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Toshiba Libretto 100CT Maintenance Manual

First edition February 1998

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Preface

This maintenance manual describes how to perform hardware service maintenance for the Toshiba Personal Computer Libretto 100CT.

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:

- ❑ Handling the LCD module
- ❑ Board layout
- ❑ Pin assignments
- ❑ Keyboard scan/character codes
- ❑ Key layout
- ❑ Wiring diagrams
- ❑ BIOS Rewrite Procedures
- ❑ 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
```

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Hardware Overview

Chapter 1 Contents

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1.1 Features

The computer uses Toshiba's advanced 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 that operates at 166MHz and 1.8/2.5 volts.

- 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 2.1GB HDD or 3.2GB HDD.

- Display

  The computer has a 7.1-inch color, Thin Film Transistor (TFT) Liquid Crystal Display (LCD), that enables display up to 256K colors at a resolution 800 x 480 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 64K colors at a resolution of 1024 x 768 pixels.

- Keyboard

  An-easy-to-use 80/82-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.

- Batteries

  The computer has two batteries a Lithium-Ion main battery pack and RTC battery that backs up the Real Time Clock and CMOS memory.

- Expansion memory slot

  An optional 32MB 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. The USB port is only on the Enhanced Port Replicator.

- External monitor port

  The port is available only on the I/O adapter and enables connection of an external SVGA compatible monitor.

- PC card slot

  A PC card slot accommodates two 5mm cards (Type II) or one 10.5mm (Type III) card, which support the PC card Standard. These slots support an external FDD, 16-bit PC cards and CardBus PC cards (32 bit) as well as the Zoomed Video (ZV) port cards, which are dedicated to high-performance video data transfer such as MPEG video play back.

- AccuPoint

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

- Docking interface

  A 140-pin, docking interface port enables connection of the I/O adapter or an optional Enhanced Port Replicator.

  The Enhanced Port Replicator has two additional PC card slots that one accommodates a 10.5mm card (Type III) and one accommodates a 5mm card (Type II). These slots support CardBus PC card. The Enhanced Port Replicator also has PS/2™ mouse, PS/2 compatible keyboard, USB, parallel, serial and external monitor ports.

- 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 speaker, microphone and stereo headphone jack.

- External FDD

  A 3.5-inch external FDD is connected to the PC card slot and accommodates both 2HD (1.44MB) and 2DD (720KB) disks.

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

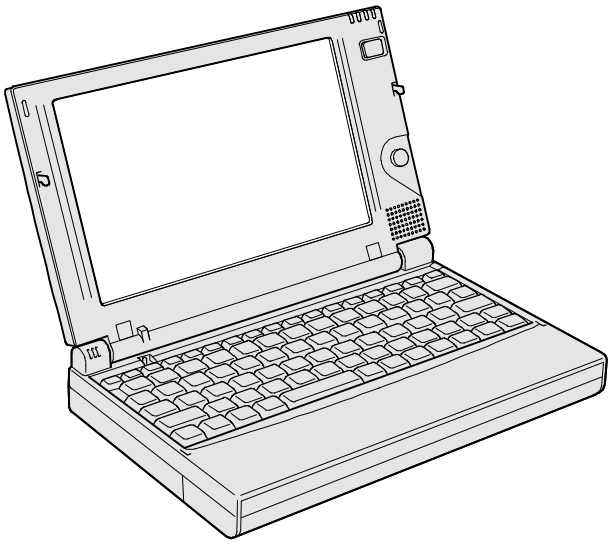


Figure 1-1 Front of the computer

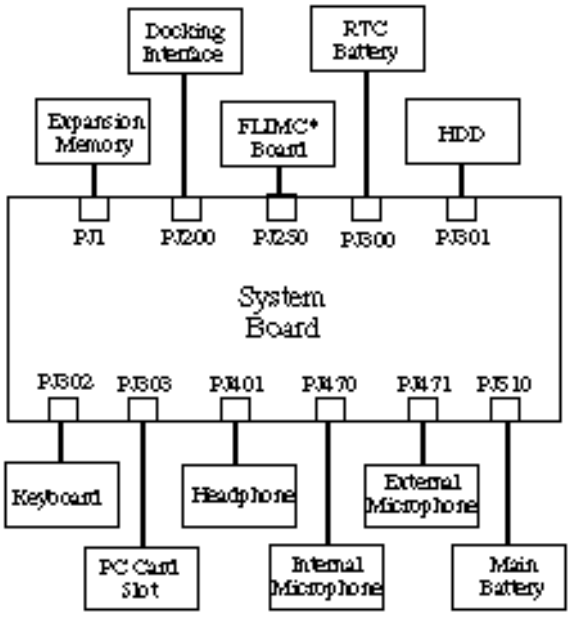


Figure 1-2 System unit configuration

1.2 System Unit Block Diagram

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

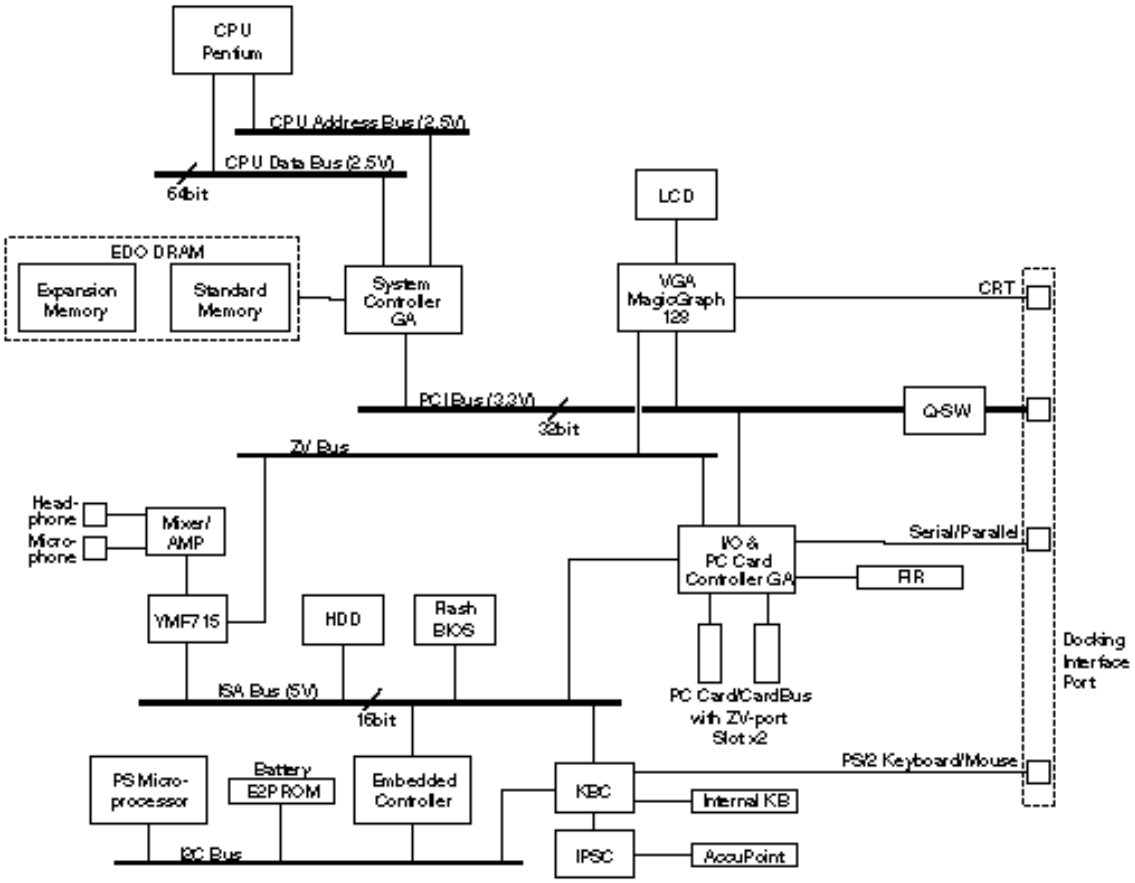


Figure 1-3 System unit block diagram

The system unit is composed of the following major components:

- Intel Pentium processor

  Intel 166MHz Pentium processor with MMX Technology.
  The math co-processor and 32KB cache memory are integrated into the Pentium.

- 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)

  - 512 KB, one 512K x 8-bit chip
    - 256 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
    - 288 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 32MB memory modules. The 32MB memory modules consist of 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

- System Controller Gate Array
  - This gate array has the following functions:
    - CPU interface/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
    - 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 parallel port control supported ECP
    - mini ISA bus control
    - PCI bus front end control
    - PC card control
    - ZV-port support
    - CardBus control
    - FIR function
    - Universal I/O port
    - Beep volume
    - Speaker control
    - RTC One T9934 chip is used

- Video Controller
  - The NeoMagic NM2160 chip is used. The Video controller incorporates 2MB of video memory using a 128-bit data path.

- Keyboard Controller (KBC)
  - One M38813S 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 EMEP 010B chip is used.
  - This controller provides simultaneous control of the Pointing Device.

- Sound Controller

  - One OPL3-SA3 is used.
  - The OPL3-SA3 incorporates OPL3 FM synthesizer, Digital Analog Converter (DAC) and MPU401 MIDI interface.

1.3 3.5-inch External FDD

The 3.5inch external FDD is a thin, high performance reliable drive that supports 720KB (formatted) 2DD and 1.44MB (formatted) 2HD disks. The FDD can be connected to the PC card slot.

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

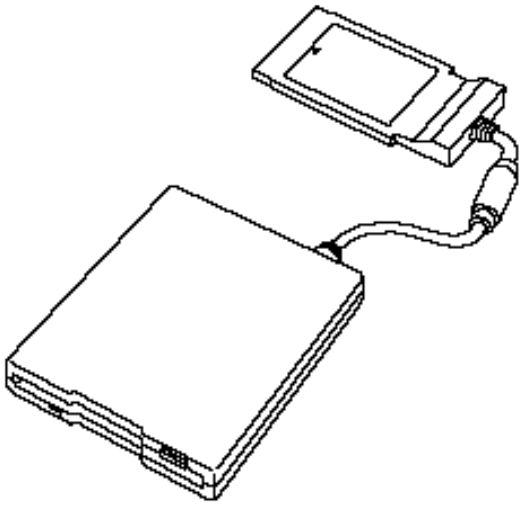


Figure 1-4 3.5-inch FDD

Table 1-1 3.5-inch FDD specifications

Item	2-MB mode	1-MB mode
Storage capacity (KB) Unformatted Formatted	 2,000 1,440	 1,000 720
Number of heads	2	2
Number of cylinders	80	80
Access time (ms) Track to track Average Head settling time	 3 181 15	 3 181 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 2.1GB HDD or 3.2GB HDD.

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

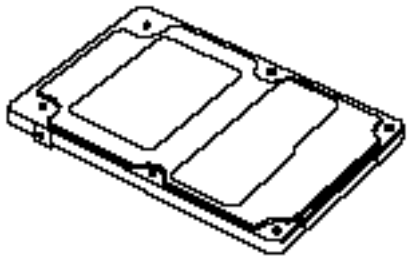


Figure 1-5 2.5-inch HDD

Table 1-2 2.5-inch HDD specifications

Items	IBM DYKA-22160	IBM DYKA-23240
Formatted capacity (bytes)	2,167,603,200	3,253,469,184
Logical cylinders	4,200	6,304
Logical heads	16	16
Logical sectors	63	63
Bytes per sector	512	512
Rotation speed (rpm)	4,200	4,200
Recording method	8-9 RLL	8-9 RLL

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 24-pin flat cable. The keyboard is shown in Figure 1-6.

See Appendix E for optional keyboard configurations.

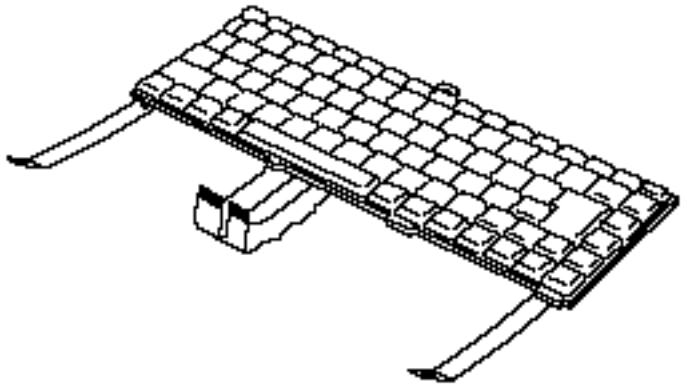


Figure 1-6 Keyboard

1.6 TFT Color LCD

The display panel contains a TFT color LCD module, a fluorescent lamp (FL) andan FL inverter board.

1.6.1 TFT Color LCD Module

The LCD enables display of up to 256K colors at a resolution 800 x 480 pixels.

The LCD is shown in Figure 1-7. Specifications are listed in Table 1-3.

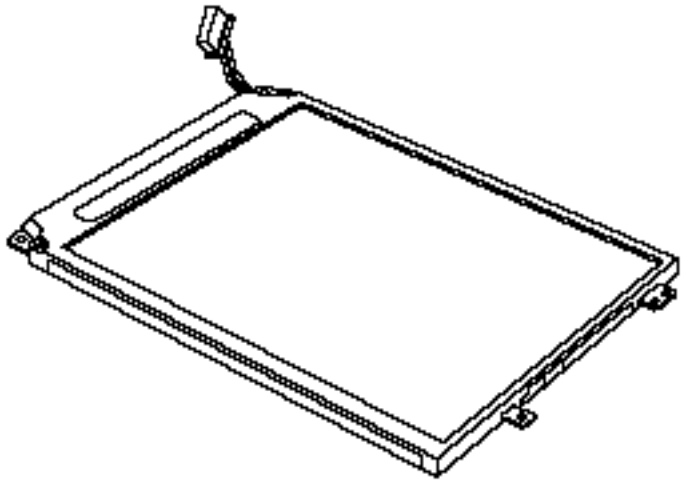


Figure 1-7 TFT color LCD

Table 1-3 LCD specifications

Items	Specifications
Number of Pixels (pixels)	800x480
Dot pitch (mm)	0.192x0.192
Display area (mm)	153.6(H)x92.16(V)
Contrast	1:150 (Typ)

1.6.2 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 1-4.

Table 1-4 FL inverter board specifications

Item	Specifications		
Input	Voltage Power	(V) (W)	5 2.3
Output	Voltage Current	(Vrms) (mA)	800 2.0 to 3.5*

***NOTE:** The FL currents at power on are:*
Level 3 : 3.5mA Level 2 : 2.9mA Level 1 : 2.6mA Level 0 : 2.0mA

1.7 Power Supply

The power supply supplies ten kinds of voltages to the system board, has one microprocessor and it operates at 4MHz. 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.

The embedded controller operates at 2MHz and has the following functions:

1. Controls ACPI in Windows 98.
2. Monitors the computer’s temperature.
3. Controls power supply to the docking port.
4. General purpose port.

The power supply output rating is specified in Table 1-5.

Table 1-5 Power supply board output rating

Use	Name	Voltage(V)	Power supplied Yes/No		
			Suspend	Power off	No battery
CPU	+1.8V	1.8	NO	NO	NO
CPU, CLKGEN, System Controller GA	+2.5V	2.5	NO	NO	NO
CLKGEN	+3.3V	3.3	NO	NO	NO
System Controller GA, PC Card Slot, VGA Controller, I/O & PC Card Controller GA, DRAM	B3V	3.3	YES	NO	NO
VGA Controller, PC Card Slot	B5V	5.0	YES	NO	NO
Flash Memory, KBC, IPSC, LCD Panel, HDD, LEDs, Sound, E2PROM,GA	VCC	5.0	NO	NO	NO
KB/Mouse Port	IFVCC	5.0	NO	NO	NO
PSC	MCV	5.0	YES	YES	NO
Embedded Controller	S5V	5.0	YES	YES	NO
RTC	RTCV	5.0	YES	YES	YES

1.8 Batteries

The computer has tow types of batteries:

- Main battery pack
- RTC battery

The battery specifications are listed in Table 1-6.

Table 1-6 Battery specifications

Battery name	Material	Output voltage	Capacity
Main battery	Lithium-Ion	10.8 V	1,200 mAh 2,400 mAh (High capacity)
RTC battery	Nickel Metal Hydride	2.4 V	11 mAh

1.8.1 Main Battery

The removable main battery pack is the computer's main power source when the Universal AC Adapter is not connected. The main battery pack maintains the state of the computer when the computer enters in resume mode.

1.8.2 Battery Icon

The icon shows the status of the removable battery pack.

The status of each can be determined by color:

Orange	The battery is being charged. (Universal AC Adapter connected)
Green	The battery is full charged. (Universal AC Adapter connected)
Blinking orange	The battery is low when the power is on.
No light	Under any other conditions, the LED does not light.

1.8.3 Battery Charging Control

Battery charging is controlled by a power supply 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 Universal AC Adapter and battery are connected to the computer. The system charges the battery using quick charge or trickle charge.

- Quick Battery Charge

  The battery quick charges when the Universal AC Adapter is connected and the system is powered off or in suspend mode.

Table 1-7 Time required for quick charges

Status	Charging time
Quick charge 1(power off)	2 to 3 hours
Quick charge 2(power on)	5 to 6 hours

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

1. The Main Battery becomes fully charged.
2. The AC adapter or Main Battery is removed.
3. The Main 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.

1.8.4 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 1-8 lists the charging time and data preservation period of the RTC battery.

Table 1-8 RTC battery charging/data preservation time

Status	Time
Charging Time	48 hours
Data preservation period (full charge)	1 month

Chapter 2
Troubleshooting Procedures

Chapter 2 Contents

Figures

Tables

1.1 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
2. FL Inverter Board
3. Floppy Disk Drive
4. Hard Disk Drive
5. Keyboard
6. Display
7. Pointing Board

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. I/O Adapter
12. External FDD

1.2 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.

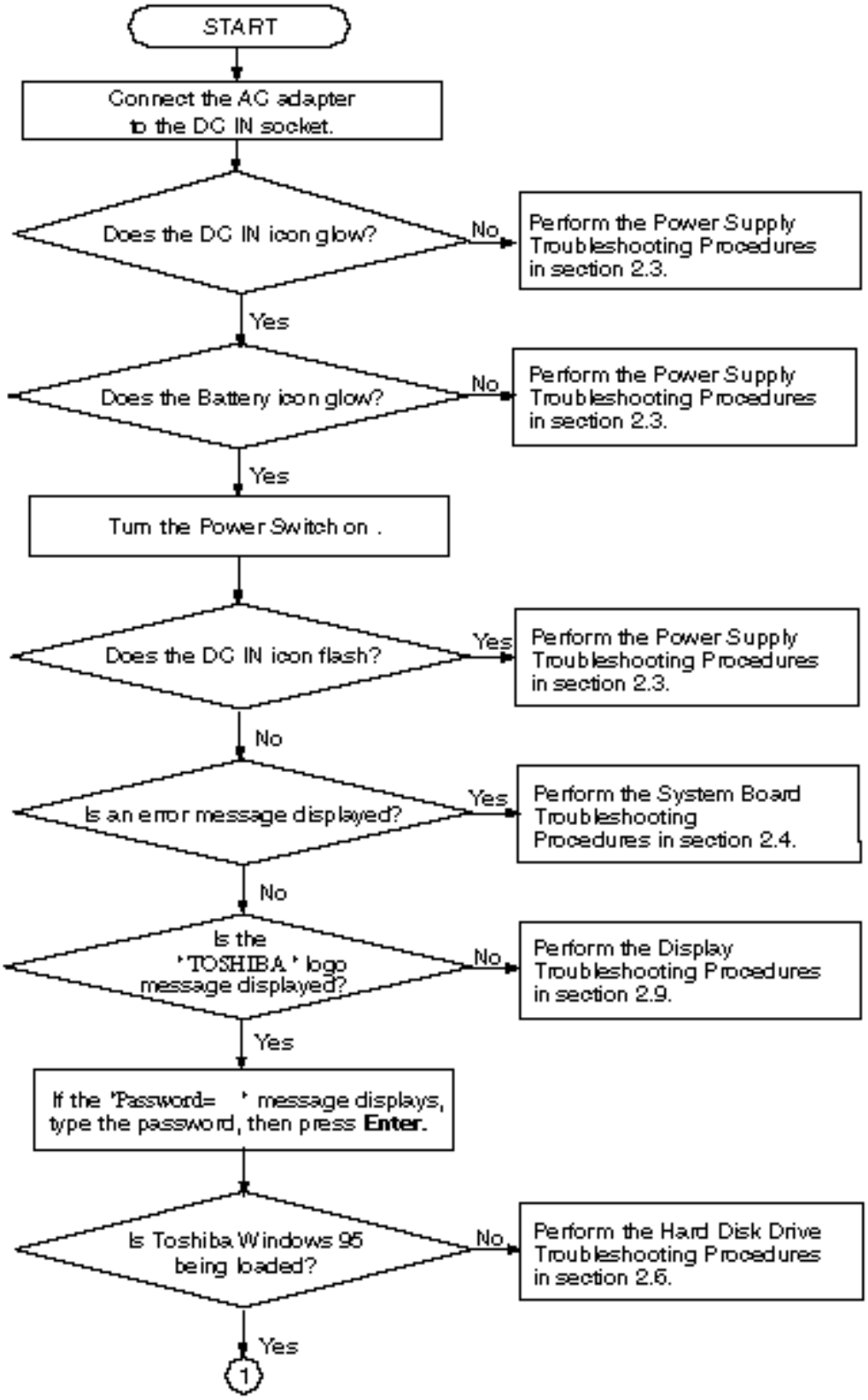


Figure 2-1 Troubleshooting flowchart (1/2)

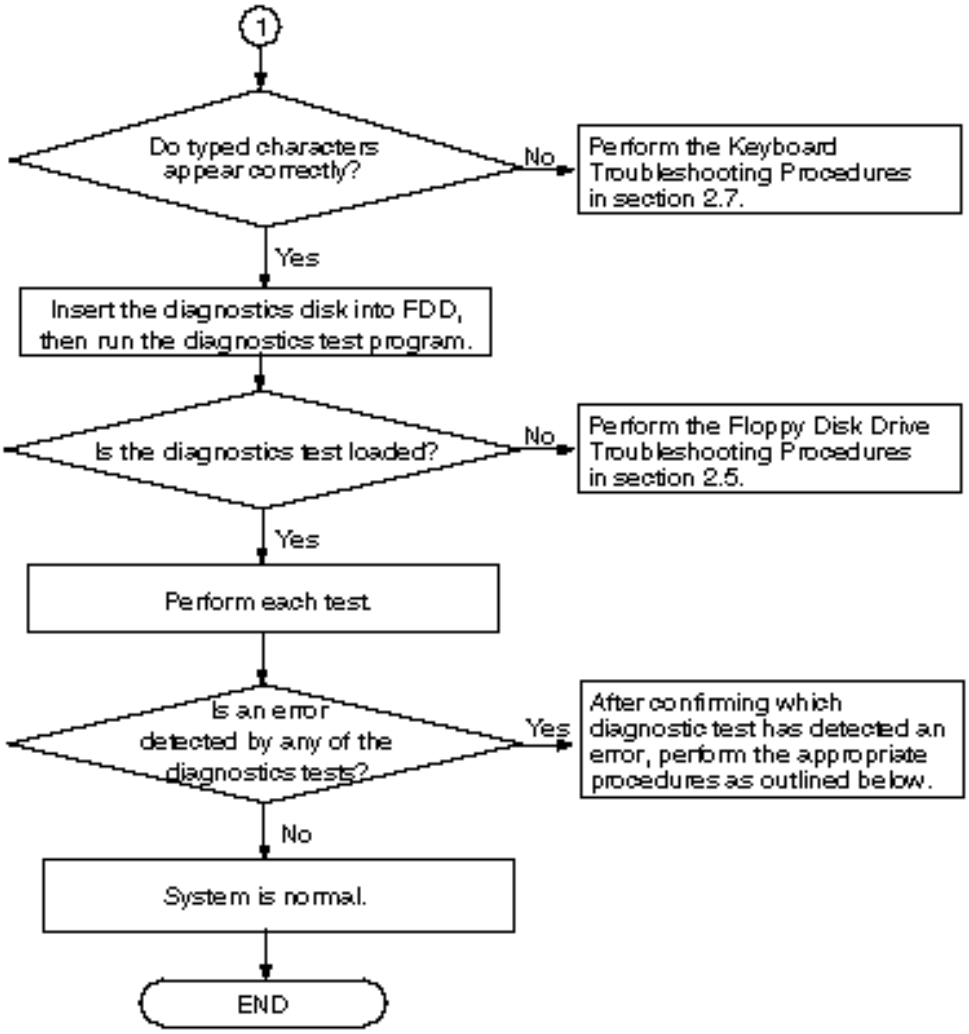


Figure 2-1 Troubleshooting flowchart (2/2)

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 2.9.

1.3 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 Auto Hibernation Off will be executed soon.

*2 Auto Hibernation 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.

CAUTION: *Use only an AC adapter manufactured for the Libretto 100CT. If you use another AC adapter, the computer's power supply may malfunction or a fuse on the system board may be blown.*

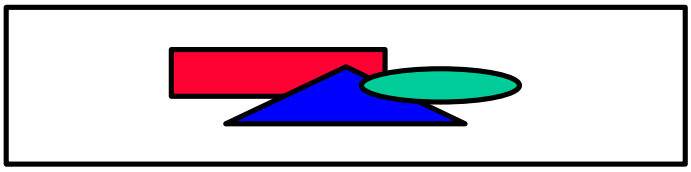
Procedure 2 Error Code Check

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 power supplied through AC adapter

Error code	Meaning
10h	AC Adapter voltage is over 16.5V (15V+10%).
12h	Current from the DC power supply is over the limit (3.13A).
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
20h	Battery voltage is over the limit (13.46V).
21h	Main battery charge current is over the limit (2.53A).
22h	Mai battery discharge current is over the maximum allowed limit when there is no load (0.5A).
23h	Main battery charge current is over limit (1.80A) when there .
24h	Current sensing IC is not normal.
25h	Main battery charge current is over the limit (0.5A).

❑ S5V output

Error code	Meaning
40h	S5V voltage is under the limit (4.75V).

❑ B5V output

Error code	Meaning
50h	B5V voltage is over the limit (5.5V).
51h	B5V voltage is under the limit (4.5V) when power supply is turned on.
52h	B5V voltage is under the limit (4.5V) when the computer is booting up.
53h	B5V dose not start up when the computer is suspended.

❑ B3V output

Error code	Meaning
60h	B3V voltage is over the limit (3.8V).
61h	B3V voltage is under the limit (2.81V) when power supply is turned on.
62h	B3V voltage is under the limit (2.81V) when the computer is booting up.
63h	B3V dose not start up when the computer is suspended.

❑ B2V output

Error code	Meaning
70h	B2V voltage is over the limit (2.88V).
71h	B2V voltage is under the limit (2.13V) when power supply is turned on.
72h	B2V voltage is under the limit (2.13V) when the computer is booting up.
73h	B2V voltage is over the limit (2.13V) when power supply is turned off.

❑ B1V output

Error code	Meaning
80h	B1V voltage is over the limit (2.16V).
81h	B1V voltage is under the limit (1.44V) when power supply is turned on.
82h	B1V voltage is under the limit (1.44V) when the computer is booting up.
83h	B1V voltage is over the limit (1.44V) when power supply is turned off.

Check 2 In the case of error code 10h:

❑ Make sure the AC adapter is firmly connected to the computer is DC IN socket and to power source. If this cables are connected correctly, go to the following step:

❑ Replace the AC adapter with a new one. If the error still exists, go to Procedure 5.

Check 3 In the case of error code 20h:

❑ 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.

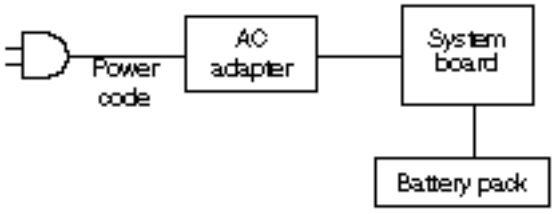
Check 4 In the case of error code 21h:

❑ Go to Procedure 3.

Check 5 When 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 Libretto 100's AC adapter is firmly connected to the computer's DC IN socket and a power source. If these cables are connected correctly, go to Check 2.

Check 2 Replace the AC adapter with a new one. If the DC IN icon does not glow green, go to Procedure 5.

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

Check 1 Replace the AC adapter with a new one. If the problem still exists, go to Check 2.

Check 2 Replace the system board with a new one. Refer to Chapter 4 for instructions on how to remove and replace the system board.

1.4 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.

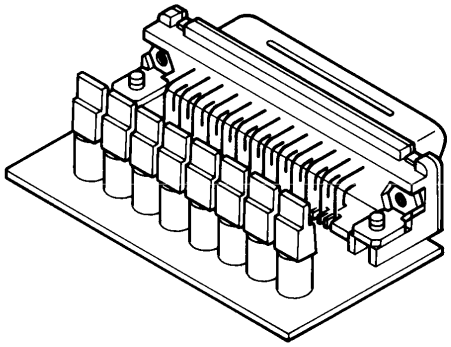


Figure 2-2 Printer port LED

To use the printer port LED follow the steps below:

1. Plug the printer port LED into the computer's parallel port.
2. Hold down the space bar and 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	Enabling cache
	ROM to RAM copy	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		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	SM-RAM base rewrite
	KBC initialization (2)	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	VGA controller power off and reset control
	Sound initialization	Sound controller initialization
	PIT 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 PC card configuration PnP automatic configuration	Serial port configuration
		Modem port 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	Printer port configuration
	FDD initialization	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, 74h, 72h, 76h, 79h, 77h, 78h, 81h, 82h, 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 Hibernation 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
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

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.

1.5 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 2.

If the test program cannot be executed on the computer, go to Procedure 2.

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.

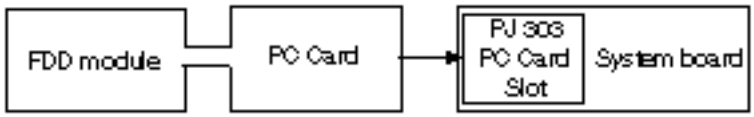
```
Write protected
```

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 FDD, cable and PC card is a single unit. Install the FDD's PC card in the computer, then begin with Check 1 below.

Check 1 Make sure the PC card is properly connected to the system board.



If the connection is loose, reinstall the PC card and repeat Procedure 2. If there is still an error, go to Check 2.

Check 2 The FDD may be defective or damaged. Replace the FDD with a new one. 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, *Replacement Procedures*.

1.6 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

***NOTE**: 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 disk or other device. 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.

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.

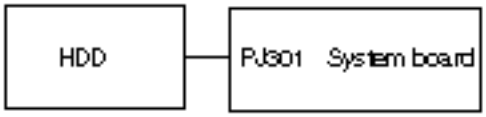
Table 2-6 Hard disk drive error code and status

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 Replaceme nt 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.

1.7 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: Diagnostic Test Program Execution Check

Procedure 2: Connector and Replacement Check

Procedure 1 Diagnostic Test Program Execution Check

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

If an error occurs, go to Procedure 2. If an error does not occur, the keyboard is functioning properly

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 Connector and Replacement Check

The keyboard is connected to the system board by flat cables. These cables or connectors may be disconnected or damaged. If there is a problem with the keyboard, disassemble the computer as described in Chapter 4, *Replacement Procedures*, and perform Check 1.

Check 1 Make sure the following cables are not damaged and are connected to the system board.

If the cables are damaged, replace the keyboard with a new one. If the cable is disconnected, firmly connect it. Perform Procedure 1 again. If the error still exists, perform Check 2.

Check 2 The system board may be damaged. Replace the system board with a new one. Refer to Chapter 4, *Replacement Procedures* for more information.

1.8 Pointing Device Troubleshooting

To determine if the computer's pointing device is functioning properly, perform the following procedures.

Procedure 1: Diagnostic Test Program Execution Check

Procedure 2: Connector and Replacement Check

Procedure 1 Diagnostic Test Program Execution Check

Execute the pointing device Test in the Diagnostic Program of Keyboard Test Program. Refer to Chapter 3, Test and Diagnostic, for more information on how to perform the test program. If an error occurs, go to Procedure 2. If an error does not occur, the pointing device is functioning properly.

Procedure 2 Connector and Replacement Check

The pointing device is connected to the system board by the FLIMC* board (flexible cable). The FLIMC* board or connectors may be disconnected or damaged. If there is a problem with the pointing device, disassemble the computer as described in Chapter 4.*Replacement Procedures,* and perform Check 1.

Check 1 Make sure the FLIMC* board or the pointing device is not damaged and that both are connected to the system board. If the FLIMC* board or the pointing device is damaged, replace the FLIMC* board or the pointing device with a new one. If the FLIMC* board or the pointing device is disconnected, firmly connect it. Perform Procedure 1 again. If the error still exists, perform Check 2.

Check 2 The System board may be damaged. Replace the System board with a new one. Refer to Chapter 4, *Replacement Procedures* for more information.

1.9 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: Diagnostic Test Program Execution Check

Procedure 2: Connector and Replacement Check

Procedure 1 Diagnostic Test Program Executi on 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 2. If an error is not detected, the display is functioning properly.

Procedure 2 Connector and Replacement Check

The FL, FL inverter board, LCD module, LCD flat cable and system board are connected to the 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 4.

If characters are not displayed clearly, perform Check 3.

If some screen functions do not operate properly, perform Check 3.

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

Check 1 Replace the LCD flat cable with a new one and test the display again. If the problem still exists, perform Check 2.

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

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

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

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

Chapter 3
Tests and Diagnostics

Chapter 3 Contents

Tables

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 12 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

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 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)
- ❑ External FDD (All tests)
- ❑ Serial port wraparound connector (ASYNC test)
- ❑ I/O Adapter

The following sections detail the tests within the Diagnostic Test function of the DIAGNOSTIC TEST MENU. Refer to Sections 3.18 through 3.24 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. Connect a wraparound connector to the I/O adapter's printer port and RS-232C port. Connect the I/O adapter to the computer. Next, connect the FDD and insert the diskette containing the test program

2. Turn on the computer and the test program will execute and the test menu will be displayed.

   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.*

3. 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
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 each Diagnostic Test 1 through 12. 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.

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

```
SYSTEM TEST     XXXXXXX

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

SUB- TEST : XX
PASS COUNT: XXXXX       ERROR COUN T: XXXXX
WRITE DATA:  XX         READ DATA : XX
ADDRESS : XXXXXX        STATUS  : XXX

SUB-TEST  MENU :

01 - ROM checksum
02 -
03 -
04 -
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.*

5. 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 3.16 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
		05	Thermistor 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
3	KEYBOARD	01	Pressed key display
		02	Pressed key code display
		03	PS/2 Mouse connect check
		04	Pointing Stick
		05	USB Warp around test
4	DISPLAY	01	VRAM read/write for VGA
		02	Gradation for VGA
		03	Gradation & Mode test for VGA
		04	“H” pattern display
		05	BUS Master Transfaer
5	FDD	01	Sequential read
		02	Sequential read/write
		03	Random address/data
		04	Write specified address
		05	Read specified address
6	PRINTER	01	Ripple pattern
		02	Function
		03	Wraparound

Table 3-1 Subtest names (2/2)

No.	Test Name	Subtest No.	Subtest Name
7	ASYNC	01	Wrap around (board)
		02	Point to point (send)
		03	Point to point (receive)
		04	Interrupt 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 wrap around
		02	DS bus wrap around
		03	RGB monitor ID
		04	PCMCIA wrap around (External)
		06	ZV port wrap around
12	SOUND	01	CODEC (REC/PLAY)
		02	FM Synthesizer
		03	SIN Wave Playback

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 05 Thermistor Check

This subtest reads the thermistor 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.

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 RAM 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 32MB.

After selecting subtest 05, the following message will appear:

```
Extended memory size (1:32 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

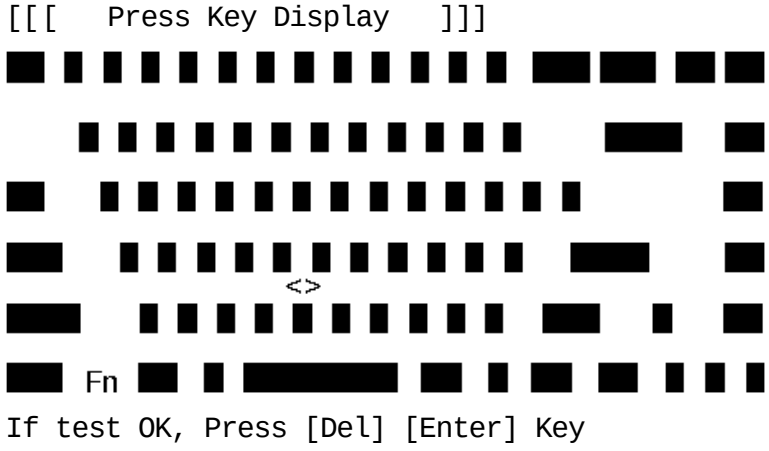
3.6 Keyboard Test

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 foursubtests that test the computer's keyboard, PS/2 mouse, and Pointing Stick actions. Move the highlight bar to the subtest you want to execute and press **Enter**.

Subtest 01 Pressed key display (80/82)

> ***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.



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:

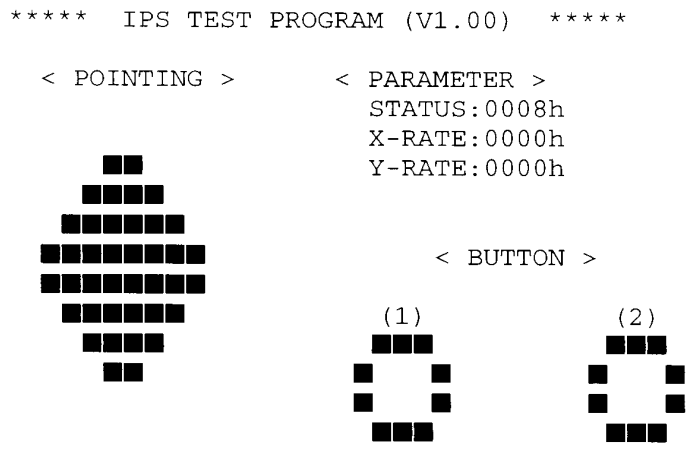
```
KBD - MOUSE INTERFACE ERROR

                                        [[ HALT OPERATION ]]

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

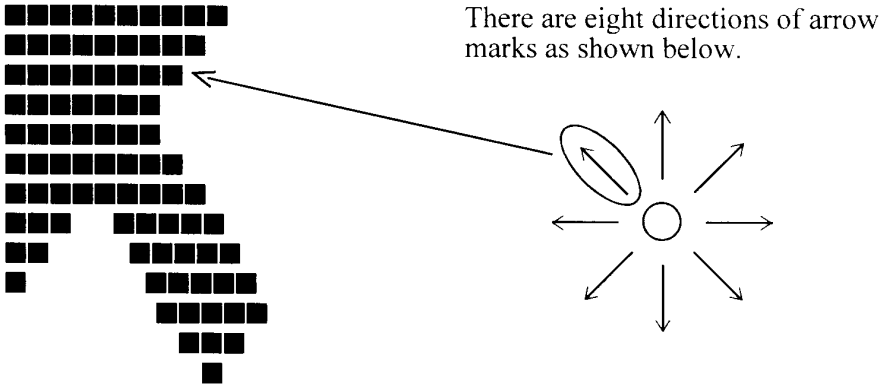
Subtest 04 Pointing stick

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

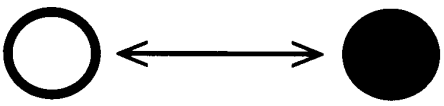
A) IPS stick pressure sensing direction and parameter.
B) IPS switch function check.

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.





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



Subtest 05 USB Wrap around 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.

> ***NOTE:*** *To execute this subtest, the Enhanced Port Replicator must be connected to the computer.*

3.7 Display Test

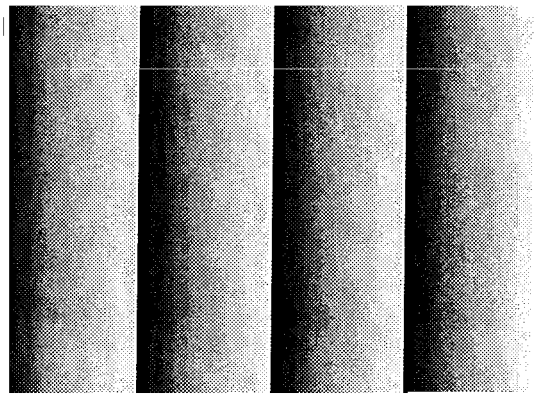
To execute the Display Test, select **4** from the DIAGNOSTIC TEST MENU, press **Enter** and follow the directions on the screen. The Display test contains eight subtests that test the display in various modes. Move the highlight bar to the subtest you want to execute and press **Enter**.

Subtest 01 VRAM read/write for VGA

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**.

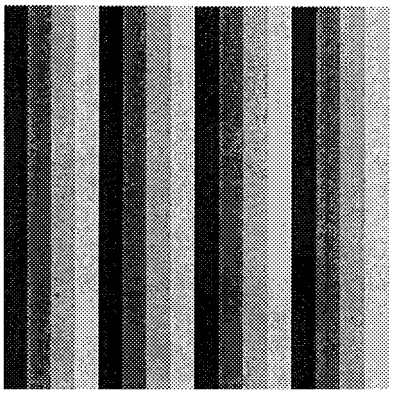
Subtest 03 Gradation & mode test for VGA

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

Resolution	Mode
800 x 480	3, 12, 13

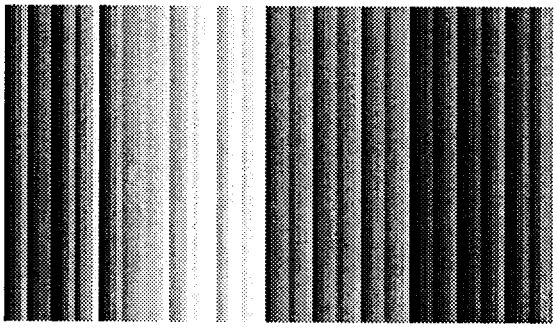
> ***NOTE**: Mode 52 test can test only an external monitor, it cannot be used for the internal LCD.*

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



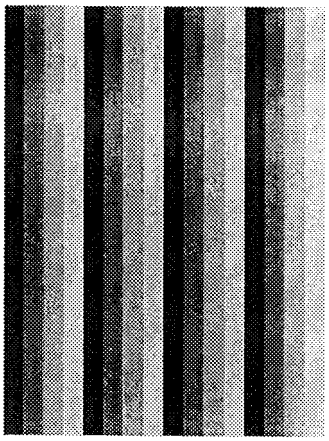
[Mode 12]

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



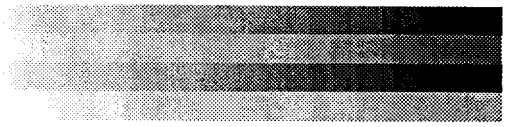
[Mode 13]

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 04 “H” pattern display

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

HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
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HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH

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 05 BUS Master Transfer

This subtest PCI BUS MASTER test.

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.

1. Select the test drive number of the floppy disk drive to be tested and press **Enter**.

   ```
   Test drive number select (1:FDD#1,2:FDD#2,0:FDD1&2    ) ?
   ```

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

   ```
   Media in drive #X mode (0:2DD  ,1:2D,2:2D-2HD/2DD,3:2HD) ?
   ```

3. Select the track you want the test to start on and press **Enter**.

   ```
   Test start track (Enter  :0/dd:00-79) ?
   ```

4. 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.

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#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:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopq
#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqr
$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrs
%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrst
&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstu
'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuv
()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvw
)*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwx
*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxy
```

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:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmn
opqrstuvwxyz{|}~
```

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, 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, 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 Wrap around (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          HDD#1
                              HDD#2
                              HDD1&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 3.19. 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 3.19. 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      XXXXXXX

SUB-TEST : XX
PASS COUNT:  XXXXX  ERROR COUNT: XXXXX
WRITE DATA:  XX  READ DATA : XX
ADDRESS : XXXXXX 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.

NOTE: *To execute this subtest, the PC card wraparound connector is required.*

Subtest 01 PCMCIA wrap around

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

NOTE: *Select the subtest number01the following message will appear: Test slot number select (1:slot0, 2:slot1, 0:slot0&1) ?*

NOTE: *Subtests 02 and 04 are for Enhanced Port Replicator . For procedures on those subtests, refer to Enhanced Port Replicator manual.*

Subtest 03 RGB monitor ID test

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

Subtest 06 ZV Port wrap around

Use the PC Card/ZV Test Card (Rev.B or higher) to conduct the test. The video and audio interfaces will be tested. When the video test is initiated, the board automatically writes data AAAAh and 5555h alternately to address A000:0000h. The data written first is determined randomly, and has no effect on the validity of the test.

After the video test is run the audio interface is tested. The test emits 1kHz sine wave sound on the left speaker and 2kHz sine wave sound on the right speaker.

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.

3.16 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 FF	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 Data Compare Error
Keyboard	01 02 03 04 05 06	Mouse interface error IPS interface error Interface error Retransmi error Mouse handler not support PS/2 mouse & IPS not support
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
	88	Modem 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
Expansion	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
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

3.17 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 overa 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.

3.18 Hard Disk Format

This command executes hard disk formatting. There are two types ofhard-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.*

3.18.1 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	IBM DYKA-22160	IBM DYKA-23240
Storage capacity Formatted (Bytes)	2,167,603,200	3,253,469,184
Cylinders	4,200	6,304
Heads	16	16
Sectors	63	63
Bytes per sector	512	512
Rotation speed (rpm)	4,200	4,200
Recording method	8-9 RLL	8-9 RLL

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.

3.18.2 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.

3.19 Head Cleaning

3.19.1 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.

3.19.2 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.

3.20 Log Utilities

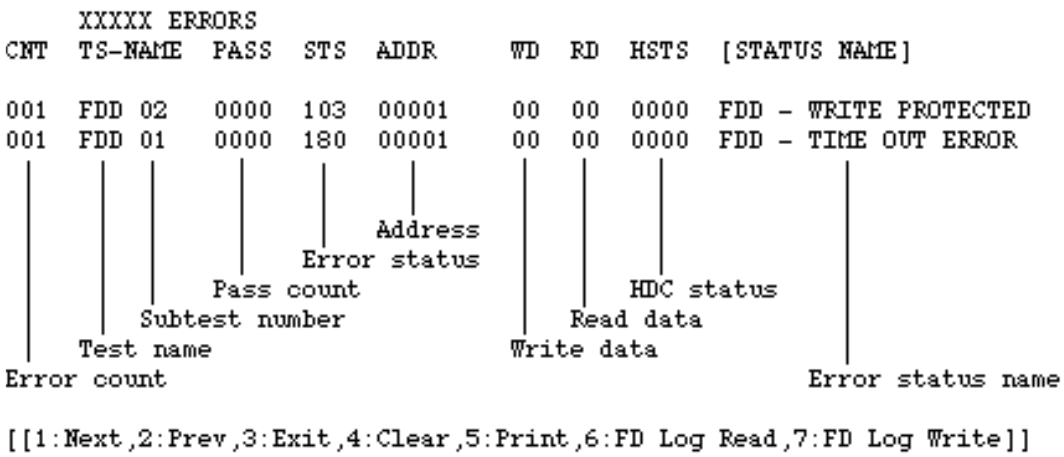
3.20.1 Function Description

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)

3.20.2 Operations

1. 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:



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 out
   puts 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.

3.21 Running Test

3.21.1 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 to 05)
4. FDD test (subtest 02)
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.

3.21.2 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.**

3.22 Floppy Disk Drive Utilities

3.22.1 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) 2DD: Double-sided, double-density, double-track, 96/135 TPI, MFM mode, 512 bytes, 9 sectors/track.

(b) 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 READ

This program reads the hard disk ID and displays the hard disk ID, serial numberand others hard disk information.

3.22.2 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
  Reswrved (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.

3.23 System Configuration

3.23.1 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. Selectbay Unit
18. Date/Time

3.23.2 Operations

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

```
System Configration 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( Converntional Memory = XXXXX KB)

** -  Sound System       =  XXXXX
*  -  X Prin ter 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 Dis k Drive(s)
                            #1 Cylinder = XXXXX, Head = XX, Sector =XX
                            #2 Cylinder = XXXXX, Head = XX, Sector =XX

*  -  Selective Bay Unit    =  XXXX

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

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

3.24 SETUP

3.24.1 Function Description

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

1. Memory
   (a) Total

2. Password

3. Peripheral
   (a) Pointing Devices
   (b) Parallel Port Mode
   (c) Hard Disk Mode

4. Boot Priority

5. Display
   (a) Power On Display CPU Cache
   (b) LCD Display Stretch

6. Others
   (a) Power-up Mode
   (b) CPU Cache
   (c) Auto Power On
   (d) Alarm Volume
   (e) System Beep
   (f) Panel Power On/Off

7. Configuration

8. I/O Ports
   (a) Serial
   (b) Parallel
   (c) Sound

9. Display

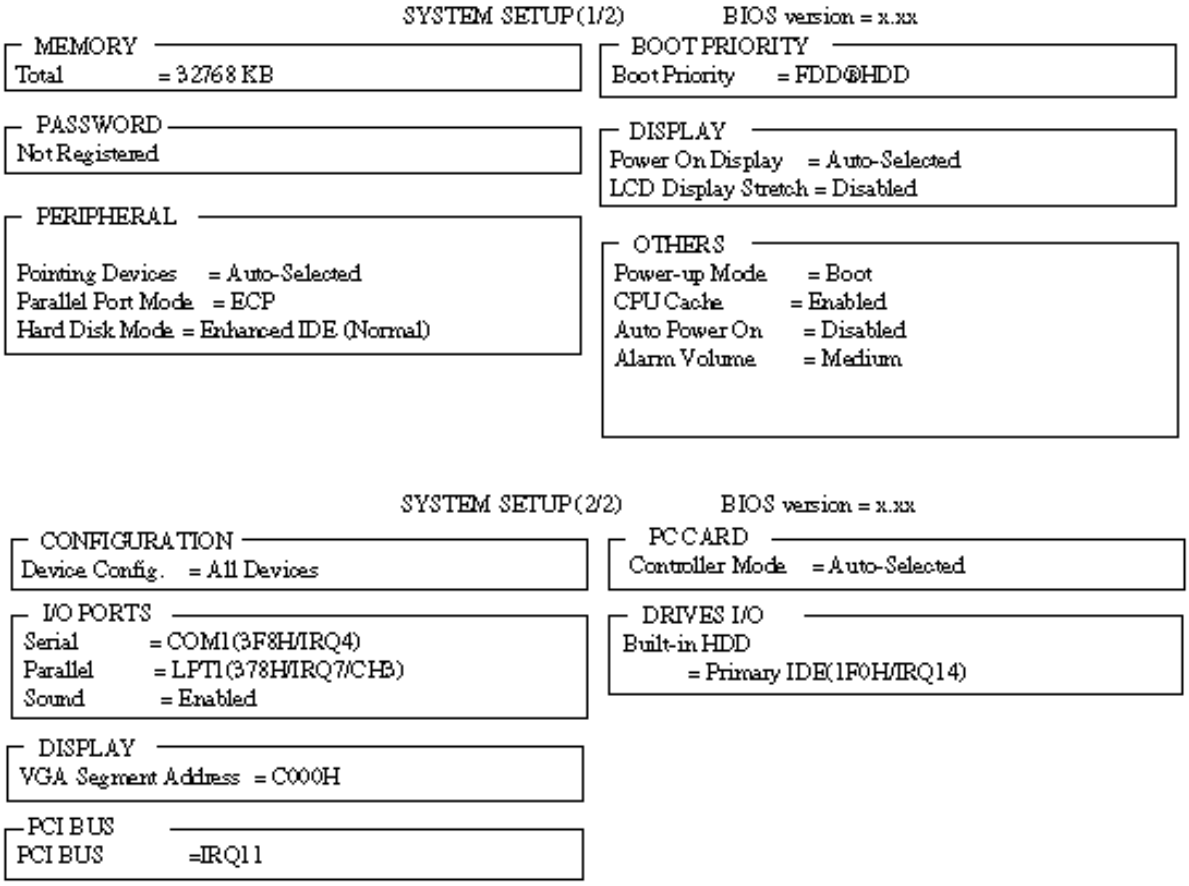
10. PCI Bus

11. PC Card

12. Floppy Disk I/O

3.24.2 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) .



NOTE: *The Panel Power On/Off item and the System Auto Off item appears when the computer is in Resume mode and Hibernation 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. 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) Parallel Port Mode

This option 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.

(c) Hard Disk Mode

Use this item to select the hard disk mode.

Enhanced IDE Select this mode when using MS-DOS®.

(Normal) 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.*

4. Boot Priority

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

FDD→HDD: The computer looks for bootable files first on the FDD and next on the HDD. (Default)

HDD→FDD: The computer looks for bootable files first on the HDD and on the FDD.

You can reverse the order by holding down the F10 key while the computer is booting. This procedure alternates the setup setting.

5. Display

(a) Power On Display

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

Auto-Selected	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.

(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)

6. 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 hibernation, resume and boot mode.

Boot Turns on boot mode. (Default)

Resume Turns on resume mode.

Hibernation Turns on hibernation mode.

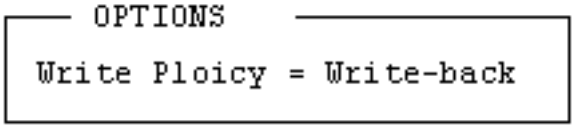
(b) CPU Cache

Use this option to enable or disable the CPU cache.

Enabled Enables the CPU cache. (Default)

Disabled Disables the CPU cache.

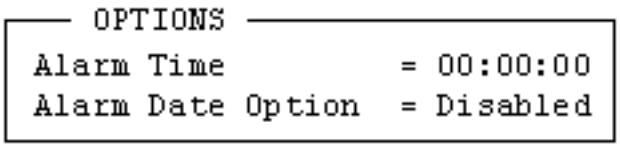
When enabled is selected, a subwindow similar to the one below displays to let you select the cache write policy. The options for this setting are **Write-back** (default) and **Write-through** for CPU cache.



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 timedata is handled by the processor.

(c) Auto Power On

Use this option to set a time and date for automatic power on the **Alarm Date Option** displays when **Alarm Time** is enabled.



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.

(d) 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.

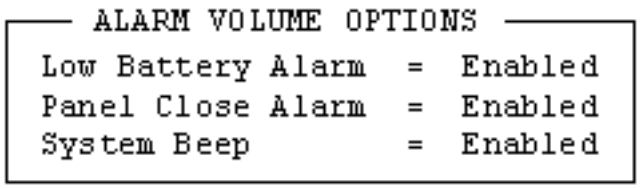
Off Disables the alarm.

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.



Enabled Enables the feature. (Default)

Disabled Disables the feature.

(e) 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 or Hibernation 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)

(f) System Auto Off

Use this option to disable or set the duration of the system automatic off function in Resume or Hibernation mode. In Boot mode and Hibernation 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.

7. Configuration

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

All Devices

8. 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

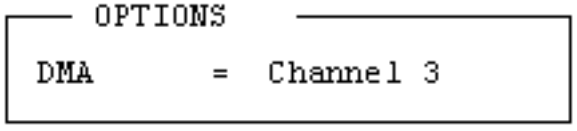
This option sets the interrupt request level (IRQ) and I/O port base address for the parallel port. When the Printer Port Type is set to **Standard Bi-directional**, the options are:

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).



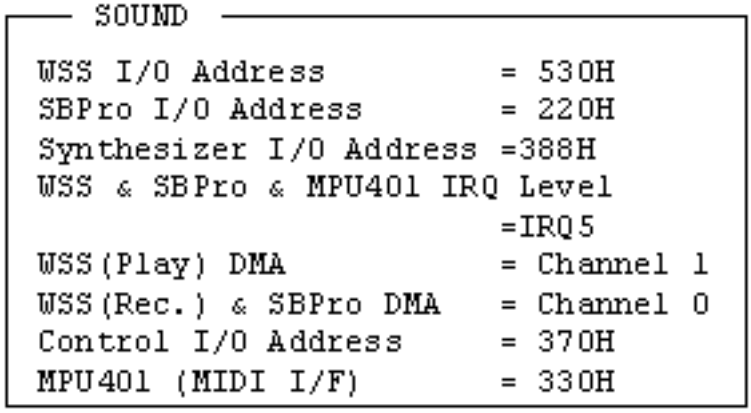
(c) Sound

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.



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.

9. Display

   (a) VGA Segment Address

   This option lets you set the VGA Segment Address

   C000h (Default)
   E400h

10. PCI Bus

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

11. 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.

12. Drives I/O

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

    Setting for Built-in HDD

Primary IDE (1F0H/IRQ14)	The built-in HDD is ready for use.
Not Used	Disables the built-in HDD.

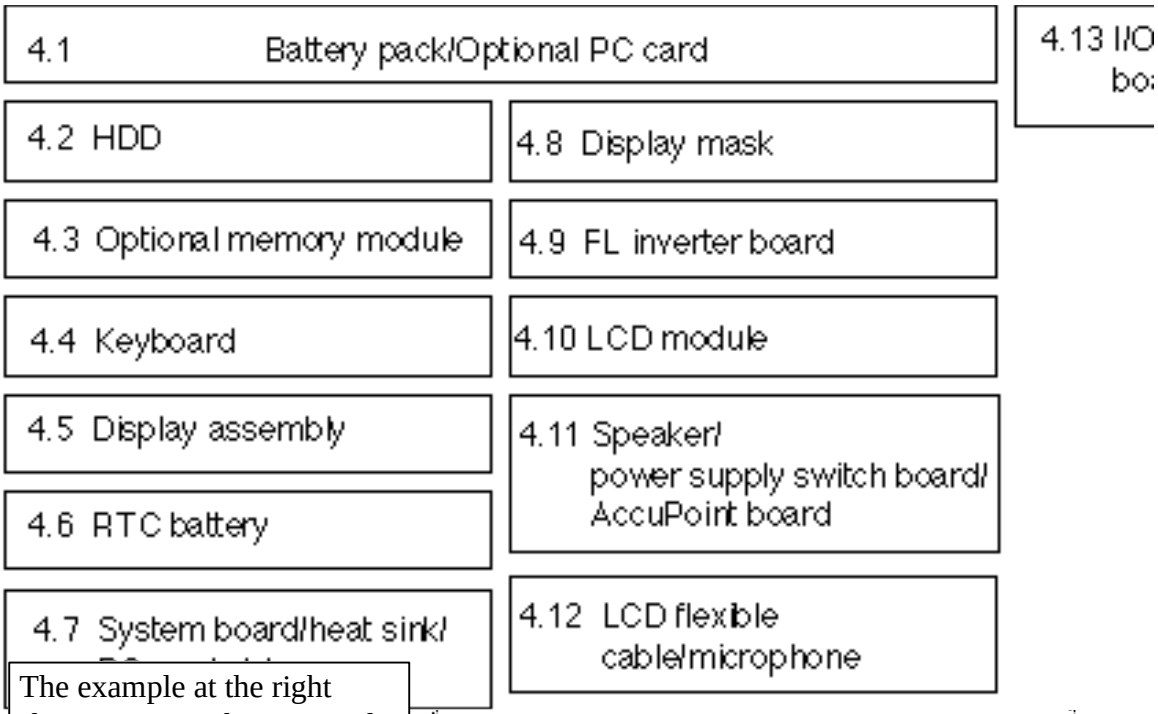
Chapter 4
Replacement Procedures

Chapter 4 Contents

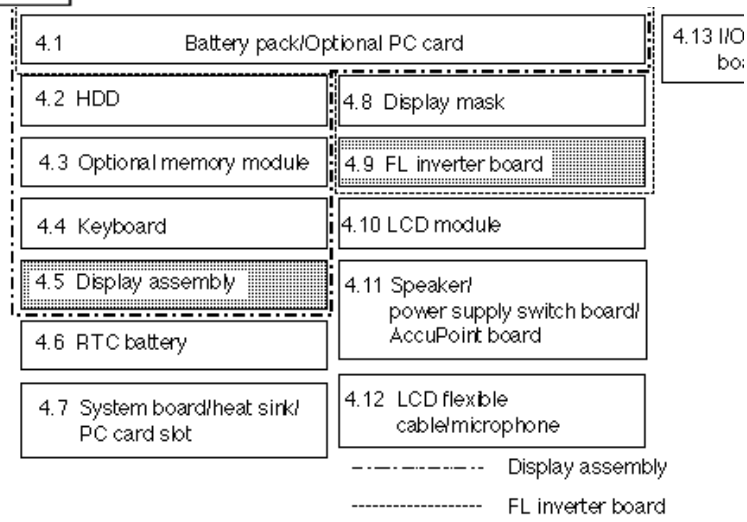
Figures

4.1 Overview

The disassembly and replacement procedures for units that can be replaced in the field (FRUs) are described in this section. It may not be necessary to remove all the FRUs in order to replace one FRU. The chart below shows a guideline on which FRUs are to be removed before removing a certain FRU. Be sure to remove the battery pack first. In repairing an FRU suspected to be the cause of a computer malfunction, determine FRUs to be removed according to the flow of the chart below.



The example at the right shows FRUs to be removed for the display assembly and for the FL inverter board. The display assembly is overlapped by the keyboard, which is overlapped by the optional memory module, HDD and battery pack/optional PC card. The FL inverter board is overlapped by the display mask and battery pack/optional PC card.



Before Beginning Work

Observe the following before beginning work. All procedures must begin with the removal of the AC adapter, battery pack and any PC cards.

1. Do not disassemble the computer unless a malfunction occurs.

2. Use the specified tools.

3. Use and storage require a work environment free of the following.

    - Dust and pollutants
    - Static electricity
    - Extremely high or low temperature or humidity

4. Conduct the diagnostic test described in Chapter 2 of this manual to identify which FRU is the cause of the malfunction.

5. Do not perform unnecessary operations. Observe the disassembly and installation procedures described in this manual.

6. The parts removed from the computer must be kept at a safe place away from the computer, free of damage and not impeding the work.

7. Many screws are removed and parts are replaced in disassembling the computer. Keep the screws in a safe place in such a way that you will be able to easily identify which screw belongs to which part.

8. Use the specified screws and mount the parts in the specified positions in reassembling the computer. Screw sizes are shown with explanations in the figures.

9. Be careful not to be injured by the many sharp edges and angles of the screws.

10. After replacing the FRU, check its operation and make sure that the computer operates normally.

11. Proceed chapter 4.2 or more after removing all items which are described in this section except otherwise noted.

Disassembly Procedures

There are two basic types of cable connectors.

- ❑ Pressure plate connector
- ❑ Normal pin connector

To disconnect the cable from a pressure plate connector, lift the tab on either side of the plastic pressure plate of the connector, and gently pull the cable out from the connector. To connect the cable to a pressure plate connector, lift the pressure plate high enough and slide the cable into the connector. Push the pressure place at both ends so the plate and connector will be at the same height, then fasten the cable at the correct position. Hold the cable, gently pull it, and make sure that the cable is securely in place. If the cable slips out of the connector, make that the pressure plate is lifted high enough, and connect the cable again.

Standard pin connectors are used for all other cables. The cables can be connected to and disconnected from these connectors by simply pulling or pushing.

Reassembly Procedures

To reassemble the computer after disassembling it and repairing the parts that caused its malfunction, observe the general instructions given below.

- ❑ Take time and reassemble it properly as instructed. Hasty work often raises problems.
- ❑ Check that the cables and connectors are securely fastened.
- ❑ Before mounting the FRUs and other parts, check that the cables are not caught by screws or FRUs.
- ❑ Check that all the latches are correctly closed.
- ❑ Check that all FRUs have been fastened securely with all the screws. If the wrong screws are used, it may result in damage to the screw threads and heads or the FRUs may not be fixed securely.
- ❑ After repairing, put all items which are removed from target machine.

After mounting the FRUs back in position, check that the computer operates normally.

Tools and Devices

It is important for the safety of the workers and others in the neighborhood to use electrostatic discharging (ESD) devices. Proper use of these devices will raise the success rate of repairs and reduce the expenses arising from damage and breakdown of the parts. The following are necessary for disassembly and reassembly.

- 2-mm Philips screwdriver
- Tweezers (for easy removal of screws)
- ESD mat (to be placed on the work bench or floor)
- ESD wrist strap or heel grounder
- Anti-static carpet or floor

Screw Tightening Torques

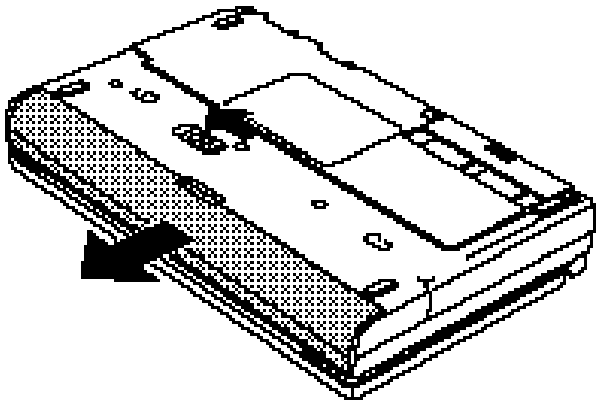
Observe the following torques in tightening the screws. Overtightening may cause damage to the parts or screws, and undertightening may lead to a shortcircuit or other damage from loose screws or parts.

M2 (2 mm)	0.22 N.m (2.2 kgf.cm)
M2.5 (2.5 mm)	0.36 N.m (3.5 kgf.cm)
HDD screw (M3)	0.3 N.m to 0.28 N.m (3.1 kgf.cm to 2.9 kg.cm)
M3 (3 mm)	0.49 N.m (5.0 kgf.cm)
Thin-head M2.5 screw	0.22 N.m (2.2 kgf.cm)
Super thin-head M2.5 screw	0.22 N.m (2.2 kgf.cm)

Removing the Battery Pack

To remove the battery pack follow the steps below.

1. Switch the computer off. Disconnect the **AC adapter** and any other external devices from the computer.
2. Turn the computer upside down.
3. Slide the **battery release latch** to the left to unlock the **battery**.



4. Slide the battery out.

CAUTION:
- *Do not short the battery pack terminals or the terminals of the personal computer to which the battery pack is to be connected. When carrying the battery pack in a bag, for example, wrap it with vinyl sheet or the like to prevent the battery pack terminals from contact with metal objects. If the terminals short, they may become heated or develop a fire.*
- *Do not heat, disassemble, or short the battery pack. Do not throw it into fire. Otherwise, the battery pack may explode or cause a fire.*
- *Before storing the battery pack, cover the terminals with insulation tape or the like to prevent shorting. Exposed terminals may cause explosion or fire during storage.*

Installing the Battery Pack

To install the battery pack, observe the following instructions.

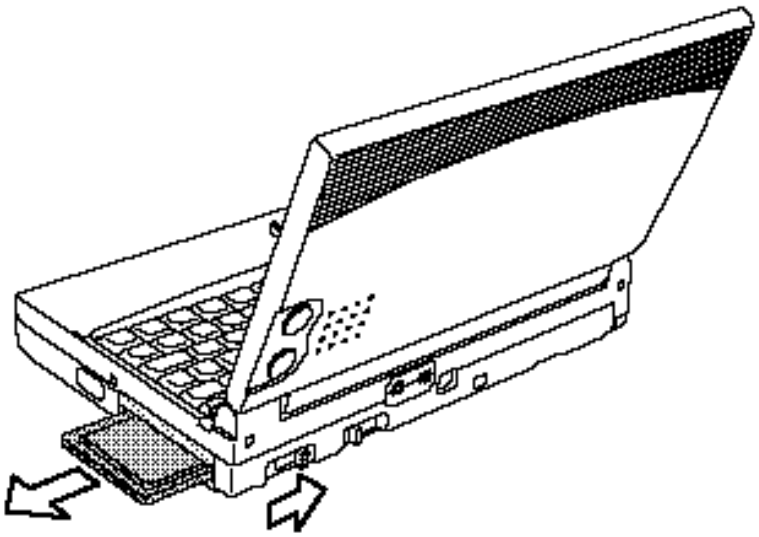
> ***WARNING:*** *Use only batteries recommended by Toshiba. Installation of the wrong battery could cause the battery to explode and cause injury or other damage.*

1. Switch the computer off. Disconnect the **AC adapter** and all external devices from the computer.
2. Align the **battery** with the **guide rails**.
3. Push the battery into position. The release latch will automatically lock when the battery is fully seated.

Removing the Optional PC Card

To remove the optional PC card, check that the computer is in boot mode and observe the following procedures.

1. Switch the computer off.
2. Slide the **PC card release switch** to the right. The right switch releases the bottom card and the left switch releases the top card.



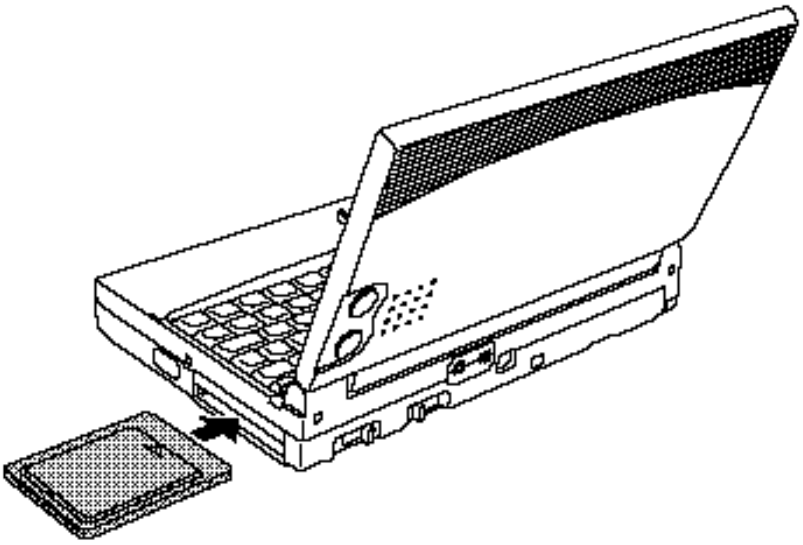
4. The **PC card** will pop out slightly. Hold it securely and pull it out.

Installing the Optional PC Card

To install the optional PC card follow the steps below.

> ***NOTE:*** *Before installing the PC card, make sure that the computer is in boot mode.*

1. Switch the computer off.



3. Insert the **PC card**. Carefully push it in place.

4. Check that, when the PC card is fully inserted, the **PC card release lever** moves to the left. The right lever releases the bottom card and the left lever releases the top card.

4.2 HDD

CAUTION: *Be very careful not to press on the top or bottom of the HDD. Pressure can destroy data or damage the drive.*

Removing the HDD

To remove the HDD follow the steps below. (See figures 4-1 to 4-3.)

1. Remove the **two M2x14 silver screws** securing the **HDD cover** and remove the cover.

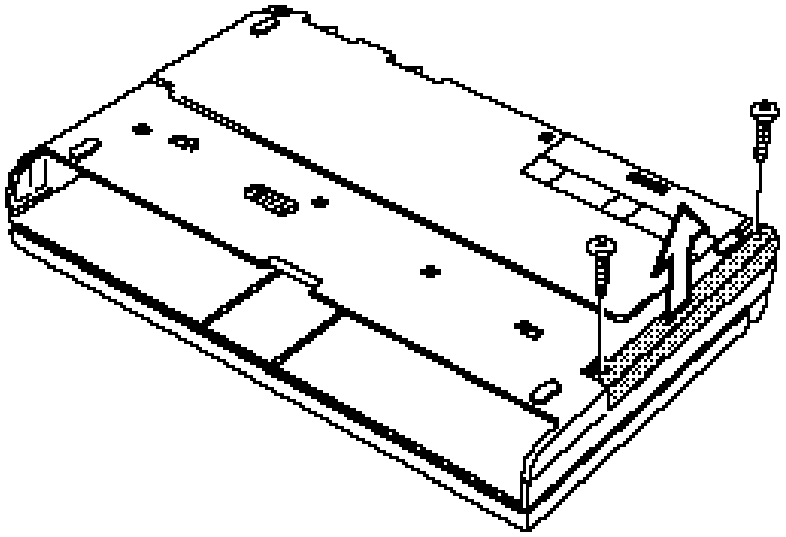


Figure 4-1 Removing the HDD cover

2. Pull the **HDD bracket straight** with your fingernail and pull the **HDD** out.

> ***NOTE**: When pulling the HDD out, be sure to hold both corners of the bracket as shown below so as not to bend the bracket.*

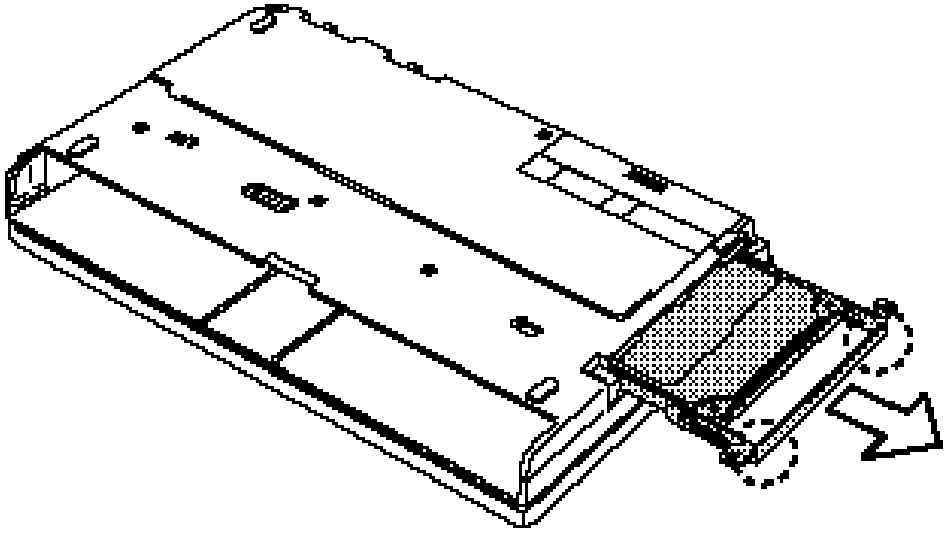


Figure 4-2 Removing the HDD

3. Remove **two thin-flat-head M3 screws** from the HDD bracket, and separate the bracket and the HDD.

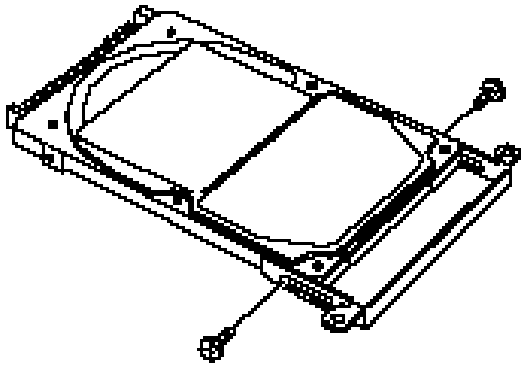


Figure 4-3 Removing the HDD bracket

Installing the HDD

To install the HDD follow the steps below. (See figures 4-1 to 4-3.)

1. Secure the **HDD bracket** to the **HDD** with **two flat-head M3 screws**.
2. Insert the HDD into the HDD slot and push it carefully and securely into place.

3. Seat the **HDD cover** and fasten it with **two M2x14 silver screws**.

4.3 Optional Memory Module

Removing Optional Memory Module

To remove the optional memory module follow the steps below. (See figures 4-4 to 4-6.)

1. Lift up the right end of the **keyboard brace** to remove it.

Figure 4-4 Removing the keyboard brace

2. Lift up the back edge of the **keyboard**.

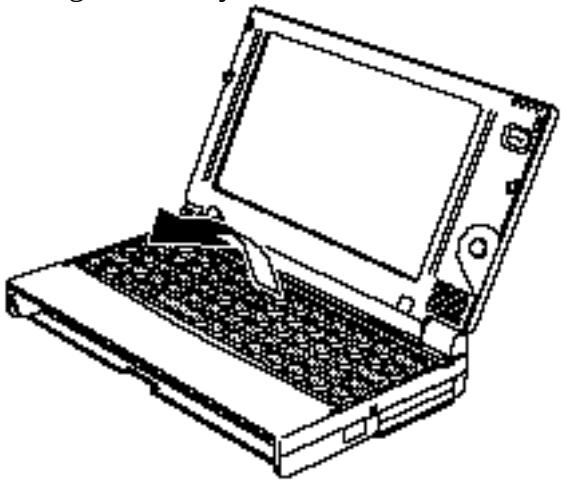


Figure 4-5 Lifting up the keyboard

4. Lift out the keyboard and lay it against the display, being careful not to apply tension to the cables. Remove the **super-thin-head M2.5 screw** first, then remove the **memory module**.

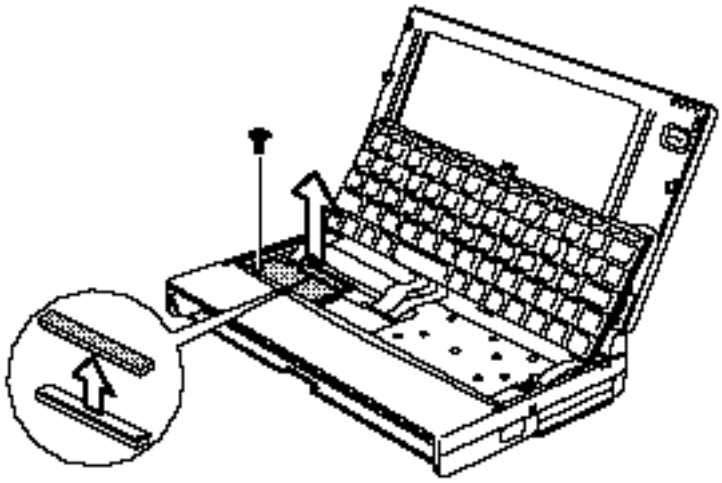


Figure 4-6 Removing the optional memory module

Installing Optional Memory Module

To install the optional memory module follow the steps below. (See figures 4-4 to 4-6.)

1. Connect the **memory module** to the connector.

> ***CAUTION**: Do not touch the connectors of the memory module or computer. Memory access trouble may arise from foreign matter adhering to the connectors.*

2. Fasten the memory module with one **super-thin-head M2.5 screw**.
3. Seat the **keyboard**. The keyboard has tabs on the front, so install it by inserting from the front, taking care not to pinch the flexible cable.
4. Secure the **keyboard brace**.
5. Install removed components.

4.4 Keyboard

Removing the Keyboard

To remove the keyboard follow the steps below. (See figure 4-7.)

1. Remove **two M2x3 silver screws** securing the **keyboard straps** and slide each strap out from under its brace.

2. Disconnect the **flexible cable** from **PJ302** and remove the **keyboard**.

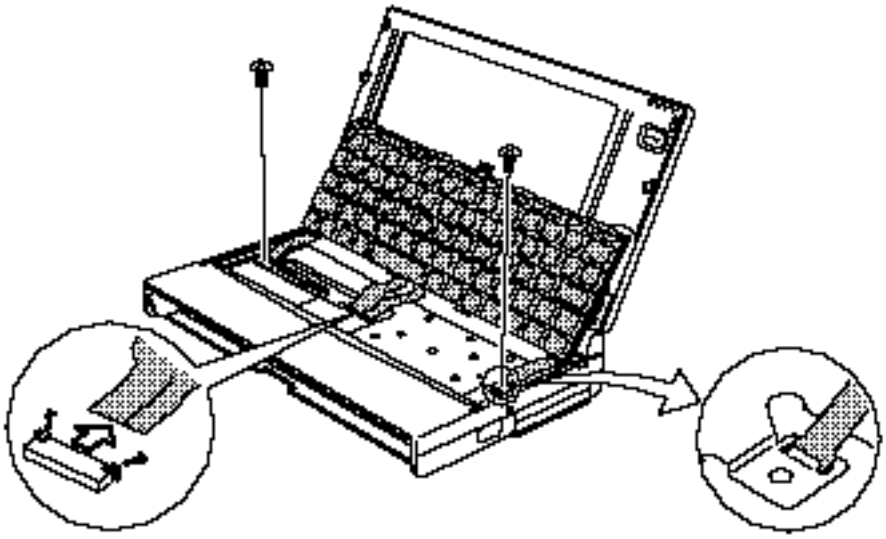


Figure 4-7 Removing the keyboard

Installing the Keyboard

To install the keyboard follow the steps below. (See figure 4-7.)

1. Slide the **keyboard straps** under slots in the metal plate and secure them with **two M2x3 silver screws**.

2. Connect the **flexible cable** to **PJ302**.

3. Seat the **keyboard**. The keyboard has tabs on the front, so install it by inserting the front first, taking care not to pinch the flexible cable.

4. Secure the **keyboard brace**.

5. Install removed components.

4.5 Display Assembly

Removing the Display Assembly

To remove the display assembly follow the steps below. (See figures 4-8 to 4-11.)

1. Lift out the **metal cover**.

CAUTION: *The metal cover is thin, so be careful not to cut yourself on the edge.*

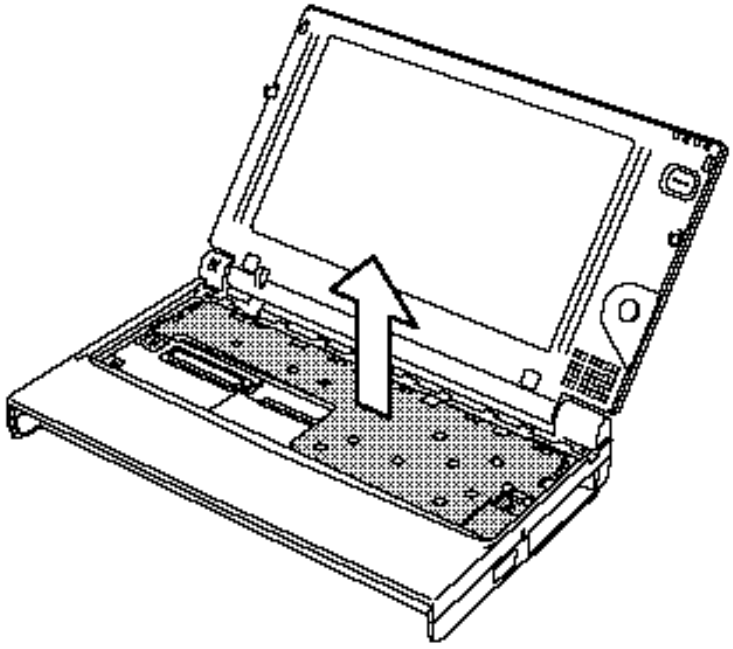


Figure 4-8 Removing the metal cover

2. Disconnect the **display flexible cable** from **PJ250** on the system board.

3. Remove insulator covering the RTC battery cable and lift the battery cable out of its groove.

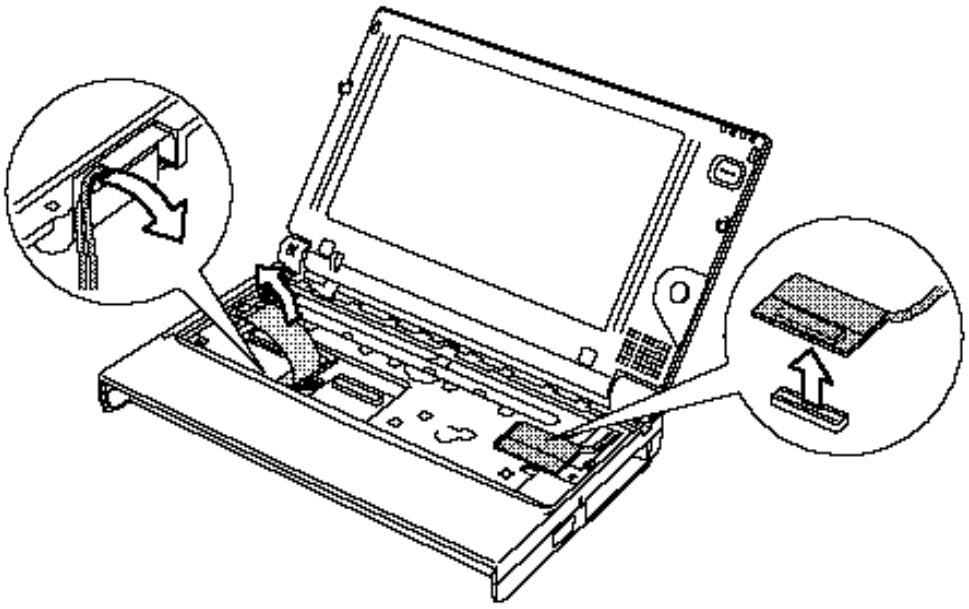


Figure 4-9 Removing the display flexible cable

4. Close the display, turn the computer upside down, and remove **five M2x14 silver screws**.

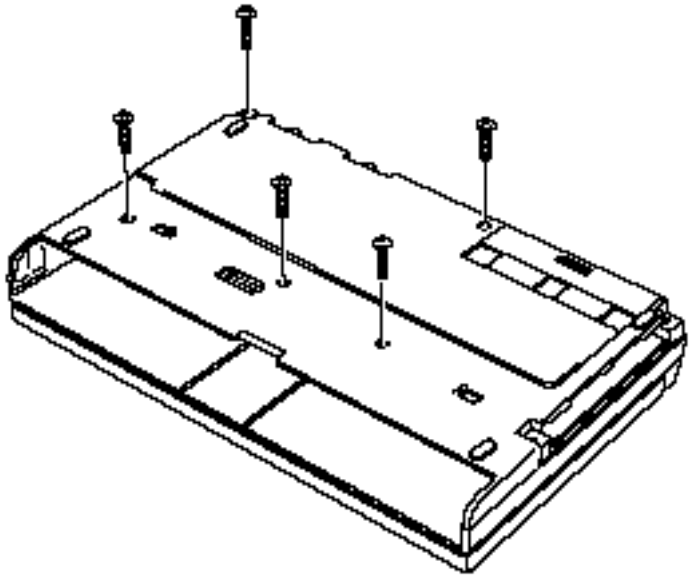


Figure 4-10 Removing five screws

5. Turn the computer right side up and open the display.

6. Disconnect the **microphone cable** from **PJ470** on the system board and lift off the **display assembly**.

***CAUTION**: Make sure the flexible cable has been removed from PJ470 on the system board before removing the display assembly. An attempt to forcibly remove the display assembly when the flexible cable is still connected to PJ470 could damage the cable.*

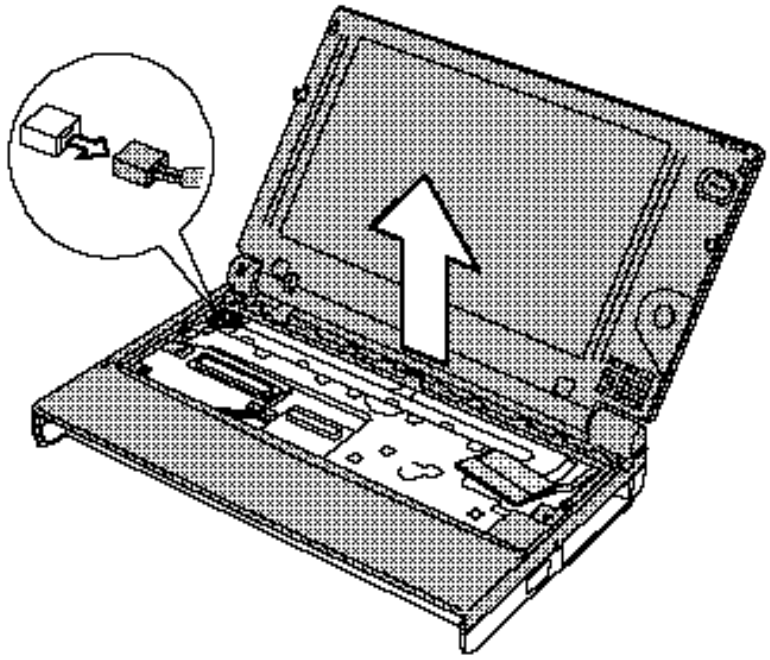


Figure 4-11 Removing the display assembly

Installing the Display Assembly

To install the display assembly follow the steps below. (See figures 4-8 to 411.)

1. Seat the **display assembly** and connect the **microphone cable** to **PJ470** on the system board.

2. Connect the **display flexible cable** to **PJ250** on the system board (figure 4-9).

3. Lay the **metal cover** in place, making sure the cover is properly aligned with the edges of the computer.

4. Route the RTC battery cable in its groove and secure it with insulator.

5. Close the display, turn the computer upside down, and fasten the display with**five M2x14 silver screws**.

6. Install removed components.

4.6 RTC Battery

Removing the RTC Battery

To remove the RTC battery follow the steps below. (See figure 4-12.)

1. Disconnect the **RTC battery cable** from **PJ300** on the system board.
2. Lift out the **RTC battery**.

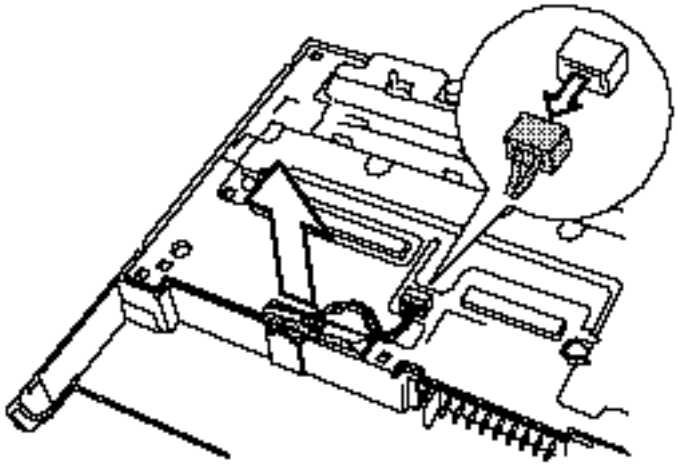


Figure 4-12 RTC battery removal

Installing the RTC Battery

To install the RTC battery follow the steps below. (See figure 4-12.)

1. Connect the **RTC battery cable** to **PJ300** on the system board.
2. Seat the **RTC battery**.
3. Install the removed components.

4.7 System Board, Heat Sink and PC Card Slot

Removing the System Board, Heat Sink and PC Card Slot

To remove the system board, heat sink and PC card slot observe the following procedures. (See figures 4-13 to 4-15.)

1. Grasp the **system board** and lift it out.

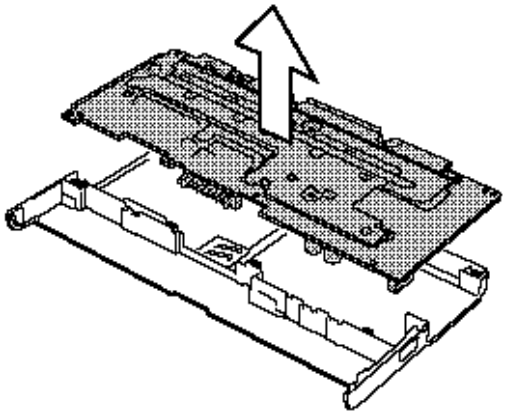


Figure 4-13 Removing the system board

2. Remove **one M2x4 screw** and **two M2x6 screw**s securing the **heat sink** to the system board.

3. Remove **four M2x14 screws** securing both the heat sink and **PC card slot** to the system board.

4. Lift off the heat sink.

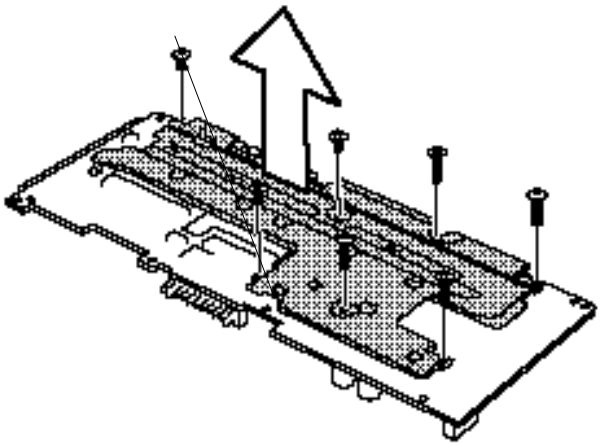


Figure 4-14 Removing the heat sink

5. Turn the system board over and lift off the PC card slot.

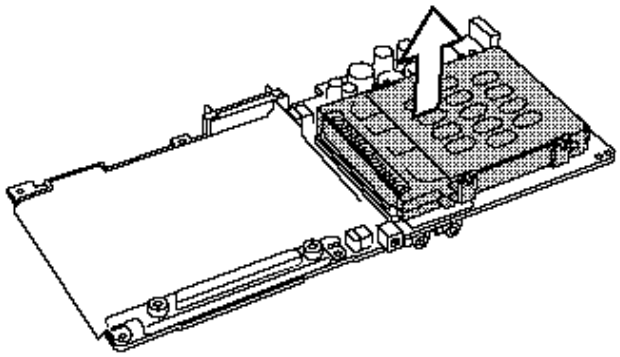


Figure 4-15 Removing the PC card slot

Installing System Board, Heat Sink and PC Card Slot

To install the system board, heat sink and PC card slot follow the steps below. (See figures 4-13 to 4-15.)

1. Secure the heat sink to the system board with one M2x4 screw, and two M2x6 screws.

2. Turn over the system board and set the **PC card slot** in place. Turn the system board back over and secure the PC card slot with **four 2x14 silver screws**.

3. Align the power connector with its housing and seat the system board.

4.8 Display Mask

Removing the Display Mask

To remove the display mask follow the steps below. (See figures 4-16 to 4-17.)

1. Remove the **two mask seals** on the right and left in the lower part of the display mask.
2. Remove **two M2.5x5 screws** that were covered by the seals.
3. Remove the **AccuPoint cap**.

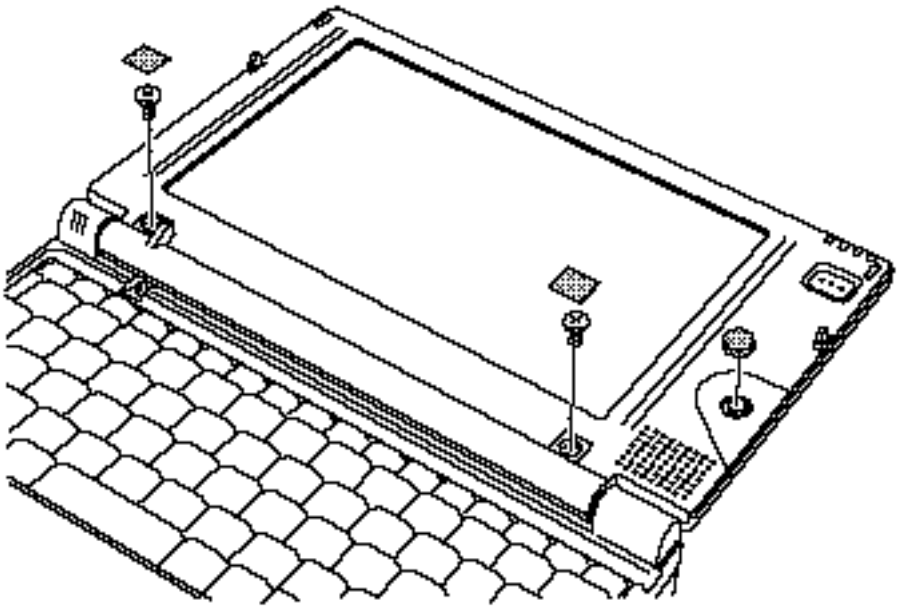


Figure 4-16 Removing the mask seals

4. Carefully insert your fingers between the mask and top of the LCD panel and release the **four latches** at the top of the display mask.

5. Continue along the sides (three latches on each side) and the bottom (three latches).

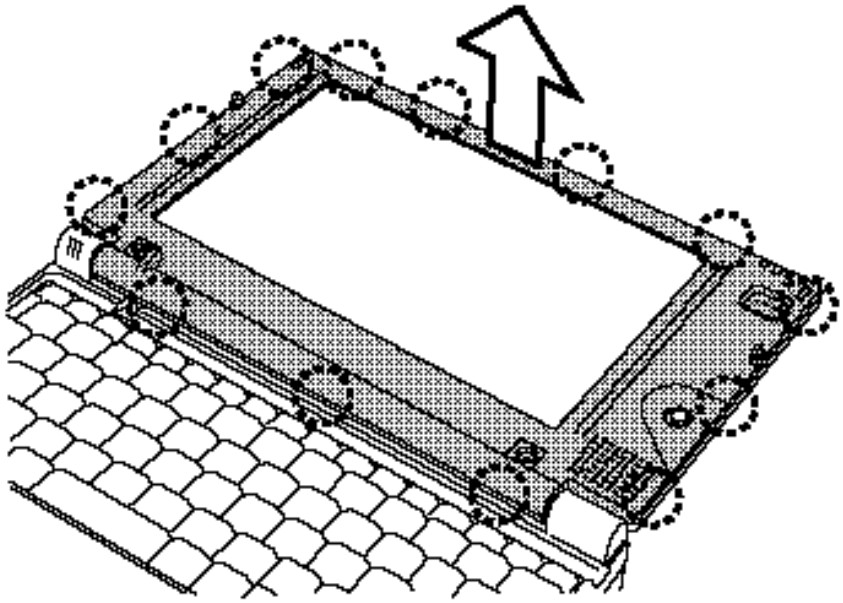


Figure 4-17 Removing the display mask

Installing the Display Mask

To install the display mask follow the steps below. (See figures 4-16 and 4-17.)

1. Set the **display mask** in place and fasten the latches starting with the three at the bottom.
2. Continue along the sides (three latches on each side) and the top (four latches).
3. Mount the **AccuPoint cap**.
4. Secure the display mask with **two M2.5x5 screws**.
5. Secure the **two mask seals**.

4.9 FL Inverter Board

Removing the FL Inverter Board

To remove the FL inverter board follow the steps below. (See figures 4-18 to 4-19.)

1. Remove **one M2x5 silver screw** securing the **FL inverter board**.

2. Slide the FL inverter board slightly to the right to clear a small **latch** and lift out the board, being careful not to apply tension to the cables.

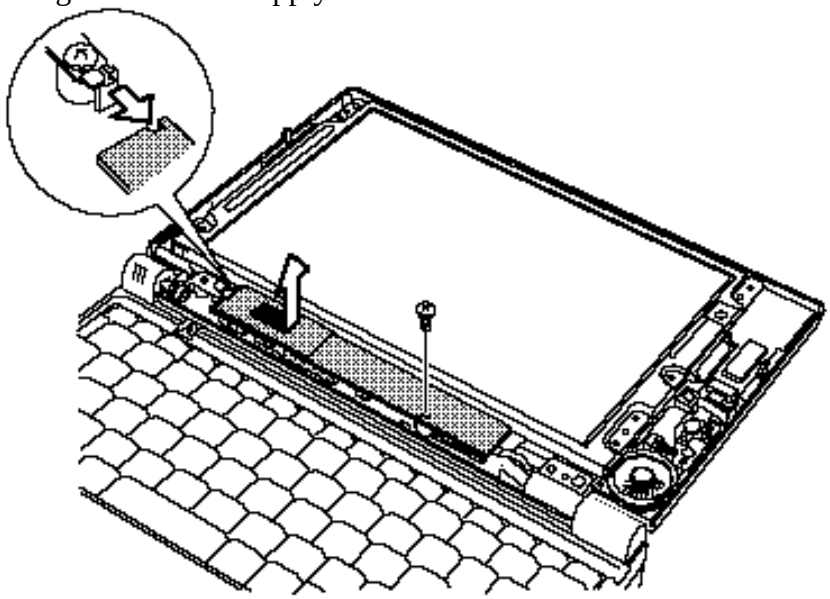


Figure 4-18 Removing the FL inverter board

3. Carefully turn the FL inverter board over and disconnect the **display cable** from **CN1** and the **FL cable** from **CN2**.

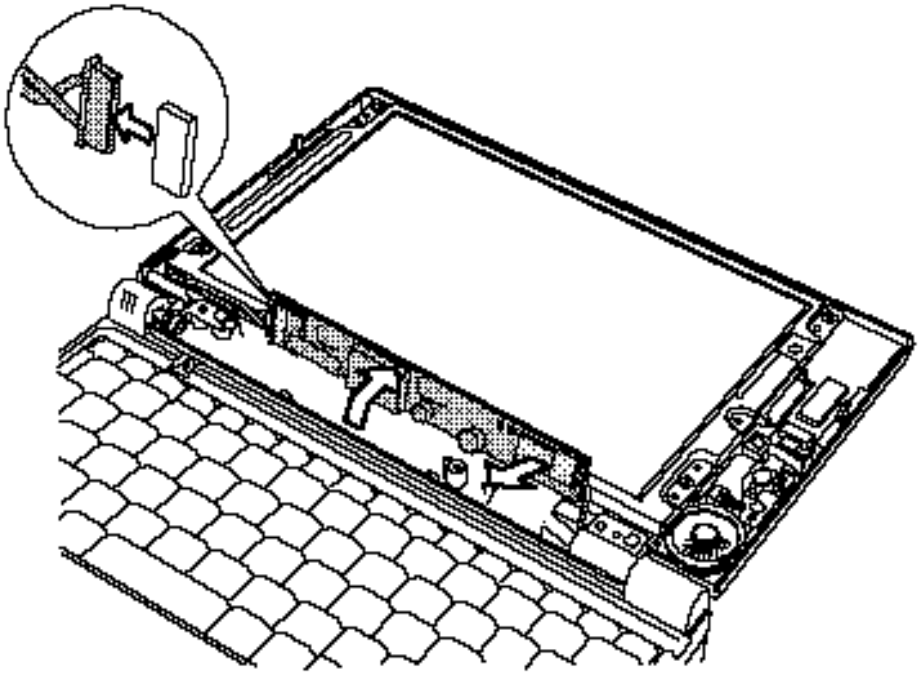


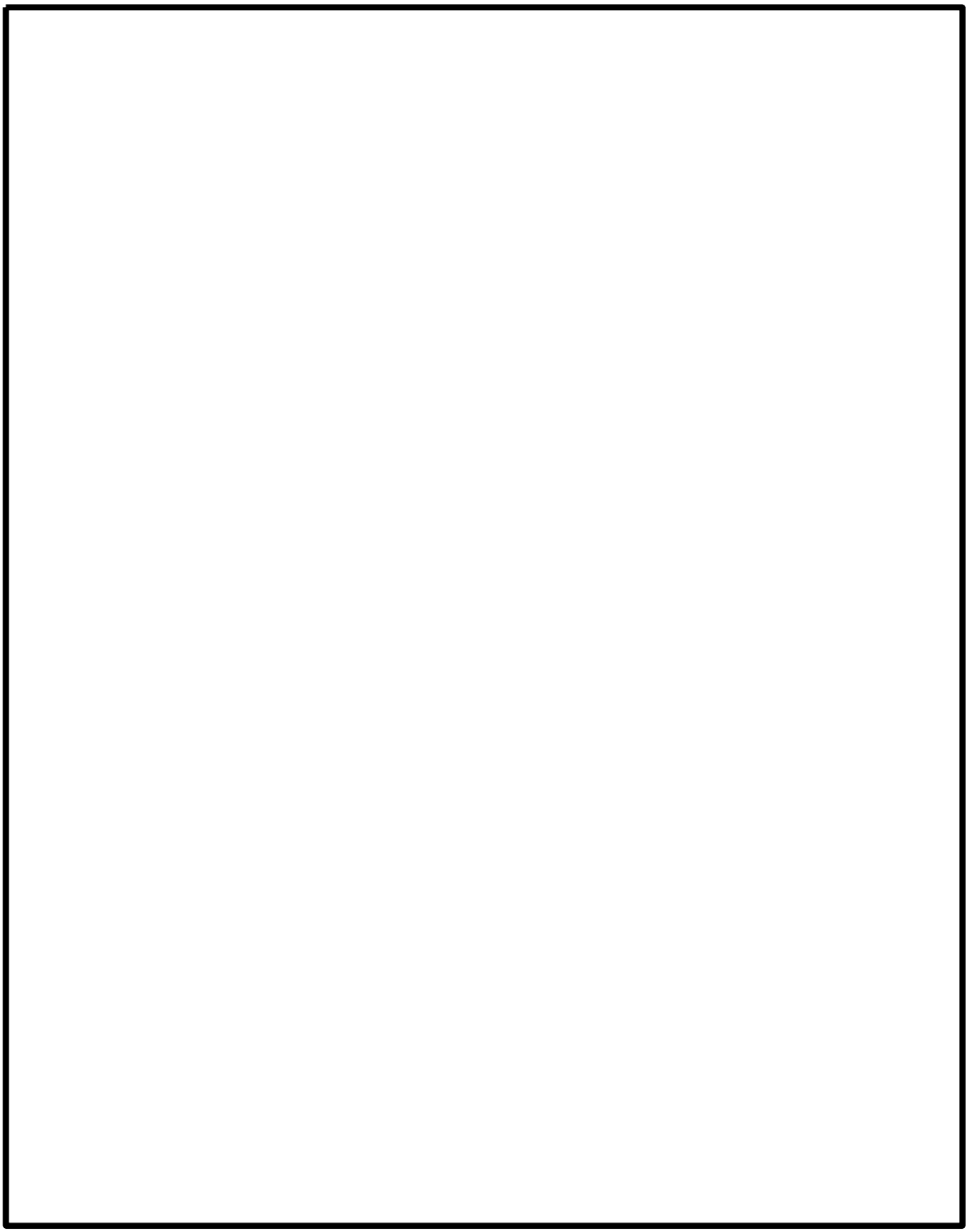
Figure 4-19 Disconnecting the display cable

Installing the FL Inverter Board

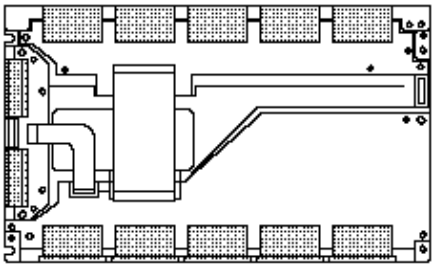
To install the FL inverter board follow the steps below. (See figure 4-18 to 4-19.)

1. Connect the **FL cable** to **CN1** on the **FL inverter board** and the **display flexible cable** to **CN2**.
2. Place the FL inverter board in position and secure it with **one M2x5 silver screw**.
3. Install the removed components.

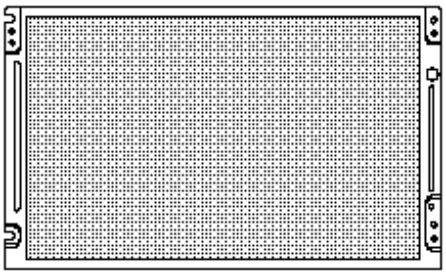
4.10 LCD Module



When handling the LCD module, do not touch or apply pressure to the surface of the LCD panel. Do not touch or apply pressure to the connectors.



LCD panel



Connectors

Removing the LCD Module

To remove the LCD module follow the steps below. (See figure 4-20.)

1. Remove **four M2x5 silver screws** securing the **LCD module** to the **top cover**.
2. Carefully rotate the LCD module out of the top cover from left to right being careful not to apply tension to the cables connected to the right side.
3. Disconnect the **display flexible cable** from **CN1** on the LCD module.

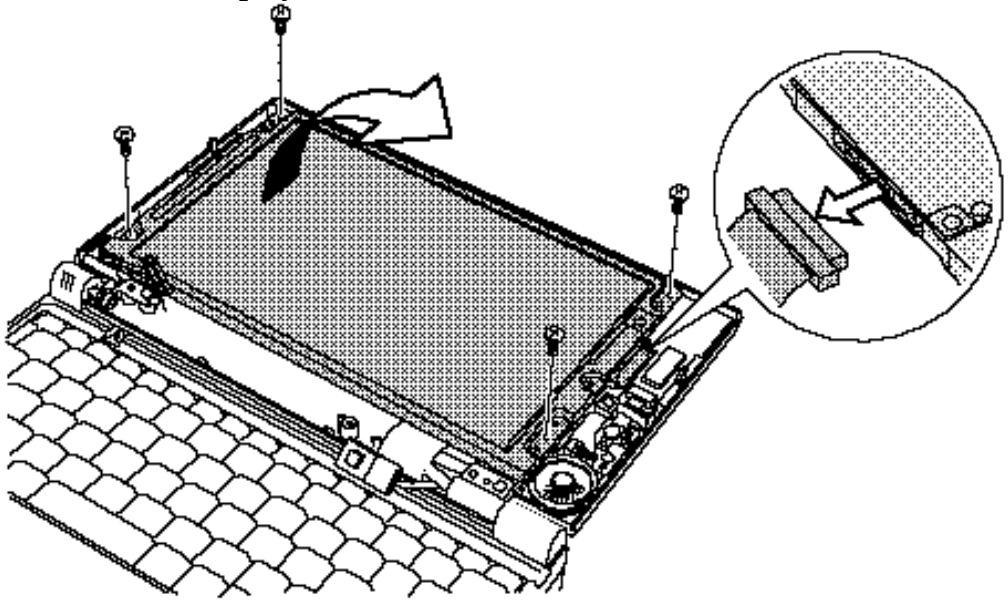


Figure 4-20 LCD module removal

Installing the LCD Module

To install the LCD module follow the steps below. (See figure 4-20.)

1. Connect the **display flexible cable** to **CN1** on the **LCD module**.
2. Carefully rotate the LCD module into the **top cover** from right to left.
3. Secure the LCD module to the top cover with **four M2x5 silver screws**.

4.11 Speaker, Power Switch Board and AccuPoint Board

Removing the Speaker, Power Switch Board and AccuPoint Board

To remove the speaker, power switch board and AccuPoint board follow the steps below. (See figures 4-21 and 4-23.)

1. Disconnect the **speaker cable** from the **speaker connector** and lift out the **speaker** with its **rubber case**.

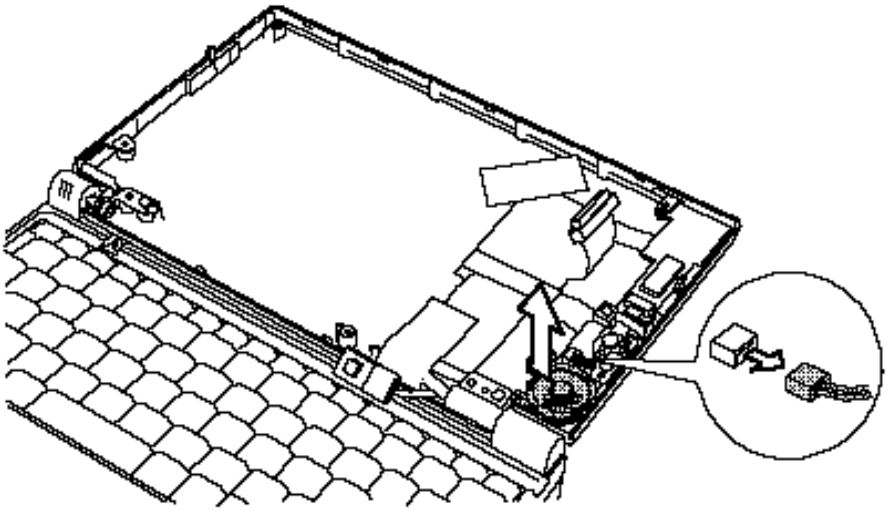


Figure 4-21 Removing the speaker

2. Separate the speaker from its case.

3. Disconnect the **AccuPoint flexible cable** from **PJ12** on the **power switch board**.

4. Turn over the power switch board, being careful not to apply tension to the remaining cable connection and disconnect the LCD flexible cable from **PJ3** on the power switch board.

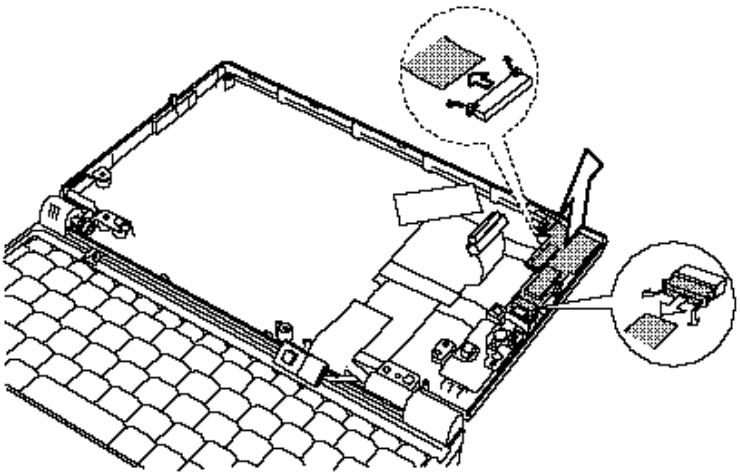


Figure 4-22 Removing the power switch board

5. Remove **one M2x3 silver screw** securing the **AccuPoint board** and lift out the board.

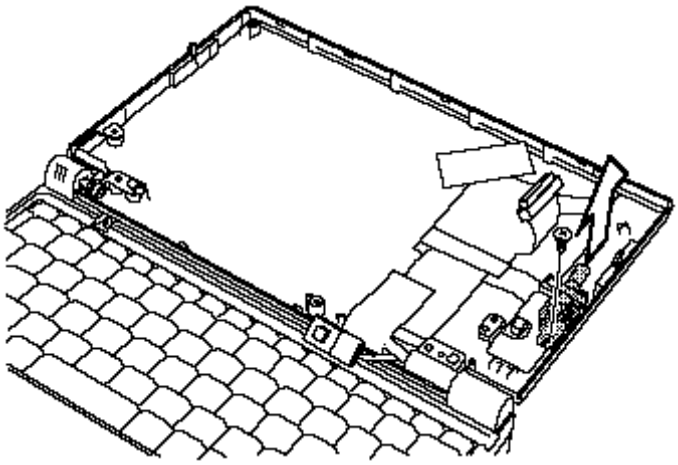


Figure 4-23 Removing the AccuPoint board

Installing the Speaker, Power Switch Board and AccuPoint Board

To install the speaker, power switch board and AccuPoint board follow the steps below. (See figures 4-21 to 4-23.)

1. Seat the AccuPoint board and secure it with one M2x3 silver screw.
2. Connect the LCD flexible cable to **PJ3** on the power switch board.
3. Connect the **AccuPoint flexible cable** to **PJ12** on the **power switch board**.
4. Seat the speaker in its case.
5. Connect the **speaker cable** to the **speaker connector** and seat the speaker with its **rubber case**.
6. Install the removed components.

4.12 LCD Flexible Cable and Microphone

Removing LCD Flexible Cable and Microphone

To remove the LCD flexible cable and microphone follow the steps below. (See figures 424 to 4-29.)

1. Remove **one M2x5 sliver screw** securing the **LCD flexible cable** and **two M2.5x5 screws** securing the **display hinges**.

2. Remove two strips of **tape** securing the LCD flexible cable.

3. Separate the **LCD module** from the **top cover**.

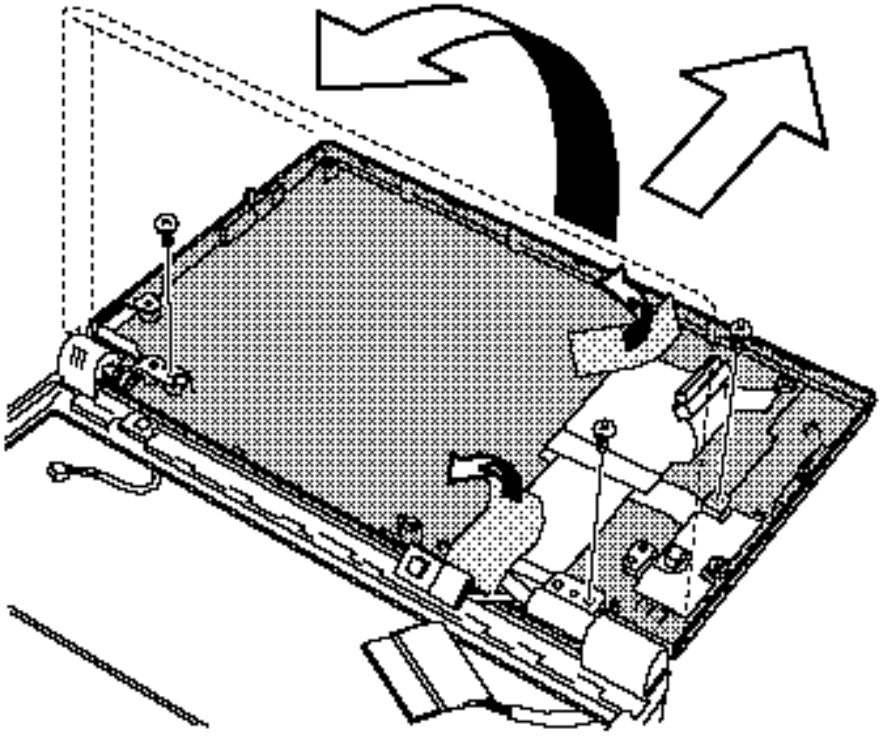


Figure 4-24 Removing the LCD module

4. Remove **insulator** covering the **microphone cable**.

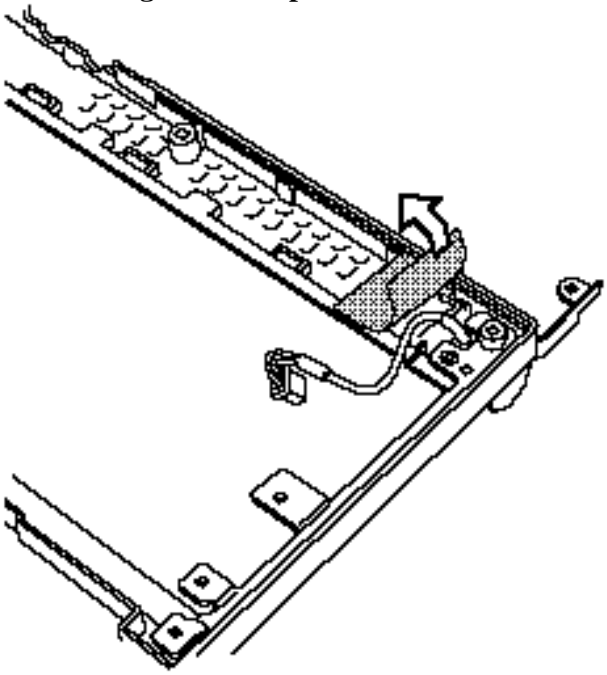


Figure 4 -25 Removing tape

5. Remove **one M2x4 screw** securing the **left top cover brace** to the top cover and remove a **plastic support** for the left top cover brace.

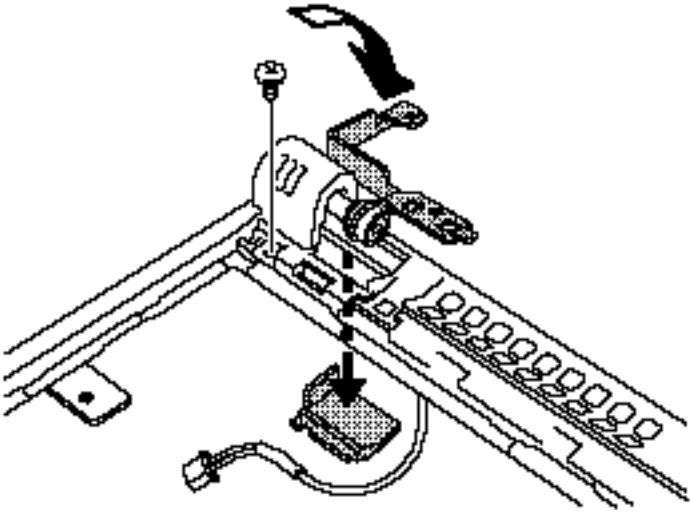


Figure 4-26 Removing one screw and plastic support

6. Remove the left top cover brace and **microphone**.

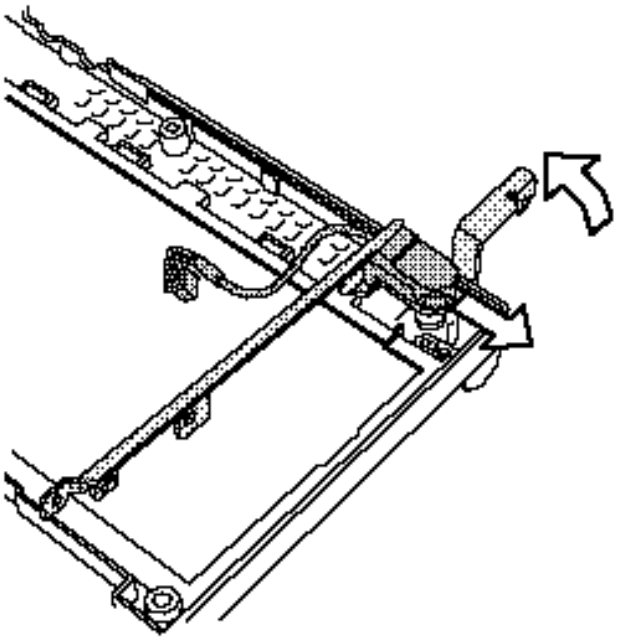


Figure 4-27 Removing the left top cover brace and microphone

7. Separate the microphone from its **rubber case**.

8. Remove **one M2x5 silver screw** and a **brace** for the LCD flexible cable.

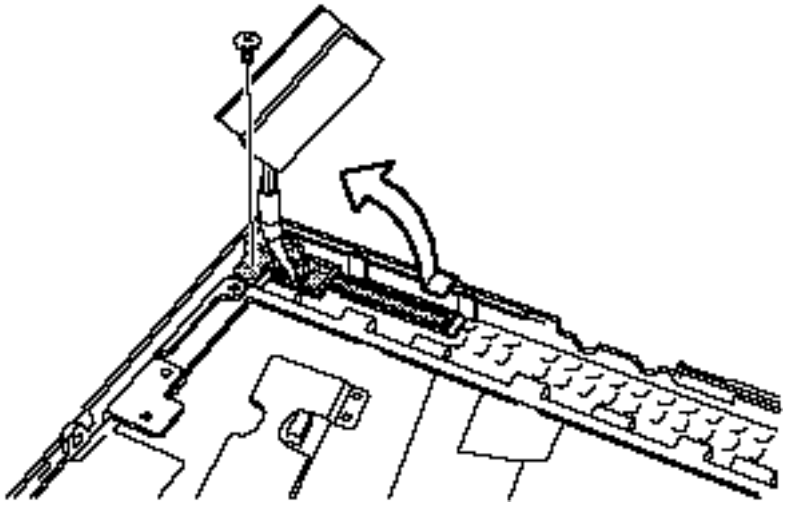


Figure 4-28 Removing the LCD flexible cable

9. Remove the LCD cable by pulling it through the opening that was covered by the brace.

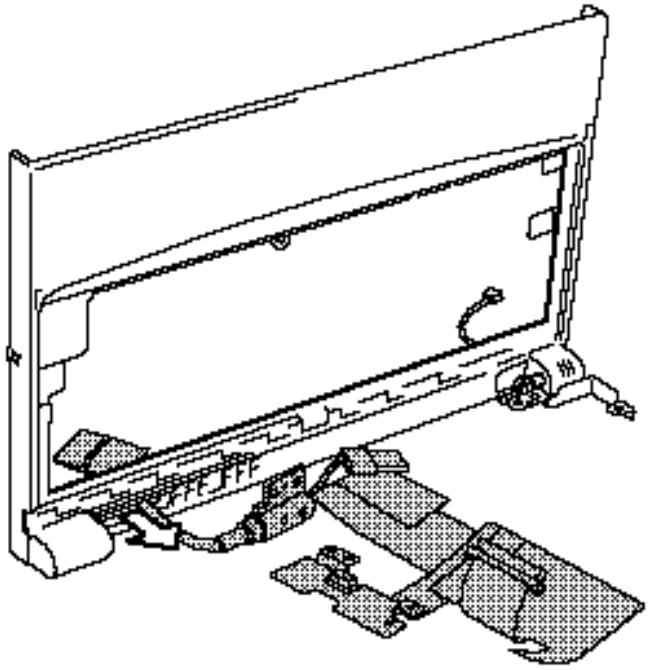


Figure 4-29 Removing the LCD cable

Installing LCD Flexible Cable and Microphone

To install the LCD flexible cable and microphone follow the steps below. (See figures 424 to 4-29.)

1. Thread the **LCD cable** through the slot in the **top cover**.
2. Seat the **LCD flexible brace** and secure it with **one M2x5 screw**.
3. Put the **microphone** in the **rubber case** and seat the microphone with rubber case in the top cover.
4. Seat the **left top cover brace** and **plastic support**, then secure the brace with **one M2x4 screw**.
5. Cover the **microphone cable** with **insulator**.
6. Seat the **LCD module** in the **top cover**.
7. Secure the **LCD flexible cable** with **two strips of tape**.
8. Secure the **display hinges** with **two M2.5x5 screws** and secure the LCD flexible cable with **one M2x5 silver screw**.
9. Install the removed components.

4.13 I/O Adapter Board

Removing the I/O Adapter Board

To remove the I/O adapter board follow the steps below. (See figures 4-30 to 4-32.)

1. Remove the **I/O adapter** from the computer. Disconnect all the external cables from the I/O adapter.

2. Turn the I/O adapter upside down, and remove **three M2x5 silver screws** from the back and **six M2x5 silver screws** from the bottom.

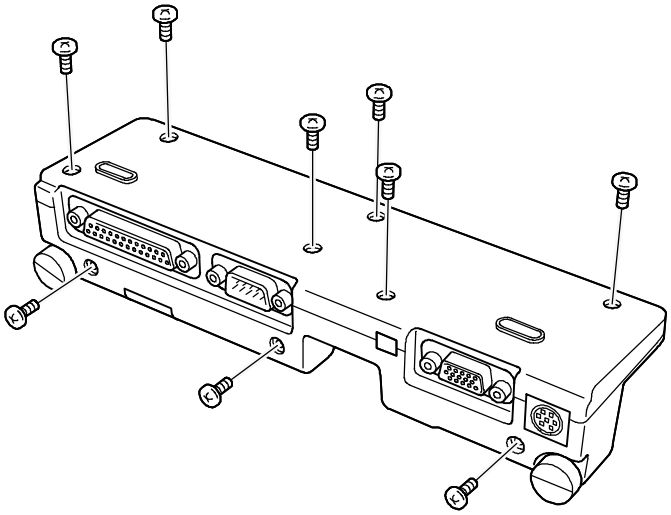


Figure 4-30 Removing nine screws

3. Release **one latch** securing the left side, **two latches** securing the front edge and **one latch** securing the right side and then remove the **upper cover**.

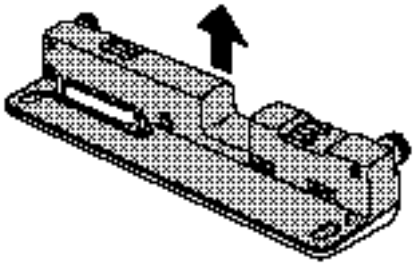


Figure 4-31 Removing the upper cover

4. Remove **four M2x4 screws** securing the **I/O adapter board** and lift out the board.

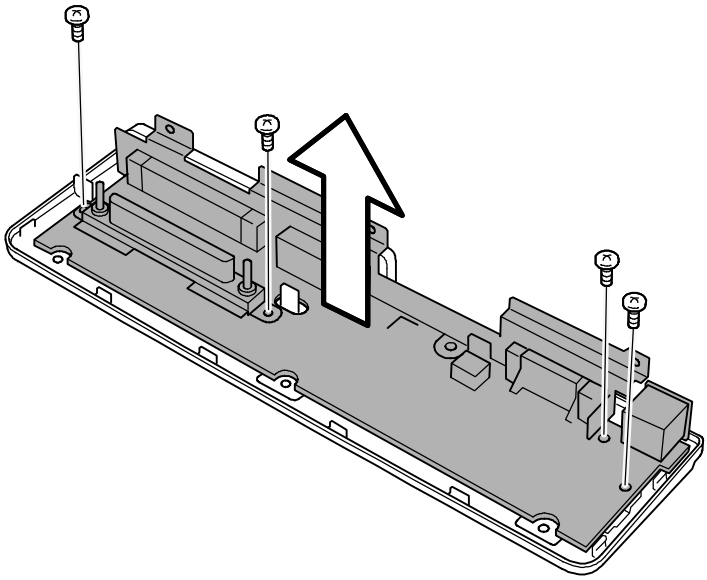


Figure 4-32 Removing the I/O adapter board

Installing the I/O Adapter Board

To install the I/O adapter board follow the steps below. (See figures 4-30 to 4-32.)

1. Seat the **I/O adapter board** and secure it with **four M2x4 screws**.
2. Seat the **top cover** on the bottom cover.
3. Turn the I/O adapter upside down, and secure **six M2x5 silver screws** to the bottom and **three M2x5 silver screw**s to the back.

Appendices

Appendix Contents

Figures

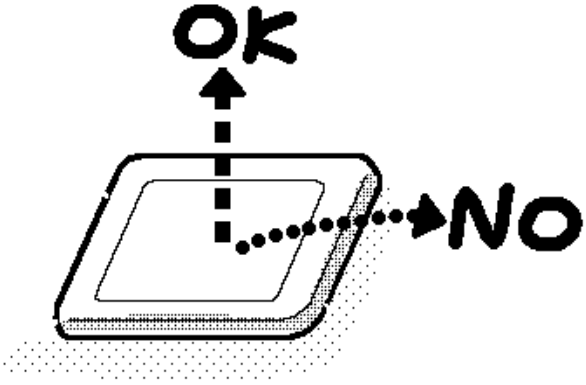
Tables

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.

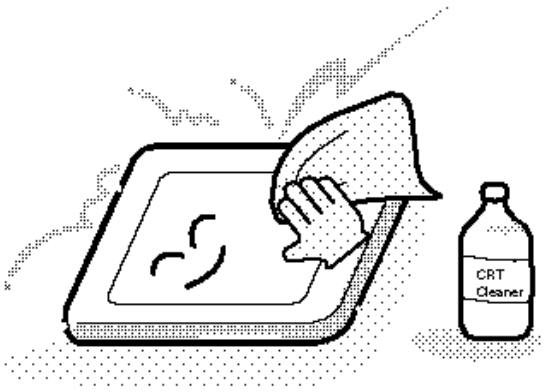


2. Be careful to align the holes at the four corners of the LCD module with the corresponding holes in its cover before securing the module with screws. Do not force the module into place, because stress can affect its performance.

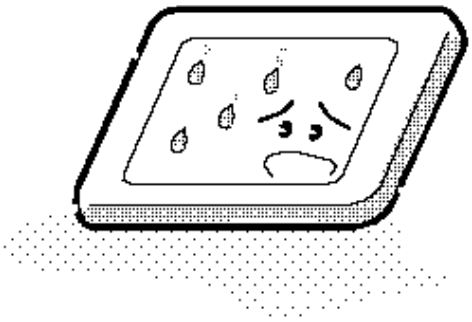
   Note: The panel's polarized surface is easily scarred, so handle it carefully.

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.

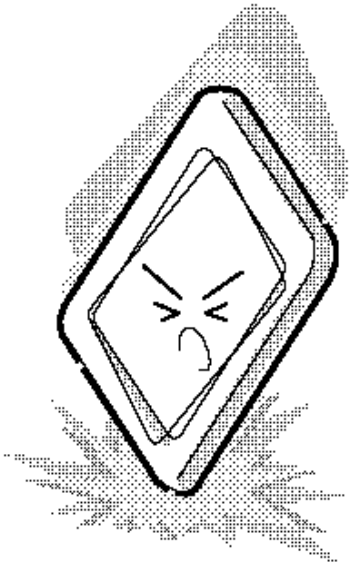
   If the surface is very dirty, use a CRT cleaning agent. Apply the agent to a cloth and then wipe the panel's surface. Do not apply cleanser directly to the panel.



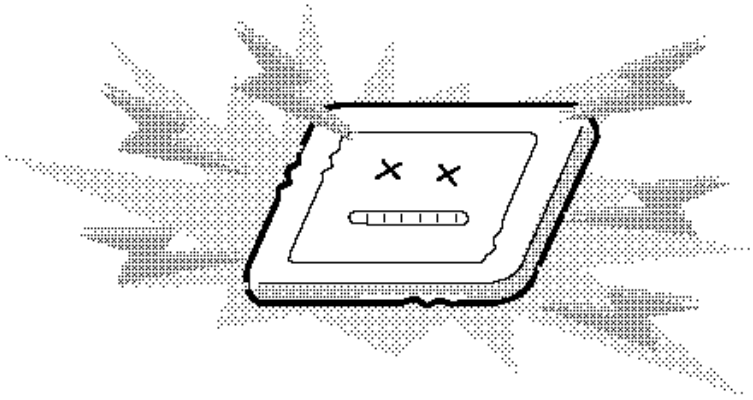
4. If water or other liquid is left on the panel's surface for a long period, it can change the screen's tint or stain it. Be sure to quickly wipe off any liquid.



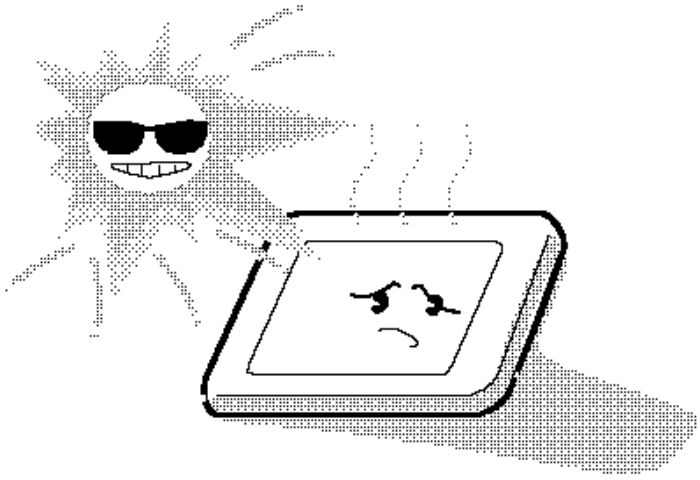
5. Glass is used in the panel, so be careful not to drop it or let it strike a hard object, which could cause breakage or cracks.



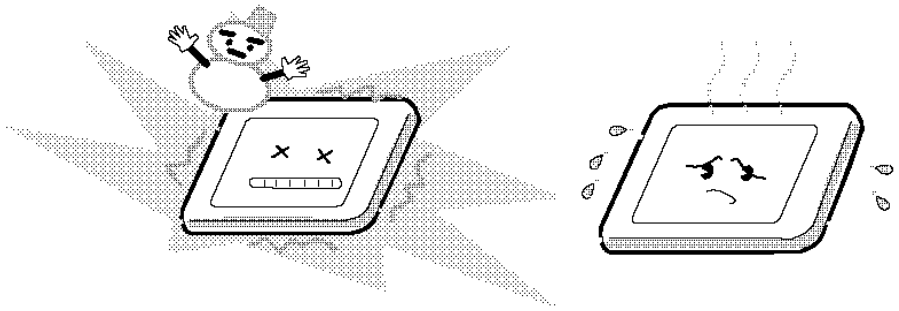
6. CMOS-LSI circuits are used in the module, so guard against damage from electrostatic discharge. Be sure to wear a wrist or ankle ground when handling the module.



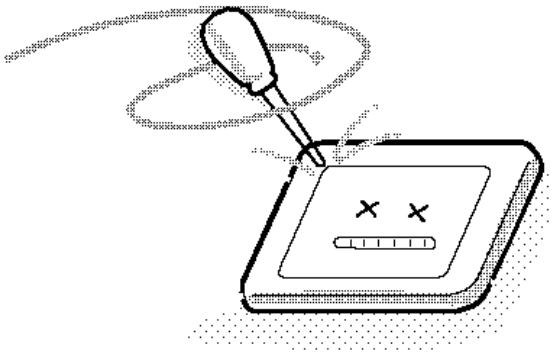
7. Do not expose the module to direct sunlight or strong ultraviolet rays for long periods.



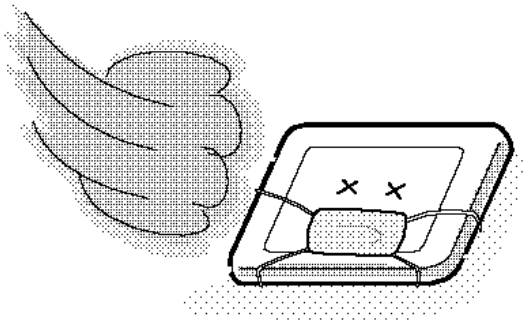
8. Do not store the module at temperatures below specifications. Cold can cause the liquid crystals to freeze, lose their elasticity or otherwise suffer damage.



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

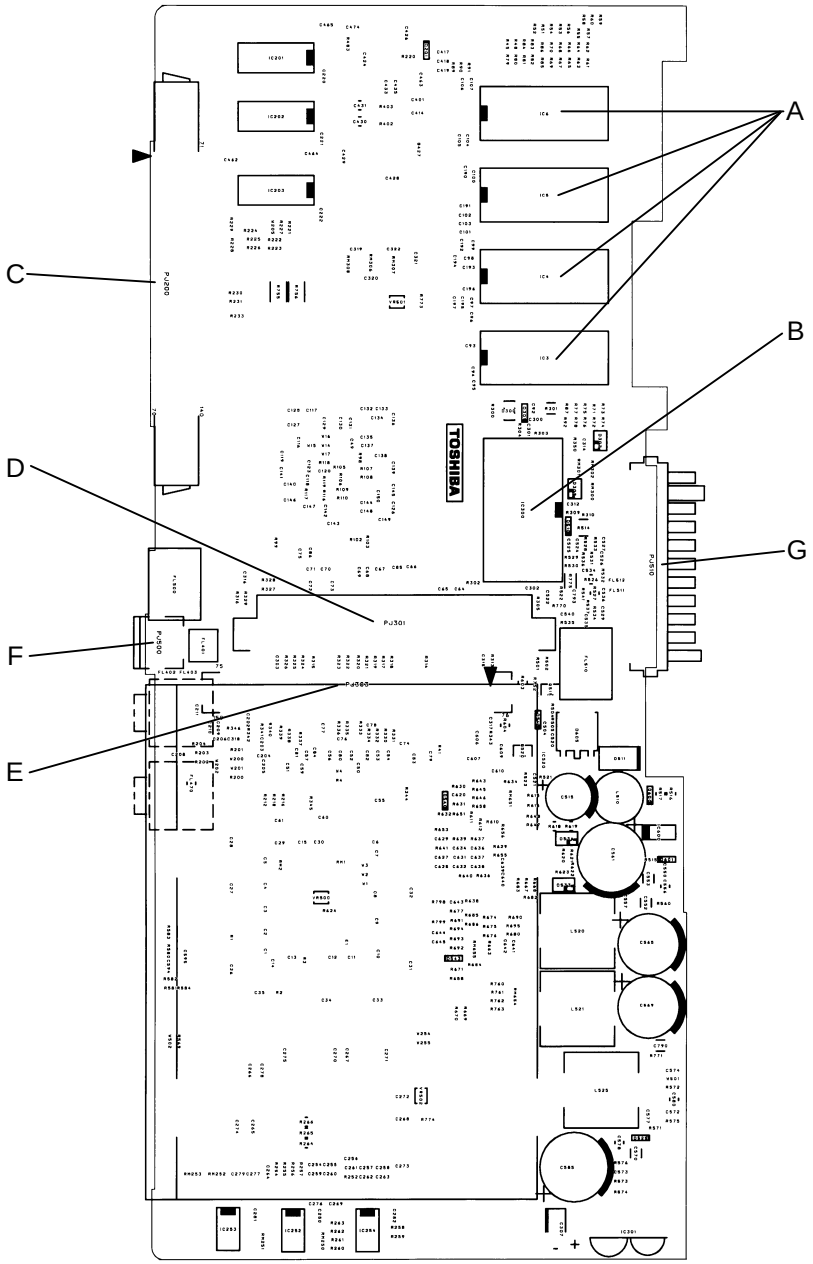


Figure B-1 Board layout (front)

B.2 System Board Back View

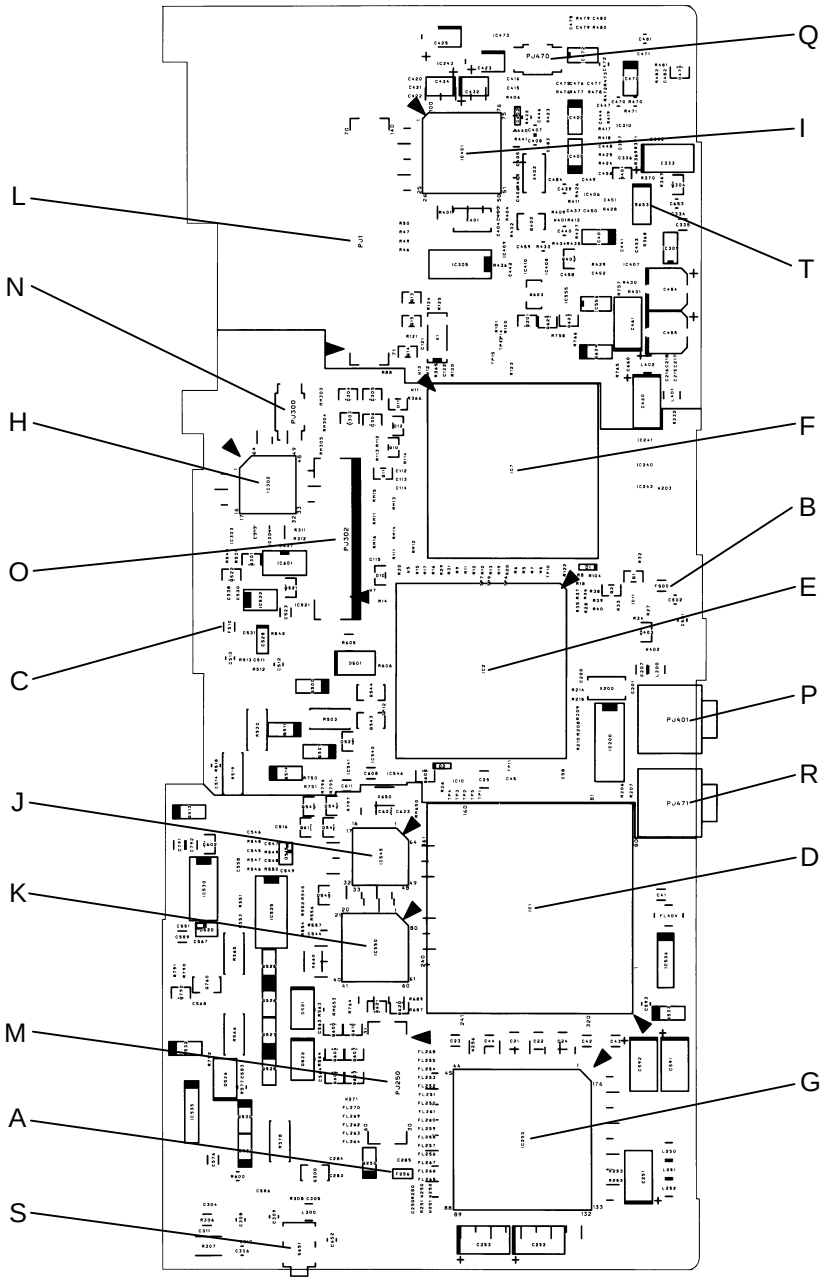


Figure B-2 Board layout (back)

Table B-1 System board ICs and connectors (front)

Mark	Number	Name
(A)	IC3 to 6	System RAM
(B)	IC300	BIOS ROM
(C)	PJ200	Docking interface connector
(D)	PJ301	HDD connector
(E)	PJ303	PC card connector
(F)	PJ500	DC-IN connector
(G)	PJ510	Main battery connector

Table B-2 System board ICs and connectors (back)

Mark	Number	Name
(A)	F256	FL inverter and LCD fuse
(B)	F500	DC-IN fuse
(C)	F510	Battery fuse
(D)	IC1	CPU
(E)	IC2	System controller GA (Cello-SSP)
(F)	IC7	I/O & PC card controller GA (Petunia3)
(G)	IC250	Video controller
(H)	IC302	KBC
(I)	IC401	Sound controller
(J)	IC545	Power supply microprocessor
(K)	IC550	Embedded controller
(L)	PJ1	Expansion memory connector
(M)	PJ250	FLIMC* board connector
(N)	PJ300	RTC battery connector
(O)	PJ302	Keyboard connector
(P)	PJ401	Headphone connector
(Q)	PJ470	Internal microphone connector
(R)	PJ471	External microphone connector
(S)	S651	Reset switch
(T)	S653	Panel close switch

Appendix C Pin Assignments

System Board

C.1 PJ1 Expansion Memory Connector (140-pin)

Table C-1 Expansion Memory connector pin assignments (140-pin)(1/3)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	GND	-	2	GND	-
3	MD00;100	I/O	4	MD32;100	I/O
5	MD01;100	I/O	6	MD33;100	I/O
7	MD02;100	I/O	8	MD34;100	I/O
9	MD03;100	I/O	10	MD35;100	I/O
11	B3V	O	12	B3V	I
13	MD04;100	I/O	14	MD36;100	I/O
15	MD05;100	I/O	16	MD37;100	I/O
17	MD06;100	I/O	18	MD38;100	I/O
19	MD07;100	I/O	20	MD39;100	I/O
21	GND	-	22	GND	-
23	CAS0;001	O	24	CAS4;011	O
25	CAS1;001	O	26	CAS5;011	O
27	B3V	O	28	B3V	-
29	MA00B;101	O	30	MA03;111	O
31	MA01B;101	O	32	MA04;111	O
33	MA02;111	O	34	MA05;111	O
35	GND	-	36	GND	-
37	MD08;100	I/O	38	MD40;100	I/O
39	MD09;100	I/O	40	MD41;100	I/O
41	MD10;100	I/O	42	MD42;100	I/O
43	MD11;100	I/O	44	MD43;100	I
45	B3V	-	46	B3V	-
47	MD12;100	I/O	48	MD44;100	I/O
49	MD13;100	I/O	50	MD45;100	I/O
51	MD14;100	I/O	52	MD46;100	I/O

Table C-1 Expansion Memory connector pin assignments (140-pin)(2/3)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
53	MD15;100	I/O	54	MD47;100	I/O
55	GND	-	56	GND	-
57	NC	-	58	NC	-
59	NC	-	60	NC	-
61	NC	-	62	NC	-
63	B3V	-	64	B3V	-
65	NC	-	66	WED;001	O
67	WEC;001	O	68	NC	-
69	RAS2;001	O	70	NC	-
71	RAS3;001	O	72	NC	-
73	NC	-	74	NC	-
75	GND	-	76	GND	-
77	NC	-	78	NC	-
79	NC	-	80	NC	-
81	B3V	-	82	B3V	-
83	MD16;100	I/O	84	MD48;100	I/O
85	MD17;100	I/O	86	MD49;100	I/O
87	MD18;100	I/O	88	MD50;100	I/O
89	MD19;100	I/O	90	MD51;100	I/O
91	GND	-	92	GND	-
93	MD20;100	I/O	94	MD52;100	I/O
95	MD21;100	I/O	96	MD53;100	I/O
97	MD22;100	I/O	98	MD54;100	I/O
99	MD23;100	I/O	100	MD55;100	I/O
101	B3V	-	102	B3V	-
103	MA06;111	O	104	MA07;111	O
105	MA08;111	O	106	MA11;111	O
107	GND	-	108	GND	-
109	MA09;111	O	110	MA00C;101	O
111	MA10;111	O	112	MA01C;101	O
113	B3V	-	114	B3V	-
115	CAS2;011	O	116	CAS6;011	O

Table C-1 Expansion Memory connector pin assignments (140-pin)(3/3)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
117	CAS3;011	O	118	CAS7;011	O
119	GND	-	120	GND	-
121	MD20;100	I/O	122	MD56;100	I/O
123	MD25;100	I/O	124	MD57;100	I/O
125	MD26;100	I/O	126	MD58;100	I/O
127	MD27;100	I/O	128	MD59;100	I/O
129	B3V	-	130	B3V	-
131	MD28;100	I/O	132	MD60;100	I/O
133	MD29;100	I/O	134	MD61;100	I/O
135	MD30;100	I/O	136	MD62;100	I/O
137	MD31;100	I/O	138	MD63;100	I/O
139	GND	-	140	GND	-

C.2 PJ200 Docking Interface Connector (140-pin)

Table C-2 Docking Interface connector pin assignments (140-pin)(1/3)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
1	GND	-	2	GND	-
3	DAD00;100	I/O	4	DAD01;100	I/O
5	DAD02;100	I/O	6	DAD03;100	I/O
7	DAD04;100	I/O	8	DAD05;100	I/O
9	DAD06;100	I/O	10	DAD07;100	I/O
11	DAD08;100	I/O	12	DAD09;100	I/O
13	DAD10;100	I/O	14	DAD11;100	I/O
15	DAD12;100	I/O	16	DAD13;100	I/O
17	DAD14;100	I/O	18	DAD15;100	I/O
19	DAD16;100	I/O	20	DAD17;100	I/O
21	DAD18;100	I/O	22	DAD19;100	I/O
23	DAD20;100	I/O	24	DAD21;100	I/O
25	DAD22;100	I/O	26	DAD23;100	I/O

Table C-2 Docking Interface connector pin assignments (140-pin)(2/3)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
27	DAD24;100	I/O	28	DAD25;100	I/O
29	DAD26;100	I/O	30	DAD27;100	I/O
31	DAD28;100	I/O	32	DAD29;100	I/O
33	DAD30;100	I/O	34	DAD31;100	I/O
35	ECGPI1;100	I	36	DPGNTH;000	O
37	GND	-	38	DCKRUN;000	O
39	DDEVSL;000	I/O	40	DTRDY;000	I/O
41	DSPOT;000	I/O	42	DINT3;000	I
43	DINT4;000	I	44	DAUDIO;100	I
45	DCDSPK;110	I	46	DCDSMI;000	I
47	DEJREQ;100	I/O	48	ECGPO0;100	O
49	QSWON;100	O	50	DPREQH;000	I
51	DOCPWN;100	O	52	DCPCLR;000	O
53	S5V	-	54	IFVCC	-
55	IFVCC	-	56	IFVCC	-
57	IFVCC	-	58	VCC	-
59	VCC	-	60	NC	-
61	PRDCIN	-	62	PRDCIN	-
63	PRDCIN	-	64	PRDCIN	-
65	PRDCIN	-	66	PRDCIN	-
67	NC	-	68	DOCDET;000	I/O
69	GND	-	70	GND	-
71	GND	-	72	GND	-
73	GND	-	74	DPREQG;000	I
75	DPGNTG;000	O	76	DCBE0;000	I/O
77	DCBE1;000	I/O	78	DCBE2;000	I/O
79	DCBE3;000	I/O	80	DFRAM;000	I/O
81	DIRDY;000	I/O	82	DPAR;100	I/O
83	DPCLK4;100	O	84	DIRQCK;100	O
85	DIRQD;000	I/O	86	+3.3V	-
87	CK32K;100	O	88	RCLR;100	O
89	+3.3V	-	90	PCONF;100	I/O

Table C-2 Docking Interface connector pin assignments (140-pin)(3/3)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
91	USBVC1	-	92	USBVC1	-
93	USBDP1;100	I/O	94	USBDN1;000	I/O
95	MOUSDT;120	I/O	96	MOUSCK;120	I/O
97	EXKBCK;101	I/O	98	EXKBDT;101	I/O
99	GND	-	100	CVSYNC;100	O
101	CRTEN;000	O	102	CHSYNC;100	O
103	MONID1;000	O	104	CRED;100	O
105	CGREEN;100	O	106	CBLUE;100	O
107	PNLST;100	I	108	MONID3;000	O
109	DCD1;010	I	110	DSR1;010	I
111	RXD1;110	I	112	CTS1;010	I
113	RI1;010	I	114	RTS1;000	O
115	TXD1;100	O	116	DTR1;000	O
117	E232C;100	O	118	RIOUT;000	I
119	GND	-	120	ACK;000	I
121	BUSY;100	I	122	PE;100	I
123	SELCT;100	I	124	ERROR;000	I
125	STROB;000	O	126	AUTFD;000	O
127	SLIN;000	O	128	PINT;000	O
129	PD0;100	I/O	130	PD1;100	I/O
131	PD2;100	I/O	132	PD3;100	I/O
133	PD4;100	I/O	134	PD5;100	I/O
135	PD6;100	I/O	136	PD7;100	I/O
137	SCL;100	I/O	138	SDA;100	I/O
139	B5V	-	140	GND	-

C.3 PJ250 FL Inverter I/F Connector (60-pin)

Table C-3 FL Inverter I/F connector pin assignments (60-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	PWRSW;000	I	2	CHGGRN;000	O
3	CHGDRG;000	O	4	DCGRN;000	O
5	PVLED	-	6	DCORG;000	O
7	VCC	-	8	VCC	-
9	ISARST;000	I	10	IPSCLK;000	O
11	IPSDAT;100	O	12	VCC	-
13	VCC	-	14	VCC	-
15	ENDATA;120	O	16	PNLD05;120	O
17	PNLD04;120	O	18	PNLD03;120	O
19	PNLD02;120	O	20	PNLD01;120	O
21	PNLD00;120	O	22	PNLD11;120	O
23	PNLD10;120	O	24	PNLD09;120	O
25	PNLD08;120	O	26	PNLD07;120	O
27	PNLD06;120	O	28	PNLD17;120	O
29	PNLD16;120	O	30	PNLD15;120	O
31	HDDLED;000	O	32	PWLEDO;100	O
33	PWLEDG;100	O	34	FL1;100	O
35	FL0;100	O	36	VCC	-
37	VCC	-	38	VCC	-
39	GND	-	40	GND	-
41	GND	-	42	GND	-
43	GND	-	44	GND	-
45	GND	-	46	GND	-
47	GND	-	48	GND	-
49	GND	-	50	GND	-
51	GND	-	52	SPKOUT;100	O
53	SPKRTN;100	O	54	PNLST;100	I
55	SHFCLK;120	O	56	LP;120	O
57	FP;120	O	58	PNLD12;120	O
59	PNLD13;120	O	60	PNLD14;120	O

C.4 PJ300 RTC Battery Connector (3-pin)

Table C-4 RTC Battery connector pin assignments (3-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	RTCVDD;100	-	2	NC	-
3	GND	-			

C.5 PJ301 HDD Connector (44-pin)

Table C-5 HDD connector pin assignments (44-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	HDDRST;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	-
23	FIOW;010	O	24	GND	-
25	FIOR;010	O	26	GND	-
27	IOCRDY;100	I	28	NC	-
29	NC	-	30	GND	-
31	IRQ14;100	I	32	IOCS16;000	O
33	SA1;100	O	34	NC	-
35	SA0;100	O	36	SA2;100	I
37	HDCS0;000	O	38	HDCS1;000	I
39	HDDLED;000	I	40	GND	-
41	VCC	-	42	VCC	-
43	GND	-	44	NC	-

C.6 PJ302 Keyboard Connector (24-pin)

Table C-6 Keyboard connector pin assignments (24-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	KBRT6;100	I	2	KBRT5;100	I
3	KBRT4;100	I	4	KBRT3;100	I
5	KBRT1;100	I	6	KBRT2;100	I
7	KBRT0;100	I	8	KBRT7;100	I
9	NC	-	10	KBOT05;000	O
11	KBOT06;000	O	12	KBOT09;000	O
13	KBOT02;000	O	14	KBOT08;000	O
15	KBOT07;000	O	16	KBOT10;000	O
17	KBOT03;000	O	18	KBOT04;000	O
19	KBOT01;000	O	20	KBOT00;000	O
21	KBOT11;000	O	22	JMODEL;000	I
23	GND	-	24	NC	-

C.7 PJ303 PC Card Slot Connector (150-pin)

Table C-7 PC card slot connector pin assignments (150-pin) (1/3)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	GND	-	2	GND	-
3	ACCD1;000	I	4	ACAD00;000	I/O
5	ACAD02;100	I/O	6	ACAD01;100	I/O
7	ACAD04;100	I/O	8	ACAD03;100	I/O
9	GND	-	10	ACAD06;100	I/O
11	ACAD05;100	I/O	12	ACD14;100	I/O
13	ACAD07;100	I/O	14	ACAD08;100	I/O
15	ACCBE0;000	I/O	16	ACAD10;100	I/O
17	GND	-	18	ACAD09;100	I/O
19	ACAVS1;100	I/O	20	ACAD11;100	I/O
21	ACAD13;100	I/O	22	ACAD12;100	I/O
23	ACAD15;100	I/O	24	ACAD14;100	I/O
25	GND	-	26	ACAD16;100	I/O
27	ACCBE1;000	I/O	28	ACA18;100	O
29	ACPAR;100	I/O	30	ACLOCK;000	I/O
31	ACPERR;000	I/O	32	ACSTOP;000	I/O
33	GND	-	34	ACGNT;000	O
35	ACDEVS;000	I/O	36	ACINT;000	I
37	MCVCCA	-	38		
39	MCVP1A	-	40	ACCLK;100	O
41	ACTRDY;000	I/O	42	ACIRDY;000	I/O
43	GND	-	44	ACFRAM;000	I/O
45	ACCBE2;000	I/O	46	ACAD17;100	I/O
47	ACAD18;100	I/O	48	ACAD19;100	I/O
49	ACAD20;100	I/O	50	ACVS2;100	I/O
51	GND	-	52	ACAD21;100	I/O
53	ACRST;000	O	54	ACAD22;100	I/O
55	ACSERR;000	I	56	ACAD23;100	I/O
57	ACREQ;000	I	58	ACAD24;100	I/O
59	GND	-	60	ACCBE3;000	I/O

Table C-7 PC card slot connector pin assignments (150-pin) (2/3)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
61	ACAD25;100	I/O	62	ACAUDI;100	I
63	ACAD26;100	I/O	64	ACSTSC;100	I
65	ACAD27;100	I/O	66	ACAD28;100	I/O
67	GND	-	68	ACAD29;100	I/O
69	ACAD30;100	I/O	70	ACD02;100	I/O
71	ACAD31;100	I/O	72	ACCLKR;000	I/O
73	ACCD2;000	I	74	GND	-
75	GND	-	76	GND	-
77	GND	-	78	BCCD1;000	I
79	BCAD00;100	I/O	80	BCAD02;100	I/O
81	BCAD01;100	I/O	82	BCAD04;100	I/O
83	BCAD03;100	I/O	84	GND	-
85	BCAD06;100	I/O	86	BCAD05;100	I/O
87	BCD14;100	I/O	88	BCAD07;100	I/O
89	BCAD08;100	I/O	90	BCCBE0;000	I/O
91	BCAD10;100	I/O	92	GND	-
93	BCAD09;100	I/O	94	BCVS1;100	I/O
95	BCAD11;100	I/O	96	BCAD13;100	I/O
97	BCAD12;100	I/O	98	BCAD15;100	I/O
99	BCAD14;100	I/O	100	GND	-
101	BCAD16;100	I/O	102	BCCBE1;000	I/O
103	BCA18;100	I/O	104	BCPAR;100	I/O
105	BCLOCK;000	I/O	106	BCPERR;000	I/O
107	BCSTOP;000	I/O	108	GND	-
109	BCGNT;000	I	110	BCDEVS;000	I/O
111	BCINT;000	O	112	MCVCCB	
113			114	MCVP1B	
115	BCCLK;100	I	116	BCTRDY;000	I/O
117	BCIRDY;000	I/O	118	GND	-
119	BCFRAM;000	I/O	120	BCCBE2;000	I/O

Table C-7 PC card slot connector pin assignments (150-pin) (3/3)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
121	BCAD17;100	I/O	122	BCAD18;100	I/O
123	BCAD19;100	I/O	124	BCAD20;100	I/O
125	BCVS2;100	I/O	126	GND	-
127	BCAD21;100	I/O	128	BCRST;000	I
129	BCAD22;100	I/O	130	BCSERR;000	O
131	BCAD23;100	I/O	132	BCREQ;000	O
133	BCAD24;100	I/O	134	GND	-
135	BCCBE3;000	I/O	136	BCAD25;100	I/O
137	BCAUDI;100	I	138	BCAD26;100	I/O
139	BCSTSC;100	I	140	BCAD27;100	I/O
141	BCAD28;100	I/O	142	GND	-
143	BCAD29;100	I/O	144	BCAD30;100	I/O
145	BCD02;100	I/O	146	BCAD31;100	I/O
147	BCCLKR;000	I/O	148	BCCD2;000	O
149	GND	-	150	GND	-

C.8 PJ401 Headphone Connector (5-pin)

Table C-8 Headphone connector pin assignments (5-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	GND	-	2	LOUT	O
3	ROUT	O	10	SPKL	I
11	SPKR	I			

C.9 PJ470 Internal Microphone Connector (2-pin)

Table C-9 Internal Microphone connector pin assignments (2-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	MIC	I	2	GND	-

C.10 PJ471 External Microphone Connector (5-pin)

Table C-10 External Microphone connector pin assignments (5-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	GND	-	2	MIC	I
3	NC	-	10	MIC	O
11	NC	-			

C.11 PJ500 AC Adapter Connector (2-pin)

Table C-11 AC adapter connector pin assignments 23-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	DCIN	-	2	GND	-

C.12 PJ510 Main Battery Connector (10-pin)

Table C-12 Main Battery connector pin assignments (10-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	(+)	-	2	BTMP1	I
3	DCHG	I	4	S5V	-
5	SCL;100	I/O	6	SDA;100	I/O
7	GND	-	8	BAT1OV;000	I
9	GND	-	10	(-)	-

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	

Table D-1 Scan codes (set 1 and set 2) (3/4)

Cap No.	Keytop	Code set 1 Make	Code set 1 Break	Code set 2 Make	Code set 2 Break	Note
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 Make	Code set 1 Break	Code set 2 Make	Code set 2 Break	Note
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 Make	Code set 1 Break	Code set 2 Make	Code set 2 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 Make				Code set 1 Break				Code set 2 Make				Code set 2 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 Make		Code set 1 Break		Code set 2 Make		Code set 2 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

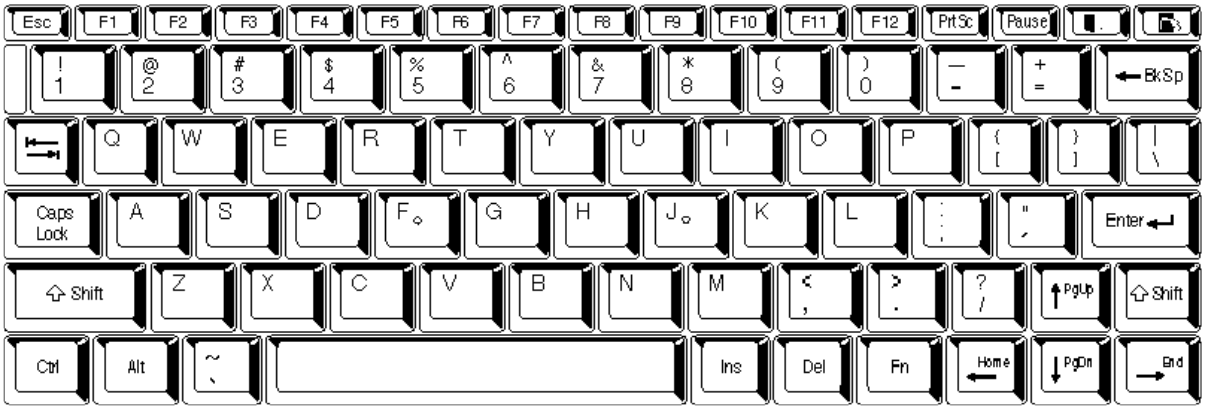


Figure E-1 US keyboard

E.2 United Kingdom (UK) Keyboard

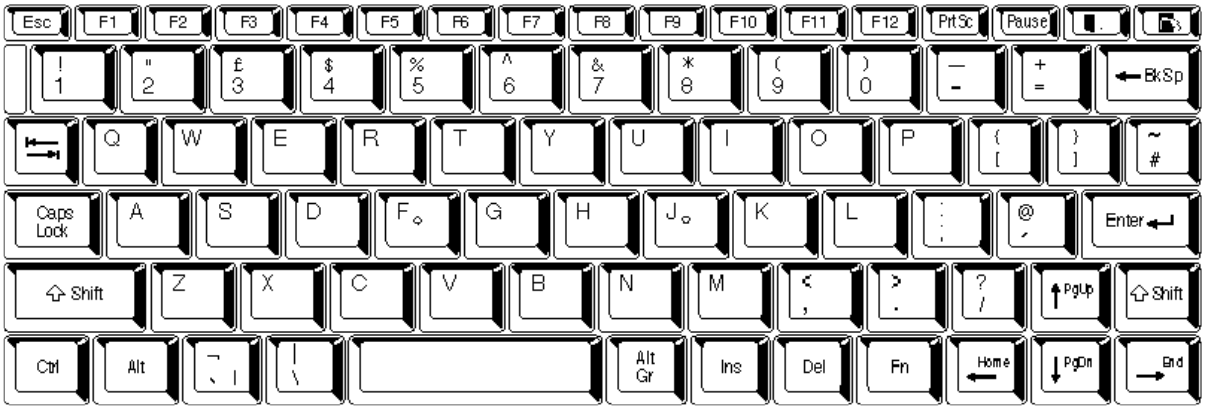


Figure E-2 UK keyboard

E.3 German (GR) Keyboard

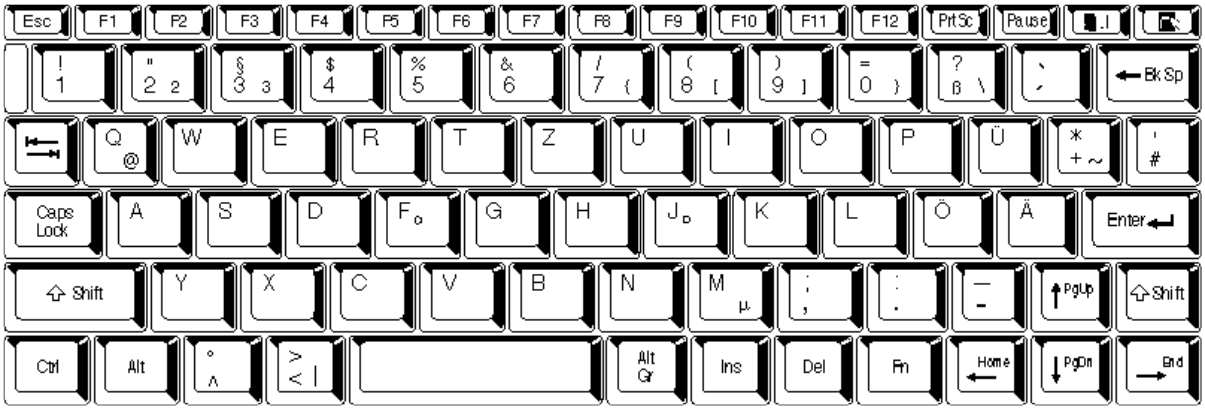


Figure E-3 GR keyboard

E.4 French (FR) Keyboard

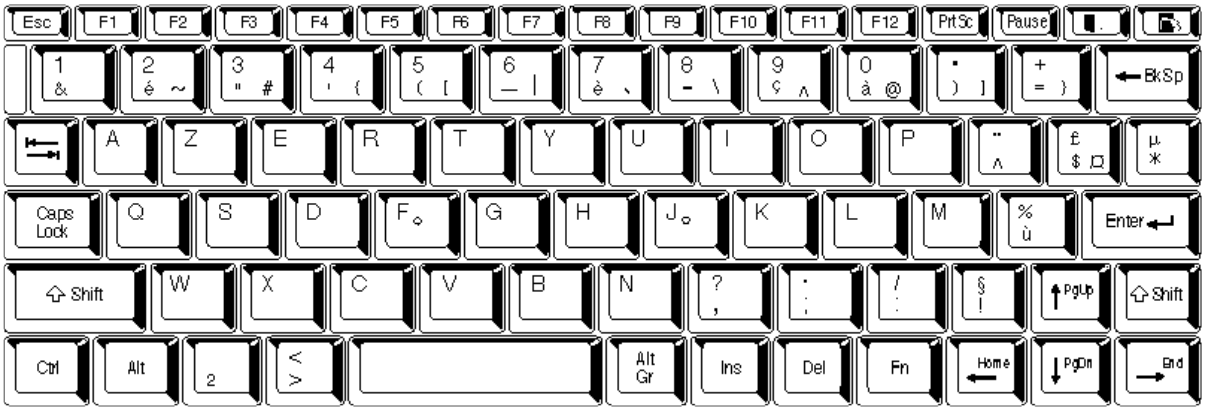


Figure E-4 FR keyboard

E.5 Spanish (SP) Keyboard

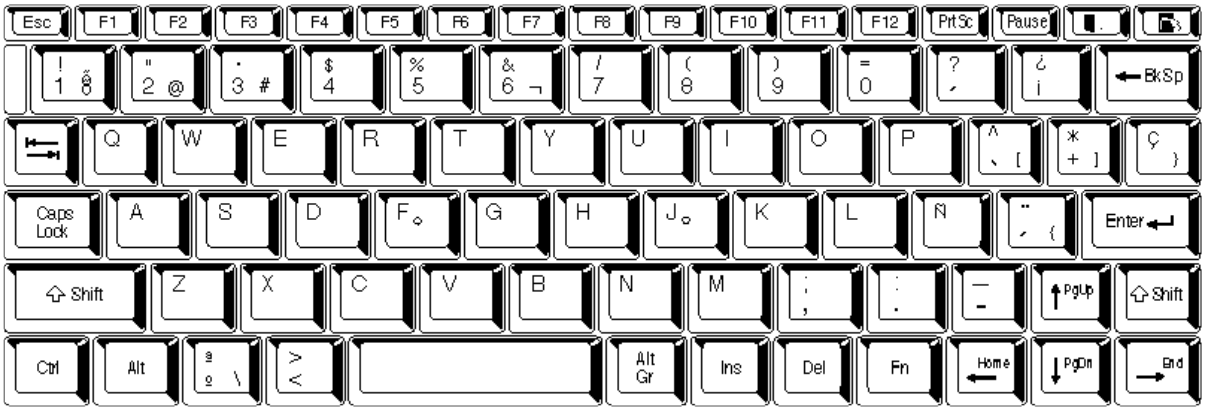


Figure E-5 SP keyboard

E.6 Italian (IT) Keyboard

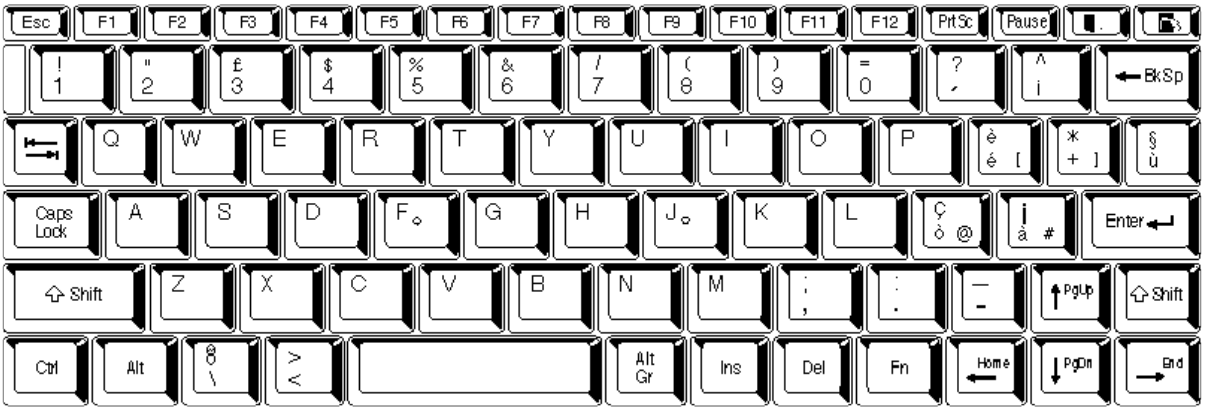


Figure E-6 IT keyboard

E.7 Scandinavian (SC) Keyboard

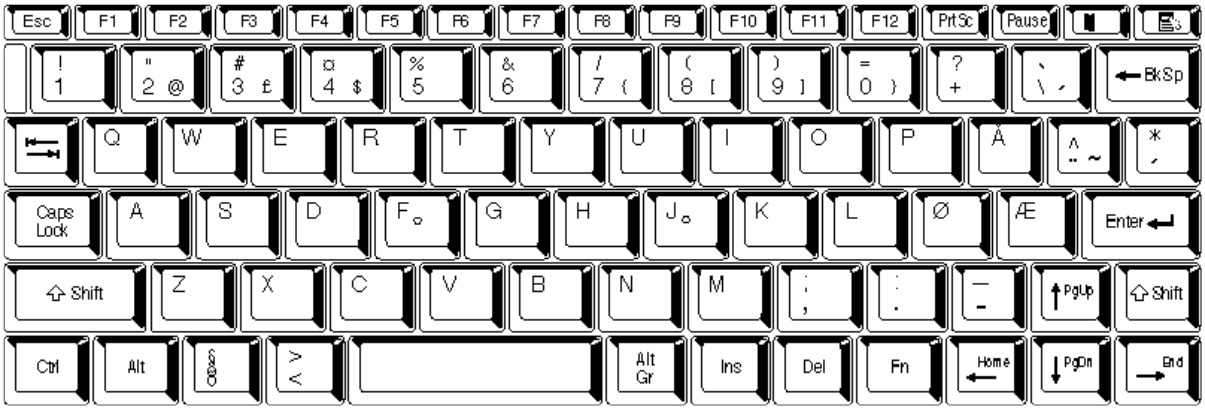


Figure E-7 SC keyboard

E.8 Swiss-German (SL) Keyboard

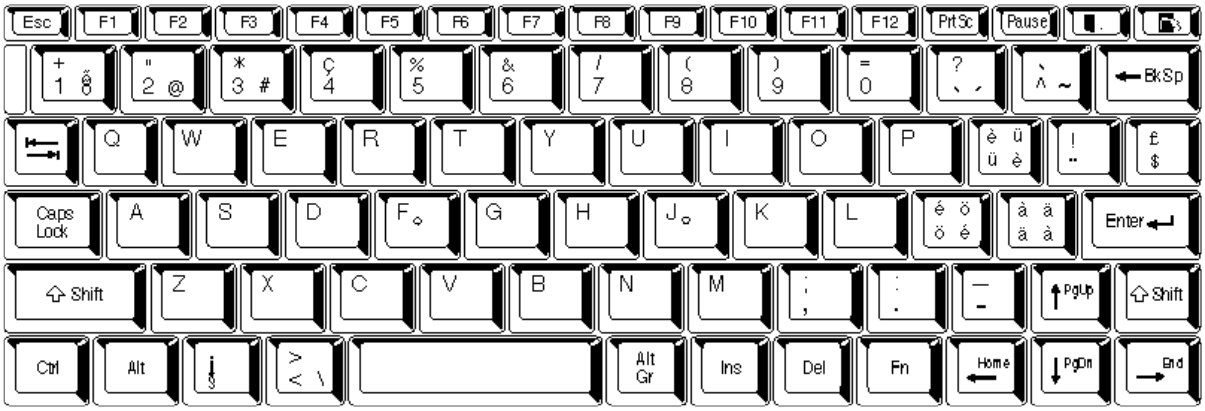


Figure E-8 SL keyboard

Appendix F Wiring Diagrams

F.1 Parallel Port Wraparound Connector

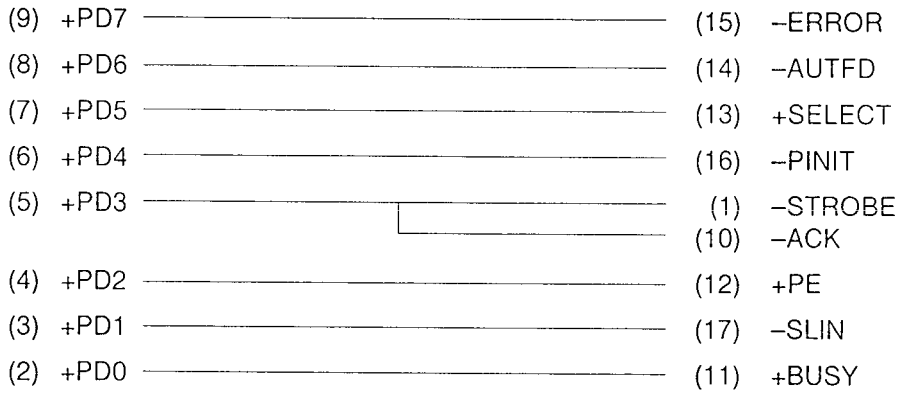


Figure F-1 Parallel port wraparound connector

F.2 Serial Port Wraparound Connector

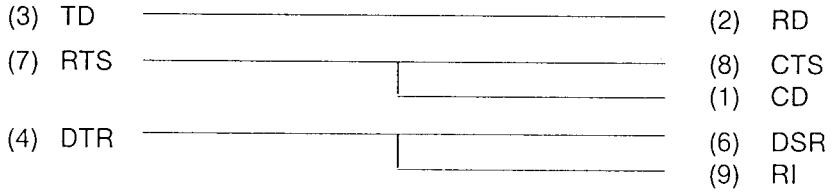


Figure F-2 Serial port wraparound connector

F.3 Serial Port Direct Cable (9-Pin to 9-Pin)

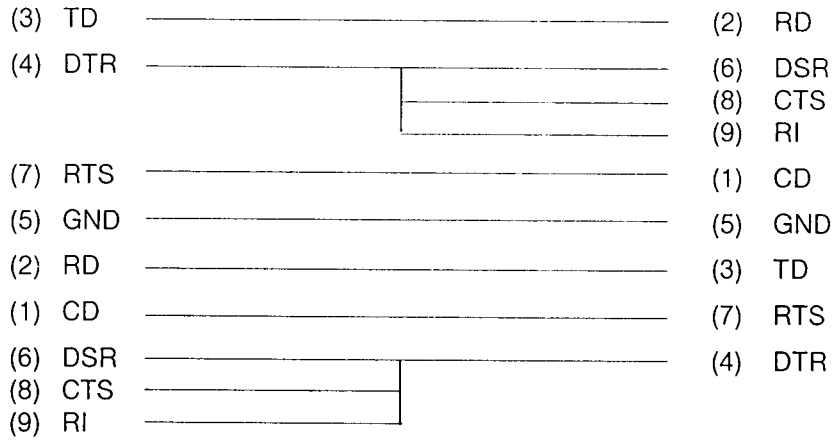


Figure F-3 Serial port direct cable (9-pin to 9-pin)

F.4 Serial Port Direct Cable (9-Pin to 25-Pin)

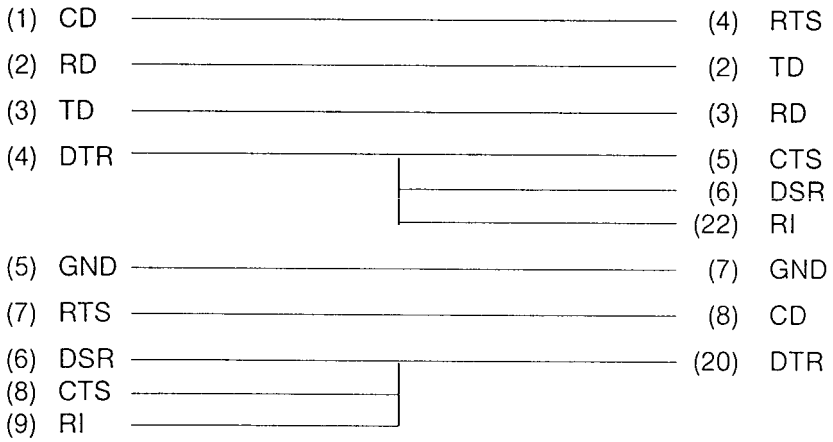


Figure F-4 Serial port direct cable (9-pin to 25-pin)

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	37,000
HDD	300,000
FDD	30,000
Pointing Device	37,000
AC adapter	50,000