

**StorageTek.**

**4280 Cartridge Tape Subsystem**

**Installation  
Instructions**

Pub. 28740601

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## CHANGE PAGE

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### Page

### Change

Incorporated Engineering Changes since last iteration.  
Addition of ICRC.

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## 1. Introduction

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### 1.1. Purpose

This installation guide for the StorageTek 4280 Cartridge Tape Subsystem covers pre-installation checks, unpacking, mounting rack slide rails, power up, initial checkout, and then host interface setup.

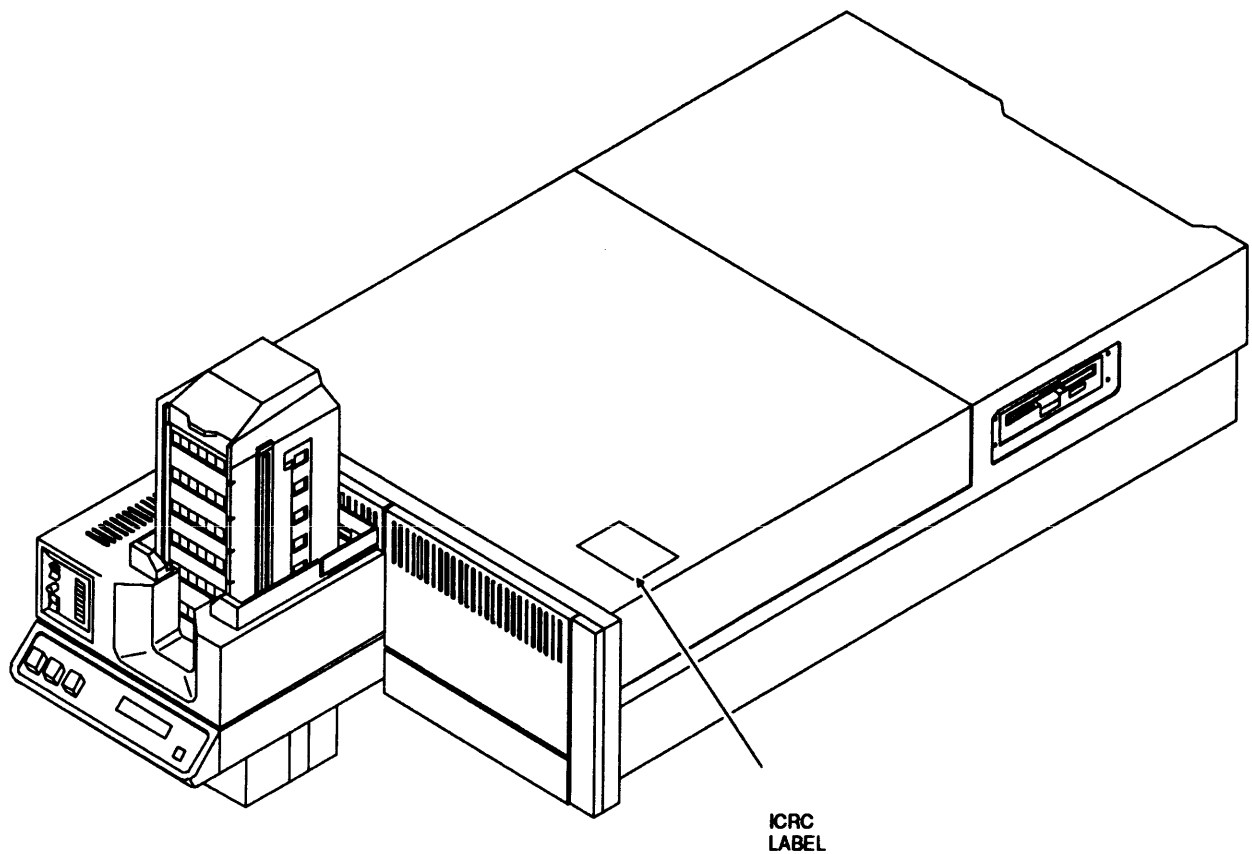


Figure 1.  
4280 Cartridge Tape Subsystem with Automatic Cartridge Loader

## **1. 2. Configurations Of The Unit**

The 4280 subsystem is available in two physical configurations:

**Model 4280-A01:** A single rack mountable unit with an integral control unit and one tape drive (1x1).

**Model 4280-A02:** A single rack mountable unit with an integral control unit and two tape drives (1x2).

An optional 10-cartridge-magazine automatic cartridge loader (autoloader) can be ordered for each tape drive, for both the A01 and the A02 units.

One of two O.E.M. interfaces (SCSI or STK 2920) can be ordered.

## **1. 3. ICRC Identification**

If a drive has ICRC or is ICRC Ready, a label will be attached to the top right corner of the drive. (Refer to Figure 1.)

An "ICRC Ready" label indicates that the drive is mechanically, electrically, and firmware structured to receive the ICRC upgrade kit.

An "ICRC" label indicates that the drive already has ICRC.

**1.4. Required Tools**

You will need the following tools to install the 4280:

- Slot head screwdriver
- Phillips head screwdriver
- 3/32" Allen driver
- 5/64" Allen driver
- #10 Torx driver
- #15 Torx driver

**WARNING:**

**An ESD (Electrostatic Device) strap is attached to the 4280 and is accessible once the partition is raised. You must wear the ESD strap any time you work on the 4280.**



## 2. Pre-installation Considerations

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### 2.1. General

Recording Method	Double Density GCR(ANSI X3B5)
Recording Tracks	18
Media Specification	ANSI X3B5
Density	All Zeros 1944 ftpmm (49378 ftpi) All Ones 972 ftpmm (24689 frpi)
Actual Maximum	1491 cpmm (37871 frpi)
Bytes	15698 bytes/cm (39872 bytes/in)
Tape Format Nominal	
Density ID Mark	2375 mm (93.5 in)
ID Separator Mark	2.0 mm (0.0787 in)
Inter Block Gap	2.0 mm (0.0787 in)
Erase Gap	7.8 mm (0.3069 in)
Tape Mark	1.0 mm (0.0393 in)
Bit Cell Length	1.029 um
Tape Length (BOT to EOT)	165 m minimum
Error Correction	Yes
Parity	Yes
Cyclic Redundancy Check	Yes
Diagonal Redundancy Check	Yes
Vertical Redundancy Check	Yes

Error correction on up to 4 tracks (of 18) simultaneously, during Read operation without repositioning.

**2. 2. Data Transfer Rate**

Host Interface	0 - 1.0 MB/s (AS400 2602 attach)
Read/Write, from/to Tape	2.982 MB/s nominal

**2. 3. Tape Motion Characteristics (read/write)**

Tape Speed	2.0 m/s
Start Time	85 ms
Stop Time	85 ms
Maximum Repositioning Time	280 ms
Rewind/Search Speed	4.0 m/s +/- 5%
Load/Unload Time	13 sec
Rewind (From PEOT)	55 sec max
Variation (Speed)	
Short Term	+/- 7% of nominal
Long Term	+/- 4% of nominal

**2. 4. Autoloader Positioning Time**

Cartridge Load	16 sec
Vertical Slot-to-Slot	1.5 sec
Magazine Eject from Top Slot	9 sec

**2. 5. Physical Dimensions (4280)**

Height	17.6 cm (6.91 in)
Width	
Enclosure	44.7 cm (17.60 in)
Front Cover	48.3 cm (19.02 in)
Depth	71.1 cm (28.00 in)
Protrusion	6.3 cm (2.47 in)

**2. 6. Physical Dimensions (Autoloader)**

Height	15.9 cm (6.25 in)
Width	21.6 cm (8.50 in)
Protrusion	26.9 cm (10.60 in)
Weight (1X1)	
4280 w/o autoloader	30.4 kg (67 lbs)
Optional autoloader	2.7 kg (6 lbs)
Full 10 Cart. Magazine	3.6 kg (8 lbs)

**2. 7. Power Specifications**

Operating Frequency	47 to 63 Hz
Required Power (including optional autoloader operation)	0.71 KVA max. 360 Watts avg. max. (1230 BTUH)
Phasing	Single phase
Nominal Input Voltage	Two ranges (automatically switched): 100-120 Vac rms (low range) 200-240 Vac rms (high range)
Maximum Input Voltage Range	Low range: 90-132 Vac rms High range: 180-264 Vac rms

**2. 7. 1. Environmental Operating Range**

Dry Bulb Temperature	10 <sup>o</sup> to 40 <sup>o</sup> C (50 <sup>o</sup> to 90 <sup>o</sup> F)
Relative Humidity	20% to 80% noncondensing
Wet Bulb Temperature	25 <sup>o</sup> C (77 <sup>o</sup> F) maximum wet bulb
Barometric Pressure	58 kPa to 109 kPa (17 inHg to 32 inHG)
Altitude	Sea Level to 1830 m (6000 ft)
Temperature Shock	Max rate of change = 15 <sup>o</sup> C/min over 2 minutes

**2. 8. Host Interconnection****2. 8. 1. SCSI**

Maximum Distance

Single Ended

6.0 m (19.75 ft)

Double Ended

25.0 m (82.3 ft)

Cable Type

50 Conductor Shielded Twisted Pair

Connector Type

50 Conductor Shielded D Type  
Ribbon Connector (Northern  
Technology) P/N 57-30500 or  
AMP P/N 554953 & 554946-1

Cables Required

2, Daisy Chain

**2. 8. 2. STK and STK Dual Host**

Maximum Distance

12 m (39 ft)

Cable Type

60 Conductor Spectrostrip

Connector Type

60 Pin Locking Berg

Cables Required

Maximum of 4, Daisy Chain

### 3. Pre-installation Considerations

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The following items should be considered before unpacking and installing a 4280 Cartridge Tape Subsystem.

#### 3.1. Power Requirements

As noted in the specifications, the 4280 can be powered from standard wall socket power. The power frequency can range between 47 and 63 Hz. There is a switchable dual range power supply that can adjust to almost any standard wall ac power voltage. An IEC-320 compatible ac input connector is provided for a "universal" power cord connection. A power cord is not a standard item on the unit, but a U.S.-compatible and a Continental Europe-compatible 115 Vac power cord can be ordered from StorageTek.

The power cord is 2.44 meters (8 feet) long and is terminated in an IEC 320 connector. Two power cable choices are available:

- For North America applications:
  - Use right angle power cord P/N 24055630.
- For international applications:
  - Use right angle power cord P/N 24055631

The power cords consists of the following parts molded together:

- Flexible Cord Type, North America
  - Plug - Parallel blade, grounding type, rated 15 Amp, 125 V.
  - Cord - Type SJT, 18 Ga., 3 conductor.
  - Connector - IEC 320 type, rated 10 Amp, 250 V.
- Flexible Cord Type, continental Europe
  - Plug - "Schuko", grounding type, rated 10 Amp, 250 V.
  - Cord - HAR, H07, 1.0 mm, 3 conductor.
  - Connector - IEC 320 type, rated 10 Amp, 250 V.



### **3. 2. Rack Standard**

The unit can be mounted on commercial slides in an Electronics Industries Association (EIA-310-C) rack configuration with a minimum depth of 762 mm (30 in). The slides should permit 0.9 m (36 in) extension and be rated for a maximum load of 55 kg (120 lbs) for serviceability of the unit:

#### **NOTE:**

**Customers must consider mounting requirements. StorageTek will not be responsible for personal injury resulting from improper mounting or failure to comply with common safety requirements**

#### **CAUTION:**

**Be sure that the design of the cabinet used can accommodate the full extension of the unit without tipping. The cartridge tape subsystem can weigh 50 kg (110 lbs) fully loaded.**

### **3. 3. Recommended Installation Height**

The unit should be installed at a height of between 91 cm (36 in) and 137 cm (54 in) above the floor for ease of loading, viewing operator display, and servicing. (Note that the cabinet will tend to be more stable the lower the subsystem is mounted.)

### **3. 4. Autoloader Clearance Requirements**

#### **3. 4. 1. Vertical Clearance**

The areas above and below the autoloader are to remain free of obstacles to permit magazine loading and operation.

Area above autoloader - 40.6 cm (16 in) above the top edge of 4280 enclosure

Area below autoloader - 27.9 cm (11 in) below the bottom edge of 4280 enclosure

#### **3. 4. 2. Horizontal Clearance - (Tabletop Use)**

To allow for proper operation of the autoloader and magazine when you install the unit on a tabletop or desktop, position the unit so that front edge of the foot pads are flush with the edge of the desktop. There should be no obstacles above

or below unit which extend more than one inch beyond the rear edge of the front cover. (See Figure 6.)

**NOTE:**

**If you are bench testing a rack mount unit prior to installing it in a rack, and no footpads are present, make sure the rear edge of the front cover is flush with the edge or within 1/2" of the edge of the desktop to allow for proper magazine clearance of the desk.**

### **3. 5. Cooling Considerations**

The rear panel of the cabinet should be louvered or constructed so that air can flow unrestricted through the unit. Do not allow any materials or cables, attached or not, to impede the air flow.

### **3. 6. Operator's Manual**

You should be familiar with the 4280 controls and operating procedures. Take time to read and understand the 4280 Operator's Manual before you continue the installation.

## 4. Unpacking

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1. Inspect the shipping container for damage. Note any damage or concerns on the installation form found on the last page of the installation instructions.
2. Cut the plastic banding, using appropriate caution to prevent personal injury.
3. Remove the top cover from the pallet assembly.
4. Remove the autoloader cover and accessory tray.
5. With one person on each side of the shipping container, pull down the sidewalls of the bottom tray.

### **WARNING:**

**This procedure requires two people to lift the 4280 out its shipping container. A 4280 can weigh between 30.4 and 50 kg (67 to 110 lbs.) in the box depending on its configuration.**

### **CAUTION:**

**The front end of the unit is heavier than the rear. As the unit clears the packaging box it may become unbalanced and tip toward the front. This must not happen, because the autoloader covers will slide into the packaging and jam the switches. To counteract this motion, lift the front and rear evenly when you remove the unit from packaging box. DO NOT GRASP THE UNIT BY THE AUTOLOADER!**

6. With one person on each side of the packaging box, slide all four hands below the unit, lifting slowly until the unit clears the packaging box.
7. Set unit at working station and remove antistatic sheet.
8. Inspect the unit for any damage. If you see or suspect damage, contact the freight carrier and file a damage claim before you proceed with the installation.
9. Make sure the unit and other contents of the shipping container are as specified on the packing list.

## 5. Setting the Voltage Range

---

### CAUTION:

Proper voltage range selection is very important to avoid damage to the power supply module. If 200-240 Vac power is applied to the 4280 while the 100-120 Vac range is selected, the power module **WILL BE DAMAGED**.

Before you apply ac power to the 4280, make sure the proper ac voltage range is selected. (Refer to Figure 2.) The slide switch has an indication of the range selected: 115 for 100-120 VAC and 230 for 200-240 VAC. A StorageTek 3939 and IBM 9309 rack both supply 200-240 Vac. The 4280 should be shipped from the factory with the 230 VAC range selected. You should check this switch setting, however, before you apply power to the unit.

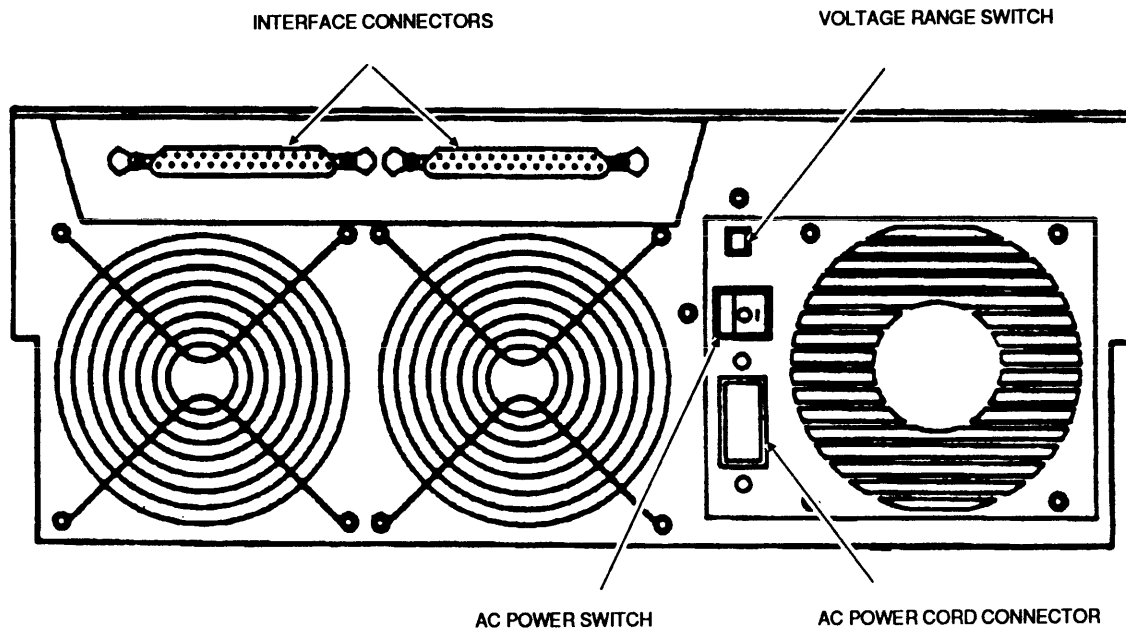


Figure 2  
4280 Rear View

## **6. Install Unit in Rack (Cabinet)**

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### **NOTE:**

The 4280 conforms to EIA-310-C rack standard specifications.

Installing the unit into a rack consists of two tasks:

1. Attaching slide rails to the unit and rack.
2. Inserting the unit into the slide rails.

### **6.1. Attach Rails**

Slide rails are shipped with the unit. To determine which version of slide rails you have, please note: Jonathan slides are silver in color and are 1 3/4" in height when mounted, Grant slides are dark gray in color and are 3" in height when mounted.

Each of the two slide rails consists of three parts:

The outer section of the slide has two brackets connected to it, and it is this section that attaches to the rack.

The middle section is basically a sliding mechanism.

The inner section is detachable from the other two sections and is the section of the slide that attaches to the 4280.

Install the rails, using either the Grant or Jonathan instructions, depending on the type of slide rails you receive with the 4280.

#### **6.1.1. Attach Grant Slide Rails**

The following instructions refer to mounting a 4280 into a cabinet using Grant slide rails, PN 24019955. (Refer to Figure 3.)

1. Attach inner section

Attach inner section of each slide to the sides of the 4280 with four screws. Note that the latch on the inner section is toward the rear of the 4280.

2. Attach adjustable bracket to outer section of the slide

- a. Align four elongated holes of the adjustable bracket with four holes in the outer section of the slide.

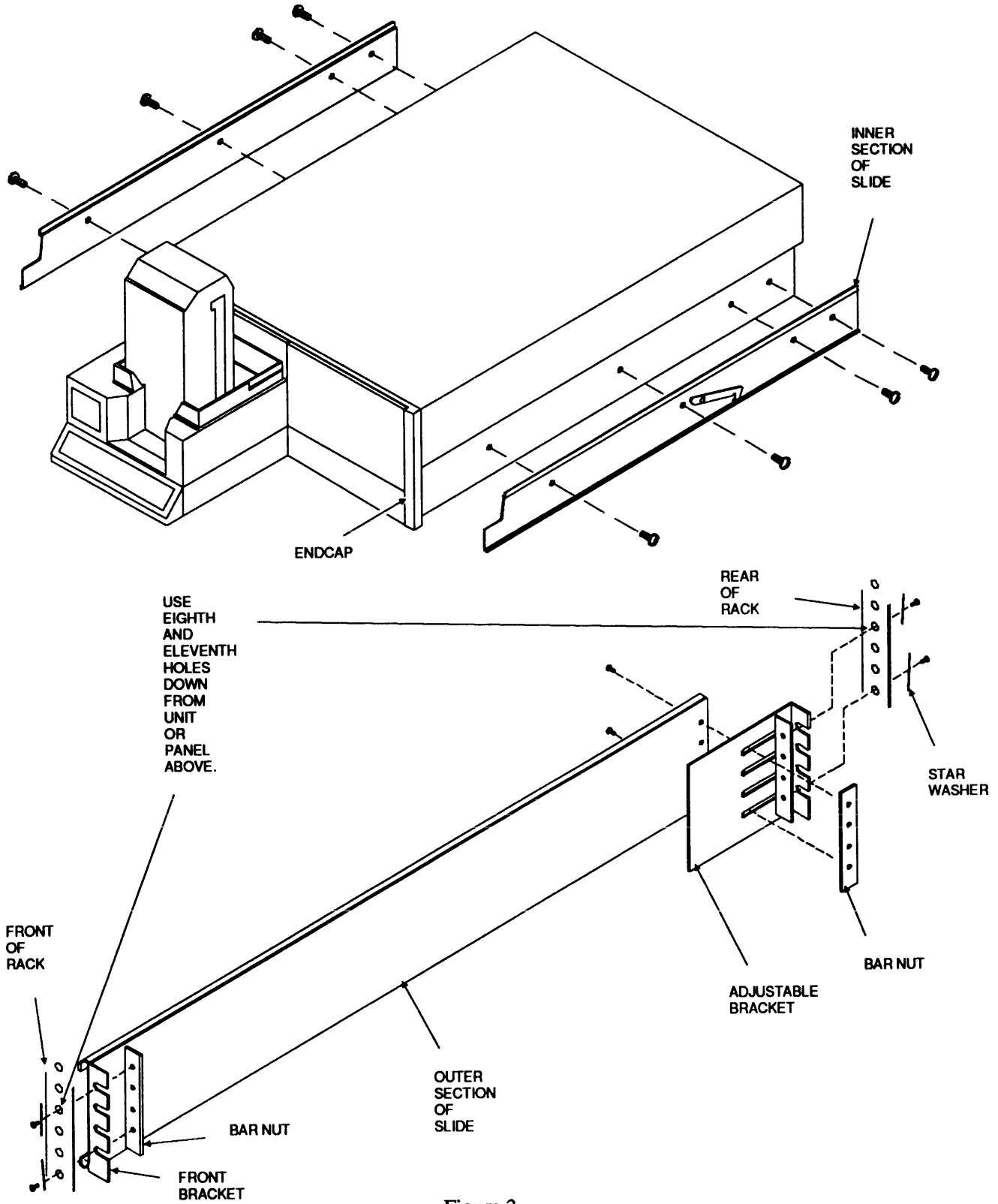


Figure 3.  
Grant Slide Rail

- b. Insert 10 - 32 screws through the top and bottom holes in the outer section.
  - c. Insert these screws through the four elongated holes in the adjustable bracket.
  - d. Place a bar nut against the adjustable bracket and tighten the screws through the bar nut; do not torque down the screws at this time.
3. Align the slide bracket holes to the rack holes
- a. To determine where to install the slide rails on the rack, count down from the panel or unit above. Insert 10 - 32 screws through holes eight and eleven.
  - b. Install the outer section of the slide with the brackets so that the adjustable bracket is at the rear of the rack, and the brackets are on the inside of the rack holes.
4. Attach the slide to the rack
- a. Secure the front bracket of the slide to the rack by installing a 10 - 32 screw through the rack and bracket holes using the top and bottom holes in the bracket.
  - b. Place a bar nut behind the front bracket and tighten both screws.
  - c. Adjust the adjustable bracket so that it aligns with the rear rack holes.
  - d. Tighten the two screws that secure the adjustable bracket to the outer section.
  - e. Secure the adjustable bracket of the slide to the rack by installing a 10 - 32 screw through the rack and bracket holes using the top and bottom holes in the bracket.
  - f. Place a bar nut behind the adjustable bracket and tighten both screws.
  - g. At the front of the rack, add a clipnut to the third hole above the slide rail.
5. Install the second slide rail

Attach the second slide rail using the same procedure that you used above.

**6. 1. 2. Attach Jonathan Slide Rails**

Do the following to mount a 4280 into a cabinet, using Jonathan slide rails, PN 24019956. (Refer to Figure 4.)

**1. Attach inner section**

Attach inner section of each slide to the sides of the 4280 with four screws.

**2. Preparation of slide rails**

- a. Move the window of the middle section so that the two adjusting screws on the front bracket show. Loosen these screws and adjust the bracket so that it is flush with the outer rail. Tighten the two screws. (Refer to Figure 4, Detail A.)
- b. Slide the middle rail forward and remove the rear bracket of the outer section. (Refer to Figure 4, Detail B.)
- c. To determine where to install the slide rails on the rack, count the holes in the rear flange of the rack, down from the panel or unit above. Insert the 10 - 32 Phillips head screws, with a #10 external tooth star washer on each screw, through holes nine and ten, leaving the head of the screw toward the rear of rack. (Refer to Figure 4, Detail C.)
- d. Mount the rear bracket to the rear rack holes with the bracket pointing toward the rear of rack. Secure the bracket with two 10 - 32 Phillips head screws (that you inserted in the previous step) going through rack hole first, then the bracket, and finally into the bar nut. (Refer to Figure 4, Detail C.)
- e. Mount the rail to the bracket, but don't tighten the screws.
- f. Mount the front bracket to the front of the rack behind the front rack holes, pointing toward the rear of the rack. Secure the bracket with two 10 - 32 Phillips head screws going through the rack hole first, then the bracket, and finally into the bar nut. (Refer to Figure 4.)
- g. Tighten the screws securing the front bracket to the flange.
- h. Tighten the screws securing the rear bracket to the flange.



4280 Cartridge Tape Subsystem  
 INSTALLATION INSTRUCTIONS

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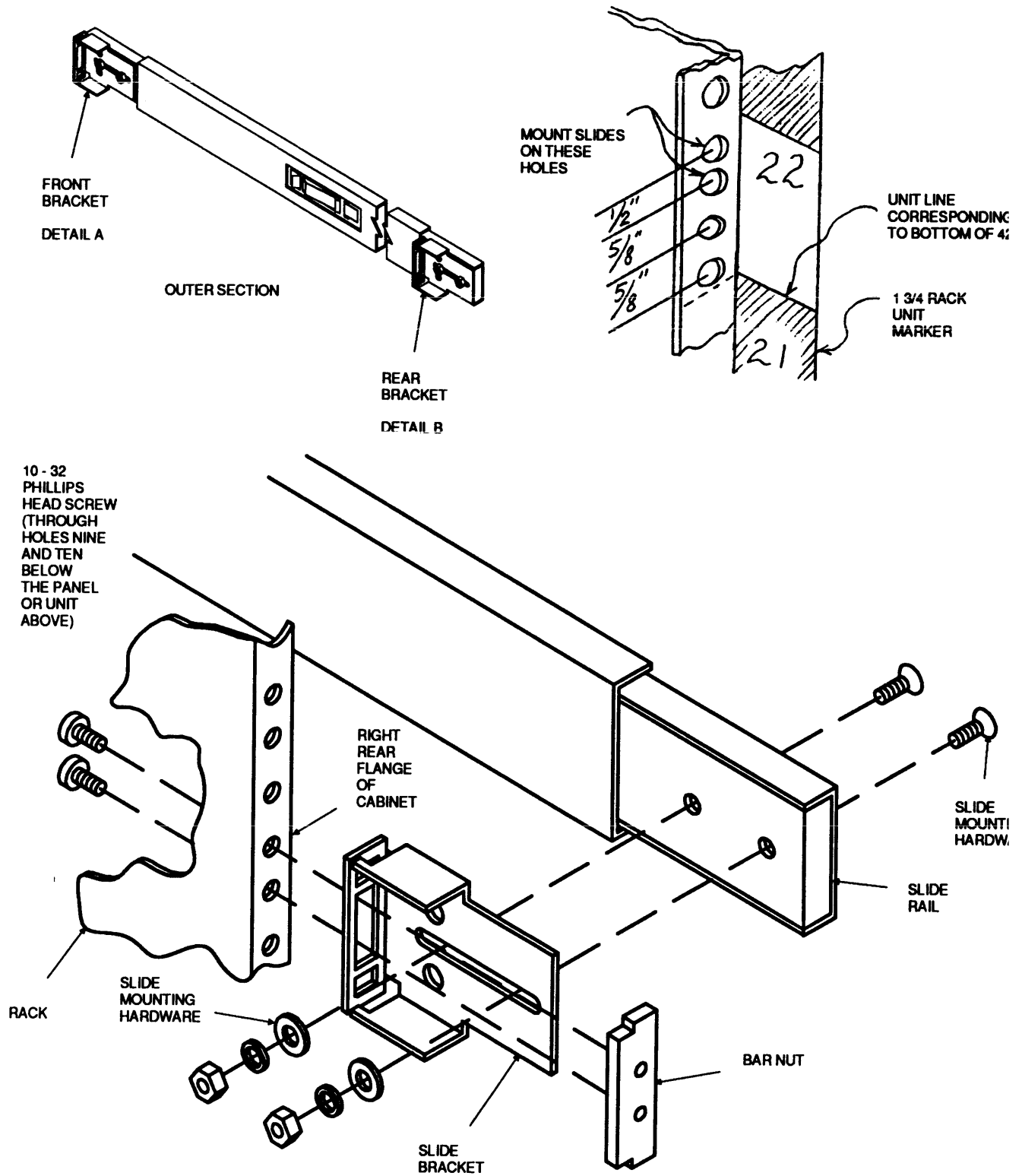


Figure 4.  
 Jonathan Slide Rails

**3. Attaching slide to 4280**

- a. The curved end of the inner section is to be placed at the rear of the 4280 with the curve facing away from the 4280 unit. The angled metal rollers will be on the outside, allowing them to match the angled slot in the slide rail's middle section.
- b. Secure the inner section of the slide to the 4280 using four binder head, 8 - 32 x 1/4, Z screws.
- c. At the front of the rack, add a clipnut to the third hole above the slide rail.

**4. Install the second slide**

Attach the second slide rail using the same procedure that you used above.

**6.2. Insert Unit Into Slides****CAUTION:**

**Before you go any farther, make sure you understand the section titled, "Rack Standard."**

Once the slides and rails are properly attached, extend the middle sections as far as they will go.

**NOTE:**

**The "Power Up" section assumes that the rear of the 4280 enclosure is accessible through the back of the rack or when the unit is fully extended from the rack. If this is not the case, you might skip this step until the very end of the installation and checkout.**

**CAUTION:**

**This procedure requires two people to lift the 4280 to insert it into a rack. A 4280 can weigh as much as 50 kg (110 lb), depending on the number of tape drives and autoloaders installed.**

**CAUTION:**

**Do not lift the 4280 by the front bezel or autoloader. The 4280 should be lifted only by the sheet metal enclosure.**

**CAUTION:**

**Be sure that the design of the rack used accommodates the full extension of the unit without tipping. Remember the cartridge tape subsystem can weigh 50 kg (110 lbs) fully loaded.**

**CAUTION:**

**When the upper front partition of the 4280 is raised, the partition arm must be seated in the slot of the slide rail to insure the operator's safety.**

1. With a person on each side of the 4280, support the unit with a hand at the rear and a hand next to the front bezel.
2. Lift the 4280 and slide the inner section of the slide into the angled slot of the middle section. Be sure all rollers enter the angled slot of the middle section. Push the 4280 until it is completely in the rack.
3. Attach filler panels on rack above and below 4280.

## 7. Install Unit on Table Top

---

You may install a unit on top of a desk or table instead of in a rack. (Refer to Figure 5.)

**WARNING:**

**Never lift the unit by yourself. Always have someone else help you. The unit (with autoloader) weighs 750 kg (110 lb).**

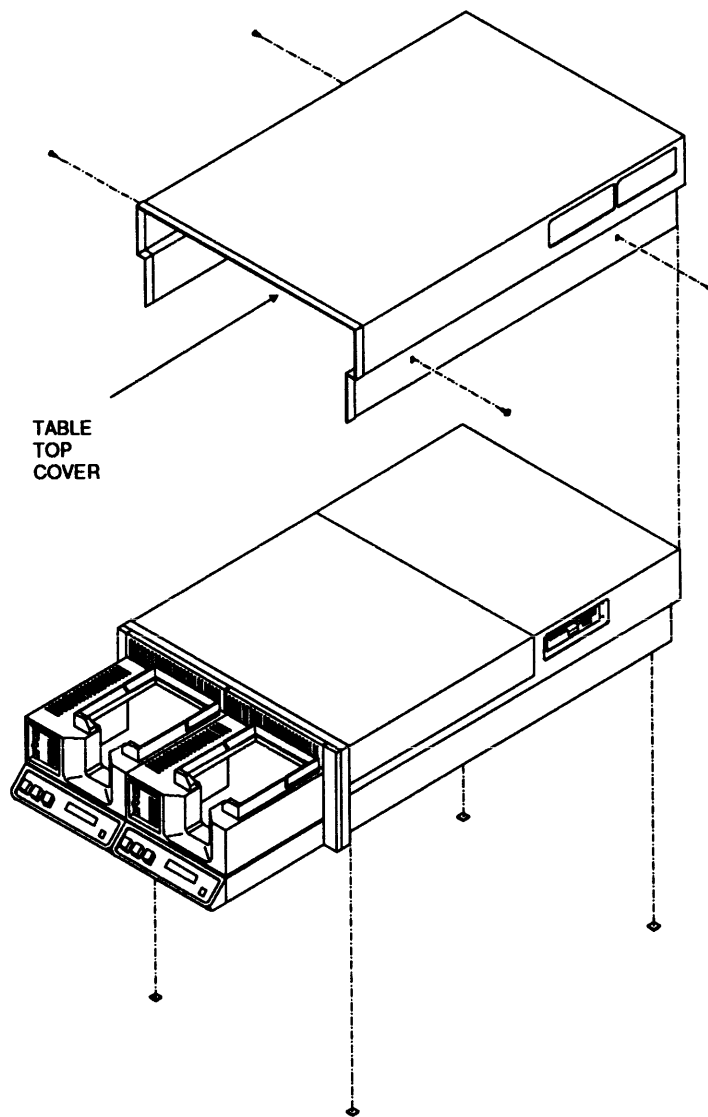


Figure 5.  
Table Top Cover and 4280 Table Top Model

**CAUTION:**

**Do not lift the unit by the autoloader, or you will damage the unit.**

1. Install four self adhesive pads to the bottom of the unit. Attach one pad in each of the four corners.
2. Slide the table top cover on the unit from the back, noting the opening on the left side of the unit, which allows access to the floppy disk drive. The trip strip of the cover will be located toward the front of the unit. (Refer to Figure 5.)
3. Align the screw holes of the cover to those of the chassis.
4. Install the four screws that secure the cover to the chassis.

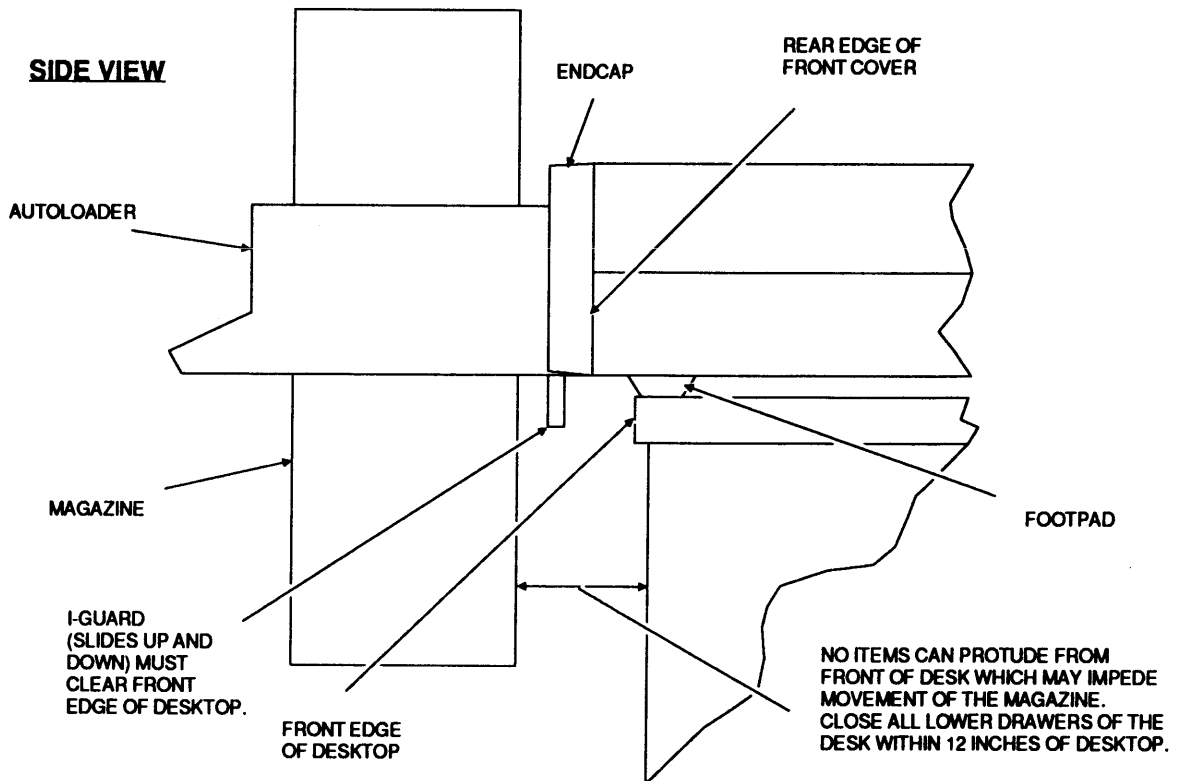


Figure 6.

**Horizontal Clearance Requirement for Proper Autoloader functioning**

**CAUTION:**

**Do not slide the unit on the surface of a table or desk; you may mar the surface.**

**NOTE:**

**Clearance from rear of unit to the wall must be 4.5 inches minimum to prevent cables from being crimped as they exit the machine.**

## 8. Read After Write Verification

In some circumstances or environments, you may wish to verify that valid data is being written to the tape; the 4280 subsystem allows you to do this. A read head next to the write head reads the data just written. These signals are available at a port on the SBI (system) board, and you may sample them with an instrument that you provide.

Table 1 shows the signals available at the port, which is a 26-pin straight connector with 0.1 x 0.1 pin spacing. The full names of the signals are listed below the table

Signal	Pin No.	Pin No.	Signal
Gnd	1	2	EN_SMC_INTF*
Gnd	3	4	SMC_RBC_CLK*
Spare	5	6	SMC_RBC_MODE
Gnd	7	8	SMC_D(0)
Gnd	9	10	SMC_D(1)
Gnd	11	12	SMC_D(2)
Gnd	13	14	SMC_D(3)
Gnd	15	16	SMC_D(4)
Gnd	17	18	SMC_D(5)
Gnd	19	20	SMC_D(6)
Spare	21	22	SMC_D(7)
Gnd	23	24	SMC_PTY
Gnd	25	26	SMC_EOD

Table 1 - Read-After-Write Verification Signals

Signal	Meaning
EN_SMC_INTF*	MINUS ENABLE SEISMIC INTERFACE <sup>(1)</sup>
SMC_RBC_CLK*	MINUS SEISMIC INTERFACE READ BACK CHECK CLOCK
SMC_RBC_MODE	PLUS SEISMIC INTERFACE READ BACK CHECK MODE
SMC_D(0)	PLUS SEISMIC INTERFACE DATA BIT 0 (LS bit)
SMC_D(1)	PLUS SEISMIC INTERFACE DATA BIT 1
SMC_D(2)	PLUS SEISMIC INTERFACE DATA BIT 2

SMC_D(3)	PLUS SEISMIC INTERFACE DATA BIT 3
SMC_D(4)	PLUS SEISMIC INTERFACE DATA BIT 4
SMC_D(5)	PLUS SEISMIC INTERFACE DATA BIT 5
SMC_D(6)	PLUS SEISMIC INTERFACE DATA BIT 6
SMC_D(7)	PLUS SEISMIC INTERFACE DATA BIT 7 (MS bit)
SMC_PTY	PLUS SEISMIC INTERFACE DATA PARITY
SMC_EOD	MINUS SEISMIC INTERFACE END OF DATA

- (1) EN\_SMC\_INF\* is an input to the SBI board provided by the user. When EN\_SMC\_INTF\* is set to TTL low, the other signals of the interface on J25 are "un-tristated."

The 4280 Product Description Manual provides a complete description of the signals, signal format, and signal timing available at the connector on the SBI board, as well as the connector type.

#### Attaching The Read-after-Write Connector

If you wish to attach to the 4280 a device to verify that valid data is being written to the tape,

1. Remove the screws securing the front cover of the unit and raise it.
2. With a pair of pliers, break off the scored tab (Figure 7) on the front edge of the front cover.
3. Join the connector from your read instrumentation to the connector (J25) on the SBI board, next to the area from which you removed the tab.
4. Route the cable from your instrument through the opening created when you broke off the tab in step 2. Holding the cable, close the front cover and secure it with the screws you removed earlier. If the unit is mounted in a rack, route the cable so it is not in the way when you slide the unit into the rack.



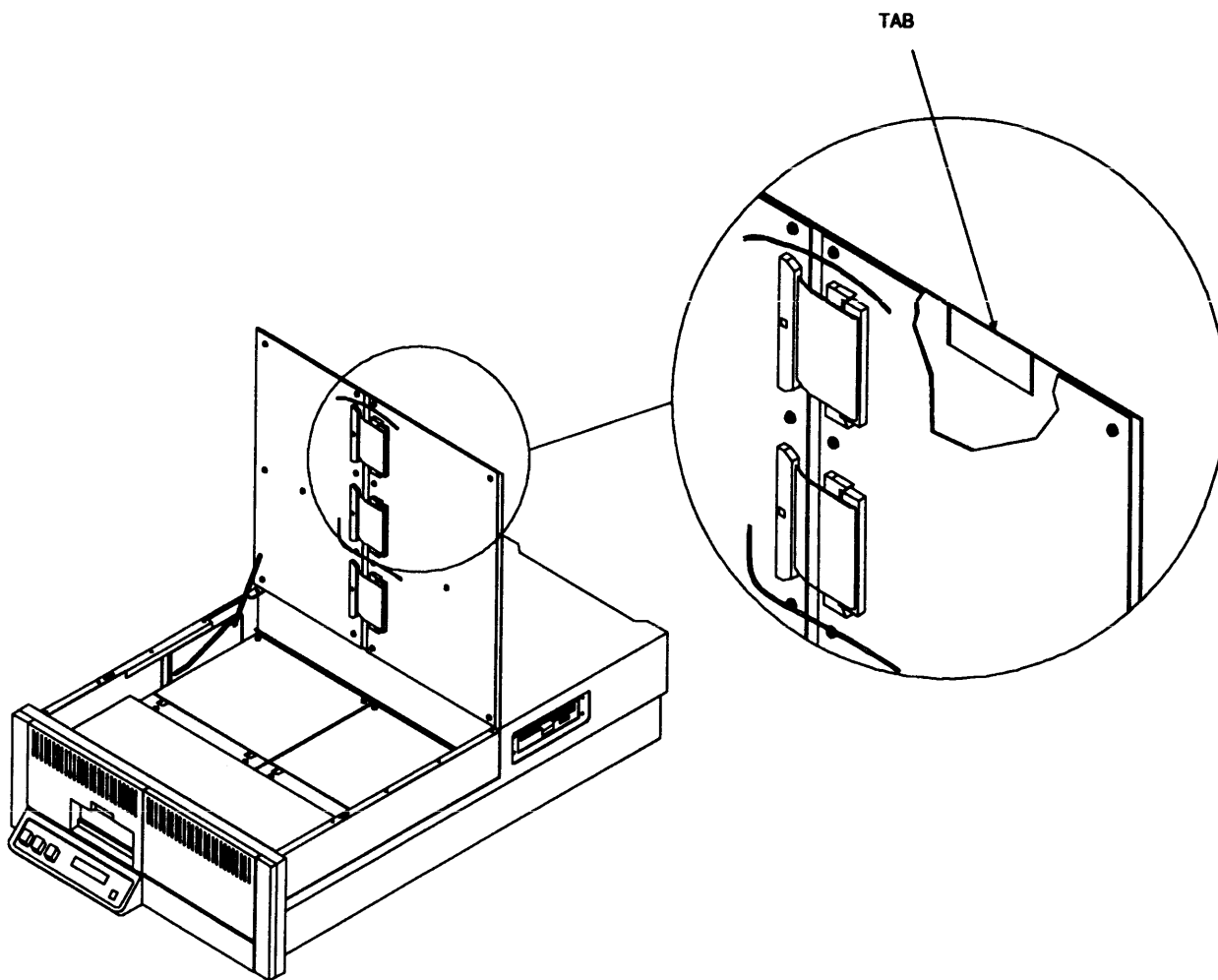


Figure 7  
Read after Write Connection

## **9. Power Up**

---

To power up the unit, you must be able to access the rear of the 4280. If you cannot do this when the unit is installed in the rack, you will have to remove it from the rack. For the relative locations of the voltage range switch, the ac power switch, and the ac power cord connector on the rear of the unit (refer to Figure 3). The exact locations of these items may vary slightly.

At this time, both power switches, dc in the front and the ac on the back, should be OFF.

### **9.1. Attach The AC Power Cord**

Plug the supplied ac power cord connector, or one that is compatible with the ac power socket that you will be using, into the IEC-320 "universal" power connector on the back of the 4280. Then insert the other plug into a "live" ac power receptacle.

### **9.2. Turn On AC Power Switch**

Make sure the voltage range switch is set properly. Refer to the section titled, "Voltage Range Setting." Place the ac power switch (on the rear of the unit) in the "ON" or "1" position. Note that this is only a switch and not a breaker. The power supply module is fused internally. (Refer to Figure 3.)

### **9.3. Insert Code Into Floppy Drive**

The latest level of microcode is shipped in an anti-static bag with the unit. Insert code into the floppy drive (located on the right side of 4280) with the label side up.

### **9.4. Turn On The DC Power Switch**

Once ac power is applied to the 4280, the unit is powered up and down only with the dc power switch on the lower left side of the front bezel. This switch enables all of the dc voltages from the power supply module.

Place the subsystem power to the "ON" or "1" position to power up the 4280.

The endcap (refer to Figure 3) on each side of the 4280 should be popped off. Insert a 10 - 32 screw through the hole of the 4280 and into the clipnut, securing the 4280 to the cabinet. This should be done on both sides of the 4280. Replace both endcaps.

## **10. Test the Subsystem**

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### **10.1. Initial Checkout**

When the dc power switch is switched on, the LCD display on the operator control panel should become backlit and display an IPL (initial program load) message: "IPL:INITIALIZING".

If this is not the case, review the power-on procedure and, if everything was done correctly, proceed to the Start section of the 4280 maintenance manual to begin diagnosing the problem.

The total IPL process should take less than four minutes (including diagnostics), after which the LCD display should indicate "IPL :COMPLETE". for three seconds, then display the online or offline status display.

If an error code is displayed, proceed to the error code dictionary section in the 4280 maintenance manual for the error code description and a suggested action.

If the unit is offline (if [OF :DIAG: \*] appears in the display), skip to the beginning of section 10.2.

If the 4280 is online (if [XX :IDLE \*], where XX = ON, A, B, or AB appears in the display), take it offline before proceeding. At the drive operator control panel,

1. Press and release the Scroll button; [+SUBSYS STATUS] should appear in the display.
2. Press Select three times. [OF :DIAG: \*] should appear in the display.

### **10.2. Test The Cartridge Loader**

Make sure each drive can load and unload a cartridge. Using a scratch cartridge and the procedures in the operator's manual for inserting and removing a cartridge, load and unload a cartridge in each drive.

No error should occur, but if one does, an error code should be displayed. Refer to the error code dictionary in the 4280 maintenance manual for the error code description and a suggested action.

If an automatic cartridge loader (autoloader) is installed, follow the procedures in the operator's manual for installing a magazine, and loading and unloading cartridges.

**WARNING:**

**Make sure you have sufficient upper and lower clearance, before attempting to load the magazine.**

**10.3. Run Diagnostics**

After you know that each drive can load and unload cartridges successfully, run the unit checkout diagnostics.

If any errors occur, refer to the error code dictionary section in the 4280 maintenance manual for the error code description and a suggested action.

**Note:** At this time, go to sections 13.3 and 13.4 and become familiar with the diagnostic tests that you must run. Do not attempt to run them. Just read those two sections and learn what tests you will run in a few minutes. Then return to step 1 below. As you run diagnostics using the procedure below, refer to sections 13.3 and 13.4 when the directions refer you to them and when you do not understand something in the procedure.

1. Press and release the SCROLL button until [+DIAGNOSTICS] appears in the display.
2. Press the SELECT button and [\*Diag Test 1] appears in the display.
3. Press the SELECT button and display should flash ON/OFF (indicating that the test is armed).
4. Press the SELECT button a second time. [#Test 1:Busy] appears in the display.
5. When [#Test 1:Pass] appears (after approximately ten minutes), press and hold all three push buttons (SCROLL, SELECT, and UNLOAD) for at least four seconds. This will re-IPL the 4280. This IPL is necessary because #TEST 1 corrupts the contents of the memory.
6. After the IPL is complete, [OF:DIAG \*] will appear in the display. perform steps 1 and 2 above.
7. Load a good scratch cartridge into the transport.
10. Press the SCROLL button and [\*Diag Test 2] appears in the display.
11. Press the select button (test armed).

12. Press the **SELECT** button a second time. [#Test 2:Busy] appears in the display.
13. [#Test 2:Pass] " appears when test two is complete.
14. Continue to run offline diagnostics, following the procedure in section 13.3. If an error occurs (indicated by an error code appearing in the display), refer to Chapters 3 and 2 in the maintenance manual.
15. When offline diagnostics are complete
  - a. If the ICRC feature is installed and the microcode loaded, run inline diagnostics (refer to section 13.4). Then proceed to section 10.
  - b. If the ICRC feature is not installed, proceed to section 11.

## **11. Set Up The Host Interface**

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When the 4280 has been powered up and tested, the host interface can be set up to allow checkout from the host system. If you use a SCSI interface, refer to 11.1 and sub-paragraphs. If you use an STK interface, refer to 11.2 and subparagraphs.

### **11.1. Set Up SCSI Interface**

#### **11.1.1. Set Up SCSI Physical Interface**

The SCSI (Small Computer Standard Interface) allows the connection of up to seven different peripherals to a common bus. The 4280 can transfer data on the bus up to 3.3 MB/s (3.0 MB/s sustained). The setup requires determination of signal drivers used, what bus termination to use, what the SCSI ID should be.

##### **11.1.1.1. Setup Single or Differential SCSI Bus**

The 4280 is capable of supporting both single and differential signals on the bus. The host adapter and all peripherals must be setup the same; devices using single and differential signal drivers can not be mixed on the bus.

Single ended drivers are generally only used for the attachment of one peripheral or the maximum SCSI cable length is 6.0 m (19.7 ft) or less.

The differential signal SCSI bus is used for SCSI bus lengths of up to 25 m (82.0 ft) and the daisy chaining of up to a total of seven peripherals.

Signals on the SCSI bus must be terminated with a resistor network at each end of the cable. The resistor network is different for single and differential driven SCSI buses.

To configure the interface card for the correct SCSI bus and termination, refer to Figure 7 and

1. Unload the tape drives and power the 4280 unit down with the front subsystem power switch. Unplug the ac power cable from the rear of the 4280.
2. Pull the 4280 completely out of the rack enclosure on its slides so that the top rear cover totally exposed.
3. Using a Torx driver remove the 12 screws securing the top rear cover. Lift the top rear cover and engage the prop that holds it up.

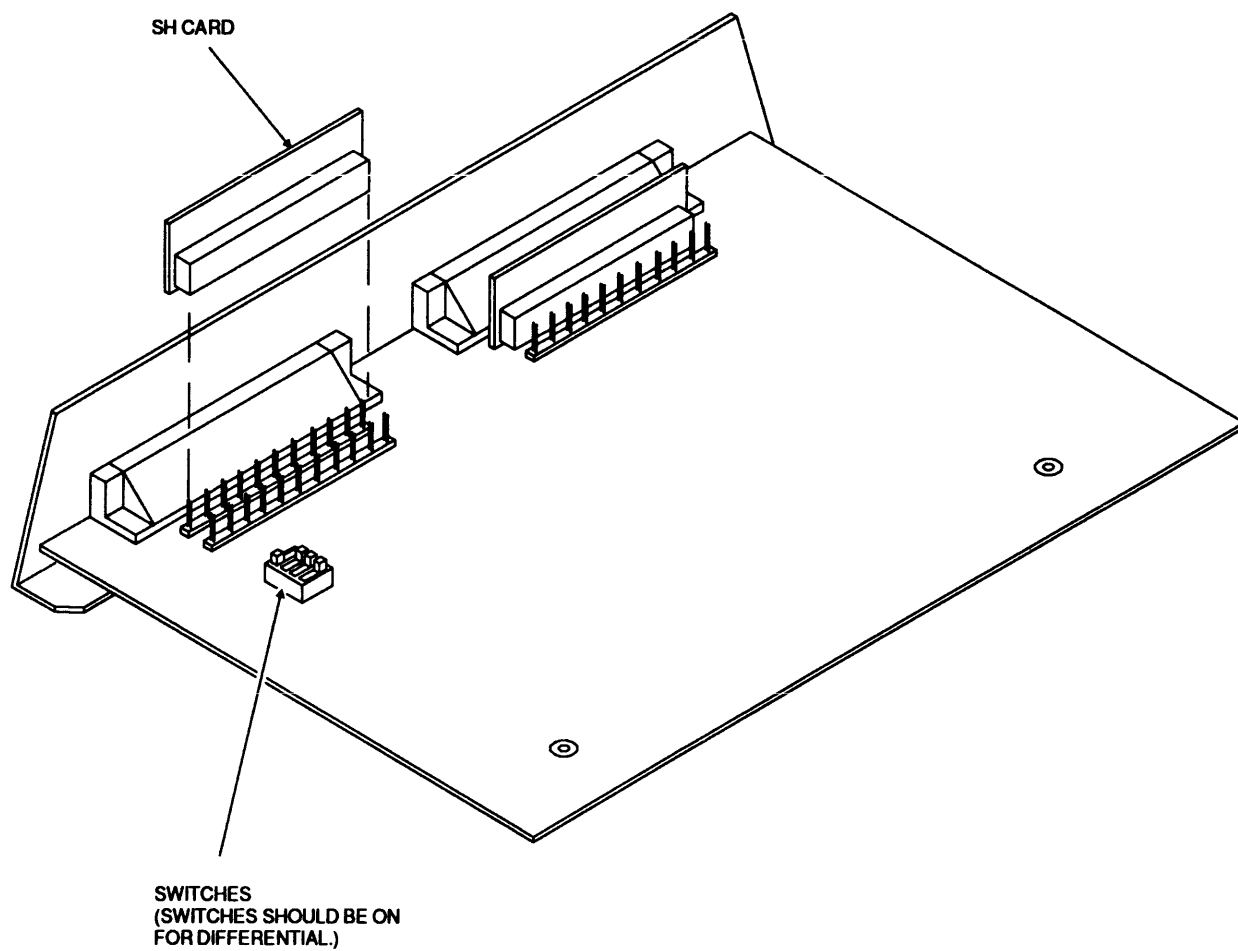


Figure 8  
SCSI Card

4. Set DIP switch 4 located on the SZ card to desired settings, On for differential, Off for singled ended. (Refer to Figure 7.) If the switch is set incorrectly, change it.
5. On the SZ card, there are two sets of terminating connectors (refer to Figure 7). Each set has a corresponding terminating SH card. Each card is inserted into the slot (connector) marked with the type of configuration desired. If necessary, change the location of both terminating SH Cards.
6. Terminate the SZ card properly.
  - a. The 4280 provides on-board termination when the bus is single ended driven, since it is usually the only peripheral device on the bus. If multiple peripheral devices are daisy chained on the bus, then only the last device can have termination. This means the two resistor DIP packs at locations DP26+ and BM19+ on the SZ card must be removed from their sockets if the 4280 is not the last daisy chained device on the SCSI bus.
  - b. For a differential driven SCSI bus an external terminator must be attached to the vacant SCSI connector when the 4280 is at the end of bus. The external differential terminator is supplied with 4280.
6. Close the top rear cover, secure with 12 Torx screws, and slide the unit back into the cabinet.

#### **11. 1. 1. 2. SCSI Bus Cable Connection**

The SCSI bus cable can be attached to either of the rear SCSI bus connectors. A second connector is provided for either daisy chaining additional peripheral devices or attaching a bus terminator. Each connector includes a locking mechanism to avoid loose connections.

#### **11. 1. 2. Set Up SCSI Software Configuration**

1. Plug the ac power cable into the rear; turn ON the front power switch and wait until the display stops at [OF:DIAG:     ].
2. Set the appropriate software switches by going through the menu described in section 13.1, "Configuring the Unit - SCSI Interface - (Offline Menu)."

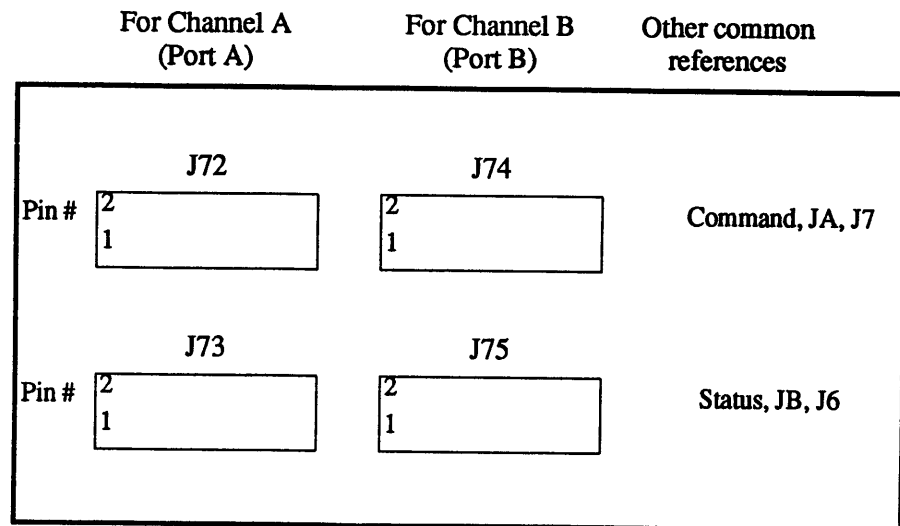


## 11. 2. Set Up STK Interface

The StorageTek Standard (STK) Interface on the 4280 is actually a dual port or channel interface. Two separate host systems can be attached to one 4280, although only one drive can be accessed at any one time.

### 11. 2. 1. Setting Up STK Physical Interface

Each channel requires a command cable and a status cable. A sticker on the back of the unit indicates the four connectors.



STK Interface Channel Connectors  
(Rear view of unit)

A 60 pin Berg 66902-260 or equivalent type connector will work with the STK connectors J72-J75. These are designed to best mate with a 3M shielded connector 3705-A260 to comply with VDE-B regulations on RFI emissions. Daisy chaining of the 4280 with up to three other tape units can be accomplished through external daisy chain cables that use a point-to-point system (there should be no Y's in the cabling). The maximum length of cable allowed is 40 ft. (12 meters).

### 11.2.1.1. Termination

Each channel has its own on-board termination in the form of two socketed DIP resistor packs per channel. The termination packs are labeled U114 and U121 for the A channel, and U129 and U130 for the B channel.

Check the interface card for proper termination.

1. Unload the tape drives and power the 4280 unit down with the front subsystem power switch. Unplug the ac power cable from the rear of the 4280.
2. Pull the 4280 completely out of the rack enclosure on its slides so that the top rear cover totally exposed.
3. Using a Torx driver remove the 12 screws securing the top rear cover. Lift the top rear cover and engage the prop that holds it up.
4. If multiple peripheral devices are to be daisy chained on the bus, then only the last device can have termination. Therefore, remove the two DIP resistor packs for **both** channels from the interface board if the unit is not last in the string, and insert one set per channel in the interface board of the last device on the string.
5. Close the top rear cover, secure with 12 Torx screws, and slide the unit back into the cabinet.

### 11.2.2. Setting Up STK Software Interface

1. Plug the ac power cable into the rear; turn ON the front power switch and wait until the display stops at [OF:DIAG:     ].
2. Set the appropriate software switches by going through the menu in section 13.2, "Configuring the Unit - STK Interface - (Offline Menu)."

## **12. Host System Checkout**

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After all of the previous host setup has been completed, execute any available tape diagnostics or test tape jobs the host system has to verify total operational capability. Refer to Section 12.3 and, if the ICRC feature is installed, section 13.4 to find out how to run diagnostics.

## 13. 4280 Operator Display Menu

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This section of the install manual takes you step by step through various menus in the subsystem program. Sections 13.1 and 13.2 tell you how to configure the unit after you install it. Choose the procedure that corresponds to the interface you are using. Section 13.3 tells you how to run offline diagnostics. Section 13.4, running inline diagnostics, applies only to units with the ICRC feature and microcode installed. Sections 13.5 and 13.6 describe the online menu (choose the section that corresponds to the interface you are using), which you may need to use from time to time.

### 13.1. Configuring the Unit - SCSI Interface - (Offline Menu)

---

In order to be configured, a unit must be at the beginning of the offline menu. The easiest way to do this when the program is loaded, is to reset by holding down the SCROLL, SELECT, and UNLOAD buttons for less than two seconds. The unit will unload any tape in the drive, then present

- |                     |  |
|---------------------|--|
| [OF:DIAG: *]        | Press SCROLL to pass to the next menu entry.   |
| [+SUBSYS STATUS]    | Press SCROLL to pass to the next menu entry.   |
| [+SET OR DISPLAY]   | Press SELECT to pass to the next menu entry.   |
| [**Configuration]   | <p>Press SELECT and UNLOAD at the same time to pass to the next menu entry.</p> <p>By default, this menu is <u>not</u> passkey protected, but passkey protection can be enabled through this submenu, and is remembered in NVRAM. If passkey protection is enabled, the following key sequence is required when the flashing [Enter Passkey !] message is displayed.</p> <ol style="list-style-type: none"> <li>1. Press and release SCROLL</li> <li>2. Press and release SCROLL and SELECT together.</li> <li>3. Press and release SCROLL and UNLOAD together.</li> </ol> <p>The key sequence must be entered within a five-second window.</p> <p>If you have entered the passkey sequence, when the [**Configuration] display returns press and release SELECT and UNLOAD together to pass to the next menu entry.</p> |
| [>>Set Diags: None] | <p>This allows different modes of automatic diagnostics (Normal, None, and Extended) at IPL. Press and release SELECT and UNLOAD to display Norm, None, or Extd, then press SELECT twice to set the desired mode.</p>  |

Extended diagnostics are equivalent to Test 1, and Normal is a subset of Test 1. Approximate IPL times for a 1 x 2 for None, Norm, and Extd modes are 1:20, 3:15, and 11:10 minutes, respectively.

Press SCROLL to pass to the next menu entry.

[>>Diag EC Lvl: 0]

This setting determines whether certain tests can be run. Press and release SELECT and UNLOAD together to sequence through eight values (0-7). Only settings of 0, 1, and 2 are supported by the diagnostics. Press SELECT twice to set the value into NVRAM. Units that have RI boards of PN 29291200 and higher support an extended Loop-Write-to-Read diagnostic. With these units, a setting of 1 or 2 executes the extended LWR\_DIAG subtests as a part of test 1. The extended LWR\_DIAG subtests are not run at IPL time. A setting of 2 allows test 7 to run as one of the offline tests.

Press SCROLL to pass to the next menu entry.

[>>Set Host: SCSI]

If "SCSI" does not appear in your display, you must press and release SELECT and UNLOAD until SCSI appears, then press SELECT twice to set this host type. If you do not set the proper host type, the menus will be different from what you see here. If you set (or re-set or change) the host type, a re-IPL will occur and you will have to start over at the beginning of this menu.

Press SCROLL to pass to the next menu entry.

[Lang: English]

This menu option allows the user to select English, Français (French), Deutsch (German), Italiano (Italian), or Español (Spanish) for the messages displayed on the operators panel. Press SELECT and UNLOAD until the desired language setting comes up. Then press SELECT twice to set.

Press Scroll to pass to the next menu entry.

[>>Set Part: Auto]

(The program skips this step if the ICRC feature--indicated by a DCI card--is installed.)

Press and release SELECT and UNLOAD until the partition size you want appears, then press

SELECT twice to set that value. Buffer sizes of 0.5, 1.0, and 2.0 MB partitions per drive are supported. "Auto" automatically uses 2.0 MB for a 1 x 1, and 1.0 MB for a 1 x 2.

Press SCROLL to pass to the next menu entry.

[>>Set Sync TM: 2]

There are three values available: 1, 2, and 3. This number signifies the number of sequential tape marks required before the buffer partition is synchronized to the tape. Press SELECT twice to set the value you want to select.

Press SCROLL to pass to the next menu entry.

[>>Passkey: Disab]

The passkey function can be enabled and disabled through this display. Press SELECT and UNLOAD simultaneously to display the status you want (Enab or Disab), then press SELECT twice to set it. The status of the passkey protection is saved in NVRAM, which survives a reset, IPL, or power off and on. Refer to the "configuration" submenu for the passkey sequence.

Press SCROLL to pass to the next menu entry.

[>>Sync Nego: Enab]

The menu first indicates whether target-initiated synchronous negotiations are enabled or disabled, by an "Enab" or "Dsab" message. To change the setting, press and release SELECT and UNLOAD, then press SELECT twice to set the displayed mode.

Press SCROLL to pass to the next menu entry.

[>>Emulate: None]

If you want to emulate an IBM 2440 or IBM 9348, press select and unload simultaneously until the desired mode appears in the display, then press SELECT twice to set that mode.

**Note:** If you have been setting the BRN option on previous code releases to a non-zero value, set the EMULATE menu to Opt(n), where (n) is the setting used for BRN, i.e., set EMULATE to Opt1 if you previously set the BRN menu to 1.

Press SCROLL to pass to the next menu entry.

[>Exit]

Press SELECT once to exit to the next submenu.

- [\*Set SCSI ID: 0]      Press **SELECT** and **UNLOAD** to increment the ID number. Press **SELECT** twice to set the SCSI ID to the indicated value. The ID is stored in nonvolatile memory.
- Press **SCROLL** to pass to the next menu entry.
- [\*\*Set LUN: 0]      Press **SELECT** and **UNLOAD** to increment the LUN value. Values 0-7 are supported. Press **SELECT** twice to set the indicated value. The LUN is stored in nonvolatile memory. The default LUN settings for the left and right hand drives (set at the factory) are 0 and 1, respectively.
- Press **SCROLL** to pass to the next menu entry.
- [\*\*Set Clean:16K]      Press **SELECT** twice to set the threshold at which the Clean message occurs. Press **SELECT** and **UNLOAD** together to sequence through 0, 8K, 12K, and 16K. The value 0 clears the clean counter.
- Press **SCROLL** to pass to the next menu entry.
- [\*Exit]      Press **SCROLL** and **SELECT** simultaneously twice to pass to the beginning of the offline menu ([OF:DIAG:xxxxxx])

### 13.2. Configuring the Unit - STK Interface - (Offline Menu)

In order to be configured, a unit must be at the beginning of the offline menu. The easiest way to do this if the program has been loaded, is to reset by holding down the SCROLL, SELECT, and UNLOAD buttons for less than two seconds. The unit will unload any tape in the drive, then present

[OF:DIAG: *]	Press SCROLL to pass to the next menu entry.
[+SUBSYS STATUS ]	Press SCROLL to pass to the next menu entry.
[+SET OR DISPLAY]	Press SELECT to pass to the next menu entry.
[**Configuration]	Press SELECT and UNLOAD at the same time to pass to the next menu entry.

By default, this menu is not passkey protected, but passkey protection can be enabled through this submenu, and is remembered in NVRAM.

If passkey protection is enabled, the following key sequence is required when the flashing [Enter Passkey !] message is displayed.

1. Press and release SCROLL
2. Press and release SCROLL and SELECT together.
3. Press and release SCROLL and UNLOAD together.

The key sequence must be entered within a five-second window.

If you have entered the passkey sequence, when the [\*\*Configuration] display returns, press and release SELECT and UNLOAD together to pass to the next menu entry.

[>Set Diags: None]	This allows different modes of automatic diagnostics (Normal, None, and Extended) at IPL. Press and release SELECT and UNLOAD to display Norm, None, or Extd, then press SELECT twice to set it. Extended diagnostics are equivalent to Test 1 and Normal is a subset of Test 1. The approximate IPL times for a 1X2 for None, Norm, and Extd modes are about 1:20, 3:15 and 11:10 minutes, respectively.
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Press SCROLL to pass to the next menu entry.



[>Diag EC Lvl: 0] This setting determines whether certain tests can be run. Press and release SELECT and UNLOAD together to sequence through eight values (0-7). Only settings of 0, 1, and 2 are supported by the diagnostics. Press SELECT twice to set the value into NVRAM. Units that have RI boards of PN 29291200 and higher support an extended Loop-Write-to-Read diagnostic. With these units, a setting of 1 or 2 executes the extended LWR\_DIAG subtests as a part of test 1. The extended LWR\_DIAG subtests are not run at IPL time. A setting of 2 allows test 7 to run as one of the offline tests.

Press SCROLL to pass to the next menu entry.

[>Set Host: STK2] If "STK1" or "STK2" does not appear in the display, you must press and release SELECT and UNLOAD until the desired setting comes up, then press SELECT twice to set this host type. If you do not set the proper host type, the menus will be different from what you see here. STK1 supports only the A channel, and STK2 supports both the A and B channels. The menu selections are changed accordingly. Setting the host type causes an automatic IPL.

Press SCROLL to pass to the next menu entry.

[>\*\*Lang: English] This menu option allows the user to select English, Français (French), Deutsch (German), Italiano (Italian), or Español (Spanish) on the operator panel. Press and release SELECT and UNLOAD until the desired language setting comes up. Then press SELECT twice to set.

Press SCROLL to pass to the next menu entry.

[>Passkey: Enable] The passkey function can be enabled and disabled through this display. Press SELECT and UNLOAD simultaneously to display the status you want (Enab or Disab), then press SELECT twice to set it. The status of the passkey protection is saved in NVRAM, which survives a reset, IPL, or power off and on. Refer to the "configuration" submenu for the passkey sequence.

Press SCROLL to pass to the next menu entry.

- [>Data A: 3MB s] To set the maximum data rate on the interface, press and release SELECT and UNLOAD together to sequence through host data transfer rates (per sec.): FreeRn, 1 MB, 760 KB, 500 KB, 300 KB, 167 KB, 90 KB. This pertains only to units with SK boards, P/N 29291201 and higher. Units with SK boards, P/N 29297101 and below still use the data rate switches on the board.
- Press SCROLL to pass to the next menu entry.
- [>Data B: 3MB s] This menu entry is available only if there are two hosts attached to the unit and STK2 has been set.
- To set the maximum data rate on the interface, press and release SELECT and UNLOAD together to sequence through host data transfer rates (per sec.): FreeRn, 1 MB, 760 KB, 500 KB, 300 KB, 167 KB, 90 KB. This pertains only to units with SK boards, P/N 29291201 and higher. Units with SK boards, P/N 29297101 and below still use the data rate switches on the board.
- Press SCROLL to pass to the next menu entry.
- [>>ICRC: Enab] (This menu entry is available only if the ICRC feature is installed.) If necessary, press SELECT and UNLOAD simultaneously to change the mode in the display to the one you want, then press SELECT twice to set that mode.
- Press SCROLL to pass to the next menu entry.
- [Exit] Press SELECT once to exit to the next menu entry.
- [\*\*Set Intf A: x] Press SELECT and UNLOAD to cause the control unit number (0-F) to appear. Press SELECT twice to set that address for channel A. The address is stored in nonvolatile memory. This pertains only to units with SK boards of P/N 29291201 and higher. Units with SK boards of P/N 29297101 and below still use the address switches on the board.
- Press SCROLL to pass to the next menu entry.

**[\*\*Set Intf B: x]** This menu item appears only if the host type is set to STK2 in the configuration menu. Press SELECT and UNLOAD to cause the CU number (0-F) to appear. Press SELECT twice to set that address for channel B. The address is stored in nonvolatile memory. This pertains only to units with SK boards of P/N 29291201 and higher. Units with SK boards of P/N 29297101 and below use address switches on the board.

Press SCROLL to pass to the next menu entry.

**[\*\*Set Dev Adr: 0]** Press the SELECT and UNLOAD buttons to increment the Dev Adr. Values 0-3 are logical device addresses. Press SELECT twice to set the device address to the indicated value. The address is stored in nonvolatile memory. Any time the address is changed, the enable settings or switches may have to be changed.

Press SCROLL to pass to the next menu entry.

**[\*\*Inf A Enab: 0]** Press the SELECT and UNLOAD buttons to toggle between Off, 0, 1, 2, 3, and All. "All" enables both devices to the A interface and "Off" disables both devices; "0-3" = the logical device enabled to the A Interface. Press SELECT twice to set your selection.

Press SCROLL to pass to the next menu entry.

**[\*\*Inf B Enab: 1]** Press the SELECT and UNLOAD buttons to toggle between Off, 0, 1, 2, 3, and All. "All" enables both devices to the B interface and "Off" disables both devices; "0-3" = the logical device enabled to the B Interface. Press SELECT twice to set you selection.

Press SCROLL to pass to the next menu entry.

**[\*\*Set Clean:16K]** Press SELECT twice to set the value at which the CLEAN message occurs. Press SELECT and UNLOAD together to sequence through 0, 8K, 12K, and 16K. 0 clears the counter.

Press SCROLL to pass to the next menu entry.

**[\*Exit]** Press SCROLL and SELECT simultaneously twice to pass to the beginning of the offline menu ((OF:DIAG:xxxxxx))

### 13.3. Running Offline Diagnostics - Menu

You can run offline diagnostics immediately after configuring the unit. Otherwise, if the program is loaded, reset the unit by holding down the SCROLL, SELECT, and UNLOAD buttons for less than two seconds. The unit will unload any tape in the drive, then present the first entry of the Offline Menu.

**Note:** If the ICRC feature is installed, after test 1 the program skips tests 2 through 6 and goes directly to test 7.

[OF:DIAG: *]	Press SCROLL to pass to the next menu entry.
[+SUBSYS STATUS ]	Press SCROLL to pass to the next menu entry.
[+SET OR DISPLAY]	Press SCROLL to pass to the next menu entry.
[+DIAGNOSTICS]	Press SELECT to access the offline tests submenu:
[*Diag: Test 1]	Press SELECT twice to execute. This test, which runs hardware diagnostics that test the SB, RI, and the SZ boards, runs for approximately 10 minutes. (Any attempt to go online after running Test 1 will cause an IPL.)
	Press SCROLL to pass to the next test.
[*Diag: Test 2]	(If the ICRC feature is installed, this test is part of the inline tests and cannot be run from this point in the program.) Press SELECT twice to execute. This test runs basic tape motion and write/read diagnostics. It requires a loaded, ready and unprotected tape.
	Press SCROLL to pass to the next test.
[*Diag: Test 3]	(If the ICRC feature is installed, this test is part of the inline tests and cannot be run from this point in the program.) Press SELECT twice to execute. This test runs an extended write/read reliability test. It executes a write pass from BOT to EOT, a read forward pass BOT to EOT, and then a read backward pass EOT to BOT. If the unit encounters a permanent error or too many blocks are ECC corrected, the test posts an error. It requires a loaded, ready and unprotected tape and runs for about 20 minutes.
	Press SCROLL to pass to the next test.

[\*Diag: Test 4] (If the ICRC feature is installed, this test is part of the inline tests and cannot be run from this point in the program.) Press SELECT twice to execute. This is a read reliability test, equivalent to the read passes of test 3. Primarily for testing read interchange between units, it requires a tape written successfully by test 3 loaded and ready.

Press SCROLL to pass to the next test.

[\*Diag: Test 5] (If the ICRC feature is installed, this test is part of the inline tests and cannot be run from this point in the program.) Press Select twice to execute. This is a write reliability test that checks ECCs on writes, equivalent to QUAL3-WRT.

Press SCROLL to pass to the next test.

[\*Diag: Test 6] (If the ICRC feature is installed, this test is part of the inline tests and cannot be run from this point in the program.) Press Select twice to execute. This is a read reliability test that reads the tape generated by test 5 and checks read ECCs. It is equivalent to QUAL3-RD.

Press SCROLL to pass to the next test.

[\*Diag: Test 7] (This test can be run only if Diag EC lvl is set to 2.) Press SELECT twice to execute. This is a read/write, RI/SBI card scan diagnostic. (If you run this test you must IPL the control unit. If you then want to continue diagnostics, you must scroll from the offline menu to this point in the program. This is because this test corrupts memory.

Press SCROLL to pass to the next test.

[\*Diag: Load/Unld] If you have a manual loader, press SELECT twice to repeatedly load and unload a tape without ejecting it. The test runs until you press SCROLL or SELECT, or a hardware error is encountered. If a tape is not loaded, you receive a prompt with a message to load one. If you have an autoloader, press SELECT twice to start a Load/Unload cycle that runs until an error occurs or you press SCROLL or SELECT.

Press **SCROLL** to pass to the next test.

[\*Diag: Loop 1]

Press **SELECT** and **UNLOAD** to display the number of loops you wish all subsequent tests to go through. The numbers displayed are 1, 10, 100, and 0. Select '0' to set a continuous looping. Press **SELECT** twice to set the loop count that you select. (If an error occurs when 1, 10, or 100 has been set, the test stops; if an error occurs when 0 has been set, the test continues.)

**Note:** This loop count setting does not apply to the autoloader Load/Unld test.

Press **SCROLL** to pass to the next test.

[\*Diag: Test Disp]

Press **SELECT** twice to execute. This test causes all of the available characters to be displayed on the 16-character display. It does not end unless **SELECT** or **SCROLL** is pressed again.

Press **SCROLL** to pass to the next test.

[\*Loader Sensor]

Press **SELECT** twice to execute. If a manual loader is present, "Done" is displayed. If an autoloader is installed, the display indicates the status of nine sensors in the autoloader.

Each of the first nine positions on the display corresponds to a sensor. If a "1" is displayed, the corresponding sensor is active; if a 0 is displayed, the sensor is inactive. The following table relates the display position to a sensor (position 1 is the leftmost position in the display).

<u>Position</u>	<u>Sensor</u>
1	Cartridge-in-drive sensor
2	Carrier-up/down sensor
3	Horizontal shuttle-at-magazine sensor
4	Cleaning cartridge sensor
5	Vertical axle rotational sensor
6	Magazine index sensor
7	Magazine slot sensor
8	Cartridge-in-magazine sensor
9	Vertical dead-man switch

Press SCROLL to pass to the next test.

[\*Disply Pressure]

Press SELECT twice to execute. If a tape is inserted, a hex number proportional to the air pressure in the transport deck plenum sensed by the pressure transducer is displayed. Allowable and nominal values (in hex) are:

High error limit	90
Nominal	70 ±10
Low error limit	50

If no tape is present, the value displayed should be 0.

Press SCROLL or SELECT once to terminate this test.

Press SCROLL to pass to the next menu entry.

[\*Disply Tension]

Press SELECT twice to execute. This displays a hex number proportional to the air pressure in the right-hand air bearing sensed by the tension transducer. Allowable and nominal values (in hex) are:

High error limit:	A0
Nominal (moving, 8 oz)	70 ±10
Nominal (stopped, 6 oz)	54 ±10
Low error limit	38

If no tape is present, the value displayed should be 0.

Press SCROLL or SELECT once to terminate this test.

Press SCROLL to pass to the next test.

[\*Exit]

Press SCROLL once to return to test one,  
or  
press SELECT once to pass to the beginning of the offline program.

**13.4. Running Inline Diagnostics - Menu**

**NOTE: This menu is available only if the ICRC microcode is installed.**

To run inline diagnostics, the unit must be in inline mode. The first menu entry for the inline mode is (1) below. If you find yourself at an earlier entry, scroll through to the inline menu.

When you reset the unit, the program displays

[OF:Diag: xxxx]	Press SCROLL to pass to the next menu item.
[+SUBSYS STATUS]	Press SELECT to pass to the next menu item.
[*Online Request]	Press SELECT twice to pass to the next menu display.
[XX:IDLE: xxxx]	Press SCROLL to pass to the next menu item.
[+SUBSY STATUS]	Press SELECT to pass to the next menu item.
[*Offline Request]	Press SCROLL to pass to the next menu item.
[*Drive Offl Req]	Press SELECT twice to pass to the next menu item.
(1) [FE:IDLE:xxxxxx]	(This is the beginning of the inline menu.)  Press SCROLL to pass to the next menu item.
[SUBSYS STATUS]	Press SCROLL to pass to the next menu item.
[+SET OR DISPLAY]	Press SCROLL to pass to the next menu item.
[DIAGNOSTICS]	Press SELECT to pass to the next menu item.
[*Diag: Test 2]	Press SELECT twice to execute. This test runs basic tape motion and write/read diagnostics. It requires a loaded, ready and unprotected tape.  Press SCROLL to pass to the next test.
[*Diag: Test 3]	Press SELECT twice to execute. This test runs an extended write/read reliability test. It executes a write pass from BOT to EOT, a read forward pass BOT to EOT, and then a read backward pass EOT to BOT. If the unit encounters a permanent error or too many blocks are ECC corrected, the test posts an error. It requires a loaded, ready and



unprotected tape. Test 3 runs for about 20 minutes.

Press SCROLL to pass to the next test.

[\*Diag: Test 4]

Press SELECT twice to execute. This is a read reliability test, which is equivalent to the read passes of test 3. It tests primarily read interchange between units. It requires that a tape be written successfully by test 3 and that it is loaded and ready.

Press SCROLL to pass to the next test.

[\*Diag: Test 5]

Press SELECT twice to execute. This is a write reliability test that checks ECCs on writes; it is equivalent to QUAL3-WRT.

Press SCROLL to pass to the next test.

[\*Diag: Test 6]

Press SELECT twice to execute. This is a read reliability test. It reads the tape generated by test 5 and checks read ECCs. This test is equivalent to QUAL3-RD.

Press SCROLL to pass to the next test.

[\*Diag: Test 8]

(This write ICRC reliability test can be run only if the ICRC code is loaded and the feature is installed and enabled.) Together with test 9, it checks ECCs on writes. It is equivalent to UAL5 - WRT.

Press SCROLL to pass to the next test.

[\*Diag: Test 9]

(This read ICRC reliability test can be run only if the ICRC code is loaded and the feature is installed and enabled.) It reads the tape generated in test 8 to check read ECCs. It is equivalent to QUAL5 - RD.

Press SCROLL to pass to the next test.

[\*Diag: Load/Unld]

If you have a manual loader, press SELECT twice to continually load and unload a tape without ejecting it. The test runs until you stop it by pressing SCROLL or SELECT, or a hardware error is encountered. If a tape is not loaded first, you receive a prompt with a message to load a tape.

If you have an **autoloader**, press SELECT twice to start a Load/Unload cycle that runs until an error occurs or you press SCROLL or SELECT.

Press SCROLL to pass to the next test.

[\*Diag: Loop 1]

Press SELECT and UNLOAD to display the number of loops you wish all subsequent tests to go through. The numbers displayed are 1, 10, 100, and 0. '0' sets a repeating loop. (If an error occurs when 1, 10, or 100 is set, the test stops; if an error occurs when 0 is set, the test continues.) Press SELECT twice to set the loop count that you select. This loop count setting does not apply to the autoloader Load/Unld test.

Press SCROLL to pass to the next test.

[\*Diag: Test Disp]

Press SELECT twice to start. This test causes all of the available characters to be displayed on the 16-character display. It does not end unless SCROLL or SELECT is pressed again.

Press SCROLL to pass to the next test.

[\*Loader Sensor]

Press SELECT twice to execute. If a manual loader is present, "Done" is displayed. If an autoloader is installed, the display indicates the status of nine sensors in the autoloader.

Each of the first nine positions on the display corresponds to a sensor. If a "1" is displayed, the corresponding sensor is active; if a 0 is displayed, the sensor is inactive. The following table relates the display position to a sensor (position 1 is the leftmost position in the display).

Position   Sensor

- |   |                                       |
|---|---------------------------------------|
| 1 | Cartridge-in-drive sensor             |
| 2 | Carrier-up/down sensor                |
| 3 | Horizontal shuttle-at-magazine sensor |
| 4 | Cleaning cartridge sensor             |
| 5 | Vertical axle rotational sensor       |
| 6 | Magazine index sensor                 |
| 7 | Magazine slot sensor                  |
| 8 | Cartridge-in-magazine sensor          |
| 9 | Vertical dead-man switch              |

Press **SCROLL** to pass to the next test.

[\*Display Pressure]

Press **SELECT** twice to execute. If a tape is inserted, a hex number proportional to the air pressure in the transport deck plenum sensed by the pressure transducer is displayed. Allowable and nominal values (in hex) are

High error limit	90
Nominal	70 ±10
Low error limit	50

If no tape is present, the value in the display should be 0.

Press **SCROLL** or **SELECT** once to terminate this test.

Press **SCROLL** to pass to the next test.

[\*Display Tension]

Press **SELECT** twice to execute. If a tape is inserted, a hex number proportional to the air pressure in the right-hand air bearing sensed by the tension transducer is displayed. Allowable and nominal values (in hex) are:

High error limit:	A0
Nominal (moving, 8 oz)	70 ±10
Nominal (stopped, 6 oz)	54 ±10
Low error limit	38

If no tape is present, the value in the display should be 0.

Press **SCROLL** or **SELECT** once to terminate this test.

Press **SCROLL** to pass to the next program entry.

[\*Exit]

Press **SCROLL** and **SELECT** simultaneously twice to return to the beginning of the inline display: [FE:IDLE: \*] If you then wish to put the unit online, press **SCROLL** once, then **SELECT** twice.

**13. 5. Online display (SCSI Interface)**

The first entry of the online program is (1) below. If you find yourself at an earlier entry, start there and scroll to (1), the beginning of the online program.

- |                               |   |
|-------------------------------|---|
| [OF:DIAG:           *]        | Press Scroll to pass to the next menu entry.  |
| [+SUBSYS STATUS]              | Press Select to pass to the next menu entry.  |
| [Online Request]              | Press Select twice to pass to the beginning of the Online menu.   |
| <b>(1)</b> [ON:IDLE:       *] | (This is the Online Status Display, the beginning of the online program.)   |
|                               | Press SCROLL to pass to the following menu entry.   |
| [+SUBSYS STATUS]              | Press SCROLL once if you wish to pass to the operator display for machine generated messages, and SCROLL once more to return to the Online Status Display.  |
|                               | Press SELECT to access the following submenu.   |
| [*Offline Request]            | Press SELECT twice if you wish to take the unit offline. The subsystem remains offline until the Online Request is executed.  |
|                               | Press SCROLL to pass to the following menu entry.   |
| [*Drive Offl Req]             | (This entry appears only if the ICRC code is installed.)  |
|                               | Press SELECT twice to pass to the inline program,   |
|                               | or  |
|                               | press SCROLL to pass to the following menu entry.   |
| [*Special Sw Mode]            | This menu entry is available only if the unit has a SCSI interface. It enables or disables switches to the host (Micro Tech host only). Press SELECT twice to change the setting from enable to disable and vice versa. |
|                               | Press Scroll to pass to the following menu entry.   |

[\*Exit]

Press SELECT to return to the Online Status  
Display:[ON:IDLE: \*]. (1)**Operator Display**

There is a window in the online menu program (the "Operator Display"). It consists of sixteen positions and displays information about the status of the drive. To access this window, start at the Online Status Display ([xx:IDLE: xxxx] and press SCROLL twice. To return to the Online Status Display, press SCROLL once.

The entries that appear in this window and their significance are

*	No tape loaded
READY U	Device ready and inactive, not file protected
READY U - BOT	Device ready and inactive at logical EOT, not file protected
READY U - LEOT	Device ready and inactive at logical EOT, not file protected
READY U - PEOT	Device ready and inactive at physical EOT, not file protected
READY F	Device ready and inactive, file protected
READY F - BOT	Device ready and inactive at BOT, file protected
READY F - LEOT	Device ready and inactive at logical EOT, file protected
READY F - PEOT	Device ready and inactive at physical EOT, file protected
TAPE MOVING	Drive active moving tape
TAPE MOVING-LEOT	Drive active moving tape in logical EOT region
TAPE REWINDING	Tape rewinding
TAPE LOCATING	Tape locating
TAPE LOADING	Tape loading
TAPE UNLOADING	Tape unloading
EJECTING	Ejecting magazine from autoloader
POSITIONING UP	Magazine positioning up to next slot
POSITIONING DOWN	Magazine positioning down to next slot
POSITION TO INDEX	Magazine positioning to slot position 0
TAPE ERASING	Drive performing DSE
SCANNING	Scanning magazine for cartridges
TAPE TENSIONING	Performing tape tensioning
CLEAN ME *	No tape loaded: drive requires cleaning
TAPE CLEANING	Displayed when cleaning cartridge installed
NO CARTRIDGE	Load failed: no cartridge in current magazine position
ERR-UNLOAD TAPE	Permanent error: must abort job
LOAD FAILURE	Tape failed to load properly in tape path
ERR:IPLOrRST RQD	An error that requires a RESET, IPL, or FE intervention

**13. 6. Online display (STK Interface)**

The first entry of the online program is (1) below. If you find yourself at an earlier entry, start there and scroll to (1), the beginning of the online program.

- |                    |   |  |
|--------------------|---|--|
| [OF:DIAG: *        | ] | Press SCROLL to pass to the next menu entry.   |
| [+SUBSYS STATUS]   |   | Press SELECT to pass to the next menu entry.   |
| [Online Request]   |   | Press SELECT twice to pass to the beginning of the Online menu.  |
| (1) [XX:IDLE: *    | ] | This is the online status display, the beginning of the online program. (XX can be "A", "B", or "AB")  |
|                    |   | Press SCROLL to pass to the following menu entry.  |
| [+SUBSYS STATUS]   |   | Press SCROLL once if you wish to pass to the operator display for machine generated messages, and SCROLL once more to return to the Online Status Display.   |
|                    |   | Press SELECT to access the following submenu.  |
| [*Offline Request] |   | The subsystem remains offline until the Online Request is executed.  |
|                    |   | Press SCROLL to pass to the following menu entry.  |
| [*Drive Offl Req]  |   | This entry appears only if the ICRC code is installed.)  |
|                    |   | Press SELECT twice to pass to the inline program,  |
|                    |   | or   |
|                    |   | Press SCROLL to pass to the next menu item.  |
| [*Channel: Dsab A] |   | Press SELECT twice to disable channel A.   |
|                    |   | Press SCROLL to pass to the next menu item.  |
| [*Channel: Enab A] |   | Press SELECT twice to enable the A channel. The channel is not necessarily enabled because the subsystem is Offline. When the A is enabled and the unit is Offline, the status display shows [A :DIAG: *], or [AB:DIAG: *] if the B channel is also enabled. If [*Channel A: Dsab] |

is shown, the channel is already enabled, and pressing SELECT twice disables the channel.

[\*Channel: Dsab B] Press SELECT twice to disable channel B.

Press SCROLL to pass to the next menu item.

[\*Channel: Enab B] This menu item appears only if the Host type is set to STK2 in the configuration menu. Press SELECT twice to enable the B channel. The channel is not necessarily enabled because the subsystem is OFFline. When the B is enabled and the unit is Online, the status display shows [B:DIAG: \*], or [AB:DIAG: \*] if the A channel is also enabled. If [\*Channel B: Dsab] is shown, the channel is already enabled and pressing SELECT twice disables the channel.

Press SCROLL to pass to the next menu item.

[\*Exit]. Press SCROLL and SELECT simultaneously twice to return to the Online Status Display:[ON:IDLE: \*].

### Operator Display

There is a window in the online menu program known as the "Operator Display". It consists of sixteen positions and displays information about the status of the drive. To access this window, start at the Online Status Display ([xx:IDLE: xxxx] and press SCROLL twice. To return to the Online Status Display, press SCROLL once.

The entries that appear in this window and their significance are listed on page 53





**READER'S COMMENT FORM**

**StorageTek.**

Account Name: \_\_\_\_\_ Date: \_\_\_\_\_

Installation Address: \_\_\_\_\_

City/State/Zip: \_\_\_\_\_

Manual Name: \_\_\_\_\_

Manual PN: \_\_\_\_\_

Please check or fill in the items, adding explanations/comments in the space provided.

Which of the following terms best describes your job?

- |  |  |   |  |
|--|--|---|--|
| <input type="checkbox"/> Field Engineer  | <input type="checkbox"/> Engineer        | <input type="checkbox"/> Instructor       | <input type="checkbox"/> Manager               |
| <input type="checkbox"/> Mathematician   | <input type="checkbox"/> Operator        | <input type="checkbox"/> Programmer       | <input type="checkbox"/> Sales Representative  |
| <input type="checkbox"/> Student/Trainee | <input type="checkbox"/> Systems Analyst | <input type="checkbox"/> Systems Engineer | <input type="checkbox"/> Other (explain below) |

How did you use this publication?

- |  |   |  |  |
|--|---|--|--|
| <input type="checkbox"/> Introductory text     | <input type="checkbox"/> Reference manual | <input type="checkbox"/> Student/Trainee | <input type="checkbox"/> Instructor text |
| <input type="checkbox"/> Other (explain below) |   |  |  |

Did you find the material easy to read and understand?

- |                              |   |
|------------------------------|---|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No (explain below) |
|------------------------------|---|

Did you find the material organized for convenient use?

- |                              |   |
|------------------------------|---|
| <input type="checkbox"/> Yes | <input type="checkbox"/> No (explain below) |
|------------------------------|---|

Specific criticisms (explain below):

Clarifications on pages \_\_\_\_\_

Additions on pages \_\_\_\_\_

Deletions on pages \_\_\_\_\_

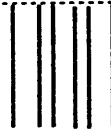
Errors on pages \_\_\_\_\_

Explanations and other comments:

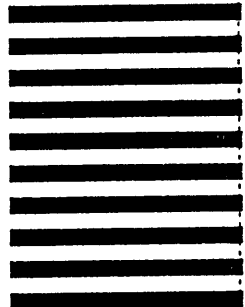
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