QT14 TAPE COUPLER
INSTALLATION AND USER GUIDE

EMULEX

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.

TABLE OF CONTENTS

Section	Title	Page

THREE TROUBLESHOOTING

Appendix A PROM REMOVAL AND REPLACEMENT

Appendix B DRIVE CONFIGURATION

LIST OF FIGURES

LIST OF TABLES

STATEMENT OF WARRANTY

DECEMBER 1, 1987

BASIC WARRANTY - In the absence of any optional warranty or continuing provisions extended by formal agreement, Emulex warranties its Products in accordance with the schedules listed below.

In all cases where equipment is to be returned to Emulex, a "Return Authorization" must be issued by the "Repair Center," (714) 662-5600.

CONTROLLERS - PERIPHERALS - DATA COMMUNICATION PRODUCTS -
Emulex warrants for a period of twelve (12) months, sixty (60) months in case of FAX modems and Data Pump modems, from the date of shipment, that each product shall be free of defects in material and workmanship. These products include all Disk and Tape Controllers, Magnetic Disk and Tape Drives, Optical Disk Drives, Communication Multiplexers, and modem products.

During this period, if the customer experiences difficulties with an Emulex product and is unable to resolve the problem via the phone with Emulex Technical Support, a Return Authorization will be issued. Following receipt of a Return Authorization, the customer is responsible for returning the product to Emulex, freight prepaid. Emulex, upon verification of warranty will, at its option, repair or replace the product in question, and return to the customer freight prepaid.

PACKAGED SUBSYSTEMS - Emulex warrants all packaged subsystems for a period of six (6) months from the date of shipment. These products include all versions of Sabre, Vault, Medley, Decathlon, and Javelin. In the event of difficulty, the procedure for problem resolution is the same as defined above. Please note that major assemblies of these packages including controllers and peripherals are covered under the 12 month warranty above if returned to Emulex as separate assemblies.

SOFTWARE WARRANTY - Emulex warrants for a period of ninety (90) days, from the date of shipment, that each software package supplied shall be free from defects and shall operate according to Emulex specifications under those Digital Equipment Corporation ("DEC"), IBM, Intel, and Unix, operating system versions supported by Emulex. Emulex does not warrant its software products under any operating system which has not been specifically identified. Any software revisions required hereunder will cover supply of distribution media only and will not cover on-site installation or integration.

CABLE WARRANTY - (Return to Factory) - All Emulex provided cables are warranted for ninety (90) days from the time of shipment. Questionable cables should be returned to Emulex, freight prepaid, where they will be repaired or replaced by Emulex at its option and returned to the customer freight prepaid.

MEDIA WARRANTY - Emulex warrants all media to be free of defects and material for a period of thirty (30) days from date of shipment. The customer is responsible for return of media to Emulex and Emulex for freight associated with replacement media being returned to the customer.

RETURN TO FACTORY - All of the warranties referenced above provide for corrective action on products returned to the Emulex factory accompanied by a "Return Authorization".

On-site services are not included as a part of these warranties.

GENERAL TERMS - The above warranties shall not apply to expendable components such as fuses, bulbs, and the like, nor to connectors and other items not a part of the basic product. Emulex 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 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. Emulex's sole obligation hereunder shall be to repair or replace items covered in the above warranties, unless covered by an Emulex On-Site Warranty Contract. Purchaser shall provide for removal of the defective Product, shipping charges for return to Emulex, and installation of its replacement. Above warranties are subject to change without notice.

RETURNED MATERIAL -Warranty claims must be received by Emulex within the applicable warranty period. A replaced product, or part thereof, shall become the property of Emulex and shall be returned to Emulex at Purchaser's expense. All returned material must be accompanied by a Return Authorization Number assigned by Emulex.

In the event product(s) returned under the provisions of this Warranty are subsequently determined by Emulex to be functionally operational and in accordance to its published specifications, i.e., "No Defect Found" (NDF), Purchaser will be charged a NDF fee and the product shall be returned to Purchaser freight collect.

THE EXPRESSED WARRANTIES SET FORTH IN THIS AGREEMENT ARE IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND ALL SUCH OTHER WARRANTIES ARE HEREBY DISCLAIMED AND EXCLUDED BY EMULEX. THE STANDARD EXPRESSED WARRANTIES ARE IN LIEU OF ALL OBLIGATIONS OR LIABILITIES ON THE PART OF EMULEX 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.

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1.1 Introduction

This manual describes the installation and use of the Emulex QT14 Tape Coupler. The contents of the manual are as follows:

- **Section 1 (Description)** contains the functional description and specifications of the QT14 Tape Coupler.

- **Section 2 (Installation)** explains how to set up and install the coupler for a subsystem, including switch settings and cabling.

- **Section 3 (Troubleshooting)** describes fault isolation procedures that can be used to pinpoint trouble spots.

- **Appendix A (PROM Removal and Replacement)** instructs on removing and replacing the firmware PROM.

- **Appendix B (Drive Configurations)** presents configuration instructions for supported tape drives with a subsystem.

1.2 Subsystem Description

The QT14 Tape Coupler is a modular, microprocessor-based quad-wide printed circuit board assembly (PCBA). With a tape drive, it can emulate either a DEC TSV05 or TMSCP subsystem. The emulation is selected by a switch onboard the QT14. The QT14 connects a single tape transport to Digital Equipment Corporation's Q-Bus in MicroVAX 3500/3600 computers via a standard Pertec interface. Emulex has designed the form-factor of the QT14 PCBA for the backplane cage of the MicroVAX 3500/3600.

The tape transport, either streaming or nonstreaming, must have an internal formatter that uses the industry-standard Pertec interface. The QT14 uses a distribution panel to ensure FCC compliance for cabling. Two 50-pin high-density round shielded cables connect the QT14 PCBA, installed in the MicroVAX, to the QT14 Distribution Panel, installed in a rack-mount panel. From the QT14 Distribution Panel, two 50-pin flat-ribbon cables connect to the embedded formatter on the tape transport. Figure 1-1 shows a typical configuration.

The QT14 is compatible with any tape transport that uses a formatted tape interface as defined by Pertec, CDC or Cipher. This interface may provide different levels of support for commands, status, etc. The QT14 firmware and NOVRAM capabilities allow you to customize the QT14 peripheral interface to support these options.

The QT14 will work with multiple density transports operating at any tape speed from 12.5 to 140 inches per second (ips). The QT14 shifts from nonstreaming to streaming mode, automatically, if enough data is available to support the higher throughput rate.

```
┌─────────────────────┐
│                     │
│        CPU          │
│                     │
└──────────┬──────────┘
           ⇕
         Q-BUS
┌──────────┴──────────┐
│        QT14         │
│    TAPE COUPLER     │
│                     │
└──────────┬──────────┘
           ⇕
         HIGH-DENSITY CABLE INTERFACE
┌──────────┴──────────┐
│        QT14         │
│    DISTRIBUTION     │
│       PANEL         │
└──────────┬──────────┘
           ⇕
         PERTEC INTERFACE
┌─────────────────────┐
│     FORMATTER       │
├─────────────────────┤
│       TAPE          │
│    TRANSPORT        │
│         0           │
└─────────────────────┘
```
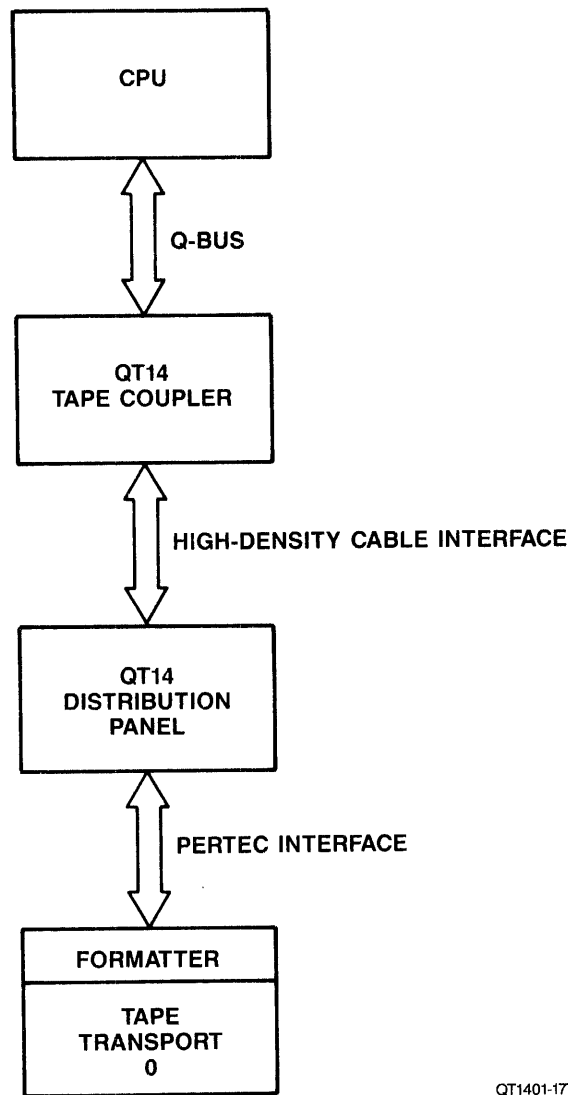
QT1401-1774

Figure 1-1. QT14 Subsystem Configuration

1.3   Subsystem Components

The QT14 tape coupler, shown in Figure 1-2, is shipped with the items listed in Table 1-1. Options are listed in Table 1-2. The QT14 requires two, round-shielded interface cables, a QT14 Distribution Panel, and two flat-ribbon cables to connect to a tape transport. You may also need a rack-mount panel for the QT14 Distribution Panel. The available cable types and lengths are listed in Table 1-3.

Table 1-1. QT14 Standard Components

Itm	Qty	Description	Part Number
1	1	QT14 Tape Coupler	QT1410201-00
2	2	Gap-filler Panel	QT1420102-00
3	1	QT14 Installation and User Guide	QT1450901-00
4	1	QT14 Distribution Panel	QT1420604-00
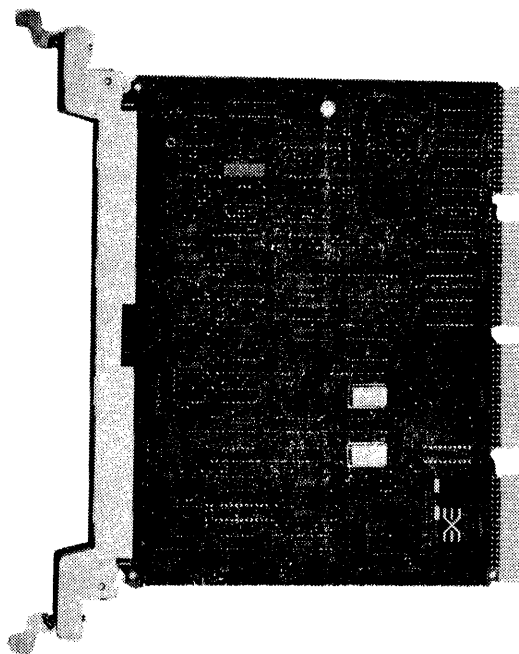
QT1401-1679

Figure 1-2. QT14 Tape Coupler

Table 1-2. QT14 Options

Item	Description	Part Number	Comment
1	TS11 Software Driver	VD9951803-XX Rev F and above	Allows the TSV05 emulation to be used under MicroVMS.
2	Onboard Port Cable	QT1311201-00	For connecting an ASCII terminal to the onboard serial port

Table 1-3. Cables and Panels

Item	Part Number	Description	Length	Qty Rqd	Application
1	CKQT14-15	Cable Kit	15 ft.	1	Interfere
2	TU1211201-01	Cable, Unshielded	3 ft.	2	Pertec
	TU1211201-02	Cable, Unshielded	5 ft.	2	Pertec
	TU1211201-03	Cable, Unshielded	8 ft.	2	Pertec
3	QT1420604	QT14 Distribution Panel	NA	1	
4	CU22/Filler	Rack-Mount Panel and filler panels	NA	1	

1.4   Features

The following features enhance the usefulness of the QT14 Tape Coupler.

- **Microprocessor Design.** An eight-bit CMOS microprocessor provides microprogramming flexibility for either TMSCP compatibility or TSV05 emulation.

- **Configuration Flexibility.** The QT14's nonvolatile random access memory (NOVRAM) permits changes to stored drive configurations through menus.

- **Onboard Port and Diagnostics.** Menu-driven embedded diagnostic firmware can be accessed through either the onboard serial port or host console.

- **Self-Test.** This routine exercises all parts of the microprocessor, the on-board memory, the buffer controller, and the host adapter controller (HAC).

- **Buffering.** The QT14 has 61K bytes of data buffering, which enables the QT14 to support a high-speed GCR transport.

- **Adaptive DMA.** The burst length value for this bus optimization feature can be programmed by the host processor or selected by the user.

- **Block-Mode DMA.** A 16-word data burst is transmitted after the memory address to reduce bus overhead.

- **22-Bit Addressing.** The QT14 supports the 22-bit addressing capability of the extended Q-Bus that is required for MicroVMS.

1.5   Compatibility

1.5.1   Diagnostics

The QT14's self-test and embedded diagnostic firmware are all that is required to test the subsystem's integrity.

1.5.2   Operating Systems

The QT14 is compatible with the indicated versions (and above) of the following DEC operating systems:

Operating System	TSV05 Version	TMSCP Version
MicroVMS	4.0*	4.0
Ultrix-32M	2.2	2.2

* with optional Emulex TS11 Software Driver listed in Table 1-2.

1.5.3   Media

Tapes written in accordance with ANSI Standard X3.40-1976, which include DEC's nine-track tape subsystems, are interchangeable with tapes written by tape transports with the QT14 Tape Coupler.

1.5.4 Hardware

The QT14 complies with DEC Q-Bus protocol and directly supports 22-bit addressing.

Tape transfer rates up to 1.0M byte per second and tape transports that use the standard Pertec interface are supported by the QT14. The following transports are certified by Emulex to work with the QT14:

- CDC 92185-02 (Buffered Enhanced only)
- Cipher F880 (1600 bpi only)
- Cipher M891
- Cipher F910
- Cipher M990
- Kennedy 9220 formatter
  with attached 9000, 9100, 9300 drives
- Kennedy 9400, 9401 embedded formatter drives
- Kennedy 9600, 9600A, 9610
- Megatape MT500, MT750

NOTE

Proper operation of any listed drive at 3200 bpi requires that the tape drive supplies the correct PEID burst.

1.5.5 Bootstrap Options

The bootstrap options supported are DEC TSV05 and TK25, the standard DEC TS bootstrap and, for TMSCP compatibility, the standard DEC TMSCP bootstrap.

1.6   General Specifications

Table 1-4 contains general specifications for the QT14 Tape Coupler.

Table 1-4. QT14 General Specifications

Parameter	Description
Emulation	Provides complete functional emulation of the DEC TSV05 or compatibility with DEC's TMSCP
TSV05 Operating System Compatibility	MicroVMS (v4 and above) Ultrix-32M Ultrix (v2.2 and above)
TMSCP Operating System Compatibility	MicroVMS (v4 and above) Ultrix-32M (v2.2 and above)
TMSCP Diagnostic Compatibility	None
Media Compatibility	0.5-inch wide magnetic tape per ANSI Standard X3.40-1976 (includes DEC TSV05 or TMSCP format)
Tape Transport Interface	Pertec (formatted)
Number of Tape Transports Supported	One
Tape Speeds	All tape speeds from 12.5 to 140 ips
CPU Interface	Extended DEC Q-Bus
Addressing Modes	16-, 18-, and 22-bit
Data Block Capacity	Up to 65,535 bytes
Priority Level	BR 4 (always enabled) or 5 (jumper selectable)

Table 1-4. QT14 General Specifications (continued)

Parameter	Description
Data Buffering	61K bytes
Data Transfer	Block mode DMA, 16-bit word; adaptive DMA. Transfer rate: 1us/word coupler-to-host
QBus-Addressable Registers	2
Base Device Address	Switch selectable to MicroVAX 3500/3600 standard and alternate addresses
Standard Alternates	TSV05 TMSCP 772520 774500 772524 760404 772530 760410 772534 760414 772440 760444 772444 760450 772450 760454 772454 760504
Vector Address	224 - (TSV05) NOVRAM programmable (TMSCP) Software selectable
Bus Loading	1 DC Load, 2.5 AD Loads
Indicators	
QT14 Tape Coupler	3 LEDs (red)
Electrical	
Power	2.5 amps @ +5 Vdc $\pm$ 5%
Bus Loading	ac bus loads: 2.5 max.; dc bus loads: 1 max.
Cabling	
QT14 Interface Cables	50-conductor, round-shielded (2)
Pertec Interface Cables	50-conductor, flat-ribbon (2)
Maximum Cable Length	25 ft (accumulated)

1.7   Physical Specifications

Table 1-6 contains physical specifications for the QT14 Tape Coupler.

Table 1-6. QT14 Tape Coupler Physical Specifications

Parameter	Description
Packaging	Quad-sized Q-Bus PCBA with attached daughter board and front panel; form-factor designed for MicroVAX 3500/3600
Shipping Weight	4 pounds
Connectors	
Q-Bus	Standard DEC PCBA edge connectors
Peripheral Interface	Two, 50-pin high-density connectors

1.8   Environmental Specifications

Table 1-7 contains environmental specifications for the QT14 Tape Coupler.

Table 1-7. QT14 Tape Coupler Environmental Specifications

Parameter	Description
Temperature	
Operating	5°C (41°F) to 50°C (122°F)
Storage	-40°C (-40°F) to 66°C (150°F)
Relative Humidity	
Operating	10% to 95%, noncondensing
Storage	10% to 95%, noncondensing
Airflow	
Operating to 50°C (122°F)	Maximum temperature rise across module must not exceed 20°C (68°F) input to output

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2.1 Overview

Procedures for installing the QT14 Tape Coupler are described in this section. The section **does not** contain every step necessary for bringing up the system. An Installation Checklist, which outlines the entire process, is provided on page 2-4.

2.1.1 Subsystem Configurations

This section is limited to switch setting data and physical installation instructions. No attempt is made to describe the many subsystem configurations that are possible.

When installing the subsystem, it is advisable to make a record of the subsystem configuration and environment. Figures 2-1 and 2-2 are Configuration Record Sheets for TSV05 and TMSCP, respectively, that list the information required and show where the data can be found. This information will also be of help to an Emulex service representative, should your subsystem require service.

2.1.2 Maintaining FCC Class A Compliance

Emulex has tested the QT14 Tape Coupler with DEC computers that comply with FCC Class A limits for radiated and conducted interference. When properly installed, the QT14 does not cause compliant computers to exceed Class A limits.

The QT14 Tape Coupler subsystem has only one physical configuration. The QT14 PCBA is installed in the MicroVAX 3500/3600 cabinet and the QT14 Distribution Panel and tape transport are mounted in a separate rack-mount cabinet.

To limit radiated interference, DEC completely encloses the components of its computers that generate or could conduct radio-frequency interference (RFI) with a grounded metal shield (earth ground). It is your responsibility to make sure that nothing must be done that reduces this shield's effectiveness (i.e., there must be no gap in the shield that would allow RFI to escape).

Conducted interference is generally prevented by installing a filter in the ac line between the computer and the ac outlet. Most power distribution panels that are of current manufacture contain suitable filters.

QT14 CONFIGURATION REFERENCE SHEET
for TMSCP

GENERAL INFORMATION

- Host computer type _____
- Host computer operating system _____
- Tape transport type _____

TMSCP NOVRAM PARAMETERS

Drive type, 0 = Start-Stop, 1 = Streamer (0-1, def = 1 dec):
On-the-fly commands (Y/N, def = Y):
Enable data busy timeout delay (Y/N, def = Y):
Remote density (Y/N, def = Y):
CDC tape drive (Y/N, def = N):
Use IDEN line to select remote density (Y/N, def = Y):
IDEN line true selects high density (Y/N, def = N):
Adaptive DMA (Y/N, def = N):
Blank tape timeout value, in seconds (1-60, def = 5 dec):
Max retry count for tape errors (1-10, def = 8):
μSec delay between DMA bursts (2/8, def = 2):
Enable write data prefill (Y/N, def = N):
Adaptive DMA threshold (1-7, def = 4 dec):
Tape drive speed thousands of bytes/second (0-65535.def = 200 dec)
Support 800 BPI density (Y/N, def = Y):
Support 1600 BPI density (Y/N, def = Y):
Support 6250 BPI density (Y/N, def = Y):

Notes: def = default. Default values indicate current NOVRAM values only.
        dec = decimal

QT14 CONFIGURATION

- Firmware revision number _____
- Top assembly number _____
- Q-Bus address _____
- Warranty expiration date _____
- Serial number_____
- Interrupt vector address_____
- Switch settings (□ = OFF   ■ = ON) _____
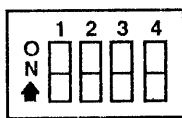
SW1
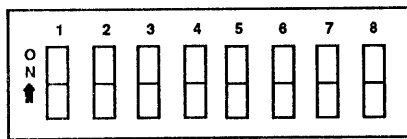
SW2
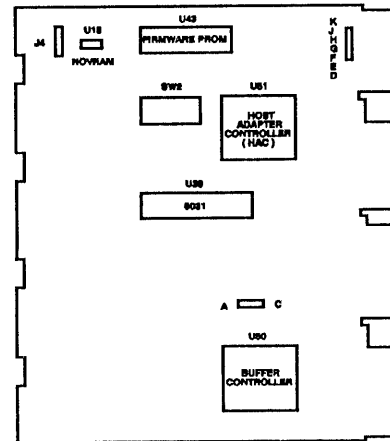
QT14-02

Figure 2-1. QT14 (for TMSCP) Configuration Reference Sheet

QT14 CONFIGURATION REFERENCE SHEET
for TSV05

GENERAL INFORMATION

- Host computer type _____
- Host computer operating system _____
- Tape transport type _____

TSV05 NOVRAM PARAMETERS

Drive type, 0 = Start-Stop, 1 = Streamer (0-1,def = 1 dec):
On-the-fly commands (Y/N, def = Y):
Enable data busy timeout delay (Y/N, def = Y):
Remote density (Y/N, def = N):
CDC tape drive (Y/N, def = N):
Use IDEN line to select remote density (Y/N, def = Y):
IDEN line true selects high density (Y/N, def = N):
Adaptive DMA (Y/N, def = N):
Blank tape timeout value, in seconds (1-60, def = 5 dec):
DMA burst word count (1-16, def = 16):
μSec delay between DMA bursts (2/8, def = 2):
Enable write data prefill (Y/N, def = N):
Adaptive DMA threshold (1-7, def = 4 dec):
Interrupt vector (0-774, def = 224 oct):

Notes:
def = default. Default values indicate current NOVRAM values only.
dec = decimal
oct = octal

QT14 CONFIGURATION

- Firmware revision number _____
- Top assembly number _____
- Q-Bus address _____
- Warranty expiration date _____
- Serial number_____
- Interrupt vector address _____
- Switch settings (☐ = OFF ■ = ON) _____
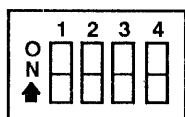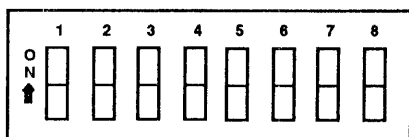
QT14-01

Figure 2-2. QT14 (for TSV05) Configuration Reference Sheet

2.2 Inspection

Emulex products are shipped in special containers designed to provide full protection under normal transit conditions. Immediately upon receipt, the shipping container should be inspected for evidence of possible damage incurred in transit. Any obvious damage to the container, or indications of actual or probable equipment damage, should be reported to the carrier company in accordance with instructions on the form included in the container.

Unpack the QT14 subsystem and, using the shipping invoice, verify that all equipment is present. Verify also that model or part numbers (P/N), revision levels, and serial numbers agree with those on the shipping invoice. Subsection 1.4 explains model numbers and details contents. These verifications are important to confirm warranty. Check for such items as bent or broken connector pins, damaged components, or any other evidence of physical damage. If evidence of physical damage or identity mismatch is found, notify an Emulex representative immediately. If the equipment must be returned to Emulex, it should be shipped in the original container.

INSTALLATION CHECKLIST

☐ 1. Inspect the QT14 Tape Coupler.

☐ 2. Set up the switches on the QT14 module.

☐ 3. Install the coupler in the backplane of the computer.

☐ 4. Install the QT14 Distribution Panel in the rack-mount cabinet and connect to the QT14 PCBA.

☐ 5. Install and connect the tape transport to the QT14 Distribution Panel.

☐ 6. Connect the serial port on the QT14, if used, to the terminal which must be set for 8-bit, no parity, 9600 baud.

☐ 7. Run the onboard embedded diagnostics.

☐ 8. Bring the system up.

2.3 Tape Coupler Setup

Several configuration setups must be made on the QT14 Tape Coupler before inserting it into the chassis. These setups are made by option switches SW1 and SW2.

Figure 2-3 shows the locations of the configuration switches referenced in the following paragraphs.
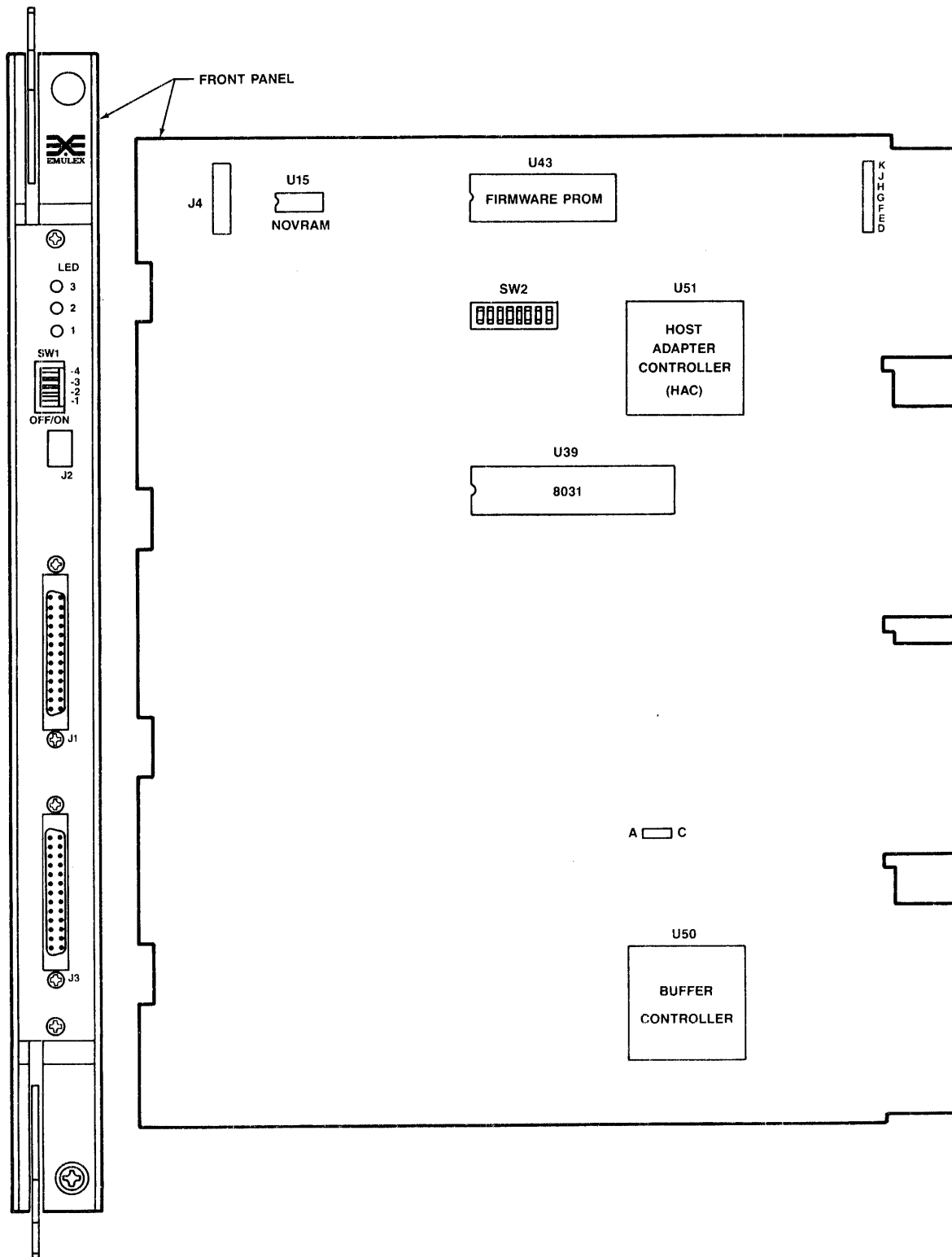
QT1401-1775

Figure 2-3. QT14 Tape Coupler Assembly

CAUTION

Setting these switches in proper sequence is
extremely important. Follow the NOVRAM loading
procedures given in subsection 2.4 carefully. In
particular, be certain that SW1-3 and SW1-4 are set
before SW1-2. Otherwise, the results are
unspecified and data corruption may occur.
Additionally, SW2-6 and SW2-7 should never be
ON or OFF at the same time.

Table 2-1 defines the function and factory configuration of all switches on the
QT14 coupler. The factory configuration switch settings are representative of
most QT14 Tape Coupler applications. Table 2-2 lists the QT14 jumpers and
their factory settings.

There are two dual function switches in SW1. In Diagnostic mode, SW1-3
enables onboard port communications (OFF) or host console communications
(ON). **TSV05 ONLY: In Operational mode, SW1-3 either enables record
buffering (ON) or disables it (OFF).** Also in Diagnostic mode, SW1-4 selects a
MicroVAX host (ON) or PDP-11 host (OFF). In Operational mode, SW1-4 loops
on self-test (ON), or continues on self-test (OFF).

Table 2-1. QT14 Switch Definitions/Factory Configuration

Switch	OFF(0)	ON(1)	Fact	Function	Section
SW1-1	Run	Reset	OFF(0)	QT14 Tape Coupler Reset	2.3
SW1-2	Operational	Diagnostic	OFF(0)	Mode Select	2.4
SW1-3	Disable	Enable	OFF(0)	Record Buffering (TSV05	2.3.3
SW1-3*	Onboard	Host	OFF(0)	Console Select	2.4.2
SW1-4	Continue	Loop	OFF(0)	Loop on Self-test Error	2.4.4.2
SW1-4*	LSI-11	MicroVAX	OFF(0)	Host Type Select	2.3.4
SW2-1	Address Sel.	-	OFF(0)	Q-Bus Address Select (1 of 8)	2.3.6
SW2-2	Address Sel.	-	OFF(0)	Q-Bus Address Select	2.3.6
SW2-3	Address Sel.	-	OFF(0)	Q-Bus Address Select	2.3.6
SW2-4	TMSCP	TSV05	OFF(0)	Emulation Select	2.3.5
SW2-5	Disable	Enable	ON(1)	22-bit Addressing	2.3.8
SW2-6	Edge Select	-	OFF(0)	WDS Lead./Trail. Edge Select	2.3.9
SW2-7	Edge Select	-	ON(1)	WDS Lead./Trail. Edge Select	2.3.9
SW2-8	-	-	OFF(0)	Reserved	

ON(1) = Closed   Fact = Factory switch setting   * Dual function switch
OFF(0) = Open   WDS = Write Data Strobe
[1]See CAUTION note on page 2-6.

Table 2-2. QT14 Jumper Definitions and Factory Configuration

Jumper	Function	Factory
BC[1]	Clock	IN
DE[1]	Factory Test	OUT
FG[2]	Monitor IRQ Level 6	OUT
GH[2]	Monitor IRQ Level 5	IN
JK[2]	IRQ Level 5 Request	OUT
[1]These are not options. They should be set as indicated at the factory. Do not reconfigure these jumpers. [2]See subsection 2.3.10 for optional settings.		

2.3.1 QT14 Tape Coupler Reset (SW1-1)

When ON, this switch causes a hard reset of the QT14 hardware. When set OFF, the QT14 operates normally after executing its power-on self-test. The host must initialize the controller after a hard reset.

2.3.2 Mode Select (SW1-2)

When ON, this switch causes the QT14 to execute the interactive on-board diagnostics for loading the NOVRAM and testing the subsystem. In this diagnostic mode, the QT14 is not emulating a tape subsystem and will not respond to host system accesses.

When set OFF, the QT14 performs a normal TSV05 or TMSCP emulation.

For a complete description of how to use this switch, see subsection 2.4.

2.3.3 Record Buffering (TSV05 ONLY) (SW1-3)

When ON, this switch selects record buffering (TSV05 emulation only). For DEC operating systems, leave this switch OFF.

The QT14 allows the software to control record buffering as required by the DEC TSV05 emulation. In those cases where the QT14 is used with custom software which does not have provision for software, control record buffering can be controlled with SW1-3.

NOTE

Be certain that your software supports record buffering before setting SW1-3 ON; otherwise, indeterminate error conditions could result. Leave this switch OFF when using DEC Operating System and Diagnostics to allow the software to control buffering.

2.3.4 Host Select (SW1-4)

This option is used only in Diagnostic mode. Switch SW1-4 is set ON for a MicroVAX host system; OFF for an LSI-11. For a complete description of how to use this switch, see subsection 2.4.

2.3.5 Emulation Select (SW2-4)

Either TMSCP or TSV05 must be selected. Set switch SW2-4 to ON to select TSV05 mode; OFF for TMSCP mode.

2.3.6 Tape Coupler Bus Address (SW2-1:SW2-3)

The address for the first of the QT14's two Q-Bus registers is selected by DIP switches SW2-1 through SW2-3. See Table 2-3 for TSV05 or TMSCP register address switch settings.

The register address you select for the QT14 depends on the emulation selected (TSV05 verses TMSCP) and the number of other devices of the same class in the system. The various operating systems used on Q-Bus machines expect to find the QT14 at specific addresses. The following table identifies those addresses:

Emulation	Standard Address	First Alternate Address
TSV05	772520	772524
TMSCP	774500	760404

For the TMSCP emulation, the first alternate address is in floating address space. The presence of other, higher ranking devices in floating address space will affect the address for the QT14 (and TMSCP-class devices are near the bottom of the current list). See the appropriate operating system manual for a discussion of floating addresses.

Some operating systems require the CSR address rather than the base address when the operating system is being configured to recognized a device. The QT14's CSR is its second register, so add 2_8 to the base address to determine the CSR address:

Emulation	Standard Address	CSR Address
TSV05	772520	772522
TMSCP	774500	774502

Table 2-3. Coupler Address Switch Settings

TSV05 Bus Address (in octal)	TMSCP Bus Address (in octal)	--- SW2 ---		
		1	2	3
772520	774500	0	0	0
772524	760404	1	0	0
772530	760410	0	1	0
772534	760414	1	1	0
772440	760444	0	0	1
772444	760450	1	0	1
772450	760454	0	1	1
772454	760504	1	1	1

2.3.7 Interrupt Vector Address

The interrupt vector address for the TSV05 emulation is specified through the NOVRAM maintenance menu. The value used for the first TSV05 device is 224_8. Vector values for additional units are selected from floating vector space, starting at 300_8. The presence of other devices which use floating vectors will affect the vector assigned to the QT14. See the appropriate operating system documentation.

For a TMSCP-class device, the operating system loads the interrupt vector into the controller during initialization. The value used for the first TMSCP device is 260_8. Vector values for additional units are selected from floating vector space, starting at 300_8. The presence of other devices which use floating vectors will affect the vector assigned to the QT14. See the appropriate operating system documentation.

2.3.8 22-Bit Addressing (SW2-5)

Twenty-two-bit addressing capability is required for the MicroVAX 3500/3600 systems. To enable, switch SW2-5 must be ON (factory setting). (The 7438 IC in socket U60 on the QT14 PCBA is installed at the factory.)

2.3.9 Write Data Strobe Option (SW2-7:SW2-8)

TA combination of switches SW2-6 and SW2-7 allows you to select operation on the leading or trailing edge of the Write Data Strobe pulse. To select leading edge, set SW2-6 ON and SW2-7 OFF. To select trailing edge, set SW2-6 OFF and SW2-7 ON. The factory setting for trailing edge should be used for all drives with the exception of the Kennedy 9300 and Anritsu Tape Drives. See the tape transport manufacturer's instructions. SW2-6 and SW2-7 should never both be ON or OFF at the same time.

Function	Switch Settings
Leading Edge	SW2-6 ON; SW2-7 OFF
Trailing Edge	SW2-6 OFF; SW2-7 ON

2.3.10 Interrupt Priority Level

The QT14 is factory configured for interrupt request (IRQ) level 4 (BR4). This is the preferred configuration for most DEC Q-Bus systems. In the case of special applications, the user may change to IRQ5 (BR5) via jumpers. The table below describes the different jumper settings. If you use IRQ5, Emulex strongly recommends that the QT14 be located ahead of all DEC devices on the bus.

Jumper	BR4 Factory	BR5
FG	OUT	IN
GH	IN	OUT
JK	OUT	IN

2.4 Onboard Diagnostics

The onboard diagnostics which are embedded in the QT14's firmware permit you to:

• Select configuration options for the tape drive

• Test the functionality of the coupler and drive

• Verify the switch settings on the QT14 module

Options are selected through menus. Menus are accessed through use of either the onboard serial port attached to a terminal or the host console.

The serial port connects to either a video or hard-copy terminal operating at 9600 baud, one stop bit, no parity. Connect the terminal to connector J2 on the QT14 front panel using Emulex terminal cable number QT1310201-00.

If you want to make a cable, the cable required is a three-wire cable. One end is DB25S (female 25-pin connector) that connects to any standard asynchronous terminal. The other is a connector that consists of two Berg/DuPont pieces (Berg part numbers 78211-003 and 48049-000). Connect the following pins on the two connectors:

- Berg Pin 1 (Signal Ground) to DB25S Pin 7 (Signal Ground)
- Berg Pin 2 (Receive Data) to DB25S Pin 2 (Transmit Data)
- Berg Pin 3 (Transmit Data) to DB25S Pin 3 (Receive Data)

NOTE

Configuration options must be loaded into the NOVRAM before the coupler can be used. The NOVRAM is loaded at the factory but its contents may not meet your system requirements.

2.4.1   Control Characters

Table 2-4 explains the functions of control characters when used with the QT14 diagnostics.

Table 2-4. Use of Control Characters with QT14 Diagnostics

CTRL/	USE
C	Aborts a currently executing test or a command being entered. If entered while test is executing, control is returned to present menu. If entered in response to a prompt, control is returned to the previous level.
O	Stops the display of test information on the screen or hardcopy terminal. Entering CTRL/O a second time will re-start the information appearing at the terminal.
S - Q	The CTRL/S, or terminal-generated XOFF, causes typed responses at the terminal to pause. CTRL/Q, or a terminal-generated XON, permits the output to resume.
T	Displays summary of currently executing test.
U	Aborts a command being entered; used only if < return > has not been entered yet. On CRTs, it deletes and ignores any characters entered. On hardcopy terminals, it displays "^U" and reprints prompt on new line.
W	Rewrites screen or prompt, as when switch settings were changed externally on board, and updates display.
Z	Same as C.

2.4.2   Diagnostic Setup Sequence

Instructions for starting the onboard diagnostics are presented in the accompanying checklist.

NOTE

TMSCP onboard port mode only: You may observe that tests hesitate intermittently or keyboard input is temporarily not accepted, due to the DEC host's polling of TMSCP devices. **This is normal.** Tests will eventually complete automatically; keep trying with keyboard input until it is accepted.

CAUTION

If you change a switch position on QT14, or change the configuration in the NOVRAM, you must also reset the QT14 so that the host operating system's initialization sequence reads the codes established by the switch settings and/or NOVRAM. To reset the QT14, either toggle switch SW1-1 (ON then OFF), or power-down and power-up system. **If you toggle SW1-1, be sure the system is offline. Resetting the coupler with the system running is likely to crash the system.**

DIAGNOSTIC STARTUP
(MicroVAX 3500/3600)

QT14 ONBOARD PORT MODE:

NOTE: Before running the onboard diagnostics, the QT14 must have all of its option switches set appropriately. If you have not specified the QT14's bus address, emulation, and other options, do so now. See subsection 2.2.

If the QT14 is in TMSCP mode, the operating system must be configured to recognize the QT14, and it must be running in order to use the onboard diagnostic port. The QT14 must be in Operational mode when the system is booted and the host system must be fully operational before switching to Diagnostic mode. In TSV05 mode, the onboard port can be used with or without the operating system running.

☐ 1. Connect a terminal to QT14 RS-232 onboard port via an appropriate cable, and set SW1-1 OFF.

☐ 2. Boot the operating system (optional for TSV05 emulations), and allocate the QT14 tape transport to prevent user access during onboard diagnostic procedure.

☐ 3. Set SW1-3 OFF to select the QT14 Onboard Port.

☐ 4. Set SW1-2 ON to select Diagnostic mode. The initial menu is displayed and either NOVRAM maintenance or subsystem diagnostics can be run at this time.

☐ 5. Perform necessary diagnostic functions (see following pages for details). Note: If NOVRAM is changed, the controller must be reset.

6. To exit Diagnostic mode, set SW1-2 OFF, set SW1-3 to original position (if changed), and type an "X" at the Main Menu prompt on the terminal. After this step, the tape transport can be accessed normally from the operating system.

SYSTEM CONSOLE MODE:

☐ 1. Set SW1-1 OFF.

☐ 2. Perform a system reset, either from power-up or reset. Do not allow the operating system to boot!

☐ 3. Set SW1-3 and 1-4 ON to select Host console and MicroVAX processor.

☐ 4. Set SW1-2 ON to select Diagnostic mode.

☐ 5. At the >>> prompt, type:

        D/P/W 20001F40 20<return>

        D/P/L 20088000 80000000<return>

        D/P/L 20088004 80000001<return>

☐ 6. Toggle QT14 switch SW1-1 from OFF (Run) to ON (Reset) to OFF. LEDs 1 and 2 on the QT14 will illuminate momentarily, indicating that the MicroVAX driver is being uploaded.

☐ 7. At the system >>> prompt, type:

        ST 80<return>

The initial menu is displayed and either NOVRAM maintenance or subsystem diagnostics can be run at this time.

2.4.3 Initial Screen

The initial Diagnostics screen shows the revision level of the diagnostic firmware being used, drive online or offline status, and CSR address location. You are prompted to specify whether a video or hardcopy terminal will be used to run the diagnostics.

NOTE

Video display mode supports VT1XX/VT2XX or compatible terminals. Use Hardcopy mode for non-VT1XX/VT2XX terminals.

After you specify the type of terminal and enter a < return >, the Main Menu is displayed.

2.4.4 Main Menu

The Main Menu for a video display terminal is shown in Figure 2-4. This menu presents choices for running diagnostic tests, configuring the subsystem for tape transport characteristics, and for displaying the switch settings.

```
                          MAIN MENU

        A - All tests
        R - Retry limit value
        N - NOVRAM maintenance
        T - Test selection menu
        S - Display switch settings
        Q - Quick test on positioning and erase
        X - Exit Maintenance mode after resetting switches


                 Select function (def = A) :


CTRL/C - Returns you to the previous level
CTRL/U - Deletes current input if no < CR > entered
CTRL/W - Rewrites the screen or prompt
```
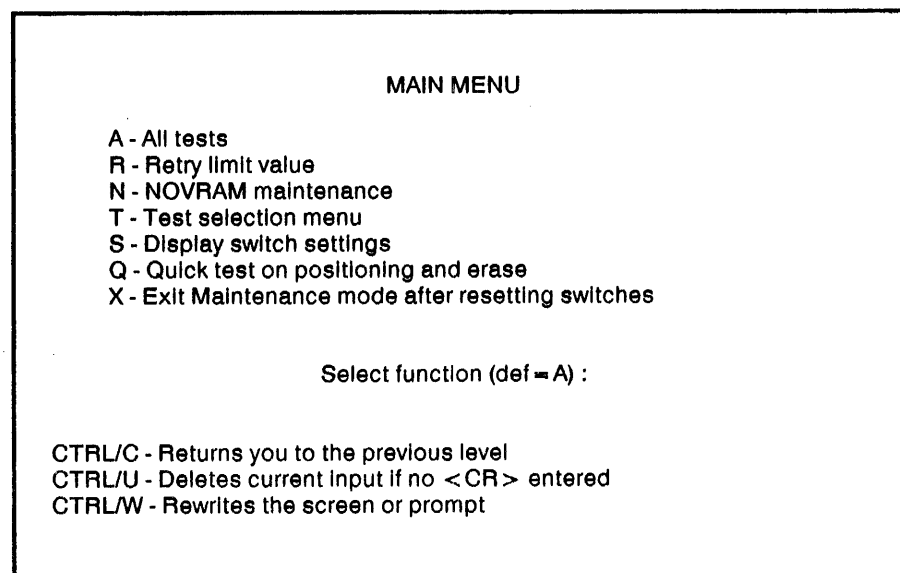
Figure 2-4. Main Menu

To make a selection from the Main Menu, type the letter of the selection you want and follow it with a < return >. The choices are:

A - All tests. All onboard firmware installation diagnostic tests are executed and any errors reported. This is a basic reliability test.

R - Retry limit value. Allows the operator to specify the number of retries to be performed on Write Errors. The program defaults to 10. Errors that occur within the limits set by this parameter are reported as soft errors. The default limit is set each time the test is restarted from the Main Menu.

N - NOVRAM maintenance. Current configuration values are displayed and any errors are reported. You can make changes to the NOVRAM through this option.

T - Test selection menu. This option lets you selectively run any of the six onboard diagnostic tests. A loop count selection lets you determine how many times the tests are run.

S - Display switch settings. The switchpack ON/OFF settings are portrayed on this screen to verify that the firmware has interpreted your settings correctly. The specific configuration option represented by the switch setting is also identified.

Q - Quick test on positioning and erase. Causes the Erase and Positioning Test to terminate after 256 records instead of running all the way to EOT. Once set, the option remains in effect until reset by the operator in the Main Menu.

X - Exit Maintenance mode after resetting switches. After resetting the Operational/Diagnostic and Loop/Continue switches, "X" will return you to the operational mode. If you haven't reset any switches, "X" will return you to the initial diagnostics screen.

2.4.4.1   NOVRAM Maintenance

This function lets you specify the QT14's configuration options. When selected, the NOVRAM's current data is displayed on the terminal. You will see the NOVRAM parameter descriptor, followed by the range of values in parentheses. There is a separate menu for TSV05 and TMSCP emulations, determined by the selection of TSV05 or TMSCP emulation through switch SW2-4.

NOVRAM menus for the TSV05 and TMSCP emulations are shown in Figures 2-5 and 2-6, respectively.

NOTE

The default value, which appears with the range of values for each option, is indeterminate and indicates **only** the current value. This value may, or may not, be the value your installation requires.

If the NOVRAM maintenance function fails, it may be because of corrupted or unprogrammed NOVRAM. In this case, an error message will be printed and you are permitted to continue the operation.

You will then be asked if you want to modify the NOVRAM.

If you answer "N", control is returned to the Main Menu.

```
        Drive type, 0 = Start-Stop, 1 = Streamer (0-1,def = 1 dec) :
        On-the-fly commands (Y/N, def = Y) :
        Enable data busy timeout delay (Y/N, def = Y) :
        Remote density (Y/N, def = N) :
        CDC tape drive (Y/N, def = N) :
        Use IDEN line to select remote density (Y/N,def = Y) :
        IDEN line true selects high density (Y/N def = N) :
        Adaptive DMA (Y/N, def = N) :
        Blank tape timeout value, in seconds (1-60, def = 5 dec) :
        DMA burst word count (1-16, def = 16) :
        uSec delay between DMA bursts (2/8, def = 2) :
        Enable write data prefill (Y/N, def = N) :
        Adaptive DMA threshold (1-7, def = 4 dec) :
        Interrupt vector (0-774.def = 224 oct) :


Modify ?  (Y/N,def = N) :
```

Figure 2-5. Sample TSV05 NOVRAM Maintenance Menu

```
        Drive type, 0 = Start-Stop, 1 = Streamer (0-1,def = 1 dec) :
        On-the-fly commands (Y/N, def = Y) :
        Enable data busy timeout delay (Y/N def = Y) :
        Remote density (Y/N, def = Y) :
        CDC tape drive (Y/N, def = N) :
        Use IDEN line to select remote density (Y/N,def = Y) :
        Ident line true selects high density (Y/N def = N) :
        Adaptive DMA (Y/N, def = N) :
        Blank tape timeout value, in seconds (1-60, def = 5 dec) :
        Max retry count for tape errors (1-10, def = 8) :
        uSec delay between DMA bursts (2/8, def = 2) :
        Enable write data prefill (Y/N, def = N) :
        Adaptive DMA threshold (1-7, def = 4 dec) :
        Tape drive speed thousands of bytes/second (0-65535.def = 200 dec)
        Support  800 BPI density (Y/N,def = Y)  :
        Support 1600 BPI density (Y/N,def = Y)  :
        Support 6250 BPI density (Y/N,def = Y)  :


Modify ?  (Y/N,def = N) :
```

Figure 2-6. Sample TMSCP NOVRAM Maintenance Menu

If you answer "Y", the cursor moves to the first data field to be modified and you can make changes.

NOTE

The tape coupler must be reinitialized before the values you enter take effect.

At a hardcopy terminal, the descriptors will be output and the cursor will be positioned at the end of the prompt.

If you enter a CTRL/Z or CTRL/C, control returns to the main menu and the NOVRAM will not be written.

Menu selections are described below. Options that pertain to both TSV05 and TMSCP applications are described first; followed by TSV05-only and TMSCP-only options.

Some of the values you enter will be mandated by the transport that you use, others by the operating system configuration; however, some of the parameters are for system tuning and thus less definite. In those cases, we have included **recommended settings**. When in doubt, use the recommended settings.

TSV05 and TMSCP:

- **Drive type.** Specify whether your transport is of the start/stop or streaming variety. In addition, you can override the built-in "auto high-speed control" function that optimizes system performance: by specifying "start/stop" when your transport type is actually a streamer, you can force the transport to respond to commands more slowly, if your application requires it.

- **On-the-fly commands.** This option is designed to optimize system performance, so normally you would specify "yes".

- **Enable data busy timeout delay.** This feature allows you to enable (Y) or disable (N) a watch-dog timer which looks for a FALSE to TRUE transition of the Data Busy (DBY) signal on the tape interface during certain operations. Most drives are compatible with this option (i.e., Y); follow the configurations given for specific drives in Appendix B. In some special cases (i.e. Helical scan tape transports), the timer should be disabled for proper operations.

- **Remote density.** If your transport supports this, specify "yes". If you specify "no", you will have to set the density on the transport itself.

- **CDC Drive.** This question applies to the remote density parameter and CDC 9218X-style tape drives. CDC drives require a special code to allow proper remote density selection. Enter Y in response to this question for CDC 9218X-style tape drives only.

- **Use IDEN line to select remote density.** If your transport supports remote density selection using an IDEN signal at the Pertec interface, specify this option (Y). If your transport uses a command sequence to select density, answer N to this question. Consult your transport documentation to determine whether or not it uses IDEN. **Remote density** must also be enabled for this option to work. This feature is used to select density **only** for start/stop transports. Consult your drive documentation for information on how to use this method.

- **IDEN line true selects high density.** The controller uses IDEN to select the tape transport's recording density. This feature allows you to invert the "true" state of the IDEN line. Consult your tape drive manual for usage requirements.

- **Adaptive DMA.** Enabling this option ensures that CPU or other device functions are not locked out for excessive periods of time, by allowing the QT14, while in the middle of a Block Mode DMA transfer, to release the bus to another device. When disabled, the QT14 will seize the bus for the entire DMA burst count. Recommended setting: "yes".

- **Blank tape timeout value.** This value tells the QT14 how long to wait for data before timing out. The value, selected from a range of 1 to 60 seconds, should approximate the number of seconds it takes 300 inches (25 feet) of tape to pass the read head. Divide your transport's maximum speed in inches per second (ips) into 300 and round to the nearest whole number to determine the timeout value.

- **uSec delay between DMA bursts.** The value of this option can be either 2 or 4 microseconds. It determines the delay, between DMA bursts, before the QT14 will attempt to gain bus control. Choose based on whether or not there are other slower DMA devices on the bus. If so, select 4 to give the other devices more opportunity to get the bus. Recommended setting: "2".

- **Enable write data prefill.** If enabled, this option allows the QT13 to fill the write buffer with a complete data record before it initiates transfer to the tape drive. Enable this option only if your system logs "data late" errors to the tape drive during write operations. Be aware that some loss of tape streaming efficiency occurs when this option is enabled. Default: disabled.

- **Adaptive DMA threshold.** The threshold is the maximum number of words processed by the QT14 before releasing the bus when another device is trying to gain bus control. The choice is any number in the range of 1 to 7 words. Choose based on your system priorities. If you wish to give interrupt service priority over DMA, set this value on the low side. If you wish to favor DMA, set this value on the high side. Avoid extremes. Recommended setting: "4".

TSV05 ONLY:

- **DMA burst word count.** This value, selected from a range of 1 to 16, specifies the number of words the QT14 will process in each burst of DMA transfer activity (unless the process is interrupted by the adaptive DMA feature). Choose based on your system priorities. If your system configuration includes devices with heavy PIO requirements or interrupt loads, set this value on the low side. If you wish to favor DMA, set this value on the high side. Also, higher values aid streaming operation. Recommended setting: 16.

- **Interrupt vector.** The standard vector is 224_8. Vector values for additional units are selected from floating vector space, starting at 300_8. The presence of other devices which use floating vectors will affect the vector assigned to the QT14. See the appropriate operating system documentation.

TMSCP ONLY:

- **Max retry count for tape errors.** This parameter defines the number of retry operations that the controller will try before reporting an error. This is not a software parameter and will not affect software retries. Lowering the retry count will reduce the time required to initialize a tape, especially for tri-density drives. Recommended setting: 1 or 2.

- **Tape drive speed.** The tape drive speed, expressed in kilobytes per second (refer to your drive documentation), is a value required from the QT14 by the host system. It does not affect system performance.

- **Support 800 BPI density.** This value is reported back to the host. It works in conjunction with the remote density option, if that option was enabled.

- **Support 1600 BPI density.** This value is reported back to the host. It works in conjunction with the remote density option, if that option was enabled.

- **Support 6250 BPI density.** This value is reported back to the host. It works in conjunction with the remote density option, if that option was enabled.

2.4.4.2 Test Selection

This option permits you to selectively run any of the six tests by means of a menu. Type the letter of the test, followed by a <return>, at the prompt. Repeat for as many tests as you want, then select "Go" to begin test execution.

```
                      TEST SELECTION MENU

          B - BOT and Rewind
          W - Write/Read
          F - File mark
          S - Space forward/reverse
          P - Positioning
          E - Erase
          H - Host Memory DMA
          L - Loop Count
          D - Display selections
          C - Clear selections
          G - Go
          X - Exit this Menu


                   Select Function (def = X):


     CTRL/C - Returns you to the previous level
     CTRL/U - Deletes current input in no <CR> entered
     CTRL/W - Rewrites the screen or prompt
```

Figure 2-7. Sample Test Selection Menu

Six diagnostic tests and their descriptions follow. Other selections deal with displaying and running the tests.

B - **BOT and Rewind.** The QT14 checks for the Beginning of Tape (BOT) status by issuing a write, then a rewind, command.

W - **Write/Read.** The QT14 issues write and read commands and compares the data.

F - **Filemark.** The QT14 writes a filemark, rewinds, spaces forward a record, and checks for the End of File (EOF).

S - **Space forward/reverse.** In this test, the QT14 issues commands to check that the tape transport is properly spacing forward and backward with respect to the EOF mark.

P - **Positioning.** The QT14 issues write, rewind, and space commands to check that the tape transport can position properly with respect to EOT and BOT.

E - **Erase.** The QT14 issues an erase command to EOT and checks for the blank tape timeout.

H - **Host memory DMA.** The QT14 uses host memory as a scratch pad to verify that the Q-Bus function is transferring data properly.

L - **Loop count.** This option lets you determine how many times, from 0 to 255, a given test is executed. Selecting 0 is equivalent to selecting an infinite number of passes. If this option is not used, the default number of executions is 1.

D - **Display selections.** This is a convenience option. Test selection is typically made by selecting (but not executing) the tests you want all at once, then selecting the "Go" option which executes the tests. If you want to see the tests you have selected prior to executing them, **Display selections** will list them on the screen. You can then either go ahead with test execution or change the tests.

C - **Clear selections.** If you want to cancel the tests you have previously selected but not executed, this option will effectively cancel all selections.

G - **Go.** This option begins test execution. You will be asked for confirmation that you do want to run the tests.

X - **Exit this Menu.** This option will return you to the Main Menu.

Completed tests are followed by a message on the screen confirming the number of passes made and the number, if any, of hard, soft, or device errors.

2.4.4.3   Display Switch Settings

This option shows the switch settings of SW1 and SW2 on the QT14 module. A sample display for SW1 follows in Figure 2-7; a sample display for SW2 is shown in Figure 2-8. With SW1-2 ON, SW1-3 and SW1-4 reflect QT14 characteristics related to the Diagnostic mode. With SW1-2 OFF, SW1-3 and SW1-4 will reflect characteristics related to Operational mode. Refer to subsection 2.3.

If, while looking at the screen display, you decide to change the switch settings, do so on the QT14 module. Then, by typing CTRL/W, the screen display will be refreshed, displaying the changes you just made.

```
        Switch 1
       OFF    ON
       ----------

        [      ]        1    QT14 Tape Coupler Reset Switch, Unreadable Hardware Switch
        [    * ]        2    Diagnostic Mode
        [    * ]        3    Onboard Port Communications
        [ *    ]        4    MicroVAX Host

       ----------
```
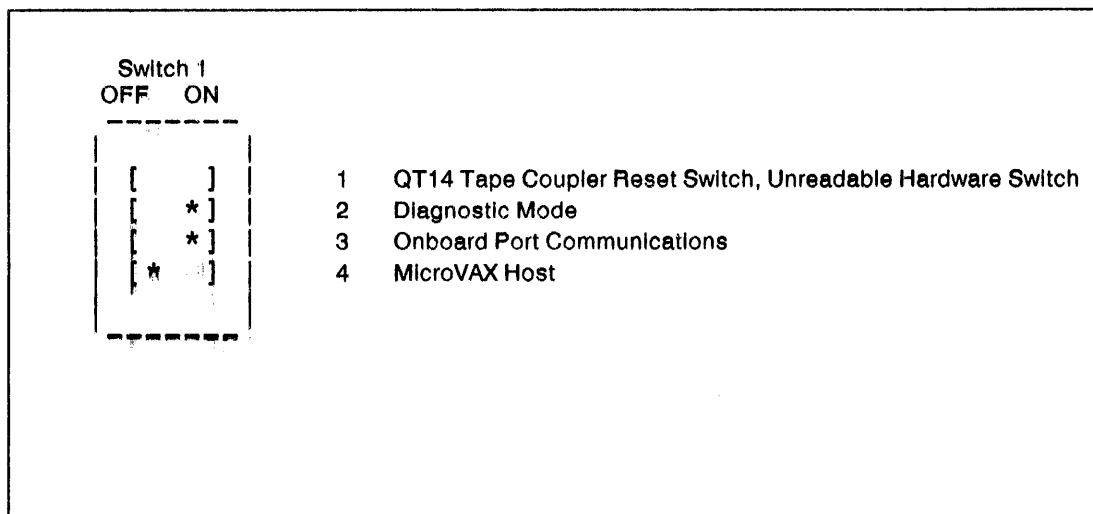
Figure 2-8. Sample SW1 Switch Setting Display

```
        Switch 2
       OFF    ON
       ----------

        [ *    ]        1    \
        [ *    ]        2    Address = 174500 Oct
        [ *    ]        3    /
        [ *    ]        4    TMSCP
        [    * ]        5    Enable 22-bit Addressing
        [      ]        6    WDS Trailing Edge Select, Unreadable Hardware Switch
        [      ]        7    WDS Leading Edge Select, Unreadable Hardware Switch
        [      ]        8    Not Used, Unreadable Hardware Switch

       ----------
```
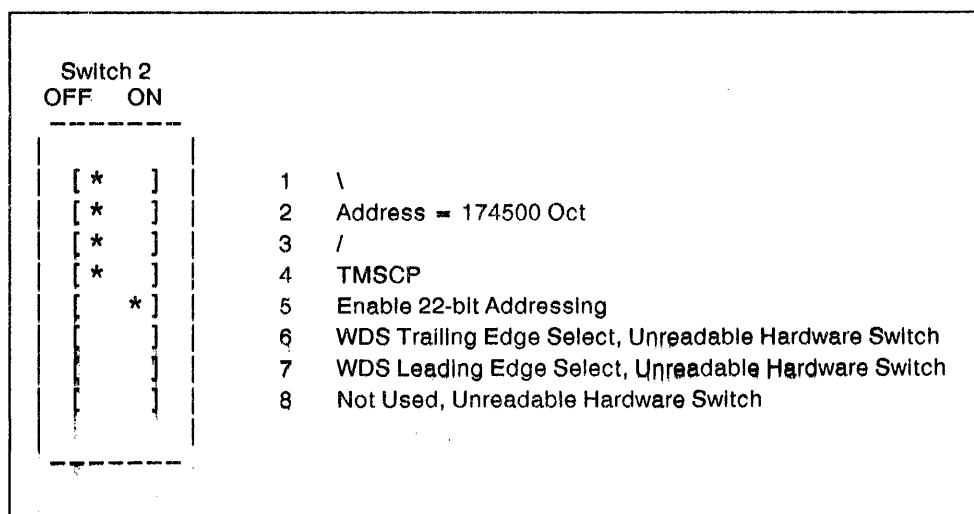
Figure 2-9. Sample SW2 Switch Setting Display

2.5   Physical Installation

2.5.1   System Preparation

To prepare the MicroVAX 3500/3600 to accept the QT14, use the following procedure:

1. Power down the system by switching OFF the main power switch.

2. Open the front chassis door.

3. Remove a blank cover from the front of the chassis so that an empty slsot is exposed.

2.5.2   Slot Selection

The QT14 may be assigned to any desired slot because it uses the LSI four-level interrupt scheme to perform distributed interrupt arbitration.

If you configure the QT14 to use interrupt level 4, install it toward the end of the NPR priority chain. The QT14 can buffer up to 61K bytes of data; therefore, it requires less direct memory access (DMA) priority than controller devices that contain less buffering.

If you configure the QT14 to use interrupt level 5, install it ahead of (closer to the CPU) DEC devices that are configured to use interrupt level 4 (some DEC devices do not monitor the next highest request level and fail to pass grants to higher priority devices).

DMA continuity must be ensured by leaving no empty Q-Bus slots between PCBAs in the backplane. For specific information regarding DMA continuity requirements, refer to the backplane or CPU user's guide.

2.5.3   Mounting

Plug the QT14 into the MicroVAX 3500/3600 backplane with components oriented in the same direction as the CPU and other modules. Always insert and remove the boards with the computer power OFF to avoid possible damage to the circuitry.

The QT14 PCBA includes a front panel with extractor handles. To install the board, slide the board in the slot with the extractor handles in the open position (aligned with the front panel of the PCBA). See Figure 2-10. When the board is properly positioned in the throat of the board guides, secure the board by pushing the extractor handles towards the center of the front panel.

The front panel of the QT14 PCBA will be set back further than the panels of the DEC boards in the backplane. Install a gap-filler panel on either side of the QT14, between a flat-board cover and the front panel of the QT14. (Each QT14 is shipped with two gap-filler panels; refer to Table 1-1 for part number.)

Use a Philips head screwdriver and push and turn the handle-locking screws a quarter-turn to lock the QT14 PCBA into the chasis.

EXTRACTOR
HANDLE

SCREW

QT14
FRONT
PANEL

SCREW

EXTRACTOR
HANDLE

CPU CHASSIS
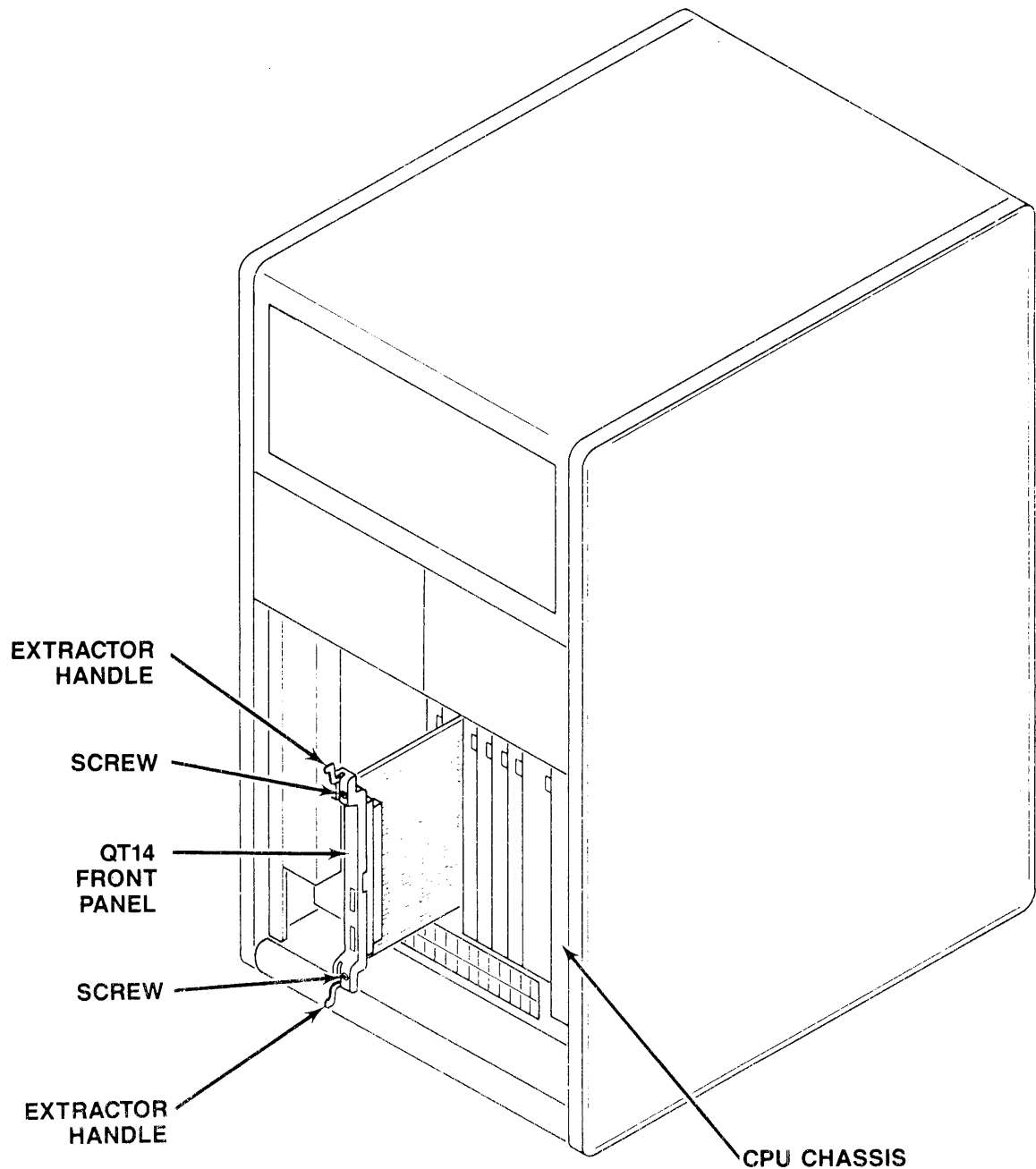
QT1401-1776

Figure 2-10. Mounting the QT14 PCBA in a MicroVAX 3500/3600

2.6   Tape Transport Preparation

In a QT14 subsystem, the tape transport must be mounted in a separate cabinet. Unpack and install the tape transport according to the manufacturer's instructions. Position and level it in its final place before beginning installation of the QT14. This allows the input/output (I/O) cable routing and length requirements to be determined accurately.

Configure the tape transport for the desired operating mode by using the appropriate switches on the transport operator control panel (OCP) or by setting jumpers and/or switches. Drive must be set up as unit O.

2.7   Cabling

In a QT14 subsystem, the QT14 PCBA is installed in the MicroVAX 3500/3600 cabinet and the tape transport is mounted in a separate rack-mount cabinet. The QT14 interfaces with the tape transport it controls using two 50-conductor round shielded cables, the QT14 Distribution Panel, and two 50-conductor flat-ribbon cables.

The two round-shielded cables are connected from the high-density connectors J1 and J3 on the QT14 PCBA front panel to the 50-pin connectors J1 IN and J3 IN (respectively) on the front side of the QT14 Distribution Panel. From connectors J1 OUT and J3 OUT on the back side of the QT14 Distribution Panel, two 50-conductor flat-ribbon cables attach to connectors on the formatter PCBA on the tape transport. Maximum cable length is 30 feet. Figure 2-11 is a basic cabling diagram. Table 2-5 lists connections from the QT14 Distribution Panel to the formatter PCBA in the tape transport.
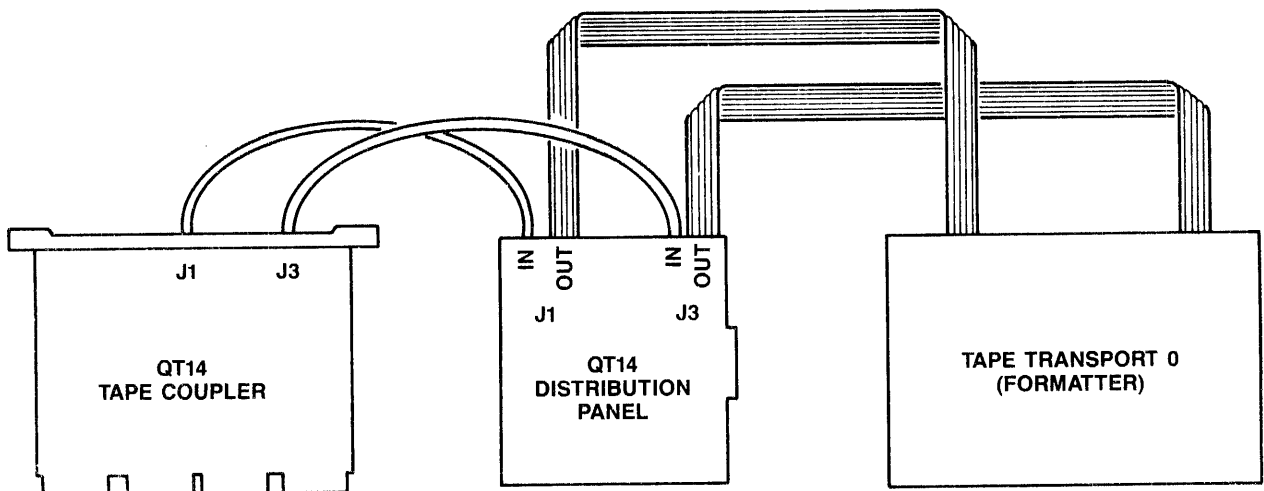
QT1401-1777

Figure 2-11. Drive Cabling

Table 2-5. QT14 Coupler-to-Formatter Connections

Manufacturer	Model	QT14 Conn. J1 OUT to:	QT14 Conn. J3 OUT to:
CDC (Tandberg)	92180	J124	J125
CDC (Keystone)	92181 (BY3A6)	P5	P4
CDC	92185	J3	J2
Cipher	F100X, F900X	P5	P4
Cipher	F880, CT-75, CT-125	P2	P1
Digi-Data	All Formatted	J3	J4
Kennedy	9000,9100,9300	J1	J5
Kennedy	9400	P200	P100
Kennedy	9600,9600A,9610	J2	J1
Pertec	Formatted Start/Stop	P5	P4
Telex	9251	I/02	I/01

NOTE

Some formatters have 100-pin connectors and need
an adapter that allows the two Emulex 50-pin
connectors to be used. The adapter must be
ordered from the formatter manufacturer.

Because the QT14 PCBA and the tape transport are located in separate cabinets,
the cables that run between the cabinets must be shielded. The points of cabinet
exit and entry must not cause the computer installation to exceed FCC limits for
RFI. The QT14 Distribution Panel, rack-mount panel, and round-shielded cables
designed for this purpose are available from Emulex (subsection 1.3) The QT14
Distribution Panel (Figure 2-12) is designed to fit directly into a rack-mount panel
which installs in any standard 19-inch RETMA rack. The rack-mount panel is
shown in Figure 2-13.

Procedure:

1. Ensure the QT14 PCBA is installed in the backplane of the MicroVAX
    3500/3600 and that the system power is OFF.

2. Remove two of the four small panels from one side of the rack-mount
    panel (Figure 2-13). Install a QT14 Distribution Panel (Figure 2-12) in the
    resulting aperture and secure it with the four captive screws. Tighten the
    screws finger-tight. Make sure that no gaps are present around the QT14
    Distribution Panel.

J1
IN

J3
IN

J3
OUT

J1
OUT

FRONT

REAR
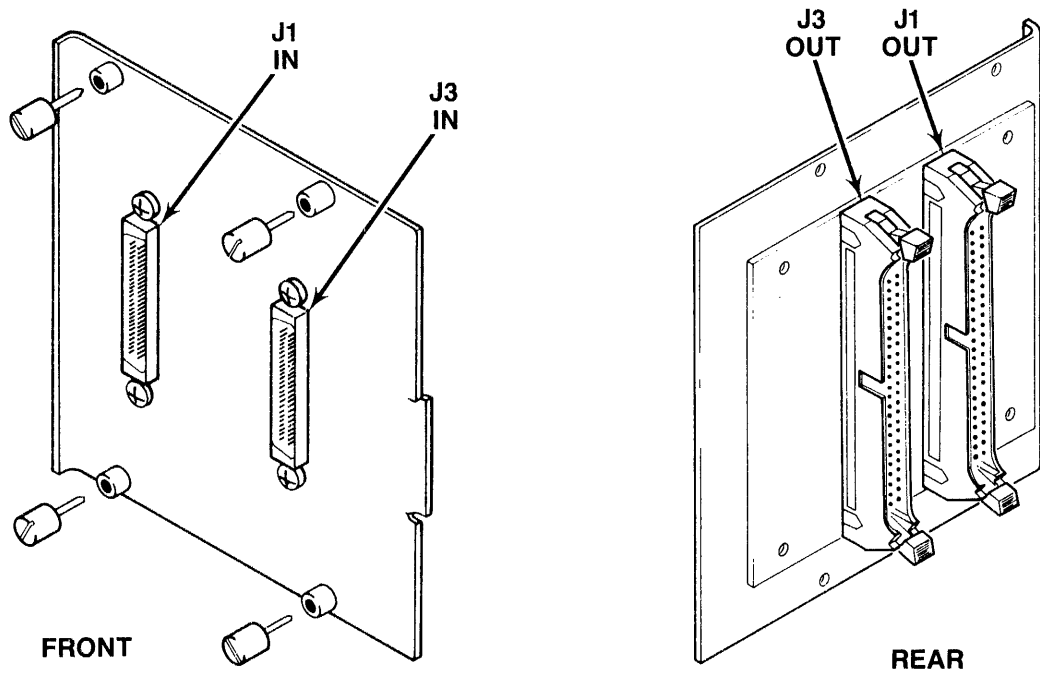
QT1401-1778

Figure 2-12. QT14 Distribution Panel
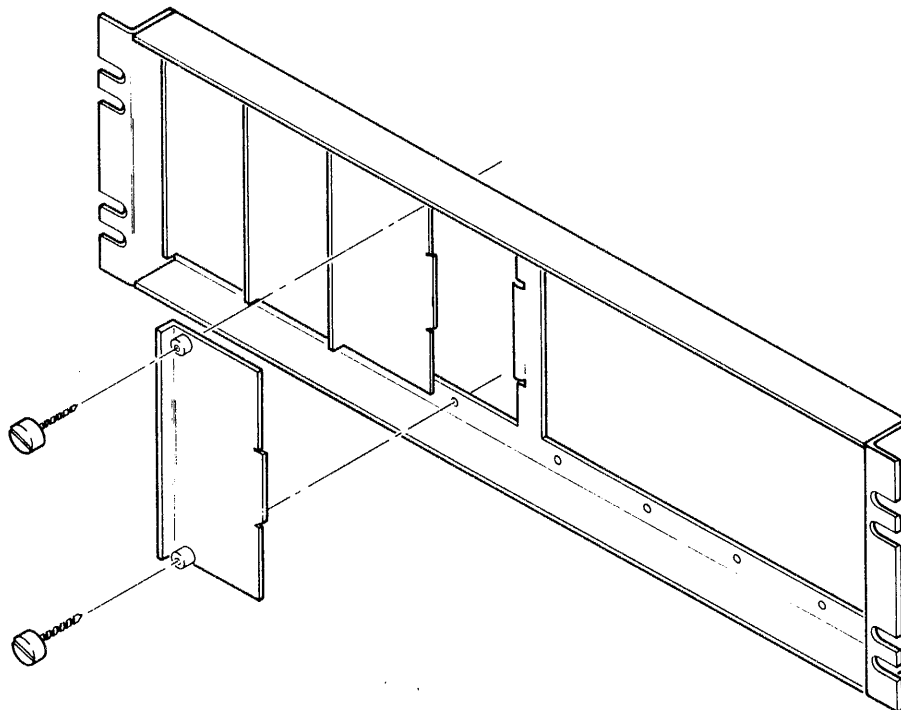
Figure 2-13. Rack-Mount Panel

QT1401-1779

3. Install the rack-mount panel containing the QT14 Distribution Panel in the RETMA rack in the transport cabinet (Figure 2-14).

4. Connect the round-shielded cables from the QT14 PCBA to the Distribution Panel. Align the top of the cable header on the first round-shielded cable (the cable runs out the bottom) with the top of the high-density connector J1 on the front panel of the QT14 PCBA. Hold in the latch on the top of the cable header and press the header into J1; connect the header at the other end to connector J1 IN on the front side of the QT14 Distribution Panel. Repeat for the second round-shielded cable from J3 on the QT14 PCBA to connector J3 IN on the QT14 Distribution Panel.

5. Connect the flat-ribbon cables from the QT14 Distribution Panel to the formatter in the tape transport. Align the molded arrow on the cable header of the first flat-ribbon cable with pin 1 of connector J1 OUT on the back side of the QT14 Distribution Panel. Press the header into J1 OUT; attach the header at the other end of the cable to the appropriate connector on the tape transport. Repeat for the second flat-ribbon cable from J3 OUT on the QT14 Distribution Panel to the appropriate connector on the tape transport. Make sure that the latches on the connector fully engage the cable header. (See Table 2-6 for tape transport connectors.)

6. Terminate the cable by installing a terminator (included with the transport) on the transport.

7. Connect a ground cable from the logic ground of the CPU to the logic ground of the tape transport.

End of Procedure

RACK-MOUNT
PANEL

TAPE
TRANSPORT

QT14
TAPE
COUPLER

ROUND
SHIELDED
CABLES

FLAT RIBBON CABLES

LATCH

CABLE
HEADER

QT14
FRONT
PANEL

J1

J3

ROUND SHIELDED
CABLES

J1 OUT

J3 OUT

J1
IN

J3
IN

ROUND SHIELDED
CABLES

QT14
DISTRIBUTION
PANEL
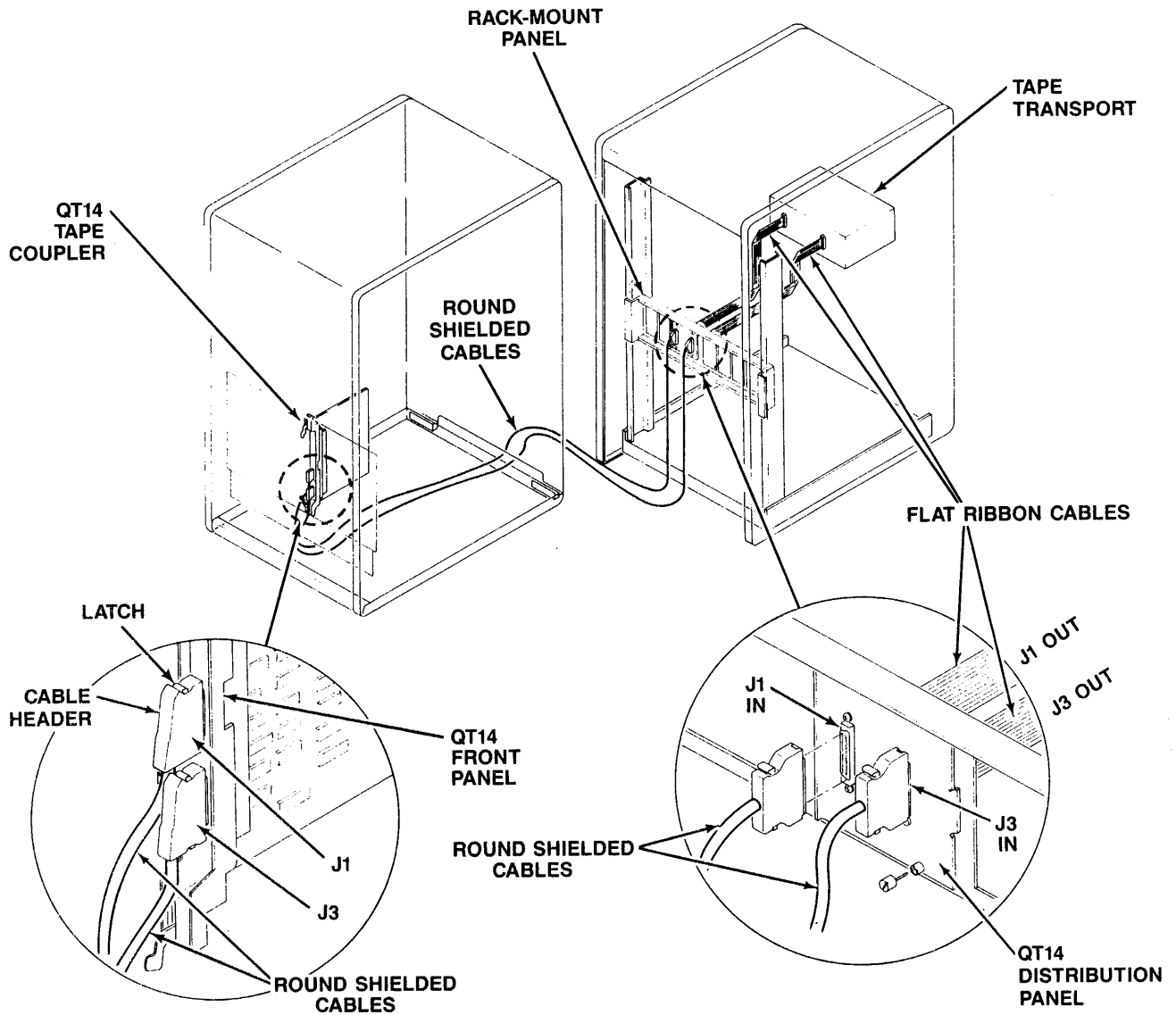
QT1401-1780

Figure 2-14. QT14 Subsystem Cabling

2.7.1 Grounding

The recommended grounding method is to connect the transport to a common point on the CPU chassis using a half-inch or larger braided ground strap, preferably insulated, or an AWG number 10 (or heavier) wire.

For most applications, connect the drive chassis and logic grounds (ac and dc grounds). In environments with noise problems, however, it may work better to separate these two grounds. Consult the tape transport manual for specific instructions on connecting the chassis and logic grounds.

NOTE

Failure to observe proper signal grounding methods generally results in marginal operation with random error conditions.

2.8 Integration and Operation

2.8.1 Testing and Indicators

There are three light-emitting diodes (LEDs) on the QT14 front panel. These LEDs are used for both diagnostics and for normal operations.

If switch SW1-4 is OFF (CONTINUE), the QT14 executes a self-test at the following times:

- on power-up
- after a reset condition
- after a bus initialization
- after a write operation to the base address register

In TSV05 mode, the QT14 will go immediately into self-test after power-up.

In TMSCP mode, the self-test routine consists of two test sequences: preliminary and self-test. The preliminary test sequence exercises the 8031 microprocessor chip. When the QT14 successfully completes the preliminary test, LED3 illuminates to indicate that the QT14 is waiting for initialization.

During TMSCP initialization, by host software control, the QT14 executes a second self-test that exercises the buffer controller chip, the Host Adapter Controller (HAC) chip and its associated circuitry, the on-board RAM, and the control memory PROM. If the QT14 passes this sequence of its self-test successfully, all QT14 LED indicators are OFF.

If a fatal error is detected either during self-test or while the system is running, all three of the front panel LED indicators are ON. If the QT14 fails, you can select Diagnostic mode (switch SW1-2 ON) which causes the LED indicators to display an error code. See Self-Test Error Reporting, in Section 3, TROUBLESHOOTING.

During normal operation, LED1 flickers occasionally to indicate that a command is being executed.

2.8.2   Operation

There are no operational instructions. The QT14 is ready for initialization as soon as it is powered up.

3.1 Overview

This section describes how to isolate problems with the QT14.

3.2 Service

Your Emulex QT14 Tape Coupler has been designed to give years of trouble-free service, and it was thoroughly tested before leaving the factory.

Should one of the fault isolation procedures indicate that the QT14 is not working properly, the product must be returned to the factory or to one of Emulex's authorized repair centers for service. Emulex products are not designed to be repaired in the field.

Before returning the QT14 Tape Coupler to Emulex, whether or not it is under warranty, you must contact the factory or the factory's representative for instructions and a Return Materials Authorization (RMA) number.

Do not return a product to Emulex without authorization. A product or component returned for service without an authorization will be returned to the owner at the owner's expense.

In the continental United States, Alaska, and Hawaii, contact:

Emulex Customer Service
3545 Harbor Boulevard
Costa Mesa, Ca 92626
(714) 662-5600   TWX 910-595-2521
Outside California: (800) 854-7112

After 5 p.m. Pacific Time, call (800) 638-7243. When answered, you will be prompted to key in 37115, followed by a # symbol, then a message.

Outside the United States, notify the distributor from whom the subsystem was initially purchased.

To help you efficiently, Emulex or its representative requires certain information about the product and the environment in which it is installed. During installation, you should have made a record of the switch settings on the Configuration Reference Sheet.

After you have notified Emulex and received an RMA, package the product (preferably using the original packing material) and send it **postage paid** to the address provided by the Emulex representative. You must also insure the package.

3.3 Fault Isolation

The fault isolation procedure is provided in flow chart format in Figure 3-1. This procedure is based on standard troubleshooting techniques as well as the self-diagnostics incorporated into the QT14. The procedure is designed to be used if the self-test fails or if many errors are flagged by the subsystem during normal operation. (If neither of these events takes place, then it is not necessary to follow these procedures.)
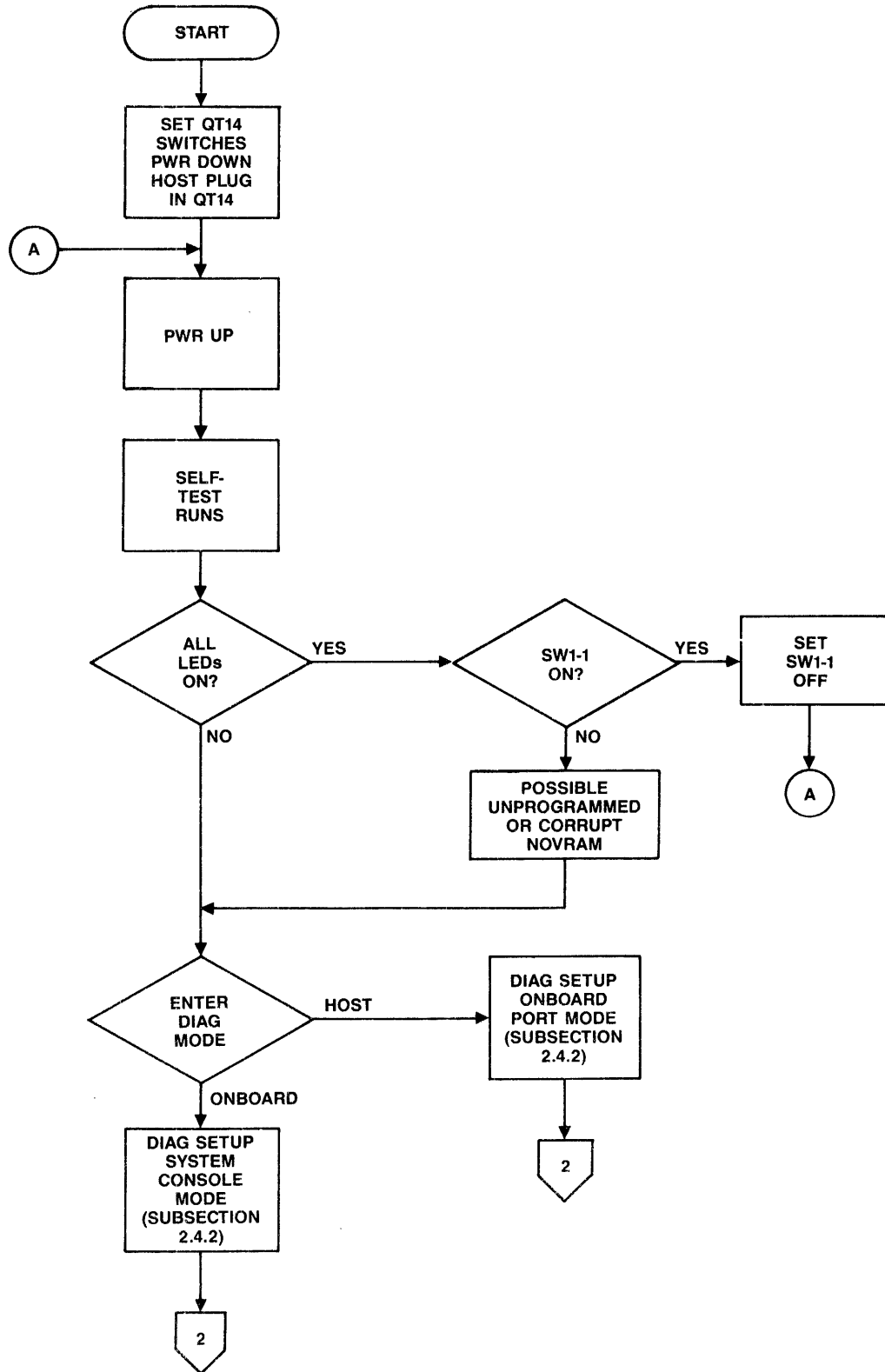
QT1401-1781

Figure 3-1. Fault Isolation Flow Chart (Sheet 1 of 2)
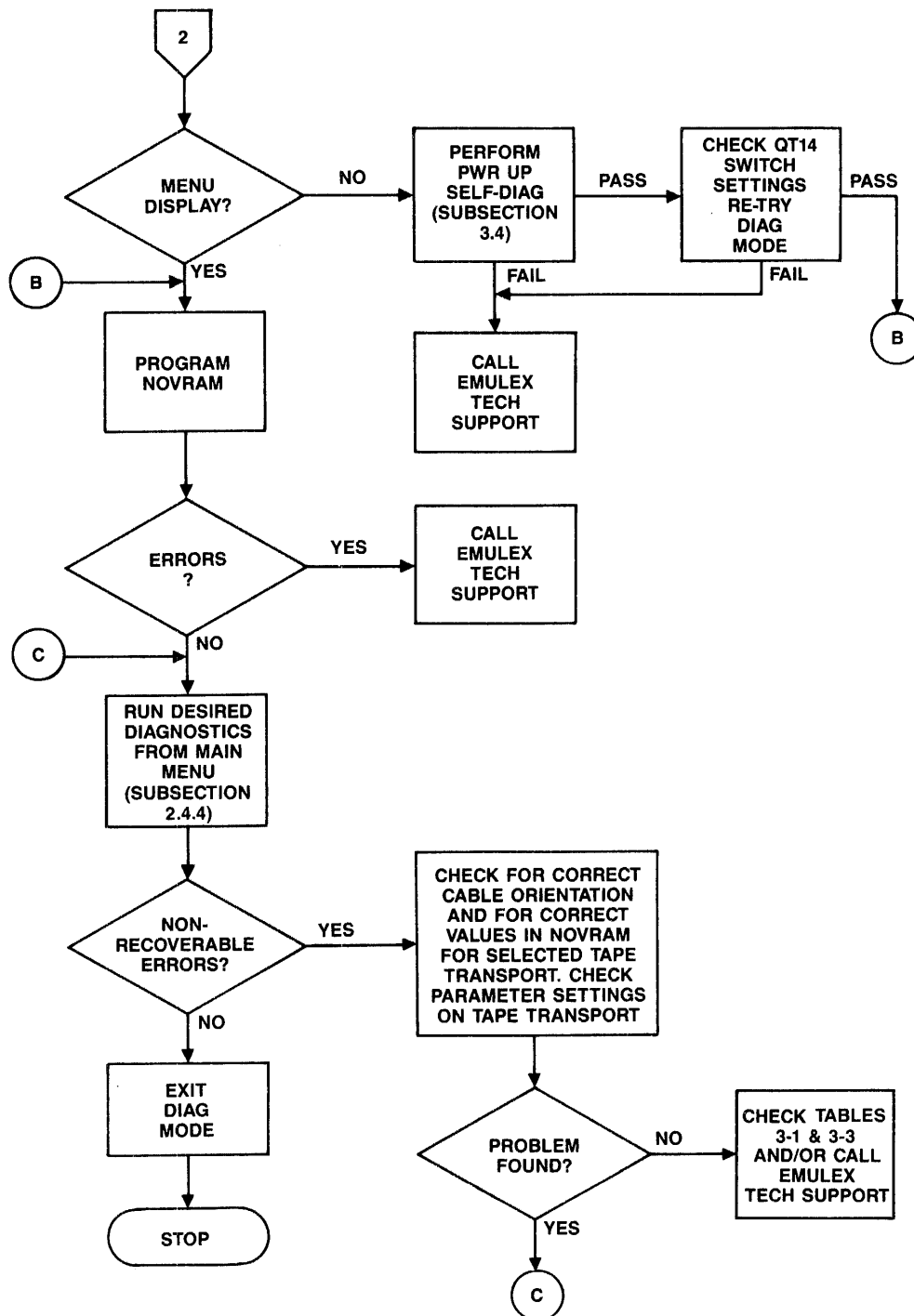
Figure 3-2. Fault Isolation Flow Chart (Sheet 2 of 2)

QT1401-1782

3.4   Power-up Self-diagnostic

The QT14 executes an extensive self-diagnostic to ensure that the tape coupler is in good working order. The self-test is divided into several parts. The LED Error Codes in Table 3-2 indicates the order in which the tests are performed.

In TSV05 mode, self-test is executed immediately after power-up, a reset, a bus INIT, or a write to the base address register. If the QT14 fails self-test, the second LED will be illuminated. If all three LEDs are illuminated and the NOVRAM has never been programmed, you can proceed to program the NOVRAM at this point. After subsequent successful self-tests, the LEDs will be off. If all three LEDs are illuminated and the NOVRAM has been previously programmed, then a fatal error has occurred and you will need to call Emulex Technical Support.

In TMSCP mode, the first test is executed immediately after power-up, a reset, a bus INIT, or a write to the base address register. The other tests are executed as the controller interacts with the initialization routine. If the QT14 fails any of the tests, it posts a TMSCP fatal error code in the low byte of the SA register (base address plus 2) and turns on a combination of the three LEDs which are located on the outside edge of the PWB. The TMSCP fatal error codes used by the QT14 are listed in Table 3-2.

To help determine the location of the problem, you can select a special Loop-on-Self-test mode that causes the LEDs to display an error code. To enable this mode, place the CPU halt switch to ON and set QT14 switch SWI-2 OFF and SW1-4 ON. Next, the host computer must be powered down or QT14 switch SW1-1 must be toggled (turned ON and then OFF) to cause the QT14 to again perform its self-test.

Upon encountering an error, the host microprocessor halts and the LEDs display an error code. The error codes are listed and described in Table 3-1.

If the QT14 completes looping on self-test without errors, all three LEDs are OFF. Set switch SW1-4 in the OFF position and reset the QT14 coupler before using.

Table 3-1. LED Error Codes
(1 = LED ON)

LED			
3	2	1	Error Description
0	0	1	CPU Chip Test failed
1	0	0	Controller idle, waiting for initialization
0	1	1	Buffer Controller or External Memory Test failed
1	0	1	HAC Test failed
1	1	0	Emulation PROM Checksum Test failed
0	0	0	Self-Diagnostic complete without errors
1	1	1	(TSV05) NOVRAM Not Programmed (or fatal)
1	1	1	(TMSCP) Refer to Table 3-2

3.5 TMSCP Fatal Error Codes

If the QT14 encounters a fatal error anytime during operation, all three LEDs are illuminated and an error code is posted in the low byte of the SA register (base address plus 2). Table 3-2 lists the TMSCP fatal error codes used by the QT14.

Table 3-2. TMSCP Fatal Error Codes used by the QT14

Octal Code	Hex Code	Description
0	0	No information in message packet.
1	1	Possible parity or timeout error when the QT14 attempted to read data from a message packet.
2	2	Possible parity or timeout error when the QT14 attempted to write data to a message packet.
4	4	QT14 diagnostic self-test indicated a controller RAM error.
5	5	QT14 diagnostic self-test indicated a firmware checksum error.
6	6	Possible parity or timeout error when the QT14 attempted to read an envelope address from a command ring.
7	7	Possible parity or timeout error when the QT14 attempted to write an envelope address to a command ring.
11	9	Host did not communicate with QT14 within the time frame established while bringing the controller online.
13	B	Controller unable to perform DMA transfer operation correctly.
14	C	QT14 diagnostic self-test indicated controller fatal error.
16	E	The TMSCP connection identifier is invalid.
23	13	An error occurred during the TMSCP initialization sequence.

3.5.1   Diagnostic Messages

The QT14 diagnostics provide informational, warning and error messages to aid the user. Table 3-3 lists the messages.

Table 3-3. QT14 Diagnostic Messages

Message	Description
Invalid Response	The typed response at terminal is invalid; re-enter it.
Out of Range	The typed response at terminal is out-of-range; re-enter it.
Unprogrammed or Corrupted NOVRAM	An error occurred while reading the contents of the NOVRAM.
Writing NOVRAM	An error occurred during an attempt to write data to the NOVRAM.

In addition, the QT14 provides a series of error messages to indicate possible errors with the tape transport. These messages are:

Cable may be upside down on connector
Cables may be reversed
Invalid byte count for read
Hard error reported
Parity error reported
Tape Drive command timeout
Blank tape read
Tape record truncated
Data miscompare
Unexpected BOT encountered
Tape not blank
Invalid byte count for write

Unit not online
Done rewinding, not at BOT
At BOT but not ready
Correctable error reported
Data Late error reported
Tape write-protected, not scratch tape
Unexpected EOF encountered
Tape record short
Expected EOF not found
Expected BOT not encountered
Tape mark not written

BLANK

A.1 Overview

This appendix provides instructions for replacing the QT14's firmware PROM.

A.2 Exchanging PROMS

The QT14 firmware PROM is located in the socket at U43. Remove the existing PROM from its socket using an IC puller or an equivalent tool.

The QT14 PROM is identified by the part numbers on top of the PROMs. Place the QT14 PROM in U43. Make certain that the PROM is firmly seated and that no pins are bent or misaligned. (If the two rows of PROM pins are too far apart to fit in the socket, grasp the PROM at its ends using your thumb and forefinger and bend one of the pin rows inward by pressing it against a table top or other flat surface.)

PROM Number	PCBA Location
G80	U43

NOTE

Installation of a different revision of firmware may result in corrupt NOVRAM values. Re-enter appropriate NOVRAM values after a PROM exchange.

B.1   Overview

The NOVRAM menu tables in this appendix define the recommended QT14 options for a variety of typical tape drives. (A point to remember is that NOVRAM default values are indeterminate. The "selected" options in the NOVRAM tables, which follow, frequently reflect whatever default value previously existed.) Although not all vendors are covered, these tables can be used for configuring almost any vendor's drive:

Tape Transport	Tables
92185-02	B-1, B-2
Cipher 891	B-3, B-4
Cipher 990	B-5, B-6
Kennedy 9400	B-7, B-8
Kennedy 9000F, 9100F, 9300	B-9
Kennedy 9600, 9600A	B-10, B-11
Kennedy 9610	B-12, B-13
Megatape MT-500, MT-750	B-14, B-15, B-16

Most drives will use the leading edge for data strobe. Known exceptions, however, are the Kennedy 9000F, 9100F, and 9300F drives which use the trailing edge for data strobe. Consult your drive documentation for information.

NOTE

Proper operation of any listed drive at 3200 bpi requires that the tape drive supplies the correct PEID burst. This is not an industry-standard capability; check your drive manufacturer's documentation for more information.

B.2   CDC 92185-02

The CDC 92185 series tape drive is a dual density drive that is capable of 1600 bpi and 6250 bpi operation. It operates at 25 ips in slow streaming mode and at 75 ips in high-speed streaming mode. The buffered version has an identification tag labeled "Buffered Std, I/O kit" on the inside lower right corner of the front door.

Option and address selection components are contained on the Interface, Formatter Write, and Servo/Control PWAs. Refer to the manufacturer's technical manual for component identification. Table B-2 summarizes tape transport parameters.

Table B-1. QT14 NOVRAM Options for CDC 92185-02

TSV05 NOVRAM Configuration Menu	Select:
Drive type, 0 = Start-Stop, 1 = Streamer (0-1,def = 1 dec)	: 1
On-the-fly commands (Y/N, def = Y)	: Y
Enable data busy timeout delay (Y/N, def = Y)	: Y
Remote density (Y/N, def = N)	: N
CDC tape drive (Y/N, def = N)	: Y
Use IDEN line to select remote density (Y/N,def = Y)	: N
IDEN line true selects high density (Y/N, def = N)	: N
Adaptive DMA (Y/N, def = Y)	: Y
Blank tape timeout value, in seconds (1-60, def = 5 dec)	: 5
DMA burst word count (1-16, def = 16)	: 16
uSec delay between DMA bursts (4/8, def = 4)	: 4
Adaptive DMA threshold (1-7, def = 4 dec)	: 4
Interrupt vector (0-774,def = 224 oct)	: 224
TMSCP NOVRAM Configuration Menu	**Select:**
Drive type, 0 = Start-Stop, 1 = Streamer (0-1,def = 1 dec)	: 1
On-the-fly commands (Y/N, def = Y)	: Y
Enable data busy timeout delay (Y/N def = Y)	: Y
Remote density (Y/N, def = N)	: Y
CDC tape drive (Y/N, def = N)	: Y
Use IDEN line to select remote density (Y/N,def = Y)	: N
IDEN line true selects high density (Y/N, def = N)	: N
Adaptive DMA (Y/N, def = Y)	: Y
Blank tape timeout value, in seconds (1-60, def = 5 dec)	: 5
Max retry count for tape errors (1-10, def = 8)	: 8
uSec delay between DMA bursts (4/8, def = 4)	: 4
Adaptive DMA threshold (1-7, def = 4 dec)	: 4
Tape drive speed thousands of bytes/second (0-65535,def = 200 dec)	: 200
Support 800 BPI density (Y/N,def = Y)	: N
Support 1600 BPI density (Y/N,def = Y)	: Y
Support 6250 BPI density (Y/N,def = Y)	: Y

Table B-2. CDC 92185-02/04 Operating Parameter Values

Parameter	Setting
Enable Buffer	Enable
Enable AVC	Enable
Remote Density	TSVO5 Disable TMSCP Enable
Error Recovery	Disable
Ramp Delay	1 msec
Density Status	Disable
Write Parity	Enable
Interface Transfer Rate (F22)	500 bytes/second
Maximum Block Size (F22)	16K bytes
Formatter Address (H24)	Transport 0-3 Transport 4-7
Transport Address (H24)	Address 0 (FAD 0), 4 (FAD 1)

B.3 Cipher 891

The Cipher 891 series tape drive is a data caching streamer that emulates start/stop operation. It is available in two versions: the 891-1 (1600 bpi, 100 ips) and the 891-2 (supports both 1600 and 3200 bpi at 100 ips). Table B-3 summarizes QT14 tape coupler NOVRAM selections for the Cipher 891, and Table B-4 lists parameter requirements.

Table B-3. QT14 NOVRAM Options for Cipher 891

TSV05 NOVRAM Configuration Menu	Select:
Drive type, 0 = Start-Stop, 1 = Streamer (0-1,def = 1 dec)	: 0
On-the-fly commands (Y/N, def = Y)	: Y
Enable data busy timeout delay (Y/N, def = Y)	: Y
Remote density (Y/N, def = N)	: N
CDC tape drive (Y/N, def = N)	: N
Use IDEN line to select remote density (Y/N,def = Y)	: N
IDEN line true selects remote density (Y/N, def = N)	: N
Adaptive DMA (Y/N, def = Y)	: Y
Blank tape timeout value, in seconds (1-60, def = 5 dec)	: 5
DMA burst word count (1-16, def = 16)	: 16
uSec delay between DMA bursts (4/8, def = 4)	: 4
Adaptive DMA threshold (1-7, def = 4 dec)	: 4
Interrupt vector (0-774,def = 224 oct)	: 224

TMSCP NOVRAM Configuration Menu	Select:
Drive type, 0 = Start-Stop, 1 = Streamer (0-1,def = 1 dec)	: 0
On-the-fly commands (Y/N, def = Y)	: Y
Enable data busy timeout delay (Y/N, def = Y)	: Y
Remote density (Y/N, def = N)	: N
CDC tape drive (Y/N, def = N)	: N
Use IDEN line to select remote density (Y/N,def = Y)	: N
IDEN line true selects high density (Y/N, def = N)	: N
Adaptive DMA (Y/N, def = Y)	: Y
Blank tape timeout value, in seconds (1-60, def = 5 dec)	: 5
Max retry count for tape errors (1-10, def = 8)	: 8
uSec delay between DMA bursts (4/8, def = 4)	: 4
Adaptive DMA threshold (1-7, def = 4 dec)	: 4
Tape drive speed thousands of bytes/second (0-65535,def = 200 dec)	: 200
Support 800 BPI density (Y/N,def = Y)	: N
Support 1600 BPI density (Y/N,def = Y)	: Y
Support 6250 BPI density (Y/N,def = Y)	: N

Table B-4. Cipher 891 Operating Parameter Values

Parameter	Setting
Unit Address Select	FAD O, UNIT O
Post-EOT Streaming	Disable
3200 BPI IDEN	Enable
EOT Location	Disable
External Parity	Enable
Maximum Block Size	9K bytes
Ramp Delay	Disable
Selected Simulated Speed	250

Refer to the manufacturer's manual for specific drive setup information.

B.4 Cipher 990

The Cipher 990 is a start/stop emulating caching streamer. It features tri-density operation (1600, 3200, or 6250 bpi) at simulated tape speed of up to 100 ips at 1600 bpi.

Table B-5 lists QT14 tape coupler NOVRAM configuration options for the Cipher 990, and Table B-6 lists tape transport parameters to be entered via the drive operator's panel.

Table B-5. QT14 NOVRAM Options for Cipher 990

TSV05 NOVRAM Configuration Menu	Select:
Drive type, 0 = Start-Stop, 1 = Streamer (0-1, def = 1 dec)	: 0
On-the-fly commands (Y/N, def = Y)	: Y
Enable data busy timeout delay (Y/N, def = Y)	: Y
Remote density (Y/N, def = N)	: N
CDC tape drive (Y/N, def = N)	: N
Use IDEN line to select remote density (Y/N, def = Y)	: N
IDEN line true selects high density (Y/N, def = N)	: N
Adaptive DMA (Y/N, def = Y)	: Y
Blank tape timeout value, in seconds (1-60, def = 5 dec)	: 30
DMA burst word count (1-16, def = 16)	: 16
uSec delay between DMA bursts (4/8, def = 4)	: 4
Adaptive DMA threshold (1-7, def = 4 dec)	: 4
Interrupt vector (0-774, def = 224 oct)	: 224

TMSCP NOVRAM Configuration Menu	Select:
Drive type, 0 = Start-Stop, 1 = Streamer (0-1, def = 1 dec)	: 0
On-the-fly commands (Y/N, def = Y)	: Y
Enable data busy timeout delay (Y/N, def = Y)	: Y
Remote density (Y/N, def = N)	: Y
CDC tape drive (Y/N, def = N)	: N
Use IDEN line to select remote density (Y/N, def = Y)	: N
IDEN line true selects high density (Y/N, def = N)	: N
Adaptive DMA (Y/N, def = Y)	: Y
Blank tape timeout value, in seconds (1-60, def = 5 dec)	: 30
Max retry count for tape errors (1-10, def = 8)	: 8
uSec delay between DMA bursts (4/8, def = 4)	: 4
Adaptive DMA threshold (1-7, def = 4 dec)	: 4
Tape drive speed thousands of bytes/second (0-65535, def = 200 dec)	: 200
Support 800 BPI density (Y/N, def = Y)	: N
Support 1600 BPI density (Y/N, def = Y)	: Y
Support 6250 BPI density (Y/N, def = Y)	: Y

Table B-6. Cipher 990 Operating Parameter Values

Parameter	Setting
Serial Port Baud Rate	150
Host Supplied Parity	Yes
Echo Read Strobes on Writes	Yes
EOT Mode	Normal
Echo 1600 bpi ID Burst	Yes
Echo 3200 bpi ID Burst	Yes
Echo 6250 bpi ID Burst	Yes
Abort Active Writes on Overwrites	No
Interface Transfer Rate	632.8K bytes/sec
Default Density at Power Up	1600 bpi
Maximum Block Size	16K
Interface Ramp Delay	0 msec
Filemark Write Sync	No
Read Error Retrys	7
Write Error Retrys	7
Error Correction On	Yes
Unit Logical Address	0
Lock Out 3200 bpi Write Error	No
Remote Density Select Enabled	TSVO5 No TMSCP Yes
Factory Mode	No

Refer to the manufacturer's manual for specific drive setup information.

B.5 Kennedy 9400

The Kennedy 9400 is a tri-density, embedded formatter, start/stop tape drive. It operates at 75 ips in either 800 or 1600 bpi, and at 45 ips at 6250 bpi.

QT14 coupler NOVRAM selections are listed in Table B-7.

Table B-7. QT14 NOVRAM Options for Kennedy 9400

TSV05 NOVRAM Configuration Menu	Select:
Drive type, 0 = Start-Stop, 1 = Streamer (0-1, def = 1 dec)	: 0
On-the-fly commands (Y/N, def = Y)	: Y
Enable data busy timeout delay (Y/N, def = Y)	: Y
Remote density (Y/N, def = N)	: N
CDC tape drive (Y/N, def = N)	: N
Use IDEN line to select remote density (Y/N, def = Y)	: Y
IDEN line true selects high density (Y/N, def = N)	: Y
Adaptive DMA (Y/N, def = Y)	: Y
Blank tape timeout value, in seconds (1-60, def = 5 dec)	: 5
DMA burst word count (1-16, def = 16)	: 16
uSec delay between DMA bursts (4/8, def = 4)	: 4
Adaptive DMA threshold (1-7, def = 4 dec)	: 4
Interrupt vector (0-774, def = 224 oct)	: 224
TMSCP NOVRAM Configuration Menu	**Select:**
Drive type, 0 = Start-Stop, 1 = Streamer (0-1, def = 1 dec)	: 0
On-the-fly commands (Y/N, def = Y)	: Y
Enable data busy timeout delay (Y/N, def = Y)	: Y
Remote density (Y/N, def = N)	: Y
CDC tape drive (Y/N, def = N)	: N
Use IDEN line to select remote density (Y/N, def = Y)	: Y
IDEN line true selects high density (Y/N, def = N)	: Y
Adaptive DMA (Y/N, def = Y)	: Y
Blank tape timeout value, in seconds (1-60, def = 5 dec)	: 5
Max retry count for tape errors (1-10, def = 8)	: 8
uSec delay between DMA bursts (4/8, def = 4)	: 4
Adaptive DMA threshold (1-7, def = 4 dec)	: 4
Tape drive speed thousands of bytes/second (0-65535, def = 200 dec)	: 200
Support 800 BPI density (Y/N, def = Y)	: Y
Support 1600 BPI density (Y/N, def = Y)	: Y
Support 6250 BPI density (Y/N, def = Y)	: Y

NOTE

Use of the remote density feature of the Kennedy 9400 permits selection of any **two** densities. Refer to your drive documentation for more information.

Table B-8. Kennedy 9400 Operating Parameter Values

Parameter
Formatter address switch OFF
Transport address is determined via front panel.
Remote Dual Density via the front panel. Two of the three densities are selected via IDEN. Requires special software for TSVO5.
IDEN = 0, PE; IDEN = 1, GCR.
IDEN = 0, NRZI; IDEN = 1, GCR.
IDEN = 0, NRZI; IDEN = 1, PE.
Data rate 312K bytes/second.

B.6 Kennedy 9000F, 9100F, and 9300F

The Kennedy 9X00F series tape drives are dual-density, single-speed transports with an attached 9220 formatter. All models support both 800 and 1600 bpi operation. The 9000F is a tension arm 45 ips drive, whereas the 9100F and 9300F are vacuum column, 75 ips/125 ips drives.

The formatter can be used with tape transports operating at seven different speeds, ranging from 12.5 to 125 ips.

Table B-9 indicates the QT14 NOVRAM selections.

Table B-9. QT14 NOVRAM Options for Kennedy 9X00F Series

TSV05 NOVRAM Configuration Menu	Select:
Drive type, 0 = Start-Stop, 1 = Streamer (0-1,def = 1 dec)	: 0
On-the-fly commands (Y/N, def = Y)	: Y
Enable data busy timeout delay (Y/N, def = Y)	: Y
Remote density (Y/N, def = N)	: N
CDC tape drive (Y/N, def = N)	: N
Use IDEN line to select remote density (Y/N,def = Y)	: Y
IDEN line true selects high density (Y/N, def = N)	: Y
Adaptive DMA (Y/N, def = Y)	: Y
Blank tape timeout value, in seconds (1-60, def = 5 dec)	: 5
DMA burst word count (1-16, def = 16)	: 16
uSec delay between DMA bursts (4/8, def = 4)	: 4
Adaptive DMA threshold (1-7, def = 4 dec)	: 4
Interrupt vector (0-774,def = 224 oct)	: 224
TMSCP NOVRAM Configuration Menu	**Select:**
Drive type, 0 = Start-Stop, 1 = Streamer (0-1,def = 1 dec)	: 0
On-the-fly commands (Y/N, def = Y)	: Y
Enable data busy timeout delay (Y/N, def = Y)	: Y
Remote density (Y/N, def = N)	: Y
CDC tape drive (Y/N, def = N)	: N
Use IDEN line to select remote density (Y/N,def = Y)	: Y
IDEN line true selects high density (Y/N, def = N)	: Y
Adaptive DMA (Y/N, def = Y)	: Y
Blank tape timeout value, in seconds (1-60, def = 5 dec)	: 5
Max retry count for tape errors (1-10, def = 8)	: 8
uSec delay between DMA bursts (4/8, def = 4)	: 4
Adaptive DMA threshold (1-7, def = 4 dec)	: 4
Tape drive speed thousands of bytes/second (0-65535,def = 200 dec)	: 200
Support 800 BPI density (Y/N,def = Y)	: Y
Support 1600 BPI density (Y/N,def = Y)	: Y
Support 6250 BPI density (Y/N,def = Y)	: N

Refer to the manufacturer's manual for specific drive switch setting requirements.

B.7   Kennedy 9600, 9600A, and 9610

The Kennedy 9600 and 9600A are autoloading buffer arm tape transports with an embedded formatter. They operate at 100 ips in streaming mode and at 45 ips in start/stop mode. The 9600 supports 800 and 1600 bpi operation; the 9600A supports 800, 1600, and 6250 bpi.

The 9610 is a hybrid streaming tape system which operates at 100 ips in streaming mode and at 50 ips in start/stop mode. Four densities are supported: 800, 1600, 3200, and 6250 bpi. (3200 bpi is not supported by DEC operating systems in either TSV05 or TMSCP mode; therefore, it must be selected via the front panel.)

Table B-10 indicates the standard QT14 NOVRAM selections for the 9600 and 9600A; Table B-12 indicates selections for the 9610.

Table B-10. QT14 NOVRAM Options for Kennedy 9600 and 9600A

TSV05 NOVRAM Configuration Menu	Select:
Drive type, 0 = Start-Stop, 1 = Streamer (0-1,def = 1 dec)	: 0
On-the-fly commands (Y/N, def = Y)	: Y
Enable data busy timeout delay (Y/N, def = Y)	: Y
Remote density (Y/N, def = N)	: N
CDC tape drive (Y/N, def = N)	: N
Use IDEN line to select remote density (Y/N,def = Y)	: Y
IDEN line true selects high density (Y/N, def = N)	: Y
Adaptive DMA (Y/N, def = Y)	: Y
Blank tape timeout value, in seconds (1-60, def = 5 dec)	: 5
DMA burst word count (1-16, def = 16)	: 16
uSec delay between DMA bursts (4/8, def = 4)	: 4
Adaptive DMA threshold (1-7, def = 4 dec)	: 4
Interrupt vector (0-774,def = 224 oct)	: 224

TMSCP NOVRAM Configuration Menu	Select:
Drive type, 0 = Start-Stop, 1 = Streamer (0-1,def = 1 dec)	: 0
On-the-fly commands (Y/N, def = Y)	: Y
Enable data busy timeout delay (Y/N, def = Y)	: Y
Remote density (Y/N, def = N)	: Y
CDC tape drive (Y/N, def = N)	: N
Use IDEN line to select remote density (Y/N,def = Y)	: Y
IDEN line true selects high density (Y/N, def = N)	: Y
Adaptive DMA (Y/N, def = Y)	: Y
Blank tape timeout value, in seconds (1-60, def = 5 dec)	: 5
Max retry count for tape errors (1-10, def = 8)	: 8
uSec delay between DMA bursts (4/8, def = 4)	: 4
Adaptive DMA threshold (1-7, def = 4 dec)	: 4
Tape drive speed thousands of bytes/second (0-65535,def = 200 dec)	: 200
Support 800 BPI density (Y/N,def = Y)	: Y
Support 1600 BPI density (Y/N,def = Y)	: Y
Support 6250 BPI density (Y/N,def = Y)	: N

Table B-11. Kennedy 9600, 9600A Operating Parameter Values

Parameter	Setting
Default density	1600 TSVO5 1600 Remote TMSCP
Speed	Auto
Timeout	25 ft on
Security	Disabled
Parity	Check
CLR Fbsy	Postrepo
Long Gap	1.2 inch

Refer to the manufacturer's manual for more information.

Table B-12. QT14 NOVRAM Options for Kennedy 9610

TSV05 NOVRAM Configuration Menu	**Select:**
Drive type, 0 = Start-Stop, 1 = Streamer (0-1,def = 1 dec)	: 0
On-the-fly commands (Y/N, def = Y)	: Y
Enable data busy timeout delay (Y/N, def = Y)	: Y
Remote density (Y/N, def = N)	: N
CDC tape drive (Y/N, def = N)	: N
Use IDEN line to select remote density (Y/N,def = Y)	: N
IDEN line true selects high density (Y/N, def = N)	: N
Adaptive DMA (Y/N, def = Y)	: Y
Blank tape timeout value, in seconds (1-60, def = 5 dec)	: 5
DMA burst word count (1-16, def = 16)	: 16
uSec delay between DMA bursts (4/8, def = 4)	: 4
Adaptive DMA threshold (1-7, def = 4 dec)	: 4
Interrupt vector (0-774,def = 224 oct)	: 224

TMSCP NOVRAM Configuration Menu	**Select:**
Drive type, 0 = Start-Stop, 1 = Streamer (0-1,def = 1 dec)	: 0
On-the-fly commands (Y/N, def = Y)	: Y
Enable data busy timeout delay (Y/N, def = Y)	: Y
Remote density (Y/N, def = N)	: Y
CDC tape drive (Y/N, def = N)	: N
Use IDEN line to select remote density (Y/N, def = Y)	: N
IDEN line true selects high density (Y/N, def = N)	: N
Adaptive DMA (Y/N, def = Y)	: Y
Blank tape timeout value, in seconds (1-60, def = 5 dec)	: 5
Max retry count for tape errors (1-10, def = 8)	: 8
uSec delay between DMA bursts (4/8, def = 4)	: 4
Adaptive DMA threshold (1-7, def = 4 dec)	: 4
Tape drive speed thousands of bytes/second (0-65535,def = 200 dec)	: 200
Support 800 BPI density (Y/N, def = Y)	: Y
Support 1600 BPI density (Y/N, def = Y)	: Y
Support 6250 BPI density (Y/N, def = Y)	: Y

Table B-13. Kennedy 9610 Operating Parameter Values

Parameter	Setting
Default density	1600 Local TSVO5 1600 Remote TMSCP
Speed	Auto
Timeout	25 ft on
Security	Disabled
Parity	Check
Long Gap	1.2 inch
GCR CERR	Enabled
ARA CAL	Enabled
NRZI CCG	Enabled
CLR FBSY	Postrepo
IFEN	Normal

Refer to the manufacturer's manual for more information.

B.8 Megatape MT-500 and MT-750

The Megatape MT-500 and MT-750 are streaming tape cartridge transports that have an unformatted capacity of 500 and 750 megabytes respectively. Each drive contains a 24 track bit serial, serpentine format cartridge unit. The MT-500 operates at 45 ips and 180 ips and supports 10,666 bpi operation. The MT-750 supports 16,000 bpi and operates at 60 ips and 120 ips.

Refer to the manufacturer's technical manual for switch locations and factory default parameters.

Table B-14 indicates the QT14 NOVRAM selections for the MT-500 and MT-750.

Table B-14. QT13 NOVRAM Selections for Megatape MT-500 and MT-750

TSV05 NOVRAM Configuration Menu	Select:
Drive type, 0 = Start-Stop, 1 = Streamer (0-1,def = 1 dec)	: 0
On-the-fly commands (Y/N, def = Y)	: Y
Enable data busy timeout delay (Y/N, def = Y)	: Y
Remote density (Y/N, def = N)	: N
CDC tape drive (Y/N, def = N)	: N
Use IDEN line to select remote density (Y/N, def = Y)	: N
IDEN line true selects remote density (Y/N, def = N)	: N
Adaptive DMA (Y/N, def = Y)	: Y
Blank tape timeout value, in seconds (1-60, def = 5 dec)	: 5
DMA burst word count (1-16, def = 16)	: 16
uSec delay between DMA bursts (4/8, def = 4)	: 4
Adaptive DMA threshold (1-7, def = 4 dec)	: 4
Interrupt vector (0-774,def = 224 oct)	: 224

TMSCP NOVRAM Configuration Menu	Select:
Drive type, 0 = Start-Stop, 1 = Streamer (0-1,def = 1 dec)	: 0
On-the-fly commands (Y/N, def = Y)	: Y
Enable data busy timeout delay (Y/N, def = Y)	: Y
Remote density (Y/N, def = N)	: N
CDC tape drive (Y/N, def = N)	: N
Use IDEN line to select remote density (Y/N, def = Y)	: N
IDEN line true selects high density (Y/N, def = N)	: N
Adaptive DMA (Y/N, def = Y)	: Y
Blank tape timeout value, in seconds (1-60, def = 5 dec)	: 5
Max retry count for tape errors (1-10, def = 8)	: 5
uSec delay between DMA bursts (4/8, def = 4)	: 4
Adaptive DMA threshold (1-7, def = 4 dec)	: 4
Tape drive speed thousands of bytes/second (0-65535,def = 200 dec)	: 200
Support 800 BPI density (Y/N,def = Y)	: N
Support 1600 BPI density (Y/N,def = Y)	: Y
Support 6250 BPI density (Y/N,def = Y)	: N

Table B-15. Megatape MT-500 Operating Parameter Values

Parameter	Setting
Formatter Board (U86):	
Track zero alignment	Enable
Blank tape detect	Enable
Track select	IRDY
Test switches	Factory setting
Formatter Board (U88):	
Normal operation	Enable
Read verify	Enable
Unit address	Unit 0
Low speed	1/2 high speed
Gap selection	Host
Gap size	Short
Cache I/O Board:	
Transfer rate	250KBS
ECC block size	32KB
Max record size	32KB
Unit select address	Unit 0
Transport tape speed	High speed
ECC enable	Error correction required
Ramp delay	No simulated ramp delay
Collect records	Write immediate
Read strobes in write	Return read strobes

Table B-16. Megatape MT-750 Operating Parameter Values

Parameter	Setting
Formatter Board (U86):	
Track zero Alignment	Enable
Blank tape detect	Enable
Track select	IRDY
Test switches	Factory setting
Formatter Board (U88):	
Normal Operation	Enable
Read verify	Enable
Unit address	Unit 0
Low speed	1/2 high speed
Gap selection	Host
Gap size	Short
Cache I/O Board:	
Transfer rate	250KBS
Unit select address	Unit 0
Transport tape speed	High speed
ECC enable	Error correction required
Ramp delay	No simulated ramp delay
Collect records	Write immediate
Read strobes in write	Return read strobes

Table B-16. Kennedy 9610 Operating Parameter Values

Parameter	Setting
Default density	1600 Local TSVO5 1600 Remote TMSCP
Speed	Auto
Timeout	25 ft on
Security	Disabled
Parity	Check
Long Gap	1.2 inch
GCR CERR	Enabled
ARA CAL	Enabled
NRZI CCG	Enabled
CLR FBSY	Postrepo
IFEN	Normal

Refer to the manufacturer's manual for more information.

B.9   Megatape MT-500 and MT-750

The Megatape MT-500 and MT-750 are streaming tape cartridge transports that have an unformatted capacity of 500 and 750 megabytes respectively. Each drive contains a 24 track bit serial, serpentine format cartridge unit. The MT-500 operates at 45 ips and 180 ips and supports 10,666 bpi operation. The MT-750 supports 16,000 bpi and operates at 60 ips and 120 ips.

Refer to the manufacturer's technical manual for switch locations and factory default parameters.

Table B-17 indicates the QT14 NOVRAM selections for the MT-500 and MT-750.

Table B-17. QT13 NOVRAM Selections for Megatape MT-500 and MT-750

TSV05 NOVRAM Configuration Menu	Select:
Drive type, 0 = Start-Stop, 1 = Streamer (0-1, def = 1 dec)	: 0
On-the-fly commands (Y/N, def = Y)	: Y
Enable data busy timeout delay (Y/N, def = Y)	: Y
Remote density (Y/N, def = N)	: N
CDC tape drive (Y/N, def = N)	: N
Use IDEN line to select remote density (Y/N, def = Y)	: N
IDEN line true selects remote density (Y/N, def = N)	: N
Adaptive DMA (Y/N, def = Y)	: Y
Blank tape timeout value, in seconds (1-60, def = 5 dec)	: 5
DMA burst word count (1-16, def = 16)	: 16
uSec delay between DMA bursts (4/8, def = 4)	: 4
Adaptive DMA threshold (1-7, def = 4 dec)	: 4
Interrupt vector (0-774, def = 224 oct)	: 224

TMSCP NOVRAM Configuration Menu	Select:
Drive type, 0 = Start-Stop, 1 = Streamer (0-1, def = 1 dec)	: 0
On-the-fly commands (Y/N, def = Y)	: Y
Enable data busy timeout delay (Y/N, def = Y)	: Y
Remote density (Y/N, def = N)	: N
CDC tape drive (Y/N, def = N)	: N
Use IDEN line to select remote density (Y/N, def = Y)	: N
IDEN line true selects high density (Y/N, def = N)	: N
Adaptive DMA (Y/N, def = Y)	: Y
Blank tape timeout value, in seconds (1-60, def = 5 dec)	: 5
Max retry count for tape errors (1-10, def = 8)	: 5
uSec delay between DMA bursts (4/8, def = 4)	: 4
Adaptive DMA threshold (1-7, def = 4 dec)	: 4
Tape drive speed thousands of bytes/second (0-65535, def = 200 dec)	: 200
Support 800 BPI density (Y/N, def = Y)	: N
Support 1600 BPI density (Y/N, def = Y)	: Y
Support 6250 BPI density (Y/N, def = Y)	: N

Table B-18. Megatape MT-500 Operating Parameter Values

Parameter	Setting
Formatter Board (U86):	
Track zero alignment	Enable
Blank tape detect	Enable
Track select	IRDY
Test switches	Factory setting
Formatter Board (U88):	
Normal operation	Enable
Read verify	Enable
Unit address	Unit 0
Low speed	1/2 high speed
Gap selection	Host
Gap size	Short
Cache I/O Board:	
Transfer rate	250KBS
ECC block size	32KB
Max record size	32KB
Unit select address	Unit 0
Transport tape speed	High speed
ECC enable	Error correction required
Ramp delay	No simulated ramp delay
Collect records	Write immediate
Read strobes in write	Return read strobes

Table B-19. Megatape MT-750 Operating Parameter Values

Parameter	Setting
Formatter Board (U86):	
Track zero Alignment	Enable
Blank tape detect	Enable
Track select	IRDY
Test switches	Factory setting
Formatter Board (U88):	
Normal Operation	Enable
Read verify	Enable
Unit address	Unit 0
Low speed	1/2 high speed
Gap selection	Host
Gap size	Short
Cache I/O Board:	
Transfer rate	250KBS
Unit select address	Unit 0
Transport tape speed	High speed
ECC enable	Error correction required
Ramp delay	No simulated ramp delay
Collect records	Write immediate
Read strobes in write	Return read strobes

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