
**S/320™ AND S/640™
INSTALLATION MANUAL**

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WARNING

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

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QUARTER-INCH CARTRIDGE TAPE: USE AND MAINTENANCE

Caution To ensure satisfactory performance and full service life of your quarter-inch cartridge (QIC) drive and tapes, you must follow the guidelines outlined below.

Be sure the write-protect cam is in the correct position. You should attain a soft (correctable) error rate of 1 in 1×10^8 bit transfers, a cartridge life of 2000 passes (one pass is equivalent to winding the tape its full length from one end to the other), and a drive life of 5 years.

Failure to follow these guidelines can result in poor performance (excessive errors); damage to the tape cartridges, tape drive, or both; loss of interchangeability; or a combination of these conditions.

Drive and Cartridge Care. Treat cartridges with care and use them in an environment with the following conditions:

- Operating temperature: 50°F to 104°F (10°C to 40°C)
- Relative humidity: 20% to 80% noncondensing
- Altitude: –1000 feet to 10,000 feet

Be sure to retension the cartridge before its initial pass (see below). Protect the drive and cartridges from excessive shocks, which can impair the drive alignment and cartridge tension. Do not expose the tape cartridge to magnetic fields, such as from CRT screens or power sources.

Approved Cartridge Use. Use only approved tape cartridges to attain the specified error rate standard. Other cartridges may initially meet this standard, yet degrade in reliability over the specified cartridge life. The following cartridge tapes are approved: the DC-600A and the DC-600XTD (3M Corporation.).

Cartridge Retensioning. Keep the cartridge properly tensioned to ensure full life service and data reliability. *Failure to adequately tension the cartridge will damage the cartridge and destroy data on the tape.* To retension the cartridge, use the tape unit retension command. (For details, see your administrator's manual or the software quarter-inch cartridge tape manual.)

Retension the cartridge for every eight hours of normal use. When using the tape drive extensively in start/stop mode, retension the cartridge once every two hours.

Cleaning the Tape Head. Clean the tape drive read/write head assembly after any initial pass of a new cartridge; once after two hours (of actual tape movement) when using a new cartridge; and at least once every eight hours thereafter for the life of the tape. In addition, if the tape drive has not been used for a week or longer (or if you are not sure how long the tape drive has been unused), clean the tape head before use.

Failure to clean the heads will result in excessive data errors and may decrease the life of the drive. (For details, see your administrator's manual or the software quarter-inch cartridge tape manual.)



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CHAPTER 1

Overview

INTRODUCTION

The S/320 and S/640 are high-performance computer systems designed around the MC68020 32-bit Microprocessor. Each base unit is enclosed in a floor-standing cabinet (see Figure 1-1) with front, side, and rear access to the mass storage devices.

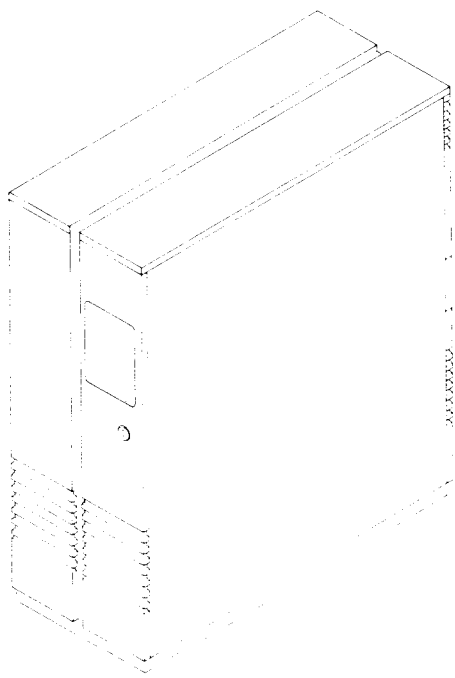


Figure 1-1. S/320 and S/640 Base Cabinet

SYSTEM INTRODUCTION ---

This manual shows you how to install the S/320 or S/640 base cabinet, which comes fully assembled.

S/320 Systems ---

The base S/320 contains the following equipment:

- 500-watt power supply
- Quarter-inch cartridge (QIC) streaming tape drive
- One hard disk drive
- Main Processor (CPU) board (with 68020 CPU)
- Local input/output (I/O) and memory card cage

In addition, the S/320 can contain any of the following expansion equipment:

- Up to four Memory Expansion boards
- Up to four 10-channel RS-232-C Expansion boards, two 20-channel RS-232-C Expansion boards, four Ethernet Combo boards, or any combination to fill four I/O slots
- One RS-422 Expansion board or one RS-232-C Input/Output (IOP) Accelerator Expansion board

- Up to two additional hard disk drives for a total of three drives
- Optional VME card cage, VME Interface Adapter board, and VME expansion boards installed as ordered

S/640 Systems _____

The base S/640 contains the following equipment:

- 500-watt power supply
- Small Computer System Interface (SCSI) tape drive
- One hard disk drive
- Main Processor (CPU) board (with 68020 CPU)
- Local input/output (I/O) and memory card cage
- Memory expansion board (4MB minimum required)

In addition, the S/640 can contain any of the following expansion equipment:

- Up to three Memory Expansion boards for a total of four boards
- Up to four 10-channel RS-232-C Expansion boards, two 20-channel RS-232-C Expansion boards, four Ethernet Combo boards, or any combination to fill four I/O slots
- One RS-422 Expansion board or one RS-232-C Input/Output (IOP) Accelerator Expansion board
- Up to two additional hard disk drives for a total of three drives
- Optional VME card cage, VME Interface Adapter board, and VME expansion cards installed as ordered

Expansion Cabinets ---

You can attach an X-Box or a V-Box expansion cabinet to any S/320 or S/640 base unit that has the VME option installed. The X-Box contains room for four storage module devices (SMDs). The V-Box contains a ten-slot VME card cage and room for two SMDs. Refer to the *S/Series Expansion Cabinet Installation Manual* and the *S/MT Series CTIX Administrator's Reference Manual* for information on installing and using X-Boxes and V-Boxes with your system.

PURPOSE OF THIS MANUAL _____

This manual has several purposes:

- Aids you in installing your system
- Provides instructions for installing expansion boards, disk drives, and terminals
- Directs you to related documentation

Intended Audience _____

This manual can be used by people with various levels of computer experience. For example, some tasks, such as connecting the power cable, can be accomplished easily and with minimal computer experience. Other tasks, such as installing a hard disk drive, require more familiarity with computers.

Manual Organization _____

The chapters in this manual guide you through the entire installation process. To install the base cabinet for the first time, follow the instructions in Chapters 1 through 4.

- **Chapter 1, “Overview”** – gives a brief introduction to the S/320 and S/640 and an overview of this manual.
- **Chapter 2, “Getting Started”** – provides information for planning your site and inspecting your system.
- **Chapter 3, “Connecting Peripherals”** – provides instruction for connecting terminals, parallel printers, serial printers, and modems.
- **Chapter 4, “Booting Your System”** – provides instructions for connecting the power cable, turning on the power, and loading the CTIX operating system.

To install expansion equipment in the base cabinet, refer to Chapters 5 through 8.

- **Chapter 5, “Powering Down and Restarting Your System”** – gives the steps to properly power down and restart your system.
- **Chapter 6, “Installing Expansion Boards”** – provides instructions for installing Memory and I/O Expansion boards.

- **Chapter 7, “Installing VME Equipment”** – provides instructions for installing the VME card cage, the VME Interface Adapter board, and VME Expansion boards.
- **Chapter 8, “Installing Hard Disk Drives”** – provides instructions for installing hard disk drives.

In addition, the following information can be found in these appendixes.

- **Appendix A, “System Status Codes”** – presents a list of S/320 and S/640 boot ROM status and error codes.
- **Appendix B, “S/320 and S/640 Specifications”** – presents a table of system specifications.
- **Appendix C, “Cable Specifications”** – provides the pin assignments for peripheral cable connectors.
- **Appendix D, “Tape Drive Maintenance”** – gives instructions on cleaning the tape drive (QIC and SCSI).
- **Appendix E, “Replacing the Battery and Fuses”** – provides instructions for replacing the battery and fuses.
- **Appendix F, “Installing the MC68881 Floating-Point Coprocessor”** – provides instructions for installing the MC68881 Floating-Point Coprocessor in the S/320 or S/640 system.

- **Appendix G, “Configuration Limitations”** – describes VME configuration limitations in S/320 and S/640 systems.
- **Appendix H, “Storage Device Configurations”** – provides the information to set the standard configurations of supported S/320 and S/640 storage devices.

CONVENTIONS

The following conventions are used in this manual:

Warning Calls attention to a procedure that could cause injury to you if improperly performed.

Caution Calls attention to a specific procedure that could cause equipment damage if improperly performed.

Note Calls attention to and stresses the importance of the associated text.

RELATED DOCUMENTATION _____

The documents described below provide additional information related to the contents of this manual.

- **Hardware**

S/MT Series CPU-02 Technical Reference Manual
S/MT Series I/O Processor (IOP) Expansion Technical Reference Manual
S/MT Series RS-232-C Expansion Technical Reference Manual
S/MT Series RS-422 Expansion Technical Reference Manual
S/MT Series Ethernet Combo Board Technical Reference Manual
S/MT Series VME Communications Controller Card Technical Reference Manual
S/MT Series VME Expansion Technical Reference Manual
S/320 VME Half-Inch Tape Controller Card Manual
S/320 VME SMD Controller Card Manual
S/MT Series Diagnostics Manual

- **Installation**

S/Series Expansion Cabinet Installation Manual
Graphics Terminal Installation Manual
Programmable Terminal Installation Manual
TO-250 Terminal User's Manual
TO-300 Setup Guide and TO-300 Quick Reference Guide

- **Operating Systems**

CTIX Operating System Manual, Version C
S/MT Series CTIX Administrator's Reference Manual
CTIX Administration Tools Manual

Hardware _____

The *S/MT Series CPU-02 Technical Reference Manual* provides a functional description, software interface information, and theory of operation.

The *S/MT Series I/O Processor (IOP) Expansion Technical Reference Manual* contains a functional and circuitry description of the Input/Output Processor board, and a description of its theory of operation and software interfaces.

The *S/MT Series RS-232-C Expansion Technical Reference Manual* describes the hardware incorporated on the 10-port and 20-port boards at a functional block and component level, including descriptions of interrupt handling, processor interface, and RS-232-C I/O operations.

The *S/MT Series RS-422 Expansion Technical Reference Manual* describes the hardware on the RS-422 Expansion board including descriptions of clock, bus, and channel control. The onboard line printer interface is also described.

The *S/MT Series Ethernet Combo Board Technical Reference Manual* contains functional and circuitry description, and describes the software interfaces on the Ethernet Combo board.

The *S/MT Series VME Communications Controller Card Technical Reference Manual* provides a functional description and user interface information for the VME Communications Controller card.

The *S/MT Series VME Expansion Technical Reference Manual* contains the functional and circuitry description, theory of operation, and software interface description for the VME Interface board.

The *S/320 VME Half-Inch Tape Controller Card Manual* describes the Half-Inch Tape Controller card, which is installed in the VME card cage of a S/320 computer system. The manual provides a detailed description of card installation, theory of operation, and software interface information.

The *S/320 VME SMD Controller Card Manual* describes the SMD Controller card, which is installed in the VME card cage of an S/320 computer system. The manual provides a detailed description of card installation, theory of operation, and software interface information.

The *S/MT Series Diagnostics Manual* describes the tests and subtests used to verify proper S/MT operation and identify problems when they occur.

Installation

The *S/series Expansion Cabinet Installation Manual* describes how to install V-Box and X-Box expansion cabinets in MegaFrame and MightyFrame computer systems.

The *Graphics Terminal Installation Manual* describes procedures for installing Graphics Terminals and connecting terminals and peripherals. The manual also contains cable specifications and error codes.

The *Programmable Terminal Installation Manual* describes procedures for installing, powering up, and testing the Programmable Terminal. The manual also describes how to connect peripherals and how to connect terminals in a cluster.

The *TO-250 Terminal User's Manual* describes installation and setup procedures, and provides emulation and character generation information for Convergent's TO-250 terminal.

The *TO-300 Setup Guide* provides installation procedures, product specifications, and setup instructions for Convergent's TO-300 terminal.

The *TO-300 Quick Reference Guide* describes the keystrokes used to initiate functions on various terminals. These functions include controlling the terminal and the keyboard, and communicating with the computer.

Operating Systems

The *CTIX Operating System Manual, Version C*, describes the CTIX operating system, which is derived from the UNIX System V operating system. This manual describes CTIX commands, application programs, system calls, library subroutines, special files, file formats, games, miscellaneous facilities, and system maintenance procedures. The manual is the starting point for detailed information about CTIX features.

The *S/MT Series CTIX Administrator's Reference Manual* defines the responsibilities of a S/MT system administrator and provides procedures for the administrator to follow. The manual explains the concepts an administrator must understand to maintain a S/MT computer system, including user support, CTIX modes, CTIX file systems, peripheral devices, and troubleshooting procedures.

The *CTIX Administration Tools Manual* provides an introduction to CTIX system administration and explains how to use the system administration tools to automate certain administration tasks. This manual and the appropriate CTIX administrator's reference provide a complete set of system administration instructions.

WHAT'S NEXT? _____

If you are installing your S/320 or S/640, proceed to Chapter 2, “Getting Started.” Chapter 2 lists the tools and equipment you need to install your system, shows you how to inspect it, and finally shows you how to install the stabilizer bars.

If your system has been installed, was fully configured by the factory, and you are not adding any hardware, proceed to Chapter 4, “Booting Your System.”

If your system is installed but you want to add expansion boards, proceed to Chapter 6, “Installing Expansion Boards.”

CHAPTER 2

Getting Started

INTRODUCTION

This chapter describes how to prepare the S/320 or S/640 for initial installation. This chapter provides the following information:

- Lists tools to use and general procedures to follow
- Provides instructions for site preparation and unpacking the unit
- Guides you through inspection of your system
- Lists the equipment needed to install your system
- Shows how to attach the stabilizer bars

Note If your system is already installed and you are adding equipment, proceed to Chapter 5.

REQUIRED TOOLS ---

You need the following tools to complete the procedures described in this manual:

- 1/4-inch hex nut driver
- 11/32-inch hex nut driver
- 7/16-inch hex nut driver
- 9/16-inch hex nut driver
- Phillips screwdriver
- Two flat-bladed screwdrivers, one small and one large

SAFETY PRECAUTIONS ---

Follow these precautions when you install or upgrade the S/320 or S/640:

- **Replace Components and Covers.** After installing an option, unused expansion board slots and unused disk drive slots must be covered with blank panels and cover plates respectively.

Caution To assure proper Electrostatic Deflection/Electromagnetic Interference (ESD/EMI) specification conformance and proper cooling, do not operate the S/320 or S/640 if any expansion slots or disk drive slots are uncovered.

- **Guard Against Static Buildup.** Before removing covers, briefly touch a metal surface on the cabinet to discharge static buildup from yourself and your tools. For better protection, wear an antistatic wriststrap grounded to the metal chassis.
- **Follow Manufacturer's Instructions.** Be sure to read and follow all instructions that accompany your hardware options.

Before upgrading your S/320 or S/640 after the initial installation, power the unit down as follows:

1. Shut down the CTIX operating system. Refer to the section “Shutting Down the Operating System,” contained in Chapter 5.
2. Turn the power switch to the 0 (off) position.
3. Turn off the monitor, terminal, and other peripherals attached to the unit.
4. Disconnect the AC power cord from the AC power source.
5. Disconnect the AC power cord from the power receptacle located on the back of the unit.

Warning Do not perform any peripheral or upgrade installation procedures with the AC power cord connected.

6. Disconnect all cables that attach external peripherals to the unit. After the upgrade, reconnect the cables as instructed in Chapter 3 or on the peripheral Installation Sheet.

CHOOSING A LOCATION

The Installation Sheet shows how to unpack the S/320 or S/640 base cabinet. The Installation Sheet also includes guidelines for temperature, electrical, and space requirements. Make sure that you consider these items carefully before proceeding.

The S/320 or S/640 fits into any environment that meets the following conditions:

Floor — a floor or firm foundation resistant to abrupt movement. The floor may be carpeted, but it should be antistatically treated (or, place an antistatic mat directly under and around the enclosure).

Space — the following items concern the space required around your system. Leave the following clearances:

- Two feet of space to open the front and rear doors. Both doors open from right to left.
- Space to access (without moving the computer) the Reset and Main Power switches. The Reset switch is located inside the front door and the Power switch in an opening in the rear door.
- Space to route cables from the rear of the cabinet to expansion cabinets and other peripherals.

- Space to remove the top and side panels.
- Space to attach expansion cabinets.

Cabling — all cables should be routed from the bottom rear of the cabinet. Be sure cables are not placed in the way of chair legs or chair wheels, or in high-traffic areas.

Note To assure compliance with ESD (Electrostatic Discharge) and EMI (Electromagnetic Interference) specifications, use only shielded cables to connect devices to the S/320 or S/640 (see Appendix C, “Cable Specifications”).

The maximum cable length specifications are:

- **RS-422** — 1,200 feet (sum of all cables on cluster line) per channel
- **RS-232-C** — 50 feet (each cable)
- **Parallel printer** — 10 feet (each cable)

Power outlets — a grounded electrical outlet conforming to electrical code requirements and not tied to the same circuit as other high-wattage electrical systems (such as lights or air conditioning) is required.

Operating temperatures – operating temperature limits for the S/320 and S/640 are:

- **Minimum** – 10° C (50° F)
- **Maximum** – 40° C (104° F)

Proper ventilation – there should be no obstruction at the front or rear ventilation grills; adequate air-conditioning in the room should be provided to handle the heat (3300 BTUs per hour for each system) generated by your system.

Power and environmental considerations are summarized in Appendix B, “S/320 and S/640 Specifications.” The S/320 and S/640 physical dimensions are also listed in Appendix B.

UNPACKING YOUR SYSTEM ---

To unpack your system, perform the following steps:

1. Remove the bands from around the box, and open the top of the box.
2. Remove the top packing foam.
3. Remove the accessory box from the top of the carton.

Figure 2-1 illustrates the unpacking process. Refer to the Installation Sheet for the rest of the unpacking process.

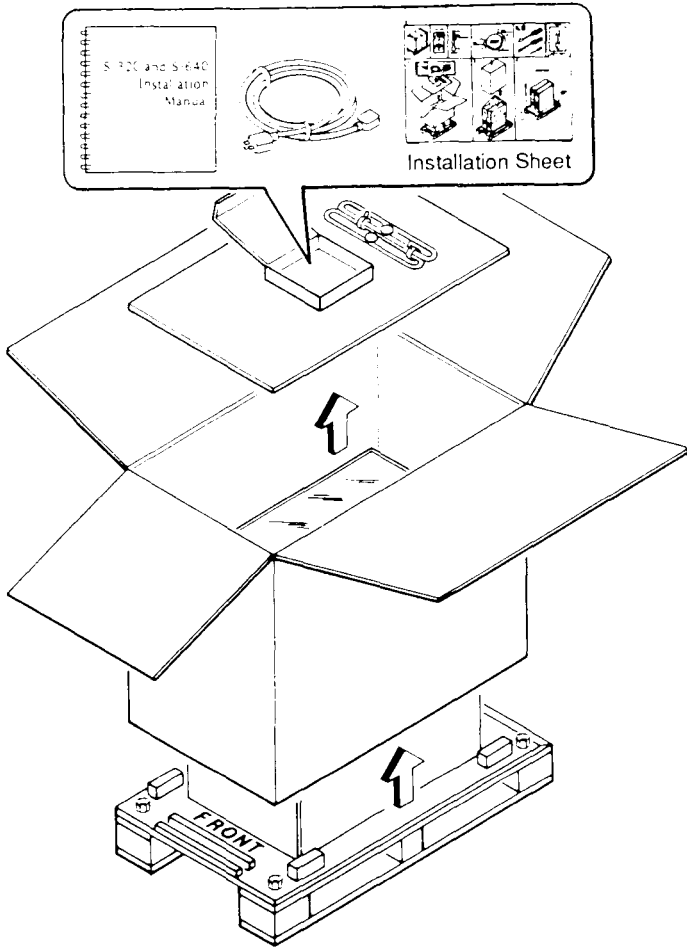


Figure 2-1. Unpacking the S/320 and S/640 System

After you remove your system from the packing container and locate it so that its operating requirements are met, use this checklist to make sure that you have the equipment required to complete the installation procedures in this manual.

The shipping container contains the following equipment:

- S/320 or S/640 base cabinet
- Power cable
- Two stabilizer bars with thumbscrews

Save the packing materials in case you move or ship your system in the future.

At least one terminal and terminal cable are required to complete the installation procedures in this manual:

- Terminals (RS-232-C and/or RS-422)
- Terminal cable (one per terminal RS-232-C and/or RS-422)
- Terminators (RS-422 only)

Refer to the installation manual that came with your terminal for information on unpacking, assembling, and testing.

Your system is shipped fully equipped with the expansion equipment you ordered. Your system may contain some or all of the following:

- Memory Expansion boards (four maximum)
- I/O Expansion boards (four maximum)
- VME Upgrade Kit (Order Number CV-501)
- VME Expansion boards (four maximum)
- Hard disk drives (three maximum)

INSPECTING YOUR SYSTEM ---

After your system is unpacked, inspect it for damage as follows:

1. Use a flat-bladed screwdriver and open the tool-operated keylock on the front door. Check that both the lock and the door are in operating condition.
2. Make sure that all drives are fully seated in place.

A front view of the system cabinet is shown in Figure 2-2. A blank tape may be located to the left of the memory card cage (refer to Figure 2-2 for the card cage location). If so, remove the tape and its foam packing, and save them for future use.

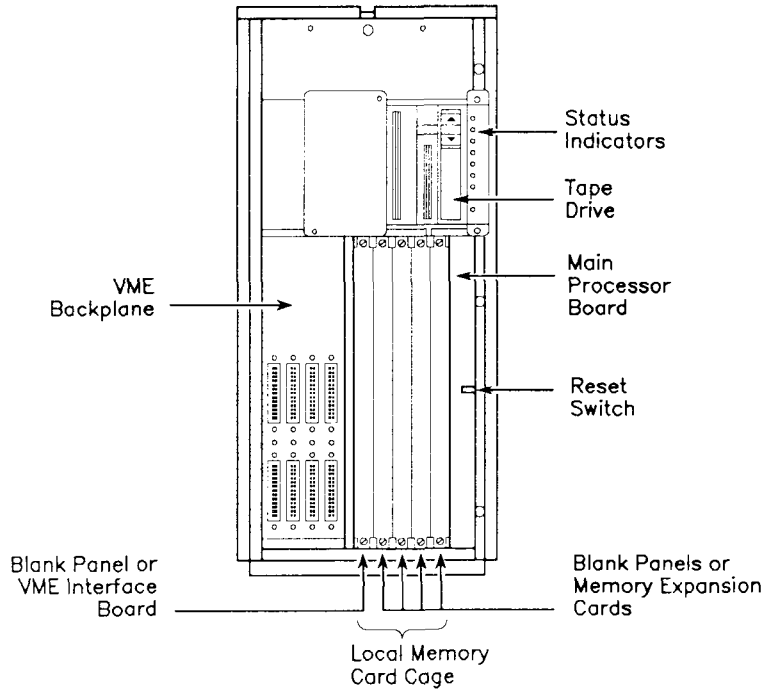


Figure 2-2. Front View

Inspect the rear of the cabinet as follows:

1. Open the rear door. The door should open smoothly and extend until it is perpendicular to the cabinet.

- A rear view of the S/320 cabinet is shown in Figure 2-3; the same view of the S/640 cabinet is shown in Figure 2-4. As shown in these figures, the Main Processor (CPU) board contains one parallel printer connector, two RS-232-C connectors, and one connector for the Uninterruptible Power Supply (UPS). The I/O side of the local card cage is visible, and at least one hard disk drive is mounted to the right of the Main Power switch.

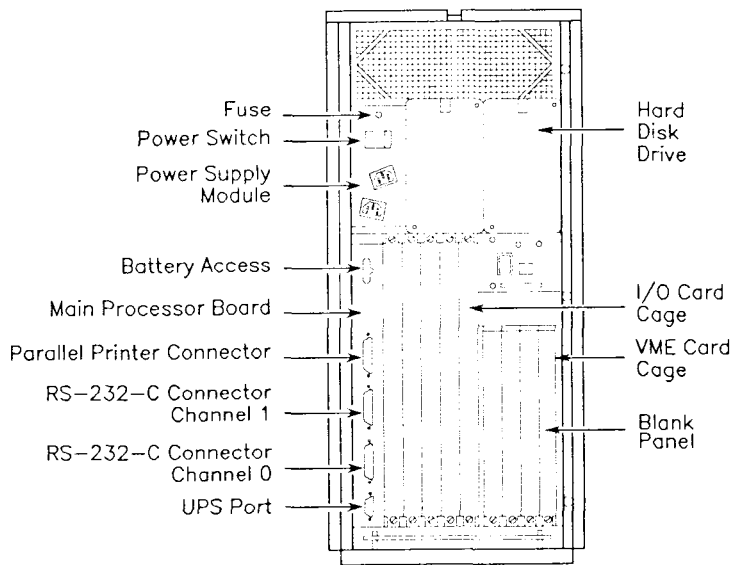


Figure 2-3. Rear View (S/320)

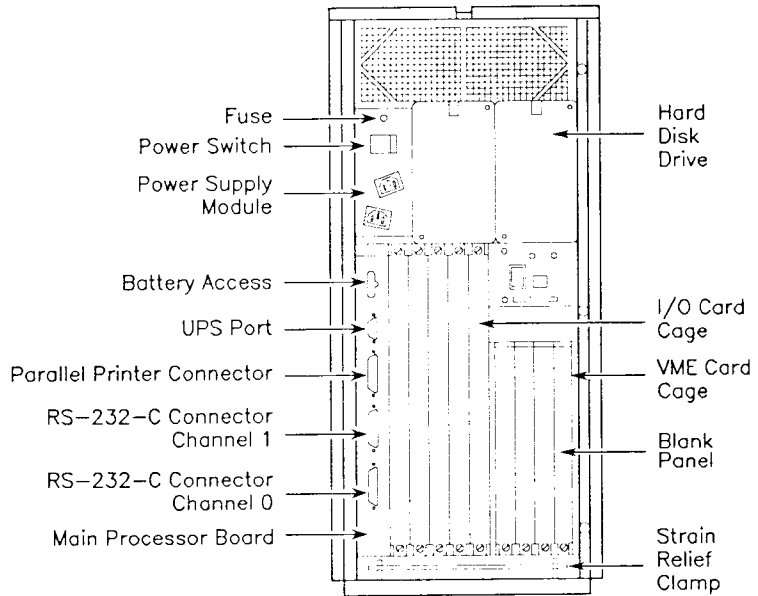


Figure 2-4. Rear View (S/640)

Your system may contain various options, including expansion boards, hard disk drives, and a VME card cage.

2. Make sure all expansion boards are attached securely to the local card cage.

3. Make sure that all disk drives are securely mounted in their respective drive slots.
4. Make sure that the VME card cage, if installed, is securely attached to the local card cage.

ATTACHING THE STABILIZER BARS ---

You must attach two stabilizer bars to the bottom of your system when it is in a stand-alone configuration. Since the stabilizer bars prevent you from moving the enclosure on its wheels, make sure that the system is situated in a permanent location before doing so.

Warning Attaching the stabilizer bars is a two-person task. One person lifts one end of the enclosure while the other slides the stabilizer bar under the lifted end.

To attach the stabilizer bars (see Figure 2-5):

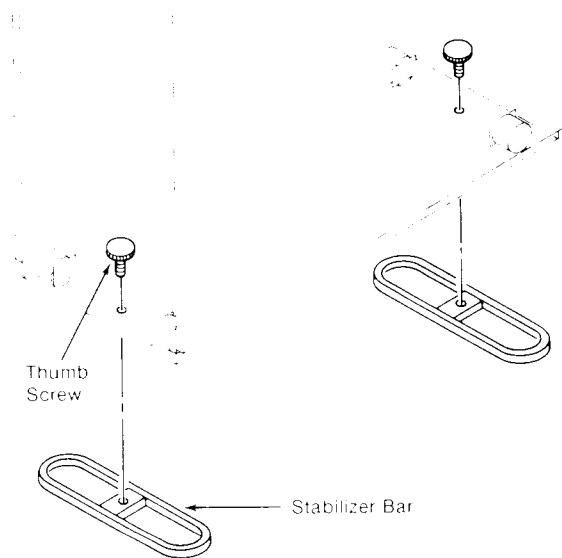


Figure 2-5. Installing the Stabilizer Bars

1. Unpack the two stabilizer bars and the thumbscrews.
2. Open the front door.
3. Place one of the bars lengthwise against the front of the enclosure.

4. Lift the front of the enclosure up, and slide the bar underneath the frame.
5. Position the stabilizer bar so that its center hole is directly below the center hole along the bottom of the enclosure cabinet.
6. Insert one of the thumbscrews into the middle hole in the enclosure, and tighten the screw until the stabilizer bar is firmly attached to the cabinet.
7. Repeat the procedure to attach the rear stabilizer bar.

WHAT'S NEXT? _____

Before powering up your S/320 or S/640, you need to install hardware options and connect peripherals.

Chapter 3, "Connecting Peripherals," describes how to attach terminals, printers, and modems.

If you are installing additional equipment, proceed to Chapters 6 through 8.

CHAPTER 3

Connecting Peripherals

INTRODUCTION

This chapter shows you how to connect peripherals to the S/320 and S/640 systems. The following procedures are included:

- Attaching terminals
- Attaching parallel printers
- Attaching serial printers and modems

ATTACHING TERMINALS ---

You can connect terminals to the following locations:

- The Main Processor (CPU) board (via RS-232-C channels)
- RS-232-C Expansion boards
- Ethernet Combo boards
- RS-422 Expansion boards

Several types of terminals can be connected to the RS-232-C connectors in the S/320 or S/640 as follows:

- Convergent Technologies TO-250 and TO-300
- Any terminal with asynchronous, RS-232-C protocol (Freedom 100 or VT-100 terminals)
- A Programmable Terminal (PT) or a Graphics Terminal (GT) used in Emulate mode

Refer to the installation manual for your terminal for instructions to unpack, assemble, and test it. The installation manual also discusses the correct baud rates, start/stop bits, and parity settings for your terminal.

The specifications and pin assignments required to assemble RS-232-C and RS-422 cables are contained in Appendix C of this manual.

Note To configure terminals connected to expansion boards, refer to the *S/MT Series CTIX Administrator's Reference Manual*.

Main Processor (CPU) Board _____

The Main Processor (CPU) board contains two 25-pin, RS-232-C connectors (labeled Channel 0 and Channel 1); one parallel printer connector; and one UPS connector. Terminals can be connected to the two RS-232-C connectors. The connectors require an RS-232-C crossed cable with 25-pin connectors on both ends (refer to Appendix C for details).

The first terminal must be connected to Channel 0, since that is the only channel already configured in the software. Connect the first terminal as follows:

1. Open the rear door.

Notice the bar along the bottom of the computer. This is called the strain relief clamp. The strain relief clamp holds the power and peripheral cables in place.

2. Use a flat-bladed or phillips head screwdriver to release one of the captive screws and loosen the other. Swing the strain relief clamp toward you and out of the way.

3. Insert the 25-pin connector into Channel 0 on the Main Processor (CPU) board (refer to Figure 3-1).

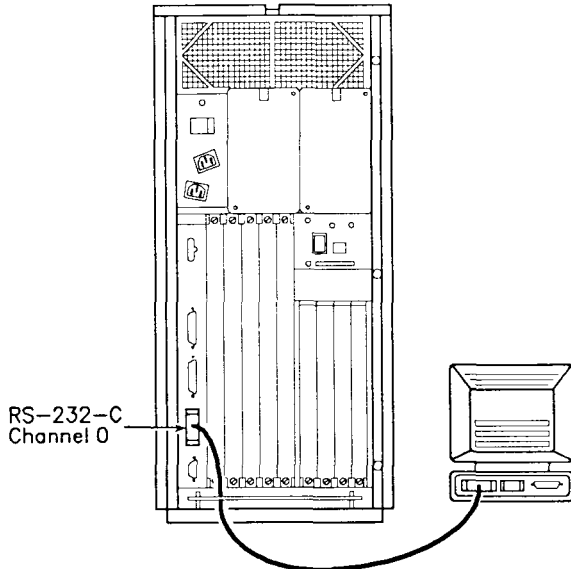


Figure 3-1. Attaching Terminal to Processor Board

4. Insert the other 25-pin connector into the RS-232-C connector on the terminal.

5. Tighten the jackscrews that secure each connector in place.
6. If you are not attaching any more cables, position the strain relief clamp over the cable, and secure it to the chassis.

Wait until you complete the steps in Chapter 4, “Booting Your System,” before turning on the terminal.

RS-232-C and Ethernet Combo Expansion Boards

You can install up to 40 additional RS-232-C channels on your system. The connectors on the expansion boards require 9-pin connectors, while the terminals require 25-pin connectors. Refer to Appendix C for cable specifications.

The 10-channel RS-232-C Expansion board contains 10 connectors, labeled from bottom to top as Channel 2 through Channel 11. The 20-channel RS-232-C Expansion board contains 20 connectors, labeled from bottom to top as Channel 2 through Channel 21. (This board takes up two slots in the card cage.) The Ethernet Combo board contains six RS-232-C channels, labeled from bottom to top as Channel 2 through Channel 7.

To connect a terminal to an RS-232-C Expansion board or Ethernet Combo board:

1. If you have not already done so, loosen the strain relief clamp, and swing it out of the way.
2. Insert the 9-pin connector end of the RS-232-C cable into a connector on the Expansion board as shown in Figure 3-2.

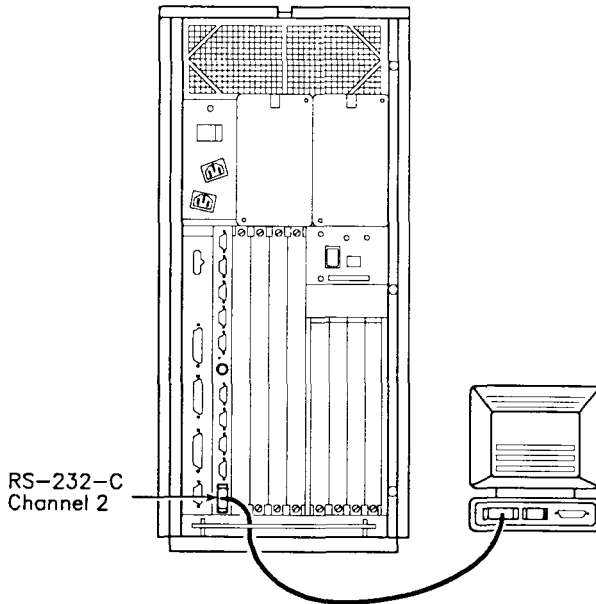


Figure 3-2. RS-232-C Terminal Connection

3. Insert the 25-pin connector on the other end of the cable into the RS-232-C connector on the terminal.
4. Tighten the jackscrews to secure each connector in place.
5. If you are not attaching any more cables, position the strain relief clamp over the cable, and secure it to the chassis.

RS-422 Expansion Board _____

There are four RS-422 cluster channels on the RS-422 Expansion board. You can connect up to eight RS-422 terminals to one RS-422 cluster channel, for a total of up to 32 RS-422 terminals.

To connect RS-422 terminals to your system, you need RS-422 cables with 9-pin connectors on both ends. Refer to Appendix C for cable specifications.

To connect RS-422 terminals:

- If you have not already done so, loosen the strain relief clamp and swing it out of the way.
- Insert a 9-pin connector into Cluster Channel 0 on the RS-422 Expansion board.

- Insert the other 9-pin connector into one of the two RS-422 channels on the terminal.
- Tighten the jackscrews to secure each connector in place.

Up to eight RS-422 terminals can be connected to one RS-422 cluster channel as shown in Figure 3-3. You need one RS-422 cable for each terminal, and one RS-422 terminator.

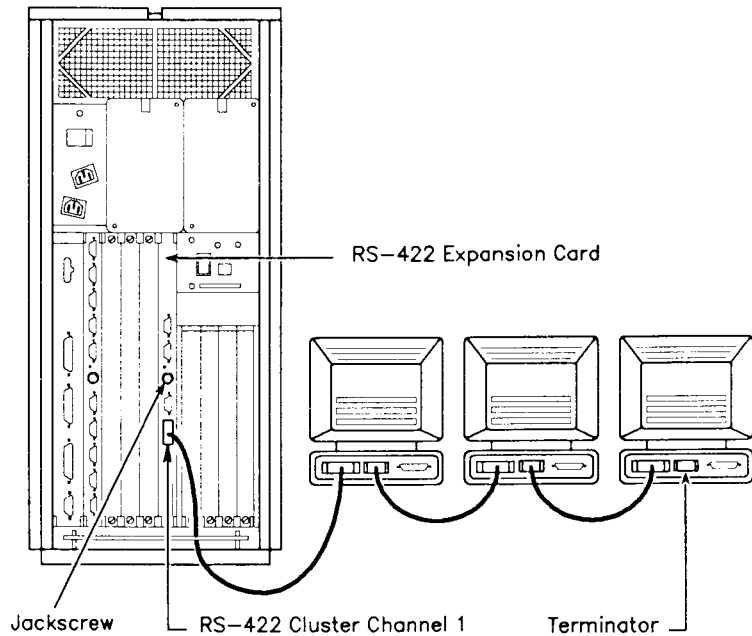


Figure 3-3. RS-422 Cluster Terminal Connection

Connect the RS-422 terminals to a cluster channel as follows:

1. Connect the first terminal to Cluster Channel 0 on the RS-422 Expansion board.
2. Attach a 9-pin connector from a second RS-422 cable to the available RS-422 channel on the first terminal.

3. Attach the other 9-pin connector of the second RS-422 cable to an RS-422 channel on the second terminal. Continue this daisy chain until as many as eight terminals are connected to each RS-422 cluster channel.
4. Tighten the jackscrews to secure each connector in place.
5. The last terminal in the cluster has one unused channel. Insert an RS-422 terminator into that unused channel.
6. If you are not attaching any more cables, position the strain relief clamp over the cables, and secure it to the chassis.

ATTACHING PARALLEL PRINTERS _____

Parallel printers are connected to the channel labeled Parallel Printer on any of the following:

- Main Processor (CPU) board
- RS-422 Expansion board
- IOP Expansion board

Note The parallel printer channel on the S/640 Main Processor (CPU) board is a bidirectional channel.

Refer to Appendix C for parallel printer cable information and pin assignments.

Connect your parallel printer to a parallel printer channel as follows:

1. If you have not already done so, loosen the strain relief clamp and swing it out of the way.
2. Insert the 25-pin connector into the parallel printer channel. (Figure 3-4 shows connection to an RS-422 Expansion board.)

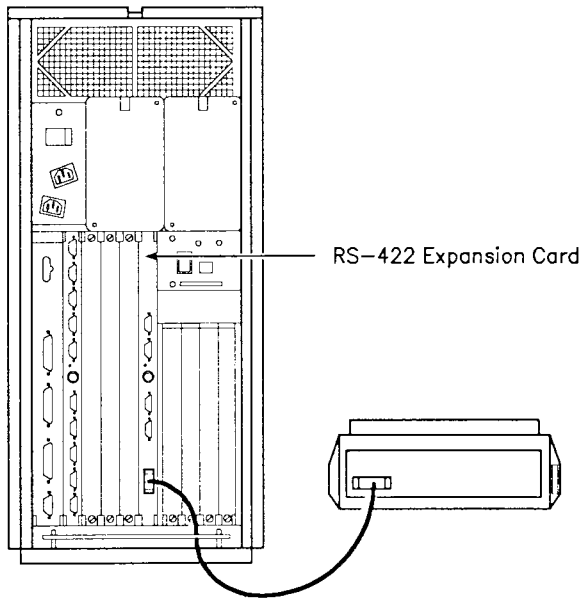


Figure 3-4. Attaching a Parallel Printer

3. Insert the 36-pin connector into the printer port.
4. Tighten the jackscrews that secure the connectors in place.
5. If you are not attaching any more cables, position the strain relief clamp over the cables, and secure it to the chassis.

ATTACHING MODEMS AND SERIAL PRINTERS

Modems and serial printers are connected to the RS-232-C channels on the RS-232-C Expansion boards or Ethernet Combo board. These channels must be configured in the software to support these peripherals. Refer to the current Release Notice for your software for more information.

An RS-232-C channel on an Ethernet Combo board or RS-232-C Expansion board requires an RS-232-C cable with a 9-pin connector on one end and a 25-pin connector on the other end. Refer to Appendix C for cable information and pin assignments.

To connect a modem or serial printer to the Ethernet Combo board or RS-232-C Expansion board:

1. If you have not already done so, loosen the strain relief clamp, and swing it out of the way.
2. Insert the 9-pin connector into the channel on the Ethernet Combo board or RS-232-C Expansion board (refer to Figure 3-5).

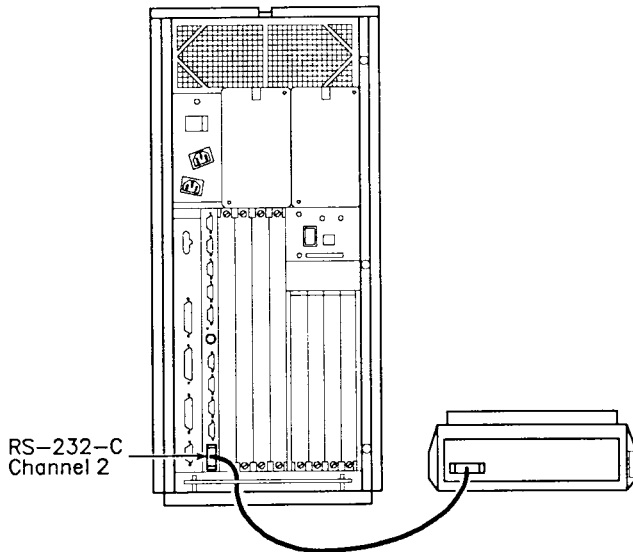


Figure 3-5. Attaching a Serial Printer

3. Insert the 25-pin connector into the RS-232-C port on the modem or serial printer.
4. Tighten the jackscrews that secure the connectors in place.
5. If you are not attaching any more cables, position the strain relief clamp over the cables, and secure it to the chassis.

WHAT'S NEXT? _____

Proceed to Chapter 4, “Booting Your System.” Chapter 4 provides instructions on how to connect the power cords, turn on system power, and load the CTIX operating system.

CHAPTER 4

Booting Your System

INTRODUCTION

This chapter shows you how to:

- Connect the AC power cable
- Load the CTIX operating system
- Start up terminals (including PTs and GTs in Emulate mode)
- Turn on the power and initially boot your system

Note The procedures discussed in this chapter pertain to initially booting the system and installing the CTIX operating system. At this time, if you have any expansion equipment to install, read Chapters 6 through 8 before proceeding with this chapter.

POWERING UP YOUR SYSTEM ---

To power up your system, you need to connect the AC power cord, then turn on the power switch.

Before attaching the power cord, check that the AC outlet into which you are plugging your system supplies the proper voltage and that it is not shared by any other high-current system (such as air conditioning). The voltage required by your system is listed on a serial label near the AC power cord outlet. The label indicates either 115 Volt Input or 220 Volt Input.

Warning The voltage indicated on the label must match the power source to which you are connecting the system. Otherwise your system can be badly damaged.

Connect the main power cord as follows:

1. Remove the power cord from its packing box.
2. Open the rear door of your system.

3. Insert one end of the cable into the slot marked MAIN POWER on the Power Supply Module.

Caution Before you begin step 3, check that the power switch is in the OFF (0) position.

4. Insert the other end of the cord into an AC power outlet. Figure 4-1 illustrates these steps.

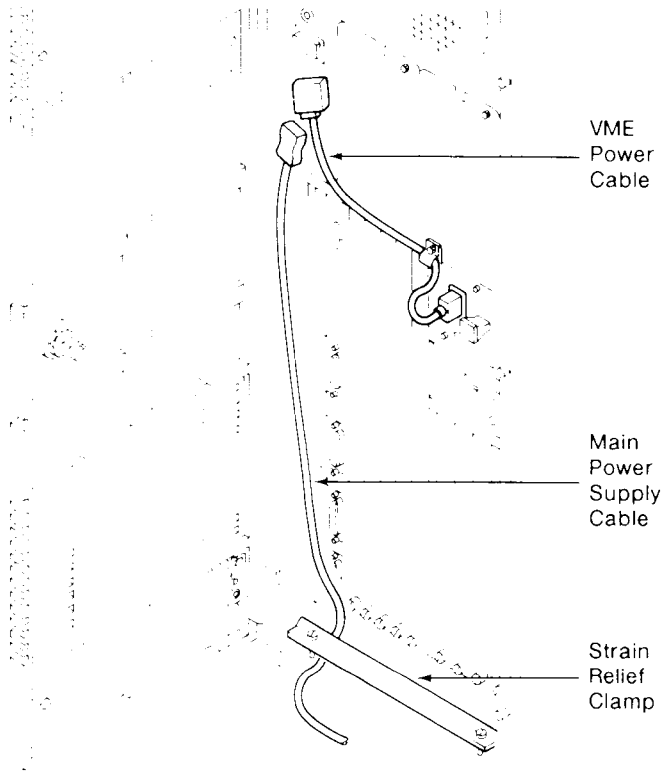


Figure 4-1. Connecting the Power Cable

5. Position the strain relief clamp over the terminal and power cables, and secure it to the chassis (refer to Figure 4-1).

6. If you installed the VME card cage, connect the VME power cord as illustrated in Figure 4-1.
7. Close the rear door.

LOADING THE QIC INSTALLATION TAPE

Before you can use your system, you must install the CTIX operating system. The QIC Installation tape (ordered separately) is needed for installation.

Insert the QIC Installation tape into the QIC tape drive as shown in Figure 4-2.

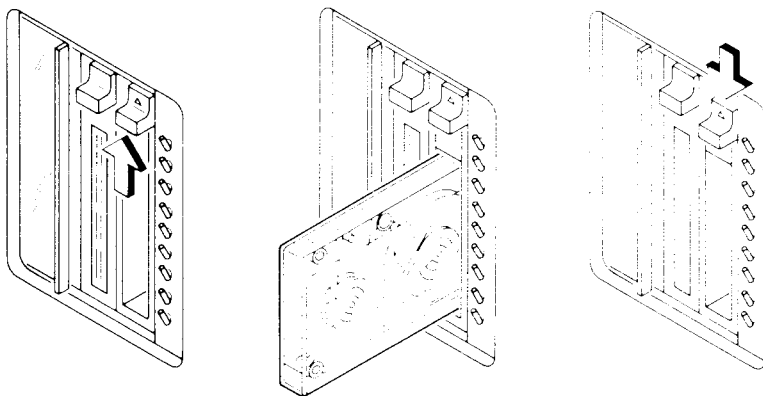


Figure 4-2. Inserting a QIC Tape

Starting Up PTs and GTs in Emulate Mode

For terminals other than programmable (PT) or graphics (GT), disregard this section and proceed to “Turning on the Power.”

If you connect a PT or GT to the Main Processor (CPU) board, that terminal must be started up in Emulate mode. Emulate mode causes the terminal to function as though it were communicating with your system on an RS-232-C line.

Start up your PT or GT in Emulate mode as follows:

1. Connect the terminal to Channel 0 on the Main Processor (CPU) Board.
2. Turn the terminal off.
3. Press the space bar down while you turn the terminal on. Continue to press the space bar down until the boot ROM prompt is displayed.

The prompt from a PT boot ROM looks like this:

```
V 2.0
B,C,E,F,I,P,R,S,T,W:
```

The prompt from a GT boot ROM looks like this:

```
V 2.0  
T 222 F 801 R 09 P 00 I  
B,C,E,F,I,P,R,S,T,W:
```

4. Type **E** (for Emulate) when one of these prompts appears.

The terminal now starts up in Emulate mode and functions like an RS-232-C terminal.

Turning On the Power

When the QIC Installation tape is in the tape drive and the terminals are properly connected and turned on, you are ready to turn on the power on your system.

Turn on the power as follows:

1. Locate the power switch on the rear of the system.
2. Place the switch in the ON (1) position as shown in Figure 4-3.

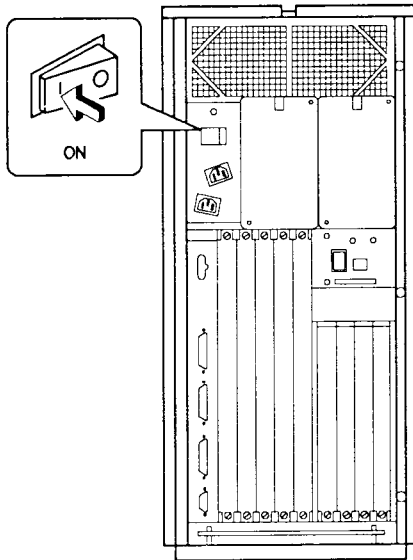


Figure 4-3. Turning On the Power

The fan should immediately come up to speed. The nine status panel indicators, located on the front, should flash for approximately 30 to 40 seconds, indicating the power-up sequence. (Status and error codes are explained in Appendix A.)

The following output appears on the screen of the terminal that is connected to Channel 0 on the Main Processor board:

```
WELCOME TO MIGHTYFRAME CTIX
Do you wish to continue and install
the CTIX software on drive 0 ('yes' or 'no')?
```

WHAT'S NEXT? ---

The initial installation of your computer system is now complete and you are ready to install the CTIX operating system. Consult the current CTIX Release Notice for further instructions.

Refer to the *S/MT Series CTIX Administrator's Reference Manual* and the *CTIX Administration Tools Manual* to properly configure the CTIX operating system for your needs.

Continue to use this manual as a reference. Consult it when you purchase options to upgrade or expand your system.

Chapter 5

Powering Down and Restarting Your System

INTRODUCTION

This chapter presents information on properly powering down your system. You must follow this procedure to prevent possible damage to the file system. (This procedure is also documented in the *S/MT Series CTIX Administrator's Reference Manual*.)

Power down your system whenever you

- Install hard disk drives
- Troubleshoot the system
- Move the system to another location

To correctly power down your system, you will

- Log in as root and find out who is using the system
- Instruct everyone using the system to log out

- Shut down the operating system
- Power down the system

Directions to properly restart the S/320 or S/640 are provided at the end of this chapter.

SHUTTING DOWN THE OPERATING SYSTEM

Follow the sequence shown below in order to properly power down or reset your system.

Caution Failure to do so may result in damage to the file system.

Shut down the operating system as follows:

1. Type **root** and press **RETURN**.
2. Type the appropriate password and press **RETURN**.
3. Type **who** and press **RETURN**.

A list of logged-in users appears on the screen. If other users are logged in, instruct them to log out before you continue with these steps. When you (**root**) are the only user logged onto the system, you can shut down all currently running processes through the shutdown program:

4. Type **shutdown** and press **RETURN**.

The following message is displayed:

```
SHUTDOWN PROGRAM
```

```
Thu Jan 30 15:11:33 PST 1988
```

```
Do you want to send your own message?:
```

5. Type **y** (for yes) or **n** (for no) and press **RETURN**.
6. You can turn off the power when the following prompt is displayed:

```
OK to stop or reset processor
```

Note If you have installed CTIX 6.0 or higher, enter **reboot -h**. You can then turn off the power or reset the system.

Proceed to the next sections for instructions on turning off the power and resetting the S/320 or S/640 systems.

SHUTTING OFF THE POWER ---

Once you have shut down the operating system, you can turn the power off.

Note You must power off all Storage Module Devices (SMDs) attached to your system before turning the system power off.

Turn the power off as follows:

1. Locate the power switch on the rear of the unit.
2. Press the right side of the switch to the off (0) position as illustrated in Figure 5-1.

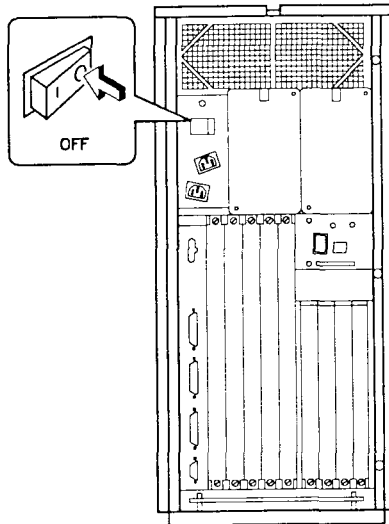


Figure 5-1. Powering Down Your System

You will immediately hear the fan stop, and the activity indicator on the front panel will no longer be on.

Proceed to Chapter 6 if you want to install expansion boards; proceed to Chapter 7 if you want to install hard disk drives.

RESETTING THE SYSTEM

After the operating system is properly shut down, the system can be reset.

The Reset switch is located on the lower right side of the CPU behind the front door (see Figure 5-2). The Reset switch is activated by momentarily pressing down.

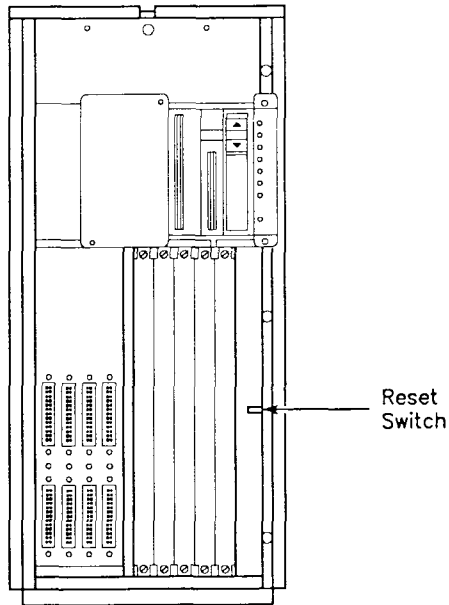


Figure 5-2. Location of the Reset Switch

RESTARTING YOUR SYSTEM ---

To restart your system, simply press the left side of the power switch to the on (1) position.

The fan immediately comes up to speed, and the indicators on the status panel flash their power-on sequence. After about 2 minutes, your system is ready for normal operation. If SMDs are attached to your system, power them up, and then reboot the system as described in Chapter 4, “Booting Your System.”

Note When powering up systems containing one or more V-Boxes, use one of the following procedures to restart your system:

Hold the Reset switch on while turning the power on; then release the Reset switch, or

Power on the system, and then immediately reset it.

WHAT'S NEXT? _____

Proceed to Chapter 6 if you want to install expansion boards; proceed to Chapter 7 if you want to install hard disk drives.

CHAPTER 6

Installing Expansion Boards

INTRODUCTION

This chapter presents information on installing expansion boards in the I/O card cage to upgrade your system. Installation procedures for VME Expansion boards are provided in Chapter 7, “Installing VME Equipment.”

The S/320 and S/640 memory and I/O capabilities can be expanded by adding or exchanging the following boards:

- Memory Expansion boards (up to four total)
- I/O Expansion boards, including 10- and 20-channel RS-232-C Expansion and Ethernet Combo (up to four)
- An RS-232-C IOP Expansion board or RS-422 Expansion board

The chapter is organized as follows:

- Powering down your system
- Removing blank panels
- Removing an expansion board
- Installing Memory Expansion boards
- Installing I/O Expansion boards

POWERING DOWN YOUR SYSTEM _____

Power down the S/320 or S/640 before installing or removing expansion boards. Refer to Chapter 5, "Powering Down and Restarting Your System," for instructions.

REMOVING BLANK PANELS ---

Empty slots on both the memory and I/O sides of the local card cage contain blank panels. To install an expansion board, first remove the blank panel from its respective slot.

Note In order to assure proper cooling and compliance with ESD/EMI specifications, remember to leave blank panels in slots that do not contain expansion boards.

Remove a blank panel as follows:

1. Loosen the two captive screws that secure the blank panel to the local card cage (refer to Figure 6-1). The two captive screws remain attached to the blank panel.

POWERING DOWN YOUR SYSTEM _____

Power down the S/320 or S/640 before installing or removing expansion boards. Refer to Chapter 5, “Powering Down and Restarting Your System,” for instructions.

REMOVING BLANK PANELS ---

Empty slots on both the memory and I/O sides of the local card cage contain blank panels. To install an expansion board, first remove the blank panel from its respective slot.

Note In order to assure proper cooling and compliance with ESD/EMI specifications, remember to leave blank panels in slots that do not contain expansion boards.

Remove a blank panel as follows:

1. Loosen the two captive screws that secure the blank panel to the local card cage (refer to Figure 6-1). The two captive screws remain attached to the blank panel.

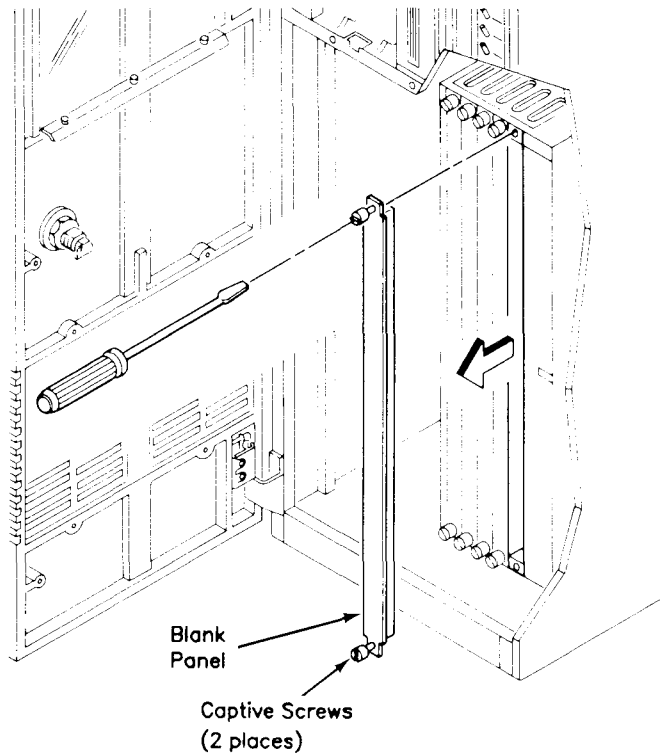


Figure 6-1. Removing a Blank Panel

2. Remove the blank panel (see Figure 6-1).
Save the blank panels for future use.

REMOVING AN EXPANSION BOARD ---

Remove expansion boards as follows:

1. Disconnect all peripheral cables from the expansion board.
2. Use the 11/32-inch hex nut driver and loosen the jackscrew (approximately 12 full turns counter clockwise) as shown in Figure 6-2.

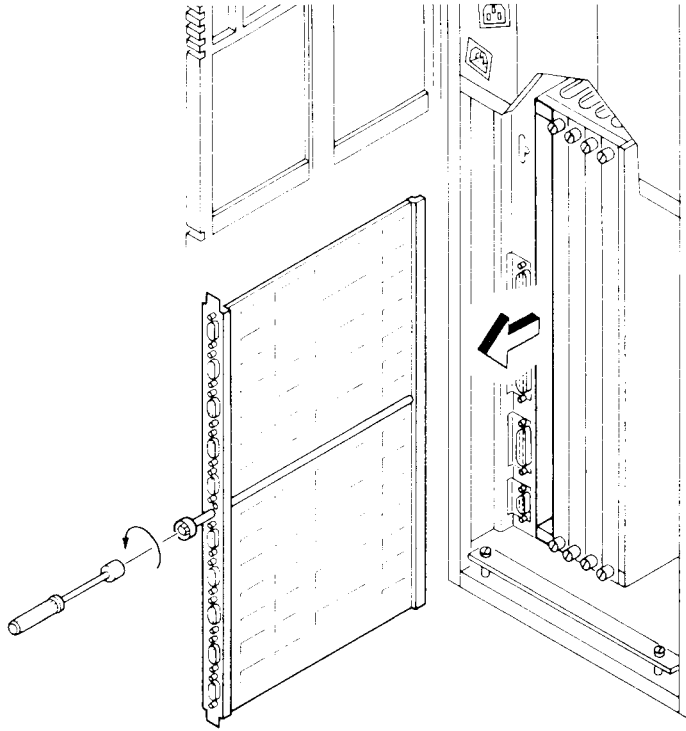


Figure 6-2. Removing an Expansion Board

3. Slide the board out of the card cage.

If you are not installing another expansion board in this slot, install a blank panel in the following manner:

1. Line up the two captive screws on the blank panel with the holes in the card cage.
2. Tighten the captive screws with a flat-bladed screwdriver.

Note Blank panels must be installed in all vacant slots to assure proper ESD/EMI specification conformance and proper cooling.

INSTALLING MEMORY EXPANSION BOARDS

Up to four Memory Expansion boards can be installed in each system. The 2 and 4MB boards can be installed in the S/320 system; the 2, 4, and 8MB boards can be installed in the S/640.

Note All Memory Expansion boards designed for the S/640 have (4) backplane connectors and can only be installed in the S/640. They cannot be installed in the S/320. Similarly, S/320 Memory Expansion boards have (2) backplane connectors and cannot be installed in the S/640.

Memory Expansion boards are installed in slots M1 through M4 on the memory (front) side of the local card cage. Slot VME I/F is reserved for the VME Interface Adapter board only and does not support Memory Expansion boards.

For optimal performance, install Memory Expansion boards contiguously from slot M1 through slot M4. Do not skip slots.

Install a Memory Expansion board as follows:

1. Open the front door.
2. Remove the blank panel from the slot as described in the section “Removing Blank Panels.”
3. Remove the Memory Expansion board from its box.

Note The size of the board is denoted on the bottom of the board. The board must be installed so that this legend is oriented on the bottom of the board.

4. Position the board with the Power LED above the jackscrew. Slide the top and bottom edges of the board into the guides in the local card cage until the board meets a solid resistance (refer to Figure 6-3).

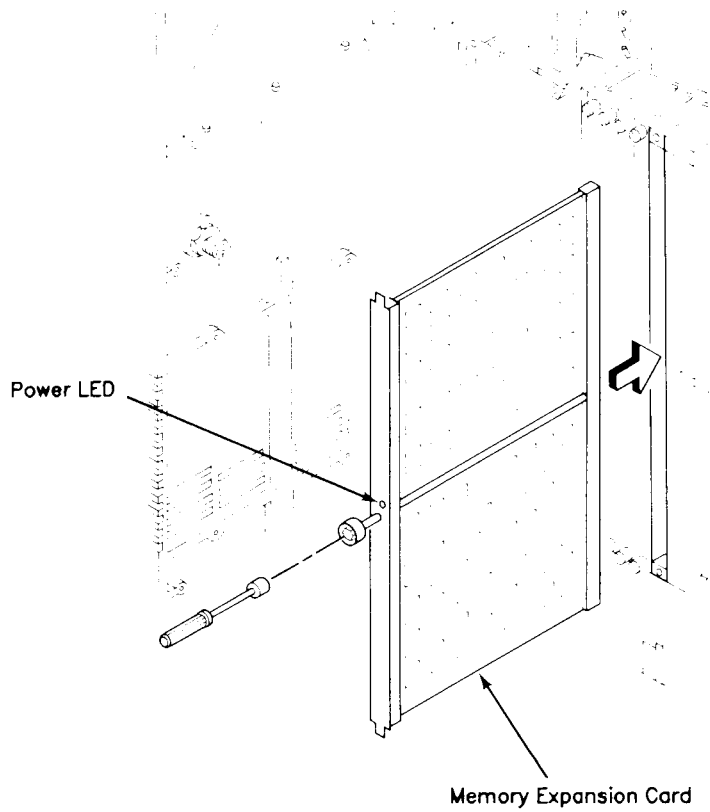


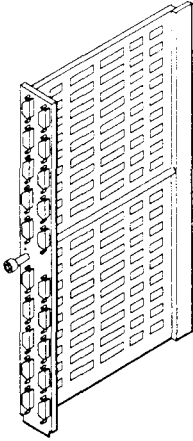
Figure 6-3. Installing a Memory Expansion Board

5. While holding the board, push it inward, and use an 11/32-inch hex nut driver to tighten the jackscrew knob (turn clockwise approximately 12 full turns) until it meets a solid resistance.

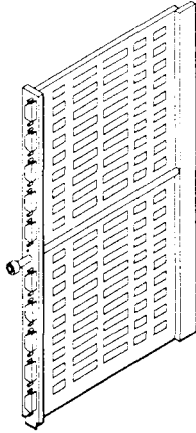
Note Remember to install blank panels in all vacant slots to assure proper ESD/EMI specification conformance and proper cooling.

INSTALLING I/O EXPANSION BOARDS _____

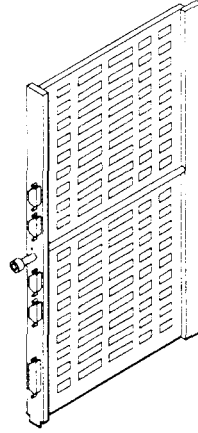
Several types of I/O expansion boards can be installed in the S/320 and S/640 systems as illustrated in Figure 6-4 (consult your Convergent sales representative for a complete list of available boards).



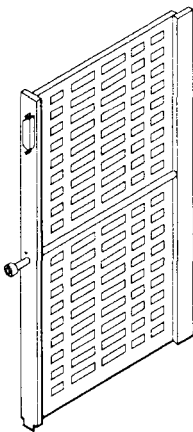
20-Channel RS-232-C
Expansion Board



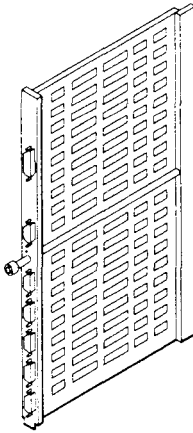
10-Channel RS-232-C
Expansion Board



RS-422
Expansion Board



RS-232-C
IOP Expansion Board



Ethernet Combo
Expansion Board

Figure 6-4. Installing an I/O Expansion Board

The I/O Expansion boards can be installed in the slots as described in Table 6-1.

Table 6-1. I/O Expansion Board Installation

Type of I/O Board	I/O Expansion Slot Number				
	IO1	IO2	IO3	IO4	X5
RS-232-C 10-channel	x	x	x	x	
RS-232-C 20-channel*	x	x	x		
Ethernet Combo‡	x	x	x	x	
RS-232-C IOP Accelerator†					x
RS-422†					x

* The 20-channel, RS-232-C Expansion board occupies two slots in the card cage.

† You cannot install both the IOP and RS-422 Expansion boards in the same system because each can only be installed in slot X5.

‡ In S/320 systems with the VME option installed, the Ethernet Combo board cannot be installed if an RS-422 Expansion board or IOP Expansion board is installed in slot X5.

When you install I/O Expansion boards, position each board so that the “power on” LED is above the jackscrew.

Install an I/O Expansion board as follows:

1. Open the rear door.
2. Remove the blank panel from the desired slot as described in the section “Removing Panel Blanks.”
3. Remove the I/O Expansion board from its box.
4. Slide the board into the guides in the card cage until the board meets a solid resistance (refer to Figure 6-5).

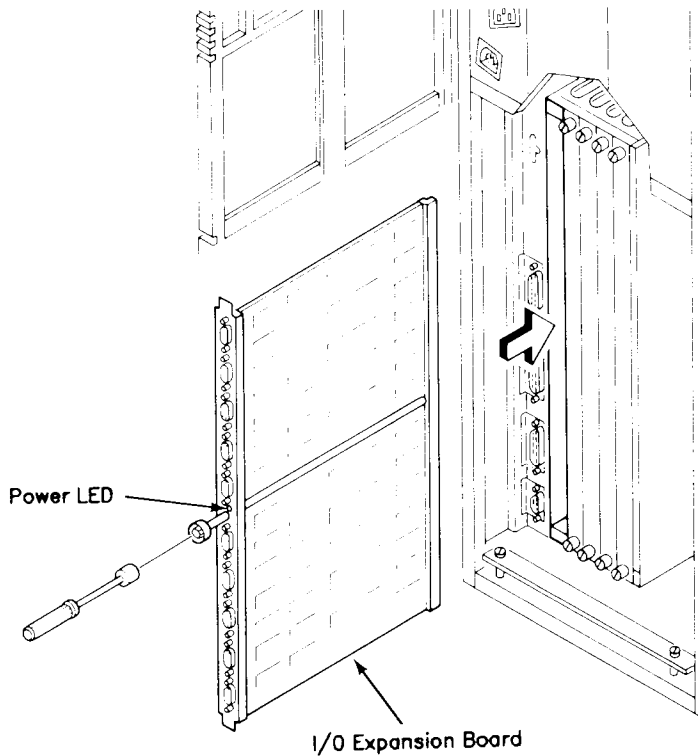


Figure 6-5. I/O Expansion Boards

5. While holding the board, push it inward, and use an 11/32-inch hex nut driver to tighten the jackscrew knob (turn clockwise approximately 12 full turns) until it meets solid resistance.

Remember that blank panels must be installed in vacant slots to assure proper ESD/EMI specification conformance and proper cooling.

WHAT'S NEXT? ---

To install the VME card cage, VME Interface board, or VME Expansion boards, proceed to Chapter 7, "Installing VME Equipment."

To connect peripherals to the expansion boards, refer to Chapter 3, "Connecting Peripherals."

To turn on the power, refer to Chapter 5, "Powering Down and Restarting Your System."

CHAPTER 7

Installing VME Equipment

INTRODUCTION

This chapter shows you how to install the VME card cage, the VME Interface Adapter board, and VME Expansion boards. You need the following equipment, contained in the VME Upgrade Kit (Order Number CV-501), to completely install the VME card cage and make it operable:

- One four-slot VME card cage
- One VME power supply
- One VME power cable
- One VME Interface Adapter board
- One cable clamp
- Three 8-32 x 1/4-inch, self-tapping screws

POWERING DOWN YOUR SYSTEM _____

Power down your system as described in Chapter 5, “Powering Down and Restarting Your System.”

INSTALLING THE VME CARD CAGE _____

To install the VME card cage, remove the top and left side panels as follows:

1. Open the front door of your system.
2. Use a 1/4-inch hex nut driver and loosen the screw on the top panel latch (shown in Figure 7-1). Rotate the screw counterclockwise approximately one-half turn.

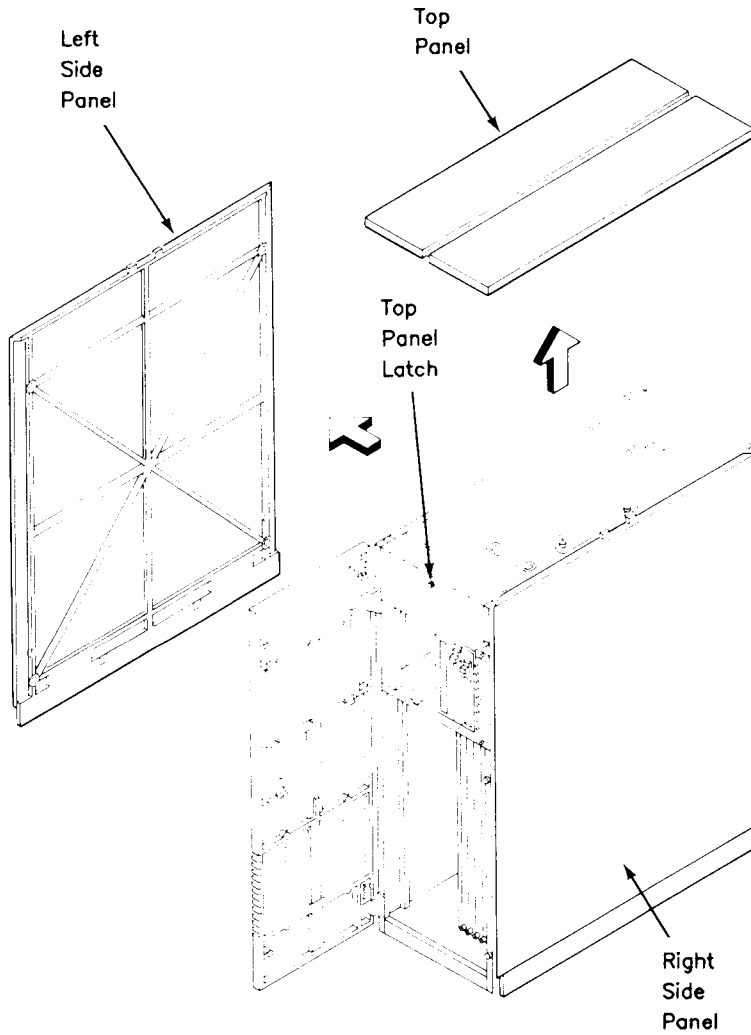


Figure 7-1. Removing the Top and Side Panels

3. Push the top panel back about 1/2 inch to free the top panel from the cabinet. Lift the top panel straight up and off.
4. To remove the left side panel (see Figure 7-1), grasp each side of the panel, and lift it up 1/2 inch. Pull it towards you and away from the frame. Lay it aside.

Two air restrictor plates are attached to the chassis (refer to Figure 7-2); one to the local Memory card cage, the other to the top of the local I/O card cage.

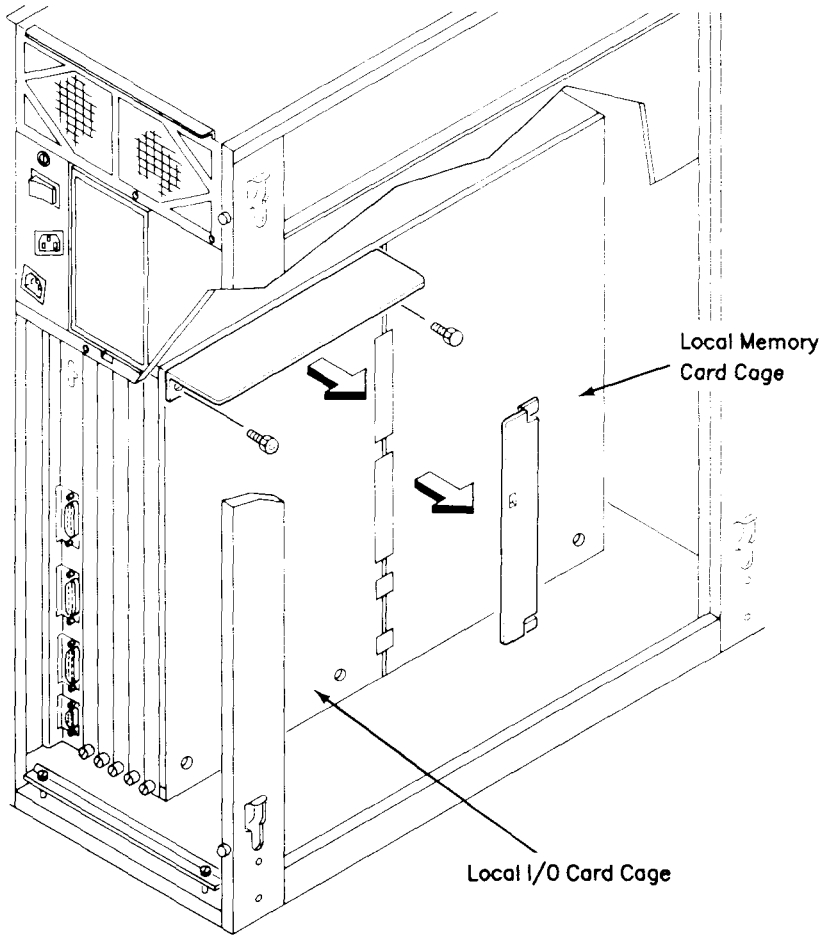


Figure 7-2. Air Restrictor Plates

Remove the plates as follows:

1. Gently lift the left side of the plate attached to the local memory card cage. Slide the plate about 1/2 inch towards the back of the enclosure, and lift it clear of the chassis. Set the plate aside for possible future use.
2. Using a 1/4-inch hex screwdriver, loosen the two screws that hold the plate attached to the top of the local I/O card cage. Remove the screws and the plate, and set them aside for possible future use.

Caution Slots X5 (in the rear) and VME I/F (in the front) must be empty. If they are not empty, loosen the jackscrew and slide any card that occupies these slots out 3 inches prior to installing the VME card cage.

The VME card cage attaches to the local I/O card cage as shown in Figure 7-3.

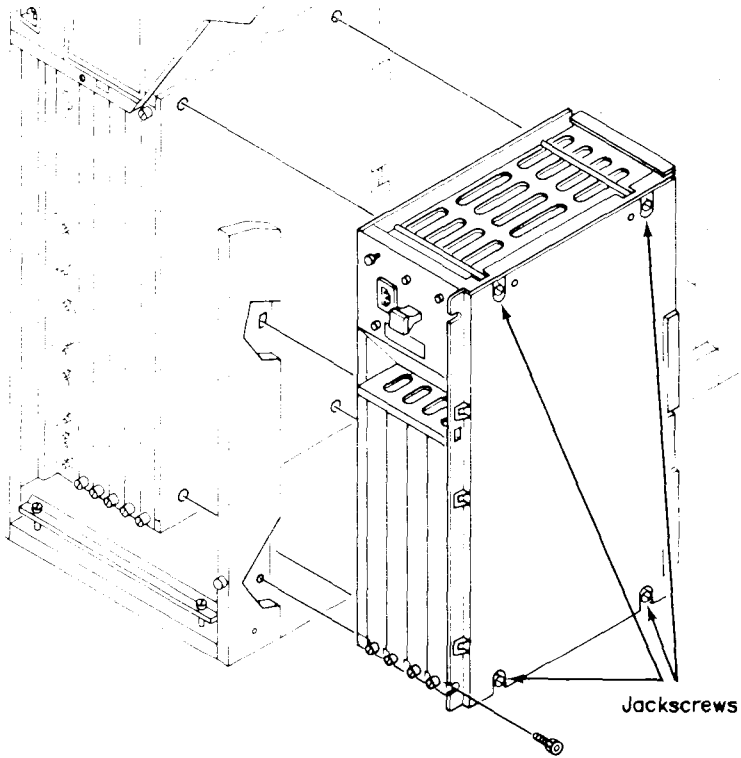


Figure 7-3. Positioning the VME Card Cage

Install the VME card cage as follows:

Caution When installing the VME card cage, take care not to damage the connectors on the card cage and local I/O card cage.

1. Carefully slide the VME card cage through the open side of the enclosure and into place.
2. Work the VME backplane notch into the I/O backplane as shown in Figure 7-4, seating the VME card cage assembly into place.

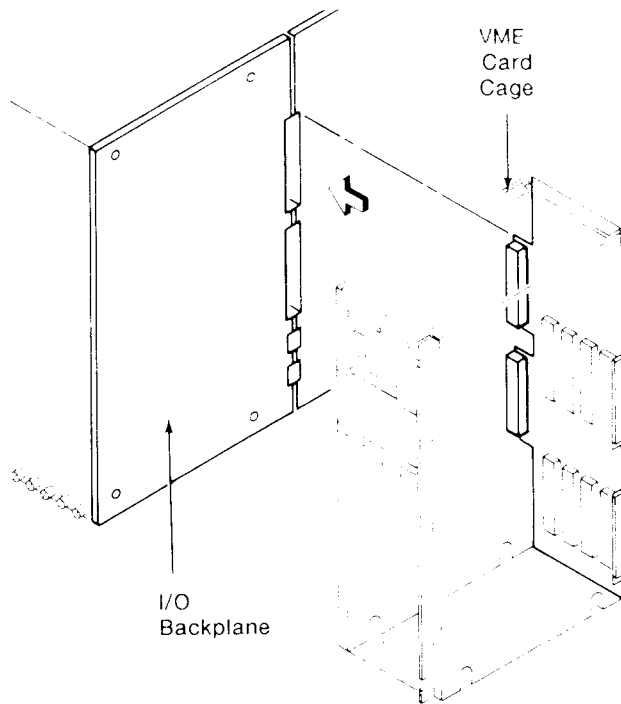


Figure 7-4. Installing the VME Card Cage

3. Using the 1/4-inch hex nut driver, alternately and evenly tighten the four jackscrews that secure the VME card cage to the local I/O card cage. The position of the jackscrews are shown in Figure 7-3.

4. Install the two self-tapping screws that secure the VME card cage to the frame.

Connect the VME power cable as follows (refer to Figure 7-5):

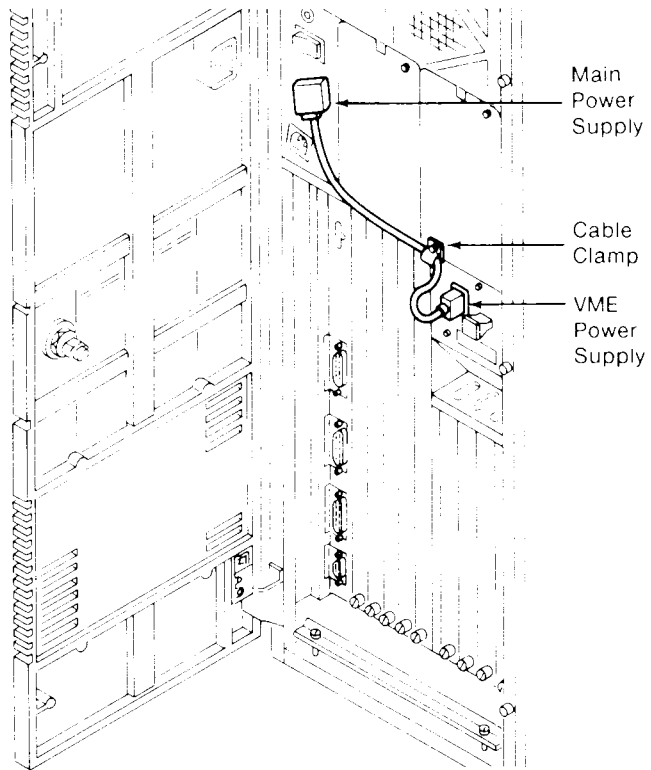


Figure 7-5. Attaching the VME Power Cable

1. Attach the VME power cable to the frame with the cable clamp.
2. Plug the VME power cable into the Main Power Supply.
3. Plug the other end of the power cable into the VME Power Supply.
4. Install the cable clamp using the hex head screw with a 1/4-inch hex nut driver.

The VME card cage is now in place. Replace the top and side panels as follows:

1. Replace the left side panel.
2. Replace the top panel, and tighten the latch screw in the front of the cabinet to secure the panel in place.

INSTALLING THE VME INTERFACE ADAPTER BOARD ---

To make the VME card cage operative, install the VME Interface Adapter board as follows:

1. Open the front door.
2. Use a flat-bladed screwdriver and remove the blank panel from slot VME I/F, which is located on the memory (front) side of the local card cage.

Note The VME Interface Adapter board is installed in slot VME I/F only. The VME card cage cannot function unless the VME Interface board is properly seated in the memory side of the local card cage.

3. Remove the VME Interface Adapter board from the packing container.
4. Position the board with the Power LED above the jackscrew. Slide the top and bottom edges of the board into the guides in the VME I/F slot until the board meets a solid resistance (refer to Figure 7-6).

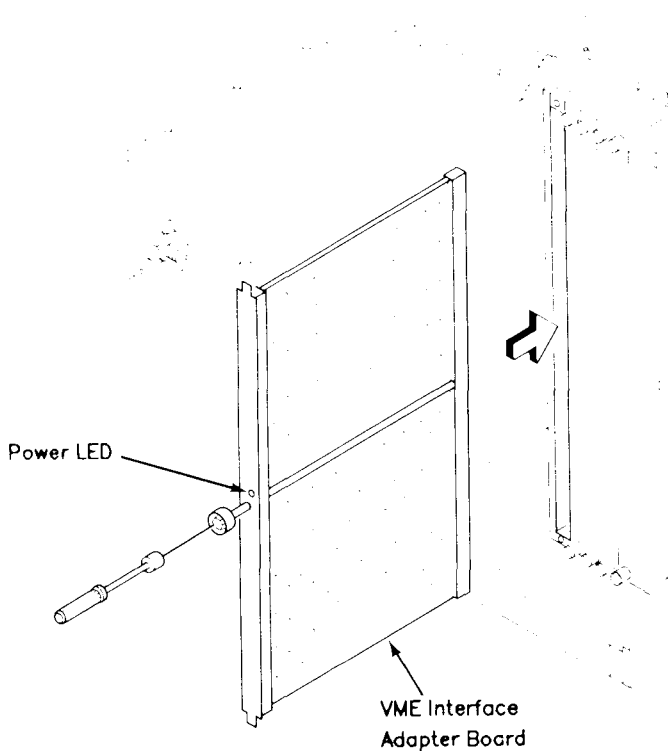


Figure 7-6. Installing the VME Adapter Board

5. While holding the board, push it inward, and use an 11/32-inch hex driver to tighten the jackscrew knob (turn clockwise approximately 10 full turns) until it meets a solid resistance.

INSTALLING VME EXPANSION BOARDS

This section shows you how to install VME Expansion boards in the base cabinet. You can also use these instructions to install VME Expansion boards in the V-Box. Refer to the *S/Series Expansion Cabinet Installation Manual* for details concerning the V-Box.

Several VME Expansion boards are available for your system, including the following (refer to the current sales guide for a complete list):

- Half-Inch Tape Controller
- Ethernet Controller
- SMD Controller

VME Expansion boards are installed in slots P6 through P9. The most natural way to install VME Expansion boards is contiguously from slot P6 through slot P9. However, slots can be skipped in order to group boards according to DMA or interrupt priority. Consult the IEEE VME Specification C.1 for details.

Note The base cabinet has certain limitations on the combination of VME Expansion boards that can be supported. Read Appendix G before installing VME Expansion boards to determine correct configurations.

Install a VME Expansion board as follows:

1. Open the rear door.
2. Use a flat-bladed screwdriver and remove the blank panel from the appropriate slot (see Figure 7-7).

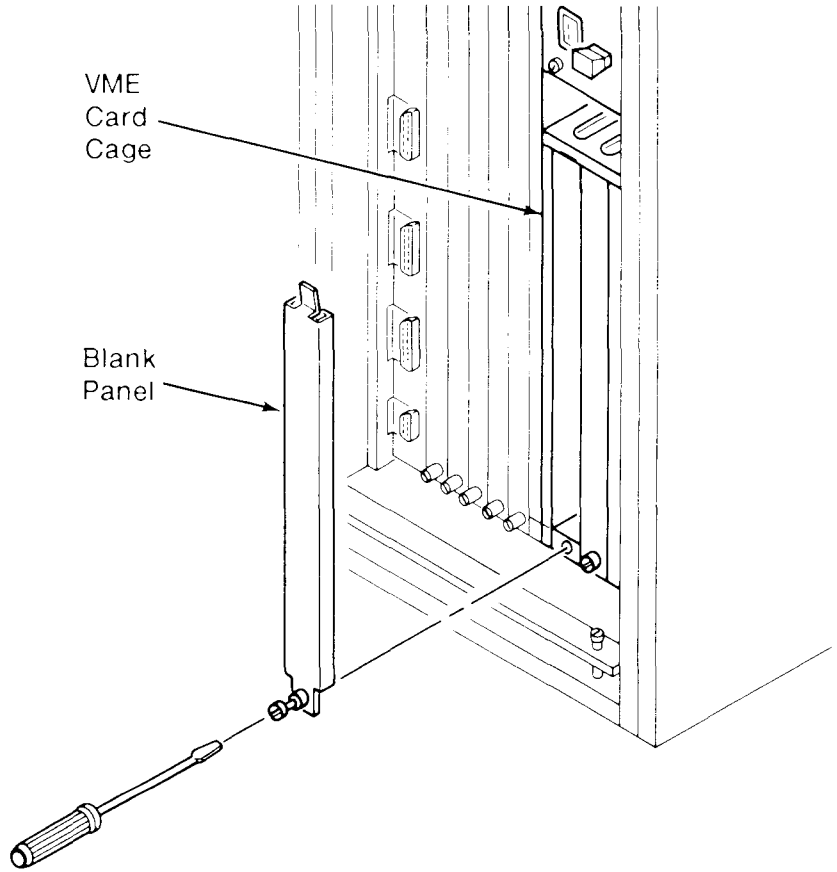


Figure 7-7. VME Card Cage Blank Panel Removal

3. Remove the VME Expansion board from its packing container.

Note It is easier to install VME Expansion boards if you first remove adjacent blank panels. Be sure, however, to replace the blank panels.

Some VME Expansion boards need to be configured before you install them in your system. If so, consult the manual accompanying the expansion board before continuing.

4. Slide the VME Expansion board into the VME card cage slot. For ease of seating the board into the backplane connector, jiggle the board vertically as you insert it.
5. Tighten the screws at the top and bottom of the board to secure it to the card cage.
6. If the VME Expansion board contains a bulkhead, you need not replace the blank panel. Otherwise, replace the blank panel by reversing the removal steps.

To make the board operable, remove the jumpers from behind the slots that contain VME Expansion boards.

1. Open the front door. Notice that the pins behind each VME card slot contain jumpers as shown in Figure 7-8.

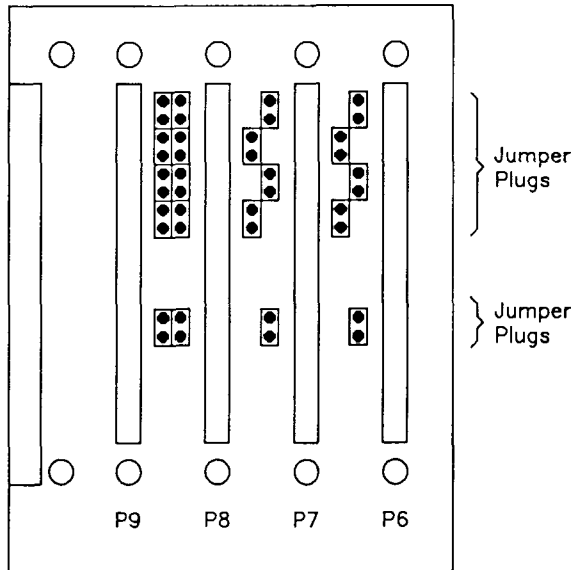


Figure 7-8. VME Card Cage Jumpers

2. Remove the jumpers from behind the slot into which you installed the VME Expansion board.

Note Leave the jumpers in place for those slots that do not contain VME Expansion boards.

CONNECTING PERIPHERALS

Refer to the manual for each VME Expansion board for information on connecting peripherals to the boards. Remember to route the cables under the strain relief clamp, as shown in Figure 7-9 (this is especially important for half-inch tape and SMD cables).

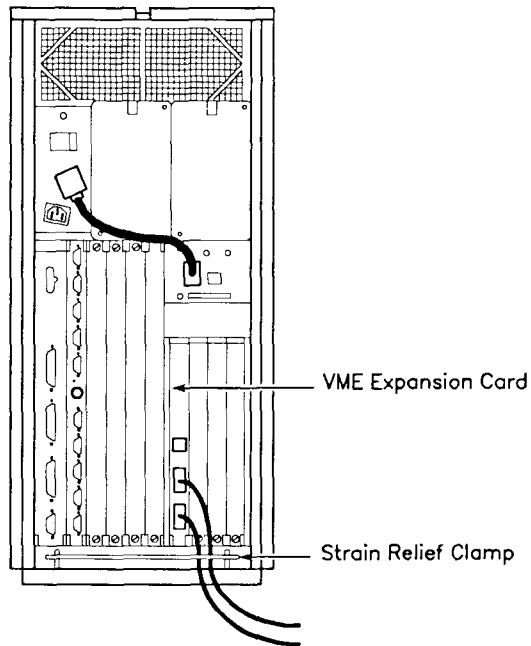


Figure 7-9. Routing VME Expansion Cables

POWERING DOWN YOUR SYSTEM _____

Power down your system as described in Chapter 5, “Powering Down and Restarting Your System.”

REMOVING PANELS ---

In order to install or remove hard disk drives in the S/320 or S/640, first power down your unit, follow the safety precautions in Chapter 2, and remove various panels.

Top Panels ---

Remove the top panel as follows:

1. Open the front door of your system.
2. Using a 1/4-inch hex nut driver, loosen the screw on the top panel latch. Rotate the screw counterclockwise, approximately one-half turn.
3. Push the top panel back about 1/2 inch to free the top panel from the cabinet. Lift the top panel straight up and off as shown in Figure 8-1.

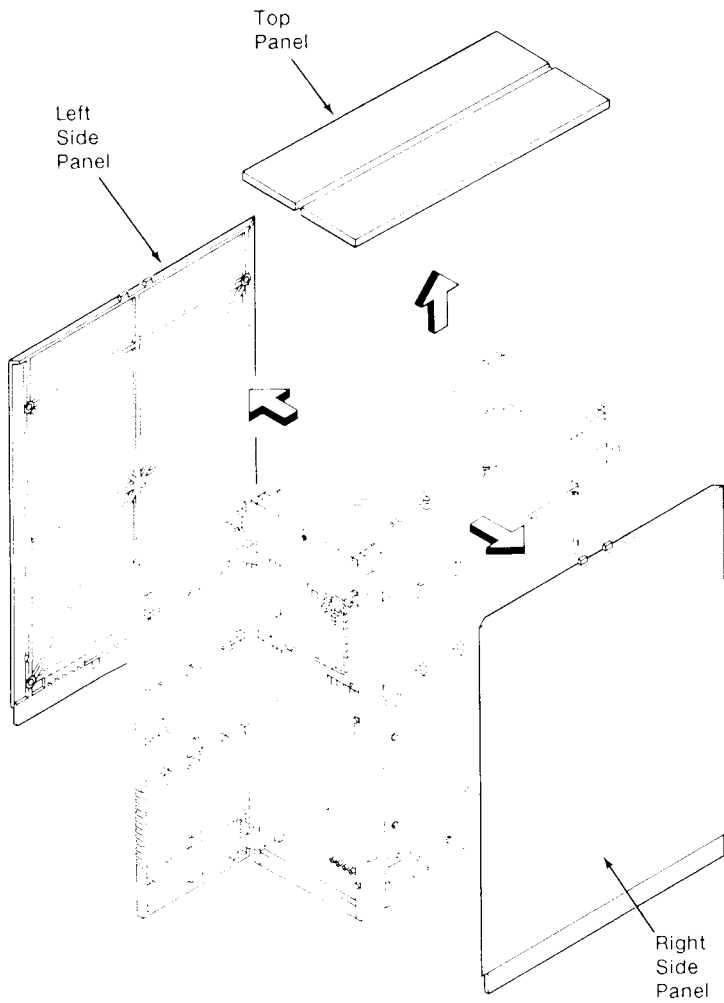


Figure 8-1. Removing the Top and Side Panels

4. Lay the panel aside.

Side Panels

Remove the side panels as follows:

1. Grasp each side of the panel, and lift it up 1/2 inch. Pull it toward you and away from the frame as shown in Figure 8-1.
2. Lay the panel aside.
3. Repeat this procedure to remove the other side panel.

Next, remove the inner side panels (shown in Figure 8-2). Each inner side panel is different. The side panel closest to the QIC tape drive has four tabs along the bottom edge that secure it to the CPU pan. The other panel has four differently notched tabs along its bottom edge that secure the panel to the frame. The procedure for removing each panel is the same.

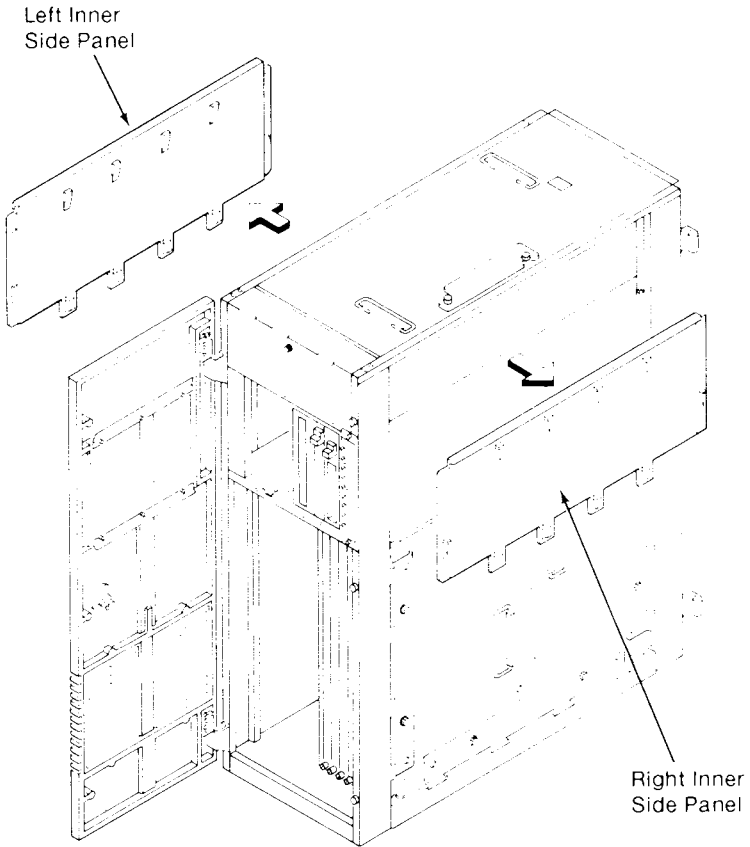


Figure 8-2. Removing the Inner Side Panels

Remove the inner side panel as follows:

1. Loosen (do not remove) the two screws that secure the inner panel to the frame.
2. Place your fingers under the lip of the panel and push up; then pull the panel toward you.
3. Lay the panel aside.
4. Repeat this procedure to remove the other inner side panel.

REMOVING DISK DRIVES ---

If you are upgrading one of the hard disk drives in your system, you need to remove the existing drive. First remove the front and side panels (as previously described) so you can access the drive and its cables.

Remove an existing drive as follows:

Warning Avoid electrical shock; disconnect the power cord from both your system and the AC outlet.

1. Disconnect the power cord and signal cable(s) attached to the rear of the drive.
2. Remove the cover plate in front of the drive.
3. Using your thumbs, gently push the drive inward.
4. While the drive is held inward, place a flat-bladed screwdriver in the slot beneath the lower locking tab; lift the tab to free it from the lock.

5. While lifting the tab upward, allow the drive to slide slightly forward until the locking tabs clear the chassis.
6. Grasp the drive on both sides and gently pull it out of the drive slot as illustrated in Figure 8-3.

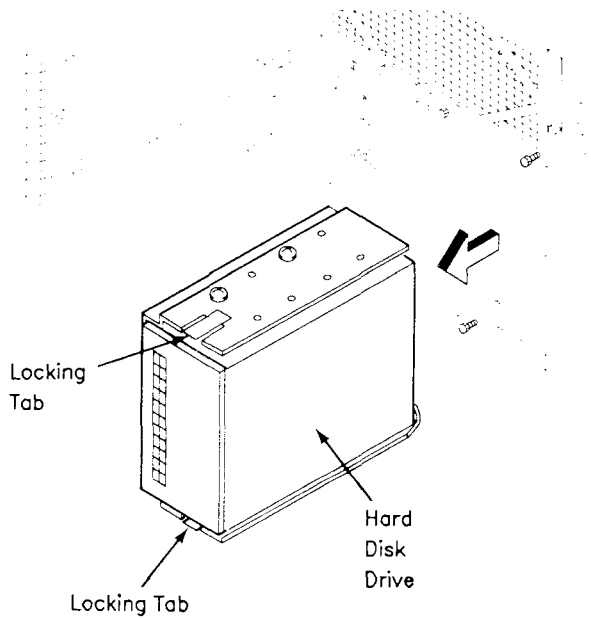


Figure 8-3. Removing Disk Drive

7. To install the new disk drive in the previously occupied slot, refer to the next section, “Installing a Disk Drive.” If no drive is to be reinstalled in this slot, install the cover plate.

INSTALLING A DISK DRIVE ---

Before a new drive is installed, it must be configured according to the instructions in Appendix H.

1. Remove the drive from its shipping container.
2. Remove the small plastic bag from the drive, and save the enclosed error map.

To perform the configuration procedure, you may need to remove the drive from its mounting bracket to access the component side of the drive.

Remove the drive from its mounting bracket as follows:

Note The following instructions apply to full height, half-height, and 3.5" drives.

1. Remove the two retaining screws from each side of the bracket as shown in Figure 8-4.

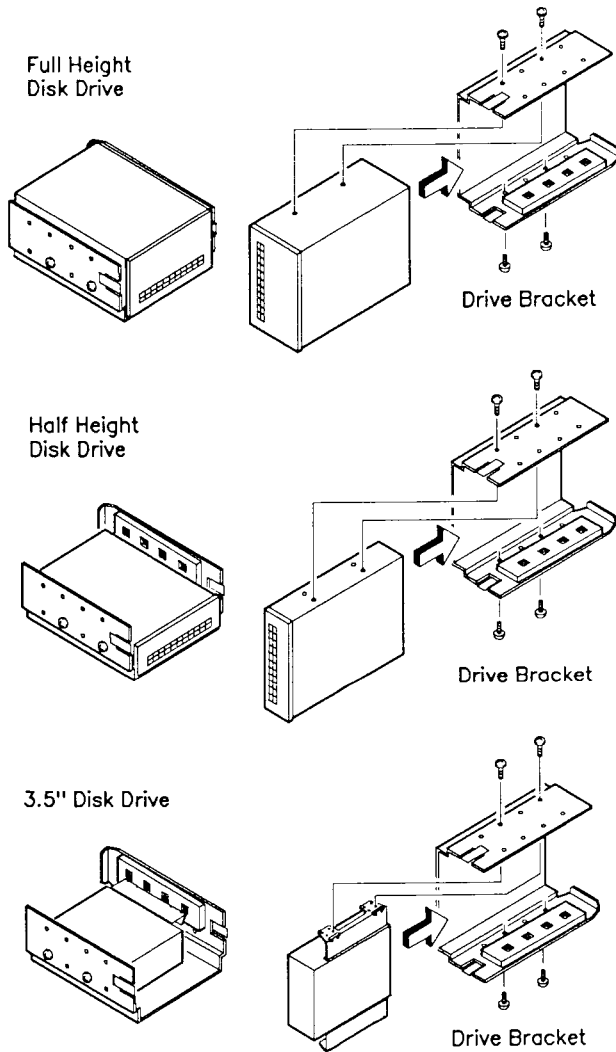


Figure 8-4. Mounting Bracket and Retaining Screws

2. Carefully slide the drive out of the bracket.
3. Configure the drive according to Appendix H.

When the drive is properly configured, reverse the removal steps to install the drive in the bracket. Refer to Figure 8-4 to locate the retaining screws in the appropriate holes. Note that all drives are installed in the bracket with HDA (head-drive assembly) on the open side of the bracket and the component side on the closed side of the bracket.

The second and third hard disk drives are installed in slots D1 and D2, respectively. Slot D1 is in the rear of the enclosure, next to the existing hard disk drive. Slot D2 is in the front of the enclosure, next to the tape drive.

Error maps for any installed disk drives are attached on the inside of the front and rear doors. They are located according to labels D0, D1, and D2.

Note Some systems do not have copies of their respective disk drive error maps attached to the inside of the front and rear doors. In these cases, remove the small plastic bag from the disk drive before you install it, and attach it to the correct position on the respective door.

If you are installing a drive in a previously unoccupied slot, perform the following steps:

1. Remove the cover plate from the drive slot.
2. Loosen the two screws that hold the plate in place with a 1/4-inch hex nutdriver and remove the plate as shown in Figure 8-5.

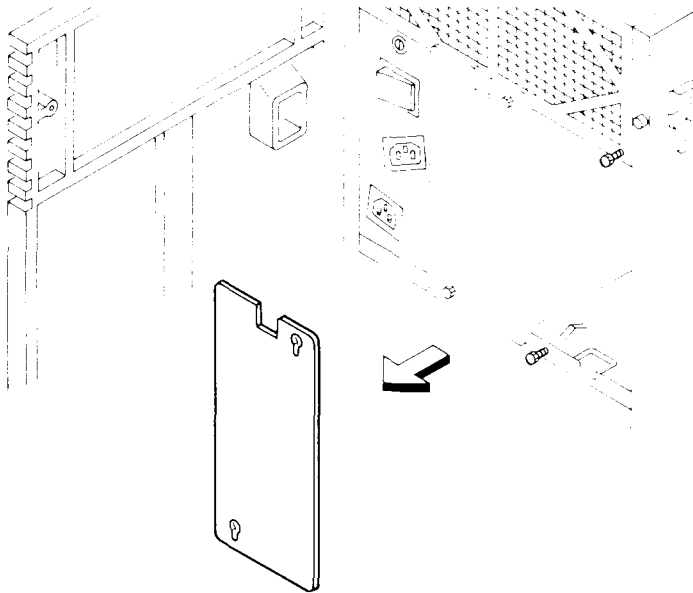


Figure 8-5. Removing the Cover Plate

3. Lay the plate aside, since you will replace it after the drive is installed.

Note Be sure to install the cover plates over both empty and occupied drive slots to assure proper cooling.

Install a disk drive as follows:

Warning Make sure that the power cord is disconnected from the system and the AC outlet.

1. Before installing a drive, make note of the orientation of pin 1 on the signal connector and the keying of the power connector on the back of the drive. (Visibility of these connectors is limited after the drive is installed in the chassis.)
2. Each drive slot contains raised guides along the top and bottom. Position the drive with pin 1 up or down (depending on manufacturer and/or slot location) per Table 8-1.

Table 8-1. S/640 Disk Drive Matrix

Drive	D0	D1	D2
Quantum 3.5 inch drive 80 MB	pin 1 up	pin 1 down	pin 1 up
Quantum 5-1/4 half H drive 80MB	pin 1 down	pin 1 up	pin 1 down
Quantum 140 MB full H	pin 1 up	pin 1 down	pin 1 up
Quantum 320MB full H	pin 1 up	pin 1 down	pin 1 up
ST-506 full H	pin 1 up	pin 1 up	pin 1 up

Note: Drive 0 upgrade may require slight repositioning of the power supply to provide clearance.

3. Slide the drive between the guides (as shown in Figure 8-6) until about 2 inches of the drive remains outside the enclosure.

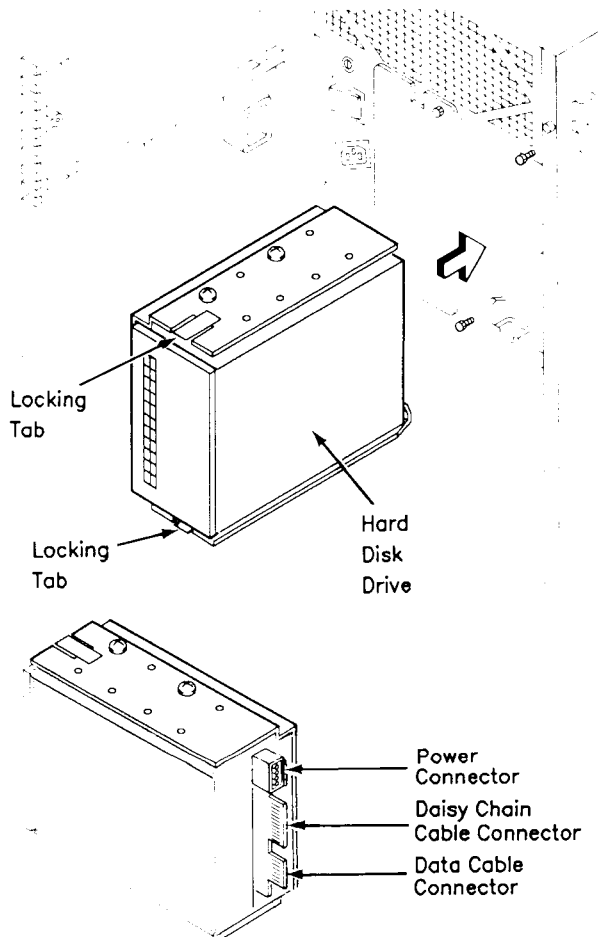


Figure 8-6. Installing the ST-506 Hard Disk Drive

Note It is easier to connect the cables in the enclosure to the disk drive before you slide the drive all the way into the slot. Leave about 2 inches of the disk drive outside the cabinet.

4. If the drive is an ST-506, attach the cables to the drive as shown in Figure 8-7. The 4-pin power cord attaches to the 4-pin connector. The 50-pin daisy chain cable attaches to the 50-pin connector on the drives.

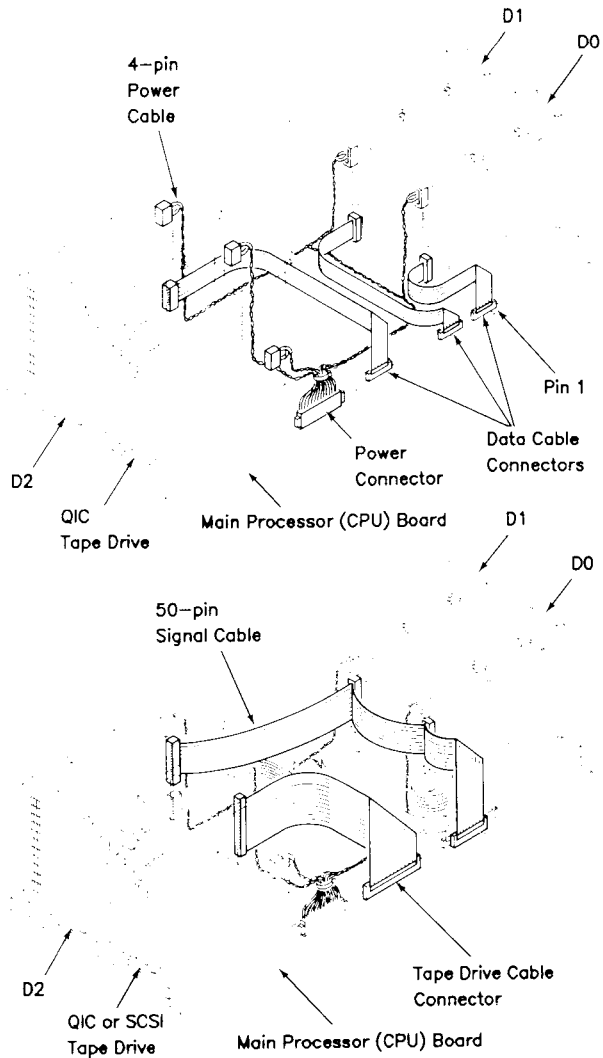


Figure 8-7. Connecting ST-506 Disk Drive Cables

5. For a SCSI drive, position the SCSI and power cables to match the keying on the drive. Do not force the cables. Figure 8-8 shows the SCSI disk drive cable connections for the S/640 only.

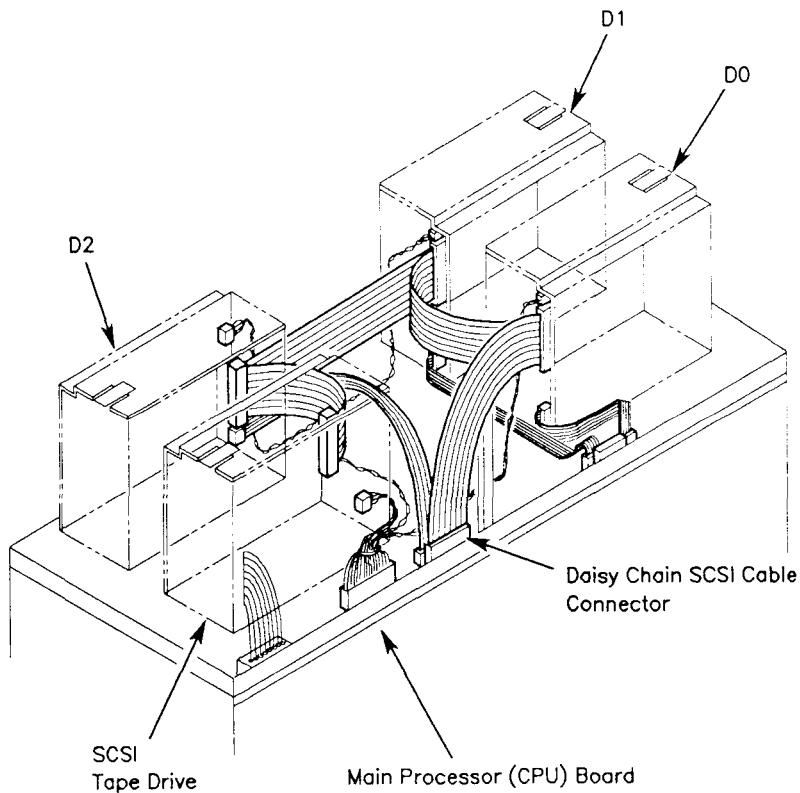


Figure 8-8. Connecting SCSI Disk Drive Cables (S/640)

6. Make sure that the cables lie between the drive and the vertical bar that is situated behind the drives.
7. Slide the drive all the way into the slot until the lower locking tab engages, indicating that the drive is securely in place.
8. Replace the cover plate over the newly installed drive.

Once the drives are securely in place:

1. Replace the inner side panels (recall that each one is different). Install the inner side panel with the four tabs next to the CPU pan assembly. Tighten the two screws that hold each panel in place.
2. Replace the side and top panels.

WHAT'S NEXT? _____

Refer to Chapter 5, “Powering Down and Restarting Your System,” for information on restarting your system.

APPENDIX A

System Status Codes

This appendix contains a summary of the S/320 and S/640 bootstrap sequence.

FRONT PANEL DISPLAY

The boot sequence is activated when the S/320 or S/640 is powered on or reset. The front panel, shown in Figure A-1, is identical for each system and contains the power on indicator and eight status LEDs.

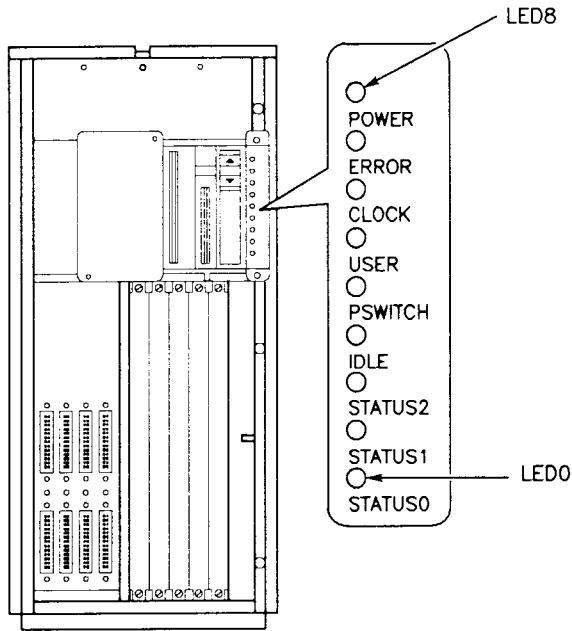


Figure A-1. S/320 and S/640 Front Panel

- LED4 through LED0 illustrate the boot sequence error and status codes. LED4 is the MSB; LED0 is the LSB.
- LED5 on indicates the CPU is executing from ROM. LED5 off indicates the CPU is executing from RAM. (During normal operation, LED5 on indicates the CPU is in User mode.)
- LED6 on indicates the CPU is executing LOADER in “C.” (During normal operation, LED6 is an idle status indicator.)
- LED7 is on when LED4 through LED0 display an error code; LED7 is off when LED4 through LED0 display a status code.

During the boot sequence, the eight status LEDs cycle through the bootstrap sequence. LED7 should be off (indicating the display is a status code and not an error code).

S/320 STATUS CODES

The steps in the following table describe the boot sequence. The step number refers to the LED status code that appears while the step is being executed. During some steps, the CPU executes more than one task.

Table A-1. S/320 Boot Status Codes

Code	Action Performed by CPU
00h	Reset LEDs. Open page 00h. Save CPU registers and memory map.
01h	Unused.
02h	Page RAM address pattern test, read/write.
03h	Page RAM inverse address pattern test, read/write.
04h	Page RAM 0B's pattern test, read/write.
05h	Page RAM 1B's pattern test, read/write.
06h	Save BSS.
07h	Enter C. Disable interrupts.
08h	Save crash dump table.
09h	Sizing memory.
0Ah	Attempt once to initialize tape controller. Go to 0Dh if successful.
0Bh	Reload EEPROM. Call VME initialization area. Make one attempt each to recalibrate all drives.
0Ch	Continue attempting to recalibrate drives. Will hang here if the QIC tape drive is non-operational. Will go to 0Eh when successful.
0Dh	Dump from memory to tape; then go to 10h.
0Eh	Search once for dump area on disks. If unsuccessful, go to 10h.

Table A-1. S/320 Boot Status Codes (continued)

Code	Action Performed by CPU
0Fh	Dump physical memory to disk.
10h	Base RAM address pattern test. Read/write without parity.
11h	Base RAM inverse address pattern test. Read/write without parity.
12h	Base RAM address pattern test. Read/write with parity.
13h	Base RAM inverse address pattern test. Read/write with parity.
14h	Base RAM address pattern with 0x1000000 test Read/write with parity.
15h	Expansion memory address pattern test. Read/write with parity.
16h	Expansion memory inverse address pattern test. Read/write with parity.
17h	Expansion memory address pattern with ORed bit test. Read/write with parity.
18h	Search QIC and onboard disks once for Loader. Go to 1Eh if successful.
19h	Rewrite EEPROM to memory. Attempt once each to recalibrate all drives. Go to 1C if successful.
1Ah	Continue attempting to recalibrate all drives.
1Bh	Unused.
1Ch	Search for Loader on all disks. Go to 1E when successful.
1Dh	Unused.
1Eh	Load Loader.
1Fh	Executing Loader (from QIC).

S/320 ERROR CODES

Table A-2 lists the bootstrap sequence error codes.

Table A-2. S/320 Boot Error Codes

Code	Status
01h	8259 read-back error.
02h	Base RAM read/write 0Bs and 1Bs at 0xFF0 failed.
03h	Unexpected NMI during memory sizing.
04h	QIC tape status shows fatal error.
05h	Not enough good physical memory to map loader (128K bytes required).
06h	NMI: Page frame number does not match expected number during memory sizing.
07h	Parity error during sizing on any memory board.
10h	Error during base RAM address pattern test. Read/write without parity.
11h	Error during base RAM inverse address pattern test. Read/write without parity.
12h	Error during base RAM address pattern test. Read/write with parity.
13h	Error during base RAM inverse address pattern test. Read/write with parity.
14h	Error during page RAM address pattern read/write test.
15h	Error during page RAM inverse address pattern read/write test.
16h	Error during page RAM address test.
17h	Error during page RAM 0B's pattern read/write test.
18h	Error during page RAM 1B's pattern read/write test.

Table A-2. S/320 Boot Error Codes (continued)

Code	Status
19h	Error during RAM address stack and BSS (b000 to 16000) read/write without parity test.
1Ah	Error during RAM inverse address stack and BSS (b000 to 16000) read/write without parity test.
1Bh	Error during RAM address and ORed 1B read/write without parity test.

S/640 BOOT SEQUENCE AND STATUS CODES

A system reset or power-up resets the General Control register, driving all of its outputs low. All of the LEDs illuminate, and bit 3, RT- (ROM Transpose), is asserted. Shortly after the reset pulse, the CPU outputs the reset address, \$00000000. RT- maps \$00000000 to \$80000000, the ROM base address.

The CPU obtains a longword vector address and stack value from \$80000000. The vector points to the starting address of the bootstrap routine. The CPU then begins executing the routine. Table A-3 gives the steps in the boot sequence. The step number refers to the LED status code that appears while the step is being executed. During some steps, the CPU executes more than one task.

Table A-3. S/640 Boot Status Codes

Code	Action Performed by CPU
00h	Negates RT- and resets all LEDs except LED5 + (in-PROM indicator). Initializes memory board(s). Tests location 0 in the memory cache (at \$48000000) to verify that the memory cache is functional. Saves internal register contents in the memory cache. Turns on the internal (CPU) instruction cache.
01h	Flushes the data cache through unmapped memory accesses, clearing all dirty bits.
02h	Tests the memory cache to verify that all dirty bits are cleared.
03h	Tests memory cache data RAMs (starting at \$48000000).
04h	Checks dirty bits at every memory cache location. All should be set.
05h	Tests memory cache tag RAMs. (This also initializes tags for step at code 0Ah, below.)
06h	Tests complete memory cache circuitry through unmapped accesses.
07h	Tests PTC tag RAMs.
08h	Tests PTC data RAMs.
09h	Tests DMA mapper RAMs.
0Ah	Tests memory cache through PTC; first initializes PTC tag and data RAMs, and then tests memory cache through PTC (starting at initialization starting address).
0Bh	Tests PROM BSS and stack area (first time that memory boards are checked).
0Ch	Tests PROM BSS and stack through MMU.
0Dh	Leaves assembler part of PROM.

Table A-3. S/640 Boot Status Codes (continued)

Code	Action Performed by CPU
0Eh	<p>Begins executing in C code. Turns on LED6.</p> <p>Makes a unity map and clears the BSS.</p> <p>Initializes RS-232-C channel 0, and prints out following message (which indicates that the CPU is executing from the PROM bootstrap program at the indicated version level):</p> <p>MightyFrame II Version X.X</p> <p>Masks out interrupts from the 8253 timer and tests the 8259 interrupt controller.</p>
0Fh	<p>Saves the contents of the crash dump table. (When it anticipates a crash, the CPU loads the crash dump table with Kernel status information.)</p>
10h	<p>Direct tests physical memory to determine memory size.</p>
11h	<p>Initializes the SCSI controller and attempts to read the volume home block off the SCSI peripheral (base system SCSI peripheral is QIC tape). If the tape contains a dump area, the CPU advances to step 14h.</p>
12h	<p>Turns off the internal instruction cache and then checks to see if the VME Interface board EEPROM is available. If it is, the CPU copies the contents of the EEPROM to memory and then turns the cache back on. The CPU makes one attempt each to recalibrate the tape and disks in the following order:</p> <ol style="list-style-type: none">1. SCSI peripheral (QIC tape)2. Onboard disk3. Bootable VME disks (if one is present; EEPROM directed) <p>If the CPU is successful, it goes to step 15h.</p>

Table A-3. S/640 Boot Status Codes (continued)

Code	Action Performed by CPU
0Eh	Begins executing in C code. Turns on LED6.
13h	Continues to try to recalibrate a tape or disk, meanwhile displaying the code 13h. When successful, the CPU goes to step 15h.
14h	If tape contained a dump area (from step 11h), the CPU dumps memory to tape and then advances to step 17h.
15h	The CPU searches for a dump area on onboard disks, then VME disks, examining each disk once. If the CPU cannot find a disk dump area, it advances to step 17h.
16h	Dumps memory to disk.
17h	Tests physical memory.
18h	Searches for a loader program (Loader) on tape or an onboard disk, examining each drive once. If the CPU finds Loader, it goes to step 1Eh.
19h	Turns off the internal instruction cache and then checks to see if the VME Interface board EEPROM is available. If it is available, the CPU copies the contents of the EEPROM to memory and then turns the internal cache back on. The CPU makes one attempt each to recalibrate the tape and disks in the following order: <ol style="list-style-type: none">1. SCSI peripheral (QIC tape)2. Onboard disk3. Bootable VME disks (if one is present, under direction of the EEPROM) The CPU advances to step 1Ch if it is successful.
1Ah	The CPU continues to try to recalibrate a tape or disk drive, meanwhile displaying the code 1Ah. The CPU advances to step 1Ch, if it can recalibrate a tape or disk.
1Bh	Not used.

Table A-3. S/640 Boot Status Codes (continued)

Code Action Performed by CPU

1Ch The CPU searches for Loader in the following order.

1. SCSI peripheral (QIC tape)
2. Onboard disk
3. Bootable VME disks (if present, under direction of the EEPROM)

The CPU advances to step 1Fh when it finds Loader.

1Dh Not used.

1Eh The CPU loads Loader.

1Fh The CPU begins executing from LOADER. The bootstrap sequence is completed.

S/640 ERROR CODES

Table A-4 lists the bootstrap sequence error codes.

Table A-4. S/640 Boot Error Codes

Code	Status (Boot Sequence Step)
00h	Memory cache is not functional (00h)
02h	Dirty bits did not clear (02h)
03h	Bad memory cache data RAMs (03h)
04h	Dirty bits did not set (04h)
05h	Bad memory cache tag RAMs (05h)
06h	Bad memory cache RAMs (06h)
07h	Bad PTC tag RAMs (07h)
08h	Bad PTC data RAMs (08h)
09h	Bad DMA mapper (09h)
0Ah	Failed memory-cache-through-MMU test (0Ah)
0Bh	Bad memory (0Bh)
0Ch	Failed memory-through-MMU test (0Ch)
0Eh	8259 read-back error
0Fh	Unexpected NMI during sizing
10h	SCSI tape shows fatal error
11h	Not enough physical memory for Loader*
12h	NMI†
13h	Hard memory error during sizing
14h	Memory board test error

*128K bytes of good memory are required.

†Page frame number does not match expected number, created during memory sizing.

APPENDIX B

S/320 and S/640 Specifications

This appendix contains two tables that summarize the power and environmental requirements and physical measurements of the S/320 and S/640.

Table B-1 lists the environmental and power specifications.

Table B-1. Power and Environmental Requirements

115 volts	
Voltage range	85 to 130 Vrms 8A
Frequency range	47-63 Hz
230 volts	
Voltage range	180 to 260 Vrms 4A
Frequency range	47-63 Hz
Temperature	
Operating	10°C to 40°C
Non-operating	-40°C to 60°C
Humidity (Relative, Noncondensing)	
Operating	20% to 80% RH
Non-operating	5% to 95% RH
Altitude	
Operating	0 to 10,000 feet
Non-operating	0 to 30,000 feet

Table B-2 lists the specifications for the cabinet.

Table B-2. Cabinet Measurements

Cabinet	Height	Width	Depth
Base	29 inches 73.66 cm	11.5 inches 29.21 cm	26 inches 66.04 cm
X-Box or V-Box	29 inches 73.66 cm	16 inches 40.64 cm	26 inches 66.04 cm

APPENDIX C

Cable Specifications

This appendix provides a list of Convergent's peripherals and cables that are fully compatible with the S/320 and S/640 systems.

This appendix also defines specific hardware and software characteristics applicable to the S/320 and S/640 for the following:

- Parallel printer interface
- RS-232-C communications interface
- RS-422 cluster communications interface
- SCSI interface
- UPS interface

For each interface, the following is provided; a description of its function and pin assignments, cabling diagrams, and a list of parts required to build the cable.

A list of recommended vendors for cables and cable hardware is included at the end of this appendix.

Note To ensure compliance with FCC and VDE emissions regulations, peripherals connected to the S/320 or S/640 systems must use Convergent Technologies (or equivalent) recommended terminators and cables. The cables incorporate special bulk cable and shielding terminations (that is, 360° shielding from connector shell to connector shell with low energy leakage). Off-the-shelf cables and terminators may not provide the shielding required to meet FCC and VDE emissions requirements. It is the user's responsibility to do whatever testing is required to assure overall system compliance.

CONVERGENT PERIPHERALS AND CABLES

This section contains a current list of Convergent-built peripherals and cables for the S/320 or S/640 computer systems.

Convergent Peripherals

A list of peripherals and model numbers follows:

- Terminals: TO-250 and TO-300
- Serial Printers: CT-2425S, CT-2426S
- Parallel Printers: CT-2425P, CT-2426P
- Document Printer: CT-2450
- System Printer: CT-2475
- Modem: DC-2400
- Uninterruptible Power Supply: UPS-1200

(Consult your Convergent sales representative for products released after the publication of this manual.)

Convergent Cables ---

A list of Convergent cables and model numbers follows:

Connects TO-250 Terminal to S/320 or S/640:

- PC-610: 25-pin host/25-socket for terminal main port
- PC-615: 9-pin host/25-socket for terminal main port
- PC-600: 25-pin host/25-pin for terminal auxiliary port
- PC-605: 9-pin host/25-pin for terminal auxiliary port

Connects TO-250 Terminal to Convergent Serial Printers:

- PC-600: 25-pin auxiliary port/25-pin printer
(for CT-2425S, -2426S, -2450, -2475)

Connects TO-250 Terminal to Convergent Modem:

- PC-640: 25-pin auxiliary port/25-pin modem
(DC-2400)

Connects TO-300 Terminal to S/320 or S/640:

- PC-600: 25-pin host/25-pin for terminal main port
- PC-605: 9-pin host/25-pin for terminal main port

- PC-620: 25-pin host/9-socket for terminal auxiliary port
- PC-675: 9-pin host/9-socket for terminal auxiliary port

Connects TO-300 Terminal to Convergent Serial Printers (RS-232-C):

- PC-620: 9-socket auxiliary port/25-pin printer (for CT-2425S, -2426S, -2450, -2475)

Connects TO-300 Terminal to Convergent Parallel Printers (Centronics):

- PC-660: 25-pin Centronics port/36-edge card printer (CT-2425P, -2426P, -2450, 2475)

Connects TO-300 Terminal to Convergent Modem:

- PC-645: 9-socket auxiliary port/25-pin modem (DC-2400)

Connects Serial Printers (RS-232-C) CT-2425S, -2450, -2475 to S/320 or S/640:

- PC-600: 25-pin host/25-pin printer
- PC-605: 9-pin host/25-pin printer

Connects Parallel Printers (Centronics) CT-2425P, -2450, -2475 to S/320 or S/640:

- PC-630: 25-pin host/36-edge card printer

Connects Modem DC-2400 to S/320 or S/640:

- PC-635: 9-pin host/25-pin modem
- PC-640: 25-pin host/25-pin modem

Connects UPS to S/320 or S/640:

- PC-650: 9-socket host/9-socket UPS

Consult your Convergent sales representative for cables manufactured after the publication of this manual.

PARALLEL PRINTER INTERFACE _____

The parallel printer interface provides a Centronics-compatible interface to parallel-interface printers. The parallel line printer can be connected to the connectors that are labeled Parallel Printer on the Main Processor board, the RS-422 Expansion board, and the IOP Expansion board.

Parallel Printer Interface Signals _____

The parallel printer interface supports the signals listed in Table C-1.

Table C-1. Parallel Printer Interface Signals

Signal	Function
LPD0+ to LPD7+	Eight bits of data sent from the S/320 or S/640 to the printer.
LPTSTROBE-	Handshake line from the S/320 or S/640 to the printer.
LPTACK-	Acknowledge signal from the printer to the S/320 or S/640 indicating that a character has been accepted and that another one can be sent.
LPTBUSY+	Status line to the S/320 or S/640 indicating that the printer cannot currently accept data.
LPTNOPAPER+	Status line to the S/320 or S/640 indicating that the printer is out of paper.
LPTSELECT+	Status line to the S/320 or S/640 indicating that the printer has been selected, has paper, and is ready to print.

Parallel Printer Cabling

The parallel printer cable connects parallel printers to the S/320 or S/640. Figure C-1 gives the pin connections for this cable.

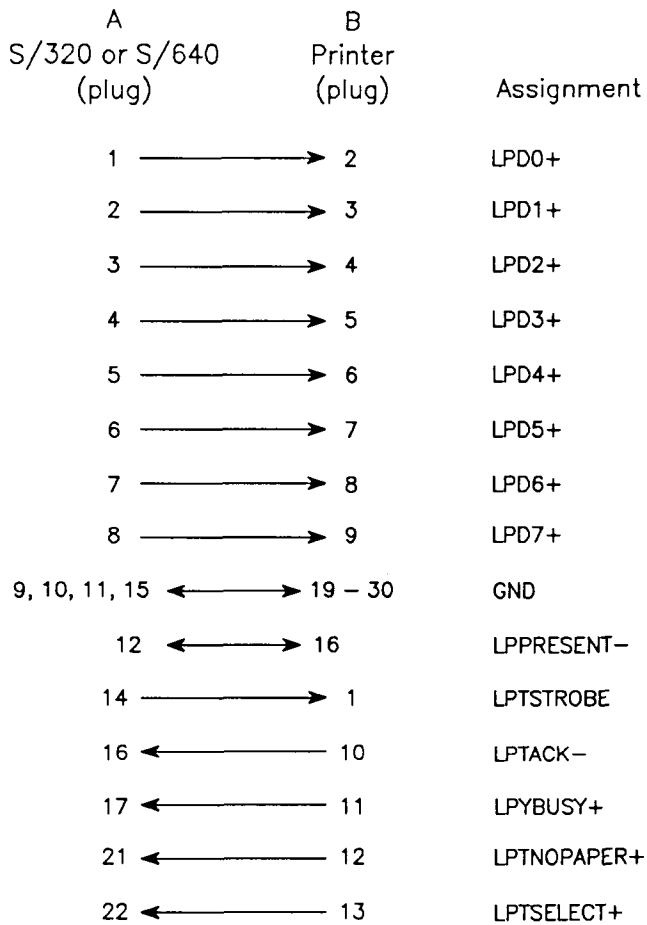


Figure C-1. Parallel Printer Cable Pin Connections

Figure C-2 illustrates assembly of this cable.

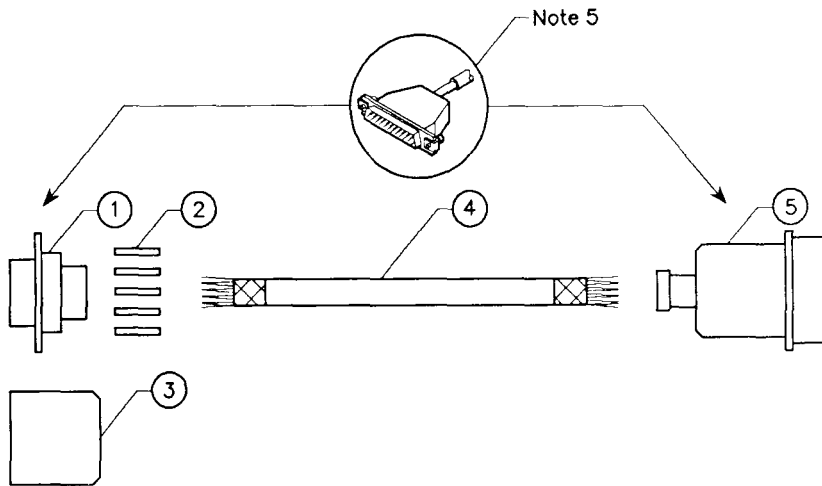


Figure C-2. Parallel Printer Cable Assembly

Table C-2 lists the parts required to construct this cable.

Table C-2. Parallel Printer Cable Parts List

Item	Quantity	Description
1	1	25-pin D-type plug assembly (male). Use AMP part number 207464-2 or equivalent.
2	25	Connector contacts. Use AMP part number 66507-3 or equivalent.
3	1	Connector shell and strain relief. Use AMP part number 745173-3 or equivalent.
4	10 feet	30-conductor shielded cable. Use Alpha part number 5279/15 or equivalent.
5	1	36-pin Blue Ribbon type connector assembly (male). Use AMP part number 57-30360 or equivalent.
6	as required	Copper foil (part number 80-00025).

When constructing the parallel printer cable, note the following:

1. The chassis ground must be connected to the shield drain wire at both ends.
2. A twisted pair consists of a signal and ground.
3. All four unused connectors must be connected to ground at both ends.

4. The vinyl insulation must be stripped back at the 36-pin printer connector so that the metal strain relief clamps down on the conducting shield.
5. Wrap foil around wires. Solder copper foil to the braid and metal connector shell around the entire periphery.
6. The cable can be 10 feet (3 meters) maximum. Longer cables must be approved by the printer manufacturer.

RS-232-C COMMUNICATIONS INTERFACE

The Main Processor (CPU) board contains two RS-232-C communications channels that allow asynchronous and synchronous communications. Both channels contain 25-pin connectors and are capable of 9600 baud. The RS-232-C Expansion boards contain ten or twenty 9-pin channels that allow asynchronous communications at 9600 baud. The Ethernet Combo board contains six 9-pin channels that allow asynchronous communications at 9600 baud.

RS-232-C communications control is handled by programmable, dual-channel, full-duplex 8530 Serial Communications Controllers (SCCs). SCCs accept data from the CPU in parallel format and convert it into a continuous serial data stream for transmission.

RS-232-C Interface Signals ---

Table C-3 lists the signals supported by the RS-232-C channels:

Table C-3. RS-232-C Interface Signals

Signal	Function
Transmit Data	Data transmitted to the data communications equipment (DCE).
Request to Send	Transition from 0 to 1 commands the DCE to enter the transmit mode; the DCE responds by activating Clear to Send line.
Data Terminal Ready	Indicates to DCE that communications channel is online and ready to operate.
Receive Data	Data received by the DCE.
Clear to Send	Indicates to the communications channel that the DCE is ready to transmit data.
Data Set Ready	Indicates to the communications channel that the DCE is online and ready to operate.
Carrier Detect	Indicates to the communications channel that a signal is being received.
Ring Indicator	Indicates to the communications channel that a ringing signal is being received.

RS-232-C Cabling

Two types of cables can be connected to the RS-232-C channels on the S/320 or S/640: straight and crossed.

- Straight cables – connect DCE to the S/320 or S/640. Some modems are data terminal equipment (DTE) and require crossed cables. Refer to the manufacturer's specifications to determine the type of modem you are connecting.
- Crossed cables – connect DTE, such as terminals and serial printers, to the S/320 or S/640.

RS-232-C crossed cables with 25-pin connectors on each end are required to connect terminals to the Main Processor (CPU) board. RS-232-C cables, straight or crossed, with 25-pin connectors on one end and 9-pin connectors on the other end are required to connect terminals, serial printers, or modems to an RS-232-C Expansion board.

STRAIGHT 25-PIN TO 25-PIN RS-232-C CABLE

The RS-232-C communications cable is a straight 25-pin to 25-pin cable. It connects modems (DCE) to 25-pin RS-232-C connectors on the Main Processor (CPU) board. Figure C-3 gives the pin connections for asynchronous and Figure C-4 gives the pin connections for synchronous applications.

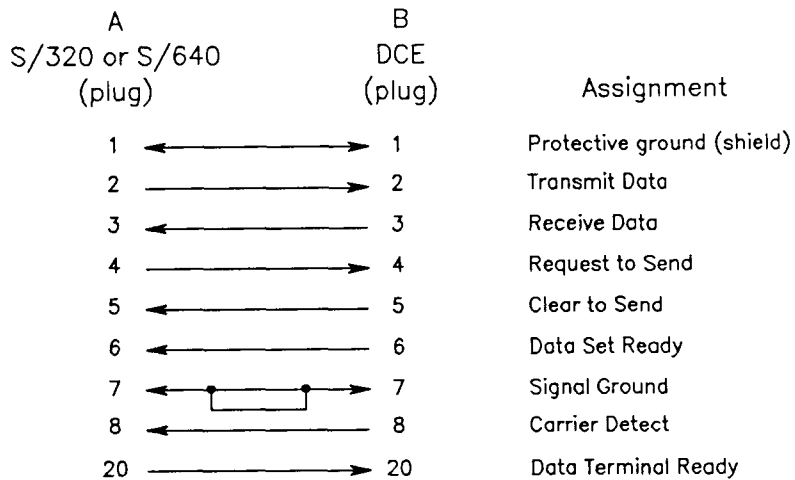
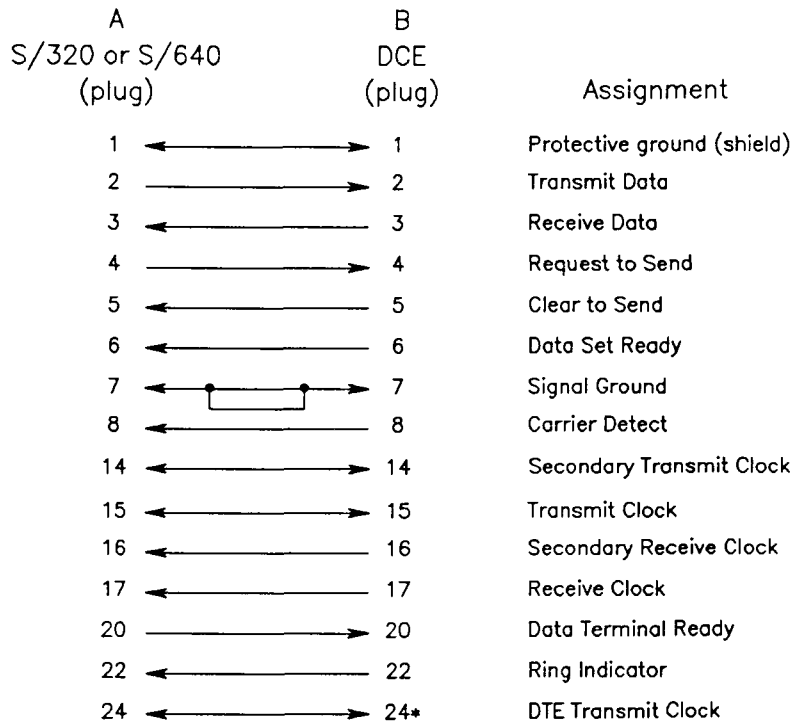


Figure C-3. Asynchronous RS-232-C Connections



* Pin 24 is not gated in the S/320 or S/640. If it is not used in your application, do not connect it.

Figure C-4. Synchronous RS-232-C Connections



Figure C-5 illustrates how to construct this cable.

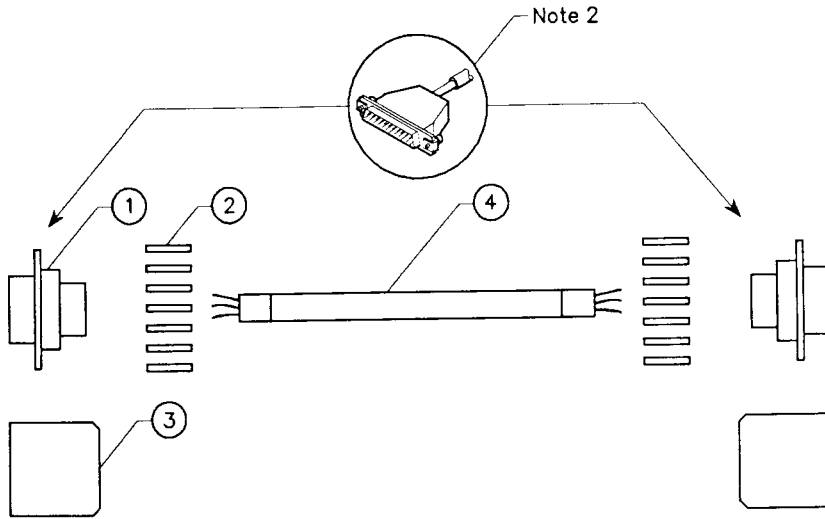


Figure C-5. Straight RS-232-C Cable Construction

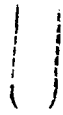


Table C-4 lists the parts required to construct this cable.

Table C-4. Straight RS-232-C Cable Parts List

Item	Quantity	Description
1	1	25-pin D-type plug assembly (male). Use AMP part number 207464-2 or equivalent.
2	18	Connector contacts. Use AMP part number 66507-3 or equivalent.
3	1	Connector shell, strain reliefs, and grounding. Use AMP part number 745173-3 or equivalent.
4	25 feet	10-conductor shielded cable. Use Alpha part number 5120 or equivalent.
5	as required	Copper foil (part number 80-00025).

When constructing the straight RS-232-C cable, note the following:

1. To meet ESD performance requirements, the minimum length of this cable is 25 feet (7.62 meters). To meet system performance specifications, the maximum length of this cable is 50 feet (15 meters).
2. Wrap foil tape around wires. Solder copper foil to the braid and metal connector shell around the entire periphery.

STRAIGHT 25-PIN TO 9-PIN RS-232-C ADAPTER CABLE

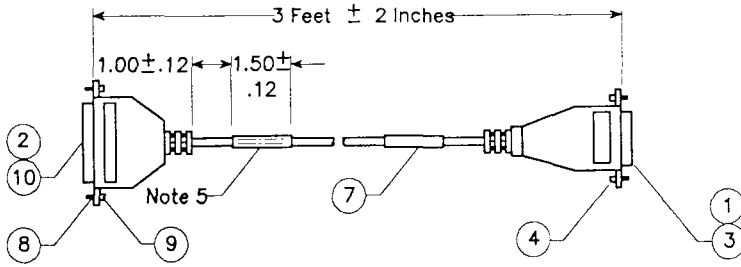
The straight RS-232-C adapter cable connects a 25-pin, RS-232-C straight cable to 9-pin channels on an RS-232-C Expansion board. Figure C-6 gives the pin connections for this cable.

A S/320 or S/640 (9-pin plug)	B DCE (25-pin socket)	Assignment
1	2	Transmit Data
2	4	Request to Send
3	6	Data Set Ready
4	20	Data Terminal Ready
5	8	Carrier Detect
6	3	Receive Data
7	5	Clear to Send
8	7	Ground

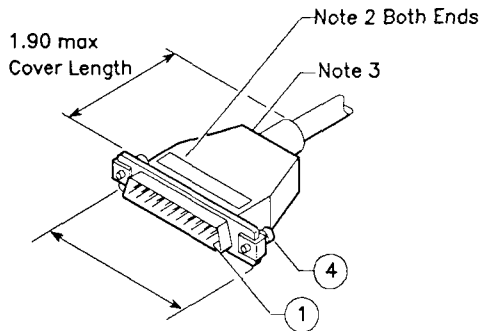
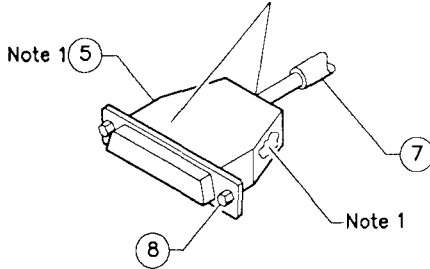
Figure C-6. Straight RS-232-C Adapter Construction

Figure C-7 illustrates how to construct this cable.





Crimp Style Ferrule or Solder Flow for 360°
 Connection Between Braid and Metallic Shield and
 Between Connector and Metallic Shield



1.250 max (9pos)/2.125 max (25 pos)
 Cover Overlap to Connector Shell (if Used)

Figure C-7. Straight RS-232-C Adapter Connections

Table C-5 lists the parts required to construct this cable.

Table C-5. Straight RS-232-C Adapter Parts List

Item	Quantity	Description
1	8	Contact, crimp pin
2	1	25-position, D-type, socket assembly
3	1	9-position, D-type, plug assembly
4	2	Screw and retainer (male)
5	1 foot	Copper foil tape
6	2 feet	Black copper wire, 300V
7	3 feet	3-conductor shielded cable
8	2	Screw lock (4-40)
9	2	Hex nut (4-40)
10	8	Socket, crimp pin (female)

When constructing the straight RS-232-C adapter cable, note the following:

1. Primary conductors must be fully encompassed and strain relieved by inner mold. Copper foil shield must cover inner mold.
2. Permanently mark part number, dash number, and revision level approximately where shown.

3. Molded cover; material, polyvinyl chloride or equivalent rated UL 94HB or better. Appearance of mold may vary within the noted dimensions. Cable jacket must be fully encompassed and strain relieved by molded cover.
4. Place a 1-1/2-inch piece of green colored shrink tubing (Raychem Versafit or equivalent) at both ends of the cable. Permanently mark on shrink tubing "RS-232-C Only" in black characters that are at least 9/10-inch high to avoid confusion with RS-422 9-pin connectors.

CROSSED 9-PIN TO 25-PIN RS-232-C ADAPTER CABLE

This cable connects DTE equipment to an RS-232-C Expansion board. Figure C-8 gives the pin connections for this cable.

APPENDIX C

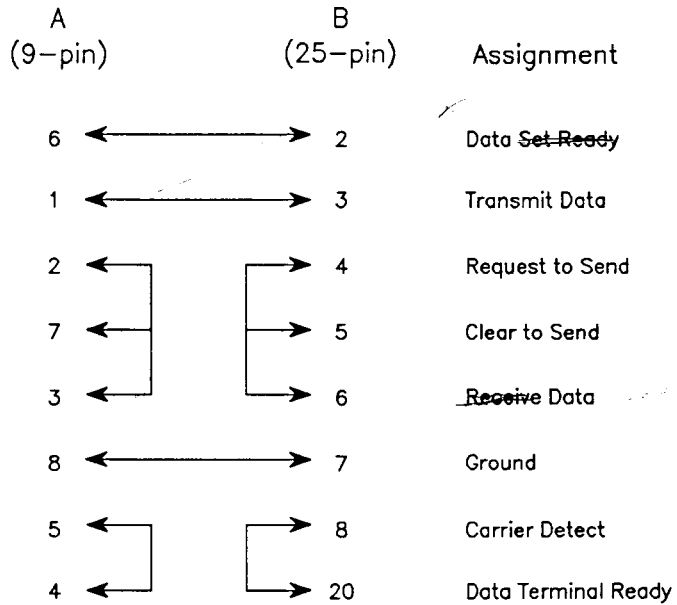
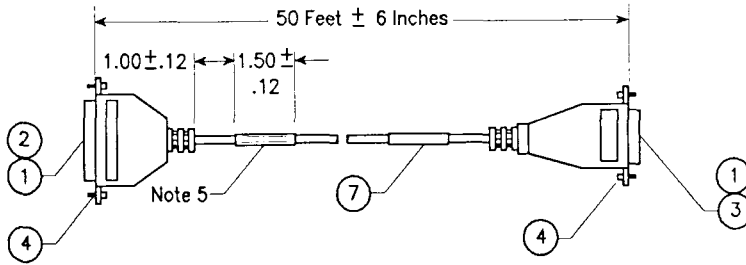


Figure C-8. Crossed RS-232-C Adapter Connections

Figure C-9 illustrates how to build this cable.



Crimp Style Ferrule or Solder Flow for 360°
 Connection Between Braid and Metallic Shield and
 Between Connector and Metallic Shield

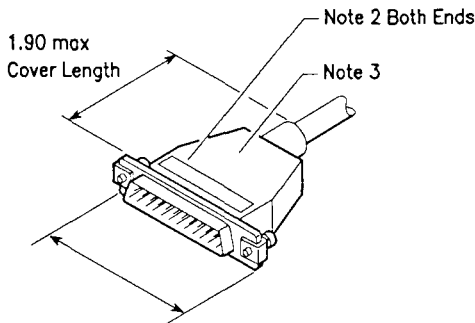
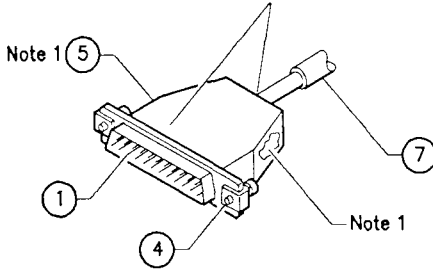


Figure C-9. Crossed RS-232-C Adapter Construction

Table C-6 lists the parts required to construct this cable.

Table C-6. Crossed RS-232-C Adapter Parts List

Item	Quantity	Description
1	16	Contact, crimp pin
2	1	25-position, D-type, socket assembly
3	1	9-position, D-type, plug assembly
4	4	Screw and retainer (male)
5	as required	Copper foil tape
6	2 feet	Black copper wire, 300V
7	3 feet	3-conductor shielded cable

When constructing the crossed RS-232-C adapter cable, note the following:

1. Primary conductors must be fully encompassed and strain relieved by inner mold. Copper foil shield must cover inner mold.
2. Permanently mark part number, dash number, and revision level approximately where shown.

3. Molded cover; material, polyvinyl chloride or equivalent rated UL 94HB or better. Appearance of mold may vary within the noted dimensions. Cable jacket must be fully encompassed and strain relieved by molded cover.
4. Place a 1-1/2-inch piece of green colored shrink tubing (Raychem Versafit or equivalent) at both ends of the cable. Permanently mark on shrink tubing "RS-232-C Only" in black characters that are at least 9/10-inch high to avoid confusion with RS-422 9-pin connectors.

CROSSED 25-PIN TO 25-PIN RS-232-C CABLE

This cable connects DTE equipment to 25-pin connectors on the Main Processor (CPU) board. Figure C-10 gives the pin connections for this cable.

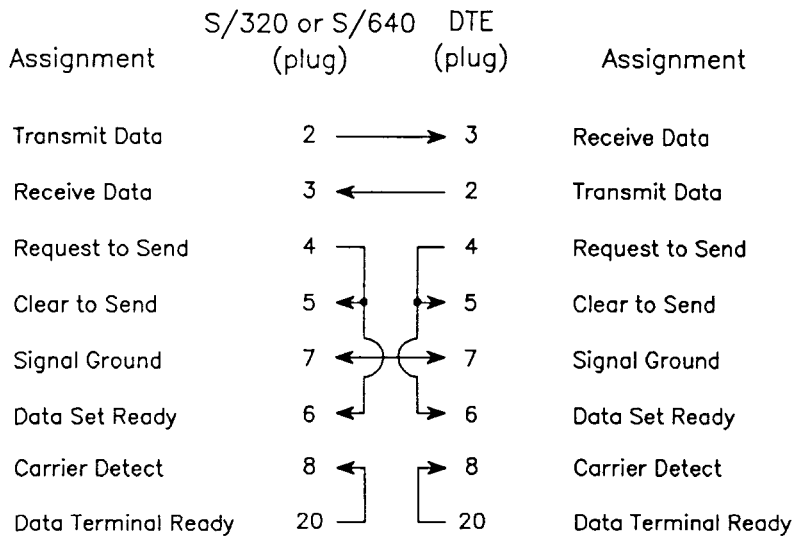
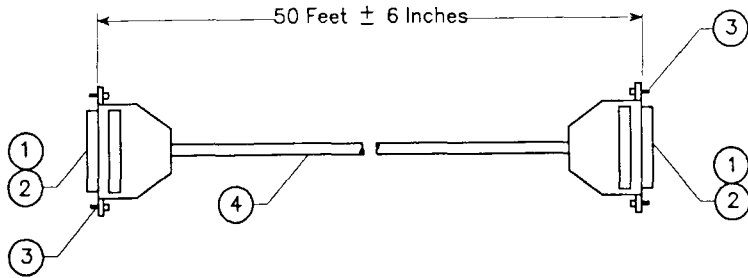


Figure C-10. Crossed RS-232-C Cable Connections

Figure C-11 illustrates how to construct this cable.



Crimp Style Ferrule or Solder Flow for 360°
 Connection Between Braid and Metallic Shield and
 Between Connector and Metallic Shield

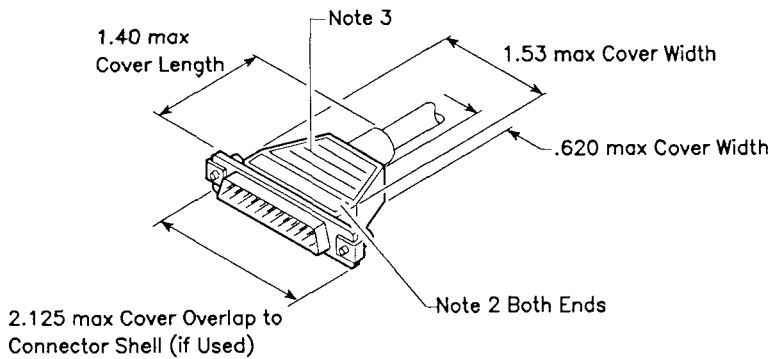
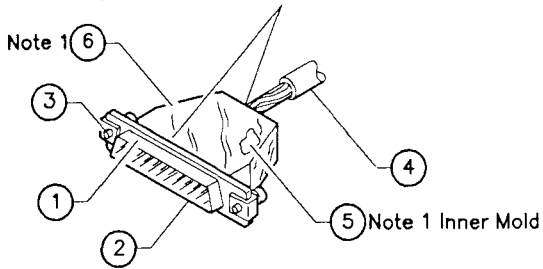


Figure C-11. Crossed RS-232-C Cable Construction

Table C-7 lists the parts required to construct this cable.

Table C-7. Crossed RS-232-C Cable Parts List

Item	Quantity	Description
1	2	25-pin plug assembly (male). Use AMP part number 207464-2 or equivalent.
2	16 or 18	Connector contacts. Use AMP part number 66507-3 or equivalent.
3	2	Connector shell, strain reliefs, and grounding. Use AMP part number 745173-3 or equivalent.
4	25 feet	3-conductor shielded cable. Use Alpha part number 5114 or equivalent.
5	2	Inner crimp ferrule. Use AMP part number 2-745129-1.
6	2	Outer crimp ferrule. Use AMP part number 745130-8.

When constructing the straight RS-232-C adapter cable, note the following:

1. Data terminal devices that have metal connectors use Convergent Technologies RS-232-C cable, part number 61-00302, or equivalent.
2. If the DTE has a plastic shell connector, pin 1 must be connected at both ends for proper grounding.

RS-422 CLUSTER COMMUNICATIONS INTERFACE _____

RS-422 terminals are connected in a daisy chain configuration to cluster channels on the RS-422 Expansion board. Each cluster channel on the board can support up to eight RS-422 terminals.

RS-422 Interface Signals _____

The RS-422 interface uses the following signals:

- CLK+
- CLK-
- DATA+
- DATA-
- GND

RS-422 Cluster Communications Cabling _____

The sections below describe how to build the following RS-422 cables:

- RS-422 cable
- RS-422 terminator
- RS-422 cable splice

RS-422 CABLE _____

This cable connects RS-422 terminals to the RS-422 Expansion board. Figure C-12 gives the pin connections for this cable.

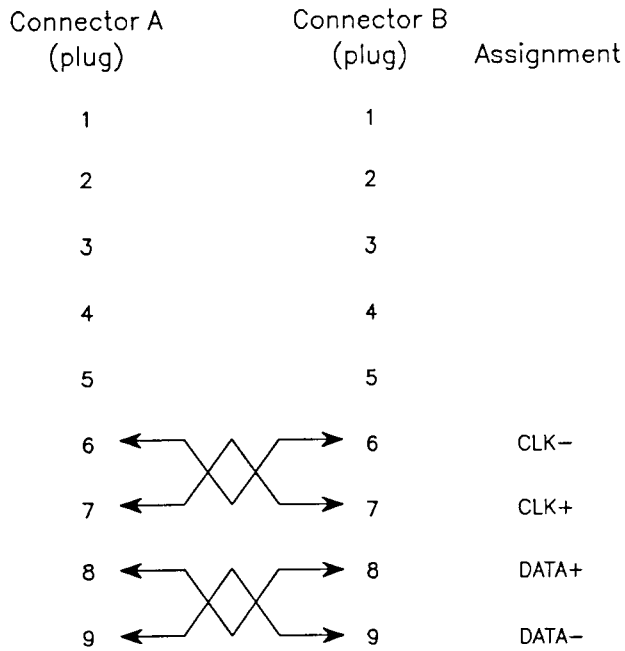
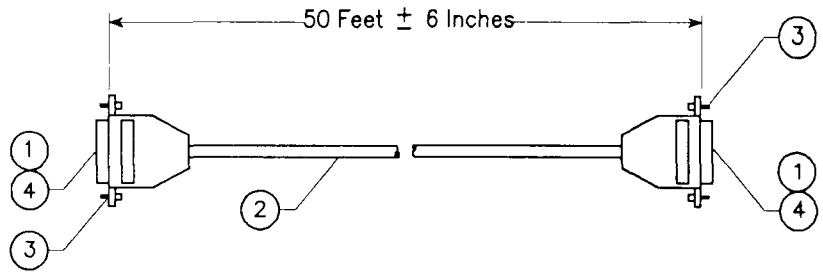


Figure C-12. RS-422 Cable Connections

Figure C-13 illustrates how to construct this cable.



Crimp Style Ferrule or Solder Flow for 360°
 Connection Between Braid and Metallic Shield and
 Between Connector and Metallic Shield

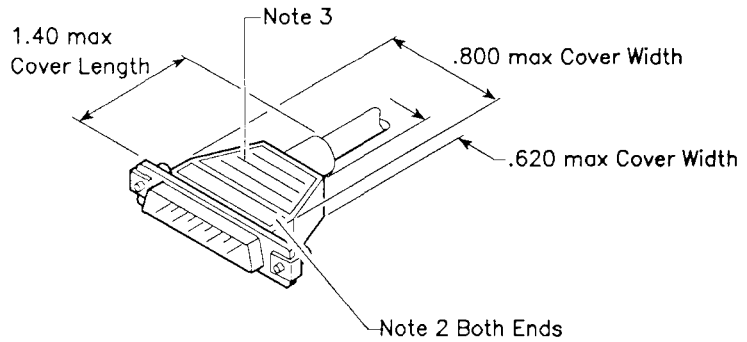
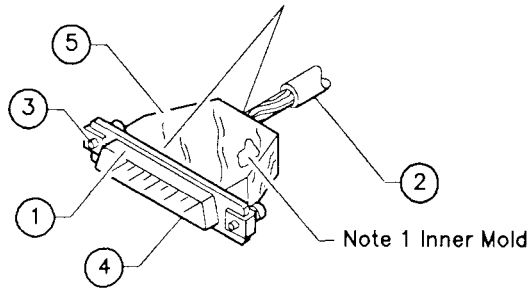


Figure C-13. RS-422 Cable Construction

Table C-8 lists the parts required to construct this cable.

Table C-8. RS-422 Cable Parts List

Item	Quantity	Description
1	2	9-pin D-type plug assembly (male). Use AMP part number 205204-4 or equivalent.
2	25 to 1,200 feet	4-conductor, shielded, twisted-pair cable. Use Belden part number 9829 or equivalent.
3	4	Screw and retainer, male (part number 58-00061).
4	8	Connector contacts. Use AMP part number 66507-3 or equivalent.
5	as required	Copper foil (part number 80-00025).

When constructing the RS-422 cable, note the following:

1. Primary conductors must be fully encompassed and strain relieved by inner mold. Copper foil shield must cover the inner mold.
2. Permanently mark part number, dash number, and revision level where shown.
3. Molded cover; color, grey; material, polyurethane or equivalent rated UL 94HB or better. Cable jacket must be fully encompassed and strain relieved by molded cover.

4. Pins 6 and 7, and pins 8 and 9, are each twisted pairs.
5. The maximum total length of a cluster communications line is 1,200 feet (365.85 meters). The minimum cable length between terminals is 25 feet (7.62 meters).

RS-422 TERMINATOR

This plug terminates the cluster communications line and ends the cluster. Figure C-14 gives the pin connections for this plug.

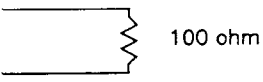
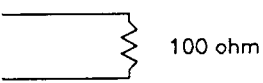
Connector A (plug)		Assignment
1		
2		
3		
4		
5		
6		CLK-
7		CLK+
8		DATA+
9		DATA-

Figure C-14. RS-422 Terminator Connections

Figure C-15 illustrates how to construct this cable.

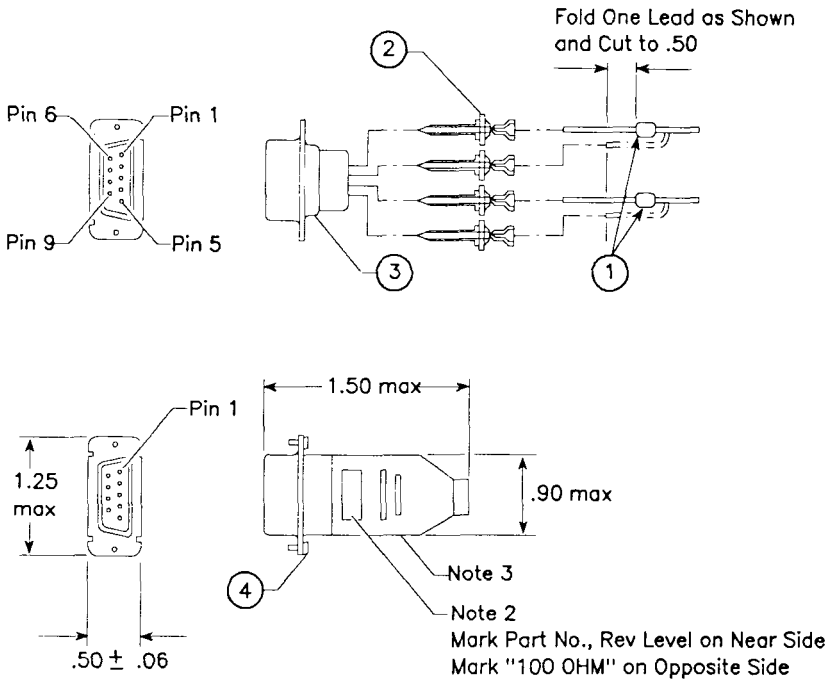


Figure C-15. RS-422 Terminator Construction

Table C-9 lists the parts required to construct the terminator.

Table C-9. RS-422 Terminator Parts List

Item	Quantity	Description
1	2	100-ohm, 1/4W resistor.
2	4	Connector contacts. Use AMP part number 66507-3 or equivalent.
3	1	9-pin, D-type, plug assembly (male). Use AMP part number 205204-4 or equivalent.
4	2	Screw and retainer, male (part number 58-00061).

When constructing the RS-422 terminator, note the following:

1. Appearance may vary within dimensions shown.
2. Mark part number and revision level in area shown.
3. Molded cover; color, grey; material, polyurethane or equivalent rated UL 94HB or better.
4. A terminator must be installed at each end of the cluster communications daisy chain.

RS-422 CABLE SPLICE

Use this splice to join two cluster communications cables. Figure C-16 gives the pin connections for this cable.

Cable A (socket)		Cable B (socket)	Assignment
1		1	
2		2	
3		3	
4		4	
5		5	
6	←→	6	CLK-
7	←→	7	CLK+
8	←→	8	DATA+
9	←→	9	DATA-

Figure C-16. RS-422 Cable Splice Connections

Figure C-17 illustrates how to construct this cable.

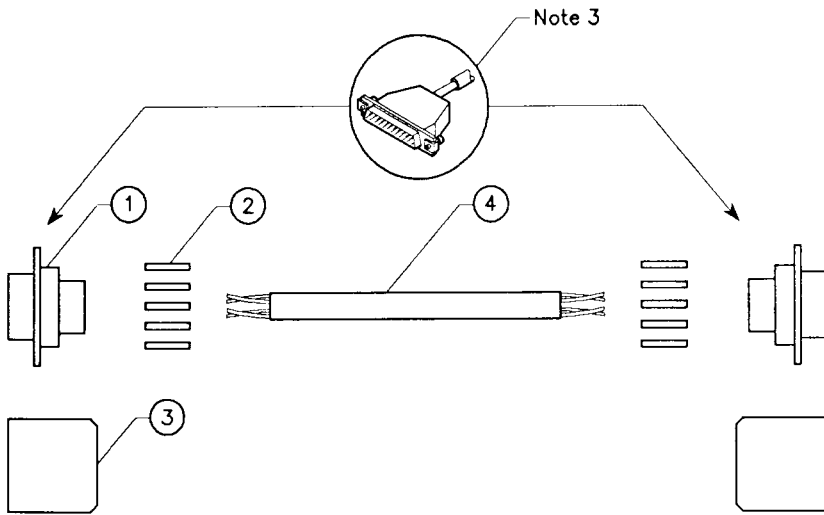


Figure C-17. RS-422 Cable Splice Construction

Table C-10 lists the parts required to construct this cable.

Table C-10. RS-422 Cable Splice Parts List

Item	Quantity	Description
1	2	9-pin, D-type, socket assembly (female). Use AMP part number 205203-4 or equivalent.
2	10	Connector contacts. Use AMP part number 66507-3 or equivalent.
3	2	Connector shell and strain relief. Use AMP part number 745171-5 or equivalent.
4	0.5 feet	4-conductor, twisted-pair, shielded cable. Use Belden part number 9829 or equivalent.
5	as required	Copper foil (part number 80-00025).

When constructing the RS-422 cable splice, note the following:

1. Pins 6 and 7, and pins 8 and 9, are each twisted pairs.
2. The maximum total length of a cluster communications line is 1,200 feet (365 meters).
3. Wrap foil tape around wires. Solder copper foil to the braid and metal connector shell around the entire periphery.

SCSI INTERFACE

The SCSI interface conforms to the single-ended alternative 1 SCSI standard in ANSI standard X3T9.2 (Rev 17B or above). Refer to the *Small Computer System Interface (SCSI)* specification for more information. Figure C-18 shows the external SCSI connector.

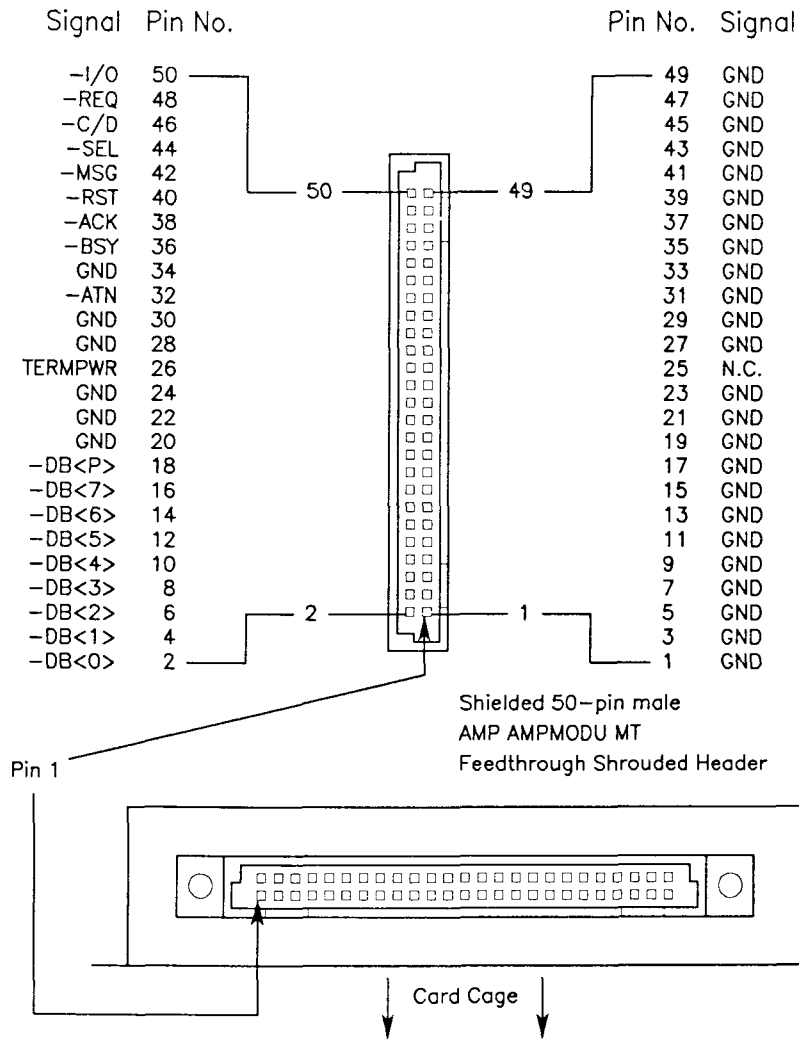


Figure C-18. External SCSI Connector

UPS CABLE

The UPS cable connects the UPS to the UPS port on the Main Processor (CPU) board in the S/320 or S/640 system. Figure C-19 shows the pin connections for this cable.

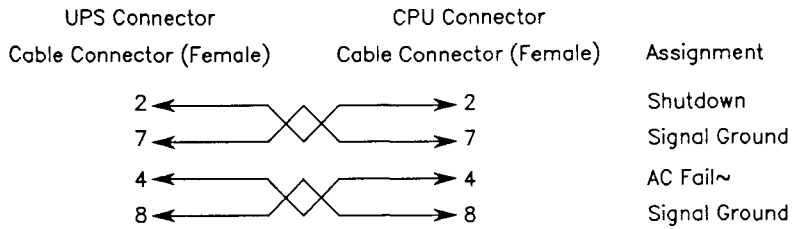


Figure C-19. UPS Cable Pin Connections

CABLE VENDORS

The recommended vendors of cable components are listed below.

- Alpha Wire Corp.
711 Lidgerwood Avenue
Elizabeth, NJ 07207
(201) 925-8000
- AMP, Inc.
Harrisburg, PA 17105
(717) 564-0100
- Astro Wire & Cable Corp.
50 Gardner Street
Worcester, MA 01613
(617) 754-3281
- Belden Corp.
P.O. Box 1980
Richmond, IN 47374
(317) 983-5200
- Computer Crafts, Inc.
57 Thomas Road
Hawthorne, NJ 07506
(201) 423-3500

- Helix Wire Corp.
217 Hamilton Street
Leominster, MA 01453
(617) 534-1434
- Mohawk Wire & Cable Corp.
9 Mohawk Drive
Leominster, MA 01453
(617) 537-4538

APPENDIX D

Tape Drive Maintenance

This appendix describes the proper cleaning procedures for the QIC tape drive in the S/320 and the SCSI tape drive in the S/640. The following information applies to both drives.

TAPE DRIVE HEAD MAINTENANCE _____

If you are using new tape cartridges, the heads must be cleaned after every two hours of actual use. For other cartridge conditions, cleaning should be performed at eight-hour intervals during normal use. Normal use is defined as two to three hours of actual drive use in a regular eight-hour day. If normal use is exceeded, or if the tape is used in extreme environments (high humidity and temperature extremes), the heads may need to be cleaned every four to six hours.

Cleaning Equipment _____

To clean the tape drive heads, you need a tape drive head cleaning kit, which contains the following items:

- Swabs (not cotton)
- Cleaning solution (95% isopropyl alcohol)
- Aerosol container of compressed air

The Inmac Tape Drive Head Cleaning Kit, Part Number 7150, contains these items. You may also need a lamp or flashlight to see inside the tape drive.

Caution Do not use a cleaner cartridge. It may damage the head assembly or the cartridge, or both.

Cleaning Procedure

Perform the following steps to clean the tape drive heads (see Figure D-1):

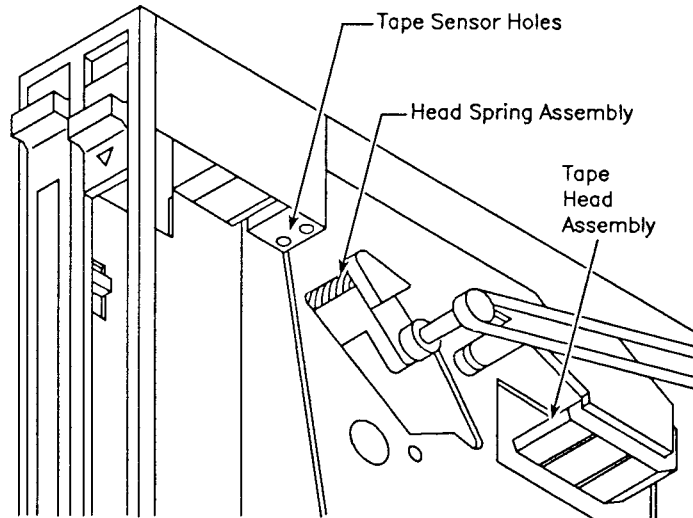


Figure D-1. Cleaning the Tape Drive

1. Open the small plastic door on the front door of the S/320 or S/640 by sliding it all the way to the left.
2. If necessary, remove the tape from the tape drive by firmly pushing the slide lever up until you reach the lever stop, about 1/2 inch. The lever action causes the head assembly to move away from the cartridge. This triggers the tape ejector, which lifts the cartridge clear from the retaining lip and pushes it out of the slot.
3. After you remove the tape, move the head assembly back into the tape contact position by pushing the slide lever down until it locks into place, about 1/2 inch.

As you do so, notice the tape head in the rear of the tape drive moves down.

4. Dampen a swab by dripping the cleaning solution onto the dual-colored spade end of the swab.

Caution Do not contaminate the cleaning solution by dipping the swab into it.

5. Insert the swab, spade-end first, through the cartridge access lot until you touch the tape head.

6. Use the coarse, green side of the swab to clean the head. Use a toothbrush-type motion to do so.
7. Remove the swab, and redampen it with another application of cleaning solution.
8. Use the swab to clean the head again. This time use the fine, white side of the swab and the same toothbrush-type motion you used earlier.
9. Remove the swab. Insert a clean, dry swab, and remove any residual cleaning fluid.
10. Discard both swabs. Store the unused swabs so that they collect no dust or debris.
11. Inspect the tape sensor holes, located inside the tape drive near the head spring assembly (see Figure D-1). Clean the tape hole sensor openings as needed by using the aerosol container of compressed air.
12. Push the slide lever up to move the head assembly back into the retract position.
13. Close the small plastic door by sliding it all the way to the right.

APPENDIX E

Replacing the Battery and Fuses

This appendix contains procedures for replacing the lithium battery in the Main Processor (CPU) board, the fuse in the Main Power Supply Module, and the fuse in the VME Power Supply.

BATTERY

The Main Processor (CPU) board contains a battery that you may need to replace periodically. The battery access slot on the rear of the CPU board enables you to quickly and conveniently replace the battery. You will need a pair of tweezers to remove the battery.

Warning If you use a pair of metal tweezers, power down the S/320 or S/640 before you attempt to replace the battery. If you use a pair of plastic tweezers, you do not need to power down your system.

To properly power down your system, see Chapter 5, “Powering Down and Restarting Your System.”

The replacement battery must conform to these specifications:

- Lithium flat-pack (manganese dioxide or polycarbon monofluoride)
- Weight: 0.141 ounce (4.0 grams)
- Nominal voltage: 3 volts
- Nominal capacity: 160-200 m

- Temperature range: -14F to +122
- Maximum current pulse: 15 mA
- Initial impedance: 250 ohms
- Impedance during discharge: 100 ohms

To replace the battery:

1. Open the rear door.
2. Locate the Battery Access slot on the CPU board (see Figure E-1).

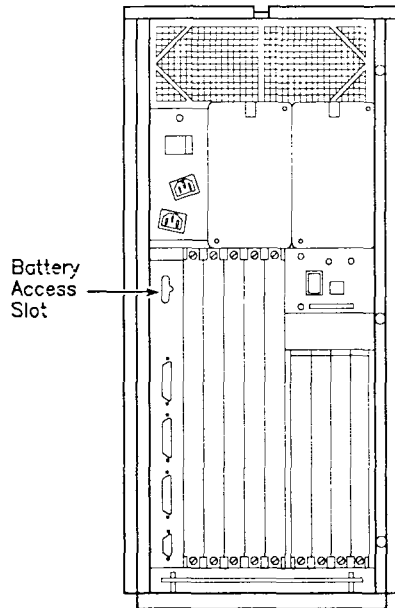


Figure E-1. Battery Access Slot

3. Insert a pair of tweezers into the Battery Access slot, and grasp the battery.
4. Pull the battery free of the Battery Access slot.

Caution Make note of the position of positive and negative sides of the battery as marked adjacent to the battery access slot.

5. Insert the new battery into the Battery Access slot.

FUSES

The Main Power Supply and the VME Power Supply contain the following fuses that you may need to replace:

- 115V Main Power Supply (500 watts) requires a 10A fuse
- 220V Main Power Supply requires a 5A fuse
- VME Power Supply (175 watts) requires a 6A fuse

Warning The S/320 or S/640 must be powered down before you replace either of the fuses.

To properly power down your system, see Chapter 5, “Powering Down and Restarting Your System.”

Follow this procedure to replace the fuses:

1. Open the rear door.
2. Locate the container that contains the fuse you want to replace (see Figure E-2).

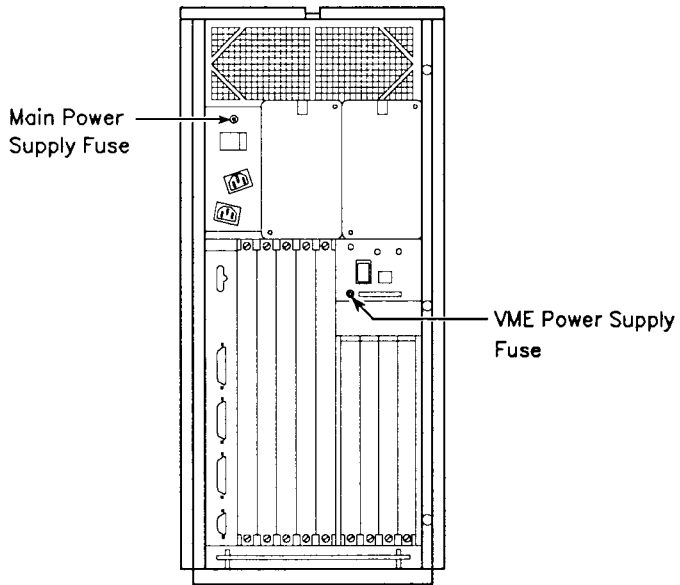


Figure E-2. Fuse Location

3. Use a small screwdriver to turn the fuse container counter clockwise by one-eighth turn.
4. Pull the fuse container free of the power supply.
5. Replace the fuse, and return the fuse container to the power supply.
6. Turn the fuse container clockwise by one-eighth turn to secure it in place.

APPENDIX F

Installing the Coprocessor

This appendix shows you how to install the MC68881 Floating-Point Coprocessor on the Main Processor (CPU) board, hereinafter referred to as the CPU board, in the S/320 or S/640 systems. Before you start, make sure that you have the MC68881 Floating-Point Coprocessor and the two plastic jumpers that are shipped with the processor. You will also need a quarter-inch nut driver.

Note The two jumpers are used only on the S/320 CPU board.

1. Power down the system (see Chapter 5).
2. Disconnect the terminal, printer, and UPS cables from the CPU board.
3. Remove the top panel and the outer side panel that is nearest the tape drive. Chapters 7 and 8 contain more specific instructions for doing so.

4. Remove the inner side panel nearest the tape drive. Chapters 7 and 8 contain more specific instructions for doing so.
5. Disconnect the cables located along the top of the CPU board.
6. Loosen but do not remove the six screws on the three brackets that attach the CPU board to the frame, and slide the brackets towards the center of the machine.
7. Remove the screws located down the middle of the CPU board that hold the board to the frame, as shown in Figure F-1.

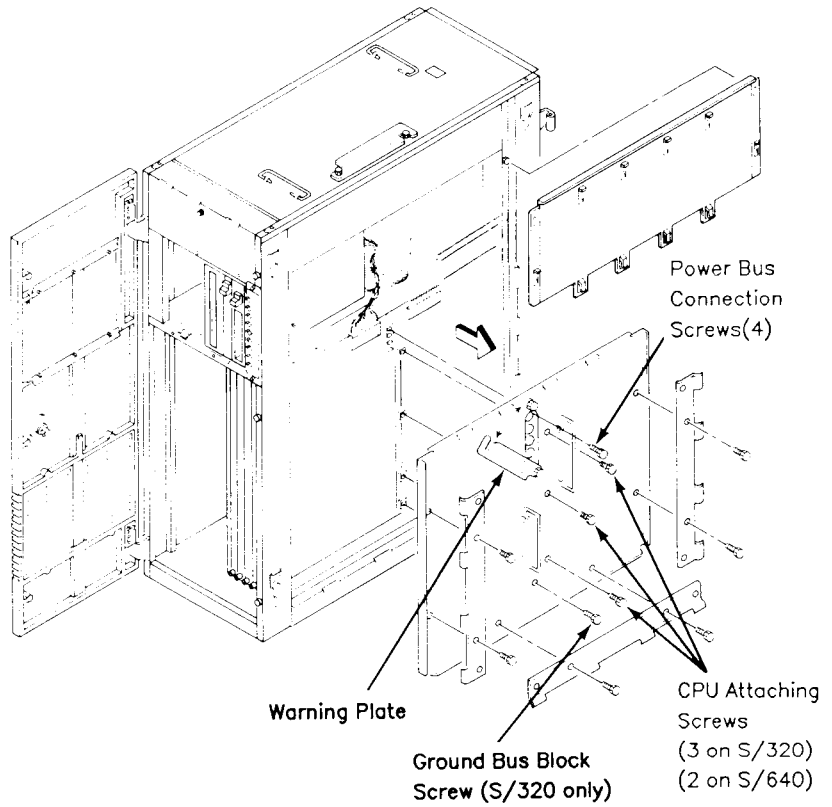


Figure F-1. Accessing the Main Processor (CPU) Board

8. Loosen the two screws that secure the Warning plate to the frame; then rotate the plate counterclockwise to reveal four Power Bus screws.
9. Remove the four Power Bus screws located behind the Warning plate. These screws are special and must be reinstalled in the same location.
10. On the S/320, remove the ground bus block screw near the bottom of the unit. This screw also must be replaced in the same location.
11. Grasp the two handles on the CPU board, and gently pull it free from the system. Lay the board aside on an antistatic surface.

For the S/320, locate the empty socket at location 21E on the S/320 CPU board. (It is next to the MC68020 located at 24D.) See Figure F-2.

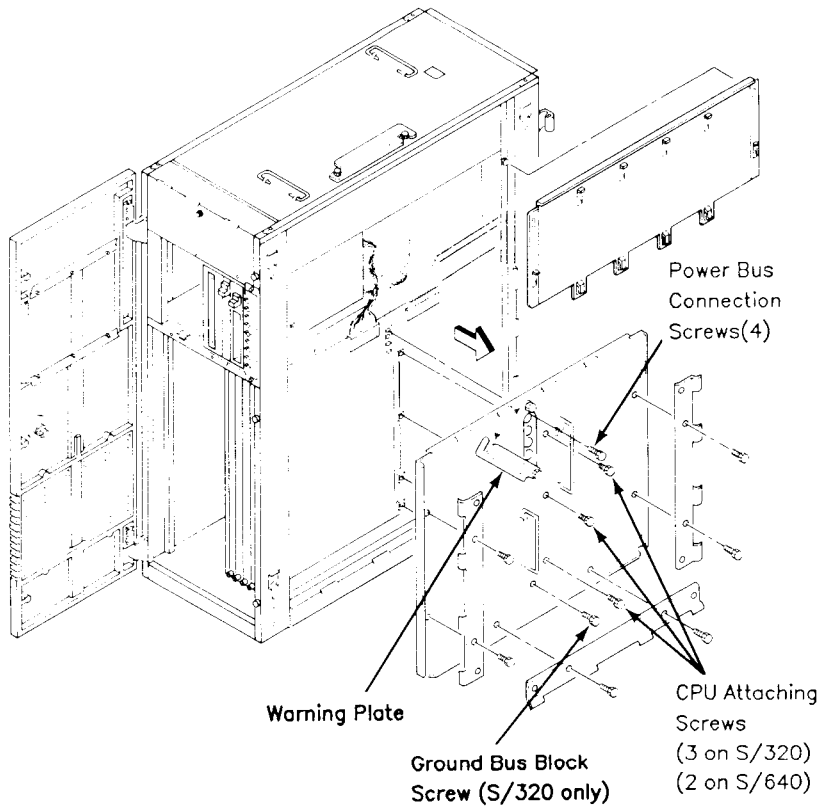


Figure F-1. Accessing the Main Processor (CPU) Board

8. Loosen the two screws that secure the Warning plate to the frame; then rotate the plate counterclockwise to reveal four Power Bus screws.
9. Remove the four Power Bus screws located behind the Warning plate. These screws are special and must be reinstalled in the same location.
10. On the S/320, remove the ground bus block screw near the bottom of the unit. This screw also must be replaced in the same location.
11. Grasp the two handles on the CPU board, and gently pull it free from the system. Lay the board aside on an antistatic surface.

For the S/320, locate the empty socket at location 21E on the S/320 CPU board. (It is next to the MC68020 located at 24D.) See Figure F-2.

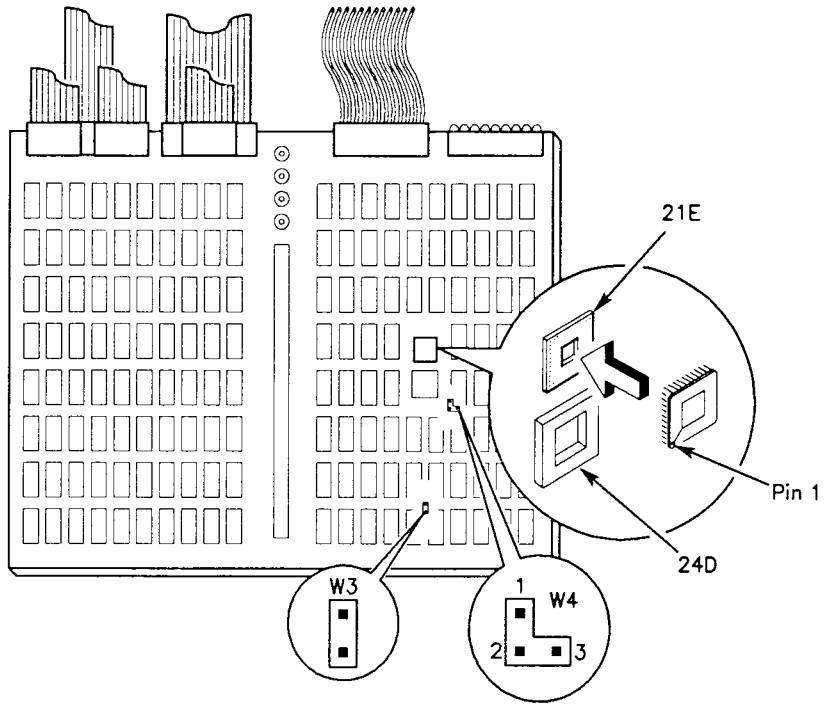


Figure F-2. Floating-Point Coprocessor (S/320)

12. Position the MC68881 so that the arrow on the chip corresponds to the intersection of pin A and pin 1 at location 21E. Gently press the MC68881 into place.

There are two sets of pins that you need to jumper at locations W3 and W4 on the S/320 CPU board (see Figure F-2). W3 (located at 23A) consists of two pins.

W4 (located between rows C and D and 25 and 26) consists of three pins. When pin 1 is jumpered to pin 2, the processor operates at 12.5MHz. When pin 2 is jumpered to pin 3, the processor operates at 16.67 MHz. Choose the correct jumpering position based on the floating-point coprocessor used.

1. At location W3, use a jumper to connect pin 1 to pin 2.
2. At location W4, use a jumper to connect the proper set of pins (pin 1 to pin 2, or pin 2 to pin 3).

To install the MC68881 Floating-Point Coprocessor on the S/640 CPU board, perform the following:

1. Locate the empty socket at location 15L on the S/640 CPU board. (It is next to the MC68020 located at 18L.) See Figure F-3.

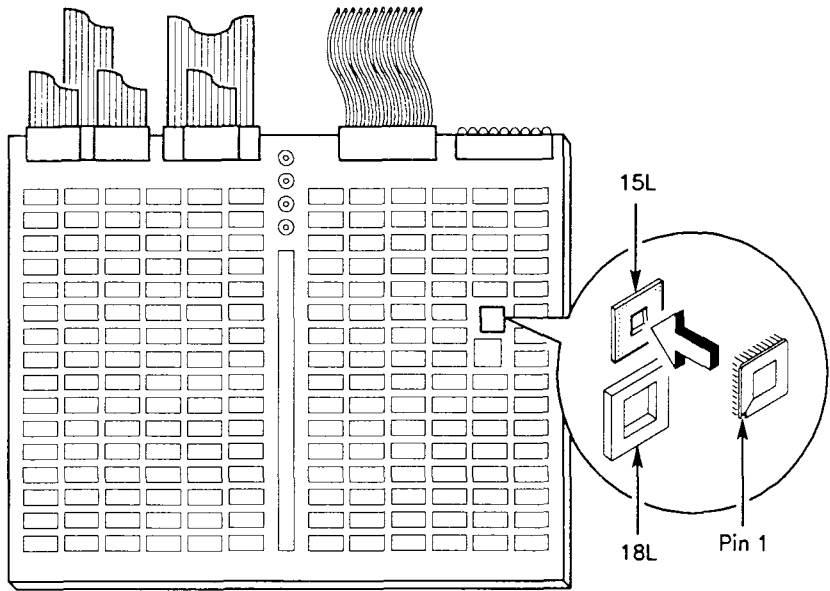


Figure F-3. Floating-Point Coprocessor (S/640)

2. Position the MC68881 so that the arrow on the chip corresponds to the intersection of pin A and pin 1 at location 15L. Gently press the MC68881 into place.

The MC68881 Floating-Point Coprocessor is now in place. To replace the CPU board, begin with step 10 (above) for the S/320 or step 9 for the S/640 and work backwards.

APPENDIX G

Configuration Limitations

This appendix describes VME configuration limitations in S/320 and S/640 systems. This information applies to the VME card cage in the base cabinet (there are no limitations for the V-Box).

The VME power supply in the base cabinet supplies 23A of +5V power. The VME Interface Adapter board draws 4A, leaving 19A for VME expansion cards. Therefore, the total power consumption of the installed VME expansion boards (obtained by adding the power consumption of each VME expansion board in your system) cannot exceed 19A.

The power consumption for each VME expansion board is:

- VME Ethernet board – 3.0A
- VME Half-Inch Tape Controller board (Interphase) – 4.5A

- VME SMD Controller board (Interphase) – 3.0A
- VME Multi Protocol Communication Controller (MPCC) board – 9.5A

The most serious limitation is that two MPCC cards fully load the VME power supply. Steps are being taken to resolve this problem for future VME MPCC card releases.

APPENDIX H

Storage Device Configurations

This appendix provides the information you need to set the standard configurations of supported S/320 and S/640 storage devices. SCSI interfaced devices to be installed externally are not covered here.

Storage devices that were factory installed are already configured properly. Refer to the information in this appendix when you purchase additional devices and install them yourself.

This appendix contains jumper, switch setting, and terminator installation information as required for standard configurations. Use this information in conjunction with that provided by the manufacturer of your particular storage device.

CURRENTLY SUPPORTED DEVICES _____

The following SCSI interfaced devices are currently supported for use with the S/640:

- Archive 2150S 150MB half-height tape cartridge drive
- Quantum Q280 80MB half-height disk drive
- Quantum 80S 80MB half-height, 3.5 inch disk drive
- Micropolis 1375 145MB full-height disk drive
- Micropolis 1578-15 320MB full-height disk drive

The current S/320 and S/640 Release Notices list new devices for which support has been added since publication of this manual.

GENERAL CONFIGURATION GUIDELINES —

Note the following when you install SCSI interfaced devices in the S/640:

- Each device connected to the S/640 SCSI bus must have a unique SCSI ID (0-6), and no device should have ID 7.
- All of the supported SCSI interfaced devices covered by this appendix use Logical Unit Number 0 (LUN).
- In the base configuration, the last device (tape drive) on the SCSI bus must have termination resistors.

ARCHIVE 2150S TAPE DRIVE

The Archive Model 2150S 150MB drive uses the industry-standard certified tape cartridges shown in Table H-1.

Table H-1. Archive 2150S Tape Cartridges

Cartridge Type	Format	Tracks	Capacity
DC600XLT	QIC-150	18 tracks	150MB
	QIC-120	15 tracks	120MB
	QIC-24	9 tracks	60MB Read Only
DC600A	QIC-120	15 tracks	120MB
	QIC-24	9 tracks	60MB Read Only

Configure the Archive 2150S by installing or removing jumpers and by removing three termination resistor packs as shown in Figure H-1.

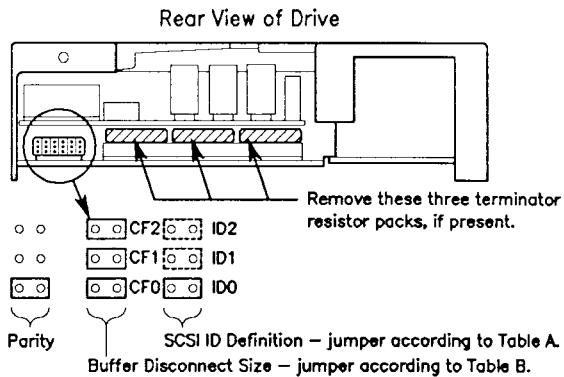


Table A
SCSI ID Definition:

SCSI ID	Jumper Placements		
	ID2	ID1	ID0
0	Remove	Remove	Remove
1	Remove	Remove	Install
2	Remove	Install	Remove
3	Remove	Install	Install
4	Install	Remove	Remove
5	Install	Remove	Install
6	Install	Install	Remove
7	Reserved		

Table B
Buffer Disconnect Size Definition:

Disconnect Size	Jumper Placements		
	CF2	CF1	CF0
2K	Remove	Remove	Remove
4K	Remove	Remove	Install
6K	Remove	Install	Remove
8K	Remove	Install	Install
12K	Install	Remove	Remove
16K	Install	Remove	Install
24K	Install	Install	Remove
32K	Install	Install	Install

Figure H-1. Archive 2150S Configuration

QUANTUM Q280 DISK DRIVE _____

The Quantum Q280 SCSI disk drive provides 80MB of data storage. Configure it by installing or removing eight jumpers and by removing three termination resistor packs.

Figure H-2 shows the locations of the jumpers and the terminators.

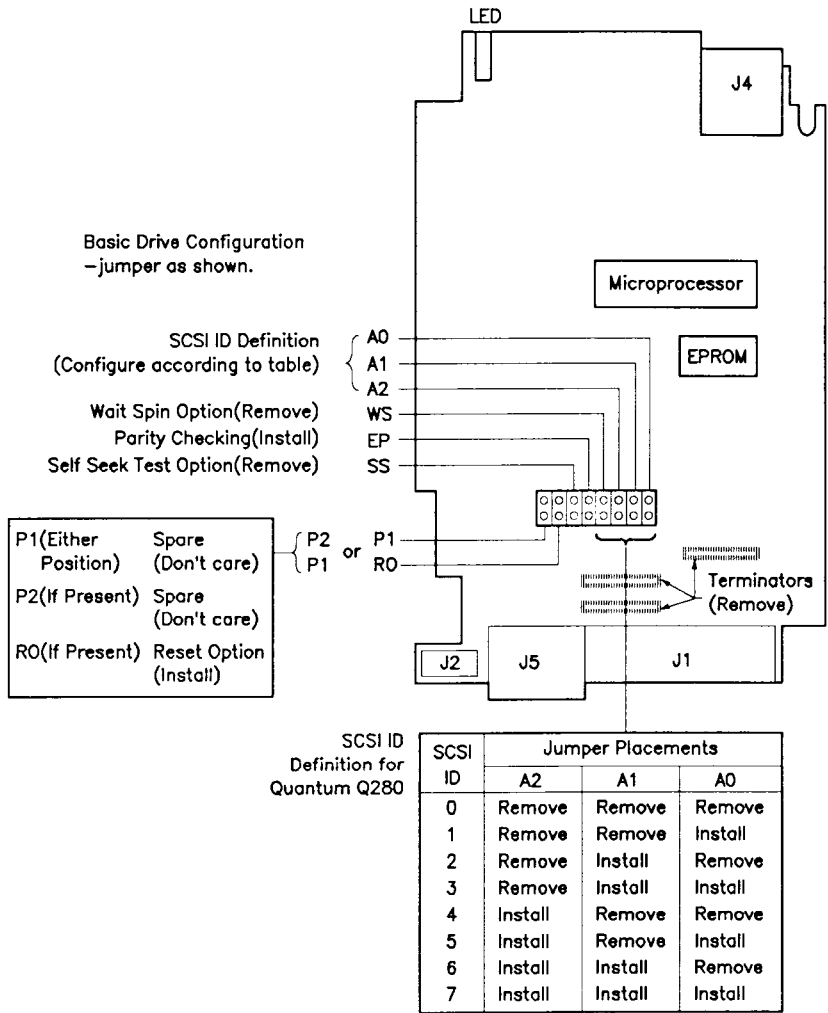
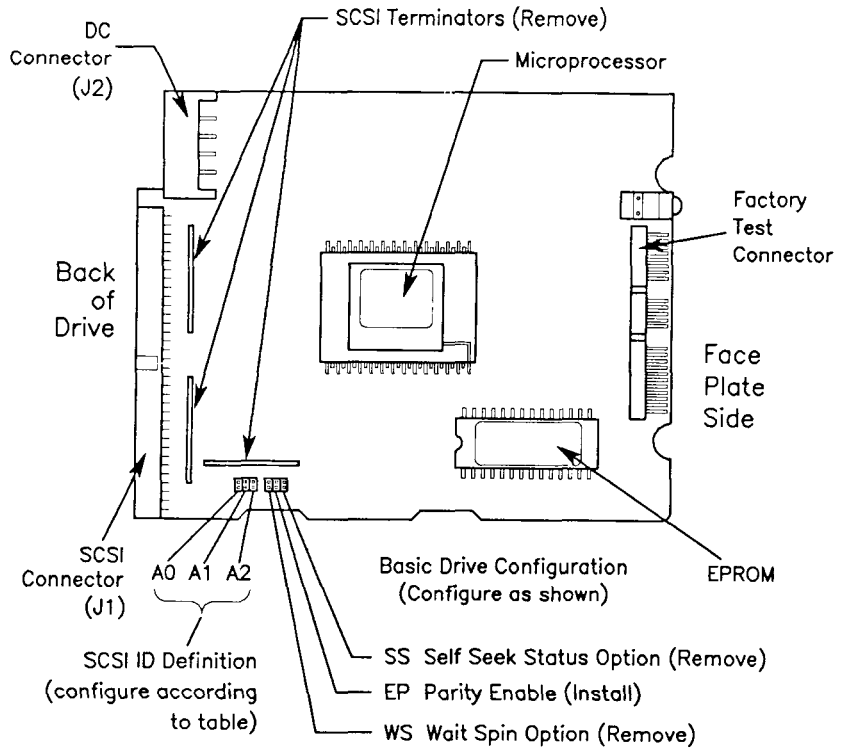


Figure H-2. Quantum Q280 80MB Disk Configuration

QUANTUM 80S DISK DRIVE ---

The Quantum 80S ProDrive provides 80MB of data storage. Configure it by installing or removing six jumpers and three termination resistor packs.

Figure H-3 illustrates the locations of the jumpers and the resistor packs.



SCSI ID
Definition for
Quantum 80S
ProDrive

SCSI ID	Jumper Placements		
	A2	A1	A0
0	Remove	Remove	Remove
1	Remove	Remove	Install
2	Remove	Install	Remove
3	Remove	Install	Install
4	Install	Remove	Remove
5	Install	Remove	Install
6	Install	Install	Remove
7	Install	Install	Install

Figure H-3. Archive 2150S Configuration

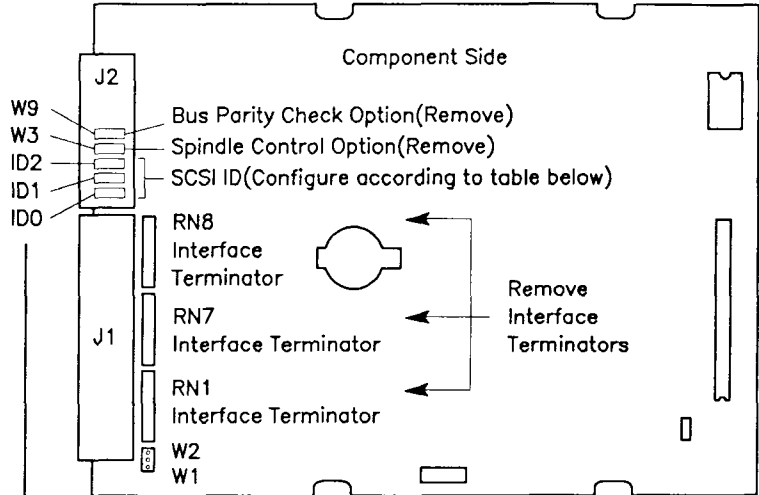
MICROPOLIS DISK DRIVES ---

Two Micropolis disk drives are offered; the Micropolis 1375 SCSI drive, which provides 145MB of hard-disk data storage, and the Micropolis 1578-15 320MB SCSI drive.

The jumpers and resistors are on the chip side of the PC board at the bottom of the unit. The boards are hinged at the front of the unit and held in place by two captive screws at the rear of the unit. Loosen the two captive screws and tip the board up to access the jumpers and resistor packs.

Configure the Micropolis 1375 disk drive as shown in Figure H-4.

Basic Drive Configuration
 –jumper as shown.

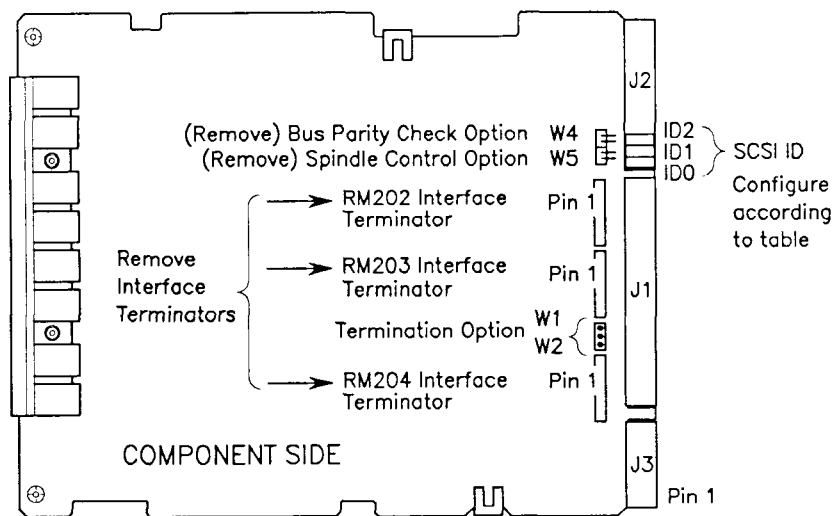


SCSI ID Definition for
 Micropolis 1375

SCSI ID	Jumper Placements		
	ID2	ID1	ID0
0	Remove	Remove	Remove
1	Remove	Remove	Install
2	Remove	Install	Remove
3	Remove	Install	Install
4	Install	Remove	Remove
5	Install	Remove	Install
6	Install	Install	Remove
7	Install	Install	Install

Figure H-4. Micropolis 1375 Configuration

Configure the Micropolis 1578 (SCSI A) disk drive as shown in Figure H-5.



SCSI ID Definition for Micropolis 1578-15	SCSI ID	Jumper Placements		
		ID2	ID1	ID0
0	0	OUT	OUT	OUT
1	1	OUT	OUT	IN
2	2	OUT	IN	OUT
3	3	OUT	IN	IN
4	4	IN	OUT	OUT
5	5	IN	OUT	IN
6	6	IN	IN	OUT
7	7	IN	IN	IN

Figure H-5. Micropolis 1578 Configuration

On some versions of these drives, it is possible to insert the SCSI connector upside down. When attaching the SCSI connector, make sure that the pin 1 line of the SCSI cable is aligned with pin 1 on the drive. The pin 1 line is a different color from the other lines.

Glossary

asynchronous	Data transmission protocol where the timing between each character is arbitrary and characters are transmitted individually using start and stop bits.
base cabinet	The S/320 and S/640 base enclosure.
baud	Communications measure of serial data transmission rate. Loosely, it means bits per second, including characteristic framing and stop bits.
board	See VME Interface Adapter board or Main Processor board .
boot	To boot is to start up a computer by loading a program into memory from an external storage medium, such as a QIC tape.

byte	Unit of information, often amounting to a single text character. A byte most commonly consists of 8 bits.
card cage	Structure that contains the printed circuit boards.
character	Letter, digit, punctuation mark, or other symbol used to organize, control, or represent data.
code	Number or symbol used to represent information in a compact or easily processed form.
command	Communication from the user to a computer system (usually typed from the keyboard) directing it to perform an action.
computer	Electronic device for performing predefined (programmed) data computation or manipulation at high speed and with great accuracy.
computer system	Consists of a computer and its associated hardware and software.

configuration	Refers to the arrangement and interrelationships of the hardware and software elements within a computer system.
configuring	Act of determining software or hardware actions by manipulating their physical or logical relationships.
connector	Physical device, such as a plug, socket, or jack, used to connect one hardware component of a system to another.
CPU	Central processing unit; controls the S/320 or S/640 operation and processes instructions from memory.
daisy-chain	A method to interconnect units in such a way that the signal passes from one unit to the next in serial fashion.
DCE	Data Communications Equipment; modems and other equipment that send serial data over long distances.
default	Value, action, or setting that is automatically used by a computer system when no other explicit information has been given.

disk	Information storage medium consisting of a flat, circular magnetic surface on which information can be recorded in the form of small magnetized spots.
disk drive	Peripheral device that writes and reads data on the surface of a magnetic disk.
display	To exhibit information visually, as on the screen of a display device, such as a video monitor.
display screen	Glass or plastic panel on the front of a display device on which images are displayed.
DTE	Data Terminal Equipment; terminals and computers that send or receive serial data.
EMI	Electromagnetic interference; disturbances caused by electromagnetic waves (radio, heat, light, etc.) that can impair the reception of the desired transmitted signal.
emulate	Process by which one device or system (such as a terminal) is made to function like another in order to accept the same data, to execute the same programs, and to achieve the same results.

error message	Message displayed or printed to notify the user of an error or problem in the execution of a program.
ESD	Electrostatic deflection; using electrostatic fields produced by voltages applied to plates to deflect the electron beam in a cathode-ray tube.
execute	To perform or carry out a specified action or sequence of actions, such as those described by a program.
expansion board	See also I/O Expansion board , Memory Expansion board , and VME Expansion board .
expansion slot	Connector inside the enclosure into which an expansion board can be installed.
gigabyte	Equals about 1.07 billion bytes.
graphics terminal	An intelligent, bit-mapped display terminal (microprocessor-based) that locally displays graphics and text. Compare with programmable terminal .
hardware	Term for those components of a computer system consisting of physical devices. Contrast with software .

input	Term for data transferred into a computer from some external source, such as the keyboard, a disk drive, or a QIC tape.
input/output (I/O)	General term for the techniques, devices, and media used to communicate with the processor in a computer and the data involved in such communications.
interface	A common boundary between two systems or devices.
I/O Expansion board	Board installed in the I/O card cage that provides I/O ports and enhances system performance. Compare with Memory Expansion board .
LED	Light-emitting diode; used as an indicator that system operations are taking place.
load	To transfer information from a peripheral storage medium (such as a QIC tape) into main memory for use, for example, to transfer a program into memory for execution.
LUN	Logical Unit Number; identifies a particular device assigned to a SCSI controller.

log in	Term used for entering your login name and password to the CTIX operating system.
login name	Name assigned to you by your system administrator, by which you are known to the operating system.
Main Processor	
(CPU) board	Large printed circuit board in the S/320 and S/640, to which the computer's processor, memory, and other important components are connected.
megabyte	Equals about 1.05 million bytes.
memory	Term for a hardware component of a computer system that can store information for later retrieval.
Memory Expansion	
board	Board installed in the I/O card cage that provides memory for the system. Compare with I/O Expansion board .
microprocessor	See CPU or processor .
mode	State of a computer or system that determines its behavior.

operating system	Software system that organizes the computer's resources and capabilities and makes them available to the user or to application programs running on the computer.
parallel printer	An external device that writes output data to paper or other media and receives data bits simultaneously. Compare with serial printer .
peripheral	Device located outside the processing unit itself that supports or assists in its communication, for example, a terminal or a buffer.
port	A part of a data processor dedicated to a single data channel for receiving data from, or transmitting data to, one or more remote external devices.
processor	Hardware component of a computer that interprets and executes instructions, which are represented in machine language and stored in main memory.
program	Set of instructions, conforming to the rules and conventions of a particular programming language, describing actions for a computer to perform in order to accomplish some task.

programmable terminal	An intelligent (microprocessor-based), multiwindow terminal that runs office automation software, data entry, and other applications. Compare with graphics terminal .
prompt	To remind or signal the user that some action is expected, typically by displaying a distinctive symbol, a reminder message, or a menu of choices on the display screen.
prompt character	Text character displayed on the screen to prompt the user for some action. It often also identifies the program or component of the system that is doing the prompting.
QIC tape drive	A peripheral device that writes and reads information on the surface of a quarter-inch cartridge (QIC) tape.
RAM	Random-access memory. Information can be written into or read from these memory locations at any time during system operation.
ROM	Read-only memory. Information stored in these memory locations can be read at any time but not changed during system operation.

RS-232-C cable	Industry-standard cable used to carry data at high speeds of 0 to 19.2K bits per second by serial binary data transmission.
RS-422 cable	Industry-standard cable used to carry data at high speeds by serial binary data transmission.
SCSI	Small Computer System Interface, a standard bus for mass storage devices.
serial printer	An external device that writes output data to paper or other media and or receives data bits one at a time. Compare with parallel printer.
shielded cable	Cable with a special metallic wrapping around its wires. The wrapping reduces radio frequency interference.
SMD	See Storage Module Drive .
software	Term used for those programs that determine or control the behavior of the computer.
stabilizer bar	Long, oval-shaped piece of metal attached to the bottom of the enclosure, used to secure the computer in its permanent location.

Storage Module

Drive	A high-speed disk controller employing caching and interleaving, installed in a V-Box or an X-Box.
synchronous	A procedure, or protocol that requires a response at an exact time and clock edge.
system administrator	The person responsible for maintaining the computer system.
terminal	A device equipped with a keyboard and video display screen that transmits and receives information over a line. See also graphics terminal and programmable terminal .
upgrade	To replace or expand existing hardware or software components with larger or improved versions.
UPS	Uninterruptible Power Supply; a device that supplies continuous power in the event of a power outage.
V-Box	Expansion cabinet that contains a 10-slot VME card cage and room for two SMDs.
VME card cage	Structure that contains VME expansion boards.

**VME Expansion
board**

Board installed in the VME card cage that provides I/O ports or enhances system performance.

**VME Interface
Adapter board**

Printed circuit board that enables the local card to communicate with the VME card cage.

X-Box

Expansion cabinet that can contain up to four SMDs.

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