

3020

Service Manual

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Preface

This Service Manual explains basic procedures of maintenance, troubleshooting, and disassembly for the 3020 series notebook computers. It is for technicians trained in basic electronic repair and testing.

For easy reference, this manual is divided into the following chapters:

Chapter 1, *General System Description*, gives the standard specifications, features, and configuration of the computer.

Chapter 2, *System View and Disassembly*, provides a view of the system and components disassembly/reassembly instructions.

Chapter 3, *Connector Input/Output Definition*, provides connector information of the system.

Chapter 4, *Troubleshooting*, contains error information during POST and run-time.

Chapter 5, *Maintenance Diagrams and Parts Lists*, shows an exploded view and block diagram of the system.

Chapter 6, *Peripheral Devices*, contains specifications on the peripherals (i.e., floppy disk drive, hard disk, and LCD display).

You will also find a “MITAC Global Support Problem Worksheet” at the back of this manual. Please fill in this form when you encounter technical problems with any of our products and send the form to us or our service dealer.

For better technical support, we will keep you updated on technical information through the Service Bulletin, Question & Answer, and Engineering Change Notice.

NORDIC CAUTION TEXTS CONCERNING LITHIUM BATTERIES

- **DANISH**

ADVARSEL!

Lithiumbatteri - Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.

- **NORWEGIAN**

ADVARSEL:

Lithiumbatteri - Eksplosjonsfare. Ved utskifting benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres apparatleverandøren.

- **SWEDISH**

VARNING:

Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikan-
tens instruktion.

- **FINNISH**

VAROITUS:

Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suositteleman tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

- **ENGLISH**

CAUTION:

Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the equipment manufacturer. Discard used batteries according to manufacturer's instructions.

1 General System Description

1.1 System Features

Light, compactly designed in a letter-sized chassis, your notebook computer is a battery-powered computer fully compatible with the IBM PC/AT. It is equipped with the high-performance functions of an 80386SL CPU and is easily upgradable via the expansion connectors.

The basic system features are:

- 25MHz 80386SL microprocessor
- Socket for an 80387SX-25 or 80387SL-25 numeric coprocessor
- 3.5-inch, 1.44MB floppy disk drive
- Hard disk drive
- NiCad rechargeable battery pack
- AC adapter
- Flat-panel, backlit LCD screen with a resolution of 640 x 480 dots in 64 shades of gray
- 84/85-key keyboard, with 12 function keys, cursor-control keys, and built-in numeric keypad
- VGA (Video Graphic Array) controller
- Connectors for expansions (i.e., PS/2 mouse/keyboard, VGA monitor, serial device, parallel device, fax/modem module, and expansion chassis/docking station)
- 2MB of DRAM standard, expandable with a 2/4/8/16MB memory module
- 64KB cache memory
- Power Management and Security features

1.2 System Specifications

The major components of the computer include the system board, DC/DC board, button board, CPU, system memory, system and VGA BIOS, floppy and hard disk drive, LCD display, CPU/AT bus controller, keyboard, AC adapter, and the battery pack. Figure 1-1 shows how these components are integrated:

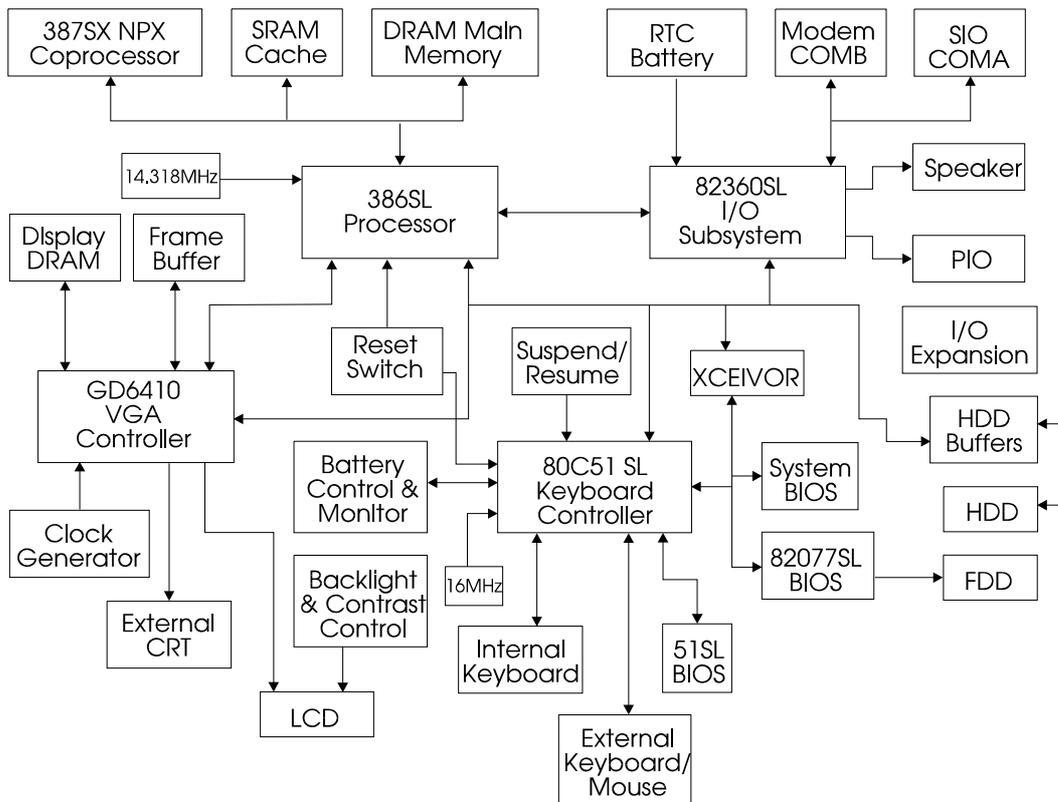


Figure 1-1. System Block Diagram

1.2.1 System Board

Figure 1-2 shows the layout of the system board, followed with key components descriptions.

Figure 1-2. Major Components of System Board

1-4 General System Description

Mark	Reference	Description	Name
A	U1	VGA controller	CL-GD6410
B	U3	VGA clock synthesizer	AV9116
C	U4	System BIOS	28F010
D	U16	CPU and memory controller and bus controller	386SL
E	U21	I/O and peripheral controller	360SL
F	U24	Keyboard BIOS	27512
G	U25	System clock synthesizer	AV9127
H	U26, 27	Cache RAM	55328
I	U28	Keyboard controller and power controller	80C51SL
J	U30	Floppy disk drive controller	82077SL
K	BT1	Lithium battery	

1.2.2 VGA Modes

The following display modes are supported by the VGA controller:

For Flat Panel Display

Mode (hex)	Type	Shades of Gray	Col. x Rows	Compatible Mode		Compression/Expansion	
				Character Size	Resolution Size	Character	Resolution
0	text	16	40 x 25	16 x 16	640 x 400	16 x 16	640 x 400
0*	text	16	40 x 25	16 x 14	640 x 350	16 x 14	640 x 350
0/1+	text	16	40 x 25	16 x 16	640 x 400	16 x 19	640 x 475
1	text	16	40 x 25	16 x 16	640 x 400	16 x 16	640 x 400
1*	text	16	40 x 25	16 x 14	640 x 350	16 x 14	640 x 350
2	text	16	80 x 25	8 x 16	640 x 400	8 x 16	640 x 400
2*	text	16	80 x 25	8 x 14	640 x 350	8 x 14	640 x 350
2/3+	text	16	80 x 25	8 x 16	640 x 400	8 x 19	640 x 475
3	text	16	80 x 25	8 x 16	640 x 400	8 x 16	640 x 400
3*	text	16	80 x 25	8 x 14	640 x 350	8 x 14	640 x 350
4	graph.	4	40 x 25	16 x 16	640 x 400	16 x 19	640 x 475
5	graph.	4	40 x 25	16 x 16	640 x 400	16 x 19	640 x 475
6	graph.	2	80 x 25	8 x 16	640 x 400	8 x 19	640 x 475
7	text	4	80 x 25	8 x 14	640 x 350	8 x 14	640 x 350
7+	text	4	80 x 25	8 x 16	640 x 400	8 x 19	640 x 475
D	graph.	16	40 x 25	16 x 16	640 x 400	16 x 19	640 x 475
E	graph.	16	80 x 25	8 x 16	640 x 400	8 x 19	640 x 475
F*	graph.	4	80 x 25	8 x 14	640 x 350	8 x 19	640 x 475
10*	graph.	16	80 x 25	8 x 14	640 x 350	8 x 19	640 x 475
11	graph.	2	80 x 30	8 x 16	640 x 480	8 x 19	640 x 480
12	graph.	16	80 x 30	8 x 16	640 x 480	8 x 19	640 x 480
13	graph.	64	40 x 25	16 x 16	640 x 400	8 x 19	640 x 475
53	text	16	80 x 60	8 x 8	640 x 480	8 x 8	640 x 480
61	graph.	16	80 x 25	8 x 16	640 x 400	8 x 19	640 x 475
74	graph.	64	40 x 30	16 x 16	640 x 480	16 x 16	640 x 480
75	graph64	80 x 25	8 x 16	640 x 400	8 x 19	640 x 475	
HGC	graph.	2	80 x 25	8 x 14	640 x 348**	8 x 19	640 x 472

Table Notes:

* = EGA state. + = VGA state. ** = The resolution is available when width compression is in use.

For External CRT Monitor

Mode (hex)	Type	Colors	Col. x Rows	Buffer	Character Size	Resolution
0	text	16/256K	40 x 25	B8000	8 x 8	320 x 200
0*	text	16/256K	40 x 25	B8000	8 x 14	320 x 350
0/1+	text	16/256K	40 x 25	B8000	9 x 16	360 x 400
1	text	16/256K	40 x 25	B8000	8 x 8	320 x 200
1*	text	16/256K	40 x 25	B8000	8 x 14	320 x 350
2	text	16/256K	80 x 25	B8000	8 x 8	640 x 200
2*	text	16/256K	80 x 25	B8000	8 x 14	640 x 350
2/3+	text	16/256K	80 x 25	B8000	9 x 16	720 x 400
3	text	16/256K	80 x 25	B8000	8 x 8	640 x 200
3*	text	16/256K	80 x 25	B8000	8 x 14	640 x 350
4	graph.	4/256K	40 x 25	B8000	8 x 8	320 x 200
5	graph.	4/256K	40 x 25	B8000	8 x 8	320 x 200
6	graph.	2/256K	80 x 25	B8000	8 x 8	640 x 200
7	text	4	80 x 25	B0000	9 x 14	720 x 350
7+	text	4	80 x 25	B0000	9 x 16	720 x 400
D	graph.	16/256K	40 x 25	A0000	8 x 8	320 x 200
E	graph.	16/256K	80 x 25	A0000	8 x 8	640 x 200
F*	graph.	4	80 x 25	A0000	8 x 14	640 x 350
10*	graph.	16/256K	80 x 25	A0000	8 x 14	640 x 350
11	graph.	2/256K	80 x 30	A0000	8 x 16	640 x 480
12	graph.	16/256K	80 x 30	A0000	8 x 16	640 x 480
53	text	16/256K	80 x 60	B8000	8 x 8	640 x 480
61	graph.	16/256K	80 x 25	A0000	8 x 16	640 x 400
62	graph.	16/256K	80 x 28	A0000	8 x 16	640 x 450
70	graph.	256/256K	45 x 30	A0000	8 x 16	360 x 480
74**	graph.	256/256K	45 x 30	A0000	8 x 16	360 x 480
HGC	graph.	2	40 x 30	A0000	8 x 8	320 x 240

Table Notes:

* = EGA state. + = VGA state. ** = for multi-frequency monitors only.

1.2.3 LCD Display

- FSTN type monochrome, B/W VGA LCD
640 x 480 resolution, 25 lines x 80 characters, 64 gray scales
Brightness/Contrast controls
CCFT backlighting
- Dimensions (effective viewing area)
Height: 147.6 mm
Width: 196 mm
Diagonal: 245 mm
- Non-glare glass face has a near 180 degree adjustable tilt
- Reverse video feature via keyboard
- Power saving feature
Screen automatically blanks out after a set period of time of non-operation

1.2.4 Power Supply System

AC Adapter

- Portable, brick-shaped power supply with a separate AC power cord
- Full-range operating between 90Vrms and 264Vrms
- Frequency 47—63Hz
- Output 16V, 1.9A, with overcurrent and overcharging protection
- AC input current:
0.6A (RMS) Max. for 100V
0.3A (RMS) Max. for 230V
- Charge current:
Fast-charge 1.7A
Trickle charge 170mA

DC\AC Inverter Board

The DC\AC inverter converts the DC to AC for the CCFT backlight in the LCD panel.

DC\DC Converter Board

The DC\DC converter supplies the 5V DC power to the system and protects the computer from over current and power surges.

Battery Pack

The battery pack is composed of eight C-size NiCad battery cells (nominal capacity 1700mAh, 9.6V per pack).

When the AC adapter is connected to the notebook, it automatically charges the battery pack. Required charging time is approximately 1 hour. If the AC power fails, the battery pack will supply power for the system automatically without interrupting the system. If the battery power is low, the Power-ON Indicator blinks and the system beeps until it runs out of power.

AC Adapter Power Conditions

Power supply	30.4 Watts
Operating temperature	0°C to 40°C
Storage temperature	-10°C to 70°C
Operating humidity	5% to 95%, non-condensed
Storage humidity	5% to 100%, non-condensed
Operating altitude	3000 meters
Storage altitude	9000 meters
Weight	250g
Size	105mm x 65 mm x 33 mm

2 System View and Disassembly

2.1 System View

2.1.1 Front and Left-Side Views

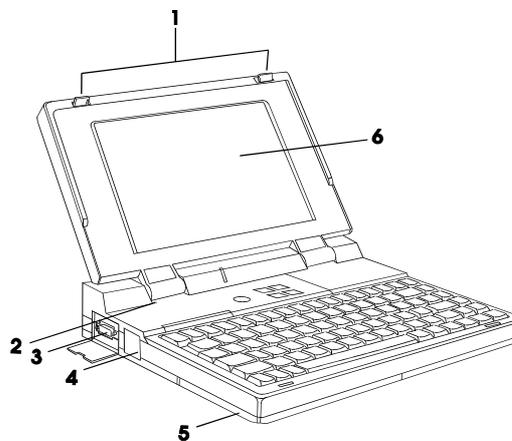


Figure 2-1. Computer Front and Left-Side Views

1. **Cover Latches**
2. **Cover Switch** (Closing the computer cover automatically switches off the power to the LCD backlight.)
3. **Video Connector**
4. **Fax/Modem Cover** (An internal fax/modem module can be installed into the internal serial port behind this cover.)
5. **Battery Pack**
6. **LCD Screen**

2.1.2 Rear and Right-Side Views

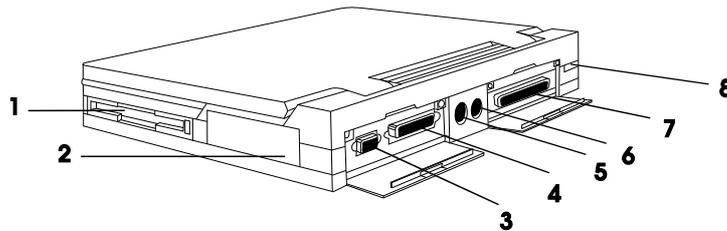


Figure 2-2. Computer Rear and Right-Side Views

1. **3.5-inch Floppy Disk Drive**
2. **HDD Cover** (The hard disk drive is installed behind this cover.)
3. **Serial Port**
4. **Parallel Port**
5. **Keyboard/Mouse Port** (Mini DIN-6)
6. **Power Connector**
7. **Expansion Connector** (This 110-pin connector is for the optional Expansion Chassis.)
8. **Security Connector** (Used for physically locking your computer to help prevent theft.)

2.2 System Disassembly

2.2.1 Preparation

Tools Required

The following tools are needed for the disassembly/assembly work on the notebook computer:

- Philips screwdriver (small)
- Philips screwdriver (medium-sized)
- Awl, pocketknife, or other sharp pointed instrument
- Hexnut screwdriver
- Extraction tool

Precautions

Before system disassembly, turn OFF power and disconnect the AC adapter and all other cables from the computer.

Integrated circuits in the computer are sensitive to static electricity. To avoid damaging chips caused by electrostatic discharge, observe the following precautions:

- Do not remove a board or chip from its anti static packaging until you are ready to install it.
- Before handling a board or chip, touch an unpainted metal surface for a few seconds to discharge any static electricity from your body.
- Wear a wrist grounding strap, available from most electronic stores, when handling boards and chips.

Assembly Overview

The notebook computer consists of three major assembly sections: the keyboard section, the LCD/cover section, and the chassis section.

The next subsections will discuss at length each major part for disassembly/reassembly and show corresponding illustrations. The parts include:

- Battery pack
- Keyboard
- Fax/modem module
- Memory module
- Numeric coprocessor
- Hard disk
- Floppy disk drive
- LCD/cover section
- DC/AC board
- DC/DC board
- System board
- LCD

You can also find details such as exploded views and parts lists in Chapter 5.

2.2.2 Battery Pack

Disassembly

1. Place the computer upside down. The battery pack is located in the corner.
2. Release the battery pack release catch by sliding it outward (Figure 2-3 Arrow A). While holding the catch in the released position, pull the battery pack forward and lift it up (Figure 2-3 Arrow B).

Reassembly

1. Align the outer edge of the battery pack with the border of the compartment, and put the battery pack flat on the compartment surface.
2. Push the battery pack inward until the release catch is locked.

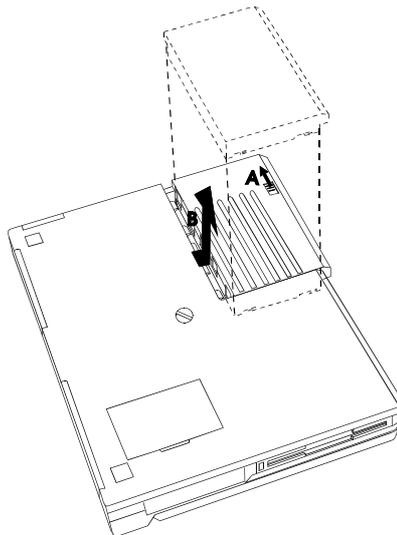


Figure 2-3. Battery Pack Disassembly/Reassembly

2.2.3 Keyboard Section

Disassembly

1. Place the computer upside down.
2. Remove the coin-screw (Figure 2-4 #1) with a flat screwdriver or small coin.
3. Remove the battery pack. (See Section 2.2.2 Disassembly.)
4. Remove the two screws (Figure 2-4 #2) from the battery pack compartment.
5. Place the computer back to its upright position. Open the LCD/cover.
6. Slide the keyboard forward approximately 2mm to release the retaining catches. Slowly lift up the loosened keyboard, starting from its front to its rear.
7. Unplug the two keyboard cables (Figure 2-4 #3). To do so:
 - a. Using your fingers, pry the connector lock upward on one side and then the other side. The connector lock should come released.
 - b. Carefully pull the cable out of the connector.

Reassembly

1. Reconnect the two keyboard cables (Figure 2-4 #3). To do so:
 - a. Make sure the connector lock is released.
 - b. Firmly plug the cable end into the connector.
 - c. Secure the connection by pushing down the connector lock.
2. Align and fix the keyboard back onto the chassis.
3. Close the LCD/cover and place the computer upside down.
4. Replace the two screws (Figure 2-4 #2) and one coin-screw (Figure 2-4 #1).
5. Replace the battery pack. (See Section 2.2.2 Reassembly.)

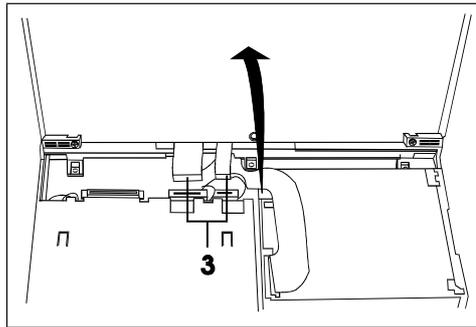
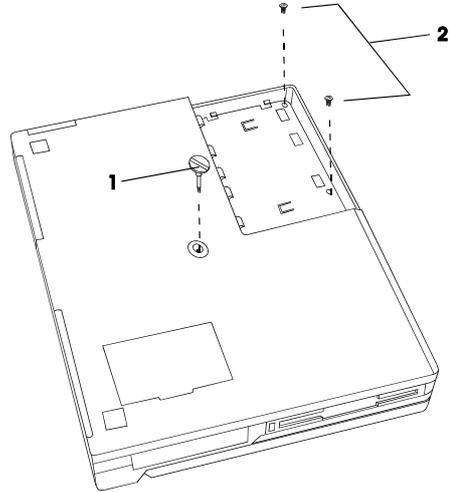


Figure 2-4. Keyboard Disassembly/Reassembly

2.2.4 Fax/Modem Module

Disassembly

1. Open the LCD/Cover.
2. Remove the controls-and-indicators panel (Figure 2-5 #1) by levering it up (Figure 2-5 Arrow A).
3. Remove the screw (Figure 2-5 #2) securing the fax/modem module to the chassis.
4. Unplug the fax/modem module from the system board.
5. Remove the fax/modem cover (Figure 2-5 #3) by pulling it straight up.

2.2.5 Reassembly

1. Replace the fax/modem cover (Figure 2-5 #3).
2. Firmly plug the module's connector into place and secure with the screw (Figure 2-5 #2).
3. Replace the controls-and-indicators panel (Figure 2-5 #1).

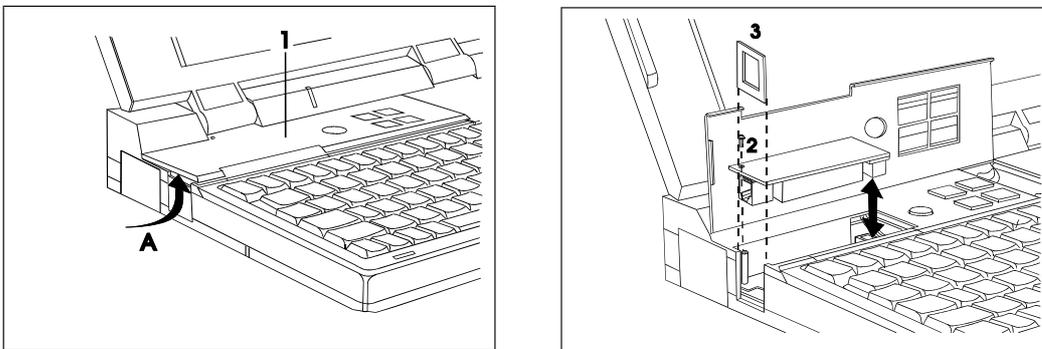


Figure 2-5. FAX/Modem Module Disassembly/Reassembly

2.2.6 Memory Module

Disassembly

1. Loosen the keyboard without unplugging the keyboard cables from the system board. (See Section 2.2.3 Disassembly steps 1 to 6.)
2. Remove the screw (Figure 2-6 #1) securing the memory module to the system board.
3. Unplug the memory module from the system board.

Reassembly

1. Firmly plug the memory module's connector into place and secure with the screw (Figure 2-6 #1).
3. Replace the keyboard. (See Section 2.2.3 Reassembly.)

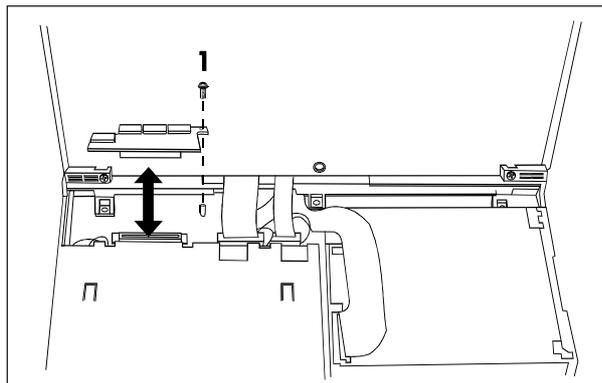


Figure 2-6. Memory Module Disassembly/Reassembly

2.2.7 Numeric Coprocessor

Disassembly

1. Place the computer upside down.
2. Remove the coprocessor protection cover (Figure 2-7 #1) by inserting a flat screwdriver into the groove along the side and levering it up.
3. With an extraction tool, carefully pull the coprocessor (Figure 2-7 #2) out of its socket.

Reassembly

1. Orientate the coprocessor (Figure 2-7 #2) so that the beveled corner aligns with the beveled corner on the socket.
2. Carefully press the coprocessor down into the socket until all the pins sit firmly in position.
3. Replace the protection cover (Figure 2-7 #1).

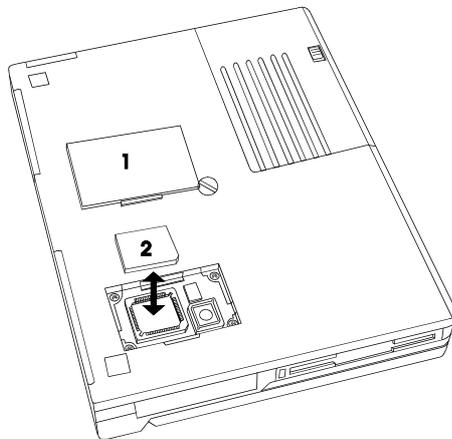


Figure 2-7. Numeric Coprocessor Disassembly/Reassembly

2.2.8 Hard Disk

Disassembly

1. Open the LCD/Cover. Remove the controls-and-indicators panel. (See Section 2.2.4 Disassembly Step 2.)
2. The hard disk data connector is located to the right of the contrast control buttons. With an extraction tool, carefully unplug the hard disk data cable from the system board.
3. Close the LCD/cover and place the computer upside down.
4. Remove the coprocessor protection cover (Figure 2-8 #1) by inserting a flat screwdriver into the groove along the side and levering it up.
5. Remove the four screws (Figure 2-8 #2) securing the hard disk to the chassis
6. Remove the HDD cover (Figure 2-8 #3) by levering it out.
7. Carefully pull the hard disk out of the chassis through the opening where the HDD cover was.

Reassembly

1. Slide the hard disk into place through the opening on the side panel.
2. Secure the hard disk with four bottom screws (Figure 2-8 #2).
3. Replace the coprocessor protection cover (Figure 2-8 #1).
4. Replace the HDD cover (Figure 2-8 #3).
5. Turn the computer back to its upright position. Open the LCD/cover.
6. Reconnect the hard disk data cable.
7. Replace the controls-and-indicator panel.

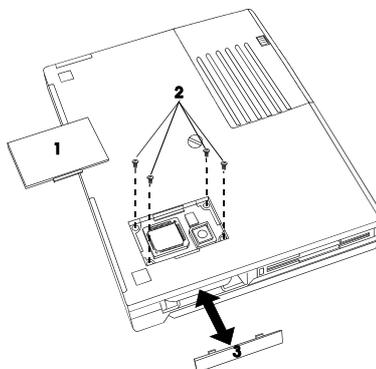


Figure 2-8. Hard Disk Disassembly/Reassembly

2.2.9 Floppy Disk Drive

Disassembly

1. Remove the keyboard. (See Section 2.2.3 Disassembly.)
2. Loosen the LCD/Cover section without detaching the cables from the system board. (See Section 2.2.9 Disassembly steps 1 to 3.)
3. Unplug the floppy disk drive cable (Figure 2-9 #1) from the connector on the system board.
4. Remove the four retaining screws (Figure 2-9 #2) and lift the floppy disk drive free.

Reassembly

1. Align and fix the floppy disk drive back onto the chassis and secure with the four retaining screws (Figure 2-9 #2).
2. Reconnect the floppy disk drive cable (Figure 2-9 #1).
3. Replace the LCD/cover section. (See Section 2.2.9 Reassembly.)
4. Replace the keyboard. (See Section 2.2.3 Reassembly.)

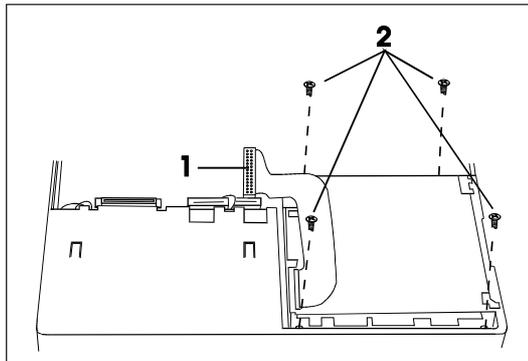


Figure 2-9. Floppy Disk Drive Disassembly/Reassembly

2.2.10 LCD/Cover Section

Disassembly

1. Remove the keyboard. (See Section 2.2.3 Disassembly.)
2. Remove the two screws (Figure 2-10 #1) from the LCD/cover feet.
3. Remove the controls-and-indicators panel. (See Section 2.2.4 Disassembly Step 2.)
4. Remove the fax/modem module, if installed. (See Section 2.2.4 Disassembly.)
5. Remove the standoff (Figure 2-10 #2) with a nexnut screwdriver.
6. Remove the four screws from the rear panel (Figure 2-10 #3).
7. To completely separate the LCD/cover from the chassis, carefully unplug all the cables connecting the LCD/cover section to the system board. (The connectors are labeled J509, J508, J510, and J504 on the system board.)

Reassembly

1. Reconnect the cables to J504, J508, J509, and J510 on the system board.
2. Align and fix the LCD/cover section to the chassis.
3. Replace the standoff (Figure 2-10 #2), fax/modem module (if installed), and controls-and-indicator panel.
3. Replace the two screws (Figure 2-10 #1) at the LCD/cover feet and four screws (Figure 2-10 #3) on the rear panel.
4. Replace the keyboard. (See Section 2.2.3 Reassembly.)

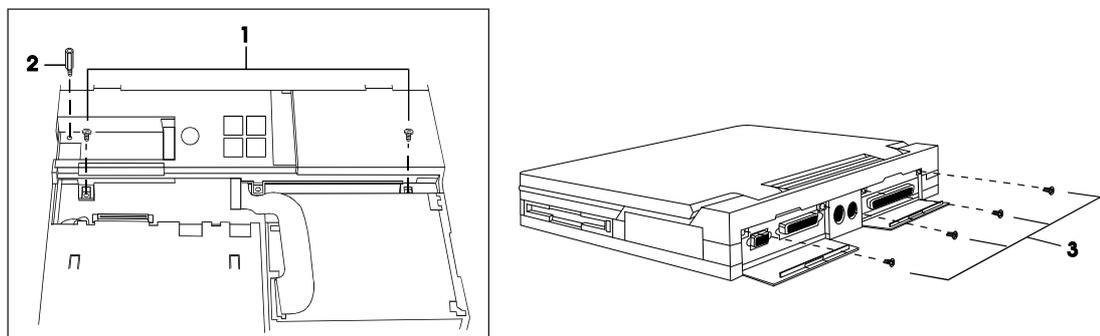


Figure 2-10. LCD/Cover Disassembly/Reassembly

2.2.11

DC/AC Board

Disassembly

1. Remove the LCD/cover. (See Section 2.2.9 Disassembly.) The DC/AC board is located at the bottom of the LCD/cover section.
2. Remove the two screws (Figure 2-11 #1) securing the DC/AC board to the LCD/cover.
3. Unplug the two cables from the DC/AC board.

Reassembly

1. Reconnect the two cables to the DC/AC board.
2. Secure the DC/AC board to the LCD/cover section with two screws (Figure 2-11 #1).
3. Replace the LCD/cover. (See Section 2.2.9 Reassembly.)

Figure 2-11. DC/AC Board Disassembly/Reassembly

2.2.12 DC/DC Board

Disassembly

1. Remove the LCD/cover section. (See Section 2.2.9 Disassembly.) The DC/DC board is stacked on the system board.
2. Remove the two screws (Figure 2-12 #1) securing the DC/DC board to the system board.
3. Unplug the DC/DC board from the system board.

Reassembly

1. Plug the DC/DC board's connector into place and secure with two screws (Figure 2-12 #1).
3. Replace the LCD/cover section. (See Section 2.2.9 Reassembly.)

Figure 2-12. DC/DC Board Disassembly/Reassembly

2.2.13 System Board

Disassembly

1. Remove the keyboard. (See Section 2.2.3 Disassembly.)
2. Remove the LCD/cover. (See Section 2.2.9 Disassembly.)
3. Remove the hard disk drive. (See Section 2.2.7 Disassembly.)
4. Remove the floppy disk drive. (See Section 2.2.8 Disassembly.)
5. Remove the two screws (Figure 2-13 #1) from the system board. Pull out the securing connector (Figure 2-13 #2) to access one of the screws.
6. Remove the metal coverplate (Figure 2-13 #3).
7. Lift the system board free.

Reassembly

1. Align the system board with the chassis.
2. Replace the metal coverplate (Figure 2-13 #3).
3. Secure the system board to the chassis with two screws (Figure 2-13 #2).
4. Replace the floppy disk drive. (See Section 2.2.8 Reassembly.)
5. Replace the hard disk drive. (See Section 2.2.7 Reassembly.)
6. Replace the LCD/cover. (See Section 2.2.9 Reassembly.)
7. Replace the keyboard. (See Section 2.2.3 Reassembly.)

Figure 2-13. System Board Disassembly/Reassembly

2.2.14 LCD

Disassembly

1. Remove the LCD/cover section. (See Section 2.2.9 Disassembly.)
2. Remove the DC/AC board. (See Section 2.2.10 Disassembly.)
3. Remove the two rubber cushions (Figure 2-14 #1) and the two screws inside (Figure 2-14 #2).
4. Remove the two screw covers (Figure 2-14 #3) and the two screws inside (Figure 2-14 #4).
5. Detach the LCD frame.
6. Move the rubber bushing (Figure 2-14 #5) away from the opening.
7. Carefully pull out the two cables (Figure 2-14 #6) through the openings.
8. Remove the four screws (Figure 2-14 #7) securing the LCD to the housing cover and lift the LCD free.

Reassembly

1. Align the LCD with the housing cover and secure with four screws (Figure 2-14 #7).
2. Insert the two cables (Figure 2-14 #6) through the openings for reconnection.
3. Move the rubber bushing (Figure 2-14 #5) back to its position, i.e. as a plug at the opening.
CAUTION: If the rubber bushing is not plugged at the opening, the cables may be damaged when you replace the LCD frame.
4. Align and fix the LCD frame into place. Be careful that the cables do not get in the way.
5. Replace the two screws (Figure 2-14 #4) and screw covers (Figure 2-14 #3).
6. Replace the two screws (Figure 2-14 #2) and rubber cushions (Figure 2-14 #1).
7. Replace the DC/AC board. (See Section 2.2.10 Reassembly.)
8. Replace the LCD/cover section. (See Section 2.2.9 Reassembly.)

Figure 2-14. LCD Disassembly/Reassembly

3 Connector Input/Output Definition

3.1 System Board Connector Definitions

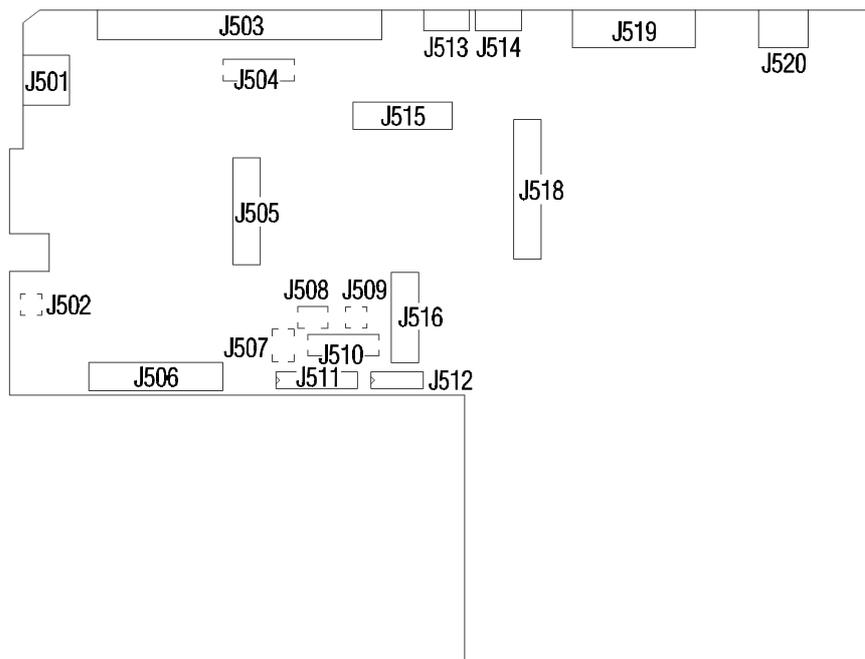
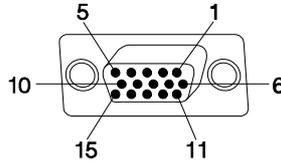


Figure 3-1. System Board Connector Positions

Connector	Definition	Connector	Definition
J501	VGA connector	J510	Button board connector
J502	Speaker connector	J511, 512	Internal connector
J503	Expansion connector	J513	AC adapter connector
J504	LCD connector	J514	PS/2 keyboard/mouse connector
J505	Fax/modem connector	J515	DC/DC connector
J506	Expansion memory connector	J516	Floppy disk drive connector
J507	Battery connector	J518	Hard disk connector
J508	DC/AC connector	J519	PIO connector
J509	Cover switch connector	J520	SIO 1 connector

3-2 Connector Input/Output Definition

3.1.1 Analog Video Port (J501)



Pin	Signal	Description	Pin	Signal	Description
1	Red	Red video	9	NC	Reserved
2	Green	Green video	10	GND	Sync. Ground
3	Blue	Blue video	11	MS(0)	Reserved
4	MS(2)	Reserved	12	MS(1)	Reserved
5	GND	Sync. Ground	13	BHSYNC	Horizontal Sync. output
6	GND	Red Ground	14	BVSYNC	Vertical Sync. output
7	GND	Green Ground	15	NC	Reserved
8	GND	Blue Ground			

3.1.2 Speaker Connector (J502)

Pin	Signal	Description
1		
2		

3.1.3 Expansion Connector (J503)

Pin	Signal	Description
-----	--------	-------------

3-4 Connector Input/Output Definition

3.1.4 LCD Connector (J504)

Pin	Signal	Pin	Signal
1	BLFS	8	UD0
2	BCLK	9	UD1
3	VDCLK	10	UD2
4	ON/OFF	11	UD3
5	LCD5V	12	LD0
6	GND	13	LD1
7	-VEE	14	LD2
		15	LD3

Note: See Section 6.3.2 for descriptions.

3.1.5 Fax/Modem Connector (J505)

Pin	Signal	Description
1 - 8, 10, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31 - 37, 39, 40	NC	Reserved
9	GND	Ground
12, 30	+5V	
14	COMBRTS	Request to Send
16	COMBD CD	Carrier Detect
18	COMBCTS	Clear to Send
20	COMBRXD	Receive Data
22	COMBDTR	Data Terminal Ready
24	COMBRI	Ring Indicator
26	COMBTXD	Transmit Data
28	COMBDSR	Data Set Ready
38	CARDEN/	Card Enable Signal

3.1.6 Expansion Memory Connector (J506)

Pin	Signal	Description
1, 2	VCC	Power supply to memory module
3	CAS1L/	CAS control signal for low byte of bank 1 in memory module
4	CAS2L/	CAS control signal for low byte of bank 2 in memory module
5	CAS1H/	CAS control signal for high byte of bank 1 in memory module
6	CAS2H/	CAS control signal for high byte of bank 2 in memory module
7	RAS1/RAS	control signal for bank 1 in memory module
8	RAS2/RAS	control signal for bank 2 in memory module
9, 10, 17, 26, 29, 30 - 34, 37, 43, 52	GND	
11	EA0	Address for memory bus
12	EA1	Address for memory bus
13	EA3	Address for memory bus
14	EA5	Address for memory bus
15	EA7	Address for memory bus
16	EA9	Address for memory bus
18	MD0	Data for memory bus
19	MD2	Data for memory bus
20	MD4	Data for memory bus
21	MD6	Data for memory bus
22	MD8	Data for memory bus
23	MD10	Data for memory bus
24	MD12	Data for memory bus
25	MD14	Data for memory bus
27, 28	VCC	Power supply to memory module
35, 36	WE/	Write enable
38	EA2	Address for memory bus
39	EA4	Address for memory bus
40	EA6	Address for memory bus
41	EA8	Address for memory bus
42	EA10	Address for memory bus
44	MD1	Data for memory bus
45	MD3	Data for memory bus

(To be continued)

3-6 Connector Input/Output Definition

(Continued)

Pin	Signal	Description
46	MD5	Data for memory bus
47	MD7	Data for memory bus
48	MD9	Data for memory bus
49	MD11	Data for memory bus
50	MD13	Data for memory bus
51	MD15	Data for memory bus

3.1.7 Battery Connector (J507)

Pin	Signal	Description
1, 2	BAT+	Positive battery voltage
3, 4	NC	Reserved
5, 6	BAT-	Negative battery voltage

3.1.8 DC/AC Converter (J508)

Pin	Signal	Description
1, 4	GND	Ground
2	ADINP	Power supply for inverter
3	Backlit_ON	Backlight ON/OFF signal
5	Backlight/Adjust	Voltage adjust output control the brightness

3.1.9 Cover Switch Connector (J509)

Pin	Signal
1	COVER_OPEN
2	GND

3.1.10 Button Board Connector (J510)

Pin	Signal	Pin	Signal
1, 2	ADINP	9	PR_BTN
3	GND	10	BACKUP
4	VDD	11	GND
5	-VEE	12	VDDRESET
6	GND	13	BACKCLK
7	FPVEE	14	GND
8	BACKDOWN	15	+5V

3.1.11 Internal Connector (J511, J512)

Keyboard Matrix 1 (J511)

Pin	Signal	Description	Pin	Signal
1	SCAN0	Scan line of keyboard matrix	9	SCAN8
2	SCAN1		10	SCAN9
3	SCAN2		11	SCAN10
4	SCAN3		12	SCAN11
5	SCAN4		13	SCAN12
6	SCAN5		14	SCAN13
7	SCAN6		15	NC
8	SCAN7		16	NC

Keyboard Matrix 2 (J512)

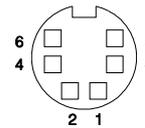
Pin	Signal	Description	Pin	Signal
1	KBMT0	Output line of keyboard matrix	5	KBMT4
2	KBMT1		6	KBMT5
3	KBMT2		7	KBMT6
4	KBMT3		8	KBMT7

3.1.12 AC Adapter Connector (J513)

Pin	Signal	Description
1, 2, 3	ADINPGND	
4, 5, 6	ADINP	Output voltage of AC adapter
7	AC_EXIST	Signal AC adapter plugged in
8	QCHARGE	Signal AC adapter into fast-charge mode

3.1.13 Auxiliary Device Port (J514)

Pin	Signal	Description
1	KBCLK	Clock to synchronous KBDATA or Mouse Data
2	NC	Reserved
3	GND	Ground
4	+5V DC	Power supply to AUX device
5	KBDATA	Serial data to and from AUX device
6	NC	Reserved

**3.1.14 DC/DC Connector (J515)**

Pin	Signal	Description
1, 2, 3	ADINP	Output voltage of AC adapter
4, 5, 6	ADGND	Ground
7, 8, 9	BAT+	Positive battery voltage
10, 11, 12	BAT-	Negative battery voltage
13, 15, 17, 19	GND	Ground
14, 23	NC	Reserved
16, 18, 20	+5V	5V power supply
21	MAINON	Signal to turn on power supply
22	AC_EXIST	Signal AC adapter plugged in
24	CHRGING	Signal to charge battery

3.1.15 Floppy Disk Drive Connector (J516)

Pin	Signal	Pin	Signal
1	DRV+5V DC	15	GND
2	INDEX/	16	WRDATA/
3	DRV+5V DC	17	GND
4	DK0/	18	WGATE/
5	DRV+5V DC	19	GND
6	DR1/	20	ITRK0/
7	NC	21	GND
8	DSKCHG	22	IWRTPRT
9	NC	23	GND
10	WTRO/	24	IRDATA/
11	NC	25	GND
12	DIR	26	DSEL
13	NC	27	NC
14	STEP/	28	NC

Note: See Section 6.1.2 for descriptions.

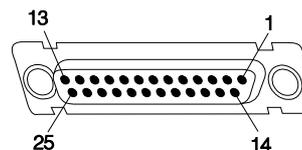
3.1.16 Hard Disk Connector (J518)

Pin	Signal	Pin	Signal
1	RESET/	23	IOW/
2	GND	24	GND
3	SD7	25	IOR/
4	SD8	26	GND
5	SD6	27	NC
6	SD9	28	ALE
7	SD5	29	NC
8	SD10	30	GND
9	SD4	31	IRQ14
10	SD11	32	IOCS16/
11	SD3	33	SA1
12	SD12	34	N
13	SD2	35	SA0
14	SD13	36	SA2
15	SD1	37	CS0/
16	SD14	38	CS1/
17	SD0	39	HDDLED
18	SD15	40	GND
19	GND	42	DRV+5V DC
21	NC	43	GND
22	GND	44	+5V DC

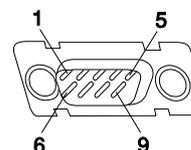
Note: See Section 6.2.2 for descriptions.

3.1.17 Parallel Port (J519)

Pin	Signal	Description
1	Strobe	Indicates data at the parallel port is valid
2	Data bit 0	Parallel port data
3	Data bit 1	Parallel port data
4	Data bit 2	Parallel port data
5	Data bit 3	Parallel port data
6	Data bit 4	Parallel port data
7	Data bit 5	Parallel port data
8	Data bit 6	Parallel port data
9	Data bit 7	Parallel port data
10	ACK	Indicates printer has received data
11	Busy	Indicates printer cannot accept another character
12	PE	Indicates when printer is out of paper
13	SLCT	Indicates when printer is selected
14	Auto feed XT	Signals the printer to automatically feed line after printing a line
15	Error	Indicated when printer has detected an error
16	INIT	Initializes the printer
17	SLCT In	Selects the printer
18 - 25	GND	

**3.1.18 Serial Port (J520)**

Pin	Signal	Description
1	CD	Carrier Detect
2	RXD	Receive Data
3	TXD	Transmit Data
4	DTR	Data Terminal Ready
5	GND	Signal Ground
6	DSR	Data Set Ready
7	RTS	Request To Send
8	CTS	Clear To Send
9	RI	Ring Indicator



4 Troubleshooting

4.1 Introduction

When computer power is first turned on, the system BIOS runs a series of internal checks on the hardware. This Power-On Self Test (POST) allows the computer to detect problems as early as the power-on stage. Error messages and system beeps of POST can alert you to the problems of your computer.

If an error is detected during these tests, you will either hear system beep(s) or see an error message displayed on the screen. If the error occurs before the display is initialized, the system beeps to report error.

If error is fatal (non-correctable), the system halts after reporting the fatal error. If error is non-fatal (correctable), the process continues after reporting the non-fatal error.

4.2 Error Messages

Within POST, there are two kinds of messages:

- Error messages—failure in hardware, software, or firmware
- Informational messages—require no action

Message	Possible Cause	Solution
Memory failed at physical address: <i>xx</i>	Circuitry associated with the memory chips has failed.	Turn the power off, then back on again. If the problem persists, replace with a new system board.
No boot device available	Both drive A and drive C are not formatted as bootable.	Replace the diskette with a bootable diskette or format drive C as bootable. If the problem persists, replace the diskette or the hard disk.

(To be continued)

4-2 Troubleshooting

(Continued)

Message	Possible Cause	Solution
Fixed disk 0 failure	Incorrect configuration of fixed disk (hard disk).	Run SETUP to enter the correct hard disk information.
	Bad hard disk.	Reboot. If this does not work, replace the hard disk.
	Hard disk cable is not tightly connected.	Check the hard disk cable for proper connection. If this does not work, replace the hard disk.
Fixed disk controller failure	The NS87310 controller has failed.	Replace the system board.
	Hard disk type incorrect.	Run SETUP to configure correct hard disk type.
Real time clock failure	The RTC failed.	Replace with a new system board.
	RTC does not update the time.	Replace RTC.
Keyboard controller failure	Keyboard controller failed.	Replace with a new keyboard controller.
Keyboard failure	Keyboard controller socket floating.	Resolder the socket.
	Keyboard encoder failed (bad).	Replace with a new keyboard encoder.
No timer tick interrupt	HT22 failed.	
Shutdown failure	CPU reset failed.	
Timer 2 failure	360SL failed.	
Keyboard clockline/dataline failure	Interface between KBDC and KBD encoder failed.	
Keyboard stuck key failure	Key pressed during power on.	Do not press any key during power-on.
Decreasing available memory	Memory failed.	Replace memory SIMM.
Invalid configuration information - run SETUP program	Current system configuration does not match with SETUP configured.	Run SETUP.
Diskette drive 0 failure	Cannot seek to track 0.	Run SETUP to configure correct diskette drive type.
Pointer device failure	PS/2 mouse failed or external keyboard key pressed during power-on.	Change PS/2 mouse or do not press external keyboard during power-on.

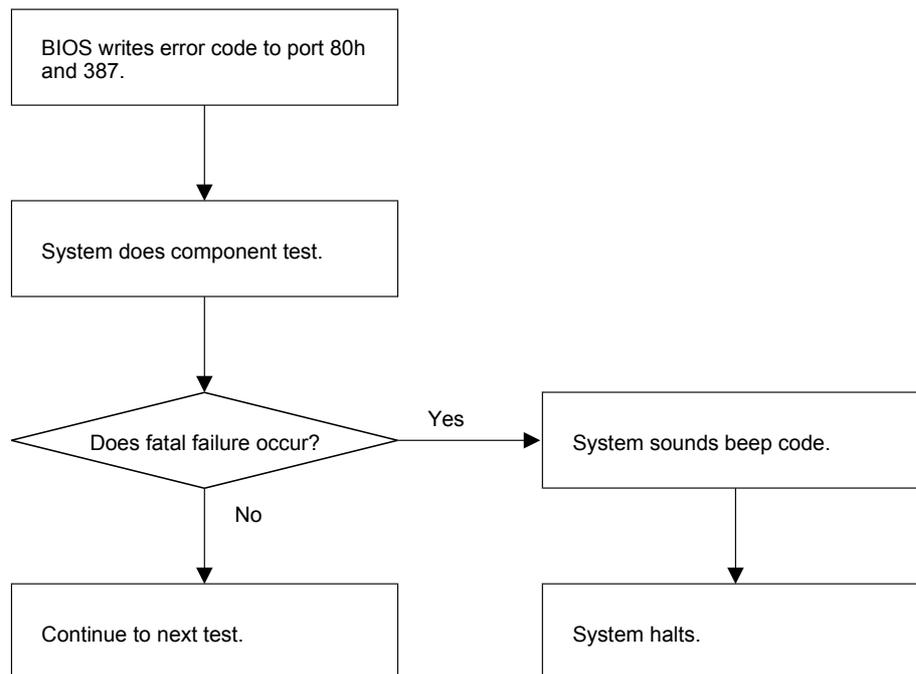
4.3 Beep Codes

In some cases, POST errors cannot be reported on the screen. When an error occurs before the screen is initialized or when the system is set to loop on the system board tests, then the screen cannot display the error message. Beep codes are used to identify a POST error that occurs when the screen is not available.

For example, a beep code of 1-3 (a single beep and a burst of three beeps) indicates failure of video memory testing. The value for the diagnostic port (port 80h) is written at the beginning of the test. Therefore, if the test failed, the user can determine where the problem occurred by reading the last value written to port 80h.

The diagram below shows the process performed by the system if an error occurs and the screen is unavailable.

The following table lists the system board and VGA board errors. Note that no beep code is sounded if a test is aborted while in progress. The contents of port 80h can be



4-4 Troubleshooting

read to identify the area of failure.

Beep Code	Contents of Port 80h	Description
None	01h	80286 register test failure
1-1-3	02h	CMOS write/read test failure
1-1-4	03h	BIOS ROM checksum failure
1-2-1	04h	Programmable Interval Timer test failure
1-2-2	05h	DMA initialization failure
1-2-3	06h	DMA page register write/read test failure
1-3-1	08h	RAM refresh verification failure
None	09h	1st 64K RAM test failure
1-3-3	0Ah	1st 64K RAM chip or data line failure
1-3-4	0Bh	1st 64K RAM odd/even logic failure
1-4-1	0Ch	1st 64K RAM address line failure
1-4-2	0Dh	1st 64K RAM parity test failure
1-4-3	0Eh	fail-safe timer test failure
1-4-4	0Fh	software NMI port test failure
2-1-1	10h	1st 64K RAM chip or data line failure
3-1-1	20h	slave DMA register test failure
3-1-2	21h	master DMA register test failure
3-1-3	22h	master interrupt mask register test failure
3-1-4	23h	slave interrupt mask register test failure
None	25h	interrupt vector loading failure
3-2-4	27h	keyboard controller test failure

(To be continued)

(Continued)

Beep Code	Contents of Port 80h	Description
None	28h	CMOS power-fail and checksum checks failure
None	29h	CMOS configuration info validation failure
3-3-4	2Bh	screen memory test failure
3-4-1	2Ch	screen initialization failure
3-4-2	2Dh	screen retrace tests failure
None	2Eh	search for video ROM failure
None	30h	screen believed operable
4-2-1	34h	timer tick interrupt test failure
4-2-2	35h	shutdown test failure
4-2-3	36h	gate A20 failure
4-2-4	37h	unexpected interrupt in protected mode
4-3-1	38h	RAM test failure above address 0FFFFh
4-3-3	3Ah	Interval timer channel 2 test failure
4-3-4	3Bh	Time-of-Day clock test failure
4-4-1	3Ch	Serial port test failure
4-4-2	3Dh	Parallel port test failure
4-4-3	3Eh	Math coprocessor test failure

Note: Beep code 1-1-3 indicates single beep, single beep, and a burst of three beeps.

4.4 Fault Isolation Flowcharts

Chart A

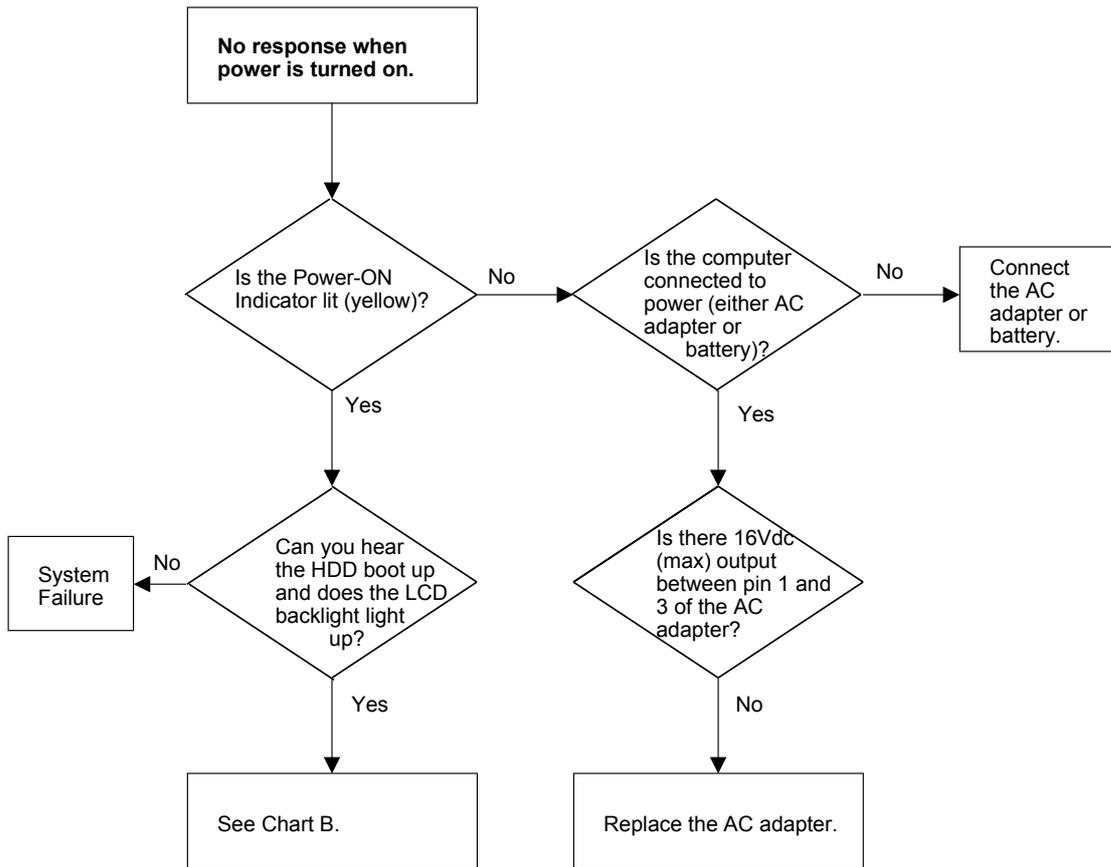


Chart B

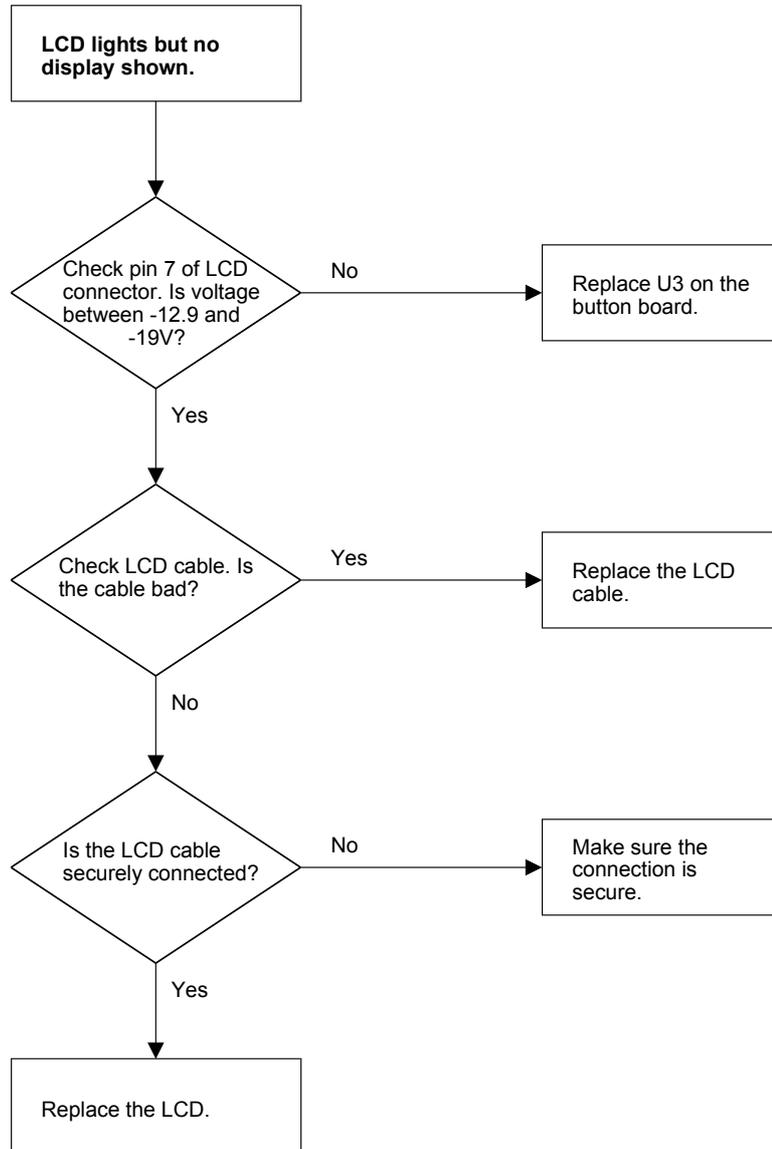


Chart C

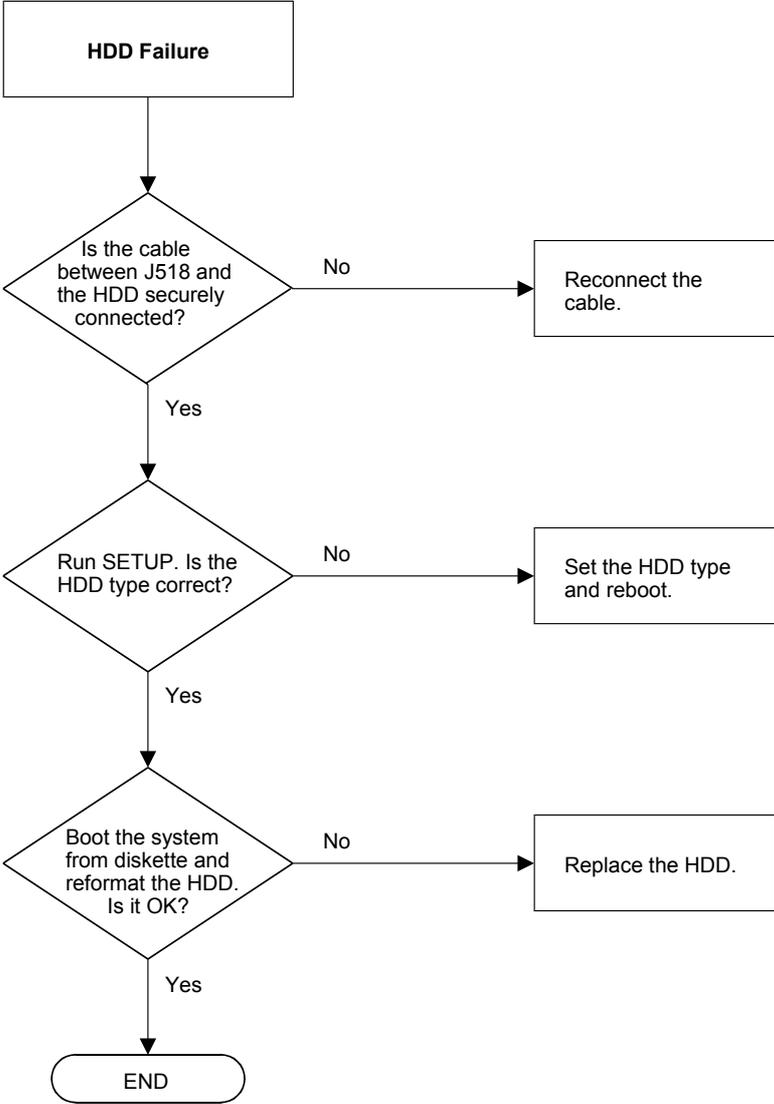


Chart D

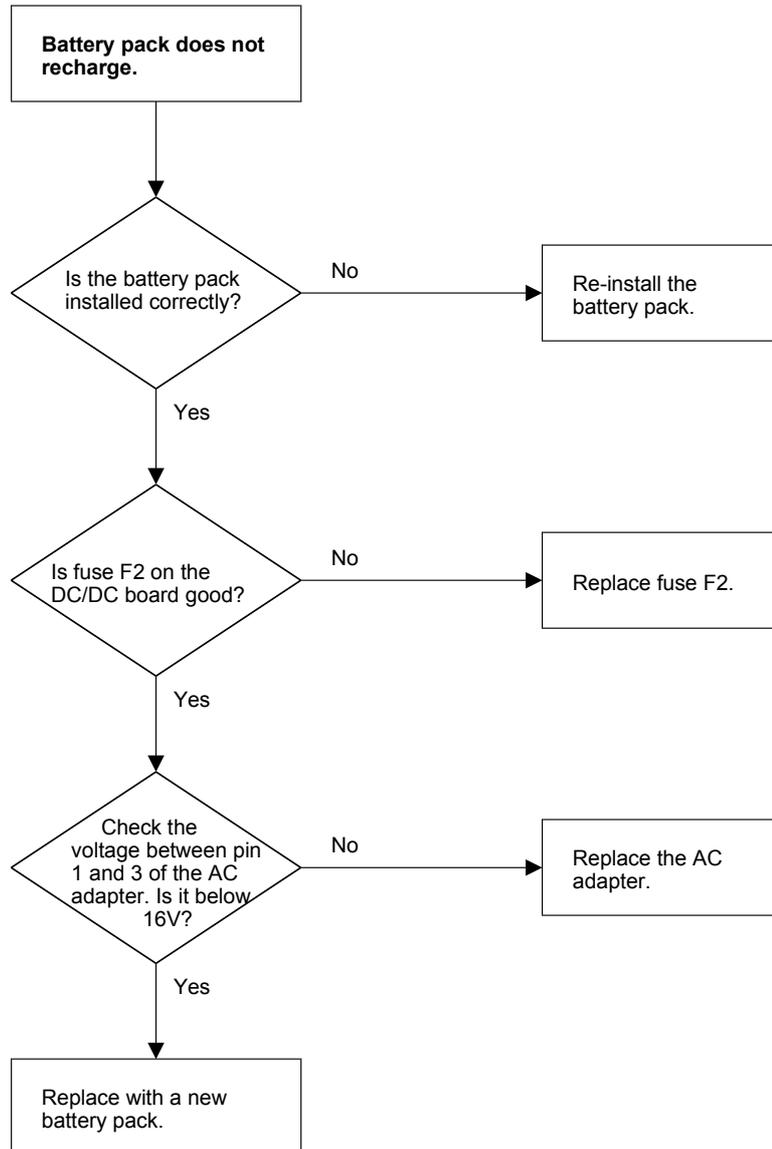


Chart E

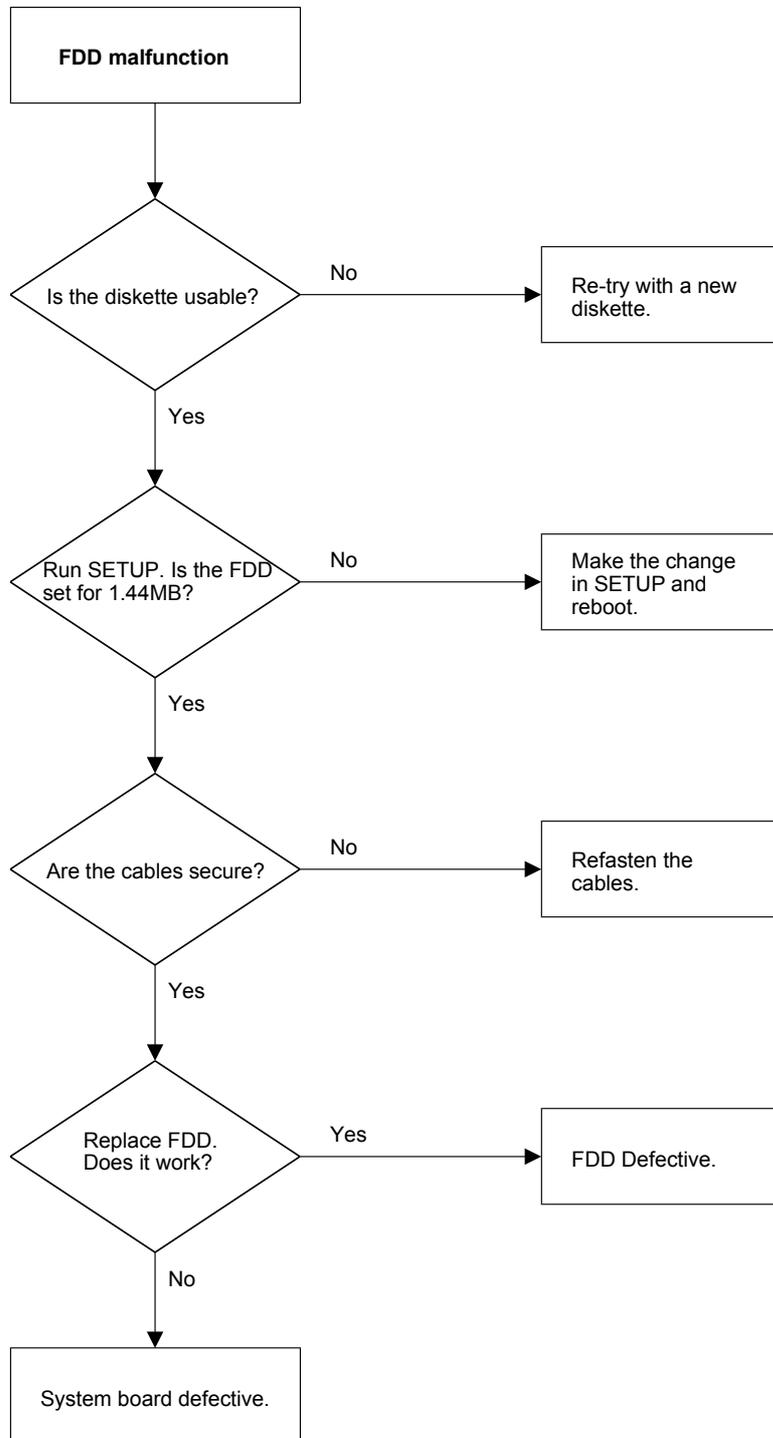
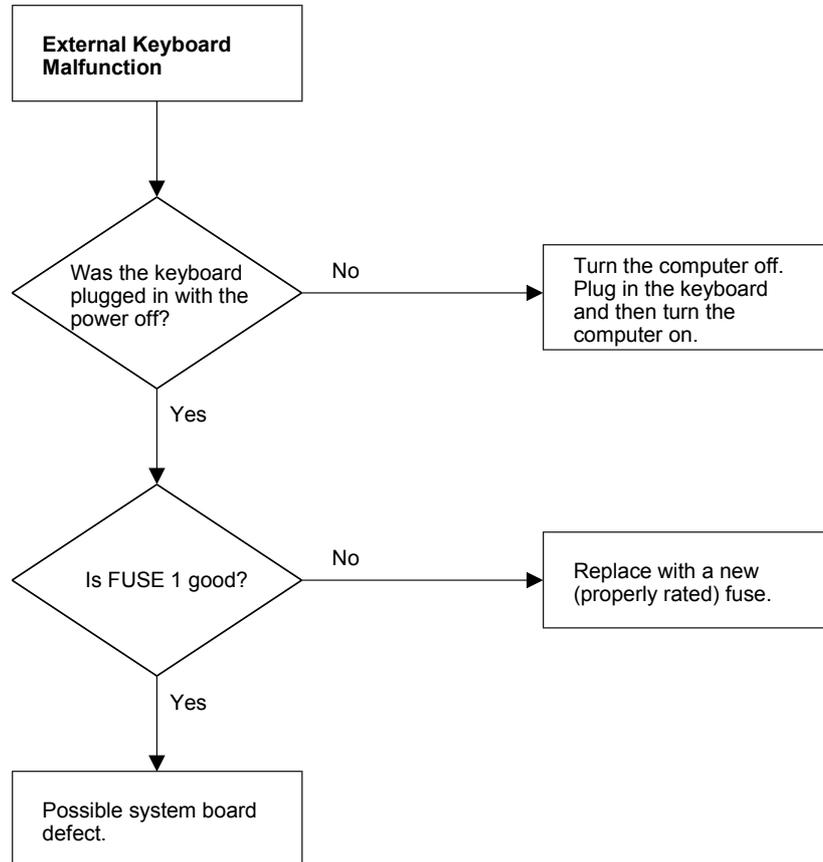


Chart F



5 Maintenance Diagrams

5.1 System Board Layout

5-2 Maintenance Diagrams

5.2 System Board Schematic Diagrams

5-4 Maintenance Diagrams

5.3 Exploded Views

6 Peripheral Devices

6.1 Floppy Disk Drive

6.1.1 Specifications

Performance

TEAC FD-05HF	Normal Density (2D)	High Density (HD)
Unformatted Capacity (KB)		
per disk	1000	2000
per surface	500	1000
per track	6.25	12.5
Formatted Capacity (KB)		
256 bytes/sector	655.36 (16)	1310.72 (32)
512 bytes/sector	737.28 (9)	1474.56 (18)
1024 bytes/sector	819.2 (5)	1638.40 (10)
Transfer Rate (K-bits/second)	250	500
Average Latency (msec)	100	100
Access Time (msec)		
track-to-track (without settling)	3	3
average (with settling)	94	94
Settling Time (msec)	15	15
Motor Start Time (sec)	0.48	0.48

Functional

TEAC FD-05HF	Normal Density (2D)	High Density (HD)
Rotational Speed (rpm)	300	300
Recording Density (BPI)	8717	17434
Track Density (TPI)	135	135
Tracks	160	160
Encoding Method	MFM	MFM

6.1.2 Pin Descriptions

Pin	I/O	Signal	Description
1	N/A	+5V DC	
2	I	Index	
3	N/A	+5V DC	
4	O	Drive Select	Drive select decoded for drive.
5	N/A	+5V DC	
6	I	Disk Change	Indicates when the disk drive door has been opened.
7	N/A	NC	Reserved
8	I	Ready	Indicates that the FDD is in ready state for read and write operation.
9	N/A	NC	Reserved
10	O	Motor On	Enables motor for drive 0.
11	N/A	NC	Reserved
12	O	Direction	Determines the direction of the head movement. (low = step in; high = step out)
13	N/A	GND	Ground
14	O	Step	Produces a pulse at a software programmable rate to move the head during a seek operation.
15	N/A	GND	Ground
16	O	Write Data	Writes precompensated serial data to be written onto the selected disk drive.
17	N/A	GND	Ground
18	O	Write Gate	Enables the write circuitry of the selected drive to prevent glitches during power up and power down.
19	N/A	GND	Ground
20	I	Track 00	Tells the controller that the head is at track zero of the selected drive.
21	N/A	GND	Ground
22	I	Write Protect	Indicates the disk is write-protected.
23	N/A	GND	Ground
24	I	Read Data	Reads raw data from the drive.
25	N/A	GND	Ground
26	O	Side 1 Select	Determines which drive head is active. (low = head 1; open (high) = head 0)

6.2 Hard Disk

6.2.1 Specifications

	Seagate ST9077A	Seagate ST9096A	Seagate ST9144A	Western Digital AH620
CMOS SETUP type	25	26	27	19
Formatted capacity (MB)	61	81	122	59.5
Number of heads	4	10	15	7
Cylinders	802	980	980	1024
Sectors/Track	39	17	17	17
Bytes/Sector	512	512	512	512

6.2.2 Pin Descriptions

Pin	Signal	Pin	Signal
1	-RESET	23	-IOW
2	GND	24	GND
3	+DATA 7	25	-IOR
4	+DATA 8 (AT Only)	26	GND
5	+DATA 6	27	-DACK (XT Only)
6	+DATA 9 (AT Only)	28	NC
7	+DATA 5	29	+DRQ (XT Only)
8	+DATA 10 (AT Only)	30	GND
9	+DATA 4	31	+IRQ
10	+DATA 11 (AT Only)	32	-IO16 (AT Only)
11	+DATA 3	33	+ADDR 1
12	+DATA 12 (AT Only)	34	-PDIAG (AT Only)
13	+DATA 2	35	+ADDR 0
14	+DATA 13 (AT Only)	36	+ADDR 2 (AT Only)
15	+DATA 1	37	-CS0
16	+DATA 14 (AT Only)	38	-CS1 (AT Only)
17	+DATA 0	39	-ACTIVE (LED)
18	+DATA 15 (AT Only)	40	GND
19	GND	41	5 Volts (Logic)
20	KEY	42	5 Volts (Motor)
21	NC	43	GND
22	GND	44	XT/AT

6.2.3 Signal Descriptions

Signal Name	Dir	Pin	Description
-RESET	O	1	Reset signal from the host system which is active low during power up and inactive thereafter in both XT and AT mode.
GND	O	2, 19, 22, 24, 26, 30, 40, 43	Ground between the drive and the host.
+DATA 0-15 I/O	3 - 18		16-bit bi-directional data between the host and the drive. In AT mode, the low eight bits, HD0 - HD7, are used for register and ECC access. The high bits are used for data transfers. In XT mode, only the lower eight bits are used. These are tri-state lines with 10mA drive capability.
KEY	N/C	20	An unused pin clipped on the drive and plugged on the cable. Used to guarantee correct orientation of the cable.
NC	O	21, 28	Reserved
-IOW	O	23	Write strobe, the rising edge of which clocks data from the host data bus into a control register or the data register of the drive.
-IOR	O	25	Read strobe, which, when low enables data from a status register or the data register of the drive onto the host data bus. The rising edge of IOR latches data from the drive at the host.
-DACK	O	27	DMA handshake signal used to select a drive data register (XT-only).
+DRQ	I	29	DMA handshake signal used to select a drive data register (XT-only).
+IRQ	I	31	Interrupt to the host system. In AT mode, this signal is enabled only when the drive is selected, and the host activates the -IEN bit in the Digital Output Register. When the -IEN bit is inactive or the drive is not selected, this output is in a high-impedance state regardless of the state of the +IRQ bit. The interrupt is set when the +IRQ bit is set by the drive CPU. +IRQ is reset to zero by a host read of the status register or a write to the command register. In XT mode, this signal is enabled when the +IRQ enable bit is set and the drive has completion status available for the host. This signal is a tri-state line with 12 mA drive capacity.
+5V (Logic)	O	41	5 volt (5% to drive circuitry.
+5V (Motor)	O	42	5 volt (10% supply to drive motors.

(To be continued)

(Continued)

Signal Name	Dir	Pin	Description
-XT/AT	O	44	Interface mode select. This signal is sampled on power up and will select XT or AT operating mode as requested by the host.
-IO16	I	32	Indication to the host system that the 16-bit data register has been addressed and that the drive is prepared to send or receive a 16-bit data word. This line is tri-state line with 20 mA drive capacity (AT mode only)
-PDIAG	I	34	Passed diagnostic. This signal is ignored by the drive.
+A0, A1, A2	O	35, 33, 36	But binary coded address used to select the individual registers in the drive.
-CS0	O	37	Chip select decoded from the host address bus. Used to select some of the host-accessible registers. NOTE: This signal should be disabled by the host when DMA transfers are in progress.
-CS1	O	38	Chip select decoded from the host address bus. Used to select three of the registers in the Task File (AT mode only).
-ACTIVE	I	39	Signal from the drive used to drive an active LED whenever the disk is being accessed.

6.2.4 Types

Vendor	Model	Type	Head	Cylinder	Sectors/track	Size
Toshiba	MK1122	24	5	988	17	40MB
Toshiba		17	10	988	17	80MB
Western Digital	AH260	19	7	1024	17	60MB
Western Digital	AH280	20	10	980	17	80MB
Seagate	ST9051A1	23	4	654	32	40MB
Seagate	ST9077A	25	4	802	39	60MB
Seagate	ST9096A	26	10	980	17	80MB
Seagate	ST9144A	27	15	980	17	120MB
Quantum	GODRIVE-40	30	6	821	17	40MB
Quantum	GODRIVE-80	31	10	991	17	80MB
Conner	CP2034	43	4	411	38	30MB
Conner	CP2044	44	5	980	17	40MB
Conner	CP2064	45	4	823	38	60MB
Conner	CP2084	46	8	548	38	80MB

6.3 LCD Display Panel and CCFT

6.3.1 Specifications

SHARP LM64P80 LCD

Effective viewing area (mm)	196 (W) x 147.6 (H)
Display format	640 (W) x 480 (H)
Dot size (mm)	0.27 x 0.27
Dot spacing (mm)	0.03
VDD-VSS (V)	4.75 - 5.25
VEE-VSS (V)	-13.2 - -21.7
Response time (Rise) (ms)	300 (MAX)
Response time (Decay) (ms)	300 (MAX)

CCFT

Circuit voltage	1000 Vrms Min
Discharging tube current	5 mA rms TYP
Power consumption	1.6W
Discharging tube voltage	320 Vrms TYP
Brightness	15,000 nit TYP

6.3.2 Pin Descriptions

LCD

Pin	Signal	Description
1	S	Scan start-up signal
2	CP1	Input data latch signal
3	CP2	Data input clock signal
4	DISP	Display control signal
5	VDD	Power for logic and LCD (+5V DC)
6	VSS	Ground
7	VEE	Power supply for LCD (-)
8	DU0	Display data signal (upper half)
9	DU1	Display data signal (upper half)
10	DU2	Display data signal (upper half)
11	DU3	Display data signal (upper half)
12	DL0	Display data signal (lower half)
13	DL1	Display data signal (lower half)
14	DL2	Display data signal (lower half)
15	DL3	Display data signal (lower half)

CCFT

Pin	Signal	Description
1	GND	Ground line (from D/A inverter)
2	NC	Reserved
3	NC	Reserved
4	HV	High voltage line (from D/A inverter)