Q2.15 / Q4.30
Service Guide

Preliminary

Information contained in this document is subject to change. In the event of changes, the publication will be revised. Comments, corrections, and suggestions for improvements to this manual are solicited. Direct comments concerning the contents of this manual to:

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5160.0050

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Preface

This manual provides the information needed to successfully install, operate and maintain the Q2.15 and Q4.30. These two products are referred to collectively through this document as the Q2 product line.

This manual is written for service personnel of these devices.

How This Manual is Organized

Chapter 1 - Introduction, provides an overview of the Library, identifies the major components, and lists specifications.

Chapter 2, System Installation explains pre-installation considerations for floor space and power requirements and instructs how to unpack and identify crate contents. This chapter also provides procedures for removing shiplocks and library installation.

Chapter 3, System Operation and Communication explains how to install tape cartridges and connect the Small Computer System Interface (SCSI) cables, and apply power. This Chapter also explains the library operational modes and how to use the front panel

Chapter 4, Service describes how to clean the library, identify usable and unusable tapes, and how to clean the tape drive heads. The troubleshooting section describes how to identify a problem and what to do to resolve the issue. Repair and replacement procedures instructions for major subassemblies are also described.

Chapter 5, Illustrated Parts Catalog displays sub-assemblies with callouts to identify parts and assembly.

Chapter 6, Pictorial Layouts illustrates a variety of views of the library.

Appendix A - Error Codes, provides a complete list of error message codes which the library displays under abnormal circumstances.

Appendix B - Bar Code Labels, lists charactor values, reflectance and contrast, and light exposure degraduation specifications for creating bar code labels.

Appendix C - Packing Instructions, are provided in the event the library must be reshipped.

Appendix D - Tape Drive Status Lights and Buttons, describes the fuctionality of the drive status lights and buttons.

Conventions Used in This Guide

Note

Text set off in this manner provides commentary, sidelights or points of interest.

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Caution

Text set off in this manner indicates that failure to follow directions could result in damage to equipment or loss of information.

Warning

Text set off in this manner indicates that failure to follow directions could result in bodily harm or loss of life.

Software GUI Commands

The GUI command instructions using the following notation (Choose File > Print); means, “Open file from the menu bar and select print.”

Safety Precautions

Warning

Remove the power plug from the unit prior to any service or removal of the power supply, tape drives, or CPU card.

Warning

Vor wartung oder Ausbau des netzteils, der Bandlaufwerke, oder der CPU-Karte muß der Netzstecker gezogen werden.

Warning

Oter la prise d'alimentation de l'unité avant toute intervention ou avant de démonter le bloc d'alimentation les unités de bande magnétique ou la carte d'CPU.

Observe the following general safety precautions when installing the Q2 product:

- Do not work alone.

  Nicht allein arbeiten.

  Ne pas travailler seul.

- Disconnect AC power when working in the vicinity of an exposed power supply.

  Das Gerät vom Wechselstromnetz trennen, wenn die Arbeit in der Nähe eines freiliegenden Netzteils durchgefuhrt wird.

  Débrancher l'unité du secteur lorsque l'on travaille à proximité de conducteurs ou d'un bloc d'alimentation exposés.

- Do not connect the AC power cord to a source of power unless the Q2 product is completely assembled and all covers are in place.

  Das Netzkabel nicht an das Wechselstromnetz anschließät Vollständig montiert ist und alle schutzabdeckungen in Stellung sínd.

  Ne pas brancher le cordon d'alimentation au secteur si l'unité n'est pas entiérèment assemblée avec tous les couvercles de protection en place.

- Do not remove warning labels.

  Die Sicherheits-, Vorsichts- und Warnetiketten nicht entfernen.

  No pas ôter les étiquettes de sécurité ou d’avertissement.

ESDS Device Handling

The Q2 products contain devices subject to damage from electrostatic discharge (ESD). Handle electrostatic discharge sensitive (ESDS) devices in accordance with the following precautions and instructions.

- ESDS components and circuit cards are shipped in special static dissipative shipping containers. Ensure that all required precautions are taken before opening the containers. Retain the containers for use when shipping ESD components. All static dissipative containers are identified with a warning label alerting the handler that the contents are ESD sensitive.
- Because most circuit cards contain ESDS components, all circuit cards should be treated as being ESD sensitive. Individual components are not generally identified as being ESDS, except in packaging.
- ESDS components should only be handled under the following conditions:
  - When handling ESDS assemblies or devices, the handler must wear a static control wrist strap connected to his or her skin.

  The wrist strap must then be connected, through a 1 megohm resistor, to a static dissipative table top or to the equipment chassis ground. (**Note:** Most wrist straps have the 1 megohm resistor built in.) The static dissipative table top must be connected to ground through a 1 megohm resistor.

  - Handle ESDS components by the case or body whenever possible, and minimize touching the leads and connector fingers.
  - Avoid the use of air blasts or aerosol sprays on ESDS circuit cards or components.
  - Pack and unpack ESDS components and devices only in static-free environments on a static dissipative table top. The handler must wear a wrist strap during packing or unpacking.
  - Keep all common plastics and clothing away from ESDS devices.
  - All test equipment and equipment chassis must be grounded. Grounded power cords must be plugged in, even if the equipment is turned off.
  - Brushes must be of natural bristle.
- Ensure that all ESDS devices are properly packaged in static dissipative coverings when in storage or transit.

FCC Regulatory Notice

This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the installation guide, 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 B of Part 15 of the FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user will be required to correct the interference at his own expense.

Shielded cables must be used for the external connections for this device to comply with FCC Rules.

VDE Notice

Achtung! Dieses ist ein Gerät der Funkstörgrenzwertklasse A. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

CSA Notice

Le présent appareil numérique n’émet pas de bruits radioélectriques dépassant les limites applicables aux appreils numériques de la classe A prescrites dans le Règlement sur le brouillage radioeléctrique édicté par le ministére des Communications du Canada.

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Standards

The Q2 products adhere to the following standards:

- Underwriters Laboratories, UL Standard 1950
- Canadian Standard Association, CSA Standards 22.2 and 950
- Euronorm Standard EN60950
- IEC Standard 950
- CISPR 55022 Class A
- Euronorm 50082-1 Light Industrial Immunity

EC Declaration of Conformity

EC Declaration of Conformity

Manufacturer:

Breece Hill Technologies, Incorporated
6287 Arapahoe Ave.
Boulder, Colorado 80303
U. S. A.

declare under sole responsibility that the

Product Name: Q2.15 Tape Library
Model Number: Q2.15
with single ended SCSI interface or with
differential SCSI interface

to which this declaration relates, **meets the essential health and safety requirements** and is in conformity with the relevant EC Directives listed below using the relevant section of the following EC standards and other normative documents;

EU EMC Directive 89/336/EEC

EN 55022 Class A
EN 50082-1 EC generic immunity requirements, Category A & B
IEC 801-2
IEC 801-3
IEC 801-4

EU Low Voltage Directive 72/23/EEC

EN 60 950
Certificate: # AL 96 10 23377 005

The CE marking has been affixed on the device according to article 10 of the EC Directive 89/336/EEC.

Director of Engineering February 4, 1997

CE

1

Introduction

An introduction to the Q2 product line with explanations of how the units operates. A description of the tape drives and cartridges, RS-232, SCSI and power connection are briefly described.

- Overview of the Q2 product line
- External Components
- Internal Components
- Back Panel
- Operational Code
- Hardware Specifications

Overview

The Q2 Library is an automated DLT data storage and retrieval system. The library connects to computer systems or network servers to provide high-capacity system backups. The library is suitable for online storage, retrieval, and archival of large files and sequential data sets.

Two base models are available in the Q-series product line and are described in **Table1.** The Q2 is scalable to two libraries inter-connected that exchange cartridges with adjacent Q2 libraries.

Table 1. Q2 Product Line

Model	Number of Drives	Number of Cartridges	Capacity (Compressed)
Q2.15	up to 2	15	1.05 TB
Q4.30	up to 4	30	2.10 TB

- The Q2 products are automated, robotic tape handling systems that provide up to 525 GB/1050 GB of uncompressed or 1050 GB (1.05 TB [1 GB = 1 000 000 000 bytes and 1 TB = 1 000 000 000 000 bytes])/2100 GB (2.1 TB) of compressed data storage capacity for network computer systems.
- The Q2.15 can hold a maximum of 15 tape cartridges; up to 10 cartridges can be held in a removable magazine and up to 5 cartridges in fixed cells located inside the library. The Q4.30 can hold up to 30 tape cartridges; up to 20 cartridges can be held in the removable magazines and up to 10 cartridges in the fixed cells.
- The Q2 products connect to computer systems or network servers to provide high-capacity system backups. They are suitable for on-line storage, retrieval and archival of large files (for example, image files), and sequential data sets. These devices are available in single-ended or differential configurations.
- The Q2 products are designed for unattended operation; however, an operator display panel on the front of the unit enables a user to monitor library and drive activities, suspend operations, load and unload tape cartridges, and run confidence tests and diagnostics. These operations can also be initiated through the host computer interface.
- Communication with a host computer is through a small computer systems interface-2 (SCSI-2).
- Each Q2 product has an RS-232 connector on the back panel. Using this connector, an operator can attach a terminal or small computer to download firmware or access diagnostic and statistical information.

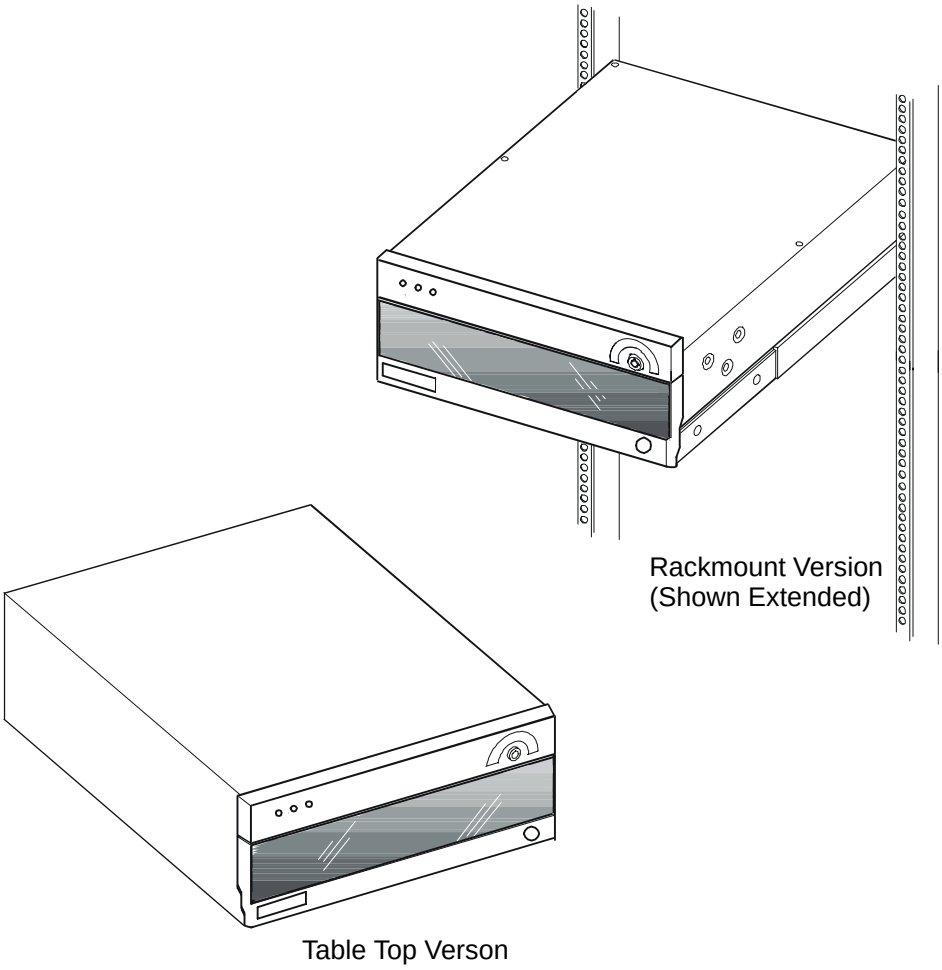


Figure 1. Installation Configurations for Q2.15

Q2.15

The Q2.15 can be configured with one or two tape drives. It has a barcode reader to help identify tape cartridges.

The Q2.15 has two robotics modes: random access mode (full library operation) and autoloader mode (sequential operation). The default operational mode is random access; however, a user can change to sequential mode by running setup and reinitializing the Q2.15.

Note

Autoloader mode for the Q2.15 requires code revision 1.20 or higher.

In the random access mode, the Q2.15 receives tape cartridge move commands from a host computer to load tape cartridges into or remove them from tape drives. The host computer requests a specific tape cartridge, sends the commands to move the robotic shuttle to the appropriate cell, and sends the commands to place the tape cartridge in a tape drive. In this mode, the robotic shuttle can move left or right, and any tape can be loaded at any time and in any order.

In the sequential mode, the user loads the tape cartridge from the first storage cell into a tape drive. The host computer writes to the tape. After the tape has been ejected from the tape drive, the Q2.15 automatically moves the tape cartridge to its original location. The Q2.15 then moves to the next storage cell containing a tape cartridge, loads the tape cartridge into a drive, and returns the tape cartridge to the cell after the tape cartridge is ejected. The Q2.15 repeats this process until all the cartridges are filled. In this mode, the robotic shuttle operates sequentially, moving incrementally from one cell to the next.

When operating in sequential mode, all tape moves are directed by firmware in the Q2.15.

The Q2.15 has two installation configurations (see **Figure 1.** on page **3**):

- Rack mounted (for use in industry standard instrument racks)
- Desktop (for use on horizontal work surfaces)

Q4.30

The Q4.30 is implemented as two Q2.15s with a PassThru mechanism. It can be configured with two to four DLT drives and up to 30 cartridges.

This device has one robotic mode: random access mode. The default operation mode is random access; however, a user can change to sequential mode by running setup and reinitializing the unit.

The Q4.30 comes in a rackmount configuration only.

External Components

Figure 2. shows the Q2.15 and the location of the control keys, front door and key lock and. Each component is described in the following sections.

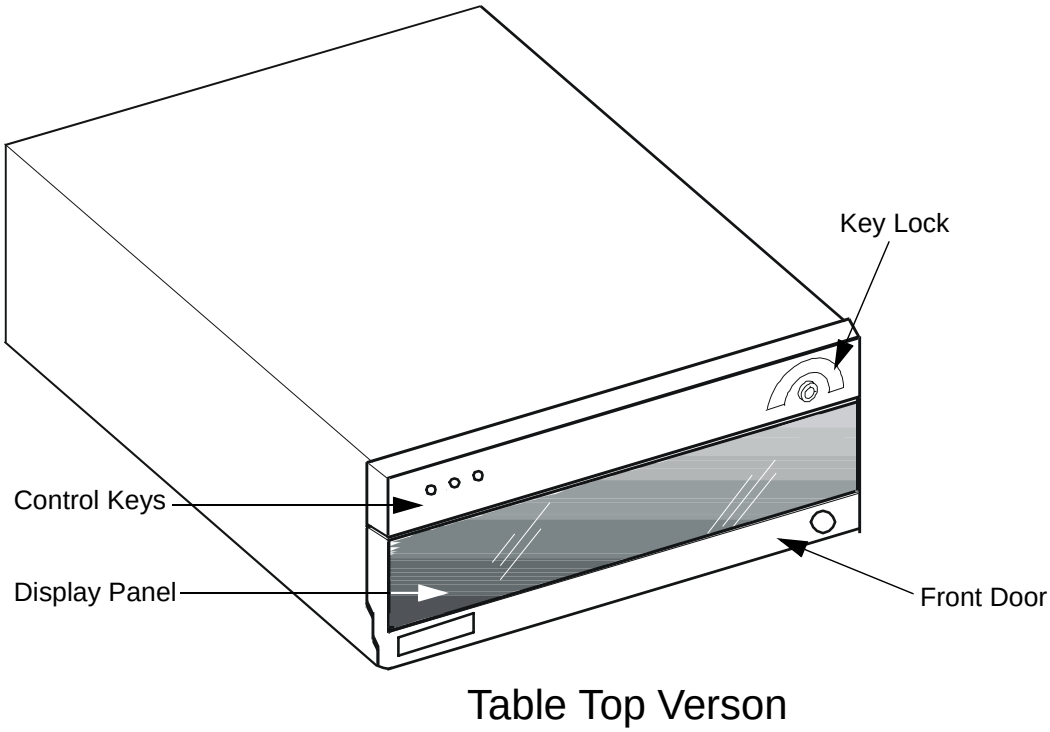


Figure 2. Q2 Library and External Components

Front Door

The front door provides access for loading and unloading a tape cartridge magazine, or to reach the front of the robotics that handle the tape cartridges. The front door also contains the operator panel and control keys. A user can change the operating mode or initiate operational and maintenance activity using the control keys: **MENU**, **CYCLE**, and **SELECT**. The front door is hinged along the bottom and is secured by a solenoid and key. When unlocked, a user can open the door by rotating it down. Whenever a user opens the front door, all robotics movement is disabled.

Caution

Each time the front door is opened and closed the device reinitializes.

Internal Components

Figure 3. shows the major components in the Q2.15. The Q4.30 is two Q2.15s with a PassThru mechanism.**Figure 4.** shows the major components in the Q4.30. The sections that follow describe each component.

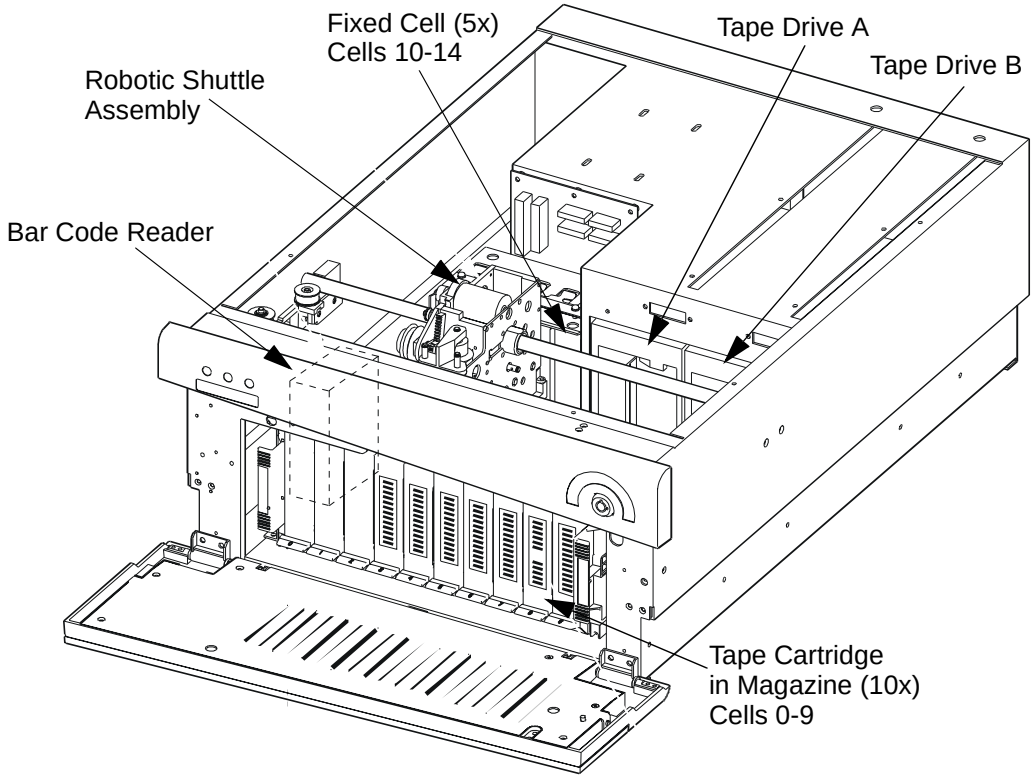


Figure 3. Q2.15 Major Internal Components

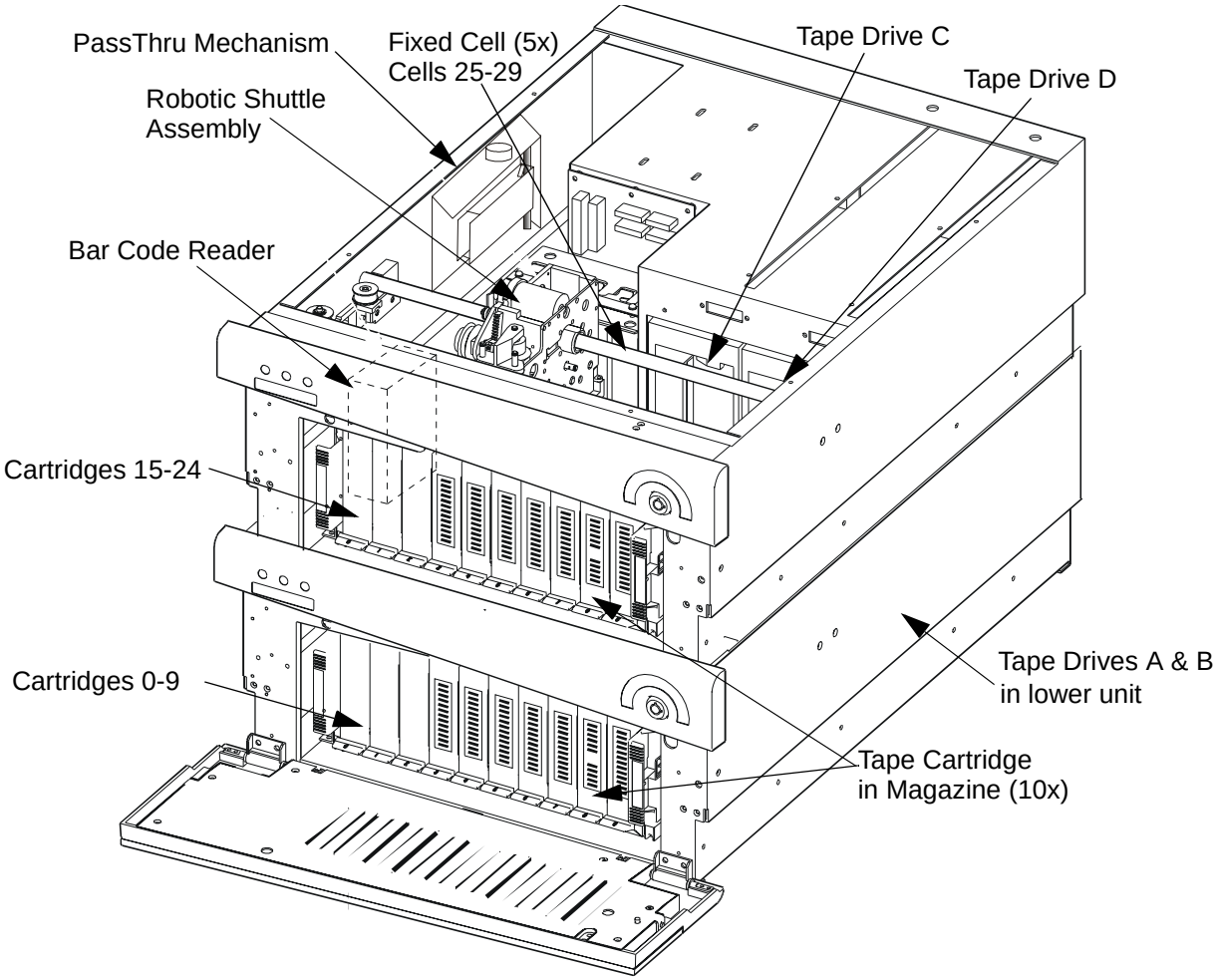


Figure 4. Q4.30 Major Internal Components

Removable Magazine

Each removable magazine holds up to ten tape cartridges used for storing data. The magazine is keyed to prevent insertion of the cartridges in the wrong orientation. A user may also add or remove cartridges by opening the front door on the unit.

Q2 magazine cells digits are identifed by starting at the front left side of the magazine (0-9 in the Q2.15). In the Q4.30, magazine cells 0-9 are located on the bottom and magazine cells 15-24 are located in the top.

Tape Drives

The Q2.15 contains one or two DLT2000XT, DLT4000, or DLT7000 tape drives; the Q4.30 contains two to four DLT4000, or DLT7000 tape drives. Each tape drive is mounted on a drive load plate that also includes a fan for cooling the tape drive. When the Q2.15 has only one tape drive, the unused drive location is filled by a cover plate. Tape drives can be added in the field to increase data transfer capability of the Q2.15 and Q4.30.

Fixed Cells

A Q2.15 product has five fixed cartridge cells located inside the chassis behind the robotic shuttle. The Q4.30 has two sets of fixed cells. The fixed cells can be used for holding cleaning, special purpose, or data tape cartridges. These cells can be loaded manually or by the robotic shuttle under host software control. An operator can also use the control keys and operator panel to move cartridges from the magazine to the fixed cells.

Q2 fixed cells digits are identifed by starting at the front left side of the fixed cell (10-14 in the Q2.15). In the Q4.30, fixed cells 10-14 are located on the bottom and magazine cells 25-29 are located in the top.

Robotic Shuttle

The robotic shuttle moves tape cartridges between the fixed cells, removable magazine, and tape drives. The shuttle is located between the removable magazine and the tape drives. It travels from side to side to position itself in front of the appropriate cartridge. The shuttle then removes the cartridge from its location, transports it to a host or user specified location, and inserts the cartridge into the new location. The shuttle is designed to ensure that a cartridge can never be dropped.

If a user needs to reach the tape drive, the user can move the robotic shuttle by gently pushing on the side of the shuttle to slide it along the shaft.

Warning

Never put hands into the path of a moving robotic shuttle.

Bar Code Reader

Using the bar code reader, the Q2.15 and Q4.30 can identify tape cartridges by bar code labels that a user can slide into the face of the cartridge. If a label is missing, the tape can be identified by its recorded data. The bar code reader consists of an LED light bar and an optical sensor located next to the removable magazine. The library reads a bar code by moving a tape cartridge from a cell and positioning the cartridge in front of the bar code reader. With the bar code reader, a complete cartridge inventory can be performed in approximately five minutes.

Back Panel

All cables for the Q2 products are connected at the back panel (see **Figure 5.** on page **9**). Each unit has three types of cable connections:

- AC Power
- SCSI Interface
- RS-232

The sections that follow describe the SCSI and RS-232 connections. For information about AC power requirements, refer to **Hardware Specifications** on page **12.**

Figure 5. shows the major components located in the back panel of the Q2. Each component is described in the following sections.

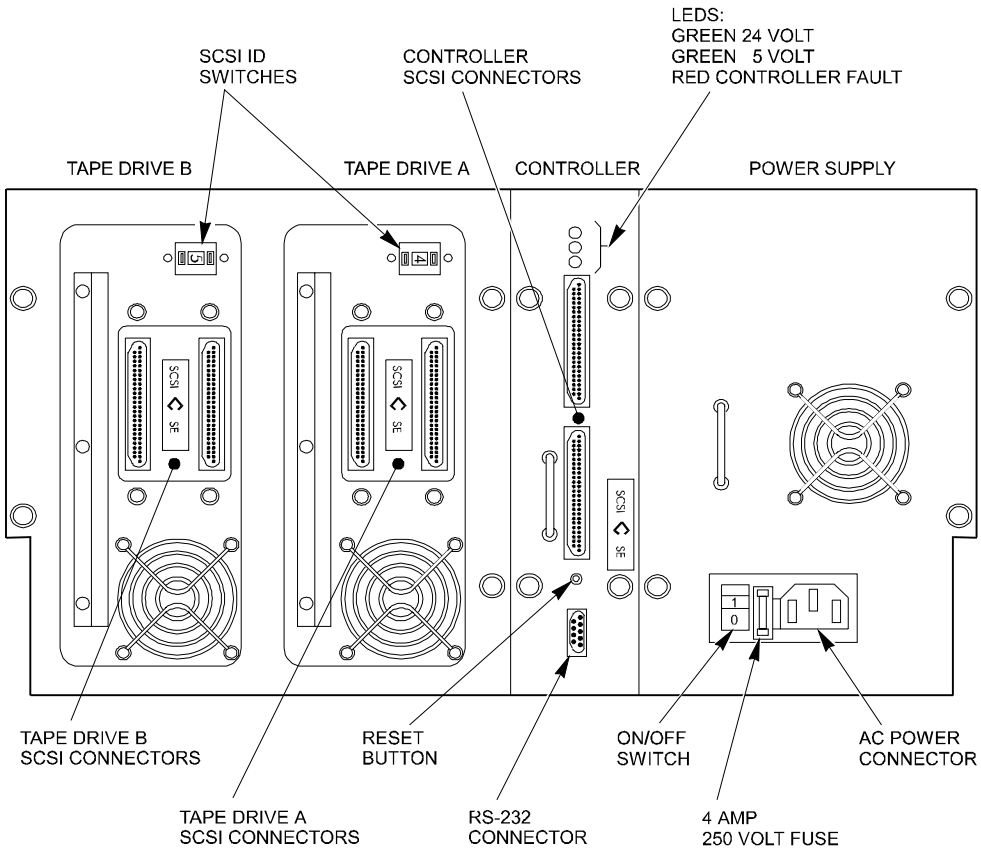


Figure 5. Back Panel

AC Line Cord and Power Switch

AC power enters the unit through a standard IEC 320 line cord connector located at the back of the unit.

The main power switch is located on the back of the library which controls all power to the unit.

The housing for the power cord also contains a spare fuse. See **Fuse Replacement** on page **120**.

SCSI Interface

The Q2 products use SCSI-2 to communicate with the host computer. They communicate as medium changer devices. These units are single device targets that do not support multiple logical units. Each Q2.15 occupies up to three SCSI target IDs: two for the drives and one for the robotics. Each Q4.30 occupies 5 SCSI IDs: four for the drives and one for the robotics.

Valid SCSI commands are listed in **Table 2.** on page **12** at the end of this chapter.

The software for the robotics is completely self-contained and executes commands received from the host over the SCSI bus. Error recovery is transparent to the host. The Q2 products do not support linked commands, tagged command queuing, or the flag bit.

To support high reliability systems, the Q2.15 and Q4.30 Tape Libraries can report internal voltages, drive temperatures and the controller temperature as log sense information that can be sent to the host computer.

When operating as a dedicated autoloader (sequential mode), only the host-to-tape drive SCSI cable needs to be connected. This is true since the host is disabled from the SCSI interface.

RS-232 Interface

A host CPU or terminal can be connected to the library CPU via the RS-232 link to access diagnostic information.

To access diagnostic and statistical information, a user can connect a host computer or terminal to the library controller through the RS-232 connection. Library microcode can also be updated using this connection.

Terminators

Termination power is supplied as the default configuration for the internal drives and the Q2.15 controller. Termination power can be disabled by removing jumper J4 on the controller (see **Figure 6.**). Drive termination power can also be disabled by removing jumpers on each of the drives. Refer to the tape drive manual for more information.

Note *This procedure should be performed by a qualified Service Engineer.*

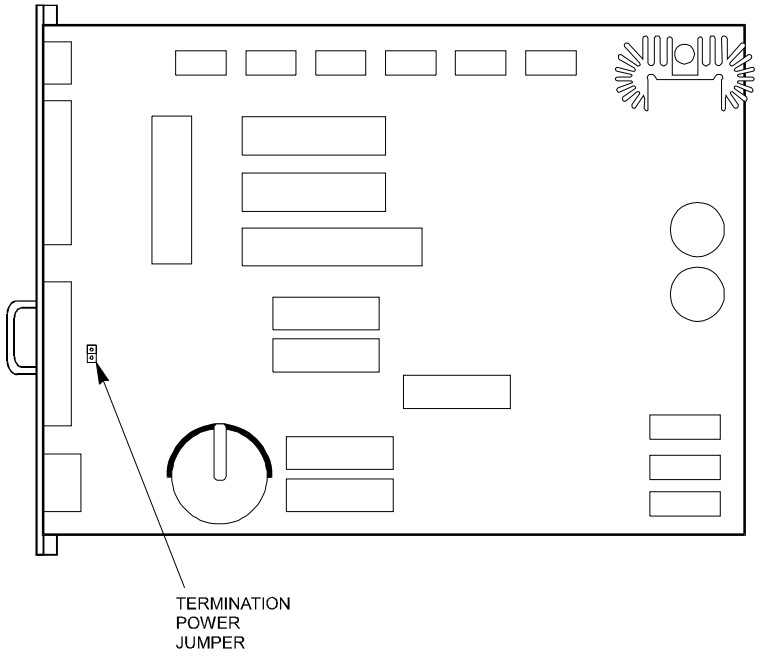


Figure 6. Termination Power Jumper on the Controller

The SCSI bus is not terminated internally by the drives or electronics. Active terminators must be installed at both ends of the SCSI bus.

Power Supply

The power supply module consists of one +5/+12V/+24V power supply. The supply is rated to deliver enough current to power the library and two DLT 7000 tape drives.

The power supplies are UL, CE and BABT certified and applicable for use at 100 VAC - 240 VAC. The power supply passes all EMI and RFI requirements for use in the USA, Europe, and Japan. Power is distributed to the tape drives and library electronics so normal library operations do not cause noise on the supply lines that affect drive read/write reliability.

Controller LEDs

The controller has three LEDs that indicate the operational state of the device (**Figure 5.** on page **9**).

The LEDs indicate:

- **Top** — A green LED that, when lit, indicates 24 V is available to power the robotic shuttle. If the LED is not lit 24 V is not available, either because the robotic shuttle could not move causing the 24 V to be disabled, or because of a problem with the power supply.
- **Middle** — A green LED that, when lit, indicates 5 V is present for the controller logic and tape drives.
- **Bottom** — A red LED that, when lit, indicates a problem with the controller.

Controller Reset Button

The controller reset button (**Figure 5.** on page **9**) is used to produce a hard system reset. The effect is the same as powering the unit off and then on again. When the reset button is pressed the library enters the initialization/setup mode. In the initialization/setup mode, the robotics calibrates the system and prepares to go on-line.

Operational Code

The operational code for running the robotics is completely self-contained and executes commands received over the SCSI-2 bus. The Q2 products do not come with application software, such as backup and restore programs.

Q2.15/Q430 Firmware

Firmware is stored alternately in two 512K x 8 flash memories. The firmware can be updated by sending new code through the RS-232 port or across the SCSI interface.

Hardware Specifications

Specifications for the Q2.15/Q4.30 are given in the following tables.

- **Table 2.** lists specifications for the Q2.15/Q4.30.
- **Table 3.** lists specifications for the DLT tape drives that can be used with the Q2.15/Q4.30.
- **Table 4.** lists the SCSI medium changer supported commands.

Table 2. Q2 Product Line Specifications

Physical Dimensions	Rackmount	Desktop
Height		
Q2.15	8.75 in (22.23 cm)	9.25 in (23.50 cm)
Q4.30	17.5 in	not available
Overall Width	18.88 in (47.96 cm)	18.88 in (47.96 cm)
Chassis Width	17.50 in (44.45 cm)	
Chassis Width at Mounting Rails	16.625 in (42.23 cm)	
Length	26.50 in (67.31 cm)	26.50 in (67.31 cm)
Bezel Height above Rack Mounting Flange	0.75 in (1.91 cm)	

Table 2. Q2 Product Line Specifications (Continued)

Q2.15 Weights		
Weight with two drives	72 lb (32.73 kg)	92 lb (41.82 kg)
Weight with one drive	63.4 lb (28.82 kg)	83.4 lb (37.91 kg)
Q4.30 Weights		
Weight with two drives	128.0 lb	169.6 lb
Weight with three drives	136.6 lb	178.2 lb
Weight with four drives	145.2	186.8 lb
Tape Drive Module	8.60 lb (3.91 kg)	8.60 lb (3.91 kg)
Magazine with 10 Cartridge	6.60 lb (3.00 kg)	6.60 lb (3.00 kg)
Clearance Requirements (Operating)		
Front	8.00 in. (20.32 cm) (for magazine replacement)	
Rear	6.00 in. (15.24 cm)	
Sides	0	
Top	0	
Operating Environment		
Temperature	+50 °F to +104 °F (+10 °C to +40 °C)	
Humidity	20% to 80% non-condensing	
Maximum Wet Bulb	+77 °F (+25 °C)	
Maximum Temperature Gradient	+50 °F/hr (+10 °C/hr)	
Maximum Humidity Gradient	10% per hour	
Operating Altitude	0 to 8000 ft (0 to 2438.4 m)	
Non-operating Environment		
Temperature	-40 °F to +140 °F (-40 °C to +60 °C)	
Humidity	20% to 80% non-condensing	
Maximum Wet Bulb	114.8 °F (+46 °C)	
Maximum Temperature Gradient	+50 °F/hr (+10 °C/hr)	
Maximum Humidity Gradient	15% per hour	
Non-operating Altitude	30,000 ft maximum (9144 m)	

Table 2. Q2 Product Line Specifications (Continued)

Performance	
Typical Power-on to Library On-line Maximum Power on to Library On-line Typical Cartridge Inventory, Barcode Disabled Typical Cartridge Inventory Barcode Enabled	30 s 148 s 30 s 300 s
Power Requirements	
Voltage Frequency Power Consumption: DLT2000XT and DLT4000 Drives Power Consumption: DLT7000 Drive	100 to 240 VAC 48 to 64 Hz 105 W typical 125 W peak 130 W typical 155 W peak
Power Supplies	
One +5/+12/+24V power supply (The power supply provides power to the tape modules and robotics.)	
AC Connector and Line Cord	
AC Power Connector	Standard IEC 320 connector (The Q2.15 is shipped with a power cord for use in the USA. For operation outside the USA, contact the distributor for a suitable power cord.)

Table 3. Tape Drive Specifications

	DLT4000	DLT7000
Transfer Rate (uncompressed)	1.5 MB/s	5.0 MB/s
Capacity (uncompressed)	20 GB	35 GB
Transfer Rate (@ 2:1 compression)	3.0 MB/s	10.4 MB/s
Capacity (@ 2:1 compression)	40 GB	70 GB
Tape Length	1778 ft	1778 ft
Tape Speed	110 ips R/W 150 ips Rew/ Search	160 ips R/W 175 ips Rew/ Search
Average Rewind Time	45 s	60 s
Average Access Time	45 s	60 s
Tracks	128; 64 pairs	208; 52 quads
Linear Bit Density	81,600 bpi/track	85,937 bpi/track
Interface Configurations	SCSI-2 SE or Differential 8 bit (narrow)	SCSI-2 16 bit fast, wide SE or Differential
MTBF	80,000 hours	200,000 hours
Head Life	10,000 tape motion hours	30,000 tape motion hours
Tape Composition	MP2 DLT Tape IV	MP2 DLT Tape IV

Table 4. SCSI Medium Changer Commands

Command	Code
Initialize Element Status	07h
Initialize Element Status with Range	E7h
Inquiry	12h
Log Select	4Ch
Log Sense	4Dh
Mode Select	15h
Mode Sense	1Ah
Move Medium	A5h
Position to Element	2Bh
Prevent/Allow Medium Removal	1Eh
Read Element Status	B8h
Receive Diagnostic Results	1Ch
Release	17h
Request Sense	03h
Request Volume Element Address	B5h
Reserve	16h
Send Diagnostic	1Dh
Send Volume Tag	B6h
Test Unit Ready	00h
Write Buffer	3Bh

2

System Installation

Correct placement and alignment of the Q2 and Q4.30 libraries are and important step in the installation process. It is highly recommended to move all library contents as close as possible to the home position. Before installation, inspect and remove obstructions in the path the library must take to the home position and ensure there is enough space for library passage.

Listed below, are the topics covered in the installation of the library

- Physical Planning
  - Crate Specifications
  - Floor Space Requirements
  - Library Orientation
  - Power Requirements
- Unpacking the Library
  - Unpacking
  - Packaging
- Setup
  - Q2 Desk Top Installation
  - Removing the Shiplocks
  - Q2 Rackmount Installation
  - Q4.30 Installation

Physical Planning

Correct placement of the library is an important step in the installation process. Before installation, inspect and remove obstructions in the path library must take to the home position and ensure there is enough space for library passage.

Crates Specifications

The library is shipped in one crate with all documentation and components.

Library Crate Dimensions:

Weight 120 lbs (264 kg)

Length 43” (110 cm)

Width 36” (92 cm)

Height 25” (64 cm)

Floor Space Requirements

The floor diagram (**Figure 7.**) illustrates the space required for installing and servicing the library.

Note *The space requirements are for service and installation only.*

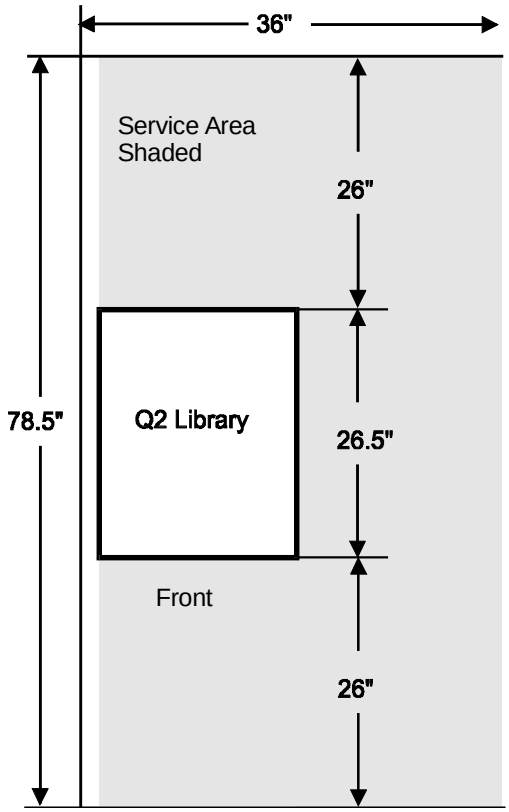


Figure 7. Space Requirements (top view)

Library Orientation

All Q2 libraries must be installed in a rack or placed on a flat table top. The library must not be turned on its side or set on an angle.

Power Requirements

The library's auto-ranging system will accept single phase power from 100 to 264 volts and a frequency of 48-64 Hz. A standard IEC 320 power cord is supplied with the library. See **Table 2** on page **12** for more information on power requirements.

UnPacking the Library

This section explains how to safely remove the shiplock from the interior of a Q2 product and how to repackage them before moving or shipping them.

Unpacking

The Q2 product packaging is specially designed to provide the most protection possible whenever a unit is being shipped or any time they are being moved. As such, it is advisable to keep the shipping carton for times when it might be necessary to relocate a unit. For any warranty service the unit must be returned in the original packaging.

Before you begin installation, carefully examine the library crate. Check the Drop-N-Tell on the library crate to verify it has not been activated and inspect the crate to see if they are free of dents, holes, or any other signs of mistreatment.

While unpacking the crate verify all parts and hardware are present before performing the installation process.

Required Tools

The list below are tools required to unpack the library.

- Utility Knife

Note *When all contents are emptied, store the packing material and crate in the event the library must be reshipped.*

Removing the packing material is a simple process which requires one person to perform. The library weighs approximately 90 lbs and requires two people to lift.

1. Cut all four strapping bands and remove from pallet.
2. Remove the box cover and accessory box.
3. Remove the library from the pallet and pull off the foam end caps and the protective plastic bag.
4. Verify all contents are present in the accessory box.

Note *The accessory box will contain tape cartridges and sliderails if ordered.*

Packaging

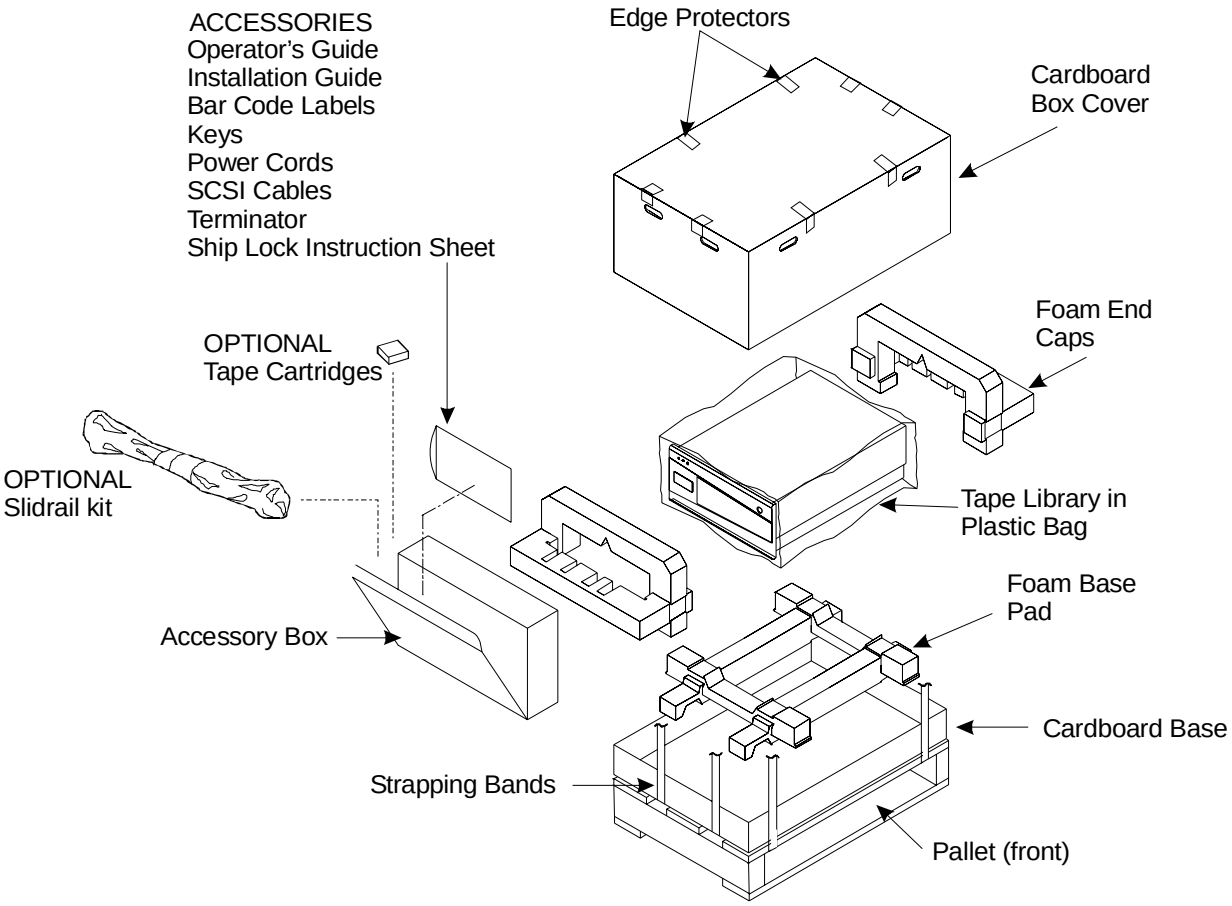


Figure 8. Q2.15 Packaging

Setup

Setup provides step-by-step instructions for installing a Q2 product in either a rack-mounted or desktop configuration. The Q4.30 is not designed for use as a desktop configuration and must be installed in a rack configuration.

Desk Top Installation

Very little preparation is required for installing a Q2.15 to operate on a desktop or other work surface. Ensure that the unit has adequate clearance in the front so that the front door can be opened. Also, ensure that the rear cooling fans are not blocked, preventing heated air from leaving the library, and that the SCSI and power cables can be easily connected.

Warning

The desktop Q2.15 Tape Library with two tape drives weighs approximately 92 lb. Two people are required to lift the Q2.15 and place it on a work surface.

Power Cables

The power connector is located on the back of the chassis.

1. Make sure the unit is turned off. (Press the **0** on the ON/OFF switch.)
2. Connect the power cable to the power supply in the unit.
3. Connect the other end of the power cable to a power source.

Removing the Shuttle Shiplock

Prior to shipment, a robotics shuttle shiplock is installed. The shiplock clamps the robotics shuttle drive belt to prevent the robotics shuttle from moving during shipment. The shiplock must be removed before installing a Q2 product. The following procedure explains how to remove the shiplock.

Note

Each Q2.15 in a Q4.30 configuration has a shiplock which must be removed.

.

Caution

Failure to remove the shiplock can damage the Q2 library and will void the warranty.

1. Locate the front door key in the accessories package.
2. Insert the key into the front door lock and turn the key to the 9 o'clock position and open the front door by rotating it down.
3. Remove the magazine by grasping the flanges on the right and left side of the magazine, then pulling the magazine straight out from the unit. The shiplock (marked with and orange ribbon in **Figure 9.**) can now be removed.
4. Reach into the library and press the spring ends of the shiplock together to release it from the drive belt.

5. Replace the magazine by pushing the magazine straight into the unit. The retention springs are strong; push firmly while keeping the magazine straight. Make sure the magazine is completely seated.
6. Completely close the front door.
7. Turn the front door key to either the 12 o'clock or 3 o'clock position to lock the front door.

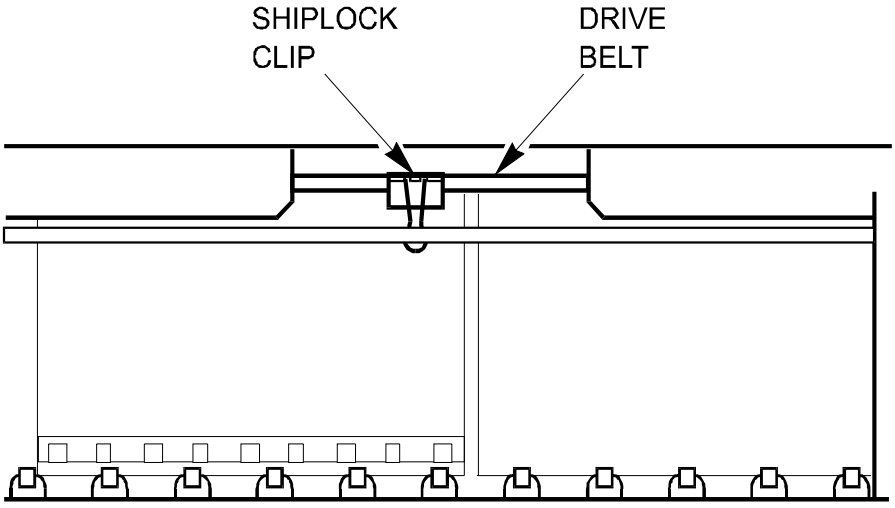


Figure 9. Shiplock

Rack Mounted Installation

The Q2 product that is configured for mounting into an EIA-310-D 19 inch instrument rack does not have covers so that slide rails can be attached to the chassis. The installation consists of mounting the inner slide rails onto the chassis, the outer slide rail assemblies onto the instrument rack, then sliding the rails on the unit into the slid/assemblies. **Figure 10.** shows the major components for installing the library into an instrument rack. **Figure 11.** on page **27** provides a detailed view of the slide assembly showing the features with which the installer needs to be familiar to perform the installation.

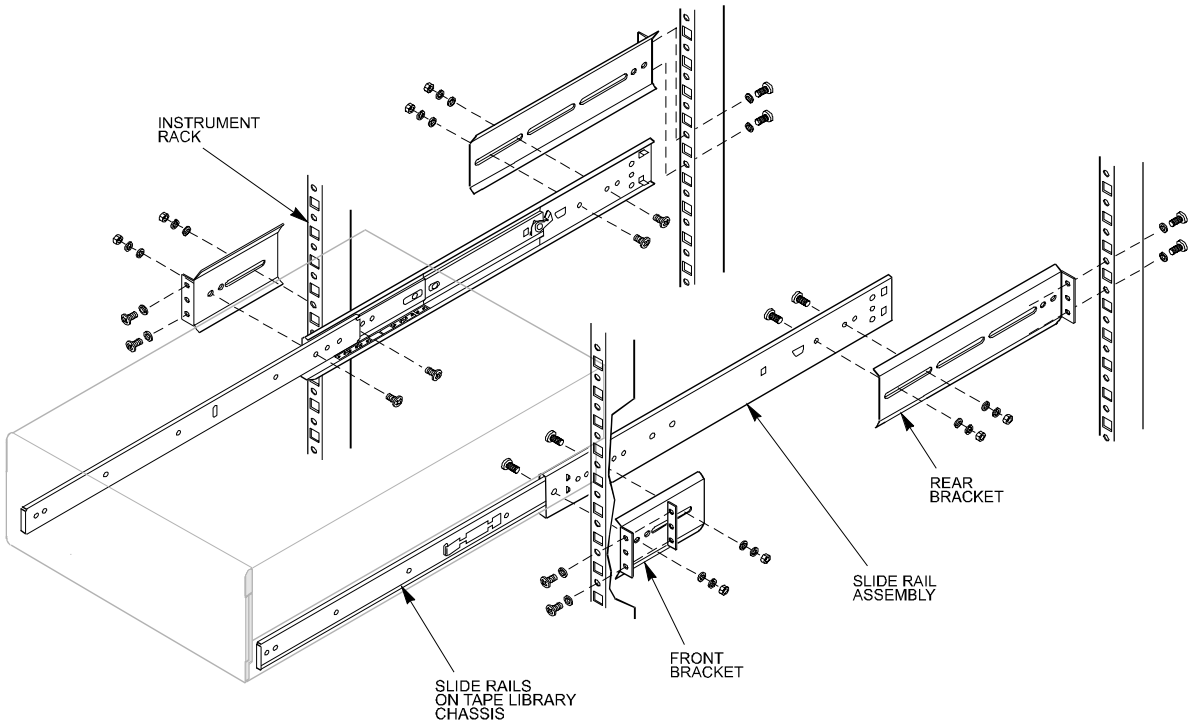


Figure 10. Q2.15 Rack Mounting Components

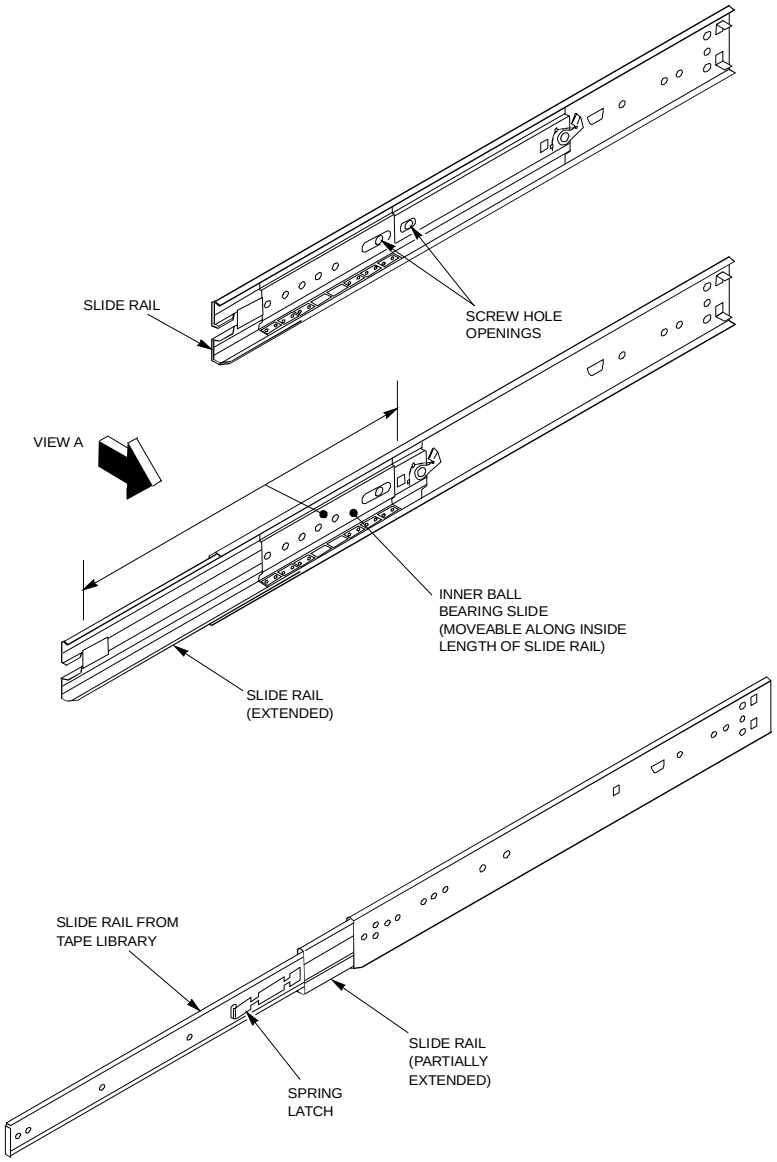


Figure 11. Slide Assembly

The following sections provide the detailed steps for performing a rack-mounted installation.

For proper device operation and to meet regulatory requirements, make sure the following conditions are met.

- The maximum ambient operating temperature, as measured at the front of the Q2 product, is not to exceed 104°F (40°C).
- The air flow from the cooling fans must be unrestricted.
- Make sure that mounting the unit into the instrument rack will not tip the instrument rack over, even when the Q2.15 is fully extended from the rack.

  This is especially relevant in the Q4.30 configuration, as the unit must be partially extended during installation.
- Make sure the library is connected to the correct power circuit.
- Make sure the library is properly grounded through the power cord while in the instrument rack.

Rack Mounted Installation Parts

A rack mounting kit is included with all Q2 products configured for rack mounted installation. **Table 5.** lists the rack mounting kit contents.

Table 5. Rack Mounting Kit Parts List

Part	Quantity
Slide assembly (includes hardware to mount slides to chassis.)	2
Front bracket (short)	2
Rear bracket (long)	2
Bar nut	4
8-32 screw	10
10-32 screw	10

Determining the Position in the Rack

The Q2.15 can be mounted immediately above or below other equipment in the instrument rack as long as adequate clearance is maintained for opening the front door and accessing the back of the unit. In a Q4.30 configuration, the Q2.15s must be mounted above/below one another.

Use one of the bar nuts included in the installation kit to determine the position of the Q2.15 in the rack. The bar nut has three holes drilled and tapped to accept 10-32 screws. The holes are on 5/8 in. (1.6 cm) centers, which corresponds to the hole pattern in an industry standard rack. **Figure 12.** shows the bar nut dimensions and how this appears in an instrument rack.

Match the holes in one bar nut to the holes in the instrument rack. Measure from the center of the middle hole to determine where the top and bottom of the Q2.15

will be in the rack. From the center of the middle hole to the top of the Q2.15 is approximately 7-1/4 in. (18.5 cm); to the bottom is approximately 1-5/16 in. (3.4 cm).

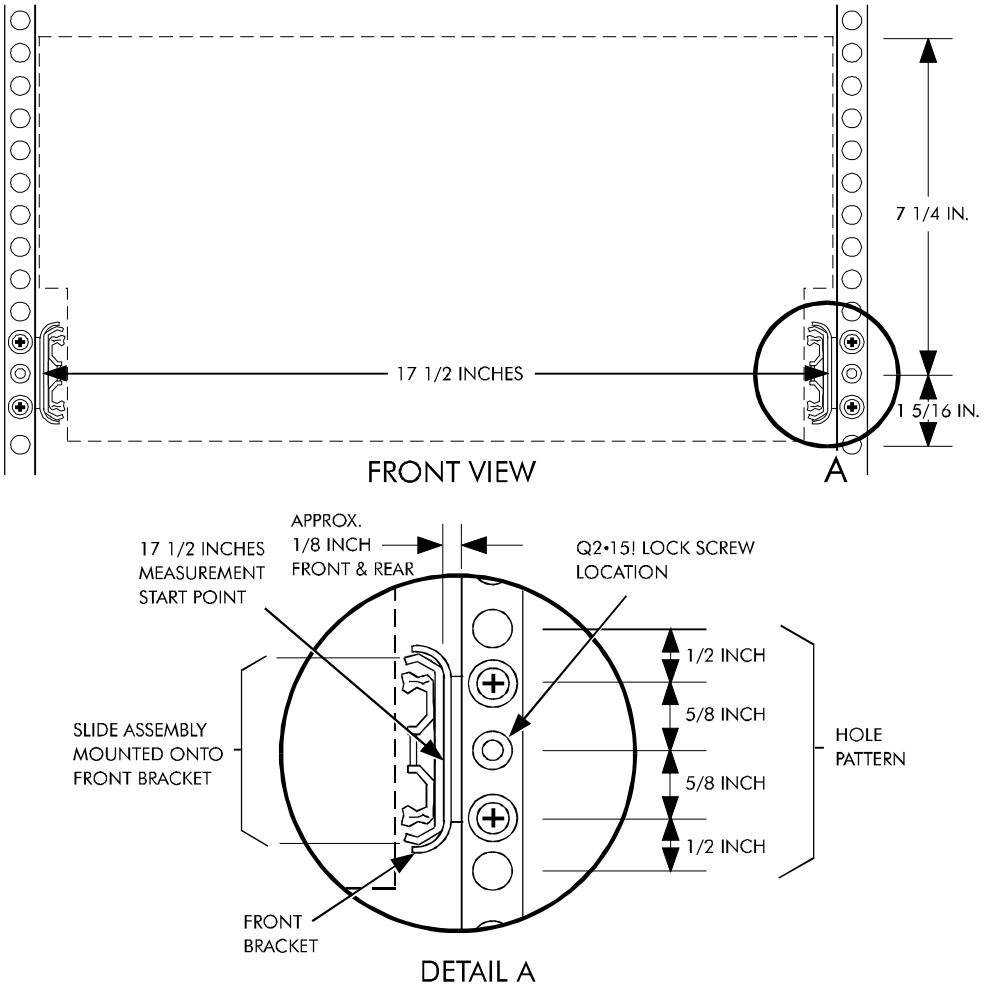


Figure 12. Dimensions for Rack-Mounting a Q2.15

Installation Procedure

Use the following procedure to install a Q2.15 in an instrument rack. Before starting the installation, review the information in **Figure 13.**, which shows an exploded view of the slide assembly and front mounting bracket relative to the instrument rack.

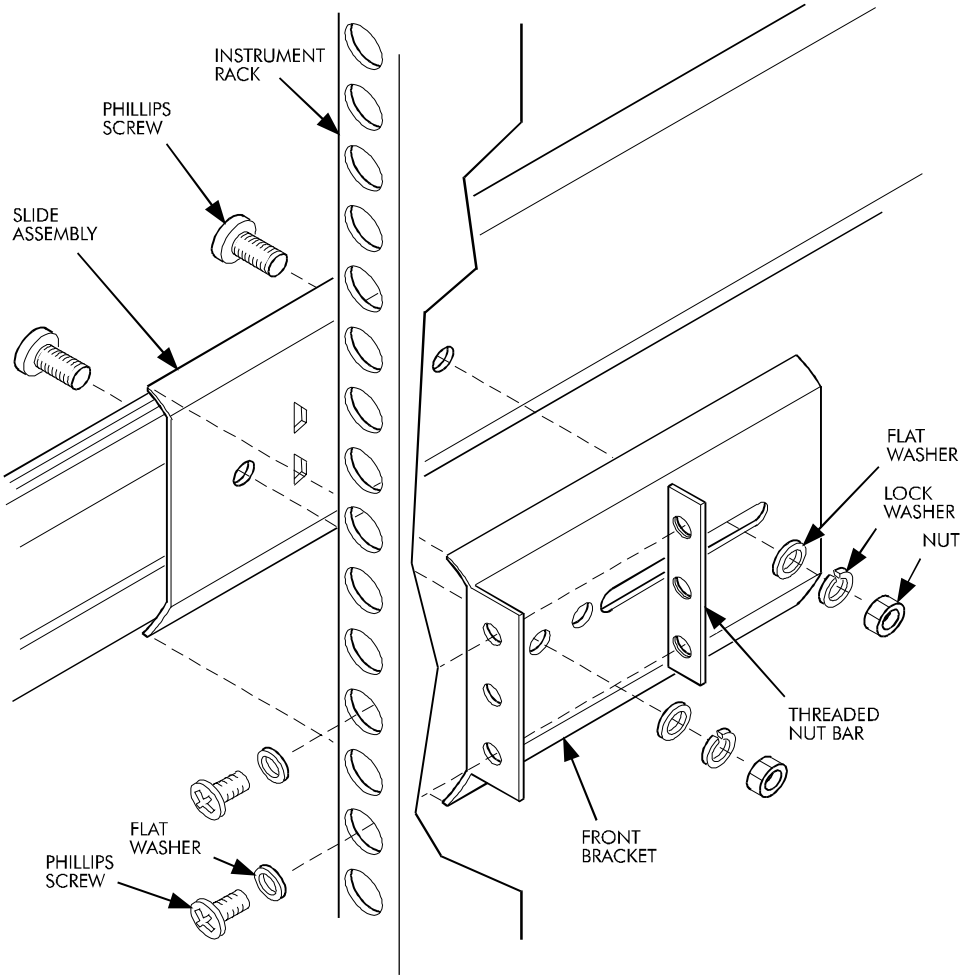


Figure 13. Exploded View of Mounting Components

Warning

The rack-mounted Q2.15 Tape Library with two tape drives weighs approximately 72 lb. Two people are required to hold the Q2.15 while mounting it onto the slide assembly.

Attaching the Right Slide Assembly

1. Attach a front bracket to the front end of one slide assembly. (The front brackets are the short brackets.) Verify the screw heads are inside the slides as shown in **Figure 14.** Tighten the screws firmly.

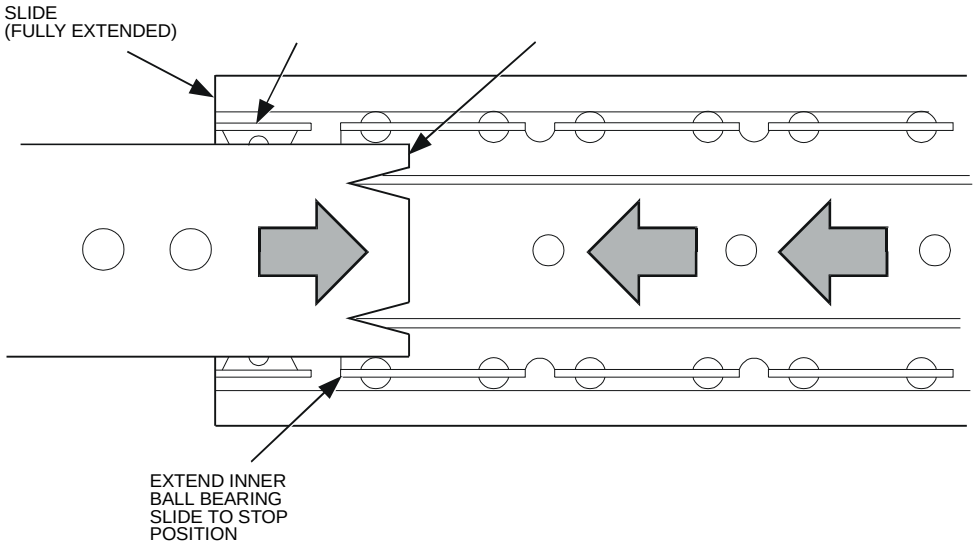


Figure 14. Attaching the Brackets to the Slide Assembly

2. Attach a **rear** bracket to the rear end of the slide assembly. (The rear brackets are the long brackets.) Verify the screw heads are inside the slides. Tighten the screws finger tight to allow for horizontal adjustment when installing into the instrument rack.
3. Place a slide assembly inside the instrument rack on the right side (when viewed from the front). Adjust the rear bracket so the flanges on the front and rear brackets press against the inside of the instrument rack.
4. Attach the **front** bracket to the instrument rack by inserting two 10-32 screws through the front of the instrument rack, through the front bracket, and screwing into a threaded bar nut (see **Figure 13.** on page **30**). Tighten the screws finger tight to allow for adjustment.
5. Attach the **rear** bracket to the instrument rack by inserting two 10-32 screws through the rear of the instrument rack, through the rear bracket, and screwing into a threaded bar nut. (The assembly is similar to that shown in **Figure 13.** on page **30**). Tighten the screws finger tight to allow for adjustment.
6. Adjust the front and rear mounting brackets so they are approximately 1/8-inch from the edge of the instrument rack (see **Figure 12.** on page **29**). Tighten the screws firmly.
7. Tighten the screws that attach the slide assembly to the rear mounting bracket.

Attaching the Left Slide Assembly

8. Attach a **front** bracket to the front end of the remaining slide assembly. (The front brackets are the short brackets.) Verify the screw heads are inside the slides (see **Figure 14.** on page **31**). Tighten the screws firmly.
9. Attach a rear bracket to the rear end of the slide assembly. (The rear brackets are the long brackets.) Verify the screw heads are inside the slides. Tighten the screws finger tight to allow for horizontal adjustment when installing into the instrument rack.
10. Place a slide assembly inside the instrument rack on the left side (when viewed from the front). Adjust the rear bracket so the flanges on the front and rear brackets press against the inside of the instrument rack.
11. Attach the **front** bracket to the instrument rack by inserting two 10-32 screws through the front of the instrument rack, through the front bracket, and screwing into a threaded bar nut. (The assembly is similar to that shown in **Figure 13.** on page **30**). Tighten the screws finger tight to allow for adjustment.
12. Attach the **rear** bracket to the instrument rack by inserting two 10-32 screws through the rear of the instrument rack, through the rear bracket, and screwing into a threaded bar nut. (The assembly is similar to that shown in **Figure 13.** on page **30**). Tighten the screws finger tight to allow for adjustment.
13. Measure the spacing between the slide assemblies at both the front and rear brackets. The distance between the slide assemblies at the front and rear brackets must be 17-1/2 in. (44.45 cm) (see **Figure 12.** on page **29**). Adjust as necessary.

    Do not completely tighten the screws at this time.

Mounting the Q2.15

14. Pull the left and right slide assembly rails out until the rails latch in the fully extend position. Ensure that the inner ball bearing slide is at the front of each slide.
15. Lift the Q2.15 and insert the rails mounted on the Q2.15 chassis into the extended slide assembly rails. Make sure that the Q2.15 is straight relative to the slide assembly and that the Q2.15 rails are in the plastic guides at the front of the slide assembly rails (see **Figure 15.**).

    It might be necessary to first lower the front of the Q2.15 then lift it up to properly join the rails on the Q2.15 with the slide assembly rails.

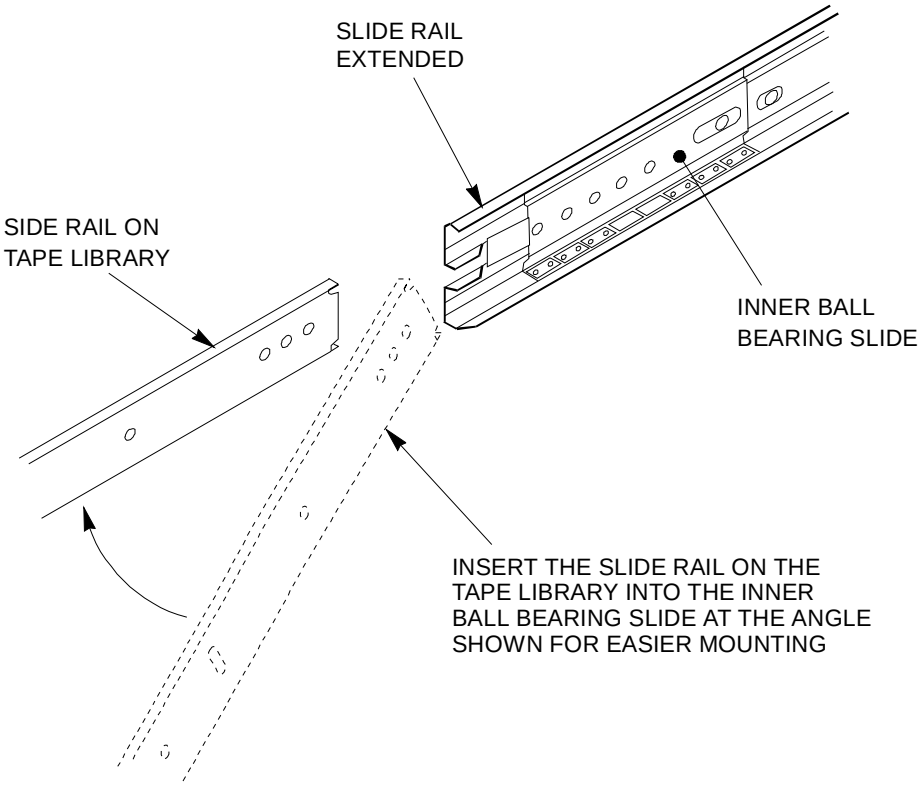


Figure 15. Mounting the Q2.15 onto the Slide Assembly

16. Slide the Q2.15 into the instrument rack. Push the spring latch on the side of each rail to slide the Q2.15 completely into the instrument rack.

17. Move the Q2.15 in and out a few times to ensure that the slide rails are properly aligned and the Q2.15 rolls smoothly on the slide rails.

18. Tighten the 10-32 screws that secure the left slide assembly to the instrument rack.

19. Open the Q2.15 front door and install one 10-32 screw into each retainer tab next to the left and right front door hinge brackets.

20. Close and lock the Q2.15 front door.

21. See **Removing the Shuttle Shiplock** on page **24** before powering the library on.

Q4.30 Installation

General Notes: ■

- The Q4.30 design requires that two Q2.15 units be rack mounted immediately above/below one another in a standard rack.
- Upon completion of this procedure, the lower unit is the MASTER and initiates all operations for the Q4.30. The upper unit is designated the CLIENT.
- PassThru installation requires that both units be partially extended from the rack. The rack must be secured to avoid tipping during installation.
- Both Q2.15 units in a Q4.30 configuration must be running the same version of firmware code.
- If the installer is unfamiliar with the operations of a Q2.15, refer to *Q2 Library Operator's Guide*.
- If installing a Q4.30 into the optional stand alone rack, the rack slides will already be installed and you may omit **Rack Mounted Installation** on page **26**.
- Rack slides must be installed with the alignment gauge tool to ensure the units are square with each other.

Tools Required: (Supplied in Kit)

- 5/64" Hex
- T15 Torx
- Alignment Gauge

Unpacking the PassThru Kit

Carefully unpack all and verify all parts listed in **Table 6.** are present.

Table 6. List of Contents

Description	Quantity	Part Number
PassThru Mechanism	1	5130.0000
Screw, 6-32x1/2	10	1413.0030
Tool, 5/64" Hex Key	1	6800.0054
Tool, T15 Torx Key	1	6800.0035
Tool, Alignment Gauge	1	6800.0058
Installation Video	1	6800.0059
Label, Q4.30*	2	1320.0124
Cover, Sheet Metal*	1	5113.0007
Cable Tie	5	1890.0050
Cable Tie Mount, Adhesive	5	1890.0020

* Pre-installed if two Q2 libraries are purchased with the PassThru kit.

Installing the Q4.30 Rack

1. To begin installation, refer to **Rack Mounted Installation** on page **26** for illustrations of the sliderails then return here to continue.

Note

Do not tighten any screws. The mounting rails must be installed 8.75 vertical inches apart as shown in **Figure 16.**

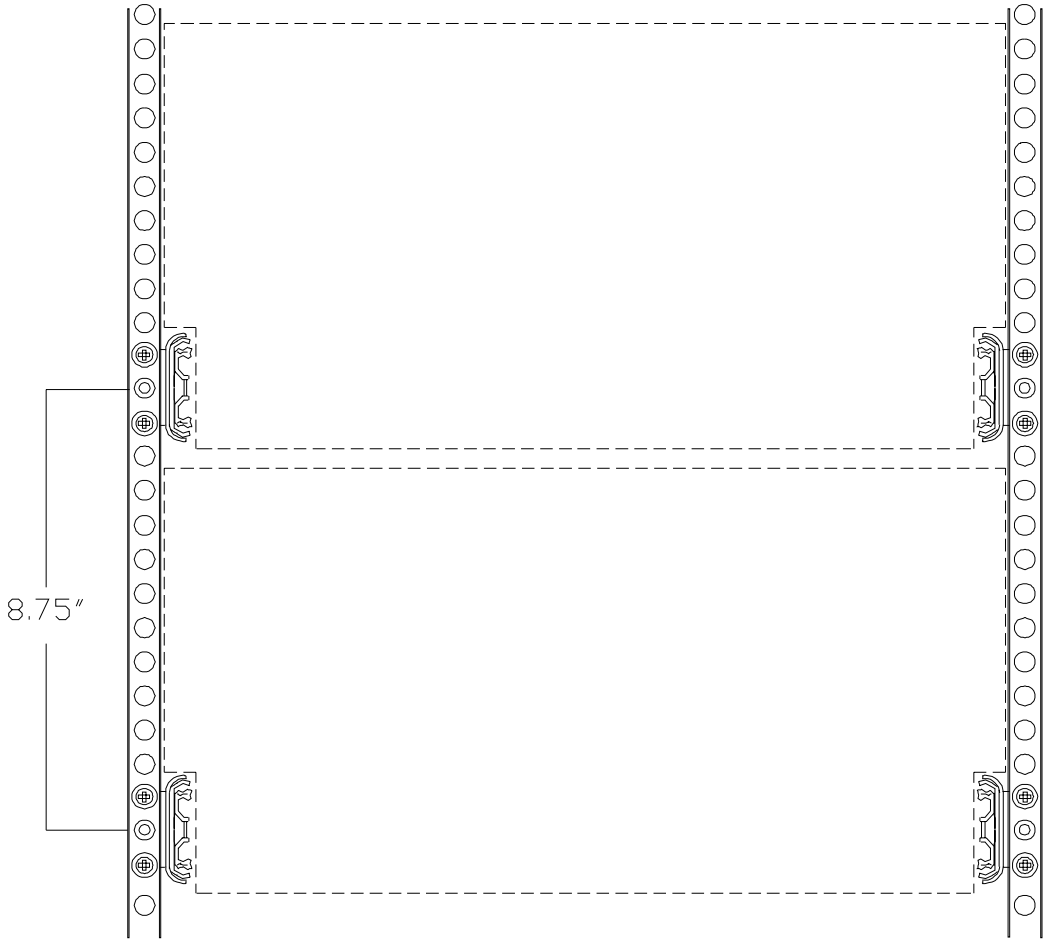


Figure 16. Vertical Rail Spacing

Note

Proper installation of the rack slides is critical to Q4.30 function. Ensure steps 1 through 5 are performed properly.

2. Tighten the screws on the lower right rack slide. Adjust the slide so it is approximately 1/8” from the rail front and rear as shown in **Figure 17.**

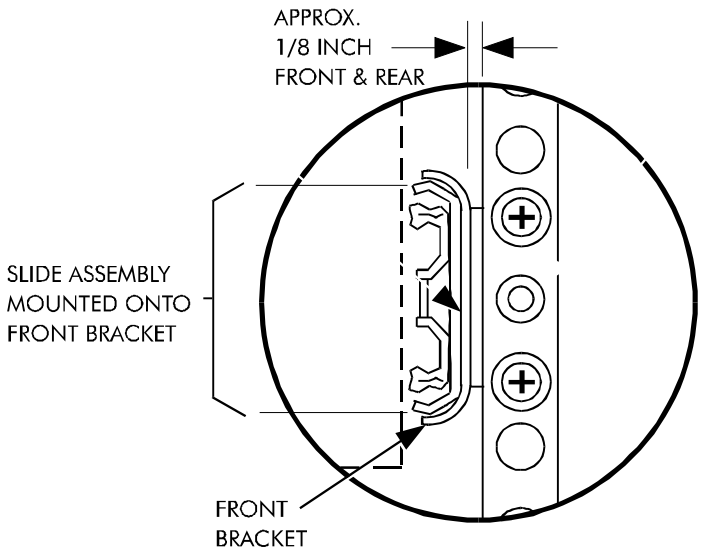


Figure 17. Rack Slide Placement

3. After the lower right rack slide is secured, use the rack slide alignment tool to locate the upper right slide as shown in **Figure 18.** The slides cannot be misaligned by more than 1/8". Secure the upper right slide by tightening the front and rear screws.

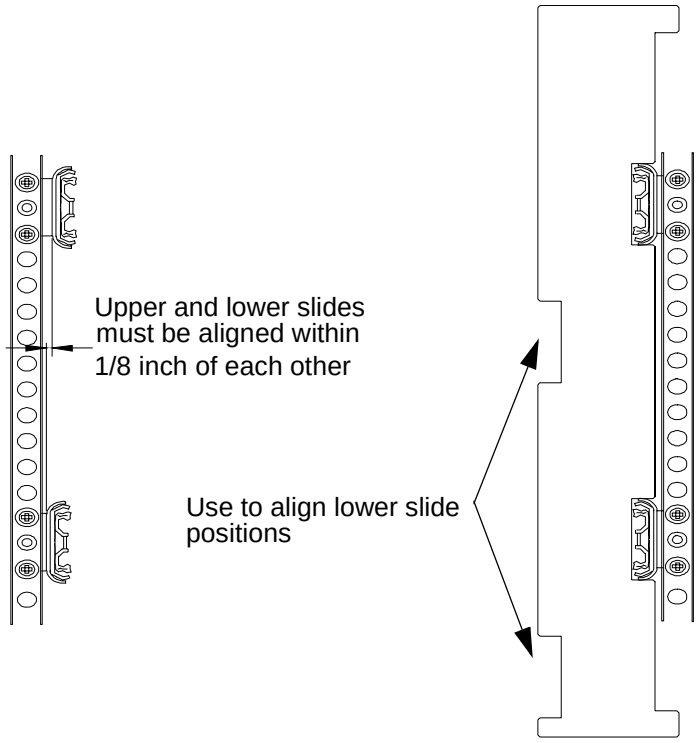


Figure 18. Vertical Alignment of Upper and Lower Slide

4. Adjust the upper and lower slides on the left, both front and rear, to the maximum distance allowed by the gauge and tighten in place as illustrated in **Figure 19.** This assures the two units are properly aligned.

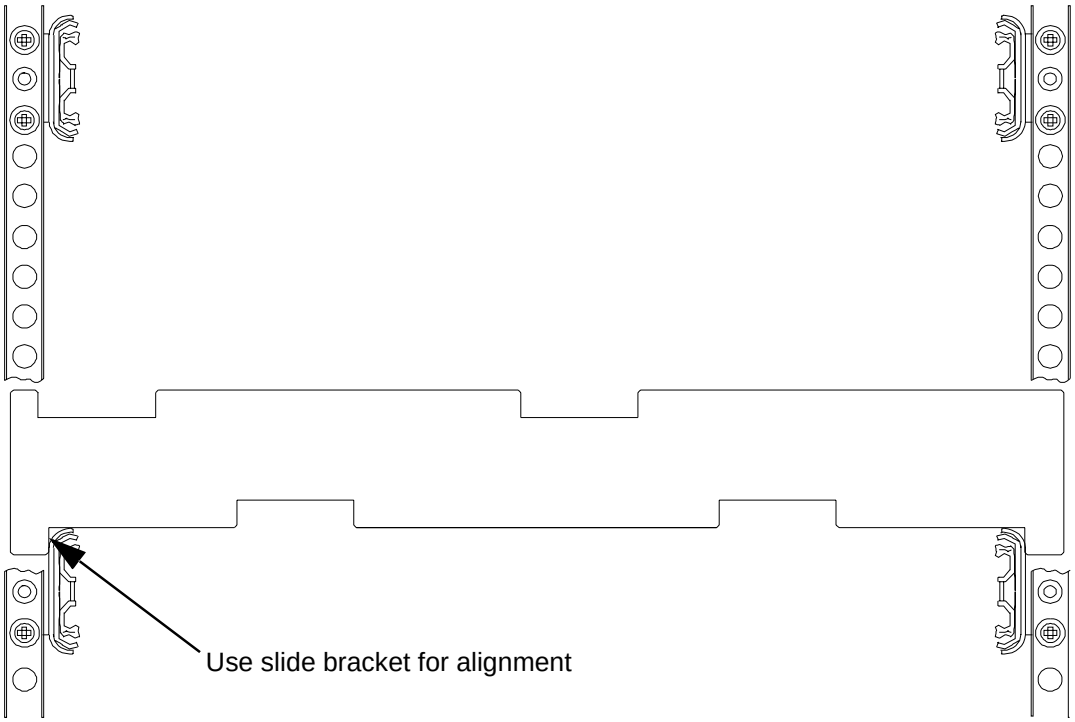


Figure 19. Horizontal Alignment of Rack Slides

5. Check the vertical alignment of the slides on the left with the rack slide alignment tool as shown in **Figure 18.** Ensure all screws are securely fastened.
6. Recheck and adjust both vertical and horizontal alignment on all four slides.

Master/Client Installation

1. Open the front bezel door on each unit and remove the cartridge magazines by firmly grasping the handles and pulling forward.
2. Remove the six screws which hold the top cover on the unit designated as CLIENT with the T15 key.
3. The PassThru Port is the rectangular opening located in the bottom left side of the chassis. On the CLIENT, remove the PassThru Port cover by removing four screws with the T15 key.
4. In the CLIENT, remove the fixed cell assembly with the 12” 5/64 allen key.
5. Insert the allen key into the two holes located in each front corner of the fixed cell assembly. Loosen *(DO NOT REMOVE)* the screws.
6. Once the screws are loosened, pull the fixed cell assembly forward to release from the key holes and lift out.

7. The MASTER unit top cover must have a PassThru cutout. If the MASTER cover does not have a PassThru cutout, replace the existing cover with a cover that has a PassThru cutout. (A cover with a PassThru cutout is included in the PassThru kit.)
8. Install the MASTER Q2.15 unit into the lower position in the rack.
9. The PassThru mechanism will arrive with the MASTER communication cable plugged into the JI connector on the PassThru board. Remove the communication cable from the PassThru board. The end of the cable (board end) is marked P1/P3.
10. After installing the MASTER unit into the rack and before installing the CLIENT unit into the rack, plug the other end of the communication cable (marked P7) into the J7 plug on the motherboard of the MASTER unit. The J7 is the 8-pin connector located just above the fixed cells in the MASTER unit. (See **Figure 22.** for motherboard connector location.)
11. Secure the communication cable to the power module wall of the MASTER unit with the cable tie down provided with the PassThru kit. See **Figure 20.**

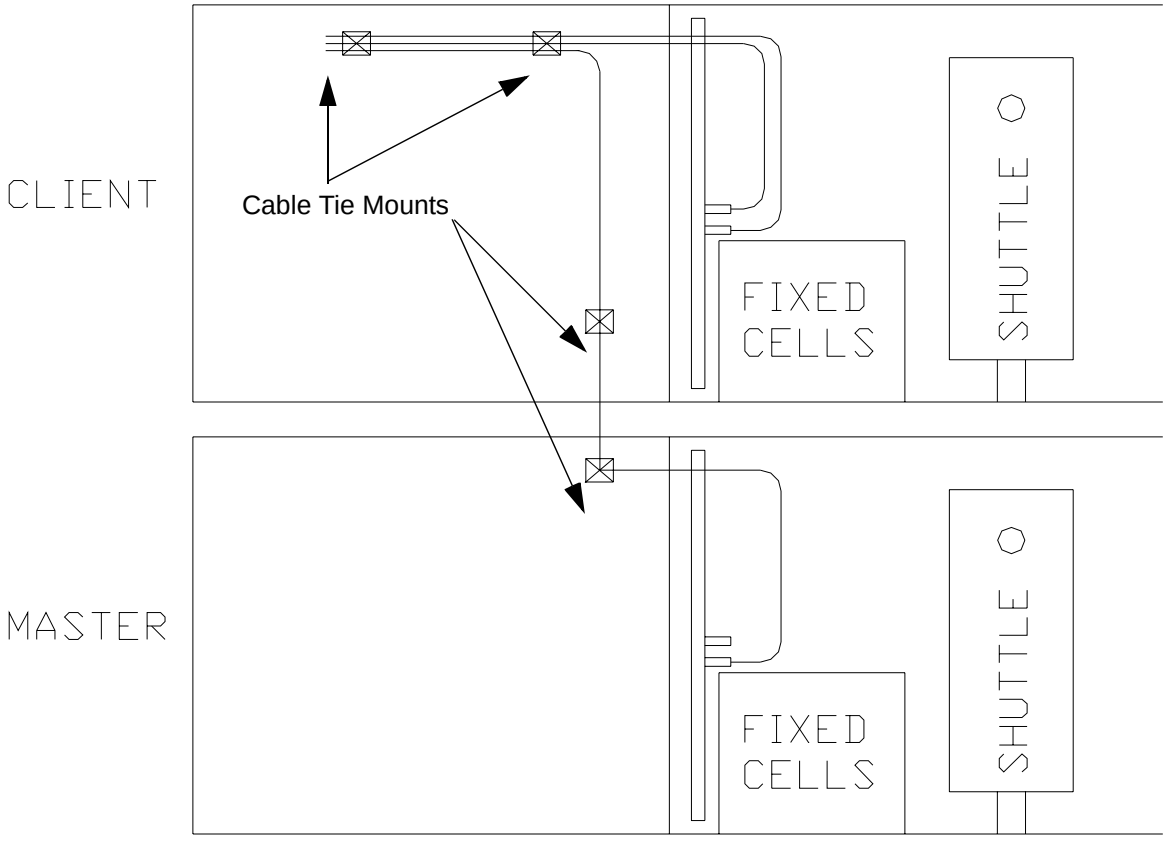


Figure 20. Cable Routing for PassThru Installation

12. Install the CLIENT unit into the rack above the MASTER unit.

13. With a tie down provided, secure the communication cable to the power module wall of the CLIENT unit to keep the cable away from the elevator as shown in **Figure 20.**

PassThru Installation

1. Move the elevator on the PassThru to its uppermost position. (The top of the PassThru is the end with the circuit board.)
2. Insert the communication cable into the J1 connector on the PassThru board.

Warning

Secure the rack so it does not tip over when both units are extended.

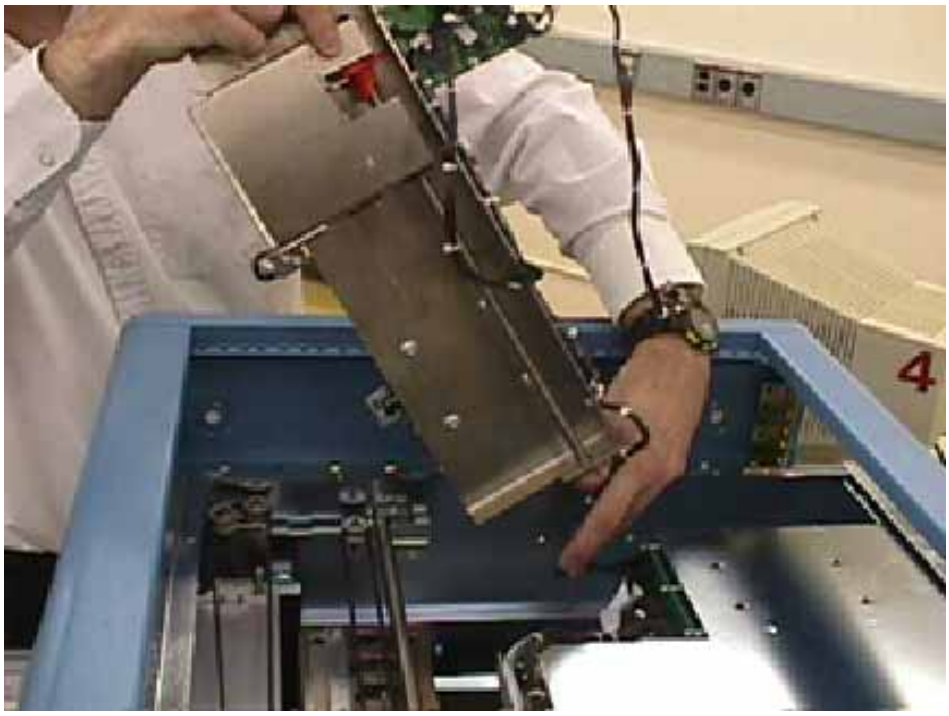


Figure 21. PassThru Installation

3. With both units partially extended from the rack, lower the PassThru mechanism into the CLIENT and MASTER machines as shown in **Figure 21.**
4. Secure the PassThru mechanism to the outer left side of each Q2.15 with eight flathead screws using the 12” 5/64 allen key.
5. In the CLIENT, attach the 8-pin P7 cable to the J7 connector and the 6-pin P6 cable to the J6 connector on the motherboard. The J7 and J6 connectors are illustrated in **Figure 22.**

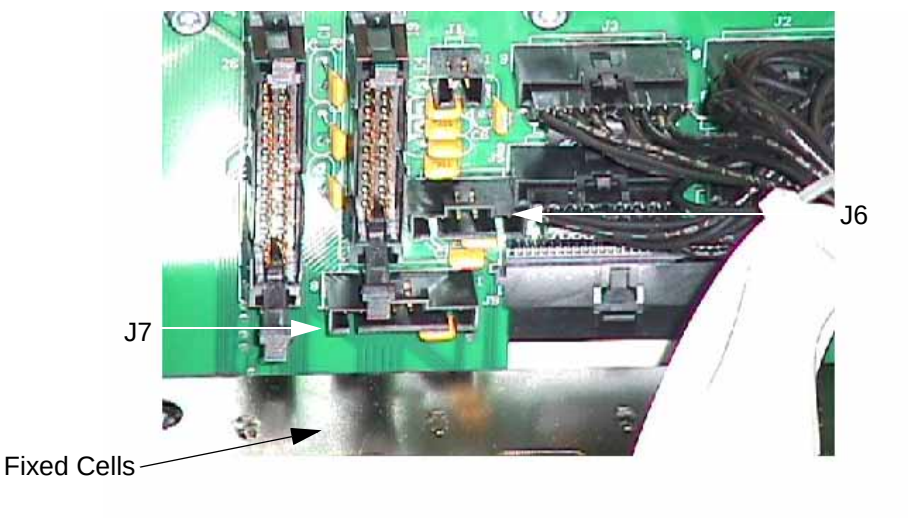


Figure 22. Detail of J7 and J6 Motherboard Connectors

6. Secure the P7 and P6 cable from the CLIENT and the communication cable from the MASTER to the power module wall of the CLIENT unit with two tie downs (provided with the PassThru kit and displayed in **Figure 20.**)
7. Replace the fixed cells in the CLIENT and tighten the screws.
8. Replace the CLIENT's top cover and secure with the 6 screws.
9. Push both machines back in to the rack and secure in place.
10. Return the removable cartridge magazines to their machines.
11. Close and lock the front bezel door, turning the key to the 12 o'clock position.

Q4.30 System Configuration

1. Power the CLIENT unit on.
2. Press a front panel key to enter the setup parameters.
3. Press the **Menu** key repeatedly until PASSTHRU OFF displayed.
4. Press the **Cycle** key until SET AS CLIENT is displayed.
5. Press the **Select** key to select this mode of operation.
6. Press the **Menu** key repeatedly until the machine re-initializes. After initialization is complete, the front panel will display PASSTHRU CLIENT.
7. Power on the MASTER unit.
8. Press a front panel key to enter the setup parameters.
9. Press the **Menu** key until PASSTHRU OFF is displayed.
10. Press the **Cycle** until SET AS MASTER is displayed.
11. Press the **Select** key to select this mode of operation.
12. Press the **Menu** key repeatedly until the machine re-initializes.

After initialization the front panel will now display Q4.30 in the place of Q2.15. The MASTER unit now will communicate with the CLIENT unit to complete the initialization process and verify code level and PassThru operation.

Y-Offset Calibration

1. Place at least one cartridge in the CLIENT magazine and at least one cartridge in the MASTER magazine.
2. On the MASTER, press the **Menu** key then **Select** on change mode. Press the **Cycle** key until DIAG OFFLINE is displayed and press the **Select** key to select DIAG OFFLINE operation.
3. Press the **Menu** key, then **Cycle** until MAINTENANCE MENU is displayed.
4. Press **Select** to select the menu.
5. Press the **Cycle** key to display PT Y CALIBRATION.
6. Press the **Select** key to start the calibration.The Q4.30 performs a series of moves to set both upper and lower Y offsets. The X offsets are set in the factory and do not need to be reset.

Note

The passthru calibration takes approximately ten minutes. The MASTER display will display PT CALIB DONE.

The Q4.30 is now ready for operation.

3

System Operation and Communication

This chapter covers operator tasks and communication topics which the end user would use under normal operation. The information included in this chapter are:

- Setup
  - Installing Tape Cartridges
  - Cabling
  - Powering the library on and off
- Operations
  - How to use the front door key
  - Operational Modes
  - Library Operations

Setup

Library Setup is performed by the end user and consist loading and unloading tape cartridge magazines, installing SCSI cables and terminators, and powering the library on and off.

Installing Tape Cartridges

Unloading a Magazine

1. Turn the front door key to the 9 o'clock position to disable the robotics, enable the operator panel, and open the front door.
2. To unload a magazine, grasp the flanges on the right and left sides of the magazine, then pull the magazine straight out from the unit.

To load the magazine with tape refer to **Loading Tapes in a Magazine** on page **45**.

Loading a Magazine

The following procedure explains how to load or unload a tape cartridge magazine through the front door.

1. Turn the front door key to the 9 o'clock position to disable the robotics, enable the operator panel, and open the front door.
2. To load a magazine, push the magazine straight into the unit. The retention springs are strong; push firmly while keeping the magazine straight. Make sure the magazine is completely seated and aligned in the opening.
3. Close the front door.
4. Turn the front door key to the 12 o'clock position to lock the front door and enable the robotics.

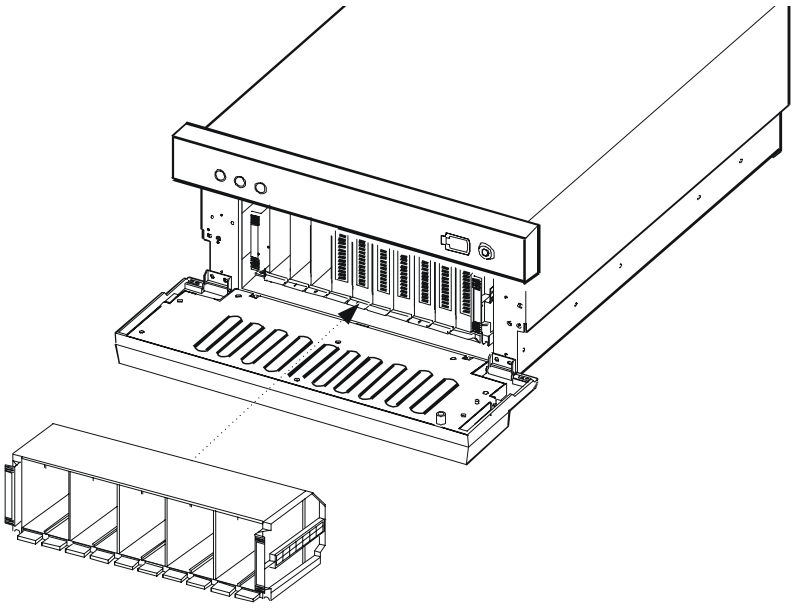


Figure 23. Magazine Load/Unload

Load/Unload a Fixed Cell

To load a fixed cell, remove the magazine (see instructions above). Load the cells by inserting a tape cartridge with the bar code facing out and the tape reel facing to the right. To unload a fixed cell, simply grasp the top and bottom edge of the tape and pull out.

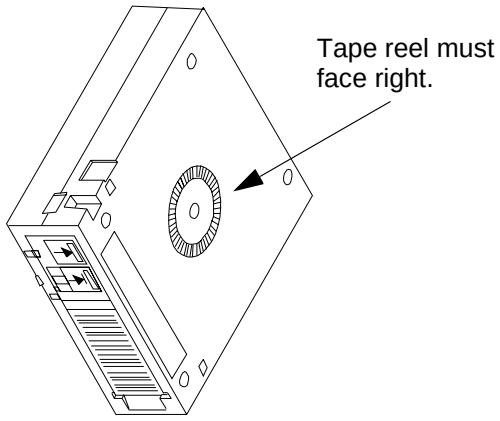


Figure 24. Tape Cartridge

Loading Tapes in a Magazine

1. Turn the front door key to the 9 o'clock position to disable the robotics, enable the operator panel, and open the front door.
2. Load the magazine by inserting a tape cartridge through the front door with the bar code facing out and the tape reel facing to the right. See **Figure 24.**
3. Push the tape cartridge all the way in until the tape is securely seated.

Unloading Tapes from a Magazine

1. Turn the front door key to the 9 o'clock position to disable the robotics, enable the operator panel, and open the front door.
2. Remove the magazine from the library by grasping the flanges on the right and left sides of the magazine, then pull the magazine straight out from the unit.
3. Place the magazine on a flat surface.
4. Hold down the front tab on the magazine and push the back of the tape forward.

Cabling

Use the following information to correctly connect the SCSI cables and power cord.

SCSI Cables

The SCSI cable configuration depends on the requirements and needs of the system to which the unit is connected. The Q2 product can be connected to a single host computer that provides motion commands as well as reading and writing data to the tape drives. Additionally, they can be connected to two computers. One possible configuration is that the first computer provides the motion commands and reads and writes data to one tape drive in the library; the second computer reads and writes data to the second tape drive in the library. When operating as a dedicated autoloader (sequential mode), only the host-to-tape drive SCSI cable needs to be connected. **Figure 25.** on page **47** shows two possible cable configurations.

The SCSI cables to connect the controller to the tape drives are included. The installer must supply the SCSI cable that connects the controller to the host computer. In a Q4.30 configuration, only one controller is cabled to the host. To ensure proper operation the SCSI cables supplied by the installer must meet the following specifications.

- Connector: 68 pin, F, W. Micro “D” screw mount (2-56 screw), gold plated connector pins.
- Cable: Double shielded, foil and braid, standard SCSI configuration.

Use only shielded cables (foil and braid) with gold plated connector pins. Cables with tin or nickel connector pins do not provide a reliable contact over time.

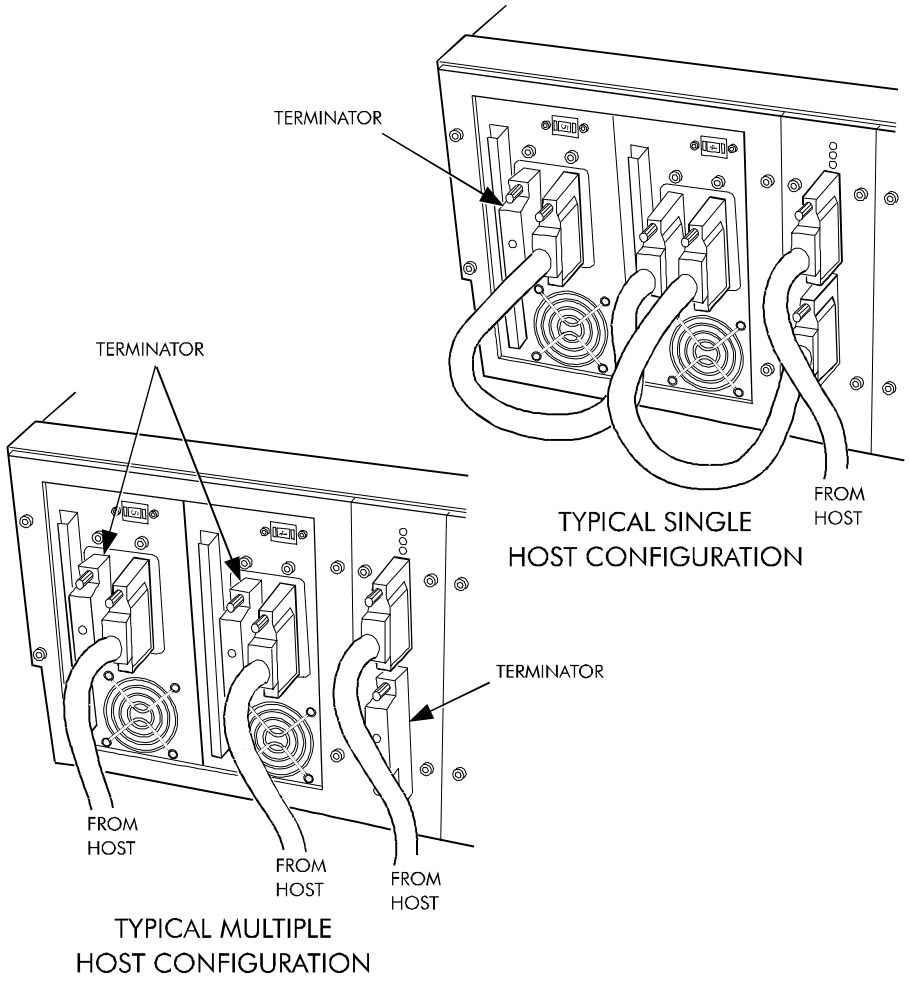


Figure 25. Q2 Cabling Example

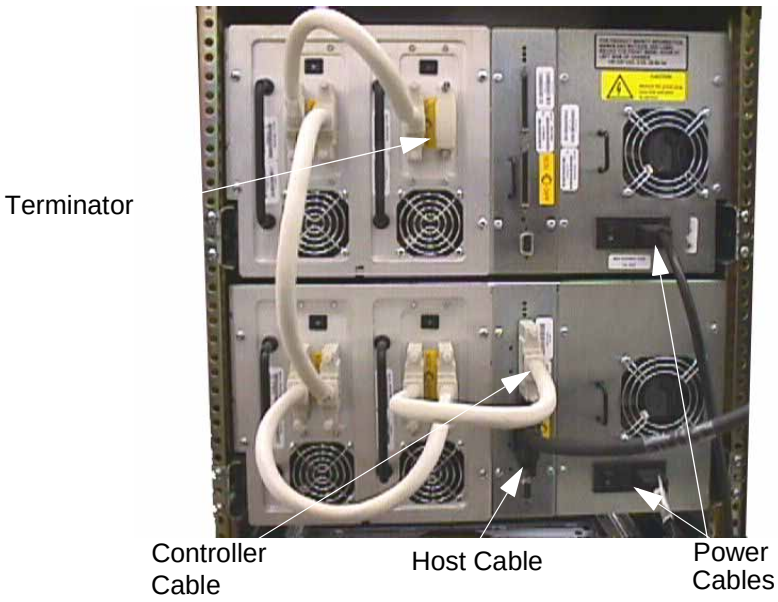


Figure 26. Q4.30 Cabling Example

Powering the Library On and Off

A Q2 product can be powered on at any time. The unit enters the initialization mode, and unless an interrupt occurs, goes into the on-line mode.

Except for system SCSI considerations, the library can be powered off at any time. To avoid errors, make sure the library is not performing an operation. If the library is shut down while performing an operation, it will conclude the operation after reinitializing, before re-establishing communications with the host computer.

Operations

The Q2 is designed for unattended operation; the normal storage and retrieval of data does not require any intervention. However, there are times when a user will need to perform routine operations. This chapter discusses the different Q2 operational modes and the following:

How to Use the Front Door Key

The front door key has three positions, two of which are used in normal operation:

KEY AT 9 O'CLOCK POSITION: Placing the key in this position opens the front door, disables the robotics and enables the operator panel. The key cannot be removed from the door in this position.

KEY AT 12 O'CLOCK POSITION: Placing the key in this position locks the front door, and enables the robotics and operator panel. The key can be removed from the door in this position.

KEY AT 3 O'CLOCK POSITION: Placing the key in this position locks the front door, enables the robotics and disables the operator panel. The key can be removed from the door in this position.

Figure 27. shows the three key positions and labeling on the front door.

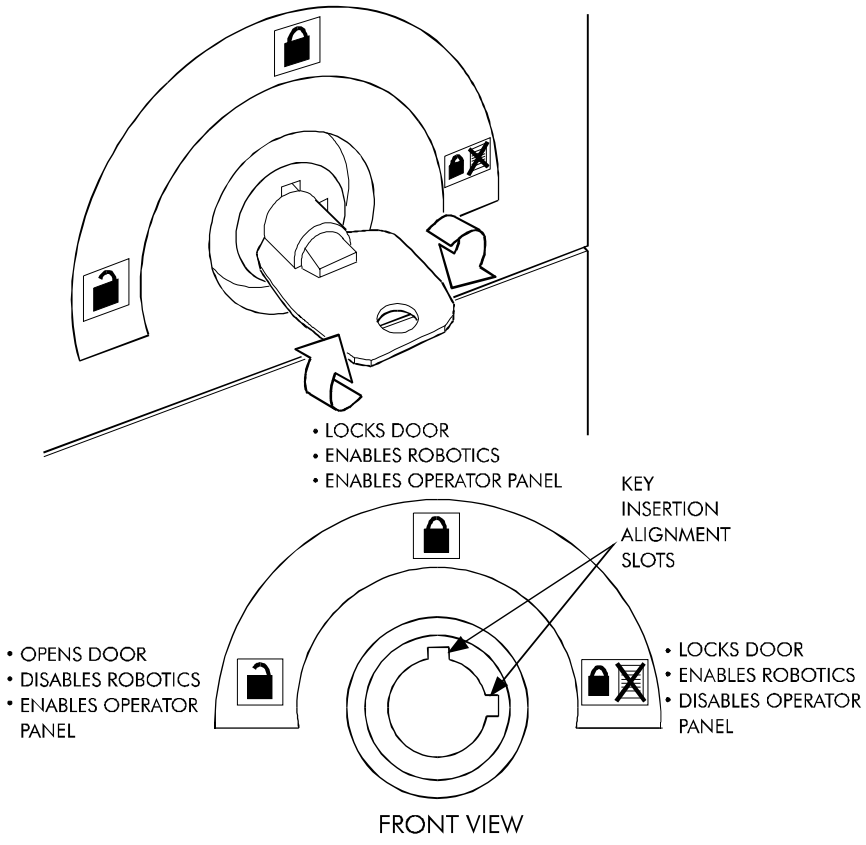


Figure 27. Key Lock

Operational Modes

While the library is powered on, it is in one of four modes:

- Initialization/Setup
- On-line
- Off-line
- Diagnostic Off-line

Each of these modes is described in the following sections.

Initialization/Setup Mode

The Q2 enters the initialization / setup mode when the subsystem is first powered on or when a subsystem reset occurs. If uninterrupted, the library automatically goes from initialization/setup into the on-line mode. No SCSI communication with a host occurs in the initialization/setup mode.

On-Line Mode

After initialization, the library automatically enter the on-line mode. Normal host operations (such as tape cartridge mounts and dismounts) are run in the on-line mode. SCSI communication with the host is enabled. Changing from on-line mode requires that another mode be selected from the operator panel.

Off-Line Mode

To enter the off-line mode, the operator must manually select OFFLINE from the operator panel.Limitad SCSI communication occurs in the off-line mode.

Diagnostic Off-Line Mode

Use the diagnostic off-line mode to perform diagnostic tests or exercises on the device. In this mode the RS-232 port is active and SCSI communication with the host is not enabled. Access the diagnostic off-line mode by selecting DIAG OFFLINE from the operator panel. Diagnostic off-line mode is exited when another mode is selected using the operator panel or after remote diagnostics are finished and turned off.

Library Operations

Control Keys and the Operator Panel

The control keys and the operator panel provide a way for a user to:

- Change the operational mode to:
  - Off-line
  - Diagnostic off-line
  - On-line
- Initiate an activity to:
  - Move a cartridge
  - Begin confidence testing
  - Enable the serial interface to perform remote diagnostics
- Change the setup parameters

Figure 28. shows the control keys and operator panel on the front door. The operator panel displays information that is typically shown during normal operation.

The control keys and operator panel can be configured for either a menu/cycle presentation or a scrolling presentation.

In the menu/cycle presentation, a user brings up the desired operational menu, chooses an operation option, and initiates the operation.

In the scrolling presentation, a user moves an arrow up or down to choose the operation and options.

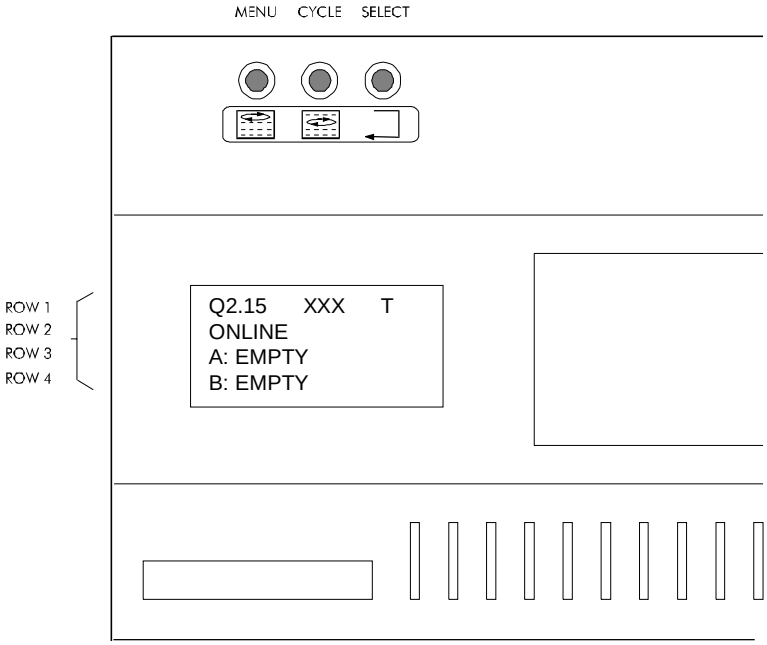


Figure 28. Control Keys and Operator Panel

The Q2.15 and Q4.30 default is the menu/cycle presentation; however, a user can change to the scrolling presentation when running setup.

Note *When placed into AUTOLOADER MODE, the menu display option is scrolling presentation. AUTOLOADER MODE is defined in Appendix A.*

How to Use the Control Keys

The Q2 products have three control keys: **Menu**, **Cycle**, and **Select** (see **Figure 28.** on page **51**). Each control key performs a specific function, regardless of whether a user is changing modes, initiating an activity, running tests, or setting parameters. **Table 7** lists the key functions for both the menu/cycle presentation and the scrolling presentation.

Table 7. Control Key Functions

Key	Menu/Cycle Presentation	Scrolling Presentation
MENU	Pressing this key changes from the current operational menu to the next. The current operational menu is shown on row 1. The operation shown on row 1 is not performed until the **Select** key is pressed.	Moves arrow up.
CYCLE	Pressing this key switches between alternative actions for the operational menus. The current alternative action is shown on row 2. The operation shown on row 2 is not performed until the **Select** key is pressed.	Moves arrow down.
SELECT	Pressing this key causes the Q2.15 to perform the menu operation and alternative chosen to be performed.	Pressing this key causes the Q2 product to perform the operation chosen to be performed.

Operator Panel

The operator panel is a liquid crystal display that provides information about the status and current operating mode of the library, and in the event of an operational problem, error codes that can be used to determine the cause of the problem. The operator panel consists of four rows with 16 characters in each row. (In this description the rows are numbered from top to bottom with the top row being row 1 and the bottom row being row 4.)

Note

The key lock must be in 9 o'clock or 12 o'clock position for the control keys to work.

When the Q2 products are in the on-line mode and running normally, information similar to the following is shown.

Random Access Mode	Autoloader Mode
Q2.15 X.XX 6 ONLINE Q2 A: IDLE B: IDLE	Q2.15 X.XX Autoloader: ON A: IDLE B: IDLE
X.XX represents the firmware version running on the Q2 product.	

Row 1 shows the model identification and the version of firmware running the unit; row 2 shows the current operational mode; row 3 shows status for tape drive A; row 4 shows status for tape drive B (when the Q2.15 has two tape drives).

Library and Autoloader Mode

All Q2 products can run in either random access (default library mode) or sequential (autoloader) robotics mode and display the appropriate information for the operational mode.

Note

The unit must be placed into autoloader mode during initialization, through the setup menu. See **Setup Procedure** *on page* **57***. While in Autoloader mode, the device disables all SCSI communication ability with the host and simply operates in sequential mode.*

Autoloader Mode

Cartridges in the drive(s) are automatically exchanged by the robotics when the cartridge in the drive is ready to unload. The "ready to unload" state is accomplished by the host computer issuing a **SCSI Unload** to a drive. The cartridges are loaded in sequential order into the drive(s). The first cartridge of a load sequence is determined by the user loading a cartridge into a drive from the front panel.

Initiating an Autoload Sequence

From the operator panel control keys, the user selects a move from the first storage cell of a desired autoload sequence into the desired drive. The Q2.15 sets up the autoload sequence to be contiguous from the source storage cell of the loaded cartridge to the last occupied cell up to storage cell 14.

For example, if a cartridge is moved from cell 1 into drive A and there are cartridges in storage cell 2 through 5. The autoload sequence will be cells 1 through 5. When cell 5 is unloaded, no more cartridges will be loaded into the drive.

Determining the Current Autoload State

The current state of an autoload sequence can be determined by selecting the option AUTOLDR MAPPING from the front panel interface. The display will have the following format.

A: XX RANGE YY-ZZ

This indicates that the cartridge from cell XX is currently in drive A. The range of the autoload sequence is from YY to ZZ.

Two Drive Autoload System

A Q2.15 with two drives supports two autoload sequences. The first sequence is initiated from a front panel move from a storage cell into a drive. The second sequence is initiated with a move from a storage cell into the other drive. The first sequence is modified internally so as not to overlap the second sequence. The front panel autoloader mapping option will show both drives and their respective sequence.

Aborting an Autoload Sequence

The autoload sequence can be terminated and the mapping cleared by any of the following:

- Opening the front door
- Reaching an unoccupied storage cell
- Powering the Q2.15 OFF then ON

Autoloader Loop Mode

Loop mode can be selected during the initialization/setup operation during power up. When the last cartridge of a set becomes unloaded, the cartridge is stored in its source storage cell. Next, the first cartridge of the sequence is automatically reloaded into the tape drive and the sequence is restarted.

When the library is in the off-line or diagnostic off-line mode, information in the display panel is similar to the display below.

Random Access Mode	Autoloader Mode
Q2.15 X.XX DIAGNOSTIC OFFLINE A: DLT7000 YYYY B: DLT7000 YYYY	 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 DIAGNOSTIC OFFLINE A: DLT7000 YYYY B: DLT7000 YYYY
X.XX is the firmware version running on the Q2 product. YYYY is the firmware level of the DLT tape drives.	

Again, row 1 shows the model identification and the version of firmware running the unit, and row 2 shows the current operational mode. Row 3 now shows the version and operational level for tape drive A and row 4 shows the same information for tape drive B.

The information shown on the operator panel changes to reflect the operational status of the unit. When a user performs different operations, the operator panel changes to prompt the user through the operation. The following section describes the menu operations and different operator panel menus for both the menu/cycle presentation and the scrolling presentation.

Display Presentations

Menu/Cycle Presentation

The menu/cycle presentation shows a unique menu at the beginning of each operation. (This is the default menu presentation for the Q2.15 and Q4.30 Tape Library.) All operations are started by pressing the **Menu** key. Each successive press of the **Menu** key causes the next menu to show on the operator panel.

After you have chosen a menu, further actions are performed by pressing combinations of the **Cycle** and **Select** keys. The sequence for pressing the keys are explained in the specific procedures.

Scrolling Presentation

The scroll presentation displays the titles for each operation on one menu. (Only four menu lines can be displayed on the operator panel at one time. However, as the user scrolls down the menu, the lower lines appear on the operator panel.) (Machine code revision 1.20 or higher can be configured for the scroll menu.) An arrow on the left side of the menu points to the operations. The arrow can be moved up or down to point at a specific operation: press the **Cycle** key to move the arrow down, the **Menu** key to move the arrow up. To choose a specific operation, move the arrow so that it points to the operation, then press the **Select** key. After pressing the **Select** key, the operation is performed or additional menus are shown for further selections. Following is how the scrolling presentation appears.

Setup Information

The setup information enables a host computer to identify and communicate with the Q2.15. Setup information is stored in non-volatile RAM. In the event of a power outage, the setup information is retained. When shipped, the Q2.15 is set to the default library mode.

If the defaults are acceptable, the Q2.15 is ready for normal operation immediately after power on. If the setup must be changed (for example, to change the SCSI ID number), perform the setup procedure in the following section.

When the Q2.15 is powered up or reset (by cycling power or pressing the reset button), the setup parameters can be redefined.

Table 8. Setup Parameters

Setup Parameter	Definitions	Default Settings	Valid Settings
SCSI ID*	SCSI target ID.	6	0-7
SCSI PARITY	SCSI bus data parity detection.	ON	ON/OFF
PASSTHRU		OFF	OFF/Master/Client
EMULATE		NATIVE	NATIVE/EXB120/ Q7 (If PassThru on client Q47)
SCSI INQUIRY	SCSI inquiry vendor ID and product ID.	Q2	Q2/7337/3447
3 or 9 CHECK	Bar code check character.	ON	ON/OFF
AUTO INV-C	Auto inventory after media change	OFF	ON/OFF
AUTO INV-Prw	Auto inventory after power cycle	OFF	ON/OFF
SCROLL MENU	Selects the scrolling menu presentation.	OFF	ON/OFF
AUTOLOADER	Selects the autoloader function.	OFF	ON/OFF LOOP
EXIT	Exits and/or restarts the setup procedures	Restart	EXIT/RESTART

*(This SCSI ID refers only the library controller. The tape drive IDs are not shown on the operator panel.)

Press the **CYCLE** key to cycle through each of the SCSI IDs, 0 through 7, until row 2 shows the desired SCSI ID.

The SCSI ID on the tape drives might need to be changed if the user changes the controller SCSI ID. The SCSI ID on a tape drive can be changed using the push-button switch on the drive rear panel. The push-button is integral with the SCSI ID number display. Press the switch button to the right or left of the number display to set the tape drive to the desired SCSI ID.

If the tape drive SCSI IDs are changed, power must be cycled off then on before the change is activated.

Setup Procedure

Use the following procedure to reset the setup parameters.

Note *Make sure the front door key lock is in the 12 o'clock position.*

1. Enter the initialization/setup mode by any of the following methods:
   - Power off and on
   - Press the reset button on the controller
   - Re-initialize through the operator panel by depressing the three control keys simultaneously for four seconds
2. Press any control key to queue the setup mode.
3. When the first parameter is displayed, use the **Menu** key to scroll through each parameter. (Parameters are described in **Table 8** on page **56**.)
4. After the parameter is displayed, use the **Cycle** key to cycle through the parameter settings.
5. Select a new setting by pressing the **Select** key to enter the change.

Menu Operations

The operations that can be performed using the control keys and operator panel are shown in **Table 9.** Certain operations can only be performed from a specific (prerequisite) mode or modes; therefore, before selecting an operation, make sure the unit is in the proper mode. For example, a cartridge move operation can only be performed with the unit in the diagnostic off-line mode. If the Q2 product is not in the correct operational mode, it will show a message on the operator panel prompting the user to change to the correct mode.

Table 9. Menu Operations

Menu Operation	Prerequisite Mode	Description
CHANGE MODE	None	Changes the Q2.15 operational mode. Operational modes are: ONLINE OFFLINE DIAGNOSTIC OFFLINE
MOVE CARTRIDGE	Diagnostic Off-line for random access mode. None for autoloader robotic mode.	Moves selected cartridges to selected storage locations.
DLT DIAGNOSTIC	Diagnostic Off-line	Performs a drive read/write test.
CONFIDENCE TESTS	Diagnostic Off-line	Moves cartridges randomly throughout storage locations. This operation does not insert a tape cartridge into a tape drive. The confidence tests can be stopped by pressing any control key.
REMOTE DIAGNOSTICS	Diagnostic Off-line	Enables communication through the RS-232 interface.
DRVLDULD	Diagnostic Off-line	Moves cartridges randomly throughout storage locations and tape drives.
COMM TEST	Diagnostic Off-line	
MAINTENANCE MENU	Diagnostic Off-line	Service related: Machine serial number SCSI configuration SE, single-ended D, differential Re-initialize the machine Reset the statistics Reset robotic datums Load Code Tape PassThru Y Calibrate (4.30 only)

Change Modes Through the Operator Panel

Use the following procedure to change the operational modes to ONLINE, OFFLINE, or DIAG OFFLINE

Note *Make sure the front door key lock is in the 9 o'clock 🕘 or 12 o'clock 🕛 position.*

Menu/Cycle Presentation

1. Press the **Menu** key once. CHANGE MODE appears in the display.
2. Press the **Cycle** key until the desired operational mode (ONLINE, OFFLINE, or DIAG OFFLINE) is shown on row two of the menu.
3. Press the **Select** key to set the new mode.

   The library is now in the new operational mode. The operator panel shows the starting menu with the new operational mode on row two.

Scrolling Presentation

1. Press the **Cycle** key until the arrow points to CHANGE MODE.
2. Press the **Select** key once to enter the sub-menu.
3. Press the **Cycle** key until the arrow is pointing to the desired operational mode.
4. Press the **Select** key to set the new mode.

   The library is now in the new operational mode. The operator panel shows the starting menu with the new operational mode on row 2.

Move a Cartridge Through the Operator Panel

A user can move a tape cartridge from a storage cell to a tape drive or another cell; or from a tape drive to a storage cell or another tape drive. The following procedures explain how to move a tape cartridge.

Note *It is not recommended to move a tape from a drive. If a tape must be moved from the drive, the unload button may need to be pressed if an error occurs.*

Note *Make sure the front door key lock is in the 9 o'clock 🕘 or 12 o'clock 🕛 position.*

Note *If the library is in random access robotics mode (the default mode) change it to the diagnostic off-line mode (see* **Change Modes Through the Operator Panel** *on page* **59***.)*

Moving a Tape Cartridge from a Cell to a Tape Drive

Menu/Cycle Presentation

1. Press the **Menu** key until MOVE CARTRIGDE appears in the display panel.
2. Press **Select** once. SELECT SOURCE appears.
3. Press **Cycle** until MAGAZINE is displayed.
4. Press **Select** to define the source. CARTRIDGE 00 is displayed. The left 0 will be highlighted and appear to flash.
5. Choose the first digit with the **Cycle** key.
6. Press the **Select** key to enter the first digit. The right 0 will now be highlighted and appear to flash.
7. Choose the second digit with the **Cycle** key.
8. Press the **Select** key to enter the second digit.
9. SELECT DEST is displayed. Press the **Cycle** key until DRIVE is displayed.
10. Press **Select** to enter the drive as the destination.
11. Press **Cycle** to display the empty drive.
12. Press **Select** to choose the drive, then **Select** again to execute the move.

Scrolling Presentation

1. Press the **Cycle** key until the arrow points to MOVE CARTRIDGE.
2. Press the **Select** key once. The arrow points to STORAGE CELL.
3. Press the **Select** key again. CARTRIDGE 0 appears in the display.
4. Press the **Cycle** key to increase the storage cell number. Press the **Menu** key to decrease the storage cell number.
5. Press the **Select** key once. SELECT DEST appears in the display.
6. Press the **Cycle** key to move the arrow from STORAGE CELL to DRIVE.
7. Press the **Select** key once.
8. For Q2 Tape Libraries with two or more tape drives, use the **Cycle** key to cycle to the desired drives.
9. Press the **Select** key once to select the drive.
10. To execute the move operation, press the **Select** key once.
11. The display menu will scroll through the current operations being performed.
12. When the operation is complete, press the **Menu** key two time to return to the main menu

Moving a Tape Cartridge from a Tape Drive to a Cell

Note *To move a cartridge from a drive, the green operate handle light must be on. To accomplish this press the unload button on the front of the drive.*

Menu/Cycle Presentation

1. Press the **Menu** key until MOVE CARTRIGDE appears in the display panel.
2. Press **Select** once. SELECT SOURCE appears.
3. Press **Cycle** until DRIVE is displayed.
4. Press **Select** to define the source
5. Choose a drive with an installed tape cartridge, by pressing the **Cycle** key to display the desired drive.
6. Press **Select** to enter your choice. The shuttle will retrieve the tape, then SELECT DESTINATION will display. (The destination cell must be empty.)
7. Press the **Cycle** key until MAGAZINE is displayed
8. Press **Select** to define the source. CARTRIDGE 00 is displayed. The left 0 will be highlighted and appear to flash.
9. Choose the first digit with the **Cycle** key.
10. Press the **Select** key to enter the first digit. The right 0 will now be highlighted and appear to flash.
11. Choose the first digit with the **Cycle** key.
12. Press the **Select** key to enter the second digit.
13. Press the **Select** again to execute the move. The screen will show the move being performed.

Scrolling Presentation

1. Press the **Cycle** key until the arrow points to MOVE CARTRIDGE.
2. Press the **Select** key once. The arrow points to STORAGE CELL.
3. Press the **Cycle** key to move the arrow to DRIVE.
4. Press the **Select** key once.
5. For Q2 Tape Libraries with two or more tape drives, use the **Cycle** key to cycle to the desired drives.
6. Press the **Select** key once to select the drive.
7. Press the **Select** key once. SELECT DEST appears in the display.
8. Press the **Select** to select STORAGE CELL. SELECT DEST appears in the display.
9. Press the **Cycle** key to increase the storage cell number. Press the **Menu** key to

decrease the storage cell number.

10. After a cell has been entered, press the **Select** key once to select the cell.

11. Press **Select** again to execute the move.

12. The display menu will scroll through the current operations being performed.

13. When the operation is complete, press the **Menu** key two time to return to the main menu.

4

Service

This chapter describes preventive and corrective maintenance for the Q2.15 Library. Service oriented preventive maintenance consists of inspecting/replacing items at specific intervals that are subject to failure over time. Corrective maintenance includes troubleshooting, system tests, repair and replacement of parts, and post-repair adjustment/calibration procedures.

The repair philosophy is basically a module exchange, with some individual high-wear parts included. Topics in this chapter include:

- Electrical Safety
- Repairing the Library
- Preventitive Maintenance
- System Test
- Troubleshooting
- Repair and Replacement Procedures

Electrical Safety

Warning

These service instructions are for use by qualified personnel only. Do not remove covers or perform procedures unless qualified to do so. The library contains dangerous high voltages. CARELESS OR IMPROPER HANDLING CAN RESULT IN SERIOUS ELECTRIC SHOCK. Never perform maintenance with power applied. .

Caution

This equipment contains ESDS devices. Proper ESDS device handling procedures must be followed. Refer to the ESDS DEVICE HANDLING information at the front the Q2.15 Operators Guide.

Observe the following precautions when performing maintenance or adjustments with power turned on.

- Verify that the library chassis and test equipment chassis are connected to earth ground, except where specifically noted.
- Restrict the test area to qualified technicians.
- Remove all metal objects from your person.
- Use an insulated adjustment tool for making adjustments.
- Avoid placing any part of your body in close proximity to any high voltage area.
- Wait for high voltages to discharge after turning the power off. Each power supply should drain off all power in one minute when modules are properly installed.

Repairing the Library

The following sections provide information to assist in repairing the library.

Limited Repair

Repair of the library is limited to module exchange, with some individual high-wear parts included. Repair of the library and its assemblies are limited to replacement of selected parts due the following reasons:

- Complexity of design
- Cost of required test equipment
- Interaction of various modules
- Low failure rate
- Low replacement cost
- Repair time considerations

Repair Parts

All field replaceable parts are listed and illustrated in **Illustrated Parts Catalog** on page **129**.

Post Repair Adjustments

Electrical adjustments or calibrations are required after the library has been repaired. Mechanical and electrical adjustments are provided in chapter 5 Service.

Tools and Test Equipment

Table 10. provides a list of recommended test equipment and tools for use when performing library maintenance. No special tools are required to maintain the library.

Table 10. Required Equipment

Description	Use
Digital Multimeter (0-250 Vdc/Vac/_, ±0.001V accuracy)	T, A
PC compatible computer w/RS-232 Comm program and one free serial port or dumb terminal w/RS-232 port with serial interconnect (null modem) cable	T
Hex-drive set (9/64 to 1/8 inch)	R
Open end wrench set (1/4 to 5/8 inch)	R
Phillips Screwdriver (small & medium) #1 & 2	R
Torx Drivers (10, 15, 20, 25)	R, A

T - Troubleshooting
A - Adjustment
R - Remove/Replace

Preventative Maintenance

Unit Shut Down

Before performing work inside the library, power the library off and unplug the power cord to prevent electrical shock. The tape library can be powered off when the tape library is not performing an operation. If the tape library is performing an operation, it will conclude the operation after reinitializing itself and re-establishing communications with the host computer.

Avoid damage to the tape cartridge by unloading and removing the tape from the drives before turning off the power.

Caution

If the setup mode is inadvertently entered by pressing any one of the control keys during library initialization, DO NOT press the SELECT control key (right most key) at any time as this action will alter the setup parameter currently shown on the operator panel. To exit the setup mode without affecting any of the setup parameters, either recycle power (press the power switch off and then on) or repeatedly press the MENU control key (left most key) until you exit the setup mode

Cover Removal

This procedure describes how to remove and install the cover on the desktop tape library. **Figure 29.** shows a view of the cover and components that attach the cover to the desktop tape library.

1. Four screws secure the cover to the desktop tape library. Two screws can be reached by opening the front door. The remaining two screws can be reached at the back of the tape library.
2. Remove power from the tape library by setting the power switch to off.
3. Turn the door key position and open the front door.
4. Remove the two screws that secure the front edges of the cover to the tape library chassis.
5. At the rear of the tape library, remove the two screws that secure the back edges of the cover to the chassis.
6. Slide the cover straight up. You might need to pull the bottom edges of the cover away from the tape library to completely free it from the chassis.

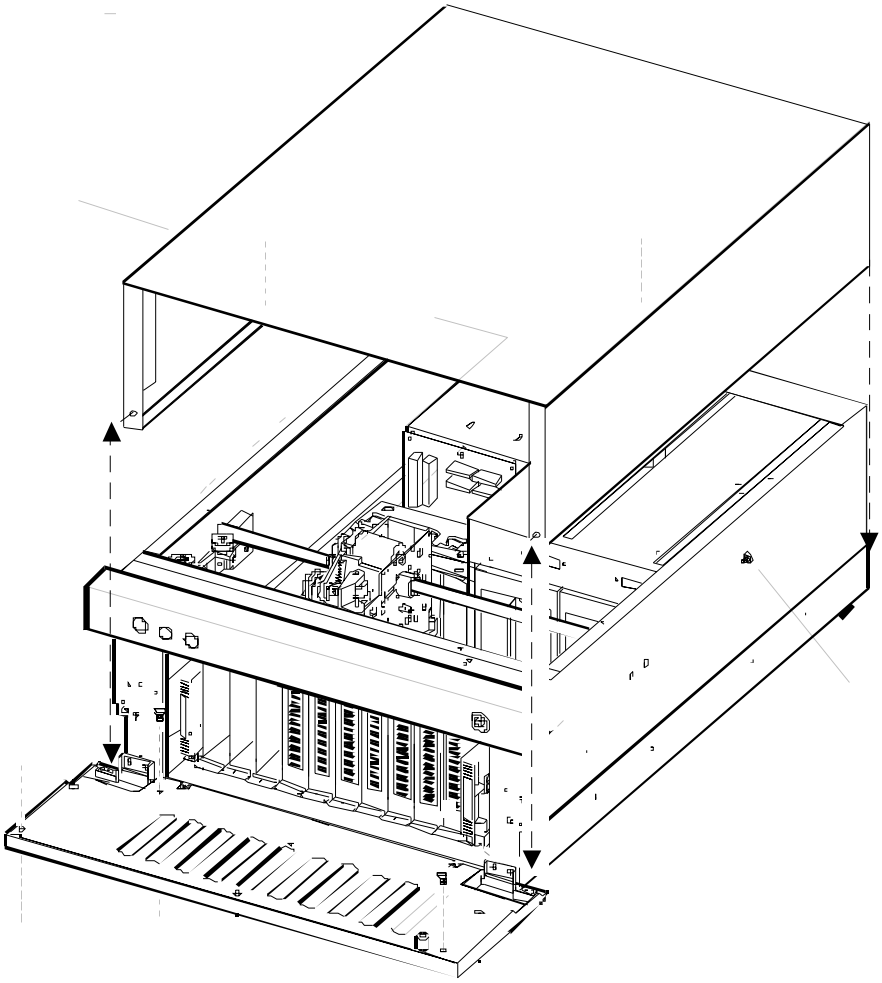


Figure 29. Table Top Cover Removal

Installation

Replaces the cover by performing the steps in this procedure in reverse order.

Rack mount Sheet Metal top Removal

This procedure describes how to remove and install the sheet metal top on the rack mount tape library.

1. Six screws secure the cover to the rack mount tape library. All of the screws can be reached from the top of the library
2. Remove power from the tape library by setting the power switch to off.
3. Slide the cover back then straight up.
4. Replace the cover in the reverse order.

Preventative Maintenance

Cleaning the Cabinet

Use a soft, lint-free cloth and a non-abrasive cleaner to wipe off the exterior of the cabinet. Use a soft, lint-free cloth and glass cleaner to all plastic bezels, interface panels, and translucent window (if applicable).

Cleaning the Heads

When the heads in a tape drive need to be cleaned, the library displays a message to that effect on the user interface and also informs the host computer over the SCSI channel. Use a DLT tape cleaning cartridge (Breece Hill Technologies part number 7123.0000) to clean the tape heads. See table **Table 11.** for the cleaning schedule.

Table 11. DLT Cleaning Schedule

Condition	Description	Action Taken
1. The Use Cleaning Tape indicator illuminates on the drive and a message appears on the user interface.	The drive head needs cleaning or the tape is bad (see item 3).	Use the cleaning cartridge by inserting it into drive. The Drive will recognize the cleaning tape and begin the cleaning routine. When cleaning is finished, the Use Cleaning Tape light turns off and the beeper sounds for you to remove the cleaning cartridge.
2. A data cartridge continually causes the Use Cleaning Tape light to blink.	The data cartridge might be damaged.	Back up this data onto another cartridge. Discard the old cartridge, which may be damaged. A damaged cartridge may cause unnecessary use of the cleaning cartridge.
3. The Use Cleaning Tape light is still on after you clean the drive head.	Your data cartridge may be causing the problem.	Try another data cartridge.
4. The Use Cleaning Tape light comes on after you load the cleaning cartridge.	Cleaning has not been done and the cartridge is expired.	Replace the cleaning cartridge.

Tape Leader Check

Check the tape leader in the cartridge by lifting the cartridge latch that opens the door to expose the leader. Be sure the leader is positioned as shown in **Figure 30.** If it is not in the correct position do not use the tape.

Warning

Do not use the tape if the leader is not in the correct position. Using a faulty tape will damage to the drive.

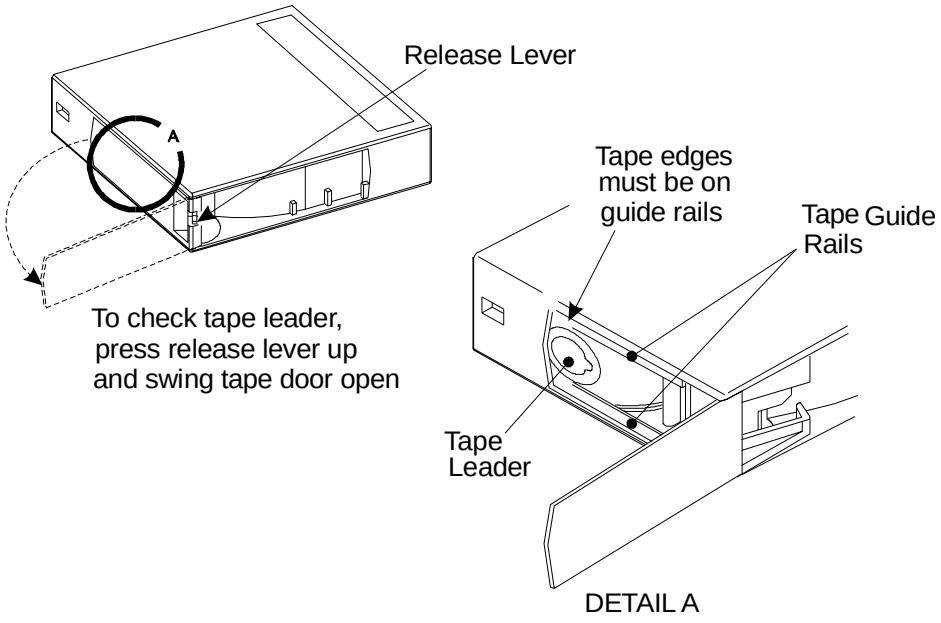


Figure 30. Tape Leader Check

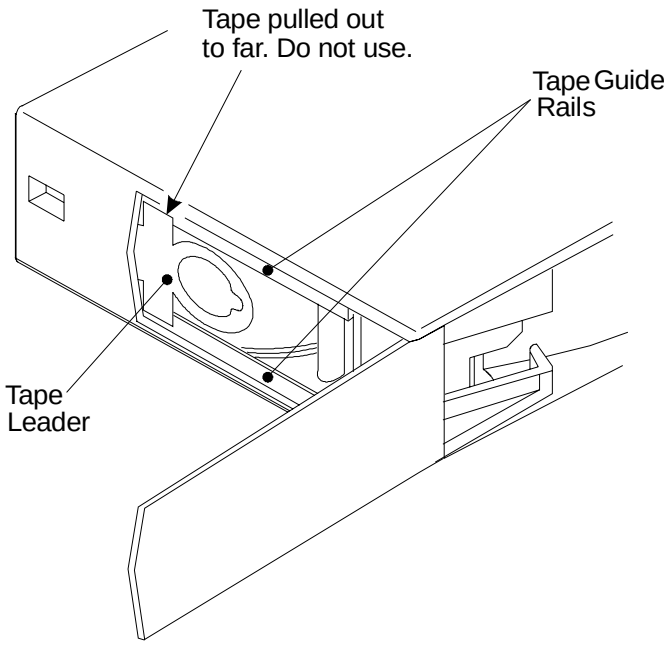


Figure 31. Defective Tape

System Tests

System Tests list tape library exercisers and diagnostics that are available in the DIAGOFFLINE mode using the tape library operator panel and control keys. Before using any of these routines, review the following notices and suggestions to help you with your selection of the tape library functions.

- Ensure that all host-to-target (especially host-to-tape drive) operations are finished and that all customer cartridges are returned to their storage cells. The tape library and tape drives must be off-line to host operations. Diagnostic tests, such as the DRVLDULD (tape drive load and unload test) the COMM TEST (SCSI communications test), and DLT DIAGNOSTICS use the tape library controller as the SCSI command initiator to the tape drives. If both the host and the tape library controller attempt to initiate SCSI commands, conflicts and bus hangs could result.
- The DRVLDULD test and CONFIDENCE TEST are excellent tests for diagnosing intermittent problems. Both of these tests can run with or without the magazine in place.

Note

For both the DRVLDULD and CONFIDENCE TEST, Never use the customer media, remove the magazine with the customer's tape cartridges and record the location of the cartridges in the fixed cells before removing the cartridges.

To run the DRVLDULD test the number of cartridges in the library must be 1 greater than the number of drives in the library (i.e. 1 drive 2 cartridges, 2 drives 3 cartridges etc.). This test moves cartridges from storage cells to DLT drives where a tape load / unload operation is performed. During the load/unload, tape cartridges are moved from one storage cell to another storage cell.

The CONFIDENCE TEST moves cartridges from storage cell to storage cell. The CONFIDENCE TEST can be run using only one tape cartridge.

Be sure to return the customer's cartridges to their original locations after running the diagnostics.

- You can use the MOVE CARTRIDGE test to verify that the library can load an unload a tape drive successfully.
- Be very careful not to select the DLT DIAGNOSTIC test while a customer tape cartridge is in a tape drive. The DLT DIAGNOSTIC test is a read/write test that will overwrite the data on the customer tape cartridge.

Some retries of tape library operations are normal and should not be construed as a problem. More than three retries per operation are excessive and might indicate a problem.

Diagnostic Off-line Mode

The test procedures described in this section require the library mode to be in DIAGNOSTIC OFFLINE.

To change the library mode to DIAGNOSITC OFFLINE follow the steps below using the default menu.

1. Press the **Menu** key until CHANGE MODE menu appears.
2. Press the **Cycle** key until DIAG OFFLINE appears.
3. Press the **Select** key. The library will return to the main menu in Diag Offline mode.

Re-Initializing, Resetting Stats, Resetting Datums

Re-initializing the library recalibrates the robotics, sensors and solenoid settings, while resetting the datums resets the cell positions to factory default values. Resetting statistics will delete all stored library statistics. Typically this procedure would be performed before conducting the confidence test in order to aid in troubleshooting. The procedures below describes how to use the operator panel to perform these procedures.

Note

Make sure the front door key lock is in the 9 o'clock 🕘 or 12 o'clock 🕛 position. Then change the library to diagnostic off-line mode.

1. Press the **Menu** key until the MAINTENANCE MENU is shown on the operator panel.
2. Press the **Cycle** key to display RE-INITIALIZE, RESET STATS, or RESET DATUMS.
3. Press the **Select** key once. The operation is performed and the library returns to the on-line mode.

Library Power on Self Test and Initialization

After powering up or resetting the tape library, opening, closing, and locking the tape library front door, the library automatically executes POST and the initialization routine, which includes some robotic motion. If POST or initialization fails, the library displays the appropriate library error code and shuts down power (24 V) to the robotic shuttle drive motors. Power shutdown to the robotic shuttle can be noted by the 24V LED turning off. The 24V LED is on the controller at the back of the library

Confidence Test

The tape library determines which cells contain cartridges (at least one cell must be unoccupied). The test then moves the cartridges from cell to cell randomly until any one of the control keys is pressed, 10,0000 cycles occur or until an error occurs. Tape cartridges are not moved to or from the DLT tape drives. This test can be run with only one cartridge.

To run the Confidence Test the library must be in DIAGNOSTIC OFFLINE. See **Diagnostic Off-line Mode** on page **72**.

1. Press the Menu button until CONFIDENCE TEST appears in the display panel.
2. Press **Select** and the test will begin.
3. After ten minutes, stop the test by pressing any key.
4. You may continue to your next operation by selecting it from the display panel.

Drive Load/ Unload Test

This test is similar to the Confidence Test, with the addition of loading and unloading cartridges to the DLT tape drives. The cartridges are only loaded to the load point and then immediately unloaded. No data is written to the tape cartridges and no data is altered on the tape cartridge. The test will last for 100 cycles or until a control key is pressed. SCSI commands are initiated by the tape library controller over the SCSI bus. This test requires a minimum of three cartridges for a tape library with two drives. The following library functions are performed:

- An inventory of each cartridge is taken and read by the tape library bar code reader and maintained throughout the test.
- The cartridges are randomly delivered to the DLT tape drives and loaded to the load point by the drives. The tape library microcode then initiates a tape drive Unload command over the SCSI bus to the tape drives. After the unload is complete, the library retrieves the cartridge from the tape drive and places the cartridge in a vacant cell.
- The test continues until any one of the tape library control keys is pressed, an error occurs, or until 100 cycles have been completed. The tape drives are automatically unloaded if the test is terminated, or after 100 cycle have been completed.

This test may be run after the library is in DIAGNOSTIC OFFLINE mode. See **Diagnostic Off-line Mode** on page **72**.

1. Press the **Menu** key until the display panel reads DRVLDUNLD.
2. Press the **Select** key once. The display panel will prompt you to ABORT or RUN.
3. Press **Select** to run the test.

Note

All tape cartridges will be read by the bar code scanner before load and unload test will begin

4. To abort the test press any control key.

5. Press the **Menu** key to continue your next procedure.

SCSI Communication Test

The COMM TEST returns the SCSI ID s of the DLT tape drives to the tape library operator panel.

Place the library in DIAGNOSTIC OFFLINE mode. See **Diagnostic Off-line Mode** on page **72**.

1. Press the **Menu** key until COMM TEST is displayed.
2. Press the **Select** key.
3. The display will prompt to ABORT or RUN. Press **Select** to run, **Menu** to abort.
4. The display should read DRV COMM DONE when **Select** is pressed.

If an error occurs check all cabling and the terminator for proper connection.

Note *All drives must be connected to the controller.*

Move Cartridge Test

This test can be run using any cartridge, or it can be directed to use a particular cartridge, such as the CE cartridge. A cell must be available to manually insert the scratch cartridge into, and another cell or DLT tape drive must be available to move it to using the Move Cartridge Test. This test will also move a cartridge from a tape drive where the cartridge is unloaded with the operate handle light lit, or from a loaded tape drive if the cartridge was placed in the tape drive by the move cartridge test. In this situation, the library will first initiate an UNLOAD command to the particular tape drive in order to put the drive in the proper state to operate the tape drive handle. The move cartridge test will NOT issue an UNLOAD command to a tape drive that was loaded from a host command or if it was manually loaded. You must first press the Unload button on the tape drive bezel if you want the move cartridge test to be able to move the cartridge to a cell or another tape drive. This test will only work for libraries with a single host configuration.

Place the library in DIAGNOSTIC OFFLINE mode. See **Diagnostic Off-line Mode** on page **72**.

Drive to Drive Move

1. Press the **Menu** key until MOVE CARTRIGDE appears in the display panel.
2. Press **Select** once. SELECT SOURCE appears.
3. Press **Cycle** until DRIVE is displayed.
4. Press **Select** to define the source
5. Choose a drive with an installed tape cartridge, by pressing the **Cycle** key to display the desired drive.
6. Press **Select** to enter your choice. The picker will retrieve the tape, then

SELECT DESTINATION will display. (The destination must be empty.)

7. Choose DRIVE with the **Cycle** key.
8. Press **Select** to enter the drive as the destination.
9. Press **Cycle** to display the empty drive.
10. Press **Select** to choose the drive, then **Select** again to execute the move.

Cell to Cell Move

1. Press the **Menu** key until MOVE CARTRIGDE appears in the display panel.
2. Press **Select** once. SELECT SOURCE appears.
3. Press **Cycle** until MAGAZINE is displayed.
4. Press **Select** to define the source. CARTRIDGE 00 is displayed. The left 0 will be highlighted and appear to flash.
5. Choose the first digit with the **Cycle** key.
6. Press the **Select** key to enter the first digit. The right 0 will now be highlighted and appear to flash.
7. Choose the second digit with the **Cycle** key.
8. Press the **Select** key to enter the second digit.
9. SELECT DEST is displayed. Press the **Cycle** key until MAGAZINE is displayed.
10. Press **Select** to define the destination.
11. Repeat steps 5 to 8.
12. Press Select again to execute the move.

Cell to Drive Move

1. Press the **Menu** key until MOVE CARTRIGDE appears in the display panel.
2. Press **Select** once. SELECT SOURCE appears.
3. Press **Cycle** until MAGAZINE is displayed.
4. Press **Select** to define the source. CARTRIDGE 00 is displayed. The left 0 will be highlighted and appear to flash.
5. Choose the first digit with the **Cycle** key.
6. Press the **Select** key to enter the first digit. The right 0 will now be highlighted and appear to flash.
7. Choose the second digit with the **Cycle** key.
8. Press the **Select** key to enter the second digit.
9. SELECT DEST is displayed. Press the **Cycle** key until DRIVE is displayed.
10. Choose DRIVE with the **Cycle** key.
11. Press **Select** to enter the drive as the destination.
12. Press **Cycle** to display the empty drive.

13. Press **Select** to choose the drive, then **Select** again to execute the move.

Drive to Cell Move

1. Press the **Menu** key until MOVE CARTRIGDE appears in the display panel.
2. Press **Select** once. SELECT SOURCE appears.
3. Press **Cycle** until DRIVE is displayed.
4. Press **Select** to define the source
5. Choose a drive with an installed tape cartridge, by pressing the **Cycle** key to display the desired drive.
6. Press **Select** to enter your choice. The shuttle will retrieve the tape, then SELECT DESTINATION will display. (The destination cell must be empty.)
7. Press the **Cycle** key until MAGAZINE is displayed
8. Press **Select** to define the source. CARTRIDGE 00 is displayed. The left 0 will be highlighted and appear to flash.
9. Choose the first digit with the **Cycle** key.
10. Press the **Select** key to enter the first digit The right 0 will now be highlighted and appear to flash.
11. Choose the first digit with the **Cycle** key.
12. Press the **Select** key to enter the second digit.
13. Press the **Select** again to execute the move.

Diagnostic Read/Write Test

Listed below is the DLT tape drive read/write test available in the DIAG OFFLINE mode using the tape library control keys. Before using this selection, all of the target devices on the SCSI bus (tape library and DLT tape drives) must be finished.

Load the tape drive that is to be tested using this diagnostic with a digital linear tape cartridge. It is recommended that the DLT tape drive be loaded manually to avoid any possibility of loading the wrong tape cartridge.

From the tape library operator panel, select the SCSI ID of the DLT tape drive that you want to perform the read/write test. If a cartridge is present in the tape drive, the library initiates a Send Diagnostic command to the drive. The test runs for approximately five minutes. After completed, success or failure of the test is posted and a query is presented asking whether to unload the tape drive.

Warning

Use Only Scratch Cartridges For This Test. Any data on the cartridge will be overwritten

The LEDs on the front bezel of the tape drive can determine the condition of a DLT tape drive. **Figure 46.** on page **A-166** displays the LEDs and controls on the front bezel. (The LEDs can be seen by looking through the open front door of the tape library.) **Figure 46.** on page **A-166** lists the indicators and what they mean.

Place the library in DIAGNOSTIC OFFLINE mode. See **Diagnostic Off-line Mode** on page **72**.

1. Load a scratch tape in the drive.
2. Press the **Menu** key until DLT DIAGNOSTIC is displayed.
3. Press **Cycle** until the SCSI ID number matches the drive to be tested. The number is shown on the display panel and is located on the back of the drive.
4. Press **Select** to engage the test, then **Select** again to overwrite data. The test will run for five minutes.
5. Unload the tape cartridge when the test is complete.

Indicator Action During Power On Self Test and Operation

When power is applied to the DLT tape drive, it performs POST. POST completes in about 15 seconds and the DLT tape drive responds normally to all commands; however, it might take longer for the media to become ready. After a bus reset, the tape drive responds within a bus selection time-out period.

The POST sequence tests the following:

- Hierarchical test of the controller hardware.
  - Tests the Microprocessor, RAM, ROM & SCSI interface etc. (Any error is considered to be a fatal error, test is terminated)
  - Test the Data Path, compression chip etc. (Most failures are considered soft errors).
  - All hard errors stop the testing.
  - Soft errors – operational software is started so errors can be reported.
  - Tape errors cannot occur.

External indicator sequence of events:

Stage	Action
1	The indicators on the top of the DLT tape drive front panel turn on sequentially from left to right. All indicators stay on for a few seconds.
2	The indicators on the bottom of the DLT tape drive front panel turn on at the same time for about three seconds and then turn off.
3	The Green Operate Handle, Orange Write Protected, and the Yellow Use Cleaning Tape indicators turn off. The Yellow Tape in Use indicator blinks while the tape drive initializes.

Stage	Action
4	After initialization, the drive is in one of the following five states:

Note

The DLT drive will only perform the POST sequence when the tape handle (or Door) is closed. The library will automatically operate the door handles of drives installed in a library as part of the library initialization sequence. Stand-alone drives the operator must manually close (or lower) the handle.

Drive State		Indicator Displays and Actions	
1	No cartridge is present.	1	The Tape in Use indicator turns off.
		2	The Operate Handle indicator turns on.
		3	The handle is unlatched.
		4	The drive beeps momentarily (7000 only). The handle can be raised and a cartridge inserted.
2	A cartridge is present and the handle is down.	The drive loads the cartridge. When the Tape in Use indicator stops blinking and stays on, the tapes actual density indicator lights. For example, if the actual tape density is 20.0 GB, then the indicator turns on next to the 20.0 label. When Density Override blinks, you can select a density. The drive is ready for use.	
3	A cartridge is present, but the handle is up (not recommended)	The Operate Handle indictor continues to flashes until the library operates the handle so the drive may complete the POST sequence. When the handle is lowered, the cartridge loads and the drive performs the POST sequence.	

	Drive State	Indicator Displays and Actions
4	The tape drive detects an error condition.	Top or bottom indicators blink repeatedly. Turn the drive power off and then on again. POST fails with the top indicators flashing = Servo failure. POST fails with the bottom indicators flashing = Controller failure.
5	The tape drive is powered on with the handle open.	If installed in a library the library will close the handle so the drive may complete the POST sequence. The Operate Handle indicator is flashing. For stand-alone drives, Close the handle and wait for the POST sequence to complete.

Troubleshooting

Getting Started

Faults are isolated in the library by evaluating current symptoms or performing the Remote Diagnostics Procedure, and checking each functional system involved to locate the malfunctioning part.

Prior to troubleshooting, perform a complete visual inspection for the following items:

- Damaged parts
- Evidence of abnormal heat
- Loose cable connectors
- Loose circuit cards
- Loose components
- Loose external signal connectors
- Loose hardware
- Loose wires
- Missing parts
- Unseated components

This chapter provides procedures used to help isolate tape library failures and to provide repair actions for those failures.

The Problem Determination Procedures in this chapter rely on error codes, sense information, observed status information, and failure information. The diagnostics and exercisers that are required are available using the control keys on the front panel.

In addition to the PDPs, a Remote Diagnostic Interface can also be used to perform maintenance analysis. The Remote Diagnostic Interface is a serial port on the tape library controller card. If you have a PC or a laptop with a communication program and a null modem cable, you can access this supplemental facility. Tape library firmware can be updated and debug trace information can be downloaded to a diskette through the interface.

Leave the tape library power on. If the library power is off, switch the power on. Have the customer vary the library and tape drives off-line. (In this procedure and those that follow, Y means yes and N means no.)

1. Note and record the following:

- Are there any obvious power or error indicator problems?
  - Are all three fans operating? (Only two fans if there is one drive installed)
  - Is the operator panel lit?
  - Do the control keys function properly?
  - Is the 5 V LED on? The 24 V LED may be on or off. (See the LEDs in the rear of the library.)

- Is the controller fault (red) LED on?

- Does the operator panel display any messages or error codes?
- Does the host console display any messages, error codes, or sense data?
- Has the customer made any comments?

2. Open the tape library front door and remove the magazine. Go to the **Initial Inspection Checklist** on page **82**, then go to Step 3.

3. Did you note any power problems or is the library controller fault LED on?

- Yes - Go to **Power Problems and Fault Indicator** on page **83**.
- No - Go to step 4.

4. Did you find and fix an observed library or tape drive problem?

- Yes - Go to See **Diagnostic Read/Write Test** on page **76**.
- No - Go to step 5

5. Does the operator panel indicate that a drive requires service or did you observe a possible drive problem (such as blinking lights, stuck cartridge), or does the host error data or message indicate a tape drive problem?

- Yes- Go to **Tape Drive Problem** on page **86**.
- No - Go to Step 6.

6. Did you observe a possible base library problem during the inspection?

- Yes - Go to **Base Library Problem** on page **90**.
- No - Go to step 7.

7. Do you have a SCSI or interface problem affecting one or more devices?

- Yes - Go to **SCSI or Interface Problem** on page **90**.
- No - Go to **Recreate, Observation and Error Code** on page **92**.

Initial Inspection Checklist

Note

If the top cover of the tape library is accessible, remove the top cover to aid in the inspection procedure. Leave the tape library front door open, however, as this action disables the robotic shuttle. The 24 V LED on the library controller card at the rear of the tape library will be off if the tape library front door is open. Also, if the tape library experiences motion problems, it automatically removes power to the robotic shuttle and the 24 V LED will be off, even with the door closed.

Caution

By removing the top cover and locking the front door you can observe robotic operations. Some of the procedures suggest you do this. You must be extremely careful not to put your fingers into the moving robotic shuttle or to let loose clothing fall into the interior of the tape library, interfering with movement of the robotic shuttle. Under no circumstances are you to place your fingers or tools into the tape library while a diagnostic test is running or robotic shuttle movement is in progress.

1. Note the cell or tape drive location of the shuttle.
2. Inspect for loose or broken parts:
   - Belts
   - Internal cable connectors or wires
   - Tape cartridge
   - Robotic shuttle
3. Gently move the robotic shuttle from side to side, with your fingers pressing on the shuttle chassis:
   - Note any unusual noises or binding
   - Note and correct (if possible) any blockage in the shuttle path
   - Note and correct any protruding cartridges
   - Note and correct if any internal cables are unplugged
   - Note the integrity of the shuttle ribbon cable
4. Move the shuttle to the extreme left (in front of the bar code reader). Observe and note the condition of the tape drives:
   - Are the LEDs blinking (top row, servo or bottom row, interface) (Refer to **DLT Drive** on page **A-166**, for the meaning of the steady and blinking status lights)
   - Are cartridges in or out of drives
   - Are the door handles on the tape drives completely open or closed. Press gently on the handle in the appropriate direction when inspecting.
5. Check for proper connection of the SCSI cables and terminator at the rear of

the library.

6. Note if the library controller fault LED (red) is on. The LED is located at the rear of the tape library, on the controller card.
7. When the inspection is complete, return to the procedure that sent you here.

Power Problems and Fault Indicator

Switch off the library power.

The tape library controller turns off the 24 V (24 V LED) when it is experiencing positioning or cartridge retrieval problems as well as more severe problems (such as failed shuttle servo motors).

Caution

Do not attempt to test voltages on the power supply. The power supply must be under load to test for correct voltage. Voltage can be checked only when running the diagnostic interface.

1. Did you observe the red fault LED indicator on at the rear of the tape library?
   - Yes - Replace the library controller card (refer to **Controller Removal and Replacement** on page **117**). After you have replaced the controller card, go to Step 8.
   - No - Go to step 2.

2. Is the power supply fan the only thing not running?
   - Yes - Replace the library power supply (refer to **Power Supply Removal and Replacement** on page **118**). After you have replaced the power supply, go to Step 8.
   - No - Go to step 3.

3. Does the power problem (fan or LEDs) seem to be isolated to the DLT tape drive (one or both, if two tape drives are installed)?
   - Yes - If two DLT tape drives are installed and both tape drives exhibit the same problem, skip the following procedure and answer “no” to the question following the procedure.
     In tape libraries with two DLT tape drives, temporarily switch the tape drive positions; that is, put drive A into the drive B position and drive B into the drive A position. Be sure to switch back after the test is complete.
     In tape libraries with only one DLT tape drive, move the tape drive to the vacant position.

     The SCSI cables and terminator do not need to be reconnected at this time.

     Switch on the library power.

     Does the problem remain with the DLT tape drive in the new position?

     Switch off the library power.

Yes - Replace the DLT tape drive.

Go to Step 8.

No - Replace the FRU's in the following order one at a time.
1. Power Supply
2. Controller Card
3. Base Library

When the power problem no longer exists, turn off the library and go to step 8.

- No- Go to step 4.

4. Is the operator panel the only tape library component that is not functioning. (The library seems to initialize and the host communications is working.)

- Yes - Replace the FRU's in the following order, one at a time.
  - Check the ribbon cable connection at the operator panel.
  - Operator Panel
  - Library Controller

  If replacement of the first FRU does not correct the problem, repeat this step for the next FRU.
- No - Go to step 5

5. Are the control keys the only tape library component not functioning?

- Yes

Note *Make sure the front door key lock is in the 9 o'clock 🕘 or 12 o'clock 🕛 position.*

- Yes - Replace the FRUs in the following order, one at a time.
  - Library Controller
  - Base Library

  If replacing the first FRU does not correct the problem, repeat this step for the next FRU.

  Go to Step 8.
- No - Go to step 6.

6. If you observed total power outage on the tape library and DLT tape drives, check the following:

- Power switch is set to on

- Power source is connected to library
- Power cord is seated
- Power cord has continuity
- Fuse is in the power supply (at the rear of the tape library)

Did you find and correct one of the previous items?

- Yes- Switch on the library power. If you replaced a burned-out fuse, go to Step 7; otherwise, go to Step 8
- No - Replace the power supply

Go to step 8.

7. Did the fuse blow again?

- Yes - Remove the DLT tape drives and replace the fuse again

Switch on the library power.

Did the fuse blow again?

Yes - Replace the FRU's in the following order, one at a time.
- Power Supply
- Controller
- Base Library

Power up the library.

When the fuse no longer burns out, go to step 8.

No - Determine which DLT tape drive is causing the power supply fuse to blow, and replace it.

When complete, go to step 8.

- No - Before going to Step 8, make sure that the Tape Library power supply fan is running. If the fan is not running, switch off the library power and replace the power supply

8. It is recommended that you run a library exerciser for 10 to 15 minutes to ensure problems do not reoccur. Perform the **Drive Load/Unload Test** on page **73**.

Does the tape library power up properly, complete library initialization and any exerciser test, and properly remain powered up?

- Yes - Go to **Final Inspection** on page **94**.
- No - If you have not replaced a FRU, replace the FRUs in the following order, one at a time.

- Power Supply
- Controller
- Base Library

After replacing each FRU, switch on the library power and repeat Step 8 until successful.

Tape Drive Problem

Note

Open the tape library front door and remove the tape cartridge magazine by firmly grasping the left and right edges and pulling it straight out. If accessible, remove the top cover. (Refer to **DLT Drive** *on page* **A-166** *for a description of the LEDs.)*

Brief description of a DLT tape load sequence.

– The drive Locates the edge of tape

– Finds the calibration tracks from bottom of tape.

– Find the calibration tracks from top of tape.

– Write circuitry develops write currents in the scratch area.

– Read directory.

– Erase Directory.

– Stop at BOT

	IF...	THEN...
1a	Cartridge is in the tape drive and. - Operate Handle LED is on steady - Other LEDs may be on steady or blinking	Slowly lift the tape drive handle and attempt to eject the cartridge **Note:** If the tape cartridge ejects, carefully inspect the cartridge before reusing. (Refer to **Tape Leader Check** on page **69**.)
1b	Cartridge is in the tape drive - Operate Handle LED is not on or it is blinking - Tape In Use light is blinking steadily for more than 4 minutes - All four top LEDs are blinking	Ensure drive handle is completely closed. Gently press on handle.

	IF...	THEN...
1c	Tape Cartridge is not in drive and all top or bottom LEDs are blinking	

Do the following:

Attempt a tape drive reset:

Press the Unload button on the tape drive bezel (this invokes a tape drive reset when a problem exists) or cycle the power on the library. If the drive performs the Power-On Self Test (POST) without errors (no blinking LEDs), remove the cartridge from the drive, if it was still in the drive. You may have to press the **Unload** button again.

If POST failed (blinking LEDs), switch off the library power and replace the tape drive.

	IF...	THEN...
2	SERVICE REQD message is displayed on the operator panel.	See Steps 1a through 1c.
3	Your system does not recognize the DLT tape drive or you are experiencing SCSI problems.	System may not be configured to see the SCSI ID. SCSI ID may not be unique. SCSI parameters may be incorrect. SCSI cables may be loose. SCSI terminator may be missing, or there may be too many terminators, or they may be terminated incorrectly or loose. SCSI bus might be too long.

Do the following:

See Steps 1a through 1c.

Configure your system to see the ID

Change the SCSI ID; reconfigure, then cycle the power.

Check your SCSI adapter installation.

Check the SCSI pins on the SCSI cables, then reset the cables.

Make sure the termination is correct. Check for bent pins and proper seating.

Make sure the SCSI cable length is correct.

	IF...	THEN...
4	You received a system message or error sense data indicating a media or hardware problem or failure (sense key 03 or 04). **Note:** Tape drive load and unload problems could possibly be attributed to library failure. Use the appropriate library diagnostics to further isolate the failure.	Refer to **SCSI Error Codes** on page **A-154** for the additional sense code (ASC) and additional sense code qualifier (ASCQ) information from the sense data.

Do the following:

Tape drive media or read/write problems should first be verified or recreated using the DLT diagnostic (DLT DIAGNOSTIC) from the tape library operator panel. This test should be performed before removing or replacing the DLT tape drive.

If the DLT DIAGNOSTIC passes, suspect an intermittent tape drive problem or a media problem. Repeat the test as required.

If the DLT DIAGNOSTIC fails, switch off the library power and replace the tape drive

Call the next level of support if you are unable to determine or isolate the problem.

	IF...	THEN...
5	Other tape drive sense key ASC-ASCQ system console error information was received.	Refer to particular appendix for the system used to review various error log capabilities and exercisers available for problem isolation.

Do the following:

Use any host diagnostic or exerciser capability to help isolate SCSI communication problems from possible software application problems. Perform

the tape drive load and unload test (DRVLDULD) from the tape library operator panel. This test performs SCSI communications as well as library and tape drive operations at the device level.

Call the next level of support if you are unable to determine or isolate the problem

Base Library Problem

Switch off the library power.

1. Did you observe a broken component (such as a belt, shuttle, or cable)?
   - Yes - Replace the Base Library
2. Did you observe excessive dust or debris in the base tape library unit?
   - Yes - Use a lint-free cotton cloth to clean the base unit. Do not use any oils or chemicals. Go to Step 4 when finished.
   - No - Go to step 3.
3. Did you observe a component that you can repair (such as an excessively loose shuttle drive belt) that is loose or out of adjustment?
   - Yes - If a drive belt appears to be loose, locate the tension arm adjustment screw on the left side of the library chassis near the front as you face the library. Tighten the tension arm adjustment screw. **DO NOT** over tighten. These belts are factory set and adjusted, and are intended to maintain the adjustment over the product life. Go to Step 4 when finished.
   - No - Re-enter the Start PDP using an error code or new symptom. If you do not have a symptom, go to **Recreate, Observation and Error Code** on page **92**.
4. Switch on the library power.

With the top cover still removed (if accessible), refer to **Move Cartridge Test** on page **74**. When finished, go to **Final Inspection** on page **94**.

SCSI or Interface Problem

Before you start, ensure that the DLT tape drive SCSI IDs, at the rear of the tape library, are the same IDs that the host program expects. If they are not correct, change the switches to the proper values. Go to **Final Inspection** on page **94** and rerun the host program.

The SCSI Interface tests and checks the SCSI connections on the tape library and DLT tape drives. The host-to-library SCSI cable is considered to be part of the host system, and is covered in the Step 4.

Switch off the system power and disconnect the host-to-tape library SCSI cable at the tape library controller. If another library or other devices are connected to the tape library on this SCSI bus, disconnect those devices from the tape library as well. If the tape library being tested does not have a terminator, temporarily install one.

Check the drive-to-drive SCSI cables and the terminator for proper seating or bent pins before proceeding. If you find a problem, correct or replace the part. Run the communication test (COMM TEST) from the tape library operator panel.

1. Is the tape library the only device failing to communicate?

- Yes - Verify the tape library SCSI ID

  Is it the same SCSI ID that the host program expects?

  Yes - Run the communication test (COMM TEST) or the tape drive load and unload test (DRVDULD) from the tape library operator panel. Refer to **Move Cartridge Test** on page **74**. The tests use SCSI communications. The library becomes the initiator that issues SCSI commands over the bus to the tape drives. If the test run without failing, suspect an intermittent problem or host-to-library SCSI cable or SCSI adaptor problem.

  No - Set the SCSI ID to the correct value.

  Go to **Final Inspection** on page **94**, after completion return the host program to verify proper operation.

- No - Go to step 2.

2. Is a tape drive (even if two are installed) the only device failing to communicate?

- Yes - Run the communication test (COMM TEST) from the operator panel.

  Did the test fail?

  Yes - If the tape drive is the last drive on the bus, replace the SCSI cable that connects to that drive. Rerun the communication test to verify. If the problem persists, replace the tape drive. Rerun the communication test to verify the replacement part. Also, run the DLT diagnostic (DLT DIAGNOSTIC) from the tape library operator panel on the replacement part.

  Go to **Final Inspection** on page **94**.

  No - Run the tape drive load and unload test (DRVLDULD) from the tape library operator panel. Refer to **Move Cartridge Test** on page **74**. These tests use the SCSI communications. The library becomes the initiator that issues SCSI commands over the bus to the tape drives. If the tests run without failing, suspect an intermittent problem or host-to-library SCSI cable or SCSI adapter problem.

Go to Step 4. If the problem persists, call your next level of support.

- No - Go to step 3.

3. You have indicated a general SCSI problem that affects two or more of the devices on the bus. Run the communication test from the tape library operator panel to determine if the library and tape drives are communicating over the SCSI bus with the library acting as the initiator.

Did the SCSI communication test fail?

- Yes - Replace the drive-to-drive SCSI cables and terminator. Rerun the Communication Test to verify proper operation.
- No - The problem does not appear to be with the tape library.

Run Drive Load/Unload system test, if the unit fails the following FRUs or firmware should be considered as problems:
- Host-to-library SCSI cable
- Check Voltages (+5 volts should be +5.25 volts)
- SCSI adapter card in the host computer
- Tape library or DLT tape drive firmware
- Host device driver or host software

Recreate, Observation and Error Code

This will attempt to recreate the library failure. The results may or may not be exactly the same as the error information that was recorded earlier. However, by observing the library operation (if possible, pull the library out on slides and remove the top cover), you should be better able to help isolate the problem area. If you cannot recreate the problem, you may have an intermittent problem.

Caution

Use only scratch cartridges when you run diagnostic selections from the operator panel. This is especially true if your selection involves loading or moving cartridges to / from drives.

1. Ensure that the following actions or precautions have been considered:

- Ensure that customer operations for both the tape library and tape drives have been completed.
- DO NOT use this if you have a known tape drive problem (such as blinking lights or a stuck cartridge). Note: The opening and closing of the tape drive handle is a library function.
- The SCSI cable to the host does not need to be connected. If you unplug the cable, first switch off system power. After unplugging the SCSI cable, switch the power back on.

- If the original cell locations for the customer cartridges need to be preserved, record the cell location for each cartridge before removing it. You don't need the magazine for the tests (unless you are testing a put/pick problem to the magazine). You need only the CE cartridge for the confidence test. For the tape drive load and unload test (DRVLDULD) you will need the CE cartridge and two scratch cartridges.

2. Refer to **Move Cartridge Test** on page **74**. The tape drive load and unload test is the most complete selection available, as it tests all library operations. The following functions and operations are exercised:

- Reading tape cartridge labels using the bar code reader.
- Moving cartridges from cells to tape drives and between cells.
- Loading tape cartridges into tape drives to the load point. (Data are not written to the tape.)
- Sending SCSI unload commands from the tape library over the SCSI bus to the tape drives. The tape library acts as the initiator
  All operations are displayed as they occur on the tape library operator panel.

3. Regardless of the test chosen, as the test proceeds, note any problems or difficulties in the following:

- Reading bar code labels (note shuttle adjustments at bar code station). If the cartridges do not have labels, you will notice maximum retry adjustment.
- Positioning the robotic shuttle in front of cell locations or drives.
- Slipping or blousing around pulleys of the drive belts.
- Moving cartridges from/into cells.
- Moving cartridges from/into shuttle.
- Moving cartridges from/into tape drive(s).
- Operating tape drive handle (openings/closings should be smooth with no or minimal over travel or bounce).

Note

Some retry of operations are normal. Note excessive retries (more than three per operation).

4. If you have observed or determined from your analysis that a library mechanism (electrical or mechanical) is likely to be the reason for the failure, and you cannot make an adjustment or cleaning (for example, the shuttle cartridge friction wheels) to correct the problem, replace the base library or tape drive module that contains the failing component. This conclusion could be reached with or without an error code. Two examples are listed below:

- The tape library fails indicating that it cannot pick a cartridge, even though the cartridge is in the robotic shuttle. Most likely, the failure is a sensor in the robotic shuttle.
- The tape drive handle mechanism has difficulty or cannot open and close. A good isolation technique is to move the tape drive to the other position and determine if the problem follows the tape drive or stays with the position. If the problem follows the tape drive, replace the tape drive; if it stays in the position, replace the tape library controller. If you swap the tape drives, make sure you change each SCSI ID to the ID correct for new position.

5. Have you determined a problem and decided which FRU needs to be replaced?

- Yes - Refer to “Removal and Installation Procedures.” Run the appropriate tape library or tape drive exercise and diagnostic selection for the replacement FRU. (Refer to the **Move Cartridge Test** on page **74**. When complete, go to **Final Inspection** on page **94**.
- No - Go to step 6.

6. Do you have an error code (original or from a recreation) or Sense Key/ASC/ASCQ code?

- Yes - Refer to the tape library error code in **Error Codes** on page **A-145** and replace the FRUs one at a time. If you received more than one error code, try to pick the one closer to your observations. Run the appropriate tape library or tape drive exercise and diagnostic selection for the replacement FRU.

Note

The FRU list does not generally list the base tape library. For all error codes, the base tape library is the last FRU in each list. The order of the FRU list per error code is not necessarily listed by probability of failure.

If you only have a Sense Key/ASC/ASCQ library code, refer to

Table 10 or to determine what type of error was reported by the library. Remember, only a Sense Key value of 4 indicates a hardware error. When the fix has been verified, go to **Final Inspection** on page **94**.

7. You have an intermittent problem. Continue to exercise the library until an error occurs. Also consider the SCSI cables (controller-to-drive, drive-to-drive and host-to-controller) and the terminator if you think the problem might be in the interface area. Check for proper seating and look for bent pins on all SCSI cables and on the terminator.

Final Inspection

1. Replace all brackets and ensure that all screws are tightened.

2. Replace the library top cover, if it was removed.

3. Slide or place the library back in its home location. In a rack-mounted unit, ensure that the library front eyelet bracket is fastened to the rack vertical rail.

4. Ensure that all SCSI cables and the SCSI terminator are connected. Make the widest possible loops in the short drive-to-drive and drive-to-controller cables. Each device in the tape library (tape drives and the tape library controller) has two SCSI connectors. Either connector on a device can be used as an in or out connector. This lets you to connect the cables so that you can make wide loops between devices; thus reducing cable stress.

Caution

When you plug in SCSI cables, ensure that the power is switched off.

5. Ensure that the tape drive SCSI IDs are returned to their original values if they were changed for any reason.
6. Remove the any scratch cartridges from the library used for trouble shooting.
7. If you removed any customer cartridges, place them back in the cells from which they were removed. Otherwise, place them in any available cell.
8. Remind the customer that it may be necessary to perform a re-inventory, if cartridges were placed back in the library randomly. If the automatic inventory features were turned on during the tape library setup, the library automatically inventories the cartridges.
9. Switch on the tape library power (if it is not already on) and ensure that initialization successfully finishes.
10. Inform the customer that tape library and DLT tape drives are ready for on-line operation.

Diagnostic Procedures

The DLT DIAGNOSTIC test issues a SEND DIAG command to the DLT tape drive to perform basic tests. Before running the DLT DIAGNOSTIC test, a scratch tape cartridge must be loaded into a tape drive and at the load point.

Warning

This is for service only. **DO NOT** use a customer data cartridge. Data will be overwritten and lost.

Starting from:

```
Q2.15!     XXX     T

DIAG OFFLINE

A: DLT   YYYY

B: DLT   YYYY
```

1. Press the CYCLE key three times. The following menu is shown on the operator panel.

CHANGE MODE

MOVE CARTRIDGE

DLT DIAGNOSTIC

CONFIDENCE TEST

2. Press the SELECT key once. The following menu is shown on the operator panel.

DLT DIAGNOSTIC

TEST TID X

A: DLT   YYYY

B: DLT   YYYY

Where TID means target ID, X is the SCSI ID of the tape drive, and YYYY is the firmware version of the tape drive.

3. Press the **Cycle** key to increase the SCSI ID number; press the **Menu** key to decrease the SCSI ID number. (If a correct SCSI ID is not selected, the following menu is shown on operator panel.

DLT DIAGNOSTIC

NO DRV COMM

A: DLT YYYY

B: DLT YYYY

The menu means the drive is not communicating or the ID is not valid.)

4. Press the **Select** key once. The DLT DIAGNOSTIC test starts to run and the following menu is shown on the operator panel.

DLT DIAGNOSTIC

Time Left Xm

A: DLT YYYY

B: DLT YYYY

Where X is the time in minutes remaining for the test. The time shown will count down as the test is run.

5. When the test is finished, the following menu is shown on the operator panel.

DLT DIAGNOSTIC

DLT DIAG PASSED

A: DLT YYYY

B: DLT YYYY

6. Press the **Menu** key once. The following menu is shown on the operator panel.

DLT DIAGNOSTIC

Unload Tape?

A: DLT YYYY

B: DLT YYYY

7. Press the **Select** key once. The tape is unloaded and the tape library returns to the on-line mode.

If the DLT tape drive does not pass the DLT DIAGNOSTIC test, the following menu is shown on the operator panel.

DLT DIAGNOSTIC

DLT DIAG Failed

A: DLT YYYY

B: DLT YYYY

Possible causes and corrections for the failure:

Cause	Correction
Dirty Head	Load a cleaning tape, the drive will automatically perform the head cleaning procedure. NOTE: You may need to run the tape through multiple times to clean the head.
Bad Media	Run the DLT DIAGNOSTIC test again using a different tape cartridge.
Failed DLT Tape Drive	Replace the tape drive.

Error messages associated with the DLT DIAGNOSTIC test that might appear on the operator panel include:

Error Message	Test
INIT SETUP ERROR	The controller has a problem so that it cannot set up as an initiator when communicating with the DLT tape drive.
NO DRV COMM	Communications could not be established with the DLT tape drive.
NO TAPE LOADED	A tape was not loaded into the DLT tape drive, or the tape was not at the load point.
ERROR ON DLT DIAG	The controller cannot send the command to perform the DLT DIAGNOSTIC test.
DLT DIAG FAILED	The diagnostic status was not 0.

Confidence Test

The confidence test is a random movement test that exercises the robotic shuttle and makes sure that the robotic shuttle can move tape cartridges between the cells. Cartridges are not moved to the drives. Before running this test, make sure that at least one cell contains a tape cartridge. Use the following procedure to run the confidence test.

Note

The tape cartridges will be moved and must be re-inventoried after running this test. Do not use customer cartridges for this test. Make sure that the front door key lock is in the 12 o'clock position.

Starting from:

```
Q2.15!      XXX   T

DIAG OFFLINE

A: DLT   YYYY

B: DLT   YYYY
```

1. Press the **Cycle** key three times. The following menu is shown on the operator panel.

```
CHANGE MODE

MOVE CARTRIDGE

DLT DIAGNOSTIC

CONFIDENCE TEST
```

2. Press the **Select** key once. The confidence test runs until you press any of the control keys.

Remote Diagnostic Interface

The remote diagnostic interface provides a way to perform more in-depth testing of the tape library, to load new firmware, and to obtain debug information. This section describes the RS-232-C serial interface and the remote diagnostic interface functionality. It also provides information needed to perform certain diagnostic tasks.

Serial Interface

The physical connection for the remote diagnostic interface is provided by an RS-232-C serial interface. The remote diagnostic port is accessed through a male DB9 connector. (**Table 12** lists the electrical pinout for this connector, which is the pinout for a null modem cable.) This interface is in conformance with the RS-232-C electrical specification. Serial information is transmitted at 19.2 K-baud, 8 bits, no parity, 1 stop bit (VT100 terminal emulation). Character framing errors are ignored. The interface conforms with the XON/XOFF protocol, with a one character maximum delay between receipt of XOFF and transmission halting. A dumb terminal or terminal emulation program can be used to communicate through the interface.

Table 12. Diagnostic Port Pinout

Pin	Name	Connection
1	DCD	Connected to Pins 4, 6
2	RXD	Data to Tape Library
3	TXD	Data from Tape Library
4	DTR	Connected to Pins 1, 6
5	GND	Logic Ground
6	DSR	Connected to Pins 1, 4
7	RTS	Connected to Pin 8
8	CTS	Connected to Pin 7
9	RI	No Connection

Enabling the Remote Diagnostic

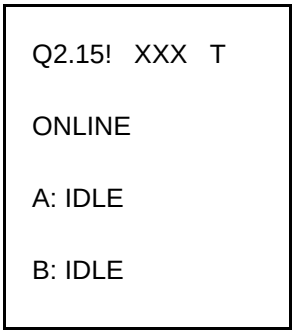
Before diagnostics can be run:

1. Take the tape library off-line by placing it in the DIAGNOSTIC OFFLINE mode
2. Enable the remote interface to allow remote diagnostic commands to be issued.

These tasks are accomplished from the tape library operator panel. Use the following procedure.

Changing to Diagnostic Off-line Mode

Starting from:



1. Press the **Cycle** key once. The following menu is shown on the operator panel.

CHANGE MODE
MOVE CARTRIDGE
DLT DIAGNOSTIC
CONFIDENCE TEST

2. Press the **Select** key once. The following menu is shown on the operator panel.

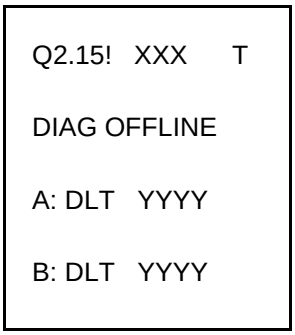
ONLINE
OFFLINE
DIAG OFFLINE

3. Press the **Cycle** key until the arrow is pointing at DIAG OFFLINE.

4. Press the **Select** key to set the tape library to diagnostic off-line mode.

Enabling the Remote Diagnostics Interface

Starting from:



1. Press the **Cycle** key four times. The following menu is shown on the operator panel.

MOVE CARTRIDGE

DLT DIAGNOSTIC

CONFIDENCE TEST

REMOTE DIAGNOSTICS

Press the **Select** key once. The tape library is now ready for remote diagnostics.

Remote Diagnostic Menus

The Remote Diagnostic Menu lists the commands that can be used to perform diagnostic tests, to initialize the library, and to update firmware. To run a command, type the appropriate key from the host keyboard and press Enter or Return. If you type an unrecognized entry, a list of supported commands is displayed. The command level prompt is: X.XX >

Where X.XX is the current firmware level.

Exit the Remote Diagnostics Menu at any time by pressing any tape library control key.

Table 13. lists each command and provides a brief description of the command function.

Table 13. Diagnostic Commands

Command	Description
$	This command forces an immediate IPL (reboot) of the tape library by inhibiting the Watchdog Timer update. An IPL can be forced from the front panel by pressing all three control keys simultaneously and holding for about six seconds.
#	This command enables field service personnel to upload new firmware into the tape library. After entering this command, the tape library erases one of the two flash memory banks it uses to store the firmware. If the tape library is unsuccessful in erasing the flash memory bank, a message is displayed and the machine continues to run with the current firmware. After successfully erasing the flash memory, the tape library prompts the user to begin uploading the firmware. At the completion of the upload, the user is informed of the upload status. If the tape library is unsuccessful in programming the flash memory bank, a message is displayed and the machine continues to run with the current firmware. After a successful upload, the tape library reboots. **Note:** The procedure must be performed and successfully completed twice so that both of the firmware are loaded with the same firmware level.
^	This command switches the operating firmware bank on the next IPL.

Table 13. Diagnostic Commands (Continued)

Command	Description
+/-	This command allows you to turn power on or off to both the motor driver and the drive handle stepper motor. Drive power is not affected by this command. + / - is typically used to free up the axes for measurement purposes and is used in conjunction with the P command.
%	This command reads and reports the temperature in degrees Fahrenheit (°F) of drive A, drive B, and the controller card.
~	This command is used in remote diagnostics only to stop after each pick or place, and to wait for user input before continuing.
*	This command resets all position datum numbers. USE THIS COMMAND WITH CAUTION.
!	This command reads and reports the voltages of the +5V, +12V and +12V power supplies.
A	This command moves the shuttle in front of the selected cell, but will not perform a pick or place move.
B	After two additional prompts, this command actuates the normal force arm.
C	This command runs the Confidence Test. The Confidence Test scans the library for cartridges, then randomly moves cartridges between cells. Cartridges are not moved to the drive(s). Stop this test at any time by pressing any key on the serial terminal or by pressing any tape library operator panel key. **Note:** This command randomly repositions cartridges in the cells unless all cell slots are full.

Table 13. Diagnostic Commands (Continued)

Command	Description
+/-	This command allows you to turn power on or off to both the motor driver and the drive handle stepper motor. Drive power is not affected by this command. + / - is typically used to free up the axes for measurement purposes and is used in conjunction with the P command.
%	This command reads and reports the temperature in degrees Fahrenheit (°F) of drive A, drive B, and the controller card.
~	This command is used in remote diagnostics only to stop after each pick or place, and to wait for user input before continuing.
*	This command resets all position datum numbers. USE THIS COMMAND WITH CAUTION.
!	This command reads and reports the voltages of the +5V, +12V and +12V power supplies.
A	This command moves the shuttle in front of the selected cell, but will not perform a pick or place move.
B	After two additional prompts, this command actuates the normal force arm.
C	This command runs the Confidence Test. The Confidence Test scans the library for cartridges, then randomly moves cartridges between cells. Cartridges are not moved to the drive(s). Stop this test at any time by pressing any key on the serial terminal or by pressing any tape library operator panel key. **Note:** This command randomly repositions cartridges in the cells unless all cell slots are full.

Table 13. Diagnostic Commands (Continued)

Command	Description
D	Drive load and unload test. Attention: To run this test the SCSI addresses must be: Drive A = 4 Drive B = 5 Controller = 6 Any other addresses will prevent the test from running.
	Drive Load and Unload Submenu
	D - Drive load and unload test
	E - Drive load and unload test, exclude drive B
	L - Drive load and unload test, exclude cells 9 and 14
	Q - Query inventory table
	R - Request sense
	S - SCSI drive communication test
	T - Target disconnected status
	U - Unload all drives
	W - Drive write and read diagnostic test
	X - Exit
E	This command continuously picks and places out of one cell only.
F	This command does a bar code scan.
G	This command engages and disengages the cartridge gate solenoid on the shuttle.
H	This command randomly positions the shuttle in front of cells but will not perform a pick or place move.
I	This command initializes the tape library robotics. The tape library performs these five steps: Turns the motor +24 V power supply on. Homes the normal force arm, cartridge seat rack, and the X-axis. Checks for magazine present. Detects and initializes drive(s) present. If an error is detected during the execution of this command, the error code and associated SCSI ASC and ASCQ bytes are printed. Refer to the **SCSI Error Codes** on page **A-154**.
J	This command sets the brake and clutches for an X-axis move, and turns the motor off.
K	This command sets the brake and clutches for an Z-axis move, and turns the motor off.

Table 13. Diagnostic Commands (Continued)

Command	Description
L	This command sets the brake and clutches for a rack move, and turns the motor off.
M	This command allows the operator to move a cartridge via the serial port. The status for the source and destination locations (full or empty) is not checked.
N	This command checks each cell for a cartridge present. This command does not attempt to read the bar code.
O	This is an internal manufacturing test only.
P	This command continuously prints out the position in counts of the motor rotation. It also prints out the state of the system ports two and three. This command is used typically with power off to check the location of elements and datums.
Q	This command prints out the internal inventory and statistics table, which provides element information such as OCCUPIED, CARTRIDGE BAR CODE LABEL, PUTS, and POWER ON-TIME.
S	This command enters the Serial EEPROM setup sub-menu.
T	This command outputs 8K ASCII hex bytes that describe the last 4000 events that were logged internally. The trace output is used as a debug tool. Refer to **Trace Bug Information** on page **106** for a complete description of that procedure.
U	The tape library prints out on the serial port debug information as the firmware is running. This command allows you to set the amount of debug information printed. There are four levels, 0-3. The default is 0.
V	This command reports the tape library serial number.
W	This command reports what is being communicated to the tape library from each drive.
X/Y	This command moves drive handles up or down. It is used mainly as a test to verify proper drive handle operation.
Z	This command zeroes the retry and put statistics of the internal inventory and statistics table. It does not zero any datum changes.

Trace Bug Information

Trace debug information consists of 8K ASCII hex bytes that describe the last 4000 events that were internally logged in a tape library. To obtain trace debug information for later analysis, you must run remote diagnostics with a remote terminal. After enabling the remote diagnostic mode, perform the following steps.

1. Insert a blank diskette into the diskette drive in your PC or laptop computer.
2. Turn on the text or ASCII capture file option in the communication program

(Hyperterminal, PROCOM, or other).

Note

*For example, on Hyerterminal, the text file capture selection has its own icon on the action bar. When the dialog box appears, type:**a:\xxxx.yyy** (example, **a:\trace1.txt**)*

3. Type:T <Enter>
4. After the trace is finished, close the capture program.
5. Give the trace information to the next level of support.

Library Firmware Updates

Use this procedure to upload a new version of the tape library firmware to your tape library. You must be running remote diagnostics with a remote terminal. After enabling the remote diagnostic mode, perform the following steps.

1. Insert the diskette that contains the new firmware into the attached PC.
2. Type: # <Enter>

The tape library erases the alternate firmware bank flash memory. After the tape library successfully erases flash memory, it prompts to begin uploading the firmware memory.

If the tape library is unsuccessful at erasing the flash memory bank, a message appears and the tape library continues to operate with the current firmware.

1. Turn on the ASCII Upload file option in the communication program (Hyperterm, PROCOM, or other).
2. Enter the new release name for the firmware file. The correct file name is on the label and uses an.ASC extension; however, if the label is missing, type **DIR A:*.ASC** to determine the name of the firmware file.

Uploading and programming takes approximately ten minutes to write and verify for each bank.

At the completion of the upload, an upload status message appears and the tape library automatically reboots. The new firmware immediately takes effect.

Note

When working with the Q2.15 the download operation must be performed twice to upgrade both flash.

If the tape library is unsuccessful at loading the new firmware, a message appears and the tape library continues to operate with the current firmware. Failure to successfully load new firmware might indicate a faulty flash memory, which would require replacement of the controller.

Internal Element and Statistics Table and Interpretation

The tape library maintains a 19-element table of the library cartridge inventory and robotics statistics. The table consists of two parts: the inventory page and the statistics page. Each table tracks the library's internal inventory by element address.

The following is a typical inventory page:

```
 I|ADDRS|   LABEL|LEPOVDSR|X DATM|X LST|Z DTM|Z LAST|TOL-
STP|R|I|SNS|ASC|ASQ|
 0     0          00101000     26     0      0     0      0 0 FF  0   0   0
 1     1    B0003 11111000      0     0      0     0      0 0 FF  0   0   0
 2     2          00101000     26     0      0     0      0 0 FF  0   0   0
 3     3          11111000      0     0      0     0      0 0 FF  0   0   0
 4     4          00101000      0     0      0     0      0 0 FF  0   0   0
 5     5          00101000      0     0      0     0      0 0 FF  0   0   0
 6     6          00101000      0     0      0     0      0 0 FF  0   0   0
 7     7          00101000      0     0      0     0      0 0 FF  0   0   0
 8     8          11111000      0     0      0     0      0 0 FF  0   0   0
 9     9    B0021 10111000    -26     0      0     0      0 0 FF  4  40  C2
10    10    C0017 10111000      0     0      0     0      0 0 FF  0   0   0
11    11    D0026 10111000      0     0      0     0      0 0 FF  0   0   0
12    12          00101000      0     0      0     0      0 0 FF  0   0   0
13    13          00101000      0     0      0     0      0 0 FF  0   0   0
14    14    B0024 10111000      0     0      0     0      0 0 FF  0   0   0
15   116          00101000    -26     0      0     0  -1402 0 FF  0   0   0
16   117          00101000    -52     0      0     0  -1380 0 FF  0   0   0
17    17          00000000      0     0      0     0      0 0 FF  0   0   0
18   132          00001000      0     0      0     0      0 0 FF  0   0   0
 I|ADDRS|   LABEL|LEPOVDSR|X DATM|X LST|Z DTM|Z LAST|TOL-
STP|R|I|SNS|ASC|ASQ|
```

Where:	Denotes:
I	Decimal internal element address.
ADDRS	Decimal SCSI element address.
LABEL	Right-justified cartridge bar code label, with the checksum character stripped.
LEPOVDSR	Bit-mapped element state field interpreted as: L Label Valid E Label Error P Magazine Present O Element Occupied V Element Occupied Flag Valid D Not Used S Not Used R Not Used
X DATM	X target offset in counts for this element.
X LST	Last X offset target in counts for this element.
Z DATM	Z target offset in counts for this element.
Z LST	Last Z offset target in counts for this element.
TOLSTP	Z count at the back of the drive for this element.
R	SCSI ID of a host reserving this element (0 -7)
I	Reservation ID: 0 - 0xFE for reserved 0xFF for not reserved
SNS	Last sense code reported to host.
ASC	Last ASC code reported to host.
ASCQ	Last ASCQ code reported to host.

The following shows a typical statistics page:

```
 I|-CRTY|RTRTY|PTRTY|CTRTY|LTRTY|  PUTS|BCRTRY|
 0     0     2     0     0     0   242      0
 1     0     0     0     0     0   264      0
 2     1     1     2     0     0   215      0
 3     0     0     0     0     0   258      0
 4     0     0     0     0     0   221      0
 5     0     0     3     0     0   237      0
 6     0     0     0     0     0   238      0
 7     0     0     2     0     0   238      0
 8     0     0     0     0     0   243      0
 9     1     0     1     0     0   246      0
10     0     0     0     0     0   248      0
11     0     0     0     0     0   226      0
12     0     0     0     0     0   212      0
13     0     0     0     0     0   243      0
14     0     0     0     0     0   232      0
15     1     0     3     0     1   548      0
16     1     3     3     0     0   337      0
17     0     0     0     0     0     0      0
18     0     0     0     2     0  4452      0
 I|-CRTY|RTRTY|PTRTY|CTRTY|LTRTY|  PUTS|BCRTRY|
Magazine Offset = 74
Fixed Cell Offset = 50
Drive A Offset  = 58
Drive B Offset  = 92
Status = 228/33/22603/5.19/12.85/26.20/76F/75F/76F
ETime =     1:16:53:16.
```

Where:	Denotes:
I	Internal element address.
CRTY	Number of retries starting cartridge on a pick from this element.
RTRTY	Number of retries after starting cartridge on a pick from this element.
PTRTY	Total number of put retries to this element.
CTRTY	Total number of center retries to this element.
LTRTY	Total number of latch retries to this element (drives only).
PUTS	Total number of puts to this element.
BCRTRY	Total number of bar code retries for this element.
Magazine Offset	Offset from nominal for the magazine.
Fixed Cell Offset	Offset from nominal for the fixed cells.
Drive A Offset	Offset from nominal for Drive A.
Drive B Offset	Offset from nominal for Drive B.

Status	Example status line: 228/33/22603/5.19/12.85/26.20/76F/75F/76F Total power on hours/Total hard pick and put errors/ Total puts/ Voltage of +5v supply/Voltage of +12v supply/ Voltage of +24v supply/Drive A temperature/ Drive B temperature/Controller temperature
Etime	Total on time in the form of Days: Hours: Minutes: Seconds.

Maintenance Menu

The maintenance menu provides a way for a user to verify the machine serial number, verify the SCSI interface type (single ended or differential), reinitialize the tape library, reset operational statistics, reset datums (datums are the reference points for positioning the robotic shuttle) and upgrade the drive and library firmware using a DLT tape. **Table 14.** lists these tasks and defines the result of performing the tasks.

Table 14. Maintenance Menu Tasks

Task	Definitions
SERIAL #	Displays Machine S/N
SCSI	Displays interface type SE or Diff
RE-INITIALIZE?	Reinitializes the library and all axes.
RESET STATISTICS?	Resets the retry statistics to zero. The retry statistics are listed in the internal inventory and statistics table.
RESET DATUMS?	Resets datums to default settings.
LD Code Tape	Upgrade Firmware to next release

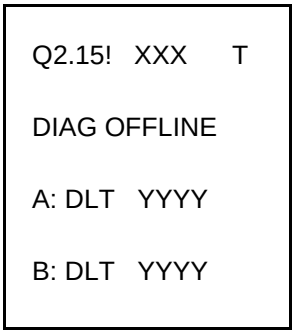
Re-initializing, Resetting and Datums Reset

The following procedure describes how to use the operator panel to re-initialize the tape library, reset the internal statistics to zero, and reset the datums to the default settings.

Note

Make sure that the front door key lock is in the 12 o'clock position. Change the tape library to the diagnostic off-line mode.

Starting from



1. Press the **Cycle** key six times. The following menu is shown on the operator panel.

DLT DIAGNOSTIC

CONFIDENCE TEST

REMOTE DIAGNOSTICS

MAINTENANCE MENU

2. Press the **Select** key once. The following menu is shown on the operator panel.

Serial #: XXXXXX

SE SCSI:

RE-INITIALIZE?

RESET STATS?

RESET DATUMS?

LD Code Tape?

Press the **Cycle** key to move the arrow down to the maintenance task to be performed.

3. Press the **Select** key once. The operation is performed and the tape library returns to the on-line mode.

Repair and Replacement Procedures

This section explains removal and replacement of the tape drives, tape library controller, power supply, and cover of the desktop tape library. It also explains to replacement procedures for the power supply fuse, front door bezel, fixed bezel and the base tape library in the event the base library must be replaced

Warning

To prevent electrical shock when servicing the system, ensure the power cords for those devices are unplugged before the signal cables are connected or disconnected. Disconnect all power cords from the existing system before you add or remove a device.

DLT Drive Load Plate Conversion

Q2.15 drive modules and all spare drives are shipped on universal load-plates configured for Q7 & Q47 libraries. This procedure describes how to convert a tape drive module to accommodate a Q2.15 library. **Figure 32.** shows ta view of the components that make up the spare tape drive module.

1. Locate the hardware and instruction envelope and remove the Allen wrench, instructions and failure report sheet.
2. Loosen the two screws securing the spacer block (1) and move it to the inside position for Q2.15 configuration.
3. Tighten the two screws.

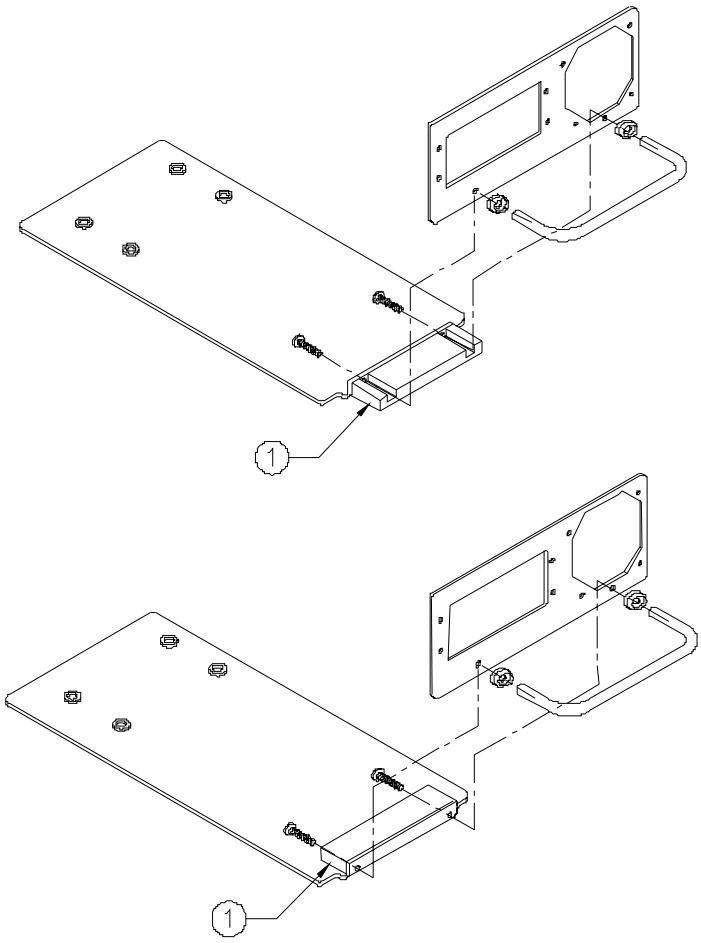


Figure 32. Drive Load Plate Conversion

Tape Drive Removal and Installation

This procedure describes how to remove and replace a tape drive module. A tape drive module consists of a tape drive, cooling fan SCSI Cable and serial interface card mounted onto a load plate. The load plate supports the tape drive and fan. shows the exploded view of the components for removing or installing a tape drive module

Removal

1. Disconnect AC power to the tape library by setting the power switch to off.
2. Disconnect the SCSI cables from the tape drive to be replaced.
3. If the tape drive module being removed has a SCSI terminator, remove the terminator.
4. Remove the four screws securing the retaining bezel to the tape library back panel and remove the bezel.
5. Remove the tape drive module by grasping the handle and pulling straight back, pulling the tape drive module from the tape library.

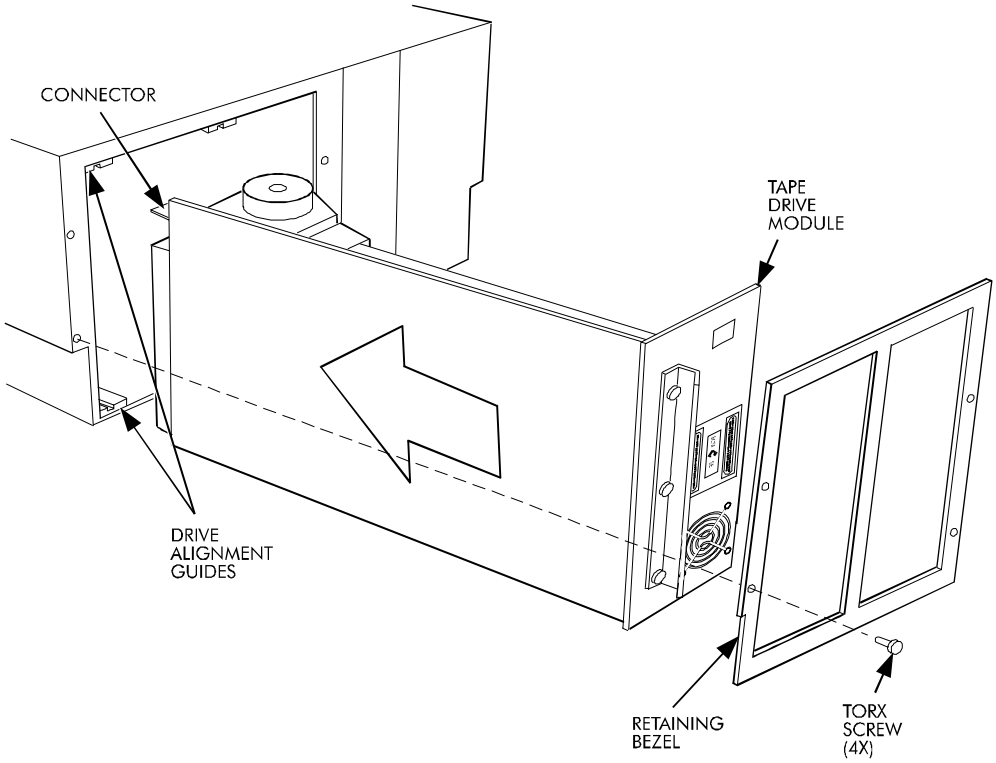


Figure 33. Tape Drive Module

Replacement

Replace the tape drive module by aligning the edges of the load plate in the slides and pushing the tape drive into the tape library until the connector on the tape drive completely engages the connector in the tape library. The connectors are completely engaged when the tape drive module is flush with the tape library back panel.

Note

Occasionally the male serial interface connector card may be knocked out of alignment and will not plug into the connector inside the library. The card on the drive load plate may need to be slightly straightened to properly engage the connector in the tape library.

1. Replace the retaining bezel and reinstall the four screws securing the bezel to the tape library back panel.
2. If the tape drive module being replaced had a SCSI terminator, install the terminator on the new tape drive module.
3. Reconnect the SCSI cables to the drives.
4. If needed, reset the SCSI addresses.

5. Restore the power to the tape library by setting the power switch to on.
6. Verify the drive successfully completes the drive POST test.

Installing an Additional Drive

If the tape library was originally configured with only one DLT tape drive, a second DLT drive can be added in the field by performing the following procedure.

1. Remove the power to the tape library by setting the power switch to off.
2. Disconnect the SCSI cables from the tape drives.
3. Remove the four screws securing the retaining bezel to the tape library back panel and remove the bezel (**Figure 33.**).
4. Remove the dust cover plate from the empty tape drive module location.
5. Insert the new tape drive module by aligning the edges of the load plate in the slides and pushing the tape drive into the tape library until the connector on the tape drive completely engages the connector in the tape library.

   The connectors are completely engaged when the tape drive module is flush with the tape library back panel.
6. Replace the retaining bezel and reinstall the four screws securing the bezel to the tape library back panel.
7. Install the SCSI terminator, as appropriate for tape library configuration.
8. Reconnect the SCSI cable to the original drive and a new cable to the new drive.
9. Verify or reset the SCSI addresses to avoid duplicate addresses.
10. Restore the power to the tape library by setting the power switch to on.
11. After power is restored, the library will complete initialization and go on-line. Verify that both drives completed POST and the tape library recognizes that two tape drives are installed as it performs its initialization (both drive doors will be exorcised).

    When the library is functioning correctly the front panel will display:

```
Q2.15      XXX   T
ONLINE
DRV A: EMPTY
DRV B: EMPTY
```

XXX = The current library firmware level

T = The SCSI Address assigned to the library.

Controller Removal and Replacement

This procedure describes how to remove and replace the controller. **Figure 34.** shows a view of the components for removing or installing the controller.

Removal

Before removing power from the unit, check the front panel and note the SCSI ID assigned to the library.

1. Remove the power to the tape library by setting the power switch to off.
2. Disconnect the SCSI cables from the controller.
3. Remove the three screws securing the controller to the tape library back panel.
4. Remove the controller by grasping the handle and pulling straight back, pulling the controller from the tape library.

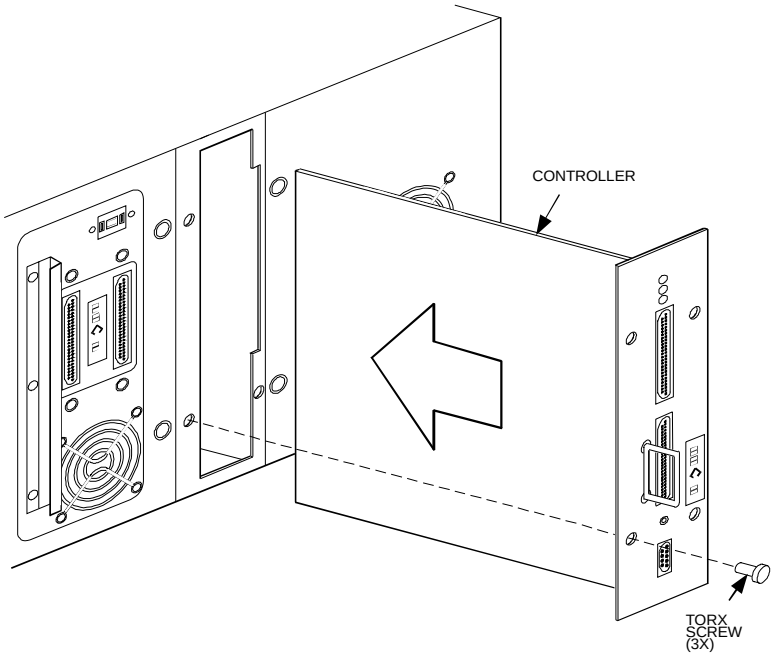


Figure 34. Controller

Replacement

Replace the controller by aligning the edges of the controller circuit card in the guides and pushing the controller into the tape library until the connector on the controller completely engages the connector in the tape library. The connectors are completely engaged when the controller is flush with the tape library back panel.

1. Reinstall the three screws securing the controller to the tape library back panel.
2. Reconnect the SCSI cables to the controller.
3. Restore the power to the tape library by setting the power switch to on.
4. If needed, reset the tape library parameters by performing the Setup Procedure.

Power Supply Removal and Replacement

This procedure describes how to remove and replace the power supply. **Figure 35.** shows a view of the components for removing or installing a power supply.

Removal

1. Remove the power to the tape library by setting the power switch to off.
2. Disconnect the power cord from the power supply.
3. Remove the four screws securing the power supply to the tape library back panel.
4. Remove the power supply by grasping the handle and pulling straight back, pulling the power supply from the tape library.

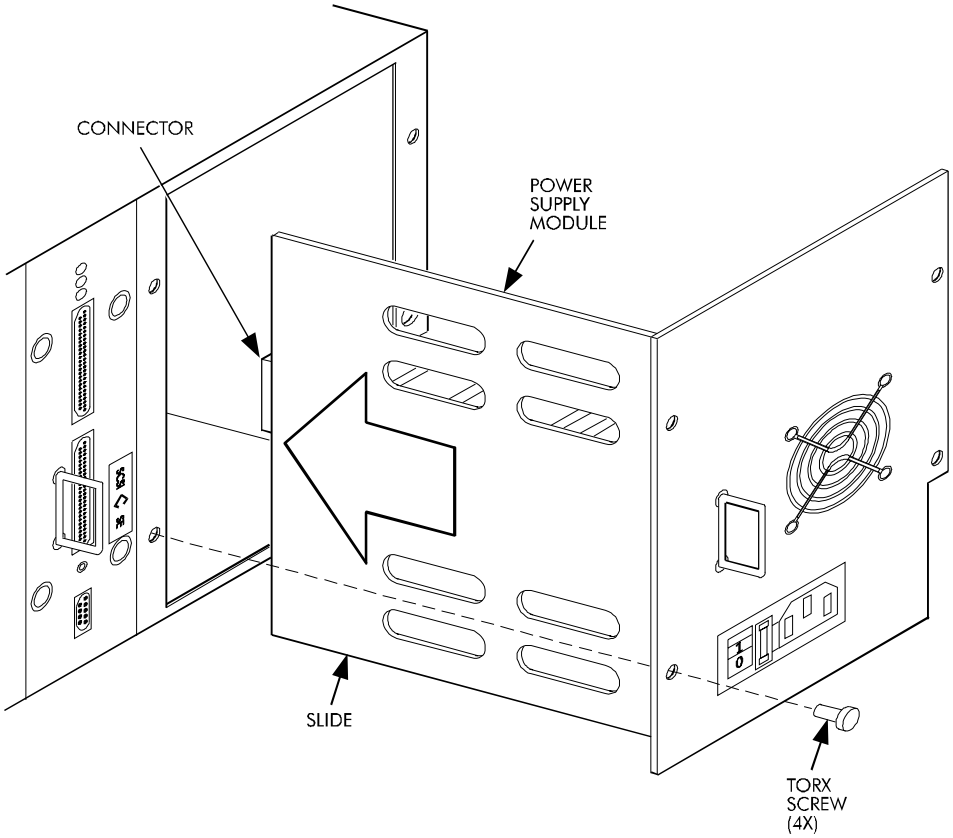


Figure 35. Power Supply

Replacement

1. Replace the power supply by aligning the edges of the power supply slide in the guides and pushing the power supply into the tape library until the female connector on the power supply completely engages the male connector in the tape library.

   The connectors are completely engaged when the power supply is flush with the tape library back panel.
2. Reinstall the four screws securing the power supply to the tape library back panel.

3. Reconnect the power cord to the power supply.
4. Restore the power to the tape library by setting the power switch to on.
5. Verify the library and drives successfully complete initialization and go on-line.
6. Verify the power supply fan is running.

Fuse Replacement

One 5 A, 115 V fuse protects the tape library in the event of excessive current flow. This procedure describes how to replace the fuse in the event it is blown.

Removal

1. Remove power from the tape library by setting the power switch to off.
2. Disconnect the power cord from the power supply.
3. Using a slot screwdriver, gently pry the fuse holder straight out from the power supply.
4. Remove the blown fuse from the clips that hold the fuse.

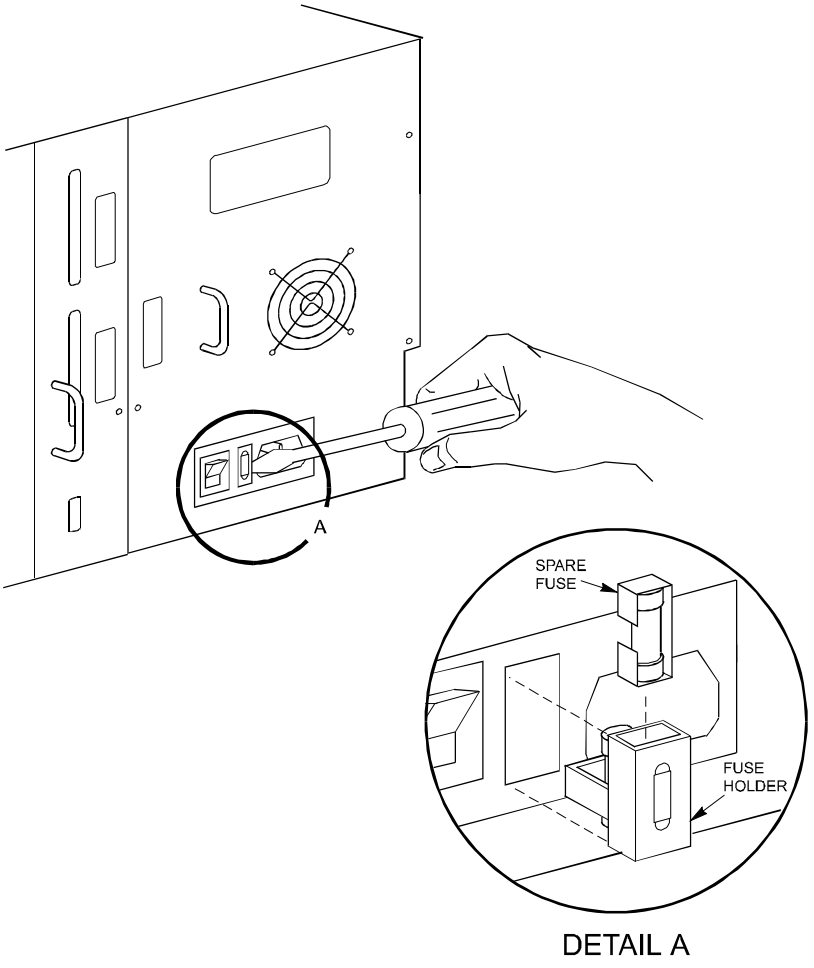


Figure 36. Fuse Replacement

Replacement

1. A spare fuse is held in a compartment in the fuse holder. Use the tip of the slot screwdriver to slide the compartment open and remove the spare fuse. Slide the compartment back into the holder.
2. Insert the new fuse into the clips.

3. Replace the fuse holder by pressing it straight into the receptacle in the power supply.
4. Reconnect the power cord to the power supply.
5. Restore power to the tape library by setting the power switch to on.
6. Verify that the library successfully completes initialization.

Door and Bezel Replacement

This procedure describes how to remove and install the plastic bezels mounted to the front door and to the chassis above the front door. illustrates the components for removing and installing the front door and fixed bezels.

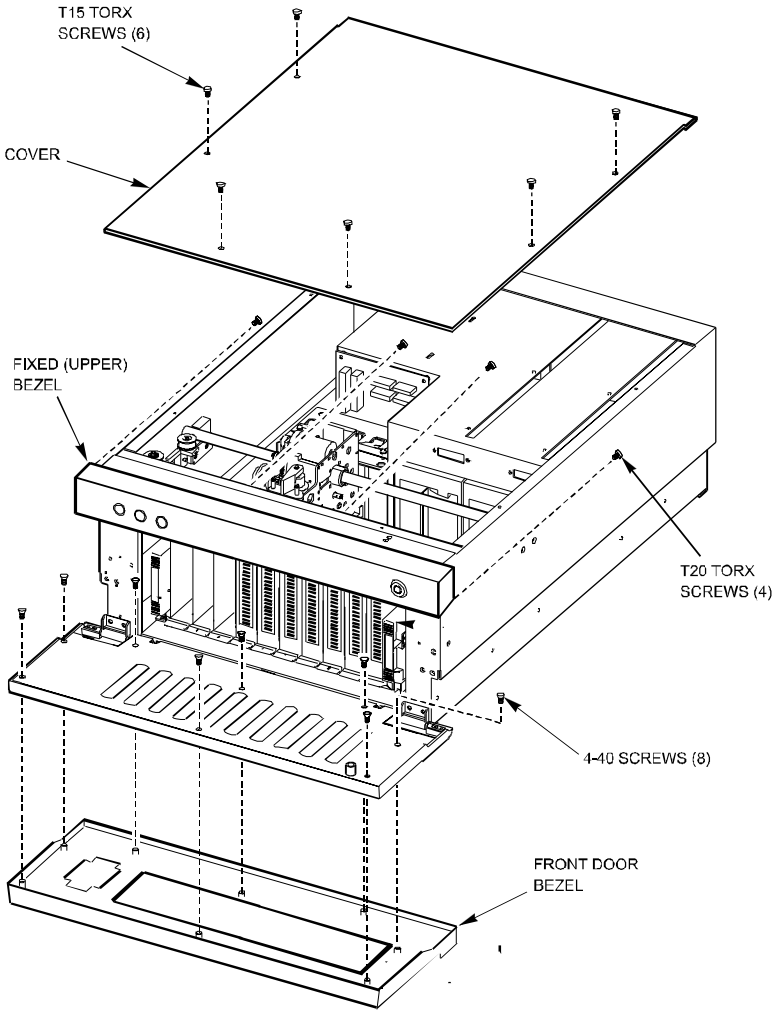


Figure 37. Door and Bezel Replacement

1. Remove power from the tape library by setting the power switch to off.
2. Remove the six Torx (T15) screws that secure the top cover to the tape library chassis and remove the top cover.
3. Turn the key at 9 o'clock 🕘 position and open the front door. Make sure that

nothing is below the door that would keep the door bezel from being removed.

Eight flat-head screws hold the front door bezel to the door sheet metal panel. The screws are inserted through the sheet metal panel and thread into inserts that are molded into the door bezel.

4. Remove the eight flat-head screws that secure the door bezel to the sheet metal panel. Hold the bezel to keep it from falling away from the sheet metal panel.
5. Remove the four Torx (T20) screws that secure the fixed bezel to the tape library chassis.

   Two screws are inserted through mounting ears at the left and right sides of the library chassis. The remaining screws are inserted through the front-center of the library chassis; these screws are partially concealed by a ribbon cable that runs along the front of the library chassis. Carefully move the ribbon cable down to gain access to the screws.
6. Install the front door and fixed bezels by performing the steps in this procedure in reverse order.

Caution

When installing the fixed bezel, make sure that the bezel does not bind the control keys and keep them from making contact or holding them closed.

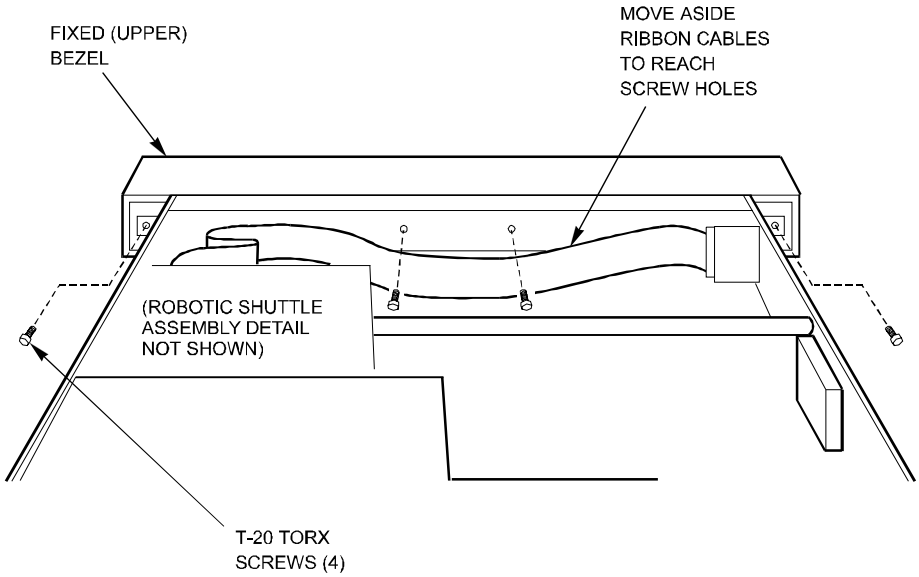


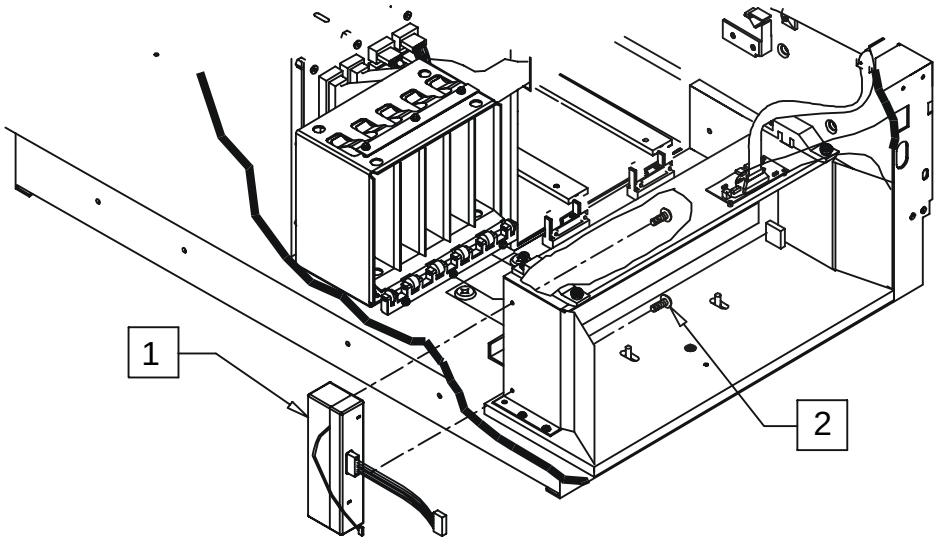
Figure 38. Bezel Mounting Screws

This illustration shows the inside of the chassis and the back of the fixed bezel as seen when standing at the rear of tape library.

Bar Code Reader Removal and Replacement

Removal

1. Remove the power from the library unit by setting the power switch to off.
2. Open the front using the key supplied.
3. Remove the magazine and set aside. If you have a Rack Mount Q2.15 go to step 6.
4. Remove the four screws in the located in the corners that hold on the cover.
5. Remove the cover and set aside. Proceed to step 6.
6. For the Rack Mount Q2.15. Remove the six screws that hold the top cover on. Remove the cover and set aside.
7. Remove the two screws located to the left on the magazine area.
8. Disconnect the Bar code cables J3 & J4.
9. Remove the Bar Code Reader.



1 PLUG BARCODE CABLES INTO J3 AND J4 ON DISPLAY BOARD.

2 12 in-lbs

Figure 39. Barcode Removal and Installation

Replacement

1. Locate the new Bar Code Reader and set in-place. Install the 2 screws removed in step 6.
2. Connect cables J3 & J4.
3. Power the unit on. Run confidence test to verity operation.
4. If confidence runs, Replace the cover and give back to the customer.

Cables and Terminator Installation

Use the following information to correctly connect the SCSI cables, terminators, and power cord.

Warning

Prevent a possible electrical shock from touching two surfaces with different electrical grounds, use one hand, when possible, to connect or disconnect signal cables.

To prevent a possible electrical shock when adding or removing any devices to or from the system, ensure that the power cords for those devices are unplugged before the signal cables are connected or disconnected. If possible disconnect all power cords from the existing system before you add or remove a device.

SCSI Cables

The SCSI cable configuration depends on the requirements and needs of the system to which the tape library is connected. The tape library can be connected to a single host computer that:

- Provides motion commands to the tape library robotic shuttle
- Reads data from a tape cartridge in a tape drive
- Writes data to a tape cartridge in a tape drive

Figure 40. shows a typical cable connection to the Q2.15 tape library. There are no in or out SCSI connectors on the tape drives or library controller. When connecting the cables from the controller to a drive, use the farthest connector to relieve cables stress. Make the widest possible cable loop as shown.

The SCSI cables that connect the tape library controller to the tape drives are included. In some installations, the installer must supply the SCSI cable that connects the tape library to the host computer. To ensure proper tape library operation, the SCSI connectors supplied by the installer must meet the following specifications.

- 68 pin
- Fast Wide (DLT-7000 only)
- Micro “D” screw mount (2-56 screw)
- Gold-plated connector pins

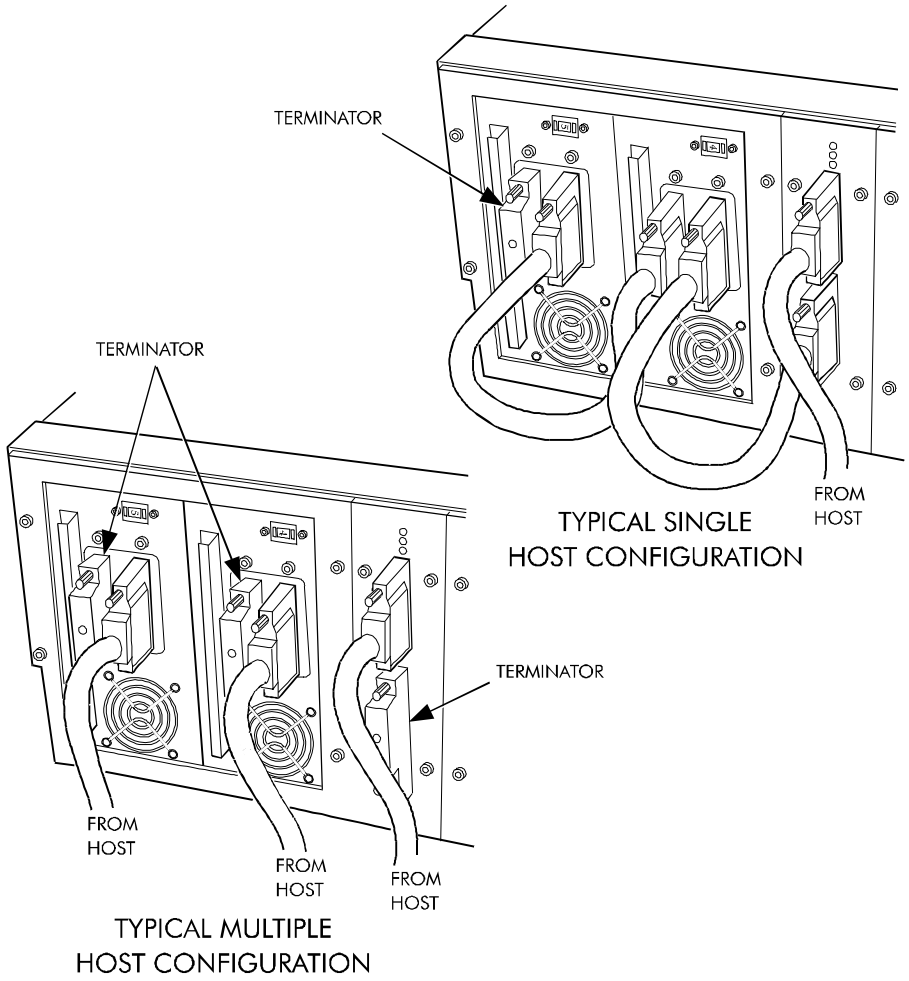


Figure 40. SCSI Cable Connections

Terminators

The tape library is available as either a single-ended or differential SCSI device. Single-ended and differential SCSI devices require different terminators. The tape drives in the tape library are clearly marked as to the type of device. Make sure that the correct terminator is installed for the type of SCSI device:

A single-ended terminator has the word **ACTIVE** on the terminator

A differential terminator has the word **DIFFERENTIAL** on the terminator

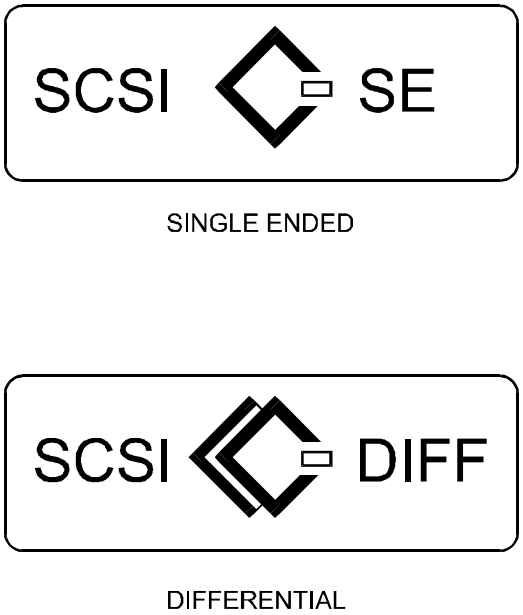


Figure 41. SCSI Labels

Figure 41. shows what the single-ended and differential SCSI labels attached to the tape library look like.

Power Cables

The library power connector is located on the back panel See.

1. Make sure that the tape library is turned off. (Press the **0** on the ON/OFF switch.)
2. Connect the power cable to the power supply in the tape library.
3. Connect the other end of the power cable to a power source.

The tape library can now be powered on and operated. The tape library comes preset with SCSI addresses and operating configurations that meet most users' requirements.

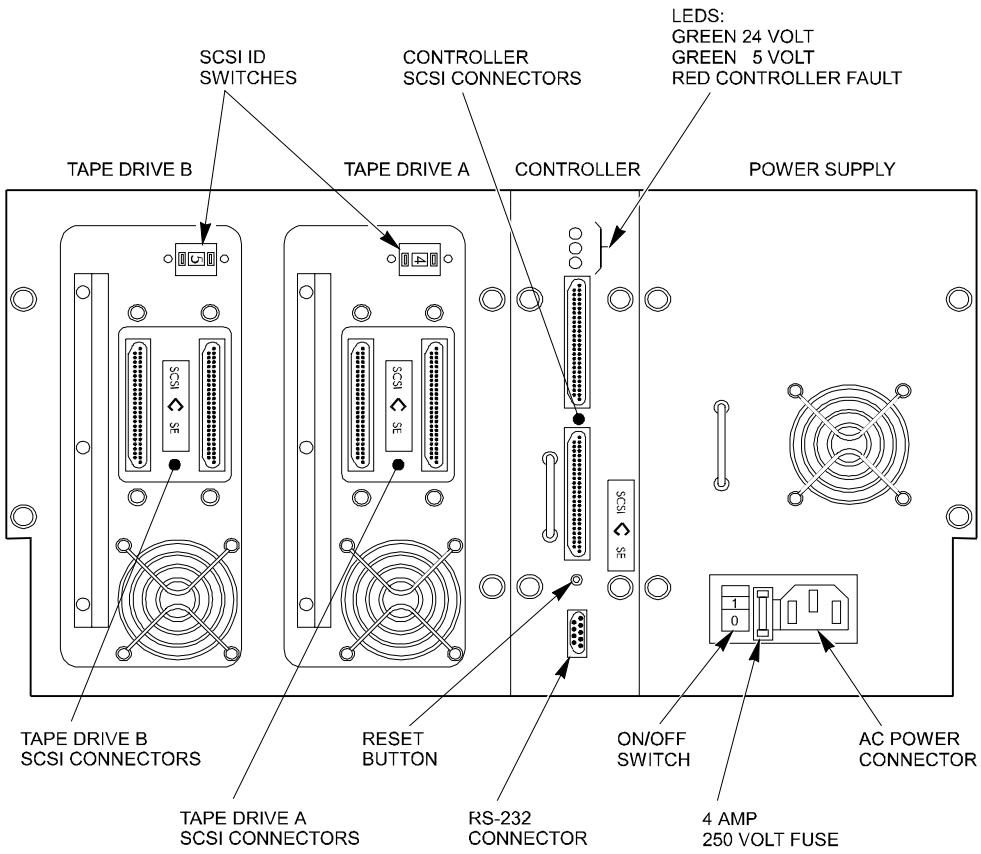


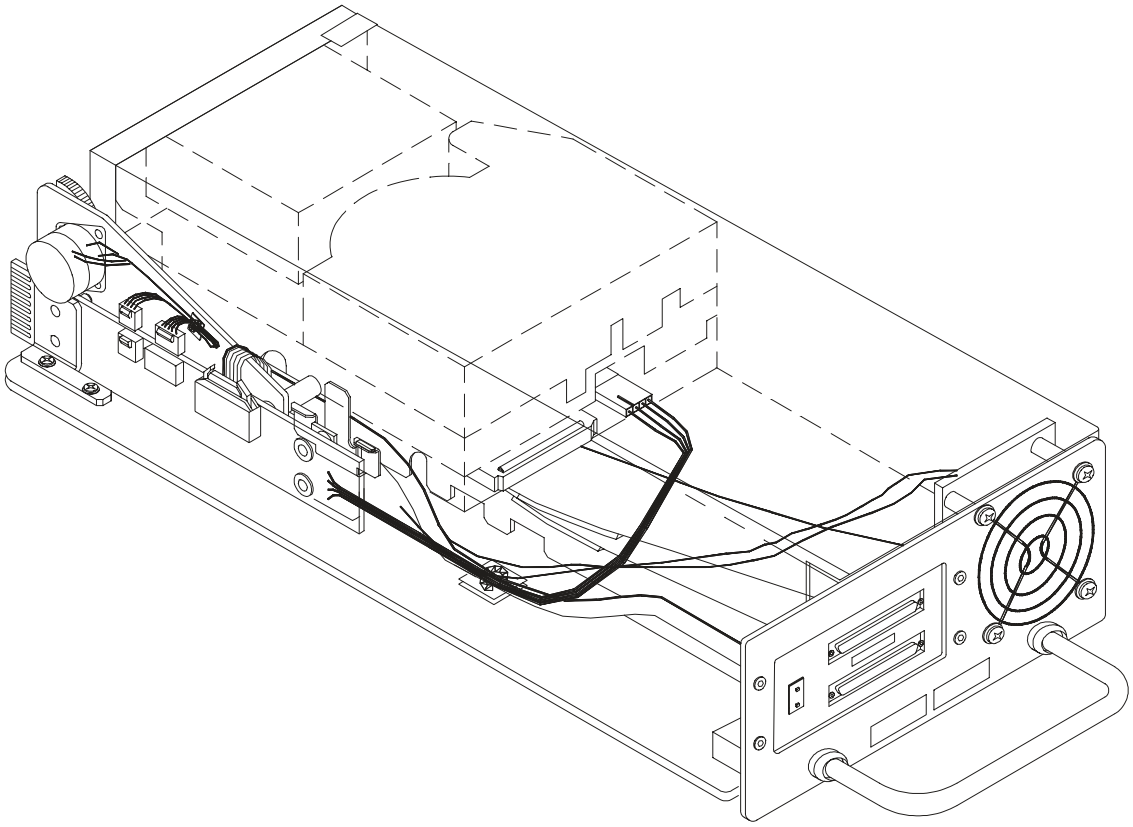
Figure 42. Rear Panel

5

Illustrated Parts Catalog

This chapter illustrates Q2 sub-assemblies to help easily identify the part with the associated part number

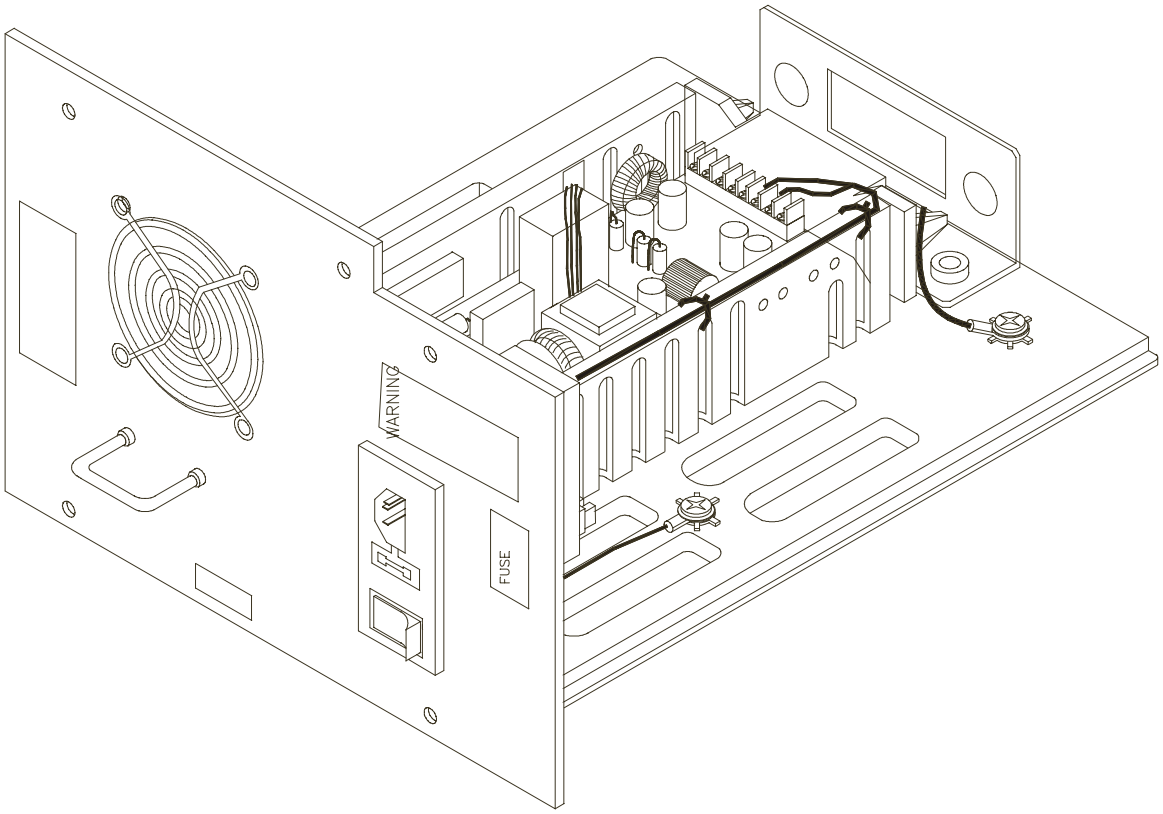
DLT Drive



Description	Part Number
DLT Drive	56xx.0000

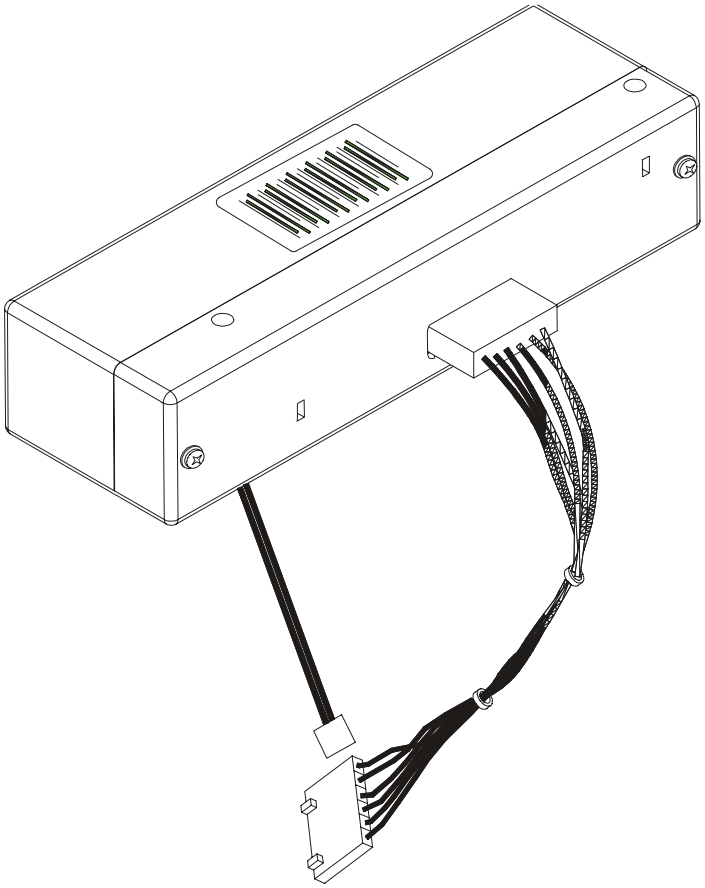
Verify the proper DLT drive type before ordering.

Power Module



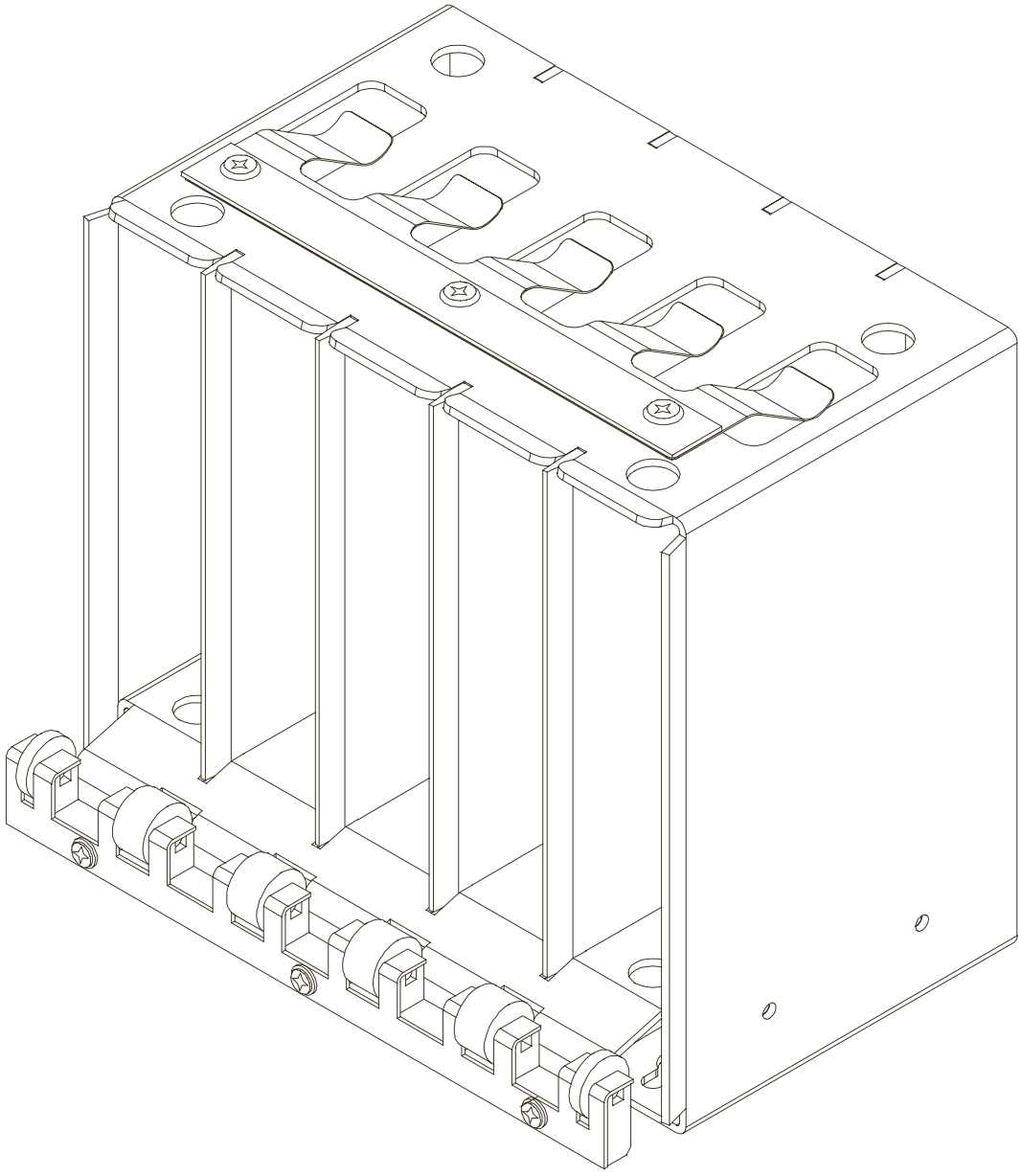
Description	Part Number
Power Module	5151.1000

Bar Code Reader



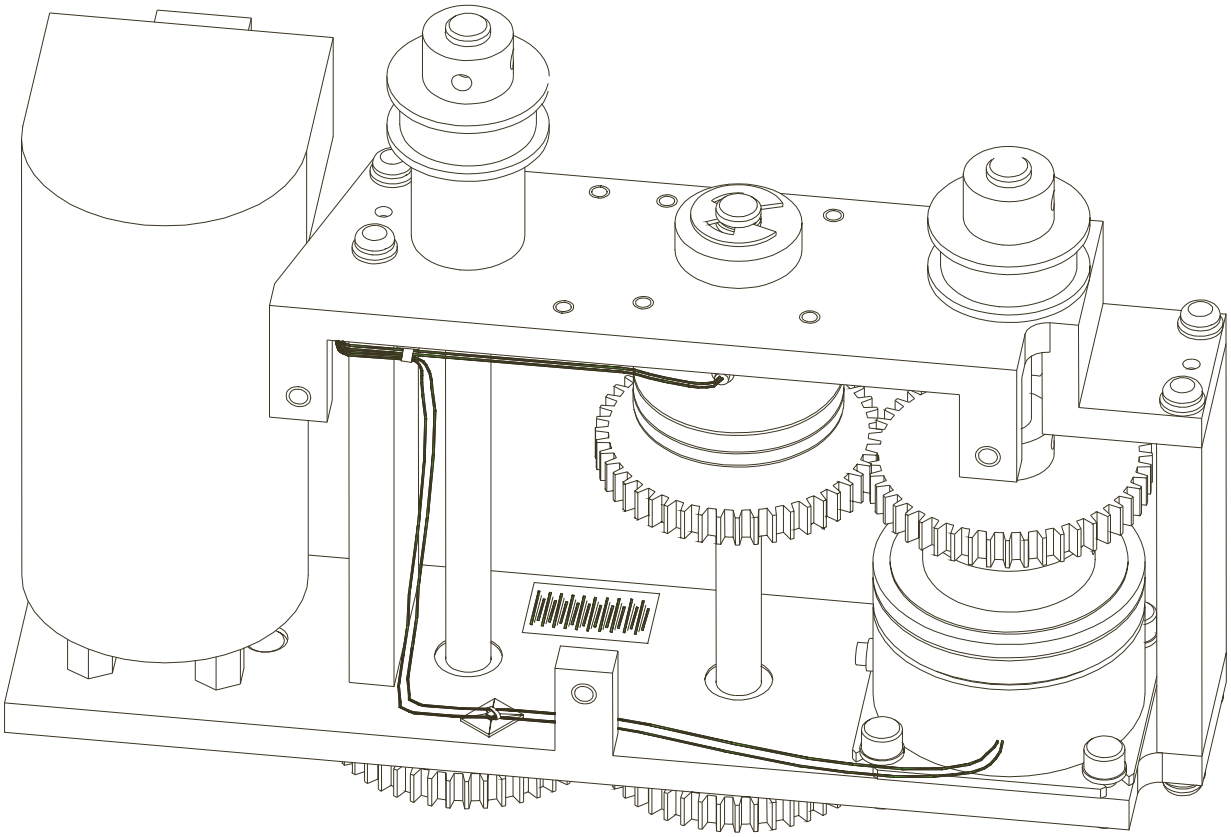
Description	Part Number
Bar Code Reader	5120.0000

Fixed Cells



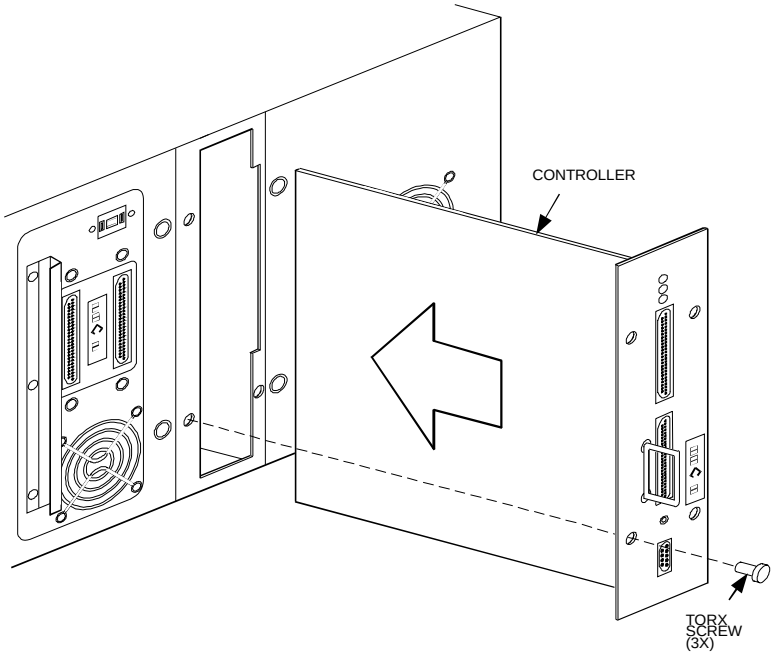
Description	Part Number
Fixed Cells	5156.0000

Main Drive



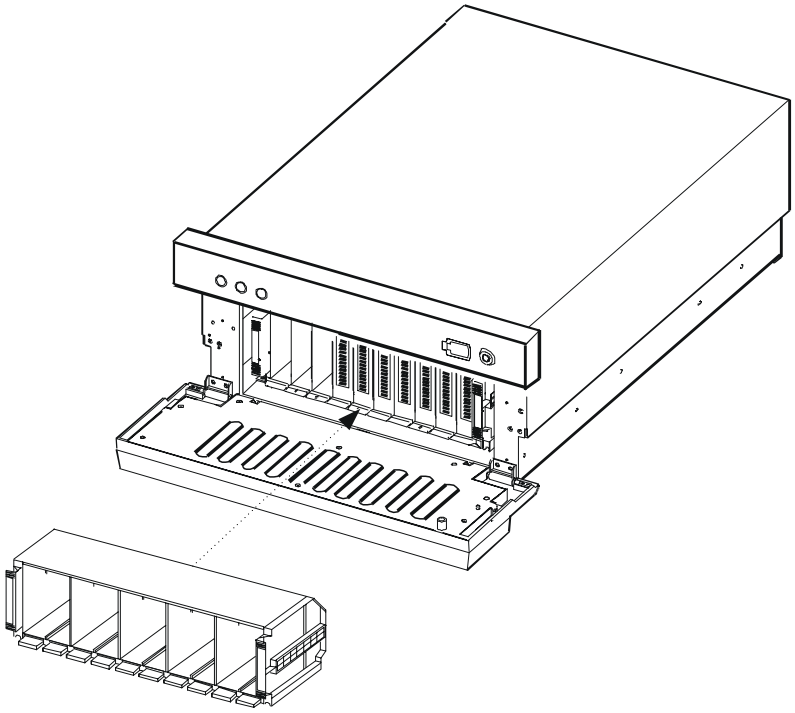
Description	Part Number
Main Drive	5123.0000

Controller / CPU



Description	Part Number
Diff CPU	2037.0000
SE CPU	2035.0000

Removeable Magazine



Description	Part Number
Magazine	5178.1100

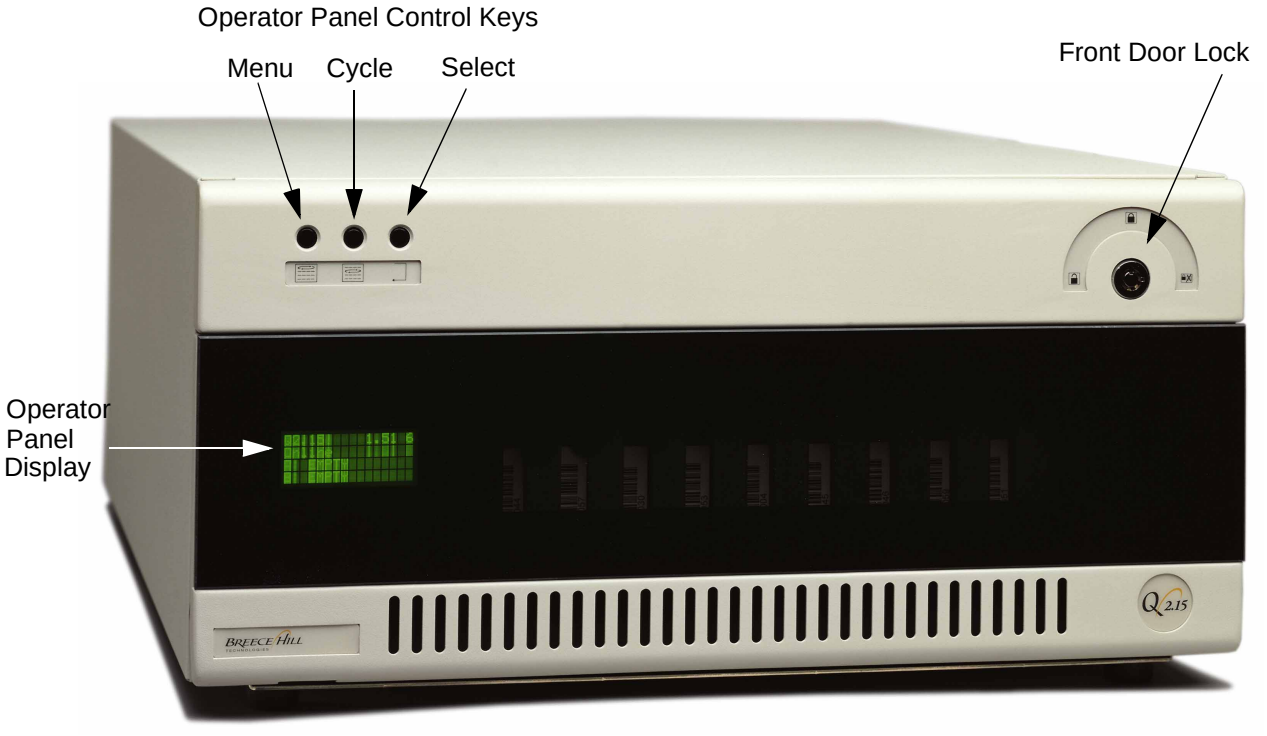
6

Pictoral Layouts

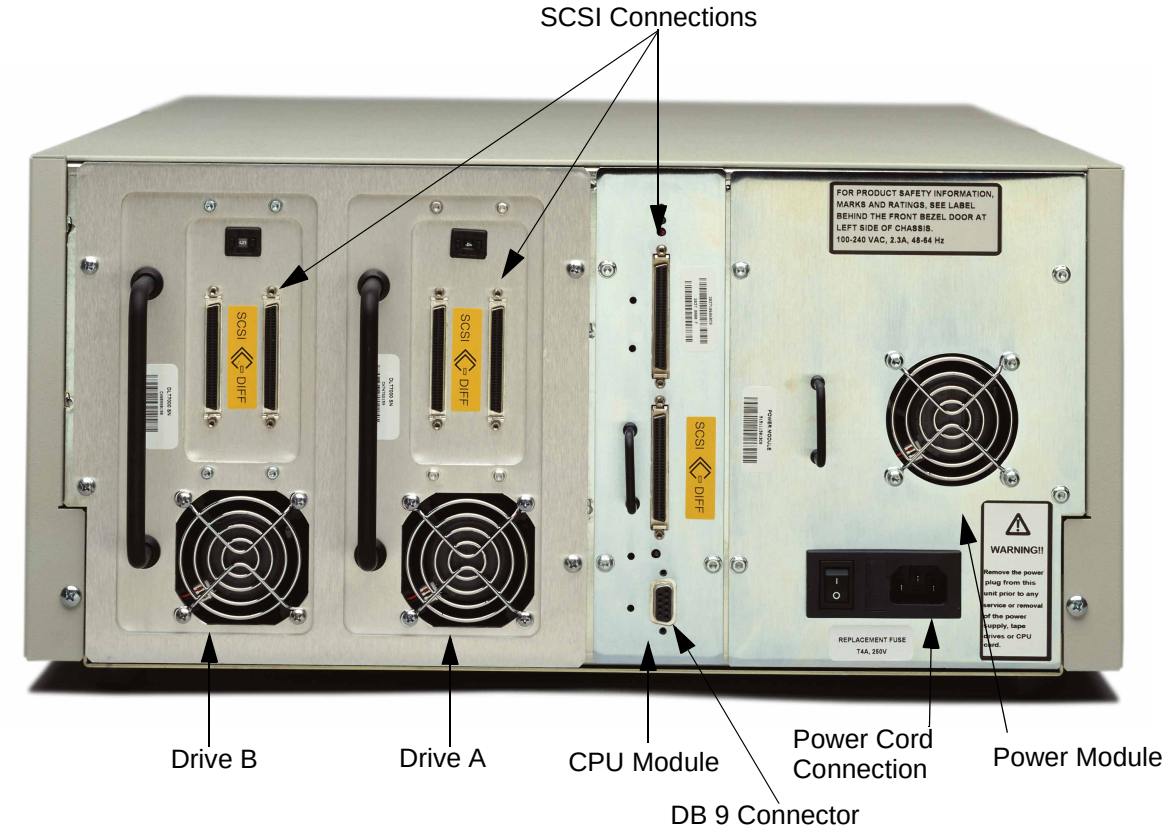
Photographs and line art drawings depicting detailed illustrations are displayed here to serve as a reference for training and for Technical Support Help Desk calls. Pictures include:

- Q2.15 Front/Rear View
- Q2.15 Internal View
- Q4.30 Front/Rear View

Q2.15 Front View

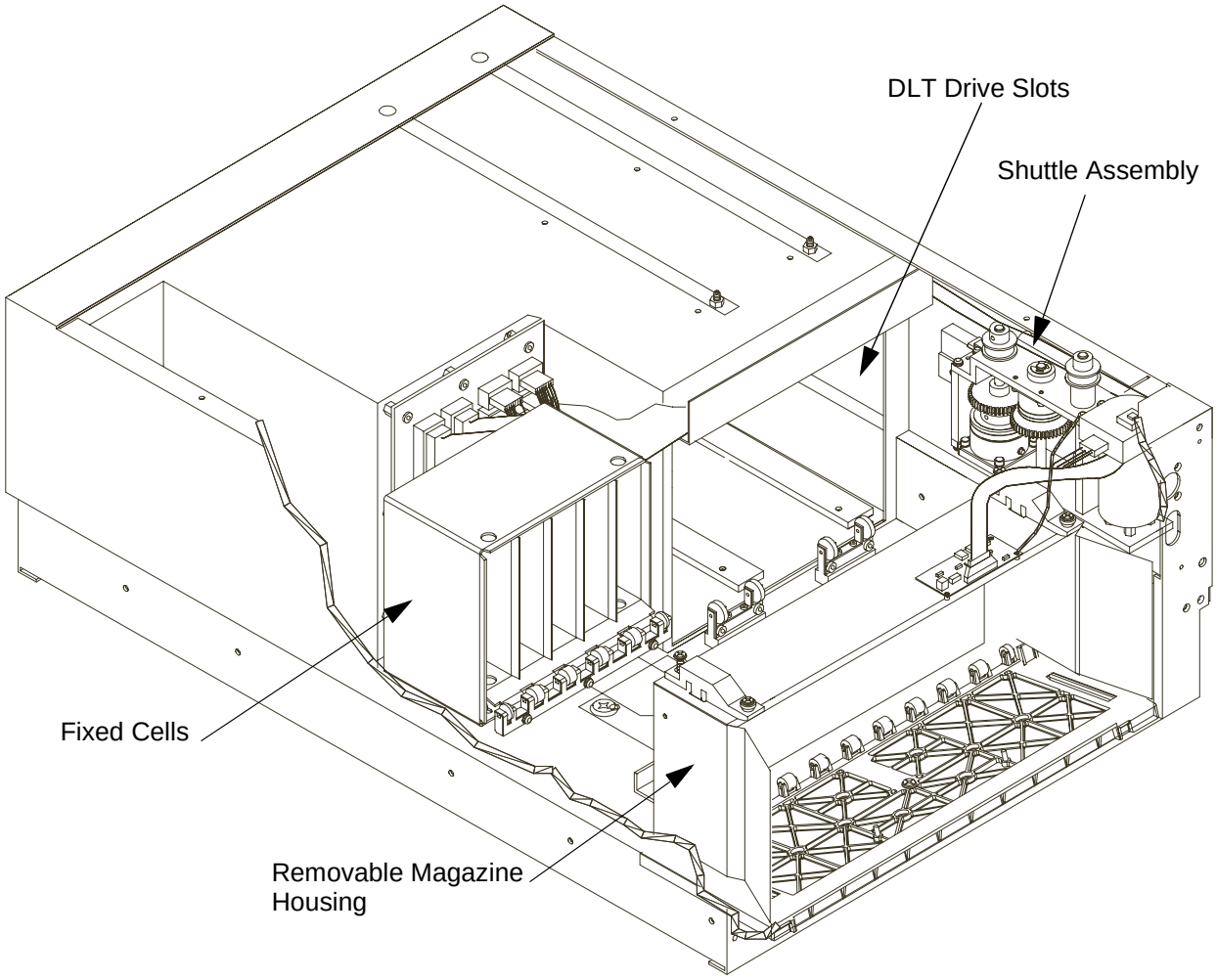


Back View


SCSI Connections
FOR PRODUCT SAFETY INFORMATION, MARKS AND RATINGS, SEE LABEL BEHIND THE FRONT BEZEL DOOR AT LEFT SIDE OF CHASSIS.
100-240 VAC, 2.3A, 48-64 Hz
SCSI
DIFF
WARNING!!
REPLACEMENT FUSE
T4A, 250V
Drive B
Drive A
CPU Module
Power Cord Connection
Power Module
DB 9 Connector

Q2.15 Front Inside View

Q2 Internal Components



Q4.30 Front View

Q4.30 Rear View

A

Error Codes

If the tape library experiences a problem while running, it reports the SCSI ASC/ASCQ bytes to the host computer and posts an error code on the operator panel. In addition to an error code. **UnSafe** or **DRIVERS HOT** might be shown on the operator panel. **UnSafe** is displayed when the front door is opened. **DRIVERS HOT** is displayed when the motor driver exceeds its maximum operating temperature. Either **UnSafe** or **DRIVERS HOT** causes the tape library to immediately turn off all motor power. As a result, error codes reported in conjunction with **UnSafe** or **DRIVERS HOT** actually represent secondary errors.

The Library Error Code table, provides descriptions, probable cause, and the module or assembly that users can replace to correct the error. The tape library has four major modules or assemblies that users can replace. They are: tape drive modules, controller, power supply, and the base tape library. The base tape library is one in which the tape drives and power supply have been removed. When more than one component is listed, the one most likely to have cause the error is listed first. Errors with codes less than 128 are hard errors. Errors greater than 128 are informational.

Library Error Codes

Table 15. Library Error Codes

Error Code	Error Description	Probable Cause	Replaceable Component
1	Servo controller did not come ready in time.	Firmware	Controller
2	Servo controller command sequence error.	Firmware	Controller
3	Servo controller did not initialize.	Firmware	Controller
4	Internal software error.	Firmware	Controller
5	Difference between desired position and actual position exceeded tolerance. Refer to ASCQ bytes to identify axis. ASCQ=: 0xA1 refers to X-axis 0xB1 refers to rack 0xC1 refers to Z-axis	Mechanical binding of axis	Controller Power module
6	Motion controller position overflowed.		Controller
7	Move in progress timed out.		Controller
8	Servo controller reported BUSY too long.	Firmware	Controller
9	Z-axis position overflowed during pick or place.	Normal force wheels dirty.	Controller
10	Pick operation timed out.	Firmware	Controller
11	Homing of rack took too long.	Firmware	Controller
12	During homing of rack, the difference between the rack actual and desired location exceeded tolerances.	Rack binding Main motor Rack home sensor Rack clutch	Controller Power module

Table 15. Library Error Codes (Continued)

Error Code	Error Description	Probable Cause	Replaceable Component
13	Rack position overflowed during rack homing.		Controller
14	Home of normal force actuator took too long.	Normal force arm binding Normal force home sensor Firmware	Controller
15	Gate actuator hung on magazine cell gate.	Gate actuator movement. Remove magazine and check the gate accutator on shuttle for proper movement.	Magazine.
17	Home of X-axis took too long.	Firmware	Controller
18	During homing of X-axis the difference between the actual and desired location exceeded tolerances.	Shuttle binding on rails Main motor Home Sensor	Controller Power module
19	X-axis position overflowed during homing.		Controller
20	Internal software error.	Firmware	Controller
21	X-axis controller address overflowed during magazine present detection.		Controller
22	X-axis difference between desired and actual position exceeded tolerance during magazine present detection phase.	Excessive binding in X-axis Main motor	Controller Power module
23	Magazine present detection took too much time.	Firmware	Controller

Table 15. Library Error Codes (Continued)

Error Code	Error Description	Probable Cause	Replaceable Component
24	X-controller address overflowed while moving to element.	Firmware	Controller
25	Difference between actual and desired position exceeded tolerances during move to element.	Shuttle binding to rails	Controller Power module
26	Move to element taking too much time.	Firmware	Controller
29	Difference between actual and desired position exceeded tolerances during cartridge latch into drive.	Shuttle binding on rails Drive	Controller Power module
30	Controller address overflowed during cartridge latch into drive.	Firmware	Controller
31	Cartridge latch took too long.		Controller
35	During cartridge retract, the difference between the actual and desired location exceeded tolerances.	Normal force wheels binding Normal force motor X-axis clutch	Controller Power module
36	Z-axis position overflowed during cartridge retract.		Controller
37	Cartridge retract took too long.	Firmware	Controller
38	Picker lost cartridge and was unable to recover moving cartridge to picker home.	Normal force belt dirty Shuttle alignment Cartridge present sensor	Base tape library

Table 15. Library Error Codes (Continued)

Error Code	Error Description	Probable Cause	Replaceable Component
39	While centering the cartridge in the shuttle, the difference between the actual and desired location exceeded tolerances.	Normal force binding Main motor	Controller Power module
40	Position overflowed during cartridge centering.		Controller
41	Cartridge centering took too long.	Firmware	Controller
42	Drive A handle did not open. For a Q4.30, drive A is the lower (master) unit.	Door motor on tape drive. PCB card on tape drive module.	Tape drive A module Controller Power module
43	Drive handle did not close. For a Q4.30, drive A is the lower (master) unit.	Door motor on tape drive. PCB card on tape drive module.	Tape drive A module Controller Power module
44	Drive B handle did not open. For a Q4.30, drive A is the lower (master) unit.	Door motor on tape drive. PCB card on tape drive module.	Tape drive B module Controller Power module
45	Drive B drive handle did not close. For a Q4.30, drive A is the lower master unit.	Door motor on tape drive. PCB card on tape drive module.	Tape drive B module Controller Power module
47	While placing a cartridge, the difference between the actual and desired location exceeded tolerances.	Shuttle binding Main motor	Controller Power module
48	Position overflowed during cartridge placing.		Controller
49	Placing took too long.	Firmware	Controller
50	Could not center cartridge in shuttle.	Shuttle binding	Controller

Table 15. Library Error Codes (Continued)

Error Code	Error Description	Probable Cause	Replaceable Component
51	While homing the rack the rack could not be centered in the shuttle.	Rack binding Main motor Rack clutch	Controller Power module
52	While homing the rack mechanism, a position error occurred as the rack was being jogged.	Rack binding Main motor	Controller Power module
53	While homing the rack mechanism, a position error occurred due to a cartridge in the shuttle.	Cartridge in shuttle	
54	X axis backlash was too great while homing the shuttle.	Main motor X axis clutch Loose drive gears Main drive belt loose	Base tape library
55	Drive C handle did not open. For a Q4.30 drive C is in the upper client unit.	Door motor on tape drive PCB card on tape drive module	Tape drive C module Controller Power module
56	Drive C handle did not close. For a Q4.30 drive C is in the upper client unit.	Door motor on tape drive PCB card on tape drive module	Tape drive C module Controller Power module
57	Drive D handle did not open. For a Q4.30 drive D is in the upper client unit.	Door motor on tape drive PCB card on tape drive module	Tape drive C module Controller Power module
58	Drive D handle did not close. For a Q4.30 drive D is in the upper client unit.	Door motor on tape drive PCB card on tape drive module	Tape drive D module Controller Power module
59	Incorrect machine configuration data read from serial EEPROM.	Defective EEPROM	Base tape library

Table 15. Library Error Codes (Continued)

Error Code	Error Description	Probable Cause	Replaceable Component
129	The tape library was unable to unlatch cartridge from magazine after 20 retries.	Gate actuator	Replace Magazine
130	Drive A was not unloaded prior to command to remove cartridge from drive A.	Host software error	--
131	Drive B was not unloaded prior to command to remove cartridge from drive B.	Host software error	--
143	The tape library was instructed to remove a cartridge from an empty element.	Host software error	--
144	In remote diagnostic mode, an out of range element was selected as either the source or destination.	Operator	
145	The tape library was UnSafe when a motion command was initiated.	--	If this occurs with the unit in the safe condition check the front panel interlock.
146	The drive interposer dropped during extraction of cartridge. The tape library reinserted the cartridge into the same drive.	Informational	--
147	Drive C was not unloaded prior to command to remove cartridge from drive C. For a Q4.30, drive C is the upper (client) unit.	Host software error	--

Table 15. Library Error Codes (Continued)

Error Code	Error Description	Probable Cause	Replaceable Component
148	Drive D was not unloaded prior to command to remove cartridge from drive D. For a Q4.30, drive C is the upper (client) unit.	Host software error	--
149	The serial EEPROM was unable to be read on power-up.		Motherboard Base tape library
152	Internal software error.	Firmware	Controller
153	Internal software error	Firmware	Controller
154	No cartridges in Q2.15 while starting confidence tests.	User	
155	During place move recovery following unsafe or power-out recovery, the destination cell (magazine) was removed by user.		Remove the cartridge from the shuttle.
156	Pick was attempted from empty cell.	Host software error Cartridge present sensors	
157	Internal self test DRVLDULD detected drive inactive too long.	Drive error SCSI connection bad.	
158	Communications error or time-out between the two units of a Q4.30.		
159	A pass through move error was detected at the upper (client) unit of a Q4.30		
224	Same as error 130		
225	Same as error 131		

Table 15. Library Error Codes (Continued)

Error Code	Error Description	Probable Cause	Replaceable Component
255	Fatal on move when attempting to run Drive load / unload	not enough media in library to run diag.	make sure there are at least 3 tapes in the Library

SCSI Error Codes

Table 16 provides a listing of the SCSI error codes and their meanings. These codes are returned by the Q2.15 and Q4.30 Medium Changer.

Table 16. Q2.15 and Q4.30 Error Codes

Sense Key	ASC (H)	ASCQ (H)	Description
02	04	01	INITIALIZATION IN PROGRESS
02	04	81	UNIT OFF-LINE
02	04	83	NOT READY; FRONT DOOR OPEN
04	08	01	SCSI HARDWARE DOES NOT RESPOND
04	15	81	PICK ERROR
04	15	83	PUT ERROR
04	15	84	MECHANICAL PROBLEM: STALL WHILE PICKING FROM DRIVE
04	3B	82	CANNOT CLOSE DRIVE DOOR
04	3B	87	CANNOT OPEN DRIVE DOOR
04	40	82	FLASH MEMORY CHECKSUM ERROR
04	40	90	NORMAL FORCE POSITION OVERFLOW
04	40	A1	X AXIS STUCK
04	40	A2	X AXIS HOME FAILURE
04	40	A3	X AXIS MOVE TIMEOUT
04	40	A4	X AXIS CONTROLLER FAILURE, WRAP ERROR
04	40	A7	MOTOR CONTROLLER RESET FAILURE
04	40	A8	X AXIS SERVO BUSY BIT SET
04	40	B1	RACK STUCK
04	40	B2	RACK HOME FAILURE
04	40	B3	RACK MOVE TIMEOUT
04	40	B4	RACK CONTROLLER FAILURE, WRAP ERROR
04	40	B6	RACK HOME WITH CARTRIDGE FAILURE
04	40	B8	RACK SERVO BUSY BIT SET
04	40	C1	Z AXIS STUCK
04	40	C2	NORMAL FORCE HOME FAILURE

Table 16. Q2.15 and Q4.30 Error Codes (Continued)

Sense Key	ASC (H)	ASCQ (H)	Description
04	40	C3	Z AXIS MOVE TIMEOUT
04	40	C4	Z AXIS CONTROLLER FAILURE, WRAP ERROR
04	40	C8	Z AXIS SERVO BUSY BIT SET
04	40	CA	READ CARTRIDGE LABELS TIMEOUT
04	44	00	INTERNAL HARDWARE ERROR
04	80	17	BARCODE RETRIES EXCEEDED LIMITS
04	84	00	INTERNAL SOFTWARE ERROR
05	1A	00	PARAMETER LIST LENGTH ERROR
05	20	00	INVALID COMMAND OPERATION CODE
05	21	01	INVALID ELEMENT ADDRESS
05	24	00	INVALID FIELD IN CDB
05	25	00	UNSUPPORTED LOGICAL UNIT
05	26	00	INVALID FIELD IN PARAMETER LIST
05	26	02	PARAMETER VALUE INVALID
05	3B	0D	MEDIUM DESTINATION ELEMENT FULL
05	3B	0E	MEDIUM SOURCE ELEMENT EMPTY
05	3B	80	USER INTERVENTION REQUIRED
05	3B	83	DRIVE INDICATES HANDLE IS NOT READY TO OPERATE
05	3B	84	DESTINATION DRIVE DOOR IS CLOSED
05	3B	85	DESTINATION CANNOT BE CARTRIDGE HANDLER
05	3B	86	SOURCE CANNOT BE CARTRIDGE HANDLER
05	3B	87	DATA CARTRIDGE STUCK IN DRIVE
05	3D	00	INVALID BITS IN IDENTIFY MESSAGE
05	53	02	MEDIUM REMOVAL PREVENTED
05	80	03	NO SOURCE MAGAZINE
05	80	04	NO DESTINATION MAGAZINE
05	80	05	NO SOURCE DRIVE
05	80	06	NO DESTINATION DRIVE

Table 16. Q2.15 and Q4.30 Error Codes (Continued)

Sense Key	ASC (H)	ASCQ (H)	Description
06	28	00	UNIT ATTENTION FOR FRONT DOOR HAS BEEN ACCESSED
06	29	00	POWER ON RESET OR BUS DEVICE RESET OCCURRED
06	2A	01	MODE PARAMETERS CHANGED
06	3F	01	MICROCODE HAS BEEN CHANGED
0B	3F	80	FLASH FIRMWARE UPGRADE ERROR: UNABLE TO ERASE
0B	3F	81	WRITE FIRMWARE, INCOMPLETE CODE DATA
0B	3F	84	FLASH FIRMWARE UPGRADE ERROR: UNABLE TO PROGRAM
0B	3F	86	FIRMWARE UPGRADE ERROR FLASH CHECKSUM ERROR
0B	43	00	SCSI MESSAGE ERROR
0B	45	00	SELECT / RE-SELECT FAILURE
0B	47	00	SCSI PARITY ERROR
0B	48	00	INITIATOR DETECTED ERROR
0B	4E	00	OVERLAPPED COMMANDS ATTEMPTED

B

Bar Code Labels

This appendix provides the information needed to create the optional bar-code labels for the Library data cartridges. The Library cartridge scanner uses the bar code information to maintain the Library cartridge inventory.

Label Characters

The Library does not need to have bar code labels affixed to the cartridges to function correctly. If the bar code feature is enabled and if bar code labels are used, the Library will include the label information as part of its internal Library inventory.

Bar Code

The bar code must be printed in the area indicated by callout number 1 in **Figure 43.** in accordance with the ANSI MH10.8M-1983 specification. The bar code is the industry standard Code 39 (“3 of 9”) and may have up to 10 usable characters as shown in **Table 17.**

Table 17. Bar Code Layout

Left	1 Start / Stop character
	1 to 10 alphanumeric characters from **Table 19** on page **A-159**.
	1 checksum character
Right	1 Start / Stop character

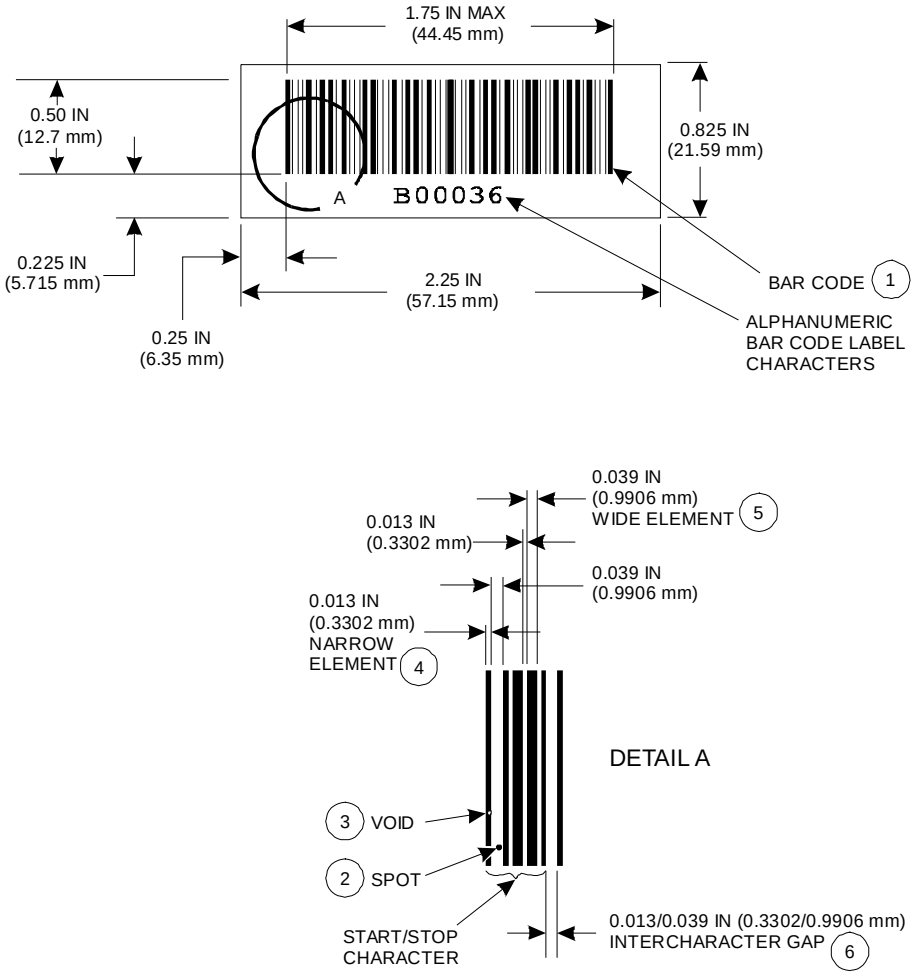


Figure 43. Bar Code Specifications

Bar Code Element Widths

Definitions of widths of the bar code elements are shown in **Table 18.**

Table 18. Bar Code Element Widths

Element	Figure 43. Find Number	Width
Narrow	4	0.013 +/- 0.004
Wide	5	0.039 +/- 0.004
Intercharacter Gap	6	between 0.013 +/- 0.004 and 0.039 +/- 0.004

Checksum Character

The checksum character is the modulus 43 sum of all the values in the five characters alphanumeric section of the bar code. Character values are given in **Table 19**.

Bar Code Label Quality

Spots and Voids

A spot is an area within the white background in which reflectively is less than 55%. See callout 2 in **Figure 43.**

A void is an area within the black element in which reflectively is more than 20%.

See callout 3 in **Figure 43.**

Spots and voids are allowed as long as the following conditions are met:

- The spot or void can be contained within a circle, of a diameter 0.4 times the nominal width of the narrow element.
- The spot or void occupies no more than 25% of the area of a circle of a diameter 0.8 times the nominal width of the narrow element.
- There are no more than 5 spots or voids per label.
- No two spots or voids are within 0.02 inches of each other.
- No spot or void is coincident with the edge of any narrow or wide elements.

Table 19. Characters and Checksum Values

Label Character	Value	Label Character	Value	Label Character	Value
0	0	F	15	U	30
1	1	G	16	V	31
2	2	H	17	W	32
3	3	I	18	X	33
4	4	J	19	Y	34
5	5	K	20	Z	35
6	6	L	21	-	36
7	7	M	22	.	37
8	8	N	23	SPACE	38
9	9	O	24	$	39
A	10	P	25	/	40

Table 19. Characters and Checksum Values

Label Character	Value	Label Character	Value	Label Character	Value
B	11	Q	26	+	41
C	12	R	27	%	42
D	13	S	28		
E	14	T	29		

Reflectance and Contrast

The reflectance and contrast should be determined using a light source of nominal 670 nm wavelength with a bandwidth of no more than 50 nm for a 50% power level. Incident irradiation should be normal to the surface and reflected flux collected within a 15° angle centered on the normal. The minimum allowable reflectance of spaces is 50%. The minimum allowable reflectance ratio of spaces to bars is 5:1.

Label Degradation after Exposure to Light

The ratio of space reflectance to bar reflectance should not fall below 4:1 after 30 days exposure to a fluorescent source of 100 foot-candles.

C

Packing Instructions

Repackaging

The following procedure explains how to repackage a Q2.15 in the original packaging. **Figure 45.** is an exploded view showing how to package of a Q2.15 for shipment. Each Q2.15 in a Q4.30 configuration is packaged separately.

Caution

Reinstall the shiplock clip before repacking the Q2.15. See **Figure 44.**

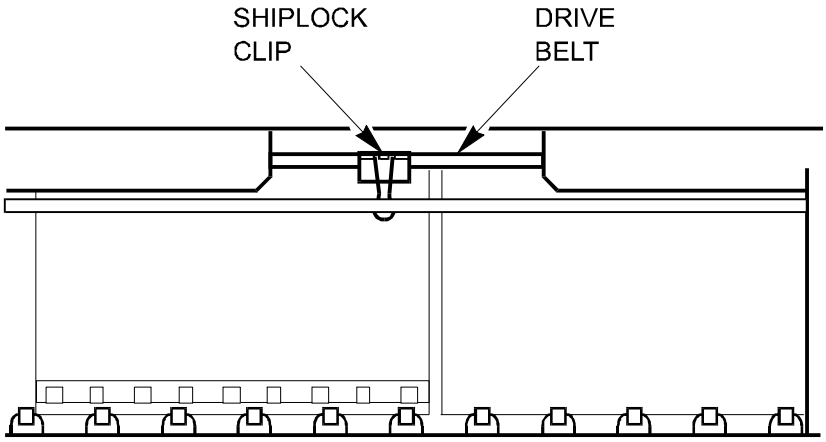


Figure 44. Shiplock Installation

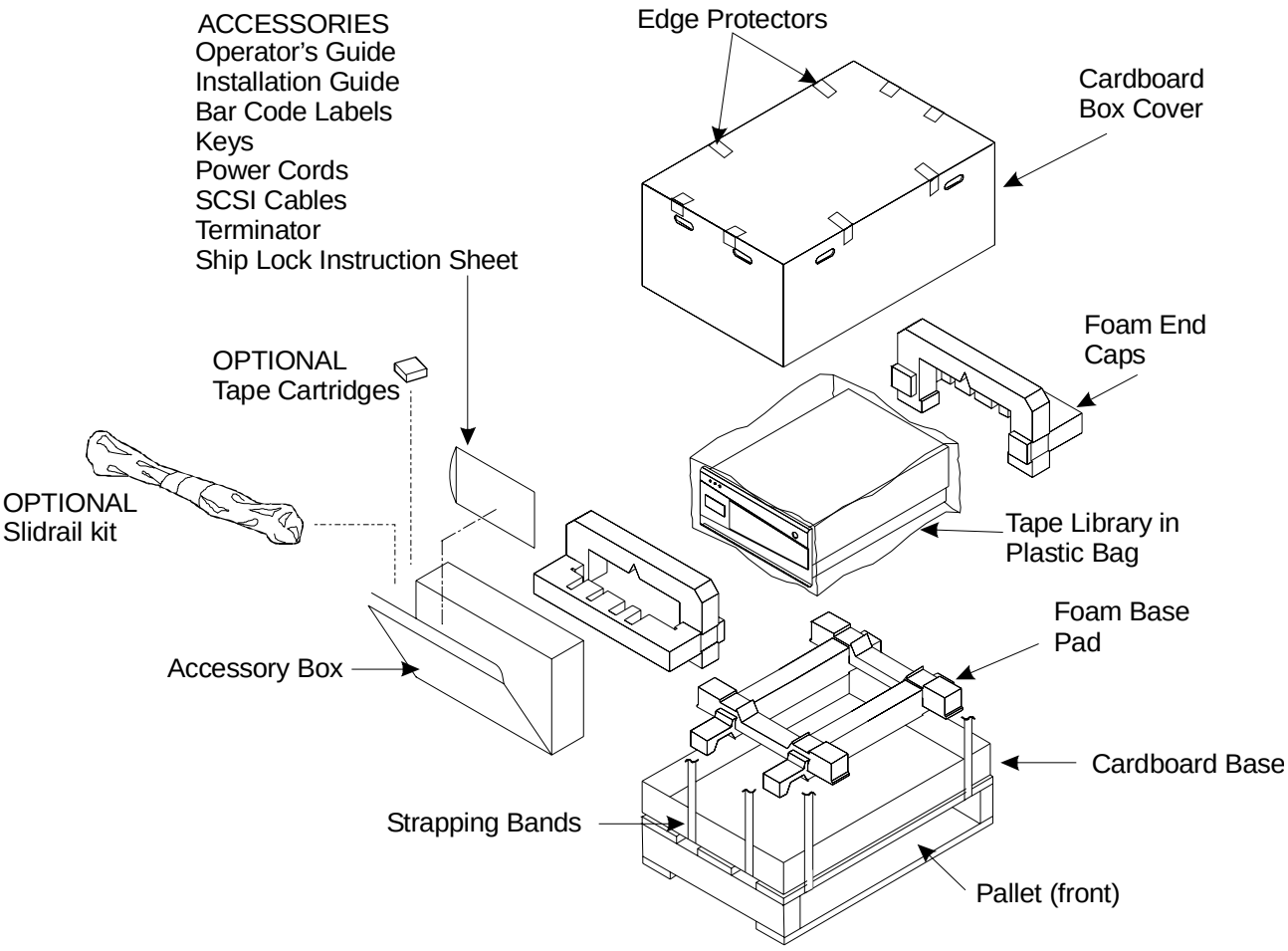


Figure 45. Packing Material

1. Place two strapping bands on top of the wooden pallet. Place the bands approximately one-third of the way from the ends.
2. Set the cardboard base on the wooden pallet on top of the bands.
3. Position the pad in the cardboard base.
4. Place the Q2.15 in the plastic bag and tape the bag opening closed.
5. Place the foam end caps on the plastic bag covered Q2.15.
6. Place the Q2.15 with foam endcaps in the cardboard box base.
7. Replace loose components into their proper plastic bags. Place the plastic bags in the appropriate locations in the accessory box tray.
8. Place the accessory tray on the side facing the front of the library.
9. Place the cardboard box cover over the cardboard box base, Q2.15 and cardboard box tray. The cardboard box cover goes inside the cardboard box base.
10. Place edge protectors on the top edges of the cardboard box cover where the bands will go over the cover.

11. Secure the bands placed in **Step 1** across the top of the cardboard box cover. Make sure the bands rest on the edge protectors.
12. Place two bands beneath the top of the wooden pallet. Position these bands across the bands placed in **Step 1** and the end of the wooden pallet.
13. Secure the bands placed in **Step 11** across the top of the cardboard box cover. Make sure the bands rest on the edge protectors.

D

Tape Drive Status Lights and Buttons

The following status lights and buttons are located on the front panel of the tape drives in the tape library:

Select Button

The Select button enables the drive density to be manually adjusted. To ensure compatibility with the host operating system, the drive density should be adjusted only via the host system.

Unload Button

The Unload button enables a tape cartridge to be removed from the tape library. To remove a cartridge, press the Unload button. After the Unload button is pressed, the tape drive rewinds the tape into the cartridge and sounds a beeper to let you know that the cartridge may be removed (unloading may take approximately one minute). The green Operate Handle light also comes on.

Note *Unloading may take up to two minutes if the cartridge is at the end of tape.*

Cartridge Insert and Release Handle

Operate the cartridge insert and release handle to load a cartridge or to eject a cartridge only when the Operate Handle indicator is on, and after the momentary beep sounds. The handle lifts to the open position and lowers to the closed position.

Beeper

A beeper sound indicates that you can operate the cartridge insert and release handle. When the tape drive “beeps,” the Operate Handle indicator should be on. To prevent damage to the tape drive, wait for the sound of the beep before opening the door.

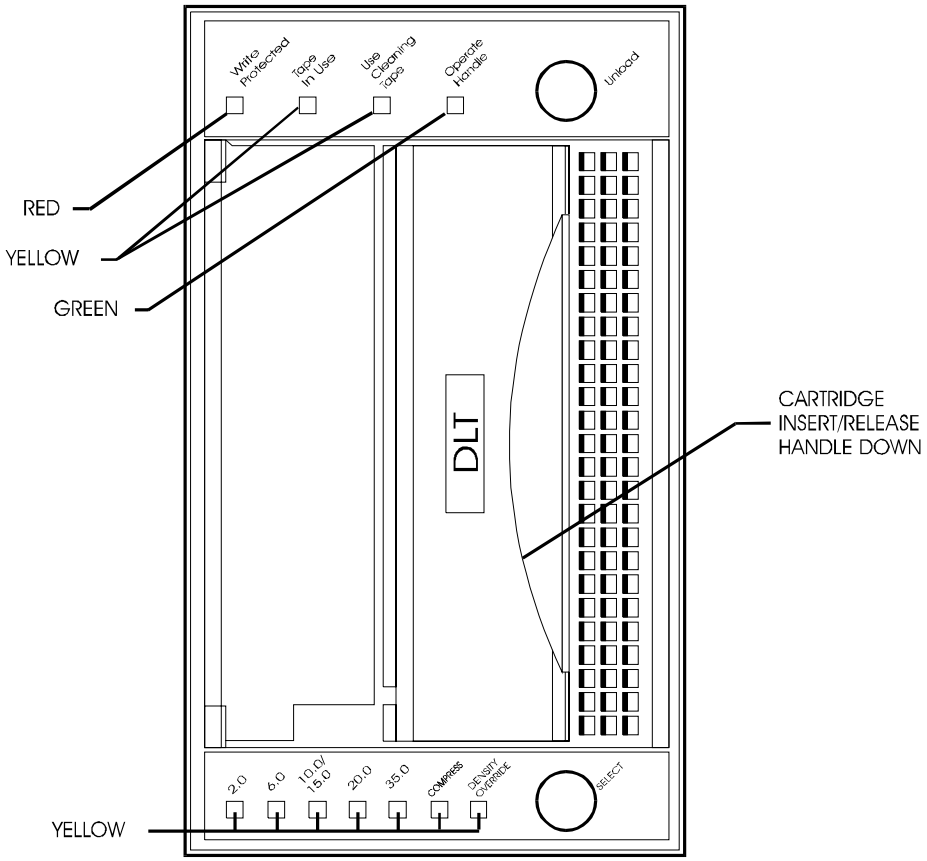


Figure 46. DLT Drive

Bottom Lights	Top Lights
2.6 (density)	Write Protected
6.0 (density)	Tape in Use
10.0/15.0 (density)	Use Cleaning Tape
20.0 (density)	Operate Handle
35.0 (density) 7000 only	
Compress	
Density Override	

Status Light	Color	State	Operating Condition
Bottom Lights			
2.6	Yellow	On	The tape is recorded in 2.6 GB format (42,500 BPI density).
		Blinking	A system command has been issued to change tape density (new density pending).
6.0	Yellow	On	The tape is recorded in 6.0 GB format (42,500 BPI density).
		Blinking	A system command has been issued to change tape density (new density pending).
10.0/15.0	Yellow	On (default)	The tape is recorded in 10.0/15.0 GB format (62,500 BPI density).
		Blinking	A system command has been issued to change tape density (new density pending).

Status Light	Color	State	Operating Condition
Bottom Lights			
20.0		On (default)	The tape is recorded in 20.0 GB format (81,633 BPI density).
		Blinking	A system command has been issued to change tape density (new density pending).
35.0	Yellow	On (default)	The tape is recorded in 35.0 GB format (85,937-BPI density).
		Blinking	A system command has been issued to change tape density (new density pending).
Compress	Yellow	On	The compression mode is enabled Compression can only be done in 10, 15, 20, or (35 GB / DLT 7000) density.
		Off	The compression mode is disabled.
Density Override	Yellow	On	Density has been manually selected.
		Off (default)	Density is automatically selected by the host system.
All Left Bottom		Blinking	An internal error has occurred. Contact your service representative.

Status Light	Color	State	Operating Condition
Top Lights			
Write Protected	Red	On	The tape is write protected.
		Off	The tape is write enabled.
Tape in Use	Yellow	Blinking	The tape is moving.
		On	The tape is loaded and ready for use.
		Off	No cartridge is loaded.
Use Cleaning Tape	Yellow	On	The tape drive needs cleaning or the tape is defective.
		Remains on after you unload the cleaning tape.	The cleaning tape attempted to clean the tape drive, but the tape had expired.
		Blinking	The data cartridge may be damaged. Back up data to another tape cartridge and discard the old tape cartridge.
		Off	The cleaning is complete or cleaning is unnecessary.
Operate Handle	Green	On	No tape cartridge is loaded. It is safe to operate the cartridge insert/release handle.
		Off	Do not operate the cartridge insert/release handle.
All top lights		Blinking	The tape leader has failed to pull, or the tape drive servos have failed.
Lights on the bottom and top		On	The Power-on Self Test (POST) is starting.
		Blinking	An error has occurred. Contact your service representative.

Index

S

T