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Toshiba 330/320 Series Maintenance Manual

First edition March 1998

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Preface

This maintenance manual describes how to perform hardware service maintenance for the Toshiba 330/320 Series Personal Computer.

The procedures described in this manual are intended to help service technicians isolate faulty Field Replaceable Units (FRUs) and replace them in the field.

SAFETY PRECAUTIONS

Four types of messages are used in this manual to bring important information to your attention. Each of these messages will be italicized and identified as shown below.

DANGER: “*Danger*” indicates the existence of a hazard that could result in death or serious injury if the safety instruction is not observed.

WARNING: “*Warning*” indicates the existence of a hazard that could result in bodily injury if the safety instruction is not observed.

CAUTION: “*Caution*” indicates the existence of a hazard that could result in property damage if the safety instruction is not observed.

NOTE: A Note contains general information that relates to your safe maintenance services.

Improper repair of the computer may result in safety hazards. Toshiba requires service technicians and authorized dealers or service providers to ensure the following safety precautions are adhered to strictly.

- ☐ Be sure to fasten screws securely with the right screwdriver. If a screw is not fully fastened, it could loosen and create a short circuit, which could cause overheating, smoke, or fire.
- ☐ If you replace the battery pack, RTC battery, or backup battery, be sure to use only the same model battery or an equivalent battery recommended by Toshiba. Installation of the wrong battery can cause the battery to explode.

The manual is divided into the following parts:

- | | |
|------------|--|
| Chapter 1 | Hardware Overview describes the system unit and each FRU. |
| Chapter 2 | Troubleshooting Procedures explains how to diagnose and resolve FRU problems. |
| Chapter 3 | Tests and Diagnostics describes how to perform test and diagnostic operations for maintenance service. |
| Chapter 4 | Replacement Procedures describes the removal and replacement of the FRUs. |
| Appendices | The eight appendices describe the following: <ul style="list-style-type: none"><input type="checkbox"/> Handling the LCD module<input type="checkbox"/> Board layout<input type="checkbox"/> Pin assignments<input type="checkbox"/> Keyboard scan/character codes<input type="checkbox"/> Key layout<input type="checkbox"/> Wiring diagrams<input type="checkbox"/> BIOS Rewrite Procedures<input type="checkbox"/> Reliability |

Conventions

This manual uses the following formats to describe, identify, and highlight terms and operating procedures.

Acronyms

On the first appearance and whenever necessary for clarification, acronyms are enclosed in parentheses following their definition. For example:

Read Only Memory (ROM)

Keys

Keys are used in the text to describe many operations. The keytop symbol, as it appears on the keyboard, is printed in **boldface** type.

Key operation

Some operations require you to simultaneously use two or more keys. We identify such operations by the keytop symbols separated by a plus (+) sign. For example, **Ctrl** + **Pause (Break)** means you must hold down **Ctrl** and at the same time press **Pause (Break)**. If three keys are used, hold down the first two and at the same time press the third.

User input

Text that you are instructed to type in is shown in the boldface type below:

DISKCOPY A: B:

The display

Text generated by the computer that appears on its display is presented in the typeface below:

Format complete

System transferred

Table of Contents

Chapter 1 Hardware Overview

1.1	Features.....	1-1
1.2	System Unit Block Diagram.....	1-5
1.3	3.5-inch Floppy Disk Drive.....	1-10
1.4	2.5-inch Hard Disk Drive.....	1-11
1.5	Keyboard.....	1-12
1.6	CD-ROM Drive.....	1-13
1.7	TFT Color LCD.....	1-14
1.8	DSTN Color LCD	1-16
1.9	Power Supply	1-18
1.10	Batteries	1-20

Chapter 2 Troubleshooting Procedures

2.1	Troubleshooting.....	2-1
2.2	Troubleshooting Flowchart.....	2-2
2.3	Power Supply Troubleshooting.....	2-6
2.4	System Board Troubleshooting.....	2-14
2.5	FDD Troubleshooting.....	2-25
2.6	HDD Troubleshooting.....	2-28
2.7	Keyboard Troubleshooting.....	2-33
2.8	Display Troubleshooting.....	2-35
2.9	CD-ROM Drive Troubleshooting.....	2-37

Chapter 3 Tests and Diagnostics

3.1	The Diagnostic Test.....	3-1
3.2	Executing the Diagnostic Test.....	3-3
3.3	Subtest Names.....	3-7
3.4	System Test.....	3-9

3.5	Memory Test	3-10
3.6	Keyboard Test	3-12
3.7	Display Test	3-15
3.8	Floppy Disk Test	3-19
3.9	Printer Test	3-21
3.10	Async Test	3-23
3.11	Hard Disk Test	3-25
3.12	Real Timer Test	3-28
3.13	NDP Test	3-30
3.14	Expansion Test	3-31
3.15	Sound Test	3-32
3.16	CD-ROM Test	3-33
3.17	Error Code and Error Status Names	3-34
3.18	Hard Disk Test Detail Status	3-37
3.19	Hard Disk Format	3-39
3.20	Head Cleaning	3-44
3.21	Log Utilities	3-45
3.22	Running Test	3-47
3.23	Floppy Disk Drive Utilities	3-49
3.24	System Configuration	3-54
3.25	SETUP	3-56

Chapter 4 Replacement Procedures

4.1	General	4-1
4.2	Battery Pack	4-6
4.3	PC Card	4-7
4.4	Keyboard	4-9
4.5	Expansion Memory	4-11
4.6	HDD	4-13
4.7	Top Cover and Display Assembly	4-16
4.8	RTC Battery and Backup Battery	4-20
4.9	LED Board	4-22

4.10	Membrane Switch.....	4-23
4.11	FDD	4-24
4.12	CD-ROM Drive.....	4-26
4.13	System Board	4-29
4.14	Cooling Fan.....	4-33
4.15	Speakers.....	4-34
4.16	Display Mask.....	4-35
4.17	FL Inverter Board.....	4-37
4.18	DSTN LCD Module and Contrast Board	4-38
4.19	TFT LCD Module.....	4-40
4.20	DSTN FL	4-41
4.21	TFT FL (SHARP).....	4-44
4.22	TFT FL (DTI).....	4-48
4.23	TFT FL (Samsung).....	4-51
4.24	TFT FL (NEC)	4-52

Appendices

Appendix A	Handling the LCD Module	A-1
Appendix B	Board Layout.....	B-1
Appendix C	Pin Assignments	C-1
Appendix D	Keyboard Scan/Character Codes	D-1
Appendix E	Key Layout	E-1
Appendix F	Wiring Diagrams	F-1
Appendix G	BIOS Rewrite Procedures	G-1
Appendix H	Reliability	H-1

Chapter 1

Hardware Overview

Chapter 1 Contents

1.1	Features.....	1-1
1.2	System Unit Block Diagram.....	1-5
1.3	3.5-inch Floppy Disk Drive.....	1-10
1.4	2.5-inch Hard Disk Drive.....	1-11
1.5	Keyboard.....	1-12
1.6	CD-ROM Drive.....	1-13
1.7	TFT Color LCD.....	1-14
	1.7.1 TFT Color LCD Module.....	1-14
	1.7.2 FL Inverter Board.....	1-15
1.8	DSTN Color LCD.....	1-16
	1.8.1 DSTN Color LCD Module.....	1-16
	1.8.2 FL Inverter Board.....	1-17
1.9	Power Supply.....	1-18
1.10	Batteries.....	1-20
	1.10.1 Main Battery.....	1-21
	1.10.2 Backup Battery.....	1-22
	1.10.3 RTC battery.....	1-22

Figures

Figure 1-1	Front of the computer.....	1-4
Figure 1-2	System unit configuration.....	1-4
Figure 1-3	System unit block diagram.....	1-5
Figure 1-4	3.5-inch FDD.....	1-10
Figure 1-5	2.5-inch HDD.....	1-11
Figure 1-6	Keyboard.....	1-12
Figure 1-7	Toshiba's XM-1602BV CD-ROM drive.....	1-13
Figure 1-8	TFT color LCD.....	1-14
Figure 1-9	DSTN color LCD.....	1-16

Tables

Table 1-1 3.5-inch FDD specifications.....	1-10
Table 1-2 2.5-inch HDD specifications	1-11
Table 1-3 CD-ROM drive specifications.....	1-13
Table 1-4 LCD specifications (TFT).....	1-14
Table 1-5 FL inverter board specifications.....	1-15
Table 1-6 LCD specifications (DSTN).....	1-16
Table 1-7 FL inverter board specifications.....	1-17
Table 1-8 Power supply board output rating.....	1-19
Table 1-9 Battery specifications.....	1-20
Table 1-10 Time required for quick charges.....	1-21
Table 1-11 Backup battery charging/data preservation time.....	1-22
Table 1-12 RTC battery charging/data preservation time.....	1-22

Chapter 1

Hardware Overview

Chapter 1 Contents

1.1	Features.....	1-1
1.2	System Unit Block Diagram.....	1-5
1.3	3.5-inch Floppy Disk Drive.....	1-10
1.4	2.5-inch Hard Disk Drive.....	1-11
1.5	Keyboard.....	1-12
1.6	CD-ROM Drive.....	1-13
1.7	TFT Color LCD.....	1-14
	1.7.1 TFT Color LCD Module.....	1-14
	1.7.2 FL Inverter Board.....	1-15
1.8	DSTN Color LCD	1-16
	1.8.1 DSTN Color LCD Module.....	1-16
	1.8.2 FL Inverter Board.....	1-17
1.9	Power Supply	1-18
1.10	Batteries	1-20
	1.10.1 Main Battery.....	1-21
	1.10.2 Backup Battery	1-22
	1.10.3 RTC battery	1-22

Figures

Figure 1-1	Front of the computer.....	1-4
Figure 1-2	System unit configuration.....	1-4
Figure 1-3	System unit block diagram.....	1-5
Figure 1-4	3.5-inch FDD	1-10
Figure 1-5	2.5-inch HDD.....	1-11
Figure 1-6	Keyboard.....	1-12
Figure 1-7	Toshiba's XM-1602BV CD-ROM drive.....	1-13
Figure 1-8	TFT color LCD.....	1-14
Figure 1-9	DSTN color LCD.....	1-16

Tables

Table 1-1 3.5-inch FDD specifications.....	1-10
Table 1-2 2.5-inch HDD specifications	1-11
Table 1-3 CD-ROM drive specifications.....	1-13
Table 1-4 LCD specifications (TFT).....	1-14
Table 1-5 FL inverter board specifications.....	1-15
Table 1-6 LCD specifications (DSTN).....	1-16
Table 1-7 FL inverter board specifications.....	1-17
Table 1-8 Power supply board output rating.....	1-19
Table 1-9 Battery specifications.....	1-20
Table 1-10 Time required for quick charges.....	1-21
Table 1-11 Backup battery charging/data preservation time.....	1-22
Table 1-12 RTC battery charging/data preservation time.....	1-22

1.1 Features

The 330/320 series Personal Computer uses extensive Large Scale Integration (LSI) , and Complementary Metal-Oxide Semiconductor (CMOS) technology extensively to provide compact size, minimum weight, low power usage and high reliability. This computer incorporates the following features and benefits:

☐ Microprocessor

The computer is equipped with an Intel® Pentium® processor with MMX™ Technology. The 330 series operates at 266MHz and 2.0/2.5 volts. The 320 series operates at 233MHz and 1.8/2.5 volts.

☐ Level-2 cache

A 512KB level-2 cache memory is provided in pipe-line burst SRAM.

☐ Memory

The computer comes with 32MB of Extend Data Out (EDO) DRAM.

☐ HDD

The computer has a 2.5-inch HDD with a capacity of 4.0GB.

☐ FDD

A 3.5-inch FDD accommodates both 2HD (1.44MB) and 2DD (720KB) disks.

☐ CD-ROM

A full-size, maximum 20-speed CD-ROM drive contains an AT Attachment Packet Interface (ATAPI) controller, and supports the following formats: Red-Book, Yellow-Book, CD-ROM XA, Photo CD, CD-Bridge, CD-I, and CD plus.

☐ Keyboard

An-easy-to-use 84/86-key keyboard provides a numeric keypad overlay for fast numeric data entry or for cursor and page control. The keyboard also includes two keys that have special functions in Microsoft® Windows® 95. It supports software that uses a 101- or 102-key enhanced keyboard.

☐ Display

The 330CDT and 320CDT have a 12.1-inch color, Thin Film Transistor (TFT) Liquid Crystal Display (LCD), that enables display up to 16M colors at a resolution 800 x 600 pixels. The 330CDS and 320CDS have a 12.1-inch color, Dual-scan Super Twist Nematic (DSTN) Liquid Crystal Display (LCD) that displays up to 16M colors at a resolution 800 x 600 pixels.

A video controller and 2MB of VRAM enable an external monitor to display 16M colors at a resolution of 800 x 600 pixels or 256 colors at a resolution of 1280 x 1024 pixels.

☐ Batteries

The computer has three batteries: a Lithium-Ion main battery pack, backup battery (for resume feature) and RTC battery (that backs up the Real Time Clock and CMOS memory).

☐ Expansion memory slot

An optional 32, 64 or 128MB memory module can be installed in the memory slot.

☐ Universal Serial Bus (USB)

The USB enables daisy-chain connection of up to 127 USB-equipped devices and 12Mbps serial data transfer. It is designed for easy configuration by a PnP operating system and provides hot insertion/ejection capability.

☐ Parallel port

A Centronics[®] compatible parallel port enables connection of a printer or other parallel device. The port supports Extended Capabilities Port (ECP) conforming to IEEE-1284.

☐ Serial port

A standard, 9-pin, serial port enables connection of such serial devices as a serial printer, mouse or modem. A Universal Asynchronous Receiver/Transmitter (UART) is 16550A equivalent.

☐ External monitor port

The port enables connection of an external monitor, which is recognized automatically by Video Electronics Standards Association (VESA) Display Data Channel (DDC) 2B compatible functions.

☐ PS/2™ mouse/keyboard port

Either a PS/2 compatible keyboard or a PS/2 compatible mouse can be connected to the port.

☐ PC card slot

A PC card slot accommodates two 5mm cards (Type II) or one 10.5mm (Type III) card, which support the PCMCIA Release 2.01 cards and are ready for advanced cards, including PC Card 16's multifunction cards and CardBus 32-bit cards, which is dedicated to high performance video and audio data transfer.

☐ AccuPoint

This pointer control stick, located in the center of the keyboard, provides convenient control of the cursor without requiring desk space for a mouse.

☐ Infrared port

The infrared port is compatible with Fast InfraRed (FIR) standards enabling wireless 4Mbps data transfer with Infrared Data Association (IrDA) 1.1 compatible devices.

☐ Sound system

A Sound Blaster™ Pro™ and Windows Sound System compatible sound system gives the computer multimedia capability. The sound system is equipped with stereo speakers and jacks for audio line-in, headphone.

The computer is shown in Figure 1-1. The system unit configuration is shown in Figure 1-2.

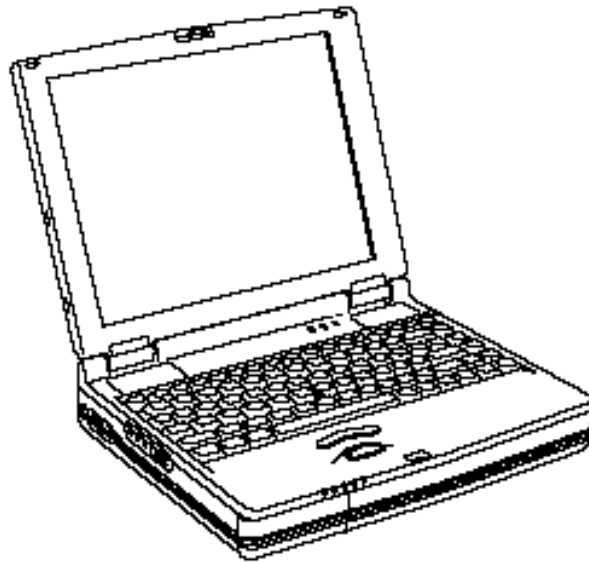


Figure 1-1 Front of the computer

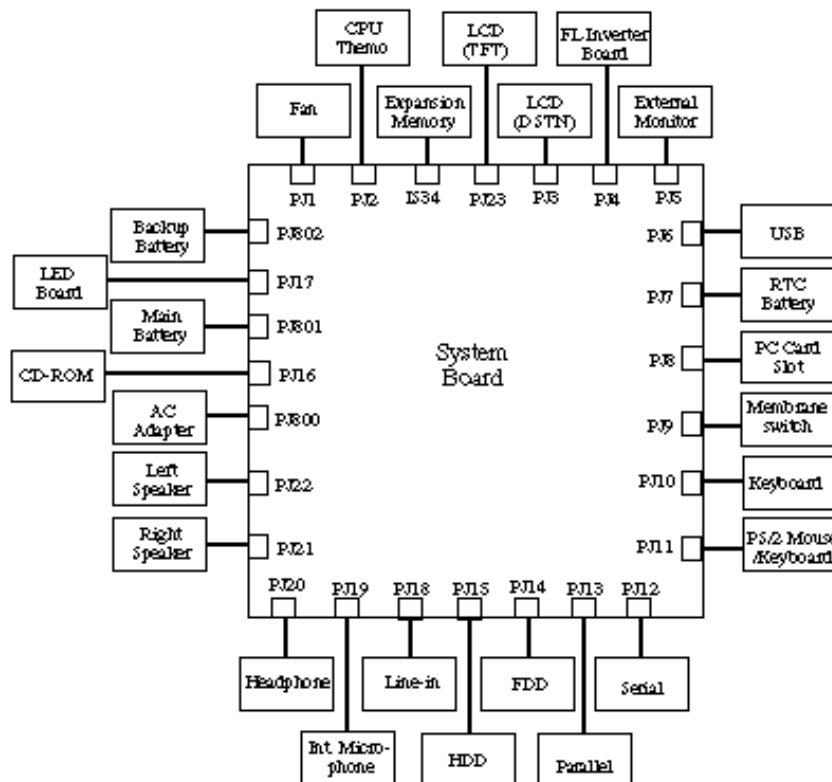


Figure 1-2 System unit configuration

1.2 System Unit Block Diagram

Figure 1-3 is a block diagram of the system unit.

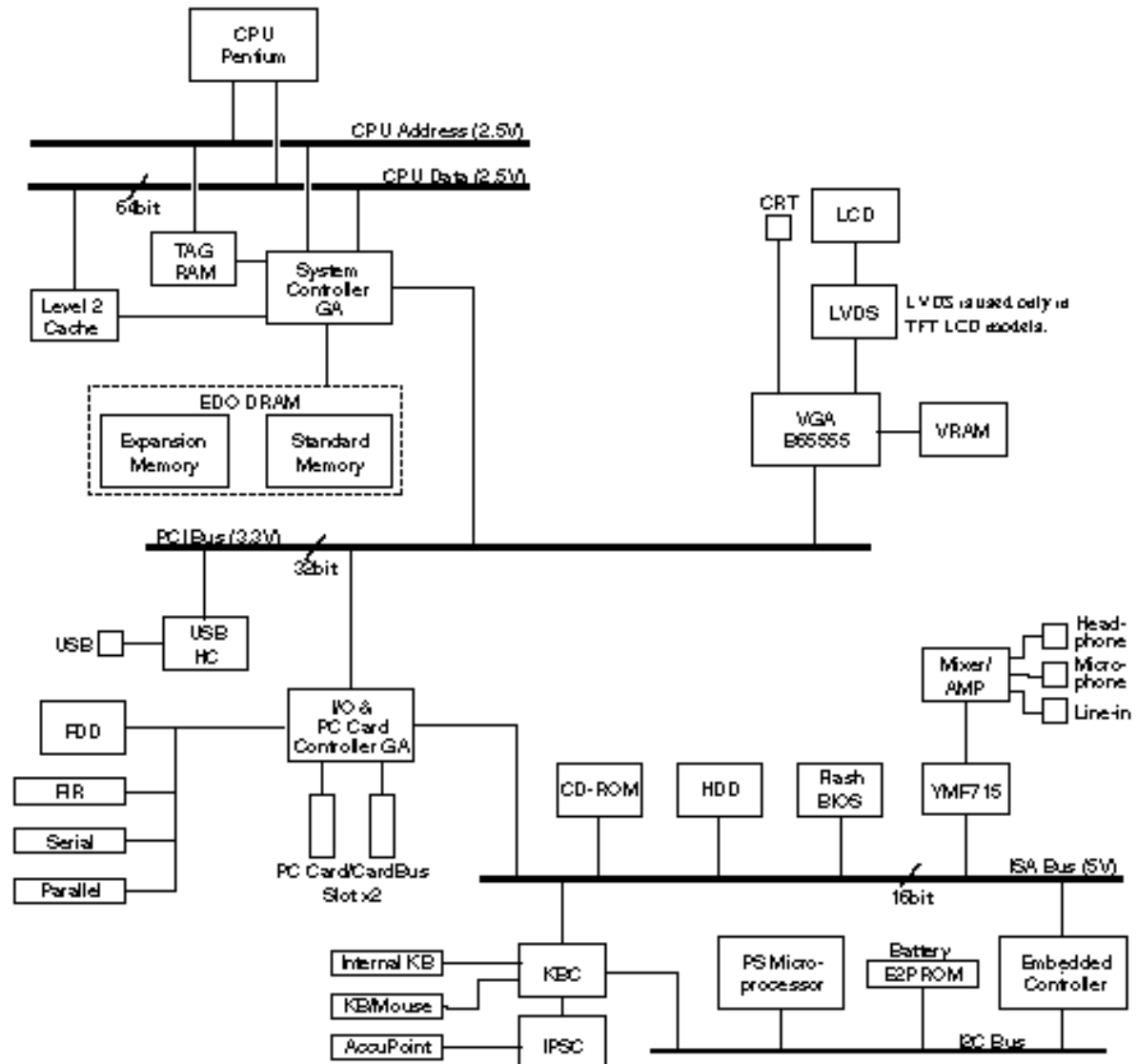


Figure 1-3 System unit block diagram

The system unit is composed of the following major components:

☐ Intel Pentium processor

330 series: Intel 266MHz Pentium processor with MMX Technology

320 series: Intel 233MHz Pentium processor with MMX Technology

The math co-processor and 32KB cache memory are integrated into the Pentium.

☐ Level-2 cache memory

Data RAM:

- 512 KB
- Two 64K x 32-bit pipe-line burst synchronous SRAM chips
- 2.5/3.3 volt operation
- Access time 8 ns

Tag RAM:

- 64 KB (only 16 KB is used)
- Two 32K x 8-bit asynchronous SRAM chip
- 3.3 volt operation
- Access time 14 ns

The level-2 cache is a direct map method and a write-back policy.

☐ Standard RAM

- 32 MB, four 4M x 16-bit EDO DRAM chips
- 3.3 volt operation
- No parity bit
- Access time 60 ns
- Data transfer is 64-bit width

❑ BIOS ROM (Flash EEPROM)

- 256 KB, one 256K x 8-bit chip
 - 128 KB are used for system BIOS
 - 64 KB are used for VGA-BIOS
 - 8 KB are used for plug and play data area
 - 8 KB are used for password security
 - 16 KB are used for boot strap
 - 32 KB are reserved
- 5 volt operation
- Access time 120 ns
- Data transfer is 8-bit width

❑ Optional memory

One expansion memory slot is available for 32, 64 and 128MB memory modules. The 32 and 64MB memory modules consist of some 4M x 16-bit EDO DRAM chips. The 128 MB memory module consists of sixteen 4M x 16-bit EDO DRAM chips.

- 3.3 volt operation
- No parity bit
- Access time 60 ns
- Data transfer is 64-bit width

❑ Video RAM

- 2 MB, four 256K x 16-bit EDO DRAM chips
- 3.3 volt operation
- Access time 50 ns

❑ System Controller Gate Array

- This gate array has the following functions:
 - CPU interface/control
 - Level-2 cache memory control
 - DRAM control
 - PCI master/slave interface
 - Write buffer (CPU-DRAM, CPU-PCI, PCI-DRAM)
 - Prefetch buffer (CPU-PCI, PCI-DRAM)
 - Mobile-PC/PCI support DMA function
 - Serial interrupt function
 - Power management control
 - Suspend/resume control
 - CPU stop clock function
 - Two DMACs: 82C37 equivalent
 - Two PICs: 82C59 equivalent
 - One PIT: 82C54 equivalent
 - PCI clock stop function
 - ACPI support function

❑ I/O & PC Card Controller Gate Array

- This gate array has the following functions:
 - One UARTs 16550A equivalent (One SIO is used for SIR.)
 - One FDC μ PD765A equivalent
 - One parallel port control supported ECP
 - mini ISA bus control
 - PCI bus front end control
 - PC card control
 - CardBus control
 - FIR function
 - Q-SW control
 - Beep volume
 - Speaker control
 - RTC One T9934 chip is used

❑ USB Controller

- Communication with USB
- OHCI

❑ Keyboard Controller (KBC)

- One M38867E8A-HP chip is used. This KBC includes the keyboard scan controller and keyboard interface controller. The KBC controls the internal keyboard, external keyboard, AccuPoint and PS/2 mouse.

❑ AccuPoint Controller (IPSC)

- One 3DA3DT293A chip is used.
- This controller provides simultaneous control of both the AccuPoint and a PS/2 mouse.

1.3 3.5-inch Floppy Disk Drive

The 3.5-inch FDD is a thin, high-performance reliable drive that supports 720-KB (formatted) 2DD and 1.44-MB (formatted) 2HD disks.

The FDD is shown in Figure 1-4. The specifications for the FDD are listed in Table 1-1.

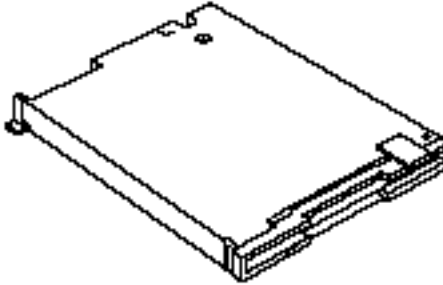


Figure 1-4 3.5-inch FDD

Table 1-1 3.5-inch FDD specifications

Item	2-MB mode	1-MB mode
Storage capacity (KB)		
Unformatted	2,000	1,000
Formatted	1,440	720
Number of heads	2	2
Number of cylinders	80	80
Access time (ms)		
Track to track	3	3
Average	181	181
Head settling time	15	15
Recording track density (tpi)	135	135
Data transfer rate (Kbps)	500	250
Rotation speed (rpm)	300	300
Recording method	Modified Frequency Modulation (MFM)	

1.4 2.5-inch Hard Disk Drive

The removable HDD is a random access non-volatile storage device. It has a non-removable 2.5-inch magnetic disk and mini-Winchester type magnetic heads.

The computer supports a 4.0GB HDD.

The HDD is shown in Figure 1-5. Specifications are listed in Table 1-2.

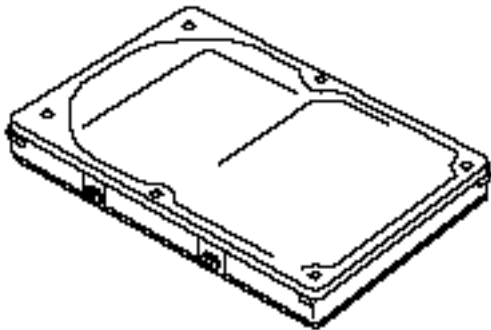


Figure 1-5 2.5-inch HDD

Table 1-2 2.5-inch HDD specifications

Items	Toshiba-MK4006MAV
Formatted capacity (bytes)	4,099,866,624
Logical cylinders	7,944
Logical heads	16
Logical sectors	63
Bytes per sector	512
Rotation speed (rpm)	4,200
Recording method	16-17 EPR

1.5 Keyboard

The 84-(USA) or 86-(European) key keyboard is mounted on the system unit. The keyboard is connected to the keyboard controller on the system board through a 25-pin flat cable. The AccuPoint, located in the center of the keyboard, provides convenient control of the cursor without requiring desk space for a mouse. The keyboard is shown in Figure 1-6.

See Appendix E for optional keyboard configurations.

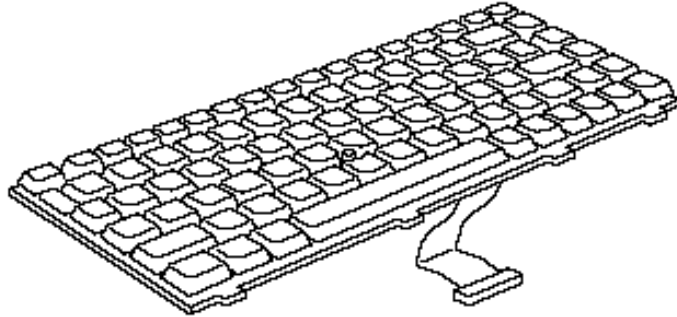


Figure 1-6 Keyboard

1.6 CD-ROM Drive

Toshiba's XM-1602B CD-ROM drive and TEAC CD-220EA CD-ROM drive accommodate either 12 cm (4.72-inch) or 8 cm (3.15-inch) CDs. They provide high-performance, 20-speed play on an maximum (reads 3,000KB per second). These drives support the following formats:

Red-Book, Yellow-Book, CD-ROM XA, Photo CD, CD-Bridge, CD-I, and CD Plus

The Toshiba's XM-1602B CD-ROM drive is shown in Figure 1-7. Specifications are listed in Table 1-3.

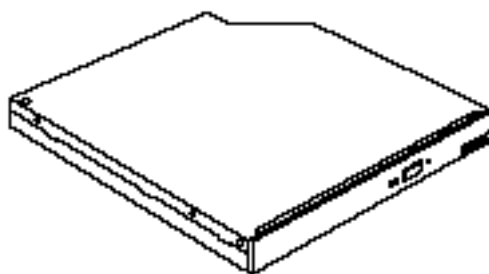


Figure 1-7 Toshiba's XM-1602B CD-ROM drive

Table 1-3 CD-ROM drive specifications

Item	Toshiba CD-ROM drive 20 x mode (Max.)	TEAC CD-ROM drive 20 x mode (Max.)
Data Capacity (bytes/block)		
Mode 1	2,048	
Mode 2	2,336	
Transfer Rate		
Sustained Block transfer speed (blocks/s)	1,500	1,500
Sustained Data transfer speed (kbytes/s)		
Mode 1	3,000	3,000
Mode 2	3,420	3,420
ATAPI Burst (Mbytes/s)	16.7(PIO mode 4)	
Access time (ms)		
Average Random Access	150	130
Average Random Seek	130	-
Average Full Stroke Access	300	300
Rotation speed (rpm)	4,225	4,280
Data Buffer Capacity (Kbytes)	128	

1.7 TFT Color LCD

The 330CDT/320CDT display panel contains a TFT color LCD module, a fluorescent lamp (FL) and an FL inverter board.

1.7.1 TFT Color LCD Module

The LCD enables display of up to 16M colors at a resolution 800 x 600 pixels.

The LCD is shown in Figure 1-8. Specifications are listed in Table 1-4.

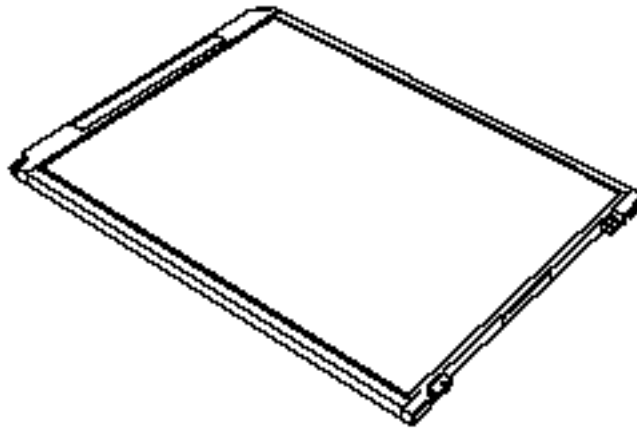


Figure 1-8 TFT color LCD

Table 1-4 LCD specifications (TFT)

Items	Specifications
Number of Pixels (pixels)	800x600
Dot pitch (mm)	0.3075x0.3075
Display area (mm)	246(H)x184.5(V)
Contrast	1:100 (Typ)

1.7.2 FL Inverter Board

The FL inverter board supplies high frequency current to light the LCD's Fluorescent Lamp.

Specifications for the FL inverter are listed in Table 1-5.

Table 1-5 FL inverter board specifications

Item	Specifications		
Input	Voltage	(V)	4.5 – 5.5
	Power	(W)	4.0
Output	Voltage	(Vrms)	1100
	Current	(mA)	2.8 to 4.6*

***NOTE:** The FL currents at power on are:

Bright : 3.6mA Semi-Bright : 2.8mA Super-Bright : 4.6mA

1.8 DSTN Color LCD

The 330CDS/320CDS display panel contains a DSTN color LCD module, a fluorescent lamp (FL) and an FL inverter board.

1.8.1 DSTN Color LCD Module

The LCD enables display of up to 16M colors at a resolution 800 x 600 pixels.

The LCD is shown in Figure 1-9. Specifications are listed in Table 1-6.

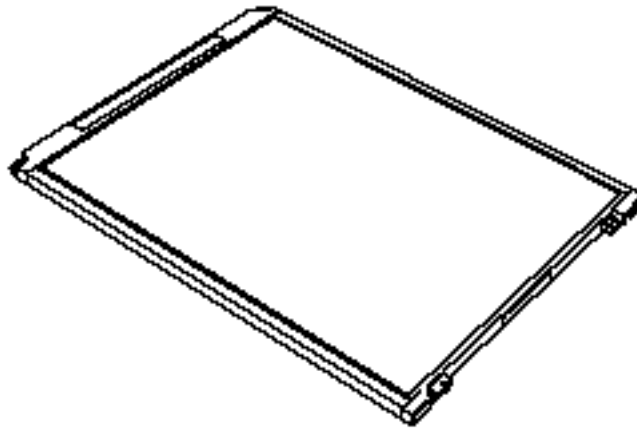


Figure 1-9 DSTN color LCD

Table 1-6 LCD specifications (DSTN)

Items	Specifications
Number of Pixels (pixels)	800x600
Dot pitch (mm)	0.3075x0.3075
Display area (mm)	248.98(H)x187.48(V)
Contrast	1:35 (Typ)

1.8.2 FL Inverter Board

The FL inverter board supplies high frequency current to light the LCD's Fluorescent Lamp.

Specifications for the FL inverter are listed in Table 1-7.

Table 1-7 FL inverter board specifications

Item	Specifications		
Input	Voltage	(V)	4.5 – 5.5
	Power	(W)	4.0
Output	Voltage	(Vrms)	1100
	Current	(mA)	2.8 to 3.6*

***NOTE:** The FL currents at power on are:
 Bright : 3.6 mA Semi-Bright : 2.8 mA

1.9 Power Supply

The power supply supplies 10 kinds of voltages to the system board, has one microprocessor and it operates at 2MHz. It performs the following functions:

1. Determines if the AC adapter or battery is connected to the computer.
2. Detects DC output and circuit malfunctions.
3. Controls the battery icon, and DC IN icon.
4. Turns the battery charging system on and off and detects a fully charged battery.
5. Determines if the power can be turned on and off.
6. Provides more accurate detection of a low battery.
7. Calculates the remaining battery capacity.
8. Detects a Ring Indicator (RI) signal for the auto power on function.

The power supply output rating is specified in Table 1-8.

Table 1-8 Power supply board output rating

Use	Name	Voltage(V)	Power supplied Yes/No		
			Suspend	Power off	No battery
CPU (320 Series)	CPUV1	1.8	NO	NO	NO
CPU (330 Series)	CPUV1	2.0	NO	NO	NO
CPU, L2-Cache, CLKGEN, System controller GA	CPUV2	2.5	NO	NO	NO
CLKGEN, TAG, L2-Cache, VGA Controller	P3V	3.3	NO	NO	NO
DRAM, VGA Controller, VRAM, PC Card Slot, USB Controller, System controller GA, I/O & PC Card GA	B3V	3.3	YES	NO	NO
VGA Controller, PC Card Slot, RS232C DRV	B5V	5.0	YES	NO	NO
Flash Memory, KBC, HDD, FDD, KB/Mouse Port, FIR, LCD Panel, LEDs, Sound, CD-ROM, IPSC, I/O & PC Card GA	VCC	5.0	NO	NO	NO
I/O & PC Card GA	S3V	3.3	YES	YES	NO
EC	S5V	5.0	YES	YES	NO
PSC	MCV	5.0	YES	YES	NO
RTC	RTCV	3.3	YES	YES	YES

1.10 Batteries

The computer has three types of batteries:

- ☐ Main battery pack
- ☐ Backup battery
- ☐ RTC battery

The removable main battery pack is the computer's main power source when the AC adapter is not attached. The backup and main battery maintain the state of the computer when the computer enters resume mode.

The battery specifications are listed in Table 1-9.

Table 1-9 Battery specifications

Battery name	Material	Output voltage	Capacity
Main battery	Lithium-Ion	10.8 V	3,600 mAh
Backup battery	Nickel Metal Hydride	7.2 V	35 mAh
RTC battery	Nickel Metal Hydride	2.4 V	12 mAh

1.10.1 Main Battery

Battery Charging Control

Battery charging is controlled by a microprocessor that is mounted on the system board. The microprocessor controls whether the charge is on or off and detects a full charge when the AC adapter and battery are attached to the computer. The system charges the battery using quick charge or trickle charge.

☐ Quick Battery Charge

When the AC adapter is attached, there are two types of quick charge: quick charge 1 when the system is powered off and quick charge 2 when the system is powered on.

Table 1-10 Time required for quick charges

Status	Charging time
Quick charge 1 (power off)	About 3 hours
Quick charge 2 (power on)	4 to 10 hours or longer

NOTES

- 1: The time required for quick charge 2 is affected by the amount of power the system is consuming. Use of the fluorescent lamp and frequent disk access diverts power and lengthens the charge time.*
- 2: Using quick charge 1, the system CPU automatically stops the charge after five hours and 30 minutes regardless of the condition of the battery.*

If any of the following occurs, the battery quick charge process stops.

1. The battery becomes fully charged.
2. The AC adapter or battery is removed.
3. The battery or output voltage is abnormal.

☐ Trickle Battery Charge

When the main battery is fully charged and the AC adapter is attached, the microprocessor automatically changes quick charge 1 or 2 to trickle charge.

☐ Detection of full charge

A full charge is detected when the battery is charging at quick charge, and under any of the following conditions:

1. The current in the battery charging circuit drops under the predetermined limit.
2. The charging time exceeds the fixed limit.
3. The battery's temperature is over 60°C.

1.10.2 Backup Battery

The backup battery maintains data in resume mode. The power source used to back up the resume data is determined according to the following priority:

AC adapter > Main battery > Backup battery

The backup battery is charged by the main battery or AC adapter. Table 1-11 lists the charging time and data preservation period of the backup battery.

Table 1-11 Backup battery charging/data preservation time

Status	Time
Charging Time	7 / 14 hours (with / without AC adapter)
Data preservation period (full charge)	4 hours

1.10.3 RTC battery

The RTC battery provides power to keep the current date, time and other setup information in memory while the computer is turned off. Table 1-12 lists the charging time and data preservation period of the RTC battery.

Table 1-12 RTC battery charging/data preservation time

Status	Time
Charging Time	50 hours
Data preservation period (full charge)	1 month

Chapter 2

Troubleshooting Procedures

Chapter 2 Contents

2.1	Troubleshooting.....	2-1
2.2	Troubleshooting Flowchart.....	2-2
2.3	Power Supply Troubleshooting.....	2-6
	Procedure 1 Power Status Check.....	2-6
	Procedure 2 Error Code Check.....	2-8
	Procedure 3 Connection Check.....	2-11
	Procedure 4 Quick Charge Check.....	2-12
	Procedure 5 Replacement Check.....	2-13
2.4	System Board Troubleshooting.....	2-14
	Procedure 1 Message Check.....	2-15
	Procedure 2 Printer Port LED Check on Boot Mode.....	2-17
	Procedure 3 Printer Port LED Check on Resume Mode.....	2-23
	Procedure 4 Diagnostic Test Program Execution Check.....	2-24
	Procedure 5 Replacement Check.....	2-24
2.5	FDD Troubleshooting.....	2-25
	Procedure 1 FDD Head Cleaning Check.....	2-25
	Procedure 2 Diagnostic Test Program Execution Check.....	2-26
	Procedure 3 Connector Check and Replacement Check.....	2-27
2.6	HDD Troubleshooting.....	2-28
	Procedure 1 Message Check.....	2-28
	Procedure 2 Partition Check.....	2-29
	Procedure 3 Format Check.....	2-30
	Procedure 4 Diagnostic Test Program Execution Check.....	2-31
	Procedure 5 Connector Check and Replacement Check.....	2-32
2.7	Keyboard Troubleshooting.....	2-33
	Procedure 1 External Keyboard Check.....	2-33
	Procedure 2 Diagnostic Test Program Execution Check.....	2-33
	Procedure 3 Connector and Replacement Check.....	2-34

2.8	Display Troubleshooting	2-35
	Procedure 1 Contrast Adjustment Check (330CDS/320CDS only)	2-35
	Procedure 2 External Monitor Check	2-35
	Procedure 3 Diagnostic Test Program Execution Check	2-35
	Procedure 4 Connector and Replacement Check	2-36
2.9	CD-ROM Drive Troubleshooting	2-37
	Procedure 1 CD Cleaning Check	2-37
	Procedure 2 Diagnostic Test Program Execution Check	2-37
	Procedure 3 Connector Check and Replacement Check	2-38

Figures

Figure 2-1	Troubleshooting flowchart	2-3
Figure 2-2	Printer port LED	2-17

Tables

Table 2-1	Battery icon	2-6
Table 2-2	DC IN icon	2-7
Table 2-3	Printer port LED boot mode status	2-18
Table 2-4	Printer port LED resume mode error status	2-23
Table 2-5	FDD error code and status	2-26
Table 2-6	Hard disk drive error code and status	2-31

2.1 Troubleshooting

Chapter 2 describes how to determine if a Field Replaceable Unit (FRU) in the computer is causing the computer to malfunction. The FRUs covered are:

- | | |
|----------------------|-------------|
| 1. System Board | 4. Keyboard |
| 2. Floppy Disk Drive | 5. Display |
| 3. Hard Disk Drive | 6. CD-ROM |

The Diagnostics Disk operations are described in Chapter 3. Detailed replacement procedures are given in Chapter 4.

The following tools are necessary for implementing the troubleshooting procedures:

1. Diagnostics Disk
2. Phillips screwdriver (2 mm)
3. Toshiba MS-DOS system disk(s)
(You must install the following onto the disk: SYS.COM, FORMAT.COM, FDISK.COM and FDISK.EXE)
4. 2DD or 2HD formatted work disk for floppy disk drive testing
5. Cleaning kit for floppy disk drive troubleshooting
6. Printer port LED
7. Printer port wraparound connector
8. Serial port wraparound connector
9. PC card wraparound card
10. Multimeter
11. External monitor
12. PS/2 or compatible keyboard
13. PS/2 or compatible mouse
14. Multimedia sound system with line-in and line-out ports
15. Headphone
16. Microphone
17. USB test module and USB cable

2.2 Troubleshooting Flowchart

Use the flowchart in Figure 2-1 as a guide for determining which troubleshooting procedures to execute. Before going through the flowchart steps, verify the following:

- ☐ Ask the user if a password is registered and, if it is, ask him or her to enter the password. If the user has forgotten the system password, perform the following procedure at the appropriate step in the flowchart in Figure 2-1:

Connect the printer port wraparound board (F31PRT), then turn the POWER switch on. The computer will override the password function by erasing the current password.

- ☐ Verify with the customer that Toshiba Windows[®] 95 is installed on the hard disk. Non-Toshiba operating systems can cause the computer to malfunction.
- ☐ Make sure all optional equipment is removed from the computer.
- ☐ Make sure the floppy disk drive is empty.

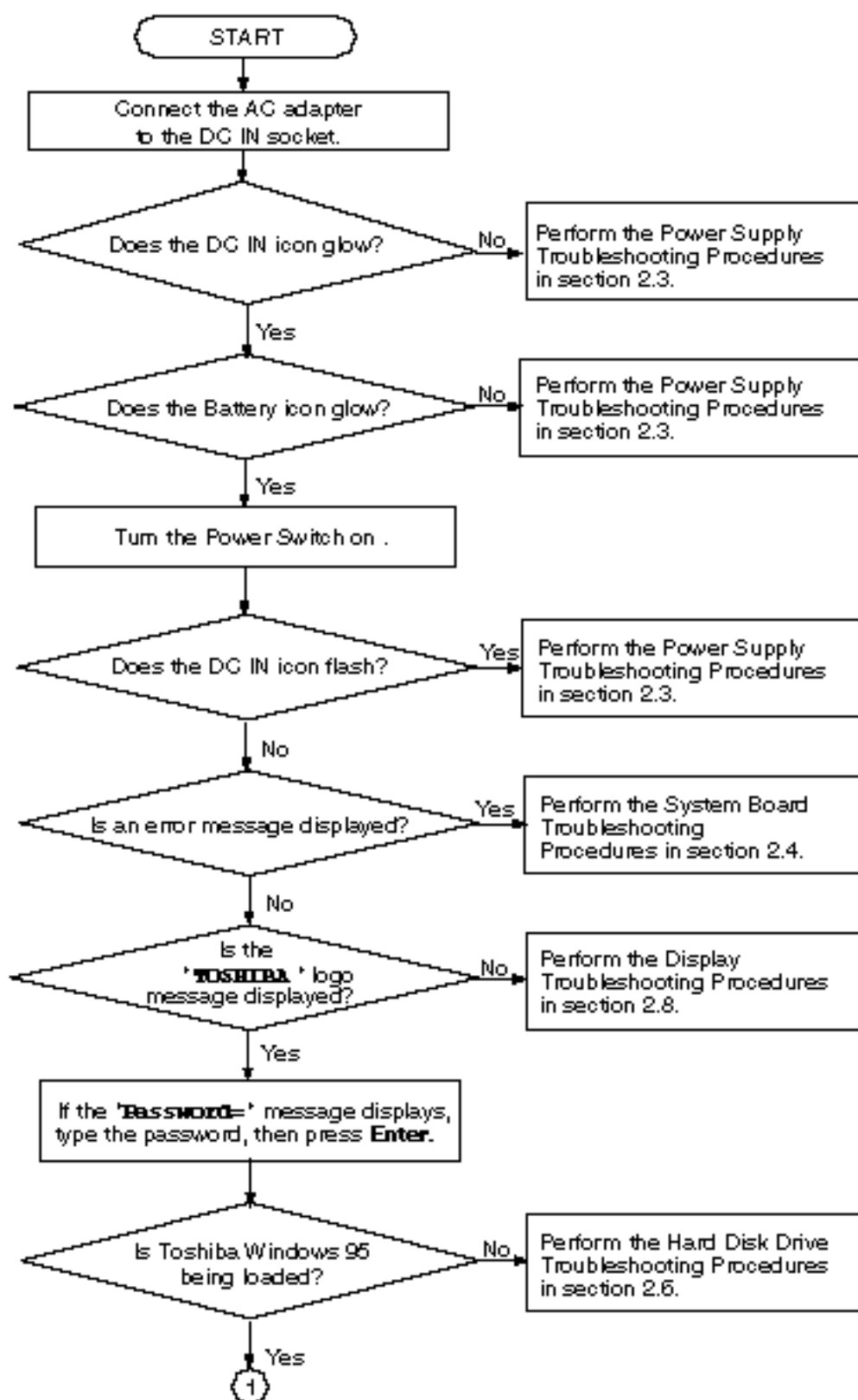


Figure 2-1 Troubleshooting flowchart (1/2)

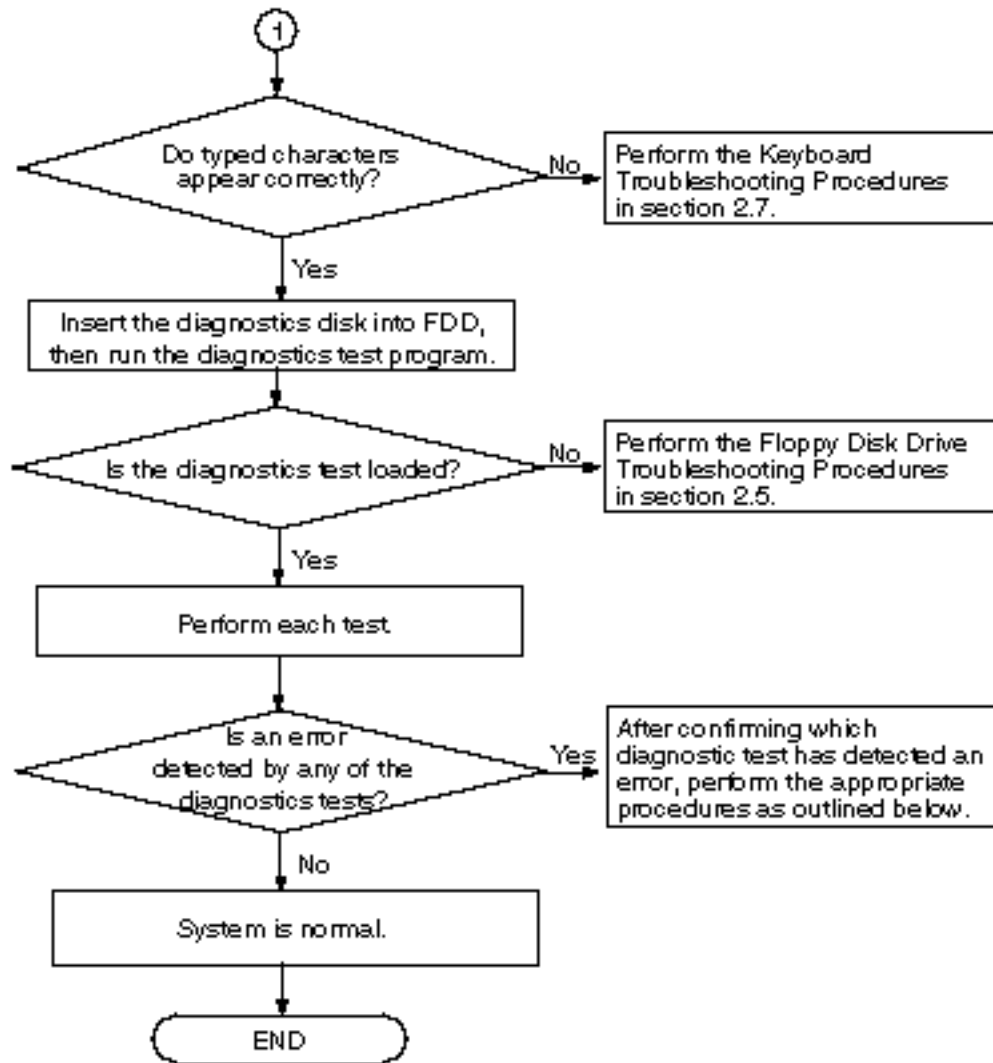


Figure 2-1 Troubleshooting flowchart (2/2)

If the diagnostics program cannot detect an error, the problem may be intermittent. The Running Test program should be executed several times to isolate the problem. Check the Log Utilities function to confirm which diagnostic test detected an error, then perform the appropriate troubleshooting procedures as follows:

1. If an error is detected on the system test, memory test, display test, async test, printer test, expansion test, sound test or real timer test, perform the System Board Troubleshooting Procedures in Section 2.4.
2. If an error is detected on the floppy disk test, perform the FDD Troubleshooting Procedures in Section 2.5.
3. If an error is detected on the hard disk test, perform the HDD Troubleshooting Procedures in Section 2.6.

4. If an error is detected on the keyboard test, perform the Keyboard Troubleshooting Procedures in Section 2.7.
5. If an error is detected on the display test, perform the Display Troubleshooting Procedures in Section 2.8.

2.3 Power Supply Troubleshooting

The power supply controls many functions and components. To determine if the power supply is functioning properly, start with Procedure 1 and continue with the other Procedures as instructed. The procedures described in this section are:

Procedure 1: Power Status Check

Procedure 2: Error Code Check

Procedure 3: Connection Check

Procedure 4: Quick Charge Check

Procedure 5: Replacement Check

Procedure 1 Power Status Check

The following icons indicate the power supply status:

☐ Battery icon

☐ DC IN icon

The power supply controller displays the power supply status through the Battery and the DC IN icons as listed in the tables below.

Table 2-1 Battery icon

Battery icon	Power supply status
Lights orange	Quick charge
Lights green	Battery is fully charged and AC adapter is connected
Blinks orange (even intervals)	The battery level becomes low while operating the computer on battery power.*1
Flashes orange	The power switch is pressed on when the battery level is low.*2
Doesn't light	Any condition other than those above.

*1 AutoResume Off will be executed soon.

*2 AutoResume Off has already been executed.

Table 2-2 DC IN icon

DC IN icon	Power supply status
Lights green	DC power is being supplied from the AC adapter.
Blinks orange	Power supply malfunction ^{*3}
Doesn't light	Any condition other than those above.

^{*3} When the power supply controller detects a malfunction, the DC IN icon blinks and an error code is displayed.

To check the power supply status, install a battery pack and connect an AC adapter.

Check 1 If the DC IN icon blinks orange, go to Procedure 2.

Check 2 If the DC IN icon does not light, go to Procedure 3.

Check 3 If the battery icon does not light orange or green, go to Procedure 4.

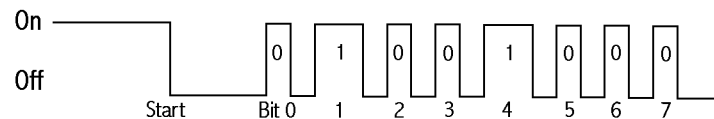
Procedure 2 Error Code Check

If the power supply microprocessor detects a malfunction, the DC IN icon blinks orange. The blink pattern indicates an error as shown below.

- ☐ Start Off for 2 seconds
- ☐ Error code (8 bit)
 - “1” On for one second
 - “0” On for half second
 - Interval between data bits Off for half second

The error code begins with the least significant digit.

Example: Error code 12h (Error codes are given in hexadecimal format.)



Check 1 Convert the DC IN icon blink pattern into the hexadecimal error code and compare it to the tables below.

☐ DC IN

Error code	Meaning
10h	AC Adapter output voltage is over 16.5V (15V+10%).
12h	Current from the DC power supply is over the limit (4.87A).
13h	Current from the DC power supply is over the limit (0.5A) when there is no load.
14h	Current sensing IC is not normal.

☐ Main Battery

Error code	Meaning
21h	Main battery charge current is over 5.06A (4.6A+10%).
22h	Main battery discharge current is over.
23h	Main battery charge current is over 3.60A.
24h	Current sensing IC is not normal.

❑ S5V output

Error code	Meaning
40h	S5V voltage is under 4.75V (5.6V-10%).

❑ B5V output

Error code	Meaning
50h	B5V voltage is over 6.0V (5V+20%).
51h	B5V voltage is under 4.5V (5V-10%) when the computer is powered on.
52h	B5V voltage is under 4.5V (5V-10%) when the computer is booting up.
53h	B5V voltage is abnormal when the computer is suspended.

❑ B3V output

Error code	Meaning
60h	B3V voltage is over 3.96V (3.3V+20%).
61h	B3V voltage is under 2.81V (3.3V-15%) when the computer is powered on.
62h	B3V voltage is under 2.81V (3.3V-15%) when the computer is booting up.
63h	B3V voltage is abnormal when the computer is suspended.

❑ B2V output

Error code	Meaning
70h	B2V voltage is over 2.88V (2.5V+15%).
71h	B2V voltage is under 2.13V (2.5V-15%) when the computer is powered on.
72h	B2V voltage is under 2.13V (2.5V-15%) when the computer is booting up.
73h	B2V voltage is over 2.13V (2.5V-15%) when the computer is powered off.

☐ B1V output

Error code	Meaning
80h	B1V voltage is over 2.40V (2.0V+20%).
81h	B1V voltage is under 1.44V (1.8V-20%) when the computer is powered on.
82h	B1V voltage is under 1.44V (1.8V-20%) when the computer is booting up.
83h	B1V voltage is over 1.44V (1.8V-20%) when the computer is powered off.

Check 2 In the case of error code 10h or 12h:

- ☐ Make sure the AC adapter and AC power cord are firmly plugged into the DC IN 15 V socket and wall outlet. If the cables are connected correctly, go to the following step:
- ☐ Connect a new AC adapter and AC power cord. If the error still exists, go to Procedure 5.

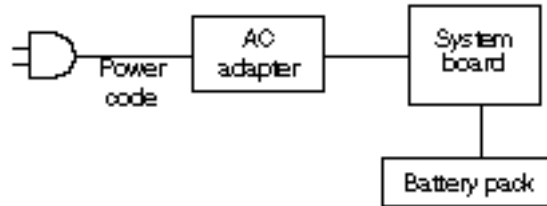
Check 3 In the case of error code 2Xh:

- ☐ Make sure the battery pack is correctly installed in the computer. If the battery pack is correctly installed, go to the following step:
- ☐ Replace the battery pack with a new one. If the error still exists, go to Procedure 5.

Check 4 For any other error, go to Procedure 5.

Procedure 3 Connection Check

The power supply wiring diagram is shown below:



Any of the connectors may be disconnected. Perform Check 1.

- Check 1 Make sure the AC adapter and AC power cord are firmly plugged into the DC IN 15 V socket and wall outlet. If these cables are connected correctly, go to Check 2.
- Check 2 Connect a new AC adapter or AC power cord.
- If the DC IN icon does not light, go to Procedure 5.
 - If the battery icon does not light, go to Check 3.
- Check 3 Make sure the battery pack is installed in the computer correctly. If the battery is properly installed and the battery icon still does not light, go to Procedure 4.

Procedure 4 Quick Charge Check

The power supply may not charge the battery pack. Perform the following procedures:

1. Reinstall the battery pack.
2. Attach the AC adapter and turn on the power. If you cannot turn on the power, go to Procedure 5.
3. Run the Diagnostic test, go to System test and execute subtest 06 (quick charge) described in Chapter 3.
4. When quick charge is complete, the diagnostics test displays the result code. Check the result code against the table below and perform any necessary check.

Result code	Contents	Check items
0	The battery is quick charging normally.	Normal
1	The battery is fully charged.	Normal
2	The AC adapter is not attached.	Check 1
3	The AC adapter's output voltage is not normal.	Check 1
4	The Battery is not installed.	Check 2
5	The battery's output voltage is not normal.	Check 3
6	The battery's temperature is not normal.	Check 4
7	A bad battery is installed.	Check 2
8	Any other problems.	Check 5

- Check 1 Make sure the AC adapter and AC power cord are firmly plugged into the DC IN socket and the wall outlet. If these cables are connected correctly, replace the AC power cord and AC adapter.
- Check 2 Make sure the battery is properly installed. If the battery is properly installed, replace it with a new one.
- Check 3 The battery pack may be completely discharged. Wait a few minutes to charge the battery pack. If the battery pack is still not charged, replace the battery pack with a new one.
- Check 4 The battery's temperature is too hot or cold. Return the temperature to a normal operating condition. If the battery pack still is not charged, replace the battery pack with a new one.
- Check 5 Go to Procedure 5.

Procedure 5 Replacement Check

The system board may be disconnected or damaged. Disassemble the computer following the steps described in Chapter 4, *Replacement Procedures*. Check the connection between the AC adapter and system board. After checking the connection, perform the following checks:

- Check 1 Replace the AC adapter with a new one. If the AC adapter is still not functioning properly, perform Check 2.
- Check 2 Replace the system board with a new one.

2.4 System Board Troubleshooting

This section describes how to determine if the system board is defective or not functioning properly. Start with Procedure 1 and continue with the other procedures as instructed. The procedures described in this section are:

Procedure 1: Message Check

Procedure 2: Printer Port LED Check on Boot Mode

Procedure 3: Printer Port LED Check on Resume Mode

Procedure 4: Diagnostic Test Program Execution Check

Procedure 5: Replacement Check

Procedure 1 Message Check

When the power is turned on, the system performs the Initial Reliability Test (IRT) installed in the BIOS ROM. The IRT tests each IC on the system board and initializes it.

- ☐ If an error message is shown on the display, perform Check 1.
- ☐ If there is no error message, go to Procedure 2.
- ☐ If Toshiba MS-DOS or Toshiba Windows 95 is properly loaded, go to Procedure 4.

Check 1 If one of the following error messages displays on the screen, press the **F1** key as the message instructs. These errors occur when the system configuration preserved in the RTC memory (CMOS type memory) is not the same as the actual configuration or when the data is lost.

If you press the **F1** key as the message instructs, the TSETUP screen appears to set the system configuration. If error message (b) appears often when the power is turned on, replace the RTC battery. If any other error message displays, perform Check 2.

- (a) *** Bad HDD type ***
Check system. Then press [F1] key
- (b) *** Bad RTC battery ***
Check system. Then press [F1] key
- (c) *** Bad configuration ***
Check system. Then press [F1] key
- (d) *** Bad memory size ***
Check system. Then press [F1] key
- (e) *** Bad time function ***
Check system. Then press [F1] key
- (f) *** Bad check sum (CMOS) ***
Check system. Then press [F1] key
- (g) *** Bad check sum (ROM) ***
Check system. Then press [F1] key

Check 2 If the following error message displays on the screen, press any key as the message instructs. If any other error message displays, perform Check 3.

The following error message appears when data stored in RAM under the resume function is lost because the battery has become discharged or the system board is damaged. Go to Procedure 3.

WARNING: RESUME FAILURE.

PRESS ANY KEY TO CONTINUE.

Check 3 The IRT checks the system board. When the IRT detects an error, the system stops or an error message appears.

If one of the following error messages (1) through (17), (24) or (25) displays, go to Procedure 5.

If error message (18) displays, go to the Keyboard Troubleshooting Procedures in Section 2.7.

If error message (19), (20) or (21) displays, go to the HDD Troubleshooting Procedures in Section 2.6.

If error message (22) or (23) displays, go to the FDD Troubleshooting Procedures in Section 2.5.

- (1) PIT ERROR
- (2) MEMORY REFRESH ERROR
- (3) TIMER CH.2 OUT ERROR
- (4) CMOS CHECKSUM ERROR
- (5) CMOS BAD BATTERY ERROR
- (6) FIRST 64KB MEMORY ERROR
- (7) FIRST 64KB MEMORY PARITY ERROR
- (8) VRAM ERROR
- (9) SYSTEM MEMORY ERROR
- (10) SYSTEM MEMORY PARITY ERROR
- (11) EXTENDED MEMORY ERROR
- (12) EXTENDED MEMORY PARITY ERROR
- (13) DMA PAGE REGISTER ERROR
- (14) DMAC #1 ERROR
- (15) DMAC #2 ERROR
- (16) PIC #1 ERROR
- (17) PIC #2 ERROR
- (18) KBC ERROR
- (19) HDC ERROR
- (20) HDD #0 ERROR
- (21) HDD #1 ERROR
- (22) NO FDD ERROR
- (23) FDC ERROR
- (24) TIMER INTERRUPT ERROR
- (25) RTC UPDATE ERROR

Procedure 2 Printer Port LED Check on Boot Mode

The printer port LED displays the IRT status and test status by turning lights on and off as an eight-digit binary value for boot mode. Figure 2-2 shows the printer port LED.

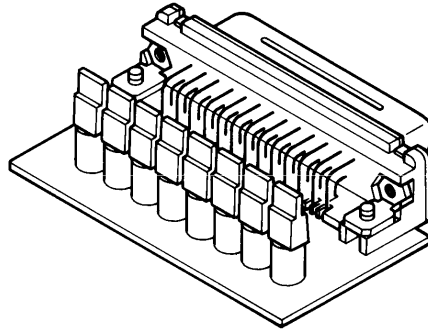


Figure 2-2 Printer port LED

To use the printer port LED follow the steps below:

1. Plug the printer port LED into the computer's parallel port.
2. Turn on the computer's power.
3. Read the LED status from left to right as you are facing the back of the computer.
4. Convert the status from binary to hexadecimal notation.
5. If the final LED status is FFh (normal status), go to Procedure 4.
6. If the final LED status matches any of the test status values in Table 2-3, perform Check 1.

NOTE: *If an error condition is detected by the IRT test, the printer port LED displays an error code after the IRT test ends. For example, when the printer port LED displays 1F and halts, the IRT test has already completed the Display initialization. In this instance, the IRT indicates an error has been detected during the system memory test.*

Table 2-3 Printer port LED boot mode status (1/5)

LED Status	Test item	Message
FFh	Start	Register initialization for boot block
B0h	Flash ROM check	PIT ch.0 initialization
		BIOS rewrite flag initialization
		Transition to protected mode
		Boot block checksum
		KBC initialization
		BIOS (runtime and IRT) checksum
B2h	KBC initialization (1)	KBC initialization
B3h	BIOS rewrite	BIOS rewrite request check
		Canceling power down of L2-cache
		Enabling CMOS access
		Port 25h unlock
00h	Special register initialization	Toshiba register initialization (1)
		Toshiba register initialization (2)
01h	Memory check	DRAM size check
		Memory structure configuration
		SM-RAM stack area test
05h	CMOS check and initialization ROM to RAM copy	Enabling cache
		CMOS access test
		CMOS checksum
		CMOS data initialization
		Set DRAM size
		Resume branch check
		CMOS error check
		Resume status check
		SM-RAM checksum
		System BIOS checksum
		Toshiba register initialization (3)
		Set SM-RAM base address
		Grant SMI
		KBC initialization

Table 2-3 Printer port LED boot mode status (2/5)

LED Status	Test item	Message
05h	CMOS check and initialization ROM to RAM copy	PIT initialization
		Start resume sequence
		Resume error process
		SM-RAM initialization
		ROM to RAM copy and enabling shadow RAM
		Toshiba register initialization (3)
06h	SMI initialization KBC initialization (2)	SM-RAM base rewrite
		Set SMI handler
		Grant SMI
		Estimate operation clock speed
		Grant all SMIs
		Measure for miscellaneous GA
		Date check for alarm power on
		Canceling HDD hardware reset
		Set COMS default configuration when CMOS error detected
		KBC initialization
03h	VGA initialization Sound initialization PIT initialization	VGA controller power off and reset control
		Sound controller initialization
		PIT test and initialization
04h	PIC initialization	PIC initialization
		PIC test
		CPU type discrimination
		Self-test control status initialization
02h	PCI initialization	PCI initialization
		Detection of VGA controller on ISA
71h	Set CMOS initialize register	Printer port wraparound connector detection
		CMOS data initialization for APM
		Set divider control register
		Set counter control register
		Set configuration number and sleep counter initialization

Table 2-3 Printer port LED boot mode status (3/5)

LED Status	Test item	Message
07h	PnP initialization	PnP initialization
73h	Desk station initialization	Initialization of NS Super I/O in desk station
72h	Get PnP information	PnP ISA card separation and get resource information
74h	Password initialization	Password initialization
76h	TSETUP	TSETUP hardware configuration
		Issuing power off grant command
		Set CPU speed
		Set speaker
		Set battery alarm
		Set panel close alarm
		Set panel power on/off
		PnP system resource configuration
79h	Serial port configuration	DMA PAGE REGISTER ERROR
	PC card configuration	Modem port configuration
	PnP automatic configuration	PC card initialization
		PnP automatic configuration
77h	EC and PSC configuration	Grant embedded controller SMI
		SLP_TYP setting
		Power supply microprocessor configuration
78h	PCI device initialization (1)	Ensure work area for automatic configuration
		Initialization of work area
		Create reserved resource map
81h	PCI device initialization (2)	Add reserved resource for primary display device to map
82h	PCI device initialization (3)	Add reserved variable resource to map
83h	PCI device initialization (4)	PCI automatic configuration
		Special process after PCI configuration

Table 2-3 Printer port LED boot mode status (4/5)

LED Status	Test item	Message
7Bh	HDD initialization FDD initialization	Printer port configuration
		HDD initialization
		Serial interrupt control
		FDD initialization
		Open closing PCI device
7Ch	BIOS RAM update	IRQ routing table update
		Copying parameter in IRT BIOS to runtime BIOS
7Ah	VGA initialization	Video card recognition and wait for VGA chip initialization
08h	Output code generation	Output code generation
09h	First 64 KB memory check	First 64 KB memory check
0Dh	System configuration	Store CMOS error information to SM-RAM
		Timer initialization
		Get version of embedded controller and PS microprocessor
		Set default value to embedded controller
		Toshiba special register initialization
		Grant SMI from docking port and Selectable Bay
19h	Display initialization	VGA BIOS initialization
	Selectable Bay lock check	Selectable Bay lock check
1Fh	Displaying logo	Displaying logo
20h	PnP configuration	PnP automatic configuration
		PnP ISA card isolation
		Search assignable resource and card configuration
21h	System memory check	System memory check
25h	Expansion memory check	Expansion memory check
30h	DMA page check	DMA page check
40h	DMAC check	DMAC check
41h	DMAC configuration	DMAC configuration
42h	Printer port check	Printer port check
70h	SIO check	SIO check
80h	NDP configuration	NDP configuration

Table 2-3 Printer port LED boot mode status (5/5)

LED Status	Test item	Message
A0h	Boot password	Boot password
C0h	External I/O check	External I/O check
A6h	BIOS information update	Set font address
		Set shadow RAM size
		Set expansion memory size to CMOS
		System resource update
		Set extended memory size to runtime BIOS for INT15h
		ACPI table update
		Set SCT area to runtime BIOS
		Set battery save mode
		Send date to PS microprocessor
		Close PCI device configuration area
		Protect system BIOS
		Cache control
FEh	System ROM check	System ROM check
FFh	End	

Check 1 If any of the following error codes display, go to Procedure 5.

B0h, B2h, B3h, 00h, 01h, 05h, 06h, 03h, 04h, 02h, 71h, 07h, 73h, 72h, 74h, 76h, 79h, 77h, 78h, 81h, 82h, 83h, 7Bh, 7Ch, 7Ah, 08h, 09h, 0Dh, 19h, 1Fh, 20h, 21h, 25h, 30h, 40h, 41h, 42h, 70h, 80h, A0h, C0h, A6h, FEh

Check 2 If error code 83h is displayed, go to the following sections:

Section 2.5. FDD Troubleshooting

Section 2.6. HDD Troubleshooting

Procedure 3 Printer Port LED Check on Resume Mode

The printer port LED displays the IRT status and test status by turning lights on and off as an eight-digit binary value for resume mode.

To use the printer port LED follow the steps below:

1. Make sure the computer is in resume mode.
2. Plug the printer port LED into the computer's parallel port.
3. Turn on the computer's power.
4. Read the LED status from left to right as you face the back of the computer.
5. Convert the status from binary to hexadecimal notation.
6. If the final LED status is FFh (normal status), go to Procedure 4.
7. If the final LED status matches any of the test status values in Table 2-4, perform Procedure 5.

Table 2-4 Printer port LED resume mode error status

Error status	Meaning of status
F1H	System BIOS RAM checksum error
F2H	External display card is connected.
F3H	HDD was installed.
F4H	SMRAM checksum error or memory error during suspend
F5H	Conventional memory checksum error
F6H	Video RAM checksum error
F7H	Extended memory checksum error
F8H	PnP RAM checksum error

Procedure 4 Diagnostic Test Program Execution Check

Execute the following tests from the Diagnostic Test Menu. Refer to Chapter 3, *Tests and Diagnostic*, for more information on how to perform these tests.

1. System test
2. Memory test
3. Keyboard test
4. Display test
5. Floppy Disk test
6. Printer test
7. ASYNC test
8. Hard Disk test
9. Real Timer test
10. NDP test
11. Expansion test
12. Sound test
13. CD-ROM test

If an error is detected during these tests, go to Procedure 5.

Procedure 5 Replacement Check

The system board may be damaged. Disassemble the computer following the steps described in Chapter 4, *Replacement Procedures* and replace the system board with a new one.

2.5 FDD Troubleshooting

This section describes how to determine if the FDD is functioning properly. Perform the steps below starting with Procedure 1 and continuing with the other procedures as required.

Procedure 1: FDD Head Cleaning Check

Procedure 2: Diagnostic Test Program Execution Check

Procedure 3: Connector Check and Replacement Check

Procedure 1 FDD Head Cleaning Check

FDD head cleaning is one option available in the Diagnostic Program. A detailed operation is given in Chapter 3, *Tests and Diagnostics*.

Insert the Diagnostics Disk in the computer's floppy disk drive, turn on the computer and run the test. Clean the FDD heads using the cleaning kit. If the FDD still does not function properly after cleaning, go to Procedure 3.

If the test program cannot be executed on the computer, go to Procedure 3.

Procedure 2 Diagnostic Test Program Execution Check

Insert the Diagnostics Disk in the FDD, turn on the computer and run the test. Refer to Chapter 3, *Tests and Diagnostics*, for more information about the diagnostics test procedures.

Floppy disk drive test error codes and their status names are listed in Table 2-5. Make sure the floppy disk is formatted correctly and that the write protect tab is disabled. If any other errors occur while executing the FDD diagnostics test, go to Check 1.

Table 2-5 FDD error code and status

Code	Status
01h	Bad command
02h	Address mark not found
03h	Write protected
04h	Record not found
06h	Media removed on dual attach card
08h	DMA overrun error
09h	DMA boundary error
10h	CRC error
20h	FDC error
40h	Seek error
60h	FDD not drive
80h	Time out error (Not ready)
EEh	Write buffer error
FFh	Data compare error

Check 1 If the following message displays, disable the write protect tab on the floppy disk. If any other message appears, perform Check 2.

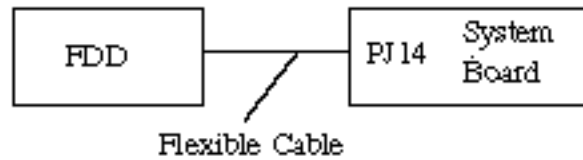
Write protected

Check 2 Make sure the floppy disk is formatted correctly. If it is, go to Procedure 3.

Procedure 3 Connector Check and Replacement Check

The 3.5inch FDD is connected to the System Board.

Check 1 Make sure the flexible cable are firmly connected to the system board.



If any of the connections are loose, reconnect firmly and repeat Procedure 2. If there is still an error, go to Check 2.

Check 2 The FDD or flexible cable may be defective or damaged. Replace it with a new one following the steps in Chapter 4, *Replacement Procedures*. If the FDD is still not functioning properly, perform Check 3.

Check 3 Replace the System board with a new one following the steps in Chapter 4.

2.6 HDD Troubleshooting

This section describes how to determine if the HDD is functioning properly. Perform the steps below starting with Procedure 1 and continuing with the other procedures as required.

Procedure 1: Message Check

Procedure 2: Partition Check

Procedure 3: Format Check

Procedure 4: Diagnostic Test Program Execution Check

Procedure 5: Connector Check and Replacement Check

CAUTION: *The contents of the hard disk will be erased when the HDD troubleshooting procedures are executed. Transfer the contents of the hard disk to floppy disks or other storage drive(s).*

Procedure 1 Message Check

When the computer's HDD does not function properly, some of the following error messages may appear on the display. Start with Check 1 below and perform the other checks as instructed.

Check 1 If any of the following messages appear, go to Procedure 5. If the following messages do not appear, perform Check 2.

HDC ERROR (After 5 seconds this message will disappear.)

or

HDD #0 ERROR (After 5 seconds this message will disappear.)

or

HDD #1 ERROR (After 5 seconds this message will disappear.)

Check 2 If either of the following messages appears, go to Procedure 2. If the following messages do not appear, perform Check 3.

Insert system disk in drive
Press any key when ready

or

Non-System disk or disk error
Replace and press any key

Check 3 Check TSETUP to see whether the Hard Disk option is set to Not used. If it is set to Not used, choose another setting and restart the computer. If the problem still exists, go to Procedure 2.

Procedure 2 Partition Check

Insert the Toshiba MS-DOS system disk and restart the computer. Perform the following checks:

- Check 1 Type **C:** and press **Enter**. If you cannot change to drive C, go to Check 2. If you can change to drive C, go to Check 3.
- Check 2 Type **FDISK** and press **Enter**. Choose Display Partition Information from the FDISK menu. If drive C is listed, go to Check 3. If drive C is not listed, return to the FDISK menu and choose the option to create a DOS partition on drive C. Restart the computer from the Toshiba MS-DOS system disk. If the problem still exists, go to Procedure 3.
- Check 3 If drive C is listed as active in the FDISK menu, go to Check 4. If drive C is not listed as active, return to the FDISK menu and choose the option to set the active partition for drive C. Restart the computer. If the problem still exists, go to Check 4.
- Check 4 Type **DIR C:** and press **Enter**. If the following message displays, go to Procedure 3. If contents of drive C are listed on the display, go to Check 5.

Invalid media type reading drive C
Abort, Retry, Fail?

- Check 5 Using the **SYS** command on the Toshiba MS-DOS system disk, install system files on the HDD.

If the following message appears on the display, the system files have been transferred to the HDD. Restart the computer. If the problem still exists, go to Procedure 3.

System transferred

Procedure 3 Format Check

The computer's HDD is formatted using the low level format program and the MS-DOS FORMAT program. To format the HDD, start with Check 1 below and perform the other steps as required.

- Check 1 Format the HDD and transfer system files using **FORMAT C:/S/U**. If the following message appears on the display, the HDD is formatted.

Format complete

If an error message appears on the display, refer to the Toshiba MS-DOS Manual for more information and perform Check 2.

- Check 2 Using the Diagnostic Disk, format the HDD with a low level format option. Refer to Chapter 3, *Tests and Diagnostics* for more information about the diagnostic program.

If the following message appears on the display, the HDD low level format is complete. Partition and format the HDD using the MS-DOS FORMAT command.

Format complete

If you cannot format the HDD using the Tests and Diagnostic program, go to Procedure 4.

Procedure 4 Diagnostic Test Program Execution Check

The HDD test program is stored in the Diagnostics Disk. Perform all of the HDD tests in the Hard Disk Drive Test. Refer to Chapter 3, *Tests and Diagnostics*, for more information about the HDD test program.

If an error is detected during the HDD test, an error code and status will display. The error codes and statuses are listed in Table 2-6. If an error code is not generated and the problem still exists, go to Procedure 5.

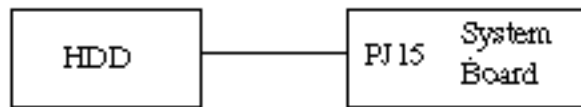
Table 2-6 Hard disk drive error code and status

Code	Status
01h	Bad command
02h	Bad address mark
04h	Record not found
05h	HDC not reset
07h	Drive not initialized
08h	HDC overrun (DRQ)
09h	DMA boundary error
0Ah	Bad sector error
0Bh	Bad track error
10h	ECC error
11h	ECC recover enable
20h	HDC error
40h	Seek error
80h	Time out error
AAh	Drive not ready
BBh	Undefined error
CCh	Write fault
E0h	Status error
EEh	Access time out error
DAh	No HDD

Procedure 5 Connector Check and Replacement Check

The HDD or system board may be disconnected or damaged. Disassemble the computer following the steps described in Chapter 4, *Replacement Procedures* and perform the following checks:

Check 1 Make sure the HDD is firmly connected to system board.



If any of the connections are loose, reconnect firmly and repeat Procedure 1. If there is still an error, go to Check 2.

Check 2 The HDD may be damaged. Replace it with a new one following the instructions in Chapter 4. If the problem still exists, perform Check 3.

Check 3 The system board may be damaged. Replace it with a new one following the instructions in Chapter 4.

2.7 Keyboard Troubleshooting

To determine if the computer's keyboard is functioning properly, perform the following procedures. Start with Procedure 1 and continue with the other procedures as instructed.

Procedure 1: External Keyboard Check

Procedure 2: Diagnostic Test Program Execution Check

Procedure 3: Connector and Replacement Check

Procedure 1 External Keyboard Check

Connect the PS/2 or compatible keyboard to the computer's PS/2 keyboard/mouse port then boot the computer. The computer automatically detects the external keyboard even if resume mode is enabled.

If the external keyboard works correctly, the internal keyboard may be damaged. Go to Procedure 3.

If the external keyboard appears to have the same problem as the internal keyboard, the system board may be damaged. Go to Procedure 2.

Procedure 2 Diagnostic Test Program Execution Check

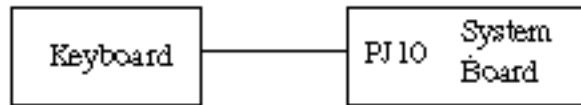
Execute the Keyboard Test in the Diagnostic Program. Refer to Chapter 3, *Tests and Diagnostics* for more information on how to perform the test program.

If an error occurs, go to Procedure 3. If an error does not occur, the keyboard is functioning properly.

Procedure 3 Connector and Replacement Check

The keyboard or system board may be disconnected or damaged. Disassemble the computer following the steps described in Chapter 4, *Replacement Procedures* and perform the following checks:

Check 1 Make sure the keyboard cable is firmly connected to the system board.



If the connection is loose, reconnect firmly and repeat Procedure 2. If there is still an error, go to Check 2.

Check 2 The keyboard may be damaged. Replace it with a new one following the instructions in Chapter 4. If the problem still exists, perform Check 3.

Check 3 The system board may be damaged. Replace it with a new one following the instructions in Chapter 4.

2.8 Display Troubleshooting

This section describes how to determine if the computer's display is functioning properly. Start with Procedure 1 and continue with the other procedures as instructed.

Procedure 1: Contrast Adjustment Check

Procedure 2: External Monitor Check

Procedure 3: Diagnostic Test Program Execution Check

Procedure 4: Connector and Replacement Check

Procedure 1 Contrast Adjustment Check (330CDS/320CDS only)

Adjust the contrast volume dial on the right side of the display panel. If the problem still exists, go to Procedure 2.

Procedure 2 External Monitor Check

Connect an external monitor to the computer's external monitor port, then boot the computer. The computer automatically detects the external monitor even if resume mode is enabled.

If the external monitor works correctly, the internal LCD may be damaged. Go to Procedure 4.

If the external monitor appears to have the same problem as the internal monitor, the system board may be damaged. Go to Procedure 3.

Procedure 3 Diagnostic Test Program Execution Check

The Display Test program is stored on the computer's Diagnostics disk. This program checks the display controller on the system board. Insert the Diagnostics disk in the computer's floppy disk drive, turn on the computer and run the test. Refer to Chapter 3, *Tests and Diagnostics* for details.

If an error is detected, go to Procedure 4. If an error is not detected, the display is functioning properly.

Procedure 4 Connector and Replacement Check

The FL, FL inverter board, LCD module, and system board are connected to display circuits. Any of these components may be damaged. Refer to Chapter 4, *Replacement Procedures*, for instructions on how to disassemble the computer and then perform the following checks:

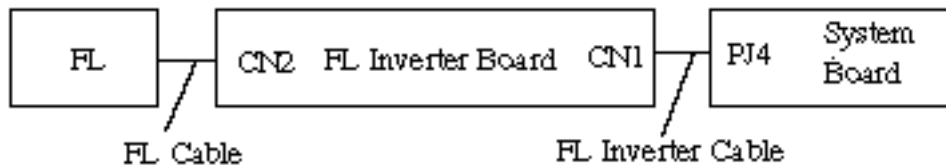
If the FL does not light, perform Check 1.

If characters or graphics are not displayed clearly, perform Check 3.

If some screen functions do not operate properly, perform Check3.

If the FL remains lit when the display is closed, perform Check4.

Check 1 Replace the FL with a new one and test the display again. If the problem still exists, perform Check2.



Check 2 Replace the FL inverter board with a new one and test display again. If the problem still exists, perform Check 3.

Check 3 Replace the LCD module with a new one and test display again. If the problem still exists, perform Check 4.

Check 4 Replace the display cable with a new one and test display again. If the problem still exists, perform Check 5.

Check 5 The system board may be damaged. Replace it with a new one.

2.9 CD-ROM Drive Troubleshooting

This section describes how to determine if the computer's internal CD-ROM drive is functioning properly. Perform the steps below starting with Procedure 1 and continue with the other procedures as required.

Procedure 1: CD Cleaning Check

Procedure 2: Diagnostic Test Program Execution Check

Procedure 3: Connector Check and Replacement Check

Procedure 1 CD Cleaning Check

1. Turn off the power to the computer.
2. Open the CD drawer by inserting a slender object such as a straightened paper clip into the eject hole. The object must be long enough to activate the eject mechanism.
3. Clean the laser pickup lens with a lens cleaner. Apply the cleaner to a cloth and wipe the lens.
4. If the CD-ROM drive still does not function properly after cleaning, go to Procedure 2.

Procedure 2 Diagnostic Test Program Execution Check

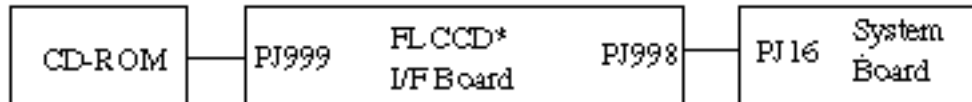
The CD-ROM drive Diagnostic test program is stored in the Diagnostics disk. Insert a test CD (Toshiba-EMI Test Disc TDY-03) into the CD-ROM drive. Insert the Diagnostics disk in the computer's floppy disk drive, turn on the computer and run the test. Refer to Chapter 3, *Tests and Diagnostics*, for more information about the diagnostics test procedures.

If any errors occur while executing the CD-ROM drive diagnostics test, go to Procedure 3.

Procedure 3 Connector Check and Replacement Check

The CD-ROM drive is connected to the system board and flexible cable. The cable may be disconnected from the system board or the flexible cable may be damaged. Disassemble the computer following the steps described in Chapter 4, *Replacement Procedures* and perform the following checks:

Check 1 Make sure the CD-ROM drive is firmly connected to the system board.



If any of the connections are loose, reconnect firmly and repeat Procedure 2. If there is still an error, go to Check 2.

Check 2 Replace the flexible cable with a new one following the steps in Chapter 4. If the CD-ROM drive is still not functioning properly, perform Check 3.

Check 3 The CD-ROM drive may be defective or damaged. Replace the drive with a new one following the steps in Chapter 4. If the CD-ROM drive is still not functioning properly, perform Check 4.

Check 4 Replace the system board with a new one following the steps in Chapter 4.

Chapter 3

Tests and Diagnostics

Chapter 3 Contents

3.1	The Diagnostic Test.....	3-1
3.2	Executing the Diagnostic Test.....	3-3
3.3	Subtest Names.....	3-7
3.4	System Test.....	3-9
3.5	Memory Test.....	3-10
3.6	Keyboard Test.....	3-12
3.7	Display Test.....	3-15
3.8	Floppy Disk Test	3-19
3.9	Printer Test.....	3-21
3.10	Async Test.....	3-23
3.11	Hard Disk Test	3-25
3.12	Real Timer Test.....	3-28
3.13	NDP Test	3-30
3.14	Expansion Test.....	3-31
3.15	Sound Test	3-32
3.16	CD-ROM Test.....	3-33
3.17	Error Code and Error Status Names.....	3-34
3.18	Hard Disk Test Detail Status.....	3-37
3.19	Hard Disk Format.....	3-39
	3.19.1 Function Description.....	3-40
	3.19.2 Operations	3-41
3.20	Head Cleaning	3-44
	3.20.1 Function Description.....	3-44
	3.20.2 Operations	3-44
3.21	Log Utilities.....	3-45
	3.21.1 Function Description.....	3-45
	3.21.2 Operations	3-45

3.22	Running Test	3-47
3.22.1	Function Description.....	3-47
3.22.2	Operations	3-47
3.23	Floppy Disk Drive Utilities.....	3-49
3.23.1	Function Description.....	3-49
3.23.2	Operations	3-50
3.24	System Configuration.....	3-54
3.24.1	Function Description.....	3-54
3.24.2	Operations	3-55
3.25	SETUP	3-56
3.25.1	Function Description.....	3-56
3.25.2	Accessing the SETUP Program.....	3-58

Tables

Table 3-1	Subtest names	3-7
Table 3-2	Error codes and error status names	3-34
Table 3-3	Hard disk controller status register contents.....	3-37
Table 3-4	Error register contents.....	3-38
Table 3-5	Hard disk formatting sequence.....	3-40

3.1 The Diagnostic Test

This chapter explains how to use the Diagnostic Test program to test the functions of the computer's hardware modules. The Diagnostics Program is stored on the Diagnostic Disk. The Diagnostic Test consists of 8 programs that are grouped into the Service Program Module (DIAGNOSTIC TEST MENU).

NOTES: *To start the diagnostics, follow these steps:*

- 1. Check all cables for loose connections.*
- 2. Exit any application you may be using and close Windows.*

The DIAGNOSTIC MENU consists of the following functions:

- ☐ DIAGNOSTIC TEST
- ☐ HARD DISK FORMAT
- ☐ HEAD CLEANING
- ☐ LOG UTILITIES
- ☐ RUNNING TEST
- ☐ FDD UTILITIES
- ☐ SYSTEM CONFIGURATION
- ☐ EXIT TO MS-DOS
- ☐ SETUP

The DIAGNOSTIC TEST MENU contains the following functional tests:

- ☐ SYSTEM TEST
- ☐ MEMORY TEST
- ☐ KEYBOARD TEST
- ☐ DISPLAY TEST
- ☐ FLOPPY DISK TEST
- ☐ PRINTER TEST
- ☐ ASYNC TEST
- ☐ HARD DISK TEST
- ☐ REAL TIMER TEST
- ☐ NDP TEST
- ☐ EXPANSION TEST
- ☐ SOUND TEST
- ☐ CD-ROM TEST

You will need the following equipment to perform some of the Diagnostic test programs.

- ☐ The Diagnostics Disk (all tests)
- ☐ A formatted working disk for the floppy disk drive test (all tests)
- ☐ A cleaning kit to clean the floppy disk drive heads (Head Cleaning)
- ☐ A cleaning kit to clean the CD-ROM drive heads (Head Cleaning)
- ☐ A PC card wraparound connector for the I/O card test (Expansion test) (Rev.B or higher)
- ☐ A printer wraparound connector for the printer wraparound test (Printer test)
- ☐ A CD test media (Toshiba-EMI test disk TDY-03 and music CD) and music CD (CD-ROM test)
- ☐ External CRT (All tests)
- ☐ PS/2 or compatible keyboard (Keyboard tests)
- ☐ PS/2 or compatible mouse (Keyboard test)
- ☐ Serial port wraparound connector (ASYNC test)
- ☐ Multimedia sound system with line-in and line-out ports (Sound test)
- ☐ Headphone (Sound test)
- ☐ A microphone
- ☐ USB test module and USB cable

The following sections detail the tests within the Diagnostic Test function of the DIAGNOSTIC TEST MENU. Refer to Sections 3.19 through 3.25 for detailed information on the remaining Service Program Module functions.

3.2 Executing the Diagnostic Test

Toshiba MS-DOS is required to run the DIAGNOSTICS PROGRAM. To start the DIAGNOSTIC PROGRAM, follow these steps:

1. Insert the Diagnostics disk in the floppy disk drive and turn on the computer. (The Diagnostics disk contains the MS-DOS boot files.)

NOTE: To execute the CD-ROM test, make sure the CD-ROM is installed in the CD-ROM drive.

The following menu will appear:

```
TOSHIBA personal computer   xxx DIAGNOSTICS
version X.XX (c) copyright TOSHIBA Corp. 19XX
```

```
DIAGNOSTICS  MENU :
```

```
1 - DIAGNOSTIC TEST
2 - HARD DISK FORMAT
3 -
4 - HEAD CLEANING
5 - LOG UTILITIES
6 - RUNNING TEST
7 - FDD UTILITIES
8 - SYSTEM CONFIGURATION
9 - EXIT TO MS-DOS
0 - SETUP
```

```
↑↓→← : Select items
Enter : Specify
Esc   : Exit
```

NOTE: To exit the DIAGNOSTIC TEST MENU, press the **Esc** key. If a test program is in progress, press **Ctrl + Break** to exit the test program, or press **Ctrl + C** to stop the test program.

2. To select the DIAGNOSTIC TEST option from the DIAGNOSTICS MENU, set the highlight bar to **1** and press **Enter**. The following DIAGNOSTIC TEST MENU will appear:

```
TOSHIBA personal computer    xxx DIAGNOSTICS
version X.XX (c) copyright TOSHIBA Corp. 19XX
DIAGNOSTIC TEST  MENU :
```

```
1 - SYSTEM TEST
2 - MEMORY TEST
3 - KEYBOARD TEST
4 - DISPLAY TEST
5 - FLOPPY DISK TEST
6 - PRINTER TEST
7 - ASYNC TEST
8 - HARD DISK TEST
9 - REAL TIMER TEST
10 - NDP TEST
11 - EXPANSION TEST
12 - SOUND TEST
13 - CD-ROM TEST
88 - ERROR RETRY COUNT SET [HDD & FDD]
99 - EXIT TO DIAGNOSTICS MENU
```

```
↑↓→←  :   Select items
Enter  :   Specify
Esc    :   Exit
```

Refer to Sections 3.4 through 3.16 for detailed descriptions of Diagnostic Tests 1 through 13. Function 88 sets the floppy disk drive and hard disk drive error retry count. Function 99 exits the submenus of the Diagnostic Test and returns to the Diagnostic Menu.

3. Select the option you want to execute and press **Enter**. The following message appears:

SYSTEM TEST XXXXXXXX

xxx DIAGNOSTIC TEST VX.XX
 [Ctrl]+[Break] ; test end
 [Ctrl]+[C] ; key stop

SUB-TEST : XX

PASS COUNT: XXXXX

ERROR COUNT: XXXXX

WRITE DATA: XX

READ DATA : XX

ADDRESS : XXXXXX

STATUS : XXX

SUB-TEST MENU :

01 - ROM checksum

02 -

03 -

04 - Fan ON/OFF

05 - Thermister check

06 - Quick charge

07 - DMI read

08 - DMI write

99 - Exit to DIAGNOSTIC TEST MENU

↑↓→←	:	Select items
Enter	:	Specify
Esc	:	Exit

NOTE: The menu displayed by your computer may be slightly different from the one shown above.

4. Select the desired subtest number from the subtest menu and press **Enter**. The following message will appear:

TEST LOOP : YES

ERROR STOP : YES

Use the arrow keys to move the cursor to the desired option and press **Enter**.

Selecting **YES** for **TEST LOOP** sets the test to run continuously until halted by the user. Selecting **NO** returns the subtest menu to the main menu after the test is complete.

Selecting **YES** for **ERROR STOP** stops the test program when an error is found and displays the operation guide on the right side of the display screen as shown below:

```
ERROR STATUS NAME    [  [ HALT OPERATION  ] ]  
  
                      1: Test end  
                      2: Continue  
                      3: Retry
```

These three selections have the following functions respectively:

1. Terminates the test program and exits to the subtest menu.
2. Continues the test.
3. Restarts the test from the error.

Selecting **NO** for **ERROR STOP** keeps the test running even if an error is found.

Table 3-1 in Section 3.3 lists the function of each test on the subtest menu. Table 3-2 in Section 3.17 lists the error codes and error status for each error.

3.3 Subtest Names

Table 3-1 lists the subtest names for each test program in the DIAGNOSTIC TEST MENU.

Table 3-1 Subtest names (1/2)

No.	Test Name	Subtest No.	Subtest Name
1	SYSTEM	01	ROM checksum
		04	Fan ON/OFF
		05	Thermister check
		06	Quick charge
		07	DMI read (Not used)
		08	DMI write (Not used)
2	MEMORY	01	RAM Constant data
		02	RAM Address pattern data
		03	RAM Refresh
		04	Protected mode
		05	Memory module
		06	Cache memory
		07	L2 Cache/TAG memory
		08	Stress test
3	KEYBOARD	01	Pressed key display
		02	Pressed key code display
		03	PS/2 Mouse connect check
		04	Pointing Stick
		05	USB test
4	DISPLAY	01	VRAM read/write for VGA
		02	Gradation for VGA
		03	Gradation for LCD
		04	Gradation & Mode test for VGA
		05	All dot on/off for LCD
		06	"H" pattern display
		07	LCD Brightness
		08	Check VRAM (Liner mode)
5	FDD	01	Sequential read
		02	Sequential read/write
		03	Random address/data
		04	Write specified address
		05	Read specified address

Table 3-1 Subtest names (2/2)

No.	Test Name	Subtest No.	Subtest Name
6	PRINTER	01	Ripple pattern
		02	Function
		03	Wraparound
7	ASYNCR	01	Wraparound board
		02	Point to point (send)
		03	Point to point (receive)
		04	Interrupt test
		05	FIR/SIR wraparound test
		06	FIR/SIR point to point (send)
		07	FIR/SIR point to point (receive)
8	HDD	01	Sequential read
		02	Address uniqueness
		03	Random address/data
		04	Cross talk & peak shift
		05	Write/read/compare (CE)
		06	Write specified address
		07	Read specified address
		08	ECC circuit
		09	Sequential write
		10	W-R-C specified address
9	REAL TIMER	01	Real time
		02	Backup memory
		03	Real time carry
10	NDP	01	NDP test
11	EXPANSION	01	PCMCIA wraparound
		03	RGB monitor ID
12	SOUND	01	CODEC (Recording/Playback)
		02	FM-Synthesizer
		03	SIN-Wave Playback
		04	CODEC (Line In/Out)
13	CD-ROM	01	Sequential read
		02	Read specified address
		03	Random address/data
		04	Playback Music

3.4 System Test

To execute the System Test select **1** from the DIAGNOSTIC TEST MENU, press **Enter** and follow the directions on the screen. Move the highlight bar to the subtest you want to execute and press **Enter**.

Subtest 01 ROM Checksum

This subtest executes a checksum test of the BIOS ROM on the system board.

Subtest 04 Fan On/Off

This subtest checks the fan operation using the on/off command.

The fan cable is connected to PJ1 on the system board. When you execute this subtest, the following message displays:

```
*** Fan ON ** * : Press [Enter] key?
```

When you press **Enter**, the fan should spin.

```
*** Fan OFF ** * : Press [Enter] key?
```

When you press **Enter**, the fan should stop.

Subtest 05 Thermister Check

This subtest reads the thermister connect check status of the power supply microprocessor, then compares it with the original data. If the data indicates the connector is open or shorted, it displays an error message.

Subtest 06 Quick Charge

This subtest determines whether the battery pack can be quick charged. Refer to the table listing the result codes in Chapter 2.

Subtest 07 DMI used

Reads the factory setting for the serial and DMI numbers.

Subtest 08 DMI write

Write to memory the factory setting for serial and DMI numbers, input from the keyboard.

3.5 Memory Test

To execute the Memory Test, select **2** from the DIAGNOSTIC TEST MENU, press **Enter** and follow the directions on the screen. Move the highlight bar to the subtest you want to execute and press **Enter**.

Subtest 01 RAM constant Data (real mode)

This subtest writes a 256-byte unit of constant data to conventional memory (0 to 640 KB). Then reads the new data and compares the result with the original data. The constant data is FFFFh, AAAAh, 5555h, 0101h, and 0000h.

Subtest 02 RAM address Pattern Data (real mode)

This subtest writes address pattern data created by the exclusive-ORing (XORing), to the address segment and address offset in conventional memory program end to 640 KB, then reads the new data and compares the result with the original data.

Subtest 03 Refresh (real mode)

This subtest writes a 256-byte unit of constant data to conventional memory (0 to 640 KB) then reads the new data and compares the result with the original data.

The constant data is AAAAh and 5555h.

NOTE: *There is a short delay between write and read operations, depending on the size of the data.*

Subtest 04 Protected Mode

NOTE: *The CONFIG.SYS file must be configured without expanded memory manager programs such as EMM386.EXE, EMM386.SYS or QEMM386.SYS. Also, the HIMEM.SYS must be deleted from the CONFIG.SYS file.*

This subtest writes constant data and address data to extended memory (maximum address 100000h) then reads the new data and compares the result with the original data.

The constant data is FFh, AAh, 55h, and 00h.

Subtest 05 Memory Module

NOTE: *To execute this subtest, an optional memory card must be installed in the computer.*

This subtest functions the same as subtest 04, except it is used for testing an optional memory card. Memory module capacity is 32, 64 and 128 MB.

After selecting subtest 05, the following message will appear:

```
Extended memory size
  (1:32 MB, 2:64 MB, 3:128 MB)?
```

Select the number that corresponds to the memory card installed in the computer.

Subtest 06 Cache Memory

To test the cache memory, a pass-through write-read comparison of '5A' data is run repeatedly to the test area ('7000':'Program' size to '7000':'7FFF' (32 KB)) to check the hit-miss ratio (on/off status) for CPU cache memory. One test takes 3 seconds.

Number of misses < Number of hits → OK

Number of misses ≥ Number of hits → Fail

Subtest 07 L2 Cache Memory

To test the L2 cache memory, a pass-through write-read comparison of '5A' data is run repeatedly to the test area ('7000':'Program' size to '7000':'7FFF' (32 KB)) to check the hit-miss ratio (on/off status) for L2 cache memory. One test takes 3 seconds.

Number of misses < Number of hits → OK

Number of misses ≥ Number of hits → Fail

Subtest 08 Stress test

This subtest reads a 15Kbyte unit of conventional memory (1MB to maximum MB), writes the data to memory and compares the read and write data.

3.6 Keyboard Test

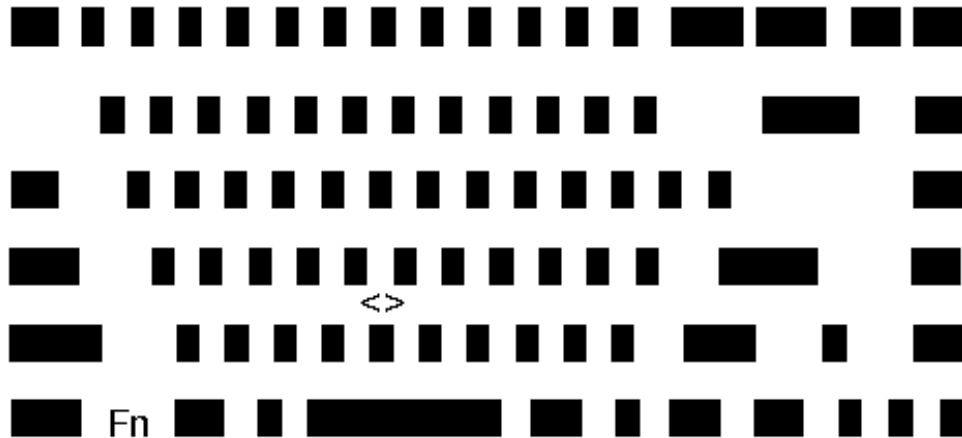
To execute the Keyboard Test, select **3** from the DIAGNOSTIC TEST MENU, press **Enter** and follow the directions on the screen. The Keyboard test contains four subtests that test the computer's keyboard, PS/2 mouse, and AccuPoint actions. Move the highlight bar to the subtest you want to execute and press **Enter**.

Subtest 01 Pressed Key Display (82/84)

***NOTE:** The **Num Lock** and the **Overlay** mode must be off to execute this subtest.*

When you execute this subtest, the keyboard layout is drawn on the display as shown below. When any key is pressed, the corresponding key on the screen changes to the key that was pressed. Holding a key down enables the auto-repeat function which causes the key's display character to blink.

[[[Press Key Display]]]



If test OK, Press [Del] [Enter] Key

Subtest 02 Pressed Key Code Display

When a key is pressed, the scan code, character code, and key top name displays on the screen in the format shown below. The **Ins**, **Caps Lock**, **Num Lock**, **Scroll Lock**, **Alt**, **Ctrl**, **Left Shift**, and **Right Shift** keys display in reverse screen mode when pressed. The scan codes, character codes, and key top names are shown in Appendix D.

```
KEYBOARD TEST IN PROGRESS 302000
```

```
Scan code  =
Character code  =
Keytop  =
```

```
Ins  Caps Lock  Num Lock  Scroll Lock
Alt  Ctrl  Left Shift  Right Shift
PRESS [Enter] KEY
```

Subtest 03 PS/2 Mouse Connect Check

NOTE: To execute the PS/2 mouse connect check, a PS/2 mouse must be connected to the computer before the power is turned on.

This subtest checks whether a PS/2 mouse is connected or not.

If this test does not detect an error, it returns to the subtest menu. If it detects an error, the following message appears:

```
KBD - MOUSE INTERFACE ERROR
```

```
[ [ HALT OPERATION ] ]
```

```
1: Test end
2: Continue
3: Retry
```

Subtest 04 Pointing Stick

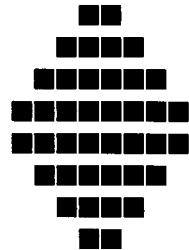
This subtest checks the functions of the pointing stick as shown below.

- A) IPS stick pressure sensing direction and parameter.
- B) IPS switch function check.

This test reports the pointing stick motion response from the IPS and IPS switch. When the stick is pressed towards the upper left, the <POINTING> display changes according to the following illustration. If an IPS switch is pressed, the <BUTTON> display alternates between black and white. The parameters appear on the right side of the display. If two IPS switches are pressed at the same time, the subtest menu displays.

***** IPS TEST PROGRAM (V1.00) *****

< POINTING >



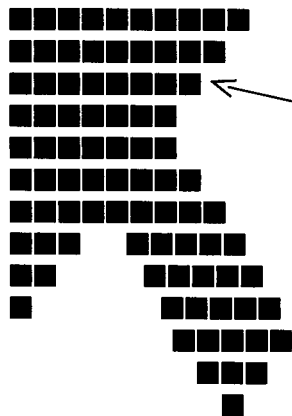
< PARAMETER >

STATUS:0008h
X-RATE:0000h
Y-RATE:0000h

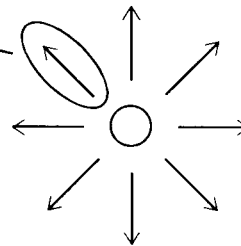
< BUTTON >



<< PRESS BUTTON1 + BUTTON2 THEN END >>



There are eight directions of arrow marks as shown below.



When a button is pressed, the display alternates as shown below.



Subtest 05 USB test

This subtest checks USB. The USB TEST Module (ZD0003P01) and USB Cable (ZD0003P02) must be connected to the computer.

If the test is completed successfully, OK is displayed. If nothing is displayed, there may be a problem with the USB port. Check the wraparound connection and repeat the test.

3.7 Display Test

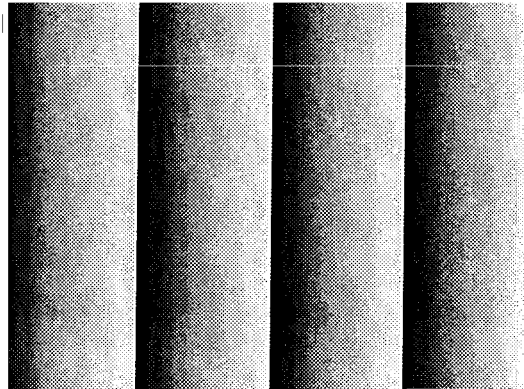
To execute the Display Test, select **4** from the DIAGNOSTIC TEST MENU, press **Enter** and follow the directions on the screen. The Display test contains eight subtests that test the display in various modes. Move the highlight bar to the subtest you want to execute and press **Enter**.

Subtest 01 VRAM Read/Write

This subtest writes constant data AAh and 55h and address data to video RAM (2MB: A0000h-AFFFFh). This data is then read from the video RAM and compared to the original data.

Subtest 02 Gradation for VGA

This subtest displays four colors: red, green, blue and white from left to right across the screen from black to maximum brightness. The display below appears on the screen when this subtest is executed.



To exit this subtest and return to the DISPLAY TEST menu, press **Ctrl + Break**.

Subtest 03 Gradation for LCD

This subtest displays eight colors: red, semi-red, green, semi-green, blue, semi-blue, white, and semi-white. Each color displays full screen for three seconds.

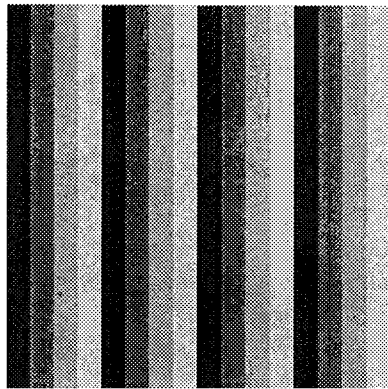
Subtest 04 Gradation & Mode test for VGA

This subtest displays gradations for each mode. Execute the test then press **Enter** to change the mode.

Resolution	Mode
800 x 600	3, 12, 13, 43, 52

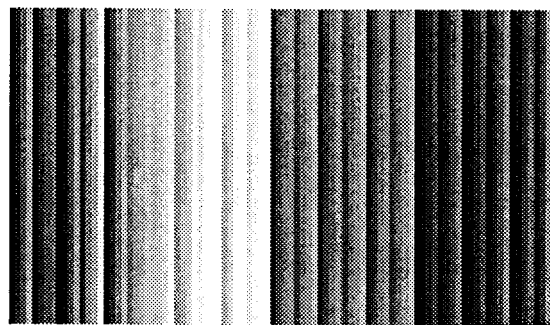
***NOTE:** Mode 52 test can test only an external monitor, it cannot be used for the internal LCD.*

The display below appears on the screen when this subtest is executed.



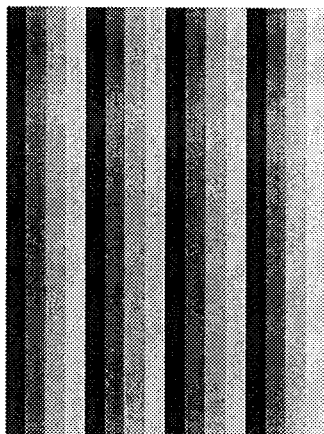
[Mode 12]

Pressing **Enter** changes the size of the displayed image.



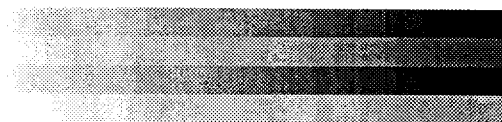
[Mode 13]

Pressing **Enter** changes the size of the displayed image.



[Mode 3]

Pressing **Enter** again changes the size of the displayed image.



To exit this subtest and return to the DISPLAY TEST menu, press **Ctrl + Break**.

Subtest 05 All Dot On /Off for LCD

This subtest displays an all-white screen (all dots on) for three seconds then an all-black screen (all dots off) for three seconds.

To exit this subtest and return to the DISPLAY TEST menu, press **Ctrl + Break**.

Subtest 06 “H” Pattern Display

This subtest displays a full screen of “H” patterns.

[illegible]

To exit this subtest and return to the DISPLAY TEST menu, press **Ctrl + Break**.

NOTE: The last row may not be completely filled. This condition does not indicate on error.

Subtest 07 LCD Brightness

The LCD brightness changes in the following order:

Super-Bright \longrightarrow Bright \longrightarrow Semi-Bright

Subtest 08 Check VRAM (Linear mode)

Set the Windows 95 display mode to 800x600, Mode32. Once set, a white dot will move throughout the screen.

3.8 Floppy Disk Test

NOTE: Before running the floppy disk test, prepare a formatted work disk. Remove the Diagnostics Disk and insert the work disk into the FDD. The contents of the floppy disk will be erased.

To execute the Floppy Disk Test, select **5** from the DIAGNOSTIC TEST MENU, press **Enter** and follow the directions displayed on the screen. The Floppy Disk test contains five subtests that test the FDD. The following messages will appear after selecting the Floppy Disk Test from the DIAGNOSTIC TEST MENU. Answer each question with an appropriate response to execute the test.

[FDD test parameters]

```

Test drive number      : FDD1
Media in drive#1 mode  : 2HD
Media mode             : 1.44MB
Media in drive#2 mode  :
Media mode             :
Test start track       : 00
↑↓→← :Select items, Enter :Finish, Esc :Exit,F5 :Set default

```

Select the test drive number, media type and the track of the floppy disk drive to be tested and press **Enter**.

```

Test drive number      FDD1
                      FDD2
                      FDD1&2
Media in drive#1 mode  2HD
                      2DD
Media mode             1.44MB
                      1.2MB(Not use without Japan.)
Media in drive#2 mode  2HD
                      2DD
Media mode             1.44MB
                      1.2MB(Not use without Japan.)
Test start track       00 to 79

```

The floppy disk test menu will appear after you select. Select the number of the subtest you want to execute and press **Enter**. The following message will appear during the floppy disk test.

Floppy Disk XXXXXXXX

```

xxx DIAGNOSTIC TEST VX.XX
[Ctrl]+[Break]   ; test end
[Ctrl]+[C]      ; key stop

```

Subtest 01 Sequential Read

This subtest performs a Cyclic Redundancy Check (CRC) that continuously reads all the tracks on a floppy disk. The following tracks are read according to the media type in the floppy disk drive:

Double-sided, double-density (2D): Tracks 0 to 39.

Double-sided, double-density, double-track (2DD) and double-sided, high-density, double-track (2HD): Tracks 0 to 79.

The start track is specified when the FDD test is started from the Diagnostic Test Menu. Refer to Step 3 at the beginning of this section to set the start track.

Subtest 02 Sequential Read/Write

This subtest continuously writes data pattern B5ADADh to all the specified tracks selected in subtest 01. The data is then read and compared to the original data.

Subtest 03 Random Address/Data

This subtest writes random data to random addresses on all tracks defined in subtest 01. The data is then read and compared to the original data.

Subtest 04 Write Specified Address

This subtest writes specified data to a specified track, head, and address.

Subtest 05 Read Specified Address

This subtest reads data from a specified track, head, and address.

3.9 Printer Test

To execute the Printer Test, select **6** from the DIAGNOSTIC TEST MENU, press **Enter** and follow the directions on the screen. The Printer Test contains three subtests that test the output of the printer connected to the computer. The following messages will appear after selecting the Printer Test. Answer each of the questions with an appropriate response to execute the test.

NOTE: An IBM compatible printer must be connected to the system to execute this test.

The following message will appear when the printer test is selected:

```
channel#1 = XXXXh
channel#2 = XXXXh
channel#3 = XXXXh
Select the channel number (1-3 ) ?
```

The printer I/O port address is specified by the XXXXh number. The computer supports three printer channels. Select the printer channel number and press **Enter** to execute the selected subtest.

Subtest 01 Ripple Pattern

This subtest prints characters for codes 20h through 7Eh line-by-line while shifting one character to the left at the beginning of each new line.

```
:"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
:"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
:"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
**,-./0123456789:;<=>?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
```


Subtest 02 Function

This subtest is for IBM compatible printers and tests the following functions:

Normal print
Double-width print
Compressed print
Emphasized print
Double-strike print
All characters print

This subtest prints the various print types shown below:

```
PRINTER TEST
1.  THIS LINE SHOWS NORMAL PRINT.
2.  THIS LINE SHOWS DOUBLE-WIDTH PRINT.
3.  THIS LINE SHOWS COMPRESSED PRINT.
4.  THIS LINE SHOWS EMPHASIZED PRINT.
5.  THIS LINE SHOWS DOUBLE-STRIKE PRINT.
6.  ALL CHARACTERS PRINT
   !"#$$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMN
   OPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
```

Subtest 03 Wraparound

NOTE: To execute this subtest, a parallel port wraparound connector must be connected to the computer's printer port. The connector's (34M741986G01) wiring diagram is shown in Appendix F.

This subtest checks the output and bi-directional modes of the data control and status lines through the parallel port wraparound connector.

3.10 Async Test

To execute the Async Test, select **7** from the DIAGNOSTIC TEST MENU, press **Enter** and follow the directions on the screen. The async test contains seven subtests that test the asynchronous communication functions. Move the highlight bar to the subtest you want to execute and press **Enter**.

The Subtests require the following data format:

Method:	Asynchronous
Speed:	9600BPS (Subtests 01 to 04) 38400BPS (Subtests 06 to 07)
Data:	8 bits and one parity bit (EVEN)
Data pattern:	20h to 7Eh

The following message will appear at the bottom of the screen when subtests 01, 02, 03, 05, 06, and 07 are selected:

```
Channel#1 = XXXXh
Channel#2 = XXXXh
Channel#3 = XXXXh
Select the Channel number (1/2/3)
```

The serial I/O port address is specified by the XXXXh number. Select the serial port channel number and press **Enter** to start the subtest.

Subtest 01 Wraparound (board)

NOTE: To execute this subtest an RS-232C wraparound connector (34M741621G01) must be connected to the RS-232C port. The RS-232C wraparound connector wiring diagram is described in Appendix F..

This subtest checks the data send/receive function through the wraparound connector.

Subtest 02 Point to Point (Send)

NOTE: To execute this subtest, two machines must be connected with an RS-232-C direct cable. One machine should be set as “send” (subtest 02) and the other set as “receive” (subtest 03). The wiring diagram for the RS-232-C direct cable is shown in Appendix F.

This subtest sends 20h through 7Eh data to the receive side, then receives the sent data and compares it to the original data.

Subtest 03 Point to Point (Receive)

This subtest is used with subtest 02 described above. This subtest receives the data from the send side, then sends the received data.

Subtest 04 Interrupt Test

This subtest checks the Interrupt Request Level of IRQ 4, 3 and 5 from the send side.

Subtest 06 FIR/SIR Point to Point (Send)

NOTE: To execute subtests 06 and 07, each computer must have access to the other computer's infrared port.

This subtest sends 20h through 7Eh data to the receive side, then receives the sent data and compares it to the original data through the SIR port.

Subtest 07 FIR/SIR Point to Point (Receive)

This subtest is used with subtest 06 described above. This subtest receives the data from the send side, then sends the received data through the SIR port.

NOTE: Select subtest numbers, 06 and 07.
The following message will appear:
Select the UIRCC mode (1:FIR /2:SIR)?
1: FIR mode
2: SIR mode

3.11 Hard Disk Test

To execute the Hard Disk Test, select **8** from the DIAGNOSTIC TEST MENU, press **Enter**, and follow the directions on the screen. The hard disk test contains ten subtests that test the hard disk drive functions.

NOTE: *The contents of the hard disk will be erased when subtest 02, 03, 04, 05, 06, 08, 09, or 10 is executed. Before running the test, the customer should transfer the contents of the hard disk to floppy disk. If the customer has not or cannot perform the back-up, create back-up disks as described below.*

Check to see if the Microsoft Create System Disks Tools (MSCSD.EXE) still exists in the System Tools Folder. (This tool can be used only once.) If it exists, use it to back up the pre-installed software, then use the Backup utility in the System Tools folder to back up the entire disk, including the user's files.

Refer to the operating system instructions.

The following messages will appear after selecting the hard disk test from the DIAGNOSTIC TEST MENU. Answer each of the questions with an appropriate response to execute the test:

```
[HDD test parameters]
  Test drive number      :#1
  HDC F/W error retry    :yes
  Data compare error dump :no
  Detail status display  :no
↑↓→←:Select items, Enter: Finish, Esc:Exit,F5:Set default
```

1. Select the hard disk drive number to be tested:

```
Test drive number      #1
                      #2
                      #1&#2
```

2. This message is used to select the retry operation when the hard disk controller detects an error. Select **yes** or **no**.

```
HDC F/W error retry    yes
                      no
```

3. This message is used to select the error dump operation when a data compare error is detected. Select **yes** or **no**:

```
Data compare error dump  yes
                      no
```

4. This message is used to select whether or not the HDD status is displayed on the screen. The HDD status is described in section 3.18. Select **yes** or **no**:

```
Detail status display      yes
                           no
```

5. This message is used to select whether or not the HDD status is displayed on the screen. The HDD status is described in section 3.18. Select **1** or **2** and press **Enter**.
6. The Hard Disk Test message will appear after you respond to the Detail Status prompt. Select the number of the subtest you want to execute and press **Enter**. The following message will appear during each subtest.

```
HARD DISK  TEST      XXXXXXXX

SUB-TEST : XX
PASS COUNT:  XXXXX  ERROR COUNT: XXXXX
WRITE DATA:  XX  READ DATA : XX
ADDRESS : XXXXXXXX STATUS  : XXX
```

The first three digits of the ADDRESS indicate which cylinder is being tested, the fourth digit indicates the head and the last two digits indicate the sector.

The first digit of the STATUS number indicates the drive being tested and the last two digits indicate the error status code as explained in Table 3-2.

Subtest 01 Sequential Read

This subtest is a sequential reading of all the tracks on the HDD starting at track 0. When all the tracks on the HDD have been read, the test starts at the maximum track and reads the tracks on the HDD sequentially back to track 0.

Subtest 02 Address Uniqueness

This subtest writes unique address data to each sector of the HDD track-by-track. The data written to each sector is then read and compared with the original data. There are three ways the HDD can be read:

- Forward sequential
- Reverse sequential
- Random

Subtest 03 Random Address/Data

This subtest writes random data to random addresses on the HDD cylinder, head and sector. This data is then read and compared to the original data.

Subtest 04 Cross Talk & Peak Shift

This subtest writes eight types of worst pattern data (listed below) to a cylinder, then reads the data while moving from cylinder to cylinder.

Worst pattern data	Cylinder
'B5ADAD'	0 cylinder
'4A5252'	1 cylinder
'EB6DB6'	2 cylinder
'149249'	3 cylinder
'63B63B'	4 cylinder
'9C49C4'	5 cylinder
'2DB6DB'	6 cylinder
'D24924'	7 cylinder

Subtest 05 Write/Read/Compare (CE)

This subtest writes B5ADADh worst pattern data to the CE cylinder on the HDD, then reads the data from the CE cylinder and compares it with the original data.

Subtest 06 Write Specified Address

This subtest writes specified data to a specified cylinder and head on the HDD.

Subtest 07 Read Specified Address

This subtest reads data which has been written to a specified cylinder and head on the HDD.

Subtest 08 ECC Circuit

This subtest checks the Error Check and Correction (ECC) circuit functions of the specified cylinder and head on the HDD.

Subtest 09 Sequential Write

This subtest writes specified 2-byte data to all of the cylinders on the HDD.

Subtest 10 W-R-C Specified Address

This subtest writes data to a specified cylinder and head on the HDD, then reads the data and compares it to the original data.

3.12 Real Timer Test

To execute the Real Timer Test, select **9** from the DIAGNOSTIC TEST MENU, press **Enter** and follow the directions on the screen. The real timer test contains three subtests that test the computer's real timer functions. Move the highlight bar to the subtest you want to execute and press **Enter**.

Subtest 01 Real Time

A new date and time can be input during this subtest. To execute the real time subtest follow these steps:

1. Select subtest 01 and the following message will appear:

```
Current date : XX-XX-XXXX
```

```
Current time : XX:XX:XX
```

```
Enter new date:
```

```
PRESS [ENTER] KEY TO EXIT TEST
```

2. If the current date is not correct, input the correct date at the "Enter new date" prompt and press **Enter**. The following prompt will appear:

```
Enter new time :
```

3. If the current time is not correct, input the correct time in 24-hour format.

Pressing **Enter** toggles between the time and the date. To exit, press **Ctrl + Break**.

Subtest 02 Backup Memory

This subtest performs the following backup memory check:

```
Writes 1-bit of "on" data to address 01h through 80h
```

```
Writes 1-bit of "off" data to address 0Eh through 80h
```

```
Writes the data pattern AAh and 55h to the RTC 114-byte memory  
(address 0Eh to 7Fh)
```

The subtest then reads and compares this data with the original data.

To exit, press **Ctrl + Break**.

Subtest 03 Real Time Carry

CAUTION: *When this subtest is executed, the current date and time are erased.*

This subtest checks the real time clock increments, making sure the date and time are displayed in the following format:

```
Current date   : 12-31-19 95
Current time   : 23:59:58
```

Pressing **Enter** displays the following

```
Current date   : 01-01-1996
Current time   : 00:00:00
```

PRESS [Enter] KEY TO EXIT TEST

Press **Ctrl + Break** to exit.

3.13 NDP Test

To execute the NDP test, select **10** from the DIAGNOSTICS TEST MENU, press **Enter** and follow the directions on the screen. The NDP test contains one subtest that tests the computer's NDP functions.

Subtest 01 NDP

This test checks the following functions of the coprocessor:

- ☐ Control word
- ☐ Status word
- ☐ Bus
- ☐ Addition
- ☐ Multiplication

Press **Ctrl + Break** to exit.

3.14 Expansion Test

To execute the expansion test, select **11** from the DIAGNOSTICS TEST MENU, press **Enter** and follow the directions on the screen. The expansion test contains two subtests.

NOTES 1: To execute this subtest, the PC card wraparound connector is required.
2: Do not use subtests 02 through 05.

Subtest 01 PCMCIA Wraparound (Main point to point (Receive))

This test checks the following signal line of the PC card slot:

- ☐ Address line
- ☐ REG#, CE#1, CE#2 line
- ☐ Data line
- ☐ Speaker line
- ☐ Wait line
- ☐ BSY#, BVD1 line

This subtest is executed in the following order:

Sub#	Address	Good	Bad	Contents
01	00001 00001	nn nn	xx xx	Address line REG#, CE#1, CE#2 nn=A0, 90, 80, 00
02	00002	ww	rr	Data line ww=write data, rr=read data
03	00003	—	—	Speaker line
04	00004	40,80	xx	Wait line (40<xx<80)
05	00005	nn	xx	Other lines (BSY#, BVD1) NN=21, 00

Subtest 03 RGB monitor ID test

Connect a Wraparound Board to the external monitor port to test the RGB monitor ID.

3.15 Sound Test

To execute the sound test, select **12** from the DIAGNOSTICS TEST MENU, press **Enter** and follow the directions on the screen. The sound test contains four subtests that test the computer's sound functions.

NOTE: *To execute this subtest, the internal microphone and internal headphone (or internal speaker) are required. The system is capable of producing high volume sound, so when you use the headphones be careful to set the volume low and adjust it as necessary. Using the headphones at full volume could damage your ears.*

Subtest 01 CODEC (REC/PLAY)

Test the functions of the Codec (AD1848) A/D, D/A converter. Test the microphone terminals and headphone terminals at the same time. When you execute this subtest the following message displays.

```
[Quick REC & PLAY for AD1848]
Press any key to *** REC ***
```

After pressing any key, start recording and immediately play the sound. (It takes three seconds.)

Subtest 02 FM Synthesizer

Test the OPL3 (YMF262) functions. Connect the headphone and check the scale on the right and left sides. Also check the sound adjustment volume.

Subtest 03 SIN Wave Playback

This subtest expands the sine wave data table to 64KB and creates sine wave data. The play data is transferred between DMA and CODEC, and plays the sound. (It is a long beep.) Also, using the oscilloscope, observe the sine waveform.

Subtest 04 Codec Line In/Out (record sound/replay)

Load the file AD1848L.COM. Connect a sound source such as a CD player or stereo to the line-in port. Connect an output device such as an amplifier for the internal speaker or a radio/cassette player to the line-out port.

After making the connections, a dialogue box will display. Press **Enter** to play a recorded sound. About three seconds after the recorded sound is played, the dialogue box will display again.

3.16 CD-ROM Test

To execute the CD-ROM test, select **13** from the DIAGNOSTICS TEST MENU, press **Enter** and follow the directions on the screen. The CD-ROM test contains four subtests that test the computer's CD-ROM functions.

NOTE: Make sure the CD-ROM driver (CDROMDRV.COM) is installed and insert the test media CD (Toshiba-EMI Test Disk TDY-03).

Subtest 01 Sequential Read

This subtest is a sequential reading of one block units (2K bytes) of all the logical addresses.

Subtest 02 Read Specified Address

This subtest reads one-block data from a specified address.

Subtest 03 Random Address/Data

This subtest reads one-block data and multi-block data from random addresses 200 times.

Subtest 04 Playback Music

NOTE: The Toshiba-EMI Test Disk TDY-03 cannot be used for Subtest 04. For this test, use an ordinary music CD.

This subtest reads track data from a specified track and plays the sound.

3.17 Error Code and Error Status Names

Table 3-2 lists the error codes and error status names for the Diagnostic Test.

Table 3-2 Error codes and error status names (1/3)

Device name	Error code	Error status name
(Common)	FF	Data Compare Error
System	01 02 03	ROM Checksum Error Location ID error Serial ID Write error
Memory	01 02 14 DD DE DF	Parity Error Protected Mode Not Changed Memory Read/Write Error Cache Memory Error 2nd Cache Error TAG-RAM Error
FDD	01 02 03 04 06 08 09 10 20 40 60 80 EE	Bad Command Address Mark Not Found Write Protected Record Not Found Media Removed DMA Overrun Error DMA Boundary Error CRC Error FDC Error Seek Error Not Drive Error Time Out Error Write Buffer Error
Printer	01 08 10 20 40 80	Time Out Fault Select Line Out Of Paper Power Off Busy Line

Table 3-2 Error codes and error status names (2/3)

Device name	Error code	Error status name
ASYNC	01	[DSR On] Time Out
	02	[CTS On] Time Out
	04	[RX READY] Time Out
	08	[TX FULL] Time Out
	10	Parity Error
	20	Framing Error
	40	Overrun Error
	50	Underrun error
	60	Timer time out error
	70	CRC error
	80	Line Status Error
HDD	01	Bad Command Error
	02	Address Mark Not Found
	04	Record Not Found
	05	HDC Not Reset Error
	07	Drive Not Initialized
	08	HDC Overrun (DRQ)
	09	DMA Boundary Error
	0A	Bad Sector
	0B	Bad Track Error
	10	ECC Error
	11	ECC Recover Enable
	20	HDC Error
	40	Seek Error
	80	Time Out Error
	AA	Drive Not Ready
	BB	Undefined Error
	CC	Write Fault
	EO	Status Error
	EE	Access Time Out Error
	DA	No HDD
NDP	01	No Co-Processor
	02	Control Word Error
	03	Status Word Error
	04	Bus Error
	05	Addition Error
	06	Multiply Error

Table 3-2 Error codes and error status names (3/3)

Device name	Error code	Error status name
PCMCIA	C1	Address Line Error
	C2	REG# Line Error
	C3	CE#1 Line Error
	C4	CE#2 Line Error
	C5	DATA Line Error
	C6	WAIT Line Error
	C7	BSY# Line Error
	C8	BVD1 Line Error
	CB	ZV Port Error
	CD	No PCMCIA
CD-ROM	01	Bad Command
	02	Illegal Length
	03	Unit Attention
	04	Media Change Request
	05	Media Detected
	06	Additional Sense
	09	Boundary Error
	11	Corrected Data Error
	20	Drive Not Ready
	40	Seek Error
	80	Time Out
	90	Reset Error
	B0	Address Error

3.18 Hard Disk Test Detail Status

When an error occurs in the hard disk test, the following message displays:

HDC status = XXXXXXXX

Detailed information about the hard disk test error displays on the screen by an eight-digit number. The first four digits represent the hard disk controller (HDC) error status number and the last four digits are not used.

The hard disk controller error status is composed of two bytes; the first byte displays the contents of the HDC status register in hexadecimal form and the second byte displays the HDC error register.

The contents of the HDC status register and error register are listed in Tables 3-3 and 3-4.

Table 3-3 Hard disk controller status register contents

Bit	Name	Description
7	BSY (Busy)	"0" HDC is ready. "1" HDC is busy.
6	DRDY (Drive ready)	"0" Hard disk drive is not ready to accept any command. "1" Hard disk drive is ready.
5	DWF (Drive write fault)	"0" DWF error is not detected. "1" Write fault condition occurred.
4	DSC (Drive seek complete)	"0" The hard disk drive heads are not settled over a track. "1" The hard disk drive heads are settled over a track.
3	DRQ (Data request)	"0" Drive is not ready for data transfer. "1" Drive is ready for data transfer.
2	CORR (Corrected data)	"0" Not used "1" Correctable data error is corrected.
1	IDX (Index)	"0" Not used "1" Index is sensed.
0	ERR Error	"0" Normal "1" The previous command was terminated with an error.

Table 3-4 Error register contents

Bit	Name	Description
7	BBK1 (Bad block mark)	"0" Not used "1" A bad block mark is detected.
6	UNC (Uncorrectable)	"0" There is no uncorrectable data error. "1" Uncorrectable data error has been detected.
5	—	Not used
4	IDNF (Identification)	"0" Not used "1" There was no ID field in the requested sector.
3	—	Not used
2	ABRT (Abort)	"0" Not used "1" Illegal command error or a drive status error occurred.
1	TK00 (Track 0)	"0" The hard disk found track 0 during a recalibrate command. "1" The hard disk could not find track 0 during a recalibrate command.
0	—	Not used.

3.19 Hard Disk Format

This command executes hard disk formatting. There are two types of hard-disk formatting:

- ☐ Low-level (physical) formatting
- ☐ MS-DOS (logical) formatting

The hard disk format function performs a low-level format of the hard disk and executes the following hard disk formats and check:

1. All track FORMAT
2. Good track FORMAT
3. Bad track FORMAT
4. Bad track CHECK

NOTE: *The contents of the hard disk will be erased when the program executes. Before running the test, the customer should transfer the contents of the hard disk onto a floppy disk. If the customer has not or cannot perform the backup, create backup disks as described below.*

Check to see if the Microsoft Create System Disks Tools (MSCSD.EXE) still exists in the System Tools Folder. (This tool can be used only once.) If it exists, use it to back up the preinstalled software, then use the Backup utility in the System Tools folder to back up the entire disk, including the user's files.

Refer to the operating system instructions.

3.19.1 Function Description

1. All Track FORMAT

This option performs a low-level format of all the tracks on the hard disk as listed in Table 3-5 below:

NOTE: Before executing the all track format option, check for bad tracks using the Bad Track CHECK option or display a list of bad tracks on the HDD.

Table 3-5 Hard disk formatting sequence

Items	Toshiba MK4006MAV
Storage capacity Formatted (Bytes)	4,099,866,624
Cylinders	7,944
Heads	16
Sectors	63
Bytes per sector	512
Rotation speed (rpm)	4,200
Recording method	16-17 EPR

2. Good Track FORMAT

This option formats a specified cylinder and track as a good track. If a good track is formatted as a bad track, use this option to change the track to a good track.

3. Bad Track FORMAT

This option formats a specified cylinder and track as a bad track. If a bad track is detected, use this option to label it as a bad track.

4. Bad Track CHECK

This option searches the hard disk for bad tracks by reading data to all the tracks on the hard disk. A list of bad tracks displays when the program is complete. If an error other than a bad track is detected, the program is automatically terminated.

3.19.2 Operations

NOTE: After the HDD has been formatted, execute the Toshiba MS-DOS FDISK command to partition the HDD. Execute the Toshiba MS-DOS FORMAT command. Refer to the Toshiba MS-DOS manual for more information about using these commands.

Selecting TEST 2 and pressing **Enter** in the DIAGNOSTIC MENU, displays the following messages:

```
DIAGNOSTICS - HARD DISK   FORMAT : VX.XX
```

```
1 - All track FORMAT
2 - Good track FORMAT
3 - Bad track FORMAT
4 - Bad track CHECK
9 - Go to TEST MENU
```

```
↑↓→← : Select items, Enter: Finish, Esc: Exit
```

1. All Track FORMAT

Pressing 1 selects All track FORMAT, which lets you format the entire disk.

```
[All track FORMAT]
```

```
Drive:      #1 = HDD      #2 = Non
Cylinder    :   XXXX
Head:       XX
Sector:     XX
```

```
<<< Model name =      >>>
```

The following selections also appear at the bottom of the screen in succession:

```
Drive number select (1 :#1,2:#2) ?
```

- (a) Select a drive number and press **Enter**. The following message will appear:

```
Interleave number (1/1 ~ 8 ) ?
```

- (b) Select an interleave number, 1 ~ 8 and press **Enter**. Pressing only **Enter** selects 1.

(c) Bad track register

The Bad Track register prompt will appear as shown below. Enter the cylinder and head numbers of bad tracks and press **Enter**. Note that if there are no bad tracks, pressing **Enter** alone is the same as executing All Track Format described in item (d) below.

```
[ WARNING:  Current DISK data will be
            completely destroyed ]
```

```
Press Bad cylinder number (  dddd) ] key ?
Press Bad head number (  dd) ] key ?
```

Enter the cylinder and head number in the format above in decimal notation. Repeat for each bad track you want to format.

After entering the bad tracks, press **Enter** to execute the format.

(d) All track format

All tracks are formatted as good tracks except those registered as bad tracks in item (c) above or those identified as bad tracks in track verification described in item (e) below.

(e) Track verification

A check is made of all tracks and if an ECC error, ECC-correctable-data error or record-not-found error is detected at a track, that track is formatted as a bad track automatically.

2. Good Track FORMAT

If a good track has been erroneously formatted as a bad track, you can use this subtest to reformat the track as a good track. To format a track as a good track, enter the number for the drive, interleave, cylinder and head as indicated in the screen prompt shown below.

```
Drive number select (1 :#1, 2:#2) ?
Interleave number (1 / 1 - 8 ) ?
Press [Cylinder number (  dddd) ] ?
Press [Head number (  dd) ] ?
```

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

3. Bad Track FORMAT

To format a track as a bad track, enter the number for the drive, interleave, cylinder and head as indicated in the screen prompt shown below.

```
Drive number select (1 :#1, 2:#2) ?  
Interleave number (1 / 1 - 8 ) ?  
Press [Cylinder number ( dddd) ] ?  
Press [Head number ( dd) ] ?
```

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

4. Bad Track CHECK

This subtest reads the entire disk and displays a list of bad tracks. The test is terminated in case of a bad track check error. To initiate the subtest enter the drive number at the prompt shown below.

```
Drive number select (1 :#1, 2:#2) ?  
  
Bad tracks will be displayed in the format shown below.  
  
[[cylinder, head = 0123 03]]
```

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

3.20 Head Cleaning

3.20.1 Function Description

This function cleans the heads in the FDD by executing a series of head load/seek and read operations. A cleaning kit is necessary to perform this program.

3.20.2 Operations

1. Selecting test **4** from the DIAGNOSTIC MENU and pressing **Enter** displays the following messages:

```
DIAGNOSTICS - FLOPPY DISK HEAD    CLEANING : VX.XX
```

```
Mount cleaning disk(s) on drive(s).
```

```
Press any key when ready.
```

2. Remove the Diagnostics Disk from the FDD, then insert the cleaning disk and press **Enter**.
3. When the `cleaning start` message appears, the FDD head cleaning has begun.
4. The display automatically returns to the DIAGNOSTIC MENU when the program is completed.

3.21 Log Utilities

3.21.1 Function Description

This function logs error information generated while a test is in progress and stores the results in RAM. This function can store data on a floppy disk or output the data to a printer. If the power switch is turned off, the error information will be lost. The error information displays in the following order:

- 1. Error count (CNT)
- 2. Test name (TS-NAME)
- 3. Subtest number (TS-NAME)
- 4. Pass count (PASS)
- 5. Error status (STS)
- 6. FDD/HDD or memory address (ADDR)
- 7. Write data (WD)
- 8. Read data (RD)
- 9. HDC status (HSTS)
- 10. Error status name (ERROR STATUS NAME)

3.21.2 Operations

Selecting **5** and pressing **Enter** in the DIAGNOSTIC MENU logs error information into RAM or onto a floppy disk. The error information displays in the following format:

XXXXX ERRORS									
CNT	TS-NAME	PASS	STS	ADDR	WD	RD	HSTS	[STATUS NAME]	
001	FDD	02	0000	103	00001	00	00	0000	FDD - WRITE PROTECTED
001	FDD	01	0000	180	00001	00	00	0000	FDD - TIME OUT ERROR
Test name		Subtest number		Pass count		Error status		Address	
Error count						Write data		Read data	
								HDC status	

2. The error information displayed on the screen can be manipulated by the following number keys:

The **1** key scrolls the display to the next page.

The **2** key scrolls the display to the previous page.

The **3** key returns to the Diagnostic Menu.

The **4** key erases all error log information in RAM.

The **5** key outputs the error log information to a printer.

The **6** key reads the log information from a floppy disk.

The **7** key writes the log information to a floppy disk.

3. In the case of “error retry OK,” a capital “R” will be placed at the beginning of the error status. However, it is not added to the error count.

3.22 Running Test

3.22.1 Function Description

This function automatically executes the following tests in sequence:

1. System test (subtest 01)
2. Memory test (subtests 01, 02, 04, and 06)
3. Display test (subtest 01)
4. FDD test (subtest 01)
5. HDD test (subtests 01 and 05)
6. Real timer test (subtest 02)
7. Printer test (subtest 03) if selected
8. Async test (subtest 01) if selected

The system automatically detects the number of floppy disk drives connected to the computer for the FDD test.

3.22.2 Operations

NOTE: Do not forget to load a work disk in the FDD. If a work disk is not loaded, an error will be generated during the FDD testing.

1. Remove the diagnostics disk from the floppy disk drive and insert the work disk.
2. Select **6** from the Diagnostic Menu and press **Enter**, the following message displays:

Printer wrap around test (Y/N) ?

Selecting **Y (yes)** executes the printer wraparound test. A printer wraparound connector must be connected to the parallel port of the computer to properly execute this test.

3. Select **Y** or **N** and press **Enter**. The following message will appear:

Serial #A wrap around test (Y/N) ?

Selecting **Y (yes)** executes the ASYNC wraparound test. An RS-232-C wraparound connector must be connected to the serial port of the computer to properly execute this test.

4. Select **Yes** or **No** and press **Enter**. The following message will appear :

```
Mount the work disk(s) on the drive(s),  
then press [Enter] key.  
[Warning : The contents of the disk(s),  
will be destroyed.]
```

5. This program is executed continuously. To terminate the program, press **Ctrl + Break**.

3.23 Floppy Disk Drive Utilities

3.23.1 Function Description

This function formats the FDD, copies the floppy disk and displays the dump list for both the FDD and HDD.

1. FORMAT

NOTE: *This program is only for testing a floppy disk drive. The option is different from the Toshiba MS-DOS FORMAT command.*

This program can format a 5.25-inch or 3.5-inch floppy disk in the following formats:

- (a) 2D: Double-sided, double-density, 48/67.5 TPI, MFM mode, 512 bytes, 9 sectors/track.
- (b) 2DD: Double-sided, double-density, double-track, 96/135 TPI, MFM mode, 512 bytes, 9 sectors/track.
- (c) 2HD: Double-sided, high-density, double-track, 96/135 TPI, MFM mode, 512 bytes, 18 sectors/track.

2. COPY

This program copies data from a source floppy disk to a target floppy disk.

3. DUMP

This program displays the contents of the floppy disk and the designated sectors of the hard disk on the display.

4. HDD ID

This program reads the hard disk ID and displays the hard disk ID, serial number and other hard disk information.

3.23.2 Operations

1. Selecting **7** from the DIAGNOSTIC MENU and pressing **Enter** displays the following message:

```
[ FDD UTILITIES ]  
  
1 - FORMAT  
2 - COPY  
3 - DUMP  
4 - HDD ID  
9 - EXIT TO DIAGNOSTICS MENU
```

2. FORMAT program

- (a) Selecting FORMAT displays the following message:

```
DIAGNOSTICS - FLOPPY DISK   FORMAT : VX.XX  
Drive number select (1:A, 2:B ) ?
```

- (b) Select a drive number to display the following message:

```
Type select (0:2DD ,3:2HD) ?
```

- (c) Select a media/drive type number and press **Enter**. A message similar to the one below will display:

```
Warning : Disk data will be destroyed.  
Insert work disk into drive A:  
Press any key when ready.
```

- (d) Remove the Diagnostics Disk from the FDD, insert the work disk and press any key.

The following message will display when the FDD format is executed:

```
[ FDD TYPE ] : TRACK = XXX  
[ FDD TYPE ] : HEAD  = X  
[ FDD TYPE ] : SECTOR = XX
```

```
Format start
```

```
[[track, head = XXX X]]
```

After the floppy disk is formatted, the following message will appear:

```
Format complete  
Another format (1:Yes/2:No ) ?
```

- (e) Typing **1** displays the message from step (c) above. Typing **2** returns the test to the DIAGNOSTIC MENU.

3. COPY program

- (a) When COPY is selected, the following message appears:

```
FLOPPY DISK FORMAT & COPY : VX.XX
Type select (0:2DD ,3:2HD) ?
```

- (b) Selecting a media/drive type number will display a message similar to the one below:

```
Insert source disk into drive A:
Press any key when ready.
```

- (c) Remove the Diagnostics Disk from the FDD, insert the source disk and press any key. The following message will appear, indicating the program has started.

```
[ FDD TYPE ] : TRACK = XXX
[ FDD TYPE ] : HEAD  = X
[ FDD TYPE ] : SECTOR = XX
```

Copy start

```
[ [ track,head = XXX X ] ]
```

- (d) Remove the source disk from the FDD, insert a formatted work disk and press any key. The [[track, head = XXX X]] message will appear and start copying to the target disk. When the amount of data is too large to be copied in one operation, the message from step (b) displays again. After the floppy disk has been copied, the following message will appear:

```
Copy complete
Another copy (1:Yes/2:No ) ?
```

- (e) To copy another disk, type **1** and the message from step (a) displays again. Entering **2** returns the test program to the DIAGNOSTIC MENU.

4. DUMP program

- (a) When DUMP is selected, the following message appears:

```
DIAGNOSTICS-HARD DISK & FLOPPY DISK    DUMP : VX.XX  
Drive type select (1:FDD, 2:HDD  ) ?
```

- (b) Select a drive type. If **1** is selected in step (a), the following message displays.

```
Select drive number    (1:A, 2:B ) ?
```

Select an FDD drive number. The display will go to step (c).

If **2** is selected in step (a), the following message displays:

```
Select drive number    (1:C, 2:D ) ?
```

After selecting the HDD, the display will go to step (f).

- (c) The following message will display:

```
Format type select (1:2DD  ,3:2HD) ?
```

- (d) Select a format type. The following message will appear:

```
Insert source disk into drive A:  
Press any key when ready.
```

(e) Insert a source disk and press any key.

(f) The following message will appear:

```

— Max. address —
[Track ] = XXXX
[ Head ] = XX
[Sector] = XX

Track number ??

```

Set the track number you want to dump. The system will access the disk and dump a list.

5. HDD ID program

Selecting HDD ID displays the following HDD ID configuration:

```

[HDD ID Read (VX.XX)] [Drive #X]
  ID code (h)                = XXXX
  No. of Cylinders            = XXXX XXXX
  Removable Cylinders        = XXXX XXXX
  No. of Heads                = XXXX XXXX
  Unformat Bytes/Track       = XXXX XXXX
  Unformat Bytes/Sector      = XXXX XXXX
  Sectors/Track              = XXXX XXXX
  Gap Length                  = XXXX XXXX
  Sync. Bytes                 = XXXX XXXX
  Reserved (h)                = XXXX
  Serial No.                  = YYY...
  Controller Type (h)         = XXXX
  Sector Buffers              = XXXX XXXX
  ECC Bytes                   = XXXX XXXX
  Firmware Rev.               = YYYYYY..
  Model No.                   = YYYY...
  Reserved (h)                = XXXX
  Double Word Capability      = XXXX XXXX

```

Press [Enter] key

Press **Enter** to return to the FDD UTILITIES MENU.

3.24 System Configuration

3.24.1 Function Description

The System Configuration program contains the following configuration information for the computer:

1. Processor Type
2. VGA Controller
3. MS-DOS Version
4. BIOS ROM Version (1st ID, 2nd ID)
5. Boot ROM Version
6. KBC Version
7. PS Microprocessor Version
8. Total Memory Size
9. Sound System
10. The number of printer ports
11. The number of ASYNC ports
12. The number of math co-processor
13. PCMCIA Slot
14. Modem Type
15. The number of floppy disk drives
16. The number of hard disk drives
17. Date/Time

3.24.2 Operations

Selecting **8** from the DIAGNOSTIC MENU and pressing **Enter** displays the following system configuration:

```
System Configuration  Display : Ver X.XX [Machine Name ???]
** - Processor Type      = XXXX
** - VGA Controller      = XXXX
*  - MS-DOS Version      = VX.XX
*  - BIOS ROM Version    = V .XX 1st ID = XXH, 2nd ID = XXH
*  - BOOT ROM Version    = VX.XX
*  - KBC Version         = VX.XX
*  - PS Micom Version    = VX.XX (EC Version = VX.XX)
*  - Total Memory Size   = XXXXXMB(Conventional Memory = XXXXX KB)

** - Sound System        = XXXXX
*  - X Printer Adapter   LPT1 = XXXX  LPT2 = XXXX  LPT3 = XXXX
*  - X ASYNC Adapter     COM1 = XXXX  COM2 = XXXX  COM3 = XXXX
*  - X Math Co-Processor
*  - X PCMCIA Slot
*  - X Modem + DAA       = XX

*  - X Floppy Disk Drive(s)  Track = XXXXX, Head = XX, Sector = XX
*  - X Hard Disk Drive(s)   #1 Cylinder = XXXXX, Head = XX, Sector =XX
                           #2 Cylinder = XXXXX, Head = XX, Sector =XX
```

Press [Enter] Key [Date = XXXX-YY-ZZ, XX :YY:ZZ]

Press **Enter** to return to the DIAGNOSTIC MENU.

3.25 SETUP

3.25.1 Function Description

This program displays the current system setup information as listed below:

1. Memory
 - (a) Total
2. Password
3. Battery
4. Peripheral
 - (a) Pointing Devices
 - (b) Ext keyboard
 - (c) USB Legacy Emulation
 - (d) Parallel Port Mode
 - (e) Hard Disk Mode
5. Boot Priority
6. Display
 - (a) Power On Display CPU Cache
 - (b) LCD Display Stretch
7. Others
 - (a) Power-up Mode
 - (b) CPU Cache
 - (c) Level 2 Cache
 - (d) Auto Power On
 - (e) Alarm Volume
 - (f) System Beep
 - (g) Panel Power On/Off
8. Configuration
9. I/O Ports
 - (a) Serial
 - (b) Parallel
 - (c) Sound

10. Display

11. PCI Bus

12. PC Card

13. Drives I/O

14. Floppy Disk I/O

3.25.2 Accessing the SETUP Program

Selecting **0** from the DIAGNOSTICS MENU and pressing **Enter** displays the TSETUP screen. The TSETUP screen is divided into two pages: SYSTEM SETUP (1/2) and SYSTEM SETUP (2/2).

SYSTEM SETUP (1/2)		BIOS version = x.xx
MEMORY Total = 32768 KB	BOOT PRIORITY Boot Priority = FDD→HDD→CD-ROM	
PASSWORD Not Registered	DISPLAY Power On Display = Auto-Selected LCD Display Stretch = Disabled	
BATTERY Battery Save Mode = Full Power	OTHERS Power-up Mode = Resume CPU Cache = Enabled Level 2 Cache = Enabled Auto Power On = Disabled Alarm Volume = High System Beep = Enabled Panel Power On/Off = Disabled	
PERIPHERAL Pointing Devices = Auto-Selected Ext Keyboard "Fn" = Disabled USB Legacy Emulation = Disabled Parallel Port Mode = ECP Hard Disk Mode = Enhanced IDE (Normal)		

SYSTEM SETUP (2/2)		BIOS version = x.xx
CONFIGURATION Device Config. = All Devices	PC CARD Controller Mode = Auto-Selected	
I/O PORTS Serial = COM1(3F8H/IRQ4) Parallel = LPT1(378H/IRQ7/CH3) Sound = Enabled	DRIVES I/O Built-in HDD = Primary IDE(1F0H/IRQ14) Built-in CD-ROM = Secondary IDE(170H/IRQ15) ATA Card = Others(110H/IRQ9)	
DISPLAY VGA Segment Address = C000H	FLOPPY DISK I/O Floppy Disk = (3F2H/IRQ6/CH2)	
PCI BUS PCI BUS = IRQ11		

NOTE: The Panel Power On/Off item appears only when the computer is in Resume mode.

Moving Within the SETUP Menu and Changing Values

1. Press ← and → to move between the two columns. Press **PgDn** and **PgUp** to move between the two pages. Press ↑ and ↓ to move between items in a column.
2. Press either the **space bar** or **BkSp** to change the value.

Accepting Changes and Exiting the SETUP Window

1. Press **End** to accept the changes you made.

If the changed item does not require the system to reboot, the following message displays:

Are you sure? (Y/N)

If the changed item requires the system to reboot, the following message displays:

Are you sure? (Y/N)

The changes you made will cause the system to reboot.

2. To make other changes, press **N**. Repeat the steps above.
3. To accept the changes, press **Y**.

NOTE: You can press **Esc** to quit at any time without saving changes. *SETUP* asks you to confirm that you do not want to save your changes.

The Factory Preset Configuration

When you access *SETUP*, the current configuration displays.

1. To show the factory preset configuration, press **Home**.
2. To accept the default settings, press **End** and then press **Y**.

NOTE: When you execute the default setting, the following settings are not changed:

HDD Mode

Password

Sound System: I/O Address, Interrupt Level, DMA

Write Policy

SETUP Options

The SETUP screen is divided into functionally related groups. This section describes each group and its options.

1. Memory

This option displays the computer's memory.

(a) Total

This field displays the total amount of memory installed and is automatically calculated by the computer. You cannot change this value.

2. Password

This field enables or disables the internal video controller.

Registered The user password has been registered.

Not registered The user password has not been registered.

For details on setting the user password refer to the User's Manual.

3. Battery

This option is used to select **Full Power**, **Low Power** or **User Setting** of the battery save mode.

Full Power The following shows full power settings.

BATTERY SAVE OPTIONS	
Processing Speed	= High
CPU Sleep Mode	= Enabled
Display Auto off	= 30Min.
HDD Auto off	= 30Min.
System Auto off	= Disabled
LCD Brightness	= Super-Bright or Bright* (330CDT/320CDT) Bright (330CDS/320CDS)
Cooling Method	= Performance

*Displays Super-Bright when the AC adapter is connected and Bright when using battery power.

Low Power The following shows low power settings.

BATTERY SAVE OPTIONS	
Processing Speed	= Low
CPU Sleep Mode	= Enabled
Display Auto off	= 03Min.
HDD Auto off	= 03Min.
System Auto off	= Disabled (Boot mode) 30Min. (Resume mode)
LCD Brightness	= Super-Bright or Bright* (330CDT/320CDT) Semi-Bright (330CDS/320CDS)
Cooling Method	= Quiet

*Displays Bright when the AC adapter is connected and Semi-Bright when using battery power.

NOTE: In boot mode, the System Auto Off item does not appear.

User Setting Use this option to set the battery save parameters on the sub-window, **BATTERY SAVE OPTIONS**. When you select this option, the automatic setting feature (Full Power or Low Power) is disabled and the user-preferred parameters become effective.

(a) Battery Save Options

The following set of options can be selected in the submenu of **User Setting**, which is one of the **Battery Save Mode** options.

Processing Speed

This feature changes the CPU processing speed.

High The CPU operates at high speed. (Default)

Low The CPU operates at low speed.

CPU Sleep Mode

Use this option to enable or disable the CPU sleep function.

Enabled Enables sleep mode.

Disabled Disables sleep mode.

Display Auto Off

Use this option to disable or set the duration of the display automatic power off function. This function causes the computer to turn the LCD panel's illumination off if you make no entry for the set period of time.

Disabled Disables display automatic power off.

xx Min. Automatically turns off power to the LCD panel's illumination if the panel is not used for the duration set. The duration **xx** can be set to **1, 3, 5, 10, 15, 20** or **30** minutes.

HDD Auto Off

Use this option to set the duration of the HDD automatic power off function.

xx Min. Automatically turns off power to the hard disk drive if it is not used for the duration set. The duration **xx** can be set to **1, 3, 5, 10, 15, 20** or **30** minutes.

System Auto Off

Use this option to disable or set the duration of the system automatic off function in Resume mode. In Boot mode, it is disabled and does not display.

Disabled Disables system automatic power off.

xx Min. Automatically turns off power to the system if it is not used for the duration set. The duration **xx** can be set to **10, 20, 30, 40, 50** or **60** minutes.

LCD Brightness

Use this option to set the level of LCD brightness.

Super-Bright	Full brightness for maximum visibility. (On the internal TFT LCD only.)
Bright	Full brightness for high visibility.
Semi-Bright	Less than full brightness for saving power.

Cooling Method

Performance	If the CPU becomes too hot, the fan turns on automatically. When the CPU temperature falls to a normal range, the fan turns off.
Quiet	If the CPU becomes too hot, the processing speed is lowered. If the temperature is still too high, the fan turns on. When the CPU temperature falls to a normal range, the fan is turned off and the processing speed is increased.

4. Peripheral

(a) Pointing Devices

This option enables or disables the AccuPoint.

Auto-Selected	If a PS/2 mouse is connected to the computer when you turn on the power, the PS/2 mouse is enabled and the AccuPoint is disabled. Otherwise, the AccuPoint is enabled. (Default)
Simultaneous	Enables both the AccuPoint and PS/2 mouse or the AccuPoint and a mouse connected to USB port.

(b) Ext Keyboard "Fn"

Use this option to set a key combination on an external keyboard to emulate the **Fn** key on the computer's internal keyboard. Setting an **Fn** key equivalent will enable you to use "Hotkeys" by pressing the set combination in place of the **Fn** key.

Disabled No **Fn** key equivalent. (Default)

Enabled Left Ctrl + Left Alt*
Right Ctrl + Right Alt*
Left Alt + Left Shift
Right Alt + Right Shift
Left Alt + Caps Lock

* If these options are made, you cannot warm boot the system by pressing **Ctrl + Alt + Del**.

<p>KEYBOARD</p> <p>Ext keyboard "Fn" key equivalent = Left Ctrl + Left Alt</p>
--

Use this option to set a key combination on an external keyboard to emulate the **Fn** key on the computer's internal keyboard. Setting an **Fn** key equivalent will enable you to use "Hotkeys" by pressing the set combination in place of the **Fn** key.

(c) USB Legacy Emulation

Use this option to enable or disable USB Legacy Emulation. If your operating system does not support USB, you can still use a USB mouse and keyboard by setting the USB Legacy item in TSETUP to Enabled.

Disabled Disables the USB Legacy Emulation. (Default)

Enabled Enables the USB Legacy Emulation.

(d) Parallel Port Mode

The options in this tab are ECP and Standard Bi-directional.

ECP Sets the port mode to Extended Capabilities Port (ECP). For most printers, the port should be set to ECP. (Default)

Std. Bi-Direct. This setting should be used with some other parallel devices.

(e) Hard Disk Mode

Use this item to select the hard disk mode.

Enhanced IDE (Normal) Select this mode when using MS-DOS®, Windows for Workgroups, Windows 95 or OS/2®. (Default)

Standard IDE Select this mode when using Novell® NetWare® or UNIX®. When this mode is selected, up to 504MB is logically available even though the disk's capacity is larger than 504MB.

NOTE: *Formats for Enhanced IDE and Standard IDE are different, so if you change the setting, you will have to reformat the hard disk for the appropriate setting.*

5. Boot Priority

Use this option to select the disk drive priority for boot up.

FDD→HDD→CD-ROM: The computer looks for bootable files first on the FDD, then on the HDD and finally on the CD-ROM. (Default)

HDD→FDD→CD-ROM: The computer looks for bootable files first on the HDD, then on the FDD and finally on the CD-ROM.

FDD→CD-ROM→HDD: The computer looks for bootable files first on the FDD, then on the CD-ROM and finally on the HDD.

HDD→CD-ROM→FDD: The computer looks for bootable files first on the HDD, then on the CD-ROM and finally on the FDD.

CD-ROM→FDD→HDD: The computer looks for bootable files first on the CD-ROM, then on the FDD and finally on the HDD.

CD-ROM→HDD→FDD: The computer looks for bootable files first on the CD-ROM, then on the HDD and finally on the FDD.

You can override the settings and manually select a boot device by pressing one of the following keys while the computer is booting:

F Selects the FDD.

B Selects the computer's built-in HDD.

C Selects the CD-ROM.

These procedure does not affect the settings.

6. Display

(a) Power On Display

This option is used to select the display when booting up.

Internal/External Selects an external monitor if one is connected, otherwise it selects the internal LCD. (Default)

Simultaneous Selects both the internal LCD and the external monitor for simultaneous display.

***NOTE:** When starting the computer in Resume mode, the last configuration is remembered. If data does not appear on the display you are using after starting in Resume mode, press **Fn+F5**. This changes the display setting in the order of internal LCD to simultaneous to external monitor.*

(b) LCD Display Stretch

LCD Display Stretch enables or disables a larger display area of the screen.

Enabled Enables the LCD display stretch feature.

Disabled Disables the LCD display stretch feature. (Default)

7. Others

Whether you need to configure the computer with these options depends primarily on the kind of software or peripherals you use.

(a) Power-up Modes

Use this option to choose between resume and boot mode. This option can also be set by hotkeys.

Boot Turns on boot mode. (Default)

Resume Turns on resume mode.

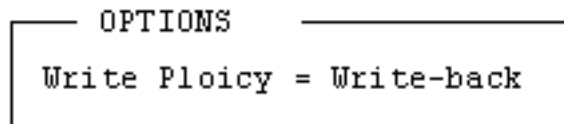
(b) CPU Cache

Use this option to enable or disable the CPU cache.

Enabled Enables the CPU cache. (Default)

Disabled Disables the CPU cache.

When enabled is selected, a subwindow similar to the one below displays to let you select the cache write policy. The options for this setting are **Write-back** (default) and **Write-through** for CPU cache.



Write-back policy provides better system performance, because main memory is accessed only when necessary to update the cache contents with changes in main memory. Write-through policy accesses main memory every time data is handled by the processor.

(c) Level 2 Cache

Use this option to enable or disable the level 2 cache.

Enabled Enables the level 2 cache. (Default)

Disabled Disables the level 2 cache.

(d) Auto Power On

Use this option to set a time and date for automatic power on and enable or disable the ring indicator feature. **Ring Indicator** displays only when the computer is in Resume mode and the **Alarm Date Option** displays when **Alarm Time** is enabled.

OPTIONS		
Alarm Time	=	00:00:00
Alarm Date Option	=	Disabled
Ring Indicator	=	Disabled

Alarm Time is set in the sequence of hours and minutes. Seconds cannot be changed. **Alarm Date Option** is set in the sequence of month and day. If Alarm Date is set to Disabled, the computer will be powered on at the same time every day. Press ↓ to move the cursor to the right and ↑ to move the cursor to the left when you set the date and time.

- NOTE:**
1. Do not remove the AC adapter and battery pack at the same time when you use this feature. If you do so, data saved by the resume function will be lost. You must also reset this option.
 2. If you have set a password and the computer boots by the Auto Power On function and Resume is on, the computer will start with the instant security function enabled. The **password =** message is not displayed; however, you must enter the password to use the computer.

(e) Alarm Volume

This option disables or sets the volume level of the alarm. Setting this option to off disables the computer's sound function for alarms. This option can also be set by hotkeys.

Off	Disables the alarm.
Low	Sets the alarm volume to low.
Medium	Sets the alarm volume to medium.
High	Sets the alarm volume to high. (Default)

When Alarm Volume is selected, the subwindow below displays to enable or disable certain functions.

```
— ALARM VOLUME OPTIONS —  
Low Battery Alarm = Enabled  
Panel Close Alarm = Enabled
```

Enabled	Enables the feature. (Default)
Disabled	Disables the feature.

(f) System Beep

Use this option to enable or disable the system beep.

Enabled	Enables the feature. (Default)
Disabled	Disables the feature.

(g) Panel Power On/Off

This option allows you to automatically turn your computer on or off by opening or closing the display panel. If this feature is enabled when the computer is in Resume mode, the system is automatically powered off when the display panel is closed, and powered on when the panel is opened. This option does not appear when the computer is in boot mode.

- Enabled** Enables the feature.
- Disabled** Disables the feature. (Default)

***NOTE:** Do not remove the AC adapter and battery pack at the same time when you use this feature. If you do so, data saved by AutoResume will be lost. You must also reset this option.*

8. Configuration

This field displays the configuration method. You cannot change this value.

All Devices

9. I/O ports

This option controls settings for the serial and parallel ports and the sound system.

NOTE: Do not assign the same interrupt request level and I/O address to the serial port and PC card.

(a) Serial

Use this option to set the COM level for the serial port. The serial port interrupt request level (IRQ) and I/O port base address for each COM level is shown below:

COM level	Interrupt level	I/O address	
COM1	4	3F8H	(Serial port default)
COM2	3	2F8H	
COM3	4	3E8H	
COM3	5	3E8H	
COM3	7	3E8H	
COM4	3	2E8H	
COM4	5	2E8H	
COM4	7	2E8H	
Not Used	Disables the port		
Others	Others settings made automatically by plug-and-play operating systems		

(b) Parallel

This option sets the interrupt request level (IRQ) and I/O port base address for the parallel port. When the Printer Port Type is set to **Standard Bi-directional**, the options are:

LPT setting	Interrupt level	I/O address
LPT 1	7	378H
LPT 2	5	278H
LPT 3	7	3BCH
Not Used	Disables the port	
Others	Others settings made automatically by plug-and-play operating systems	

When the Printer Port Type is set to **ECP**, the DMA channel can also be set to **1, 2 or 3**. The default is 3.

LPT setting	Interrupt level	I/O address	DMA channel
LPT 1	7	378H	3 (Parallel port default)
LPT 2	5	278H	3
LPT 3	7	3BCH	3
Not Used	Disables the port		
Others	Others settings made automatically by plug-and-play operating systems		

When you select one of the above options, except for **Not Used**, a subwindow similar to the one below appears to let you set the DMA. The options for this setting are **Channel 1** and **Channel 3**(default).

— OPTIONS —

DMA = Channel 3

(c) Sound

Use this option to enable or disable the sound system.

Enabled Enables the sound system. (Default)

Disabled Disables the sound system.

When **Enabled** is selected, a subwindow similar to the one below appears to let you set the **WSS I/O address**, **SBPro I/O address**, **Synthesizer I/O address**, **WSS & SBPro & MPU401 IRQ Level**, **WSS (Play) DMA**, **WSS (Rec.) & SBPro DMA**, **Control I/O address**, and **MPU401 (MIDI I/F)** for the sound system.

SOUND	
WSS I/O Address	= 530H
SBPro I/O Address	= 220H
Synthesizer I/O Address	=388H
WSS & SBPro & MPU401 IRQ Level	=IRQ5
WSS (Play) DMA	= Channel 1
WSS (Rec.) & SBPro DMA	= Channel 0
Control I/O Address	= 370H
MPU401 (MIDI I/F)	= 330H

WSS I/O address

Use this option to set the Windows Sound System I/O address from among the following settings:

530h (default), 540h, 550h, 560h

SBPro I/O address

Use this option to set the Sound Blaster Pro I/O address from among the following settings:

220h (default), 240h, Others

Synthesizer I/O address

You cannot change this value.

WSS & SBPro & MPU401 IRQ level

This option sets the IRQ level for the Windows Sound System, Sound Blaster Pro and MPU401. The available settings are:

IRQ5 (default), IRQ7, IRQ9, IRQ11, IRQ15

WSS (Play) DMA

This option sets the DMA channel for the Windows Sound System (playback). The available settings are:

Channel 0, Channel 1 (default), Channel 3

WSS (Rec.) & SBPro DMA

This option sets the DMA channel for the Windows Sound System (recording) and Sound Blaster Pro. The available settings are:

Channel 0 (default), Channel 1, Channel 3

NOTE: When you set the **WSS (Play) DMA** and **WSS (Rec.) & SBPro DMA** option to the same channel, the **WSS (Play) DMA** option will display **Same as Playback**.

Control I/O Address

You cannot change this value.

MPU401 (MIDI I/F)

You cannot change this value.

10. Display

This option lets you set the VGA Segment Address only when the Display Adapter option is set to VGA Compatible. If it is set to Not Used, this option is not displayed, however, if you change the setting from VGA Compatible to Not Used and back to VGA Compatible, the setting does not change.

C000h (Default)
E400h

11. PCI Bus

This option displays the interrupt request level for the CardBus in the computer. It is for information only and cannot be changed.

12. PC Card

This option lets you set the PC Card Controller mode.

Auto-Selected	Use this setting for all PC Card if you are using Windows 95. (Default)
Card Bus/16 bit	If the card does not work properly with the Auto-Selected setting, use this setting for Card Bus PC card.
PCIC Compatible	If the card does not work properly with the Auto-Selected and CardBus/16 bit setting, use this setting for 16-bit PC Card.

13. Drives I/O

This item display the installed hard disk drives and/or CD-ROM drives: Built-in HDD, Built-in CD-ROM or no drive. It appears only in TSETUP.

(a) Setting for Built-in HDD

Primary IDE (1F0H/IRQ14)	The built-in HDD is ready for use.
Not Used	Disables the built-in HDD.
Others	Other settings made automatically by plug-and-play operating systems.

(b) Setting for CD-ROM drive

Secondary IDE (170H/IRQ15)	The CD-ROM drive is ready for use.
Not Used	Disables the CD-ROM drive.
Others (1E8H/IRQ11)	The CD-ROM drive is ready for use.
Others (168H/IRQ10)	The CD-ROM drive is ready for use.
Others	Other settings made automatically by plug-and-play operating systems.

14. Floppy disk I/O

This option displays the address, interrupt request level and DMA channel settings for the FDD. It is for information only and cannot be changed.

Chapter 4

Replacement Procedures

Chapter 4 Contents

4.1	General.....	4-1
4.2	Battery Pack.....	4-6
4.3	PC Card.....	4-7
4.4	Keyboard.....	4-9
4.5	Expansion Memory.....	4-11
4.6	HDD.....	4-13
4.7	Top Cover and Display Assembly.....	4-16
4.8	RTC Battery and Backup Battery.....	4-20
4.9	LED Board.....	4-22
4.10	Membrane Switch.....	4-23
4.11	FDD	4-24
4.12	CD-ROM Drive.....	4-26
4.13	System Board	4-29
4.14	Cooling Fan.....	4-33
4.15	Speakers.....	4-34
4.16	Display Mask.....	4-35
4.17	FL Inverter Board.....	4-37
4.18	DSTN LCD Module and Contrast Board.....	4-38
4.19	TFT LCD Module.....	4-40
4.20	DSTN FL	4-41
4.21	TFT FL (SHARP).....	4-44
4.22	TFT FL (DTI).....	4-48
4.23	TFT FL (Samsung).....	4-51
4.24	TFT FL (NEC)	4-52

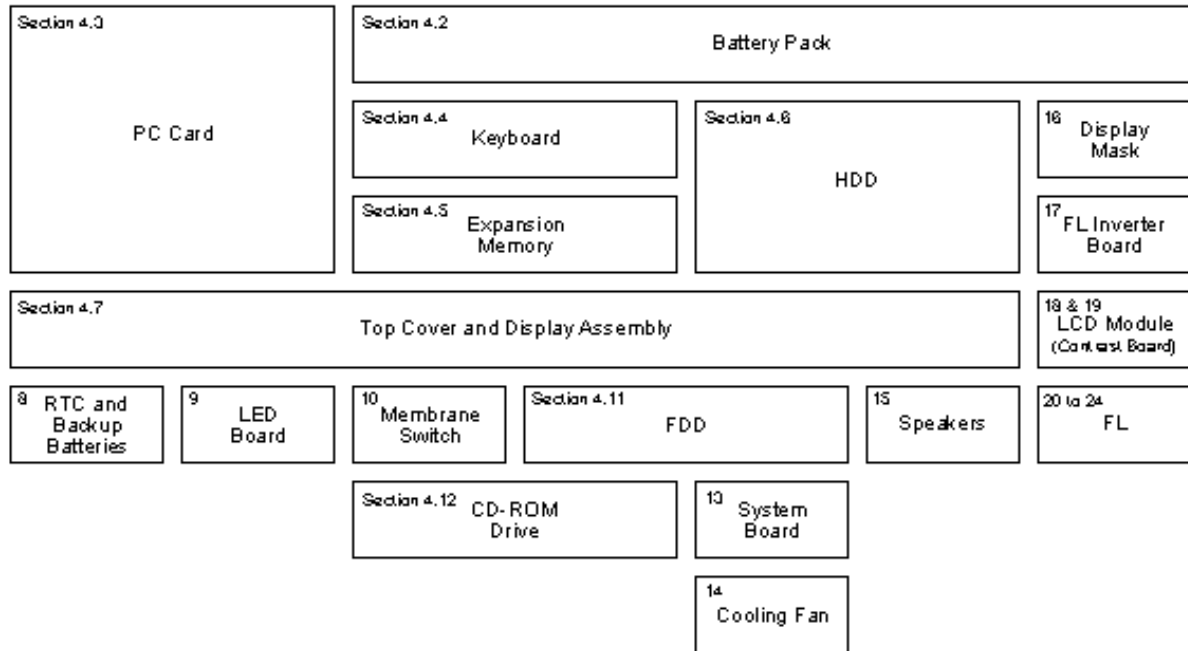
Figures

Figure 4-1 Removing the battery pack.....	4-6
Figure 4-2 Removing the PC card.....	4-7
Figure 4-3 Removing the keyboard brace.....	4-9
Figure 4-4 Removing the keyboard.....	4-10
Figure 4-5 Removing the expansion memory	4-11
Figure 4-6 Removing the HDD slot cover.....	4-13
Figure 4-7 Removing the HDD.....	4-14
Figure 4-8 Removing the HDD case.....	4-14
Figure 4-9 Removing ten screws securing the top cover.....	4-16
Figure 4-10 Disconnecting the FL, LCD and speaker cables.....	4-17
Figure 4-11 Removing four screws securing the top cover.....	4-17
Figure 4-12 Removing the top cover and display assembly.....	4-18
Figure 4-13 Removing the insulator.....	4-18
Figure 4-14 Removing the RTC and backup batteries.....	4-20
Figure 4-15 Removing the LED board.....	4-22
Figure 4-16 Removing the membrane switch.....	4-23
Figure 4-17 Removing the FDD.....	4-24
Figure 4-18 Disassembling the FDD	4-25
Figure 4-19 Removing the CD-ROM drive.....	4-26
Figure 4-20 Disassembling the CD-ROM drive.....	4-27
Figure 4-21 Releasing two latches securing the PC card slot cover.....	4-29
Figure 4-22 Removing the PC card slot cover.....	4-30
Figure 4-23 Disconnecting five cables connected to the system board.....	4-30
Figure 4-24 Removing the system board.....	4-31
Figure 4-25 Removing the cooling fan.....	4-33
Figure 4-26 Removing the speaker	4-34
Figure 4-27 Removing two screws securing the display mask.....	4-35
Figure 4-28 Removing the display mask.....	4-36
Figure 4-29 Removing the FL inverter board.....	4-37

Figure 4-30 Removing the LCD module.....	4-38
Figure 4-31 Removing the contrast board.....	4-39
Figure 4-32 Removing the LCD module.....	4-40
Figure 4-33 Releasing 12 latches on the LCD module.....	4-41
Figure 4-34 Opening the LCD module's rear cover.....	4-42
Figure 4-35 Removing the FL.....	4-42
Figure 4-36 Securing three strips of tape on the LCD module.....	4-43
Figure 4-37 Removing three screws from the LCD module.....	4-44
Figure 4-38 Removing the LCD frame.....	4-45
Figure 4-39 Removing the FL cover.....	4-46
Figure 4-40 Removing the FL cable.....	4-46
Figure 4-41 Removing the FL.....	4-47
Figure 4-42 Removing the shield plate.....	4-48
Figure 4-43 Removing the FL metal cover.....	4-49
Figure 4-44 Removing the FL.....	4-49
Figure 4-45 Securing the metal cover.....	4-50
Figure 4-46 Disassembly NEC TFT LCD (1).....	4-53
Figure 4-47 Disassembly NEC TFT LCD (2).....	4-53
Figure 4-48 Disassembly NEC TFT LCD (3).....	4-54
Figure 4-49 Disassembly NEC TFT LCD (4).....	4-54

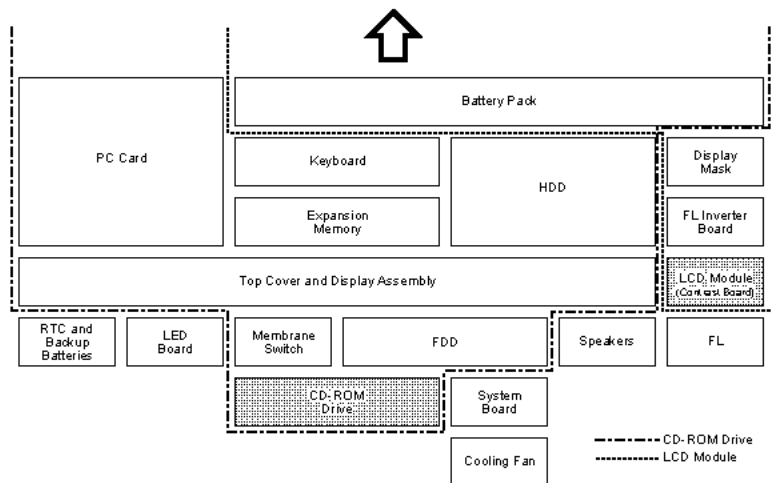
4.1 General

This section explains how to disassemble the computer and replace Field Replaceable Units (FRUs). It may not be necessary to remove all the FRUs in order to replace one. The chart below is a guide to which FRUs need to be removed in order to remove others. To use the chart, locate the FRU you think is causing the problem, then remove all FRUs whose box is overlapped by the FRU above it. Refer to the example at the bottom of the page.



When you have determined the FRUs that need to be removed, follow the numerical order of the sections written in each box.

The example to the right shows FRUs to be removed for the CD-ROM drive and for the LCD module. The CD-ROM drive is overlapped by the membrane switch and FDD, which are overlapped by the top cover and display assembly. That, in turn, is overlapped by the PC card, expansion memory, keyboard, HDD and battery pack. The LCD module is overlapped by the FL inverter board, display mask and battery pack.



Safety Precautions

Before you begin disassembly, read the following safety precautions and observe them carefully as you work.

- DANGER:**
1. *Always use the lithium ion battery pack or backup battery that is authorized by Toshiba or compatible with the unit. Since other battery packs have different specifications, they may be incompatible with the unit, and may burst or explode. Heating or disassembling the battery pack could cause leakage of alkaline solution. Throwing the battery pack into a fire could cause the battery pack to explode.*
 2. *The power supply, FL inverter and other components carry high voltages. To avoid the risk of electric shock when you need to turn on the power of a partially disassembled computer to check its operation, be very careful not to touch connectors or components. Also, do not disassemble individual components in first-level maintenance.*

WARNING: To avoid the risk of electric shock or other injury:

1. *Always turn the power off and disconnect the AC adapter from the power source.*
2. *Remove any metal jewelry or accessories such as necklaces, bracelets, or rings. Batteries in the computer retain an electrical charge so there is danger of electrical shock even when the computer is disconnected from an AC power source.*
3. *Never work with wet or damp hands.*
4. *The computer contains many sharp edges and corners, so be careful not to injure yourself.*
5. *Make sure that all replacement components meet the specifications for the computer and that all cables and connectors are securely fastened.*

CAUTION: To avoid damage to the computer:

1. *When you change a component, be sure the replacement component meets the required specifications. Never use foreign parts.*
2. *Metal objects such as screws or paper clips which fall into the unit can cause a short-circuit, fire, or other internal damage.*
3. *When assembling the computer, make sure you use the correct screws to secure the various pieces in place. Screw sizes are listed in their corresponding figure. Make sure all screws are securely fastened. Loose screws can cause short circuits, resulting in heat, smoke, or fire.*
4. *Before removing an FRU or other component, make sure all cables to the component have been disconnected.*
5. *If you use AC power, be sure to use the cable that came with the computer or one recommended by Toshiba.*

Before You Begin

Look over the procedures in this section before you begin disassembling the computer. Familiarize yourself with the disassembly and reassembly steps. Begin each procedure by removing the AC adapter and the battery pack as instructed in Section 4.2, *Battery Pack*:

1. Do not disassemble the computer unless it is operating abnormally.
2. Use only the correct and approved tools.
3. Make sure the working environment is free from the following elements whether you are using or storing the computer.
 - ☐ Dust and contaminants
 - ☐ Static electricity
 - ☐ Extreme heat, cold and humidity
4. Make sure the FRU you are replacing is causing the abnormal operation by performing the necessary diagnostics tests described in this manual.
5. Do not perform any operations that are not necessary and use only the described procedures for disassembling and installing FRUs in the computer.
6. After removing parts from the computer, place them in a safe place away from the computer so they will not be damaged and will not interfere with your work.
7. You will remove and replace many screws when you disassemble the computer. When you remove screws, make sure they are placed in a safe place and identified with the correct parts.
8. When assembling the computer make sure you use the correct screws to secure the various pieces in place. Screw sizes are listed in their corresponding figures.
9. The computer contains many sharp edges and corners, so be careful not to injure yourself.
10. After you have replaced an FRU, make sure the computer is functioning properly by performing the appropriate test on the FRU you have fixed or replaced.

Disassembly Procedures

The computer has two basic types of cable connectors:

- ☐ Pressure Plate Connectors
- ☐ Normal Pin Connectors

To disconnect a Pressure Plate connector, lift up the tabs on either side of the connector's plastic pressure plate and slide the cable out of the connector. To connect the cable to a Pressure Plate connector, make sure the pressure plate is fully lifted and slide the cable into the connector. Secure the cable in place by pushing the sides of the pressure plate down so the plate is flush with the sides of the connector. Gently pull on the cable to make sure the cable is secure. If you pull out the connector, connect it again making sure the connector's pressure plate is fully lifted when you insert the cable.

Standard pin connectors are used with all other cables. These connectors can be connected and disconnected by simply pulling them apart or pushing them together.

Assembly Procedures

After you have disassembled the computer and fixed or repaired the problem that was causing the computer to operate abnormally, you will need to reassemble the computer.

While assembling the computer, remember the following general points:

- ☐ Take your time, making sure you follow the instructions closely. Most problems arise when you get in a hurry assembling the computer.
- ☐ Make sure all cables and connectors are securely fastened.
- ☐ Before securing the FRU or other parts, make sure that no cables will be pinched by screws or the FRU.
- ☐ Check that all latches are closed securely in place.
- ☐ Make sure all the correct screws are used to secure all FRUs. Using the wrong screw can either damage the threads on the screw or the head of the screw and may prevent proper seating of an FRU.

After installing an FRU in the computer, confirm that the FRU and the computer are functioning properly.

Tools and Equipment

The use of Electrostatic Discharge (ESD) equipment is very important for your safety and the safety of those around you. Proper use of these devices will increase the success rate of your repairs and lower the cost for damaged or destroyed parts. The following equipment is necessary to disassemble and reassemble the computer:

- ☐ One M2 Phillips screwdriver to remove and replace screws.
- ☐ Tweezers, to lift out screws that you cannot grasp with your fingers.
- ☐ ESD mats for the floor and the table you are working on.
- ☐ An ESD wrist strap or heel grounder.
- ☐ Anti-static carpeting or flooring.
- ☐ Air ionizers in highly static sensitive areas.

Screw Tightening Torque

When you fasten screws, be sure to follow the torque list below. Overtightening can damage components and screws; undertightening can result in electrical shorts or other damage if screws or components come loose.

- | | |
|---|------------------------------|
| <input type="checkbox"/> M2 | 0.22 N·m (2.2 kgf·cm) |
| <input type="checkbox"/> M2.5 | 0.36 N·m (3.5 kgf·cm) |
| <input type="checkbox"/> FDD | 0.22 N·m (2.2 kgf·cm) |
| <input type="checkbox"/> HDD | 0.3 N·m (3.1 kgf·cm) or less |
| <input type="checkbox"/> LCD (internal use) | 0.176 N·m ±0.02 N·m |

4.2 Battery Pack

Removing the Battery Pack

To remove the battery pack, follow the steps below and refer to Figure 4-1.

1. Turn the computer upside down.
2. Slide the **battery latch** to release it, then pull the **battery pack** slightly forward and lift it out.

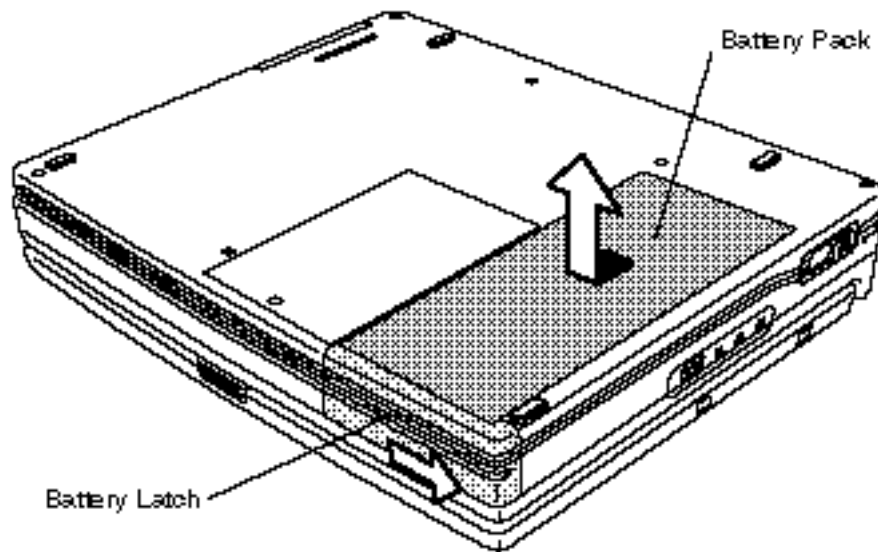


Figure 4-1 Removing the battery pack

NOTE: For environmental reasons, do not throw away a spent battery pack. Please return the spent battery packs to Toshiba.

Installing the Battery Pack

To install the battery pack, follow the steps below and refer to Figure 4-1.

WARNING: The battery is a lithium ion battery and can explode if not properly replaced, used, handled or disposed of. Use only batteries recommended by Toshiba as replacements.

1. Align the back edge of the **battery pack** with the icon and gently press down and back.
2. Slide the **battery latch** into place to secure the battery pack.

4.3 PC Card

Removing the PC Card

To remove the PC card, follow the steps below and refer to Figure 4-2.

1. Open the **PC card slot cover**.
2. Release the **PC card lock**.
3. Pull out the **eject button** next to the PC card you want to remove and press the button to pop the card out slightly.
4. Grasp the **PC card** and remove it.

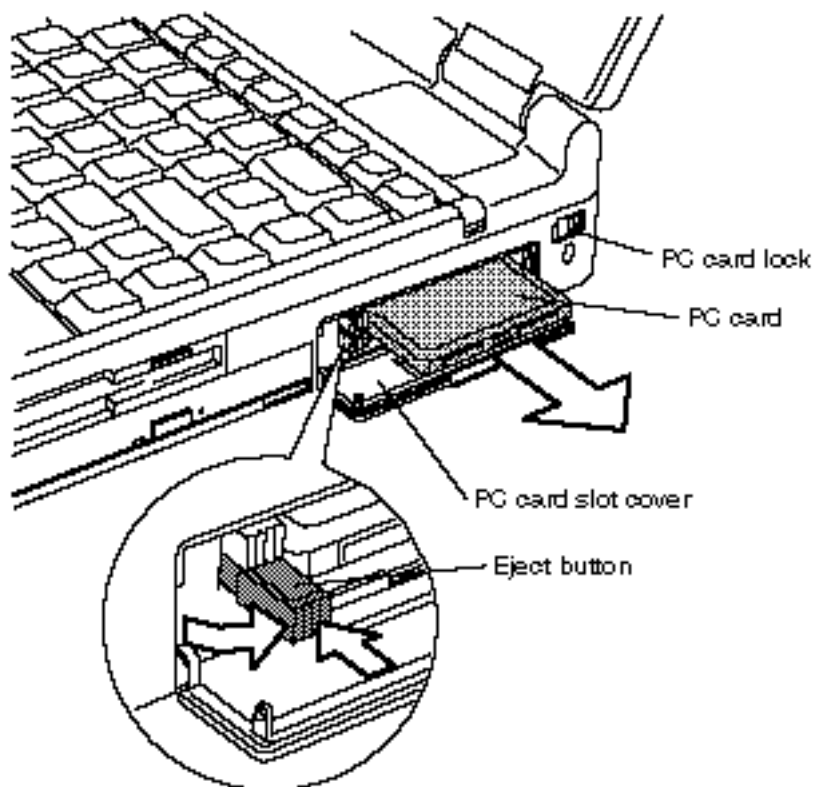


Figure 4-2 Removing the PC card

Installing the PC Card

To install the PC card, follow the steps below and refer to Figure 4-2.

1. Insert the **PC card** and press gently to ensure a firm connection.
2. Pull out the **eject button** and fold it down.
3. Slide the **PC card lock** into the locked position.
4. Close the **PC card slot cover**.

4.4 Keyboard

Removing the Keyboard

To remove the keyboard, follow the steps below and refer to Figures 4-3 and 4-4.

1. Open the display panel.
2. Left out the **keyboard brace**.

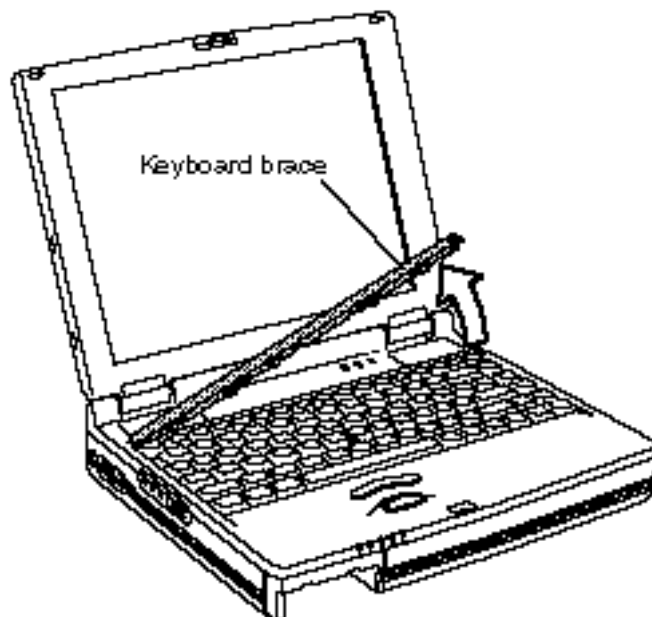


Figure 4-3 Removing the keyboard brace

3. Rotate the **keyboard** out and lay it face down on the palm rest. Be careful not to apply pressure to the keyboard cable.
4. Disconnect the **keyboard cable** from **PJ10** on the system board and remove the keyboard.

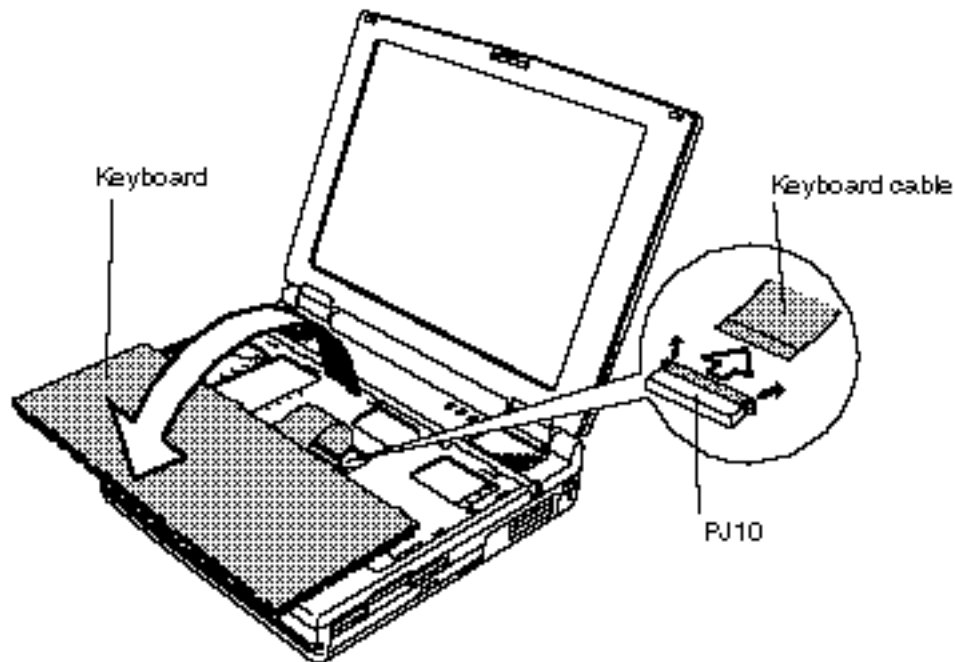


Figure 4-4 Removing the keyboard

Installing the Keyboard

To install the keyboard, follow the steps below and refer to Figures 4-3 and 4-4.

1. Lay the keyboard on the palm rest and connect the **keyboard cable** to **PJ10** on the system board.
2. Seat the **keyboard**.
3. Seat the **keyboard brace**.

4.5 Expansion Memory

Removing the Expansion Memory

To remove the expansion memory, make sure the computer is in boot mode, then follow the steps below and refer to Figure 4-5.

1. Lift up the **insulation sheet** covering the expansion memory.
2. Gently press out on the **latches**. One end of the expansion memory will pop up.
3. Grasp the **expansion memory** and pull it out.

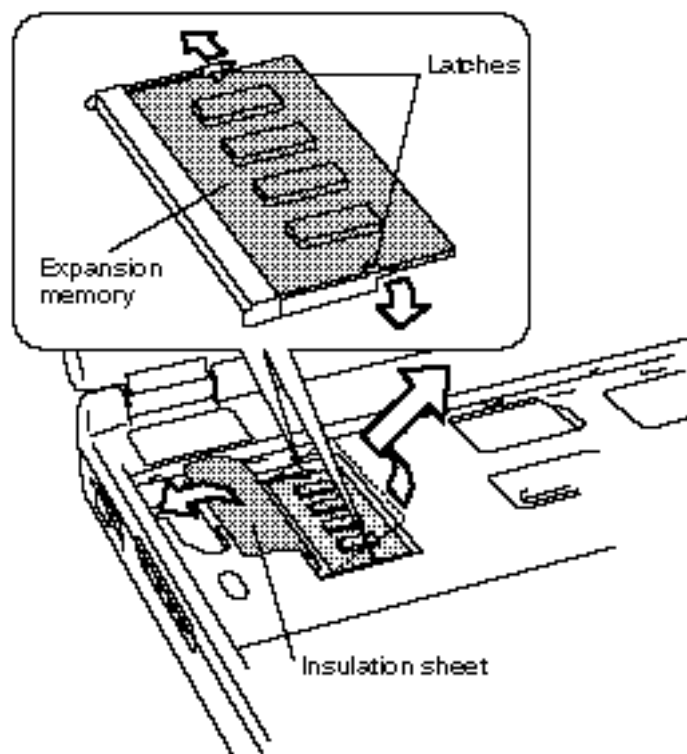


Figure 4-5 Removing the expansion memory

CAUTION: Do not touch the connectors on the expansion memory or on the computer. Debris on the connectors may cause memory access problems.

Installing the Expansion Memory

To install the expansion memory, make sure the computer is in boot mode, then follow the steps below and refer to Figure 4-5.

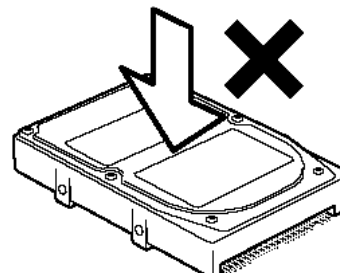
1. Lift up the **insulation sheet** covering the expansion memory slot.
2. Fit the expansion memory's connectors into the computer's connectors and press carefully to ensure firm contact.

CAUTION: *Do not touch the connectors on the expansion memory or on the computer. Debris on the connectors may cause memory access problems.*

3. Gently, push the **expansion memory** down until **latches** on either side engage the expansion memory to hold it in place.

4.6 HDD

CAUTION: When handling the HDD, do not press the top surface as shown by the arrow. Hold it by the sides.



Removing the HDD

To remove the HDD, follow the steps below and refer to Figures 4-6 to 4-8.

1. Turn the computer upside down.
2. Remove **one M2.5x25 silver screw** and lift off the **HDD slot cover**.

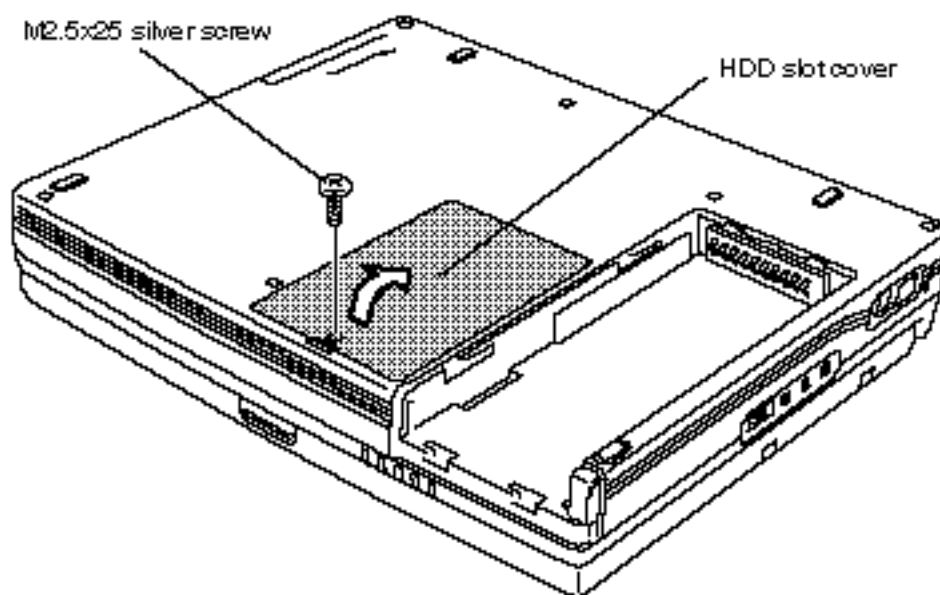


Figure 4-6 Removing the HDD slot cover

3. Grasp the HDD case and pull it forward to disconnect the **HDD**, then grasp the back end of the case and lift it out.

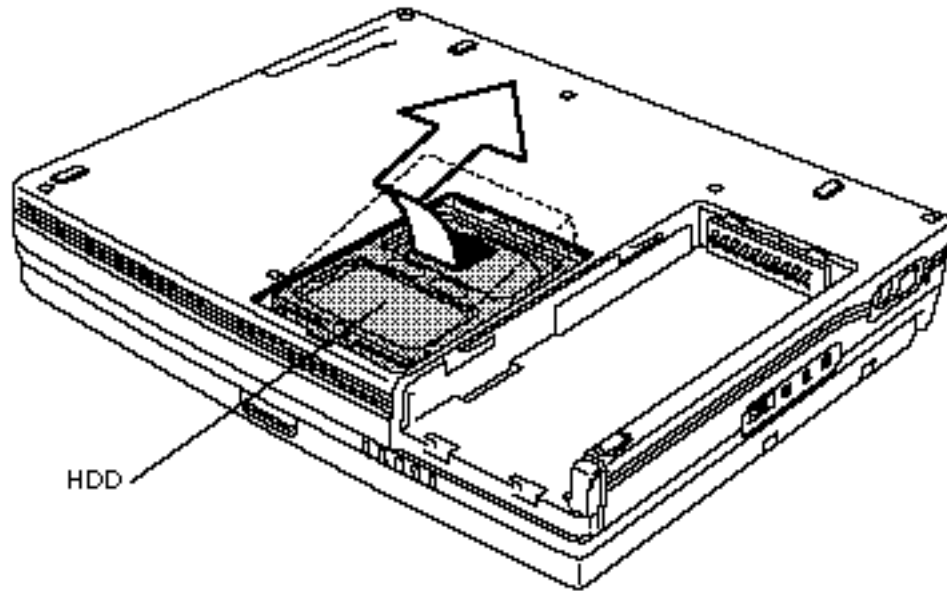


Figure 4-7 Removing the HDD

4. Remove **four flat-head screws** from the **HDD case** and lift out the HDD.

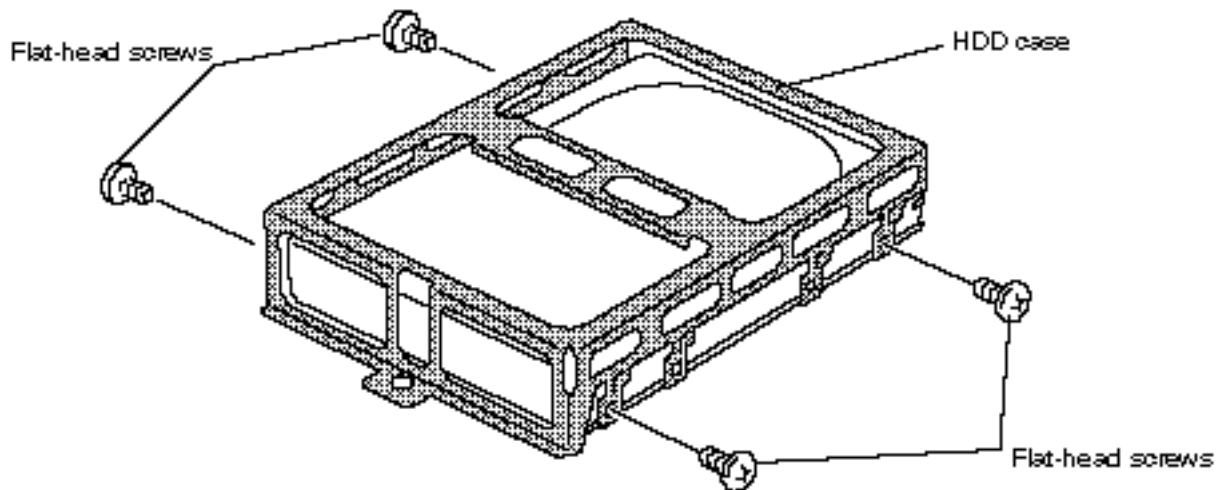


Figure 4-8 Removing the HDD case

Installing the HDD

To install the HDD, follow the steps below and refer to Figures 4-6 to 4-8.

1. Seat the HDD in the **HDD case** and secure it with **four flat-head screws**. The HDD case has eight screw holes; secure the screws in the pair of holes on the outside.
2. Insert the **HDD** into the HDD slot and press to ensure a firm connection.
3. Seat the **HDD slot cover** and secure it with **one M2.5x25 silver screw**.

4.7 Top Cover and Display Assembly

Removing the Top Cover and Display Assembly

To remove the top cover and display assembly, follow the steps below and refer to Figures 4-9 to 4-13.

1. Turn the computer upside down and remove **two M2.5x6 silver screws** from the battery slot, **one M2.5x6 silver screw** from the HDD slot, **five M2.5x25 silver screws** from the bottom cover and **two M2.5x6 silver screws** from the back of the computer.

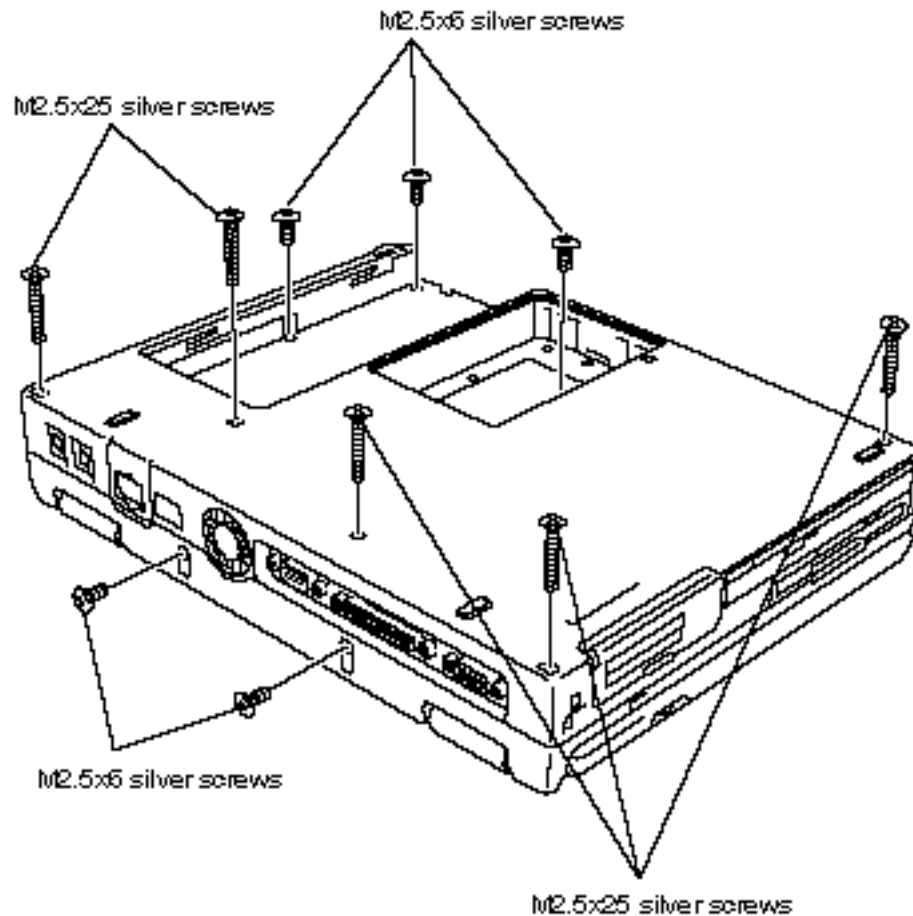


Figure 4-9 Removing ten screws securing the top cover

2. Turn the computer right side up and open the display.
3. Lift up the **insulator** covering four cables and disconnect them: **left speaker cable** from **PJ21**, **right speaker cable** from **PJ22**, **FL cable** from **PJ4** and **LCD cable** from **PJ3** (DSTN models) or **PJ23** (TFT models).

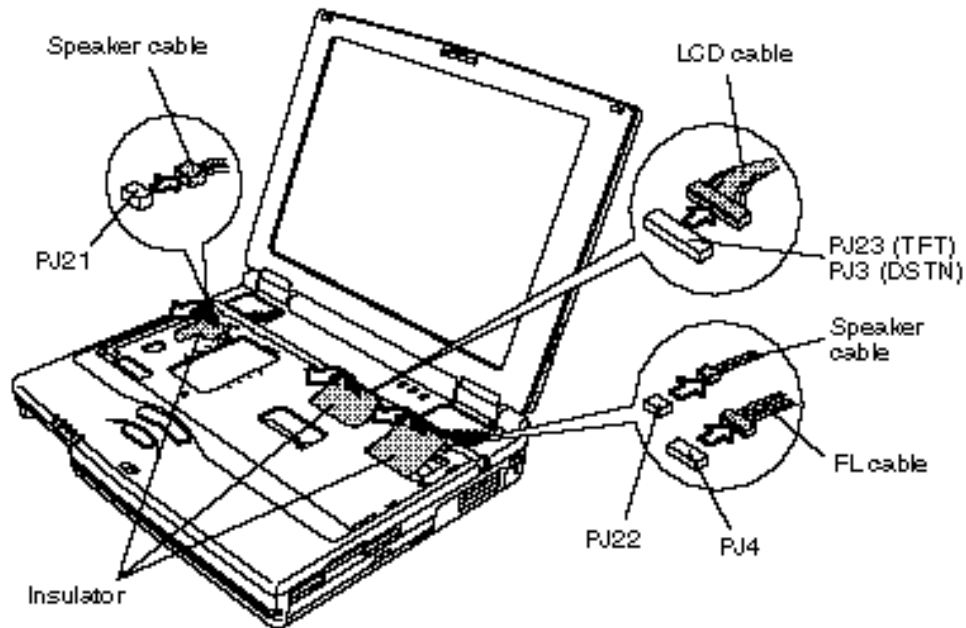


Figure 4-10 Disconnecting the FL, LCD and speaker cables

4. Remove **four M2.5x6 screws** and securing the top cover.

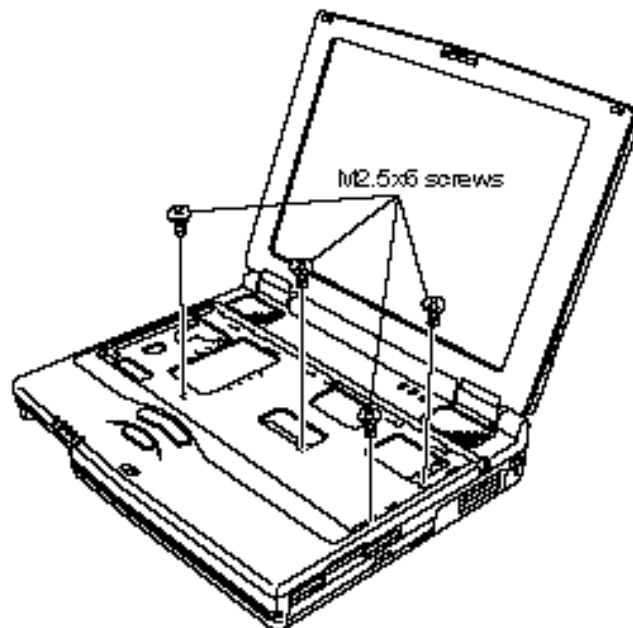


Figure 4-11 Removing four screws securing the top cover

5. Release eight latches securing the top cover and display assembly: **three latches** on the left side, **three latches** on the front and **two latches** on the right side.
6. Lift off the **top cover** and **display assembly**.

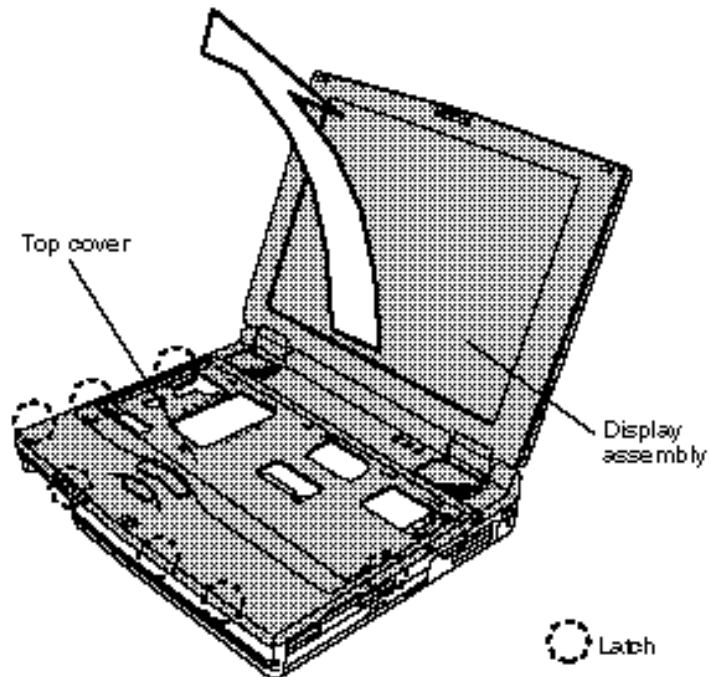


Figure 4-12 Removing the top cover and display assembly

7. Lift out the **insulator**.

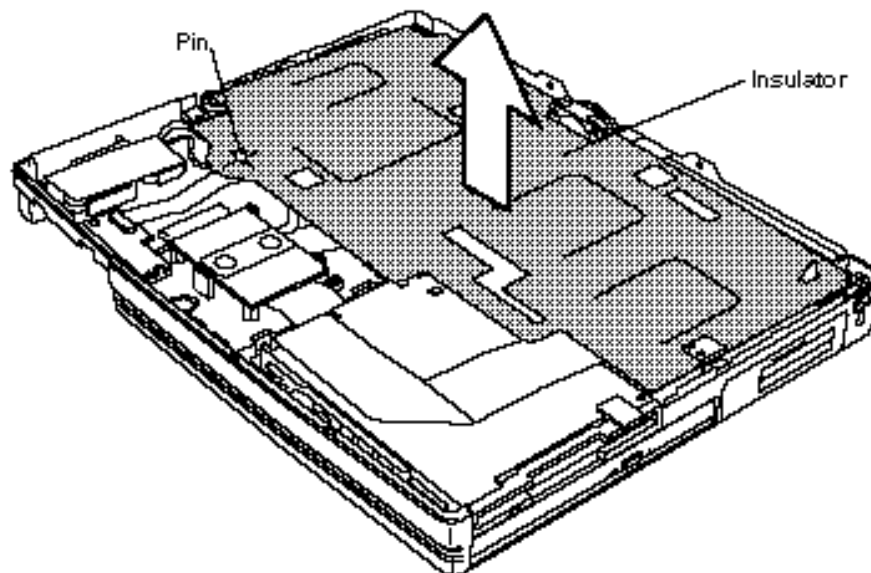


Figure 4-13 Removing the insulator

Installing the Top Cover and Display Assembly

To install the top cover and display assembly, follow the steps below and refer to Figures 4-9 to 4-13.

1. Align a hole in the **insulator** with the **positioning pin** on the bottom cover.
2. Seat the **top cover** and **display assembly** and secure **eight latches**.
3. Secure the top cover with **four M2.5x6 screws**.
4. Connect four cables: **left speaker cable** to **PJ21**, **right speaker cable** to **PJ22**, **FL cable** to **PJ4** and **LCD cable** to **PJ3** (DSTN models) or **PJ23** (TFT models).
5. Close the display panel and turn the computer upside down.
6. Secure **two M2.5x6 silver screws** to the battery slot, **one M2.5x6 silver screw** to the HDD slot, **five M2.5x25 silver screws** to the bottom cover and **two M2.5x6 silver screws** to the back of the computer.

4.8 RTC Battery and Backup Battery

WARNING: If you replace the RTC battery or backup battery, be sure to use only batteries recommended by Toshiba. Installation of the wrong battery can cause the battery to explode or otherwise cause damage.

Removing the RTC Battery and Backup Battery

To remove the RTC battery and backup battery, follow the steps below and refer to Figure 4-14.

1. Remove the tape securing a **pad** over the RTC and backup batteries.
2. Disconnect the **RTC battery cable** from **PJ7** on the system board.
3. Disconnect the **backup battery cable** from **PJ802** on the system board.
4. Lift out the **RTC battery** and **backup battery**.

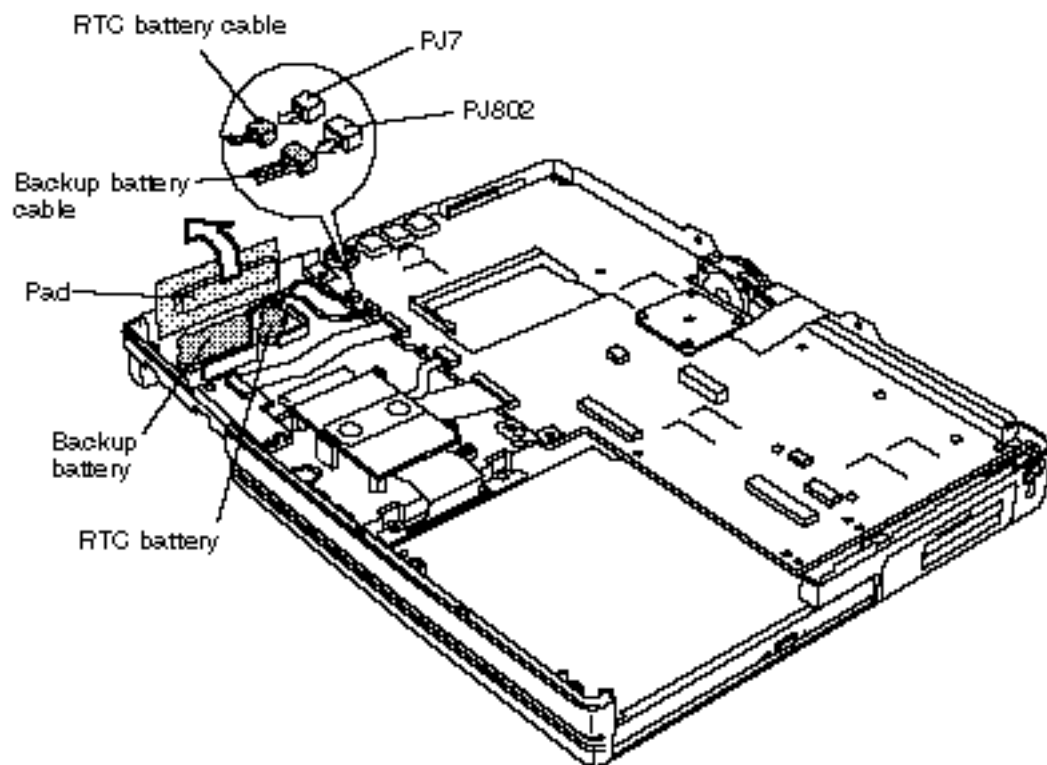


Figure 4-14 Removing the RTC and backup batteries

Installing the RTC Battery and Backup Battery

To install the RTC battery and backup battery, follow the steps below and refer to Figure 4-14.

1. Seat the **RTC battery** and **backup battery**.
2. Connect the **RTC battery cable** to **PJ7** and the **backup battery cable** to **PJ802**.
3. Secure the **pad** over the batteries with tape.

4.9 LED Board

Removing the LED Board

To remove the LED board, follow the steps below and refer to Figure 4-15.

1. Disconnect the **LED board flexible cable** from the **LED board**.
2. Remove **one M2.5x6 screw**.
3. Lift up the left side of the **LED board** to clear a latch on the right side to remove the board.

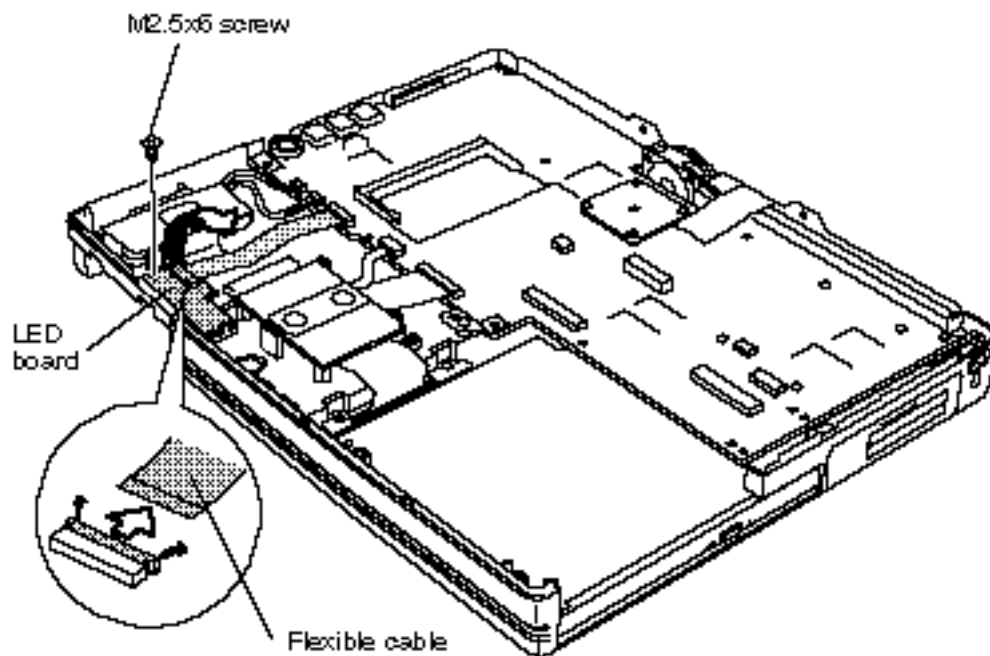


Figure 4-15 Removing the LED board

Installing the LED Board

To install the LED board, follow the steps below and refer to Figure 4-15.

1. Seat the **LED board**, making sure the right edge fits under the latch.
2. Secure the LED board with **one M2.5x6 screw**.
3. Connect the **LED board flexible cable** to the LED board.

4.10 Membrane Switch

Removing the Membrane Switch

To remove the membrane switch, follow the steps below and refer to Figure 4-16.

1. Disconnect the **membrane switch cable** from **PJ9** on the system board.
2. Release one latch at the front edge of the **membrane switch** and lift it.

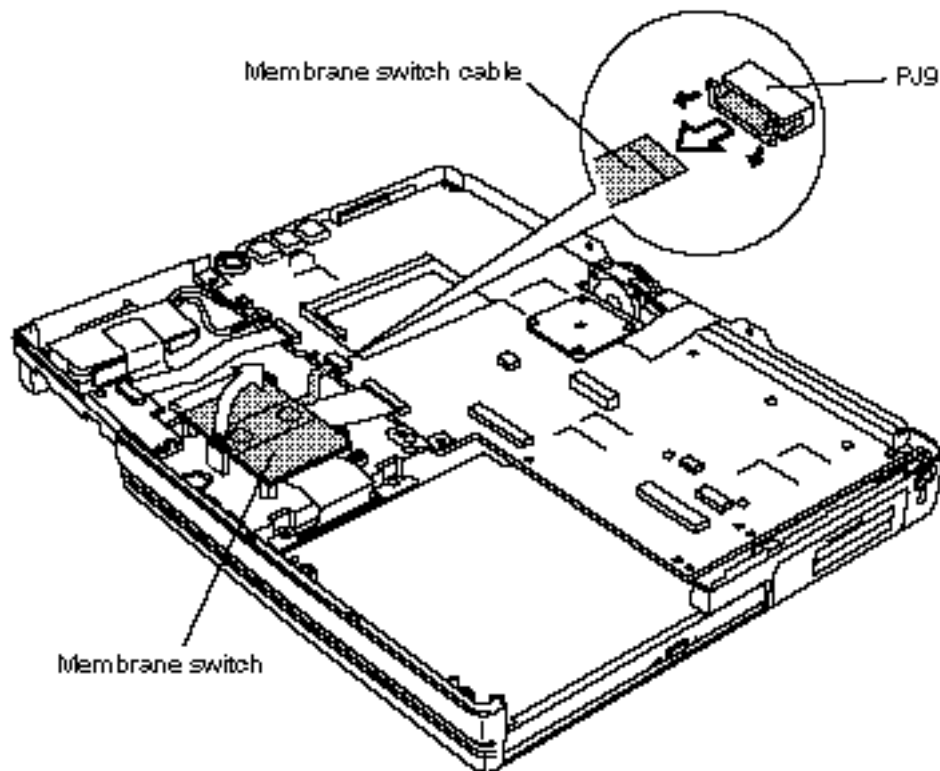


Figure 4-16 Removing the membrane switch

Installing the Membrane Switch

To install the membrane switch, follow the steps below and refer to Figure 4-16.

1. Seat the **membrane switch** and secure the latch.
2. Connect the **membrane switch cable** to **PJ9** on the system board.

4.11 FDD

Removing the FDD

To remove the FDD, follow the steps below and refer to Figures 4-17 and 4-18.

1. Disconnect the **FDD flexible cable** from **PJ14** on the system board.
2. Remove **one M2.5x6 screw** securing the FDD and remove the **FDD**.

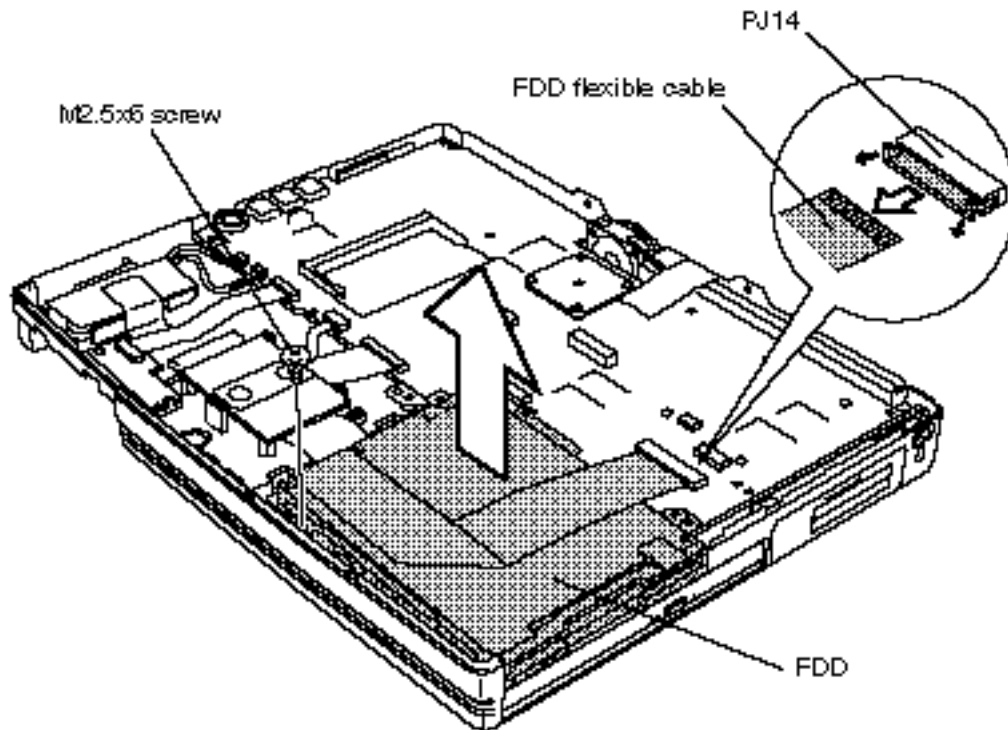


Figure 4-17 Removing the FDD

3. Remove **four flat-head screws** securing the FDD to the **FDD case** and separate the FDD from its case.
4. Disconnect the **FDD flexible cable** from the FDD.

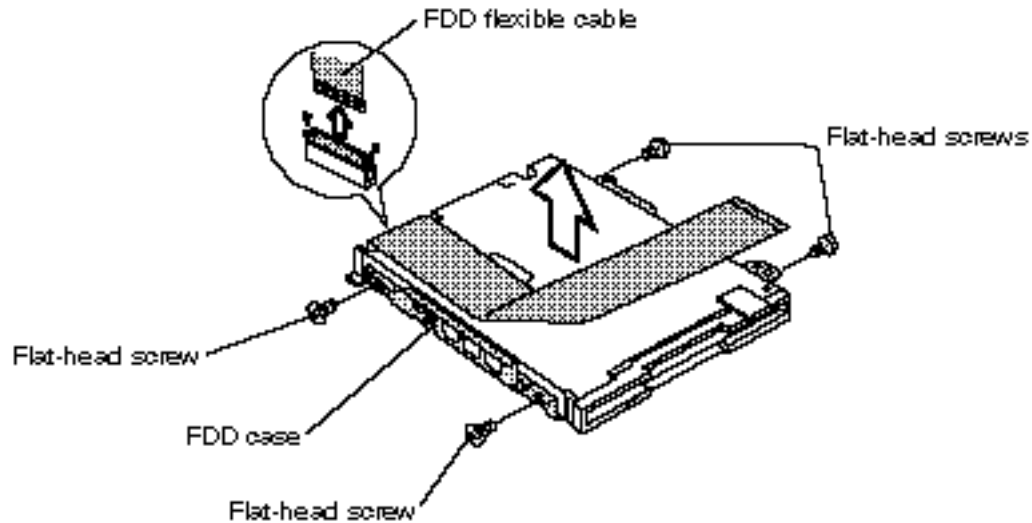


Figure 4-18 Disassembling the FDD

Installing the FDD

To install the FDD, follow the steps below and refer to Figures 4-17 and 4-18.

1. Insert the **FDD cable** into the FDD. Press gently to assure a firm connection.
2. Seat the **FDD** in the **FDD case** and secure **four flat-head screws**.
3. Seat the FDD and secure it with **one M2.5x6 screw**.
4. Connect the **FDD flexible cable** to **PJ14** on the system board.

4.12 CD-ROM Drive

Removing the CD-ROM Drive

To remove the CD-ROM drive, follow the steps below and refer to Figures 4-19 and 4-20.

1. Disconnect the **CD-ROM flexible cable** from **PJ16** on the system board.
2. Remove **two M2x6 screws** securing the CD-ROM drive.
3. Slide out the **CD-ROM drive**.

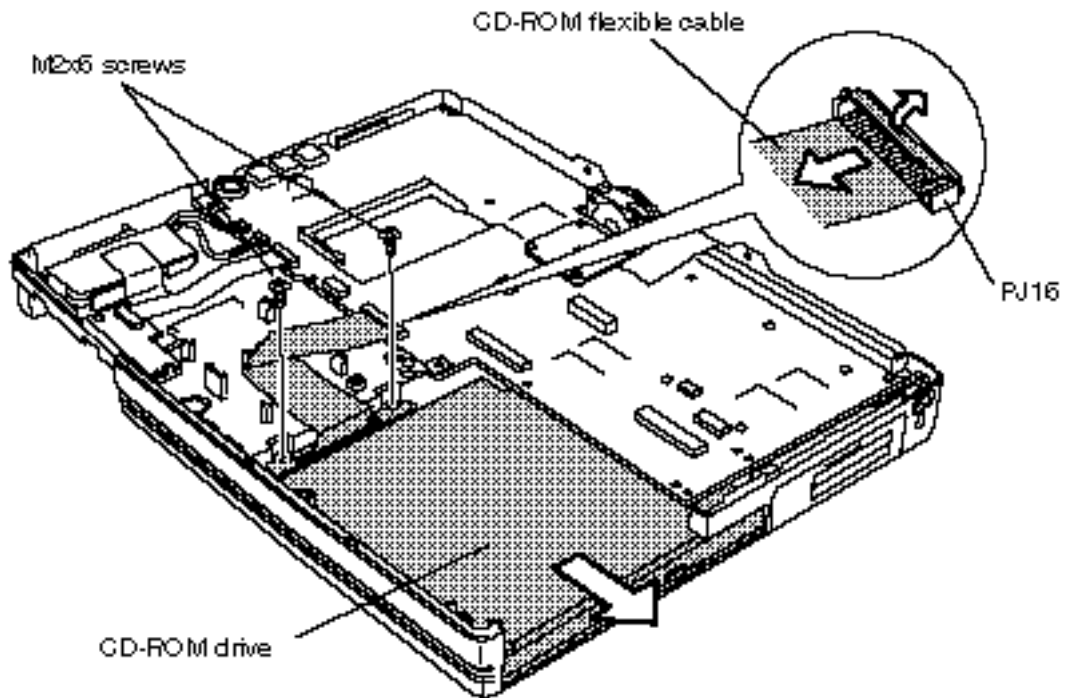


Figure 4-19 Removing the CD-ROM drive

4. Remove **two M2x6 screws** securing the CD-ROM connector assembly.
5. Separate the **CD-ROM connector** and **connector brace** from the CD-ROM drive.
6. Disconnect the **CD-ROM flexible cable** from **PJ998** on the CD-ROM connector.

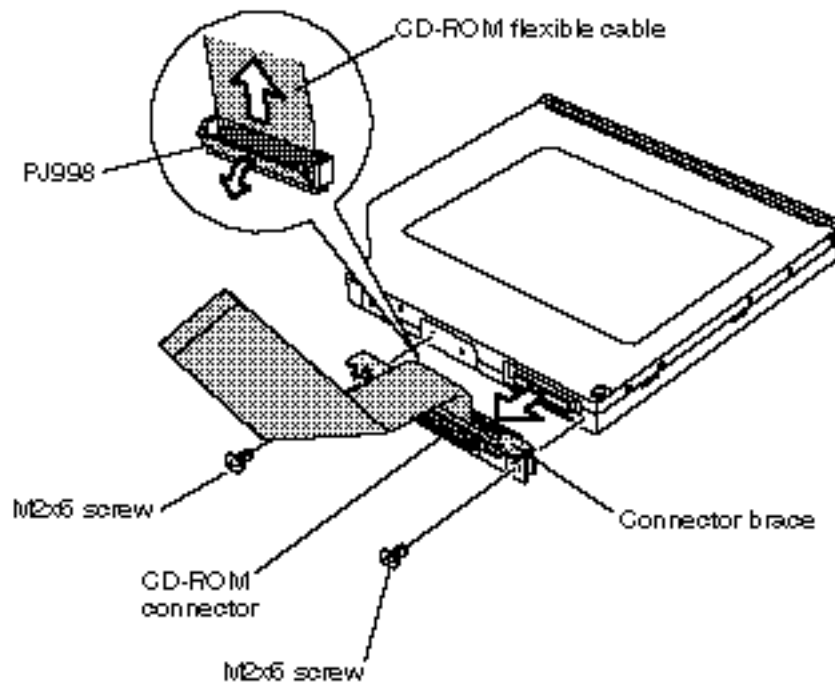
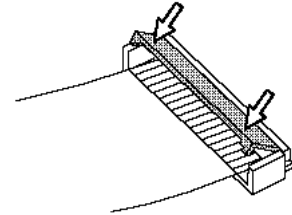


Figure 4-20 Disassembling the CD-ROM drive

Installing the CD-ROM drive

To install the CD-ROM drive, follow the steps below and refer to Figures 4-19 and 4-20.

CAUTION: When you lock PJ998 on the CD-ROM connector and PJ16 on the system board, push both sides of the connector lever at the same time. If you push the center of the lever, the cable can become disconnected easily.



1. Connect the **CD-ROM flexible cable** to **PJ998** on the CD-ROM connector.
2. Set the **CD-ROM connector brace** on the **CD-ROM connector** and connect the connector assembly to the **CD-ROM drive**.
3. Secure the connector assembly with **two M2x6 screws**.
4. Insert the CD-ROM drive into its slot.
5. Secure the CD-ROM drive with **two M2x6 screws**.
6. Connect the **CD-ROM flexible cable** to **PJ16** on the system board.

4.13 System Board

Removing the System Board

To remove the system board, follow the steps below and refer to Figures 4-21 to 4-24.

1. You will first remove the PC card slot cover. Pull out the PC card eject buttons and push them in fully; do not bend them.
2. Insert tweezers between the top of the PC card slot cover and the bottom cover of the computer to release **two latches**.

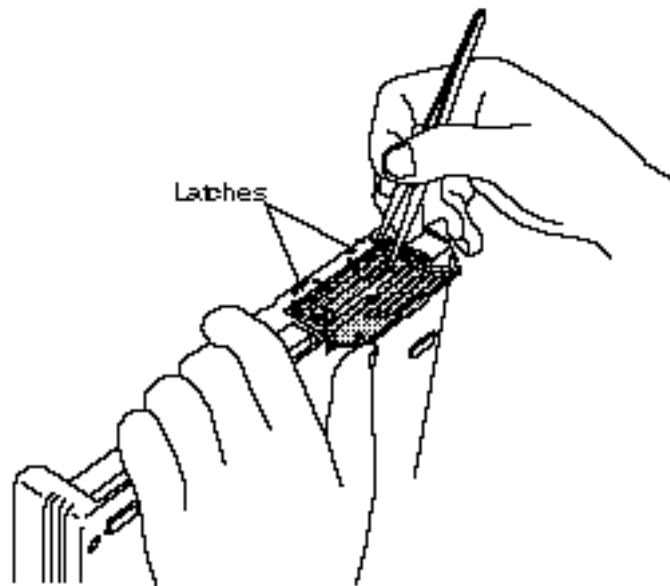


Figure 4-21 Releasing two latches securing the PC card slot cover

3. Pull the top of the **PC card slot cover** forward to remove it. Two internal **latches** prevent the card from being pulled straight out, so rotate it from the top.

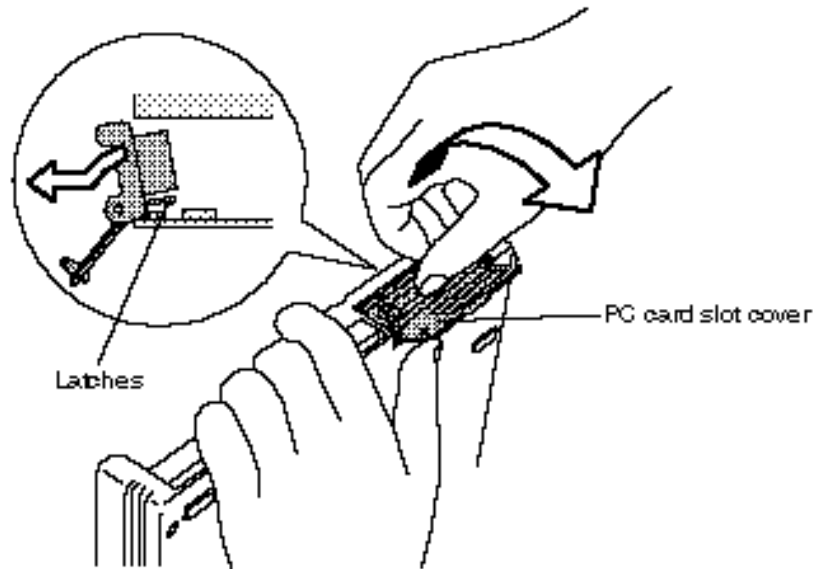


Figure 4-22 Removing the PC card slot cover

4. Disconnect five cables: **RTC battery cable** from **PJ7**, **backup battery cable** from **PJ802**, **LED board flexible cable** from **PJ17**, **membrane switch cable** from **PJ9** and **CD-ROM flexible** from **PJ16** on the system board.

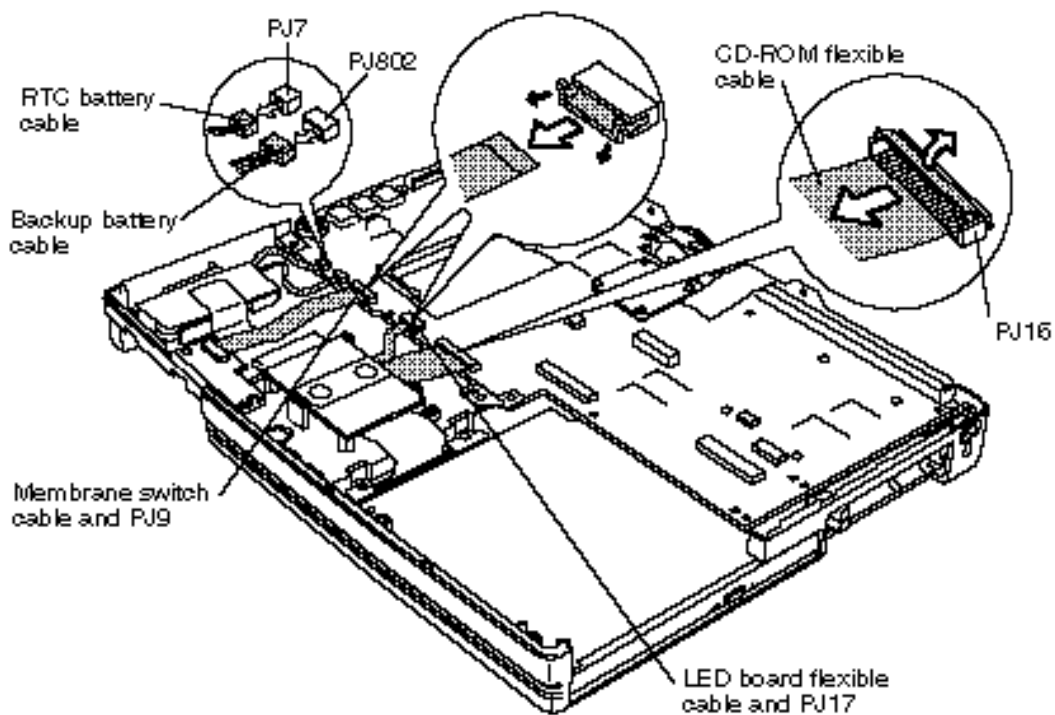


Figure 4-23 Disconnecting five cables connected to the system board

5. Remove **two M2.5x4 screws**. One secures the system board directly and the other secures a small brace on the corner of the system board. Lift out the **brace** with the screw.
6. Remove **two M2.5x6 screws** securing the system board.
7. Lift up the left side of the **system board** about 5 cm and pull it out from the left side to void damaging the PC card eject buttons.

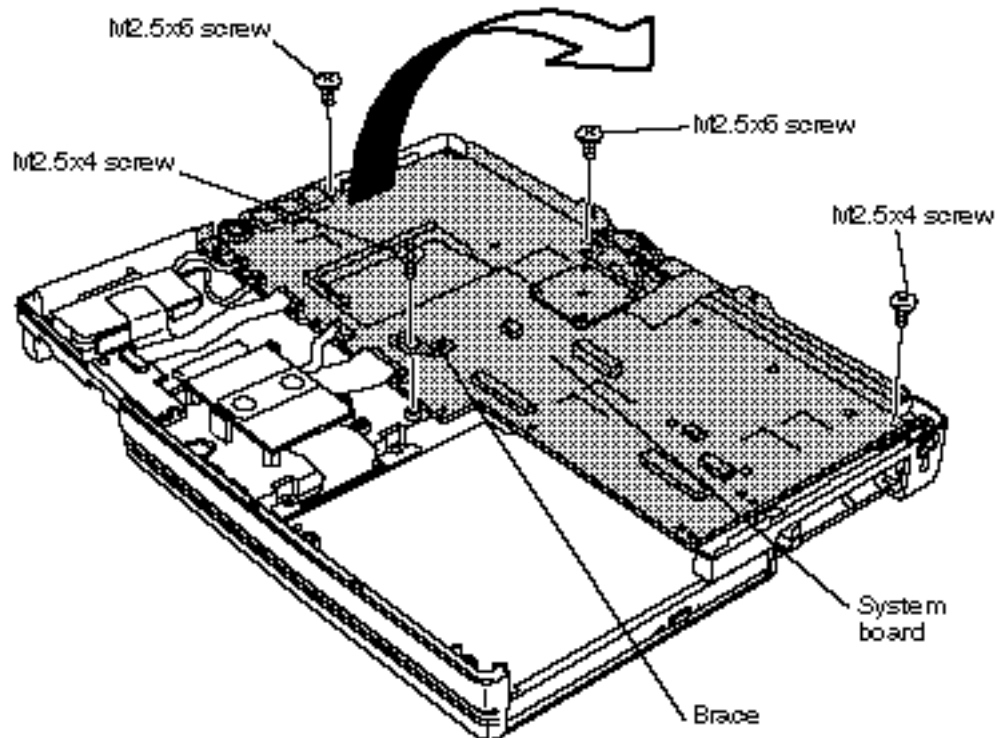


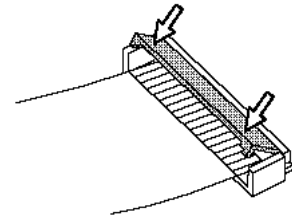
Figure 4-24 Removing the system board

Installing the System Board

To install the system board, follow the steps below and refer to Figures 4-21 to 4-24.

1. Set the right side of the **system board** into the bottom cover so that the PC card eject buttons go through the PC card slot, then lay the system board into place.
2. Secure **two M2.5x6 screws** to the system board.
3. Secure **two M2.5x4 screws** to the system board. One screw secures the board directly and the other secures a small brace. Set the **brace** in place before you secure the screw.
4. Connect five cables: **RTC battery cable** to **PJ7**, **backup battery cable** to **PJ802**, **LED board flexible cable** to **PJ17**, **membrane switch cable** to **PJ9** and **CD-ROM flexible** to **PJ16** on the system board.

CAUTION: When you lock PJ16 on the system board, push both sides of the connector lever at the same time. If you push the center of the lever, the cable can become disconnected easily.



5. Make sure the PC card eject buttons are not bent, then insert the **PC card slot cover**.

4.14 Cooling Fan

Removing the Cooling Fan

To remove the cooling fan, follow the steps below and refer to Figure 4-25.

1. Remove **tape** covering PJ1 and the fan cable.
2. Disconnect the **fan cable** from **PJ1** on the system board.
3. Remove **two M2x14 screws** securing the cooling fan.
4. Lift out the **cooling fan** from the system board.

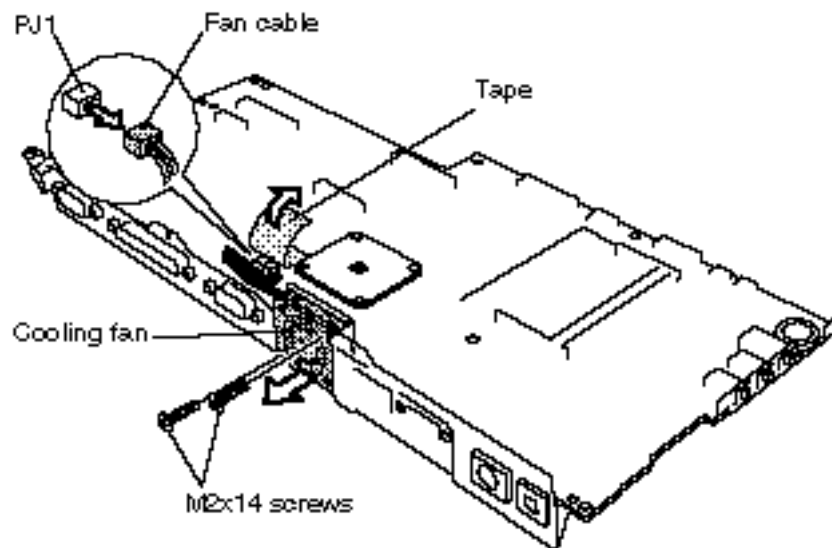


Figure 4-25 Removing the cooling fan

Installing the Cooling Fan

To install the cooling fan, follow the steps below and refer to Figure 4-25.

1. Secure the **cooling fan** to the system board with **two M2x14 screws**.
2. Connect the **fan cable** to **PJ1** on the system board.
3. Cover PJ1 and the fan cable with **tape**.

4.15 Speakers

Removing the Speakers

To remove the speakers, follow the steps below and refer to Figure 4-26.

1. Remove **one M2.5x6 screw** securing each **speaker brace**.
2. Remove each brace and lift out the **speaker**.

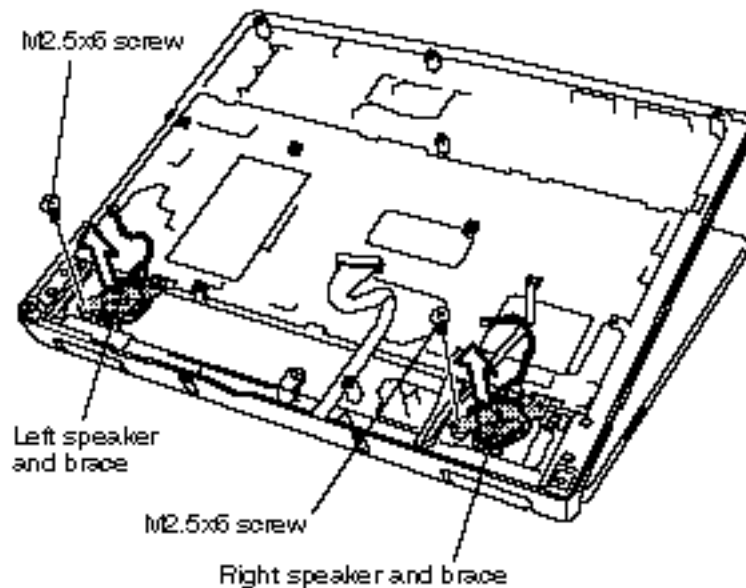


Figure 4-26 Removing the speaker

Installing the Speakers

To install the speakers, follow the steps below and refer to Figure 4-26.

1. Seat a **speaker**.
2. Set the **speaker brace** in place and secure it with **one M2.5x6 screw**.
3. Repeat for the other speaker.

4.16 Display Mask

Removing the Display Mask

To remove the display mask, follow the steps below and refer to Figures 4-27 and 4-28.

1. Remove **two mask seals** at the hinges to expose two screws securing the display mask.
2. Remove the **two M2.5x6 screws** that were covered by the mask seals.

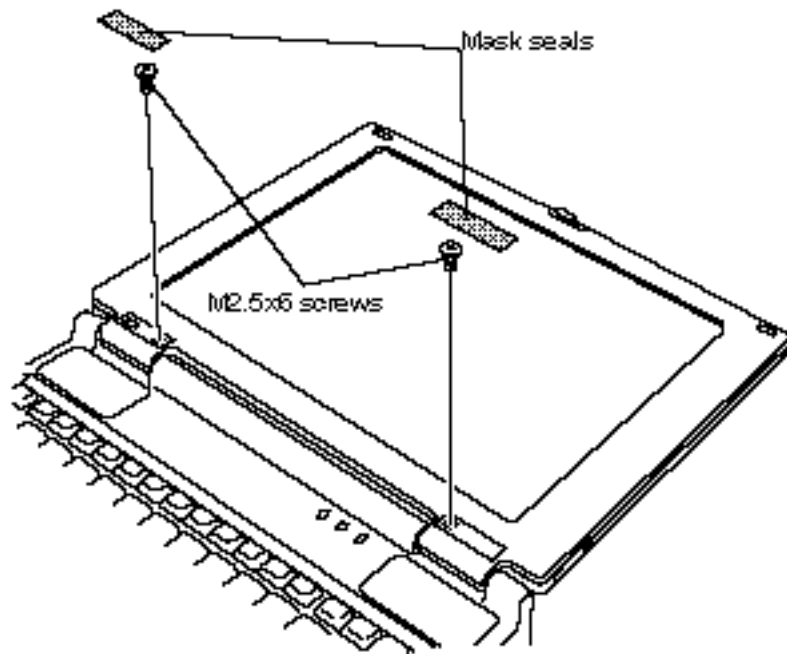


Figure 4-27 Removing two screws securing the display mask

3. A total of 18 snaps secure the display mask. Carefully insert your fingers between the mask and the LCD panel and pry open the snaps. Start with the **six snaps** across the top of the display mask.
4. Continue unsnapping the **display mask** along the sides (**four snaps** on each side), at the bottom (**two snaps**) and at the hinges (**two snaps**).

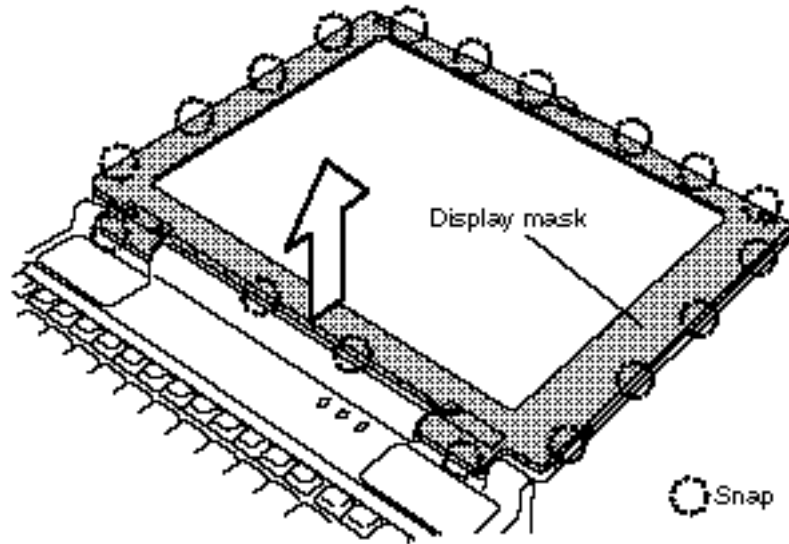


Figure 4-28 Removing the display mask

Installing the Display Mask

To install the display mask, follow the steps below and refer to Figures 4-27 and 4-28.

1. Set the **display mask** in place and secure the snaps beginning with the **two snaps** at the hinges and **two snaps** at the bottom of the display mask.
2. Continue along the sides (**four snaps**) and across the top (**six snaps**).
3. Secure the display mask with **two M2.5x6 screws** at the hinges.
4. Attach the **two mask seals** to cover the screws.

4.17 FL Inverter Board

Removing the FL Inverter Board

To remove the FL inverter board, follow the steps below and refer to Figure 4-29.

1. Remove **tape** securing the HV cable.
2. Remove the **two M2.5x6 screws** securing the **FL inverter board**.
3. Carefully rotate the FL inverter board out from right to left and disconnect the **FL cable** from **CN1** and the **HV cable** from **CN2**.

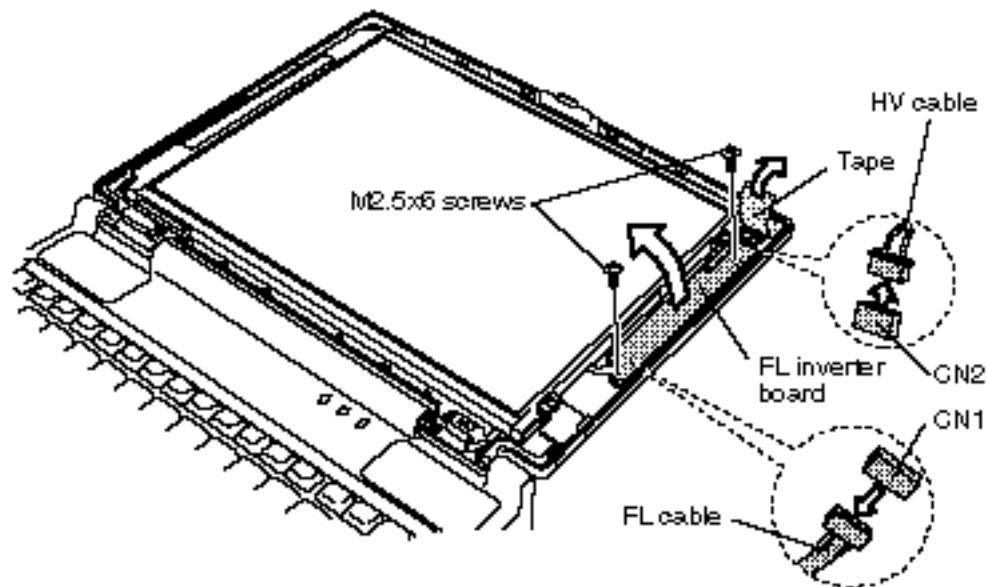


Figure 4-29 Removing the FL inverter board

Installing the FL inverter Board

To install the FL inverter board, follow the steps below and refer to Figure 4-29.

1. Connect the **FL cable** to **CN1** and the **HV cable** to **CN2** on the FL inverter board.
2. Route the cables so they are not pinched by the FL inverter board, display hinge or other component.
3. Rotate the **FL inverter board** into place and secure it with the **two M2.5x6 screws**.
4. Secure the HV cable with **tape**.

4.18 DSTN LCD Module and Contrast Board

Removing the DSTN LCD Module and Contrast Board

To remove the DSTN LCD module and contrast board, follow the steps below and refer to Figures 4-30 and 4-31.

1. Remove the **four M2.5x7 silver screws with washer** securing the LCD module.
2. Rotate the **LCD module** from right to left out of the LCD cover. Be careful not to apply pressure to the flexible cable.
3. Disconnect the **flexible cable** from the **LCD module** and from the **LCD cable** in the computer.

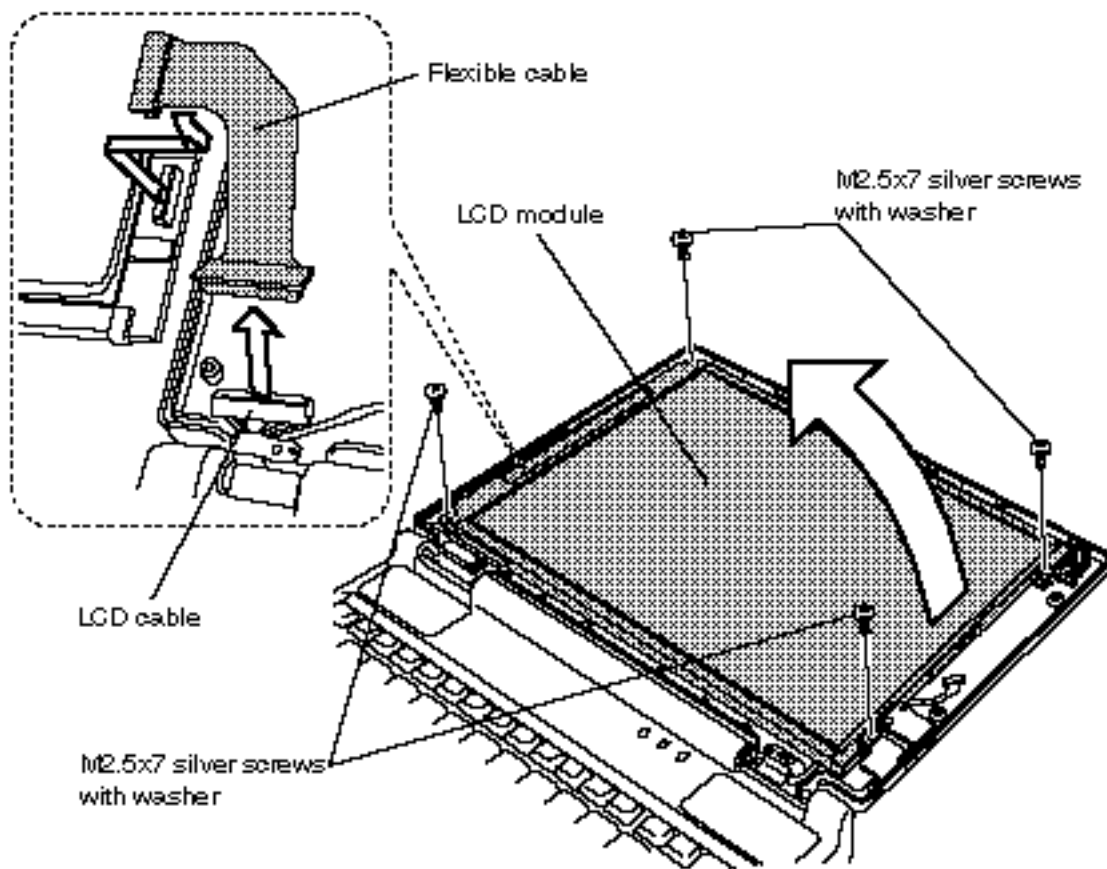


Figure 4-30 Removing the LCD module

4. Remove **one M2.5x6 screw** securing the **contrast board**.
5. Disconnect the **contrast board cable** from the contrast board and lift out the board.

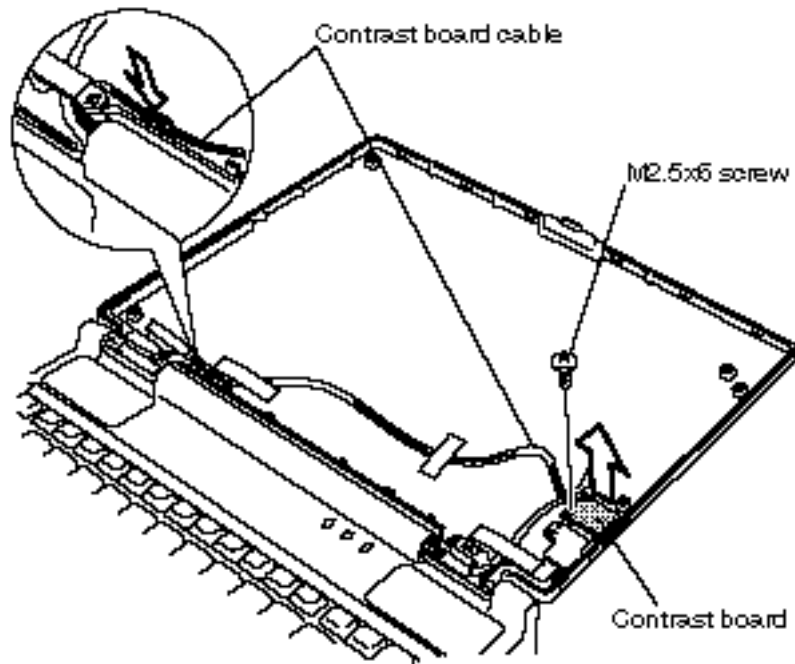


Figure 4-31 Removing the contrast board

Installing the DSTN LCD Module and Contrast Board

To install the DSTN LCD module and contrast board, follow the steps below and refer to Figures 4-30 and 31.

1. Route the **contrast board cable** in the groove on the side of the left hinge and connect it to the contrast board.
2. Seat the **contrast board** and secure it with **one M2.5x6 screw**.
3. Connect the **flexible cable** to the **LCD module** and to the **LCD cable** in the computer.
4. Rotate the **LCD module** into place and secure it with **four M2.5x7 silver screws with washer**.

4.19 TFT LCD Module

Removing the TFT LCD Module

To remove the TFT LCD module, follow the steps below and refer to Figure 4-32.

1. Remove the **four M2.5x7 silver screws with washer** securing the LCD module.
2. Rotate the **LCD module** out and lay it face down on the keyboard and palm rest. Be careful not to apply pressure to the LCD cable.
3. Disconnect the **LCD cable** from the LCD module.

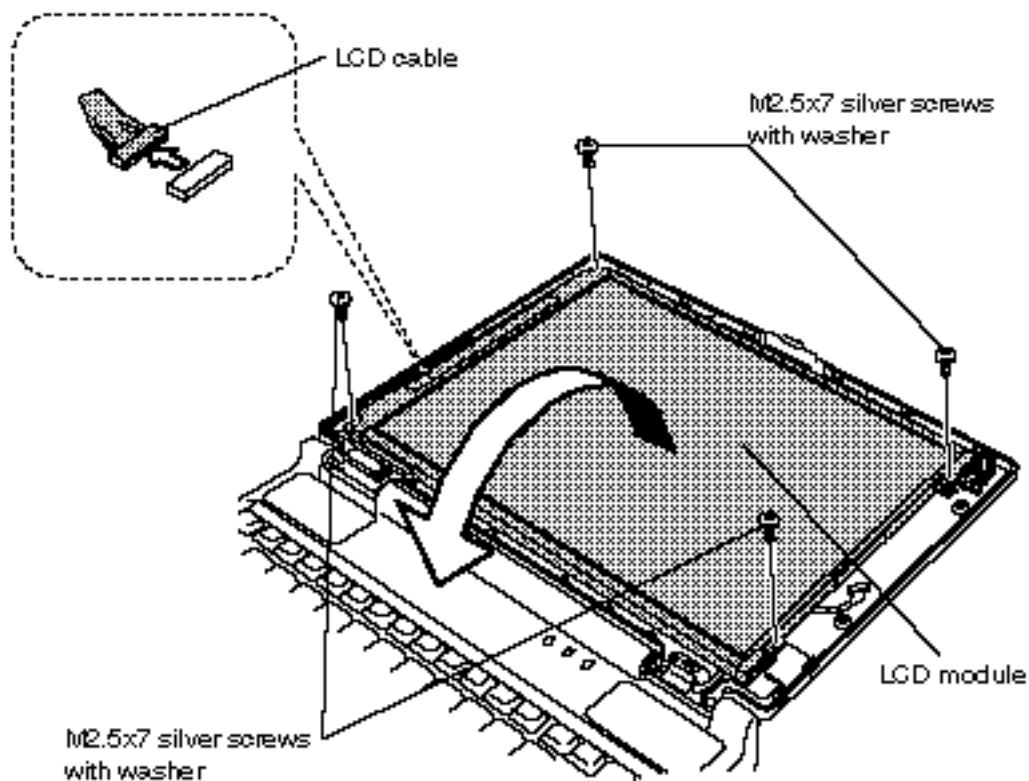


Figure 4-32 Removing the LCD module

Installing the TFT LCD Module

To install the TFT LCD module, follow the steps below and refer to Figure 4-32.

1. Connect the **LCD cable** to the LCD module.
2. Rotate the **LCD module** into place and secure it with **four M2.5x7 silver screws with washer**.

4.20 DSTN FL

CAUTION: When you remove the FL, be careful not to let any dust or other foreign matter contaminate the LCD panel. Any contamination can affect the performance of the unit.

Removing the DSTN FL

To remove the DSTN FL, follow the steps below and refer to Figures 4-33 to 4-35.

1. Remove **strips of tape** from three sides of the LCD module.
2. Release **12 latches** on the LCD module and turn over the module.

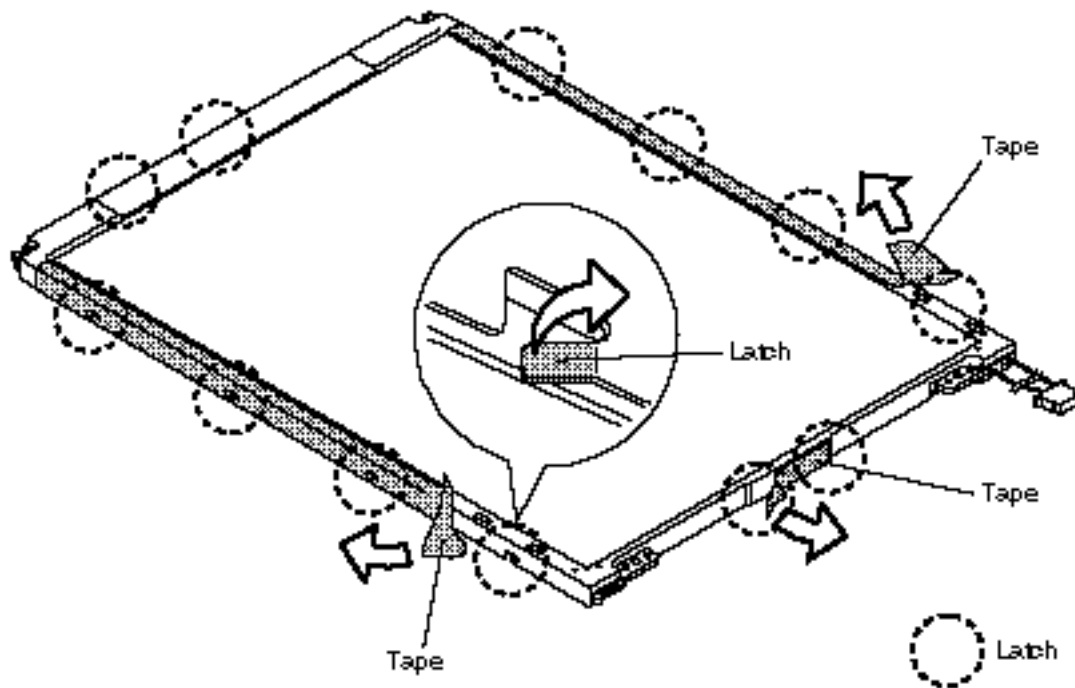


Figure 4-33 Releasing 12 latches on the LCD module

3. Remove **five flat-head screws** and lift off the LCD module's **rear cover**.

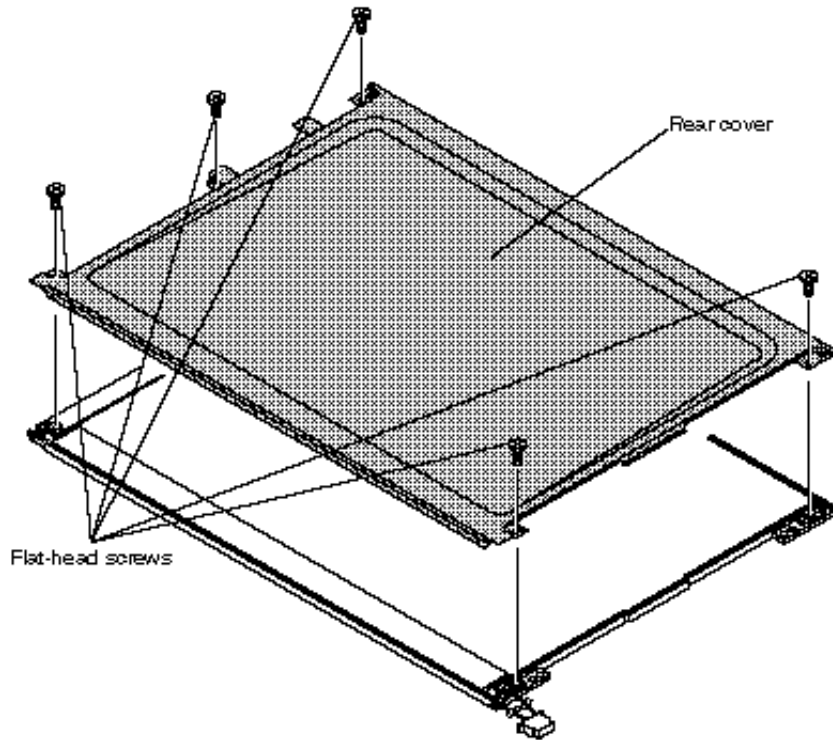


Figure 4-34 Opening the LCD module's rear cover

4. Fold back the **FL cover** and lift out the **FL**.

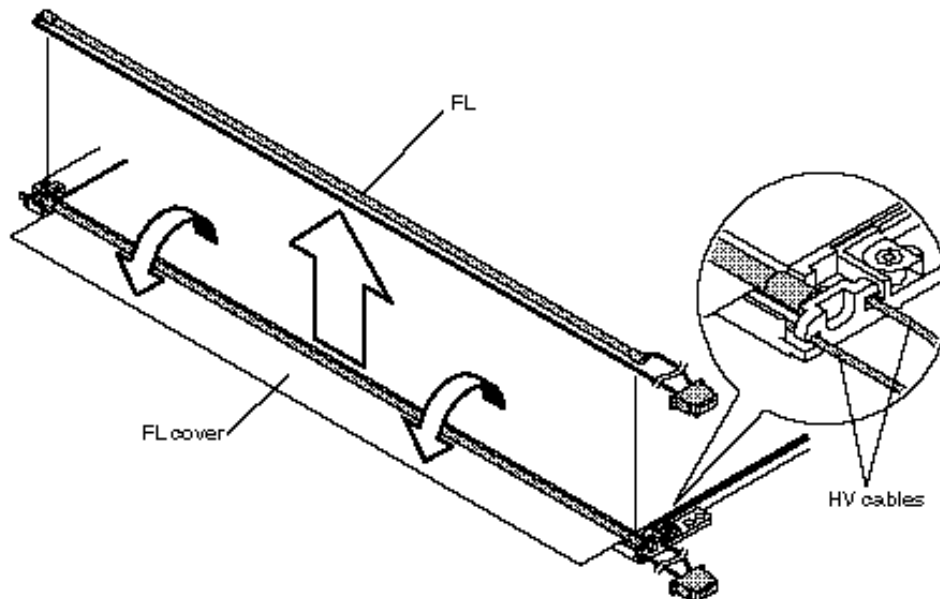


Figure 4-35 Removing the FL

Installing the DSTN FL

To install the DSTN FL, follow the steps below and refer to Figures 4-33 to 4-36.

1. Run the **HV cables** in the grooves and seat the **FL**.
2. Lay the **FL cover** on top of the FL.
3. Seat the **rear cover** and secure it with **five flat-head screws**.
4. Secure **12 latches** and replace **new strips of tape** on three sides.

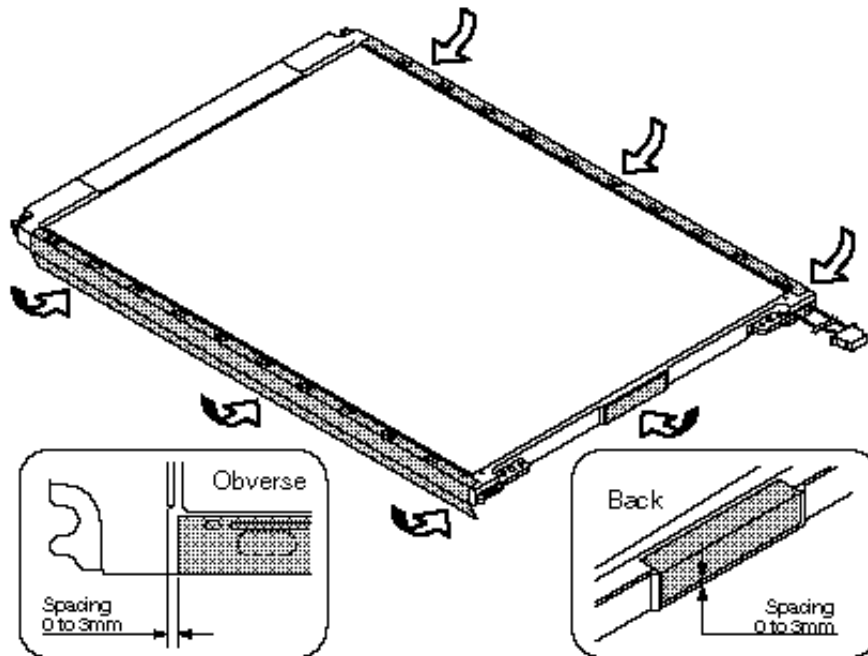


Figure 4-36 Securing three strips of tape on the LCD module

4.21 TFT FL (SHARP)

CAUTION: When you remove the FL, be careful not to let any dust or other foreign matter contaminate the LCD panel. Any contamination can affect the performance of the unit.

Removing the TFT FL (SHARP)

To remove the TFT FL (SHARP), follow the steps below and refer to Figures 4-37 to 4-41.

1. Turn the LCD module upside down and remove the **insulation** and the **polyimide tape** securing the FL cover. When you remove the insulation, be careful not to remove the filament tape securing the LCD segment-driver circuit board to the plastic frame.
2. Remove **three long flat-head screws** securing the LCD frame.

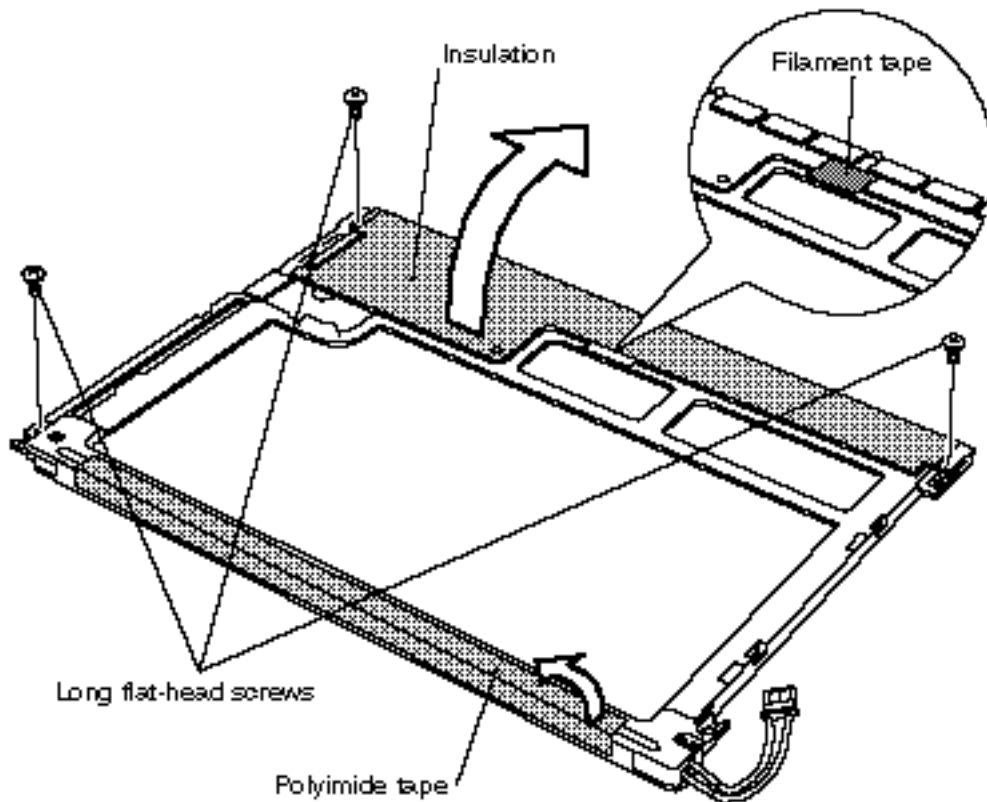


Figure 4-37 Removing three screws from the LCD module

3. Release **three latches** securing the LCD frame.

CAUTION: When you remove the LCD frame, be careful to hold the glass panel in place to prevent it from falling.

4. Release **two latches** securing the LCD frame and separate the **frame** from the module.

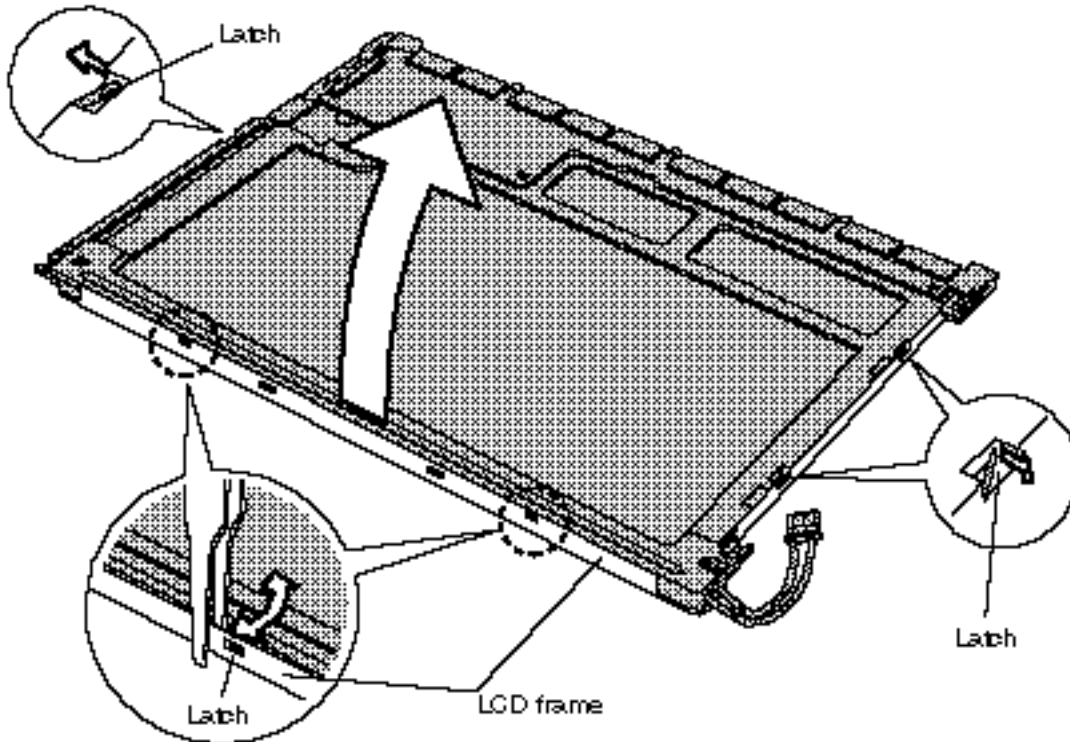


Figure 4-38 Removing the LCD frame

5. Remove **two short flat-head screws** securing the FL cover.
6. Release **four latches** securing the FL cover and remove the **cover**.

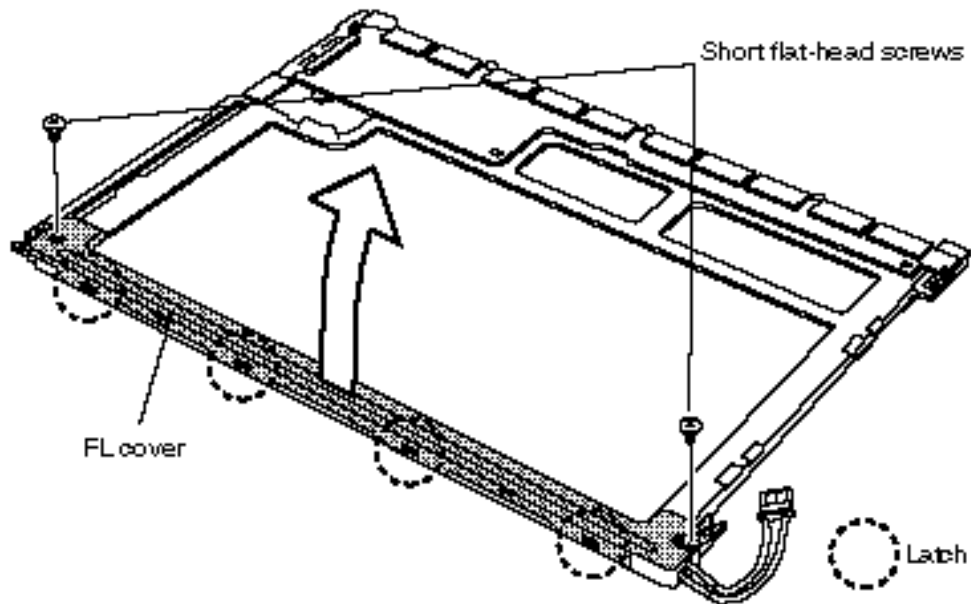


Figure 4-39 Removing the FL cover

7. Hold the glass panel and pull the **HV cable** out of its groove.

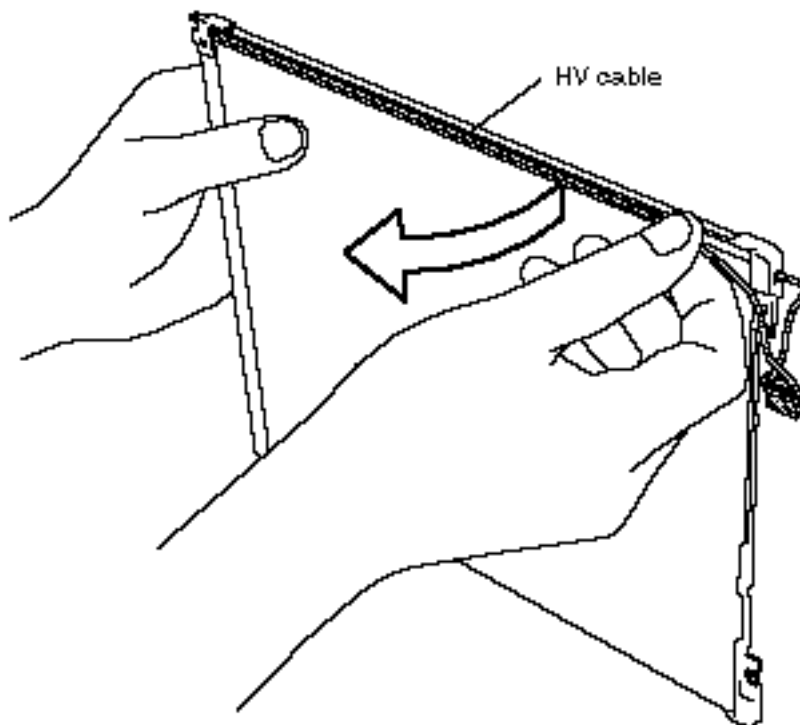


Figure 4-40 Removing the FL cable

8. Lay back the **plastic reflector sheet** and remove the **FL** from its groove.

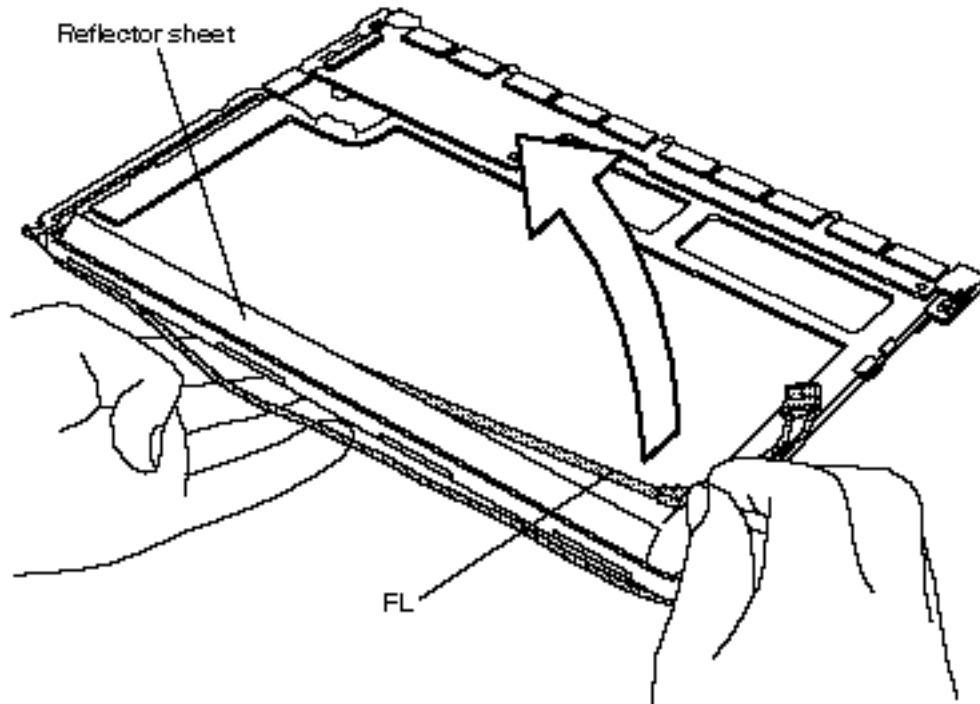


Figure 4-41 Removing the FL

Installing the TFT FL (SHARP)

To install the TFT FL (SHARP), follow the steps below and refer to Figures 4-37 to 4-41.

1. Seat the **FL** in its groove and lay the **reflector sheet** in place.
2. Route the **HV cable** in its groove.
3. Lay the **FL cover** in place and secure it with **four latches**.
4. Secure the FL cover with **two short flat-head screws**.
5. Seat the LCD module in its frame and secure the **frame** with **five latches**.
6. Secure the LCD frame with **three long flat-head screws**.
7. Secure the FL cover with new **polyimide tape** (8 x 220 mm). If the filament tape (19 x 20 mm) securing the LCD segment-driver circuit board is broken or removed, replace it with new tape.
8. Reapply the **insulation** with new one.

4.22 TFT FL (DTI)

CAUTION: When you remove the FL, be careful not to let any dust or other foreign matter contaminate the LCD panel. Any contamination can affect the performance of the unit.

Removing the TFT FL (DTI)

To remove the TFT FL (DTI), follow the steps below and refer to Figures 4-42 to 4-44.

1. Remove the **shield plate** from the LCD module.

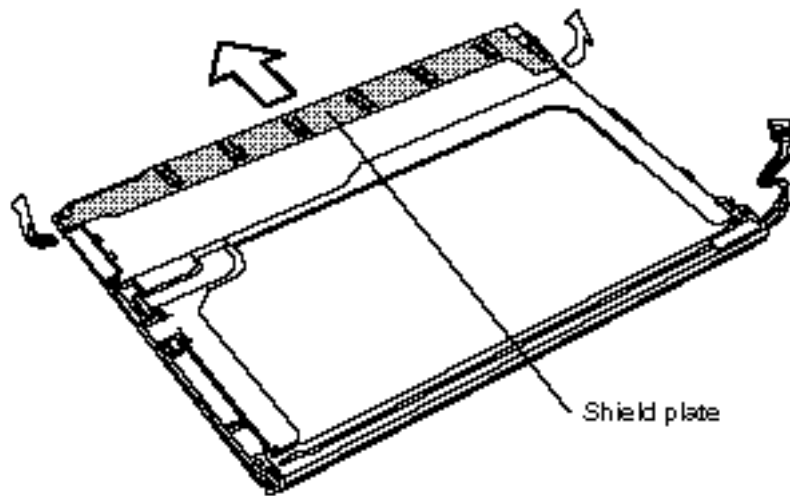


Figure 4-42 Removing the shield plate

2. Remove **one black flat-head screw** and **one brass flat-head screw** securing the FL metal cover.
3. Slide off the **FL metal cover**.

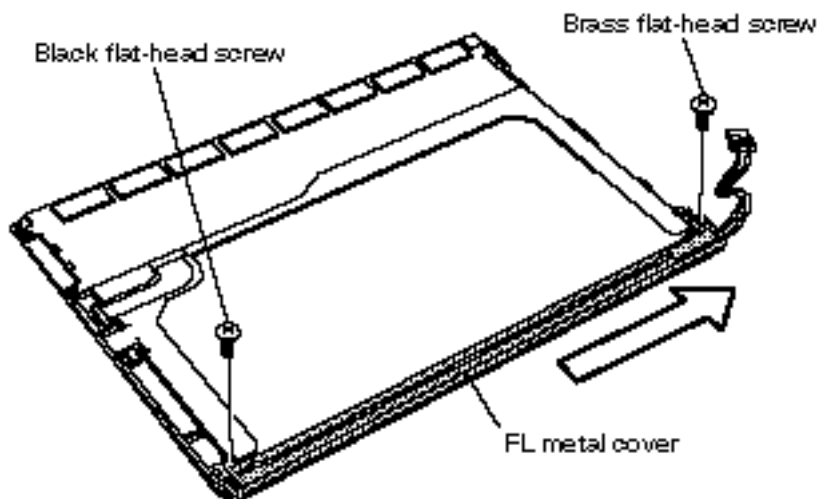


Figure 4-43 Removing the FL metal cover

4. Lift up the HV cable and lift the **FL plastic cover**.
5. Lift out the **FL**.

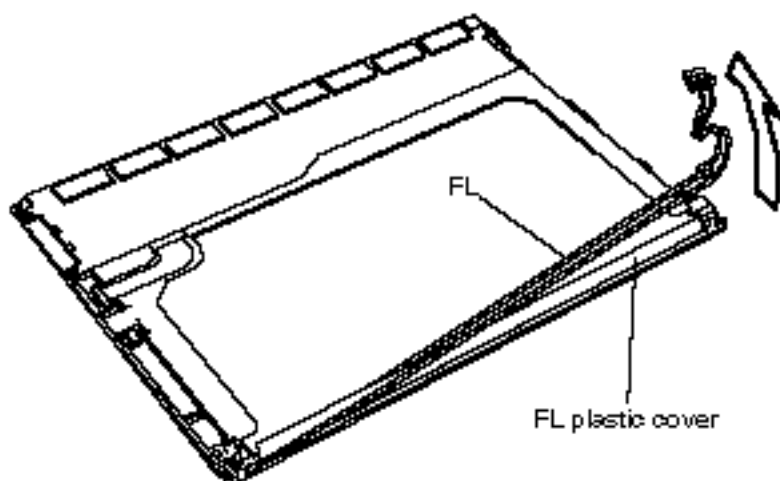


Figure 4-44 Removing the FL

Installing the TFT FL (DTI)

To install the TFT FL (DTI), follow the steps below and refer to Figures 4-42 to 4-45.

1. There are two support rings on the FL. Make sure each ring is positioned so the FL is divided evenly into thirds.
2. Set the end of the **FL** into place and route the **FL plastic cover** between the FL and the HV cable. Route the HV cable between the FL plastic cover and the edge of the LCD module frame.
3. Slide the **FL metal cover** into place and secure it with **one black flat-head screw** and **one brass flat-head screw**.

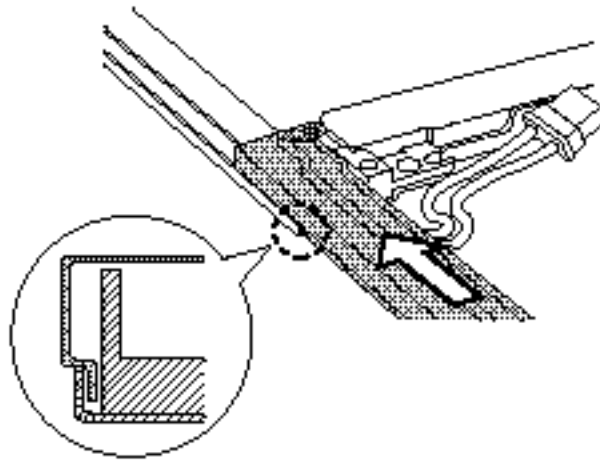


Figure 4-45 Securing the metal cover

4. Seat the **shield plate** to the LCD module.

4.23 TFT FL (Samsung)

*CAUTION: Do not disassemble the LCD panel manufactured by Samsung Electronics.
Return it to the manufacturer for FL replacement.*

4.24 TFT FL (NEC)

CAUTION: When you remove the FL, be careful not to let any dust or other foreign matter contaminate the LCD panel. Any contamination can affect the performance of the unit.

Removing the TFT FL (NEC)

To remove the TFT FL (NEC), follow the steps below and refer to Figures 4-46 to 4-49.

1. Turn the LCD face down and remove four pieces of tape one at the top, one at the right and two at the bottom. Throw the tape away; it is not reusable.
2. Remove four screws, one at each corner.
3. Turn the panel right side up and bend out two metal latches at the top, two latches at the left and one latch at the right.

CAUTION: Handle the panel very carefully. Do not touch surface-mounted ICs on the left side of the display surface.

4. Remove two screws securing the outer plate shielding the LCD driver board and lift off the shield plate.
5. Remove one screw, then disconnect the flat-cable connector.
6. Lift up the horizontal LCD driver board and disconnect the back light from the LCD panel. Set the LCD panel aside.

CAUTION: Do not touch surface-mounted ICs. Also do not bend the panel.

7. Place the backlight module upside down.
8. Remove one screw from the inner plate shielding and release five latches securing the plate, then lift it off.
9. Free two cables from notches in the panel and lift out the FL with its holder.
10. Remove the FL from the holder.

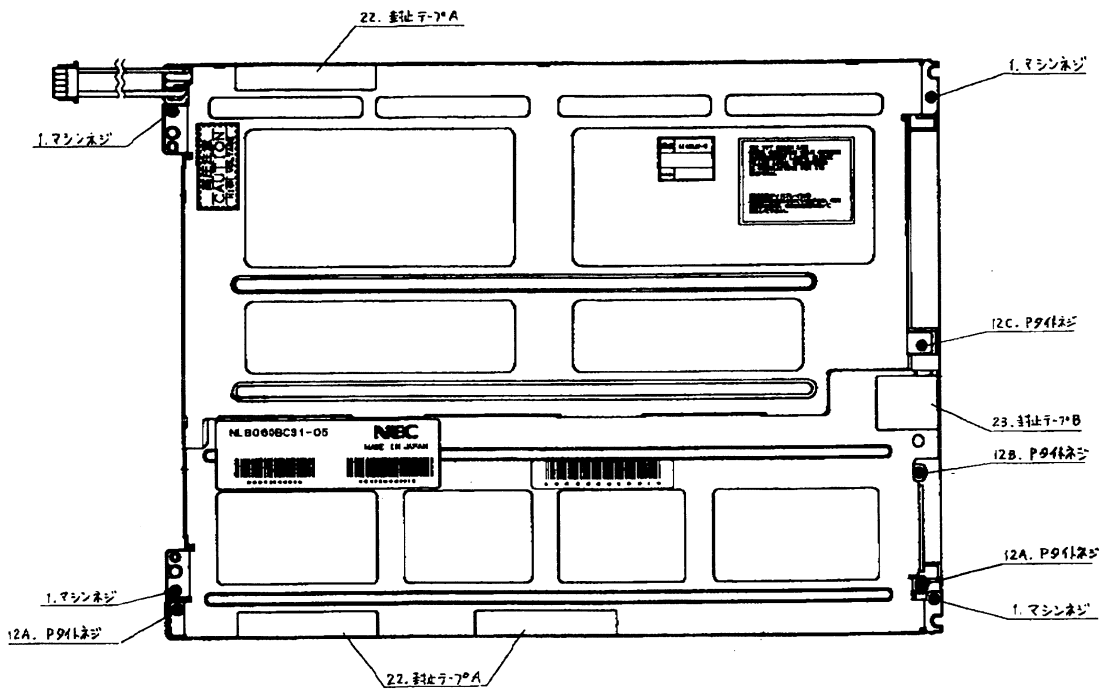


Figure 4-46 Disassembly NEC TFT LCD (1)

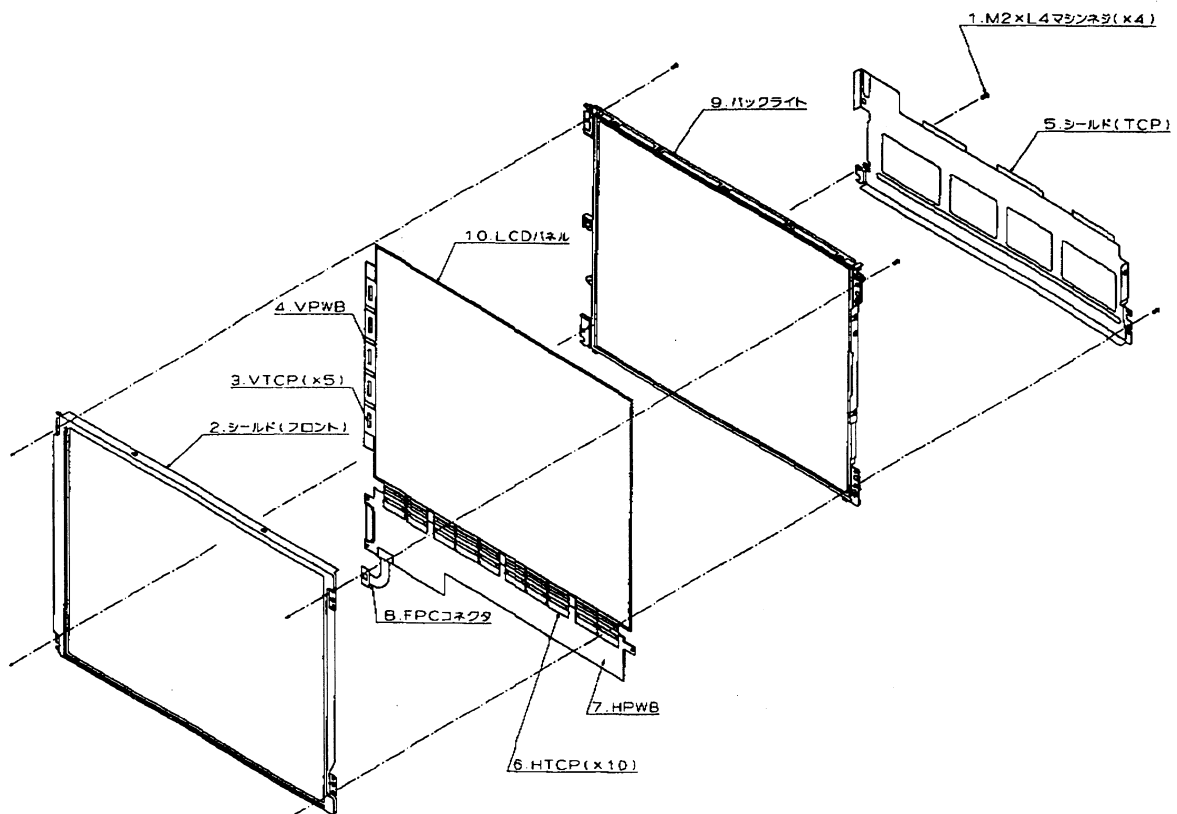


Figure 4-47 Disassembly NEC TFT LCD (2)

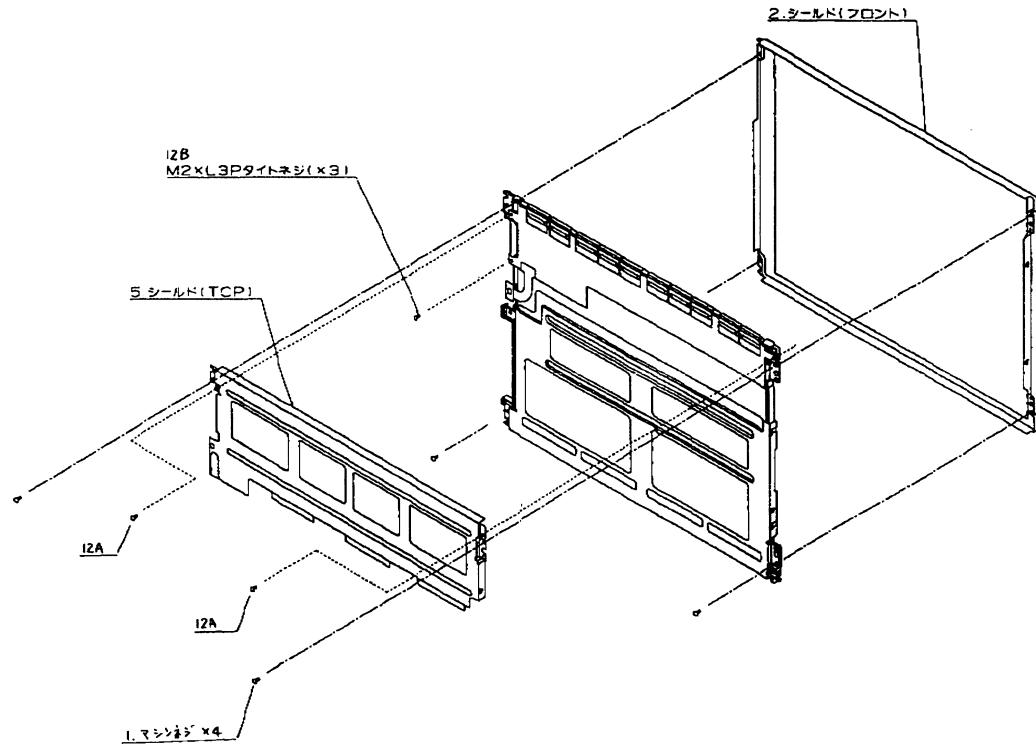


Figure 4-48 Disassembly NEC TFT LCD (3)

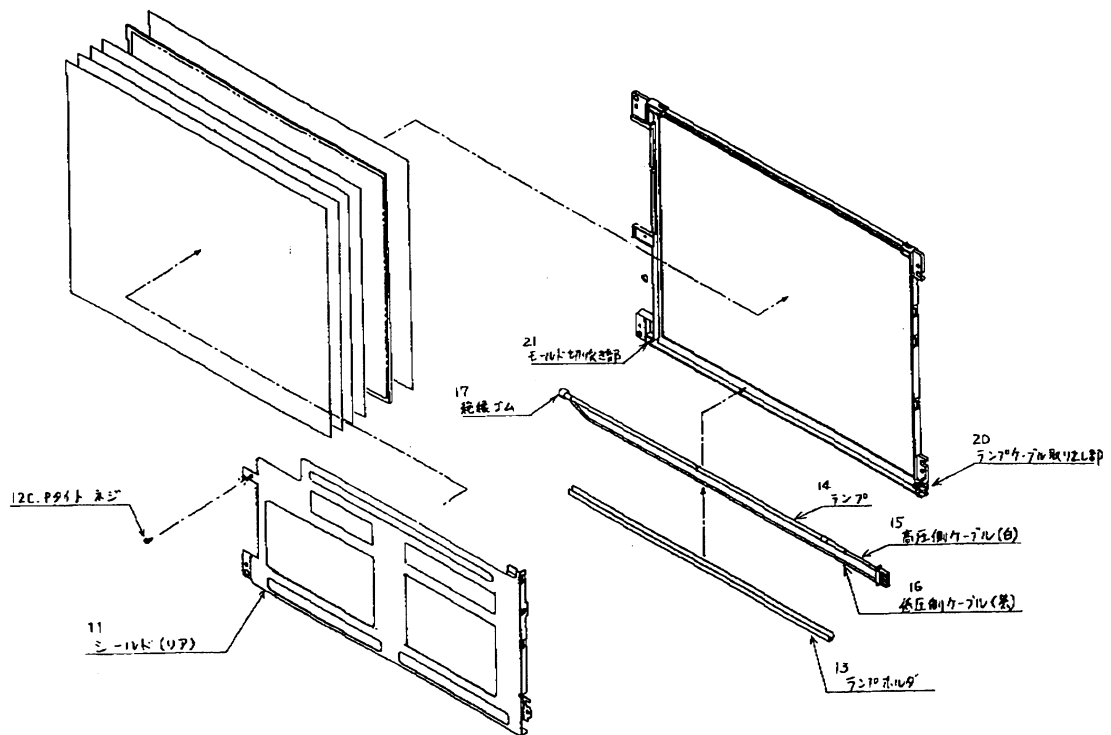


Figure 4-49 Disassembly NEC TFT LCD (4)

Installing the TFT FL (NEC)

To install the TFT FL (NEC), refer to Figures 4-46 to 4-49.

NOTE: Assemble the LCD panel in reverse procedure.

Appendices

Appendix Contents

Appendix A Handling the LCD ModuleA-1

Appendix B Board LayoutB-1

B.1	System Board Front View (TFT).....	B-1
B.2	System Board Back View (TFT).....	B-2
B.3	System Board Front View (DSTN).....	B-5
B.4	System Board Back View (DSTN).....	B-6

Appendix C Pin AssignmentsC-1

C.1	PJ1	Fan Connector (2-pin).....	C-1
C.2	PJ2	CPU Theramistor Connector (3-pin).....	C-1
C.3	IS34	Expansion Memory Connector (144-pin).....	C-1
C.4	PJ23	TFT LCD I/F Connector (20-pin).....	C-4
C.5	PJ3	DSTN LCD I/F Connector (40-pin).....	C-4
C.6	PJ4	FL Inverter I/F Connector (7-pin).....	C-5
C.7	PJ5	RGB Connector (15-pin).....	C-5
C.8	PJ6	USB I/F Connector (4-pin).....	C-6
C.9	PJ7	RTC Battery Connector (3-pin).....	C-6
C.10	PJ8	PC Card Slot Connector (156-pin).....	C-6
C.11	PJ9	IPS Button FPC Connector (4-pin).....	C-8
C.12	PJ10	Key Board Connector (28-pin).....	C-9
C.13	PJ11	PS/2 Mouse/Keyboard Connector (6-pin).....	C-9
C.14	PJ12	Serial Connector (9-pin).....	C-10
C.15	PJ13	Parallel Connector (25-pin).....	C-10
C.16	PJ14	FDD Connector (26-pin).....	C-11
C.17	PJ15	HDD Connector (44-pin).....	C-11
C.18	PJ16	PCB FLCCD* I/F Connector (50-pin).....	C-12
C.19	PJ17	PCB FLCLE* I/F Connector (11-pin).....	C-13

C.20	PJ18	Line Input Connector (3-pin)	C-13
C.21	PJ19	Microphone Connector (3-pin).....	C-14
C.22	PJ20	Headphone Connector (6-pin).....	C-14
C.23	PJ21	Left Speaker Connector (2-pin).....	C-14
C.24	PJ22	Right Speaker Connector (2-pin)	C-14
C.25	PJ800	AC Adapter Connector (3-pin).....	C-14
C.26	PJ801	Main Battery Connector (10-pin).....	C-15
C.27	PJ802	Backup Battery Connector (2-pin).....	C-15
 Appendix D Keyboard Scan/Character Codes			D-1
 Appendix E Key Layout.....			E-1
E.1	United States (US) Keyboard		E-1
E.2	United Kingdom (UK) Keyboard.....		E-1
E.3	German (GR) Keyboard		E-2
E.4	French (FR) Keyboard.....		E-2
E.5	Spanish (SP) Keyboard.....		E-3
E.6	Italian (IT) Keyboard.....		E-3
E.7	Scandinavian (SC) Keyboard.....		E-4
E.8	Swiss-German (SL) Keyboard.....		E-4
E.9	Canadian (CS) Keyboard.....		E-5
 Appendix F Wiring Diagrams.....			F-1
F.1	Parallel Port Wraparound Connector.....		F-1
F.2	Serial Port Wraparound Connector.....		F-1
F.3	Serial Port Direct Cable (9-Pin to 9-Pin).....		F-2
F.4	Serial Port Direct Cable (9-Pin to 25-Pin).....		F-2
 Appendix G BIOS Rewrite Procedures.....			G-1
 Appendix H Reliability			H-1

Figures

Figure B-1	Board layout (front)	B-1
Figure B-2	Board layout (back).....	B-2
Figure B-3	Board layout (front)	B-5
Figure B-4	Board layout (back).....	B-6
Figure E-1	US keyboard	E-1
Figure E-2	UK keyboard.....	E-1
Figure E-3	GR keyboard.....	E-2
Figure E-4	FR keyboard.....	E-2
Figure E-5	SP keyboard.....	E-3
Figure E-6	IT keyboard.....	E-3
Figure E-7	SC keyboard.....	E-4
Figure E-8	SL keyboard.....	E-4
Figure E-9	CS keyboard.....	E-5
Figure F-1	Parallel port wraparound connector.....	F-1
Figure F-2	Serial port wraparound connector.....	F-1
Figure F-3	Serial port direct cable (9-pin to 9-pin).....	F-2
Figure F-4	Serial port direct cable (9-pin to 25-pin).....	F-2

Tables

Table B-1	System board ICs and connectors (front).....	B-3
Table B-2	System board ICs and connectors (back).....	B-4
Table B-3	System board ICs and connectors (front).....	B-7
Table B-4	System board ICs and connectors (back).....	B-8
Table C-1	Fan connector pin assignments (2-pin).....	C-1
Table C-2	CPU Thermistor connector pin assignments (3-pin).....	C-1
Table C-3	Expansion memory connector pin assignments (144-pin).....	C-1
Table C-4	TFT LCD I/F connector pin assignments (20-pin).....	C-4
Table C-5	DSTN LCD I/F connector pin assignments (40-pin).....	C-4

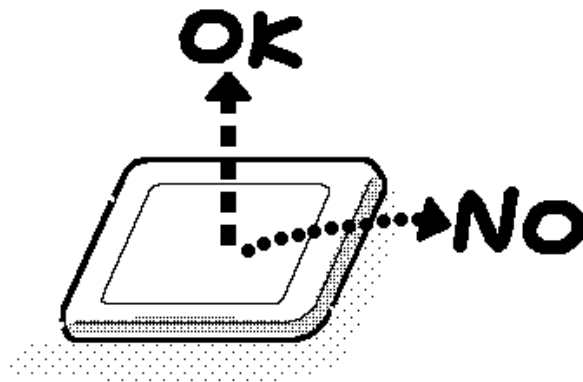
Table C-6	FL inverter I/F connector pin assignments (7-pin).....	C-5
Table C-7	RGB connector pin assignments (15-pin).....	C-5
Table C-8	USB I/F connector pin assignments (4-pin).....	C-6
Table C-9	RTC Battery connector pin assignments (3-pin).....	C-6
Table C-10	PC card slot connector pin assignments (156-pin)	C-6
Table C-11	IPS Button FPC connector pin assignments (4-pin).....	C-8
Table C-12	Key Board connector pin assignments (28-pin).....	C-9
Table C-13	PS/2 Mouse/Keyboard connector pin assignments (6-pin).....	C-9
Table C-14	Serial connector pin assignments (9-pin).....	C-10
Table C-15	Parallel connector pin assignments (25-pin).....	C-10
Table C-16	FDD connector pin assignments (26-pin).....	C-11
Table C-17	HDD connector pin assignments (44-pin)	C-11
Table C-18	PCB FLCCD* I/F connector pin assignments (50-pin)	C-12
Table C-19	PCB FLCLE* connector pin assignments (11-pin).....	C-13
Table C-20	Line input connector pin assignments (3-pin).....	C-13
Table C-21	Microphone connector pin assignments (3-pin).....	C-14
Table C-22	Headphone connector pin assignments (6-pin).....	C-14
Table C-23	Left speaker connector pin assignments (2-pin).....	C-14
Table C-24	Right speaker connector pin assignments (2-pin).....	C-14
Table C-25	AC adapter connector pin assignments (3-pin).....	C-14
Table C-26	Main battery connector pin assignments (10-pin)	C-15
Table C-27	Backup battery connector pin assignments (2-pin).....	C-15
Table D-1	Scan codes (set 1 and set 2).....	D-1
Table D-2	Scan codes with left Shift key	D-5
Table D-3	Scan codes in Numlock mode.....	D-6
Table D-4	Scan codes with Fn key	D-6
Table D-5	Scan codes in overlay mode.....	D-7
Table D-6	Scan codes with Ctrl key	D-7
Table D-7	Scan codes with Alt key	D-8
Table H-1	MTBF.....	H-1

Appendix A Handling the LCD Module

Precautions for handling the LCD module

The LCD module can be easily damaged during assembly or disassembly. Therefore, please observe the following precautions when handling it:

1. When installing the LCD module in its cover, be sure to seat it so that it is properly aligned and maximum visibility of the display is maintained.



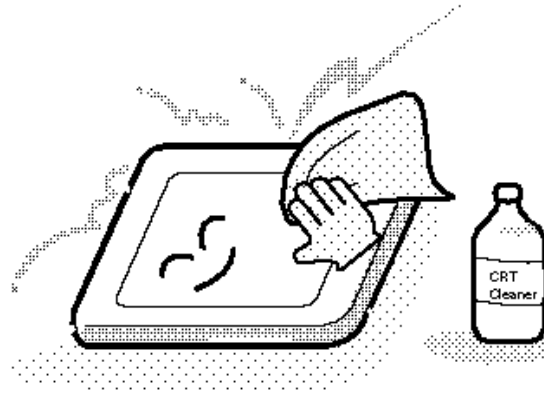
2. Be careful to align the holes at the four corners of the LCD module with the corresponding holes in its cover before securing the module with screws. Do not force the module into place, because stress can affect its performance.

Note: The panel's polarized surface is easily scarred, so handle it carefully.



3. If the panel's surface gets dirty, wipe it with cotton or a soft cloth. If it is still dirty, try breathing on the surface to create a light condensate and wipe it again.

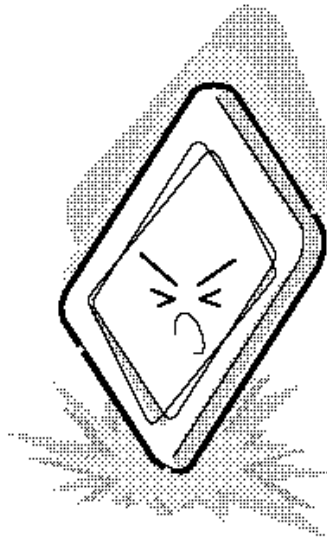
If the surface is very dirty, use a CRT cleaning agent. Apply the agent to a cloth and then wipe the panel's surface. Do not apply cleanser directly to the panel.



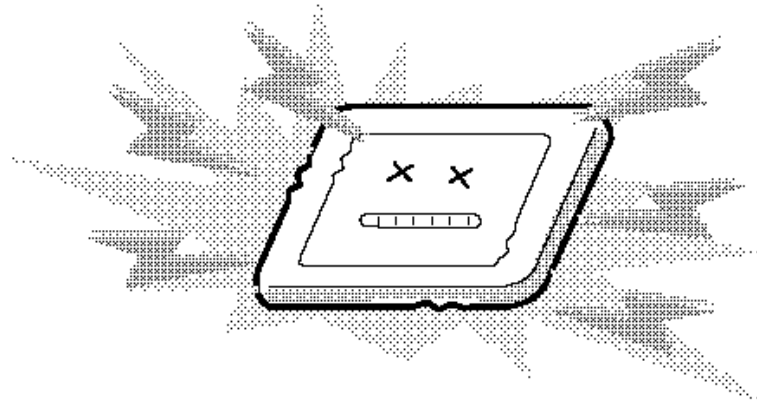
4. If water or other liquid is left on the panel's surface for a long period, it can change the screen's tint or stain it. Be sure to quickly wipe off any liquid.



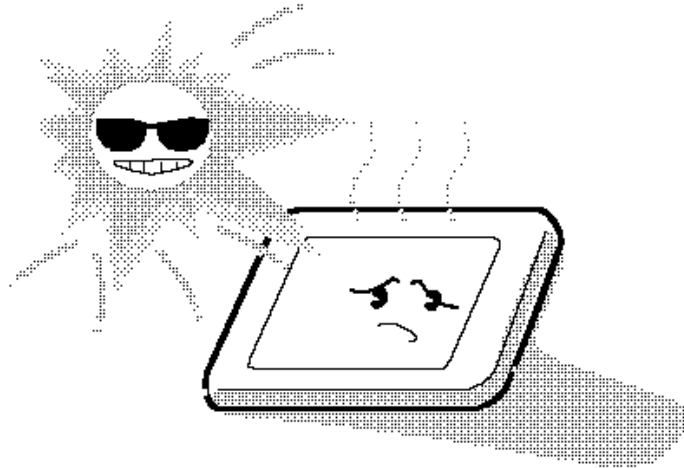
5. Glass is used in the panel, so be careful not to drop it or let it strike a hard object, which could cause breakage or cracks.



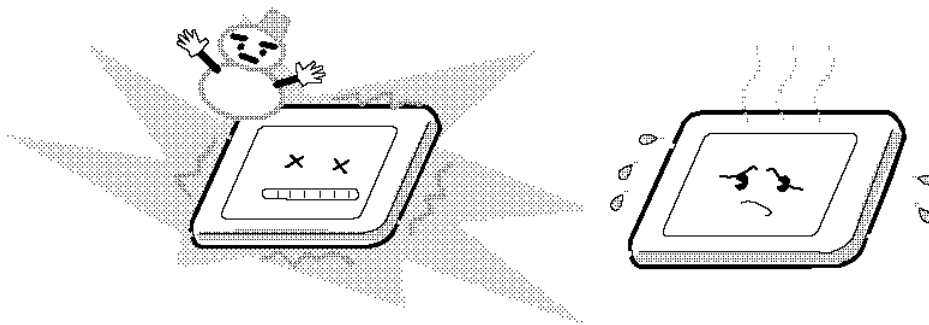
6. CMOS-LSI circuits are used in the module, so guard against damage from electrostatic discharge. Be sure to wear a wrist or ankle ground when handling the module.



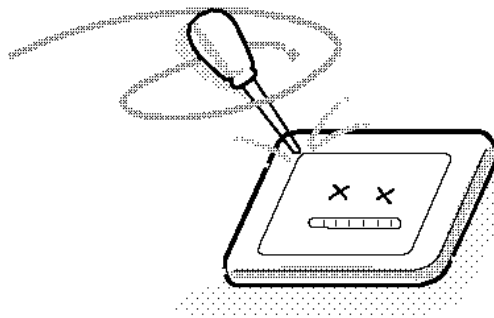
7. Do not expose the module to direct sunlight or strong ultraviolet rays for long periods.



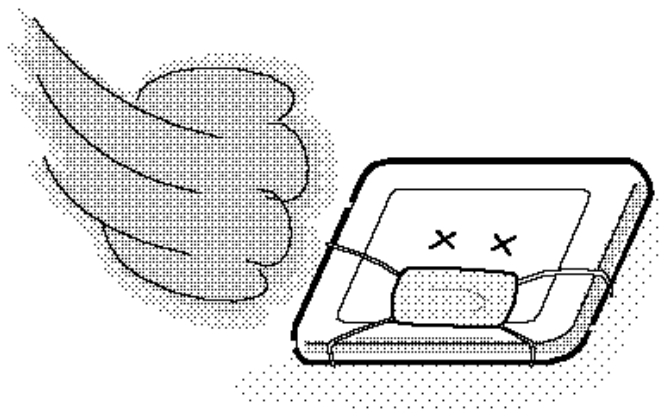
8. Do not store the module at temperatures below specifications. Cold can cause the liquid crystals to freeze, lose their elasticity or otherwise suffer damage.



9. Do not disassemble the LCD module. Disassembly can cause malfunctions.



10. If you transport the module, do not use packing material that contains epoxy resin (amine) or silicon glue (alcohol or oxime). These materials can release gas that can damage the panel's polarization.



Appendix B Board Layout

B.1 System Board Front View (TFT)

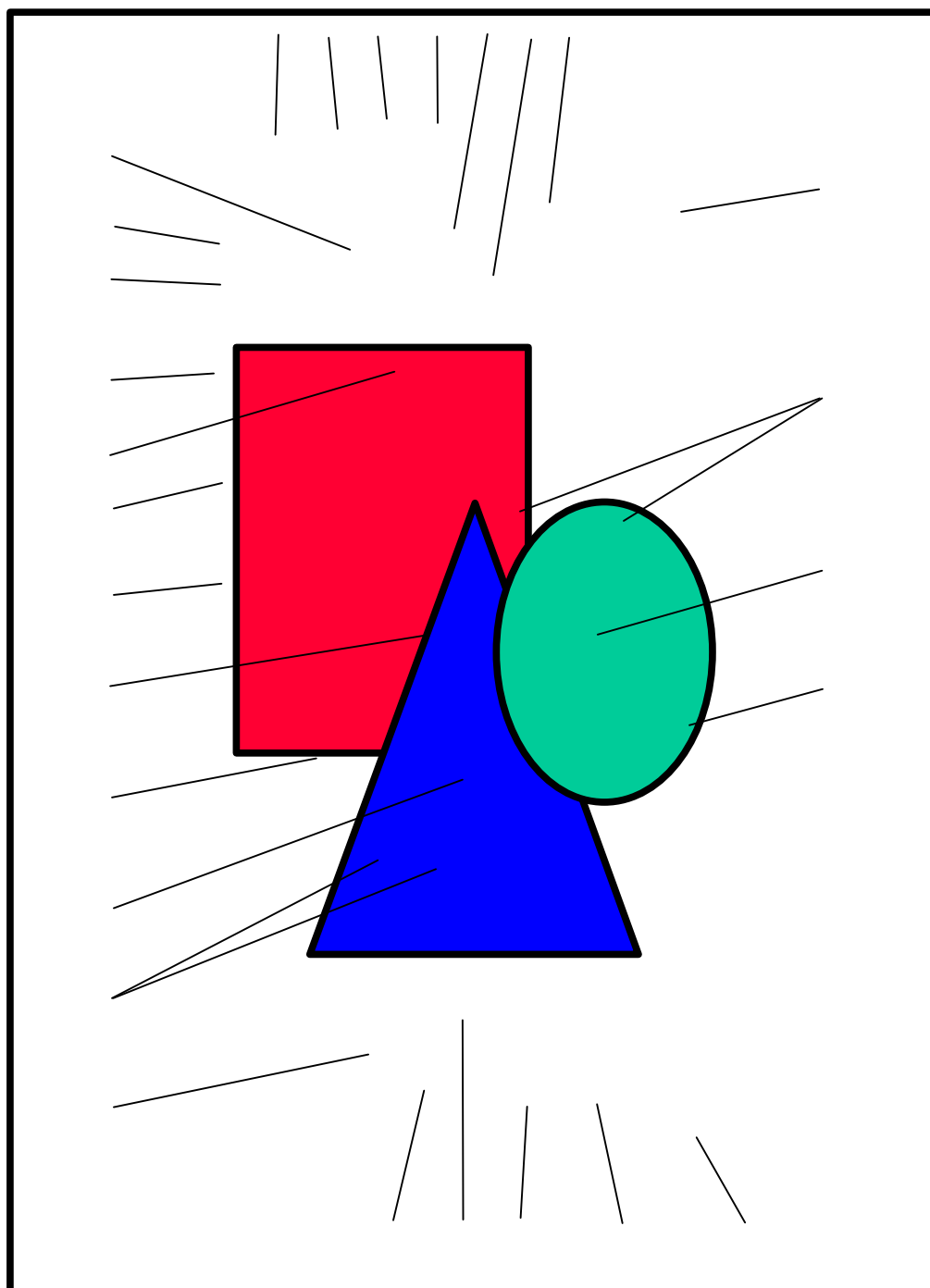


Figure B-1 Board layout (front)

B.2 System Board Back View (TFT)

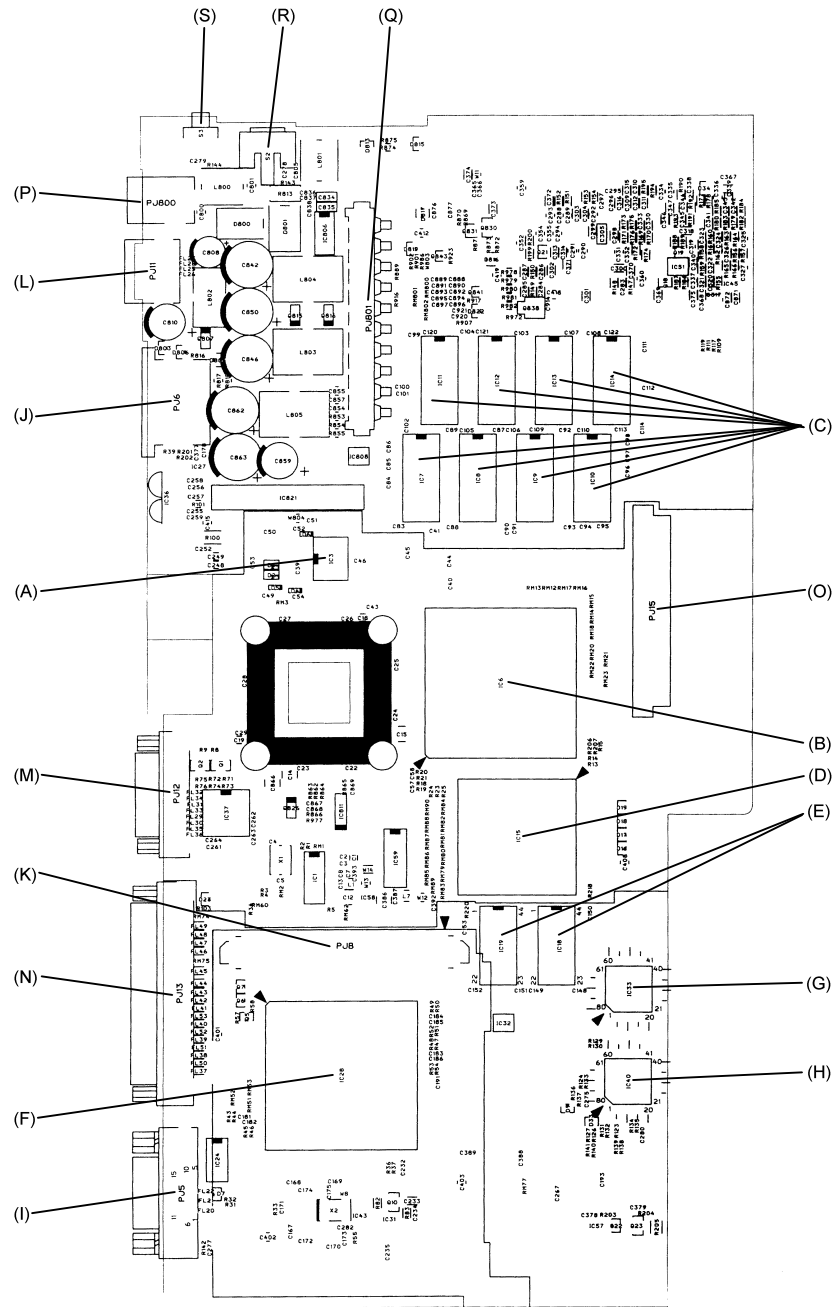


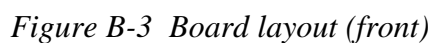
Figure B-2 Board layout (back)

Table B-1 System board ICs and connectors (front)

Mark	Number	Name
(A)	F800	Fuse for DC IN
(B)	F801	Fuse for Main Battery
(C)	IC2	CPU
(D)	IC4 and 5	Level 2 cache
(E)	IC16 and 17	Video RAM
(F)	IC25	USB-HC
(G)	IC30	BIOS ROM
(H)	IC44	OPL3-SA3
(I)	IC817	PS microprocessor
(J)	IS34	Expansion memory connector
(K)	PJ1	Cooling Fan Connector
(L)	PJ2	CPU Thermo Connector
(M)	PJ4	FL Inverter Board Connector
(N)	PJ7	RTC Battery Connector
(O)	PJ9	Membrane Switch Connector
(P)	PJ10	KB Connector
(Q)	PJ14	FDD Connector
(R)	PJ16	CD-ROM Connector
(S)	PJ17	LED Board Connector
(T)	PJ18	Line-in Connector
(U)	PJ19	Microphone Connector
(V)	PJ20	Headphone Connector
(W)	PJ21	Left Speaker Connector
(X)	PJ22	Right Speaker Connector
(Y)	PJ23	LCD Connector
(Z)	PJ802	Backup Battery Connector
(AA)	S1	Panel ON/OFF Sensor
(AB)	VR1	Speaker Volume

Table B-2 System board ICs and connectors (back)

Mark	Number	Name
(A)	IC3	TAG RAM
(B)	IC6	System controller GA (Cello-SS GA)
(C)	IC7 to 14	System RAM
(D)	IC15	VGA controller
(E)	IC18 and 19	Video RAM
(F)	IC28	I/O & PC Card controller GA (PETUNIA3 GA)
(G)	IC33	KBC
(H)	IC40	Embedded controller
(I)	PJ5	External Monitor Connector
(J)	PJ6	USB Connector
(K)	PJ8	PC Card Slot Connector
(L)	PJ11	PS/2 Mouse/Keyboard Connector
(M)	PJ12	Serial Connector
(N)	PJ13	Parallel Connector
(O)	PJ15	HDD Connector
(P)	PJ800	AC Adapter
(Q)	PJ801	Main Battery Connector
(R)	S2	Power Switch
(S)	S3	Reset Switch



B.4 System Board Back View (DSTN)

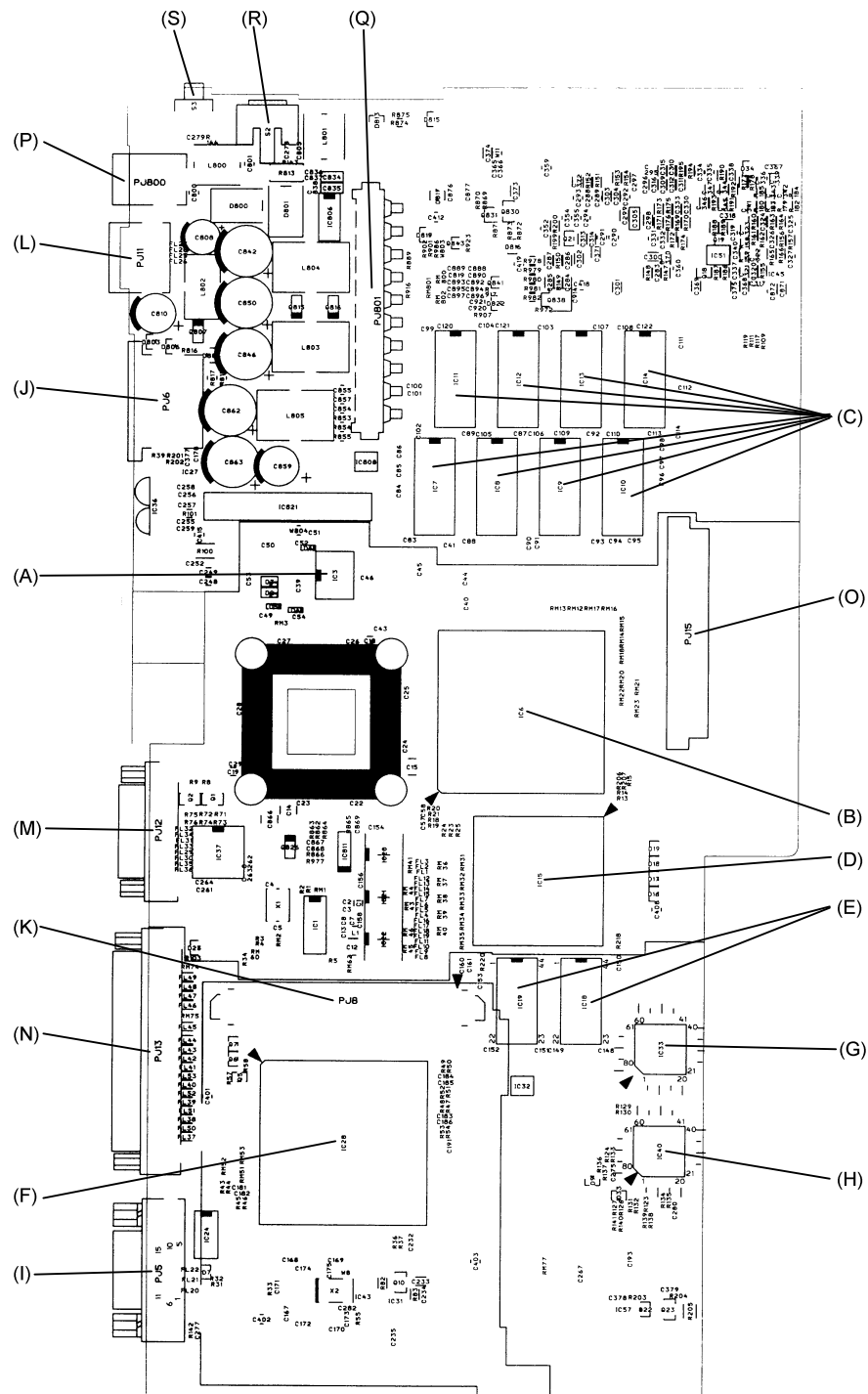


Figure B-4 Board layout (back)

Table B-3 System board ICs and connectors (front)

Mark	Number	Name
(A)	F800	Fuse for DC-IN
(B)	F801	Fuse for Main Battery
(C)	IC2	CPU
(D)	IC4 and 5	Level 2 cache
(E)	IC16 and 17	Video RAM
(F)	IC25	USB-HC
(G)	IC30	BIOS ROM
(H)	IC44	OPL3-SA3
(I)	IC817	PS microprocessor
(J)	IS34	Expansion memory connector
(K)	PJ1	Cooling Fan Connector
(L)	PJ2	CPU Thermo Connector
(M)	PJ3	LCD Connector
(N)	PJ4	FL Inverter Board Connector
(O)	PJ7	RTC Battery Connector
(P)	PJ9	Membrane Switch Connector
(Q)	PJ10	KB Connector
(R)	PJ14	FDD Connector
(S)	PJ16	CD-ROM Connector
(T)	PJ17	LED Board Connector
(U)	PJ18	Line-in Connector
(V)	PJ19	Microphone Connector
(W)	PJ20	Headphone Connector
(X)	PJ21	Left Speaker Connector
(Y)	PJ22	Right Speaker Connector
(Z)	PJ802	Backup Battery Connector
(AA)	S1	Panel ON/OFF Sensor
(AB)	VR1	Speaker Volume

Table B-4 System board ICs and connectors (back)

Mark	Number	Name
(A)	IC3	TAG RAM
(B)	IC6	System controller GA (Cello-SS GA)
(C)	IC7 to 14	System RAM
(D)	IC15	VGA controller
(E)	IC18 and 19	Video RAM
(F)	IC28	I/O & PC Card controller GA (PETUNIA3 GA)
(G)	IC33	KBC
(H)	IC40	Embedded controller
(I)	PJ5	External Monitor Connector
(J)	PJ6	USB Connector
(K)	PJ8	PC Card Slot Connector
(L)	PJ11	PS/2 Mouse/Keyboard Connector
(M)	PJ12	Serial Connector
(N)	PJ13	Parallel Connector
(O)	PJ15	HDD Connector
(P)	PJ800	AC Adapter
(Q)	PJ801	Main Battery Connector
(R)	S2	Power Switch
(S)	S3	Reset Switch

Appendix C Pin Assignments

System Board

C.1 PJ1 Fan Connector (2-pin)

Table C-1 Fan connector pin assignments (2-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	VCC	O	2	GND	-

C.2 PJ2 CPU Thermistor Connector (3-pin)

Table C-2 CPU Thermistor connector pin assignments (3-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	CPUTHP	O	2	NC	-
3	GND	-			

C.3 IS34 Expansion Memory Connector (144-pin)

Table C-3 Expansion memory connector pin assignments (144-pin)(1/3)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	GND	-	2	GND	-
3	MD0;100	I/O	4	MD16;100	I/O
5	MD1;100	I/O	6	MD17;100	I/O
7	MD2;100	I/O	8	MD18;100	I/O
9	MD3;100	I/O	10	MD19;100	I/O
11	B3V	O	12	B3V	I
13	MD4;100	I/O	14	MD20;100	I/O
15	MD5;100	I/O	16	MD21;100	I/O
17	MD6;100	I/O	18	MD22;100	I/O
19	MD7;100	I/O	20	MD23;100	I/O
21	GND	-	22	GND	-
23	CAS0;002	O	24	CAS2;002	I

Table C-3 Expansion memory connector pin assignments (144-pin)(2/3)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
25	CAS1;002	O	26	CAS3;002	I
27	B3V	O	28	B3V	I
29	MA0B;101	O	30	MA3;102	I
31	MA1B;101	O	32	MA4;102	I
33	MA;102	O	34	MA5;102	I
35	GND	-	36	GND	-
37	MD8;100	I/O	38	MD24;100	I/O
39	MD9;100	I/O	40	MD25;100	I/O
41	MD10;100	I/O	42	MD26;100	I/O
43	MD11;100	I/O	44	MD27;100	I
45	B3V	O	46	B3V	-
47	MD12;100	I/O	48	MD28;100	I/O
49	MD13;100	I/O	50	MD29;100	I/O
51	MD14;100	I/O	52	MD30;100	I/O
53	MD15;100	I/O	54	MD31;100	I/O
55	GND	-	56	GND	-
57	NC	-	58	NC	-
59	NC	-	60	NC	-
61	NC	-	62	NC	-
63	B3V	O	64	B3V	I
65	NC	-	66	WED;001	I
67	WEC;001	O	68	RAS4;001	I
69	RAS2;001	O	70	RAS5;001	I
71	RAS3;001	O	72	NC	-
73	GND	-	74	NC	-
75	GND	-	76	GND	-
77	NC	-	78	NC	-
79	NC	-	80	NC	-
81	B3V	O	82	B3V	I
83	MD32;100	I/O	84	MD48;100	I/O
85	MD33;100	I/O	86	MD49;100	I/O

Table C-3 Expansion memory connector pin assignments (144-pin)(3/3)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
87	MD34;100	I/O	88	MD50;100	I/O
89	MD35;100	I/O	90	MD51;100	I/O
91	GND	-	92	GND	-
93	MD36;100	I/O	94	MD52;100	I/O
95	MD37;100	I/O	96	MD53;100	I/O
97	MD38;100	I/O	98	MD54;100	I/O
99	MD39;100	I/O	100	MD55;100	I/O
101	B3V	O	102	B3V	I
103	MA6;102	O	104	MA7;102	I
105	MA8;102	O	106	MA11;102	I
107	GND	-	108	GND	-
109	MA9;102	O	110	MA0C;101	I
111	MA10;102	O	112	MA1C;101	I
113	B3V	O	114	B3V	I
115	CAS4;002	O	116	CAS6;002	I
117	CAS5;002	O	118	CAS7;002	I
119	GND	-	120	GND	-
121	MD40;100	I/O	122	MD56;100	I/O
123	MD41;100	I/O	124	MD57;100	I/O
125	MD42;100	I/O	126	MD58;100	I/O
127	MD43;100	I/O	128	MD59;100	I/O
129	B3V	O	130	B3V	I
131	MD44;100	I/O	132	MD60;100	I/O
133	MD45;100	I/O	134	MD61;100	I/O
135	MD46;100	I/O	136	MD62;100	I/O
137	MD47;100	I/O	138	MD63;100	I/O
139	GND	-	140	GND	-
141	NC	-	142	NC	-
143	B3V	O	144	B3V	I

C.4 PJ23 TFT LCD I/F Connector (20-pin)

Table C-4 TFT LCD I/F connector pin assignments (20-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	GND	-	2	GND	-
3	GND	-	4	GND	-
5	TXCLK0;100	O	6	TXCLK0;000	O
7	TXDT2;100	O	8	TXDT2;000	O
9	TXDT1;100	O	10	TXDT1;000	O
11	TXDT0;100	O	12	TXDT0;000	O
13	GND	-	14	GND	-
15	GND	-	16	GND	-
17	VCC	O	18	VCC	O
19	VCC	O	20	VCC	O

C.5 PJ3 DSTN LCD I/F Connector (40-pin)

Table C-5 DSTN LCD I/F connector pin assignments (40-pin)(1/2)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	GND	-	2	LP	O
3	GND	-	4	FP	O
5	GND	-	6	SHFCLK	O
7	GND	-	8	DL7	O
9	GND	-	10	DL6	O
11	GND	-	12	DL5	O
13	GND	-	14	DL4	O
15	GND	-	16	N.C	-
17	GND	-	18	DU4	O
19	GND	-	20	DU5	O
21	GND	-	22	DU6	O
23	GND	-	24	DU7	O
25	GND	-	26	DL3	O
27	GND	-	28	DL2	O
29	N.C	-	30	DL1	O

Table C-5 DSTN LCD I/F connector pin assignments (40-pin)(2/2)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
31	VCC(5V)	O	32	DL0	O
33	VCC(5V)	O	34	DU0	O
35	VCC(5V)	O	36	DU1	O
37	VCC(5V)	O	38	DU2	O
39	VCC(5V)	O	40	DU3	O

C.6 PJ4 FL Inverter I/F Connector (7-pin)

Table C-6 FL inverter I/F connector pin assignments (7-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	VCC	O	2	VCC	O
3	GND	-	4	GND	-
5	BRI2;100	O	6	BRI1;100	O
7	BRI0;100	O			

C.7 PJ5 RGB Connector (15-pin)

Table C-7 RGB connector pin assignments (15-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	CRED;100	O	2	CGREEN;100	O
3	CBLUE;100	O	4	N.C	-
5	GND	-	6	CRGND	-
7	CGGND	-	8	CBGND	-
9	NC	-	10	GND	-
11	NC	-	12	MONID1;100	I/O
13	CHSYNC;100	O	14	CVSYNC;100	O
15	MONID3;100	I/O			

C.8 PJ6 USB I/F Connector (4-pin)*Table C-8 USB I/F connector pin assignments (4-pin)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	VCC	O	2	USBDN1;000	I/O
3	USBDP1;100	I/O	4	GND	-

C.9 PJ7 RTC Battery Connector (3-pin)*Table C-9 RTC Battery connector pin assignments (3-pin)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	RTCV	-	2	NC	-
3	GND	-			

C.10 PJ8 PC Card Slot Connector (156-pin)*Table C-10 PC card slot connector pin assignments (156-pin) (1/3)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	GND	-	2	GND	-
3	ACAD0;100	I/O	4	ACCD1;000	I
5	ACAD1;100	I/O	6	ACAD2;100	I/O
7	ACAD3;100	I/O	8	ACAD4;100	I/O
9	GND	-	10	ACAD5;100	I/O
11	ACAD6;100	I/O	12	ACAD7;100	I/O
13	ACD14;100	I/O	14	ACCB E0;000	I/O
15	ACAD8;100	I/O	16	GND	-
17	ACAD9;100	I/O	18	ACAD10;100	I/O
19	ACAD11;100	I/O	20	ACVS1;100	I/O
21	ACAD12;100	I/O	22	GND	-
23	ACAD13;100	I/O	24	ACAD14;100	I/O
25	ACAD15;100	I/O	26	ACCB E1;000	I/O
27	ACAD16;100	I/O	28	GND	-
29	ACPAR;100	I/O	30	ACA18;100	O

Table C-10 PC card slot connector pin assignments (156-pin) (2/3)

31	ACPERR;000	I/O	32	ACLOCK;000	I/O
33	ACGNT;000	O	34	ACSTOP;000	I/O
35	ACINT;000	I	36	ACDEVS;000	I/O
37	ACVCC	O	38	ACVCC	O
39	ACVPP	O	40	ACVPP	O
41	GND	-	42	ACCLK;100	O
43	GND	-	44	ACTRDY;000	I/O
59	GND	-	60	ACREQ;000	I
61	ACAD24;100	I/O	62	ACCB3;000	I/O
63	ACAD25;100	I/O	64	ACAUDI;100	I
65	ACAD26;100	I/O	66	ACSTSC;100	I
67	ACAD27;100	I/O	68	GND	-
69	ACAD28;100	I/O	70	ACAD29;100	I/O
71	ACAD30;100	I/O	72	ACD2;100	I/O
73	ACAD31;100	I/O	74	GND	-
75	ACCLKR;000	I/O	76	ACCD2;000	I
77	GND	-	78	GND	-
79	GND	-	80	GND	-
81	BCAD0;100	I/O	82	BCCD1;000	I
83	BCAD1;100	I/O	84	BCAD2;100	I/O
85	BCAD3;100	I/O	86	BCAD4;100	I/O
87	GND	-	88	BCAD5;100	I/O
89	BCAD6;100	I/O	90	BCAD7;100	I/O
91	BCD14;100	I/O	92	BCCBE0;000	I/O
93	BCAD8;100	I/O	94	GND	-
95	BCAD9;100	I/O	96	BCAD10;100	I/O
97	BCAD11;100	I/O	98	BCVS1;100	I/O
99	BCAD12;100	I/O	100	GND	-
101	BCAD13;100	I/O	102	BCAD14;100	I/O
103	BCAD15;100	I/O	104	BCCBE1;000	I/O
105	BCAD16;100	I/O	106	GND	-

Table C-10 PC card slot connector pin assignments (156-pin) (3/3)

107	BCPAR;100	I/O	108	BCA18;100	I/O
109	BCPERR;000	I/O	110	BCLOCK;000	I/O
111	BCGNT;000	I	112	BCSTOP;000	I/O
113	BCINT;000	O	114	BCDEVS;000	I/O
115	BCVCC	I	116	BCVCC	I
117	BCVPP	I	118	BCVPP	I
119	GND	-	120	BCCLK;100	I
121	GND	-	122	BCTRDY;000	I/O
123	BCIRDY;000	I/O	124	BCFRAM;000	I/O
125	BCCBE2;000	I/O	126	BCAD17;100	I/O
127	BCAD18;100	I/O	128	BCAD19;100	I/O
129	GND	-	130	BCAD20;100	I/O
131	BCVS2;100	I/O	132	BCAD21;100	I/O
133	BCRST;000	I	134	BCAD22;100	I/O
135	BCSERR;000	O	136	BCAD23;100	I/O
137	GND	-	138	BCREQ;000	O
139	BCAD24;100	I/O	140	BCCBE3;000	I/O
141	BCAD25;100	I/O	142	BCAUDI;100	I
143	BCAD26;100	I/O	144	BCSTSC;100	I
145	BCAD27;100	I/O	146	GND	-
147	BCAD28;100	I/O	148	BCAD29;100	I/O
149	BCAD30;100	I/O	150	BCD2;100	I/O
151	BCAD31;100	I/O	152	GND	-
153	BCCLKR;000	I/O	154	BCCD2;000	O
155	GND	-	156	GND	-

C.11 PJ9 IPS Button FPC Connector (4-pin)

Table C-11 IPS Button FPC connector pin assignments (4-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	GND	-	2	SWL	O
3	GND	-	4	SWR	O

C.12 PJ10 Key Board Connector (28-pin)*Table C-12 Key Board connector pin assignments (28-pin)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	KBOT00;000	I	2	KBOT01;000	I
3	KBOT08;000	I	4	KBOT07;000	I
5	KBOT06;000	I	6	KBOT05;000	I
7	KBOR04;000	I	8	KBOT03;000	I
9	KBOT10;000	I	10	KBOT09;000	I
11	KBOT02;000	I	12	KBOT11;000	I
13	KBRT4;000	O	14	KBRT7;000	O
15	KBRT3;000	O	16	KBRT1;000	O
17	KBRT0;000	O	18	KBRT5;000	O
19	KBRT2;000	O	20	KBRT6;000	O
21	JMODEL;000	O	22	GND	-
23	IPSY;100	O	24	VCC	I
25	IPSX;100	O	26	IPSY;100	O
27	GND	-	28	IPSX;100	O

C.13 PJ11 PS/2 Mouse/Keyboard Connector (6-pin)*Table C-13 PS/2 Mouse/Keyboard connector pin assignments (6-pin)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	MOUSDT;100	I/O	2	EXKBDT;100	I/O
3	GND	-	4	VCC	O
5	MOUSCK;100	I/O	6	EXKBCK;100	I/O

C.14 PJ12 Serial Connector (9-pin)*Table C-14 Serial connector pin assignments (9-pin)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	DCD;010	I	2	RXD;110	I
3	TXD;100	O	4	DTR;000	O
5	GND	-	6	DSR;010	I
7	RTS;000	O	8	CTS;010	I
9	RI;010	I			

C.15 PJ13 Parallel Connector (25-pin)*Table C-15 Parallel connector pin assignments (25-pin)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	STROB;000	I	2	PD0;100	I/O
3	PD1;100	I/O	4	PD2;100	I/O
5	PD3;100	I/O	6	PD4;100	I/O
7	PD5;100	I/O	8	PD6;100	I/O
9	PD7;100	I/O	10	ACK;000	I/O
11	BUSY;100	O	12	PE;100	O
13	SELCT;100	O	14	AUTFD;000	I
15	ERROR;000	O	16	PINT;000	I
17	SLIN;000	I	18	GND	I
19	GND	-	20	GND	-
21	GND	-	22	GND	-
23	GND	-	24	GND	-
25	GND	-			

C.16 PJ14 FDD Connector (26-pin)*Table C-16 FDD connector pin assignments (26-pin)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	IFSSEL;000	O	2	GND	-
3	IFRDAT;000	I	4	GND	-
5	IFWPRO;000	I	6	GND	-
7	IFTRK0;000	I	8	GND	-
9	IFWEN;000	O	10	GND	-
11	IFWDAT;000	O	12	GND	-
13	IFSTEP;000	O	14	NC	-
15	IFDIRC;000	O	16	IFLD2A;000	O
17	IFAMON;000	O	18	IFHMED;000	I
19	IFRADY;000	I	20	NC	-
21	DSKCH3;000	I	22	VCC	O
23	IFDASL;000	O	24	VCC	O
25	IFINDEX;000	I	26	VCC	O

C.17 PJ15 HDD Connector (44-pin)*Table C-17 HDD connector pin assignments (44-pin) (1/2)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	IORST;000	O	2	GND	-
3	SD7;100	I/O	4	SA8;100	I/O
5	SD6;100	I/O	6	SA9;100	I/O
7	SD5;100	I/O	8	SA10;100	I/O
9	SD4;100	I/O	10	SA11;100	I/O
11	SD3;100	I/O	12	SA12;100	I/O
13	SD2;100	I/O	14	SA13;100	I/O
15	SD1;100	I/O	16	SA14;100	I/O
17	SD0;100	I/O	18	SA15;100	I/O
19	GND	-	20	NC	-
21	NC	-	22	GND	-

Table C-17 HDD connector pin assignments (44-pin) (2/2)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
23	HDDIOW;000	O	24	GND	-
25	HDDIOR;000	O	26	GND	-
27	IOCRDY;100	I	28	NC	-
29	VCC	O	30	GND	-
31	HDDIRG;100	I	32	IOCS16;000	O
33	SA1;100	O	34	NC	-
35	SA0;100	O	36	SA2;100	I
37	HDDCS0;000	O	38	HDDCS1;000	I
39	HDDLED;000	I	40	GND	-
41	VCC	O	42	VCC	I
43	GND	-	44	NC	-

C.18 PJ16 PCB FLCCD* I/F Connector (50-pin)

Table C-18 PCB FLCCD I/F connector pin assignments (50-pin) (1/2)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	GND	-	2	GND	-
3	GND	-	4	GND	-
5	CDRDET;000	I	6	VCC	O
7	VCC	O	8	VCC	O
9	VCC	O	10	VCC	O
11	CDRLED;000	I	12	CDRCS1;000	O
13	CDRCS0;000	O	14	SA2;100	O
15	SA0;100	O	16	SA1;100	O
17	GND	-	18	IOCS16;000	I
19	CDRIRQ;100	I	20	IORDY;100	I
21	GND	-	22	CDRIOW;000	O
23	CDRIOR;000	O	24	GND	-
25	GND	-	26	SD0;100	I/O
27	SA15;100	I/O	28	SD1;100	I/O
29	SA14;100	I/O	30	SD2;100	I/O
31	SA13;100	I/O	32	SD3;100	I/O

Table C-18 PCB FLCCD I/F connector pin assignments (50-pin) (2/2)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
33	SA12;100	I/O	34	GND	-
35	GND	-	36	SD4;100	I/O
37	SA11;100	I/O	38	SD5;100	I/O
39	SA10;100	I/O	40	SD6;100	I/O
41	SA9;100	I/O	42	SD7;100	I/O
43	SA8;100	I/O	44	IORST;000	O
45	GND	-	46	GND	-
47	ANGND0	-	48	CDAUDR	I
49	ANGND0	-	50	CDAUDL	I

C.19 PJ17 PCB FLCLE* I/F Connector (11-pin)*Table C-19 PCB FLCLE* connector pin assignments (11-pin)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	LEDPWR	O	2	DCINOR;000	O
3	DCINGR;000	O	4	PWLEDG;100	O
5	PWLEDO;100	O	6	GND	-
7	BT10RG;000	O	8	BT1GRN;000	O
9	VCC	O	10	HDDLED;000	O
11	CDRLED;000 IFAMON;000	O			

C.20 PJ18 Line Input Connector (3-pin)*Table C-20 Line input connector pin assignments (3-pin)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	ANGND0	-	2	LININL	O
3	LININR	O			

C.21 PJ19 Microphone Connector (3-pin)*Table C-21 Microphone connector pin assignments (3-pin)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	ANGND0	-	2	MIK	O
3	NC	-			

C.22 PJ20 Headphone Connector (6-pin)*Table C-22 Headphone connector pin assignments (6-pin)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	ANGND0	-	2	HDPHNL	O
3	HDPHNR	O	4	NC	-
5	SPKENIN	I	6	ANGNDO	-

C.23 PJ21 Left Speaker Connector (2-pin)*Table C-23 Left speaker connector pin assignments (2-pin)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	SPKL+	O	2	SPKL-	O

C.24 PJ22 Right Speaker Connector (2-pin)*Table C-24 Right speaker connector pin assignments (2-pin)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	SPKR+	O	2	SPKR-	O

C.25 PJ800 AC Adapter Connector (3-pin)*Table C-25 AC adapter connector pin assignments (3-pin)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	DCIN	-	2	GND	-
3	GND	-			

C.26 PJ801 Main Battery Connector (10-pin)*Table C-26 Main battery connector pin assignments (10-pin)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	(-)	-	2	GND	-
3	BATOV1;000	O	4	GND	-
5	SDA;100	I/O	6	SCL;100	I/O
7	MCV	I	8	DCHG	O
9	BTMP1	O	10	(+)	I/O

C.27 PJ802 Backup Battery Connector (2-pin)*Table C-27 Backup battery connector pin assignments (2-pin)*

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	SUBBAT	-	2	GND	-

Appendix D Keyboard Scan/Character Codes

Table D-1 Scan codes (set 1 and set 2) (1/4)

Cap No.	Keytop	Code set 1		Code set 2			Note
		Make	Break	Make	Break		
01	' ~	29	A9	0E	F0 0E		
02	1 !	02	82	16	F0 16		
03	2 @	03	83	1E	F0 1E		
04	3 #	04	84	26	F0 26		
05	4 \$	05	85	25	F0 25		
06	5 %	06	86	2E	F0 2E		
07	6 ^	07	87	36	F0 36		
08	7 &	08	88	3D	F0 3D		*2
09	8 *	09	89	3E	F0 3E		*2
10	9 (0A	8A	46	F0 46		*2
11	0)	0B	8B	45	F0 45		
12	- _	0C	8C	4E	F0 4E		
13	= +	0D	8D	55	F0 55		
15	BkSp	0E	8E	66	F0 66		
16	Tab	0F	8F	0D	F0 0D		
17	Q	10	90	15	F0 15		
18	W	11	91	1D	F0 1D		
19	E	12	92	24	F0 24		
20	R	13	93	2D	F0 2D		
21	T	14	94	2C	F0 2C		
22	Y	15	95	35	F0 35		
23	U	16	96	3C	F0 3C		*2
24	I	17	97	43	F0 43		*2
25	O	13	98	44	F0 44		*2
26	P	19	99	4D	F0 4D		*2
27	[{	1A	9A	54	F0 54		
28] }	1B	9B	5B	F0 5B		

Table D-1 Scan codes (set 1 and set 2) (2/4)

Cap No.	Keytop	Code set 1		Code set 2			Note
		Make	Break	Make	Break		
29 (42)	\	2B	AB	5D	F0 5D		*5
30	Caps Lock	3A	BA	58	F0 58		
31	A	1E	9E	1C	F0 1C		
32	S	1F	9F	1B	F0 1B		
33	D	20	A0	23	F0 23		
34	F	21	A1	2B	F0 2B		
35	G	22	A2	34	F0 34		
36	H	23	A3	33	F0 33		
37	J	24	A4	3B	F0 3B		*2
38	K	25	A5	42	F0 42		*2
39	L	26	A6	4B	F0 4B		*2
40	; :	27	A7	4C	F0 4C		*2
41	' "	28	A8	52	F0 52		
43	Enter	1C	9C	5A	F0 5A		
44	Shift (L)	2A	AA	12	F0 12		
45	No.102 key	56	D6	61	F0 61		
46	Z	2C	AC	1A	F0 1A		
47	X	2D	AD	22	F0 22		
48	C	2E	AE	21	F0 21		
49	V	2F	AF	2A	F0 2A		
50	B	30	B0	32	F0 32		
51	N	31	B1	31	F0 31		
52	M	32	B2	3A	F0 3A		*2
53	, <	33	B3	41	F0 41		*2
54	. >	34	B4	49	F0 49		*2
55	/ ?	35	B5	4A	F0 4A		*2

57	Shift (R)	36	B6	59	F0	59	
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Table D-1 Scan codes (set 1 and set 2) (3/4)

Cap No.	Keytop	Code set 1		Code set 2			Note
		Make	Break	Make	Break		
58	Ctrl	1D	9D	14	F0 14		*3
60	Alt (L)	38	B8	11	F0 11		*3
61	Space	39	B9	29	F0 29		
62	ALT (R)	E0 38	E0 B8	E0 11	E0 F0 11		
75	Ins	E0 52	E0 D2	E0 70	E0 F0 70		*1
76	Del	E0 53	E0 D3	E0 71	E0 F0 71		*1
79	←	E0 4B	E0 CB	E0 6B	E0 F0 6B		*1
80	Home	E0 47	E0 C7	E0 6C	E0 F0 6C		*1
81	End	E0 4F	E0 CF	E0 69	E0 F0 69		*1
83	↑	E0 48	E0 C8	E0 75	E0 F0 75		*1
84	↓	E0 50	E0 D0	E0 72	E0 F0 72		*1
85	PgUp	E0 49	E0 C9	E0 7D	E0 F0 7D		*1
86	PgDn	E0 51	E0 D1	E0 7A	E0 F0 7A		*1
89	→	E0 4D	E0 CD	E0 74	E0 F0 74		*1
110	Esc	01	81	76	F0 76		
112	F1	3B	3B	05	F0 05		
113	F2	3C	BC	06	F0 06		
114	F3	3D	BD	04	F0 04		
115	F4	3E	BE	0C	F0 0C		
116	F5	3F	BF	03	F0 03		
117	F6	40	C0	0B	F0 0B		
118	F7	41	C1	83	F0 83		
119	F8	42	C2	0A	F0 0A		
120	F9	43	C3	01	F0 01		
121	F10	44	C4	09	F0 09		

Table D-1 Scan codes (set 1 and set 2) (4/4)

Cap No.	Keytop	Code set 1		Code set 2			Note
		Make	Break	Make	Break		
122	F11	57	D7	78	F0 78		*3
123	F12	58	D8	07	F0 07		*3
124	PrintSc	*6	*6	*6	*6		*6
126	Pause	*7	*7	*7	*7		*7
202	Fn	—	—	—	—		*4
203	Win	E0 5B	E0 DB	E0 1F	E0 F0 1F		
204	App	E0 5D	E0 DD	E0 2F	E0 F0 2F		

Notes:

1. * Scan codes differ by mode.
2. * Scan codes differ by overlay function.
3. * Combined with the **Fn** key, different codes are generated.
4. * The **Fn** key does not generate a code by itself.
5. * This key corresponds to key No. 42 in a 102-key model.
6. * Refer to Table D-6, Scan codes with **Ctrl** key.
7. * Refer to Table D-7, Scan codes with **Alt** key.

Table D-2 Scan codes with left Shift key

Cap No	Key top	Code set 1				Code set 2			
		Make		Break		Make		Break	
75	INS	E0 AA	E0 52	E0 D2	E0 2A	E0 F0 12	E0 70	E0 F0 70	E0 12
76	DEL	E0 AA	E0 53	E0 D3	E0 2A	E0 F0 12	E0 71	E0 F0 71	E0 12
79	←	E0 AA	E0 4B	E0 CB	E0 2A	E0 F0 12	E0 6B	E0 F0 6B	E0 12
80	Home	E0 AA	E0 47	E0 C7	E0 2A	E0 F0 12	E0 6C	E0 F0 6C	E0 12
81	End	E0 AA	E0 4F	E0 CF	E0 2A	E0 F0 12	E0 69	E0 F0 69	E0 12
83	↑	E0 AA	E0 48	E0 C8	E0 2A	E0 F0 12	E0 75	E0 F0 75	E0 12
84	↓	E0 AA	E0 50	E0 D0	E0 2A	E0 F0 12	E0 72	E0 F0 72	E0 12
85	PgUp	E0 AA	E0 49	E0 C9	E0 2A	E0 F0 12	E0 7D	E0 F0 7D	E0 12
86	PgDn	E0 AA	E0 51	E0 D1	E0 2A	E0 F0 12	E0 7A	E0 F0 7A	E0 12
89	→	E0 AA	E0 4D	E0 CD	E0 2A	E0 F0 12	E0 74	E0 F0 74	E0 12
203	Win	E0 AA	E0 5B	E0 DB	E0 2A	E0 F0 12	E0 1F	E0 F0 1F	E0 12
204	App	E0 AA	E0 5D	E0 DD	E0 2A	E0 F0 12	E0 2F	E0 F0 2F	E0 12

NOTE: The table above shows scan codes with the left **Shift** key. In combination with the right **Shift** key, scan codes are changed as listed below:

	With left Shift	With right Shift
Set 1	E0 AA _____	E0 B6
	E0 2A _____	E0 36
Set 2	E0 F0 12 _____	E0 F0 59
	E0 12 _____	E0 59

Table D-3 Scan codes in Numlock mode

Cap No	Key top	Code set 1				Code set 2			
		Make		Break		Make		Break	
75	INS	E0 2A	E0 52	E0 02	E0 AA	E0 12	E0 70	E0 F0 70	E0 F0 12
76	DEL	E0 2A	E0 53	E0 D3	E0 AA	E0 12	E0 71	E0 F0 71	E0 F0 12
79	←	E0 2A	E0 4B	E0 CB	E0 AA	E0 12	E0 6B	E0 F0 6B	E0 F0 12
80	Home	E0 2A	E0 47	E0 C7	E0 AA	E0 12	E0 6C	E0 F0 6C	E0 F0 12
81	End	E0 2A	E0 4F	E0 CF	E0 AA	E0 12	E0 69	E0 F0 69	E0 F0 12
83	↑	E0 2A	E0 48	E0 C8	E0 AA	E0 12	E0 75	E0 F0 75	E0 F0 12
84	↓	E0 2A	E0 50	E0 D0	E0 AA	E0 12	E0 72	E0 F0 72	E0 F0 12
85	PgUp	E0 2A	E0 49	E0 C9	E0 AA	E0 12	E0 7D	E0 F0 7D	E0 F0 12
86	PgDn	E0 2A	E0 51	E0 D1	E0 AA	E0 12	E0 7A	E0 F0 7A	E0 F0 12
89	→	E0 2A	E0 4D	E0 CD	E0 AA	E0 12	E0 74	E0 F0 74	E0 F0 12
203	Win	E0 2A	E0 5B	E0 DB	E0 AA	E0 12	E0 1F	E0 F0 1F	E0 F0 12
204	App	E0 2A	E0 5D	E0 DD	E0 AA	E0 12	E0 2F	E0 F0 2F	E0 F0 12

Table D-4 Scan codes with Fn key

Cap No	Keytop	Code set 1		Code set 2	
		Make	Break	Make	Break
43	ENT	E0 1C	E0 9C	E0 5A	E0 F0 5A
58	CTRL	E0 1D	E0 9D	E0 14	E0 F0 14
60	LALT	E0 38	E0 B8	E0 11	E0 F0 11
121	ARROW	05	C5	77	F0 77
122	NUMERIC	05	C5	7E	F0 7E

Table D-5 Scan codes in overlay mode

Cap No.	Keytop	Code set 1		Code set 2		
		Make	Break	Make	Break	
08	7 (7)	47	C7	6C	F0	6C
09	8 (8)	48	C8	75	F0	75
10	9 (9)	49	C9	7D	F0	7D
11	0 (•)	37	B7	7C	F0	7C
23	U (4)	4B	CB	6B	F0	6B
24	I (5)	4C	CC	73	F0	73
25	O (6)	4D	CD	74	F0	74
26	P (–)	4A	CA	7B	F0	7B
37	J (1)	4F	CF	69	F0	69
38	K (2)	50	D0	72	F0	72
39	L (3)	51	D1	7A	F0	7A
40	; (+)	4E	CE	79	F0	79
52	M (0)	52	D2	70	F0	70
53	, (.)	33	B3	41	F0	41
54	(.)	53	D3	71	F0	71
55	/ (/)	E0 35	E0 B5	40 4A	E0 F0	4A

Table D-6 Scan codes with Ctrl key

Key top	Shift	Code set 1				Code set 2							
		Make		Break		Make		Break					
Prt Sc	Common	E0 2A	E0 37	E0 B7	E0 AA	E0 12	E0 7C	E0 F0	7C	E0 F0	12		
	Ctrl*	E0 37		E0 B7		E0 7C		E0 F0	7C				
	Shift*	E0 37		E0 B7		E0 7C		E0 F0	7C				
	Alt*	54		D4		84		F0	B4				

Table D-7 Scan codes with Alt key

Key top	Shift	Code set 1 Make	Code set 2 Break
Pause	Common	E1 1D 45 E1 SD C5	E1 14 77 E1 F0 14 F0 77
	Ctrl*	E0 46 E0 C6	E0 7E E0 F0 7E

*: This key generates only make codes.

Appendix E Key Layout

E.1 United States (US) Keyboard

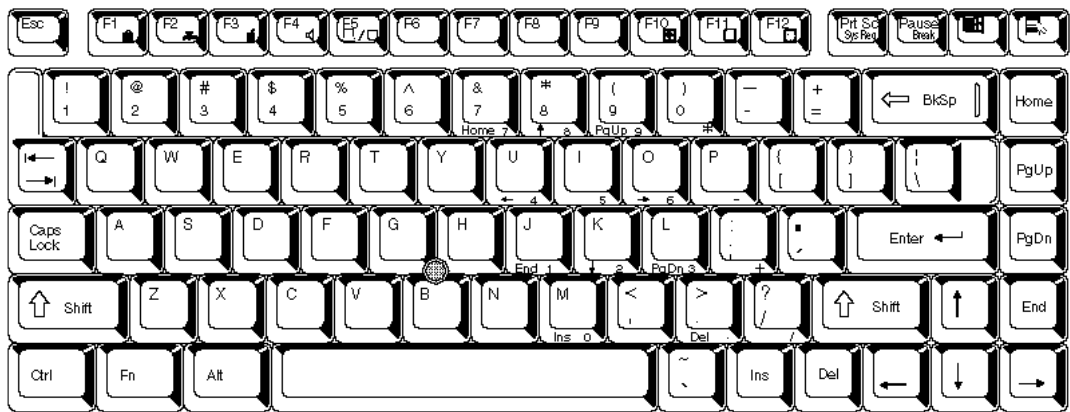


Figure E-1 US keyboard

E.2 United Kingdom (UK) Keyboard

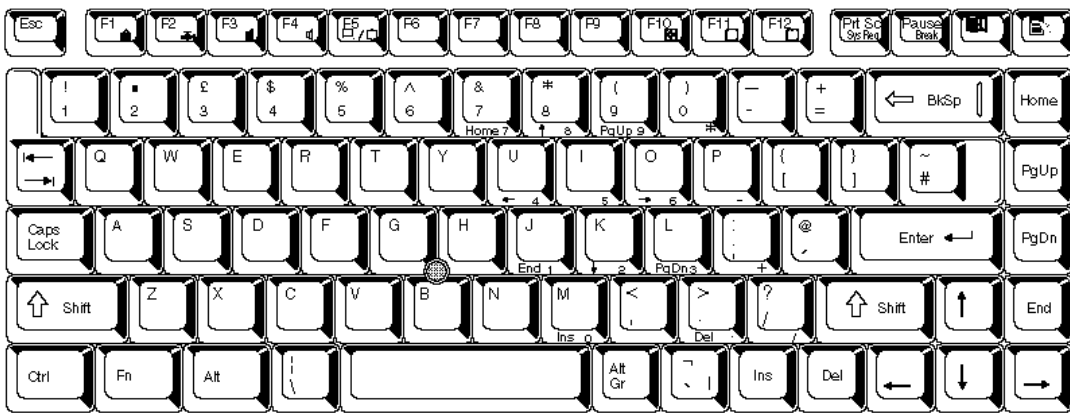


Figure E-2 UK keyboard

E.3 German (GR) Keyboard

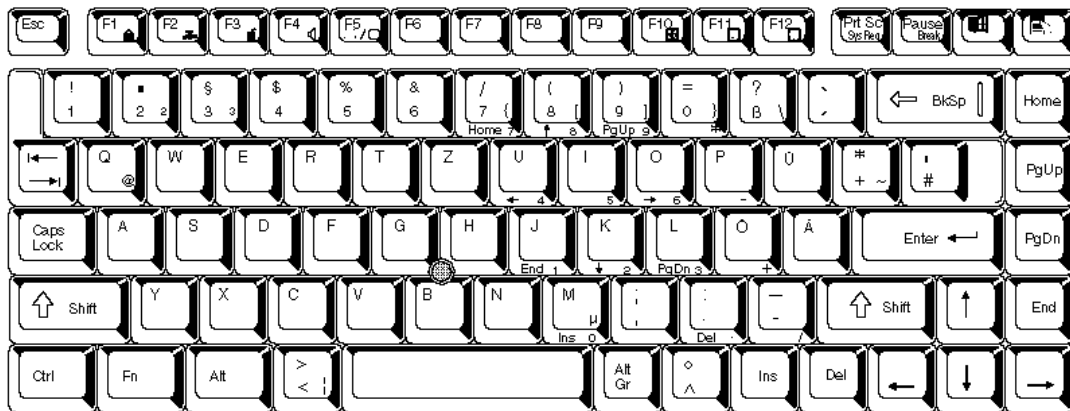


Figure E-3 GR keyboard

E.4 French (FR) Keyboard

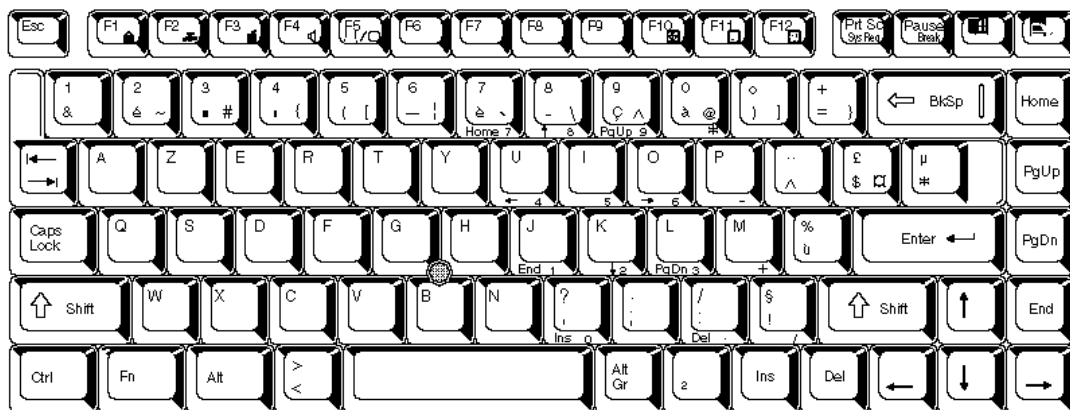


Figure E-4 FR keyboard

E.5 Spanish (SP) Keyboard

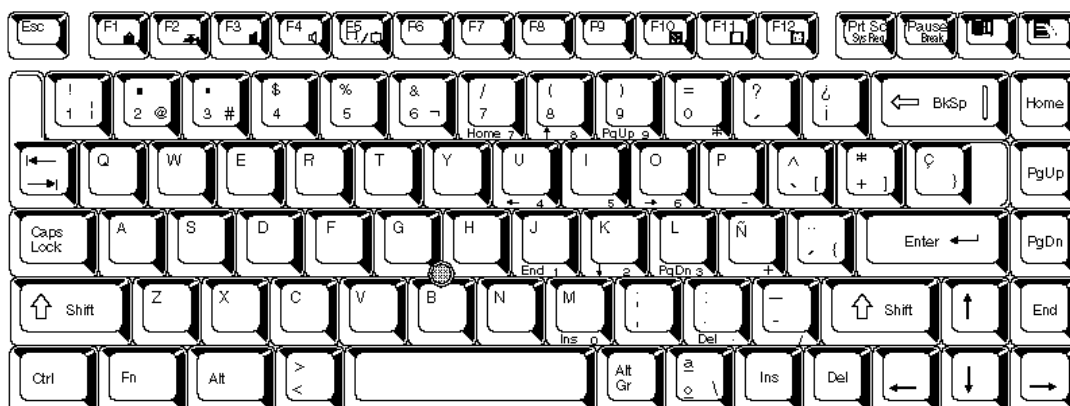


Figure E-5 SP keyboard

E.6 Italian (IT) Keyboard

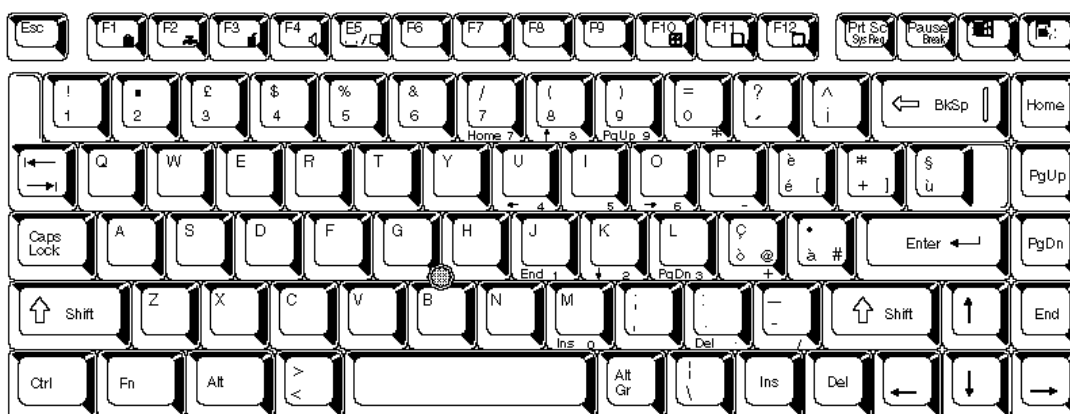


Figure E-6 IT keyboard

E.7 Scandinavian (SC) Keyboard

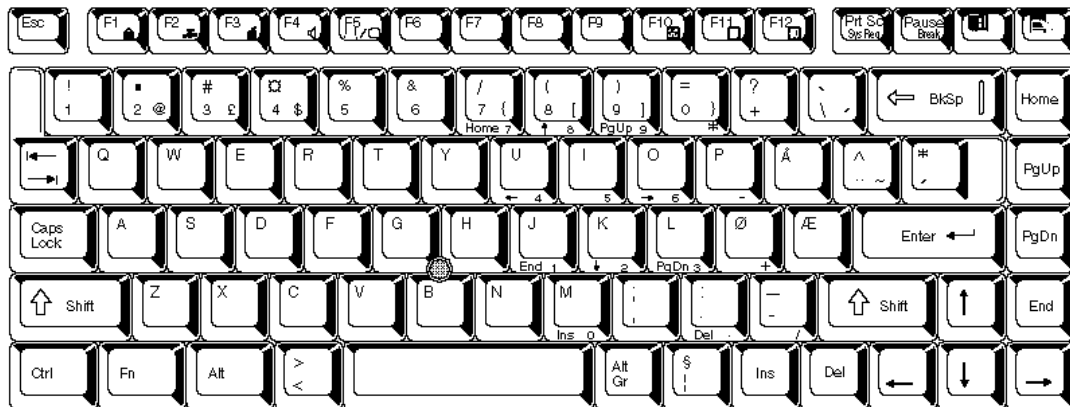


Figure E-7 SC keyboard

E.8 Swiss-German (SL) Keyboard

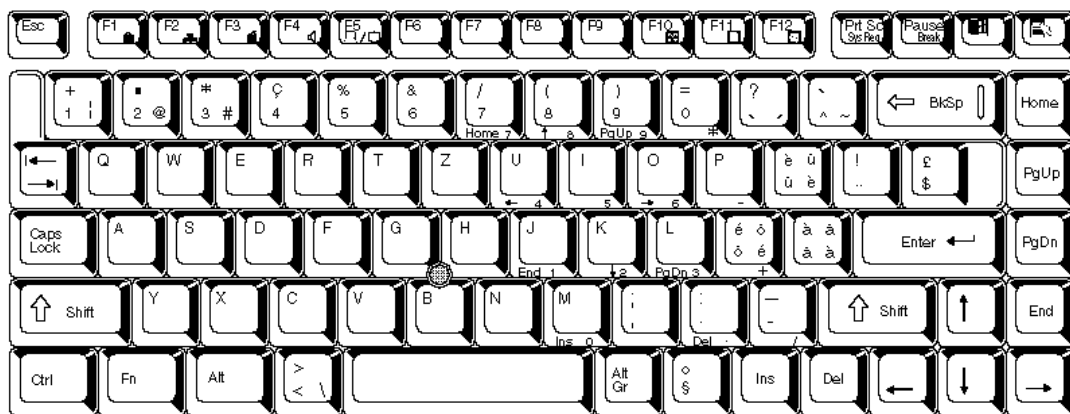


Figure E-8 SL keyboard

E.9 Canadian (CS) Keyboard

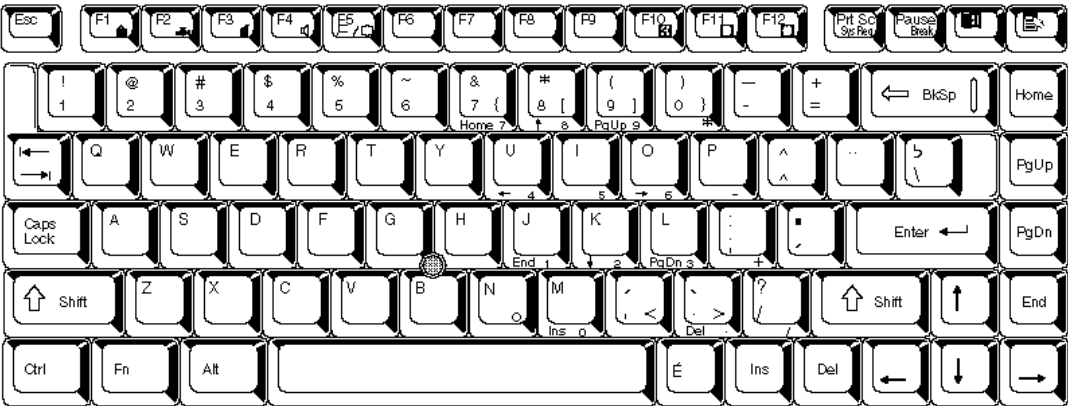


Figure E-9 CS keyboard

Appendix F Wiring Diagrams

F.1 Parallel Port Wraparound Connector

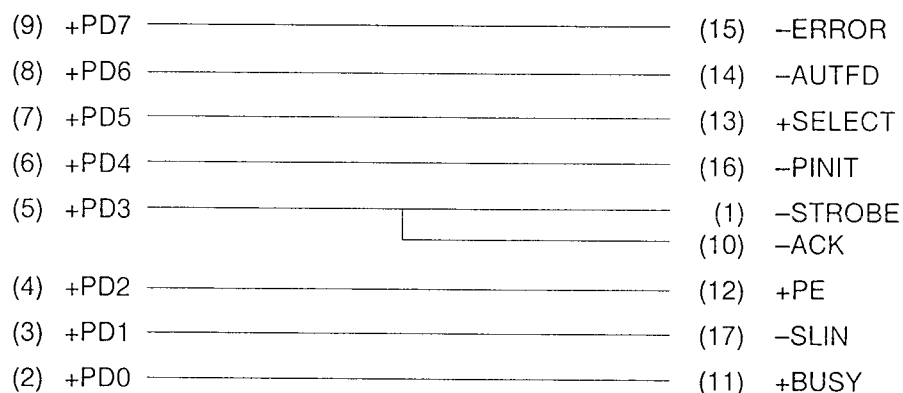


Figure F-1 Parallel port wraparound connector

F.2 Serial Port Wraparound Connector

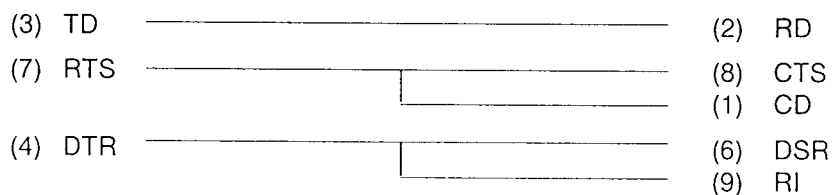


Figure F-2 Serial port wraparound connector

F.3 Serial Port Direct Cable (9-Pin to 9-Pin)

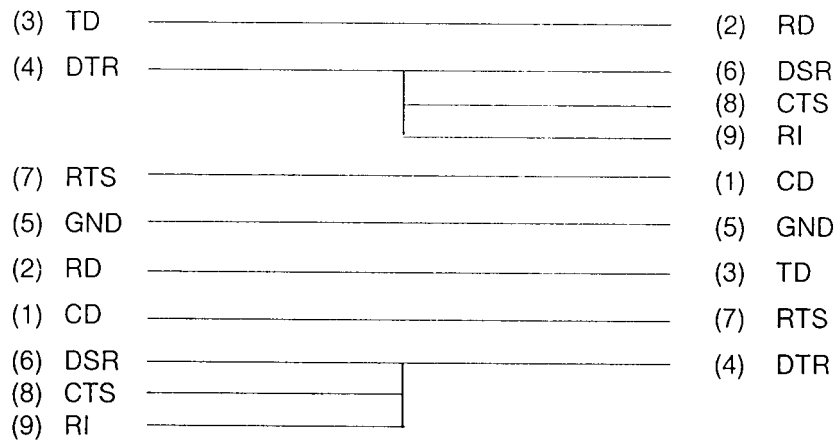


Figure F-3 Serial port direct cable (9-pin to 9-pin)

F.4 Serial Port Direct Cable (9-Pin to 25-Pin)

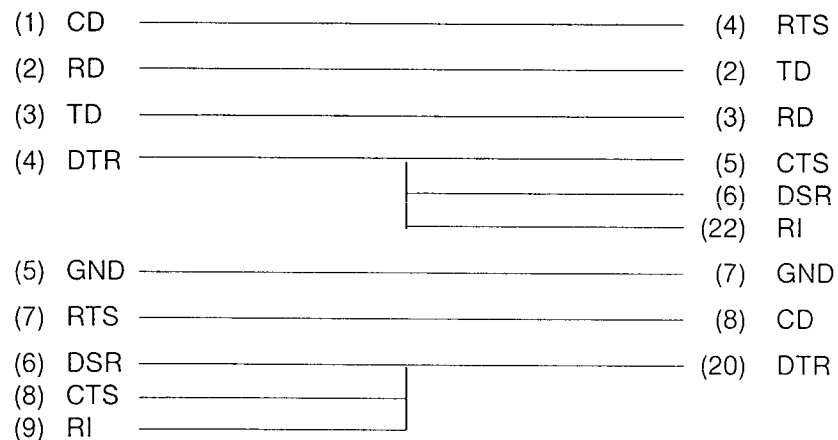


Figure F-4 Serial port direct cable (9-pin to 25-pin)

Appendix G BIOS Rewrite Procedures

This Appendix explains how to rewrite the system BIOS program when you update the system BIOS.

Tools

To rewrite the BIOS, you need the following tool:

- ☐ Diagnostics disk for the computer

Rewriting the BIOS

1. Set the system to boot mode.
2. Turn off the power to the computer.
3. Remove the external cable and any optional memory or PC card.
4. Turn on the power while holding down the **F12** key. (Keep holding down the key until the system speaker sounds a beep.)
5. When the BIOS message displays, insert the diagnostics disk into the FDD, then press **Enter** to start the BIOS rewrite program.
6. When the process is completed, eject the diagnostics disk and press the reset switch to restart the system.

Appendix H Reliability

The following table shows MTBF (Mean Time Between Failures) for each component.

Table H-1 MTBF

Component	Time (hours)
LCD	50,000
Keyboard	40,000
HDD	300,000
FDD	20,000
CD-ROM drive	45,000
AC adapter	60,000

