TC44-AA/BA STI to StorageTek 4400 ACS Interconnect Hardware Installation Guide

Order Number EK–TC44I–IM–002

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FCC NOTICE: The equipment described in this manual generates, uses and may emit radio frequency energy. The equipment has been type tested and found to comply with the limits for a class A computing device pursuant to Subpart J of part 15 of FCC rules, which are designed to provide reasonable protection against such radio frequency interference when operating in a commercial environment. Operation of this equipment in a residential area may cause interference, in which case the user at his own expense may be required to take measures to correct the interference.

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Preface

This manual provides the information necessary for installing and performing basic troubleshooting on the TC44 Standard Tape Interface (STI) to Federal Information Processing Standard (FIPS–60) Interconnect.

The information in this manual is for the Digital-trained Customer Services technician qualified to service TA9x and HSC units, and is intended to address the installer's need for information on the TC44 Interconnect.

Structure of the Manual

Chapter 1 provides general information and describes the physical characteristics of the TC44 Interconnect. This chapter also contains the electrical, mechanical, and environmental specifications.

Chapter 2 provides information on installing and configuring the TC44 Interconnect.

Chapter 3 provides information on basic error interpretation and troubleshooting.

Appendix A provides physical, electrical, and environmental specifications.

Related Documentation

- TC44–AA/BA STI to StorageTek 4400 ACS Interconnect Maintenance Manual (EK–TC44I–TM)
- HSC Installation Manual (EK–HSCMN–IN)

Conventions

Table 1 lists the conventions observed in this manual.

Table 1:

Convention	Meaning
NOTE	Highlights important information or provides explanations.
CAUTION	Highlights areas that could cause damage to the equipment.
a,b,c	Lowercase italics used in CE Panel Display examples represent variables that change based on the type of configuration.
key	Press the specified key. For example, Return indicates that you should press the Return Key.

Chapter 1
Introduction

The TC44–AA/BA two channel Digital interface (STI) to IBM® interface (FIPS–60) Interconnect is designed to allow a VAX system to access a Storage Technology Automated Cartridge System (StorageTek®ACS) or a Digital TA92 standalone tape subsystem. When configured with the StorageTek ACS, client-level software is loaded on the VAX to communicate to the tape library server over an Ethernet link. This software translates the VAX operating system tape commands into StorageTek ACS commands to control the library robotics. Simplified configuration diagrams are shown in Figure 1–1 and Figure 1–2.

Figure 1–1: TC44–AA/BA and TA92

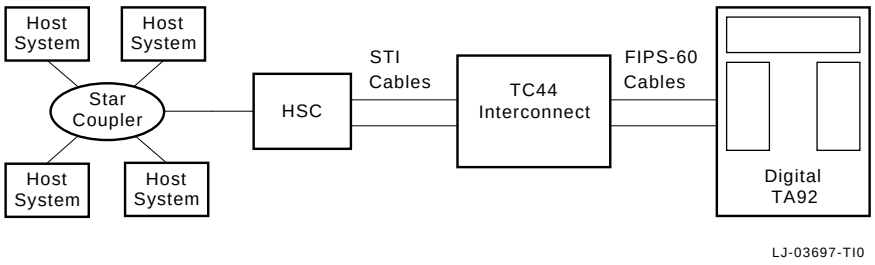
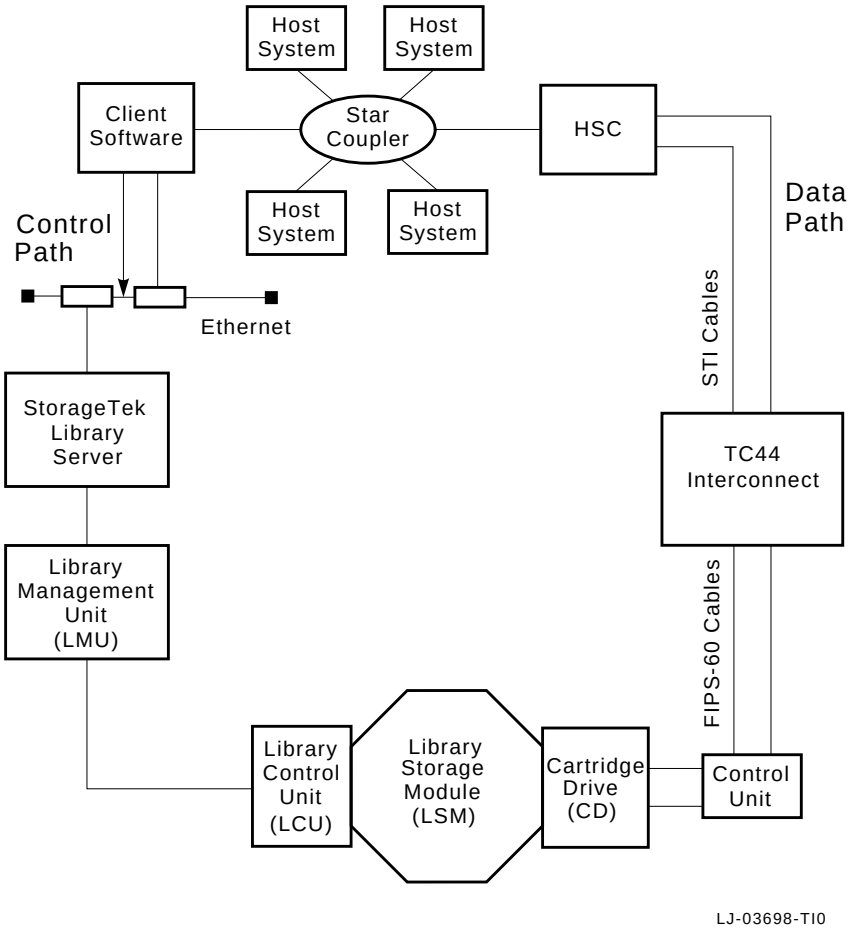


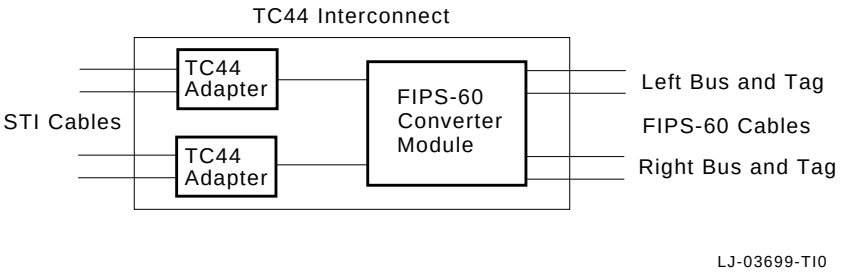
Figure 1–2: TC44–AA/BA and StorageTek ACS



The TC44 Interconnect hardware is a standard rack-mountable, user-transparent system. The major system components are listed below (See Figure 1–3):

- The FIPS–60 converter module
- Two TC44 Adapter Module

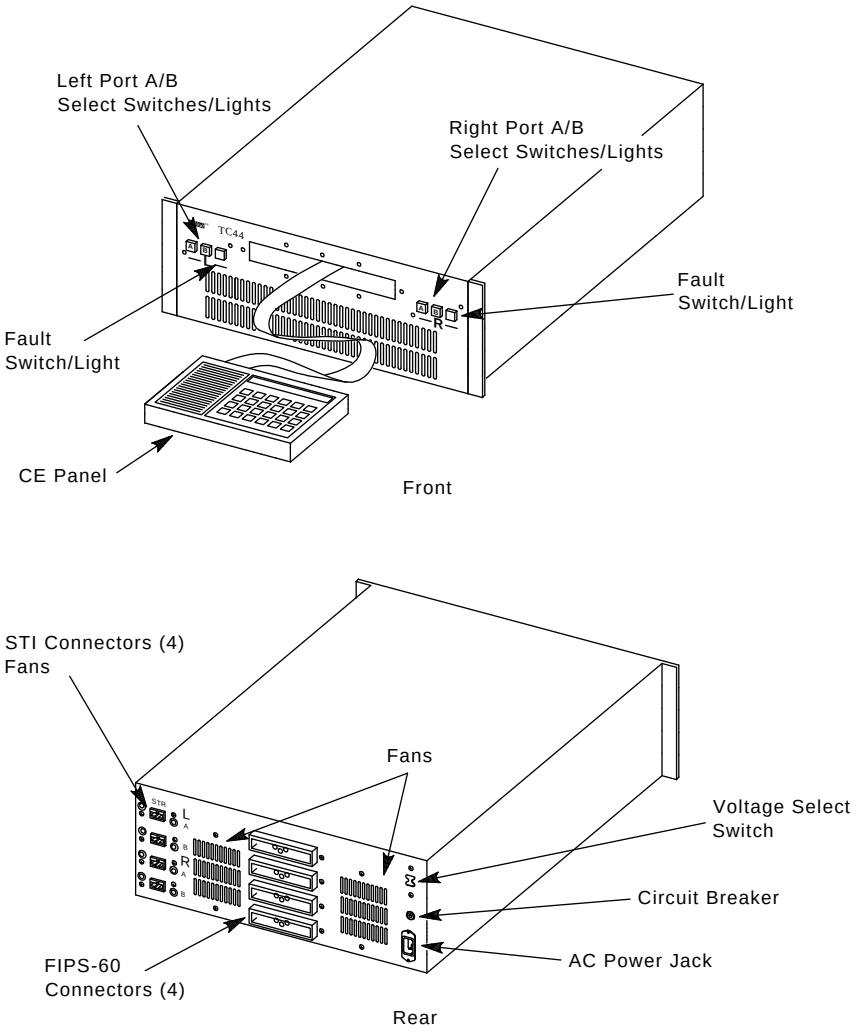
Figure 1–3: Major System Components



The following supporting components are housed in the same enclosure:

- One power supply
- Two fans
- One voltage select switch
- One customer engineer (CE) panel

Figure 1–4: Front and Rear View



1.1 Site Preparation

Computer systems and peripherals may be affected by static discharge, temperature changes, and humidity. These conditions may cause poor operation and affect the dependability of the equipment. Good site planning can minimize these effects and make the installation process easier.

1.1.1 Preinstallation Considerations

Space

It is recommended that the TC44 Interconnect be installed in a cabinet. Allow enough space so the cabinet doors can be opened to service the unit and the air circulation is not obstructed. Run the power cord and data cables in areas where no one will step on or trip over them and ensure that all the STI and FIPS–60 cables reach the cabinet without needing to be stretched.

Note

If the FIPS–60 cables are routed prior to installation of the hardware, ensure that the dark colored connectors are located where the TC44 Interconnect will be installed and the light colored connectors are located where the control unit will be installed.

Power

Primary power is provided and installed by the customer. This circuit must meet all national and local codes that apply to it. It is important that the TC44 Interconnect receive well regulated power. Do not connect the TC44 Interconnect to a circuit that supplies power to equipment such as air conditioners, office copiers or coffee pots. If power disturbances cannot be prevented and they adversely effect the TC44 Interconnect, it is the customer's responsibility to provide the necessary power conditioning equipment to ensure the correct operation of the TC44 Interconnect.

Because the TC44 Interconnect requires 3.0 A maximum at 120 Vac, it may be plugged into the same circuit as other system components, as long as the total current does not exceed the circuit capability. This circuit must be stable without any electrical noise, and provide a good system ground. Do not use extension cords.

1.1.2 Environment

The system that controls the environment should be capable of maintaining the recommended temperature and humidity ranges year-round. (See Section A.3.) This system should filter the air to remove dust and other particles, as well as provide an even distribution of the air to prevent hot areas in the room where the TC44 Interconnect is installed. Keep the TC44 Interconnect away from heaters and direct sunlight.

1.1.3 Static Electricity

Static discharge is a common problem for any electronic device and may cause lost data, equipment downtime, and other problems. The most common source of static electricity is the movement of people in contact with carpets and clothing. Low humidity allows a large amount of static charge to build up. To minimize problems with static electricity:

- Maintain more than 40% relative humidity
- Place the TC44 Interconnect away from the heavy traffic areas

Chapter 2
Installation

This chapter contains all the necessary information for a successful installation and subsequent checkout of the TC44 Interconnect. No assembly of equipment is required.

The topics covered in this chapter are:

- Unpacking
- Installation
- Controls and indicators
- Selecting configurations
- Cabling

2.1 Unpacking the TC44–AA/BA STI to FIPS-60 Interconnect

Place a check mark (√) in each box as you complete the task:

☐ Open the shipping carton and check the contents. Save the carton and shipping material.

☐ Remove the shipping restraint from the top of the TC44 Interconnect.

☐ Remove the TC44 Interconnect from the shipping carton.

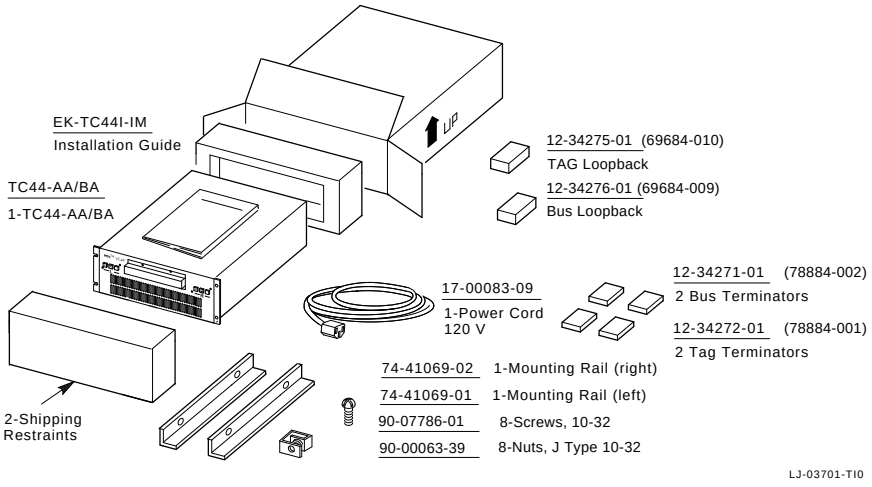
☐ Remove the TC44 Interconnect from the plastic bag.

Also contained in the shipping carton are:

- 1 pair of mounting rails with hardware
- 1 power cord
- 4 terminators (2 bus and 2 tag)
- 1 installation guide
- 2 loopback connectors (1 bus and 1 tag)

Figure 2–1 shows the contents of the TC44 Interconnect.

Figure 2–1: Unpacking the TC44 Interconnect



If there are any missing items:

☐ Identify the missing pieces.

☐ Contact your sales representative and delivery agent.

If there is any damage:

☐ Identify the damaged parts.

☐ Contact your sales representative and delivery agent.

2.2 Installing the TC44–AA/BA STI to FIPS-60 Interconnect in a Cabinet

Place a check mark (√) in each box as you complete the task:

- ☐ Verify that the TC44 Interconnect and rails fit into the rack (Figure 2–2).
- ☐ Install the two mounting rails inside the rack as shown in Figure 2–3.
- ☐ Slide the TC44 Interconnect into the cabinet on the rails.
- ☐ Install and secure the four mounting screws in the front panel.

Figure 2–2: Cabinet Requirements

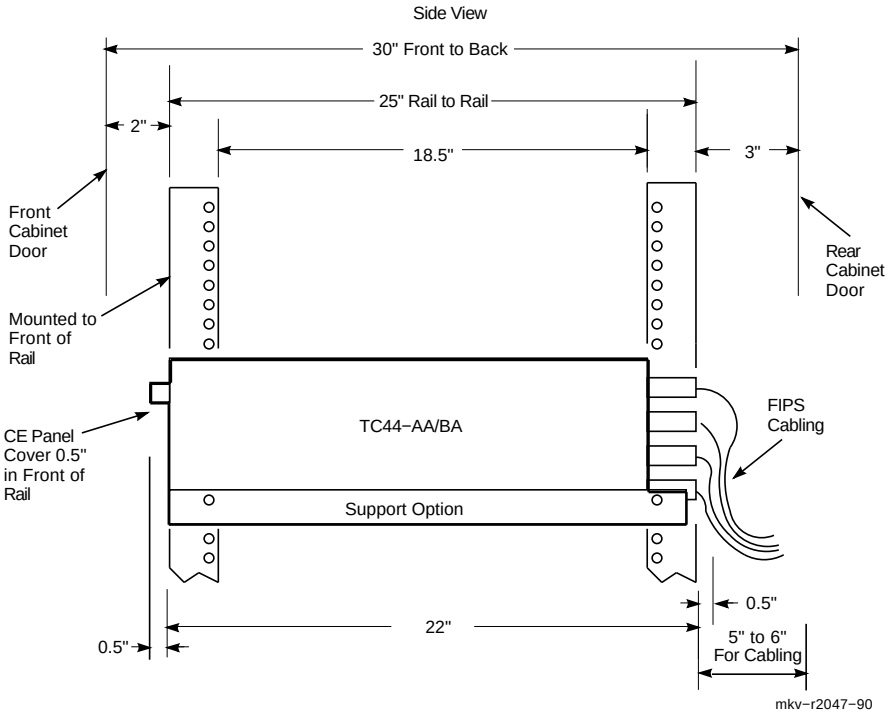
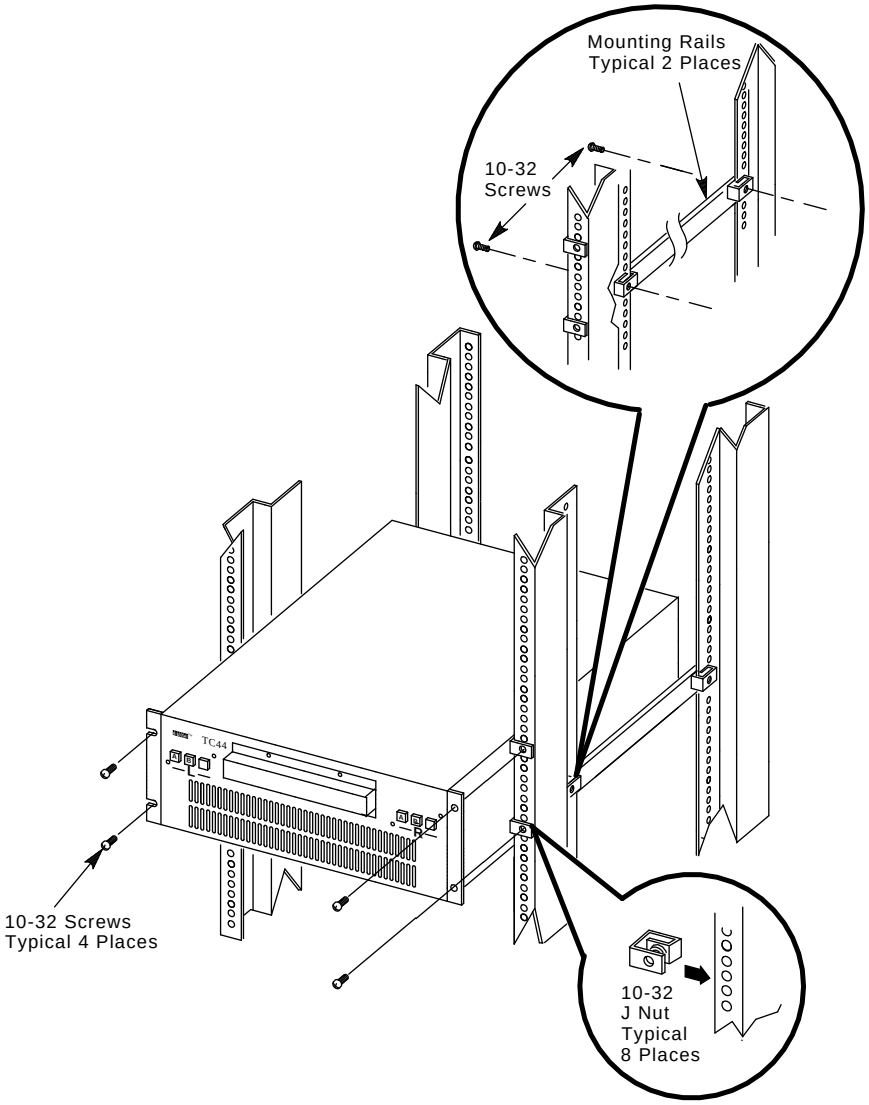


Figure 2–3: Rack Mounting



2.3 Controls and Indicators

The section describes the various input and output devices in the TC44 Interconnect.

2.3.1 A/B Port Select and Fault Switches

The front panel of the TC44 Interconnect has two sets of switches, one on the left and one on the right.

- The left set of switches enables or disables access to the tape drives connected to the STI ports located in the top right corner of the rear panel and the FIPS-60 ports located in the top center of the rear panel.
- The right set of switches enables or disables access to the tape drives connected to the STI ports located in the bottom right corner of the rear panel and the FIPS-60 ports located in the bottom center of the rear panel.

Each TC44 Adapter Module will communicate with up to four tape drives. Each TC44 Interconnect contains two adapters, so it can access up to eight tape drives. The eight tape drives are numbered consecutively starting from a base address that is selected using the CE Panel. The left TC44 Adapter Module uses drives numbered base address + 0, base address + 2, base address + 4 and base address + 6. The right TC44 Adapter Module uses drives numbered base address + 1, base address + 3, base address + 5, and base address + 7.

When set to the on (in) position, the port select A or B switch allows the Hierarchical Storage Controller (HSC) to access port A or B. When port select A and B switches are enabled, the TC44 Adapter Module samples each port until one receives a command to go on line. Until a port goes on line, communications with the HSC are limited to very few commands.

Placing the port select switch in the off (out) position with the port on line causes the formatter to alert the HSC. After completing the current operation, the HSC disconnects the port and places it off line.

Each switch has an internal LED that is used to light the switch cap. The port select LED lights if the port is on line or if an error has been detected and the fault switch has been pressed. The Fault LED lights when a potentially fatal error has been detected in the formatter. (Even though an error has occurred, the formatter still attempts to communicate to the HSC per the STI Specification. See Chapter 3 for additional error information.)

Note

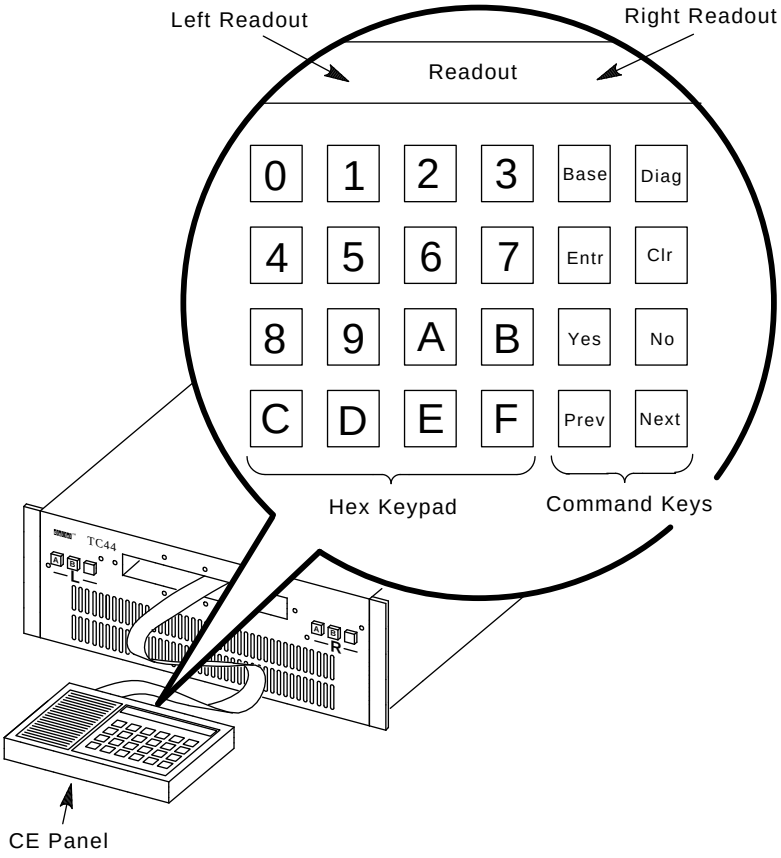
Unless there is a problem, never release the A or B Port Select switches if the port is active. An active port is indicated when an A or B Port Select switch is lit.

2.3.2 The CE Panel

The customer engineer (CE) panel is the primary maintenance tool for the TC44 Interconnect. It is used to:

- Set a logical base drive address
- "Mask" drives that the TC44 Interconnect cannot use because they are allocated to other systems connected to the FIPS–60 channel
- Perform loopback diagnostics
- Display configuration and status information

Figure 2–4: The CE Panel



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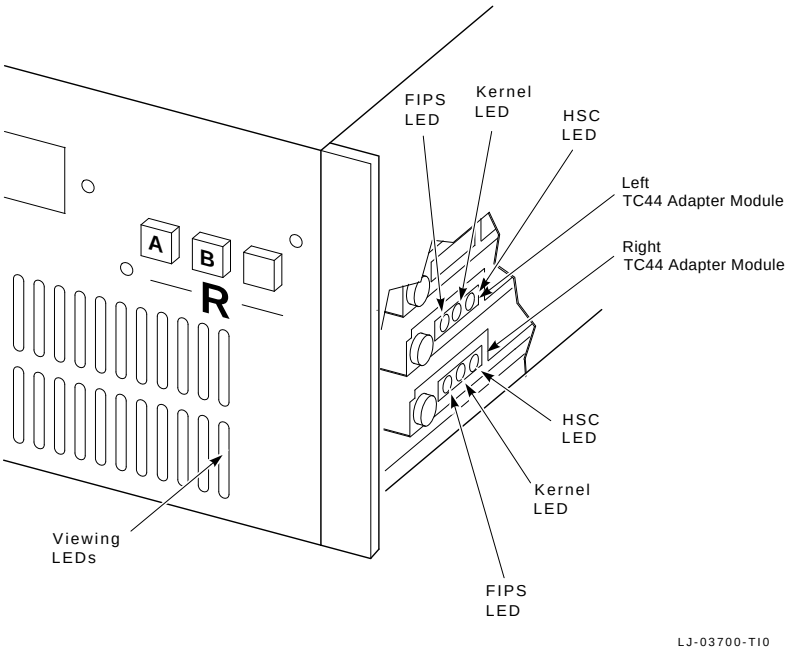
2.3.3 TC44 Adapter Module Status LEDs

Each TC44 Adapter Module contains three LED indicators. These LEDs can be seen by looking through the right side of the grill located in the front panel. The top set of LEDs display the status of the left TC44 Adapter Module and the bottom set displays the status of the right TC44 Adapter Module. Figure 2–5 shows the location of the LEDs and Chapter 3 describes each of them.

Figure 2–5: TC44 Adapter Module



2.4 Selecting Configurations

Each TC44 Interconnect can communicate with up to eight tape drives (four per TC44 Adapter Module). It is important to determine which drives will be connected to the TC44 Interconnect prior to setting up the entire configuration because the TC44 Interconnect cannot share any of its tape drives with other hosts. Once eight or fewer tape drives have been selected and they are no longer accessible by any other systems, you may begin to set up the configuration.

2.4.1 Configuring the TC44–AA/BA STI to FIPS-60 Interconnect

The TC44 Interconnect must be powered up and configured prior to being connected to an active channel.

2.4.1.1 Installing Loopback Connectors

Two loopback connectors are included with each TC44 Interconnect, one BUS loopback and one TAG loopback. This means only one channel can be configured or tested at any time. Before powering up the TC44 Interconnect install the loopbacks on the top two connectors to use the left channel or install them on the bottom two connectors to use the right channel.

2.4.1.2 Turning the Power On

Operating voltage is present before shipment. If the voltage selected is not compatible with the site power, set the switch to the correct voltage as shown in Figure 2–6.

The TC44 Interconnect does not have a power switch. To power up the unit, plug in the power cord. When connecting the power cord for the first time, perform the following steps:

1. Make sure the Voltage Select switch is set to the voltage required at your site.
2. Remove and discard the safety tape.
3. Plug the correct power cord into the power plug on the unit.

When power is applied the power-up diagnostics will be executed and the status of the tests are output to the TC44 Adapter Module LEDs and the CE Panel Display. If the diagnostics run successfully, the following events will occur:

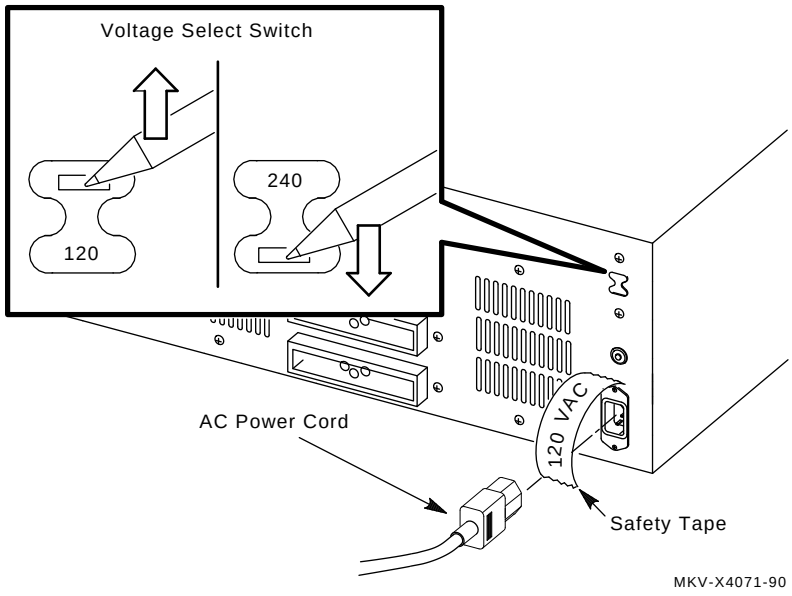
- The LEDs on the TC44 Adapter Module will light sequentially and the CE Panel hardware and software revisions will be displayed on the CE Panel display.
- All the LEDs will go out and the microprocessor kernel LED will begin blinking to indicate that the microprocessor kernel is operational. At the same time the message "PWRUP OK" will be displayed on the left side, right side, or both sides of the CE Panel display, depending which TC44 Adapter Module is connected to a channel or a set of loopbacks.
- The FIPS LED will light and remain on, indicating an operational status.
- The HSC LED will light and remain on. If a loopback is installed on that TC44 Adapter Module then this indicates the internal circuits are operational. If an active channel is connected to that TC44 Adapter Module then this indicates a valid connection to the HSC.

If the power-up diagnostics do not execute successfully, then go to Chapter 3 to perform basic troubleshooting.

2.4.1.3 Turning the Power Off

Before removing the power cord to turn the power off, make sure that none of the A or B Port Select switches are lit (indicating activity on the port). If a switch is lit, wait until it goes out. When all activity on the ports has stopped, disable the ports by placing the A and B Port Select switches in the off (out) position. The TC44 Interconnect is now ready to be unplugged.

Figure 2–6: AC Power Cord and Voltage Select Switch



2.4.1.4 Selecting a Base Address

To set the base address:

1. Slide the CE Panel out of its pocket and press the Base key.
2. When the message BASE ADDRESS IS *a* :CHANGE? appears on the display press Yes.
3. The message NEW BASE ADDRESS? will be displayed. Input the new base address and press Entr. The new address will be displayed as BASE ADDRESS: *b*.

2.4.1.5 Masking Drives

The TC44 Interconnect requires that it be the only device that has access to the drives its cluster has been allocated. Problems will occur if other hosts are allowed to use the drives that have been allocated to the cluster using the TC44 Interconnect. Drive Masking was developed so the TC44 Interconnect would not try to communicate to drives it was not allocated. Drive Masking configures the TC44 Adapter Module to send back a "drive not there" status to the hierarchical storage controller (HSC) and it will never initiate communications to the "masked" drives over the FIPS channel. This allows other hosts to use the masked drives.

When using a TA92, if a tape drive does not exist at one or more of the eight addresses, it must be masked out or the TC44 Interconnect will not pass self-test when it is connected to the channel.

Note

Even if the TC44 Interconnect is not using all eight drives a block of eight contiguous drive addresses must remain available on the HSC, starting from the base address selected for the TC44 Interconnect.

Follow this procedure to mask off drives:

1. Disable the STI ports by putting the A and B Port Select switches in the off (out) position.
2. Install the loopback connectors on the channel that controls the drives to be masked off (Section 2.3.1).
3. Slide the CE Panel out of its pocket and select diagnostics by pressing Diag.
4. To select the left adapter, press Yes when USE LEFT ADAPTER? appears on the display.

   To select the right adapter, press No when USE LEFT ADAPTER? appears on the display.
5. Press D followed by Entr. MY DRIVES *a, b, c, d* will appear, where "*a,b,c,d*" are the drives that are allocated to the TC44 Adapter Module.
6. Pressing the drive number followed by Yes will enable the drive, and No will disable or mask the drive. The display will then show its latest drive selection configuration. Continue to select/deselect drives until the desired combination is reached. (At least one drive has to be selected at all times.)
7. Select diagnostics again by pressing Diag to leave the drive selection and return to the main menu.
8. If more drives must be masked from the other TC44 Adapter Module turn the TC44 Interconnect power off, move the loopback connectors to the other FIPS–60 channel, turn the TC44 Interconnect power on and run steps 2 through 7 again.
9. When the drives are masked out as required turn the TC44 Interconnect power off and remove the loopback connectors.

Note

Digital does not recommend sharing access to the Storage Technology control units with other hosts. Should it be necessary to do this, make sure that no other system on the channel has access to the drives that have been allocated to the cluster connected via the TC44 Interconnect (this is usually accomplished by using the "vary offline" command on the non-Digital hosts). If the masking is not done correctly, data may be lost and unpredictable operation will result.

2.5 Cabling

The system manager will determine the physical configuration of the system.

2.5.1 Selecting Control Unit Transfer Speed

It is beyond the scope of this manual to discuss the details of setting up a Storage Technology or Digital tape subsystem. When installing the TC44 Interconnect with Storage Technology equipment it is recommended that the installation be a joint effort between the Storage Technology and Digital Customer Service Engineers. When installing a TA92 configuration, review its documentation for installation and configuration information.

In order to setup a Storage Technology Control Unit or a Digital TA92 correctly, the channel transfer speed must be set to 3 MBytes/second streaming. In some cases this is equivalent to a setting of "0D" and in other cases it is "00" The correct settings can be determined by reading the documentation for the control unit being configured.

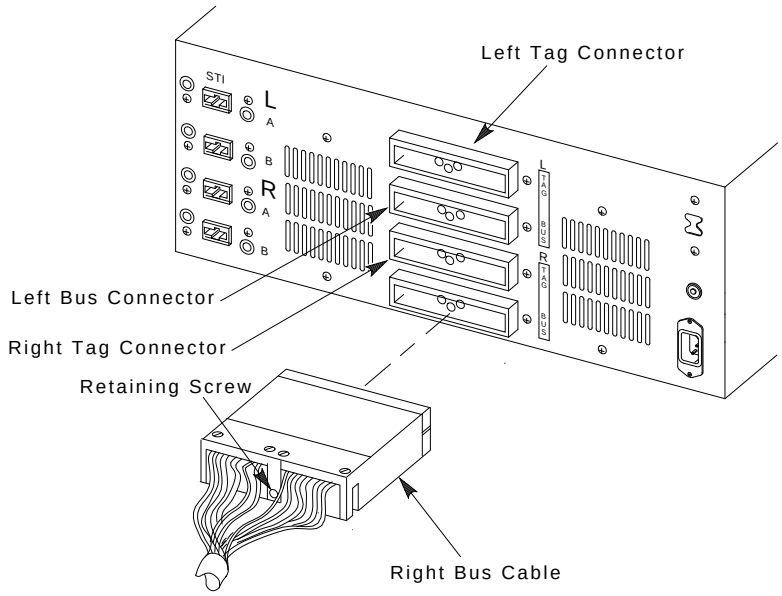
2.5.2 Connecting the FIPS-60 Cables

If both channels are being used there will be two pairs of standard blue FIPS channel cables. They have 50-pin keyed connectors on each end and a maximum length of 122 meters (400 feet). They connect the TC44 Interconnect to a Storage Technology control unit or Digital TA92.

To connect the FIPS-60 cables (Figure 2–7), perform the following steps:

1. Remove the protective caps from the four FIPS-60 connectors on the rear of the enclosure.
2. Inspect the enclosure connectors and cable end connectors for bent pins. Straighten them, if necessary.
3. Tag the individual cables "R BUS," "R TAG," "L BUS," and "L TAG" at both ends. (This will prevent confusion during installation, or when removing these cables for loopback testing.)

Figure 2–7: Connecting the FIPS-60 Cables



CAUTION

Use extreme caution when performing steps 4, 8, and 10 because a misalignment can damage the connector pins.

Note

Ensure that the dark colored connectors of the FIPS-60 cables are connected to the TC44 and the light colored connectors are connected to the control unit.

4. Connect the right bus cable by pressing the dark colored end into the bottom connector at the center rear of the cabinet. (Note that the narrow side is up and the retaining screw is on the bottom.)
5. Secure the connector in place by tightening the connector retaining screw (slotted).

6. Repeat the previous two steps with the right tag cable (the next higher one on the cabinet).
7. Follow this procedure again to install the left tag cable, and then the left bus cables.
8. Connect the light colored connector ends to the appropriate plugs on the Storage Technology control unit or Digital TA92.
9. Secure the connector in place by tightening the connector retaining screw (slotted).

Note

The FIPS–60 Interface must be terminated at the Storage Technology control units. The TC44 Interconnect will not operate properly if the channel is connected to multiple Storage Technology control units.

10. When working with a Storage Technology control unit install the terminators on the signal-out ports.
11. Secure the terminator in place by tightening the connector retaining screw (slotted).

2.5.3 Connecting the STI/HSC Cables

The TC44 Interconnect connects to an HSC by means of Digital's standard interface (SI) cables, which come in various lengths from 3 meters (10 feet) to 24.4 meters (80 feet). See Table 2–1.

Table 2–1: STI/HSC Cable Information

Part Number	Length
BC26V-10	3.05 meters (10 feet)
BC26V-25	7.62 meters (25 feet)
BC26V-50	15.24 meters (50 feet)
BC26V-80	24.38 meters (80 feet)

If there is one HSC, connect the "A" port only. With two HSCs, use both "A" and "B" ports for a redundant configuration (Figure 2–8).

Verify that the following HSC setup has been performed:

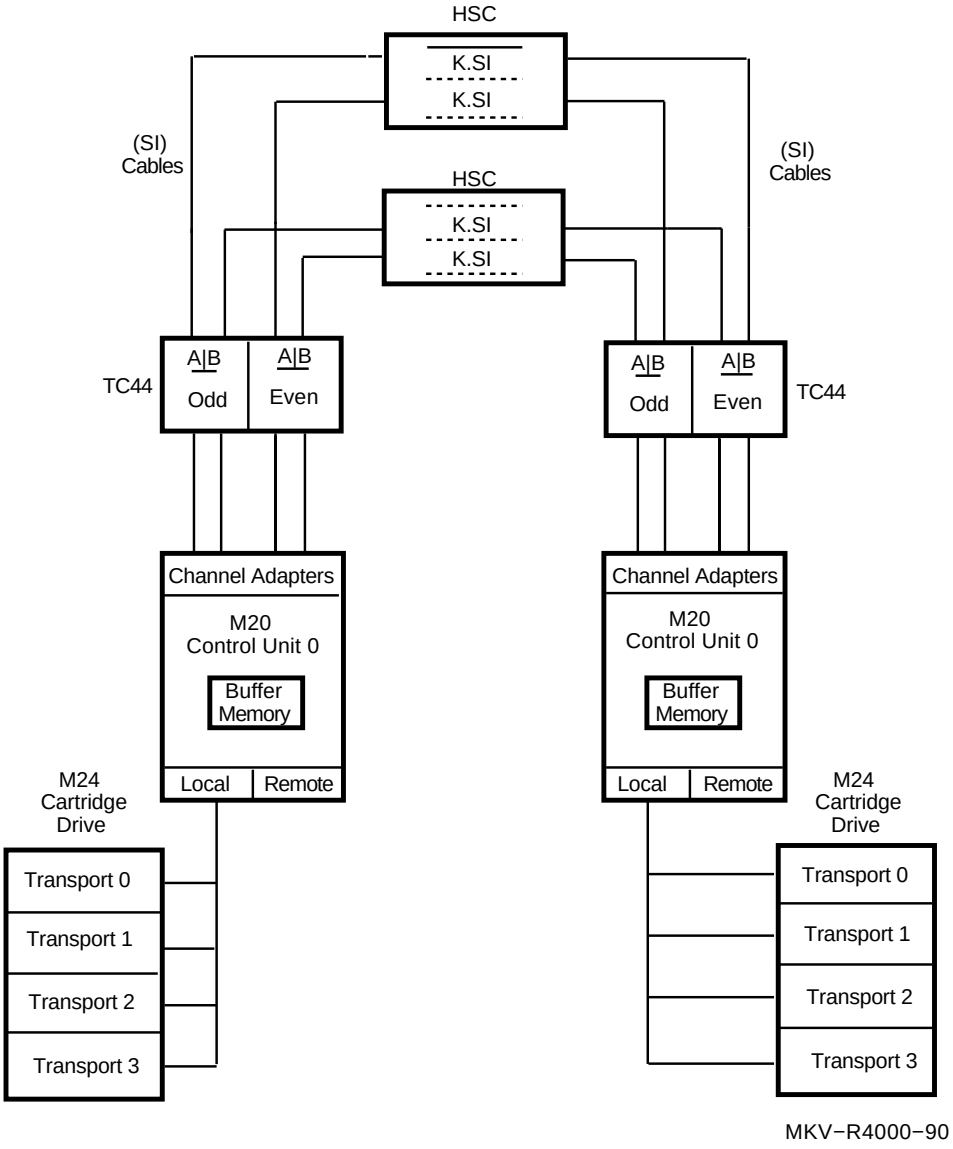
1. The K.SI module(s) is installed in the slot closest to the CPU subsystem.

NOTE

The TC44 Interconnect works only with the L0119-YA D/T K.SI cards and not with the L0108-YB K.STI card.

2. The K.SI card is configured for TAPE (the default is DISK).

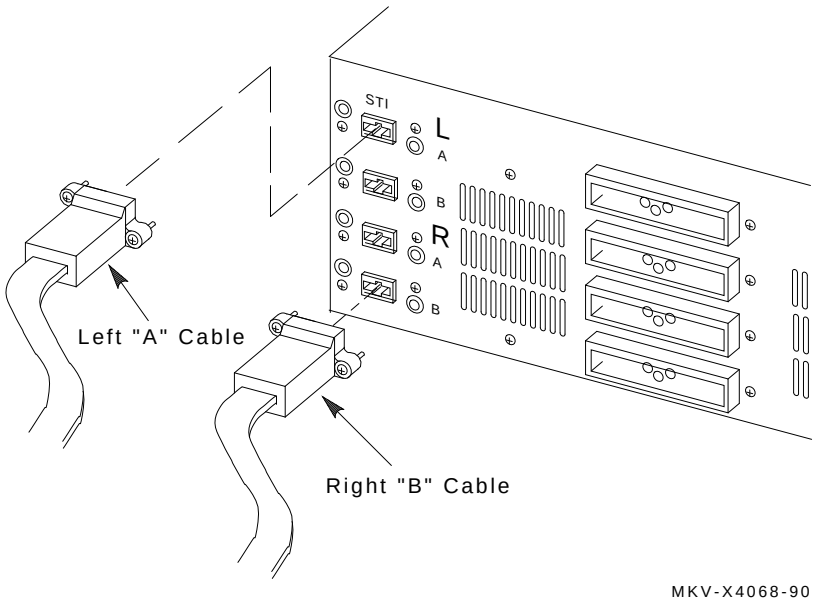
Figure 2–8: Redundant System Configuration



To connect the STI/HSC cables (Figure 2–9), perform the following steps:

1. Tag the individual cables "RB," "RA," "LB," and "LA" at both ends. (This will prevent confusion when removing these cables.)
2. Connect the right "A" cable by pressing it into the bottom "A" connector at the left rear of the cabinet. (Note the key pin position.)

Figure 2–9: Connecting the STI/HSC Cables



3. Secure the connector in place by tightening the two connector retaining screws (Phillips).
4. Repeat the previous two steps with the right "B" cable (the next lower one on the cabinet).
5. Follow this procedure to install the left "A" and "B" cables.
6. Be sure that the HSC requestor cards are in place and have been properly configured. See the *HSC Installation Manual* (EK-HSCMN-IN).

The configuration is ready to be brought on line. Refer to Section 2.4.1.2 to turn the TC44 Interconnect power on. If problems occur, refer to Chapter 3 for basic troubleshooting instructions.

Chapter 3

Verification and Error Indications

This chapter contains information on basic installation troubleshooting for the TC44 Interconnect.

3.1 Basic Troubleshooting

Basic troubleshooting consists of performing the corrective actions indicated by error codes reported by the CE panel display, the LEDs on the front panel, or by messages on the host system.

For additional information on error codes, service aid diagnostics, and field replaceable unit replacement, see the *TC44-AA/BA STI to StorageTek 4400 ACS Interconnect Hardware Maintenance Manual* (EK-TC44I-TM).

3.1.1 Power-Up Diagnostics Errors

At power-up, the display on the CE panel shows the hardware and software versions of the CE Panel. After approximately 30 seconds the diagnostics should complete and the message "PWRUP OK" should be displayed on both halves of the CE Panel display (if both channels are connected). If there is a fault, follow the steps below based on the TC44 Adapter Module status LEDs (Figure 2–5) and the A/B Port Select Switches (See Table 3–1).

3.1.1.1 Kernel Error Indication

The microprocessor kernel failure is indicated by a failure of the center LED to light, and means that the associated TC44 Adapter Module must be replaced. See the *TC44-AA/BA STI to StorageTek 4400 ACS Interconnect Hardware Maintenance Manual* (EK-TC44I-TM) for replacement procedures.

3.1.1.2 FIPS Error Indication

If the FIPS LED does not blink, the data connection to a channel has not been made. If the other TC44 Adapter Module is operating correctly, isolate the problem by performing the following steps:

1. Turn the TC44 Interconnect power off.
2. Swap the FIPS cables and turn the TC44 Interconnectpower on.

If the problem has moved to the other board, the problem is in the FIPS-60 cables or the control unit.

If the fault indication persists, the problem is internal to the TC44 Interconnect enclosure (cables or board). See the maintenance manual for further troubleshooting and replacement procedures.

3.1.1.3 HSC Error Indication

If the HSC LED does not blink, the connection to a valid channel has not been made. Note that a fault indication in the FIPS LED will not allow the HSC power-up diagnostics to start. If the other TC44 Adapter Module is operating correctly, isolate the problem by performing the following steps:

1. Turn the TC44 Interconnect power off.
2. Remove the suspect pair of STI cables from the rear of the TC44 Interconnect enclosure.
3. Replace the cables with the pair from the HSC that worked correctly.
4. Turn the TC44 Interconnect power on and complete the power-up diagnostics.

If the LED now indicates no fault, the problem is in the HSC or with STI cables.

If the fault indication persists, the problem is internal to the TC44 Interconnect enclosure (cables or board). See the maintenance manual for further troubleshooting and replacement procedures.

3.1.1.4 Front Panel Error Indication

When a fatal error occurs, press the Fault switch once to display the error code (see Table 3–1) and a second time to clear the error. If you press the Fault switch when no fatal error has occurred, all three front panel switch LEDs will light (A, B, and Fault).

Table 3–1: Front Panel Fault Indications

A	B	Fault	Indication
–	–	*[1]	Kernel Memory Error
–	*	*	TCU (FIPS) Interface Error
*	–	*	STI Interface Error
*	*	*	Kernel Nonmemory Error

[1] An asterisk (*) indicates that the lamp is lit.

3.2 Advanced Troubleshooting

Advanced Troubleshooting Procedures are described in the *TC44-AA/BA STI to StorageTek 4400 ACS Interconnect Maintenance Manual* (EK-TC44I-TM).

Appendix A
Specifications

A.1 Physical

Table A–1: TC44–AA/BA Enclosure Dimensions

	Centimeters	Inches
Height	17.78	7.0
Width	44.45	17.5
Depth	59.69	23.0

A.2 Electrical

The TC44 Interconnect complies with Underwriters' Laboratories (UL®) for power cord grounded equipment, VDE (German standards and testing organization), and Canadian Standards Association (CSA®) requirements.

Table A–2: Voltage, Frequency and Power Consumption Specifications

	Low Range	High Range
Voltage	100 to 120 Vac	200 to 240 Vac
Frequency	60 Hz	50 Hz
Consumption	400 W (max)	400 W (max)

Note

The only difference between the AA variation and the BA variation is the position of the voltage select switch. The AA variation is set to 120 Vac and the BA variation is set to 220 Vac.

A.3 Environmental

Table A–3: Temperature, Humidity and Altitude Specifications

	Operating	Non-Operating
Temperature	15.0°C to 32.0°C	-40.0°C to 65.0°C
	(59.0°F to 90.0°F)	(-40.0°F to 149.0°F)
Humidity	20.0 %RH to 80.0 %RH	20.0 %RH to 80.0 %RH
Wet Bulb (max)	25.0°C	25.0°C
	(77.0°F)	(77.0°F)
Altitude	2438 m (8000 ft)	9100 m (30,000 ft)

A.4 Performance

The TC44 Interconnect can sustain an average data transfer rate of two Mbytes/sec.

A.5 Installation

Mean Time to Install (MTTI) is less than two hours for the rack mounted unit.