TOSHIBA

730CDT

Maintenance Manual

PN: 730-9400

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730CDT Maintenance Manual
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About this Manual

This maintenance manual describes how to perform hardware service maintenance for the Toshiba Personal Computer 730CDT, referred to as 730CDT in this manual.

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 bodily 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 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 that the following safety precautions are strictly adhered to:

❏ Be sure to fasten screws securely with the right screwdriver. If a screw is not fully fastened, it could come loose, creating a danger of 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 730CDT 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 tests and diagnostic operations for maintenance service.

Chapter 4 **Replacement Procedures**
Describes the removal and replacement of the FRUs.

Appendices The appendices describe the following:

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

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. For example:

Enter Identifies the **Enter** key

Key Operation

Some operations require that you simultaneously use two or more keys. We identify these operations by the keytop symbols separated by a plus (+) sign. For example, **Ctrl** + **Pause (Break)** means you must hold down the **Ctrl** key, 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 is displayed in the following boldface type:

DISKCOPY A: B:

The Display

Text generated by the 730CDT that appears on its display is presented in the type face:

```
Format complete
System transferred
```

1.1 Features

The Toshiba 730CDT uses extensive Large Scale Integration (LSI) and Complementary Metal-Oxide Semiconductor (CMOS) technology to provide minimum size and weight, low power usage and a high degree of reliability. The computer is fully optimized for Windows ® 95 and supports plug and play technology. The computer incorporates the following features and benefits:

❑ Microprocessor

   This computer uses an Intel ® Pentium® 150 MHz processor with Voltage Reduction Technology (VRT) operating at 3.1/3.3 volts.

❑ Cache memory

   The CPU contains a 16 KB cache and a 256 KB level-2 cache with pipe-line burst SRAM.

❑ Disk storage

   This computer has a 2.1 billion byte (2.02 GB) removable HDD pack.

❑ Selectable Bay

   The Selectable Bay allows connection to either a Floppy Disk Drive (FDD) or a CD-ROM drive.

   The FDD supports 3.5-inch 2HD (1.44 MB) disks and 2DD (720 KB) disks. The FDD drive can be connected to an external FDD port with an attachment when the CD-ROM drive is installed in the Selectable Bay.

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

❑ Memory

   This computer comes standard with 16 MB of Extend Data Out (EDO) DRAM. This includes 640 KB of conventional memory and 15488 KB of extended memory.

❑ Display

   The 730CDT has a 12.1-inch, Thin Film Transistor (TFT) color LCD displaying 1024 x 768 pixels. The built-in display controller supports full color capability up to 1280 x 1024 resolution on an external monitor.

❑ Keyboard

An-easy-to-use 82/84-key keyboard includes a numeric keypad overlay for fast numeric data entry or for cursor and page control. The keyboard supports software that uses a 101-key or 102-key enhanced keyboard.

❑ Batteries

Three different batteries are used in this computer: a Lithium-Ion main battery, a backup battery (for memory backup), and a Real Time Clock (RTC) battery.

❑ Expansion memory slot

An optional 8, 16, 32, 64, or 128 MB memory module can be installed in the memory slot.

❑ Parallel port

This port can be used to connect a Centronics ® compatible printer or other parallel device. The port supports Extended Capabilities Port (ECP) conforming to IEEE·1284.

❑ Serial port

The serial controller is 16550UART compatible. This standard, 9-pin, serial port can be used to connect serial devices such as a serial printer, serial mouse, or external modem.

❑ External monitor port

The female, 15-pin, D-shell connector can be connected to an external SVGA monitor. This computer supports Video Electronics Standards Association (VESA) Display Data Channel (DDC) 2B compatible functions.

❑ PS/2™ mouse/keyboard port

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

❑ PC card slot

The PC card slot accommodates two Personal Computer Memory Card International Association (PCMCIA) 5 mm cards (Type II), or one 10.5 mm (Type III) card which supports PCMCIA Release 2.01. These slots can also support advanced PC cards, such as PC Card 16's multifunction card, CardBus 32-bit card, or a Zoomed Video (ZV) port, which is dedicated to high-performance video data transfer such as MPEG video playback. The optional Desk Station V Plus and Enhanced Port Replictor II support two additional 10.5 mm cards.

❏ Docking interface port

This 240-pin port allows connection to an Enhanced Port Replicator II or a Desk Station V Plus.

The Enhanced Port Replicator II duplicates the following ports on the computer: PS/2 keyboard, PS/2 mouse, serial, parallel, external monitor, audio line-in, audio line-out, headphone, and microphone. It also provides a joystick port and two additional PC card slots (Type III).

The Desk Station V Plus expands the features of the Enhanced Port Replicator II by adding two PCI/ISA and one PCI bus expansion slots, a 5.25-inch disk drive bay, a Selectable Bay, and an on-board SCSI-2 (small computer system interface) controller.

❏ External FDD port

The external FDD port lets you connect an external FDD device when a CD-ROM drive is installed.

❏ AccuPoint

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

❏ Serial infrared port

This computer incorporates an IrDA1.0 (infrared data association) standard infrared transmitter and receiver. It allows cableless data transfer at 115.2 Kbps.

❏ Sound System

The sound system is compatible with Sound Blaster ™ Pro™ and Windows Sound System. This computer is equipped with a microphone, stereo speakers, and the following jacks: audio line-in, audio line-out, headphone, and microphone.

❏ Internal Modem (optional in some markets)

The modem supports V.34 data communication at 28.8 Kbps, V.17 class-1 facsimile transmissions at 14.4 Kbps, and can be used as a speaker phone and Telephone Answering Machine (TAM). The computer is equipped with an RJ11 modem jack to connect directly to a telephone line.

The 730CDT Personal Computer is shown in Figure 1-1 and its system configuration in Figure 1-2.
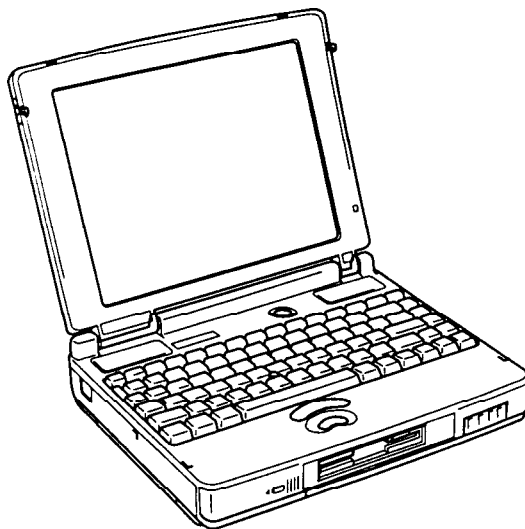
Figure 1-1 730CDT personal computer
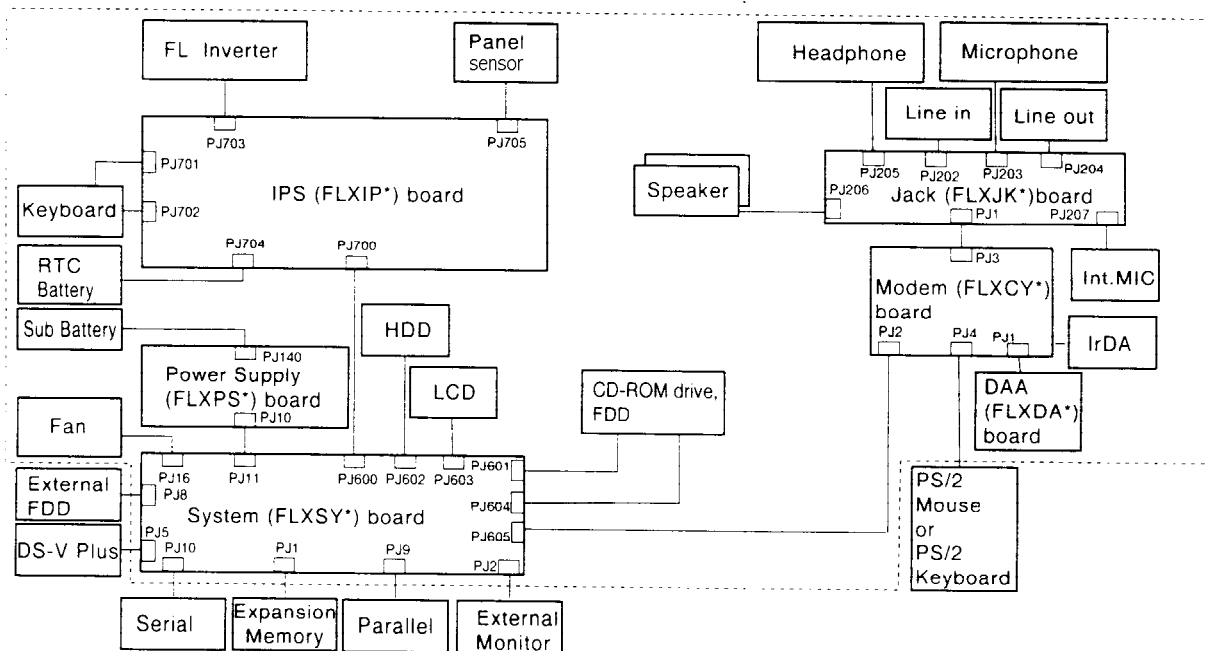
Figure 1-2 730CDT system unit configuration

1.2   System Unit Block Diagram

The following figure shows a block diagram of the system unit.
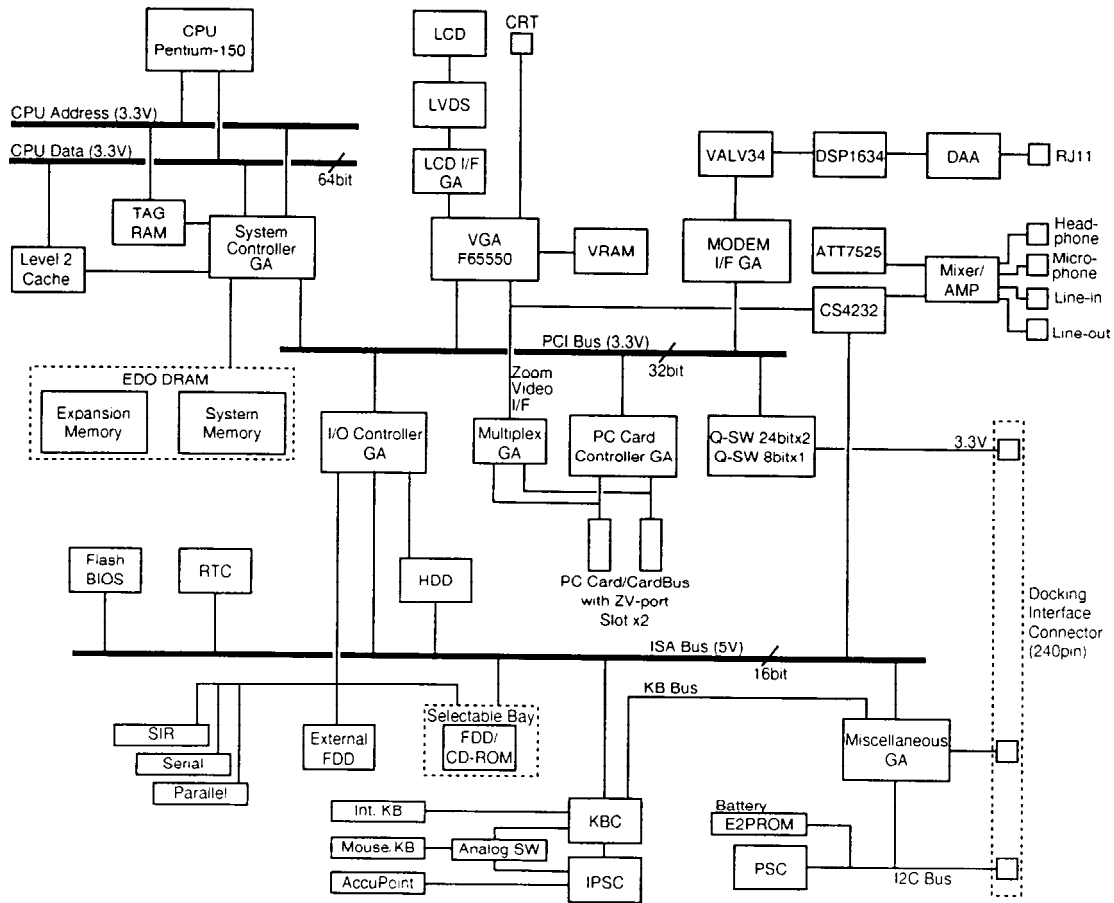
Figure 1-3 System board block diagram

The system board is composed of the following major components:

❑ Intel Pentium processor operating at 150 MHz and 3.1/3.3 volts. A math co-processor and 16 KB cache memory are integrated into the processor.

❑ Level-2 cache memory
   Data RAM:
         - 256 KB
         - Two 32K x 32-bit pipe-line burst synchronous SRAM chips
         - 3.3 volt operation
         - 8 ns access time

Tag RAM:
- 32 KB (only 8 KB is used)
- One 32K x 8-bit asynchronous SRAM chip
- 3.3 volt operation
- 15 ns access time

The level-2 cache uses direct mapping, utilizing a write-through policy.

❏ Standard RAM

16 MB, eight 1M x 16-bit EDO DRAM chips
3.3 volt operation
No parity bit
60 ns access time
64-bit width data transfer

❏ BIOS ROM (Flash EEPROM)

256 KB, one 256K x 8-bit chip
- 128 KB are used for system BIOS
- 64 KB are used for VGA-BIOS
- 8 KB are used for plug and play data area
- 8 KB are used for password security
- 16 KB are used for boot strap
- 32 KB are reserved

5 volt operation
120 ns access time
8-bit width data transfer

❏ Optional memory

One expansion memory slot for 8, 16, 32, 64, and 128MB memory modules, which
consist of 1M x 16-bit chips (8, 16, 32MB) and 4M x 16-bit chips (64, 128MB).
EDO DRAM is used
3.3 volt operation
No parity bit
60 ns access time
64-bit width data transfer

❏ Video RAM

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

❏ System controller Gate Array

This gate array has the following functions:
- CPU interface/control
- Level-2 cache memory control
- DRAM control
- PCI master/slave interface
- Write buffer (CPU-DRAM, CPU-PCI, PCI-DRAM)

- Prefetch buffer (PCI-DRAM)
- Two DMACs: 82C37 equivalent
- Two PICs: 82C59 equivalent
- One PIT: 82C54 equivalent
- Serial interrupt function
- Power management control
- Suspend/resume control
- CPU stop clock function

❏ I/O controller Gate Array
   This gate array has the following functions:
      - Two UARTs   16550A equivalent (one SIO is used for SIR)
      - One FDC   μPD765A equivalent
      - One ECP supported parallel port control
      - ISA bus control
      - PCI bus front end control

❏ Multiplex Gate Array
   This gate array is a multiplexer for a ZV port.

❏ LCD interface Gate Array
   This gate array controls data transfer between a VGA controller and LVDS.

❏ PC Card Controller Gate Array
   This gate array has the following functions:
      - PC card control
      - CardBus control
      - ZV port support (multiplex gate array control)

❏ Miscellaneous Gate Array
   This gate array has the following functions:
    - Communication control
       • Communication with KBC
       • I2C bus interface
            Communication with power supply
            Communication with Desk Station V Plus
            Communication with EEPROM
       • Communication register set
    - PWM control
       • Beep volume
    - Speaker control
    - Universal I/O port
    - Q-SW control

❏ Modem interface Gate Array
   This gate array controls modem interface LSIs.

❑ Video Controller

Chips & Technology F65550 is used.
The video controller controls the internal LCD and an external CRT.

❑ Keyboard Controller (KBC)

One M38802M4 chip is used.
The KBC includes the keyboard scan controller and keyboard interface controller.
The KBC controls the internal keyboard, external keyboard, AccuPoint, or PS/2 mouse.

❑ AccuPoint Controller (IPSC)

One KPAAC0062A chip is used.
The controller provides simultaneous control of both the AccuPoint and a PS/2 mouse.

❑ Real Time Clock (RTC)

One T9934 chip is used.
The T9934 has 128 bytes of memory. Fourteen (14) bytes are used for the calendar and clock, and the remaining 114 bytes are used for system configuration data.

1.3 3.5-inch Floppy Disk Drive

The removable 3.5-inch FDD is a thin, high-performance, reliable drive that supports 720-KB (formatted) 2DD and 1.44-MB (formatted) 2HD disks. When a CD-ROM is installed in the Selectable Bay, an FDD attachment can be used to connect the FDD to the external FDD port.

The FDD is shown in Figure 1-4, and its specifications are listed in Table 1-1.
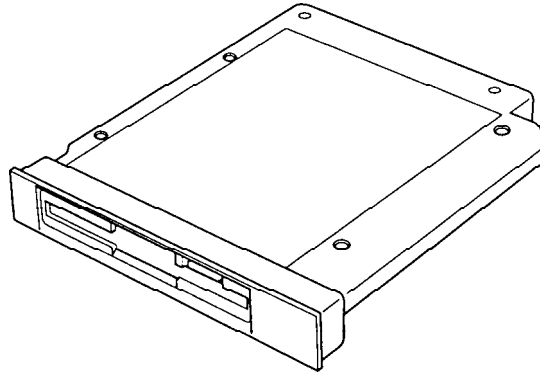
Figure 1-4 3.5-inch FDD

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, nonvolatile storage device. It has a non-removable 2.5-inch magnetic disk and mini-winchester type magnetic heads.

The 730CDT supports a 2.1 billion (2.02 GB) HDD.

The HDD is shown in Figure 1-5, and its specifications are listed in Table 1-2.
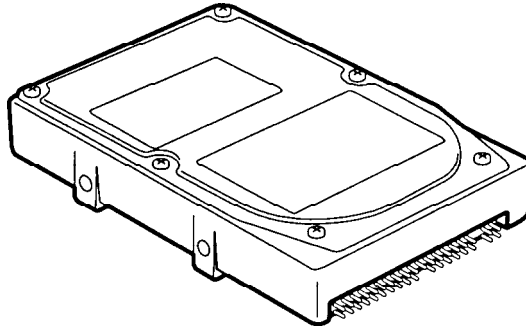
Figure 1-5 2.5-inch HDD

Table 1-2 2.5-inch HDD specifications

Items	(MK2101MAN)
Storage capacity (GB)	2,167,603,200
Cylinders	525
Heads	128
Sectors	63
Bytes per sector	512
Rotation speed (rpm)	4,200
Recording method	8-9 RLL

1.5   Keyboard

The 82-key (USA) or 84-key (European) keyboard is mounted on the system unit. The keyboard is connected to the keyboard controller on the system board through a 25-pin flat cable.

The 730CDT AccuPoint pointer control stick, located in the center of the keyboard, provides convenient control of the cursor without requiring desk space for a mouse. The keyboard is shown in Figure 1-6.

See Appendix E for optional keyboard configurations.
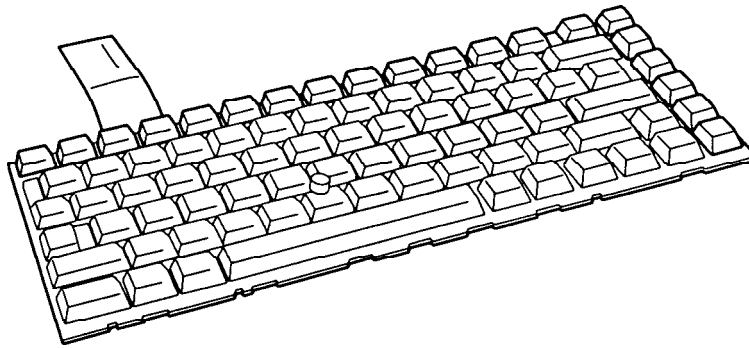
Figure 1-6 Keyboard

1.6   CD-ROM Drive

The removable CD-ROM drive accommodates both 12 cm (4.72-inch) or 8 cm (3.15-inch) CDs. It provides high-performance, six-speed play, and reads 900KB per second. The drive supports the following formats: Red-Book, Yellow-Book, CD-ROM XA, Photo CD, CD-Bridge, CD-I, and CD Plus.

The CD-ROM drive is shown in Figure 1-7 and its specifications listed in Table 1-3.
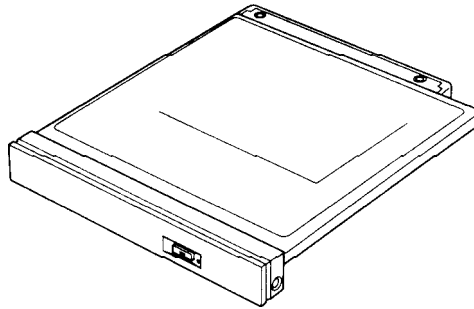
Figure 1-7 CD-ROM drive

Table 1-3 CD-ROM drive specifications

Item	1 x mode	6 x mode
Data Capacity (bytes/block)		
Mode 1	2,048	
Mode 2	2,336	
Transfer Rate		
Sustained Block transfer speed (blocks/s)	75	450
Sustained Data transfer speed (kbytes/s)		
Mode 1	150	900
Mode 2	171	1,026
ATAPI Burst (Mbytes/s)	8.33 (PIO mode 2)	
Access time (ms)		
Average Random Access	350	190
Average Random Seek	230	160
Average Full Stroke Access	500	330
Rotation speed (rpm)	200 to 530	1,200 to 3,180
Data Buffer Capacity (Kbytes)	128	

1.7   TFT Color LCD

The TFT Color Liquid Crystal Display (LCD) contains an LCD module, a Fluorescent Lamp (FL), and an FL inverter board.

1.7.1   TFT Color LCD Module

The 730CDT TFT color LCD is backlit supporting 1024x 768 pixels with a built-in display controller. The controller incorporates functions of the Video Graphics Array (VGA) and Super VGA (SVGA) for external displays.

The display controller is F65550, and enables an LCD to display a maximum 16 million colors.

The TFT LCD is shown in Figure 1-8, and its specifications are listed in Table 1-4.
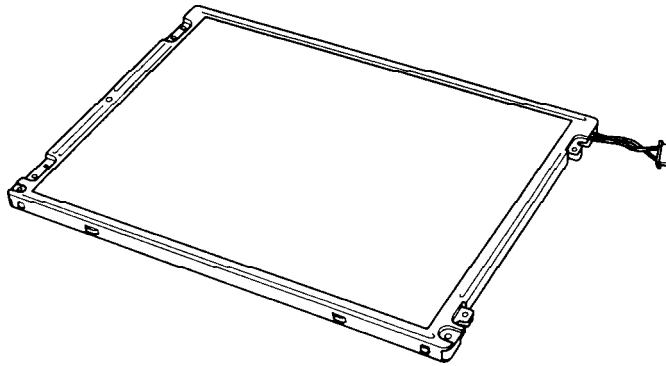
Figure 1-8 730CDT color LCD

Table 1-4 730CDT color LCD specifications

Item		Specifications
Number of Pixels	(pixels)	1024x 768
Dot pitch	(mm)	0.24x 0.24
Display area	(mm)	245.76 (W) x 184.32 (H)
Contrast		150:1
FL current	(mA)	6.0/4.0/3.6/2.4* (Bright/Semi-bright)

NOTE: FL currents at power on are:

	Bright	Semi-bright
AC adapter connected	6 mA	3.6 mA
AC adapter not connected	4 mA	2.4 mA

(The settings at power on do not change even if the AC adapter connection changes.)

1.7.2   Fluorescent Lamp (FL) Inverter Board

The FL inverter board supplies a high frequency current to light the LCD's Fluorescent Lamp.Specifications for the FL inverter are listed in Table 1-5.

Table 1-5 FL inverter board specifications for 730CDT color LCD

Status	Item		Specifications
Input	Voltage	(V)	4 to 5.5
	Power	(W)	4.8
Output	Voltage	(Vrms)	1,100
	Current	(mA)	6.0/4.0/3.6/2.4*

NOTE: FL currents at power on are:

	Bright	Semi-bright
AC adapter connected	6 mA	3.6 mA
AC adapter not connected	4 mA	2.4 mA

(The settings at power on do not change even if the AC adapter connection changes.)

1.8 Power Supply

The Power Supply sends four variations of voltages to the system board, has one microprocessor, and operates at 2 MHz. It offers the following features:

1. Determines if the AC adapter or battery is connected to the computer.

2. Detects DC output and circuit malfunctions.

3. Controls the Battery Capacity 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 remaining battery capacity.

8. Detects Ring Indicator (RI) signal for the Auto Power On function.

The power supply output ratings are specified in Table 1-6.

Table 1-6 Power supply board output ratings

Use	Name	DC voltage (V)	Regulation tolerance (%)	Maximum current (mA)	Ripple (mV)
System logic, FDD, HDD Display panel, FL and PC card	B5V	+5.0	±5	3,400	100
CPU, RAM, PC card	B3V	+3.3	±5	3,800	60
Flash ROM, PC card	B12V	+12.0	±5	100	240
System logic	MCV	+5.0	±5	5	100

1.9   Batteries

The computer has three types of batteries:

❑   Main battery pack
❑   Backup battery
❑   Real Time Clock (RTC) battery

The removable main battery pack is the computer's main power source when the AC adapter is not attached. The backup and main batteries maintain the current state of the computer when AutoResume is enabled.

Battery specifications are listed in Table 1-7.

Table 1-7 Battery specifications

Battery name	Material	Output voltage	Capacity
Main battery	Lithium-Ion	10.8 V	5,600 mAh
Backup battery	Nickel Metal Hydride	7.2 V	35 mAh
RTC battery	Nickel Metal Hydride	3.6 V	35 mAh

1.9.1   Main Battery

Battery Charging Control

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

❑   Quick Battery Charge

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

Table 1-8 Time required for quick charges

Status	Charging time
Quick charge 1 (power off)	4 hours
Quick charge 2 (power on)	4.5 to 12.5 hours

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

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

1. The battery becomes fully charged.

2. The AC adapter or battery is removed.

3. The battery or output voltage is abnormal.

❑ Trickle Battery Charge

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

❑ Detection of full charge

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

1. The current in the battery charging circuit drops under the fixed limit.

2. The charging time exceeds the fixed limit.

3. The battery's temperature is over 60 °C.

1.9.2   Backup Battery

The backup battery maintains data for AutoResume. The power source used to back up the AutoResume data is determined by the following priority:

AC adapter > Main battery > Backup battery

The backup battery is charged by the main battery or AC adapter. Table 1-9 lists the charging time and data preservation period of the backup battery.

Table 1-9 Backup battery charging/data preservation time

Status	Time
Charging Time	7 hours with AC adapter 14 hours without AC adapter
Data preservation period (full charge)	2 hours

1.9.3   RTC Battery

The RTC battery provides power to keep the current date, time and other setup information in memory while the computer is turned off. Table 1-10 lists the charging time and data preservation period for the RTC battery.

Table 1-10 RTC battery charging/data preservation time

Status	Time
Charging Time (Power On)	40 hours
Data preservation period (full charge)	1 month

2.1   Troubleshooting

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

1.	System (FLXSY*) Board	7.	Floppy Disk Drive
2.	Modem (FLXCY*) Board	8.	Hard Disk Drive
3.	Jack (FLXJK*) Board	9.	CD-ROM Drive
4.	IPS (FLXIP*) Board	10.	Keyboard
5.	Power Supply (FSTPS*) Board	11.	Display
6.	DAA (FLXDA*) Board		

> *NOTE: The DAA (FLXDA*) Board is standard equipment in Canada and the United States, and an option in Europe.*

The Diagnostics Disk operations are described in Chapter 3 and detailed replacement procedures 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. A 2DD or 2HD formatted work disk used for floppy disk drive testing
5. Cleaning kit for floppy disk drive troubleshooting
6. Printer port LED
7. Printer wraparound connector
8. Serial port wraparound connector
9. PC card wraparound card
10. Multimeter
11. External monitor
12. PS/2 or compatible keyboard
13. PS/2 or compatible mouse
14. Multimedia sound system with line-in and line-out ports
15. Headphone
16. Microphone
17. Speakers with amplifier
18. External FDD attachment
19. Lens cleaner for the CD-ROM drive troubleshooting.
20. Toshiba-EMI Test Disc TDY-3.

2.2 Troubleshooting Flowchart

Use the flowchart shown in Figure 2-1 as a guide to determine which troubleshooting proce-
dures to execute. Before proceeding through the flowchart steps:

❑ Ask the user if a password is registered and, if it is, ask him or her to enter the pass-
   word. If the user has forgotten the password, 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 MS-DOS or Toshiba Windows ® 95 is installed
   on the hard disk. Non-Toshiba operating systems can cause the computer to malfunc-
   tion.

❑ Make sure all optional equipment is disconnected from the computer.

❑ Make sure the floppy disk drive is empty.
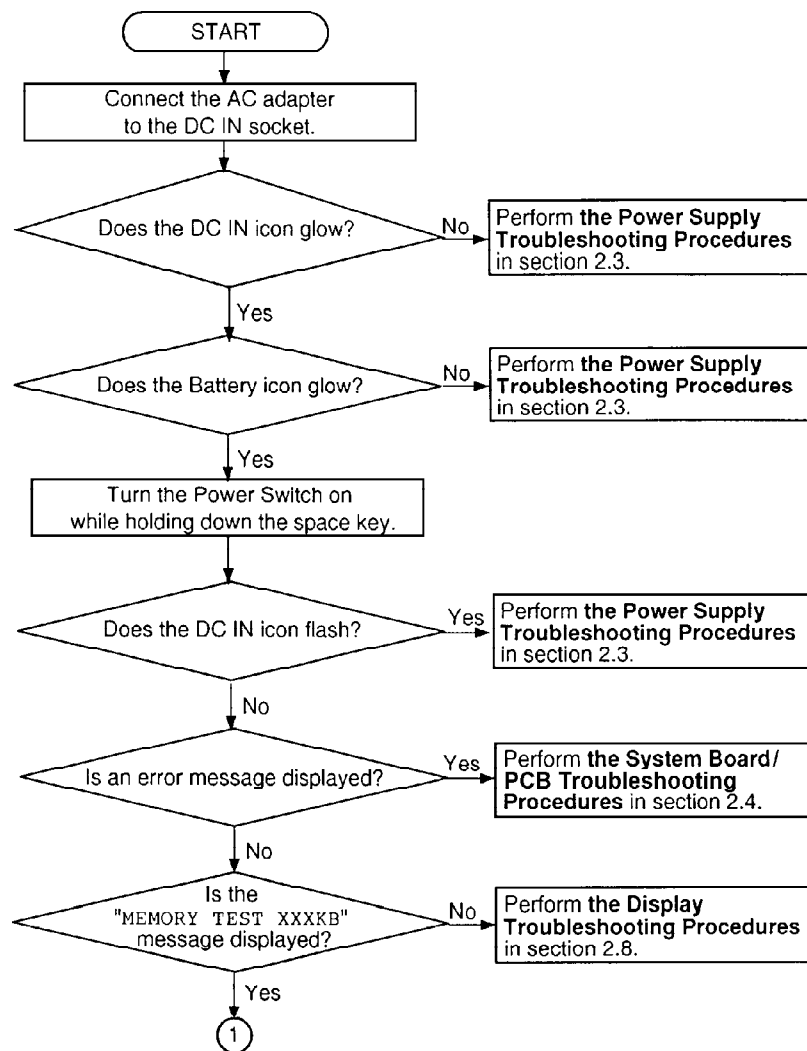
Figure 2-1 Troubleshooting flowchart (1/2)
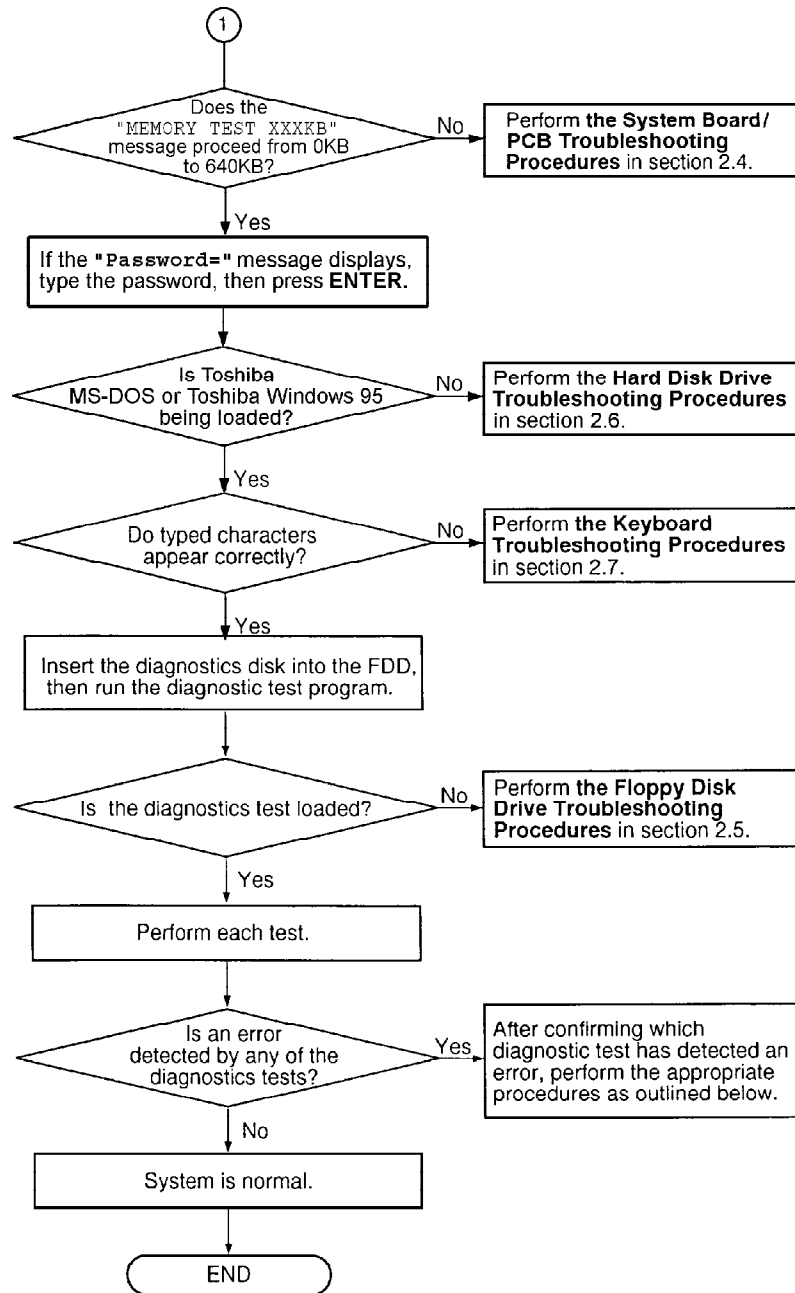
Figure 2-1 Troubleshooting flowchart (2/2)

If the diagnostics program cannot detect an error, the problem may be intermittent. The Running Test program should be executed several times in order to isolate the problem.

Check the Log Utilities function to confirm which diagnostic test detected an error(s), 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, execute the system board/ PCB procedures outlined in Section 2.4.

2. If an error is detected on the floppy disk test, execute the floppy disk drive troubleshooting procedures outlined in Section 2.5.

3. If an error is detected on the hard disk test, perform the hard disk drive troubleshooting procedures outlined in Section 2.6.

4. If an error is detected on the keyboard test, execute the keyboard troubleshooting procedures outlined in Section 2.7.

5. If an error is detected on the display test, execute the display troubleshooting procedures outlined in Section 2.8.

6. If an error is detected on the CD-ROM test, execute the CD-ROM drive trouble-shooting procedures outlined in Section 2.9.

7. If an error is detected on the modem test, execute the modem troubleshooting procedures outlined in Section 2.10.

2.3 Power Supply Troubleshooting

The power supply controls many functions and components. To determine if the power supply is functioning properly, start with Procedure 1 and continue with 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 using the Battery and the DC IN icons as shown in the following tables.

Table 2-1 Battery icon

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

[*1] AutoResume Off will be executed soon.

[*2] AutoResume Off has already been executed.

Table 2-2 DC IN icon

DC IN icon	Power supply status
Lights green	DC power is being supplied from the AC adapter, or Desk Station V Plus.
Blinks green	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 flashes yellow, 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 yellow or green, go to Procedure 4.

Procedure 2   Error Code Check

If the microprocessor detects a malfunction, the DC IN icon blinks yellow. 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 a half second
    Interval between data bits   Off for a half second

An error code begins with the least significant digit.

Example: Error code 12h (error codes are displayed in a hexadecimal format.)
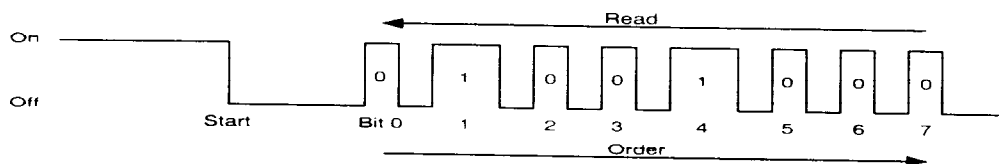
Check 1   Convert the DC IN icon blink pattern into the hexadecimal error code and compare it to the following tables.

❑ DC power supplied through AC adapter or Desk Station V Plus

Error code	Meaning
01h	AC Adapter output is over the maximum allowed limit.
02h	Desk Station V Plus output is over the maximum allowed limit.
04h	Current from the DC power supply is over the maximum allowed limit.
05h	Current from the DC power supply is over the maximum allowed limit when there is no load.

❑ Battery pack

Error code	Meaning
10h	Battery voltage is over the maximum allowed limit.
11h	Battery charge current is over the maximum allowed limit.
12h	Battery discharge current is over the maximum allowed limit when there is no load.
13h	Battery charge current is over the maximum allowed limit.

❑ B5V, VCC power supply output

Error code	Meaning
20h	B5V voltage is over the maximum allowed limit.
21h	B5V voltage is below the minimum allowed limit.
22h	B5V or VCC does not start up when the power supply is turned on.
23h	VCC voltage is below the minimum allowed limit.
24h	During suspend, B5V voltage is below the minimum allowed limit.

❑ B3V output

Error code	Meaning
30h	B3V voltage is over the maximum allowed limit.
31h	B3V voltage is below the minimum allowed limit.
32h	B3V does not start when the power supply is turned on.
33h	B3V is below the minimum allowed limit during suspend.

❏ B12V Output

Error code	Meaning
40h	B12V voltage is over the maximum allowed limit.
41h	B12V voltage is below the minimum allowed limit.
42h	B12V does not start when the power supply is turned on.
43h	B12V is below the minimum allowed limit during suspend.

❏ Power supply microcontroller

Error code	Meaning
50h	Firmware or program error.

❏ Environmental condition

Error code	Meaning
80h	CPU temperature is outside the allowable range.
88h	The CPU overheats, the system enters resume mode and automatically shuts down.

Check 2   If error code 01h displays:

❏ Make sure the AC adapter and AC power cord are firmly plugged into the DC IN 15 V socket and wall outlet. If these cables are connected correctly, go to the following step:

❏ Connect a new AC adapter. If the error still exists, go to Procedure 5.

Check 3   In error code 02h displays:

❏ Make sure the Desk Station V Plus is firmly connected to the computer's docking interface port. If this port is connected correctly, go to the following step:

❏ Visually check the connector to make sure that no pins are bent. If a pin(s) is bent, go to *Chapter 4*, *Replacement Procedures*. If the connector is not physically damaged, go to the following step:

❏ Check the Desk Station V Plus for malfunctions. Refer to the *Desk Station V Plus* maintenance manual for details. If the error still exists, go to Procedure 5.

Check 4   In error code 10h displays:

    ❑ 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 5   When 80h is displayed, it indicates that the CPU temperature is outside the allowable operating range. Perform the following steps:

    ❑ Leave the computer in an area that is room temperature until the CPU's internal temperature is within the allowable operating range.

    ❑ If the error still exists, go to Procedure 5.

Check 6   When 88h is displayed, it indicates that the CPU temperature is too high. In this case, the computer automatically enters resume mode and shuts down.

    ❑ Leave the computer off until the DC IN icon stops blinking. It is recommended that you leave the computer off until its interior reaches room temperature even though the DC IN icon stops blinking.

    ❑ If the error still exists, go to Procedure 5.

Check 7   For any other error, go to Procedure 5.

Procedure 3   Connection Check

The power supply wiring diagram is shown below:
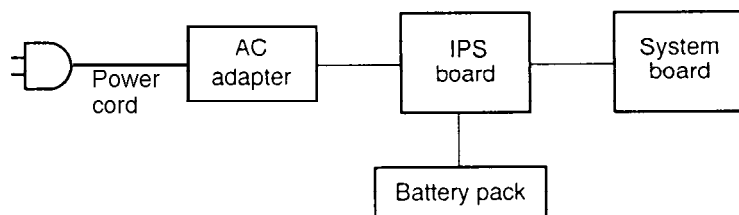
Any of the connectors may be disconnected. Perform Check 1.

Check 1   Make sure the AC adapter's cable and AC power cord are firmly plugged into the DC IN 15 V socket and wall outlet. If these cables are connected correctly, go to Check 2.

Check 2   Connect a new AC adapter.

      ❑   If the DC IN icon does not glow green, go to Procedure 5.

      ❑   If the Battery icon does not glow orange, go to Check 3.

Check 3   Make sure the battery pack is installed correctly in the computer. If the battery is properly installed, and the Battery icon still does not glow orange, go to Procedure 4.

Procedure 4   Quick Charge Check

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

1.   Reinstall the battery pack.

2.   Attach the AC adapter and turn on the power. If the power does not come on, go to Procedure 5.

3.   Run the Diagnostic test and execute subtest 06 (Quick Charge) from the System test as described in Chapter 3.

4.   When the quick charge is complete, the diagnostics test displays the result code. Check the result against the following table and perform any necessary check(s).

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	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 problem.	Check 5

Check 1   Make sure the AC adapter's cable and AC power cord are firmly plugged into the DC IN socket and 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 it is, replace it with a new battery.

Check 3   The battery pack is completely discharged. Wait a few minutes to charge it. If the battery pack still isn't charged, replace it with a new one.

Check 4   The battery's temperature is hot or cold. Return the battery to a normal operating condition. If the battery pack still doesn't charge, replace it with a new one.

Check 5   Go to Procedure 5.

Procedure 5   Replacement Check

The power supply board or system board may be disconnected or damaged. Disassemble the computer following the steps described in *Chapter 4*, *Replacement Procedures*, and check the connections between the power supply board and system board. If the boards are properly connected, perform the following check(s):

Check 1   Replace the power supply board with a new one. If the power supply is still not functioning properly, perform Check 2.

Check 2   Replace the system board with a new one.

2.4 System Board/PCB Troubleshooting

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

> 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 3.

Check 1 If any one of the following error messages display, 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, the TSETUP screen appears allowing you 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 is displayed, 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, press any key (as the message instructs).

> WARNING: RESUME FAILURE.
> PRESS ANY KEY TO CONTINUE.

This 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.

If any other message appears, perform Check 3.

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

❑ If any of the following error messages display, replace the system board: (1) through (17), (24) or (25).

❑ 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.
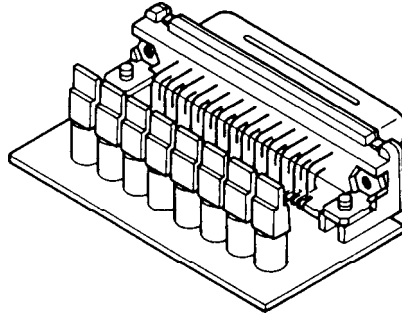
Figure 2-2 Printer port LED

To use the printer port LED:

1.   Plug the printer port LED into the computer's parallel port.

2.   Hold down the space bar and turn on the computer.

3.   Read the icon 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 icon status is FFh (normal status), go to Procedure 3.

6.   If the final icon 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 case, the IRT indicates an error has been detected during the system memory test.*

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

LED status	Test item	Message
01H	Special register initialization	
02H	PIT test	PIT ERROR
	PIT initialization	—
	PIT function check	MEMORY REFRESH ERROR TIMER CH.2 OUT ERROR
03H	CMOS check	CMOS CHECKSUM ERROR CMOS BAD BATTERY ERROR
04H	Initialization of memory configuration	—
05H	SM-RAM check	—
06H	ROM/RAM copy	
07H	Selftest skip check	—
08H	Initialization of internal VGA	—
09A	System check	—
0AH	First 64 KB memory test	FIRST 64KB MEMORY ERROR FIRST 64KB MEMORY PARITY ERROR
0BH	System memory initialization	—
0CH	System initialization	—
0DH	Interrupt vector initialization	—
18H	PIC initialization	—
1FH	Display initialization	VRAM ERROR
25H	System memory test	SYSTEM MEMORY ERROR SYSTEM MEMORY PARITY ERROR
30H	Extended memory test	EXTENDED MEMORY ERROR EXTENDED MEMORY PARITY ERROR
40H	DMA page register test	DMA PAGE REGISTER ERROR
41H	DMAC test	DMAC #X ERROR
42H	DMAC initialization	—
4AH	PIC test	PIC #X ERROR
50H	Mouse initialization	—
55H	KBC initialization	KBC ERROR
5AH	Boot password	—

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

LED status	Test item	Message
60H	HDD initialization	HDC ERROR/HDD #0 ERROR
65H	FDD initialization	FDC ERROR/NO FDD ERROR
70H	Printer initialization	—
80H	SIO initialization	—
90H	Timer initialization	RTC UPDATE ERROR TIMER INTERRUPT ERROR
A0H	NDP initialization	
C0H	Password check	—
A6H	Initialization of expansion ROM	—
FEH	Setup boot check	*** Bad xxxx xxxx *** Check system. Then press [F1] key.
FFH	Boot load	—

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

> 00h, 01h, 02h, 03h, 04h, 05h, 06h, 07h, 08h, 09h, 0Ah, 0Bh, 0Ch, 0Dh, 18h, 1Fh, 25h, 30h, 40h, 41h, 42h, 4Ah, 55h, 65h, 70h, 80h, 90h, A0h, A6h, C0h, FEh

Check 2   If error code 50h displays, go to the Keyboard Troubleshooting procedures in Section 2.7.

Check 3   If error code 5Ah displays, go to the HDD Troubleshooting Procedures in Section 2.6.

Check 4   If error code 60h displays, go to the FDD Troubleshooting Procedures in Section 2.5.

Procedure 3   Printer Port LED Check on Resume Mode

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

To use the printer port LED:

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.

4. Read the icon 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 icon status is FFh (normal status), go to Procedure 4.

7. If the final icon status matches any of the test status values in Table 2-4, perform Procedure 5.

Table 2-4 Printer port LED resume mode error status

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

Procedure 4   Diagnostic Test Program Execution Check

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

1. System test
2. Memory test
3. Printer test
4. ASYNC test
5. Real Timer test
6. NDP test
7. Expansion test
8. Sound test
9. Modem test

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

Procedure 5   Replacement Check

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

❑ If the *Real Timer diagnostic test* detects an error, go to Check 1.

❑ If the *Sound diagnostic test* detects an error, go to Check 2.

❑ If the *Modem diagnostic test* detects an error, go to Check 4.

❑ If the *System, Memory, Printer, Expansion, or Async diagnostic tests* detect an error, go to Check 6.

Check 1   Replace the IPS board with a new one. If the problem still exists, go to Check 6.

Check 2   Replace the jack board with a new one. If the problem still exists, go to Check 3.

Check 3   Replace the flexible cable with a new one. If the problem still exists, go to Check 6.

Check 4   Replace the DAA board with a new one. If the problem still exists, go to Check 5.

Check 5   Replace the modem board with a new one. If the problem still exists, go to Check 6.

Check 6   Replace the system board with a new one.

> *NOTE: Refer to Chapter 4 for instructions on how to remove and replace each of the above items.*

2.5 Floppy Disk Drive Troubleshooting

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

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

Cleaning the FDD head is an option available in the Diagnostic Program. Detailed procedures for perfoming this check are provided 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. If the test program cannot be run, go to Procedure 3.

Once the diagnostic test has been run, clean the FDD heads using the cleaning kit. If the FDD does still not function properly after cleaning, go to Procedure 3.

Procedure 2 Diagnostic Test Program Execution Check

Insert the Diagnostics disk in the FDD, turn on the computer, and run the test. For detailed diagnostics test procedures, refer to *Chapter 3*, *Tests and Diagnostics*.

Floppy disk drive test error codes and their status names are shown in Table 2-5. Make sure that the floppy disk in the FDD 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 (1/2)

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

Table 2-5 FDD error code and status (2/2)

Code	Status
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 displays, 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

There are two ways to connect the FDD: through the Selectable Bay and through the external FDD port. If the FDD is installed in the Selectable Bay, begin with Check 1. If the FDD is connected to the external FDD port, begin with Check 3.

Check 1   Make sure the Selectable Bay cable is firmly connected to the FDD module and system board.
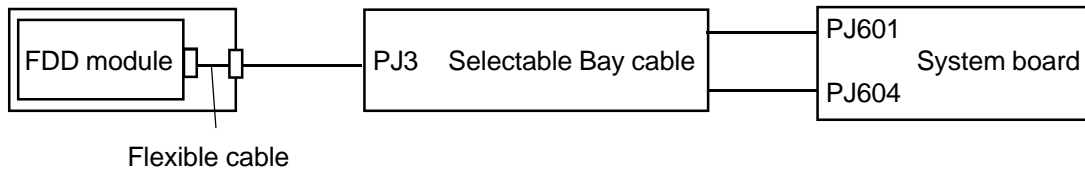
If any of the connections are loose, reconnect them firmly and repeat Procedure 2. If there is still an error, go to Check 2.

Check 2   The Selectable Bay cable may be defective or damaged. Replace the cable. If the FDD is still not functioning properly, perform Check 4.

Check 3   Make sure the FDD cable is firmly connected to the external FDD port.
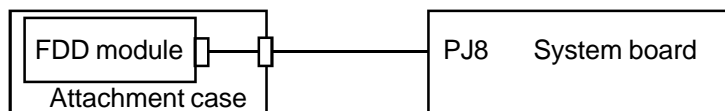
If this cable is disconnected, connect it to the system unit and repeat Procedure 2. If the FDD is still not functioning properly, perform Check 4.

Check 4   The flexible cable may be defective or damaged. Replace the FDD cable with a
            new one following the steps outlined in *Chapter 4*, *Replacement Procedures*. If
            the FDD is still not functioning properly, perform Check 5.

Check 5   The FDD may be defective or damaged. Replace the FDD with a new one fol-
            lowing the steps outlined in *Chapter 4*, *Replacement Procedures*. If the FDD is
            still not functioning properly, perform Check 6.

Check 6   Replace the system board with a new one following the steps outlined in *Chapter
            4*, *Replacement Procedures*.

2.6   Hard Disk Drive Troubleshooting

To determine if the hard disk drive is functioning properly, perform the following procedures starting with Procedure 1. Continue with the other procedures as instructed.

Procedure 1:   Partition Check

Procedure 2:   Message Check

Procedure 3:   Format Check

Procedure 4:   Diagnostic Test Program Execution Check

NOTES: The contents of the hard disk will be erased when the HDD troubleshooting procedures are executed. Transfer the contents of the hard disk to an appropriate backup system (i.e., floppy disks, tape, etc).

If the customer has not or cannot perform the backup, create backup disks as described below.

If MS-DOS 6.22 and Windows for Workgroups is selected, use the Master Diskette Creator (MDC) utility in the Toshiba Utility folder to back up the preinstalled software. After backing up the preinstalled software, use the BACKUP command in the Toshiba Companion Utility to back up the entire disk, including the user's files.

If Windows 95 is selected, use the Microsoft Create System Disks Tools (MSCSD.EXE) located in the System Tools folder to back up the preinstalled software, (this tool can only be used once, and if previously used, will not exist in the folder), then use the Backup utility to back up the entire disk, including the user's files.

Refer to the appropriate instructions for each operating system to execute the backup procedure.

Procedure 1   Partition Check

Insert the Toshiba MS-DOS system disk into the disk drive, turn on the computer, then 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 Procedure 2.

Check 2   Type **FDISK** and press **Enter**. Choose the Display Partition Information option from the FDISK menu. If the C drive is listed, go to Check 3. If the C drive is not listed, return to the FDISK menu, choose the option to create a DOS partition on drive C, then recheck the system. If the problem still exists, go to Procedure 2.

Check 3   If the C drive is listed as active in the FDISK menu, go to Check 4. If the C drive is not listed as active, return to the FDISK menu, choose the option to set the active partition for drive C, then recheck the system. If the problem still exists, go to Procedure 2.

Check 4   Remove the system disk from the FDD and cold boot the computer. If the problem still exists, go to Procedure 2. Otherwise, the HDD is operating normally.

Procedure 2   Message Check

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

Check 1   If any of the following messages display, perform Check 5. If they 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 display, perform Check 3. If they do not appear, perform Check 5.

```
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 so, choose another setting and repeat Check 1. If Not Used has not been selected, go to Check 4.

Check 4   Using the Toshiba MS-DOS system disk, install a system program on the hard disk using the SYS command.

If the following message appears on the display, the system program has been transferred to the HDD:

```
System transferred
```

Restart the computer. If the error message still appears, perform Check 5.

Check 5   The HDD is connected to the flexible cable and the system board. The flexible cable can become disconnected or damaged. Disassemble the computer as described in *Chapter 4*, *Replacement Procedures*. If the HDD is not firmly connected, connect it to the flexible cable and return to Procedure 1. If the HDD is firmly connected to the system board, perform Check 6.
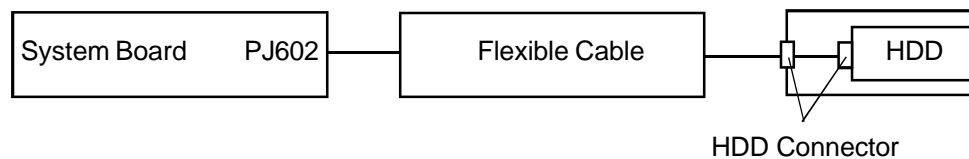
HDD Connector

Check 6   The HDD connector may be defective or damaged. Replace the HDD connector with a new one following the steps outlined in *Chapter 4*, *Replacement Procedures*. If the HDD is still not functioning properly, perform Procedure 3.

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   Using the Toshiba MS-DOS system disk, partition the hard disk using the FDISK command. Format the hard disk using **FORMAT C:/S/U** to transfer the system program to the HDD. If the following message appears on the display, the HDD is formatted.

```
Format complete
```

If any other 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: "Format Complete".

Partition and format the HDD using the MS-DOS FORMAT command.   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 be displayed. In this case, perform Check 1. Error codes and their status are described in Table 2-6. If an error code is not generated, the HDD is operating properly.

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 initialize
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
FFh	Data compare error

Check 1   Replace the HDD unit with a new one following the instructions outlined in
           Chapter 4, Replacement Procedures. If the HDD is still not functioning prop-
           erly, perform Check 2.

Check 2   Replace the flexible cable with a new one following the instructions outlined in
           Chapter 4, Replacement Procedures. If the HDD is still not functioning properly,
           perform Check 3.

Check 3   Replace the system board with a new one following the instructions outlined in
           Chapter 4, Replacement Procedures.

2.7　Keyboard Troubleshooting

To determine if the computer's keyboard is functioning properly, perform the following procedures starting with Procedure 1. 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*, *Tests 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.

Procedure 2　Connector and Replacement Check

The keyboard is connected to the IPS board by a flat cable, and the IPS board is connected to the system board. This cable or connector may be disconnected or damaged. Disassemble the computer as described in *Chapter 4*, *Replacement Procedures*, and perform the following checks:

Check 1　Make sure the keyboard cable is not damaged and is connected to the IPS board.

```
 ┌──────────────┐     ┌──────────────────────────┐      ┌──────────────────────┐
 │              │     │PJ702                     │      │                      │
 │   Keyboard   │─────│      IPS board   PJ700   │──────│ PJ600  System board  │
 │              │─────│PJ701                     │      │                      │
 └──────────────┘     └──────────────────────────┘      └──────────────────────┘
```
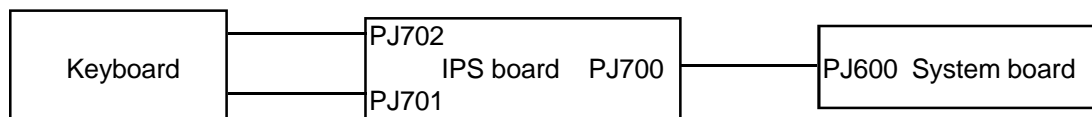
> If this cable is damaged, replace the keyboard with a new one. If the cable is disconnected, connect it firmly. Perform Procedure 1 again. If the keyboard is still not functioning properly, perform Check 2.

Check 2　The IPS board may be damaged. Replace the IPS board with a new one. Refer to *Chapter 4*, *Replacement Procedures* for more information. If the keyboard is still not functioning properly, perform Check 3.

Check 3　The keyboard controller on the system board may be damaged. Replace the system board with a new one. Refer to *Chapter 4*, *Replacement Procedures* for more information.

2.8 Display Troubleshooting

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

> Procedure 1: External Monitor Check
>
> Procedure 2: Diagnostic Test Program Execution Check
>
> Procedure 3: Connector Check
>
> Procedure 4: Replacement Check

Procedure 1 External Monitor Check

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

❑ If the external monitor works correctly, the internal LCD display may be damaged. Go to Procedure 3.

❑ If the external monitor appears to have the same problem as the internal LCD, the display controller may be damaged. Go to Procedure 2.

Procedure 2 Diagnostic Test Program Execution Check

The Display Test program is stored on the computer's Diagnostic Disk. This program checks the display controller on the system board. Insert the Diagnostics disk into 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 3. If an error is not detected, the display is functioning properly.

Procedure 3 Connector Check

The Display unit has an LCD module, FL, display switch, and FL inverter board. The FL and FL inverter board are connected by two cables, and the LCD module and system board are connected by one signal cable as shown in Figure 2-3. Any of these cables may be disconnected.

Disassemble the display unit and check the cable connections shown in Figure 2-3. Refer to *Chapter 4*, *Replacement Procedures*, for more information about how to disassemble the computer.
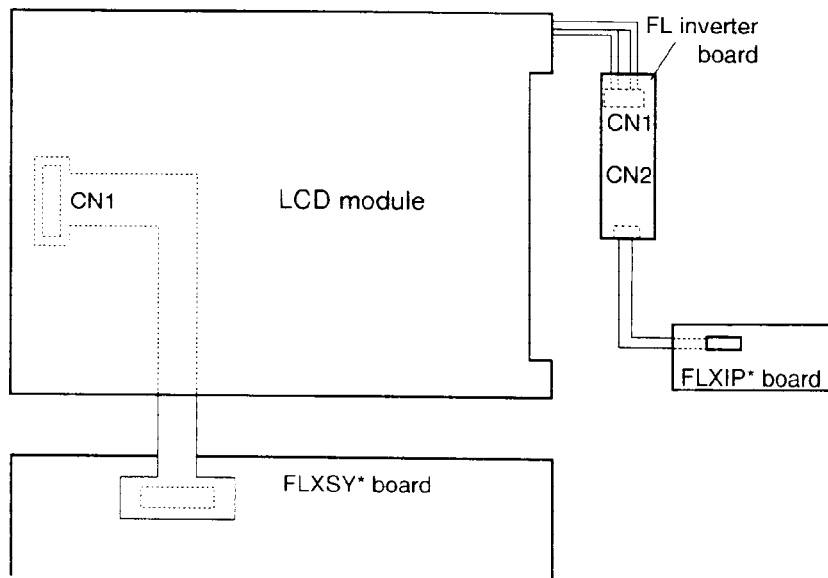
Figure 2-3 Display connection

If any of the cables are not connected, reconnect it firmly and repeat Procedures 1 and 2. If the problem still exists, perform Procedure 4.

Procedure 4   Replacement Check

The FL, FL inverter board, LCD module, 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 1.

❑ 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 Check 4.

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

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

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

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

Check 5   Replace the display cable with a new one and test the display again. If the
           problem still exists, perform Check 6.

Check 6   The system board may be damaged. Replace the system board with a new one.

2.9 CD-ROM Drive Troubleshooting

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

        Procedure 1:   CD Cleaning Check

        Procedure 2:   Diagnostic Test Program Execution Check

        Procedure 3:   Connector Check and Replacement Check

Procedure 1　　CD Cleaning Check

1. Turn off the power.

2. Open the CD drawer by inserting a slender object, such as a straightened paper clip, into the eject hole. The object must be long enough to activate the eject mechanism.

3. Clean the laser pickup lens with a lens cleaner. Apply the cleaner to a cloth and wipe the lens.

4. If the CD-ROM drive still does not function properly after cleaning, go to Procedure 2.

Procedure 2　　Diagnostic Test Program Execution Check

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

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

Procedure 3　　Connector Check and Replacement Check

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

Check 1   Make sure the Selectable Bay cable is connected firmly to the CD-ROM drive and the system board.
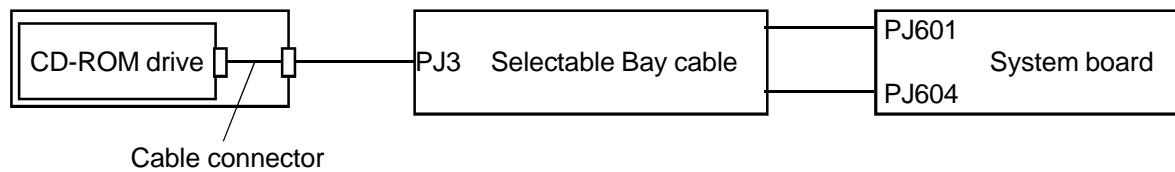
```
┌─────────────────────┐                    ┌─────────────────────────┐          ┌──────────────────────────┐
│ ┌─────────────────┐ │                    │                         │          │ PJ601                    │
│ │ CD-ROM drive    │▯┤▯───────────────── PJ3    Selectable Bay cable │══════════│         System board     │
│ └─────────────────┘ │                    │                         │          │ PJ604                    │
└─────────────────────┘                    └─────────────────────────┘          └──────────────────────────┘
                   Cable connector
```

Cable connector

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

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

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

Check 4   The CD-ROM drive may be defective or damaged. Replace the CD-ROM drive with a new one following the steps outlined in Chapter 4. If the CD-ROM drive is still not functioning properly, perform Check 5.

Check 5   Replace the system board with a new one following the steps outlined in Chapter 4.

2.10 Internal Modem Troubleshooting

This section describes how to determine if the computer's internal modem is functioning properly. Perform the steps below starting with Procedure 1, continuing with the other procedures as required.

> Procedure 1: Diagnostic Test Program Execution Check
>
> Procedure 2: Connector Check and Replacement Check

Procedure 1   Diagnostic Test Program Execution Check

The internal modem Diagnostic Test program is stored on the computer's Diagnostic Disk. This program checks the internal modem. Insert the Diagnostics disk into the computer's floppy disk drive, turn on the computer and run the test. Refer to *Chapter 3*, *Tests and Diagnostics*, for details.

Check 1   Execute Modem Test 1. If an error occurs, the modem I/F board may be malfunctioning. Replace the I/F board. If errors still occur, go to Check 2.

Check 2   Execute Modem Test 3. If an error occurs, the DAA module may be malfunctioning. Replace the DAA module. If errors still occur, go to Check 3.

Check 3   Execute Modem Test 2. If an error occurs, the I/F board and DAA module may be malfunctioning. Replace both.

If any other errors occur while executing the internal modem diagnostics tests, go to Procedure 2.

Procedure 2   Connector Check and Replacement Check

The DAA board is connected to the modem I/F board. If the modem malfunctions, there may be a bad connection between the DAA board and the modem I/F board, or between the modem I/F board and the system board. The DAA module, modem I/F board or system board might also be damaged.

Disassemble the computer following the steps described in *Chapter 4*, *Replacement Procedures* and perform the following checks:

Check 1   Make sure DAA board PJ1 is connected firmly to the modem I/F board PJ1 and that the modem I/F board PJ2 is connected firmly to the system board PJ605.

| DAA board   PJ1 |—| PJ1   Modem I/F board   PJ2 |—| PJ605   System board |
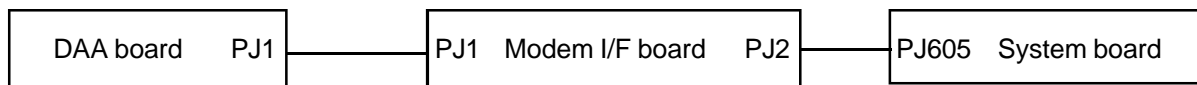
If a connector is disconnected, connect it to the system unit and repeat Procedure 2. If the DAA board is still not functioning properly, perform Check 2.

Check 2   The DAA board may be defective or damaged. Replace the DAA board with a new one following the steps outlined in Chapter 4. If the DAA board is still not functioning properly, perform Check 3.

Check 3   Replace the modem I/F board with a new one following the steps outlined in Chapter 4. If the DAA board is still not functioning properly, perform Check 4.

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

3.1 The Diagnostic Test

This chapter explains how to use the Diagnostic Test program which is used to test the functions of the computer's hardware modules. The Diagnostics Program is stored on the Diagnostic Disk and consists of 23 programs grouped into the Service Program Module (DIAGNOSTICS menu) and the Test Program Module (DIAGNOSTIC TEST menu).

> *NOTES: The Diagnostic Test programs for the computer, the Enhanced Port Replicator II, and the Desk Station V Plus are different. Be sure to use the correct test program for each device.*
>
> *Before starting the diagnostics tests:*
>
> *1.   Check all cables for loose connections.*
>
> *2.   Exit any open application(s) and close Windows.*

The DIAGNOSTIC menu consists of the following options:

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

The DIAGNOSTICS TEST option contains the following functional tests:

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

The following equipment is required 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)
❑ An external FDD attachment
❑ 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)
❑ A printer wraparound connector for the printer wraparound test (printer test)
❑ An RS-232-C wraparound connector for the RS-232-C port wraparound test (ASYNC test)
❑ A CD test media (Toshiba-EMI test disk TDY-03, and music CD for the CD-ROM test)
❑ External CRT (all tests)
❑ PS/2 or compatible keyboard (all tests)
❑ PS/2 or compatible mouse (keyboard test)
❑ Serial port wraparound connector (ASYNC test)
❑ Multimedia sound system with line-in and line-out ports (sound test)
❑ Headphone (sound test)
❑ CD-ROM drive (CD-ROM test)
❑ A telephone
❑ A microphone
❑ A modular cable
❑ An external speaker(s)

The following sections detail the tests contained within the Diagnostic Test function of the DIAGNOSTICS menu. Refer to Sections 3.18 through 3.26 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 program
follow the steps listed below:

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

> *NOTE: To execute the CD-ROM test, make sure the CD-ROM and CD-ROM
> drive are installed in the computer and that the external FDD is attached to
> the FDD port.*

The following menu will display:

```
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 **Ctrl** +
> **C** to stop the program.*

2. To select the DIAGNOSTIC TEST menu from the DIAGNOSTICS menu, set the
    highlight bar to **1** and press **Enter**.

The following menu will display:

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

                 1 - SYSTEM TEST
                 2 - MEMORY TEST
                 3 - KEYBOARD TEST
                 4 - DISPLAY TEST
                 5 - FLOPPY DISK TEST
                 6 - PRINTER TEST
                 7 - ASYNC TEST
                 8 - HARD DISK TEST
                 9 - REAL TIMER TEST
                10 - NDP TEST
                11 - EXPANSION TEST
                12 - SOUND TEST
                13 - CD-ROM TEST
                14 - MODEM 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 3.17 for detailed descriptions of Diagnostic Tests 1 through 14. Function 88 sets the floppy disk drive and hard disk drive error retry count. Function 99 exits the submenus of the Diagnostic Test and returns to the Diagnostic menu.

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

```
    SYSTEM TEST     XXXXXXX
                                ┌──────────────────────────┐
                                │ xxx DIAGNOSTIC TEST VX.XX │
                                │ [Ctrl]+[Break] ; test end │
                                │ [Ctrl]+[C]     ; key stop │
                                └──────────────────────────┘

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

    SUB-TEST MENU :

    01 - ROM checksum
    02 -
    03 -
    04 - Fan ON/OFF
    05 - Thermistor check
    06 - Quick charge
    99 - Exit to DIAGNOSTIC TEST MENU

                                        ↑↓ →← : Select items
                                        Enter  : 1Specify
                                        Esc    : Exit
```

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

4. Select the desired subtest from the subtest menu and press **Enter**. The following messages will display:

```
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 it is halted by the user. Selecting **NO** returns the screen 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:

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

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

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 3.18 lists the error codes and error status for each error.

3.3 Subtest Names

The following table 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 Item
1	SYSTEM	01	ROM checksum
		04	Fan ON/OFF
		05	Thermistor check
		06	Quick charge
2	MEMORY	01	Constant data
		02	Address pattern data
		03	Refresh
		04	Protected mode
		05	Memory module
		06	Cache memory
		07	L2 Cache/TAG memory
3	KEYBOARD	01	Pressed key display
		02	Pressed key code display
		03	PS/2 Mouse connect check
		04	Pointing stick
4	DISPLAY	01	VRAM read/write for VGA
		02	Gradation for VGA
		03	Gradation for LCD
		04	Gradation & Mode test for VGA
		05	All dot on/off for LCD
		06	"H" pattern display
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 Item
7	ASYNC	01	Wraparound (board)
		02	Point to point (send)
		03	Point to point (receive)
		04	Interrupt test
		05	SIR wraparound test
		06	SIR point to point (send)
		07	SIR point to point (receive)
8	HDD	01	Sequential read
		02	Address uniqueness
		03	Random address/data
		04	Cross talk & peak shift
		05	Write/read/compare (CE)
		06	Write specified address
		07	Read specified address
		08	ECC circuit
		09	Sequential write
		10	W-R-C specified address
9	REAL TIMER	01	Real time
		02	Backup memory
		03	Real time carry
10	NDP	01	NDP test
11	EXPANSION	01	PCMCIA wraparound
		02	DS bus wraparound (Not used)
		03	RGB monitor ID (Not used)
		04	Joystick (Not used)
		05	Joystick wraparound (Not used)
12	SOUND	01	CODEC (Recording/Playback)
		02	FM-Synthesizer
		03	SIN-Wave Playback
		04	CODEC (Line In/Out)
13	CD-ROM	01	Sequential read
		02	Read specified address
		03	Random address/data
		04	Playback Music
14	MODEM	01	Modem

3.4 System Test

To execute the System Test, select **1** from the DIAGNOSTIC TEST menu, press **Enter** and follow the directions as they are displayed 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 02   Not used

Subtest 03   Not used

Subtest 04   Fan on/off

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

The fan cable is securely connected to PJ16 on the system board. When you execute this subtest, the following message displays:

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

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

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

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

Subtest 05   Thermistor check

This subtest reads the thermistor connect check status of the power supply microprocessor, then compares it with its 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 Chapter 2 for a list of result codes.

3.5   Memory Test

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

Subtest 01   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, and 0000h.

Subtest 02   Address pattern data (real mode)

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

Subtest 03   Refresh (real mode)

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

The constant data is AAAAh and 5555h.

> *NOTE: There may be 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, 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 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 8 MB, 16 MB, 32 MB, 64 MB and 128 MB.

After selecting Subtest 05, the following message displays:

```
Extended memory size
          (1:8 MB,2:16 MB,3:32 MB,4:64 MB,5:128 MB)?
```

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

Subtest 06   Cache memory

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

> Number of misses $<$ Number of hits $\rightarrow$ OK
> Number of misses $\geq$ Number of hits $\rightarrow$ Fail

Subtest 07   L2 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 L2 cache memory. One test takes three seconds.

> Number of misses $<$ Number of hits $\rightarrow$ OK
> Number of misses $\geq$ Number of hits $\rightarrow$ Fail

3.6   Keyboard Test

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

Subtest 01   Pressed key display (82/84)

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

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

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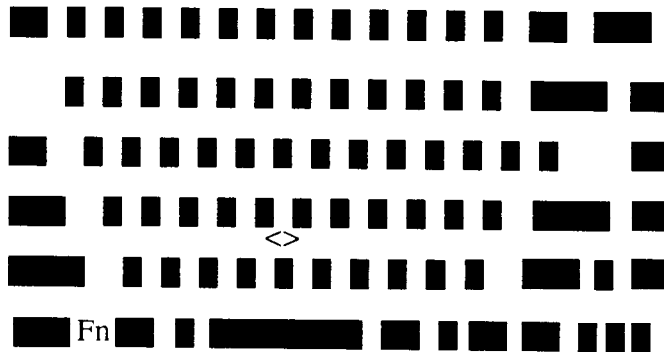
```
        If test OK, Press [Del] [Enter] Key
```

Subtest 02   Pressed key code display

When a key is pressed, the scan code, character code, and key top name are displayed on the screen in the format shown below.

The **Ins**, **Caps Lock**, **Num Lock**, **Scroll Lock**, **Alt**, **Ctrl**, **Left Shift**, and **Right Shift** keys are displayed in reverse video when pressed. The scan codes, character codes, and key top names are listed in Appendix D.

```
          KEYBOARD TEST  IN PROGRESS  302000

                  Scan code  =
                  Character code =
                  Keytop   =

      Ins Lock 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.*

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 displays:

```
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 by displaying the location parameters. 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. Also, the parameters appear on the right side of the display. If two IPS switches are pressed at the same time, the subtest menu is displayed.

```
*****  IPS TEST PROGRAM (V1.00)  *****
```
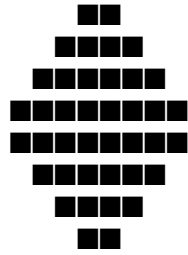
```
      < POINTING >          < PARAMETER >
                            STATUS:0008h
                            X-RATE:0000h
                            Y-RATE:0000h

                               < BUTTON >

                            (1)              (2)
```

<< PRESS BUTTON1 + BUTTON2 THEN END >>

There are eight directions of arrow
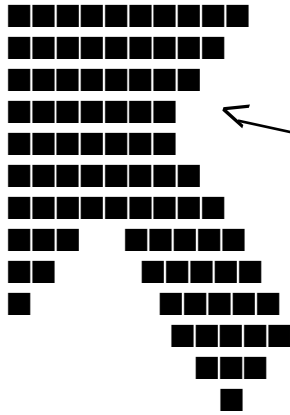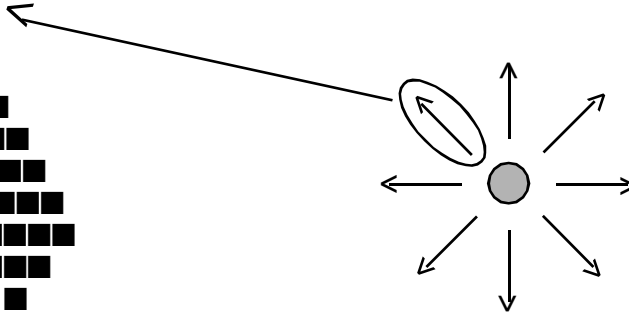marks as shown below.

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

3.7   Display Test

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

Subtest 01   VRAM Read/Write

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

Subtest 02   Gradation for VGA

This subtest displays four colors: red, green, blue and white, from left to right across the screen, from black to maximum brightness. The display below appears on the screen when this subtest is executed.
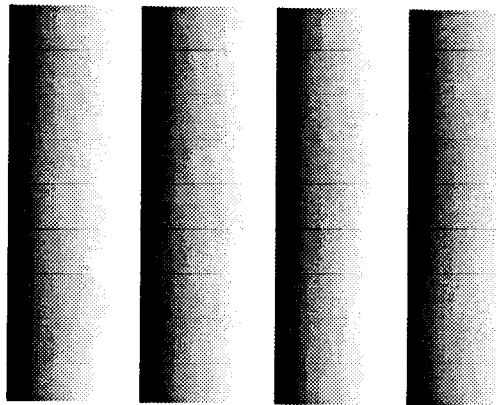
To exit this subtest and return to the DISPLAY TEST menu, press **Ctrl** + **Break**.

Subtest 03   Gradation for LCD

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

Subtest 04   Gradation & Mode test for VGA

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

Resolution	Mode
800 x 600	3, 12, 13, 43, 52
1024 x 768	3, 12, 13, 45

The display below appears on the screen when this subtest is executed.
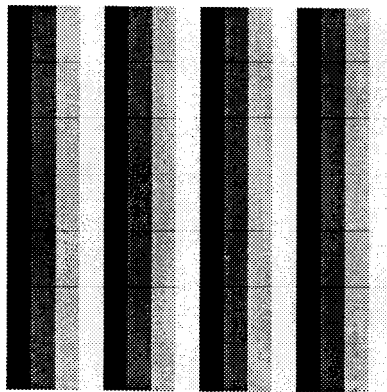
[Mode 12]

Pressing **Enter** changes the size of the displayed image.
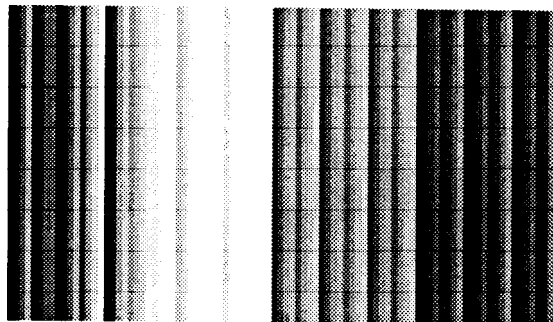
[Mode 13]

Pressing **Enter** changes the size of the displayed image.
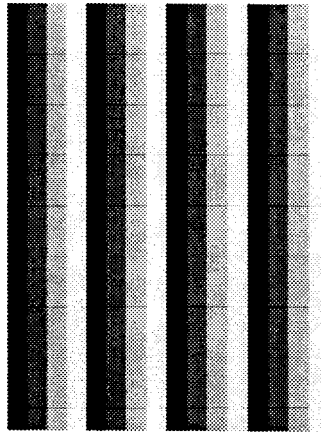
{ Mode 3 }

Pressing **Enter** changes the size of the displayed image.
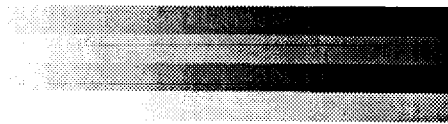
To exit this subtest and return to the DISPLAY TEST menu, press **Ctrl** + **Break.**

Subtest 05   All dot on /off for LCD

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

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

Subtest 06   "H" pattern display

This subtest displays a full screen of "H" patterns.

```
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
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HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
```

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

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 as they are displayed on the screen. The Floppy Disk Test contains five subtests that test the FDD.

The following messages display after selecting the Floppy Disk Test. 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 for the floppy disk 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**. Pressing **Enter** without first specifying a track sets the start track to zero.

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

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

```
FLOPPY DISK              XXXXXXX
```

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

Subtest 01   Sequential Read

This subtest performs a Cyclic Redundancy Check (CRC) that continuously reads all the tracks on the 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 as they are displayed on the screen. The Printer Test contains three subtests that test the output of the printer connected to the computer.

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

The following message will appear when the Printer Test is selected:

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

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

Subtest 01   Ripple Pattern

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

```
!"#$%&'()*+,-./0123456789:;<=>?@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

The 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 printer wraparound connector must be connected to the computer's printer port. The printer wraparound connector (34M741986G01) wiring diagram is shown in Appendix F.*

This subtest checks the output and bidirectional modes of the data control and status lines through the printer wraparound connector.

3.10 Async Test

To execute the Async Test, select **7** from the DIAGNOSTIC TEST menu, press **Enter** and follow the directions as they are displayed 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:	9600 BPS (Subtests 01 to 04)
	38400 BPS (Subtests 05 to 07)
Data:	8 bits and one parity bit (EVEN)
Data pattern:	20h to 7Eh

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

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

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

Subtest 01   Wraparound (board)

> **NOTE**: *To execute this subtest, an RS-232-C wraparound connector (34M741621G01) must be connected to the RS-232-C port. The RS-232-C wraparound connector wiring diagram is shown 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, used with Subtest 02 described above, 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 05   SIR Wrap around test

NOTE: Before conducting Subtests 05 to 07, you must execute SIRDRV.COM to enable the infrared communication port.

This subtest checks the data send/receive function through the SIR port.

Subtest 06   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   SIR point to point (Receive)

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

3.11 Hard Disk Test

To execute the Hard Disk Test, select **8** from the DIAGNOSTIC TEST menu, press **Enter** and follow the directions as they are displayed on the screen. The Hard Disk Test contains 10 subtests that test the functions of the hard disk drive.

> *NOTES*: *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, transfer the contents of the hard disk to floppy disk(s).*
>
> 1. *If MS-DOS 6.22 and Windows for Workgroups is selected, use the Master Diskette Creator (MDC) utility located in the Toshiba Utility folder to back up the preinstalled software. Now use the BACKUP command from the Toshiba Companion Utility to back up the entire disk, including the user's files.*
>
> 2. *If Windows 95 is selected, use the Microsoft Create System Disks Tools (MSCSD.EXE) located in the System Tools folder to back up the preinstalled software (this tool can only be used once and may not exist if it has previously been used.) Now use the Backup utility located in the System Tools folder to back up the entire disk, including the user's files*
>
> *For more information, refer to the appropriate instructions for each operating system.*

The following messages display after selecting the Hard Disk Test. Answer each one with an appropriate response to execute the test:

1. When you select the Hard Disk Test from the DIAGNOSTIC TEST menu, the following message displays:

    ```
    Test drive number select (1:HDD#1,2:HDD#2,0:HDD1&2) ?
    ```

2. Select the hard disk drive number to be tested and press **Enter**. The following message displays:

    ```
    HDC F/W error retry  (1:yes,2:no) ?
    ```

    This message is used to select the retry operation when the hard disk controller detects an error.

3. Select **1** or **2** and press **Enter**. The following message displays:

    ```
    Data compare error dump (1:no,2:yes) ?
    ```

This message is used to select the error dump operation when a data compare error is detected.

4. Select **1** or **2** and press **Enter**. The following message displays:

```
Detail status display (1:no,2:yes) ?
```

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.

5. Select **1** or **2** and press **Enter**.

The Hard Disk Test message displays after you respond to the Detail Status prompt.

6. 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 tracks 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 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 (shown 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 as they are displayed 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 displays:

```
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, enter the correct date at the "Enter new date" prompt and press **Enter**. The following prompt displays:

```
Enter new time :
```

3.   If the current time is not correct, enter the correct time using a 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 : 12-31-1995
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 as they are displayed 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 as they are displayed on the screen. The Expansion Test contains one subtest.

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

Subtest 01   PCMCIA wraparound (Main) (Point to point (Receive))

This test checks the following signal lines 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

3.15 Sound Test

To execute the Sound Test, select **12** from the DIAGNOSTICS TEST menu, press **Enter** and follow the directions as they are displayed 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.*

> *WARNING: The system is capable of producing high volume sound, so when using 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)

This subtest tests the functions of the Codec (AD1848) A/D, D/A converter. At the same time, it tests the microphone and headphone terminals. When you execute this subtest, the following message is displayed:

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

After pressing a key, start recording, then immediately play the sound (it takes three seconds.)

Subtest 02   FM Synthesizer

This subtest tests the OPL# (YMF262) functions. Connect the headphone, then check the scale on the right and left side. Also, be sure to check the sound adjustment volume.

Subtest 03   SIN wave playback

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

Subtest 04   Codec line in/out (record sound/replay)

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

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

3.16 CD-ROM Test

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

> *NOTE: Make sure the CD-ROM driver (CDROMDRV.COM) is installed, then insert the test media CD (Toshiba-EMI Test Disk TDY-03) before executing this test.)*

Subtest 01   Sequential Read

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

Subtest 02   Read Specified Address

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

Subtest 03   Random Address/Data

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

Subtest 04   Playback Music

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

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

3.17 Modem Test

To execute the Modem Test, select **14** from the DIAGNOSTICS TEST menu, press **Enter** and follow the directions as they are displayed on the screen. The Modem Test contains one subtest that tests the modem functions.

> *NOTE: Use the Setup program to select COM2 (2F8H/IRQ3) for the modem COM port, I/O address and IRQ before executing this test.*

Subtest 01   Modem

This subtest contains the following tests:

(a)   FLXCY* TEST

Initializes the modem and sends an ATZ command.

(b)   LOOPBACK TEST

A loopback signal is sent from board FLXCY* to FLXDA.

(c)   SPEAKER (L) TEST

A dial tone sound is generated in the left speaker.

(d)   SPEAKER (R) TEST

A dial tone sound is generated in the right speaker.

(e)   TERMINAL

> *NOTE: Before you conduct the Terminal Test, connect the DAA module to a telephone using a modular cable.*

When you have connected the DAA module to a telephone, test the connection by calling the line from another phone.

Test operation is described below.

1. Select the MODEM option in the SUBTEST menu and press **Enter**. The following screen displays:

```
---------------[EXECUTION AREA]---------------------

[ASYNC MODEM (FAX/DATA) INSPECTION] : VX.XX

    1 .FLXCY* TEST
    2 .LOOPBACK TEST
    3 .SPEAKER (L) TEST
    4 .SPEAKER (R) TEST
    5 .TERMINAL
    9 .END

PRESS [1] - [9] KEY?
                                       STOP=[crtl]+[break]

----------------[ERROR MESSAGE]--------------------
```

2. Select an item **1** to **5**. The following screen displays:

```
[XXXXX-X]              [ XXXXXXXXXX]

----------------[EXECUTION AREA]-------------------

Select the COM(1:COM1/3F8h,2:COM2/2F8h)?
```

3. Select the COM port (the same one selected in the Hardware Setup program). The following screen displays:

```
 Baud rate
(2:300,,4:1200,5:2400,6:9600,7:14400,8:19200,9:38400)?
```

4. Select the Baud rate and press **Enter**. The selected test is executed.

   Function 9 exits this subtest and returns to the SUBTEST menu.

3.18 Error Codes and Error Status Names

The following table lists the error codes and error status names for the Diagnostic Tests.

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

Device Name	Error Code	Error Status Name
(Common)	FF	Data Compare Error
System	01	ROM Checksum Error
Memory	01	Parity Error
	02	Protected Mode Not Changed
	14	Memory Read/Write Error
	DD	Cache Memory Error
	DE	2nd Cache Error
	DF	TAGRAM Error
FDD	01	Bad Command
	02	Address Mark Not Found
	03	Write Protected
	04	Record Not Found
	06	Media Removed
	08	DMA Overrun Error
	09	DMA Boundary Error
	10	CRC Error
	20	FDC Error
	40	Seek Error
	60	FDD Error
	80	Time Out Error
	EE	Write Buffer Error
Printer	01	Time Out
	08	Fault
	10	Select Line
	20	Out Of Paper
	40	Power Off
	80	Busy Line
Async	01	DSR On Time Out
	02	CTS On Time Out
	04	RX-READY Time Out
	08	TX-BUFFER Full Time Out
	10	Parity Error
	20	Framing Error
	40	Overrun Error
	80	Line Status Error
	88	Modem Status Error

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

Device Name	Error Code	Error Status Name
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
	E0	Status Error
	EE	Access Time Out Error
NDP	01	No Co-Processor
	02	Control Word Error
	03	Status Word Error
	04	Bus Error
	05	Addition Error
	06	Multiplication Error
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
	CD	No PCMCIA
CD-ROM	01	Bad Command
	02	Illegal Length
	03	Unit Attention
	04	Media Change Request
	05	Media Detected
	06	Additional Sense
	09	Boundary Error
	11	Corrected Data Error
	20	Drive Not Ready
	40	Seek Error
	80	Time Out
	90	Reset Error
	B0	Address Error

3.19 Hard Disk Test Detail Status

When an error occurs in the Hard Disk Test, the following message is displayed:

```
HDC status = XXXXXXXX
```

Detailed information about the Hard Disk Test error is displayed 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 format, 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" --- The HDC is ready. "1" --- The HDC is busy.
6	DRDY (Drive ready)	"0" --- The hard disk drive is not ready to accept a command. "1" --- The hard disk drive is ready.
5	DWF (Drive write fault)	"0" --- A DWF error was not detected. "1" --- A write fault condition occurred.
4	DSC (Drive seek complete)	"0" --- The hard disk drive heads are not settled over a track. "1" --- The hard disk drive heads are settled over a track.
3	DRQ (Data request)	"0" --- The drive is not ready for data transfer. "1" --- The drive is ready for data transfer.
2	CORR (Corrected data)	"0" --- Note used "1" --- A correctable data error was corrected.
1	IDX (Index)	"0" --- Not used "1" --- The Index was 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 was detected.
6	UNC (Uncorrectable)	"0" There is no uncorrectable data error. "1" An uncorrectable data error was detected.
5	——	Not used
4	IDNF (Identification)	"0" Not used "1" There is 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 has found track 0 during a recalibrate command. "1" The hard disk could not find track 0 during a recalibrate command.
0	——	Not used

3.20 Hard Disk Format

There are two types of hard-disk formatting:

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

This 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

> **NOTES**: *The contents of the hard disk will be erased when this program is executed. Before running the test, transfer the contents of the hard disk to floppy disk(s).*
>
> *1.* *If MS-DOS 6.22 and Windows for Workgroups is selected, use the Master Diskette Creator (MDC) utility located in the Toshiba Utility folder to back up the preinstalled software. Now use the BACKUP command from the Toshiba Companion Utility to back up the entire disk, including the user's files.*
>
> *2.* *If Windows 95 is selected, use the Microsoft Create System Disks Tools (MSCSD.EXE) located in the System Tools folder to back up the preinstalled software (this tool can only be used once and may not exist if it has previously been used.) Now use the Backup utility located in the System Tools folder to back up the entire disk, including the user's files*
>
> *For more information, refer to the appropriate instructions for each operating system.*

3.20.1   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	(MK2101MAN)
Storage capacity Formatted (Byte)	2,167,603,200
Cylinders	525
Heads	128
Sectors	63
Bytes per sector	512
Rotation speed (rpm)	4,200
Recording method	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 is displayed when the program is complete.
    If an error other than a bad track is detected, the program is automatically termi-
    nated.

3.20.2   Operations

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

Selecting 2 and pressing **Enter** in the DIAGNOSTIC menu, displays the following submenu:

```
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 display 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 displays:

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

(b)   Select an interleave number (1 ~ 8) and press **Enter**. Pressing **Enter** without making a selection selects 1 by default.

(c)   Bad track register

The Bad Track register prompt will appear as shown 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 numbers of bad tracks and press **Enter**. Note that if there are no bad tracks, pressing **Enter** without making an entry is the same as executing `All Track Format` described in item (d) below.

Enter the cylinder and head number in decimal notation. Repeat this entry 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 automatically formatted as a bad track.

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 when a bad track check error occurs. 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 following format:

```
[[cylinder, head = 0123 03]]
```

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

3.21 Head Cleaning

3.21.1   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.

3.21.2   Operations

1. Selecting **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, insert the cleaning disk, and press **Enter**.

3. When the "cleaning start" message displays, the FDD head cleaning has begun.

4. The display automatically returns to the DIAGNOSTIC menu when the program completes.

3.22 Log Utilities

3.22.1   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 data to a printer. If the power switch is turned off, the error information will be lost. Error information is displayed 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)

3.22.2   Operations

1.   Selecting **5** and pressing **Enter** in the DIAGNOSTIC menu logs error information into RAM or onto a floppy disk. Error information is displayed in the following format:

```
     XXXXX ERRORS
 CNT TS-NAME PASS STS ADDR    WD RD HSTS [STATUS NAME]

 001 FDD 02 0000 103 00001   00 00  |FDD - WRITE PROTECTED
 001 FDD 01 0000 180 00001   00 00  |FDD - TIME OUT ERROR
```

```
                          Address
                    Error status
              Pass count              HDC status
          Subtest number           Read data
       Test name            Write data
 Error count                          Error status name
```

```
 [[1:Next,2:Prev,3:Exit,4:Clear,5:Print,6:FD Log Read,7:FD Log Write]]
```

2. Error information displayed on the screen can be manipulated with the following number keys:

❑ The **1** key scrolls the display to the next page.
❑ The **2** key scrolls the display to the previous page.
❑ The **3** key returns to the Diagnostic Menu.
❑ The **4** key erases all error log information in RAM.
❑ The **5** key outputs the error log information to a printer.
❑ The **6** key reads the log information from a floppy disk.
❑ The **7** key writes the log information to a floppy disk.

3. If an "error retry OK" condition occurs, a capital "R" is placed at the beginning of the error status. It is not, however, added to the error count.

3.23 Running Test

3.23.1   Function Description

This function automatically executes the following tests in sequence:

1.   System test (Subtest 01)
2.   Memory test (Subtest 01, 02, 04, and 06)
3.   Display test (Subtest 01 to 06)
4.   FDD test (Subtest 02)
5.   HDD test (Subtest 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.

3.23.2   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 computer's parallel port to properly execute this test.

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

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

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

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

```
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 executes continuously. To terminate the program, press   **Ctrl + Break.**

3.24 Floppy Disk Drive Utilities

3.24.1   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. This option is different from the Toshiba MS-DOS FORMAT command.*

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

(a)   2D: Double-sided, double-density, 48/67.5 TPI, MFM mode, 512 bytes, 9 sectors/track.

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

(c)   2HD: Double-sided, high-density, double-track, 96/135 TPI, MFM mode, 512 bytes, 18 sectors/track.

2.   COPY

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

3.   DUMP

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

3.24.2   Operations

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

```
[ FDD UTILITIES ]

    1 - FORMAT
    2 - COPY
    3 - DUMP
    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-2DD,1:2D-2D,2:2D-2HD,3:2HD-2HD) ?
   ```

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

   ```
   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 displays 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 displays:

   ```
       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 displays:

   ```
    FLOPPY DISK FORMAT & COPY : VX.XX
    Type select (0:2DD-2DD,1:2D-2D,2:2D-2HD,3:2HD-2HD) ?
   ```

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

   ```
    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 displays, 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 displays and starts copying to the target disk. If the amount of data is too large to be copied in one operation, the message from step (b) is displayed again. After the floppy disk has been copied, the following message displays:

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

(e) To copy another disk, type **1** and the message from step (a) will be displayed again. Entering **2** returns the test program to the DIAGNOSTIC menu.

4. DUMP program

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

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

(b) Select a format 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, 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 displays:

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

(d) Select a format type. The following message displays:

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

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

(f)   The following message displays:

```
        ── 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.

3.25 System Configuration

3.25.1   Function Description

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

1.   BIOS ROM version
2.   Boot ROM version
3.   KBC version
4.   PS microprocessor version
5.   Base memory size
6.   The number of floppy disk drives
7.   The number of ASYNC ports
8.   The number of hard disk drives
9.   The number of printer ports
10. Extended memory size
11. The number of math co-processors

3.25.2   Operations

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

```
SYSTEM CONFIGURATION :

   * - BIOS ROM VERSION = VX.XX
   * - BOOT ROM VERSION = VX.XX
   * - KBC VERSION      = VX.XX
   * - PS MICOM VERSION = VX.XX
   * - 639KB MEMORY
   * - 1 FLOPPY DISK DRIVE(S)
   * - 1 ASYNC ADAPTER
   * - 1 HARD DISK DRIVE(S)
   * - 1 PRINTER ADAPTER
   * - XXXMB + XXXXKB EXTENDED MEMORY
   * - 1 MATH CO-PROCESSOR

Press [Enter] Key
```

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

3.26 SETUP

3.26.1   Function Description

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

1.   Memory
    (a)   Total

2.   Display
    (a)   Display Adapter
    (b)   LCD Display Colors
    (c)   Power On Display
    (d)   Text Mode Stretch

3.   Password
    (a)   User Password
    (b)   Eject Password

4.   Hard Disk

5.   Battery

6.   Others
    (a)   Power-up Mode
    (b)   CPU Cache
    (c)   Level2 Cache
    (d)   Auto Power On
    (e)   Alarm Volume
    (f)   System Beep
    (g)   Panel Power On/Off
    (h)   Keyboard
    (i)   Boot Priority
    (j)   Pointing Devices
    (k)   PC Card Controller Mode

7.   Display

8.   I/O Ports
    (a)   Serial Port
    (b)   Infrared Port
    (c)   Built-in Modem Port
    (d)   Parallel Port
    (e)   Sound System

9.   PCI Bus

10. Drives I/O

11. Floppy Disk I/O

3.26.2   Accessing the SETUP Program

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

```
                        SYSTEM SETUP (1/2)     BIOS version = x.xx
         ┌─ MEMORY ──────────┐        ┌─ BATTERY ──────────────────┐
         │ Total       =   16384 KB │        │ Battery Save Mode    = Full Power │
         └──────────────────────────┘        └──────────────────────────────────┘

         ┌─ DISPLAY ──────────────┐        ┌─ OTHERS ───────────────────┐
         │ Display Adapter   = VGA Compatible │  Power-up Mode        = Resume      │
         │ LCD Display Colors = 256K Colors   │  CPU Cache            = Enabled     │
         │ Power On Display  = Internal/External │ Level 2 Cache      = Enabled     │
         │ Text Mode Stretch = Disabled       │  Auto Power On        = Disabled    │
         └────────────────────────────────────┘ Alarm Volume         = High        │
                                                 System Beep          = Enabled     │
         ┌─ PASSWORD ──────────┐                 Panel Power On/Off   = Disabled    │
         │ Not Registered      │                 Ext Keyboard "Fn"    = Disabled    │
         └─────────────────────┘                 Boot Priority        = FDD→Built-in HDD │
                                                 Pointing Devices     = Auto-selected │
         ┌─ HARD DISK ─────────┐                 PC Card Controller Mode │
         │ Internal Standard HDD │                              = PCIC Compatible   │
         │   Mode    = Enhanced IDE (Normal) │
         └───────────────────────┘
```

```
                        SYSTEM SETUP (2/2)     BIOS version = x.xx
         ┌─ DISPLAY ──────────────┐        ┌─ DRIVES I/O ───────────────┐
         │ VGA Segment Address = E400H-EFFFH │ Built-in HDD              │
         └────────────────────────────────┘  │      = Primary IDE(1F0H/IRQ14) │
                                              └────────────────────────────────┘
         ┌─ I/O PORTS ─────────┐
         │ Serial       =    COM1(3F8H/IRQ4)  │
         │ Infrared     =    Not Used         │
         │ Built-in Modem =  COM2(2F8H/IRQ3)  │ ┌─ FLOPPY DISK I/O ──────────┐
         │ Parallel     =    LPT1(378H/IRQ7/CH3) │ Floppy disk  = (3F2H/IRQ6/CH2) │
         │ Sound        =    Enabled          │ └────────────────────────────────┘
         └────────────────────────────────────┘

         ┌─ PCI BUS ───────────┐
         │ PCI BUS       = IRQ 11 │
         └────────────────────────┘
```

↑↓→← : **Select items Space, BkSp : Change values PgDn, PgUp : Change pages**
Esc: Exit without saving Home: Set default values End: Save changes and Exit

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

3.26.3   Moving within the SETUP Menu and Changing Values

1.   Press ← and → to move between the two columns. Press ↑ and ↓ to move between items in a column.

2.   Press either the **space bar** or **BkSp** to change a value.

3.26.4   Accepting Changes and Exiting the SETUP Window

1.   Press **End** to accept any changes which may have been made.

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

     ```
     Are you sure? (Y/N)
     ```

     If a 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**, then repeat the steps above.

3.   To accept the changes, press **Y**. The system will automatically reboot.

*NOTE: You can press **Esc** to quit at any time without saving changes. Before exiting the SETUP window, the system will ask you to confirm that you don't want to save your changes.*

3.26.5   The Factory Preset Configuration

When you access SETUP, the current configuration is displayed.

1.   To show the factory preset configuration, press **Home**.

2.   To accept the default settings, press **End** and then **Y**.

NOTE: When you execute the default settings, the following settings are not changed:
> *HDD Mode*
> *Password*
> *Sound System: I/O Address, Interrupt Level, DMA*
> *Write Policy*

3.26.6　SETUP Options

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

1.　Memory

This option lists the computer's memory allocation.

(a)　Total

Displays the total amount of memory installed. This field is automatically calculated by the computer and the value cannot be changed.

2.　Display

These options configure the computer's display.

(a)　Display Adapter

Enables or disables the internal controller for the VGA internal display.

VGA compatible　　Enables the internal VGA controller (Default).

Not Used　　Disables the internal VGA controller.

(b)　LCD Display Colors

Displays the color palette of the internal TFT display when the LCD mode is set to **Color**.

256K colors　　Displays 256 colors out of 262,144 colors. (This value cannot be changed.)

(c)　Power On Display

Selects the display when booting the computer.

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

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

---

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

(d)   Text Mode Stretch

Enables a larger screen display area.

Enabled	Enables the text mode stretch feature.
Disabled	Disables the text mode stretch feature (Default).

3.   Password

(a)   User Password

Allows you to set or reset the user password for power on and instant security.

Registered	The user password has been registered.
Not registered	The user password has not been registered.

(b)   Eject Password

This option is available to prevent an unauthorized user from removing the computer from an optional Desk Station V Plus.

Enabled	The eject password has been registered.
Disabled	The eject password has not been registered (Default).

For details on setting passwords, refer to the computer User's Guide.

4.   Hard Disk

Selects the hard disk mode.

Enhanced IDE (Normal)	Select this mode when using MS-DOS ®, Windows for Workgroups®, Windows 95®, or OS/2® (Default).
Standard IDE	Select this mode when using Novell ® NetWare® or UNIX®. When this mode is selected, up to 504MB is logically available even though the disk's capacity is larger than 504MB.
Not used	HDD is not installed.

To display the capacity of the hard disk, use the CHKDSK command. See your DOS documentation for details on using CHKDSK.

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

5.　Battery

This option selects the **BATTERY SAVE** option**.** Selections include *Full Power, Low Power* and *User Setting.*

    Full Power　　　　The following shows the full power settings:

```
┌────────BATTERY SAVE OPTIONS────────┐
│ Processing Speed =     Low         │
│ CPU Sleep Mode    =     Enabled    │
│ Display Auto Off  =     30 Min.    │
│ HDD Auto Off      =     30 Min.    │
│ System Auto Off   =     Disabled   │
│ LCD Brightness    =     Bright     │
│ Cooling Method    =     Performance│
└────────────────────────────────────┘
```

    Low Power　　　　The following shows the low power settings:

```
┌────────BATTERY SAVE OPTIONS────────┐
│ Processing Speed =     Low         │
│ CPU Sleep Mode   =     Enabled     │
│ Display Auto Off =     03 Min.     │
│ HDD Auto Off     =     03 Min.     │
│ System Auto Off  =     30 Min.     │
│ LCD Brightness   =     Semi-Bright │
│ Cooling Method   =     Quiet       │
└────────────────────────────────────┘
```

NOTE:　*In boot mode, the System Auto Off message does not display.*

    User Setting　　　This option allows you to set the battery save parameters on the subwindow, **BATTERY SAVE OPTIONS**. When you select this option, the automatic setting feature (*Full Power* or *Low Power*) is disabled and the user-preferred parameters become effective. The default setting in the subwindows depends on the **Battery Save Mode:** *Low Power (Long Life)* or *Full Power (Normal Life).* For details, see Battery Save Options below.

(a)　Battery Save Options

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

(1)   Processing Speed

This feature changes the CPU processing speed.

High   The CPU operates at high speed (Default).

Low   The CPU operates at low speed.

(2)   CPU Sleep Mode

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

Enabled   Enables sleep mode.

Disabled   Disables sleep mode.

(3)   Display Auto Off

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

Disabled   Disables the display's automatic power off function.

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

(4)   HDD Auto Off

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

Disabled   Disables the HDD automatic power off function.

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

(5)　System Auto Off

Use this option to enable or disable the system's automatic off function in Resume mode when you are working in DOS. In Boot mode, it is disabled and not displayed.

Disabled　　　Disables the automatic power off function.

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.

(6)　LCD Brightness

Use this option to set the level of LCD brightness.

Bright　　　Full brightness for maximum visibility.

Semi-Bright　Less than full brightness used for saving power.

(7)　Cooling method

Performance　If the CPU becomes too hot, the fan is turned on automatically. When the CPU temperature falls to a normal range, high-speed processing is resumed and the fan is turned off.

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

6.　Others

Whether or not you need to configure the computer with these options depends primarily on the kind of software or peripherals you use.

(a)　Power-up Modes

This option lets you choose between AutoResume and boot mode. You can also set this option using hot keys. AutoResume is effective with either the internal LCD or with an external monitor.

Boot　　　Turns on boot mode (Default).

Resume　　Turns on the AutoResume feature.

(b) CPU Cache

Use this feature 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 is displayed allowing you select the cache write policy. The options for this setting are **Write-back** (default) and **Write-through**.

```
┌──────────── Option ────────────┐
│                                 │
│  Write Policy = Write-back      │
│                                 │
└─────────────────────────────────┘
```

The **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. The **write-through** policy accesses main memory every time data is handled by the processor.

(c) Level 2 Cache

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

Enabled   Enables the level 2 CPU cache (Default).

Disabled   Disables the level 2 CPU cache.

(d) Auto Power On

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

```
┌─────────────────Options ───────────┐
│                                     │
│  Alarm Time          =    XX:XX:00  │
│  Alarm Date Option   =    XX-XX     │
│  Ring Indicator      =    Enable    │
└─────────────────────────────────────┘
```

Alarm Time is set using hours and minutes. Seconds cannot be changed. The **Alarm Date Option** is set using the month and the 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.

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

(e) Alarm Volume

This option disables or sets the volume level of the alarm. Setting the option to *Off* disables the computer's sound function for alarms. This option can also be set by hot keys.

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 is displayed to let you enable or disable certain functions.

```
┌──────── Alarm Volume Options ────────┐
│                                      │
│  LOW BATTERY Alarm    =    Enabled   │
│  Panel Close Alarm    =    Enabled   │
│                                      │
└──────────────────────────────────────┘
```

Enabled   Enables the feature (Default).

Disabled   Disables the feature.

(f) System Beep

Use this feature to enable or disable the system beep.

Enabled   Enables the feature (Default).

Disabled   Disables the feature.

(g) Panel Power On/Off

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

Enabled　　　　　　Enables the feature.

Disabled　　　　　　Disables the feature (Default).

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

(h) Keyboard

This option allows you to change the keyboard layout and set the **Fn** key equivalent when you are using an external keyboard. Selecting this option displays the following subwindow.

```
┌──────────────── Keyboard ────────────────┐
│                                          │
│ Ext keyboard "Fn" key equivalent         │
│           = Left Ctrl + Left Alt          │
│                                          │
└──────────────────────────────────────────┘
```

(1) External Keyboard Fn key equivalent

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

Disabled　　　　　　No Fn key equivalent (Default).

Fn Equivalent　　　　Left Ctrl + Left Alt*
　　　　　　　　　　　Right Ctrl + Right Alt*
　　　　　　　　　　　Left Alt + Left Shift
　　　　　　　　　　　Right Alt + Right Shift
　　　　　　　　　　　Left Alt + Caps Lock

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

(i) Boot Priority

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

FDD Built-in HDD   The computer looks for bootable files first on
                               the FDD and then on the built-in HDD
                               (Default).

Built-in HDD FDD   The computer looks for bootable files first on
                               the built-in HDD and then on the FDD.

FDD Second HDD   The computer looks for bootable files first on
                               the FDD and then on the second HDD.

Second HDD FDD   The computer looks for bootable files first on
                               the second HDD and then on the second FDD.

*NOTE: These settings are displayed even if the computer is not connected
to a Desk Station V Plus. In this case, however, the Desk Station V Plus
HDD settings will not be effective.*

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

F   Selects the FDD.
B   Selects the internal HDD.
S   Selects the Desk Station V Plus' second HDD.

(j) Pointing Devices

This option enables or disables the AccuPoint pointer control stick.

Auto selected   If the 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.

(k) PC Card Controller Mode

Use this option to set the PC card controller mode.

PCIC Compatible   Used for the PCMCIA R2.01 and ZV port card
                    (Default).

CardBus/16bit   Used for the PC 16 multi-function card, CardBus card
                    and ZV port card.

7. Display

Use this option to set the VGA segment address from the following options:

(a) VGA Segment Address

> *E000h-EFFFh*
> *E400h-EFFFh (Default).*
> *C000h-CBFFh*
> *E000h-EBFFh*

8. I/O ports

This option controls settings for the serial and parallel ports, and the sound system. It also controls the setting for the joystick on the optional Desk Station V Plus.

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

(a) Serial Port

This option allows you 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 port)	
Others		(Others settings are made automatically by plug-and-play operating systems)	

> *NOTE: If the setting for the serial port is the same as that for the infrared or Modem port, the infrared or Modem port is automatically set to disabled.*

(b)   Infrared Port

This option allows you to set the COM level for the infrared port.   The infrared 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
COM2	3	2F8H
COM3	4	3E8H
COM3	5	3E8H
COM3	7	3E8H
COM4	3	2E8H
COM4	5	2E8H
COM4	7	2E8H
Not used		(Disables port)(Infrared port default)
Others		(Others settings are made automatically by plug-and-play operating systems)

NOTE: If the setting for the infrared port is the same as that for the serial or Modem port, the serial or Modem port is automatically set to disabled.

(c)   Built-in Modem

This option allows you to set the COM level for the Modem port.   The Modem port interrupt request level (IRQ) and I/O port base address for each COM level is shown below:

NOTE: If an internal modem (optional in some markets) is not installed, this selection does not display.

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

> *NOTE: If the setting for the Modem port is the same as that for the serial or infrared port, the serial or infrared port is automatically set to disabled.*

(d)   Parallel Port

This option sets the address for the parallel port. When the Printer Port Type is set to Standard Bi-directional (see the settings below), options include:

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

When the Printer Port Type (see settings below) 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 (Default)
LPT 2	5	278H	3
LPT 3	7	3BCH	3
Not Used	(Parallel port default)		
Others	(Others settings are made automatically by plug-and-play operating systems)		

When you select one of these options (except for *Not used*), a subwindow similar to the one below displays allowing you to set the parallel port mode. The options for this setting are *ECP* (default) and *Standard Bi-Directional*.

```
┌──────── Options ────────┐
│                         │
│ Mode  =     ECP         │
│ DMA   =     Channel 3   │
└─────────────────────────┘
```

For most printers, the port should be set to *ECP*. With other parallel de-vices, the setting should be *Standard Bi-Directional*.

(e)   Sound system

Allows you 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 displays to let you set the **WSS I/O address**, **SBPro I/O address**, **Synthesizer I/O address**, **WSS & SBPro IRQ Level**, **WSS & SBPro DMA**, **Control I/O address**, **MPU401 IRQ Level**, and **Joystick I/O address**.

```
┌──────────────Sound System──────────────┐
│                                         │
│ WSS I/O Address            =      220H  │
│ SBPro I/O Address          =      220H  │
│ Synthesizer I/O Address    =      388H  │
│ WSS & SBPro IRQ Level      =      IRQ5  │
│ WSS & SBPro DMA Playback   =      Channel 1  │
│ Record                     =      Channel 0  │
│ Control I/O Address        =      120H  │
│ MPU401 (MIDI I/F) IRQ Level=      Not Used  │
│ Joystick I/O Address       =      200H  │
│                                         │
└─────────────────────────────────────────┘
```

(1)   WSS I/O address

Sets the WSS I/O address from among the following settings:

534h *(Default)*, 608h, E84h, F44h

(2)   SBPro I/O address

Sets the SBPro I/O address from among the following settings:

220h *(Default)*, 240h

(3)   Synthesizer I/O address

You cannot change this value.

(4)   WSS & SBPro IRQ level

Sets the WSS & SBPro IRQ level for the sound system from the following options:

IRQ5 *(Default)*, IRQ7, IRQ9, IRQ11, IRQ15

(5) WSS & SBPro DMA Playback

Sets the WSS & SBPro DMA Playback for the sound system from the following settings:

```
Playback:  Channel 0, Channel 1 (Default),
           Channel 3
```

(6) Record

Sets the Record for the sound system from the following settings:

```
Capture:   Channel 0 (Default), Channel 1,
           Channel 3, Same as Playback
```

(7) Control I/O Address

You cannot change this value.

(8) MPU401 (MIDI I/F) IRQ level

Sets the MPU401 IRQ level for the sound system from the following settings:

```
Not Used (Default), 330H/IRQ5, 330H/IRQ7,
330H/IRQ9,330H/IRQ11, 330H/IRQ15
```

(9) Joystick I/O address

You cannot change this value.

> *NOTE: If you set the **Playback** and **Record** option to the same channel, the **Record** option will display **Same as Playback**.*

9. PCI Bus

Displays the interrupt level for the CardBus in the computer and the PCI bus in the Desk Station V Plus. This display is informational only and cannot be changed.

The setup program displays the message below under the following conditions:

(a) No PCI card is installed in the Desk Station V Plus.
(b) The system cannot assign an interrupt level to the PCI bus.
(c) The PC Card Controller Mode is not set to CardBus/16Bit in TSETUP.

```
PCI bus = IRQ Not Used
```

> **NOTE**: *In this case, the system will sound a warning beep when you connect the Desk Station V Plus and turn on the computer. Also, you will not be able to use the PCI bus slots, ISA bus slots, PC card slots, and SCSI port on the Desk Station V Plus.*

10. Drives I/O

    Displays the installed disk drives and/or CD-ROM drives: internal standard, Selectable Bay, Desk Station V Plus, or no drive.

    (a) Settings for the hard disk drive

    Primary IDE (1F0H/IRQ14)   The HDD is ready for use.

    Not used   Disables the HDD.

    No drive   The HDD is not installed.

    Other settings are automatically made by plug-and-play operating systems.

    (b) Settings for the CD-ROM (internal Selectable Bay)

    Secondary IDE (170H/IRQ15)   Selectable Bay CD-ROM.

    (c) Setting for the CD-ROM (external Selectable Bay)

    Secondary IDE (170H/IRQ15)   Desk Station V Plus Selectable
                                   Bay CD-ROM.

    Not used   Disables the selected CD-ROM.

    Other settings are automatically made by plug-and-play operating systems.

> **NOTE**: *If the computer is attached to a Desk Station V Plus, you have access to two Selectable Bays. However, you cannot use two CD-ROM drives in the Selectable Bays at the same item. If two CD-ROM drives are installed in the Selectable Bays, the Desk Station V Plus Selectable Bay is set to **Not used** by default.*

11. Floppy disk I/O

    Displays the address, internal level and channel settings for the diskette drive.

    (3F2H/IRQ6/CH2)   The FDD is ready for use.

    Others   Other setting made automatically by plug-
                          and play operating system.

    Not used   Disables the diskette drive.

4.1 General

This section explains how to disassemble the computer and replace Field Replaceable Units (FRUs). It may not be necessary to remove all the FRUs in order to replace one. The chart below is a guide to which FRUs need to be removed in order to remove others.   *Always start by removing the battery pack*, then follow the chart below to determine which FRUs you must remove in order to repair the one you think is causing the computer to operate improperly.

```
┌────────────────────────────────┐
│ ❏  Battery Pack                │
│ ❏  Optional Memory Module      │
│ ❏  Optional PC Card            │
│ ❏  FDD                         │
│ ❏  CD-ROM Drive                │
│ ❏  Hard Disk Drive             │
│ ❏  Upper Cover and             │
│     Keyboard                   │
│ ❏  DAA module                  │                    ┌──────────────────┐        ┌──────────────────────┐
│ ❏  Display Assembly, Jack ─────┼────────────────────┤ ❏  Display Mask  ├────────┤ ❏  FL Inverter Board │
│     Board, and Modem Board     │                    └──────────────────┘        │ ❏  LCD Module        │
│ ❏  IPS (FLXIP*) Board , RTC    │                                                │ ❏  Microphone        │
│     Battery, and Backup Battery│                                                └──────────────────────┘
│ ❏  Power supply                │
│     (FLXPS*) Board             │
│ ❏  System (FLXSY*) Board       │
│ ❏  Fan                         │
└────────────────────────────────┘
```
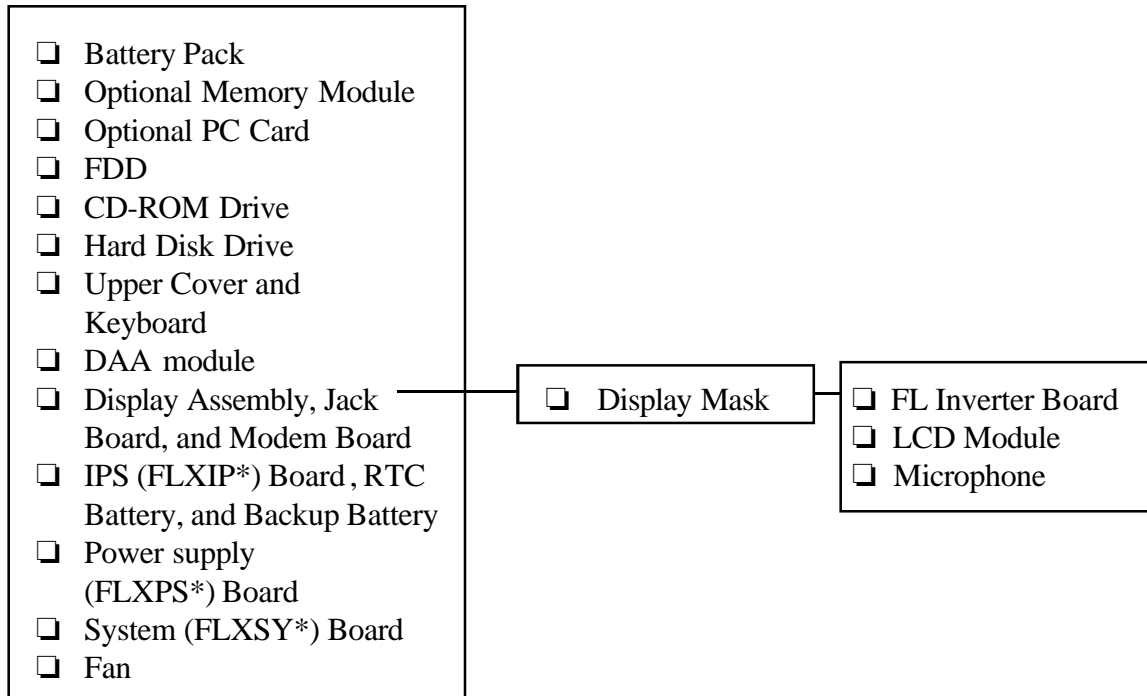
Safety precautions

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

DANGER: 1. *Always use the lithium ion battery pack or backup battery that is authorized by Toshiba or compatible with the unit. Since other battery packs have different specifications, they may be incompatible with the unit and may burst or explode. Heating or disassembling the battery pack could cause leakage of alkaline solution. Throwing the battery pack into a fire could cause the battery pack to explode.*

2. *The power supply, FL inverter, and other components carry high voltages. To avoid the risk of electric shock when you need to turn on the power of a partially disassembled computer to check its operation, be very careful not to touch connectors or components. Also, do not disassemble individual components in first-level maintenance.*

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

1. *Always turn the power off and disconnect the AC power cord from the power source.*

2. *Remove any metal jewelry or accessories such as necklaces, bracelets, or rings. Batteries in the computer retain electrical charge, so there is danger of electrical shock even when the computer is disconnected from an AC power source.*

3. *Never work with wet or damp hands.*

4. *The computer contains many sharp edges and corners, so be careful not to injure yourself.*

5. *Make sure that all replacement components meet the specifications for the computer and that all cables and connectors are securely fastened.*

CAUTION: ***To avoid damage to the computer:***

1. *When you change a component, be sure the replacement component meets the required specifications. Never use foreign parts.*

2. *Metal objects, such as screws or paper clips, which fall into the unit can cause short-circuit, fire, or other internal damage.*

3. *When assembling the computer, make sure you use the correct screws to secure the various pieces in place. Make sure all screws are securely fastened. Loose screws can cause short circuits, resulting in heat, smoke, or fire.*

4. *Before removing an FRU or other component, make sure all cables to the component have been disconnected.*

5. *If you use AC power, be sure to use the cable that came with the computer or one recommended by Toshiba.*

Before You Begin

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

1. Do not disassemble the computer unless it is operating abnormally.

2. When working on the computer, use only the correct and approved tools.

3. Make sure the working environment is free from the following elements whether you are using or storing the computer:

    ❏ Dust and contaminates
    ❏ Static electricity
    ❏ Extreme heat, cold, and humidity

4. Make sure the FRU you are replacing is causing the abnormal operation by performing the necessary diagnostics tests as described in this manual.

5. Do not perform any operation that is not necessary, and use only the procedures described in this manual for disassembling and installing FRUs in the computer.

6. After removing parts from the computer, place them in a safe place away from the computer so they will not be damaged or interfere with your work.

7. You will remove and replace many screws when you disassemble the computer. When you remove screws, make sure they are placed in a safe place and identified with the correct parts.

8. When assembling the computer, make sure you use the correct screws to secure the various pieces in place. Screw sizes are listed in the corresponding figures.

9. The computer contains many sharp edges and corners, so be careful not to injure yourself.

10. After you have replaced an FRU, make sure the computer is functioning properly by performing the appropriate test on the FRU you have fixed or replaced.

Disassembly Procedures

The computer has three basic types of cable connectors:

❑ Pressure Plate Connectors
❑ Normal Pin Connectors
❑ Flexible Cable Connections

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

Standard pin connectors and flexible cable connectors can be connected and disconnected by simply pulling them apart or pushing them together.

Assembly Procedures

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

While assembling the computer, remember the following general points:

❑ Take your time, making sure you follow the instructions closely. Most problems arise when you get in a hurry re-assembling the computer.

❑ Make sure all cables and connectors are securely fastened.

❑ Before securing the FRU or other parts, make sure that no cables will be pinched by screws or the FRU.

❑ Check that all latches are closed securely in place.

❑ Make sure all the correct screws are used to secure all FRUs. Using the wrong screw can either damage the threads on the screw or the head of the screw, and may prevent proper seating of an FRU.

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

Tools and Equipment

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

❑ One M2 Phillips screwdriver to remove and replace screws.

❑ Tweezers, to lift out screws that you cannot grasp with your fingers.

❑ ESD mats for the floor and the table you are working on.

❑ An ESD wrist strap or heel grounder.

❑ Anti-static carpeting or flooring.

❑ Air ionizers in highly static sensitive areas.

Screw Tightening Torque

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

❑ M2   0.22 N·m (2.2 kgf·cm)

❑ M2.5   0.36 N·m (3.5 kgf·cm)

❑ FDD   0.22 N·m (2.2 kgf·cm)

❑ HDD   0.3 N·m (3.1 kgf·cm) or less

❑ LCD (internal use)   0.175 N·m ±0.02 N·m

4.2 Battery Pack

Removing the Battery Pack

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

1. Turn off the power to the computer, then disconnect the AC adapter and all external cables connected to the computer.

2. Turn the computer over.

3. Slide the **battery cover** to the right to unlatch it.

4. Slide the **battery** out.
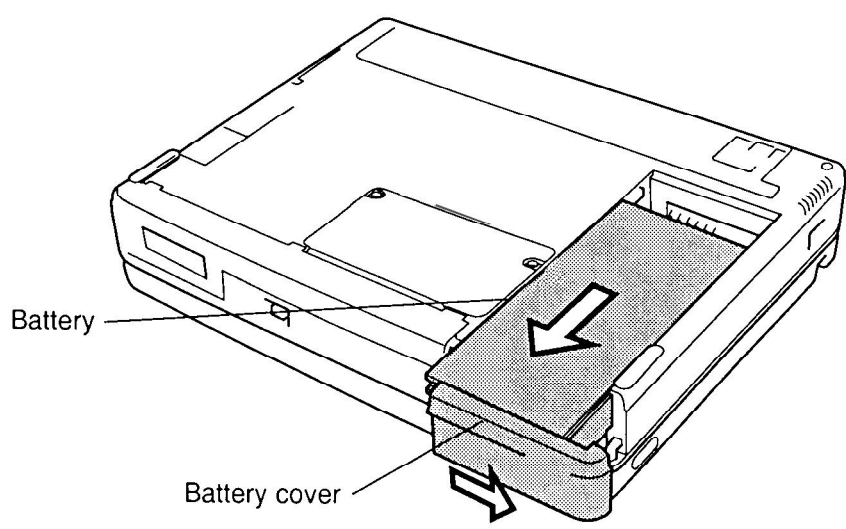
Figure 4-1 Removing the battery

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

5. Remove the battery cover. Carefully push up slightly as you slide the cover past the unlock position.

Installing the Battery Pack

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

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

1. Turn off the power to the computer, then disconnect the AC adapter and all external cables connected to the computer.

2. Place the battery cover on the battery, then slide the cover to the left to secure the latches.

3. Fit the **battery** onto the guide rails.

4. Push the **battery** into place and slide the **battery cover** to the left to lock it.

4.3 Optional Memory Module

Removing an Optional Memory Module

To remove an optional memory module, make sure the computer is in boot mode, then follow the steps below and refer to Figures 4-2 and 4-3.

1. Turn off the power to the computer, then disconnect the AC adapter and all external cables connected to the computer.

2. Remove the battery pack as described in Section 4.2.

3. Remove **two M2x3 silver screws** securing the **memory slot cover** and lift off the cover.
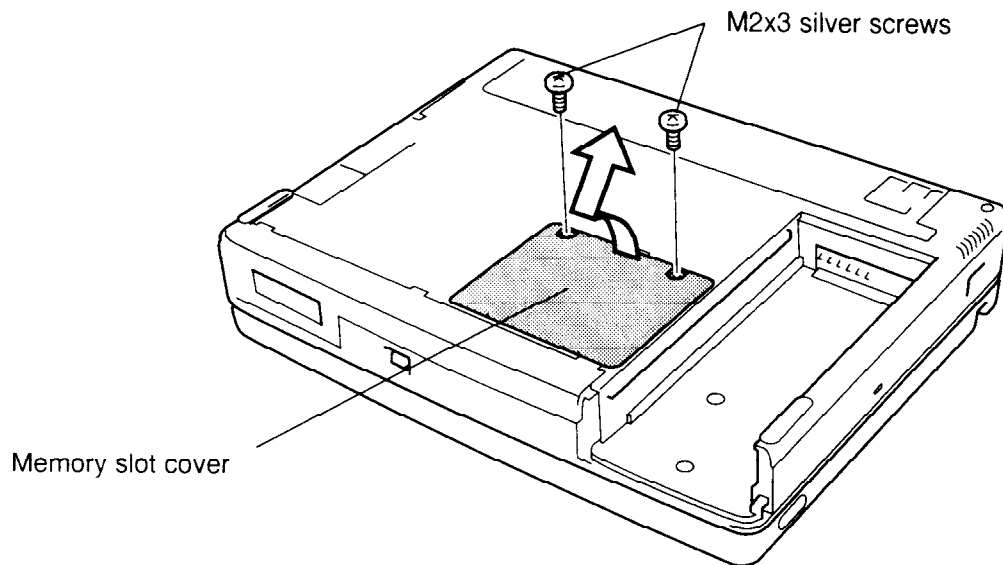
Figure 4-2 Removing the memory module cover

4. Remove **two M2x10 screws** securing the memory module to a brace at the center of the module.

5. Grasp the memory card on the right edge toward the connector, or if a plastic tab is present, lift up on the plastic tab to disengage the connectors, then grasp the module by the edges and remove it.
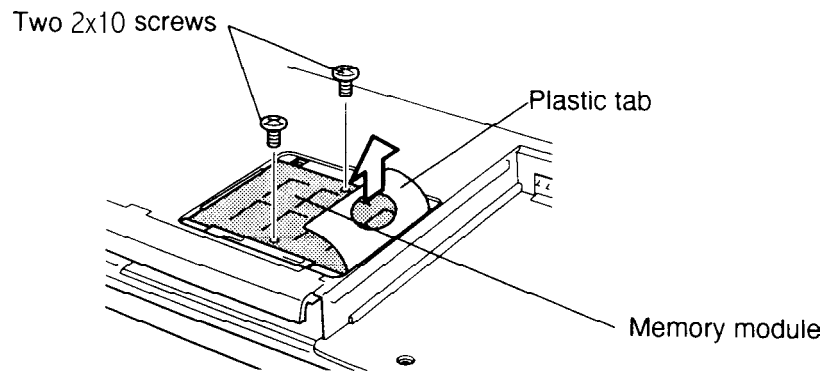
Figure 4-3 Disconnecting the memory module

Installing an Optional Memory Module

To install an optional memory module, make sure the computer is in boot mode, then follow the steps below and refer to Figures 4-2 and 4-3.

1. Position the module's connector over the corresponding connector on the system board.

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

2. Place your fingers above the connector and press firmly but gently to assure a solid connection. The module should be seated level.

3. Secure the module to the brace with **two M2x10 screws**.

4. Fold down the plastic tab, if it is present, and lay the **memory slot cover** in place. Secure it with **two M2x3 silver screws**.

5. Install the battery pack as described in Section 4.2.

4.4 Optional PC Card

Removing an Optional PC Card

To remove an optional PC card, make sure the computer is in boot mode, then follow the steps below and refer to Figure 4-4.

1. Turn off the power to the computer.

2. Remove the battery pack as described in Section 4.2.

3. Open the **PC slot cover**.
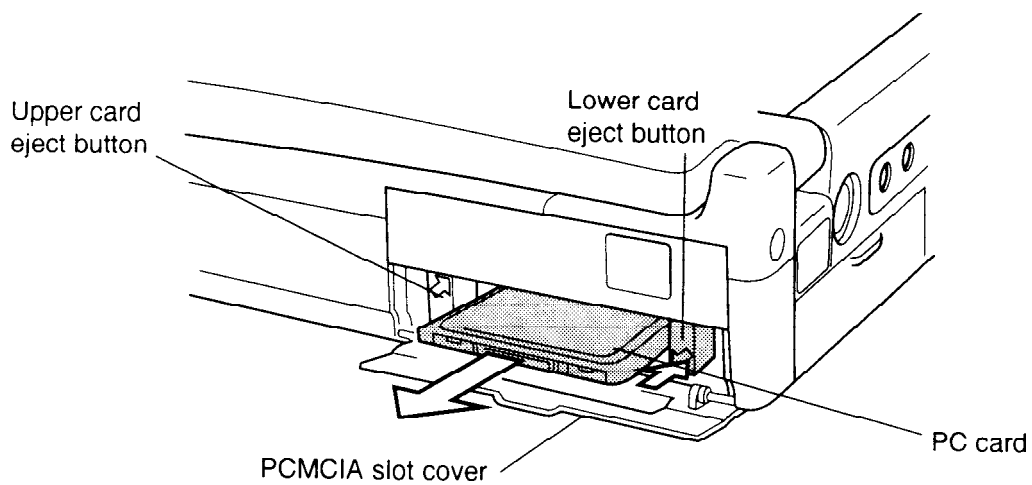
Figure 4-4 Removing the lower PC card

4. Press the **eject button** for the upper and/or lower card.

5. Grasp the **PC card** and remove it.

Installing an Optional PC Card

To install a PC card, follow the steps below and refer to Figure 4-5.

NOTE: Before you install the PC card, make sure the computer is in boot mode.

---

1.   Turn off the power to the computer.

2.   Insert the **PC card**. Press gently to ensure a firm connection.
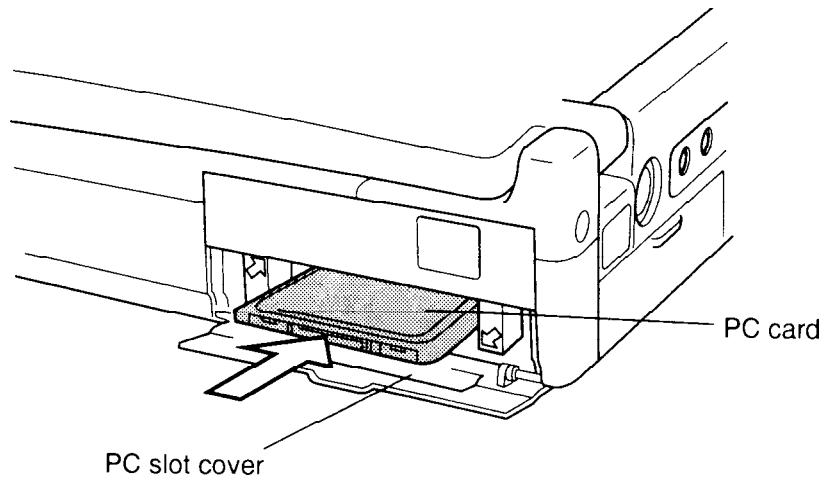
Figure 4-5 Installing the lower PC card

3.   Close the **PC slot cover**.

4.   Install the optional memory module and battery pack as described in Sections 4.3 and 4.2.

4.5 Floppy Disk Drive (FDD)

Removing the FDD

To remove the FDD, follow the steps below and refer to Figures 4-6 to 4-9.

1. Turn off the power to the computer, then disconnect the AC adapter and all external cables connected to the computer.

2. Remove the battery pack, optional memory module and optional PC card as described in Sections 4.2, 4.3, and 4.4.

3. Turn the computer upside down.

4. Slide the **LED indicator cover** to the left to free it from its latches.

5. Rotate the cover up.

6. Pull the **release handle** to pop the drive out slightly.

7. Grasp the **FDD** and pull it out.
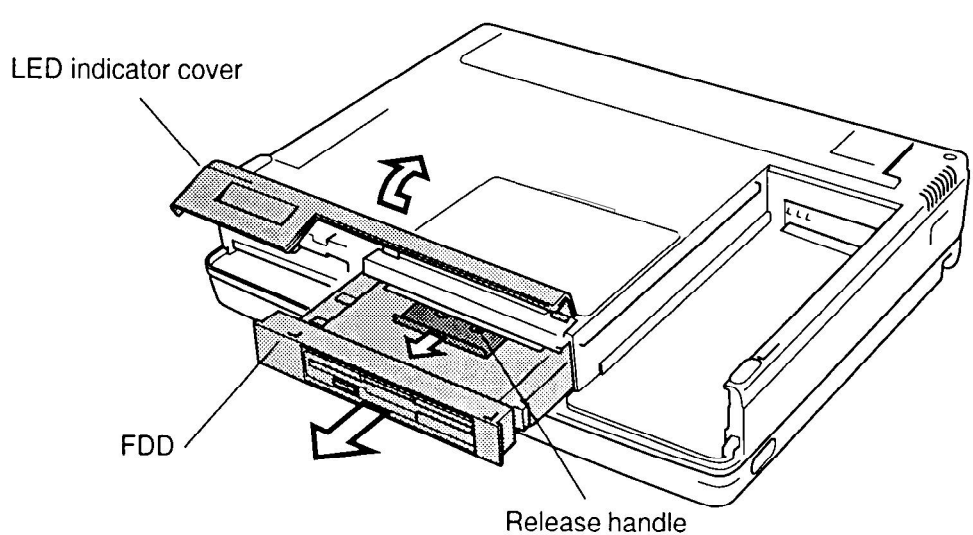
Figure 4-6 Removing the FDD

8.   Remove **six M2x6 silver screws**.

9.   Turn the FDD over and release **two latches** securing the upper plastic cover. Turn
     it back over and carefully lift off the cover.
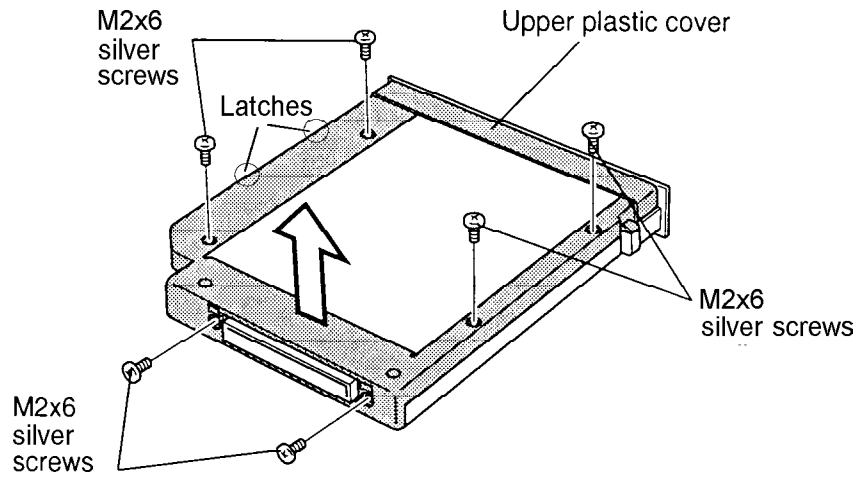
Figure 4-7 Removing the FDD screws

10. Lift off the **plate**, unseat the **flexible cable connector** from the **lower plastic
     cover**, and lift out the FDD.
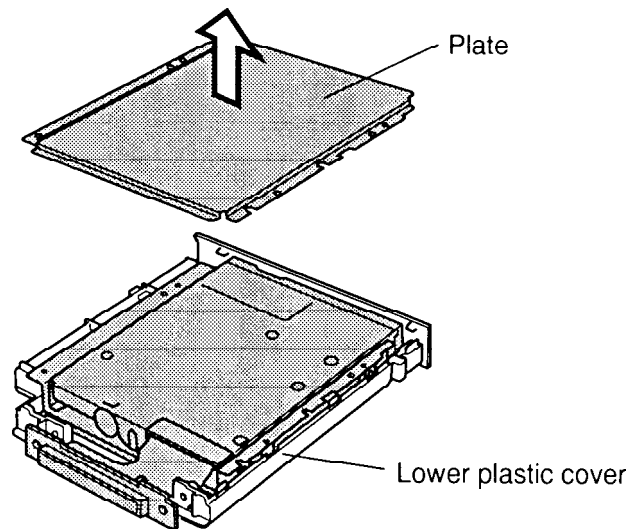
Figure 4-8 Removing the plate

11.   Disconnect the **flexible cable** by pulling it out from the **FDD connector**.

12.   Remove **four M2x3 silver screws** and remove the **FDD** from the **bracket**.
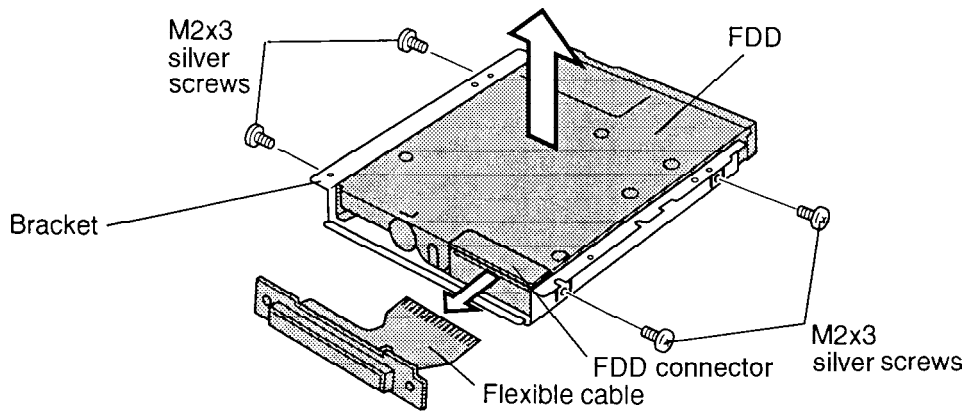
Figure 4-9 Removing the FDD from the bracket

Installing the FDD

To install the FDD, follow the steps below and refer to Figures 4-10 back through 4-6.

1.   Seat the **FDD** in the **metal bracket** and secure it with **four M2x3 screws**.

2.   Insert the **flexible cable** into the **FDD cable connector**. Gently apply uniform pressure across the cable to assure a firm connection.

3.   Re-seat the **connector** in the **lower plastic cover** and drop the drive into it.

4.   Set the **plate** in the upper plastic cover.

5.   Seat the **flexible cable connector** into the lower plastic cover.

6.   Set the **upper plastic cover** in place and while holding the plate in place, snap the two latches closed and secure **six M2x6 silver screws**.

7.   Turn the computer upside down.

8.   Make sure that the LED indicator cover is facing up, insert the   **FDD** into the computer, and gently press until it locks into place.

9. Close the **LED indicator cover**.

10. Slide the cover to the right to engage the **latches**.
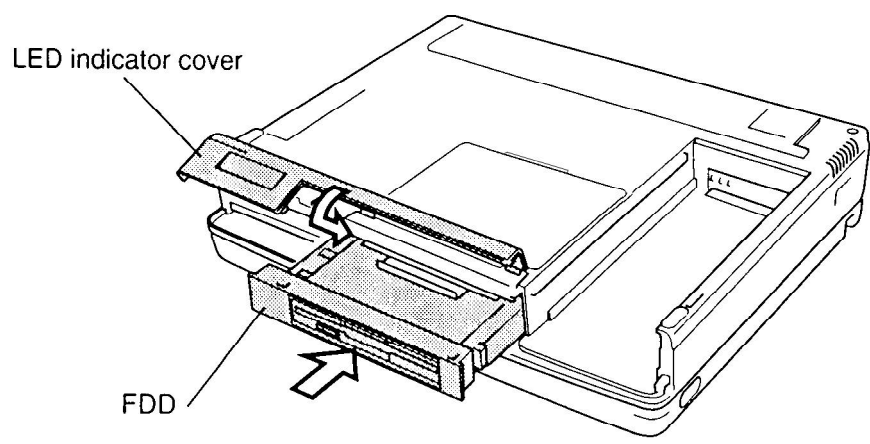
Figure 4-10 Installing the FDD

11. Install the optional memory module, optional PC card, and battery pack as described in Sections 4.4, 4.3, and 4.2.

4.6 CD-ROM Drive

Removing the CD-ROM Drive

To remove the CD-ROM drive, follow the steps below and refer to Figures 4-11 to 4-13.

1. Turn off the power to the computer, then disconnect the AC adapter and all external cables connected to the computer.

2. Remove the battery pack, optional memory module, and optional PC card as described in Sections 4.2, 4.3, and 4.4.

3. Turn the computer upside down.

4. Slide the **LED indicator cover** to the left to free it from the **latches**.

5. Rotate the cover up.

6. Pull the **release handle** to pop the drive out slightly.

7. Grasp the drive and pull it out.
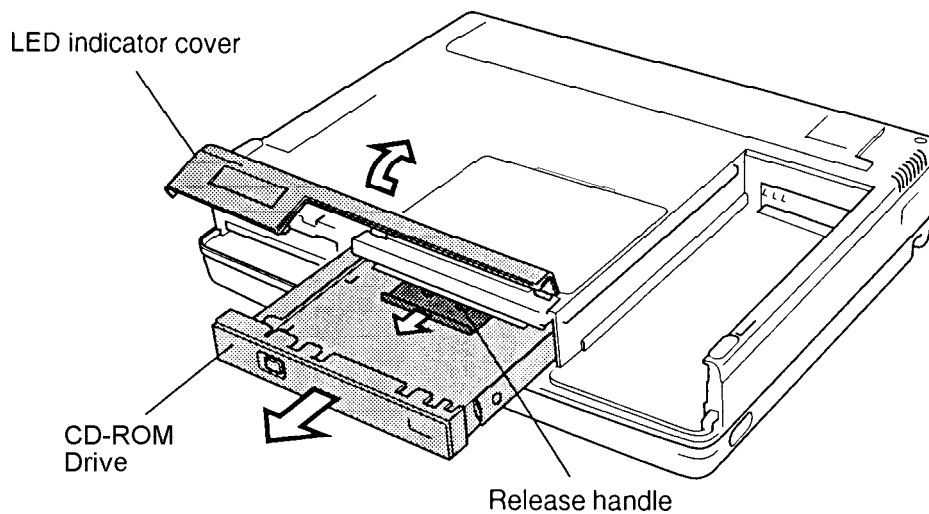
Figure 4-11 Removing the CD-ROM drive

8. Remove **four M2x3 silver screws** and **two M2.5x6 silver screws** securing the frame to the CD-ROM drive.

M2x3
silver screws

M2.5x6
silver
screws

M2x3
silver
screws
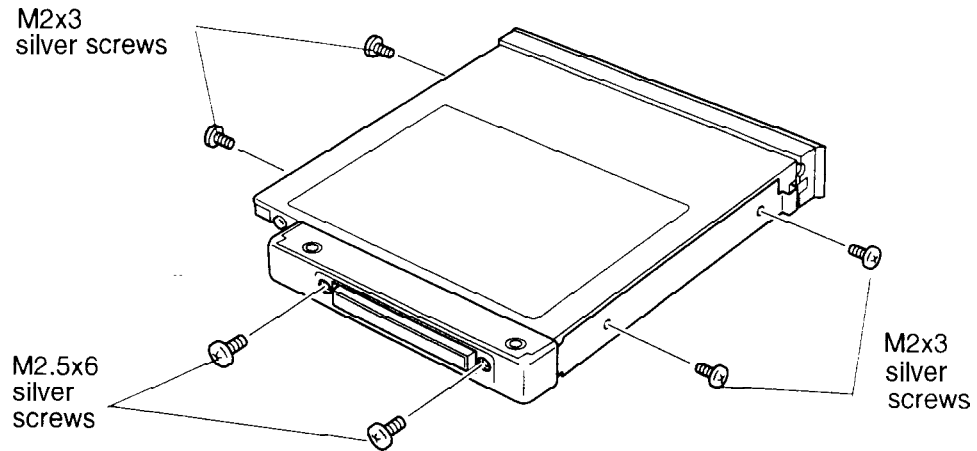
Figure 4-12 Removing the CD-ROM screws

9. Slide the **drive partially** out of the frame.

10. Remove the drive from the **cover** and **cable cover,** then disconnect the **cable connector**.

CD-ROM drive

Cable cover

Cover

Cable connector

Drive frame
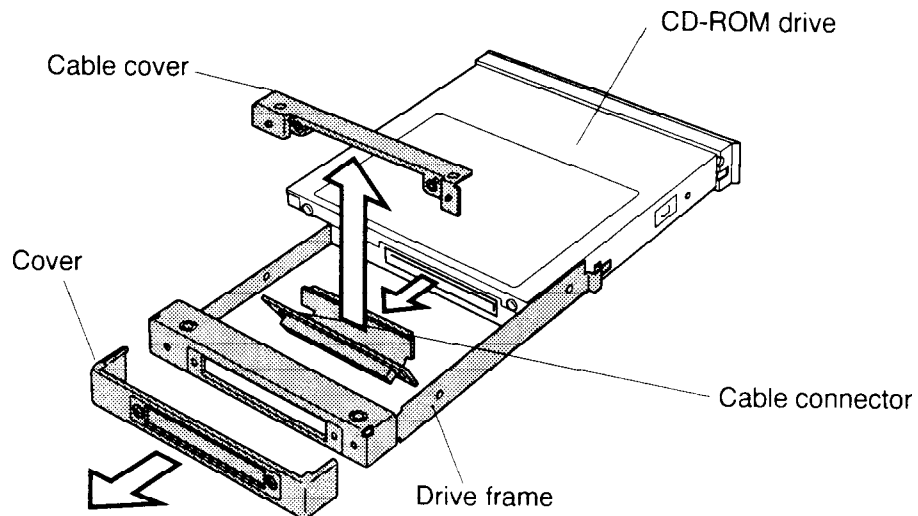
Figure 4-13 Removing the CD-ROM

Installing the CD-ROM Drive

To install the CD-ROM drive, follow the steps below and refer to Figures 4-14 back through 4-11.

1. Seat the **cable cover** (be sure the cable cover is *between* the connector and the drive), then connect the **cable connector**.

2. Replace the **connector cover**.

3. Push the **CD-ROM drive** fully into the frame.

4. Secure the frame to the drive with **four M2x3 silver screws** and **two M2.5x6 silver screws**.

5. Turn the computer upside down.

6. Insert the CD-ROM drive in the computer and press gently until it locks into place (make sure the LED indicator cover is in the up position).

7. Close the **LED indicator cover**.

8. Slide the cover to the right to engage the latches.
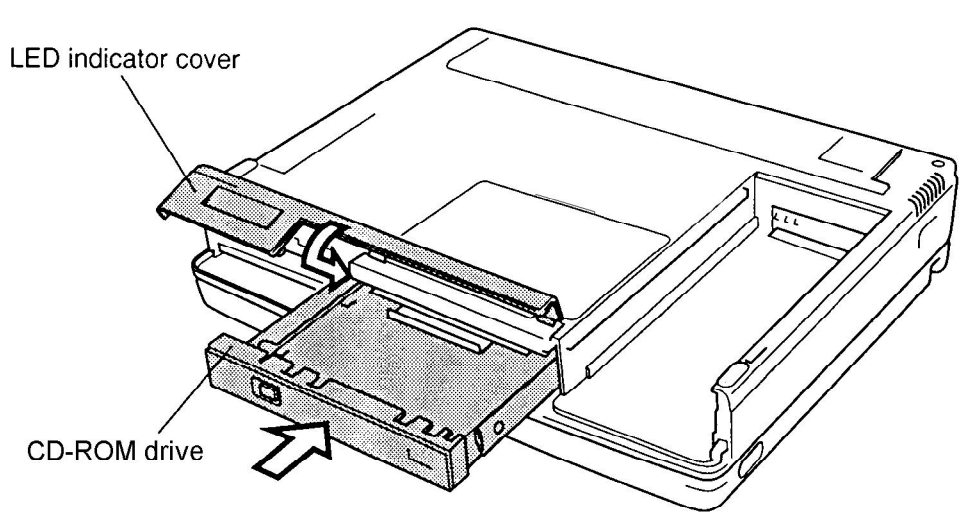
Figure 4-14 Installing the CD-ROM drive

9. Install the optional PC card, optional memory module, and battery pack as described in Sections 4.4, 4.3, and 4.2.

4.7 Hard Disk Drive (HDD)

Removing the Hard Disk Drive

To remove the hard disk drive, follow the steps below and refer to Figures 4-15 to 4-17.

1. Turn off the power to the computer, then disconnect the AC adapter and all external cables connected to the computer.

2. Remove the battery pack, optional memory module, optional PC card as described in Sections 4.2 through 4.5.

3. Slide the **LED indicator cover** to the left to free it from the **latches**.

4. Rotate the cover up.

5. Grasp the **plastic handle** and pull out the **HDD**.
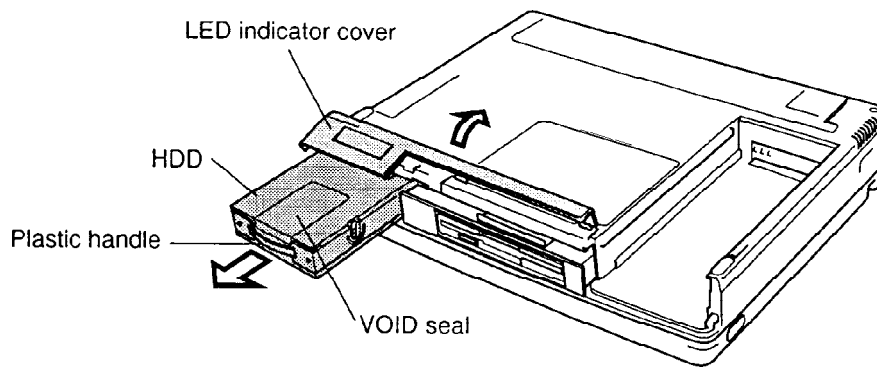
Figure 4-15 Removing the HDD

6. Peel off the **VOID seal** at the top, and remove **four flat M3x4 screws** securing the cover to the pack. Slide the cover forward slightly (about 2 cm) and lift it off.
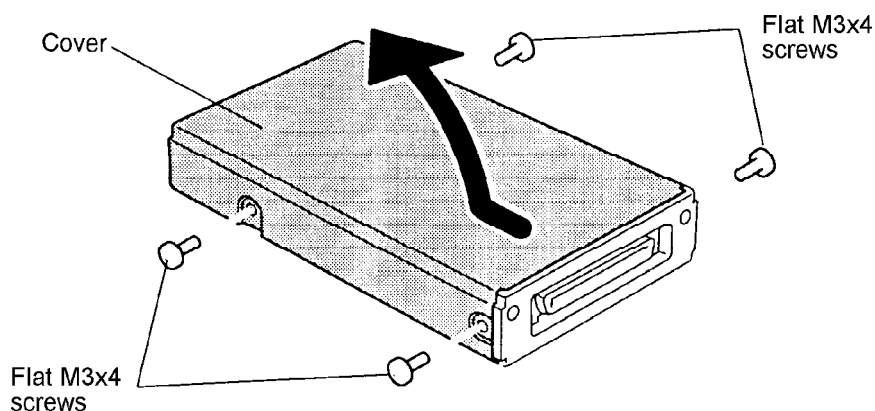
Figure 4-16 Removing the HDD screws

7.   Remove **two flat M3x4 screws** securing the HDD to the case and lift out the HDD.

8.   Carefully pull off the HDD connector.
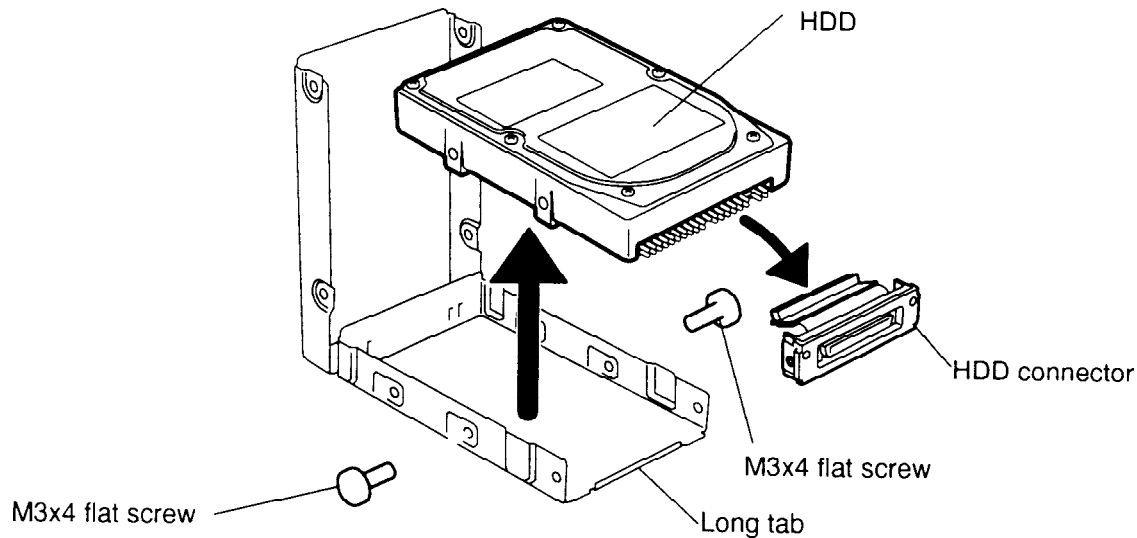
Figure 4-17 Removing the HDD

Installing the Hard Disk Drive

To install the hard disk drive, follow the steps below and refer to Figures 4-17 back through 4-15.

1.   Connect the **HDD connector**.

2.   Seat the **HDD** in the case and place the HDD connector holder into the **long tab**.

3.   Secure **two flat M3x4 screws**.

4.   Put the HDD **cover** in place; then place your hand on the cover and press lightly to ensure the cover seats completely. Verify the HDD connector is seated properly.

5.   Secure **four flat M3x4 screws**, then apply a new **VOID seal**. Do not re-use the old one.

6.   Turn the computer upside down, slide the **LED indicator cover** to the left, and rotate the cover up.

7.   Insert the **HDD**, **VOID label** side up, and press to ensure a firm connection.

8.   Install the optional PC card, optional memory module, and battery pack as described in Sections 4.4 back through 4.2.

4.8 Upper Cover and Keyboard

Removing the Upper Cover and Keyboard

To remove the upper cover and keyboard, follow the steps below and refer to Figures 4-18 to 4-21.

1. Turn off the power to the computer, then disconnect the AC adapter and all external cables connected to the computer.

2. Remove the battery pack, optional memory module, optional PC card, FDD or CD-ROM drive, and HDD as described in Sections 4.2 through 4.7.

3. Remove the **right** and **left connector covers** on the back of the computer.

4. Remove **four silver M2.5x4 screws** from the back of the computer.
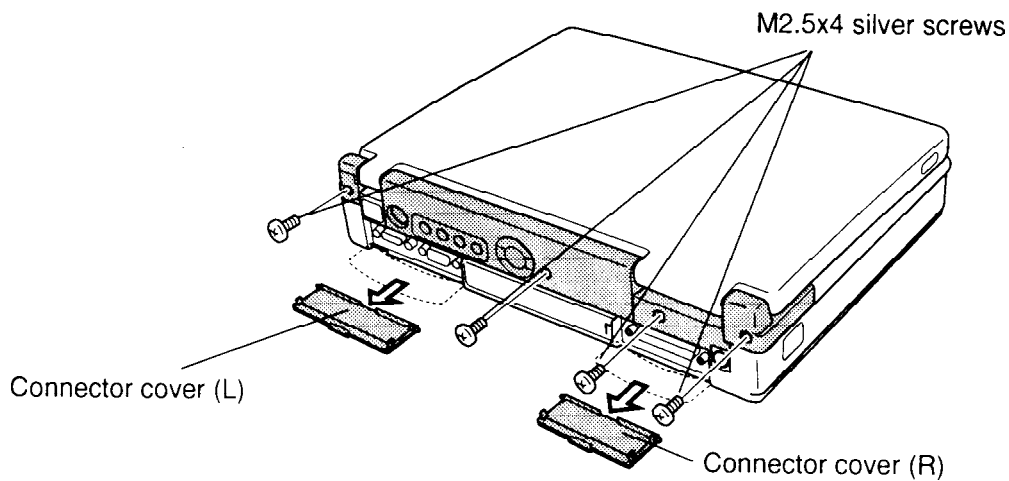
Figure 4-18 Removing screws from the back of the computer

5. Lift up slightly on the **upper cover** at the back of the computer so it can easily clear the audio jacks. Open the **display panel** and lay the display back fully.

6. Starting from the back left corner and finishing with the front right corner, release **six latches** and remove the **upper cover**.
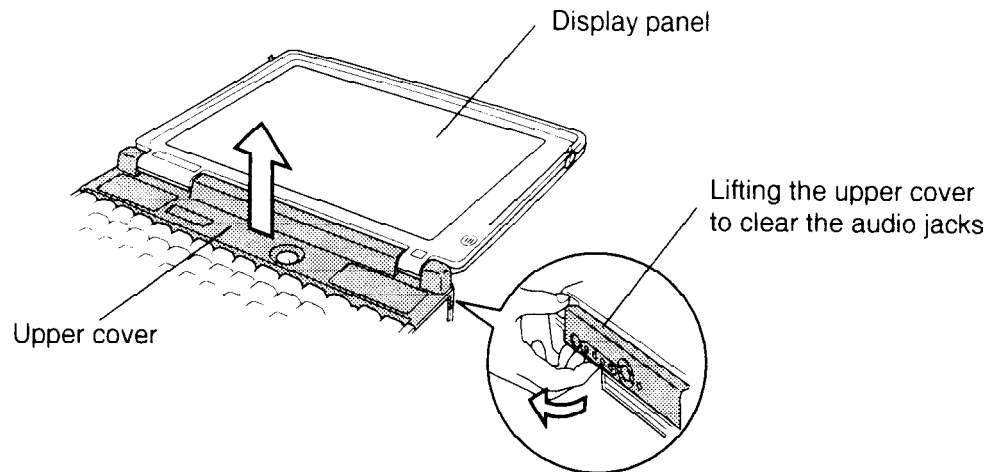
Figure 4-19 Removing the upper cover

7. Remove the **volume control knob** and **insulator**.

8. Remove **one left M2.5x6** and **one right M2.5x4 screw** securing the **metal brace** near the keyboard and AccuPoint mouse connector, then remove the brace.

9. Remove **one M2.5x6 screw** securing the **display ground wire** and **metal cover**, then lift out the cover.
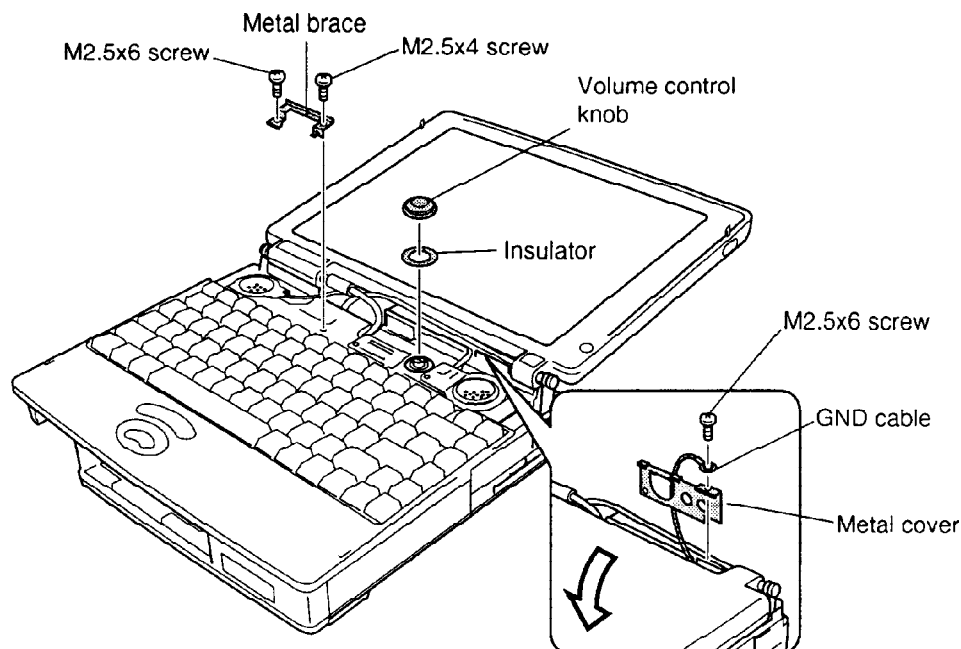
Figure 4-20 Removing the metal brace and cover

10. Lift the **keyboard** up from the back and slide it forward to disengage the keyboard tabs from the palm rest, then place the keyboard on the palm rest.

11. Disconnect the **flexible keyboard cable** from **PJ702** (gently release it from its pressure plate connector) and remove the keyboard.
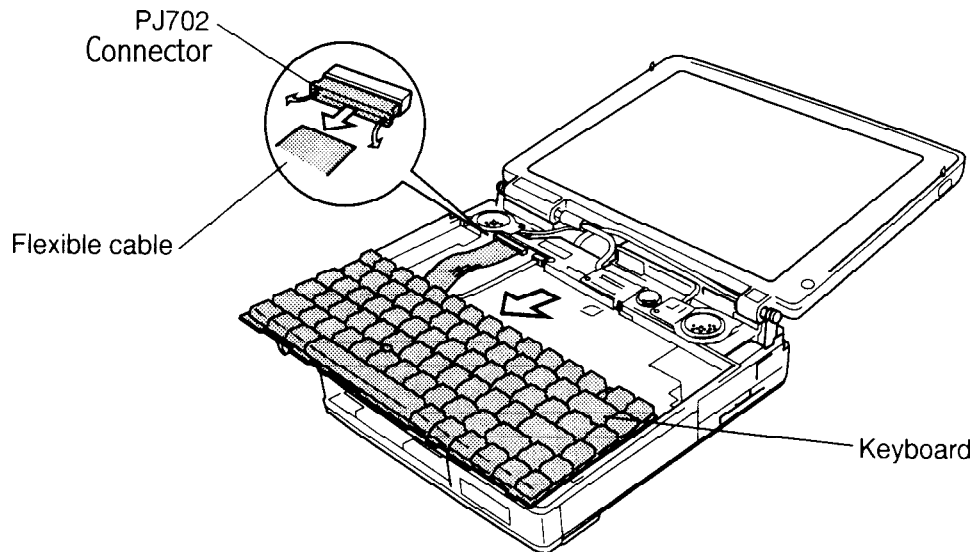
Figure 4-21 Removing the keyboard

Installing the Upper Cover and Keyboard

To install the upper cover and keyboard, follow the steps below and refer to Figures 4-21 back through 4-18.

1. Connect the **keyboard cable** to the **PJ702** connector. Be careful when connecting the cable to the connector as it only releases approximately 1-2mm.

2. Seat the **keyboard** by sliding it backwards and gently pressing down to secure the keyboard tabs.

3. Seat the **metal cover** and secure it and the **display ground wire** with **one M2.5x6 screw**.

4. Secure the **metal keyboard brace** to the keyboard with **one M2.5x6 screw** and **one M2.5x4 screw**.

5. Seat the **Volume knob** and **white plastic washer**, then replace the tape over the display cables.

6.   Starting at the right front corner and working your way back, seat the **upper cover** and secure the latches.

7.   Close the **display panel**.

8.   Secure **four M2.5x4 silver screws** on the back of the computer.

9.   Replace the **right** and **left connector covers** on the back of the computer.

10. Install the HDD, CD-ROM drive or FDD, optional memory module, optional PC card, and battery pack as described in Sections 4.7 back through 4.2.

4.9 DAA Module

Removing the DAA Module

To remove the DAA Module, follow the steps below and refer to Figures 4-22 to 4-25.

1. Turn off the power to the computer, then disconnect the AC adapter and all external cables connected to the computer.

2. Remove the battery pack, optional memory module, optional PC card, FDD or CD-ROM drive, HDD, and upper cover and keyboard as described in Sections 4.2 through 4.8.

3. Carefully remove the DAA module **lower cover**.

4. Remove **two M2.5x4 silver screws** securing the DAA module **jack cover** and remove the jack cover.
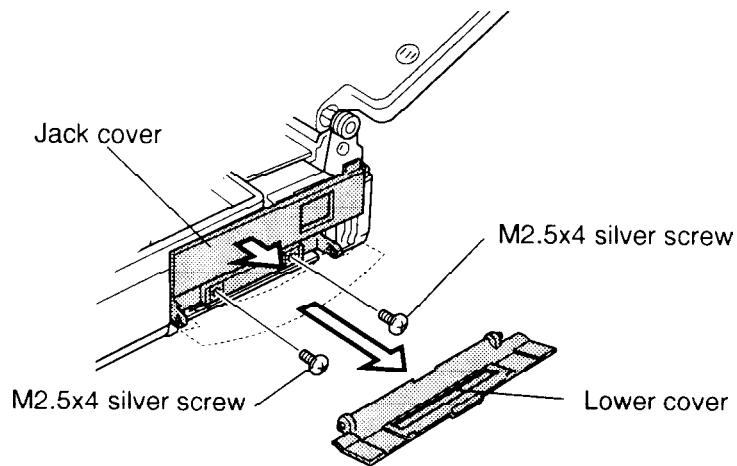
Figure 4-22 Removing the lower cover screws

5.   Remove **one M2.5x4 silver screw** and **one M2.5x4 screw** securing the **DAA module**.
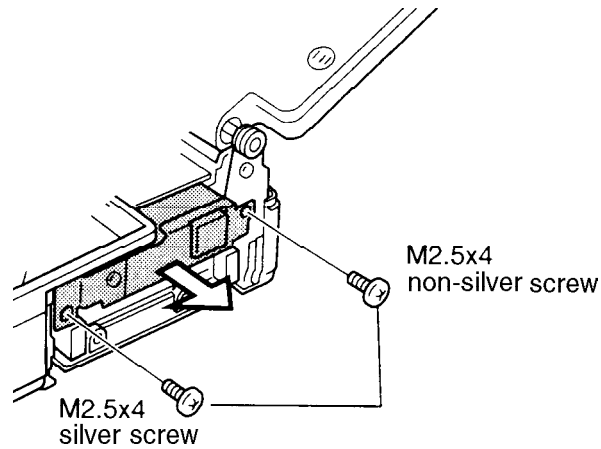
6.   Pull out the **DAA module**.

Figure 4-23 Removing the DAA module screws

7.   Remove **three M2.5x4 screws** securing the DAA module's **metal cover** and remove the cover, taking care to clear the **guide post**.
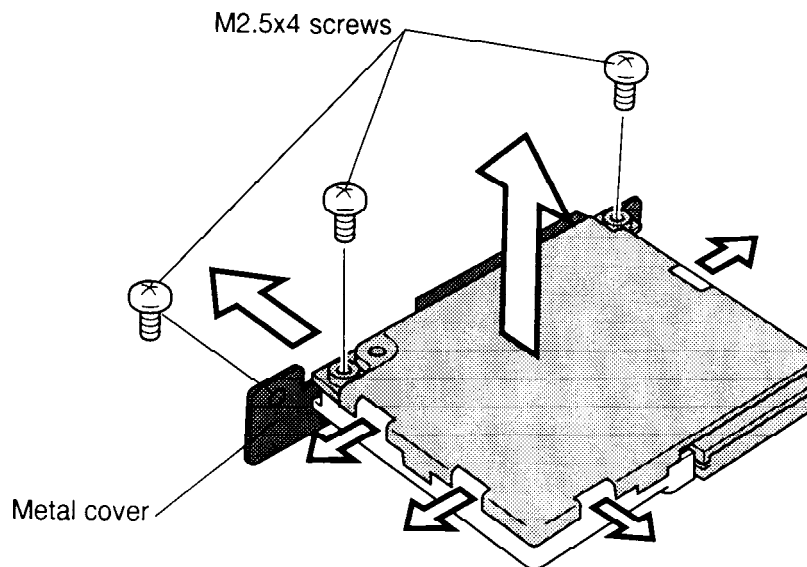

Figure 4-24 Removing the DAA module metal cover screws

8. Remove the DAA module **plastic upper cover** by removing the centered latches.

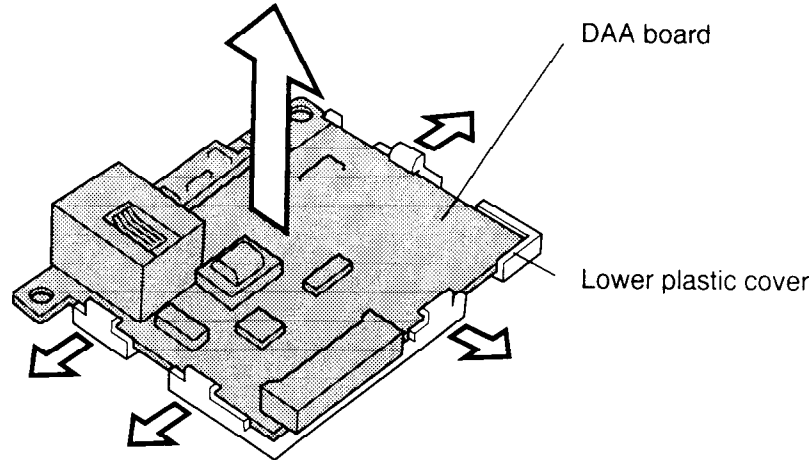9. Separate the **DAA board** from the **lower plastic cover**.

Figure 4-25 Separating the DAA module from the lower plastic cover

Installing the DAA Module

To install the DAA Module, follow the steps below and refer to Figures 4-25 back through 4-22.

1. Seat the **DAA board** in the **lower plastic cover**.

2. Attach the **upper plastic cover**.

3. Secure the DAA module **metal cover** with **three M2.5x4 screws**.

4. Insert the **DAA module** into the computer and press gently to assure a firm connection. The metal cover should lie flush against the computer.

5. Secure the DAA module with **one M2.5x4 silver screw** and **one M2.5x4 screw.**

6. Seat the **jack cover** and secure it with **two M2.5x4 screws**.

7. Replace the **DAA module cover**.

8. Install the upper cover and keyboard, HDD, CD-ROM drive or FDD, optional memory module, optional PC card, and battery pack as described in Sections 4.8 through 4.2.

4.10 Display Mask

Removing the Display Mask

To remove the display mask, follow the steps below and refer to Figures 4-26 and 4-27.

1. Turn off the power to the computer, then disconnect the AC adapter and all external cables connected to the computer.

2. Remove the battery pack, optional memory module, and optional PC card as described in Sections 4.2 through 4.4.

3. Carefully remove **two mask seals** at the hinges, pulling them up, to expose **two M2.5x6 screws** securing the **display mask**.

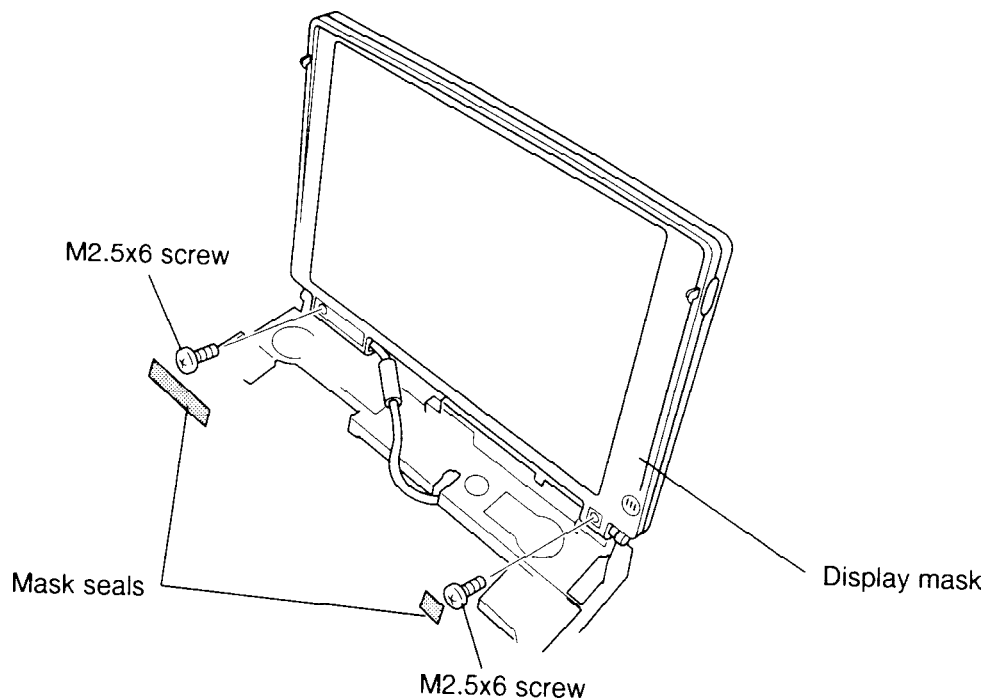4. Remove the **two M2.5x6 screws** that were covered by the **Mask seals**.

Figure 4-26 Removing the display mask screws

5. Carefully insert your fingers between the mask and the LCD panel and pry open the latches. Start with **five latches** across the top of the display mask.

6. Continue releasing the mask along the **sides** (**four latches** on each side), then at the **bottom** (**four latches**).
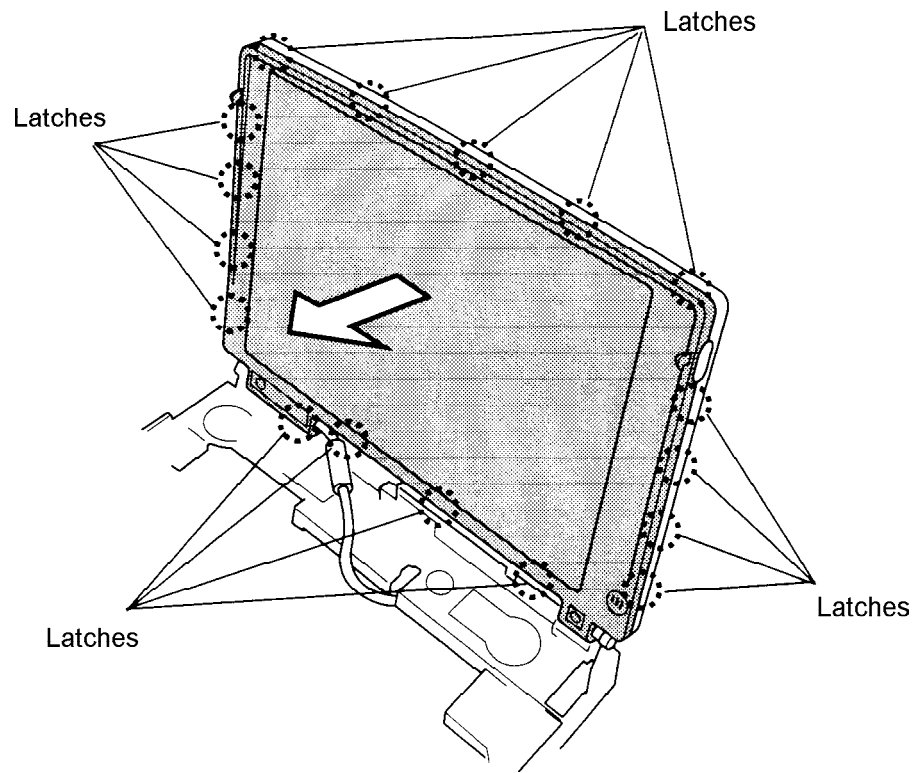
Figure 4-27 Removing the display mask

Installing the Display Mask

To install the display mask, follow the steps below and refer to Figures 4-26 and 4-27.

1. Set the **display mask** in place and secure the latches beginning with the four latches at the bottom.

2. Continue along the sides **(four latches)** and then across the top **(five latches)**.

3. Secure the cover with **two M2.5x6 screws** at the hinges.

4. Attach the **two mask seals** to cover the screws.

5. Install the optional memory module, optional PC card, and battery pack as described in Sections 4.4, 4.3, and 4.2.

4.11 FL Inverter Board

Removing the FL Inverter Board

To remove the FL inverter board, follow the steps below and refer to Figure 4-28.

1. Turn off the power to the computer, then disconnect the AC adapter and all external cables connected to the computer.

2. Remove the battery pack, optional memory module, optional PC card, and display mask as described in Sections 4.2, 4.3, 4.4, and 4.10.

3. Remove **two M2.5x6 screws** securing the **FL inverter board**.

4. Carefully rotate the **FL inverter board** out from right to left and disconnect the **input cable** from **CN1** and the **HV cable** from **CN2**.

> *Note: You may wish to place a binder and form pad under the display to provide additional stability while performing these steps.*
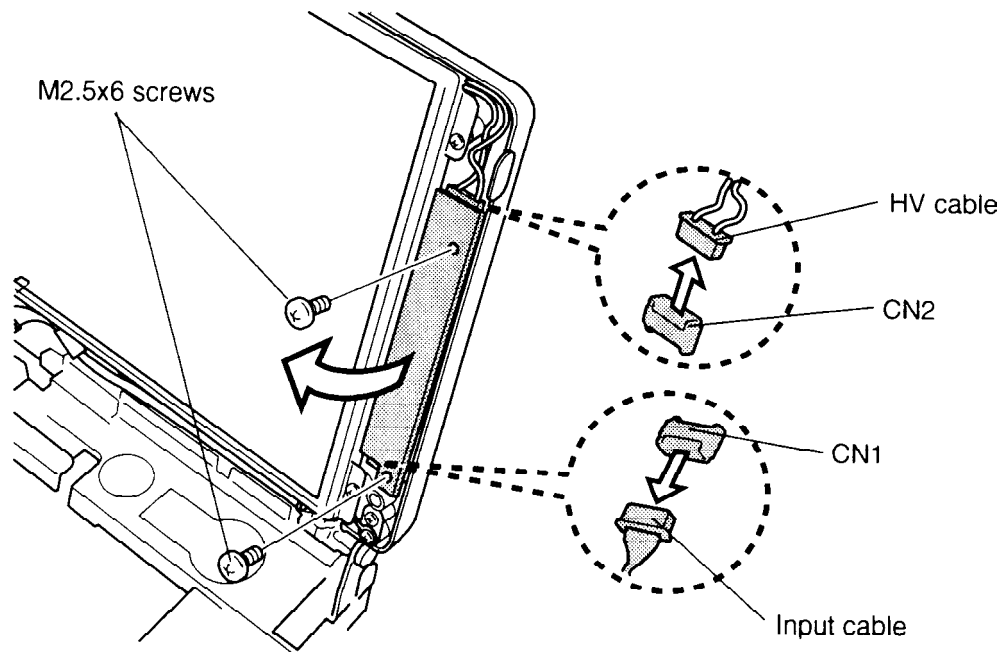

Figure 4-28 Removing the FL inverter board

Installing the FL inverter board

To install the FL inverter board, follow the steps below and refer to Figure 4-28.

1. Connect the **input cable** to **CN1** on the **inverter board** and the **HV cable** to **CN2**.

2. Route the cables so they are not pinched by the FL inverter board, display hinge, or other component when the display mask is re-installed.

3. Replace the FL inverter board and secure it with **two M2.5x6 screw**.

4. Install the display mask, optional memory module, optional PC card, and battery pack as described in Sections 4.10, 4.4, 4.3, and 4.2.

4.12 LCD Module

Removing the LCD Module

To remove the LCD module, follow these steps and refer to Figure 4-29.

1. Turn off the power to the computer, then disconnect the AC adapter and all external cables connected to the computer.

2. Remove the battery pack, optional memory module, optional PC card, display mask, and FL Inverter board as described in Sections 4.2, 4.3, 4.4, 4.10, and 4.11.

3. Remove **four M2.5x6 screws** securing the **LCD module** to the **LCD cover**.

4. Remove the tape, then carefully rotate the **LCD module** from right to left out of the display cover and disconnect the **LCD cable** from **CN1** on the LCD module. Note the position of the noise-reduction gasket.
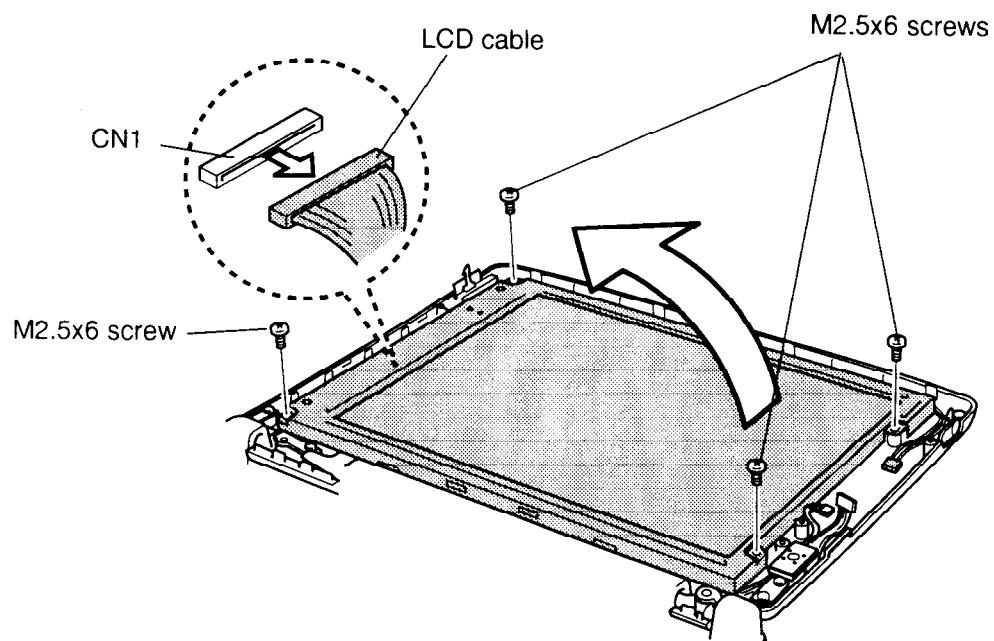

Figure 4-29 Removing the LCD module

Installing the LCD Module

To install the LCD module, follow the steps below and refer to Figure 4-29.

1. Connect the **LCD cable** to **CN1** on the **LCD module**.

> *NOTE: A gasket to reduce noise that might affect the LCD is attached to the LCD flexible cable. When you connect the flexible cable, make sure the gasket is turned so that it lies against the panel's metal cover. If the gasket is turned outward, it will be ineffective.*

2. Seat the **LCD module** and then secure it to the **LCD cover** with **four M2.5x6 screws**.

3. Install the FL inverter board, display mask, optional memory module, optional PC card, and battery pack as described in Sections 4.11, 4.10, 4.4, 4.3, and 4.2.

4.13 FL Inverter Cable

Removing the FL Inverter Cable

To remove the FL inverter cable, follow the steps below and refer to Figure 4-30.

1. Turn off the power to the computer, then disconnect the AC adapter and all external cables connected to the computer.

2. Remove the battery pack, optional memory module, optional PC card, upper cover, display mask, FL Inverter board, and LCD module as described in sections 4.2, 4.3, 4.4, 4.10, 4.11, and 4.12.

3. Remove **two M2.5x6 screws** securing **two ground cables** to the right hinge.

4. Remove **one M2.5x6 screw** securing **one ground cable** to the left hinge.

5. Remove **one M2.5x6 ground screw** in the top cover cable channel and disconnect the FL Inverter cable from PJ703 on the IPS board.

6. Remove the tape from the back cover and covering the cable, and lift out the **FL inverter cable**.
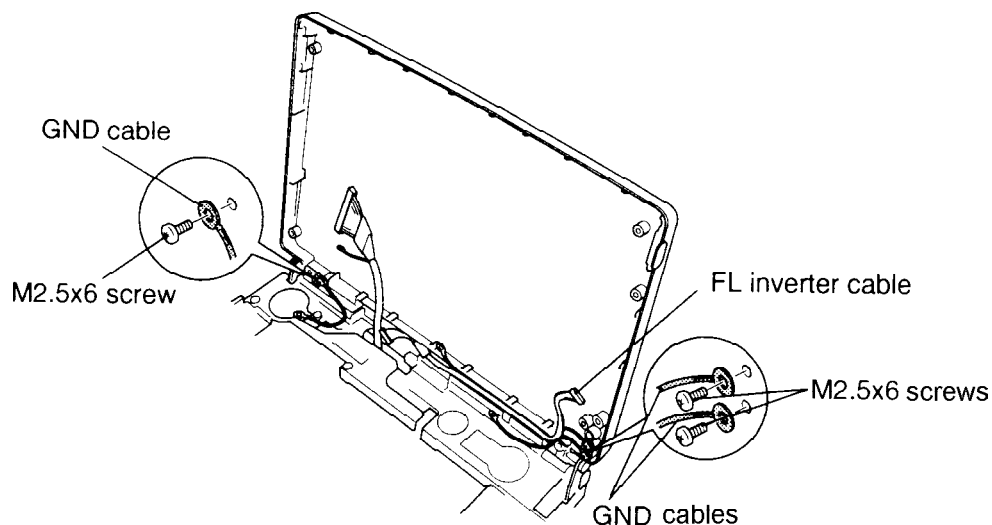
Figure 4-30 Removing the ground cable screws

Installing the FL Inverter Cable

To install the FL inverter cable and LCD cable, follow the steps below and refer to Figure 4-30.

1. Insert the **FL Inverter cable** and replace the tape on the cable and back cover.

2. Connect the **FL Inverter cable** to **PJ703** on the IPS board and secure the ground wire in the top cover cable channel with **one M2.5x6 screw**.

3. Secure the **one ground cable** to the **left hinge** with **one M2.5x6 screws**.

4. Secure the **two ground cables** to the **right hinge** with **two M2.5x6 screws**.

5. Install the display mask, upper cover, optional memory module, optional PC card, and battery pack as described in Sections 4.12, 4.11, 4.10, 4.4, 4.3, and 4.2.

4.14 Display Assembly, Jack Board, Speaker, and Modem Board

> *CAUTION: To avoid damage to the keyboard base: Do not open or close the display assembly without suporting the keyboard base at the hinge area or you might break delicate parts. Also, after disconnecting the keyboard base from the bottom cover, do not touch the area around the palm rest of the keyboard base.*

Removing the Display Assembly, Jack Board, Speaker, and Modem Board

To remove the display assembly, sound board, jack board, speaker, and modem board follow the steps below and refer to Figures 4-31 to 4-39.

1. Turn off the power to the computer, then disconnect the AC adapter and all external cables connected to the computer.

2. Remove the battery pack, optional memory module, optional PC card, FDD or CD-ROM drive, HDD, upper cover and keyboard, DAA module, display mask, FL Inverter board and LCD module as described in Sections 4.2 through 4.13.

   > *CAUTION: The LCD cover, top cover, and chassis can be easily damaged if the cover is not opened and closed very carefully.*

3. Grip the LCD outer cover between your thumb and fingers, placing your thumbs on the screws inside the base of each corner and your fingers just above the hinges on the outside of the cover. When closing the cover, apply even pressure on each side. Press down slightly toward the chassis to ensure you apply even pressure on the chassis as well as the cover.

4. Turn the computer upside down and remove **two M2.5x6 silver screws** from the **battery pack slot**, **two M2x3 silver screws** from the **selectable bay,** and **three M2.5x20 silver screws** from the computer base.
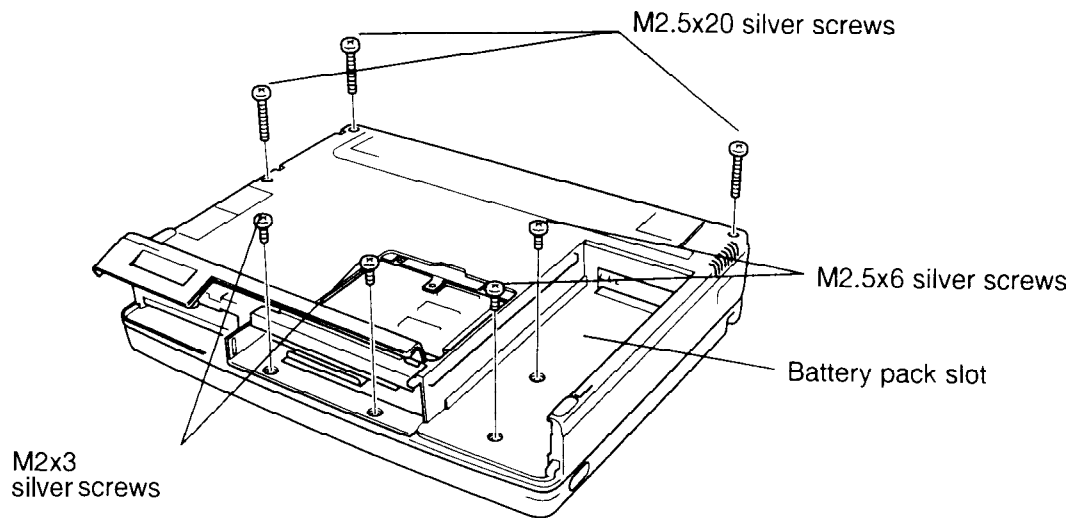
Figure 4-31 Removing the screws

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

> *CAUTION: To avoid damage to the LCD outer cover, top cover, and chassis, unlatch the LCD outer cover and open it just enough to clear the latches. Press on each corner at the base of the cover with your thumbs, and press down on the hinges with your fingers. Slowly open the cover just enough to fit your thumbs over the screws on the inside of each corner. With your fingers still on the hinges, apply even pressure as you now fully open the cover.*

6. Remove **one M2.5x6 screw** securing the **metal fan cover** and lift out the cover.

7. Remove **one silver M2.5x20 screw** and **one M2.5x4 screw** securing the metal cover over the left speaker. The M2.5x4 screw also secures a **ground cable**. Remove the left speaker.

8. Disconnect the **speaker cable** from **PJ6** on the **jack board** and remove the right speaker.

9. Disconnect the **microphone cable** from **PJ207** on the jack board.

10. Remove **one M2.5x6 screw** securing the **ground cable** to the computer. This screw is somewhat hidden under the FL Inverter cable near the right hinge.
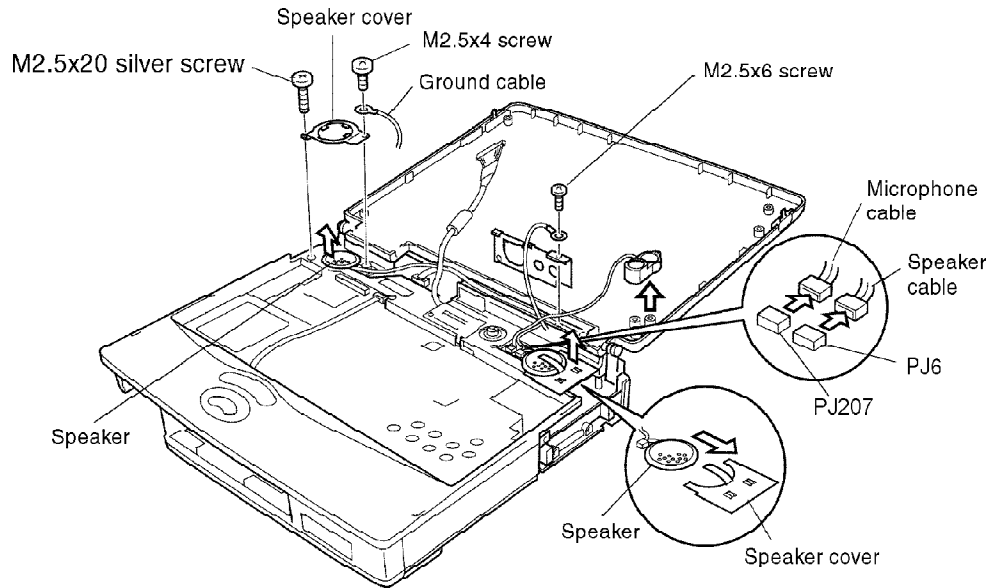
Figure 4-32 Removing cables

11. Disconnect the **membrane switch cable** from **PJ701** on the **IPS board**. Be careful when disconnecting the cable as it only releases approximately 1-2mm. Gently release it from its pressure plate.

12. Disconnect the **FL inverter cable** from **PJ703** on the IPS board.
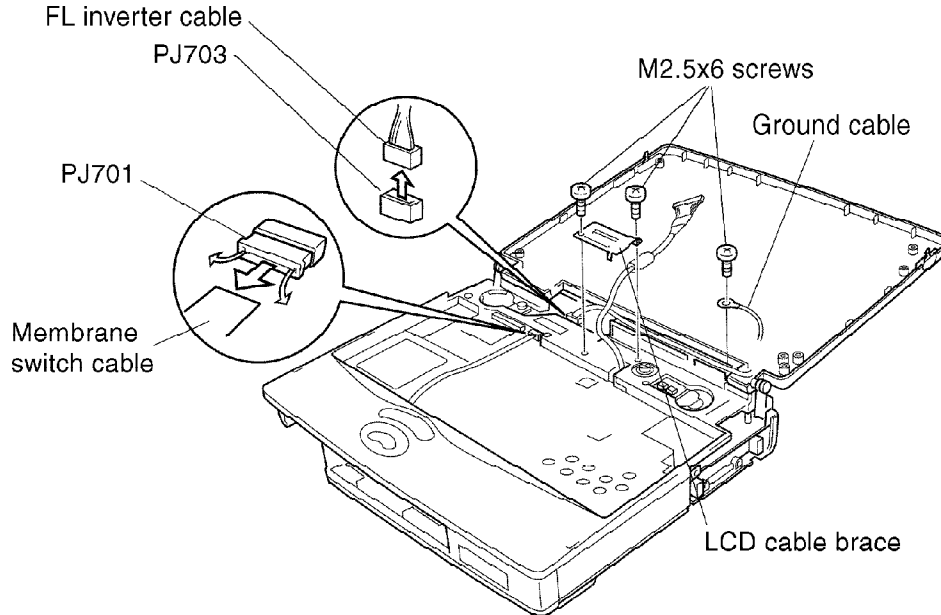
Figure 4-33 Removing additional cables

13. Remove the **volume control knob**.

14. Release **nine latches** securing the keyboard base: three on the right, two in front, and four on the left.

15. Lift up the **keyboard base** and **display assembly** so you can disconnect the **display sensor cable** from **PJ705** on the **IPS board**. The narrow strings at the sides of the keyboard base can be easily broken, so be careful when handling them.
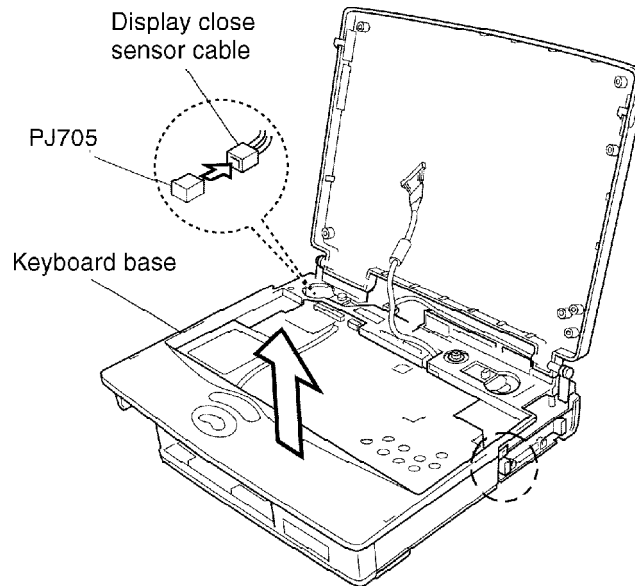
Figure 4-34 Lifting up the keyboard base

NOTE: A dotted circle indicates an area that is particularily vulnerable to breakage.

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16. Carefully rotate the keyboard base backward about 90 degrees and slip the video cable out of the slot on the keyboard base.

17. Lift off the **keyboard base** and **display assembly**.
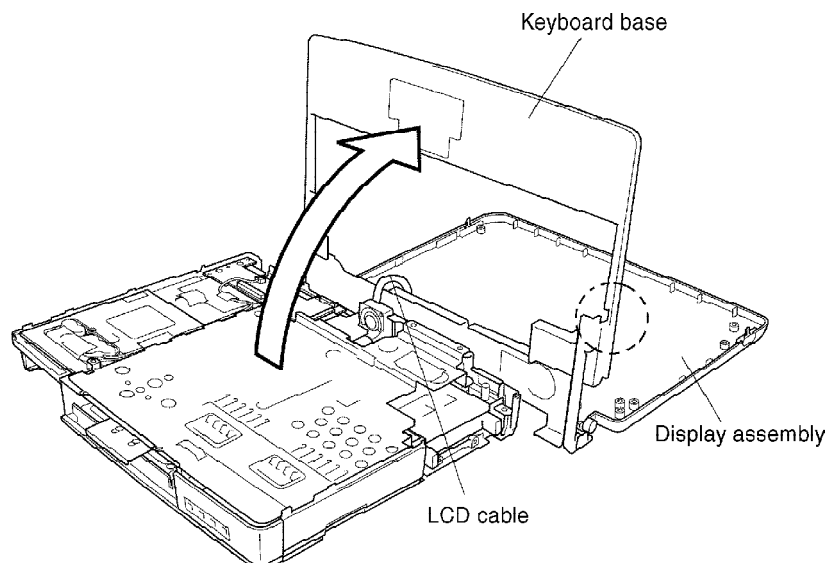
Figure 4-35 Removing the keyboard base and display assembly

18.   Remove **four M2.5x6 screws, one M2.5x8 screw,** and **two M2.5x4 screws** securing the **metal cover**.

19.   Lift off the metal cover.
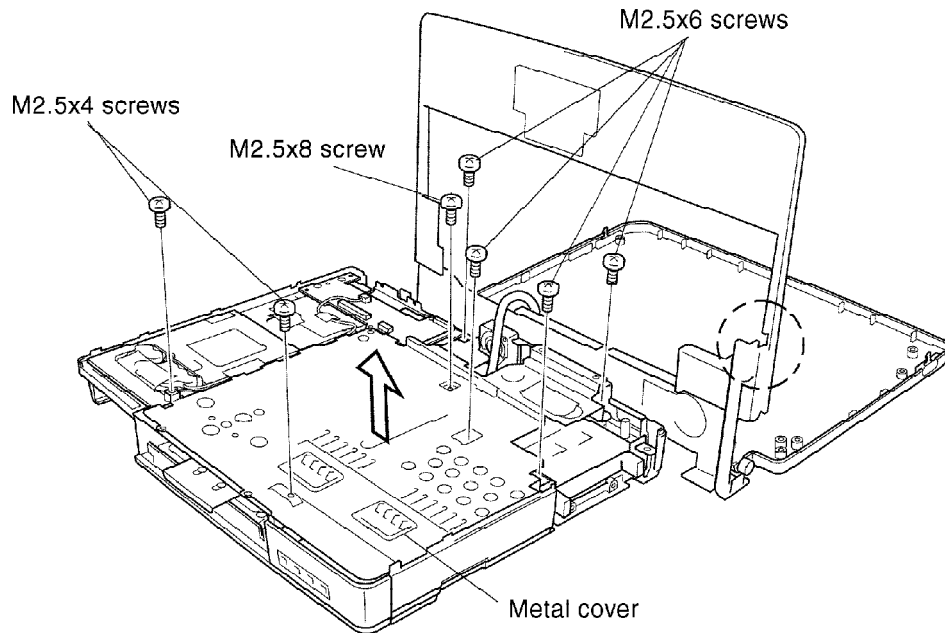
Figure 4-36 Removing the metal cover

20.   Disconnect the **jack board connector (PJ201)** from the **modem board connector (PJ3)** to remove the **jack board**. Be careful to note the position of the mylar covering on the jack board.
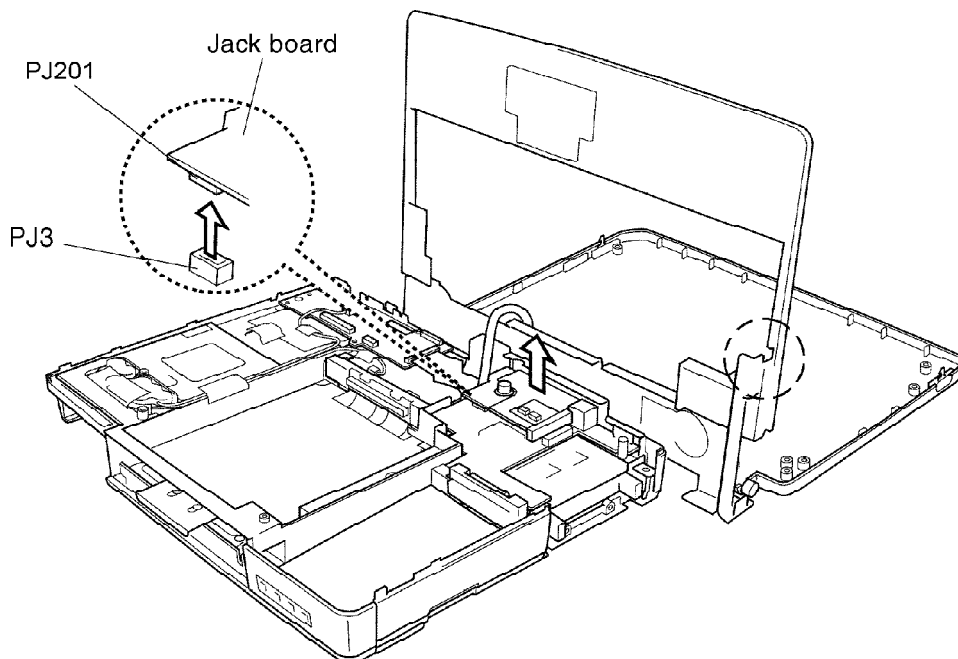
Figure 4-37 Disconnecting the jack board

21. Remove **one M2.5x4 screw** securing a **metal shield** on the modem I/F board, then lift off the shield.

22. Disconnect the **PJ2** connector on the modem board from the **PJ605** connector on the system board, directing your pressure near the HDD connector, and lift out the modem board.
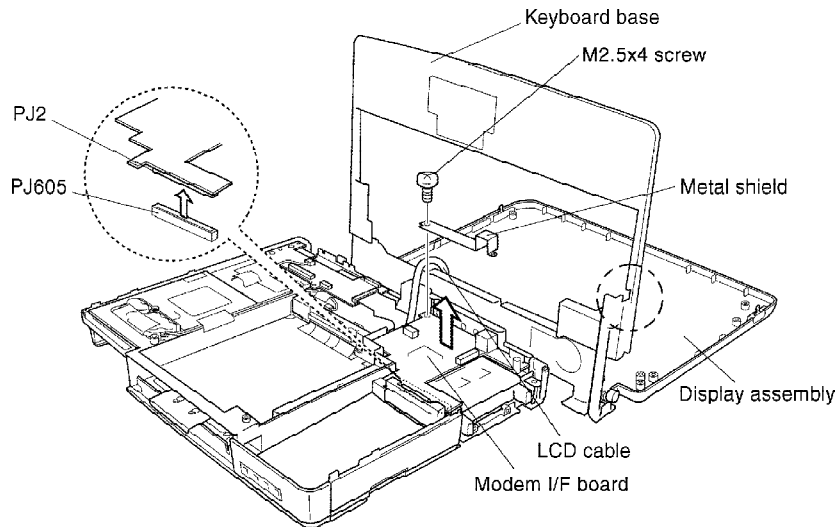
Figure 4-38 Removing the modem board

23. Disconnect the **video cable** from **PJ603** on the system board.

24. Disconnect the **fan cable** from **PJ16** on the system board.
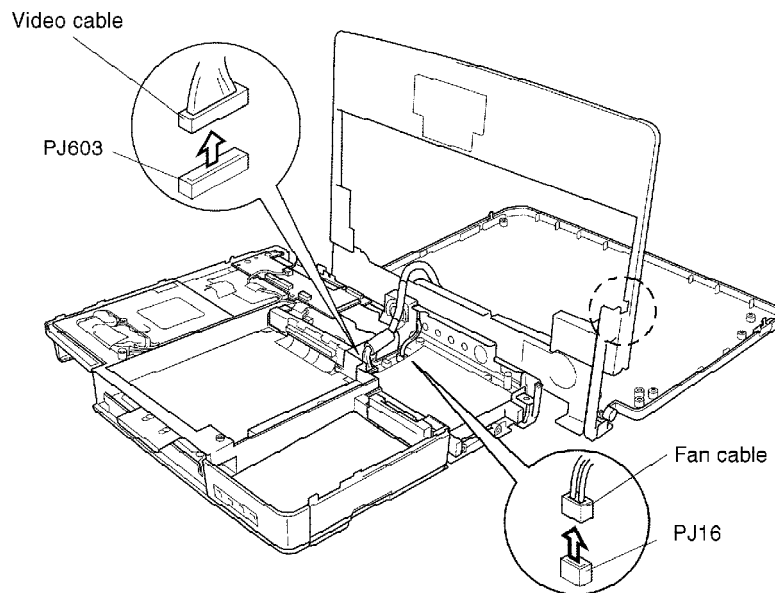
Figure 4-39 Disconnecting the video cable and fan cable

25. Remove the **keyboard base** and **display assembly**.

Installing the Display Assembly, Jack Board, Speaker, and Modem Board

To install the display assembly, jack board, speaker, and modem board, follow the steps below and refer to Figures 4-39 back through 4-31.

1. Connect the **fan cable** to **PJ16** on the **system board**.

2. Connect the **video cable to PJ603** on the system board.

3. Seat the **modem board** and carefully press to connect **PJ2** to **PJ605** on the system board.

4. Seat the **metal shield**, and secure the shield and modem board with **one M2.5x4 screw**.

5. Connect **PJ201** on the **jack board** to **PJ3** on the **modem board**, and reinstall the mylar cover.

6. Seat the **metal cover** and secure it with **two M2.5x4 screws**, **four M2.5x6 screws,** and **one M2.5x8 screw**.

7. Seat the **keyboard base** and **display assembly**.

8. Connect the **display close sensor cable** to **PJ705** on the **IPS board**.

9. Press to secure the **nine latches**.

10. Secure the **LCD cable** and **ground cable** with **one M2.5x6 screw** near the right hinge.

11. Connect the **FL inverter cable** to **PJ703** on the IPS board.

12. Connect the **membrane switch cable** to **PJ701** on the IPS board.

13. Connect the **microphone cable** to **PJ207** on the jack board.

14. Secure the **LCD cable brace** with **two M2.5x6 screws**.

15. Connect the **speaker cable** to **PJ6** on the jack board.

16. Set the **volume control knob** in place.

17. Secure **one M2.5x4 screw** and **one silver M2.5x20 screw** on the metal cover over the left speaker. The M2.5x4 screw also secures a **ground cable**.

18. Secure the metal fan cover with **one M2.5x6 screw**.

19. Close the display.

20. Turn the computer upside down and secure **two silver M2.5x6 screws** in the battery pack slot, **two silver M2x3 screws** in the selectable bay, and **three M2.5x20 silver screws** in the computer base.

21. Install the LCD module, FL Inverter board, display mask, DAA module, upper cover and keyboard, HDD, CD-ROM drive or FDD, optional memory module, optional PC card, and battery pack as described in Sections 4.13 through 4.2.

4.15 IPS Board, RTC Battery, and Backup Battery

WARNING: If you replace the RTC battery or sub-battery, be sure to use only batteries recommended by Toshiba. Installation of the wrong battery can cause the battery to explode or otherwise cause damage.

Removing the IPS Board, RTC battery, and Backup Battery

To remove the IPS board, RTC battery, and backup battery, follow the steps below and refer to Figures 4-40 and 4-41.

1. Turn off the power to the computer, then disconnect the AC adapter and all external cables connected to the computer.

2. Remove the battery pack, optional memory module, optional PC card, FDD or CD-ROM drive, HDD, upper cover and keyboard, DAA module, display mask, FL Inverter board, LCD module, display assembly, jack board, speaker and modem board as described in Sections 4.2 through 4.14.

3. Disconnect the **RTC battery cable** from **PJ704**.

4. Flip up the pressure connector to easily disconnect the **drive connector flexible cable** from **PJ700**.

5. Remove **one M2.5x6 screw**.

6. Lift out the **IPS board**.
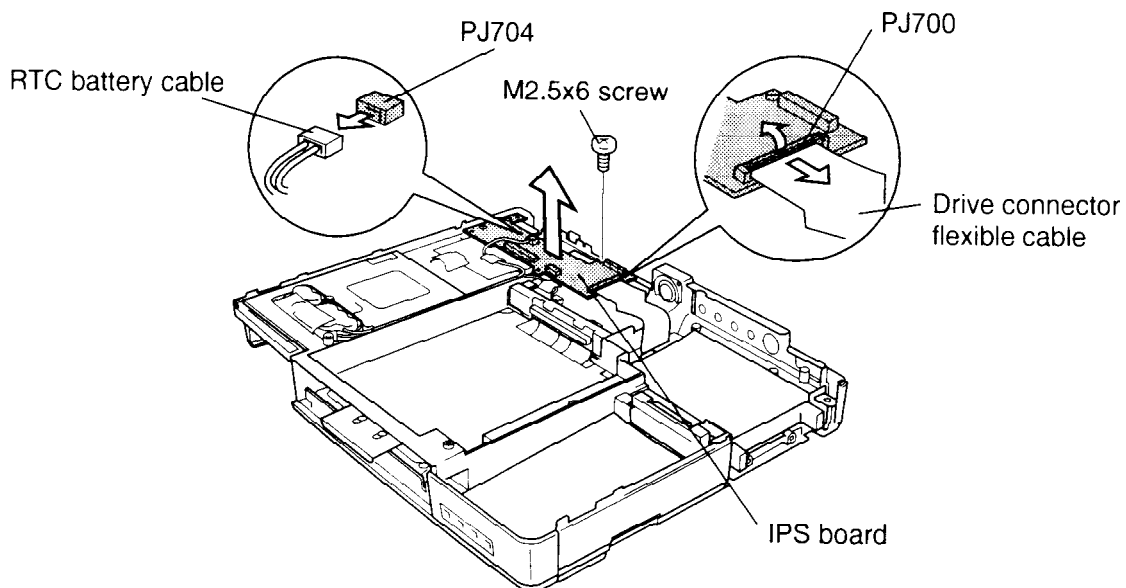
Figure 4-40 Removing the IPS board

7. Disconnect the **backup battery cable** from **PJ140** on the **power supply board**.

8. Remove the **rubber bar** securing the RTC and backup battery cables, and the tape securing the batteries themselves.

> *Note*: *Take note of the cable routing and tape placement before removing them.*

9. Lift out the RTC and backup batteries.

10. Remove the insulator.
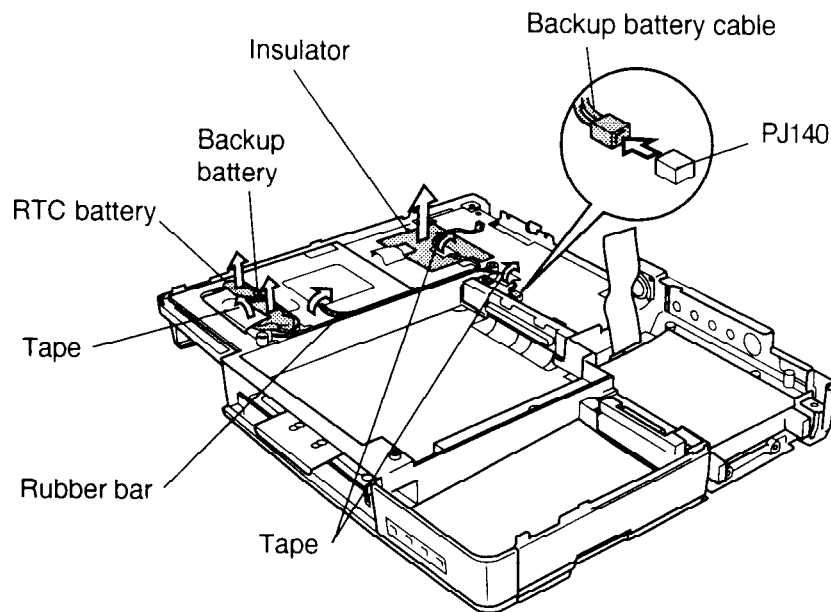
Figure 4-41 Removing the RTC and backup batteries

Installing the IPS Board and RTC battery

To install the IPS board and RTC battery, follow the steps below and refer to Figures 4-40 and 4-41.

1. Apply the **insulator**.

2. Seat the **backup battery**, then carefully route the cable and connect it to **PJ140**.

3. Seat the **RTC battery** and route the cable.

4. Secure the batteries with **tape** and press the **rubber bar** in place to secure the battery cables.

5. Seat the **IPS board**.

6. Connect the RTC battery cable to **PJ704** on the IPS board.

7. Secure **one M2.5x6 screw**.

8. Connect the **drive connector flexible cable** to **PJ700** and close the pressure connector.

9. Install the display assembly, jack board, modem board, speaker, LCD module, FL Inverter board, display mask, DAA module, upper cover and keyboard, HDD, CD-ROM drive or FDD, optional memory module, optional PC card, and battery pack as described in Sections 4.14 back through 4.2.

4.16 Power Supply Board

Removing the Power Supply Board

To remove the power supply board, follow the steps below and refer to Figure 4-42.

1. Turn off the power to the computer, then disconnect the AC adapter and all external cables connected to the computer.

2. Remove the battery pack, optional memory module, optional PC card, FDD or CD-ROM drive, HDD, upper cover and keyboard, DAA module, display mask, FL Inverter board, LCD module, display assembly, jack board, speaker, modem board, IPS board, RTC battery, and backup battery as described in Sections 4.2 through 4.15.

3. Remove **two M2.5x6 screws** securing the power supply board.

4. Remove **one M2.5x6 screw** securing the **plastic connector brace** and lift out the brace.

5. Pull up on the **DC IN socket** to disconnect **PJ10** on the **power supply board** from **PJ11** on the **system board**, and remove the **power supply board** (directing pressure near the AC jack). Be sure to note how the selectable bay connector tabs are routed on top of the power supply board.
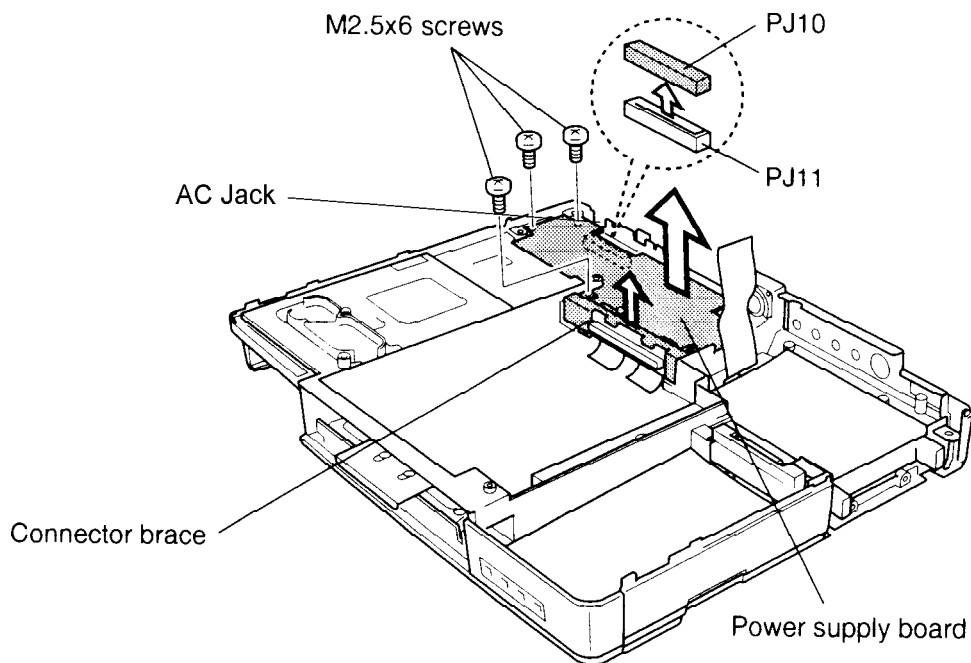
Figure 4-42 Removing the power supply board

Installing the Power Supply Board

To install the power supply board, follow the steps below and refer to Figure 4-42.

1. Connect **PJ10** on the **power supply board** to **PJ11** on the **system board**. Be sure to route selectable bay connector tabs *on top* of the power supply board.

2. Install the **plastic connector brace** and secure it with **one M2.5x6 screw** on the left of the brace.

3. Secure **two M2.5x6 screws** on the power supply board.

4. Install the IPS board, RTC battery and backup battery, display assembly, jack board, modem board, speaker, display mask, FL Inverter board, LCD module, DAA module, upper cover and keyboard, HDD, CD-ROM drive or FDD, optional memory module, optional PC card, and battery pack as described in Sections 4.15 back through 4.2.

4.17 System Board

Removing the System Board

To remove the system board, follow the steps below and refer to Figures 4-43 to 4-48.

1. Turn off the power to the computer, then disconnect the AC adapter and all external cables connected to the computer.

2. Remove the battery pack, optional memory module, optional PC card, FDD or CD-ROM drive, HDD, upper cover and keyboard, DAA module, display mask, FL Inverter board, LCD module, display assembly, jack board, speaker, modem board, IPS board, RTC battery, backup battery, and power supply board as described in Sections 4.2 through 4.16.

3. Remove **three M2.5x4 flat-head screws** and **one M2.5x8 screw** securing the **metal cover**.

4. Lift out the **metal cover**.
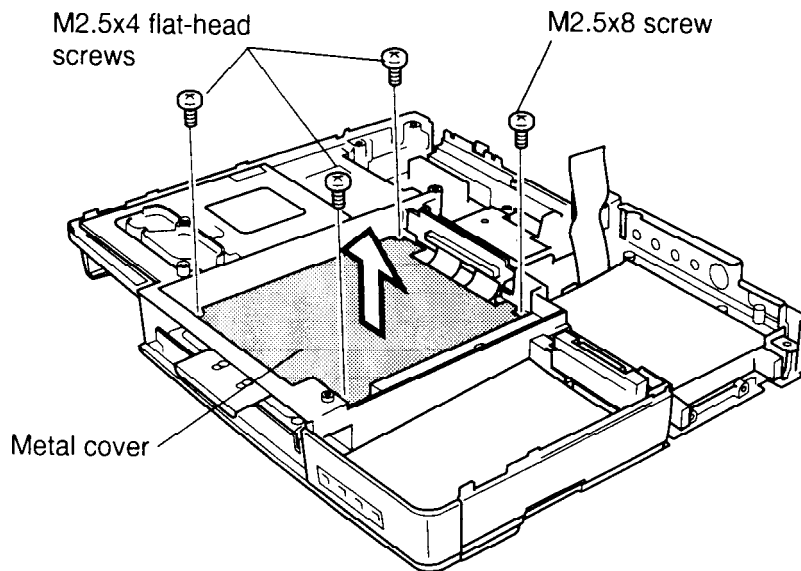
Figure 4-43 Removing the metal cover

5. Use tweezers to disconnect the selectable bay connector cables from **PJ601** and **PJ604** on the system board, or lift the pressure connectors to quickly remove them, and then remove the **selectable bay connector**.

6. Lift out the **plastic brace** for the **HDD connector**.

7. Lift the pressure connectors and disconnect the flexible cable from **PJ602** on the system board.
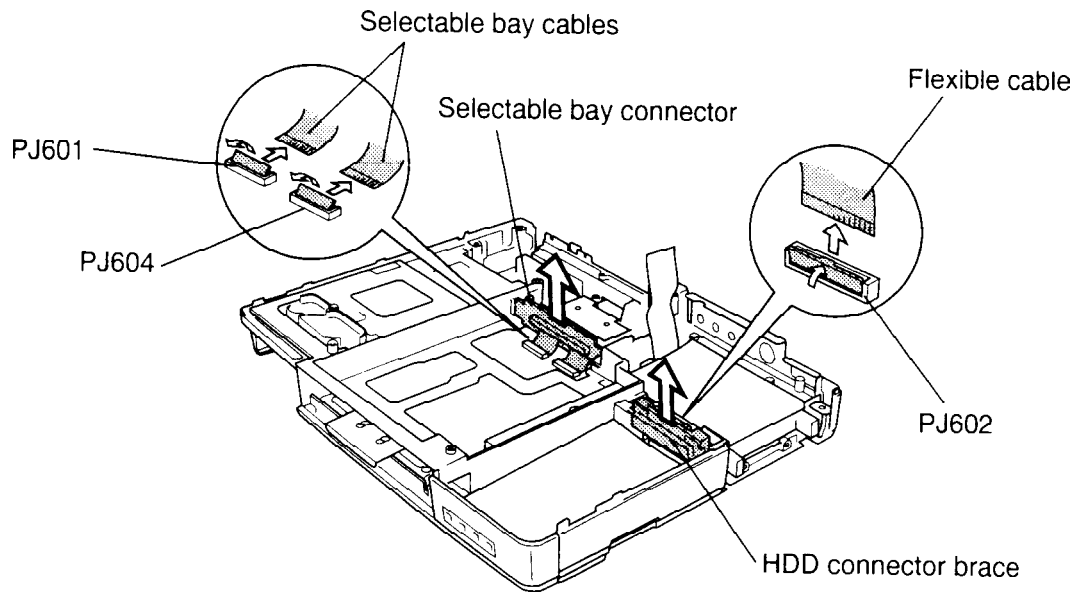
Figure 4-44 Disconnecting the flexible cables

8. A total of 10 screws secure the system board and frame to the bottom cover. Remove **two M2.5x4 screws** in the HDD slot. Then remove **four M2x4 screws** over the CPU, **one M2.5x8 screw** between the PC card connector and the metal back panel, and **one M2.5x6 screw** in the frame hole on the other side of the HDD slot. Finally, remove **two M2.5x6 screws** in the selectable bay slot.
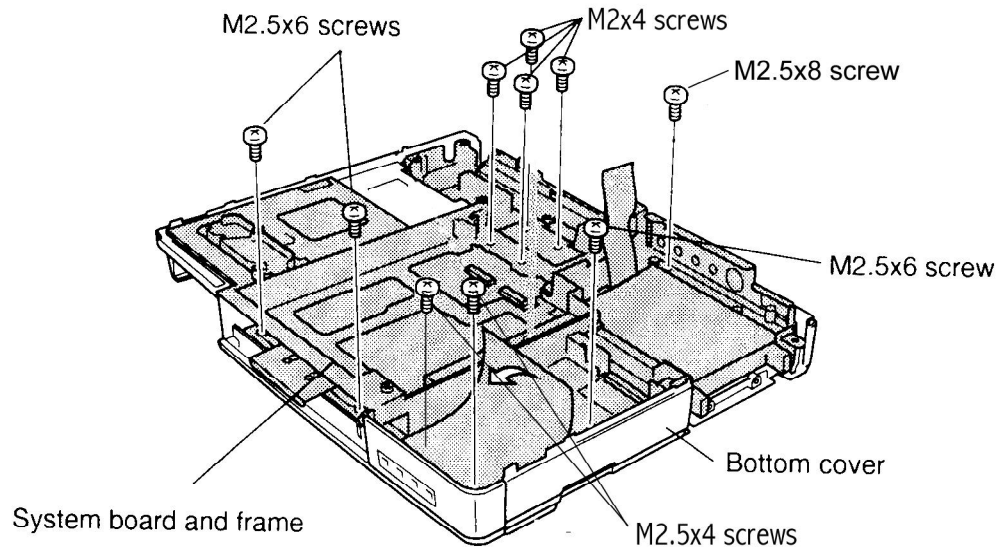
Figure 4-45 Removing the frame and system board screws

9. Lift out the frame and system board.
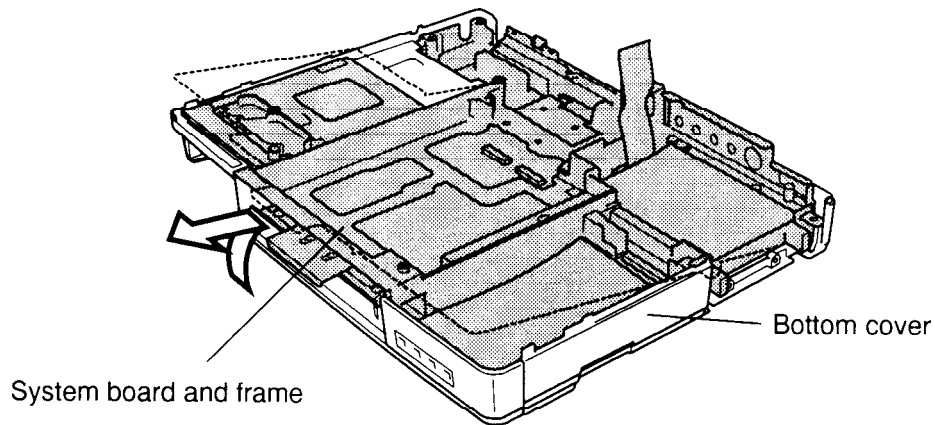
Figure 4-46 Removing the frame and system board

10. Turn the system board over and remove **five M2.5x6 screws** securing the metal **heat sink** to the system board and lift off the heat sink.

11. Remove **one M2.5x6** screw securing the system board to the frame and separate the system board from the frame.
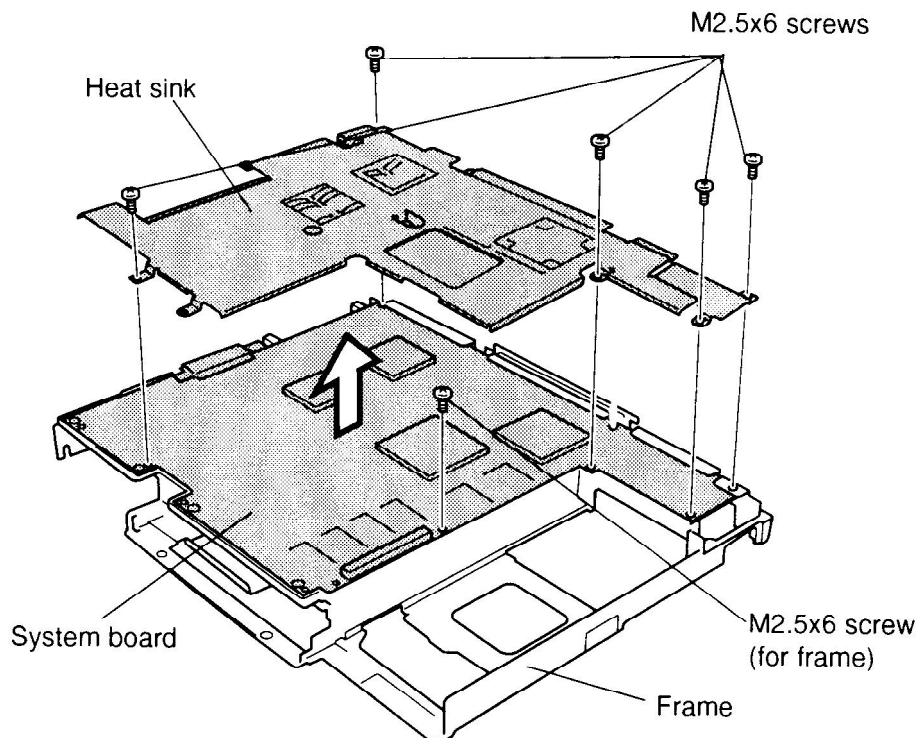
Figure 4-47 Separating the system board, heat sink, and frame

12. Turn the system board back over and remove the flexible cable from PJ600 on the system board.
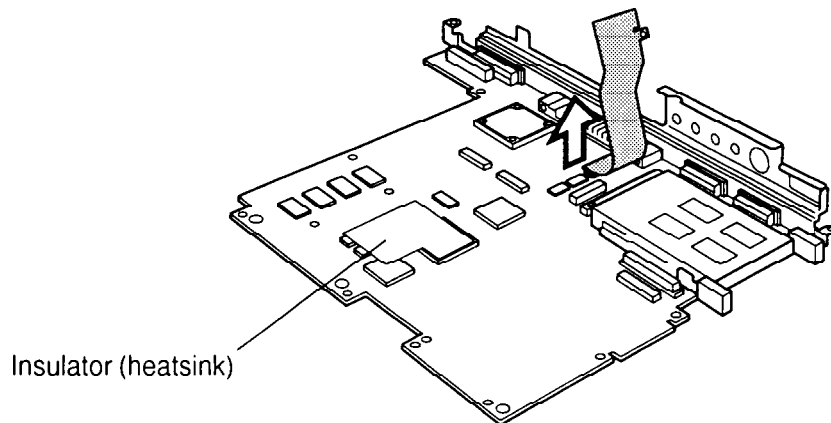
Figure 4-48 Removing the flexible cable

Installing the System Board

To install the bottom cover, follow the steps below and refer to Figures 4-48 back through 4-43.

1. Connect the **flexible cable to PJ600** on the system board.

2. Carefully seat the **system board** in the **frame** and secure it with **one M2.5x6 screw**.

   > *NOTE*: *If you replace the system board, remove the insulators from chips on the old board and apply them to the new board.*

3. Lay the **heat sink** in place and secure it with **five M2.5x6 screws**.

4. Seat the **system board** and **frame** in the **bottom cover**. Be careful of the Desk Station V connection doors when seating the board and frame.

5. A total of 10 screws secure the system board and frame to the bottom cover. Secure **two M2.5x4 screws** in the HDD slot. Next, secure **four M2x4 screws** over the CPU, **one M2.5x8 screw** between the PC card connector and the metal back panel, and **one M2.5x6 screw** in the frame hole on the other side of the HDD slot. Finally, secure **two M2.5x6 screws** in the selectable bay slot.

6. Connect the **flexible cable** to **PJ602** on the system board. Be sure to unlatch the pressure connector first.

7. Install the **plastic brace** for the HDD connector.

8. Seat the selectable bay connector and connect its cables to **PJ601** and **PJ604** on the system board. Again, be sure to unlatch the pressure connectors first.

9. Secure **one M2.5x8 screw** and **three M2.5x4 flat-head screws** on the metal cover.

10. Install the power supply board, IPS board, RTC battery and backup battery, display assembly, jack board, modem board, speaker, display mask, FL Inverter board, LCD module, DAA module, upper cover and keyboard, HDD, CD-ROM drive or FDD, optional memory module, optional PC card, and battery pack as described in Sections 4.16 back through 4.2.

4.18 Fan

Removing the Fan

To remove the fan, follow the steps below and refer to Figure 4-49.

1. Turn off the power to the computer, then disconnect the AC adapter and all external cables connected to the computer.

2. Remove the battery pack, optional memory module, optional PC card, FDD or CD-ROM drive, HDD, upper cover and keyboard, DAA module, display mask, FL Inverter board, LCD module, display assembly, jack board, speaker, modem board, IPS board, RTC battery, backup battery, power supply board, and system board as described in Sections 4.2 through 4.17.

3. Remove **two M2.5x4 screws** from the **metal cover**.

4. Remove the **fan**.
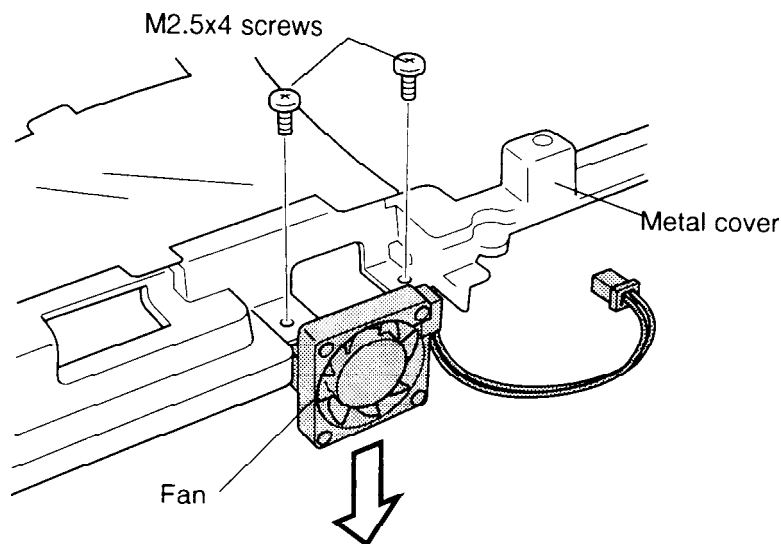
Figure 4-49 Removing the fan

Installing the Fan

To install the fan, follow the steps below and refer to Figure 4-49.

1. Seat the **fan** on the **metal cover**.

2. Secure **two M2.5x4 screws**.

3. Install the system board, power supply board, IPS board, RTC battery and backup battery, display assembly, jack board, modem board, speaker, display mask, FL Inverter board, LCD module, DAA module, upper cover and keyboard, HDD, CD-ROM drive or FDD, optional memory module, optional PC card, and battery pack as described in Sections 4.17 back through 4.2.

4.19 FL

> *CAUTION: When you remove the **FL**, be careful not to let any dust or other foreign matter contaminate the **LCD panel**. Any contamination can affect the performance of the unit.*

Removing the FL tube

To remove the FL tube, follow the steps below and refer to Figures 4-50 to 4-55.

1. Turn off the power to the computer. Disconnect the AC adapter and all external cables connected to the computer.

2. Remove the battery pack, optional memory module, optional PC card, FDD or CD-ROM drive, HDD, upper cover and keyboard, DAA module, display mask, FL Inverter board, LCD module, display assembly, jack board, speaker, modem board, IPS board, RTC battery, backup battery, power supply board, system board and fan as described in Sections 4.2 through 4.18.

3. Remove **four M2x8 silver screws** and **two M2x3 silver screws** from the LCD module.

4. Release **four latches** on the LCD module.
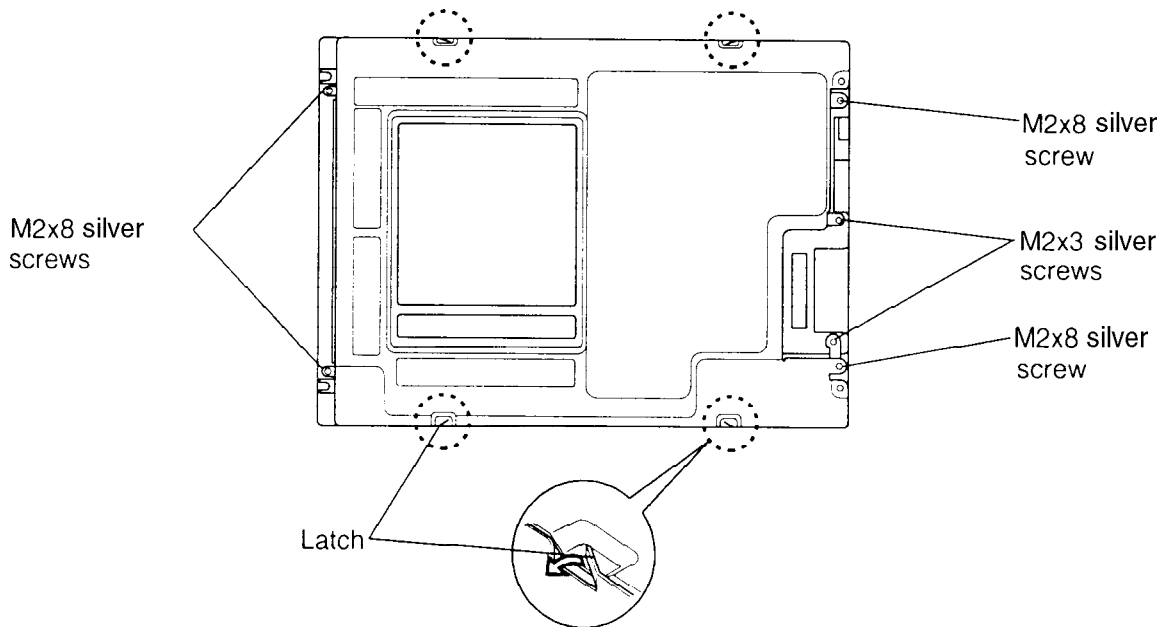
Figure 4-50 Removing the LCD module screws

5. Lay the panel face up and remove the **LCD frame**. Lift up the FL lamp side first (about 40 mm), then lift the other side. This process makes it easier to release the two corner latches as shown below:
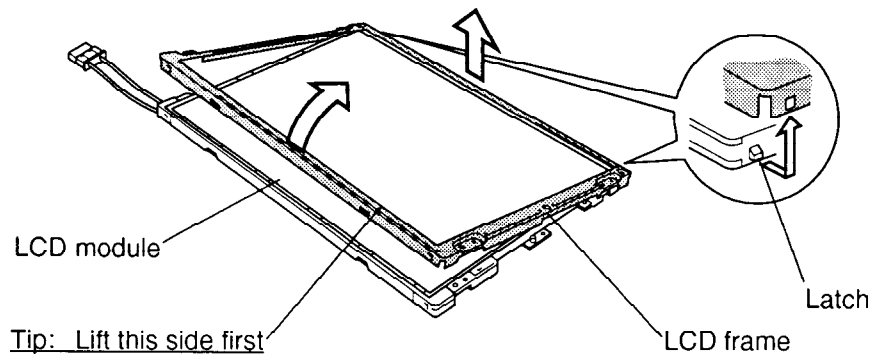
Figure 4-51 Removing the LCD frame

6. Turn the panel over and lift off the **back shield**. The two latches release as you lift up. The ICs on the LCD module are very sensitive; be very careful not to touch or jar them.
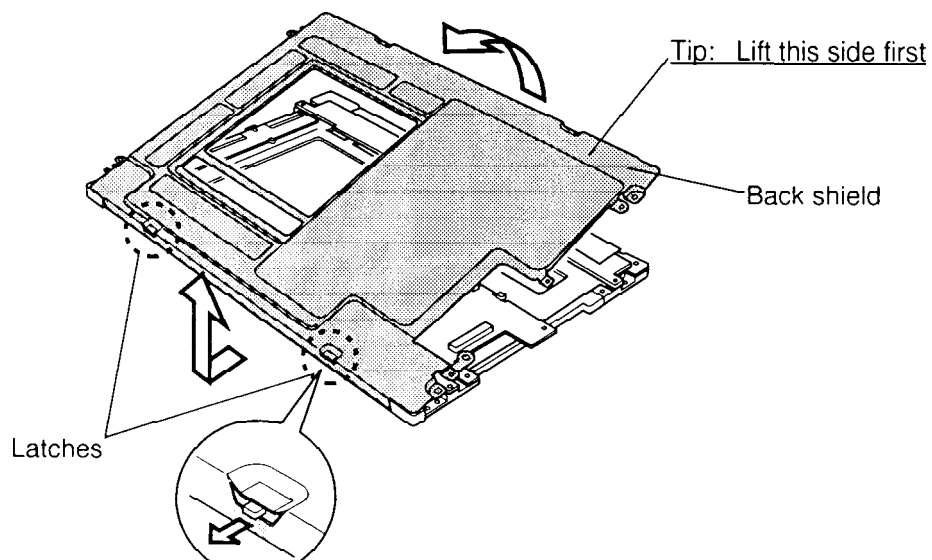
Figure 4-52 Removing the back shield

7. Disconnect **two flexible cables** from the **controller board** and remove **two M2x3 screws**.
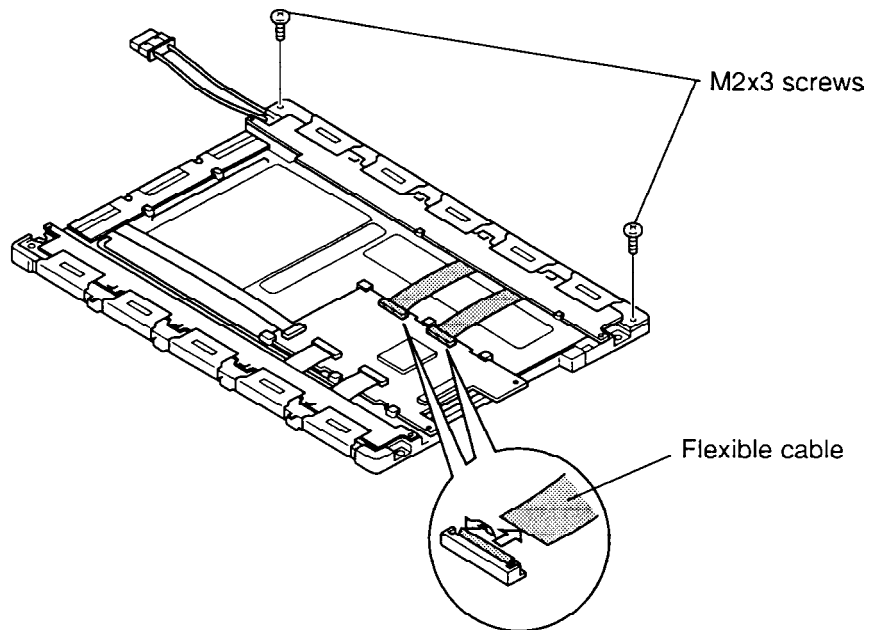
Figure 4-53 Removing the controller board screws

8. Carefully rotate the **controller board** out and lift up the **reflecting sheet** on top of the **FL tube cover**.
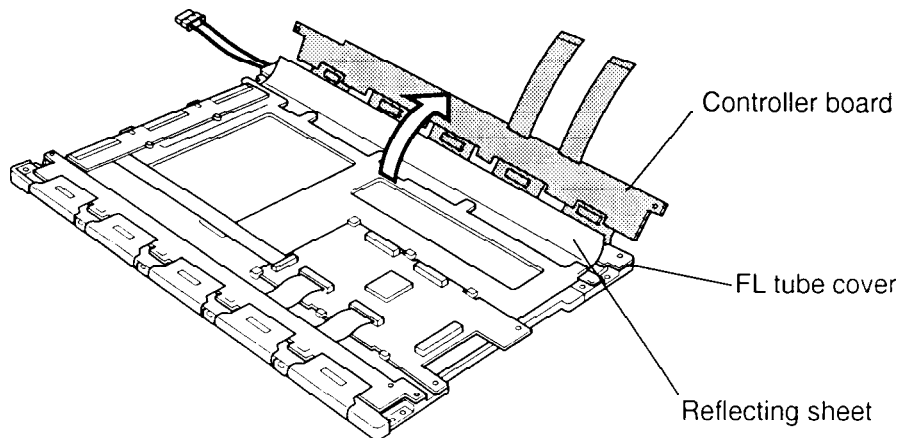
Figure 4-54 Opening the controller board

9.   Gently slide the FL tube cover about 2 mm to the left and remove the FL tube cover.

FL tube cover
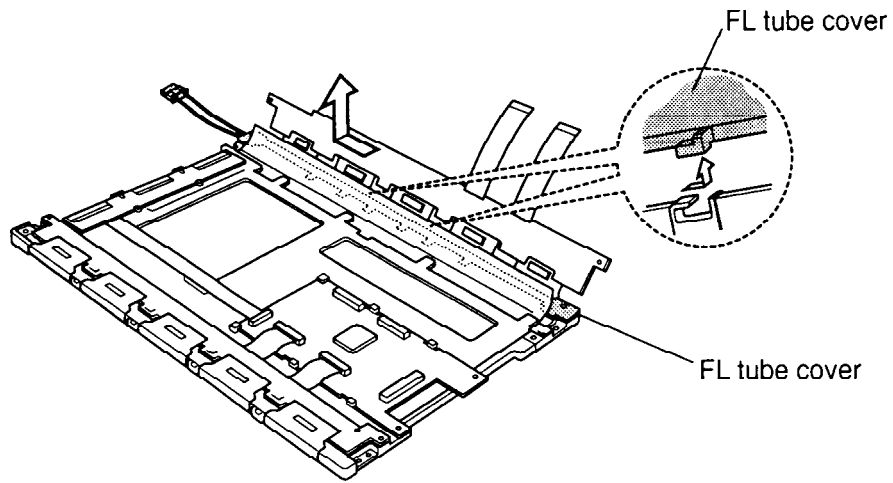
FL tube cover

Figure 4-55 Removing the FL tube cover

10.   Gently lift up the reflecting film covering the FL tube, taking note how the tube and cable are threaded, and remove the FL tube.

UPDATE

Installing the FL tube

To install the FL tube, follow the steps below and refer to Figures 4-56 back through 4-50.

1. Seat the **FL tube** and **cable**.

2. Seat the **FL tube cover** and slide it to lock it into place.

3. Lay the **reflecting sheet** on the FL tube cover and rotate the **controller board** into place.

4. Secure **two M2x3 screws**.

5. Connect **two flexible cables** to the **system interface board**.

5. Seat the **back shield** and secure the **two latches**.

6. Turn the LCD module face up. Lay the **LCD frame** in place and secure **two latches** on one side, then gently press the other side into place.

7. Secure **four M2x8 silver screws** and **two M2x3 silver screws** in the numbered order: 1 to 6. Tighten screws 1 to 6 a torque of 0.176 N·m ±0.02 N·m. Bend **four latches** as shown below:
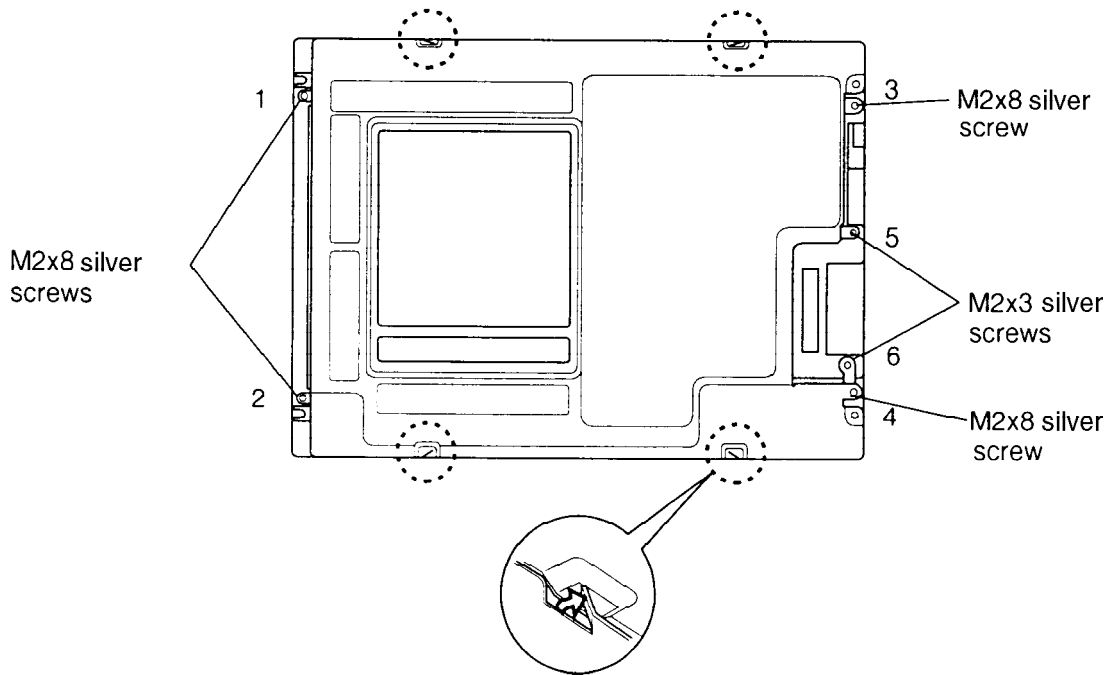
Figure 4-56 Securng screws

4.20 Microphone

Removing the Microphone

To remove the microphone, follow the steps below and refer to Figure 4-57.

1. Turn off the power to the computer, then disconnect the AC adapter and all external cables connected to the computer.

2. Remove the battery pack, optional memory module, optional PC card, and display mask as described in sections 4.2, 4.3, 4.4, and 4.10.

3. Lift out the **microphone** and pull out the **cable** from **PJ207** on the jack board.
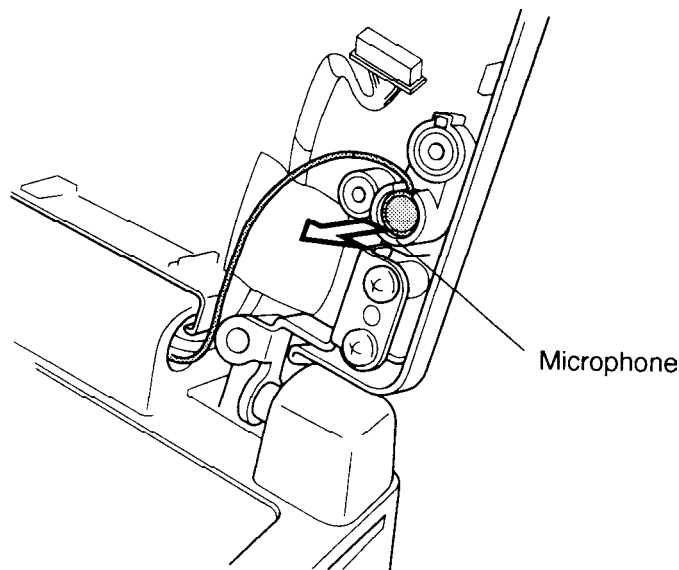
Figure 4-57 Removing the microphone

Installing the Microphone

To install the microphone, follow the steps below and refer to Figure 4-57.

1. Route the cable and seat the **microphone**, then connect the cable to PJ207 on the jack board.
.
2. Install the display mask, optional memory module, optional PC card, and battery pack as described in sections 4.10, 4.4, 4.3, and 4.2.

Appendix A Handling the LCD Module

Precautions for handling the LCD module

The computer's LCD module can be easily damaged during assembly or disassembly. Observe the following precautions when handling the module:

    1.   When installing the LCD module in the LCD cover, be sure to seat it so that it is properly aligned and maximum visibility of the display is maintained.
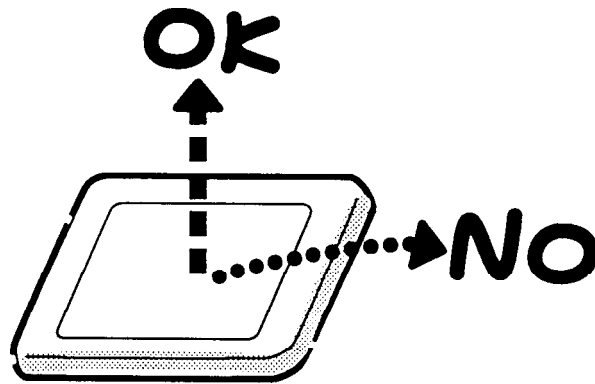
    2.   Be careful to align the holes at the four corners of the LCD module with the corresponding holes in the LCD cover before securing the module with screws. Do not force the module into place, because stress can affect its performance.

          Also, the panel's polarized surface is easily scarred, so be careful when handling it.

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, we recommend 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.
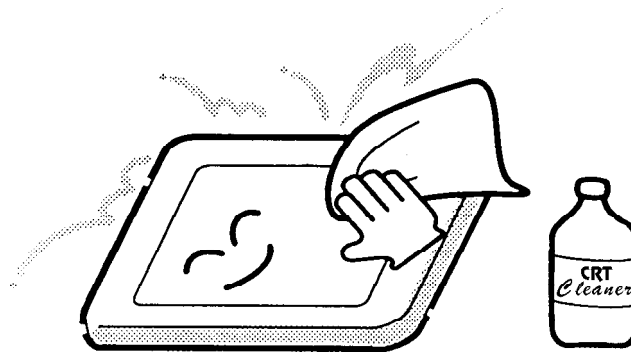
4. If water or other liquid is left on the panel's surface for a long period, it can change the screen's tint or stain it. Be sure to quickly wipe off any liquid.
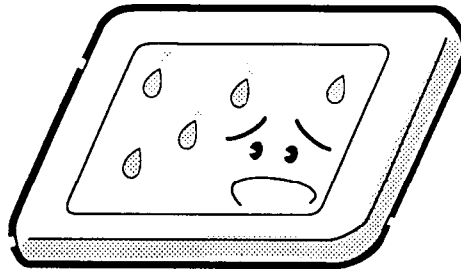
5. Glass is used in the panel, so be careful not to drop it or let it strike a hard object, which could cause breakage or cracks.
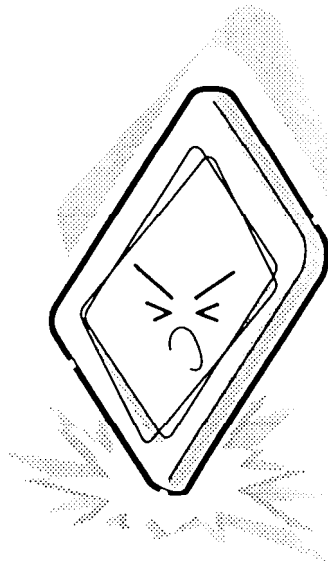
6.   CMOS-LSI circuits are used in the module, so guard against damage from electro-static discharge. Be sure to wear a wrist or ankle ground when handling the module.
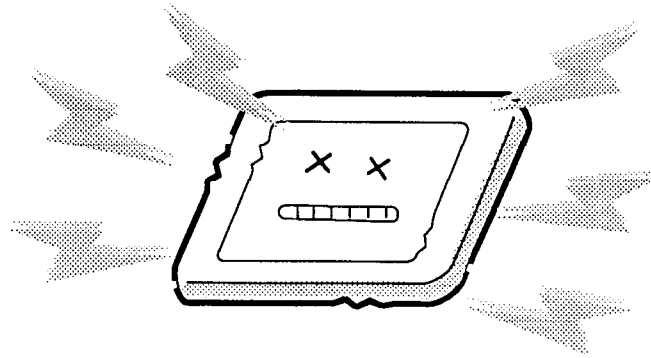
7.   Do not expose the module to direct sunlight or strong ultraviolet rays for long periods.
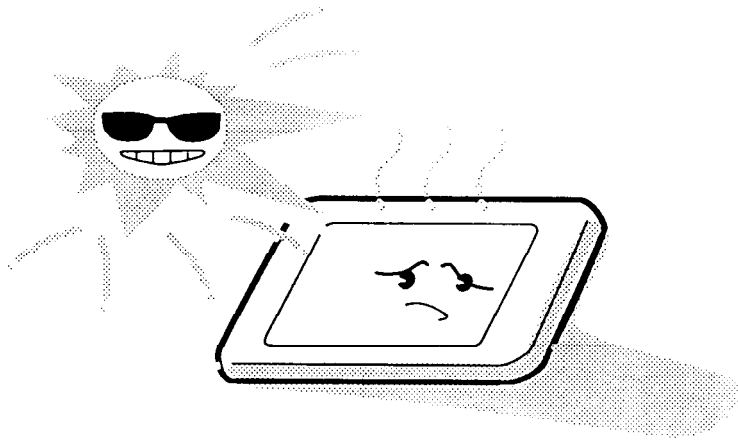
8.   Do not store the module at temperatures below specifications. Cold can cause the liquid crystals to freeze, lose their elasticity or otherwise suffer damage.
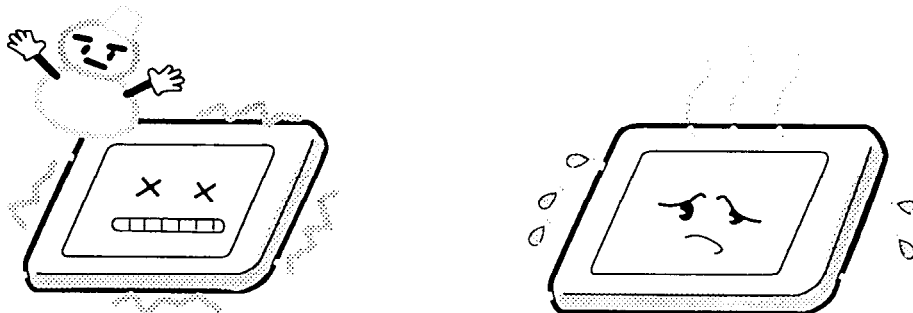
9. Do not disassemble the LCD module. Disassembly can cause malfunctions.
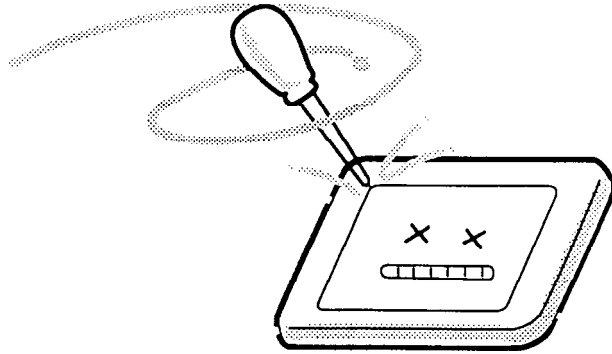
10. If you transport the module, do not use packing material that contains epoxy resin (amine) or silicon glue (alcohol or oxime). These materials can release gas that can damage the panels' polarization.
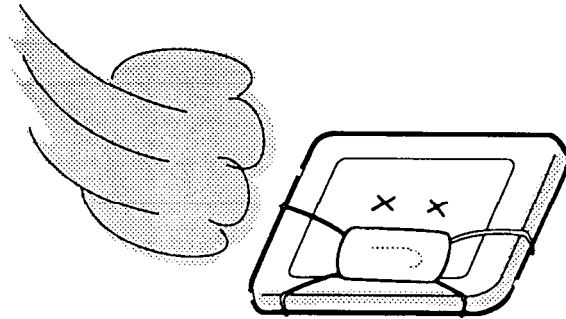
Appendix B Board Layouts

B.1   System Board Front View
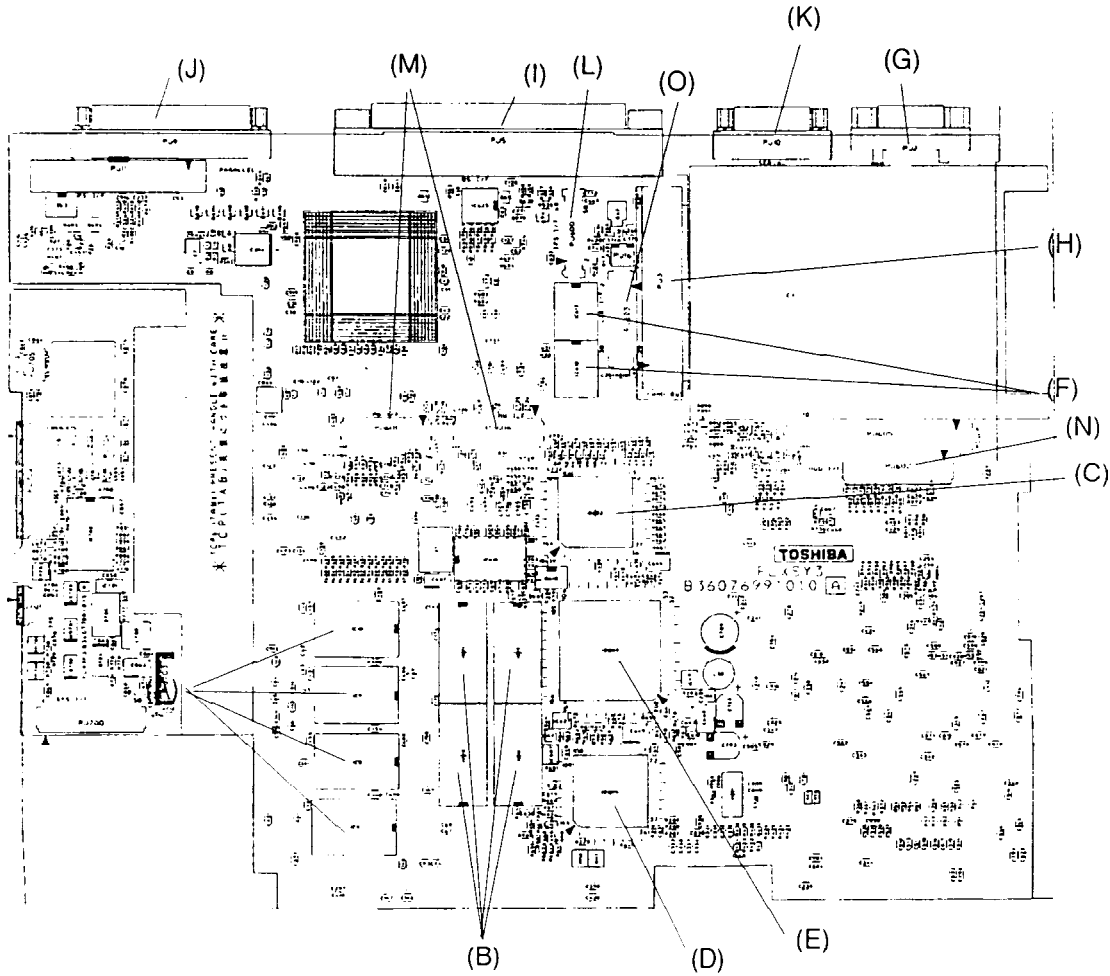
Figure B-1 System board layout (front)

B.2   System Board Back View
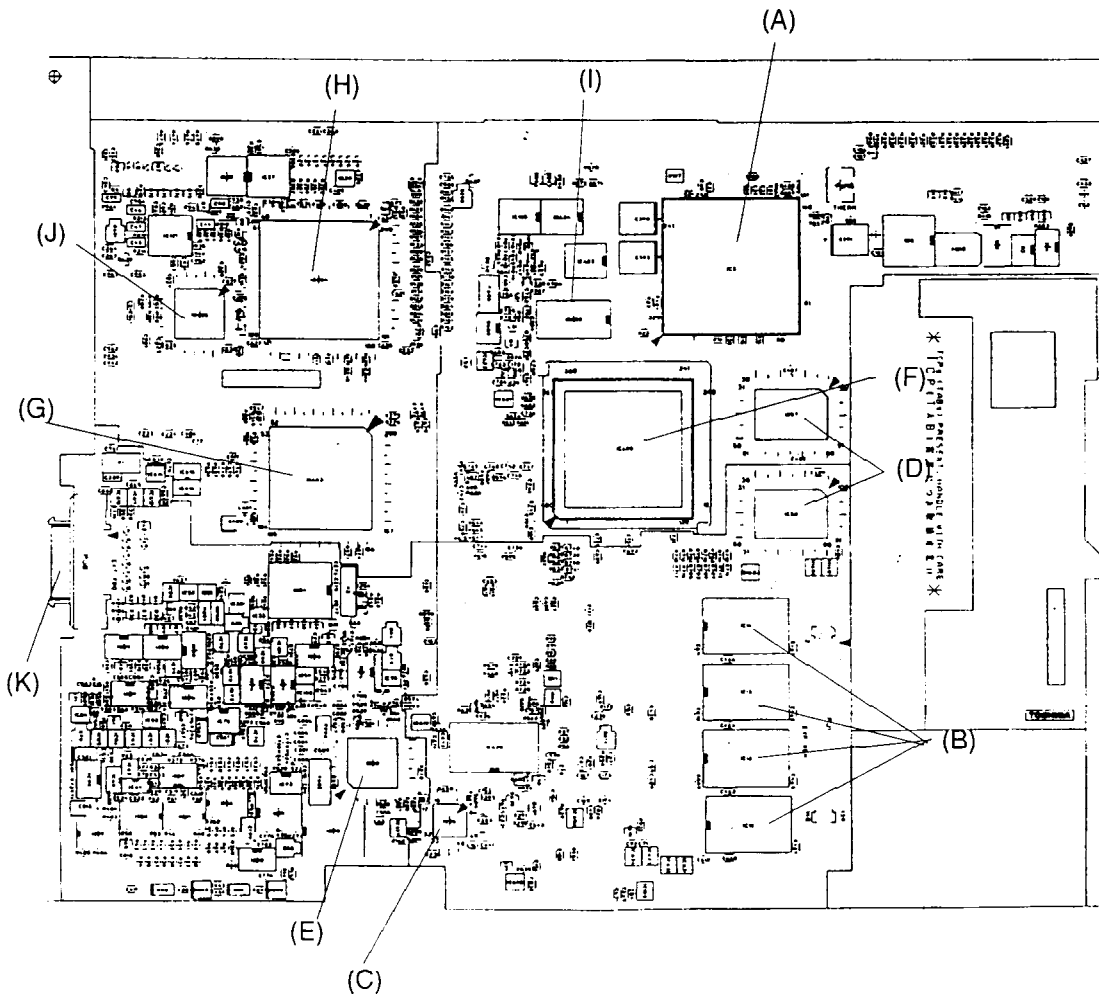
Figure B-2 System board layout (back)

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

Mark	Number	Name
(A)	IC8 to IC11	System Memory
(B)	IC18 to IC21	VRAM
(C)	IC602	LCD I/F GA
(D)	IC605	Miscellaneous GA
(E)	IC609	VGA Controller
(F)	IC617,618	LVDS Controller
(G)	PJ2	External Monitor I/F Connector
(H)	PJ3	PC Card I/F Connector
(I)	PJ5	Docking I/F Connector
(J)	PJ9	Parallel I/F Connector
(K)	PJ10	Serial I/F Connector
(L)	PJ600	IPS I/F Connector
(M)	PJ601,PJ604	Selectable Bay I/F Connector
(N)	PJ602	HDD I/F Connector
(O)	PJ603	LCD I/F Connector

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

Mark	Number	Name
(A)	IC3	CPU
(B)	IC12 to IC15	System Memory
(C)	IC36	Keyboard Controller
(D)	IC57, IC58	L2 Cache Memory (SRAM)
(E)	IC60	Sound Controller
(F)	IC600	System Controller GA
(G)	IC603	I/O Controller GA
(H)	IC604	PC Card Controller GA
(I)	IC620	TAGRAM
(J)	IC628	Multiplex GA
(K)	PJ8	Ext. FDD Connector

B.3   IPS Board Front View
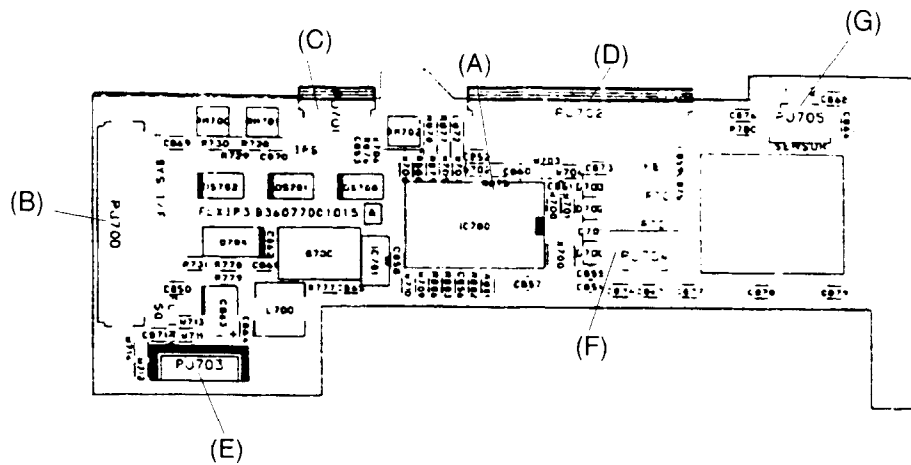
Figure B-3 IPS board layout (front)

Table B-3 IPS board ICs and connectors (front)

Mark	Number	Name
(A)	IC700	IPS Controller
(B)	PJ700	IPS I/F Connector
(C)	PJ701	Membrane switch Connector
(D)	PJ702	Keyboard Connector
(E)	PJ703	FL Inverter Connector
(F)	PJ704	RTC Battery Connector
(G)	PJ705	Panel Sensor Connector

B.4 Modem I/F Board
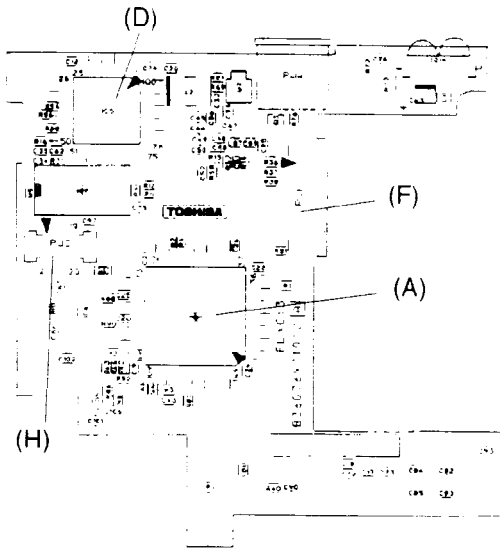
Modem I/F board layout (front)
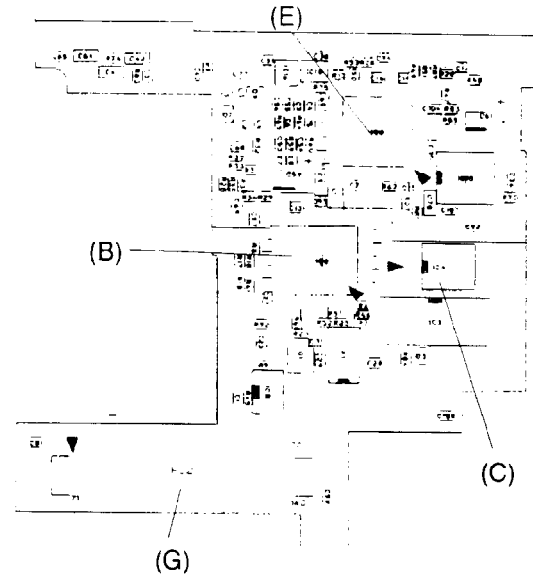
Modem I/F board layout (back)

Figure B-4 Modem I/F board layout

Table B-4 Modem I/F board ICs and connectors

Mark	Number	Name
(A)	IC1	Modem I/F GA
(B)	IC2	Modem Controller
(C)	IC4	SRAM
(D)	IC5	VALV34
(E)	IC6	DSP1634
(F)	PJ1	DAA I/F Connector
(G)	PJ2	System-Modem I/F Connector
(H)	PJ3	Modem-Jack I/F Connector

B.5 Jack Board Front View
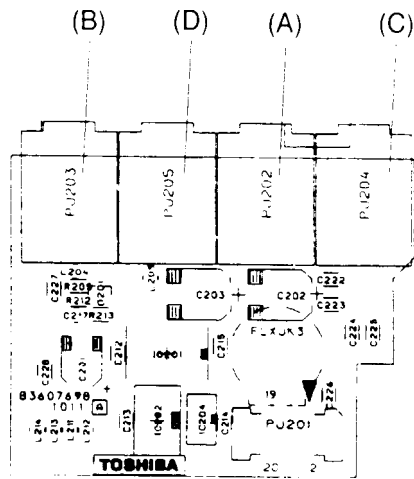
Figure B-5 Jack board layout (front)

Table B-5 Jack board connectors

Mark	Number	Name
(A)	PJ202	Line-Out Jack
(B)	PJ203	Headphone Jack
(C)	PJ204	Line-In Jack
(D)	PJ205	Microphone Jack

Appendix C   Pin Assignments

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

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

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
01	B3V	-	02	B3V	-
03	GND	-	04	MD36;100	I/O
05	MD35;100	I/O	06	MD37;100	I/O
07	MD34;100	I/O	08	MD38;100	I/O
09	MD33;100	I/O	10	GND	-
11	B3V	-	12	MD39;100	I/O
13	MD32;100	I/O	14	MD40;100	I/O
15	MD44;100	I/O	16	MD41;100	I/O
17	MD45;100	I/O	18	B3V	-
19	GND	-	20	MD42;100	I/O
21	MD46;100	I/O	22	MD43;100	I/O
23	MA47;100	I/O	24	MD16;100	I/O
25	MD20;100	I/O	26	GND	I/O
27	B3V	-	28	MD17;100	I/O
29	MD21;100	I/O	30	MD18;100	I/O
31	MD22;100	I/O	32	MD19;100	I/O
33	MD23;100	I/O	34	B3V	-
35	GND	-	36	MD24;100	I/O
37	MD28;100	I/O	38	MD25;100	I/O
39	MD29;100	I/O	40	MD26;100	I/O
41	MD30;100	I/O	42	GND	-
43	B3V	-	44	MD27;100	I/O
45	MD31;100	I/O	46	MD00;100	I/O
47	MD04;100	I/O	48	MD01;100	I/O
49	MD05;100	I/O	50	B3V	-
51	GND	-	52	MD02;100	I/O
53	MD06;100	I/O	54	MD03;100	I/O
55	MD07;100	I/O	56	MD08;100	I/O
57	MD12;100	I/O	58	GND	-
59	B3V	-	60	MD09;100	I/O
61	MD13;100	I/O	62	MD10;100	I/O
63	MD14;100	I/O	64	MD11;100	I/O
65	MD15;100	I/O	66	B3V	-

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

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
67	GND	-	68	MD48;100	I/O
69	MD52;100	I/O	70	MD49;100	I/O
71	MD53;100	I/O	72	MD50;100	I/O
73	MD54;100	I/O	74	GND	-
75	B3V	-	76	MD51;100	I/O
77	MD55;100	I/O	78	MD56;100	I/O
79	MD60;100	I/O	80	MD57;100	I/O
81	MD61;100	I/O	82	MD58;100	I/O
83	MD62;100	I/O	84	MD59;100	I/O
85	MD63;100	I/O	86	GND	-
87	CAS1;011	O	88	CAS0;011	O
89	CAS3;011	O	90	CAS2;011	O
91	CAS5;011	O	92	CAS4;011	O
93	CAS7;011	O	94	CAS6;011	O
95	NC	-	96	NC	-
97	NC	-	98	NC	-
99	WEC;001	O	100	GND	-
101	NC	-	102	NC	-
103	GND	-	104	NC	-
105	RAS2;001	O	106	RAS4;001	O
107	RAS3;001	O	108	RAS5;001	O
109	NC	-	110	NC	-
111	NC	-	112	NC	-
113	NC	-	114	NC	-
115	NC	-	116	NC	-
117	GND	-	118	GND	-
119	NC	-	120	NC	-
121	GND	-	122	GND	-
123	NC	-	124	NC	-
125	GND	-	126	GND	-
127	MA00;111	O	128	MA01;111	O
129	MA02;111	O	130	MA03;111	O
131	MA04;111	O	132	MA05;111	O
133	GND	-	134	MA06;111	O
135	MA07;111	O	136	MA09;111	O
137	MA08;111	O	138	MA11;111	O
139	MA10;111	O	140	GND	-

C.2 PJ2 CRT Connector (15-pin)

Table C-2 CRT connector pin assignments (15-pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
01	RED;100	O	02	LGREN;100	O
03	BLUE;100	O	04	MNTID2;100	I/O
05	GND	-	06	GND	-
07	GND	-	08	GND	-
09	NC	-	10	GND	-
11	MNTID0;100	I/O	12	MNTID1;100	I/O
13	HSYNC;100	I	14	OVSYNC;100	I
15	MNTID3;100	I/O			

C.3 PJ3 PC Card Connector (152-pin)

Table C-3 PC Card connector pin assignments (152-pin) (1/3)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
A01	GND	-	A02	BD03;100	I/O
A03	BD04;100	I/O	A04	BD05;100	I/O
A05	BD06;100	I/O	A06	BD07;100	I/O
A07	BCE1;000	I/O	A08	BA10;100	O
A09	BOE;000	O	A10	BA11;100	O
A11	BA09;100	O	A12	BA08;100	O
A13	BA13;100	O	A14	BA14;100	O
A15	BBWE;000	I	A16	BIREQ;000	I
A17	MCVCCB	-	A18	MCVP1B	-
A19	BA16;100	O	A20	BA15;100	O
A21	BA12;100	O	A22	BA07;100	O
A23	BA06;100	O	A24	BA05;100	O
A25	BA04;100	O	A26	BA03;100	O
A27	BA02;100	O	A28	BA01;100	O
A29	BA00;100	O	A30	BD00;100	I/O
A31	BD01;100	I/O	A32	BD02;100	I/O
A33	BIIS16;000	I	A34	GND	-
A35	GND	-	A36	BCD1;000	I/O
A37	BD11;100	I/O	A38	BD12;100	I/O
A39	BD13;100	I/O	A40	BD14;100	I/O

Table C-3 PC Card connector pin assignments (152-pin) (2/3)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
A41	BD15;100	I/O	A42	BCE2;000	I/O
A43	BVS1;100	-	A44	BIORD;000	I
A45	BIOWR;000	I/O	A46	BA17;100	O
A47	BA18;100	O	A48	BA19;100	O
A49	BA20;100	O	A50	BA21;100	O
A51	MCVCCB	-	A52	MCVP1B	-
A53	BA22;100	O	A54	BA23;100	O
A55	BA24;100	O	A56	BA25;100	O
A57	BVS2;100	-	A58	BRESET;100	I/O
A59	BWAIT;000	I/O	A60	BINPCK;000	I/O
A61	BREG;000	O	A62	BSPKR;000	I/O
A63	BTSCHG;000	I/O	A64	BD08;100	I/O
A65	BD09;100	I/O	A66	BD10;100	I/O
A67	BCD2;000	I/O	A68	GND	-
A69	GND	-	A70	GND	-
A71	GND	-	A72	GND	-
A73	GND	-	A74	GND	-
A75	GND	-	A76	GND	-
B01	GND	-	B02	AAD03;100	O
B03	AAD04;100	O	B04	AAD05;100	O
B05	AAD06;100	O	B06	AAD07;100	O
B07	ACE1;000	O	B08	AA10;100	O
B09	AOE;000	O	B10	AA11;100	O
B11	AA09;100	O	B12	AA08;100	O
B13	AA13;100	O	B14	AA14;100	O
B15	AAWE;000	O	B16	AIREQ;000	O
B17	MCVCCA	-	B18	MCVP1A	-
B19	AA16;100	O	B20	AA15;100	O
B21	AA12;100	O	B22	AA07;100	O
B23	AA06;100	O	B24	AA05;100	O
B25	AA04;100	O	B26	AA03;100	O
B27	AA02;100	O	B28	AA01;100	O
B29	AA00;100	O	B30	AAD00;100	O
B31	AAD01;100	O	B32	AAD02;100	O
B33	AIIS16;000	O	B34	GND	-
B35	GND	-	B36	ACD1;000	I/O
B37	AAD11;100	O	B38	AAD12;100	O

Table C-3 PC Card connector pin assignments (152-pin) (3/3)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
B39	AAD13;100	O	B40	AAD14;100	O
B41	AAD15;100	O	B42	ACE2;000	O
B43	AVS1;100	-	B44	AIORD;000	I/O
B45	AIOWR;000	I	B46	AA17;100	O
B47	AA18;100	O	B48	AA19;100	O
B49	AA20;100	O	B50	AA21;100	O
B51	MCVCCA	-	B52	MCVP1A	-
B53	AA22;100	O	B54	AA23;100	O
B55	AA24;100	O	B56	AA25;100	O
B57	AVS2;100	O	B58	ARESET;100	I/O
B59	AWAIT;000	O	B60	AINPCK;000	O
B61	AREG;000	O	B62	ASPKR;000	O
B63	ATSCHG;000	O	B64	AAD08;100	O
B65	AAD09;100	O	B66	AAD10;100	O
B67	ACD2;000	O	B68	GND	-
B69	GND	-	B70	GND	-
B71	GND	-	B72	GND	-
B73	GND	-	B74	GND	-
B75	GND	-	B76	GND	-

C.4   PJ5 Docking I/F Connector (240-pin)

Table C-4 Docking I/F connector pin assignments (240-pin) (1/4)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
01	GND	-	02	GND	-
03	DOCDT1;000	I	04	DSKDC	-
05	DSKDC	-	06	DSKDC	-
07	DSKDC	-	08	GND	-
09	PINIT;000	I/O	10	PDB01;100	I/O
11	PDB00;100	I/O	12	AUTFD;000	I/O
13	DAD08;100	I/O	14	DAD06;100	I/O
15	GND	-	16	DAD04;100	I/O
17	DAD02;100	I/O	18	DAD00;100	I/O
19	GND	-	20	DREFRH;000	I/O
21	DHFRAM;000	I/O	22	(B3V pull-up)	I
23	GND	-	24	DSTOP;000	I/O
25	DTRDY;000	I/O	26	DCBE2;000	I/O
27	GND	-	28	DCBE0;000	I/O
29	DIOCHK;000	I/O	30	(B3V pull-up)	I
31	GND	-	32	DINTC;000	I/O
33	GND	-	34	DINTB;000	I/O
35	GND	-	36	DINTA;000	I/O
37	DPREQ;000	I/O	38	DPGNT;000	I/O
39	MIDIIN;100	I/O	40	MIDIOT;100	I/O
41	IFVCC	-	42	IFVCC	-
43	IFVCC	-	44	IFVCC	-
45	SNDMUT;000	O	46	SPKDIS;100	O
47	MICDIS;100	O	48	LINEIR;100	O
49	LINEIR;000	O	50	CDR;000	O
51	CDR;100	O	52	CDL;100	O
53	MICR;000	O	54	MICR;100	O
55	MICL;000	O	56	LINEOR;100	O
57	LINEOL;000	O	58	LINEOR;000	O
59	LINEOL;100	O	60	MICL;100	O

Table C-4 Docking I/F connector pin assignments (240-pin)(2/4)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
61	GND	-	62	GND	-
63	GND	-	64	DSKDC	-
65	DSKDC	-	66	DSKDC	-
67	PDB03;100	-	68	GND	-
69	PDB04;100	I/O	70	ERROR;000	I
71	ACK;000	I	72	STROB;000	I
73	DAD07;100	I/O	74	DAD05;100	I/O
75	GND	-	76	DAD03;100	I/O
77	DAD01;100	I/O	78	DRST;000	I/O
79	GND	-	80	DDEVSL;000	I/O
81	DPAR;100	I/O	82	(B3V pull-up)	I
83	GND	-	84	DIRDY;000	I/O
85	DCBE3;000	I/O	86	DCBE1;000	I/O
87	GND	-	88	DIRQCK;100	I/O
89	DIRQD;000	I/O	90	DINTD;000	I/O
91	GND	-	92	GND	-
93	GND	-	94	DGNT;000	I/O
95	GND	-	96	GND	-
97	DFRAME;000	I/O	98	NC	-
99	IDENSL;001	I	100	EXKBCK;100	I/O
101	NC	-	102	EXKBDT;100	I/O
103	GND	-	104	MOSCK;100	I/O
105	DOCKEN;000	I/O	106	MOSDT;100	I
107	PCM2SP;100	I/O	108	LINEIL;000	I/O
109	GND	-	110	LINEIL;000	I/O
111	DOCSMI;100	I/O	112	CDL;000	I/O
113	EJCTRQ;100	I	114	JOYDTO;100	I
115	GND	-	116	JOYDT2;100	I
117	JOYDT3;100	I	118	JOYDT5;100	I
119	GND	-	120	JOYDT7;100	I

Table C-4 Docking I/F connector pin assignments (240-pin) (3/4)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
121	GND	-	122	GND	-
123	NC	-	124	GND	-
125	NC	-	126	DSKDC	-
127	PDB05;100	I/O	128	SLIN;000	I/O
129	PDB06;100	I/O	130	GND	-
131	MCV	-	132	PE;100	I/O
133	DAD31;100	I/O	134	DAD17;100	I/O
135	GND	-	136	DAD16;100	I/O
137	DAD28;100	I/O	138	DAD15;100	I/O
139	GND	-	140	DAD14;100	I/O
141	DAD25;100	I/O	142	DAD13;100	I/O
143	GND	-	144	DAD12;100	I/O
145	DAD22;100	I/O	146	DAD11;100	I/O
147	GND	-	148	DAD10;100	I/O
149	DAD19;100	I/O	150	DAD09;100	I/O
151	GND	-	152	GND	-
153	GND	-	154	DREQ;000	I/O
155	GND	-	156	GND	-
157	NC	-	158	NC	-
159	DCD1;100	I/O	160	SCL;100	I/O
161	RD1;000	I/O	162	SDA;100	I/O
163	GND	-	164	DOCRI;100	
165	CTS1;100	I/O	166	DSCREQ;000	I/O
167	GND	-	168	DSCGNT;000	I/O
169	DTR1;100	I/O	170	DCPCLR;100	I/O
171	MNTID0;100	I/O	172	GND	-
173	MNTID1;100	I/O	174	DSKCHG;000	I/O
175	MNTID2;100	I/O	176	JOYDT1;100	I/O
177	MNTID3;100	I/O	178	JOYDT4;100	I/O
179	NC	-	180	JOYDT6;100	I/O

Table C-4 Docking I/F connector pin assignments (240-pin) (4/4)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
181	GND	-	182	SELCT;100	I
183	GND	-	184	BUSY;100	I/O
185	GND	-	186	PDB07;100	I/O
187	GND	-	188	PDB02;100	I/O
189	GND	-	190	PCONF;100	I/O
191	GND	-	192	DOCPWN;100	I/O
193	GND	-	194	DAD30;100	I/O
195	GND	-	196	DAD29;100	I/O
197	GND	-	198	DAD27;100	I/O
199	GND	-	200	DAD26;100	I/O
201	GND	-	202	DAD24;100	I/O
203	GND	-	204	DAD23;100	I/O
205	GND	-	206	DAD21;100	I/O
207	GND	-	208	DAD20;100	I/O
209	GND	-	210	DAD18;100	I/O
211	GND	-	212	GND	-
213	GND	-	214	DSCLK;100	I/O
215	GND	-	216	GND	-
217	GND	-	218	RI1;100	I
219	GND	-	220	DSR1;100	I
221	GND	-	222	RTS1;100	I
223	GND	-	224	SD1;000	I
225	GND	-	226	SIRRXP;100	I/O
227	GND	-	228	SIRTXP;000	I/O
229	GND	-	230	HSYNC;100	I/O
231	GND	-	232	OVSYNC;100	I/O
233	GND	-	234	RED;100	O
235	GND	-	236	LGREN;100	O
237	GND	-	238	BLUE;100	O
239	GND	-	240	DOCDT2;000	I/O

C.5 PJ8 Ext. FDD Connector (26-pin)

Table C-5 Ext. FDD connector pin assignments (26-pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
01	VCC	-	02	INDX;001	I
03	VCC	-	04	EFSL;000	O
05	VCC	-	06	DSKCHS;001	I
07	VCC	-	08	FREADY;000	O
09	IHMEDB;100	I	10	EFMO;001	O
11	DENSEL;101	O	12	DIR;001	O
13	SLFDLD;000	I	14	STEP;001	O
15	GND	-	16	WDATA;001	O
17	GND	-	18	WGATE;001	O
19	GND	-	20	TRK0;001	I
21	GND	-	22	WP;001	I
23	GND	-	24	RDATA;001	I
25	GND	-	26	HDSEL;001	O

C.6 PJ9 Parallel I/F Connector (25-pin)

Table C-6 Parallel I/F connector pin assignments (25-pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
01	STROB;000	I/O	02	PDB00;100	I/O
03	PDB01;100	I/O	04	PDB02;100	I/O
05	PDB03;100	I/O	06	PDB04;100	I/O
07	PDB05;100	I/O	08	PDB06;100	I/O
09	PDB07;100	I/O	10	ACK;000	O
11	BUSY;100	I	12	PE;100	O
13	SELCT;100	O	14	AUTFD;000	O
15	ERROR;000	O	16	PINIT;000	I/O
17	SLIN;000	I/O	18	GND	O
19	GND	-	20	GND	-
21	GND	-	22	GND	-
23	GND	-	24	GND	-
25	GND	-			

C.7 PJ603 LCD I/F Connector (30-pin)

Table C-7 LCD I/F connector pin assignments (30-pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
01	PNL1;001	I	02	NC	-
03	NC	-	04	NC	-
05	VCC	-	06	VCC	-
07	NC	-	08	GND	-
09	GND	-	10	GND	-
11	NC	-	12	NC	-
13	GND	-	14	GND	-
15	R100P;100	O	16	R100M;100	O
17	R101P;100	O	18	R101M;100	O
19	R102P;100	O	20	R102M;100	O
21	CK10P;100	O	22	CK10M;100	O
23	R200P;100	O	24	R200M;100	O
25	R201P;100	O	26	R201M;100	O
27	R202P;100	O	28	R202M;100	O
29	CK20P;100	O	30	CK20M;100	O

C.8 PJ703 FL Inverter I/F Connector (8-pin)

Table C-8 FL Inverter I/F connector pin assignments (8-pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
01	DSPV	-	02	DSPV	-
03	GND	-	04	GND	-
05	BRIGHT;100	I	06	B5V	-
07	B5V	-	08	NC	-

C.9 PJ702 Keyboard Connector (25-pin)

Table C-9 Keyboard connector pin assignments (25-pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
01	KBRT6;100	I	02	KBRT2;100	I
03	KBRT5;100	I	04	KBRT0;100	I
05	KBRT1;100	I	06	KBRT3;100	I
07	KBRT7;100	I	08	KBRT4;100	I
09	KBOT02;000	O	10	KBOT09;000	O
11	KBOT10;000	O	12	KBOT03;000	O
13	KBOT04;000	O	14	KBOT05;000	O
15	KBOT06;000	O	16	KBOT07;000	O
17	KBOT08;000	O	18	KBOT01;000	O
19	KBOT00;000	O	20	IPSY;100	I
21	GND	–	22	IPSX;100	I
23	IPSY;000	I	24	VCC	–
25	IPSX;000	I			

C.10 PJ704 RTC battery Connector (3-pin)

Table C-10 RTC battery connector pin assignments (3-pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
01	RTCBAT	-	02	NC	-
03	GND	-			

C.11 PJ705 Panel Sensor Connector (2-pin)

Table C-11 Panel sensor connector pin assignments (2-pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
01	PNLOFF;000	I	02	GND	-

C.12 PJ602 HDD Connector (50-pin)

Table C-12 HDD connector pin assignments (50-pin)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
01	HDIN;000	I	02	GND	-
03	VCC	-	04	VCC	-
05	GND	-	06	GND	-
07	HDDLED	I/O	08	NC	-
09	GND	-	10	SA04;100	I/O
11	SA05;100	I/O	12	SA02;100	I/O
13	SA00;100	I/O	14	GND	-
15	GND	-	16	HDDIRG;100	I
17	SA01;100	I/O	18	IOCHRY;100	I/O
19	IOCS16;000	I	20	GND	-
21	GND	-	22	FIOW;000	I/O
23	FIOR;000	I/O	24	GND	-
25	GND	-	26	SA15;100	I/O
27	SD00;100	I/O	28	SA14;100	I/O
29	SD01;100	I/O	30	GND	-
31	GND	-	32	SA13;100	I/O
33	SD02;100	I/O	34	SA12;100	I/O
35	SD03;100	I/O	36	GND	-
37	GND	-	38	SA11;100	I/O
39	SD04;100	I/O	40	SA10;100	I/O
41	SD05;100	I/O	42	GND	-
43	GND	-	44	SA09;100	I/O
45	SD06;100	I/O	46	SA08;100	I/O
47	SD07;100	I/O	48	GND	-
49	GND	-	50	ISARST;002	I/O

C.13 PJ3 Selectable Bay I/F Connector (80-pin)

Table C-13 Selectable Bay I/F connector pin assignments (80-pin) (1/2)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
01	GND	-	02	IORST;000	O
03	HDSEL;000	I/O	04	GND	-
05	TRK0;000	I/O	06	SA08;100	O
07	SD07;100	I/O	08	GND	-
09	GND	-	10	SA09;100	O
11	SD06;100	I/O	12	GND	-
13	WGATE;000	I/O	14	SA10;100	O
15	SD05;100	I/O	16	GND	-
17	GND	-	18	SA11;100	O
19	SD04;100	I/O	20	GND	-
21	STEP;000	I/O	22	SA12;100	O
23	SD03;100	I/O	24	GND	-
25	GND	-	26	SA13;100	O
27	SD02;100	I/O	28	GND	-
29	DIR;000	I/O	30	SA14;100	O
31	SD01;100	I/O	32	GND	-
33	GND	-	34	SA15;100	O
35	SD00;100	I/O	36	GND	-
37	IFMO;000	I/O	38	CDDRQ;100	I
39	FIOW;010	I/O	40	GND	-
41	GND	-	42	FIOR;010	I/O
43	IOCHRY;100	I	44	GND	-
45	RDATA;000	I/O	46	CDDACK;000	O
47	CDRIRQ;100	I	48	GND	-
49	GND	-	50	IOCS16;000	I
51	SA01;100	O	52	GND	-
53	WDATA;000	I/O	54	SA00;100	O
55	FREADY;000	I	56	GND	-
57	GND	-	58	SA02;100	O
59	SA06;100	O	60	GND	-
61	IFSL;000	I/O	62	SA07;100	O
63	INDEX;000	I/O	64	VCC	-
65	VCC	-	66	VCC	-
67	VCC	-	68	VCC	-

Table C-13 Selectable Bay I/F connector pin assignments (80-pin) (2/2)

Pin No.	Signal Name	I/O	Pin No.	Signal Name	I/O
69	DSKCHG;000	1	70	INCDL;100	I/O
71	MBSTS0;100	I/O	72	INCDLG	-
73	CDRLED;000	I	74	INCDR;100	I/O
75	MBSTS1;100	I/O	76	INCDRG	-
77	IDENSL;100	I/O	78	WP;000	I
79	IHMED;000	I	80	ISARST;010	O

Appendix D   Keyboard Scan/Character Codes

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

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

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

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

NOTES:
1*   Scan codes differ by mode.
2*   Scan codes differ by overlay function.
3*   Combination with **Fn** key, makes different codes.
4*   The **Fn** key does not generate a code by itself.
5*   This key corresponds to key No. 42 in the 102-key model.
6*   Refer to Table D-6, scan codes with **Ctrl** key.
7*   Refer to Table D-7, scan codes with **Alt** key.

Table D-2 Scan codes with left Shift key

Cap No.	Key top	Code set 1		Code set 2	
		Make	**Break**	**Make**	**Break**
75	INS	E0 AA E0 52	E0 D2 E0 2A	E0 F0 12 E0 70	E0 F0 70 E0 12
76	DEL	E0 AA E0 53	E0 D3 E0 2A	E0 F0 12 E0 71	E0 F0 71 E0 12
79	←	E0 AA E0 4B	E0 CB E0 2A	E0 F0 12 E0 6B	E0 F0 6B E0 12
80	Home	E0 A 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

*Note: The table above shows scan codes with the left **Shift** key. In combination with the right **Shift** key, scan codes are changed as listed below:*

	With left **Shift**	With right **Shift**
Set 1	E0 AA -----------	E0 B6
	E0 2A -----------	E0 36
Set 2	E0 F0 12 ----------	E0 F0 59
	E0 12 ----------	E0 59

Table D-3 Scan codes in Numlock mode

Cap No.	Key top	Code set 1		Code set 2	
		Make	**Break**	**Make**	**Break**
75	INS	E0 2A E0 52	E0 02 E0 AA	E0 12 E0 70	E0 F0 70 E0 F0 12
76	DEL	E0 2A E0 53	E0 D3 E0 AA	E0 12 E0 71	E0 F0 71 E0 F0 12
79	←	E0 2A E0 4B	E0 CB E0 AA	E0 12 E0 6B	E0 F0 6B E0 F0 12
80	Home	E0 2A E0 47	E0 C7 E0 AA	E0 12 E0 6C	E0 F0 6C E0 F0 12
81	End	E0 2A E0 4F	E0 CF E0 AA	E0 12 E0 69	E0 F0 69 E0 F0 12
83	↑	E0 2A E0 48	E0 C8 E0 AA	E0 12 E0 75	E0 F0 75 E0 F0 12
84	↓	E0 2A E0 50	E0 D0 E0 AA	E0 12 E0 72	E0 F0 72 E0 F0 12
85	PgUp	E0 2A E0 49	E0 C9 E0 AA	E0 12 E0 7D	E0 F0 7D E0 F0 12
86	PgDn	E0 2A E0 51	E0 D1 E0 AA	E0 12 E0 7A	E0 F0 7A E0 F0 12
89	→	E0 2A E0 4D	E0 CD E0 AA	E0 12 E0 74	E0 F0 74 E0 F0 12

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 Make	Code set 1 Break	Code set 2 Make	Code set 2 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 Make	Code set 1 Break	Code set 2 Make	Code set 2 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						Code set 2						
		Make						**Make**						
Pause	Common	E1	ID	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

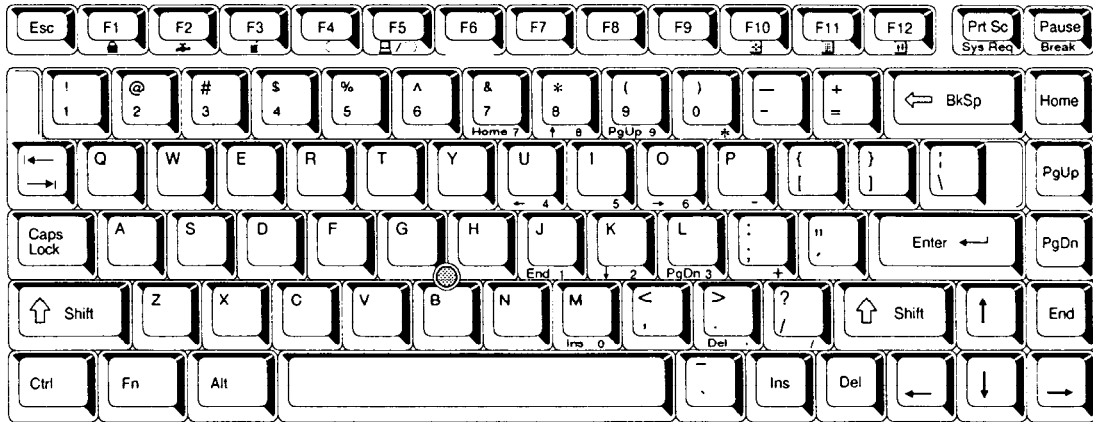## E.1   United States (US) Keyboard

Figure E-1 US keyboard
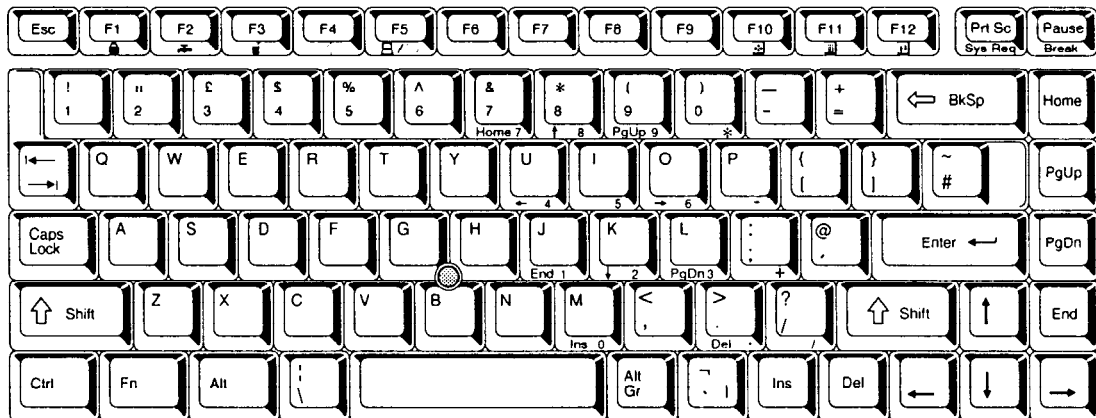
E.2   United Kingdom (UK) Keyboard

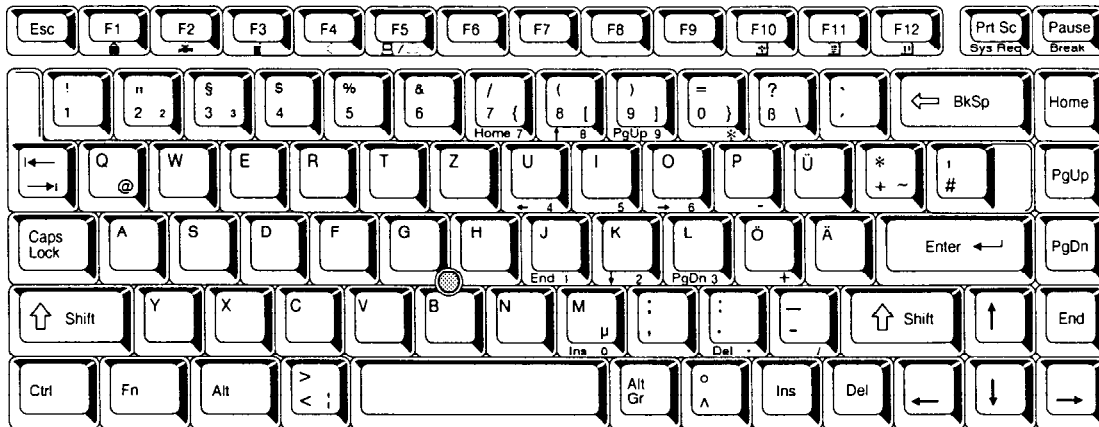

Figure E-2 UK keyboard

E.3   German (GR) Keyboard

Figure E-3 GR keyboard

E.4   French (FR) Keyboard
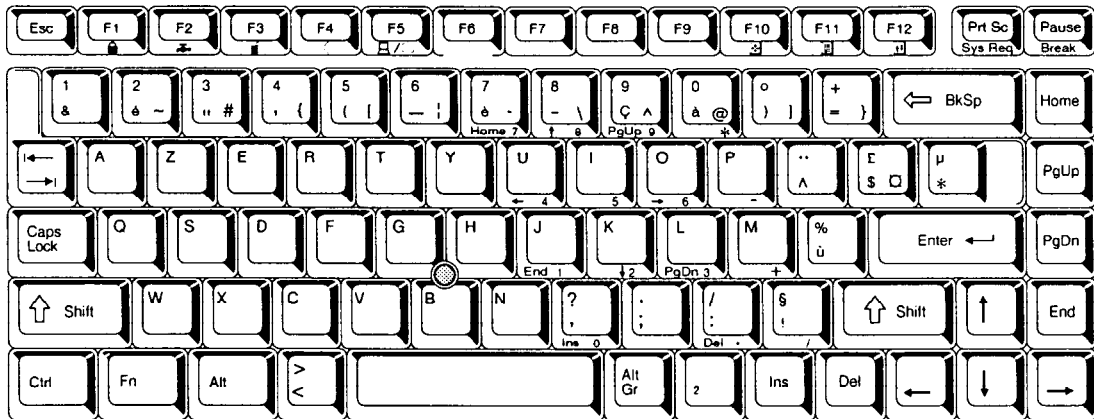

Figure E-4 FR keyboard

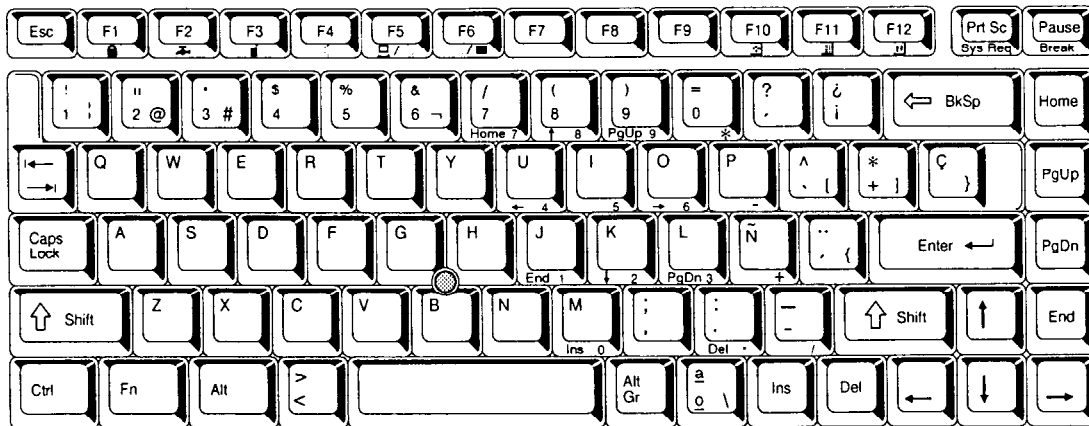## E.5   Spanish (SP) Keyboard

Figure E-5 SP keyboard

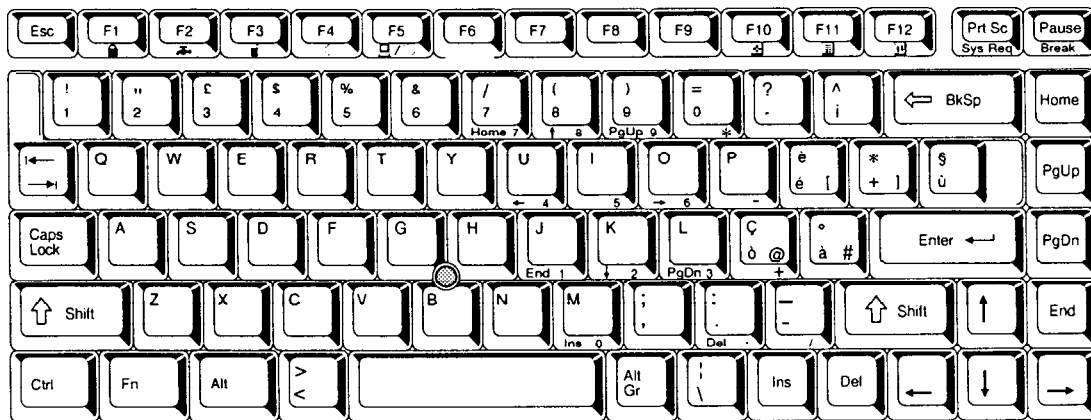## E.6   Italian (IT) Keyboard

Figure E-6 IT keyboard
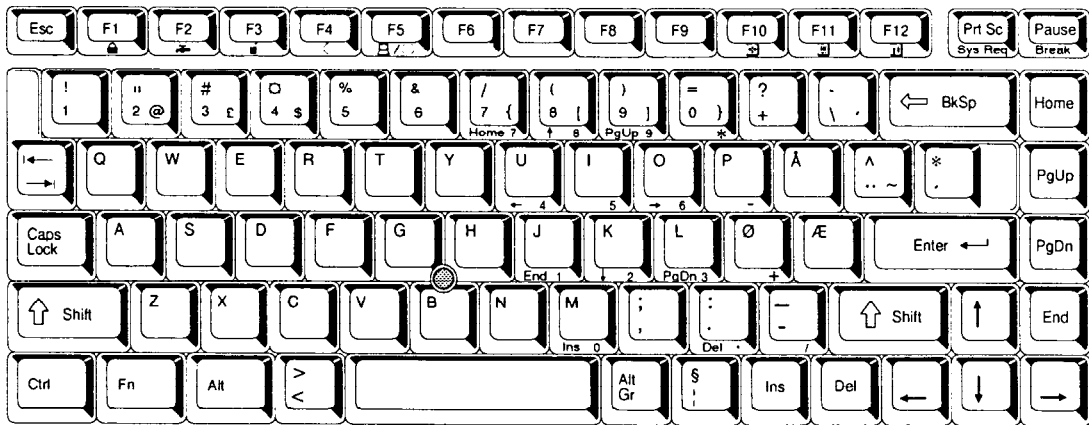
E.7   Scandinavian (SC) Keyboard

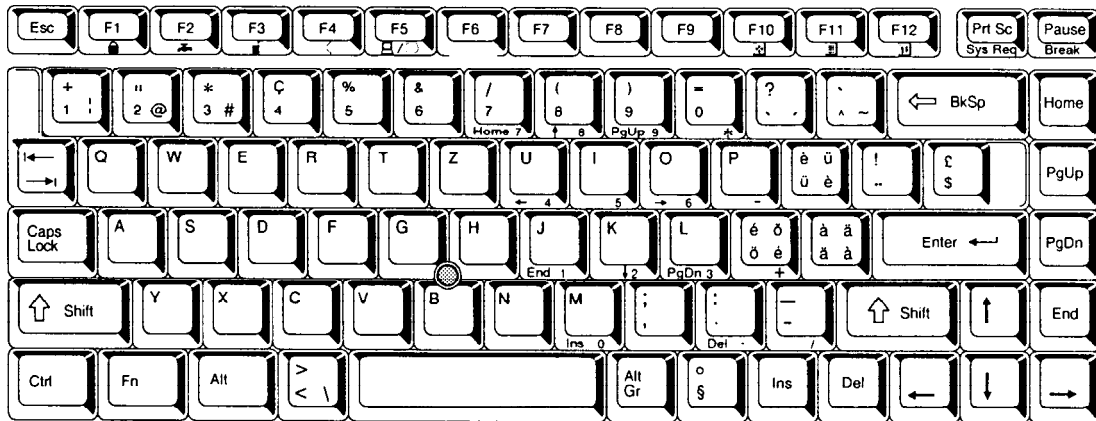*Figure E-7 SC keyboard*

E.8   Swiss-German (SL) Keyboard

Figure E-8 SL keyboard

Appendix F Wiring Diagrams
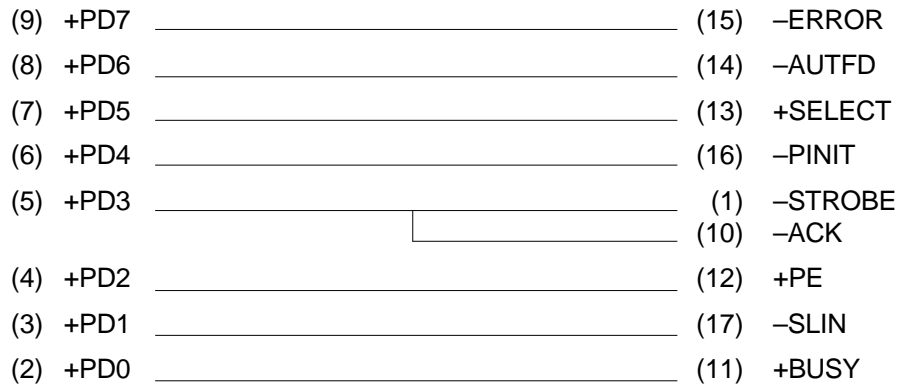
F.1   Printer Wraparound Connector

```
(9)  +PD7  ──────────────────────────────  (15)  −ERROR
(8)  +PD6  ──────────────────────────────  (14)  −AUTFD
(7)  +PD5  ──────────────────────────────  (13)  +SELECT
(6)  +PD4  ──────────────────────────────  (16)  −PINIT
(5)  +PD3  ───────────────────┐             (1)  −STROBE
                              └──────────  (10)  −ACK
(4)  +PD2  ──────────────────────────────  (12)  +PE
(3)  +PD1  ──────────────────────────────  (17)  −SLIN
(2)  +PD0  ──────────────────────────────  (11)  +BUSY
```

Figure F-1 Printer wraparound connector

F.2   RS-232-C Wraparound Connector

```
(3)  TD   ──────────────────────────────  (2)  RD
(7)  RTS  ───────────────────┐            (8)  CTS
                             └──────────  (1)  CD
(4)  DTR  ───────────────────┐            (6)  DSR
                             └──────────  (9)  RI
```
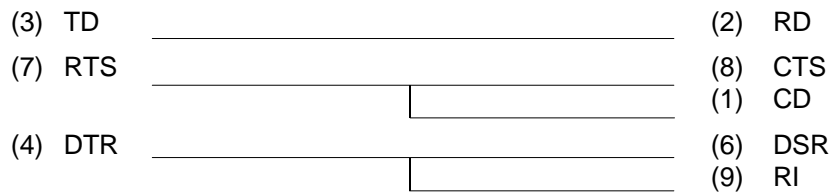
Figure F-2 RS-232-C wraparound connector

F.3   RS-232-C Direct Cable (9-Pin to 9-Pin)

```
(3)  TD   ──────────────────────────────  (2)  RD
(4)  DTR  ───────────────────┐            (6)  DSR
                             ├──────────  (8)  CTS
                             └──────────  (9)  RI
(7)  RTS  ──────────────────────────────  (1)  CD
(5)  GND  ──────────────────────────────  (5)  GND
(2)  RD   ──────────────────────────────  (3)  TD
(1)  CD   ──────────────────────────────  (7)  RTS
(6)  DSR  ───────────────────┐            (4)  DTR
(8)  CTS  ──────────────────┤
(9)  RI   ──────────────────┘
```
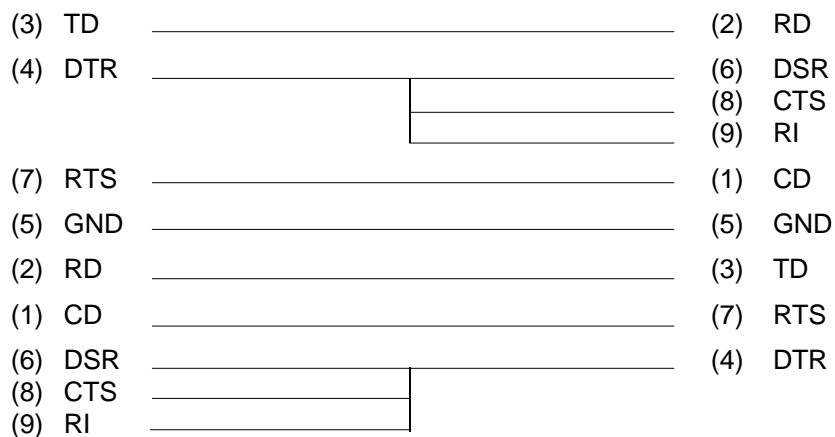
Figure F-3 RS-232-C direct cable (9-pin to 9-pin)

F.4   RS-232-C Direct Cable (9-Pin to 25-Pin)

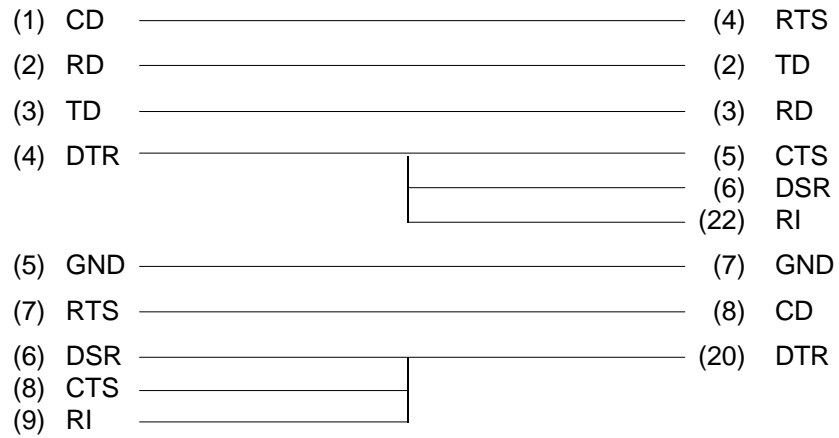|				
(1)	CD	————————————	(4)	RTS
(2)	RD	————————————	(2)	TD
(3)	TD	————————————	(3)	RD
(4)	DTR	———————————	(5)	CTS
			(6)	DSR
			(22)	RI
(5)	GND	———————————	(7)	GND
(7)	RTS	———————————	(8)	CD
(6)	DSR	———————————	(20)	DTR
(8)	CTS			
(9)	RI			

Figure F-4 RS-232-C direct cable (9-pin to 25-pin)

Appendix G BIOS Rewrite Procedures

This Appendix explains how to rewrite the system BIOS program when you are updating the BIOS on the computer.

Tools

To rewrite the BIOS, the following tool is required:

❑ Diagnostics disk for the computer

Rewriting the BIOS

> *NOTE: To rewrite the BIOS, use the FDD either in the Selectable Bay or attached to the external FDD port.*

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 cards.

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 is displayed, insert the diagnostics disk into the FDD, then press the **Enter** key to start the BIOS rewrite program.

6. When the process is completed, eject the diagnostics disk and restart the system.