EPSON® NX

Service Manual

Revision Level

Revision	Date
First Printing	7/23/93

Copyright Information

Trademark Information

FCC Comdiance Statement for American Users

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Subpart B of Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

❑   Reorient or relocate the receiving antenna.

❑   Increase the separation between the equipment and receiver.

❑   Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.

❑   Consult the dealer or an experienced radio/TV technician for help.

The user may find the following booklet, prepared by the Federal Communications Commission, helpful: *How to Identify and Resolve Radio-TV Interference Problems. This* booklet is available from the U.S. Government Printing Office, Washington, D.C., 20402, Stock No. 044-000-00345-4.

You can determine whether your computer is causing interference by turning it off. If the interference stops, it was probably caused by the computer or its peripheral devices. To further isolate the problem, disconnect either the peripheral device or its I/O cable.

These devices usually require a shielded cable. For Epson peripheral &vices, you can obtain the proper shielded cable from your dealer. For non-Epson devices, contact the manufacturer or dealer for assistance.

Warning

This equipment has been certified to comply with the limits for a Class B computing device, pursuant to Subpart B of Part 15 of the FCC Rules. Only peripherals (computer input/output devices, terminals, printers, etc.) certified to comply with the Class B limits may be attached to this computer. Operation with non-certified peripherals is likely to result in interference to radio and TV reception. The connection of a non-shielded equipment interface cable to this equipment will invalidate the FCC Certification of this device and may cause interference levels which exceed the limits established by the FCC for this equipment.

Changes or modifications not expressly approved by the manufacturer could void the user's authority to operate the computer.

DOC Compliance Statement for Canadian Users

This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus set out in the radio interference regulations of the Canadian Department of Communications.

Conformation á les normes d'émission radioélectriques Canadiennes

Le présent appareil numérique n' émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la classe B prescrites dans le règlement sur le brouillage radioélectrique édicté par le Ministère des Communications du Canada.

Other Agency Approvals

Application for approval of this equipment has been made to the following agencies:

United States:	UL, FCC Class B
Canada:	CSA, DOC
Europe:	VDE Class B, CISPR Class B, TUV, NEMKO, SEMKO, SETI

About this Manual

This manual is designed to be used with the Epson NX system.

Chapter 1, *System Description,* includes the overall system specifications, subassembly descriptions, and the locations of all major components.

Chapter 2, *Troubleshooting,* describes the steps you need to take to troubleshoot and service the computer.

Chapter 3, *Removing and Replacing Subassemblies,* describes the disassembly and assembly of the computer to its replaceable components.

Appendix A, *Reference Materials,* provides supplemental information that you may need when servicing the computer.

Appendix B, *System Utilities,* provides a summary of the SETUP program, the System Diagnostics, and other utilities on the Reference diskette.

Appendix C, *Schematics,* provides a series of system schematics.

A detailed *Contents* is provided at the beginning of each Chapter and Appendix. A complete list of Tables and Figures is also provided in the *Contents.*

A comprehensive Index is provided at the back of the manual.

1 *System Description*

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Tables

System Overview

The Epson NX desktop computer is an advanced, high-performance desktop system fully compatible with Industry Standard Architecture (ISA) at the hardware and software level. This computer has the capacity for installation of up to three storage devices and addition of four option cards. The system comes standard with a 3½-inch, 1.44MB diskette drive. There are four configurations, giving you a choice of no hard disk drive, a 170MB IDE, a 240MB IDE, or a 525MB SCSI hard disk drive. Systems with hard drives come with the NeXTSTEP^{TM} operating system preinstalled A 16-bit Ethernet adapter card also is installed.

Figure l-l shows the main system unit and components that are packaged with the product (monitor not included; the configuration without a hard drive does not include software).
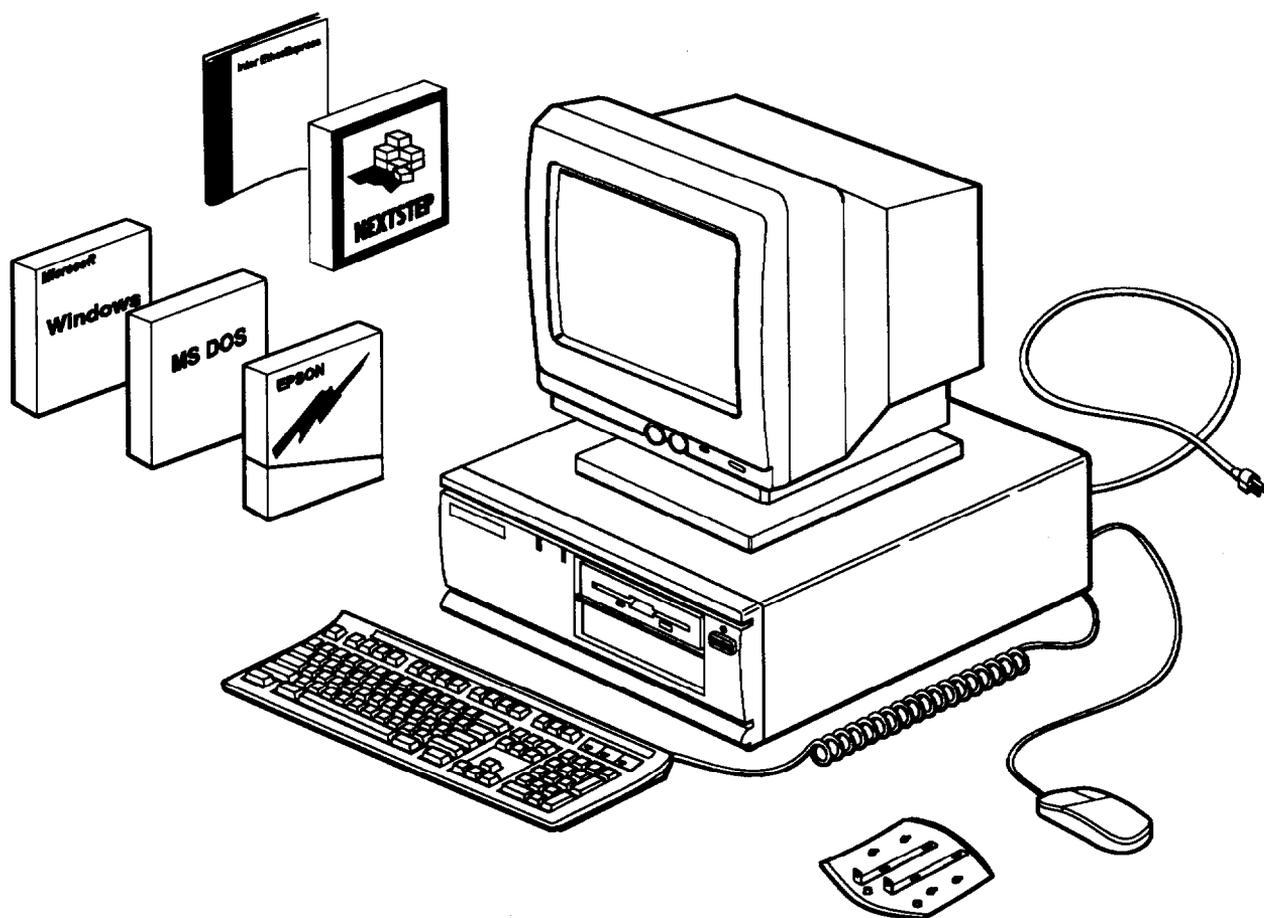
Figure l-l System Overview

General Features

The following features are standard:

❏ Intel i486DX2/66 CPU

❏ PGA CPU-type ZIF socket that can also contain a future OverDrive processor

❏ 8KB CPU Cache and Epson VirtualCache™ (secondary)

❏ C&T Wingine™ 64200 video display driver

❏ Diskette drive (3%inch)

❏ A choice of no hard drive, a 170MB Conner IDE hard disk drive, a 24OMB Quantum IDE hard disk drive, or a 525MB Quantum SCSI hard disk drive

❏ 20MB of on-board memory in the 170MB or 240MB HDD configurations or 36MB of on-board memory in the 525MB HDD configuration; expandable with SIMMs to 128MB

❏ 2MB of on-hoard video DRAM

❏ Texas Instruments RAMDAC

❏ A 16-bit Ethernet adapter (either an Intel EtherExpress™16C or an SMC EtherCard PLUS Elite16 Combo)

❏ Selectable shadow RAM for system BIOS and video BIOS

❏ Two RS-232C serial ports and a Centronics standard bidirectional parallel port

❏ PS/2compatible mouse and keyboard ports

❏ Built-in VGA video port

❏ Four full-length, horizontal, 16-bit, ISA option slots (three available)

❏ Keyboard with mini-DIN type connector

❏ 100-240 VAC worldwide power supply with switch-selectable input; 145 watts.

Table 1-l describes the overall physical dimensions of the system.

Table l-l
Physical Description

Dimension	Measurement
Width	14.8 inches (370 mm)
Height	4.8 inches (120 mm)
Depth	16.5 inches (412 mm)
Weight (With one FDD and one HDD)	16.7 lbs (7.5 kg)

Front Panel

Figure l-2 shows the features on the front panel of the system. Table l-2 describes the front panel features.
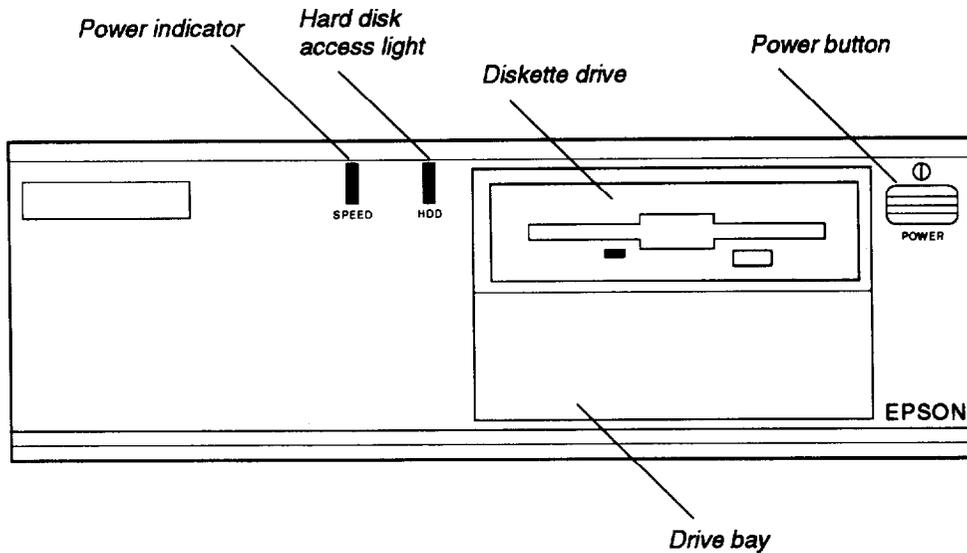
Figure 1-2 Front View

Table 1-2
Front Panel Features

Power-on/speed light	Lights when system is powered on: Amber when low speed Green when high speed
Hard disk access light	Lights (orange) when a hard disk drive is accessed
Diskette drive	3½-inch, half-height, high-density drive
Power on/off button	Push on and push off
Diskette, hard disk, or tape drive bay	Optional 3½-inch or 5¼-inch, high-density drive, IDE hard drive, SCSI hard drive, or 250MB tape drive

Rear Panel

Figure l-3 shows the features on the rear panel of the system. Table 1-3 describes the rear panel features.
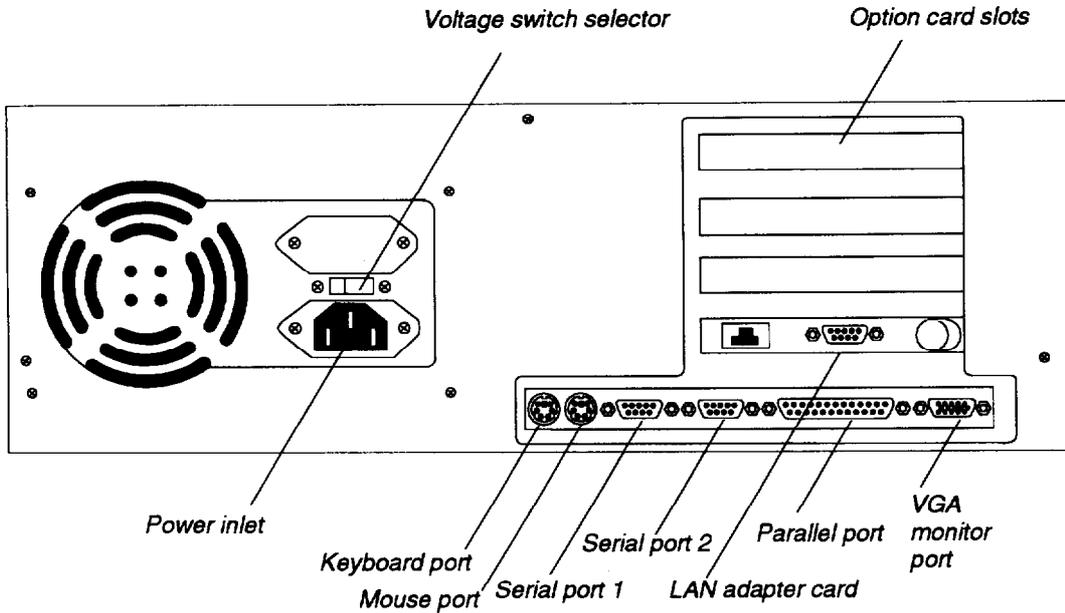
Figure 1-3 Rear View

Table 1-3
Rear Panel Features

Rear Panel Feature	Description
115/230V voltage switch selector	115 or 230 VAC selectable input-voltage
Power inlet	98-132 VAC or 195-264 VAC
Keyboard port	6-pin mini DIN female connector (non-interchangeable with mouse)
Mouse port	6-pin mini DIN female connector (non-interchangeable with keyboard)
Serial ports	9-pin D-shell male connectors
Parallel port	25-pin D-shell female connector
VGA port	15-pin D-shell female connector

Options

In addition to the standard configurations, the following are available:

❏   An optional 3½-inch or 5¼-inch diskette drive

❏   3½-inch 8OMB, 12OMB, or 240MB IDE hard disk drives

❏   1, 4, 16, or 64MB (when available), 36-bit, 70-ns SIMM option kits

❏   VGA, Super VGA, and multi-frequency color monitors

❏   Epson 25OMB tape backup drive

❏   Media Vision Spectrum[TM] 16 multimedia sound card

❏   Labtec CSS-550 speaker option kit.

Upgrades

Figure l-4 shows the possible CPU upgrade paths for the standard system configurations. You can find instructions for removing and replacing CPUs in Chapter 3.

Standard
Configuration

End User
Overdrive

486DX2/66 ──────────────▶ **Future Intel ODP**
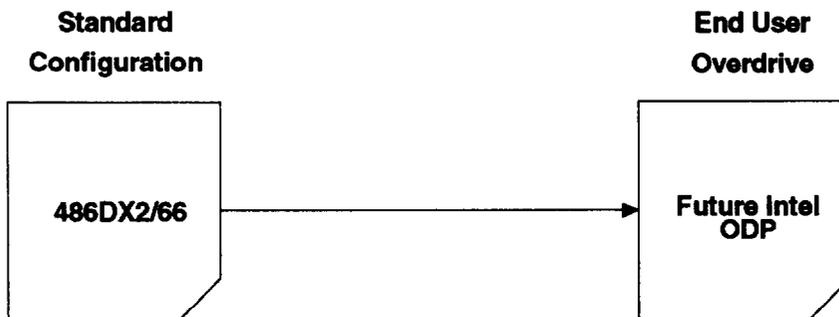
Figure 1-4 CPU Upgrade Path

Document Sources

Subject	Document	Source
CPU	Intel i486DX2/66 Specifications	Intel Corporation Literature Sales POB 7641 Mt. Prospect, IL 60056-7641
System controller	UMC 82C482	United Microelectronics Corp. 3350 Scott Blvd. Santa Clara, CA 95054 Fax: 408-492-1720
Peripheral controller	UMC F82721	
Integrated peripheral controller	UMC 82C206	
VGA controller	Wingine 64200 Specifications	Chips & Technologies 2099 Gateway Place San Jose, CA 95110 Fax: 408-437-0959
IDE hard disk drive	Conner CP30174E Specifications	Conner Peripherals 3081 Zanker Road San Jose, CA 95134 Fax: 408-433-3303
IDE and SCSI hard disk drive	Quantum ProDrive LPS240AT and LPS525S	Quantum Corporation 500 McCarthy Boulevard Milpitas, CA 95035 BBS: 408-894-3214
Ethernet card	Intel EtherExpress 16C	Intel Corporation 5200 N.E. Elam Young Parkway Hillsboro, OR 97124-6497 Fax: 800-525-3019
	SMC EtherCard PLUS Elite16 Combo	Standard Microsystems Corp. 80 Arkay Drive Hauppage, NY 11788

Emissions and Safety Agency Information

The Epson NX in a typical configuration meets or exceeds the requirements of the emissions and safety agencies listed in Table 1-4.

Table 1-4
Emissions and Safety Agency Data

Agency	Specification
CISPR	PUB.22
CSA	22.2, No. 154, IEC 950
DEMKO, NEMKO, SEMKO, SETI	IET 950
DOC	
FCC	Part 15, class B (Information Technology Equipment)
GS	IEC 950
TUV	IEC 950
UL	1950
VDE	0806; 0871, class B

Environmental Specifications

Table l-5 lists the. environmental specifications for the Epson NX.

Table l-5
Environmental Specifications

Condition	Operating Range	Non-operating Range	Storage Range
Temperature	41° to 90° F (5° to 32° C)	–4° to 140° F (–20° to 60 ° C)	–4° to 140° F (–20° to 60 ° C)
Humidity (non-condensing)	20% to 90%	10% to 90%	10% to 90%
Altitude	–330 to 9900 ft (–100 to 3000 m)	–330 to 11880 ft (–100 to 3600 m)	–330 to 11880 ft (–100 to 3600 m)
Maximum wet bulb	68° F (20° C)	104° F (40° C)	134° F (57° C)
Accoustical noise	37.5 dB(A)	N/A	N/A

Subassembly Descriptions

This section gives descriptions and specifications for the following subassemblies:

❏   Case

❏   System board along with connectors and jumpers

❏   Power supply

❏   Memory

❏   Disk drives

❏   Keyboard.

Figure l-5 shows the major subassemblies of the computer.
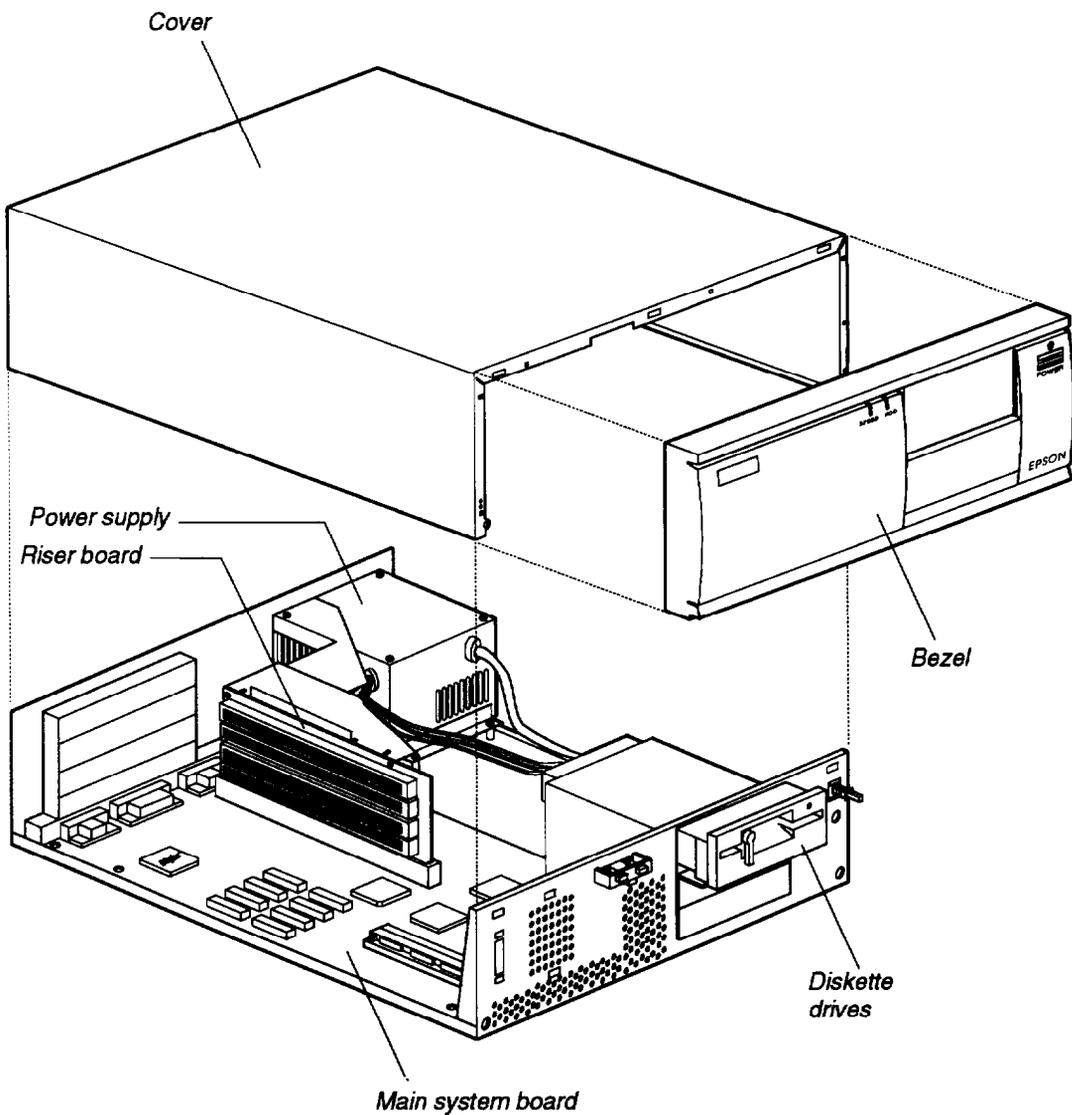
Figure 1-5 System Level Assemblies

Case

The multi-piece case unit is shown in Figure l-5 and described in Table 1-6, below.

Table 1-6
Case Specifications

Component	Description

Construction
    Chassis and cover
    Bezel
	Steel–formed, welded, and painted
	Molded ABS plastic

Dimensions
    Width
    Depth
    Height
	14.8 inches (370 mm)
	16.5 inches (412 mm)
	4.8 inches (120 mm)

System Board

Figure l-6 shows the major components on the main system board. The functions of these components are described in Table l-7.

Table 1-7
System Board Component Functions

Component	Description
82C482 (U17)	System controller: provides AT bus control logic data bus conversion logic, CPU reset logic, clock generation for CPU, keyboard and timer, DMA/refresh logic and peripheral interface logic
F82721 (U42)	Peripheral controller: provides one printer/bidirectional parallel port, two 16450 UARTS, IDE HDD interface, FDC, bus interface buffers
82C206F (U114)	Integrated peripheral controller: provides two 8259 DMA controllers (seven DMA channels), 13 interrupt request channels, 8254 timer/counter (two channels), MC146818-compatible RTC (64 bytes user RAM), 74LS612 memory mapper
64200 Wingine (U83)	Video controller: provides direct access to video memory as part of system memory in Wingine acceleration mode. With 2MB of video memory and an extended VGA RAMDAC, supports the following display modes: 1024 x 768 x 64K colors and 1120 x 832 x 64K colors (NeXT native mode).
EP6075NB (U18)	VirtualCache Memory Controller. Also provides control of the on-board, 20MB of base memory, DRAMs, and SIMMs
8742AH (U120)	Integrated, 8042-compatible, keyboard and mouse controller
27C010A (U1)	192KB two-part system BIOS: contains system and VGA/Wingine BIOS plus the SETUP program code. Supports shadow RAM
27C512 (U113)	64KB EPROM: Contains SETUP text messages in 5 languages
DRAM (U65-U72)	4MB of standard memory soldered on the mother board and either 16MB or 32MB of 70-ns DRAM installed in SIMM sockets
Video DRAM (U84-U87 and U92-U95)	2048KB DRAM soldered on main system board
Option slots	Four 8-/16-bit, ISA slots on the riser board

VGA video — Parallel — Serial 2 — Serial 1 — Mouse — Keyboard

Alternate VGA feature connector

Video DRAM

SIMM 2

SIMM 1

System DRAM

Option board riser card connector

FDD connector
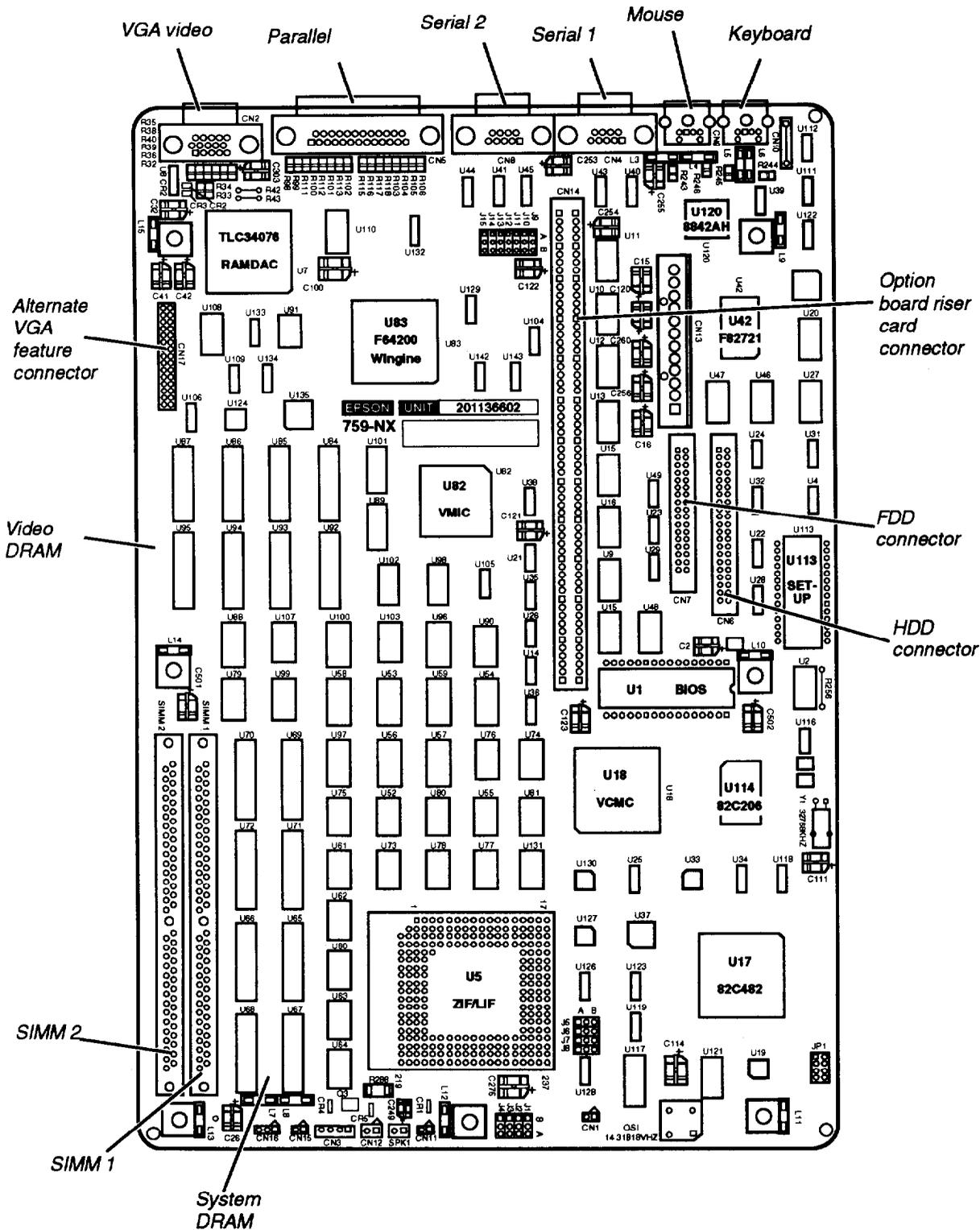
HDD connector

Figure l-6 System Board Components

Connectors and Jumpers

This section describes the connectors and jumpers on the main system board. The location of each connector and jumper block is shown in Figure l-6.

Connectors

Table l-8 lists the connectors on the main system board. You can find a description of all connector pin assignments in Appendix A.

Table 13
System Board Connectors

Connector	Description
Auxiliary fan (CN1)	Not installed
VGA (CN2)	15-pin D-SUB
Speaker (CN3)	4-pin header connector
Serial port (CN4)	COM1, 9-pin D-SUB (rear panel)
Parallel port (CN5)	25-pin D-SUB (rear panel)
IDE/HDD (CN6)	40-pin box header connector
FDD (CN7)	34-pin box header connector
Serial port (CN8)	COM2, 9-pin D-SUB (rear panel)
Mouse (CN9)	6-pin mini-DIN (rear panel)
Keyboard (CN10)	6-pin mini-DIN (rear panel)
Battery connector (CN11)	2-pin strip header connector
Reset connector (CN12)	Not installed
Power supply (CN13)	12-pin connector
I/O option card connector board (CN14)	120-pin box header connector; supports riser board for 8- and 16-bit option cards
HDD LED (CN15)	2-pin header connector
Power LED (CN16)	3-pin header connector
VGA Feature connector (CN17)	26-pin header connector
SIMM (SIMM 1 and SIMM 2)	Accepts 36-bit, 70-ns SIMMs in 1, 4, 16 and 64MB sizes. (1 or 2 16MB SIMMs installed, standard)

Jumpers

The location of each jumper is shown in Figure l-6. A jumper's setting is determined by where the jumper is placed on a set of pins. The jumper connects either pin A and the middle pin or pin B and the middle pin. The jumper settings are defined in Table 1-9, Table l-10, and Table l-11.

Table 1-9
System Board Jumper Settings (51-54)

CPU Speed	J1*	J2*	J3*	J4*
DX2/66 (33 MHz)	A	A	B	A

*Factory setting according to processor external speed clock.

Table l-10
System Board Jumper Settings (JS-J8)

CPU Type	J5*	J6*	J7*	J8*
486DX-PGA/DX OVERDRIVE	A	A	B	B

*Factory setting according to system type.

Table l-11
System Board Jumper Settings (J9-515)

Jumper	Setting	Function
J9	A* B	Enables the built-in mouse Disables the built-in mouse
J10	A* B	Enables the built-in VGA display adapter Disables the built-in VGA display adapter
J11	A* B	Color adapter installed Monochrome adapter installed
J12	A* B	Enables pointing device from option slot Disables pointing device from option slot
J13	A B*	Disable password Enable password
J14	A* B	Reserved
J15	A* B	Reserved

*Factory default setting.

Power Supply

The computer has a 145-watt power supply with switch-selectable AC input voltage. The power supply is a totally self-contained module that connects PS1 and PS2 to the main circuit board via a 12 pin connector (CN13). In addition to the normal power supply circuitry, the module also includes the following components:

❏ Power on/off switch

❏ 115/23OV input select switch

❏ AC input connector for detachable power cord

❏ Cooling fan.

All minimum load requirements for the power supply are met by the standard configuration of the main circuit board.

To prevent damage from excessive temperature inside the computer, the power supply includes sensors and a detection circuit that shuts down the power supply when an excessive operating temperature is detected. To restart the computer, you must identify and correct the problem that caused the system to overheat (such as a blocked fan), turn off the power switch, wait at least thirty seconds, and turn the power back on.

The power supply is shown in Figure l-7. Specifications are given in Table 1-12.
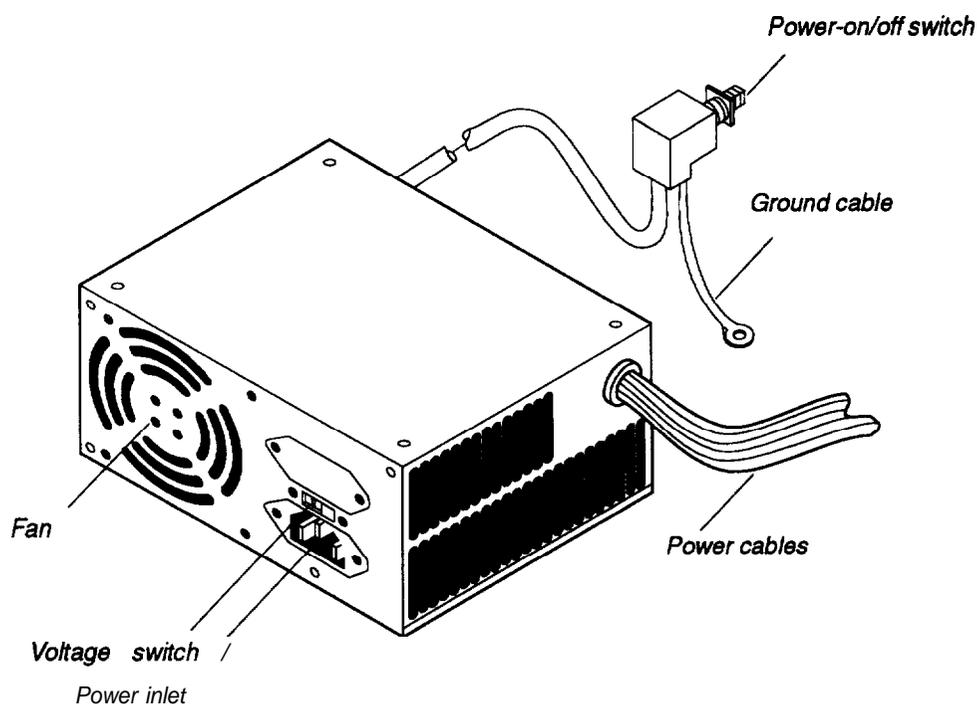
Figure 1-7 Power Supply

Table 1-12
Power Supply Specifications

Function	Description
Power output	145 watts
Input voltage	98–132 VAC, 195–264 VAC; switch-selectable
Input frequency	47–63 Hz
Maximum output current	+ 5 VDC @ 18 A (3.5 A minimum) + 12 VDC @ 4 A (4.5 A peak for 15 seconds) – 12 VDC @ 0.3 A – 5 VDC @ 0.3 A
System signal	POWERGOOD signal
Cooling	Fan cooled
Cable connections	1 to on/off switch, 2 to system board (CN13), and 4 to drives

Figure l-8 shows the power supply cable layout and connectors.
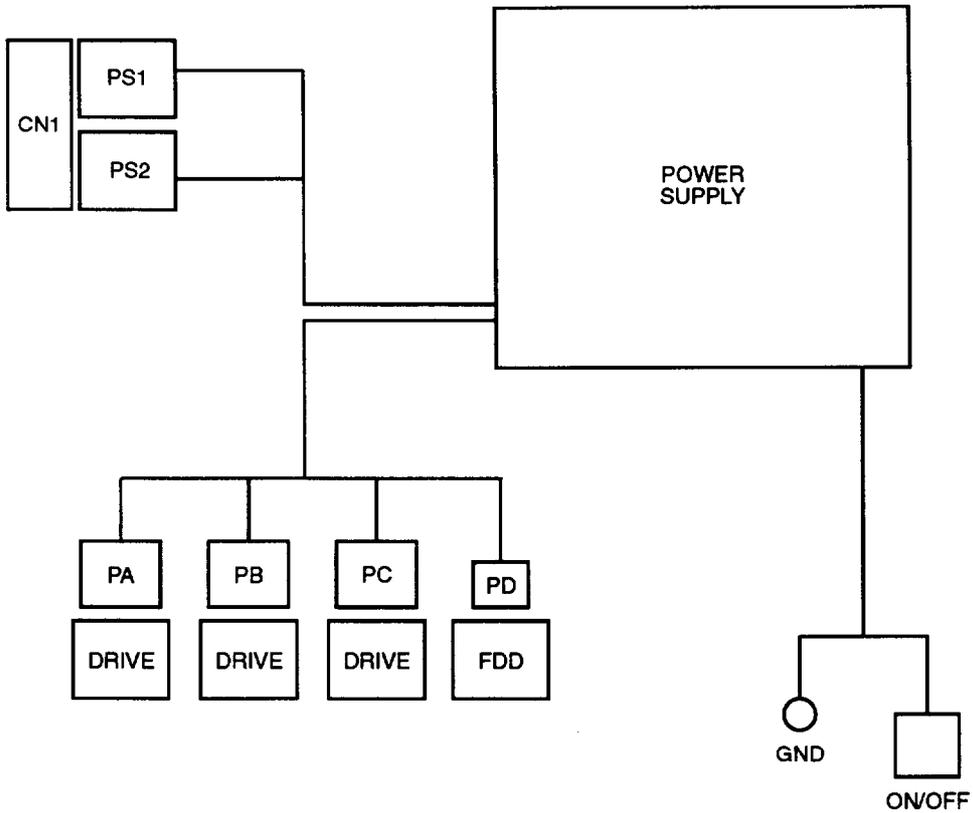
Figure 1-8   Power Supply Cable Layout

Memory

The 170MB and 240MB HDD configurations for this system have 4MB of memory soldered on the system board and one 16MB SIMM installed, for 20MB total memory. The 525MB HDD configuration has 4MB of memory soldered on the system board and two 16MB SIMMs installed, for 36MB total memory. The DRAM on the system board consists of eight high-performance 512KB, 70-ns chips. The system supports 1, 4, 16, or 64MB (when available), 70-ns SIMMs; two SIMMs may be installed for a maximum of 128MB Memory is controlled by a custom ASIC designed by Epson that permits burst cycles from standard DRAM. The system memory has the following features:

❏   Standard memory includes cache and shadow RAM

❏   ROM BIOS and CMOS RAM

❏   Video DRAM

❏   Zero wait state memory access

❏   32-bit data access

❏   LIM 4.0 EMS compatiblity.

Figure l-9 shows the system memory map.
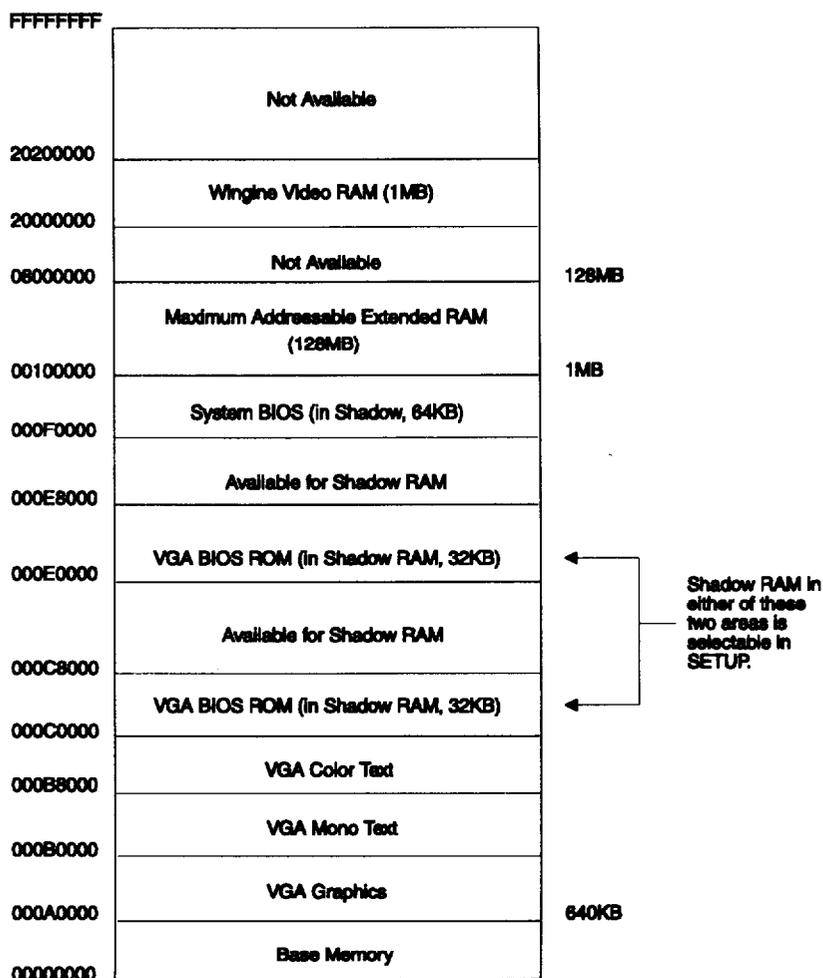
Figure 1-9   System Memory Map

Shadow RAM

128KB of the remaining first 1MB of DRAM is used to shadow the system BIOS and VGA BIOS. Shadow RAM is address selectable through SETUP.

Cache Memory

8KB of internal cache is built into the microprocessor. Cache address control is selectable through SETUP and testing is available through the system diagnostics.

The system also supports a new feature designed by Epson called VirtualCache. VitualCache is a dynamic DRAM memory cache that functions like cache SRAM. VirtualCache utilizes the burst-mode capabilities of the 486 CPU to minimize memory access time. In addition, look-ahead circuitry attempts to predict where the next memory access will be, and access that region before the CPU needs it.

BIOS ROM

The system uses a BIOS that conforms to the ISA IEEE specifications. The BIOS supports all applications that run on PC XT/AT systems and supports all ISA option cards.

The system board contains a 128KB EPROM in Ul for the system and video BIOS plus the code for the SETUP utility. The 64KB EPROM in U113 contains the Nanguage text messages for SETUP

The current BIOS version is shown during system start up. Installing a new version of the BIOS requires replacement of the EPROMs in Ul and U113. See Chapter 3 for details.

CMOS RAM

The CMOS RAM is contained within the 82C206 and power is provided via the lithium backup battery. The CMOS memory supports the standard 64 bytes of battery-backed RAM: 14 bytes for clock and control registers and 50 bytes of general purpose data. All CMOS RAM is reserved for BIOS use and can be set to specific values or cleared to system default values using the SETUP program.

Video DRAM

The system comes with 2MB of video DRAM consisting of eight 256KB chips soldered onto the main system board in sockets U84-U87 and U92-U95.

Memory Expansion

The system board has two SIMM sockets, SIMM1 and SIMM2. The SIMMs that you install should be single- or double-sided 70-ns, 36-bit fast-page-mode SIMMs with gold connectors. Table 1-13 shows the possible memory expansion configurations.

Table 1-13
Memory Configuration

Standard Memory	SIMM1	SIMM2	Total Memory
4MB	16MB	—	20MB*
4MB	16MB	1MB	21MB
4MB	16MB	4MB	24MB
4MB	16MB	16MB	36MB*
4MB	64MB	—	68MB
4MB	64MB	1MB	69MB
4MB	64MB	4MB	72MB
4MB	64MB	16MB	84MB
4MB	64MB	64MB	128MB†

SIMM positions can be reversed to achieve same total memory.

* 20MB of RAM is standard for 170MB and 240MB HDD configurations; 36MB of RAM is standard for the 525MB HDD configuration.

+ The standard 4 MB of memory is not accessible when both SIMM sockets are populated with 64MB SIMMs.

Mass Storage

The system can support up to three mass storage devices. A hard disk drive can be installed in the horizontal drive bays or outside **the drive** bay on **the** right side. Diskette, **CD-ROM, cx** tape drives can be installed in the horizontal drive bays.

Diskette Drive and Tape Drive Options

The on-board diskette controller directly supports two diskette drives of any of the following: 3½&inch, 72OKB or 1.44MB and 5¼-inch 360KB or 1.2MB drives. The controller can also support one tape drive.

The standard diskette drive is a Mitsumi D-359T3 drive. Optional diskette drives can be selected from Table 1-14.

Table 1-14
Diskette and Tape Drive Options

Model Number	Height	Diskettes Supported
Canon MD3611-55	Half-height, upper/lower bay	3½-inch, 1.44MB
Canon MD5501-65VE	Half-height, upper/lower bay	5¼-inch, 1.2MB
Canon MD5511-V6	Half-height, upper bay	3½- and 5¼-inch 1.44MB and 1.2MB
Epson Tape Drive	Half-height, upper/lower bay	250MB tape

Hard Disk Drive Options

There are three optional hard disk drive configurations available from the factory: a Conner CP30174E 170MB drive, a Quantum LPS240AT 240MB drive, or a Quantum LPS525S 525MB drive.

Table l-15
Hard Disk Configurations

Model number	Height	Drive Capacity	Drive Type
Conner CP30174E	1-inch	170MB IDE	26
Quantum LPS240AT	1-inch	240MB IDE	34
Quantum LPS525S	1-inch	525MB SCSI	None

Specifications for the Conner CP30174E HDD

Table 1-16
Conner CP30174E 170MB IDE HDD Specifications

Native Mode	Translation Mode
1806 cylinders	903 cylinders
4 heads	8 heads
0 w precomp	0 w precomp
1806 landing zone	903 landing zone
46 sectors	46 sectors

Specifications for the Quantum LPS240AT HDD

Table 1-17
Quantum LPS240AT 240MB IDE HDD Specifications

Formatted Capacity	245
Form Factor	3.5"
Heads/Disks	4/2
Track Density (TPI)	1900
Average Seek Time	16 ms
Burst Transfer Rate (S)	10MB/sec.
MTBF (POH)	250,000
Cache Size	256KB

Specifications for the Quantum LPS525S HDD

Table 1-18
Quantum LPS525S 52SMB SCSI HDD Specifications

Formatted Capacity	525
Form Factor	3.5"
Heads/Disks	6/3
Track Density (TPI)	2670
Average Seek Time	10 ms
Burst Transfer Rate (S)	10MB/sec.
MTBF (POH)	350,000
Cache Size	512KB

Conner CP-30174E
17O MB IDE HDD

Master = C/D jumpered
Slave = C/D not jumpered

Quantum LPS240AT
24OMB IDE HDD

Master = DS jumpered
Slave = not jumpered
(or if drive is configured
for cable selection using the
CS jumper, the drive is a
master drive if pin 28 is
grounded and a slave if
pin 28 is not grounded)

CS DS SP
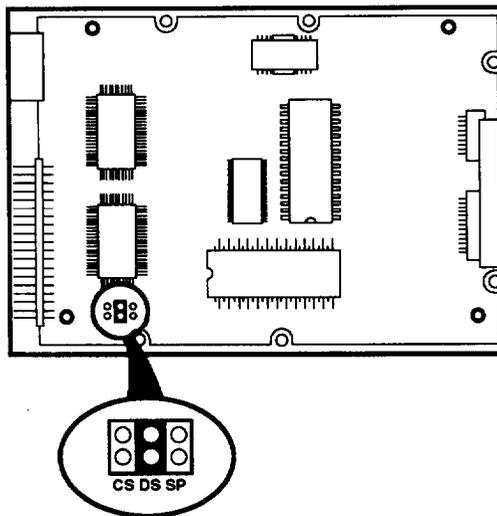
Quantum LPS525S
525MB SCSI HDD

See Table 1-19 for jumper
settings.

Jumpers

A0 A1 A2 WS SP TE SS*
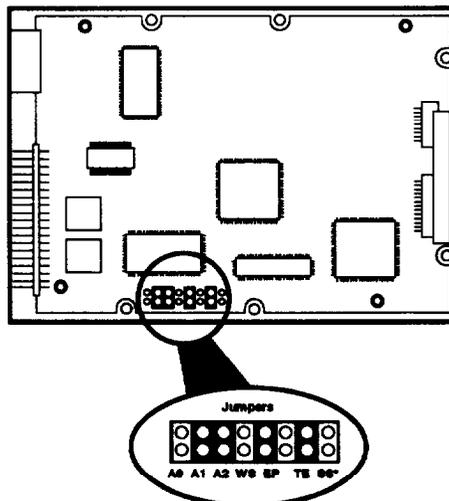
* Jumper SS is for factory use only.

Figure l-10. Jumper Placement for HDDs

Table 1-19
Quantum LPS525S Jumper Settings

Jumper	Setting	Description
EP	Off On*	Parity checking disabled. Parity checking enabled.
WS	Off* On	Wait/Spin disabled. Motor power applied when power is applied to computer. Wait/Spin enabled. Motor controlled by START/STOP command.
TE	Off On*	Drive SCSI terminating resistors disabled. Terminating resistors connected to SCSI bus (to be used when drive is last physical device on the SCSI bus).

A2, A1, A0		Set SCSI IDs shown below:	
A2	**A1**	**A0**	**SCSI ID**
Off	Off	Off	0
Off	Off	On	1
Off	On	Off	2
Off	On	On	3
On	Off	Off	4
On	Off	On	5
On*	On*	Off*	6*
On	On	On	7

*   Factory default jumper setting

Keyboard

The system includes a detached keyboard that connects to the computer through a coiled cable. Adjustable legs allow you to use the keyboard at two different heights. Figure 1-11 shows the 101-key keyboard. A 102-key model is also available. Table 1-20 provides the specifications for the 101-key keyboard.
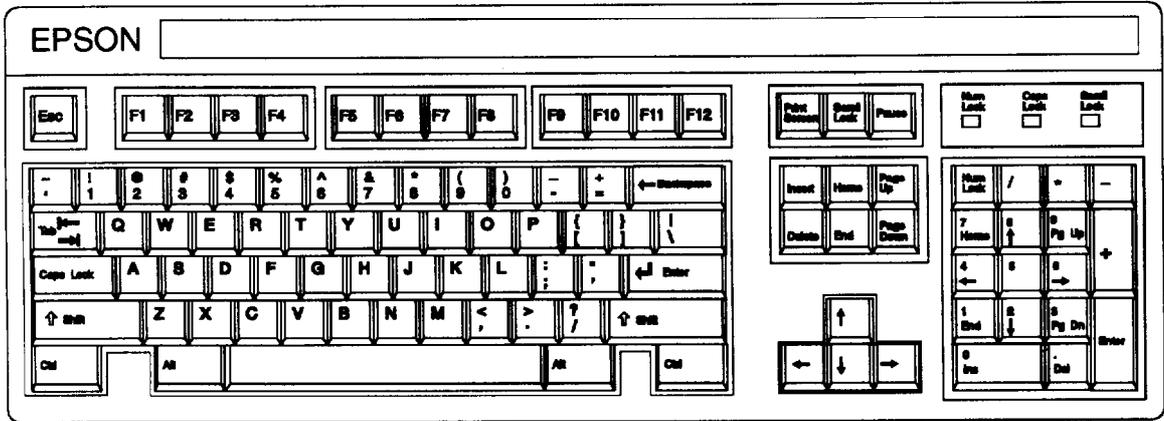
Figure 1-11 101-Key Enhanced Keyboard

Table 1-20
Keyboard Specifications

Aspect	Description
Design	Detachable
Layout	101-key or 102-key, enhanced AT
Interface	PS/2-compatible
Connector	6-pin, mini-DIN, male
Cable length	1300 mm (51 inches) coiled
Weight	1.36 kg (3.0 lb)
Dimensions: Width Depth Height	446 mm (17.5 in.) 175 mm (6.9 in.) 37.6 mm (1.5 in.) without legs 51.0 mm (2.0 in.) with legs

2 *Troubleshooting*

Contents

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Tables

General Information

This chapter describes the various procedures you can follow to diagnose problems with the system. The diagnostics are broken down into three sections:

❏ **Power-on diagnostics** and boot errors

❏ Error tone codes

❏ General system problems.

Recommended Service Tools

The recommended service tools are listed in Table 2-1. All tools are commercially available.

Table 2-1
Recommended Service Tools

Tool	Used For
Phillips screwdriver #2	Removing drives Removing option cards Removing the system board Removing the power supply Removing the speaker Removing the riser board
Chip puller	Removing the BIOS EPROM chips
Multimeter circuit tester	Testing continuity Testing system voltages Checking for short circuits
Parallel port loopback connector	Testing parallel port
Serial port loopback connector	Testing serial ports
Anti-static mat and wristband	Protecting all electrical components and modules from damage due to static electricity
Commercial diagnostic software package	Testing hardware and detecting problems or conflicts. (Boot system using an MS-DOS diskette, and run program.)

Epson Authorized Replacement Modules

Table 2-2 lists the authorized replacement modules for the Epson NX. The reference letter assigned to each module is used in this chapter to indicate when you should replace that module and test the system again.

Table 2-2
Authorized Replacement Modules

Replacement Module	Reference Letter
System board	A
Processor	B
Power supply	C
SIMM	D
128KB EPROM in U1	E
64KB EPROM in U113	F
System controller (82C482A)	G*
Peripheral controller (F82721)	H*
Integrated peripheral controller (82C206)	J*
Video controller (64200 Wingine)	K*
VirtualCache memory controller (EP6075)	L*
Keyboard/mouse controller	M*
Base memory DRAM	N*
Video DRAM	O*
Lithium backup battery	P
Hard disk drive	Q
Diskette drive	R
Option card riser board	S
Speaker	T
Keyboard	U

* Replacement of these components is performed only by authorized service centers outside the U.S. Servicers In the U.S. should replace the system board when there is a malfunction of any of the components marked with an asterisk.

Power-On Diagnostics and Boot Errors

The computer's ROM BIOS contains a series of diagnostic programs, called Rower-On Diagnostics (ROD). These programs check internal devices, such as ROM, RAM, the timer, the keyboard controller, and the hard disk drive every time you turn on the computer or reset the system.

When the POD tests detect an error, the computer displays a message on the screen as described below. In some instances, the computer may also sound a beep. This happens when the error occurs before the computer initializes the video display. If the error is serious, the computer cancels further checking and halts system initialization. The error message remains on the screen and the computer locks up.

Table 2-3 provides a list of the error messages that may appear. The solutions that are provided must be followed in order. If more than one replacement module is specified, replace them in order, one at a time.

Table 2-3
Power-on Diagnostic Error Messages

Error Number	Message	Solution
101	Primary/Secondary Interrupt Controller Failure	Replace J*, A
102	Timer 0 Failure	Replace J*, G*, A
103	Timer 0 Interrupt Failure	Replace J*, G*, A
105	Keyboard Input Buffer Full	Check the keyboard connection Replace U, M*, G*, A
106	I/O Port Word Access Error	Check the mouse connection Replace mouse Check fuse F1 Replace M*, A
107	NMI Failure	Replace J*, A
108	Timer 2 Failure	Replace J*, A
161	System Options Not Set (Run SETUP)	Run SETUP Check all hardware connections Replace P, J*, A
162	System Options Not Set (Run SETUP)	Run SETUP Check connections inside drive bay Check hard disk type number Replace P, H*, J*, A
163	Time & Date Not Set (Run SETUP)	Run SETUP Replace P, J*, A
164	Memory Size Error (Run SETUP)	Run SETUP Check SIMM connections Replace D, N*, L*, A
171	BIOS Shadow RAM Error	Run SETUP Replace E (System BIOS) Replace L*, A
173	Cache Options Error	Replace L*, B, A

Error Number	Message	Solution
201	Memory Error	Run SETUP Replace D, N*, L*, A
202	RAM Memory Error	Replace D, N*, L*, A
203	Memory Address Error	Replace D, N*, L*, A
301	Keyboard Error	Check for stuck key Check for damaged connector or cable Replace U, M*
303	Keyboard or System Unit Error	Check for stuck key Check for damaged connector or cable Replace U, M*
304	Keyboard or System Unit Error	Check for stuck key Check for damaged connector or cable Replace U, M*
401	Monochrome CRT Error	Run SETUP Check jumper J11 Replace H, M*, A
501	Color CRT Error	Run SETUP Check jumper J11 Replace K*, A
601	Diskette Error	Run SETUP Check all diskette cable connections Run diskette drive diagnostics Replace FDD cable, R, H*, A
901	Parallel Port Error	Run SETUP Check printer connections Run parallel port diagnostics Replace printer cable, printer Replace H*, A
1101	Serial Port Error	Run SETUP Check serial device connections Run serial port diagnostics Replace serial cable, serial device Replace H*, A
1760	Disk 0 Parameter Failure	Run SETUP Check HDD interface connections on drive 0 Check jumpers on HDD Run HDD diagnostics Replace HDD interface cable, Q, H*, A
1761	Disk 1 Parameter Failure	Run SETUP Check HDD interface connections on drive 1 Check jumpers on HDD Run HDD diagnostics Replace HDD interface cable, Q, H*, A
1770	Disk 0 Parameter Failure	Run SETUP Check HDD interface connections on drive 0 Check jumpers on HDD Run HDD diagnostics Replace HDD interface cable, Q, H*, A

Error Number	Message	Solution
1771	Disk 1 Parameter Failure	Run SETUP Check HDD interface connections on drive 1 Check jumpers on HDD Check jumpers on HDD Run HDD diagnostics Replace HDD interface cable, Q, H*, A
1780	Disk 0 Failure	Run SETUP Check HDD interface connections on drive 0 Check jumpers on HDD Run HDD diagnostics Replace HDD interface cable, Q, H*, A
1781	Disk 1 Failure	Run SETUP Check HDD interface connections on drive 1 Check jumpers on HDD Run HDD diagnostics Replace HDD interface cable, Q, H*, A
1782	Disk Controller Failure	Run SETUP Check HDD interface connections on drive 0 Check jumpers on HDD Run HDD diagnostics Replace HDD interface cable, Q, H*, A
1790	Disk 0 Error	Run SETUP Check HDD interface connections on drive 0 Check jumpers on HDD Run HDD diagnostics Replace HDD interface cable, Q, H*, A
1791	Disk 1 Error	Run SETUP Check HDD interface connections on drive 1 Check jumpers on HDD Run HDD diagnostics Replace HDD interface cable, Q, H*, A
8601	Auxiliary Device Failure	Check mouse connection Check jumpers J9 and J12 Replace mouse Check fuse F1 (replace if blown) Replace M*, A
8602	Auxiliary Device Reset Failure	Check mouse connection Check jumpers J9 and J12 Replace mouse Check fuse F1 (replace if blown) Replace M*, A
8603	Auxiliary Device Interrupt Failure	Check mouse connection Check jumpers J9 and J12 Replace mouse Check fuse F1 (replace if blown) Replace M*, A
None	Incorrect Diskette Drive Type in CMOS (Run SETUP)	Run SETUP Replace FDD cable, R, P, H*, A

* Replacement of these components is performed only by authorized service centers outside the U.S. Servicers in the U.S. should replace the system board when there is a malfunction of any of the components marked with an asterisk.

Error Beep Codes

If the POD detects an error but cannot display an error message, the computer sounds an error tone code. The tone code is a distinct pattern of beeps that identifies the error, such as one long beep and two short beeps. If there are no errors, the system beeps once before it loads the operating system.

Table 2-4 lists the error beep codes.

Table 2-4
Error Beep Codes

Beep Code	Description	Solution
1 long, 2 short	Video error	Check monitor connection Check jumpers J10 and J11 Replace video card if installed Replace K*, A
1 long, 3 short	Bad ROM error	Check if EPROM chips are completely inserted in sockets (U1 & U113) Replace EPROM chips Replace A
2 short	CMOS RAM or SETUP error	Run SETUP Replace P, J*, A
1 short	No errors	None

Replacement of these components is performed on   by authorized service centers outside the U.S. Servicers in the U.S. should replace the system board when there is a malfunction of any of the components marked with an asterisk.

General System Problems

This section describes problems you may encounter with systems that do not produce POD error messages. A series of possible solutions is provided for each type of problem in two formats: a flowchart and a stepby-step text description.

Note   Retry the system after you have performed the suggested solution. Only go on to the next step when the suggested solution fails.

For certain problems, a hardware test is available as one of the options of the System Diagnostics. You can find the System Diagnostics program on the Reference diskette; user instructions are in the User's Guide and a summary can be found in Appendix B of this manual.

Power or Lock-up Problems

If there is a problem with the computer's power or the system locks up, see the suggestions below:
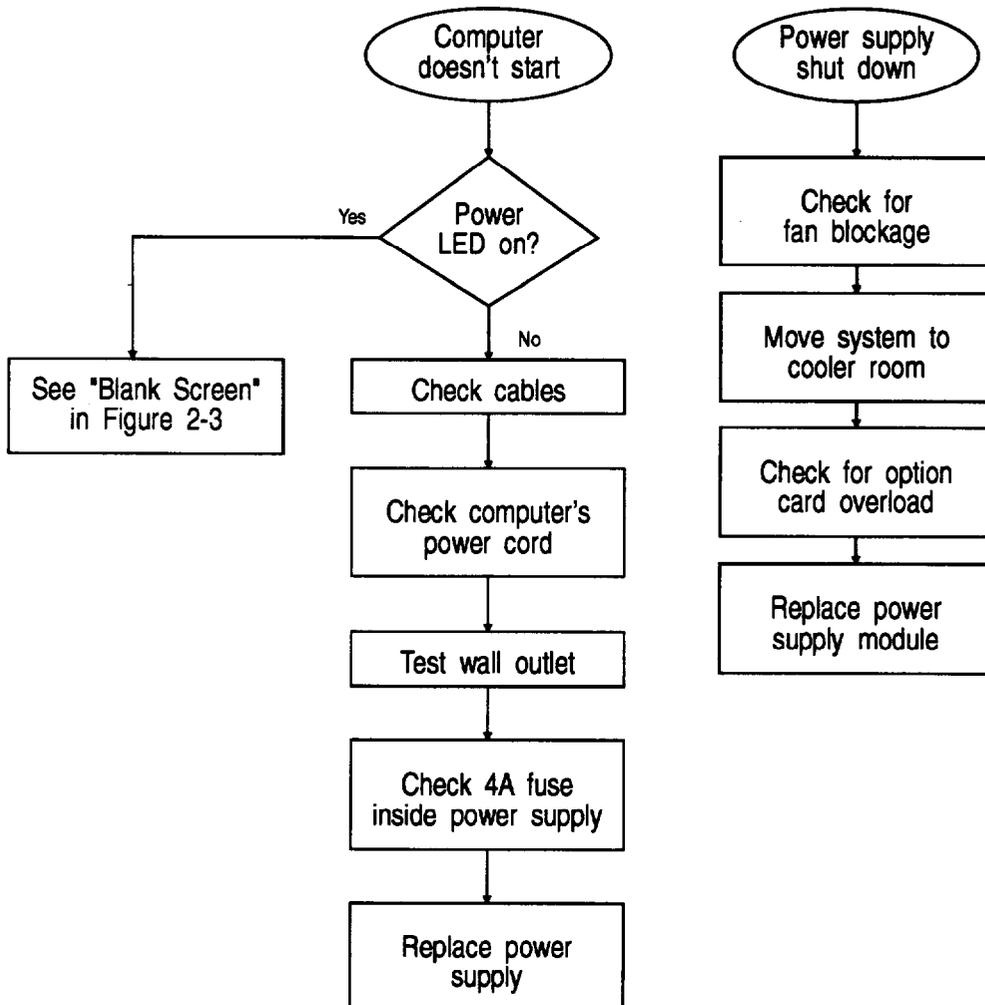
Figure 2-1   Power or Lock-up Problems

Computer Doesn't Start

If the Rower LED is on, see "Video Problems" on page 2-10. If the Rower LED is off, turn off the power and check the following:

1   Be sure all cables are securely connected to the computer.

2   Check that the computer and monitor power cords are plugged completely into their electrical outlets.

3   Test the outlet to see if it supplies power.

4   Remove the Rower cord from the electrical wall outlet and from the rear of the power supply module.

5   Remove the Rower supply and test the continuity of the 4A fuse inside the module with a multimeter. Replace the fuse if necessary.

6   Replace the power supply.

Blank Screen

See "Blank Screen" on page 2-l 1.

Power Supply Shut Down

The Power supply contains detection circuits that automatically shut down the power if they detect excessive operating temperatures. This protects the system from damage due to overheating.

When these circuits detect a high temperature, they shut off all the DC outputs in the power supply and the computer stops operating. This does not damage the power supply, but you must remove the cause of the high temperature before the system can be used again.

After you eliminate the problem causing the overheating, allow the computer to cool down for at least five minutes at a room temperature of about 25° C (78° F). This resets the thermal detection circuits.

To determine the cause of the high temperature and correct the condition, check for the following:

1   A blocked power supply fan. Make sure that nothing blocks the power supply fan vents. Check both inside and outside the computer for blockage. Make sure there is ample room around the system for air circulation.

2   Room temperatures of 40° C (104° F) or above. If this is the case, move the computer to a cooler area.

3   An overload of the power supply limitations. Check the information on page 1-14 to see if the power limits have been observed.

4   If the power supply shuts off again after you follow the steps above to correct the problem, replace the Rower supply module.

Keyboard Problems

If there is a problem with the computer's keyboard, see the suggestions below:
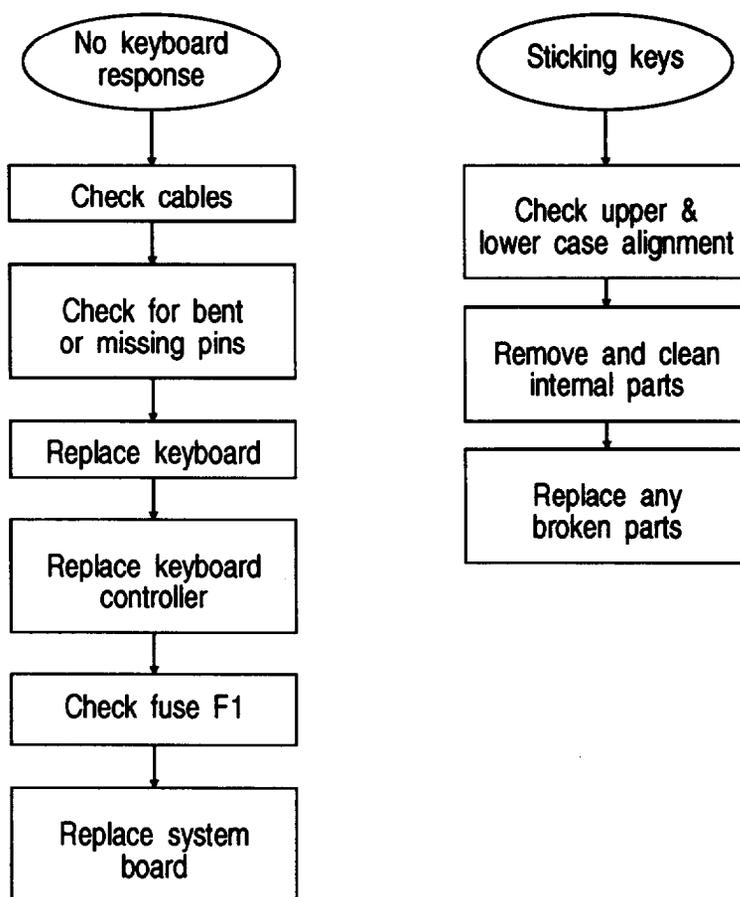
Figure 2-2   Keyboard Problems

No Keyboard Response

If the computer boots properly but does not respond when you type, follow these suggestions:

1   Make sure the keyboard cable is securely connected to the keyboard port and not the mouse port.

2   Check the keyboard cable connector for any bent or missing pins. If necessary, repair the connector or replace the cable.

3   Replace the keyboard unit. The internal circuit board may be faulty.

4   Replace the keyboard controller. The controller may be faulty.

5   Check the continuity of fuse Fl (1A @ 125V) on the system board and replace it if blown.

6   Replace the system board.

Sticking Keys

When the keys are sticking, follow these suggestions:

1   Make sure the keyboard's upper and lower cases are properly aligned.

2   Remove the sticking keys and clean all internal parts.

3   Remove the keys and replace any broken parts.

Video Problems

If there is a problem with the computer's video system, see the suggestions below:

```
    ( Blank screen )              ( Incorrect images )
          |                              |
  +----------------+            +----------------+
  |  Check cables  |            |  Check cables  |
  +----------------+            +----------------+
          |                              |
  +----------------+            +----------------+
  | Check monitor  |            |   Check contrast & |
  | power switch & |            |  brightness controls |
  | electrical outlet |         +----------------+
  +----------------+                     |
          |                     +----------------+
  +----------------+            | Check for monitor |
  |   Check contrast & |        | & video type match |
  | brightness controls |       +----------------+
  +----------------+                     |
          |                     +----------------+
  +----------------+            |  Check adapter |
  | Check for bent |            |  type in SETUP |
  | or missing pins |           +----------------+
  +----------------+                     |
          |                     +----------------+
  +----------------+            | Check if VGA driver |
  |  Check video   |            | & monitor type match |
  | jumpers J10 & J11 |         +----------------+
  +----------------+                     |
          |                     +----------------+
  +----------------+            |   Run Video    |
  | Replace monitor |           |  Diagnostics   |
  +----------------+            +----------------+
          |                              |
  +----------------+            +----------------+
  | Replace system |            | Replace system |
  |     board      |            |     board      |
  +----------------+            +----------------+
```

Figure 2-3 Video Problems

Blank Screen

If the power LED is on but the screen is blank, follow these suggestions:

1   Make sure the monitor cables are securely connected to the monitor, the computer, and the electrical outlet.

2   Check that the monitor's power switch is on and that the power light on the monitor is lit. If the Rower light is not lit, check to see if the electrical outlet supplies power.

3   If the power light is on but you still do not see anything on the screen, check the monitor's brightness and contrast controls.

4   Check the monitor cable connector for any bent or missing pins. If necessary, repair the connector or replace the cable.

5   If the monitor is connected to the built-in video adapter, make sure that jumper Jl0 has a jumper in position A. (See page 1-12.) If the monitor is connected to an optional video adapter, make sure that jumper Jl0 has a jumper in position B. If the optional video adapter is monochrome, make sure that jumper Jll is in position B.

6   Replace the monitor.

7   Replace the system board. The video controller may be faulty. Authorized service centers outside the U.S. can replace the video controller chip.

Incorrect Images

If the screen displays incorrect or blurred images, follow these suggestions:

1   Make sure the monitor cables are securely connected to the monitor, the computer, and the electrical outlet.

2   Check the monitor's brightness and contrast controls. See the manufacturer's guide for references to other controls that may affect picture quality.

3   Make sure the monitor and video adapter types match.

4   Make sure the correct display adapter type is selected in the SETUP program.

5   If an extended VGA driver is installed in memory, make sure the specified resolution is supported by the monitor.

6   Test the video adapter by running the video diagnostics tests. If the tests indicate an error, replace the system board. The video controller may be faulty. Authorized service centers outside the U.S. can replace the video controller chip.

Diskette Drive Problems

If there is a problem with the diskette drive, see the suggestions below:

```
     ┌──────────────────┐              ┌──────────────┐
     │ Operating system │              │ Diskette drive│
     │  error messages  │              │     noise     │
     └──────────────────┘              └──────────────┘
              │                                │
              ▼                                ▼
     ┌──────────────────┐              ┌──────────────────┐
     │   Check status of│              │                  │
     │built-in drive controller│       │ Check for loose parts│
     │      in Setup    │              │                  │
     └──────────────────┘              └──────────────────┘
              │                                │
              ▼                                ▼
     ┌──────────────────┐              ┌──────────────────┐
     │   Check drive type│             │                  │
     │  setting in SETUP│              │ Replace diskette drive│
     └──────────────────┘              └──────────────────┘
              │
              ▼
     ┌──────────────────┐
     │   Check internal │
     │  drive connections│
     └──────────────────┘
              │
              ▼
     ┌──────────────────┐
     │  Run Diagnostics;│
     │ replace drive if errors│
     └──────────────────┘
              │
              ▼
     ┌──────────────────┐
     │Replace system board│
     └──────────────────┘
```
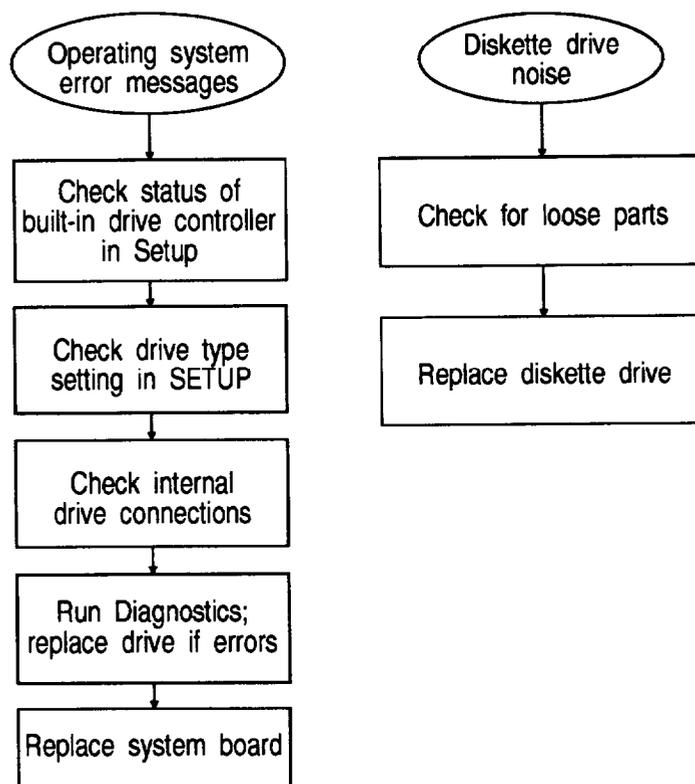
Figure 24   Diskette Drive Problems

Operating System Error Messages

If the system boots, but the operating system displays a diskette access error message, follow these suggestions:

1   Run the SETUP program and make sure the diskette drive type is set correctly and the diskette drive controller is enabled.

2   Remove the computer cover and make sure the diskette drive interface and power connectors are completely inserted. Replace the cover.

3   Test the drive by running the diskette drive diagnostics test. If the test indicates an error, replace the diskette drive.

4   Replace the system board. The FDD controller in the 82C711 gate array may be faulty. Authorized service centers outside the U.S. can replace the gate array chip.

Diskette Drive Noise

lf the diskette drive is making loud or unusual noises, check for any loose parts and replace the diskette drive if necessary.

Hard Disk Problems

If there is a problem with the hard disk drive, see the suggestions below:

```
   ╭──────────────╮              ╭──────────────╮
   │ Newly-installed│            │  Hard disk   │
   │ drive problems │            │ boot failure │
   ╰──────────────╯              ╰──────────────╯
          │                             │
  ┌───────────────┐            ┌───────────────┐
  │ Check status of HDD│       │ Check hard disk│
  │ controller and type│       │  drive type   │
  │   in SETUP    │            └───────────────┘
  └───────────────┘                    │
          │                   ┌───────────────┐
  ┌───────────────┐           │ Boot system from│
  │ Check internal │          │ DOS diskette  │
  │ connections and│          └───────────────┘
  │ jumper settings│                   │
  └───────────────┘           ┌───────────────┐
          │                   │  Enter DIR C: │
  ┌───────────────┐           └───────────────┘
  │ Use FDISK to test if│              │
  │ drive has a partition│     ◇───────────────◇  No
  └───────────────┘           ╱     See        ╲───────┐
          │                   ╲  directory?     ╱       │
  ┌───────────────┐            ◇───────────────◇        │
  │  Run hard disk │                  │ Yes            │
  │  Diagnostics   │          ┌───────────────┐         │
  └───────────────┘           │ Set primary partition│   │
          │                   │ active with FDISK│       │
  ┌───────────────┐           └───────────────┘         │
  │ Replace the drive│                │                 │
  └───────────────┘           ┌───────────────┐         │
                              │ Reformat hard disk│←─────┘
                              │  Reinstall OS  │
                              └───────────────┘
```

Figure 2-5 Hard Disk Problems

Newly-installed Drive Problems

If there is a problem with a newly installed drive, follow these suggestions:

1   Verify that you ran the SETUP program to enable the built-in hard disk controller and have defined the hard disk drive type correctly.

2   Check all the cable connections to make sure you installed the drive correctly. (See page 3-16.) Also, check the jumper settings on the drive to be sure they are set correctly.

3   Lf you installed a non-Epson hard disk drive, verify that it has a DOS partition. (The hard disk drives Epson provides with the Epson NX have a DOS partition as well as a partition for NeXTSTEP software.) You can check for a DOS partition by booting with a DOS system diskette and running the FDISK program. If FDISK reports that no partition exists, then it means that DOS has not been installed.

Note If the hard disk is not an IDE-type drive, it may need to be physically formatted. Follow the instructions in the *User's* Guide for the HDD format program on the Reference diskette.

4   Test the drive by running the hard disk diagnostics tests. If the tests indicate a problem, replace the drive.

Hard Disk Boot Failure

When the computer starts but does not load the operating system, follow these suggestions:

1   Run the SETUP program and make sure the hard disk drive type is correct.

2   Boot the system from a DOS system diskette in drive A. Then enter the command **DIR C:** . (The drives Epson provides for the Epson NX have a partition for DOS as well as a partition for the NeXTSTEP operating system.) If you see a message similar **to Invalid device sgecification,go** to step 4.

3   If you see a valid directory listing, run the DOS FDISK program and make sure the primary partition is set as the active partition.

4   Reformat the hard disk and reinstall the operating system on it. (See "Hard Disk Problems" on page 2- 13 .)

5   If the hard disk is not an IDE-type, perform a low-level format on the HDD with the Hard Disk Format program on the Reference diskette. (See the User's Guide for instructions.) Reformat the hard disk and reinstall the operating system on it.

System Software Problems

If there is a problem using the built-in system software, follow the suggestions below:
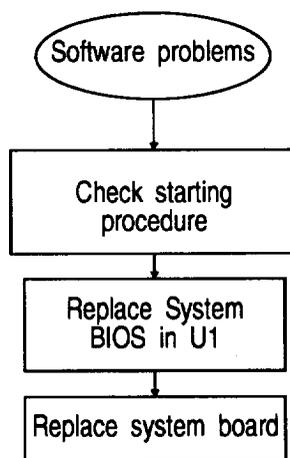
Figure 2-6 Software Problems

1   Make sure you are using the correct procedure for starting the program.

2   Check your Service Information Bulletins for System BIOS updates. Install the most recent version of the BIOS in Ul.

3   If you are unable to run the SETUP program, replace the System BIOS chip in Ul and the SETUP text chip in U113 (see page 3-21).

4   Replace the system board.

Parallel Printer Problems

If there is a problem using a printer from the parallel port, follow the suggestions below:

```
        ┌─────────────────────┐
        │   Parallel printer  │
        │      problems       │
        └─────────────────────┘
                  │
                  ▼
        ┌─────────────────────┐
        │  Check printer power │
        │   and connections    │
        └─────────────────────┘
                  │
                  ▼
        ┌─────────────────────┐
        │  Check printer DIP   │
        │   switch settings    │
        └─────────────────────┘
                  │
                  ▼
        ┌─────────────────────┐
        │    Try a different   │
        │   cable and printer  │
        └─────────────────────┘
                  │
                  ▼
        ┌─────────────────────┐
        │   Check primary &    │
        │  secondary settings  │
        │  with multiple ports │
        └─────────────────────┘
                  │
                  ▼
        ┌─────────────────────┐
        │   Run Diagnostics    │
        └─────────────────────┘
                  │
                  ▼
        ┌─────────────────────┐
        │ Replace system board │
        └─────────────────────┘
```
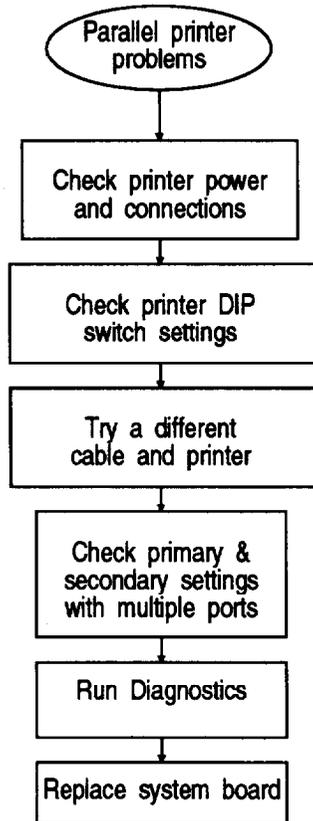
Figure 2-7 Parallel Printer Problems

1   Make sure the printer has power and is properly connected to the computer. (Also, be sure the printer has paper in it.)

2   Check the printer manual for the printer's correct DIP switch or control panel settings.

3   Try a different cable. Also, try a different printer if one is available.

4   If there is more than one parallel port, check the primary and secondary port settings in the SETUP program to make sure they are correct.

5   Run the parallel port diagnostics test.

6   Replace the system board. Connector CN5 or the parallel port controller in the F82C711 gate array may be faulty. Authorized service centers outside the U.S. can replace the gate array chip or connector.

Serial Port Problems

If there is a problem using a serial device from a serial port, follow the suggestions below:

```
        ╭─────────────────╮
       (   Serial port     )
       (    problems        )
        ╰─────────────────╯
                 │
                 ▼
        ┌─────────────────┐
        │ Check device power │
        │  and connections   │
        └─────────────────┘
                 │
                 ▼
        ┌─────────────────┐
        │ Check protocol DIP │
        │  switch settings   │
        └─────────────────┘
                 │
                 ▼
        ┌─────────────────┐
        │   Try a different  │
        │    serial cable    │
        └─────────────────┘
                 │
                 ▼
        ┌─────────────────┐
        │  Check primary &   │
        │ secondary settings │
        │ with multiple ports│
        └─────────────────┘
                 │
                 ▼
        ┌─────────────────┐
        │  Run Diagnostics   │
        └─────────────────┘
                 │
                 ▼
        ┌─────────────────┐
        │Replace system board│
        └─────────────────┘
```
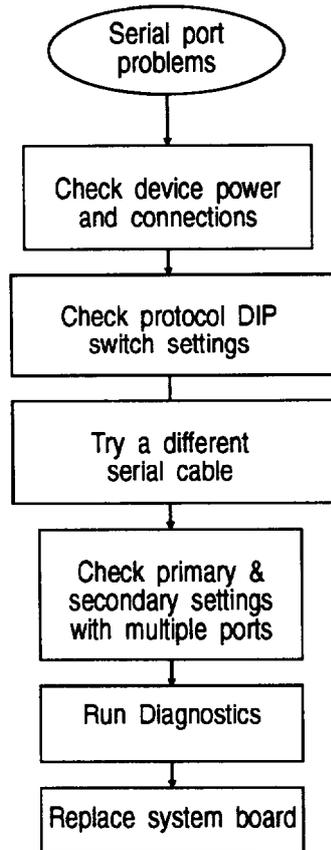
Figure 2-8 Serial Port Problems

1   Make sure the device has power and is properly connected to the computer.

2   Check the device's manual for any DIP switch or control panel settings. The baud
     rate, parity, and number of stop bits of the device and serial port must match.

3   Try a different cable. Also, make sure you are using a null modem cable if the device
     is a serial printer.

4   Check the primary and secondary port settings in the SETUP program to make sure
     they are correct.

5   Run the Serial port Diagnostics test.

6   Replace the system board. Connectors CN4 and CN8 or the serial port controller in the
     F82C711 gate array may be faulty. Authorized service centers outside the U.S. can
     replace the gate array chip or connector.

Option Card Problems

If there is a problem using an option card, follow the suggestions below:
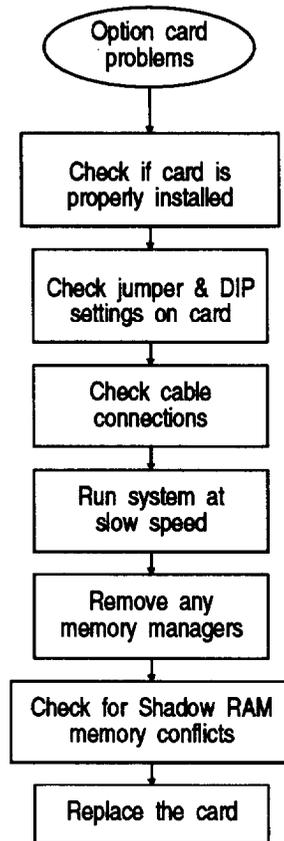
Figure 2-9   Option Card Problems

1   Make sure the option card is properly inserted in its slot.

2   Check to see if any necessary DIP switches or jumpers on the option card are set correctly.

3   Make sure that you used the proper cable to connect the device to the option card connector.

4   Switch the system to low speed.

5   If you still have trouble with the option card and the system is using a memory manager program such as QEMM-386^{TM} or 386MAX^{TM}, try removing the program from memory and rebooting your computer.

6   Some cards may use a part of the memory address space that conflicts with the addresses assigned to Video Shadow RAM. Use the SETUP program to disable the Video Shadow RAM.

7   Replace the option card.

Memory Module Problems

If there is a problem using a SIMM, follow the suggestions below:

```
        ┌─────────────────────┐
        (    SIMM problems     )
        └─────────────────────┘
                  │
        ┌─────────────────────┐
        │  Check installation │
        └─────────────────────┘
                  │
        ┌─────────────────────┐
        │  Check SIMM speed;  │
        │   70 ns or faster   │
        └─────────────────────┘
                  │
        ┌─────────────────────┐
        │   Check memory      │
        │ configuration with SETUP │
        └─────────────────────┘
                  │
        ┌─────────────────────┐
        │    Run Memory       │
        │  Diagnostics test   │
        └─────────────────────┘
                  │
        ┌─────────────────────┐
        │   Replace SIMMs     │
        │    one at a time    │
        └─────────────────────┘
                  │
        ┌─────────────────────┐
        │ Replace system board│
        └─────────────────────┘
```
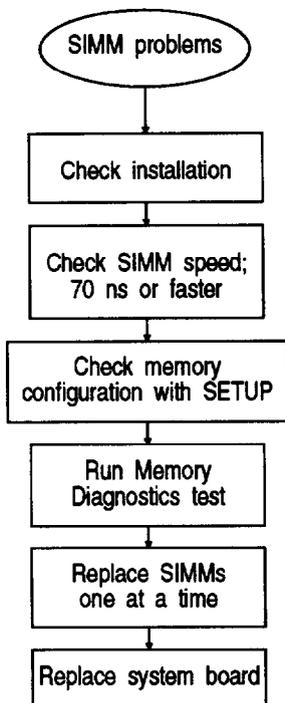
Figure 2-10   Memory Module Problems

1   If the memory count displayed by the POD or the SETUP program is incorrect, the
     SIMMs may not be installed correctly. The SIMMs may be the wrong type, or they
     may not be inserted all the way into their sockets. Remove the cover and check the
     installation.

2   Verify the speed of the SIMMs. Install only 70-ns (or faster), 36-bit, gold-plated,
     fast-page mode SIMMs.

3   Run the SETUP program to check the memory configuration.

4   Run the memory diagnostics test.

5   Replace the SIMMs one at a time.

6   Replace the system board. The SIMM connectors or memory controller in the EP6075
     gate array may be faulty. Authorized service centers can replace the gate array chip or
     Connector.

Mouse Problems

When the computer boots properly but does not respond when you move the mouse, follow the suggestions below:
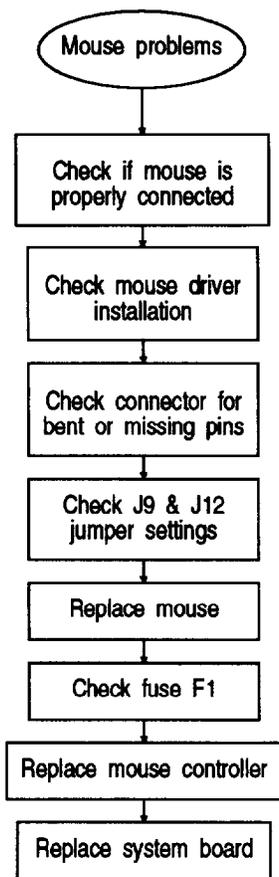
Figure 211 Mouse Problems

1   Make sure the mouse cable is securely connected to the mouse port (CN9) and not to the keyboard port (CNl0).

2   Check whether the mouse driver program is loaded into the computer's memory correctly.

3   Check the mouse cable connector for any bent or missing pins.

4   Check that the built-in mouse port jumper J9 is in position A.

5   Replace the mouse. It may be faulty.

6   For servicers outside the U.S., replace the keyboard/mouse controller. The controller may be faulty.

7   Check the continuity of fuse Fl (1 A @ 125V) on the system board. Replace the fuse if it is blown.

8   Replace the system board.

Troubleshooting with the NeXTSTEP Operating System

As has been described previously, you can diagnose hardware problems for the Epson NX system by inserting a DOS boot or diagnostics diskette and running the checks in this chapter. The paragraphs below describe a few features of the NeXTSTEP operating system that may be useful for a service technician to know during troubleshooting.

1   Like the UNIX operating system, NeXTSTEP needs to be powered down in an orderly manner. If you want to exit NeXTSTEP and power off the system:

Hold down the right **Alt** key, press **Num Lock,** and then press **h** to halt the system.

2   If there is an abnormal system shut down, the NeXTSTEP operating system runs an extensive check of the hard disk drive to investigate the problem. The screen displays the message "Checking disks" for several minutes. After successfully running the system check, NeXTSTEP cleans the file system state (i.e., performs the procedure for an orderly shutdown), and then reboots. The system displays the message "Pile system clean" during initialization of the software.

(In some instances of abnormal shutdown, the site system administrator (SUPERUSER) will be required to intervene and manually clean the file system.)

3 *Removing and Replacing Subassemblies*

Contents

Figures

General Service Information

This chapter provides instructions for removing and replacing the major subassemblies of the Epson NX. The following precautions must be observed when performing any service procedures.

DANGER Turn off the computer and all peripheral devices and disconnect all peripheral interface cables from the system unit before removing the system unit cover. Failure to heed this warning could expose you to an electrical shock hazard. Remove the AC power cord only when you need to disassemble the system.

Components on the main system board can get very hot. After turning off the computer, wait for at least 10 minutes for the components to cool before removing the cover.

WARNING Most of the components used in the manufacture of circuit boards and disk drives in the computer are static-sensitive CMOS devices. To prevent damage from static electricity, always discharge body static by touching a grounded surface before opening the computer's case. Always wear a grounded wrist strap when handling any circuit boards or cables inside the computer. Do not touch any of the circuit board components or connector pins with your hands, including the gold edge connectors, as damage from static discharge and/or contamination may result. Place circuit boards and disk drives on anti-static rubber mats or similar anti-static surfaces when they are removed from the computer.

Do not rock, twist, or physically stress the circuit boards while removing them, as permanent damage may result.

Follow all instructions in the order given. Failure to do so may cause damage to a subassembly or component.

Caution Do not allow the speaker attached to the front of the system chassis to come in close proximity to diskettes, hard disk drives, or other magnetic media, as the speaker's magnetic field can cause loss of data.

System Unit

This section describes how to remove and replace the components of the main system unit.

Removing the Cover

> **WARNING** Be sure to ground yourself by touching the back panel of the computer every time you remove the cover. If you are not properly grounded, you could generate an electric shock when you touch a component.

Before following these instructions, read the warnings on page 3-l.

Follow these steps to remove the computer's cover:

1   Turn off the computer and then any peripheral devices (including the monitor and printer).

2   Disconnect the computer's power cable from the electrical outlet and from the back panel if you plan to remove a major component. Also, disconnect any cables that are connected to the computer, including the keyboard cable.

3   If the monitor is on top of the computer, lift it off and set it to one side.

4   Turn the computer around so you are facing the back panel.

5   Remove the three retaining screws securing the cover to the back panel, as shown in Figure 3- 1.
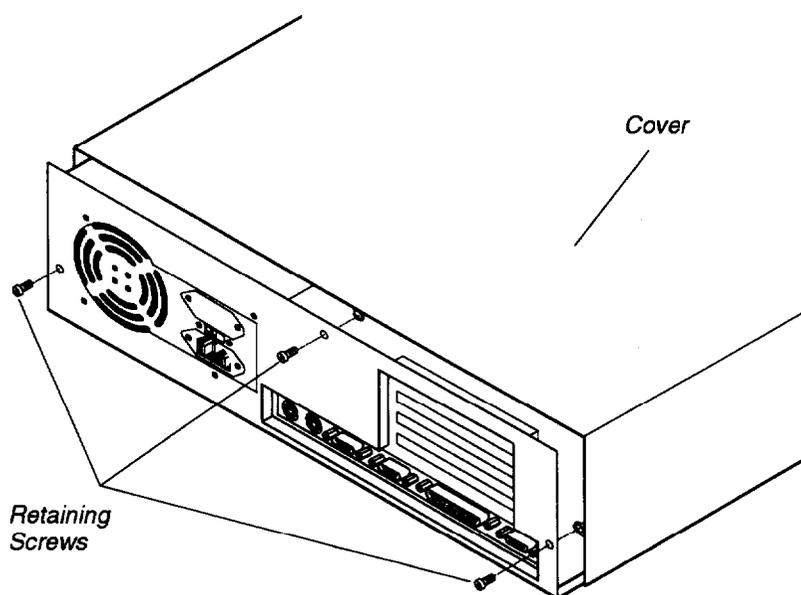
Figure 3-1   Removing the Cover Retaining Screws

6 Turn the computer around again so that the front panel is facing you.

7 Grasp the sides of the cover and pull it straight toward you until it stops, just before it reaches the front of the computer. Then lift it off at an angle as shown in Figure 3-2.
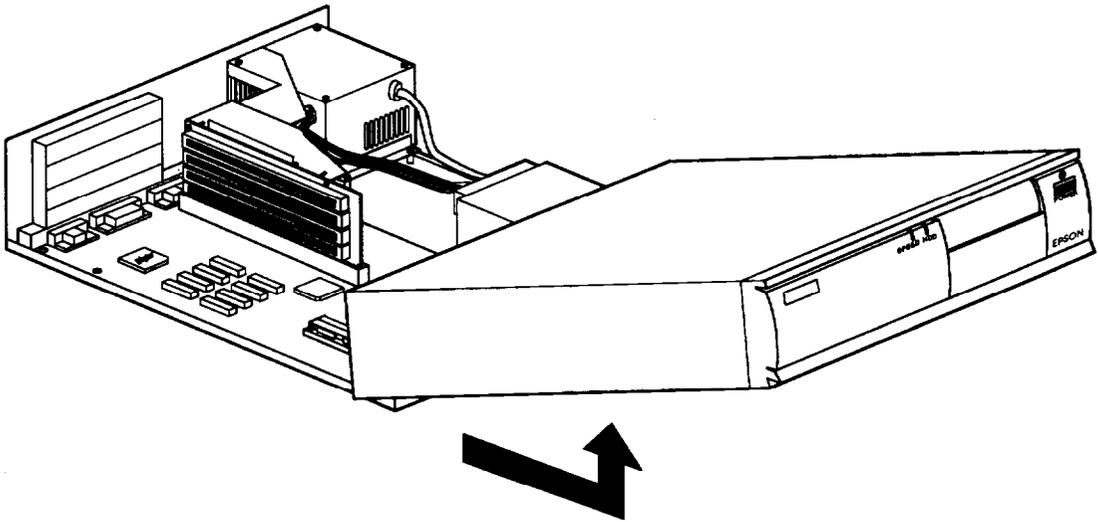
Figure 3-2 Removing the Cover

8 Set the cover aside on a flat surface.

Replacing the Cover

To replace the computer's cover, follow these steps:

1   Facing the front of the computer, position the cover so the lips on its bottom edges
     slide under the guiderails along both sides of the computer case, as shown in
     Figure 3-3.

Chassis
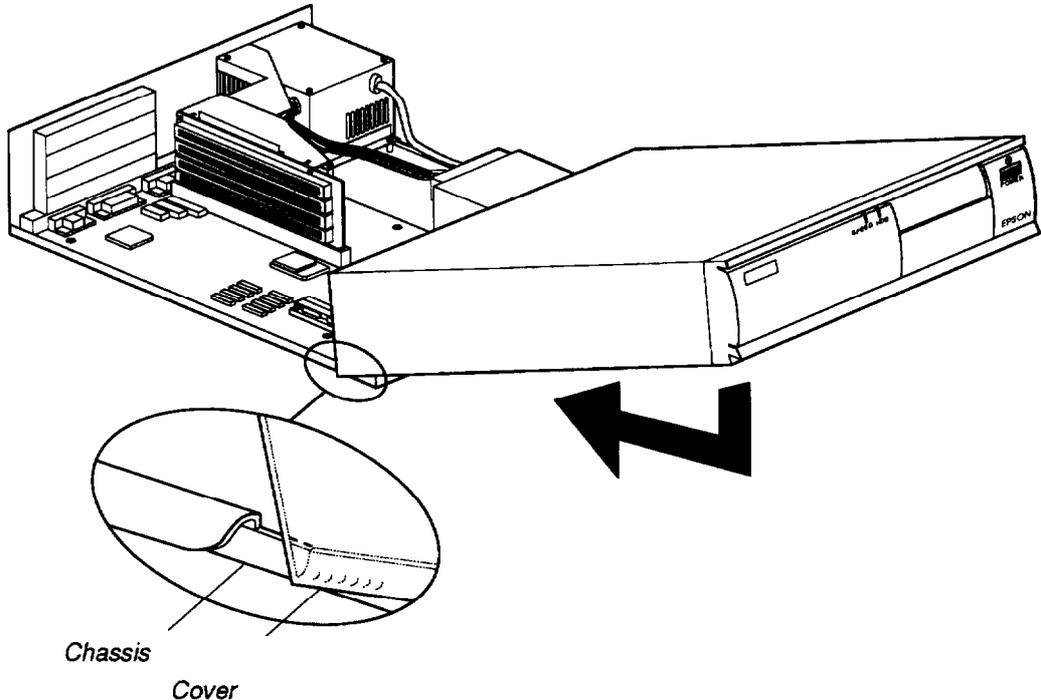
Cover

Figure 3-3   Replacing the Cover

2   Lower the cover and slide it straight back over the computer until it stops against the
     rear panel.

3   Replace the three cover retaining screws as shown in Figure 3- 1.

4   Reconnect the computer to the monitor, printer, keyboard, mouse, and any other
     peripheral devices. Then reconnect the power cable to the back of the computer and to
     an electrical outlet.

Removing an Option Card

Follow these steps to remove an option card that has been installed in the computer in order to access components on the main system board, to change a jumper setting, or to change option cards:

1   Remove the computer's cover as described on page 3-2.

2   Remove the retaining screw securing the option card to the computer as shown in Figure 3-4. Then pull the card straight out from the riser board.
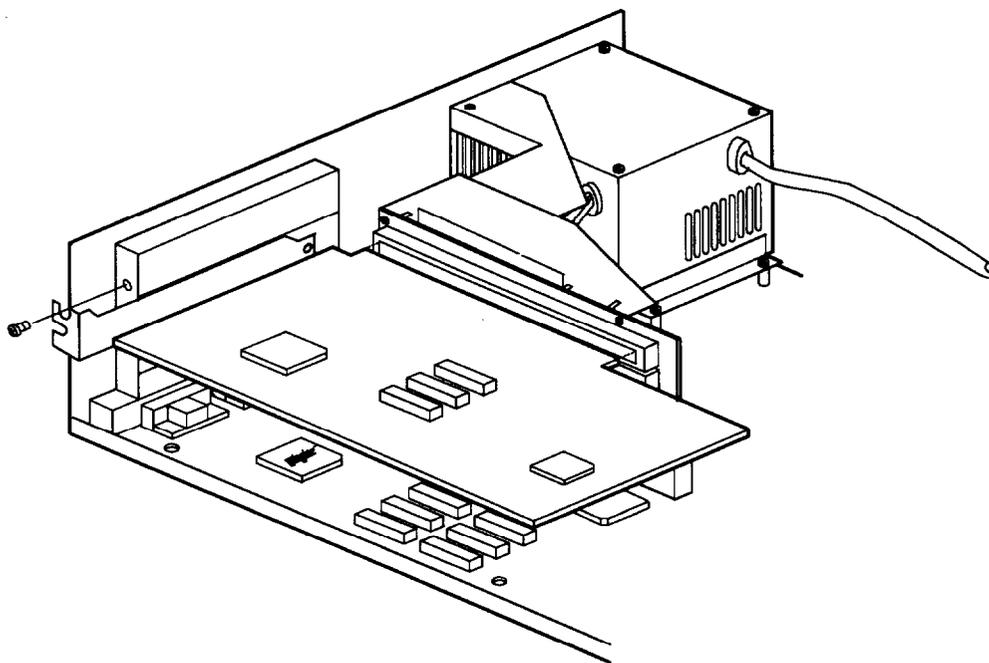
Figure 3-4   Removing/Installing the Option Card

3   Set the option card aside with the component side facing up.

Note   After removing an option card, check to see if any jumper settings on the main system board need to be changed. For example, if you remove a mouse interface card, the setting of jumper J12 needs to be changed. If you remove a video card, the settings of jumper Jl0 or J11 may need to change. See page 1 - 12 for more information on jumper settings.

Removing the Option Slot Cover

Follow these steps to remove the option slot cover so you can install an option card:

1   Remove the cover as described on page 3-2.

2   Remove the retaining screw securing the option slot cover and slide out the slot cover as shown in Figure 3-5. Keep the screw to secure the option card to the computer. Store the slot cover in a safe place in case the option card is later removed.
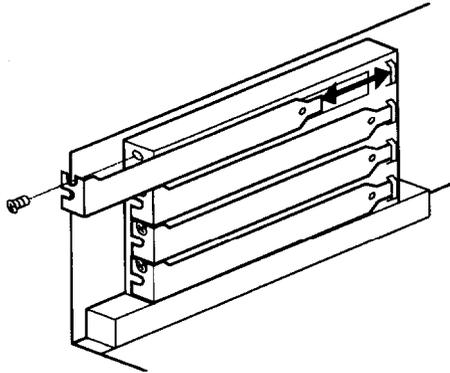
Figure 3-5   Removing/Replacing the Option Slot Cover

Replacing the Option Slot Cover

Follow these steps to replace the option slot cover:

1   Remove the cover as described on page 3-2.

2   To replace the option slot cover, insert the cover as shown above in Figure 3-5 and secure it with the retaining screw.

3   Replace the computer's cover. (See page 3-4.)

Installing an Option Card

The computer has four 16-bit option slots located on the option card connector board and accommodates up to four option cards. (The Epson NX comes with a network card in one option slot, and some configurations may have a SCSI interface in another slot.) An option card can occupy any slot. For example, an 8-bit card can be installed in a 16-bit slot. However, the following restrictions apply:

❏   If an 8-bit card has an additional tab along the bottom, it will interfere with the option slot connector and will not fit.

❏   If a disk drive controller card is installed, place the card in one of the lower slots, so the drive cable will not be in the way when replacing the computer's cover.

❏   If a high-resolution graphics adapter card is installed, place the card in one of the lower slots, so the cable will reach the VGA feature connector (CN17) on the system board. Consult the instructions that come with the card for further instructions.

Note Before installing an option card, check to see if any jumper settings on the main system board need to be changed. For example, if installing a mouse interface card, the settings of jumpers J9 and J12 need to be changed. If installing a video card, the settings of jumpers Jl0 or Jl 1 may need to change. See page l-l2 for more information on jumper settings.

Follow these steps to install an option card that has been removed or to add a new option card in the computer:

1   Remove the computer's cover as described on page 3-2.

2   Remove the option slot cover as described on page 3-6.

3   Unpack the option card and adjust any switches or jumpers on it, if necessary. (Check the option card instructions.) When handling the card, be careful not to touch any of the components on the circuit board or the gold-plated connectors. If you need to set it down before you install it, place it gently on top of its original packing material with the component side facing up. Keep the packing materials in case the card is removed later.

4   Hold the card along the top corners and guide it into the connector as shown in Figure 3-4. If installing a full-length card insert the front edge of the card into the corresponding guide inside the computer's front panel.

5   Once the connectors reach the slot, push the card in firmly to insert it fully. If it does not go in smoothly, do not force it; pull the card all the way out and try again.

6   Secure the end of the card to the computer's option slot with the retaining screw that once held the option slot cover.

7   Follow the instructions on page 3-4 to replace the computer's cover.

Removing the Option Card Riser Board

Follow these steps to remove the option card riser board:

1   Remove the computer's cover as described on page 3-2.

2   Remove any option cards as described on page 3-5.

> **Caution** To prevent damage, remove any option cards before removing the riser board.

3   Remove the retaining screw securing the bracket to the option card riser board and to the power supply as shown in Figure 3-6. Then remove the bracket.
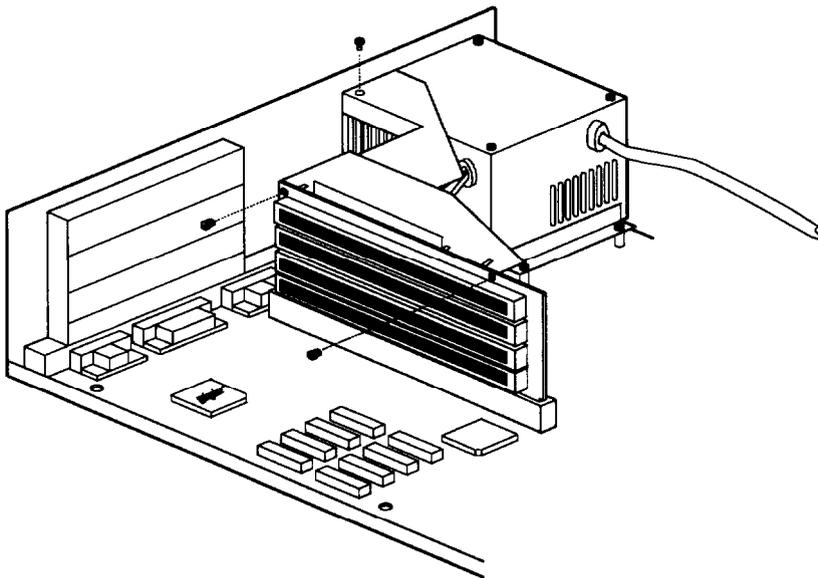
Figure 3-6   Removing the Option Card Riser Board

4   Using both hands, pull the riser board straight up and out of its socket (CN14).

5   Set the board aside.

Replacing the Option Card Riser Board

Follow these steps to reinstall the option card riser board inside the computer:

1   Position the board above its slot (CN14) as shown in Figure 3-6 and then firmly push it straight in.

2   Secure the bracket to the power supply and then to the board with the retaining screws.

3   Replace any option cards previously removed before replacing the computer's cover.

Removing SIMMs

If you need to remove SIMMs from the computer, follow these steps:

1   Remove the computer's cover as described on page 3-2.

2   Remove any option cards that may be blocking access to the SIMM sockets (see page 3-5).

3   Use your fingers or a small screwdriver to pull away the metal tabs that secure the SIMM at each end. Be careful not to pull the tabs too far, or they may bend.
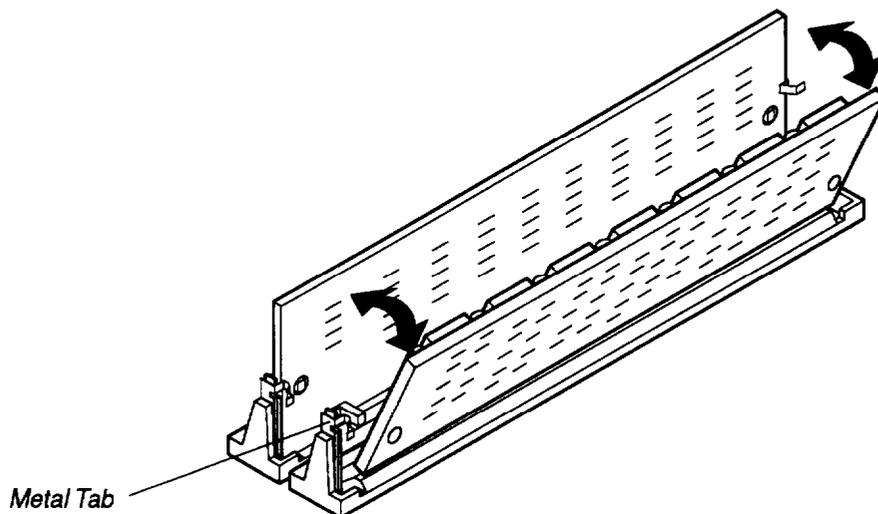
Figure 3-7 Removing SIMMs

4   As you pull away the tabs, the SIMM falls to the side of its socket as shown in Figure **3-7.** When the SIMM is at an angle, carefully remove the SIMM and store it in an anti-static bag.

5   Repeat steps 3 and 4 for removing additional SIMMs.

6   Replace any option cards removed (see page 3-7).

7   Replace the computer's cover (see page 3-4).

8   Run the SETUP program immediately to update the computer's configuration with the new memory information.

Installing SIMMs

Follow these steps to install SIMMs:

1   Remove the computer's cover as described on page 3-2.

2   Remove any option cards that may be blocking your access to the SIMM sockets (see page 3-5).

3   The SIMM sockets are located near the front of the computer. Install the first SIMM in the socket farthest from the edge of the main system board. Note that both SIMM sockets must be occupied with the same size SIMM or the system will not work properly.

4   Position each SIMM so its component side is toward the left side of the computer; then insert it in the socket at a slight angle. (See Figure 3-7.)

5   Gently press down on the SIMM and, at the same time, press the top corners forward until the SIMM is vertical and clicks into place between the metal clips and the retaining posts. Make sure the SIMM is fully inserted into the socket and that the retaining post pins fit into the holes at each end of the SIMM.

6   Repeat steps 4 and 5 for each SIMM you want to install.

7   Replace any option cards you removed and the cover.

8   Run the SETUP program immediately in order to update the computer's configuration with the new memory information.

Installing Another Processor

You can install a future Intel OverDrive processor in the Epson NX system, when it becomes available.

> **Caution** You must observe strict anti-static procedures to avoid damaging the CPU as you install or remove it.

Follow these steps to install the CPU in socket U5:

1   Remove the cover (see page 3-2) and any option card that may be in the way of accessing the socket (see page 3-5). Remove any attached heat sink.

2   Raise the lever up and over the ZIF socket (see Figure 3-8). This will release the pressure holding the legs of the CPU in the socket.

3   Gently lift the CPU out of the socket and place it in an anti-static bag for protection.
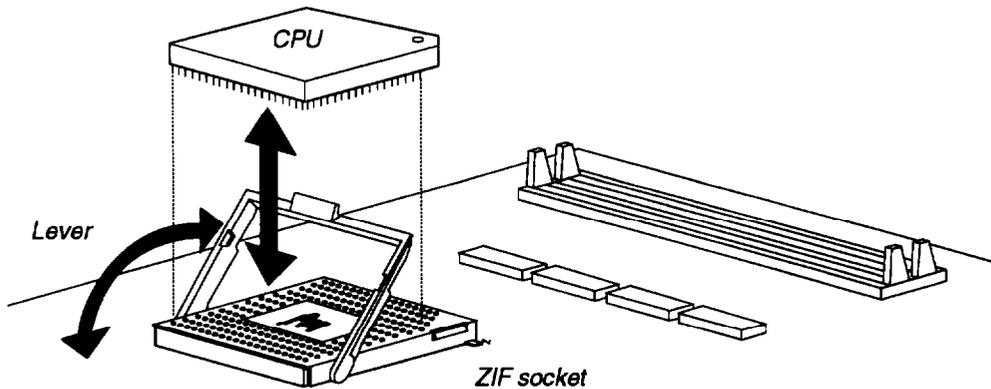
Figure 3-8 Removing/Installing the Processor

4   Locate the orientation dot in one corner of the new CPU and turn the CPU so that the dot is in the position shown in Figure 3-8. Be sure the dot is aligned with the corner that has a " 1" printed on the system board.

> **Caution** **If** you insert the CPU in the wrong position, you could permanently damage it.

5   Gently lower the CPU into the ZIF socket and raise the lever up over the socket so that it locks in place. Examine the CPU to be sure it is inserted all the way into the socket and is secure.

6   Attach a heat sink to the top of the CPU.

7   Replace any option card removed and the cover.

8   Run the SETUP program immediately to update the computer's configuration with the
     new information.

Removing a Drive From the Horizontal Position

Follow these steps to remove a drive from a horizontal position:

1   Remove the computer's cover (see page 3-2).

2   Remove the drive ribbon cable and the power supply cable from the back of the drive.

3   Remove the two front retaining screws securing the diskette drive to the chassis. Then,
     gently pull the drive out from the front of the bay as shown in Figure 3-9.
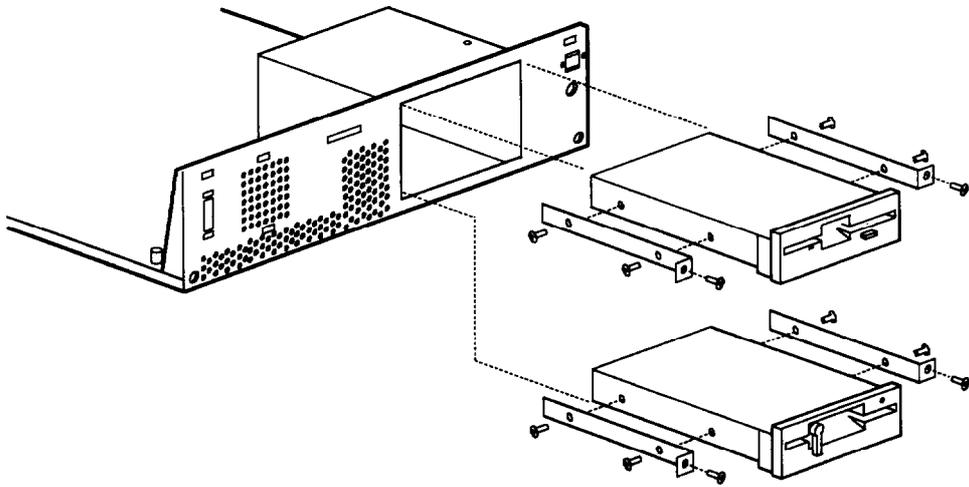
Figure 3-9   Removing/Installing a Horizontal Drive

4   Keep the screws so that you can use them to install a drive later.

5   When removing the lower drive, replace the lower drive bay cover on the chassis and
     on the front panel as shown in Figure 3-10.

6   If one of two hard disk drives is removed, the jumpers on the remaining hard disk
     drive must be changed Check the hard disk drive documentation for details.

7   Replace the cover (see page 3-4).

8   Reconfigure the system with the SETUP utility before using the computer.

Installing a Drive In the Horizontal Position

Note   On an IDE drive, set any necessary jumpers and take note of the hard disk type number on the label (if present); see your hard disk drive documentation for instructions. If a second hard disk drive is installed, the jumpers on both of the hard disk drives may need to be moved.

Follow these steps to install a drive in the horizontal position:

1   Remove the computer's cover as described on page 3-2.

2   If you are installing a drive in the lower drive bay, remove the two retaining screws securing the drive slot cover to the front of the lower drive bay and remove it. Also, remove the drive slot cover from the front panel. (See Figure 3-10.) Store the cover in a safe place.
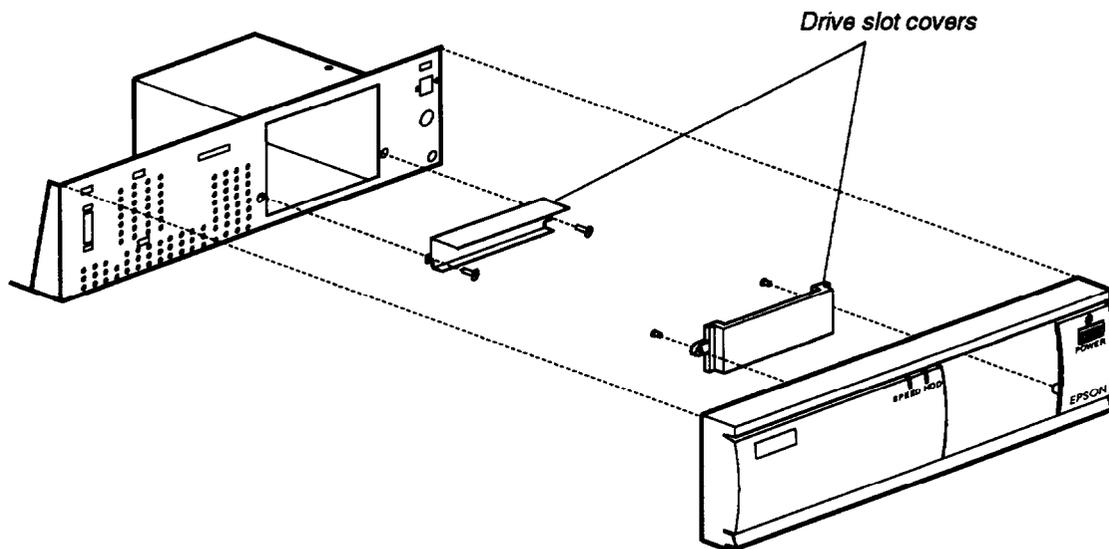
Figure 3-10   Removing/Installing Drive Panels

3   Attach the two mounting rails to the appropriate holes on the sides of the drive with four screws, as shown below. The mounting rails are included with the system and if removed from a drive they should be stored in a safe place for future use.

4   If you are installing a 5¼-inch diskette drive, turn it so that the diskette drive release latch is above the slot. If installing a 3½-inch diskette drive, turn it so that the eject button is below the slot. If installing a hard disk drive, turn it so that the component side is down. Align the mounting rails on each side of the drive with the notch on each side of the drive bay and slide the drive into the bay.

5   Secure the drive mounting rails to the front of the chassis with the two retaining screws removed in step 2 above.

6   If you are installing a diskette or tape drive in the lower drive bay, locate the diskette drive cable; one end is connected to the upper diskette drive and the other end is connected to the FDD interface connector (CN7). Use the middle **conneCtor** to connect the second drive. If installing a hard disk drive in the lower drive bay, locate the HDD cable; one end may be connected to an already installed hard disk drive located in the vertical position outside of the main drive bays and the other end is connected to the HDD interface connector (CN6). Use the middle connector to connect the second drive if one end is already connected to a hard drive or leave the middle connector free and use the end connector if no other HDD drive is present.

7   Ensure that the connector is aligned properly and fits properly onto the drive interface. See Figure 3- 11.
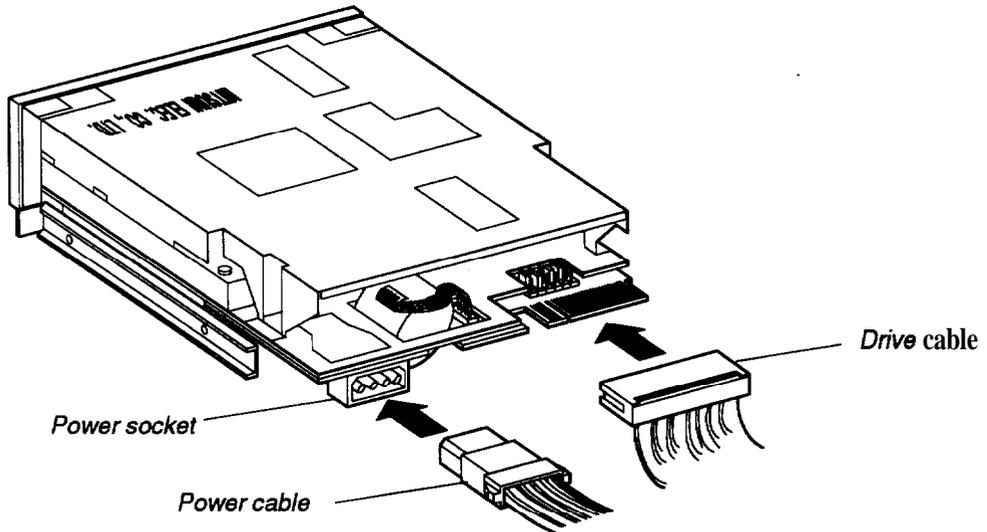
Figure 3-11   Attaching Drive Cables

8   Locate one of the power supply cable connectors that lead from the power supply behind the horizontal bays. The cables are labeled PA, PB, PC, and PD; plug the appropriate size connector that is free to the power supply socket in the drive (see Figure 3- 11).

9   Replace the cover (see page 3-4).

10   Reconfigure the system with the SETUP utility before using the computer.

Removing a Hard Disk Drive From the Vertical Position

Follow these steps to remove an IDE hard disk drive in the vertical position:

1   Remove the computer's cover as described on page 3-2.

2   Remove the HDD mounting bracket screw located on top of the drive bay as shown in Figure 3- 12.

3   Slide the drive toward the back of the computer and gently lift out the hard drive and its mounting bracket (the mounting bracket has tabs inserted in slots on the bottom of the system chassis).

4   Remove the four screws located on the back of the hard drive mounting bracket to remove the hard drive. Keep the screws so that you can use them to install a drive later.
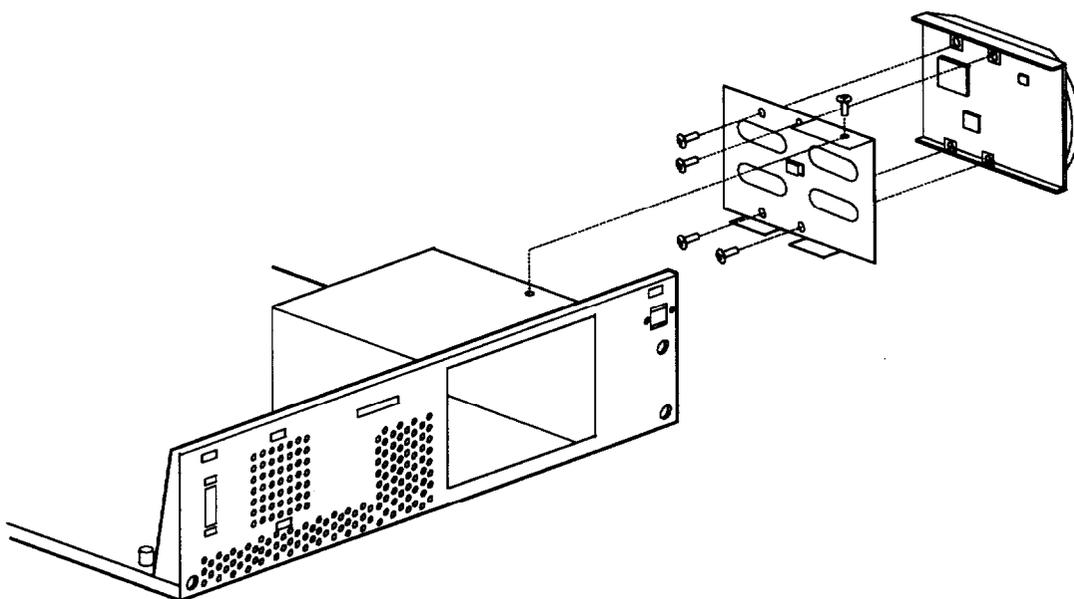
Figure 3-12   Removing/Installing a Vertical HDD

5   Replace the hard drive mounting bracket onto the drive bay and secure both in place with the screw removed in step 2 above.

6   Replace the cover (see page 3-4).

7   Reconfigure the system with the SETUP utility before using the computer.

Installing a Hard Disk Drive In the Vertical Position

Follow these steps to install a hard disk drive:

Note   On an IDE drive, set any necessary jumpers and take note of the hard disk type number on the label (if present); see your hard disk drive documentation for instructions.

1   Remove the computer's cover as described on page 3-2.

2   Remove the HDD mounting bracket screw located on top of the drive bay.

3   Slide the bracket toward the back of the computer to release the two bottom tabs from the slots located on the bottom of the system chassis and gently lift it out.

4   Secure the hard disk drive onto the mounting bracket with the four screws located as shown in Figure 3- 12.

5   Align the tabs of the mounting bracket with the slots in the bottom of the system chassis; then slide the bracket toward the front of the computer. Secure the bracket with the screw removed in step 2 above.

6   Plug the drive and power cables into the drive (see Figure 3-l 1). If required, connect the drive data cable to the system board. Be sure that you plug the connectors all the way into their sockets.

7   Replace the cover (see page 3-4).

8   Reconfigure the system with the SETUP utility before using the computer.

Removing the Power Supply

Follow these steps to remove the power supply:

1   Remove the computer's cover as described on page **3-2.**

2   Disconnect the power cables (connectors PA through PD) from all disk drives. Some of the cables may not be in use.

3   Disconnect the grounding wire located on the front of the chassis (see Figure 3-13).

4   Remove the two screws securing the power on/off switch to the front panel and pull the switch back toward the power supply (see Figure 3-13).
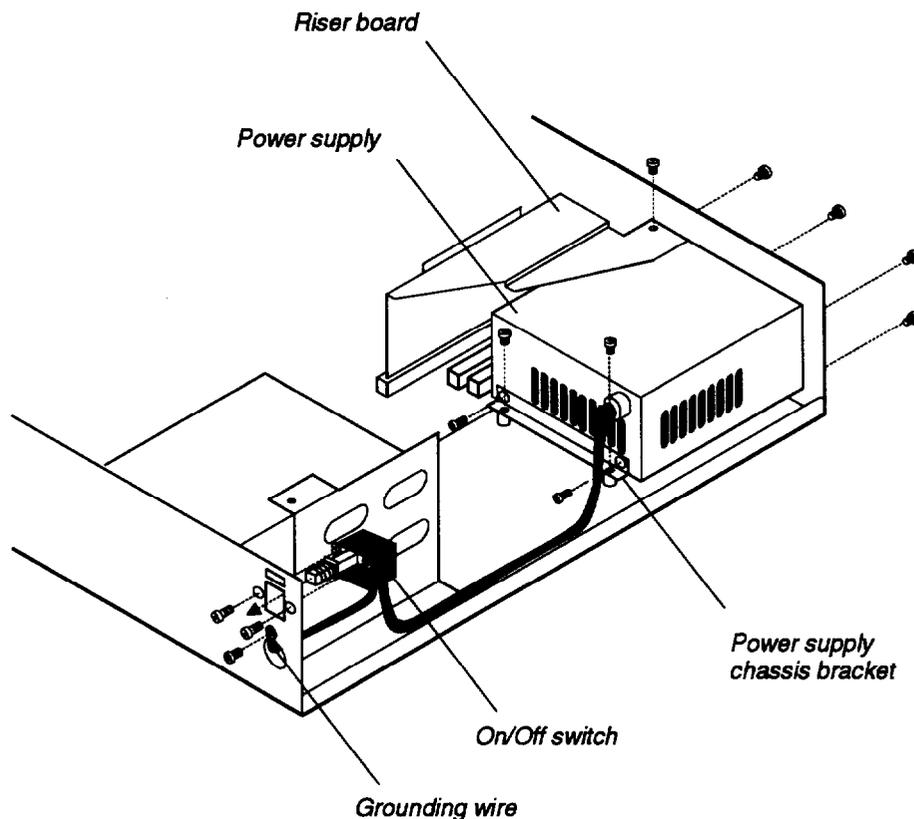
Figure 3-13   Power Supply Assembly

5   Remove any option cards and the option card riser board (see page 3-8).

6   Disconnect the power cable connectors PS1 and **PS2** from the system board (CN13).

7   Remove the four screws securing the power supply to the rear panel.

8   Remove the two screws securing the power supply to the base of the system chassis and then the two screws attaching the power supply chassis bracket. Save all screws and the power supply chassis bracket to reinstall the power supply later.

9   Pull the power supply toward the front of the chassis until the back of the power supply has cleared the rear panel. Then lift it up and set it aside.

Reinstalling the Power Supply

Follow these steps to reinstall the power supply:

1   Position the main chassis so its right side is facing you.

2   Attach the power supply chassis bracket to the power supply with two screws.

3   Align the holes between the power supply and the rear panel and the stand-offs where the power supply chassis bracket will be secured.

4   Using four screws, secure the power supply to the rear panel.

5   Using two screws, secure the power supply chassis bracket to the chassis.

6   Connect the power cables PSI and PS2 from the power supply to the system board connector CN13 (see Figure 3-14).
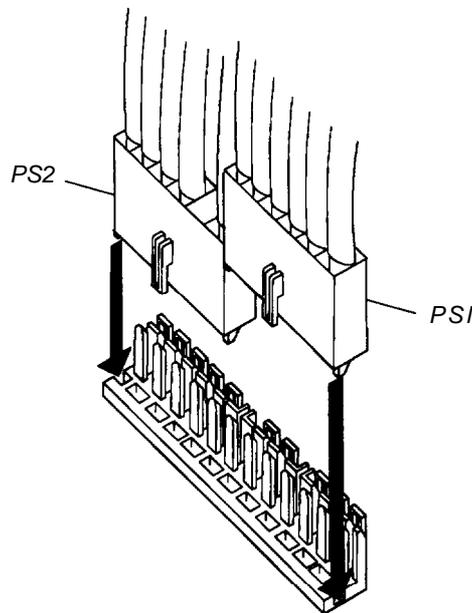
Figure 3-14   Power Supply Power Cables

7   Reinstall the option card riser board and any option cards (see page 3-8).

8   Push the power switch through the front panel and secure it in place with two screws.

9   Connect the grounding wire to the front of the chassis.

10   Connect one power cable (connectors PA through PD) to each drive in the system (see Figure 3-l 1). Some of the cables may not be in use.

11   Replace the cover (see page 3-4).

12   Connect the computer's power cable from the electrical outlet to the input receptacle located at the rear panel. Also connect any peripheral device cables that were previously disconnected from the computer, including the keyboard and mouse.

Removing the Speaker

Follow these steps to remove the speaker:

1   Remove the cover (see page 3-2) and any option cards that may be in the way (see page 3-5).

2   Disconnect the speaker cable from CN3 on the system board

3   From the front of the chassis lift up on the lower speaker unit tab to release it from the lower chassis mounting hole (see Figure 3-15).

4   From the backside of the front chassis, pull the bottom of the speaker unit up and away from the front of the chassis.

5   From the backside of the speaker unit the speaker can be removed by pushing it out of its holder.

Speaker assembly
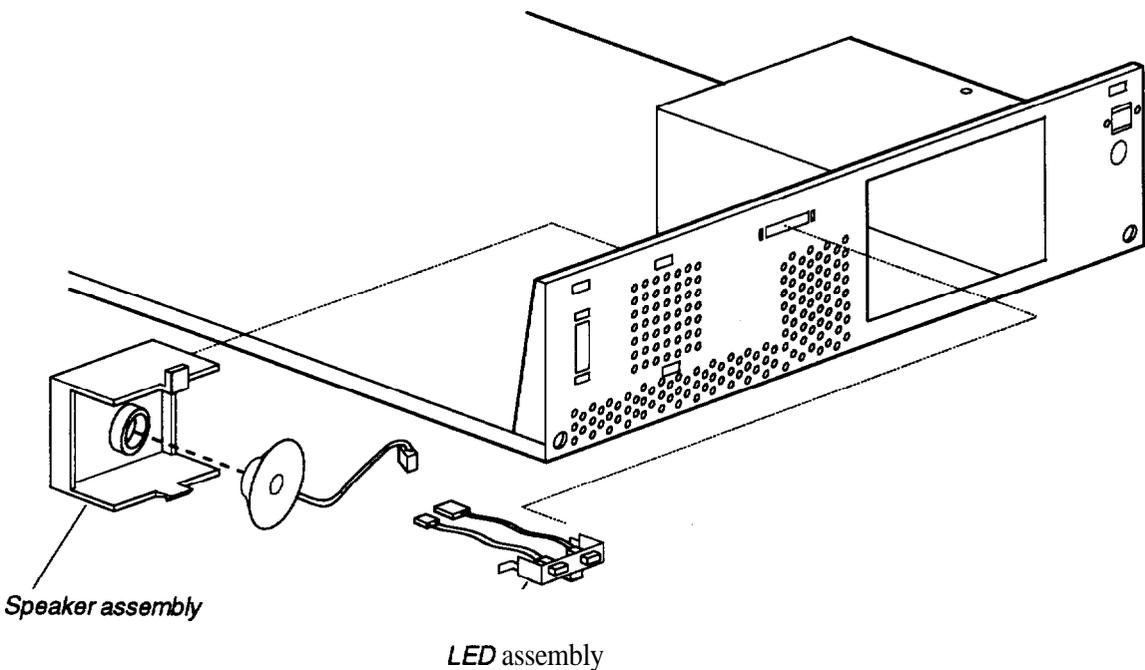
LED assembly

Figure 3-15   Speaker and LED Assemblies

Replacing the Speaker

Follow these steps to replace the speaker:

1   From the backside of the front chassis, insert the upper tab of the speaker unit into the upper mounting hole and lower the bottom tab of the speaker unit down and into the lower mounting hole in the front of the chassis (see Figure 3-15).

2   Connect the speaker cable to CN3 on the system board.

3   Replace any option cards removed and the cover.

Removing the LEDs

Follow these steps to remove the LEDs:

1   Remove the cover (see page 3-2) and any option cards that may be in the way (see page 3-5).

2   Disconnect the LED cables from CN15 and CN16 on the system board.

3   From the front of the chassis, press in on the right side of the LED unit and pull it forward to release it from the right chassis mounting hole. (See Figure 3-15.)

4   Continue bringing the right side of the LED unit forward and away from the front of the chassis until the left tab of the LED unit clears its mounting hole.

Replacing the LEDs

Follow these steps to replace the LED unit:

1   Ensure the LED wires are inserted through the LED access hole in the front of the chassis. Insert the left tab of the LED unit into its mounting bracket, then swing the right locking tab into its mounting hole. Ensure the LED wires are inserted through the LED access hole in the front of the chassis.

2   Rush the right locking tab through its hole in the front of the chassis. (See Figure 3-15.)

3   Connect the HDD LED cable to CN15 and the speed LED cable to CN 16.

4   Replace any option cards removed and the cover.

Removing the BIOS EPROMs

Follow these steps to remove the BIOS EPROM chips from sockets Ul and U113:

1   Remove the cover (see page 3-2) and any option cards that may be in the way (see page 3-5).

> Caution   You must observe strict anti-static procedures to avoid damaging the EPROMs as you install or remove them.

2   With a chip puller, lift each EPROM out of its socket and place it in an anti-static bag for protection.

Replacing the BIOS EPROMs

Follow these steps to install the BIOS EPROM chips in sockets Ul and U113:

1   Remove the cover (see page 3-2) and any option cards that may be in the way (see page 3-5).

2   Gently insert the System/VGA EPROM into socket Ul. Align the half-circle notch of the chip with the notch of the socket to assure proper orientation (see Figure 3-16).
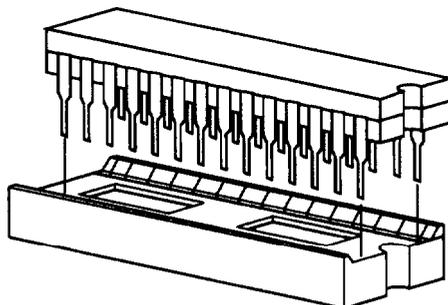
Figure 3-16   BIOS Chips Installation

3   Gently insert the SETUP Text EPROM into socket U113. Align the half-circle notch of the chip with the notch of the socket to assure proper orientation (see Figure 3-16).

4   Replace the cover and any option cards removed

Removing the System Board

Follow these steps to remove the system board:

1   Remove the cover (see page 3-2), any option cards (see page 3-5), and the option card riser board (see page 3-8).

2   Disconnect the power supply cables from CN13, any drive cables from CN6 and CN7, the speaker and LED connectors at CN3, CN11 and CN16, any VGA feature connector at CN17, and cables connected to the serial, parallel, mouse, video, and keyboard ports.

3   Remove the six screws that secure the system board to the main chassis (see Figure 3-17).
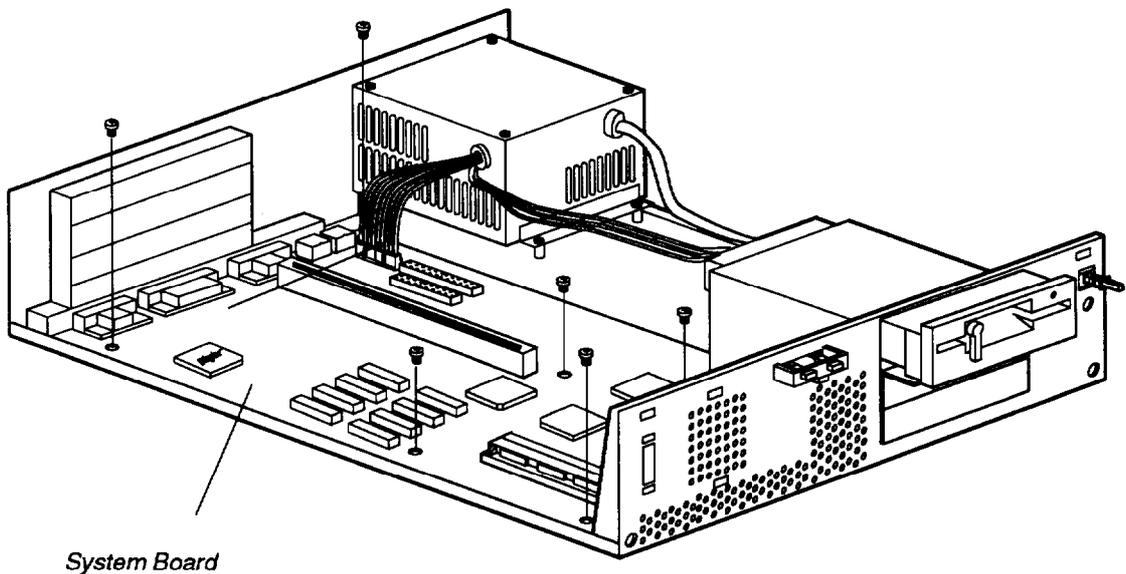
System Board

Figure 3-17   Removing/Replacing the System Board

4   Pull the system board forward then tilt it up. Then pull the system board slightly toward you and lift it up and out of the chassis. Place the system board on an anti-static surface or in an anti-static bag for protection.

Replacing the System Board

Follow these steps to replace the system board:

1   From the left side of the chassis, insert the system board into the chassis at a slight angle.

2   Slide the far edge of the system board under the drive bay.

3   Lower the board into the chassis and position the six screw holes over the mounting holes in the chassis.

4   Secure the board with the six retaining screws (see Figure 3-17).

5   Reinstall the option card riser board (see page 3-8) and replace any option cards (see page 3-7).

6   Reconnect all cables and replace the cover.

Removing the Front Bezel

Follow these steps to remove the front bezel:

1   Remove the cover (see page 3-2).

2   Remove the two retaining screws located on the back side of the bezel as shown in Figure 3-18.
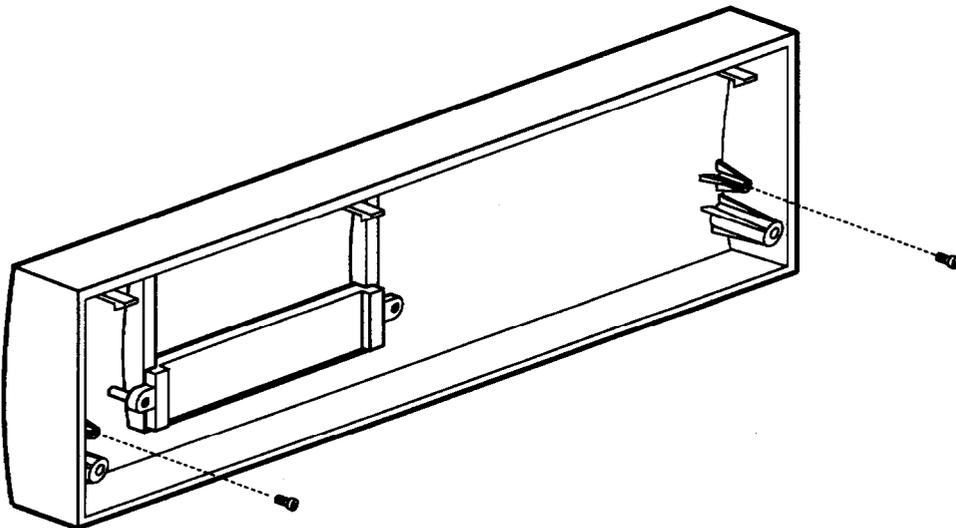
Figure 3-18   Removing/Replacing the Front Bezel

3   Set the cover upside down on a smooth flat surface and locating the front bezel locking tabs gently press down on the tabs while pulling the bezel away from the cover.

Replacing the Front Bezel

Follow these steps to replace the front bezel:

1   Set the cover upside down on a smooth flat surface and gently push the front panel locking tabs into the tab slots located in the front end of the cover.

2   Secure the front panel to the cover with the two retaining screws (see Figure 3-18).

3   Replace the cover (see page 3-4).

A *Reference Materials*

Contents

Figures

Tables

Hard Disk Drive Types

Type	Cylinders	Heads	Precomp (WPcom)	Landing Zone	Sectors (Sec)	Size* (In MB)	Drive Name/ Manufacturer
1	306	4	128	305	17	10	
2	615	4	300	615	17	20	ST-225, ST-4026
3	615	6	300	615	17	31	
4	940	8	512	940	17	62	
5	940	6	512	940	17	47	
6	615	4	none	615	17	20	CP-3024, ST-125
7	462	8	256	511	17	31	
8	733	5	none	733	17	30	ST-4038
9	900	15	none	901	17	112	
10	820	3	none	820	17	20	
11	855	5	none	855	17	35	
12	855	7	none	855	17	50	
13	306	8	128	319	17	20	
14	733	7	none	733	17	43	
15							- reserved -
16	612	4	0	663	17	20	
17	977	5	300	977	17	41	CP-3044, 7040, 8051A
18	977	7	none	977	17	57	
19	1024	7	512	1023	17	60	CP-2064
20	733	5	300	732	17	30	MK-133FA
21	733	7	300	732	17	43	MK-134FA, ST-157A
22	733	5	300	733	17	30	
23	306	4	0	336	17	10	
24	903	4	none	902	46	81	CP-30084
25	776	8	none	755	33	100	CP-3104
26	903	8	65535	902	46	162	CP-30174E**
27	698	7	300	732	17	41	
28	976	5	488	977	17	41	
29							- reserved -

Hard Disk Drive Types

Type	Cylinders	Heads	Precomp (WPcom)	Landing Zone	Sectors (Sec)	Size* (In MB)	Drive Name/ Manufacturer
30							- reserved -
31	732	7	300	732	17	43	
32	1023	5	none	1023	17	42	
33	901	5	none	900	53	117	LPS120AT
34	723	13	none	722	51	234	LPS240AT**
35	934	16	none	933	17	124	MK2124FC
36							- reserved -
37	683	16	none	682	38	203	CP-3204F
38	548	8	none	547	38	81	CP-2048
39	761	8	none	760	39	116	CP-30104
40	980	10	none	979	17	81	7080A, MK2024FC
41	1022	5	none	1022	34	85	CDC-94216-106
42	1022	5	none	1022	36	90	CDC-94216-106
43	1024	8	512	1023	17	68	1325, 3085
44	828	10	none	828	34	137	MK-156F
45	1024	5	512	1023	17	43	
46	615	8	128	618	17	41	
UD							User defined Press <F2>

* Actual size when formatted may be slightly different than the size listed on the drive label.

** Epson HDD options

System I/O Address Map

Hex Address	Assigned Device
000-01F	DMA controller 1, 8237A-5
020-021	Interrupt controller 1, 8259A, master
022-024	Epson reserved function
040-043	Timer, 8254-2
060-061, 064	8042 (keyboard and mouse)
070-071 (CMOS)	Real-time clock NMI (non-maskable interrupt mask)
080-08F	DMA page register, 74LS612
0A0-0A1	Interrupt controller 2, 8259A
0C0-0DF	DMA controller 2, 8237A-5
0F0	Clear math coprocessor busy
0F1	Reset math coprocessor
0F8-0FF	Math coprocessor
1F0-1F8	Hard disk
200-207	Game I/O
278-27A	Parallel printer port 3
2B0-2DF	Alternate enhanced graphics adapter
2E1	GPIB (adapter 0)
2E2 & 2E3	Data acquisition (adapter 0)
2F8-2FF	Serial port 2
300-31F	Reserved
348-357	DCA 3278
360-363	PC network (low address)
364-367	Reserved
368-36B	PC network (high address)
36C-36F	Reserved
378-37A	Parallel printer port 2
380-38F	SDLC, bisync 2
390-393	Cluster
3A0-3AF	Bisynchronous 1
3B0-3BA	Monochrome display and printer adapter
3BC-3BE	Parallel printer port 1

Hex Address	Assigned Device
3C0-3CF	Enhanced graphics adapter
3D0-3DF	Color/graphics monitor adapter
3F0-3F7	Diskette controller
3F8-3FF	Serial port 1
6E2 & 6E3	Data acquisition (adapter 1)
790-793	Cluster (adapter 1)
AE2 & AE3	Data acquisition (adapter 2)
B90-B93	Cluster (adapter 2)
EE2-EE3	Data acquisition (adapter 3)
1390-1393	Cluster (adapter 3)
22E1	GPIB (adapter 1)
2390-2393	Cluster (adapter 4)
42E1	GPIB (adapter 2)
43C6	WINGINE/RAMDAC
62E1	GPIB (adapter 3)
82E1	GPIB (adapter 4)
83C6	WINGINE/RAMDAC
A2E1	GPIB (adapter 5)
C2E1	GPIB (adapter 6)
C3C6	WINGINE/RAMDAC
E2E1	GPIB (adapter 7)
F0A8	Epson reserved function
F0AC	Epson reserved function
F060-F065	Epson reserved function
F069-F06D	Epson reserved function

DMA Assignments

Level	Assigned device
DMA0	Spare (8-bit)
DMA1	Spare (8-bit)
DMA2	Floppy Controller (8-bit)
DMA3	Spare (8-bit)
DMA5	Spare (16-bit)
DMA6	Spare (16-bit)
DMA7	Spare (16-bit)

Hardware Interrupts

IRQ No.	Function
IRQ0	Timer output
IRQ1	Keyboard
IRQ3	Serial port 2
IRQ4	Serial port 1
IRQ5	Available (parallel port 2)
IRQ6	FDD controller
IRQ7	Parallel port 1
IRQ8	Real-time clock
IRQ9	Available
IRQ10	Available
IRQ11	Available
IRQ12	PS/2-compatible mouse Optional pointing devices
IRQ13	Math coprocessor
IRQ14	HDD controller
IRQ15	Available

Connector Pin Assignments

This section describes the pin assignments of each connector in the system.

Auxiliary Fan Connector

The auxiliary fan connector (CN1) is a 2-pin connector that has no posts and is in place for future use. Figure A-l shows the connector and Table A-l provides the pin assignments.
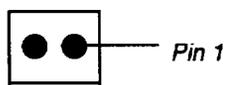
Figure A-1   Auxiliary Fan Connector

Table A-1
Auxiliary Fan Connector Pin Assignments

Pin	Signal
1	+12V
2	Ground

VGA Port Connector

The VGA connector (CN2) is a 15-pin D-shell, female receptacle accessible from the rear of the computer. Figure A-2 shows the connector and Table A-2 provides the pin assignments.
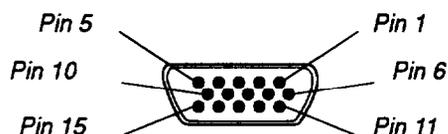
Figure A-2   VGA Port Connector

Table A-2
VGA Port Connector Pin Assignments

Pin	Signal	Pin	Signal
1	Red	9	NC
2	Green	10	Ground
3	Blue	11	NC
4	NC	12	NC
5	Ground	13	Horizontal Sync
6	RGround	14	Vertical Sync
7	GGround	15	NC
8	BGround		

Speaker Connector

The speaker connector (CN3) is a 4-pin, male header connector, accessible from inside the computer and located on the system board Figure A-3 shows the connector and Table A-3 provides the pin assignments.

— Pin 1

Figure A-3   Speaker Connector

Table A-3
Speaker Connector Pin Assignments

Pin	Signal
1	VCC
2	NC
3	NC
4	Audio

Serial Port Connectors

The serial ports (CN4 and CN8) are 9-pin, D-shell male connectors, accessible from the rear of the computer. Figure A-4 shows the connector and Table A-4 provides the pin assignments.

Pin 1   Pin 5

Pin 6   Pin 9
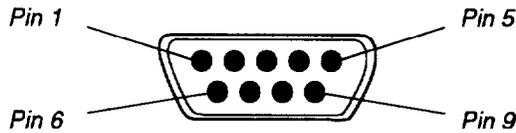
Figure A-4   Serial Port Connector

Table A-4
Serial Port Connector Pin Assignments

Pin	Signal	Pin	Signal
1	Data Carrier Detect	6	Data Set Ready
2	Receive Data	7	Request to Send
3	Transmit Data	8	Clear to Send
4	Data Terminal Ready	9	Ring Indicator
5	Not used		

Parallel Port Connector

The parallel port connectar (CNS) is a 25-pin, D-shell female connector, accessible from the rear of the computer. Figure A-5 shows the connector and Table A-5 provides the pin assignments.
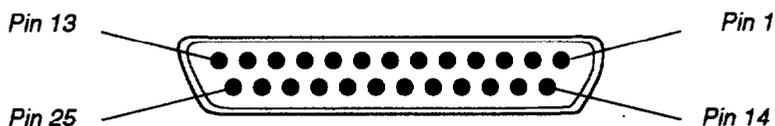
Figure A-5 Parallel Port Connector

Table A-5
Parallel Port Connector Pin Assignments

Pin	Signal	Pin	Signal	Pin	Signal
1	Strobe	10	ACK#	19	Signal Ground
2	Data0	11	Busy	20	Signal Ground
3	Data1	12	PE	21	Signal Ground
4	Data2	13	Select	22	Signal Ground
5	Data3	14	Auto#	23	Signal Ground
6	Data4	15	Error#	24	Signal Ground
7	Data5	16	Init#	25	Signal Ground
8	Data6	17	Selectin#		
9	Data7	18	Signal Ground		

\# = Active low logic

IDE Hard Disk Drive Data Connector

The IDE hard disk drive data connector (CN6) is a 40-pin, header connector, accessible from inside the computer and located on the system board. Figure A-6 shows the connector and Table A-6 provides the pin assignments.
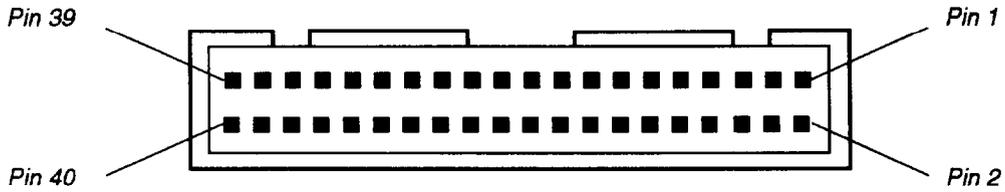
Figure A-6   IDE Hard Disk Drive Data Connector

Table A-6
IDE Hard Disk Drive Data Connector Pin Assignments

Pin	Signal	Pin	Signal	Pin	Signal
1	RESET#	15	D1	29	Reserved
2	Ground	16	D14	30	Ground
3	D7	17	D0	31	IRQ14
4	D8	18	D15	32	IOCS16#
5	D6	19	Ground	33	SA1
6	D9	20	Key	34	Reserved
7	D5	21	Reserved	35	SA0
8	D10	22	Ground	36	SA2
9	D4	23	IOW#	37	CS0#
10	D11	24	Ground	38	CS1#
11	D3	25	IOR#	39	HDLED#
12	D12	26	Ground	40	Ground
13	D2	27	IOCHRDY		
14	D13	28	ALE		

= Active low logic

Diskette Drive Data Connector

The diskette drive data connector (CN7) is a 34-pin header connector, accessible from inside the computer and located on the system board. Figure A-7 shows the **connector and** Table A-7 provides the pin assignments.
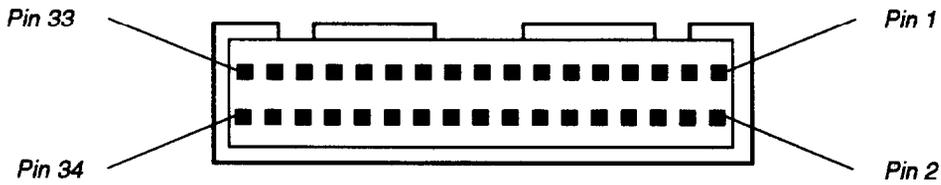
Figure A-7   Diskette Drive Data Connector

Table A-7
Diskette Drive Data Connector Pin Assignments

Pin	Signal	Pin	Signal
2	RWC#	20	STEP#
4	Reserved	22	WDATA#
6	Reserved	24	WE#
8	INDEX#	26	TRK00#
10	MOTEN1#	28	WP#
12	DS2#	30	RDDATA#
14	DS1#	32	HS0#
16	MOTEN2#	34	DCHG#
18	DIR#		

All odd-numbered pins are grounds.
\# = Active low logic

Keyboard and Mouse Connectors

The mouse (CN9) and keyboard (CNlO) connectors are 6-pin mini DIN receptacles, accessible from the rear of the computer. Figure A-8 shows the connector and Table A-8 provides the pin assignments.
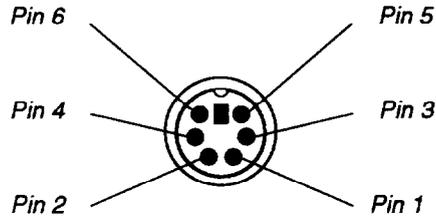
Figure A-8   Keyboard and Mouse Connector

Table A-8
Keyboard and Mouse Connector Pin Assignments

Pin	Signal
1	Data
2	Reserved
3	Ground
4	+ 5 VDC (fused)
5	Clock
6	Reserved

Note   Although the keyboard and mouse connectors are physically identical, they cannot be used   interchangeably.

Battery Connector

The battery connector (CNll) is a 2-pin, male header **connector,** accessible from inside the computer and located on the system board Figure A-9 shows the connector and Table A-9 provides the pin assignments.
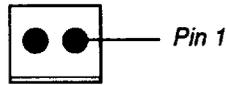
Figure A-9   Battery Connector

Table A-9
Battery Connector Pin Assignments

Pin	Signal
1	+3.6V
2	Ground

Reset Connector

The reset connector (CN12) is a 2-pin connector that has no posts and is in place for future use. Figure A- 10 shows the connector and Table A-10 provides the pin assignments.

Figure A-10 Reset Connector

Table A-10
Reset Connector Pin Assignments

Pin	Signal
1	Reset
2	Ground

Power Supply Connectors

The power connector (CN13) is a 12pin male header connector. It is located on the system board and supplies power to the board and the option slots. Figure A- 11 shows the connector; Table A- 11 provides the pin assignments.
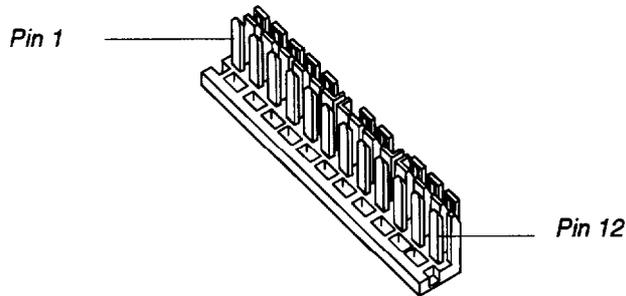
Figure A-11   Power Supply Connector

Table A-11
Power Connector Pin Assignments

Pin	Signal	Pin	Signal
1	POWERGOOD	7	Ground
2	+ 5 VDC	8	Ground
3	+ 12 VDC	9	– 5 VDC
4	– 12 VDC	10	+ 5 VDC
5	Ground	11	+ 5 VDC
6	Ground	12	+ 5 VDC

Option Card Riser Board Connector

The riser board connector (CN14) is a 120-pin, female recepticle that supplies power and interface lines to the four option slots on the riser board. Figure A-12 shows the connector and Table A-12 provides the pin assignments.
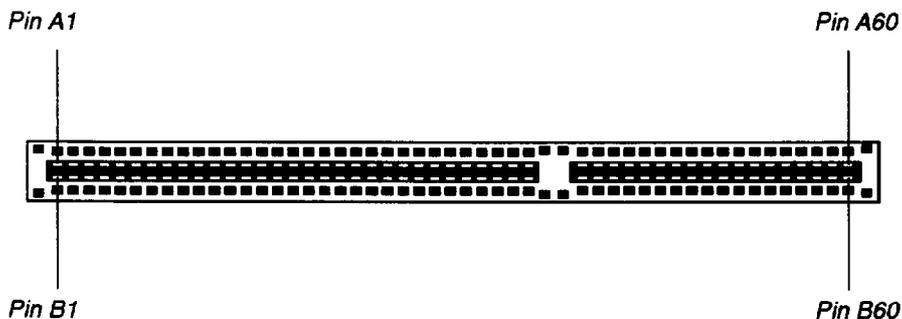
Figure A-12   Option Card Riser Board Connector

Table A-12
Option Card Riser Board Connector Pin Assignments

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A1	+12 VDC	A31	SA3	B1	+12 VDC	B31	BALE
A2	Ground	A32	SA2	B2	+5 VDC	B32	+5 VDC
A3	Ground	A33	SA1	B3	Ground	B33	OSC
A4	IOCHCK#	A34	SA0	B4	Ground	B34	Ground
A5	SD7	A35	Ground	B5	RESETDRV	B35	Ground
A6	SD6	A36	Ground	B6	+5 VDC	B36	+5 VDC
A7	SD5	A37	+5 VDC	B7	IRQ9	B37	+5 VDC
A8	SD4	A38	SBHE	B8	-5 VDC	B38	MEMCS16#
A9	SD3	A39	LA23	B9	DRQ2	B39	IOCS16#
A10	SD2	A40	LA22	B10	-12 VDC	B40	IRQ10
A11	SD1	A41	LA21	B11	OWS#	B41	IRQ11
A12	SD0	A42	LA20	B12	+12 VDC	B42	IRQ12
A13	IOCHRDY	A43	LA19	B13	Ground	B43	IRQ15
A14	AEN	A44	LA18	B14	SMEMR#	B44	IRQ14
A15	SA19	A45	LA17	B15	SMEMW#	B45	DACK0#
A16	SA18	A46	MEMR#	B16	IOW#	B46	DRQ0
A17	SA17	A47	MEMR#	B17	IOR#	B47	DACK5#
A18	SA16	A48	SD8	B18	DACK3#	B48	DRQ5
A19	SA15	A49	SD9	B19	DRQ3	B49	DACK6#
A20	SA14	A50	SD10	B20	DACK1#	B50	DRQ6
A21	SA13	A51	SD11	B21	DRQ1	B51	DACK7#
A22	SA12	A52	SD12	B22	REFRESH#	B52	DRQ7
A23	SA11	A53	SD13	B23	SYSCLK	B53	+5 VDC
A24	SA10	A54	SD14	B24	IRQ7	B54	MASTER#
A25	SA9	A55	SD15	B25	IRQ6	B55	Ground
A26	SA8	A56	Ground	B26	IRQ5	B56	Ground
A27	SA7	A57	Ground	B27	IRQ4	B57	Ground
A28	SA6	A58	Ground	B28	IRQ3	B58	+5 VDC
A29	SA5	A59	+5 VDC	B29	DACK2#	B59	+5 VDC
A30	SA4	A60	+5 VDC	B30	TC	B60	+5 VDC

= active low logic

HDD Access LED Connector

The HDD access LED connector (CN15) is a 2-pin, male header connector, accessible from inside the computer and located on the system board Figure A-14 shows the connector and Table A-13 provides the pin assignments.
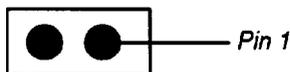
Figure A-14   HDD Access LED Connector

Table A-13
HDD Access LED Connector Pin Assignments

Pin	Signal
1	HDD LED anode (VCC)
2	HDD LED cathode

Power (SPEED) LED Connector

The Power LED connector (CN16) is a 3-pin, male header connector, accessible from inside the computer and located on the system board. Figure A-13 shows the connector and Table A-14 provides the pin assignments.
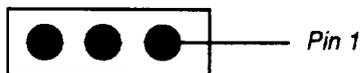
Figure A-13   Power (SPEED) LED Connector

Table A-14
Power (SPEED) LED Connector Pin Assignments

Pin	Signal
1	Vcc
2	Turbo#
3	Ground

= active low logic

VGA Feature Connector

The VGA Feature connector (CN17) is a 26-pin header, accessible from the inside of the computer. Figure A-15 shows the connector and Table A- 15 provides the pin assignments.

Pin 1   Pin 13

Pin 14   Pin 26
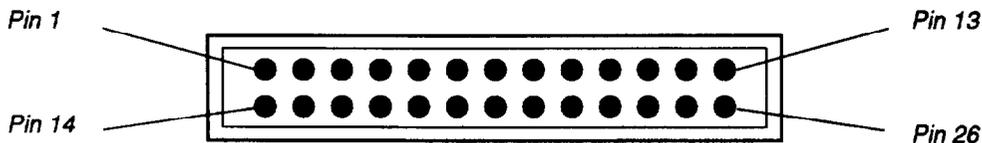
Figure A-15 VGA Feature Connector

Table A-15
VGA Feature Connector Pin Assignments

Pin	Signal	Pin	Signal	Pin	Signal
1	Data 0	10	BLANK	19	ENPCLK#
2	Data 1	11	HSYNC	20	Not connected
3	Data 2	12	VSYNC	21	Ground
4	Data 3	13	Ground	22	Ground
5	Data 4	14	Ground	23	Ground
6	Data 5	15	Ground	24	Ground
7	Data 6	16	Ground	25	Not connected
8	Data 7	17	ENDATA#	26	Not connected
9	PCLK	18	ENSYNC#		

= active low logic

Option Slot Connectors

The option slot connectors on the riser board are 98-pin, female receptacles. Figure A-16 shows one of these connectors and Table A-16 provides the pin assignments.
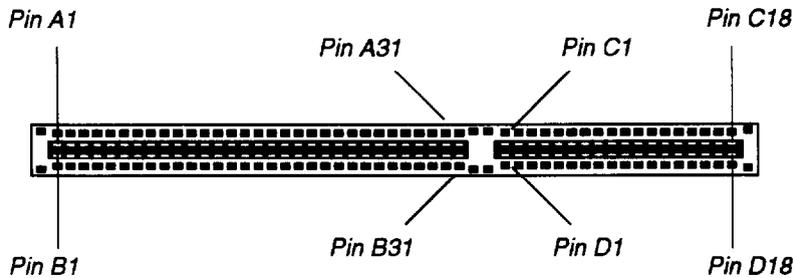
Figure A-16   Option Slot Connector

Table A-16
Option Slot Connector Pin Assignments

Pin	Signal	Pin	Signal	Pin	Signal	Pin	Signal
A1	IOCHCK#	A26	SA5	B20	CLK	C14	SD11
A2	SD7	A27	SA4	B21	IRQ7	C15	SD12
A3	SD6	A28	SA3	B22	IRQ6	C16	SD13
A4	SD5	A29	SA2	B23	IRQ5	C17	SD14
A5	SD4	A30	SA1	B24	IRQ4	C18	SD15
A6	SD3	A31	SA0	B25	IRQ3	D1	MEMCS16#
A7	SD2	B1	Ground	B26	DACK2#	D2	IOCS16#
A8	SD1	B2	RESETDRV	B27	TC	D3	IRQ10
A9	SD0	B3	+5 VDC	B28	BALE	D4	IRQ11
A10	IOCHRDY	B4	IRQ9	B29	+5 VDC	D5	IRQ12
A11	AEN	B5	-5 VDC	B30	OSC	D6	IRQ15
A12	SA19	B6	DRQ2	B31	Ground	D7	IRQ14
A13	SA18	B7	-12 VDC	C1	SBHE	D8	DACK0#
A14	SA17	B8	OWS#	C2	LA23	D9	DRQ0
A15	SA16	B9	+12 VDC	C3	LA22	D10	DACK5#
A16	SA15	B10	Ground	C4	LA21	D11	DRQ5
A17	SA14	B11	SMEMW#	C5	LA20	D12	DACK6#
A18	SA13	B12	SMEMR#	C6	LA19	D13	DRQ6
A19	SA12	B13	IOW#	C7	LA18	D14	DACK7#
A20	SA11	B14	IOR#	C8	LA17	D15	DRQ7
A21	SA10	B15	DACK3#	C9	MEMR#	D16	+5 VDC
A22	SA9	B16	DRQ3	C10	MEMR#	D17	MASTER#
A23	SA8	B17	DACK1#	C11	SD8	D18	Ground
A24	SA7	B18	DRQ1	C12	SD9		
A25	SA6	B19	REFRESH#	C13	SD10		

Drive Power Connectors

Connectors PA through PC are functionally the same and provide power to disk and tape drives. PD has a different shape, but has the same pin assignments. Figure A-17 shows one of the connectors. Table A-17 provides the pin assignments.

Pin 1
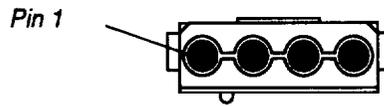
Figure A-17   Drive Power Connector

Table A-17
Drive Power Connector Pin Assignments

Pin	Signal
1	+ 12V
2	Ground
3	Ground
4	+ 5V

Intel Ether Express 16C

The Intel EtherExpress 16C is a 16-bit, ISA-compatible Ethernet adapter card that supports BNC coax (thin Ethernet), AUI DB-15S (thick Ethernet), and RJ45 (10BaseT Ethernet). The card is software configurable for I/O address, IRQ, connector type, and I./O or memory-mapped buffering. A diagnostic utility is included.

Table A-18
Intel EtherExpress LED Indicators

Light	Status	Cause	Description
ACT (Activity)	Blinking	Data transmission/redeipt	Normal.
	Off	No data transmission/receipt	If this problem persists, there may be a problem on the network.
LNK (Link)	On	Good link integrity	Normal.
	Off	Link lost	No link to hub can be caused by a bad connector, bad cable, or a problem at the hub.

By default this card uses I/O address 300-31F and IRQ10.

SMC Ether Card PLUS Elite16 Combo

The SMC EtherCard PLUS Elite16 Combo is a 16-bit, ISA-compatible Ethernet adapter card that supports UTP, BNC coax (thin Ethernet), AUI DB-15s (thick Ethernet). The card is software configurable for I/O address, IRQ, connector type, and I/O or memory-mapped buffering. A diagnostic utility is included.
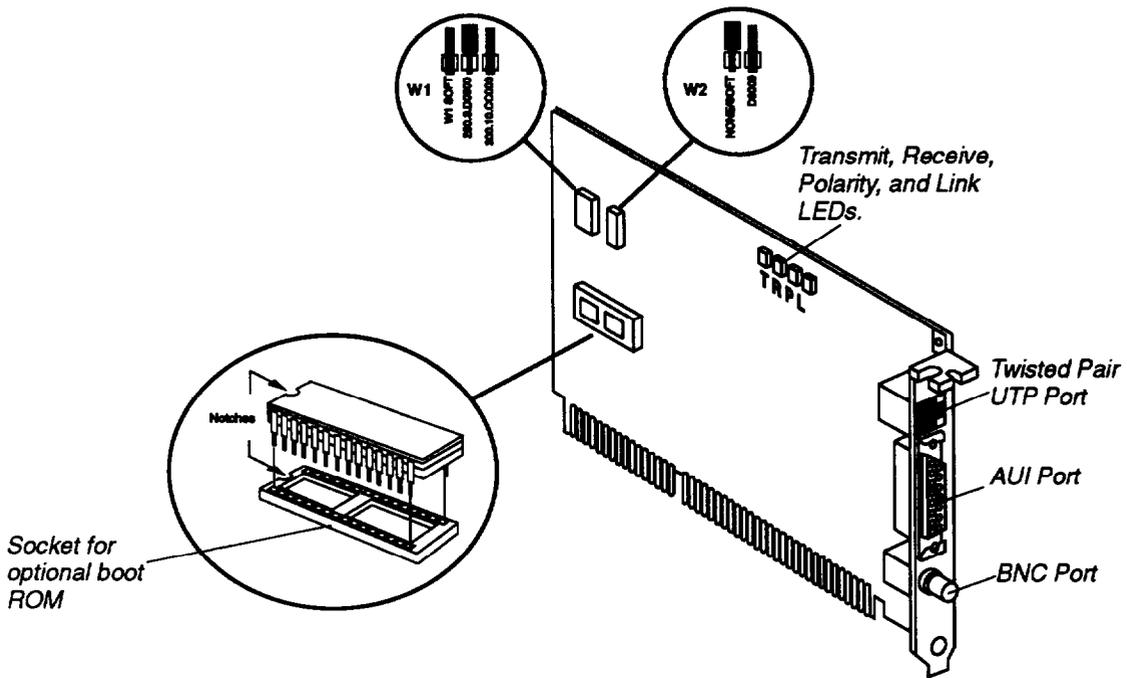
Figure A-18. SMC EtherCard PLUS Elite16 Combo

By default this card uses I/O address 280, IRQ3, and RAM base address D0000. You can move jumper W 1, shown in the figure above, to SOFT to use the adapter setup program to select the I/O address, IRQ, and RAM base address; or move it to 300, 10, CC000 to select I/O address 300, IRQlO, and RAM base address CC000.

Table A-19
SMC EtherCard LEDs

Light	Status	Cause	Description
T (transmit)	On	Adapter is transmitting data	Normal.
R (receive)	On	Traffic is directed on network or data transmitted from adapter is looped back	Normal.
P (polarity correct)	On	Twisted pair is being used, and received signal polarity is correct	Both P and L are on normally when the twisted pair is used. If the P LED is off and the adapter still operates, received polarity is reversed.
L (link integrity)	On	Twisted pair is being used, and twisted pair link is valid	Both P and L are on normally when the twisted pair is used.

Adaptec AHA-1504B
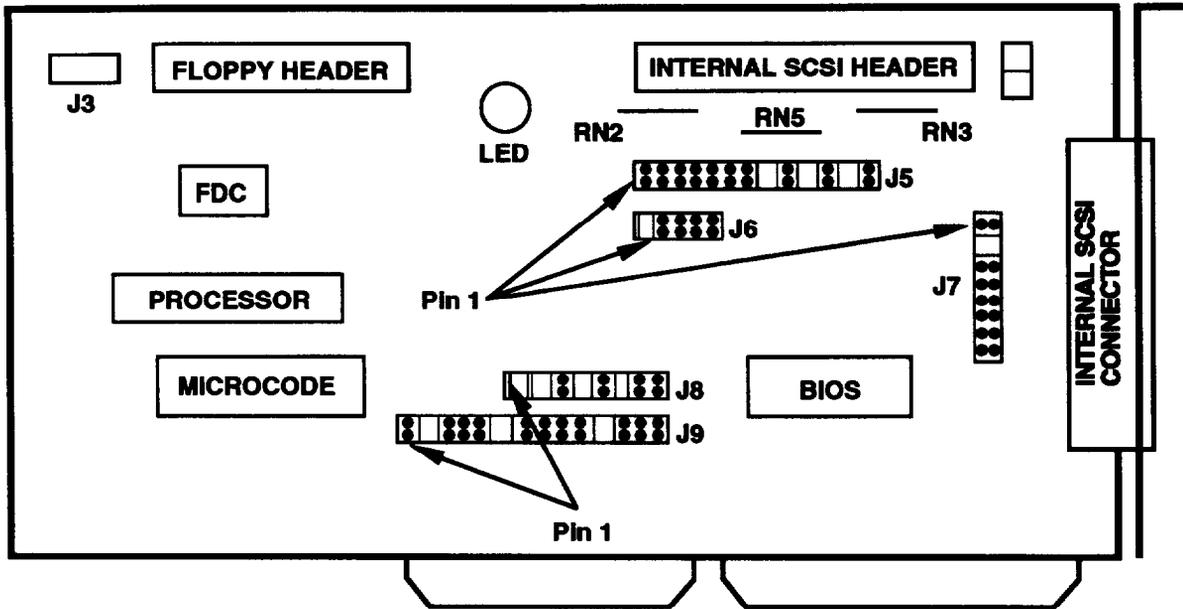
Figure A-19 Adaptec Jumper Locations

Table A-20
Adaptec Default Settings

SCSI Address	7
SCSI Parity	Enabled
Terminators	Installed
Terminator Power	Supplying
Synchronous Negotiation	Disabled
DMA Channel	5
Interrupt Channel	11
AT Port Address	330H
AT BIOS Address	DC000H, Enabled
BIOS Wait State	0, Disabled
FD Controller	Disabled
DMA Transfer Speed	5.7 MB/second
Auto Sense	Enabled

Table A-21
Adaptec Jumper Settings

J5 General Control

Pin	Factory	Description
1	□	Synchronous transfer negotiation enabled
2	□	Diagnostics (used only at Adaptec)
3	□	SCSI parity disabled

Pin	Factory	SCSI address ID (SCSI should be set for ID 0 and 1)							
4	□	□	■	□	■	□	■	□	■
5	□	□	□	■	■	□	□	■	■
6	□	□	□	□	□	■	■	■	■
Number		7	6	5	4	3	2	1	0

Pin	Factory	DMA channel select (see also jumper J9)			
7	□	□	■	□	■
8	■	□	□	■	■
Number		7	6	5	4

Pin	Factory	Interrupt channel select (see also jumper J9)					
9	□	□	■	□	■	□	■
10	■	□	□	■	■	□	□
11	□	□	□	□	□	■	■
Number		9	10	11	12	14	15

Pin	Factory	DMA transfer speed in MB/sec.			
12	□	□	■	□	■
13	□	□	□	■	■
Number		5.0	5.7	6.7	8.0

J6 BIOS/Auto Sense Control

Pin Number	1	2	3	4	5
Function	BIOS enable	Not used.			Auto sense disable
Factory	■	□			□

□ = No Jumper Installed

■ = Jumper

Adaptec Jumper Settings Continued

J7 Address Selection

Pin	Factory	Description
1	□	Floppy secondary address select (AHA-1542B only)

Pin	Factory	AT I/O port address select in hexadecimal					
2	■	□	■	□	■	□	■
3	□	□	□	■	■	□	□
4	□	□	□	□	□	■	■
Hex Number		334	330	234	230	134	130

Pin	Factory	BIOS wait state select in nanoseconds			
5	□	□	■	□	■
6	□	□	□	■	■
Nanoseconds		0	100	200	300

Pin	Factory	BIOS base address select in hexadecimal			
7	□	□	■	□	■
8	□	□	□	■	■
Hex Number		DC000	CC000	D8000	C8000

J9 DMA/Interrupt Selection

Pin	Factory	Description
1	□	DMA Request 0 Select
2	■	DMA Request 5 Select
3	□	DMA Request 6 Select
4	□	DMA Request 7 Select
5	□	DMA ACK 0 Select
6	■	DMA ACK 5 Select
7	□	DMA ACK 6 Select
8	□	DMA ACK 7 Select
9	□	INT Request 9 Select
10	□	INT Request 10 Select
11	■	INT Request 11 Select
12	□	INT Request 12 Select
13	□	INT Request 14 Select
14	□	INT Request 15 Select

List of Abbreviations

Abbreviation	Description
A	ampere: unit of electrical current flow
ABS	acrylonitrile-butadiene-styrene
ACE	asynchronous communications element
ACK	acknowledge command
ADP	advanced data path
ASCII	American Standard Code for Information Interchange
ASIC	application-specific integrated circuit
AT	Advanced Technology (from the IBM AT model computer)
AUI	attachment unit interface
BIOS	basic input/output system
bps	bits per second
CGA	color graphics adapter
CMOS	complementary metal oxide semiconductor
CPU	central processing unit
CRT	cathode ray tube
DIN	Deutsche Industrie Normenausschuss (German standard-setting association—refers to type of connector used for keyboard and mouse interfaces)
DIP	dual inline pin (chip package)
DMA	direct memory access
DRAM	dynamic random access memory
DRAMC	DRAM controller
DRQ	DMA request
EEPROM	electrically erasable programmable read-only memory
EGA	enhanced graphics adapter
EPROM	erasable programmable read-only memory
FDC	floppy disk controller
FDD	floppy disk drive
HDC	hard disk controller
HDD	hard disk drive
Hz	hertz: unit of frequency (formerly cps)
IBB	ISA bus buffer
IBC	ISA bus controller
IC	integrated circuit
IDE	integrated drive electronics
I/O	input/output
IRQ	interrupt request
ISA	industry standard architecture
ISP	integrated system peripheral

Abbreviation	Description
Kb	kilobit: 1024 bits
KB	kilobyte: 1024 bytes
LAN	local area network
LED	light-emitting diode
mA	milliampere: 1/1000 of an ampere
MB	megabyte: 1,048,576 bytes
MDA	monochrome display adapter
MHz	megahertz: 1,000,000 cycles per second
ms	millisecond: 1/1000 of a second
NMI	non-maskable interrupt
NPX	numeric coprocessor
ns	nanosecond: 1/1,000,000,000 of a second
PCBA	printed circuit board assembly
PGA	pin grid array (chip package)
PLCC	plastic leaded chip carrier (chip package)
POD	power-on diagnostics
PQFP	plastic quad flat pack
PST	programmable state timer
RAM	random access memory
RAMDAC	random access memory digital-analog converter
RFI	radio frequency interference
ROM	read-only memory
rpm	revolutions per minute
RTC	real-time clock
SIMM	single inline memory module
SIP	single inline pin (chip package)
SRAM	static random access memory
TPE	twisted pair ethernet
tpi	tracks per inch
V	volt: unit of electro-motive force
VAC	volts
VDC	volts
VGA	video graphics array
W	watt: unit of electrical power
XT	Extended Technology (from the IBM XT model computer)
ZIP	zig-zag inline pin (chip package)

B *System Utilities*

Contents

Tables

Running the SETUP Program

If components were removed from, replaced, or upgraded in the computer, run the SETUP program to define the new system configuration. The SETUP program is stored in the computer's read-only memory (ROM) and is available during power-on diagnostics and after a computer reset by pressing **F2.**

SETUP allows verification or change to the following:

❑ Current date and time

❑ Installed base and extended memory

❑ Various processor speed settings

❑ Fast boot option

❑ Location of the built-in video BIOS

❑ System and video shadow RAM address operation

❑ Keyboard delay, speed, and num lock status

❑ Installed equipment detected

❑ Parallel and serial port operation and address assignments

❑ Speaker operation

❑ Built-in diskette drive and hard disk drive controller operation

❑ Password and network server mode operation

❑ Type(s) of diskette and hard drive(s) installed

❑ Cache, cache testing, and non-cacheable address operation for internal cache in the i486DX2/66 microprocessor

❑ High vertical refresh rate setup.

Note If someone has set a password, you may need to move jumper J13 from the B position (enabled) to the A position (disabled) to access the computer.

The configuration defined through SETUP is stored in CMOS RAM. This memory is backed up by a battery, so it is not erased when the computer is turned off or reset. At power on and reboot, the computer checks the CMOS RAM settings, and if it finds a difference between the information in the CMOS RAM and the actual hardware configuration, it prompts you to run SETUP. You see a message like the example message below:

```
Memory size mismatch

 (Run SETUP)

Press <F2> to run SETUP

(Resume = <Fl> key)
```

If this happens, press **F2** to run SETUP and correct the setting.

Starting the SETUP Program Stored in ROM

To start SETUP, make sure there is no diskette in the diskette drive. Then turn on the computer. (If the computer is on, press Ctrl, **Alt,** Del to reset it; or turn it off, wait 20 seconds, and then turn it on again.) As soon as you see the following prompt, press **F2:**

> **Press <F2> to run SETUP**

Note   If you do not press **F2** within five seconds, the computer tries to load the operating system and you will not be able to run SETUP from the system ROM. If this happens, reset the computer to try again

The SETUP Screens

After pressing **F2** or entering SETUP at the MS-DOS prompt, you see the first screen of SETUP information:

```
╔═══════════[ SYSTEM SETUP                    English ]═══════════╗
║ <F1>=Help  <F3>=Set Date/Time  <F9>=Set defaults  <F10>=Save  <Esc>-Exit ║
║                                                                 ║
║  [ Installed Memory ]                                           ║
║    Base memory........................... 0000640 KB            ║
║    Extended memory....................... 0003072 KB            ║
║                                                                 ║
║  [ Boot Options ]                                               ║
║    Auto speed............................ Disabled              ║
║    Software speed change................. Enabled               ║
║    Power-on low speed.................... Disabled              ║
║    Fast boot option...................... Enabled               ║
║    On-board video BIOS located at........ C000h                 ║
║                                                                 ║
║  [ Keyboard Options ]                                           ║
║    Keyboard function..................... Enabled               ║
║    Keyboard delay........................ Keyboard Delay = 0250 ms ║
║    Keyboard speed........................ Keyboard Speed = 020 kps ║
║    Num Lock status after boot............ Num Lock ON           ║
║                                                                 ║
║                                                  [ More... ]    ║
║  ═════════[ Date/Time ]═══════                                  ║
║  Date:09/14/1992  Time:11:13:23 │ Non-Editable Field           ║
╚═════════════════════════════════════════════════════════════════╝
```

There are several screens of SETUP options. A box in the lower left comer continuously displays the current date and time. The help lines at the bottom of the screen list some of the keys you can press to perform various SETUP options.

You can change most of the SETUP options listed in this appendix; however, the program automatically sets the following options which cannot be changed:

❑   Base memory

❑   Extended memory

❑   Number of diskette drives installed

❑   Video type.

Selecting Options

A solid cursor bar highlights the option currently selected. You can scroll through the options using the up and down arrow keys (↑or ↓). When you reach an option you want to change, press **Enter** to edit the option. Then press the + or - keys on the numeric key pad or the keyboard - or shift + to toggle between choices. When the setting is correct, press ↑or ↓ to go to the next option.

Table B-l lists the keys you can use to perform all SETUP operations.

Table B-l
SETUP Key commands

Key	Function
F1	Displays a help screen describing some of the keys used in the SETUP program
F3	Displays the date and time prompts so you can set a new date and/or time
F4	Sets all the options to the settings last stored in the CMOS RAM
F9	Sets all the options to their default settings
F1 or F10	Saves the current configuration setting in the computer's CMOS RAM
Esc	Allows save or discard of current settings and exits the program
↑ or ↓	Move the cursor to the next or previous option and highlight it
Home or End	Move the cursor to the first or last SETUP option and highlight it
Enter	Select the highlighted option so you can change its setting

Setting the Date and Time

To change the date and/or time, follow these steps:

1   Press F3. You see the date prompt:

```
================[ SYSTEM SETUP                        English ]=========
 <F1>=Help  <F3>=Set Date/Time  <F9>=Set defaults  <F10>-Save  <Esc>-Exit

 [ Installed Memory ]
     Base memory............................. 0000640 KB
 ====================[ Message ]================ 0003072 KB
 [ B   Enter the date in mm/dd/yyyy format.
        09/14/1992                            Disabled
                                              Enabled
                                              Disabled
     Fast boot option....................... Enabled
     On-board video BIOS located at......... C000h

 [ Keyboard Options ]
     Keyboard function...................... Enabled
     Keyboard delay......................... Keyboard Delay = 0250 ms
     Keyboard speed......................... Keyboard Speed = 020 kps
     Num Lock status after boot............. Num Lock ON

                                                  [ More... ]
 ==========[ Date/Time ]=======
  Date:09/14/1992  Time:11:14:55 |  Non-Editable Field
```

2   The cursor flashes in the month **(mm)** field. If the entire date is correct, press **Enter** and go to step 5.

       If the date needs to be changed, type two digits for the current month, such as 09 for September. The cursor moves to date (dd) field.

3   Type the current, two-digit date, and the cursor moves to the year (yyyy) field.

4   Type four digits for the year, for instance 1999, and press **Enter.** (If you make a mistake, press **Backspace** to erase the characters before you press **Enter.)**

       If an invalid date (such as month 13) is entered, the date prompt will flash on the month (mm) field again. Follow steps 2 through 4 again and enter a valid date.

5   Now you see the time prompt:

```
┌──────────────[ SYSTEM SETUP                        English ]─────────┐
│ <F1>-Help  <F3>-Set Date/Time  <F9>-Set defaults  <F10>-Save  <Esc>-Exit │
│                                                                       │
│  [ Installed Memory ]                                                  │
│    Base memory............................ 0000640 KB                  │
│        ┌────────────[ Message ]────────────┐.. 0003072 KB            │
│        │                                    │                          │
│  [ B   │ Enter the time in hh/mm/ss format. │.. Disabled             │
│        │ 11 15 03                           │.. Enabled              │
│        │                                    │.. Disabled             │
│        └────────────────────────────────────┘.. Disabled            │
│    Fast boot option........................ Enabled                   │
│    On-board video BIOS located at.......... C000h                     │
│                                                                       │
│  [ Keyboard Options ]                                                  │
│    Keyboard function....................... Enabled                   │
│    Keyboard delay.......................... Keyboard Delay = 0250 ms  │
│    Keyboard speed.......................... Keyboard Speed = 020 kps  │
│    Num Lock status after boot.............. Num Lock ON               │
│                                                                       │
│                                                      [ More... ]      │
│  ════════════[ Date/Time ]════════════                                │
│  Date:09/14/1992  Time:11:15:12 ║ Non Editable Field                  │
└───────────────────────────────────────────────────────────────────────┘
```

If the time is correct, press **Enter.**

If the time needs to be changed, type in the current hour (hh), then minutes (mm), and then seconds (ss) according to a 24-hour clock (For example, 5 p.m. would be hour 17.) Then press **Enter. (If** you make a mistake, press **Backspace** to erase the characters before you press **Enter.)**

If an invalid time (such as hour 25) is entered, the time prompt will flash on the hour (hh) field again. Repeat step 5 again and enter a valid date.

The time prompt disappears and the date and time set is displayed on the screen.

Setting the Processor Speed Options

There are three processor speed options available to customize the system's processing speed. The table below lists these options and their default settings.

Table B-2
Processor Speed Options

Option	Default Setting
Auto speed	Disabled
Software speed change	Enabled
Power-on low speed	Disabled

The Auto speed and Power-on low speed optionsahowthecomputer's processor to operate at one of three different speeds: high, low, and automatic speed.

Note   When the processor is running at high speed, the SPEED light on the front panel is green; when it runs at low speed, the SPEED light is amber.

The automatic setting causes the system to run at low speed when a diskette drive is accessed and at the high speed at all other times.

The Software sgeed **change** option disables the keyboard speed changing commands if they are not compatible with certain application programs. The default is Disabled.

Setting the Fast Boot Option

Enabling the Fast boot option allows the power-on diagnostic testing to skip certain system memory tests. The default is Disabled.

Setting the System and Video BIOS Options

The computer's shadow RAM feature copies the contents of the system and video BIOS ROM (and any external BIOS ROM installed) into RAM so the computer can perform certain operations faster.

The computer enables shadow RAM automatically. However, there are two SETUP options to control the memory addresses the computer uses for shadow RAM: On-board video BIOS location at and Shadow RAM areas.

The default setting of the video BIOS ROM is memory address C000h, which allows the computer to use AT-compatible software. For PS/2-compatible software, change the On-board video BIOS located at address to E000h.

To exclude certain portions of RAM (up to 12,16KB address areas) from being used for Shadow **RAM areas, press the End** key to go to the bottom of the options menu. Then enable or disable shadow RAM in these address ranges:

❏   *C000h-C3FFFh

❏   *C400h-C7FFFh

❏   *CS00h-CBFFFh

❏   *CC00h-CFFFFh

❏   D000h-D3EEFh

❏   D400h-D7FFFh

❏   D800h-DBFFFh

❏   DC00h-DFFFFh

❏   E000h-E3FFFh

❏   E400h-E7FFFh

❏   E800h-EBFFFh

❏   EC00h-EFFFFh.

* These four addresses default to enabled. If you attempt to change the setting the following message appears:

   Warning! On-board video **BIOS** must **be shadowed - enabling** at C000

The default setting for all these address areas is Enabled. To disable shadow RAM at an **address,** select the area and **press Enter** then press ↑ or ↓₁ to change the setting to Disabled.

Setting the Keyboard Options

There are four keyboard options available:

❑ Keyboard function

❑ Keyboard delay

❑ Keyboard speed

❑ Num Lock status after boot.

The Keyboard **function must he set to its default setting (Enabled) to change the delay and speed setting. The Num Lock status after boot setting can he changed anytime.**

The Keyboard delay default setting is 250 ms, or ¼ second The options are 0, **250, 500, 750,** or 1000 milliseconds (ms).

The Keyboard speed default setting is 020 kps (keys per second). The options are any speed between **002** and 031 kps.

The Num Lock status after boot default setting is ON. The option is **OFF.**

Installed Equipment

Setup displays information about the following equipment (except for math coprocessor, these fields are non-editable):

❑ Number of diskette drives

❑ Video type

❑ Math coprocessor.

Setting the Built-in I/O Port Options

The I/O (input/output) port options let you define how the following ports operate:

❏ Primary parallel port (LPTl)

❏ Primary serial port (COMl)

❏ Secondary serial port (COM2)

❏ Speaker

❏ Diskette drive controller

❏ Hard disk controller.

Setting the Parallel Port

The parallel port's default setting is Enabled which designates it as LPT1. If the Primary parallel port is to he ignored as LPTl change the setting to Disabled.

Setting the Serial Port

The primary and secondary serial port default settings are Enabled, which designates them as COMl and COM2 respectively. If one of the ports is to he ignored as COMl or COM2, change the setting to Disabled This may he necessary if a FAX/modem hoard is installed.

Setting the Speaker

The speaker's default setting is Enabled which allows the speaker to beep during certain operations. To turn the speaker off change the setting to Disabled.

Setting the Internal Diskette Drive Controller

The internal diskette drive controller's default setting is Enabled which allows the internal diskette drive controller to function. To override the internal diskette drive controller function change the setting to Disabled.

Setting the Internal Hard Disk Drive Controller

The internal hard disk drive controller's default setting is Enabled which allows the internal hard disk drive controller to function. To override the internal hard disk drive controller function change the setting to Disabled.

Setting the Port Configuration

The I/O (input/output) port address options let you define the address for the following ports:

❏   Primary parallel port

❏   Primary and secondary serial ports.

The table below list the I/O address options for each port.

Table B-3
I/O address options.

Port	I/O Address Options
Primary parallel	378h, 278h, *3BCh
Primary serial	*3F8h, 2F8h, 338h, 238h
Secondary serial	*2F8h, 3F8h, 338h, 238h

* Default setting

Network Server and Password Status

The password status options let you define the password for the following:

❏   Network server mode

❏   Password security

❏   Password.

Setting the Network sewer mode

The network server's default setting is Not installed. To install the network server security mode change the setting to Installed.

Setting the Password security

The default setting is Not   installed. To install a password change the setting to Installed.

Setting the Password

The default setting is Not set. To set a password press **Enter. You see the** message below on the help line:

```
<F2> sets password
```

Note Change the settingsof **Password security** and/or Network server **security from Disabled** to Enabled before setting a password.

Press F2 and you see the prompt Enter Power on Password. Type in your password and press **Enter. The Password option setting changes** to Set.

Note **If someone has set a password,** you may need to move **jumper** J13 from the B position (enabled) to the A position (disabled) to access the computer.

Installed Diskette Drive(s)

SETUP automatically detects the number and type of diskette drives in the system as shown **in the Diskette Drives option. The options are:**

❑   Not installed

❑   360KB 5.25"

❑   **720KB *3.5"***

❑   1.2MB 5.25"

❑   1.4MB 3.5".

Installed Hard Disk Drive(s)

SETUP lets you select the type of hard disk drive(s) installed in the computer. Follow these guidelines to choose the correct setting for each drive:

❑   If the system does not have a hard drive, select **Not** installed for drives 1 and 2. If one hard disk drive is installed, select Not installed for drive 2.

❑   If a Conner 170MB hard disk drive is installed as drive 1, select type 26.

❑   If a Quantum 240MB hard disk drive is installed as drive 1, select type 34.

❑   **If** a Quantum 525MB SCSI drive is installed as drive 1, select Not installed.

cl   If another type of hard disk drive is installed, select the drive type that matches the drive. See "Hard Disk Drive Types" below.

Hard Disk Drive Types

The table in Appendix A lists the types of standard hard disk drives that can be installed in the computer. Check this table and the documentation that is supplied with the hard disk drive to determine the correct type number for the drive. If none of the drive types listed matches the drive, see "Defining Drive Type" below.

Note **The SETUP program Hard Drive options do not list the Precomp or Land** zone parameters for the hard drive types. These parameters are included in the table in Appendix A.

Defining Your Own Drive Type

If the parameters for the hard disk (listed in its documentation) do not match any of the types listed in Appendix A, you can define your own type. Follow these steps:

1   Highlight the Hard **disk 1: or Hard disk 2 :** option, and press **Enter.**

2   Use the numeric keys along the top of the keyboard or the numeric keypad to enter the appropriate values for these parameters:

```
Enter number of cylindera on disk
Enter number of cylinder heads
Enter number of sectors per track
```

The total amount of storage capacity on the disk is calculated by SETUP automatically based on the other values entered.

Press Enter after typing each number. If you enter an invalid number, the computer beeps and does not go on to the next parameter. Check the drive documentation and try again.

Setting the Non-cache Areas

The computer automatically caches all the system memory except two non-cache address areas listed in the table below. You can enable or disable caching in any of the six, System Defined Cache Control Areas and two sets of additional User Defined non-cached Areas (also listed in the table below).

Note The computer does not cache any RAM that is installed on an option card.

Certain address areas may be disabled to avoid memory conflicts if an option card or other device uses the same address area.

Table B-4
Non-cache address areas

Option	Default Setting
System defined areas,	
A0000h-AFFFFh caching	Disabled
B0000h-BFFFFh caching	Disabled
C0000h-CFFFFh caching	Enabled
D0000h-DFFFFh caching	Enabled
E0000h-EFFFFh caching	Enabled
F0000h-FFFFFh caching	Enabled
User defined areas,	
1st User defined non-cache low address	0000000h
1st User defined non-cache high address	0000000h
2nd User defined non-cache low address	0000000h
2nd User defined non-cache high address	0000000h

If you set any user-defined non-cache areas, SETUP automatically sets the high address at least 4KB higher than the corresponding low address.

To change the setting of a system-defined non-cache area, select the address area and press + or - to choose enabled or disabled

To disable caching in a user-defined non-cache area, set the beginning address of the range in the low address option; then set the ending address in the corresponding high address option.

First highlight the low address option and press **Enter**. Then press + or - to scroll through the addresses in 4KB increments; or press **Pg Up** or **Pg Dn** to scroll in 256KB increments. Once the low address is set, set the corresponding high address in the same manner.

Setting the Cache Test and User Control Options

Using SETUP, you can enable or disable the computer's internal cache (built into the microprocessor) or external cache (built into an optional cache module). The default setting for both cache options is Enabled.

Disable the cache if it malfunctions or if you are using timing-loop-dependent software that requires a slower system speed.

Power-on diagnostic testing of the cache can also be disabled, if you are receiving cache errors that prevent you from using the computer. The default setting is Enabled.

Setting the High Vertical Refresh Rate

SETUP allows you to set the vertical refresh rare for system screen resolutions. The default rates and optional settings are shown in the table below:

Table B-5
Vertical Refresh Rate Options

Resolution	Default Refresh Rate
640 x 480	60* or 73 Hz
800 x 600	56*, 60, or 72 Hz
1024 x 768	60, 70, 72*, or 75 Hz

* Factory default vertical refresh rate

Saving Your Settings

After you have made your selections for SETUP, press **Esc** to exit. You see the following prompt:

```
Save and Exit
No Save and Exit
Return to Setup
```

To save the settings in the CMOS **RAM, highlight Save ,and exit and press Enter.** To exit SETUP without saving your changes, press / to highlight No Save **and Exit; then press Enter.** To remain in SETUP, select Return to Setup and press **Enter;** the exit menu disappears.

Note   You can also save your settings and remain in SETUP by pressing **F1O any time in** the program. You see a message **Changes Saved;** then press any key and return to SETUP.

If you saved your changes, the SETUP program resets your system and the computer performs its power-on diagnostic tests (except if you are using the SETUP **program on the** Reference disk).

If power-on diagnostics detects a problem, however, you see an error message and a prompt to run SETUP. Follow the instructions on the screen to run SETUP again to correct it. (You may need to turn the computer off and then on again.)

Performing System Diagnostics

This section describes how to test the operation of your computer and its peripheral devices using the System diagnostics program on your Reference diskette. Run the diagnostics program if you are not sure whether a device is performing correctly. The table at the end of this appendix lists the error messages you may see during testing

You can test the following devices using System diagnostics:

❑ System board

❑ Numeric coprocessor

❑ System memory

❑ Diskette drive(s)

❑ Hard disk drive(s)

❑ Serial ports

❑ Parallel port(s)

❑ Video adapter

❑ Dot matrix printer(s).

Note When performing diskette and hard disk diagnostics, the Write/Read function checks may destroy data on the disk Be sure to back up any data on your hard disk or insert a blank, formatted diskette before you run this test. Also, be sure to do this if you select Run all above checks.

Starting the System Diagnostics Program

Follow these steps to start the System diagnostics program:

1   Insert the Reference diskette in drive A and turn on the computer.

Note   Always boot the computer from the Reference diskette to start System diagnostics. This clears any terminate-and-stay-resident (TSR) programs or other utilities from memory and frees it for use by the diagnostics program.

2   At the **A:** prompt, type **DIAG** and press **Enter**.

3   You see a menu bar at the top of the screen with Items   Detected   highlighted Press **Enter.**

```
 Items Detected     Execute    Add Tests    Delete Tests   Quit
  ══════════════ Detected Items ══════════════
   System Board          80486DX 266 Mhz
   CoProcessor           Embedded 80487
   Memory                640 Base / 9216 Ext.
   Diskette drive A      1.4 MB - 3.5"
   Diskette drive B      1.2 MB - 5.25"
   Hard drive #1         Drive type 060
   Hard drive #2         Drive type 017
   Serial port 1 (3F8h)  Installed
   Parallel port 2 (378h)  Installed
   Color display
   Keyboard
```

4   You see a list of all the testable devices the computer detects in your system. If the list is correct, go to page B-19.

5   If the list is not correct, press **+** to select Quit and press **Enter.** Run the SETUP program to make sure any missing devices ate configured properly.

When the list is correct, you can run diagnostic tests on each device. If you do not want to test a device, you can remove it from the list. You can also add a device to the list.

Deleting Tests

To remove devices from the Items Detected list so the system diagnostics program cannot test them, follow these steps:

1   Press + to select Delete Tests. You see the Delete menu, as shown below:

Items Detected   Execute   Add Tests   Delete Tests   Quit

```
                          Delete
                    System Board
                    Numeric Coprocessor
                    System Memory
                    Diskette Drive A
                    Diskette Drive B
                    Hard Disk Drive #1
                    Hard Disk Drive #2
                    Serial Port COM1
                    Printer Port LPT1
                    Video Adapter Test
                    Keyboard Test
```
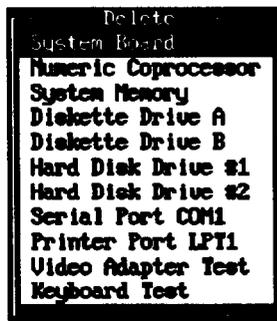
2   **Press ↓ or ↑**   to highlight the device you want to delete **and press** Enter. The device is removed from the Delete menu. You can delete as many devices as you want.

3   When you are finished deleting devices, press <- to select Execute; see "Running Tests" on page B-19.

Adding Tests

If you want to add devices to the Items Detected list, follow these steps:

1   Press <- or -> to select Add Tests. You see the following Add menu:

```
Items Detected    Execute    Add Tests    Delete Tests   Quit

                      ┌──── Add ────────┐
                      │ Diskette Drive B │
                      │ Serial Port COM2 │
                      │ Serial Port COM3 │
                      │ Serial Port COM4 │
                      │ Printer Port LPT2│
                      │ Printer Port LPT3│
                      │ LPT1 Printer Test│
                      │ LPT2 Printer Test│
                      └──────────────────┘
```

2   Press ↓ or ↑ to highlight the device you want to add and press **Enter. The device** is removed from the Add menu and added to the Items Detected list. You can add as many devices as you want.

3   When you are finished adding devices, press <- to select Execute. Then see the next section.

Running Tests

Follow these steps to run a test from the Execute menu:

1   Press <- or -> to select Execute. You see the following Execute menu:

```
Items Detected     Execute    Add Tests    Delete Tests   Quit
                    ┌──────── Execute ────────┐
                    │ System Board            │
                    │ Numeric Coprocessor     │
                    │ System Memory           │
                    │ Diskette Drive A        │
                    │ Hard Disk Drive #1      │
                    │ Hard Disk Drive #2      │
                    │ Serial Port COM1        │
                    │ Printer Port LPT1       │
                    │ Keyboard Test           │
                    └─────────────────────────┘
```
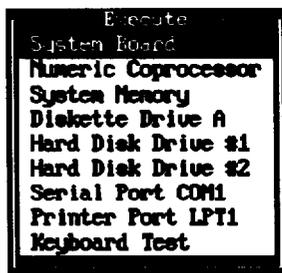
2   Press ↑ or ↓ to highlight the device you want to test and press **Enter.** You see the
    Repeat Count prompt:

```
Items Detected     Execute    Add Tests    Delete Tests   Quit
                    ┌──────── Execute ────────┐
                    │ System Board            │
                    │ Numeric Coprocessor     │
                    │ System Memory           │
                    │ Diskette Drive A        │
                    │ Hard Disk Drive #1      │
                    │ Hard Disk Drive #2      │
                    │ Serial Port COM1        │
                    P┌──────── Repeat Count ─────────┐
                    K│ How often to repeat test?   1 │
                     └───────────────────────────────┘
```
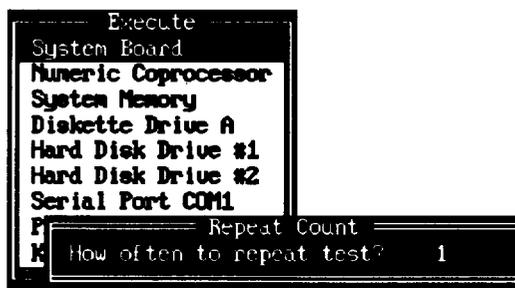
If you want to run the test once, press **Enter.** To run the test more than once, type the
number of times you want to run it and press **Enter.**

3   If there is only one test for a device, the program begins testing immediately. If there is more than one test for the device, you see a submenu.

4   Use ↑ or ↓ or type the number of the desired option to highlight a test and then press **Enter** to run it.

Note   If you selected to run the tests more than once, you do not see a submenu. The program immediately begins executing all the tests that do not destroy data.

5   When the test is completed, you see the Execute menu or the test submenu again. You can select another test or exit the menu.

6   To exit system diagnostics, press -> to select Quit and press **Enter. You return** to the operating system command prompt.

Resuming From an Error

If an error prevents a test from running, you see a Runtime Error information box. Follow the instructions on the screen to solve the problem.

If an error occurs during a test, the test stops and an error message appears. Follow the instructions on the screen to print the message or to continue without printing it.

For a complete list of the error messages the program may display, see the table at the end of this chapter.

System Diagnostics Tests

The table below lists all the system diagnostics tests you can run on your system.

Table B-6
System Diagnostics Tests

Device	Tests Available	Description
System Board		Checks the system board components
Numeric Coprocessor		Tests the operation of any built-in coprocessor
System Memory		Checks all memory and displays a memory count
Diskette Drive(s) A or B	Sequential seek check	Tests the operation of the selected diskette drive; requires a formatted diskette for some tests
	Random seek check	
	Write, read check *	
	Disk change check	
	Run all above checks	
Hard Disk Drive(s) #1 or #2	Seek check	Tests the operation of the selected hard disk drive
	Write, read check *	
	Read, verify check	
	Run all above checks	
Serial Port(s)	COM1 to COM4	Tests the selected serial port; requires a loop-back connector
Parallel Port(s)	LPT1 and LPT2	Tests the selected parallel port; requires a loop-back connector
Video Adapter	Adapter check	Tests the operation of the built-in VGA display adapter
	Attribute check	
	Character set check	
	Graphics mode check	
	Screen paging check	
	Video check	
	Sync check	
	Run all above checks	
Printer	LPT1 and LPT2	Tests the operation of the selected dot matrix printer and prints a test pattern
Keyboard	Individual keys	Tests keyboard scan codes

*The Write/Read check destroys data on the disk. Be sure to back up data on a hard disk or insert a blank diskette

Error Messages

The following table lists all the error messages that may appear during system diagnostics testing.

Table B-7
System Diagnostics Error Messages

Error Code	Message
System board	
0101	CPU error
0102	ROM checksum error
0103	Timer counter register error
0104	Timer counter error
0105	Refresh error
0105	DMA controller register error
0106	DMA page register error
0107	Refresh error
0108	Keyboard controller timeout error
0108	Keyboard controller self diagnostic error
0108	Keyboard controller write command error
0109	CMOS checksum error
0110	CMOS shutdown byte error
0111	CPU instruction error
0112	CMOS battery error
0113	Interrupt controller error
0114	Protect mode error 1
0115	Protect mode error 2
Memory	
0201	Memory error
0202	Parity error
Diskette drive(s)	
0601	Diskette drive controller error
0602	Sequential seek error
0603	Random seek error
0604	Write error
0605	Read error
0606	Remove error
0607	Insert error

Error Code	Message
Coprocessor	
0701	Coprocessor not installed
0702	Coprocessor initialize error
0703	Coprocessor invalid operation mask error
0704	Coprocessor st field error
0705	Coprocessor comparison error
0706	Coprocessor zero divide mask error
0707	Coprocessor addition error
0708	Coprocessor subtraction error
0709	Coprocessor multiplication error
0710	Coprocessor precision error
Parallel port(s)	
0901	Error pin p
Serial port(s)	
1101	*control signal* always low
1101	*control signal* always high
1102	Timeout error
1103	Verify error
Hard disk drive(s)	
1701	Seek error
1702	Write error
1703	Read error

Formatting a Hard Disk

This section describes how to low-level (or physically) format a hard disk. This procedure should not be confused with the logical format performed by the operating system. The physical formatting of a hard disk is a separate step that is usually done at the factory by the disk manufacturer.

If the computer came with a factory-installed hard disk, or if you installed an optional IDE hard disk from Epson, it has already been physically formatted. You need only follow the instructions in the operating system manual to prepare the hard disk for use.

You may need to use the procedure in this section to physically format a hard disk if you installed a non-Epson hard disk in the computer that has never received the low-level format and did not come with its own format utility. If you installed a hard disk that came with its own format utility, use that program to physically format the disk.

> Caution Physically formatting a hard disk erases any data it contains. Be sure to back up any data on the hard disk before you format it. In addition to destroying all the data on the hard disk, formatting removes any partitions and logical formatting defined on the disk by the operating system. After you physically format a new or used hard disk, you need to logically format the disk again using the operating system.

Starting the Program

Follow these steps to start the hard disk formatting program:

1   Insert the Reference diskette in drive A and start the system.

2   Type HDFMTALL and press Enter.

You see the Hard Disk Format Menu:

```
1 - Format
2 - Destructive surface analysis
3 - Non-destructive surface analysis

0 - Exit
```

The option you choose depends on whether you are formatting a new disk or reformatting a used disk. The options work as follows:

❏   Format first scans the disk for defective (bad) tracks (if it has no defective track table) and lets you decide which tracks to mark as bad. Then it formats the disk and marks the bad tracks so they are never used to store data.

❏   Destructive **surface analysis tests the entire disk for read/write errors or** unflagged bad tracks and updates the defective track table. Because this option writes and reads data on the disk, it destroys all data on any track that produces an error. YOU *cannot run this test on a disk that has never been formatted.*

❏   Non-destructive **surface analysis** checks the disk for unflagged bad tracks without destroying data. You *cannot run this test on a disk that has never been formatted.*

Fomatting a **New** *Disk*

To format a new hard disk that has never been formatted, select the Format option. You may need to modify the defective track table to add bad tracks when you format the disk Many hard disk drives come with a printed list of bad tracks, but the bad tracks am not flagged on the disk Other hard disks (such as Epson's disks) come with the bad tracks already flagged.

Reformatting a Used Disk

To reformat a disk you have been using, follow these steps:

1   Use the Non-destructive surface **analysis** option to check for unflagged bad tracks.

2   If errors occur during the non-destructive surface analysis, back up your hard disk to diskettes.

3   Run the Destructive surface analysis option to update the defective track table.

4   Run the Format option to format the disk.

Selecting an Option

When you use this program, you often need to select an option from a menu. There am two ways to do this:

❑   Use the arrow keys (↑, ↓, ←, →)) to highlight the option **and press Enter.**

❑   Type the number of the option and press **Enter.**

You can select almost any option that appears on the screen using either method.

Selecting a Drive

If you have more than one hard disk drive, you see this prompt:

> **Enter drive number ? (l/2)**

Select **1** for the first hard disk or **2** for the second hard disk Then see the instructions below for the Hard Disk Format Menu option you want to use.

Option 1, Format

If you select **Format** from the Hard Disk Format Menu, you see the following (for a disk with no defective track table):

    Format Hard Disk < Drive n: >

    Scan hard disk to get defective track information? (Y/N)

(If the disk already has a defective track table, you do not see this because you do not need to scan for bad tracks.)

1   Enter Y to scan the disk or **N** to skip the scanning process.

     If you select Y, the program scans the disk and displays these messages during the process:

         Scanning for flagged bad tracks...

         Head : nnn Cylinder : nnnnn

     You see the head and cylinder numbers decrease as the program progresses. After scanning the disk, the program displays the results, such as the following:

         Scanning finished.

         Count of tracks flagged bad   =   1

         Count of tracks with other errors =   0

         Count of good tracks   = 4884

2   Next you see the following prompt:

         Accept recomnended skewed sectors in format **: 1 ? (Y/N)**

     For a hard disk drive installed by Epson , it is best to accept the recommended skewed sector (also called the interleave factor) of 1, since this setting allows your drive to perform more efficiently. For other hard disk drives, you may need to change this value if the documentation that came with the disk recommends a different number.

     To accept the default, select **Y.** Then go to step 3.

     To enter a new value, select **N**. You see the following prompt:

         Enter new skewed sectors in format (l-16):

     Enter the recommended number, which equals the maximum sector number for the drive minus 1. Then press **Enter.**

3   Next you see this prompt:

         Accept recommended skewed sectors per head in format : 0 ? (Y/N)

     For an Epson hard disk drive, accept the recommended value of 0. For another type of drive, use the value recommended in the documentation for the drive.

     To accept the default, select **Y.** Then go to step 4.

To enter a new value, select **N.** You see the following prompt:

Enter new skewed sectors per head in format (O-16):

Enter the recommended number, which equals the maximum sector number for the drive minus 1. The maximum sector number varies, depending on the drive type. Then press **Enter.**

4   The program now allows you to edit the defective track table. At the bottom of the table is this prompt:

Modify **defective track table ? (Y/N)**

Select **N** if you want to leave the table as it is. Then skip the next section and go to "Formatting the Disk" on page B-28.

To add bad tracks to the defective track table, see the next section.

Modifying the Defective Track Table

If you select Y to modify the table, you see the following options at the bottom of the table:

Defective Track Table : Move box cursor to desired track with cursor key A ı Add track, C ı Change track, D = Delete track, F = Finish editing

Enter   command:

To add a bad track, follow these steps:

1   Press **A.** You see this prompt:

Enter cylinder number (1 -nnnn):

2   Type the number of the cylinder containing the bad track and press **Enter.** You see this prompt:

Enter head *number* **(0 - nn):**

3   Type the head number for the bad track and press **Enter.** (To cancel the operation, press **Enter** without typing a value.)

When you complete a valid entry, it appears in the table and you can add the next bad track, if necessary.

If you make a mistake, move the cursor block to the incorrect track and press **C** to change the track data or **D** to delete the track from the table. Change the track data in the same way as you add a track

The maximum valid cylinder number and head number *(nnnn* and *nn)* vary according to the capacity of the hard disk If you enter an invalid cylinder or head number, a reminder of the range of values appears and the program asks you to enter the value again.

When you finish adding all the bad tracks, press **Enter** without typing a value. Then check the entries in the defective track table. When you are sure the table is correct, press **F. The** program displays a warning about the consequences of proceeding with formatting, as described in the next section.

Fotmatting the Disk

When you are ready to start formatting the disk, you see the following warning:

> **WARNING! ALL DATA WILL BE DESTROYED IN ALL PARTITIONS OF HARD**
> **DISK, NOT JUST IN MS-DOS PARTITION!**
>
> **Do you want to start formatting ? (Y/N)**

If you are not sure you want to format the hard disk, select **N.** If you are sure, select **Y;** the program gives you one more chance to cancel:

> **DOUBLE CHECK THAT YOU HAVE BACKUP DISKETTE COPIES OF ALL**
> **YOUR FILES.**
>
> **Do you want to exit and check your file copies ? (Y/N)**

Select Y to cancel formatting or **N** to continue.

If you continue with formatting, you see:

> **Format started.**
>
> **Head :nnn Cylinder : nnnnn**

You see the head and cylinder numbers decrease as the program progresses.

When formatting is complete, the program flags any bad tracks and you see a series of messages like these:

> **Format finished.**
>
> **Flagging bad tracks...**
>
> **Cylinder is nnnn, head is nn**
>
> **Format completed.**

Press **Enter** to return to the Hard Disk Format Menu.

Option 2, Destructive Surface Analysis

You can perform a destructive surface analysis of your hard disk to accurately locate any bad tracks and flag them, if they are not flagged. The test writes, reads, and verifies information on every track of the hard disk, except for tracks that are already flagged as bad.

Caution If any errors occur during this check, all data on the track that caused the error is destroyed. If you think that an unflagged bad track is causing trouble, first run the Non-destructive surface analysis to check the disk surface.

To start this test, select Destructive **surface analysis** from the Hard Disk Format Menu. You see these messages:

```
Analyze Hard Disk <Drive n:>

Read/Save/Write/Read/Restore/Read check for all tracks...

Current cylinder is nnnn
```

As the program checks each track, it decreases the cylinder numbers to zero.

When the test is complete, the program displays a report on the status of the disk, including a table of unflagged tracks that produced write, read errors-such as the following:

```
Analysis finished.

Count of tracks flagged bad               =    n

Count of tracks with write, read errors   =    n

Count of good tracks                      = nnnn

No write, read error was detected.

No data was destroyed.
```

Press Enter to return to the Hard Disk Format Menu.

If the program finds an uflagged bad track, the report is followed by a table like this:

```
Write, Read Error Tracks

 Cylinder Head Cylinder Head Cylinder Head Cylinder Head

 237         2

Confirm to register the tracks in the Write, Read Error Track
Table as bad tracks.

Do you want to register the error tracks as bad tracks? (Y/N)
```

To flag these tracks as bad, select Y. You see a list of the tracks as they are flagged. When the process is complete, press **Enter** to return to the Hard Disk Format Menu.

Option 3, Non-destructive Surface Analysis

The non-destructive surface analysis does not destroy any data, and you can use it to safely check the condition of your hard disk drive. However, this test does not flag any bad tracks it detects.

To start the **test, select Non-destructive surface** analysis from the Hard Disk Format Menu. You see these messages:

> **Analyze Hard Disk <Drive n:>**
>
> **Read/Verify check for all tracks...**
>
> **Current cylinder is nnnn**

As the program checks each track, it decreases the cylinder numbers to zero. When the test is complete, the program displays a report on the status of the disk, such as the following:

> **Analysis finished.**
>
> **Count of tracks flagged bad   =   P**
>
> **Count of tracks with read, verify errors =   n**
>
> **count of good tracks   = *nnnn***
>
> **No read, verify error was detected.**

If the program finds errors, the screen displays a table of the tracks that produced the errors. Then you see this message:

> **Press ENTER to return to the menu.**

Check the information displayed. Then press **Enter** to return to the Hard Disk Format Menu.

Exiting the Program

To leave the Hard Disk Format Menu, select **Exit.** You see the operating system command prompt.

If you formatted the hard disk or ran the destructive surface analysis option, you must now prepare your hard disk for use with your operating system. See your operating system manual for instructions.

Additional Utilities

The Reference diskette contains the following additional utilities:

❑   ESPEED

❑   HDSIT.

Changing the Processor Speed

The computer's processor can operate at two speeds: high or low. High speed is the highest speed at which the microprocessor is capable of running. Low speed simulates an 8 MHz processor to provide compatibility with older application programs.

You can also set the computer to automatic speed which switches your computer's processor from high to low speed when it accesses a diskette drive.

Note   When your computer is operating at high speed, the power light on the front panel is green. It is amber when the computer is operating at low speed.

There are three ways to change the processor speed:

❑   Run the SETUP program

❑   Enter a keyboard command

❑   Run the ESPEED program.

The ESPEED program is useful in batch files that start applications that have key functions that conflict with the keyboard commands. To use the program at the DOS prompt, type ESPEBD option and press Enter. Table B-7 lists the options.

Table B-8
ESPEED Command Options

Option	Function
/H or /HIGH	Sets high speed
/L or /LOW	Sets low speed
/A or /AUTO	Sets auto speed

Preparing the Hard Disk for Moving

If you need to move the computer to a new location, you may want to run the HDSIT program provided on the Reference diskette to protect the hard disk during the move. This program is not necessary on IDE drives as long as you do not move the system for 20 seconds after turning the power off. IDE drives automatically park the heads.

C *Schematics*

Contents

AUXILLIARY FAN

CPU CONFIGURATION (J5-J8)

CPU TYPE	J5	J6	J7	J8
486DX	A	A	A	A
486SX	B	B	B	B
486SX-PQFP/487	B	B	A	A
486SX-PQFP/OVERDRIVE	A	A	A	A

CPU TYPE

CPU SPEED

CPU SPEED (J1-J4)

SPEED	J4	J3	J2	J1
16MHz	A	A	A	A
18MHz	A	A	A	B
20MHz	A	A	B	A
25MHz	A	A	B	B
33MHz	A	B	A	A
40MHz	A	B	A	B
50MHz	A	B	B	A
66MHz	A	B	B	B

ASSEMBLY OPTION
IN PLACE OF J1-J8

NOT INSTALLED

P [0..7]

PCLK

U133B
74F125

R707
NOT INSTALLED

R242   15

U106D
74ALS04

U108
P0   2   1A1   1Y1   18   R231   62   LP0
P1   4   1A2   1Y2   16   R536   62   LP1
P2   6   1A3   1Y3   14   R533   62   LP2
P3   8   1A4   1Y4   12   R535   62   LP3
P4   11   2A1   2Y1   9   R239   62   LP4
P5   13   2A2   2Y2   7   R236   62   LP5
P6   15   2A3   2Y3   5   R237   62   LP6
P7   17   2A4   2Y4   3   R238   62   LP7
      1   1G
      19   2G
           74FR244

U106B
74ALS04

VGA
Feature
Connector

VCC   VCC   VCC
R241   R239   R240
4.7K   4.7K   4.7K

CN17
14   1   R222   33   LP0
15   2   R224   33   LP1
16   3   R226   33   LP2
17   4   R228   33   LP3
18   5   R229   33   LP4
19   6   R235   33   LP5
20   7   R240   33   LP6
21   8   R230   33   LP7
22   9
23   10
24   11
25   12
26   13
HEADER 13X2

U109B
74F125
5   6

U106C
74ALS04
5   6

XPCLK   XPCLK   3

LP [0..7]   LP [0..7]   3

/BLANK   /XBLANK   /XBLANK   3

HHSYNC   U109C
              74F125
              9   8   XHSYNC   XHSYNC   3

HVSYNC   U109D
              74F125
              12   11   XVSYNC   XVSYNC   3

4, 5, 7, 10   SD [0..15]   SD [0..15]   XPD [0..7]   XPD [0..7]   3

3, 7

/PALRD   /PALRD

U110
SD0   2   A1   B1   18   XPD0
SD1   3   A2   B2   17   XPD1
SD2   4   A3   B3   16   XPD2
SD3   5   A4   B4   15   XPD3
SD4   6   A5   B5   14   XPD4
SD5   7   A6   B6   13   XPD5
SD6   8   A7   B7   12   XPD6
SD7   9   A8   B8   11   XPD7
/PALRD 19   G
        1   DIR
             74ALS245

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