITIES

SELECT OPTION :  4

QUALIFY DRIVE # <0 TO 6>:  0
*** WILL DESTROY DATA ON THIS DRIVE, ARE YOU SURE?  Y

QUALIFY LOOP 1

TO ABORT, ENTER ^C ( CONTROL C).
```

4.1.4. Manual Replace Bad Sectors

This program allows user to replace bad sectors manually. Please note that the controller supports dynamic defect management which replaces defective sectors online. All the grown defects will be replaced automatically by the controller.

```
     1 = BOOT DRIVE
     2 = CONFIGURE LUN OFFSET
     3 = FORMAT DRIVE
     4 = QUALIFY DRIVE
     5 = MANUAL REPLACE BAD SECTORS
     6 = READ, WRITE AND VERIFY TEST
     7 = ADDITIONAL UTILITIES

SELECT OPTION :  5

ENTER DRIVE NUMBER <0 TO 6>:  0

REPLACE LOGICAL BLOCK NUMBER ?  XXXXXX

REPLACE LOGICAL BLOCK XXXXXX. ARE YOU SURE ?  Y

--REPLACED--
```

4.1.5 Read, Write and Verify Test

This option allows the user to test the integrity of the controller board, SCSI cable and disk drive. The program will generate random data patterns for testing.

```
     1 = BOOT DRIVE
     2 = CONFIGURE LUN OFFSET
     3 = FORMAT DRIVE
     4 = QUALIFY DRIVE
     5 = MANUAL REPLACE BAD SECTORS
     6 = READ, WRITE AND VERIFY TEST
     7 = ADDITIONAL UTILITIES

SELECT OPTION :  6

RANDOM READ WRITE TEST
DO YOU WANT READ ONLY ? <Y OR N>  N

DRIVE NUMBER <0 TO 6>:  0
*** WILL DESTROY DATA ON THIS DRIVE, ARE YOU SURE?  Y

TEST FROM BLOCK # <0-XXXXX> ?
```

```
TO BLOCK # <XXXXX-YYYYY> ?

TESTING STARTED. TYPE CTRL-C TO ABORT.
```

4.1.6 Utility Bootstrap

To bootstrap the operating system on drive 0 to 6, just select option 1 from main menu.

```
     1 = BOOT DRIVE
     2 = CONFIGURE LUN OFFSET
     3 = FORMAT DRIVE
     4 = QUALIFY DRIVE
     5 = MANUAL REPLACE BAD SECTORS
     6 = READ, WRITE AND VERIFY TEST
     7 = ADDITIONAL UTILITIES

SELECT OPTION :  1

BOOT DRIVE NUMBER <0 TO 6>   0

BOOT DU0. ARE YOU SURE ?   Y

WAIT ...
```

4.1.7 Additional Utilities

User can use this option to display the SCSI ID's of the attached SCSI devices, issue SCSI commands to the selected device, test SCSI devices and format the disk drive RCT (replacement and caching table) blocks. When this option is selected, the menu will display

```
ADDITIONAL UTILITIES  (REV. XX)          SN = XXXX


     D = SETUP CONFIGURATION AND DISPLAY SCSI DEVICE
     S = SEND SCSI COMMAND TO THE DEVICE
     T = TEST SCSI DEVICE
     R = FORMAT RCT BLOCK

SELECT OPTION ?
```

Note: 1. Partitioning and Shadowing configuration are set-up through the 'D' selection.
2. Please refer to section 4.3 for details.

4.2 Tape Utility for CQD-220/T, CQD-220/TM

The CMD Technology tape utility program is designed for LSI-11 systems only. The tape utility can be started by means of an ODT command. One example is shown with the the SCSI host adapter set to the first tape CSR address.

LSI-11 SYSTEMS

1. Halt the processor.
2. Hit the Boot Switch.
3. 17774502/005700 123456 <CR> ;CSR BASE ADDRESS + 2
4. 17774502/001000 100 <CR> ;Load utility to memory
5. 5000G ;5000 and a G
   ;The Utility program
   ;will begin executing.

Note that the address shown in step 3 is equal to the CSR address (selected by jumper W6-3 to W6-7 of CQD-220/T or W6-5 to W6-7 of CQD-220/TM) plus 2.

The utility will display:

```
SCSI UTILITY PROGRAM

    DISK          TAPE
1 = 772150    A = 774500
2 = 760334    B = 760404
3 = 760354    C = 760444
4 = 760374    D = 760504
5 = 760340    E = 760544
6 = 760344    F = 760410
7 = 760350    G = 760450
8 = 760360    H = 760454

SELECT CSR ADDRESS
```

The user will then select the number which matches with the tape CSR address.

The main menu will display

```
1 = BOOT DRIVE
2 = CONFIGURE LUN (Logical Unit Number) OFFSET
3 = TAPE DIAGNOSTIC
4 = ADDITIONAL UTILITIES

SELECT OPTION :
```

The operator now has 4 options to choose from. To modify or examine the LUN OFFSET, the operator types in a 2. If at any time the operator types in a ctrl C, the command is aborted and the utility program returns to the main menu. If the operator types in <CR> with no value, then the parameters will remain unchange.

4.2.1 Configure LUN Offset

For the LSI-11 systems only, each TMSCP drive requires a different Logical Unit Number. If there are no other TMSCP controllers in your system, then the LUN offset number is 0 (Drive 0 will be LUN 0, and Drive 1 will be LUN 1). If there exists another TMSCP controller with 4 LUN units (0 to 3), then the LUN offset should be 4. In this case Drive 0 will be LUN 4 and Drive 1 will be LUN 5. When the CQD-220 is used in VAX/VMS system, the LUN Offset can remain as factory setting (LUN=0).

```
MAIN MENU

     1 = BOOT DRIVE
     2 = CONFIGURE LUN (Logical Unit Number) OFFSET
     3 = TAPE DIAGNOSTIC
     4 = ADDITIONAL UTILITIES

SELECT OPTION :  2

PRESENT LUN OFFSET = 0, ENTER NEW VALUE:  X
SAVE NEW CONFIGURATION (Y or N)?   Y
COMPLETE.
```

4.2.2 Boot Drive

To bootstrap the operating system on drive 0 to 6, just select option 1 from main menu.

```
     1 = BOOT DRIVE
     2 = CONFIGURE LUN (Logical Unit Number) OFFSET
     3 = TAPE DIAGNOSTIC
     4 = ADDITIONAL UTILITIES

SELECT OPTION :  1

BOOT DRIVE NUMBER <0 TO 6>   0

BOOT MU0. ARE YOU SURE ?   Y

WAIT ...
```

4.2.3 Tape Diagnostic

User can use this option to test the integrity of the CQD-220, SCSI cable, and the tape drives connected.

4.2.4 Additional Utilities

User can use this option to display the SCSI ID's of the attached SCSI devices, issue SCSI commands to the selected device, and test SCSI devices. When this option is selected, the menu will display

```
ADDITIONAL UTILITIES  (REV. XX)          SN = XXXX

     D = SETUP CONFIGURATION AND DISPLAY SCSI DEVICE
     S = SEND SCSI COMMAND TO THE DEVICE
     T = TEST SCSI DEVICE

SELECT OPTION ?
```

Note: Please refer to section 4.3 for details.

4.3 RS-232 Utility for CQD-220/M,/T,/TM

This is a general purpose on-board utility for any DEC system with Q-bus. To access the RS-232 utility, user needs to connect a terminal and cable to the CQD-220's RS-232 port (10 pin connector J1 of CQD-220 or DEC compatible RJ-11/ Modified Module 423 Jack connector of CQD-223),and sets the terminal baud rate to 9600 (8 bit data, no parity). Then halt the system and toggle the reset switch. The main menu will be displayed automatically on the terminal.

Once the main utility menu shows up, user can key in the number or letter and <CR> to select the desired option. Press the <BREAK> or <CONTROL C> at any time to reset the SCSI bus and return to the main menu.

Please note that the pin 8 (receive data) of the CQD-220's RS-232 port is also used as a write protect input for the front panel interface of the controller during normal operation. Remove the terminal cable from the RS-232 port after using the SCSI utility.

The CQD-220 RS-232 port supports cable length up to 12 feet.

For the CQD-220/TM, the main menu of the utility will display:

```
SCSI HOST ADAPTER UTILITY      (REV. XX)

[DISK]                                  [TAPE]
1 = LOGICAL UNIT NUMBER OFFSET          6 = LOGICAL UNIT NUMBER OFFSET
2 = FORMAT DRIVE                        7 = ADDITIONAL UTILITIES
3 = QUALIFY DRIVE
4 = MANUALLY REPLACE BAD BLOCKS
5 = ADDITONAL UTILITIES

SELECT OPTION ?
```

For CQD-220/M, the main menu will display:

```
SCSI HOST ADAPTER UTILITY       (REV. XX)

1 = LOGICAL UNIT NUMBER OFFSET
2 = FORMAT DRIVE
3 = QUALIFY DRIVE
4 = MANUALLY REPLACE BAD BLOCKS
5 = ADDITONAL UTILITIES

SELECT OPTION ?
```

For CQD-220/T, the main menu will display:

```
SCSI HOST ADAPTER UTILITY       (REV. XX)

1 = LOGICAL UNIT NUMBER OFFSET
2 = ADDITIONAL UTILITIES

SELECT OPTION ?
```

The sub-menu for the additional utilities will display:

```
ADDITIONAL UTILITIES    (REV. XX)        SN = XXXX

D = SETUP CONFIGURATION AND DISPLAY SCSI DEVICE
S = SEND SCSI COMMAND TO THE DEVICE
T = TEST SCSI DEVICE
R = FORMAT RCT BLOCK

SELECT OPTION ?
```

Selection 'D' can be used to change the controller default configurations, such as number of disk and tape devices supported, SCSI ID and SCSI LUN assignment, disk partition selection, disk shadow set selection (for /TMS only), SCSI reset enable/disable, SCSI disconnect enable/disable, sync/async mode selection, tape buffer mode enable/disable, prevent medium removal enable/disable, disk write with verify enable/disable, etc. It will also scan/display the SCSI devices attached to the controller.

Selection 'S' can be used to send generic SCSI commands to the selected disk/tape drives directly.

Selection 'T' can be used to either read or write/read/verify the selected disk/tape drive continuously.

Selection 'R' can be used to format the RCT blocks of the disk drive selected.

Note: 1. The disk drive can only be partitioned into two or four equally divided partition. After the drive been partitioned, selection 'R' should be used to format the RCT blocks of each partition properly.

4.4 ODT Utility

Users can also follow the ODT utility procedure to communicate directly with the CQD-220 SCSI host adapter in LSI-11 and all VAX systems.

4.4.1 ODT Bootstrap

For LSI-11 only

```
17772150/000000  0              ;Enter 0 to CSR address
17772152/005400  123456         ;ODT utility, CSR+2
/001000  600                    ;BOOT
/004000  0                      ;Logic unit number
R0/xxxxxx 0                     ;boot from LUN 0
R1/xxxxxx 172150                ;CSR address
R7/xxxxxx 0                     ;Start from 0
RS/xxxxxx 340                   ;Highest priority
P                               ;Proceed
```

4.4.2 Specify LUN Offset

a. LSI-11

```
17772150/000000  0              ;CSR address
17772152/005400  123456         ;CSR+2
/001000 42
/004000 0                       ;LUN offset
```

b. VAX

```
>>>D/W/P 20001468 0            ;CSR address
>>>D/W/P 2000146A A72E         ;CSR+2
>>>D * 22
>>>D * 0                       ;LUN offset
```

4.4.3 Verify LUN Offset

a. LSI-11

```
17772150/000000  0              ;CSR address
17772152/005400  123456         ;CSR+2
/001000 43
/offset 0                       ;Display LUN offset
```

b. VAX

```
>>>D/W/P 20001468 0            ;CSR address
>>>D/W/P 2000146A A72E         ;CSR+2
>>>D * 23
>>>E *                         ;Display LUN offset
```

4.4.4 Format Drive

a. LSI-11

```
17772150/000000  0              ;CSR address
17772152/005400  123456         ;CSR+2
/001000 40
/004000  0                      ;Select drive 0
/010000  0                      ;Drive volume serial number
/020000                         ;Value=20000, formatting
                                ;Value=0, format complete
```

b. VAX

```
>>>D/W/P 20001468 0            ;CSR address
>>>D/W/P 2000146A A72E         ;CSR+2
>>>D * 20
>>>D * 0                       ;Select drive 0
>>>D * 0                       ;Drive volume serial number
>>>E *                         ;Value=2000, formatting
                                ;Value=0, format complete
```

4.4.5 Qualify Drive

a. LSI-11

```
17772150/000000  0              ;CSR address
17772152/005400  123456         ;CSR+2
/001000 41
/004000 0                       ;Select drive 0
/loop count                     ;Show current qualify loop
                                ;count
```

b. VAX

```
>>>D/W/P 20001468 0
>>>D/W/P 2000146A A72E
>>>D * 21
>>>D * 0                       ;Select drive 0
>>>E *                         ;Show current qualify loop
                                ;count
```

CHAPTER 5 SCSI INFORMATION

5.1 SCSI Definitions:

Connect: The function that occurs when an initiator selects a target to start an operation.

Disconnect: The function that occurs when a target release control of the SCSI bus, allowing it to go to the BUS FREE phase.

Initiator: An SCSI device (usually a host system) that requests an operation to be performed by another SCSI device.

LUN: Logic Unit Number

Peripheral device: A peripheral that can be attatched to an SCSI device (e.g., magnetic disk, magnetic tape, or optical disk).

Reconnect: The function that occurs when a target selects an initiator to continue an operation after a disconnect.

SCSI address: The octal representation of the unique address (0-7) assigned to an SCSI device. This address would normally be assigned and set in the SCSI device during system installation.

SCSI ID: The bit-significant representation of the SCSI address refering to one of the signal lines DB(7-0).

SCSI device: A host computer adapter or a peripheral controller or an intelligent peripheral that can be attatched to the SCSI bus.

Target: An SCSI device that performs an operation requested by an initiator.

5.2 SCSI Commands

SCSI commands used by CQD-220/M or CQD-220/TM for MSCP emulation are listed in the following table.

Code	Command Name
00h	Test Unit Ready
01h	Rezero Unit
03h	Request Sense
04h	Format Unit (1)
07h	Reassign Block
08h	Read
0Ah	Write
0Bh	Seek
12h	Inquiry
15h	Mode Select
16h	Reserve Unit
17h	Release Unit
1Ah	Mode Sense
1Bh	Start/Stop Unit
1Eh	Prevent/Allow Medium Removal
25h	Read Capacity
28h	Extended Read
2Ah	Extended Write
2Bh	Extended Seek
3Eh	Read Long (2)
3Fh	Write Long(2)

(1) The Format Unit command is used by the on-board utility only.
(2) These commands are used if the drives support them.

SCSI commands used by CQD-220/T or CQD-220/TM for TMSCP emulation are listed in the following table.

Code	Command Name
00h	Test Unit Ready
01h	Rewind
03h	Request Sense
08h	Read
0Ah	Write
10h	Write Filemarks
11h	Space
12h	Inquiry
15h	Mode Select
16h	Reserve Unit
17h	Release Unit
19h	Erase
1Ah	Mode Sense
1Bh	Load/Unload
1Eh	Prevent/Allow Medium Removal

5.3 SCSI Status

The SCSI status codes used by CQD-220 are listed in the following table.

Code	Status Name
00h	Good
02h	Check Condition
08h	Busy
10h	Intermediate/Good
18h	Reservation Conflict

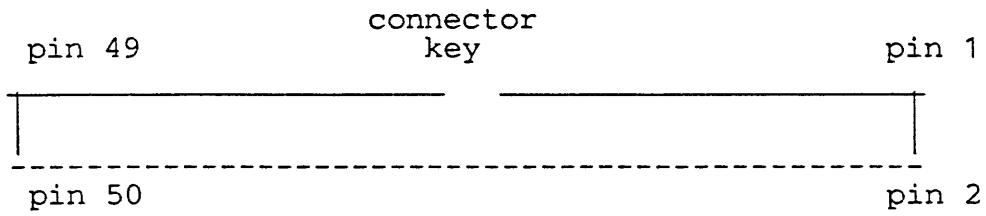
5.4 SCSI Messages

The SCSI Messages used by CQD-220 are listed in the following table.

Code	Message Name
00h	Command Complete
01h	Extended Message
02h	Save Data Pointer
03h	Restore Pointer
04h	Disconnect
05h	Initiator Detected Error
07h	Message Reject
08h	No Operation
09h	Message Parity Error
80-FFh	Identify

5.5 SCSI Single-Ended Signals

5.5.1 Pin assignment of the CQD-220 non-shielded SCSI device Connector (J2):

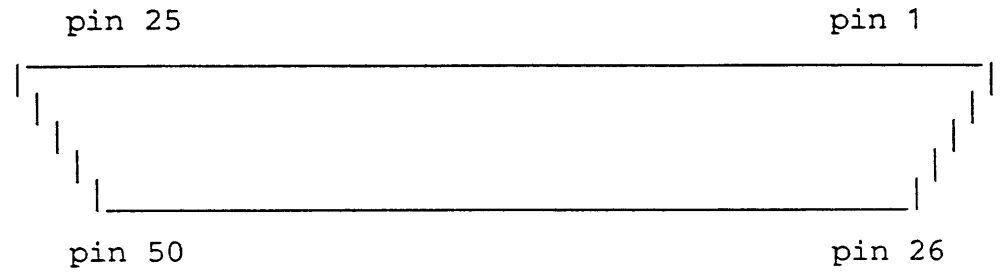


Signal	Pin Number
-DB(0)	2
-DB(1)	4
-DB(2)	6
-DB(3)	8
-DB(4)	10
-DB(5)	12
-DB(6)	14
-DB(7)	16
-DB(P)	18
GROUND	20
GROUND	22
GROUND	24
TERMPWR	26
GROUND	28
GROUND	30
-ATN	32
GROUND	34
-BSY	36
-ACK	38
-RST	40
-MSG	42
-SEL	44
-C/D	46
-REQ	48
-I/O	50

Table 3 CQD-220 SCSI Connector (J2) Pin Assignment

NOTE: All odd pins except pin 25 are connected to ground. Pin 25 is left open. The minus sign next to the signal indicates active low.

5.5.2 Pin assignment of the CQD-223 shielded SCSI device Connector :



Signal	Pin Number
-DB(0)	26
-DB(1)	27
-DB(2)	28
-DB(3)	29
-DB(4)	30
-DB(5)	31
-DB(6)	32
-DB(7)	33
-DB(P)	34
GROUND	35
GROUND	36
GROUND	37
TERMPWR	38
GROUND	39
GROUND	40
-ATN	41
GROUND	42
-BSY	43
-ACK	44
-RST	45
-MSG	46
-SEL	47
-C/D	48
-REQ	49
-I/O	50

Table 4 CQD-223 SCSI Connector (J2) Pin Assignment

NOTE: Pin 1 to pin 25 (except pin 13) are connected to ground. Pin 13 is left open. The minus sign next to the signal indicates active low.

Appendix 1 CMD Technology Product Warranty

CONTROLLER WARRANTY - CMD Technology, Inc. warrants products of its manufacture to be free from defects in material and workmanship for a period of one year from date of shipment.

CABLE WARRANTY - All CMD Technology, Inc. provided cables are warranted for ninety (90) days from the time of shipment.

The above warranties shall not apply to expendable components such as fuses, bulbs, and the like, nor to connectors, adapters, and other items not a part of the basic product. CMD Technology, Inc. shall have no obligation to make repairs or to cause replacement required through normal wear and tear or necessitated in whole or in part by catastrophe, fault or negligence of the user, improper or unauthorized use of the Product, or use of the Product in such a manner for which it was not designed, or by causes external to the Product, such as, but not limited to, power failure or air conditioning. CMD Technology's sole obligation hereunder shall be to repair or replace any defective Product, and, unless stated, pay return transportation costs within the United States of America for such replacement. Purchaser shall provide labor for removal of the defective Product, shipping charges for return to CMD Technology, Inc. and installation of its replacement.

THE EXPRESSED WARRANTIES SET FORTH IN THIS AGREEMENT ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WITH LIMITATION, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND ALL SUCH OTHER WARRANTIES ARE HEREBY DISCLAIMED AND EXCLUDED BY CMD TECHNOLOGY, INC. THE STATED EXPRESS WARRANTIES ARE IN LIEU OF ALL OBLIGATIONS OR LIABILITIES ON THE PART OF CMD TECHNOLOGY, INC. FOR DAMAGES, INCLUDING BUT NOT LIMITED TO SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH THE USE OR PERFORMANCE OF THE PRODUCTS.

RETURNED MATERIAL - Warranty claims must be received by CMD Technology, Inc. with the applicable warranty period. A replaced product, or part thereof, shall become the property of CMD Technology, Inc. and shall be returned to CMD Technology, Inc. at Purchaser's expense. All returned material must be accompanied by a RETURN MATERIALS AUTHORIZATION (RMA) number assigned by CMD Technology, Inc.

Appendix 2 Operating Systems Supported by CQD-220

All DEC-compatible products designed by CMD Technology, Inc. implement MSCP (Mass Storage Control Protocol) / TMSCP (Tape Mass Storage Control Protocol). CMD supports its implementation of MSCP/TMSCP beginning with the indicated version of the following DEC operating systems.

Operating Systems	*Version*
VMS	4.0-5.4
Ultrix	1.2-3.2
Unix/Berkeley	4.2 & 4.3
RSX-11M	Disk 4.1-5.3 Tape 4.2-5.3
RSX-11M-Plus	3.0-4.3
RSTS/E	Disk 9.0-9.7 Tape 9.5-9.7
RT-11	Disk 5.1-5.4C Tape 5.4
DSM-11	3.3-4.1
ISM-11	3.4
TSX +	(See RT-11)
VAXELN	x.x
AT&T UNIX	System 5

TABLE 4 Operating Systems Supported by CQD-220/223

Appendix 3 SCSI Devices Supported by CQD-220

Disk drives supported by CQD-220/M, CQD-220/TM SCSI host adapter:

~ indicates new qualified device.
# indicates device supporting multi-hosting

Magnetic disk drives:

SEAGATE	WREN-IV, WREN V, WREN VI #, SWIFT (3-1/2") SABRE 8", WREN VII #, ELITE (5400 RPM) ~#
CONNER PERIPHERALS	CP-3100, CP3200 ~
CITOH	YD-3042, YD3082
DEC	RZ23 ~, RZ24 ~, RZ56 ~, RZ57 ~
FUJITSU	M2246SA Series, M2263SA ~#
HITACHI	DK515C Series #, DK516C ~
HP	97548S/D series
IBM	320 MB, 3-1/2"
MAXTOR	XT-4000S Series, XT-8000S Series
MICROPOLIS	1588-15 ~#
QUANTUM	ProDrive 40S/80S
TEAC	FD235HF (3-1/2" FLOPPY, DEC RX33 compatible) ~

More disk drives will be qualified soon.

Erasable Optical disk drives:

MAXOPTICS	Tahiti	Magneto optical disk
SONY	SMO-D501 #	Magneto optical disk
RICOH	RO-5030E, RO-5030E2	Magneto optical disk ~

Erasable Optical disk cartridge manufacturers:

SONY, RICOH, MAXOPTICS, PDO, 3M.

CD ROM disk drives:

DEC	RRD40 RRD50
LMS	CM210, CM212
TOSHIBA	XM3200 series

WORM drives:

1. with Ten X Technology Optical Convertion Unit

MAXTOR	RXT-800S, Rev. J, K
LMSI	LD510, LD1200
MITSUBISHI	MW-5U1
PIONEER	DD-55001 etc.

2. with LASERDRIVE interface

LASERDRIVE	Model 800 series

Tape drives supported by CQD-220/T, CQD-220/TM SCSI host adapter:

~ indicates new qualified device.
# indicates device supporting multi-hosting

1. 8mm helical scan tape drives

EXABYTE	EXB-8200 # 8mm helical scan

2. 4mm helical scan tape drives (Digital Audio Tape)

Archive	Python 4520 DAT #
GIGATREND	1200 series DAT
HP	35450A DAT #
SONY	SDT-1000 DAT #
WangDat	1300-003 DAT #
Wangtek	6130FS DAT #

3. VHS helical scan tape drives

Digidata	-

4. IBM-3480 compatible 18-track cartridge tape drives

ASPEN	System 480
FUJITSU	M2480 series
LMS	Independence
Storage Tech	4280 series (model Summit)

5. 1/2" reel to reel tape drives

Cipher	F880-II
HP	Model 88780B
KENNEDY	Model 9612
M4 data	Model 9914 (Async mode only)

6. 1/2" TK50 compatible tape drives

DEC	TZ30

7. 1/2" cartridge tape drives

FUJITSU	M2452E

Jukeboxs supported by CQD-220/TMJ SCSI host adapter

~ indicates new qualified device.

1. Disk Jukebox

Hewlett-Packard	C1710A ~
IDE	7000 ~
Kodak	~
NKK	~

2. Tape Jukebox

Colorado Tech Designs	CTD/8L ~

Appendix 4 CQD-220 old hardware Rev. A

8 CSR addresses supported by the CQD-220/M old hardware Rev. A with the IC P20011A in U40.

Address	LSI-11	MicroVAX	W6-2	W6-3	W6-4	W6-5
Standard:	17772150	20001468	IN	IN	OUT	OUT
Second:	17760334	200000DC	IN	OUT	OUT	OUT
Third:	17760354	200000EC	OUT	IN	OUT	OUT
Fourth:	17760374	200000FC	OUT	OUT	OUT	OUT
Fifth:	17760340	200000E0	IN	IN	IN	OUT
Sixth:	17760344	200000E4	IN	OUT	IN	OUT
Seventh:	17760350	200000E8	OUT	IN	IN	OUT
Eighth:	17760360	200000F0	OUT	OUT	IN	OUT

30 CSR addresses supported by the CQD-220/T old hardware Rev. A with the IC P20012B in U40.

Address	LSI-11	MicroVAX	W6-1	W6-2	W6-3	W6-4	W6-5
1	17774500	20001940	IN	OUT	OUT	IN	IN
2	17760404	20000104	IN	OUT	OUT	IN	OUT
3	17760444	20000124	IN	OUT	OUT	OUT	IN
4	17760504	20000144	IN	OUT	OUT	OUT	OUT
5	17760544	20000164	IN	OUT	IN	IN	IN
6	17760410	20000108	IN	OUT	IN	IN	OUT
7	17760450	20000128	IN	OUT	IN	OUT	IN
8	17760454	2000012C	IN	OUT	IN	OUT	OUT
9	17760414	2000010C	IN	IN	OUT	IN	IN
10	17760420	20000110	IN	IN	OUT	IN	OUT
11	17760460	20000130	IN	IN	OUT	OUT	IN
12	17760510	20000148	IN	IN	OUT	OUT	OUT
13	17760514	2000014C	IN	IN	IN	IN	IN
14	17760520	20000150	IN	IN	IN	IN	OUT
15	17760550	20000168	IN	IN	IN	OUT	IN
16	17760554	2000016C	IN	IN	IN	OUT	OUT
17	17760560	20000170	OUT	OUT	OUT	IN	IN
18	17760604	20000184	OUT	OUT	OUT	IN	OUT
19	17760610	20000188	OUT	OUT	OUT	OUT	IN
20	17760614	2000018C	OUT	OUT	OUT	OUT	OUT
21	17760620	20000190	OUT	OUT	IN	IN	IN
22	17760644	200001A4	OUT	OUT	IN	IN	OUT
23	17760650	200001A8	OUT	OUT	IN	OUT	IN
24	17760654	200001AC	OUT	OUT	IN	OUT	OUT

Address	LSI-11	MicroVAX	W6-1	W6-2	W6-3	W6-4	W6-5
25	17760660	200001B0	OUT	IN	OUT	IN	IN
26	17760704	200001C4	OUT	IN	OUT	IN	OUT
27	17760710	200001C8	OUT	IN	OUT	OUT	IN
28	17760714	200001CC	OUT	IN	OUT	OUT	OUT
29	17760744	200001E4	OUT	IN	IN	IN	IN
30	17760750	200001E8	OUT	IN	IN	IN	OUT

The CSR jumper setting for the CQD-220/TM (disk and tape) old hardware Rev. A with the IC P20010A in U40:

CSR jumper setting for disk is

Address	LSI-11	MicroVAX	W6-2	W6-3
Standard:	17772150	20001468	IN	IN
Second:	17760334	200000DC	IN	OUT
Third:	17760354	200000EC	OUT	IN
Disable disk:			OUT	OUT

CSR jumper setting for tape is

Address	LSI-11	MicroVAX	W6-4	W6-5
Standard:	17774500	20001940	IN	IN
Second:	17760404	20000104	IN	OUT
Third:	17760444	20000124	OUT	IN
Disable tape:			OUT	OUT

Appendix 5 Proper Use of VMS SYSGEN Connect Statement

To properly use the CONNECT statement in the SYSGEN utility of VMS 5.0 and up, the following rules must be followed.

From either terminal mode or through a command file run the SYSGEN utility. It is recommended that SYCONFIG.COM be used if an automatic command file is used.

```
$ MC SYSGEN
SYSGEN>
```

Then issue the CONNECT statement under SYSGEN to connect the controller.

```
SYSGEN>CONNECT aaaa/ADAPTER=bbb/CSR=%Occcccccc/VECTOR=%Oddd/
       DRIVER=eeDRIVER
```

aaaa is the designation of the controller (no :) such as PTB0

bbb is the adapter number such as UB0 which can be found from the SYSGEN utility SHOW/CONFIG (the NEXUS number)

cccccccc is the CSR of the controller being added on the specified NEXUS preceeded by %O (letter O)

ddd is the VECTOR of the controller being added on the specified NEXUS preceeded by %O (letter O)

ee is the name of the driver for the controller being connected.

Then issue the next CONNECT statement under SYSGEN to connect the drive.

```
SYSGEN> CONNECT ffff/NOADAPTER/SYSIDHIGH=%Xgggg/SYSIDLOW=
        %Xhhhhhhhh/DRIVER=iiDRIVER
```

ffff is the designation of the drive (no :) such as MUB0

gggg is the SYSIDHIGH number which is 8000 plus the NEXUS number

hhhhhhhh is the SYSIDLOW number which can be obtained after the controller is connected by using the SYSGEN utility SHOW/UNIBUS. The newly attached controller will be seen at the CSR address previously specified followed by the SYSIDLOW number seen in (hhhhhhhh).

EXAMPLE: User wish to connect a tape drive to a MicroVAX 3300. This tape drive is the third MU: device to be added to the Q-bus. The AUTOCONNECT recommended CSR for this device will not be used but the CSR of 760444 will be used instead with a VECTOR of 340 on UB0.

```
$ MC SYSGEN

SYSGEN> SHOW/CONFIG


        System CSR and Vectors on 11-JAN-1990 10:43:47.59

Name: PUA  Units: 1  Nexus:0  (UBA)  CSR: 772150  Vector1 : 774 ...
Name: PTA  Units: 1  Nexus:0  (UBA)  CSR: 774500  Vector1 : 260 ...
Name: PUB  Units: 1  Nexus:0  (UBA)  CSR: 760334  Vector1 : 300 ...
Name: TXA  Units: 8  Nexus:0  (UBA)  CSR: 760500  Vector1 : 310 ...
                             |
Note the Nexus number -------|  for the specified bus.


SYSGEN> CONNECT PTC0/ADAPTER=UB0/CSR=%O760444/VECTOR=%O340/
        DRIVER=PUDRIVER


SYSGEN> SHOW/UNIBUS

Address 760444 (8002A924) responds with value 0020 (hex).
                          |
Note the SYSIDLOW ---  value.

Calculate the SYSIDHIGH value by adding 8000 to the nexus 0
(=8000).


SYSGEN> CONNECT MUC0/NOADAPTER/SYSIDHIGH=%X8000/SYSIDLOW=
        %X8002A924/DRIVER=TUDRIVER

SYSGEN> *EXIT* (CONTROL Z to exit)

$
```

Appendix 6 Troubleshooting with VMS Analyze/Error Utility

The CQD-220/T and CQD-220/TM log controller dependent information in ERRLOG.SYS file. User can use the VMS ANALYZE/ERROR utility to open the file ERRLOG.SYS and display the error messages for troubleshooting. By including option switches such as /SINCE=DATE and /INCLUDE=MUB0, user may define the time reference and device. To enter the ANALYZE/ERROR utility, log on to the system and enter

ANA/ERR/SINCE=[TIME]/INCLUDE=[DEVICE]

Some examples are shown in the following:

To view all errors that VMS has logged, enter

ANA/ERR <CR>

To view the errors only on tape devices, enter

ANA/ERR/INC=TAPES <CR>

To view the errors that have occured only on one tape unit (MUB0), enter

ANA/ERR/INC=MUB0 <CR>

ANA/ERR/INC=(PTB,MUB0) <CR>

To view the MUB0 errors that occured on April 20, 1990 since 14:22 (02:22 PM), enter

ANA/ERR/SINCE=20-APR-1989:12:22/INC=MUB0 <CR>

One example of the error log message is shown in the following.

```
                    BEGINING OF INTERVENING ENTRIES

************************** ENTRY      6.**************************

ERROR SEQUENCE  9.                                LOGGED ON SID 02005F78

ERL$LOGMESSAGE ENTRY    20-APR-1989   10:21:55.41
                        KA750       REV# 120.    UCODE  REV# 95.

I/O SUB-SYSTEM, UNIT _MUA0:

     MESSAGE TYPE         0002
                                    TAPE MSCP MESSAGE
     MSLG$L_CMD_REF  99730004
```

```
    MSLG$W_SEQ_NUM        0001
                                        SEQUENCE #1.
    MSLG$B_FORMAT           00
                                        CONTROLLER ERROR
    MSLG$B_FLAGS            00
    MSLG$W_EVENT          00E8
                                        DATA ERROR
                                        UNRECOVERABLE ECC ERROR


    MSLG$Q_CNT_ID     00340000
                      03090000
                                        UNIQUE IENTIFIER, 000000340000
                                        TAPE CLASS DEVICE
                                        TK50P
    MSLG$B_CNT_SVR          01
                                        CONTROLLER SOFTWARE VERSION #1.
    MSLG$B_CNT_HVR          01
                                        CONTROLLER HARDWARE VERSION #1.


CONTROLLER DEPENDENT INFORMATION    ;COMMENTS:
                                    ;SCSI COMMAND, 6 BYTES
    LONGWORD 1.       00000008      ;COMMAND BYTE 3 TO 0
                             /..../;(LEFT TO RIGHT, BYTE 3,2,1,0)
    LONGWORD 2.       00000050      ;BYTE 7 TO 6 DONT CARE
                                    ;COMMAND BYTE 5 TO 4
                           /P.../;EXTENDED SENSE, 26 BYTES
    LONGWORD 3.       00030070      ;SENSE DATA BYTE 3 TO 0
                           /P.../;(LEFT TO RIGHT, BYTE 3,2,1,0)
    LONGWORD 4.       12000000      ;SENSE DATA BYTE 7 TO 4
                             /..../;
    LONGWORD 5.       00000000      ;SENSE DATA BYTE 11 TO 8
                             /..../;
    LONGWORD 6.       00000000      ;SENSE DATA BYTE 15 TO 12
                             /..../;
    LONGWORD 7.       10000000      ;SENSE DATA BYTE 19 TO 16
                             /..../;
    LONGWORD 8.       04000000      ;SENSE DATA BYTE 23 TO 20
                             /..../;
    LONGWORD 9.       0000E202      ;SENSE DATA BYTE 26 TO 24
                           /.b../;
    LONGWORD 10       00000000      ;(RESERVED)
                             /..../;
```

User can refer to the SCSI tape drive manual to find out the meaning of the error reported by the tape drive or call CMD for detail information.