1.1 Features

The 620CT uses extensive Large Scale Integration (LSI), and Complementary Metal-Oxide Semiconductor (CMOS) technology to provide minimum size and weight, low power usage, and high reliability. This computer incorporates the following features and benefits:

❏ Microprocessor

Uses an Intel Pentium processor 100 MHz with VRT (Voltage Reduction Technology) that operates at 2.9/3.3 volts. The math co-processor and 16 KB cache memory are integrated into Pentium.

❏ Disk storage

An internal 1.3 billion byte (1.26 GB) Hard Disk Drive (HDD). An external 3.5-inch Floppy Disk Drive (FDD) supports 2HD (1.44 MB) floppy disks and 2DD (720 KB) floppy disks.

❏ Memory

Standard with 8 MB of EDO (Extend Data Out) DRAM. This includes 640 KB of conventional memory and 7360 KB of extended memory, which can be utilized as expanded memory compatible with the Lotus/Intel/Microsoft Expanded Memory Specification (LIM-EMS).

❏ LCD

A 10.4-inch TFT (Thin Film Transistor) color LCD 800 x 600 pixels. The built-in display controller supports full color capability and up to 1024 x 768 resolution on an external CRT.

❏ Keyboard

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

❏ Batteries

Three different batteries: a Lithium-Ion main battery, a backup battery (for memory backup), and an RTC battery (Real Time Clock).

❏ Exp. memory slot

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

❏ Parallel port

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

❏ Serial port

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

❏ Port replicator port

A port replicator port which enables connection of a port replicator or external monitor adapter. The port replicator allows connection of a PS/2 mouse, PS/2 keyboard, external monitor, printer, DC IN, serial I/O, and an external FDD. The display adapter allows connection of an external monitor.

❏ External FDD port

The external FDD port lets you connect an external FDD.

❏ PC card slot

A PC card slot supports up to two Personal Computer Memory Card International Association (PCMCIA) release 2.0 standard cards. The upper and lower slots can each accommodate one Type II (5.0 mm) card. The lower slot can accommodate one Type III (10.5 mm) card when the upper slot is empty.

❏ 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.

❏ Sound System

Sound Blaster Pro compatible sound system to record sound and play it back with a built-in microphone and speaker. The sound system provides a volume control dial, headphone jack, and microphone jack.
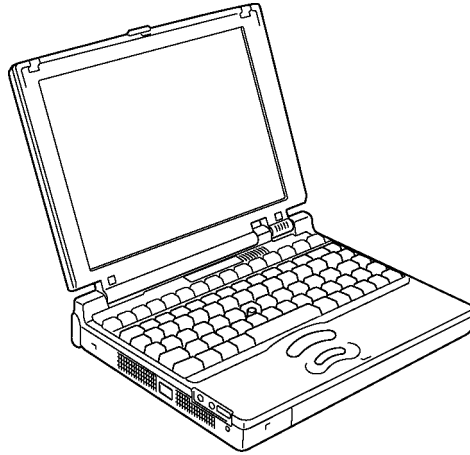
The computer is shown in Figure 1-1.

Figure 1-1 Computer

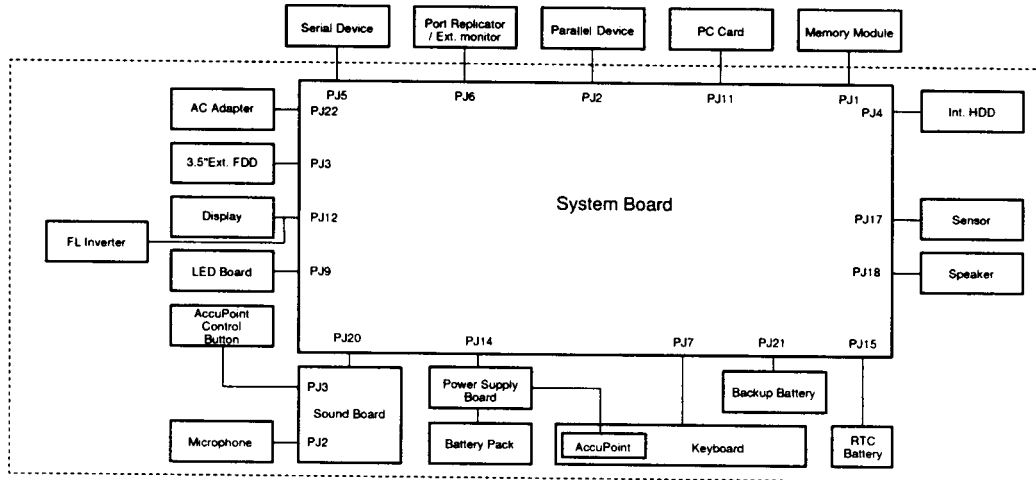The system configuration is shown in Figure 1-2.

Figure 1-2 System unit configuration

1.2 System Unit Block Diagram
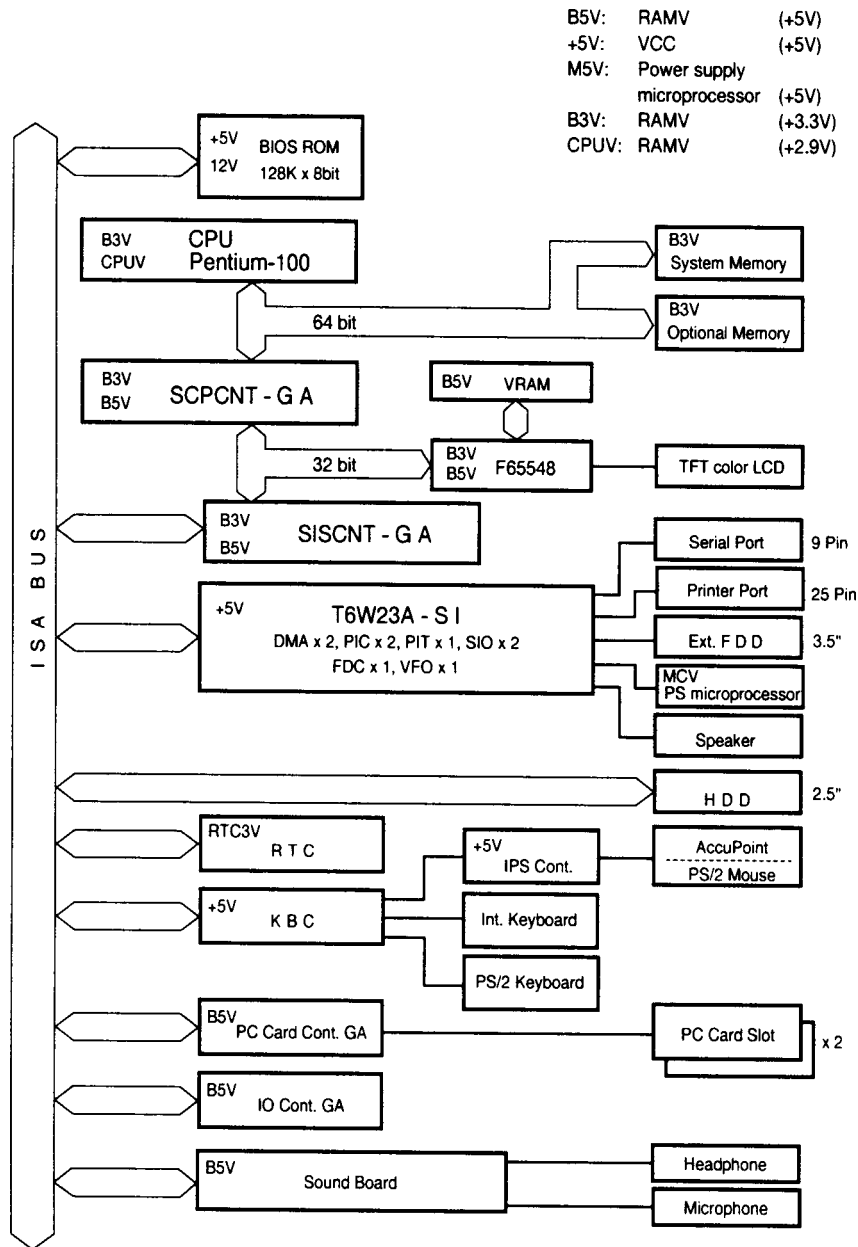
Figure 1-3 is a block diagram of the system unit.

Figure 1-3 System board block diagram

The system board is composed of the following major components:

❑ One Intel Pentium-100 MHz with VRT 64-bit microprocessor
Intel Pentium processor operates at 100 MHz and 2.9 volts and 3.3 volts. It incorporates a math coprocessor and a 16KB cache.

❑ Standard RAM
8 MB, four 1Mx16-bit EDO DRAM chips
3.3 volt operation
No parity bit
Access time 60 ns
Data transfer is 64-bit width

❑ BIOS ROM (Flash EEPROM)
128 KB (One 128Kx8-bit chip) memory
    64 KB in the ROM are used for system BIOS
    32 KB in the ROM are used for VGA BIOS
    32 KB in the ROM are reserved
    Access time 150 ns
    Data transfer is 8-bit width

❑ Video RAM
1 MB (Two 256Kx16-bit DRAMs)
5 volt operation

❑ Optional memory
    One expansion memory slot is available for 8, 16, and 32 MB memory modules,
    which may consist of 1 MBx16-bit EDO DRAM chips. Total maximum
    memory size is 40 MB (if a 32 MB memory module is installed).
    3.3 volt operation
    No parity bit
    Access time 60 ns
    Data transfer is 64-bit width

❑ One super integration (SI-T6W23A)
    Consists of the following components:

Two DMACs	82C37 equivalent
Two PICs	82C59 equivalent
Two SIOs	16550 equivalent (One SIO is not used)
One PIT	82C54 equivalent
One FDC	TC8565 equivalent
One VFO	TC8568 equivalent
One I/O port decode	
One SIO port control	
One printer port control supported ECP	
One FDD control	
One speaker control	
One power communication control	

❑ System Controller Gate Array (SCPCNT-GA)

This gate array has the following functions:

CPU control
SMI control
CPU clock control
Memory control
64-bit bus memory control
32-bit bus memory control
Bus control
64-bit data bus <==> 32-bit data bus
32-bit local bus control
Address latch control
I/O register control
Processing speed control

❑ ISA Bus Controller Gate Array (SISCNT-GA)

This gate array has the following functions:

Bus control
32-bit data bus <==> 16-bit data bus
ISA bus interface control
ISA bus access control
DMAC control
DMA address generation
I/O control
Memory control
ISA bus interface control
Refresh address generation
I/O register control
Suspend/Resume sequence

❑ PC Card Controller Gate Array

This gate array has the following functions:

PCMCIA memory card control
PCMCIA I/O card control

❑ I/O Controller Gate Array

This gate array has the following functions:

Internal Communication control
KBC, main CPU communication register file
KBC interrupt control
Others
KBC communication control. Contrast adjust,
speaker volume adjust PWM control, Sound board
interface, BIOS-ROM interface, SMI control

❑ Video Controller

Chips & Technologies F65548 is used.

Controls internal TFT color LCD and external SVGA compatible CRT.

❏ Keyboard Controller (KBC)
   One M38802M4 chip is used.
   This KBC includes the keyboard scan controller and keyboard interface controller.
   The KBC controls the internal keyboard, external keyboard, AccuPoint, and PS/2
   mouse.

❏ AccuPoint Controller (IPSC)
   One U43SC10 chip is used.
   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 bytes of memory are used for the
   calendar and clock. The remaining 114 bytes are used for the system configuration
   data.

1.3   3.5-inch External Floppy Disk Drive (FDD)

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

The FDD is shown in Figure 1-4.
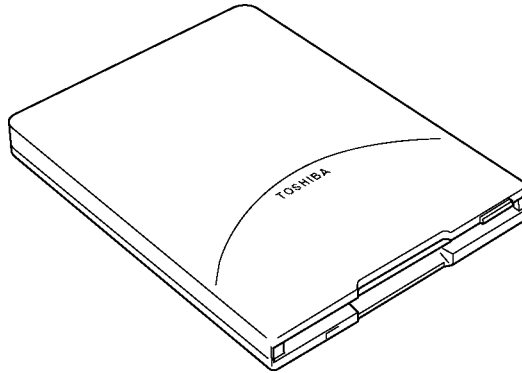
Figure 1-4 3.5-inch external FDD

The specifications for the FDD are listed in Table 1-1.

Table 1-1 3.5-inch external 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 (HDD)

The HDD is a random access non-volatile storage device. It has a non-removable 1.3 billion byte (1.26GB), 2.5-inch magnetic disk and mini-winchester type magnetic heads.

The HDD is shown in Figure 1-5.
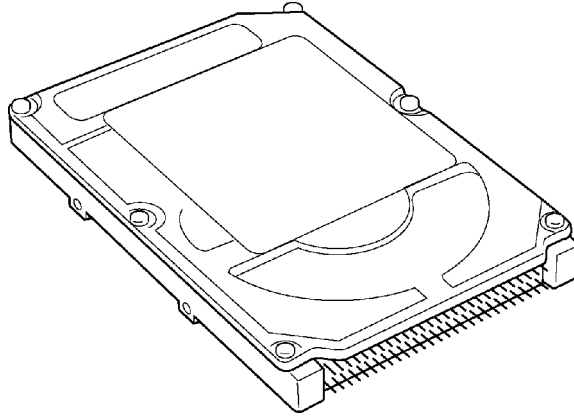
Figure 1-5 2.5-inch HDD

Specifications for the HDD are listed in Table 1-2.

Table 1-2 2.5-inch HDD specifications

Items	(MK1301MAV)
Storage capacity (GB) Formatted	1.26
Number of disks	3
Data heads	16
Data surfaces	6
Bytes per sector	512
Rotation speed (rpm)	4200
Recording method	8-9 RLL

1.5 Keyboard

The 82-(USA) or 84-(European) key keyboard is mounted on the system unit. The keyboard is connected to the keyboard controller on the system board through a 25-pin flat cable. The 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 of the Portégé 610CT Maintenance Manual for optional keyboard configurations.
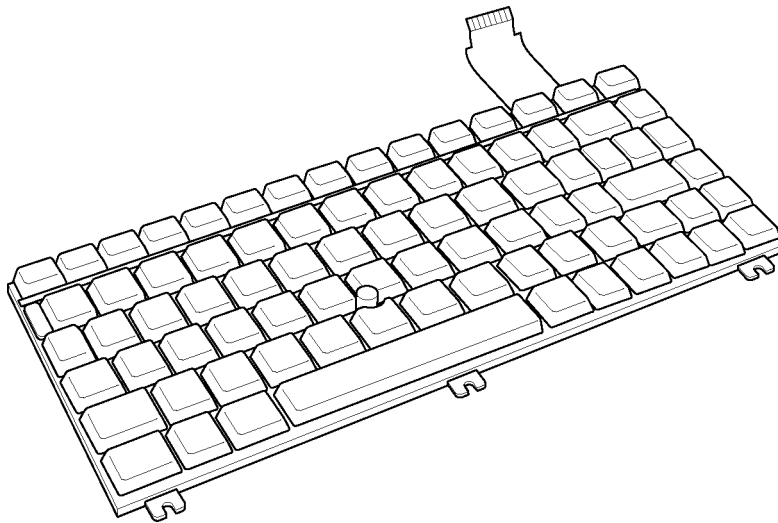
Figure 1-6 Keyboard

1.6 TFT Color LCD

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

1.6.1 LCD Module

The TFT color LCD supports 800 x 600 pixels with an internal display controller and 256K colors for graphics and characters. This controller includes the functions of Video Graphics Array (VGA) and Super VGA (SVGA) for display.

The LCD receives 9-bit data signals, data enable signals, and a shift clock for data transmission. All signals are CMOS-level compatible.

The TFT LCD is shown in Figure 1-7.
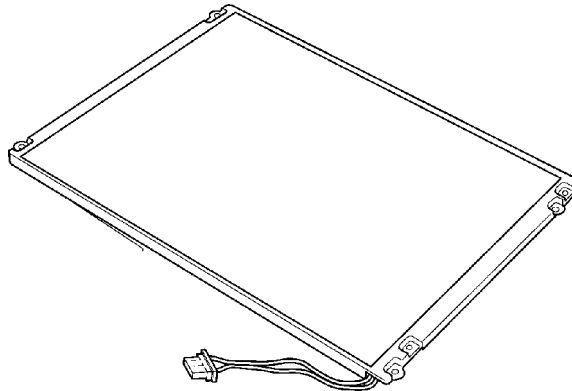
Figure 1-7 TFT color LCD

The specifications for the LCD are listed in Table 1-3.

Table 1-3 TFT color LCD specifications

Item		Specifications
Number of dots	(dots)	800 x 600
Dot pitch	(mm)	0.264 x 0.264
Display area	(mm)	211.2 x 158.4
Contrast		100
FL current	(mA)	4.6/4.0/2.8/2.4* (Bright/Semi-bright)

NOTE: The FL currents at power on are:

	Bright	Semi-bright
AC adapter connected	4.6 mA	2.8 mA
AC adapter not connected	4.0 mA	2.4 mA

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

1.6.2   Fluorescent Lamp (FL) Inverter Board

The FL inverter board supplies high frequency current to light the LCD Fluorescent Lamp. The specifications for the FL inverter are listed in Table 1-4.

Table 1-4 FL inverter board specifications

Item			Specifications
Input	Voltage	(VDC)	4 to 5.5
	Power	(W)	4.8
Output	Voltage	(Vrms)	1,100
	Current	(mA)	4.6/4.0/2.8/2.4*
			(Bright/Semi-bright)

NOTE: The FL currents at power on are:

	Bright	*Semi-bright*
AC adapter connected	*4.6 mA*	*2.8 mA*
AC adapter not connected	*4.0 mA*	*2.4 mA*

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

1.7   Power Supply

The power supply provides five kinds of voltages to the system board. The power supply has one microprocessor that operates at 500 KHz and contains the following functions:

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

2. Controls the LED icon and speaker.

3. Determines when the battery is fully charged.

4. Controls power on/off.

5. Searches for low/high voltage at power I/O areas.

6. Calculates the remaining battery capacity.

7. Displays error status on the LED.

8. Controls boot mode and resume mode reset.

9. Controls power to the LCD/FL based on the LCD panel sensor.

10. Controls intensity of the backlight FL.

11. Conserves data in the system buffer when power is off.

12. Controls the main battery's power flow.

13. Controls alarm beeps for power supply errors.

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

Table 1-5 Power supply output rating

Use for	Name	DC voltage (V)	Regulation tolerance (%)
System logic, FDD, HDD, Display	VCC	+5	±5
RS-232C	P+12V	+12	±5
RAM	B3V	+3.3	±5
VGA,I/O	B5V	+5	±5
CPU	CPUV, B3V	+2.9, +3.3	±5

1.8   Batteries

The computer has three types of batteries:

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

Battery specifications are listed in Table 1-6.

Table 1-6 Battery specifications

Battery name	Material	Output voltage	Capacity
Main battery	Lithium-Ion	10.8 V	4,000 mAH
Backup battery	Nickel Metal Hydride	6.0 V	110 mAH
RTC battery	Nickel Metal Hydride	3.6 V	30 mAH

1.8.1   Main Battery

The removable main battery pack is the computer's main power source when the AC adapter is not attached. The main battery recharges the backup battery when the system power is on. The backup and main battery maintain the state of the computer when you enable AutoResume.

❑ Battery Indicator

   The battery indicator is located on the front of the computer. The indicator shows the status of the removable battery pack, power supply, and AC adapter.

   The status of each can be determined by color:

Orange   The battery is being charged. (AC adapter is attached.)

Green   The battery is fully charged. (AC adapter is attached.)

No light The AC adapter is disconnected from the computer.   The AC adapter is connected, but it cannot charge the battery for one of the following reasons:

   •   The battery is extremely hot. Allow the computer and the battery to reach room temperature before attempting to charge the battery.

   •   The battery is almost fully discharged. The battery will not begin charging immediately in this state, it will begin charging a few minutes after the AC adapter is connected.

   •   The AC adapter is not receiving power.

1.8.2   Battery Charging Control

Battery charging is controlled by a power supply 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 quick charge or trickle charge.

❏ Quick Battery Charge

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

Table 1-7 Time required for quick charges

	Charging time
Quick charge (power off)	About 4 hours
Trickle charge (power on)	About 5 to 8 hours

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 AC adapter output voltage is abnormal.

4.   The charge current is abnormal.

❏ Trickle Battery Charge

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

1.8.3   Backup Battery

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

AC adapter > Main battery > Backup battery

The backup battery is charged by the main battery or AC adapter when the system is powered on. Table 1-8 shows the charging time and data preservation period of the backup battery.

Table 1-8 Backup battery charging/data preservation time

		Time
Charging Time	Power On	40 H
	Power Off (with AC Adapter)	40 H
	Power Off (Without AC Adapter)	Doesn't charge
Data preservation period (full charge)		1.5 H

1.8.4   RTC Battery

The RTC battery provides power to keep the current date, time, and other setup information in memory while the computer is turned off. Table 1-9 shows the charging time and data preservation period of the RTC battery.

Table 1-9 RTC battery charging/data preservation time

		Time
Charging Time	Power On	70 H
	Power Off	Dosen't charge
Data preservation period (full charge)		1 month

2.1 Troubleshooting

Chapter 2 describes how to determine if a Field Replaceable Unit (FRU) in the 610CT is causing the computer to malfunction. The FRUs covered are:

1. Power Supply

2. System Board

3. Floppy Disk Drive

4. Hard Disk Drive

5. Keyboard

6. Display

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

The following tools are necessary for implementing the troubleshooting procedures:

1. A 610CT Diagnostics Disk

2. A Phillips screwdriver (2 mm)

3. A Toshiba MS-DOS system disk(s)

4. A 2DD or 2HD formatted work disk for floppy disk drive testing

5. A cleaning kit for floppy disk drive troubleshooting

6. A printer port LED

7. An RS-232-C wraparound connector

8. A printer wraparound connector

9. A multimeter

10. An external monitor adapter

11. An external monitor

2.2   Troubleshooting Flowchart

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

❑ Ask the user if a password is registered and, if it is, ask him or her to enter the password. If the user has forgotten the 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 is installed on the hard disk. Non-Toshiba operating systems can cause the computer to malfunction.

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

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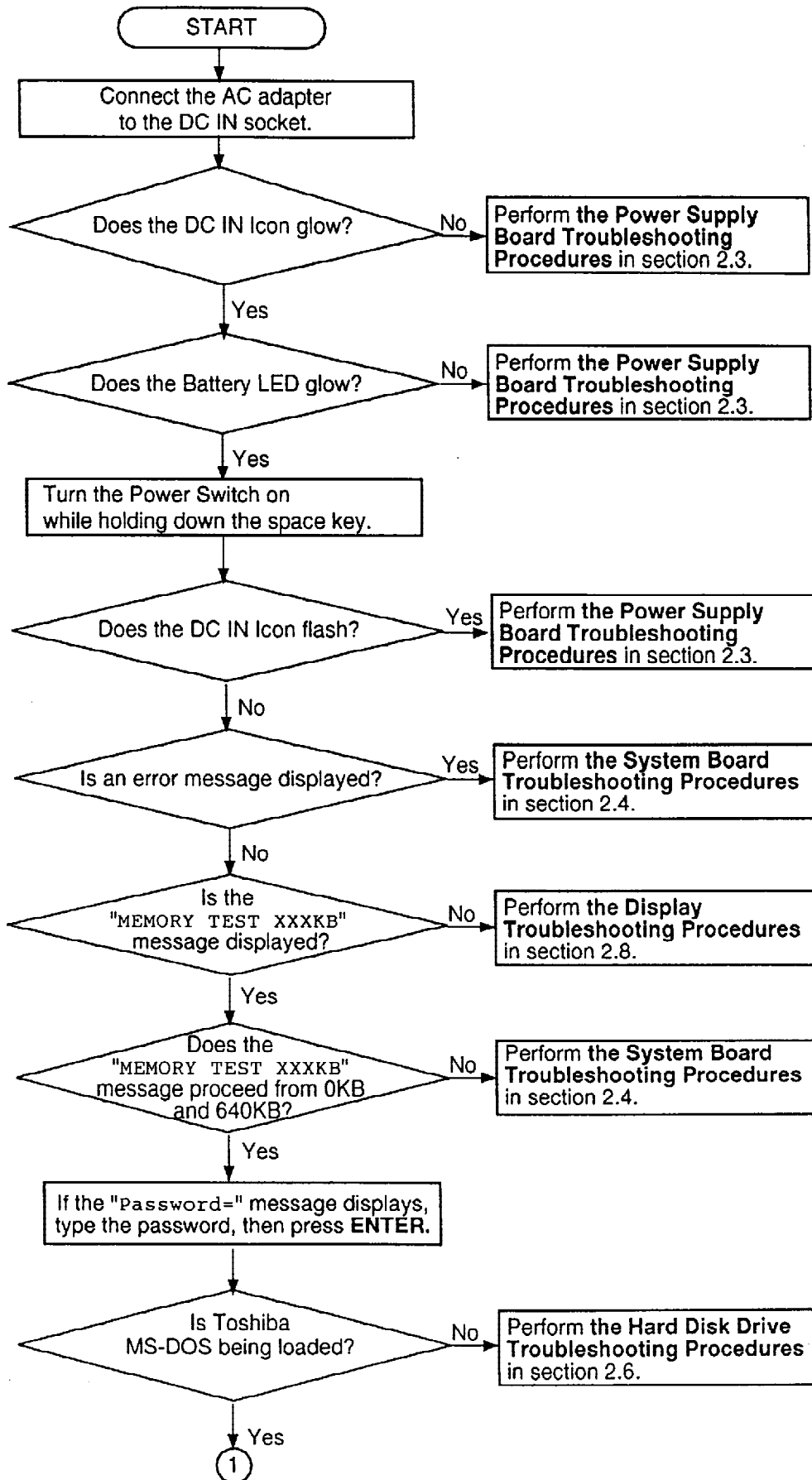
Figure 2-1 Troubleshooting flowchart (1/2)
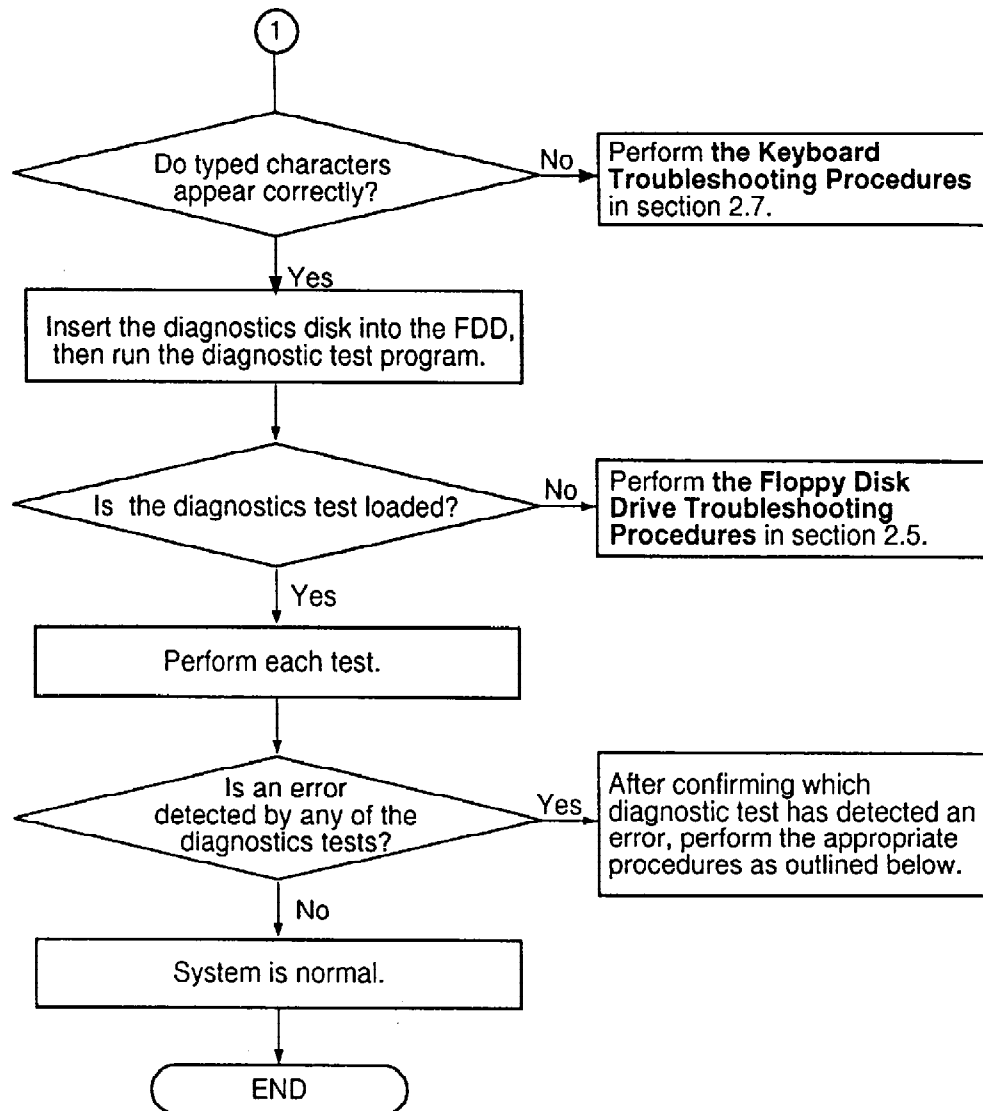
Figure 2-1 Troubleshooting flowchart (2/2)

If the diagnostics program cannot detect an error, the problem may be intermittent. The Running Test program should be executed several times 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, or real timer test, perform the system board troubleshooting procedures in section 2.4.

2.   If an error is detected on the keyboard test, perform the keyboard troubleshooting procedures in section 2.7.

3.   If an error is detected on the floppy disk test, perform the floppy disk drive troubleshooting procedures in section 2.5.

4.   If an error is detected on the hard disk test, perform the hard disk drive troubleshooting procedures in section 2.6.

2.3   Power Supply Troubleshooting

The power supply controls many functions and components in the 610CT. To determine if the power supply is functioning properly, start with Procedure 1 and continue with the other Procedures as instructed. The procedures described in this section are:

        Procedure 1:   DC IN Icon Indicator Check

        Procedure 2:   Battery LED Indicator Check

        Procedure 3:   Connection and Replacement Check

Procedure 1   DC IN Icon Indicator Check

The 610CT AC adapter converts AC power to DC power and contains a charging circuit which charges the batteries. The adapter connects to the DC IN socket connector on the back side of the computer. When the AC adapter is connected to the computer and the power is turned off, the AC adapter charges the batteries.

The DC IN icon displays whether or not the AC adapter is connected and supplying power.

When the DC IN icon is green, the AC adapter is connected and supplying power to the 610CT.

If the DC IN icon does not light, the AC adapter is not supplying power or the AC adapter is not attached to the 610CT, go to Check 1.

If the DC IN icon is flashing orange, the AC adapter's voltage supply is abnormal or the power supply is not functioning properly, go to Check 1.

If any of the above indicator conditions are abnormal, make sure the DC IN icon's LED indicator lights are not burned out before performing the following checks:

Check 1   Make sure the correct AC adapter cable is firmly plugged into the DC IN socket on the back of the computer.

Check 2   If the DC IN icon flashes orange when the AC adapter is connected, its voltage output is abnormal. Connect a new AC adapter and turn the 610CT on again to verify the indicator condition.

Check 3   The battery pack may be malfunctioning. Replace the battery pack with a new one and turn the computer on again. If the problem still exists, perform Check 4.

Check 4   Place the 610CT in an environment between –20°C and 70°C until it is at the ambient temperature. Repeat the steps which caused the computer to operate abnormally. If the same problem still occurs, perform Procedure 3.

Procedure 2   Battery LED Indicator Check

The Battery LED indicator shows the battery charging status. The Battery LED, identified by a battery icon on the front of the computer, glows amber when the AC adapter is charging the 610CT battery pack.

If the Battery LED indicator glows green, the AC adapter is connected and the battery is fully charged.

If the Battery LED indicator glows amber, the AC adapter is connected and the battery is being charged.

If the Battery LED indicator does not glow, go to Check 1.

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

Check 2   Make sure the battery pack is installed in the computer correctly. If the battery pack is installed correctly, go to Check 3.

Check 3   Remove the battery pack and check that the battery and system board terminals are clean and not bent.

If the battery and/or terminal appears dirty, clean it/them gently with a cotton swab dipped in alcohol.

If either terminal looks bent or damaged, replace the battery or the system board.

If the terminals are clean and not bent, go to Check 4.

Check 4   Connect a new AC adapter. If the Battery LED indicator still does not glow, go to Check 5.

Check 5   Install a new battery pack. If the Battery LED indicator still does not glow, go to Procedure 3.

Procedure 3   Connection and Replacement Check

The power supply board is connected to the system board. This connection may become damaged or disconnected from the system board. Disassemble the 610CT following the steps described in chapter 4, *Replacement Procedures,* and perform the following checks.

Check 1   Make sure the power supply board and system board are firmly connected to each connector.

```
+------------+        +--------------------+        +--------------+
| AC Adapter |--------| Power Supply Board |--------| System Board |
+------------+        +--------------------+        +--------------+
```

If any of these boards is disconnected, connect it and repeat Procedure 1. If the system is still not functioning properly, perform Check 2.

Check 2   The power supply board may be defective or damaged. Replace the power supply board with a new one following the steps in chapter 4, *Replacement Procedures.* If the system is still not functioning properly, perform Check 3.

Check 3   Replace the system board with a new one and restart the system. If the problem still exists, other FRUs may be damaged.

2.4 System Board Troubleshooting

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

Procedure 1:   Message Check

Procedure 2:   Printer Port LED Check on Boot Mode

Procedure 3:   Printer Port LED Check on Resume Mode

Procedure 4:   Diagnostic Test Program Execution Check

Procedure 5:   Replacement Check

Procedure 1   Message Check

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

❑ If an error message is shown on the display, perform Check 1.

❑ If there is no error message, go to Procedure 2.

❑ If Toshiba MS-DOS is properly loaded, go to Procedure 3.

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

If you press the **F1** key as the message instructs, the system configuration in the RTC memory configuration is set to the default setting. 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) *** Error in CMOS.  Bad HDD type ***
    Check system.  Then press [F1] key ......
(b) *** Error in CMOS.  Bad battery ***
    Check system.  Then press [F1] key ......
(c) *** Error in CMOS.  Bad check sum ***
    Check system.  Then press [F1] key ......
(d) *** Error in CMOS.  Bad memory size ***
    Check system.  Then press [F1] key ......
(e) *** Error in CMOS.  Bad time function ***
    Check system.  Then press [F1] key ......
```

Check 2   If the following error message is displayed on the screen, 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 appears.

If one of the following error messages (1) through (7), (9) through (18), (23), or (24) is displayed, replace the system board.

If error message (8) is displayed, go to the Keyboard Troubleshooting Procedures in section 2.7.

If error message (19) or (20) is displayed, go to the HDD Troubleshooting Procedures in section 2.6.

If error message (21) or (22) is displayed, go to the FDD Troubleshooting Procedures in section 2.5.

```
(1)      TIMER CH.2 OUT ERROR
(2)      PIT ERROR
(3)      MEMORY REFRESH ERROR
(4)      FIRST 64KB MEMORY ERROR
(5)      RTC ERROR
(6)      CRTC ERROR
(7)      VRAM ERROR
(8)      KBC 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)     HDC ERROR
(19)     HDD #0 ERROR
(20)     HDD #1 ERROR
(21)     NO FDD ERROR
(22)     FDD ERROR
(23)     TIMER INTERRUPT ERROR
(24)      RTC UPDATE ERROR
```

Procedure 2   Printer Port LED Check on Boot Mode

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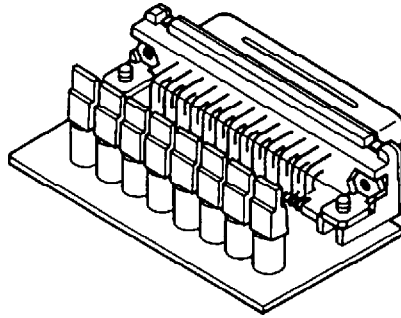
Figure 2-2 Printer port LED

To use the printer port LED follow these steps:

1. Turn on the 610CT power, then set to boot mode.

2. Turn off the computer's power.

3. Plug the printer port LED into the 610CT Printer connector.

4. Hold down the space bar and turn on the computer's power.

5. Read the LED status from left to right as you are facing the back of the computer.

6. Convert the status from binary to hexadecimal notation.

7. If the final LED status is FFh (normal status), go to Procedure 3.

8. If the final LED status matches any of the test status values in table 2-1, 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 22 and halts, the IRT test has already completed the KBC test. In this instance, the IRT indicates an error has been detected during the next item, system memory test.*

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

Error status	Test item	Message
01H	Pre-init for warm start test	—
05H	PIT test	TIMER CH.2 OUT ERROR
		PIT ERROR READ DATA = XXH WRITE DATA = XXH
06H	PIT initialization	—
07H	PIT function test	MEMORY REFRESH ERROR
0AH	First 64KB memory test	FIRST 64KB MEMORY ERROR
0BH	System memory initialization	—
0DH	Interrupt vector initialization	—
15H	RTC test	RTC ERROR READ DATA = XXH WRITE DATA = XXH
16H	CMOS RAM test	****Error in CMOS. Bad battery**** ****Error in CMOS. Bad check sum**** ****Error in CMOS. Bad configuration**** ****Error in CMOS. Bad memory size**** ****Error in CMOS. Bad HDD type**** ****Error in CMOS. Bad time function**** Check system. Then press [F1] key
18H	PIC initialization	—
1FH	Display initialization	CRTC ERROR
		VRAM ERROR READ DATA = XXXXXXXXH WRITE DATA = XXXXXXXXH
22H	KBC test	KBC ERROR
25H	System memory test	SYSTEM MEMORY ERROR
		ADDRESS = XXXXXXXXH READ DATA = XXXXXXXXH WRITE DATA = XXXXXXXXH
		SYSTEM MEMORY PARITY ERROR ADDRESS = XXXX0000H – XXXXFFFFH
30H	Extended memory test	EXTENDED MEMORY ERROR
		ADDRESS = XXXXXXXXH READ DATA = XXXXXXXXH WRITE DATA = XXXXXXXXH
		EXTENDED MEMORY PARITY ERROR ADDRESS = XXXX0000H – XXXXFFFFH
40H	DMA page register test	DMA PAGE REGISTER ERROR READ DATA = XXH WRITE DATA = XXH

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

Error status	Test item	Message

41H	DMAC test	DMAC #1 ERROR
		   READ DATA = XXXXH
		   WRITE DA = XXXXH

		DMAC #2 ERROR READ DATA = XXXXH WRITE DATA = XXXXH
42H	DMAC initialization	–
4AH	PIC test	PIC #1 ERROR READ DATA = XXH WRITE DATA = XXH
		PIC #2 ERROR READ DATA = XXH WRITE DATA = XXH
54H	Keyboard test	KEYBOARD ERROR
55H	KBC initialization	KBC ERROR
5AH	Mouse initialization	–
60H	HDD initialization	HDC ERROR HDC #0 ERROR HDC #1 ERROR
65H	FDD initialization	NO FDD ERROR
		FDD ERROR
70H	Printer test	–
80H	RS-232-C test	–
90H	Timer initialization	TIMER INTERRUPT ERROR
		RTC UPDATE ERROR
A0H	NDP initialization	–
A6H	Expansion I/O ROM	–
FFH	Expansion system ROM	–

Check 1   If the following error codes are displayed, go to Procedure 5.

       01h, 05h, 06h, 07h, 0Ah, 0Bh, 0Dh, 15h, 16h, 18h, 1Fh, 22h, 25h, 30h, 40h,
       41h, 42h, 54h, 55h, 65h, 70h, 80h, 90h, A0h, A6h

Check 2   If error code **4Ah** is displayed, go to the Keyboard Troubleshooting procedures in Section 2.7.

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

Check 4   If error code **60h** is displayed, 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 follow these steps:

1. Turn the computer's power on, then set to resume mode.

2. Turn the computer off.

3. Plug the printer port LED into the printer connector.

4. Turn the computer on.

5. Read the LED status from left to right as you face the back of the computer.

6. Convert the status from binary to hexadecimal notation.

7. If the final LED status is FFh (normal status), go to Procedure 4.

8. If the final LED status matches any of the test status values in table 2-2, go to procedure 5.

Table 2-2 Printer port LED resume mode error status

Error status	Meaning of status
00H	RAM BIOS error
F0H	Press the reset switch
F1H	Suspend process error (The system will suspend while FDD is accessed, etc.)
F2H	The system has optional ROM, or an optional card (CGA, MDA)
F4H	Backup RAM checksum error
F5H	Main memory checksum error
F6H	Video RAM checksum error
F7H	Extended memory checksum error
F8H	Backup RAM checksum error
F9H	Main memory checksum error
FAH	Video RAM checksum error
FBH	Extended memory checksum error
FDH	Card modem error
FEH	Password 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. PCMCIA test

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

Procedure 5   Replacement Check

The system board may be damaged. Disassemble the 610CT following the steps described in chapter 4, *Replacement Procedures,* and perform the following check:

Check   Replace the system board with a new one. If the problem still exists, other FRUs may be damaged.
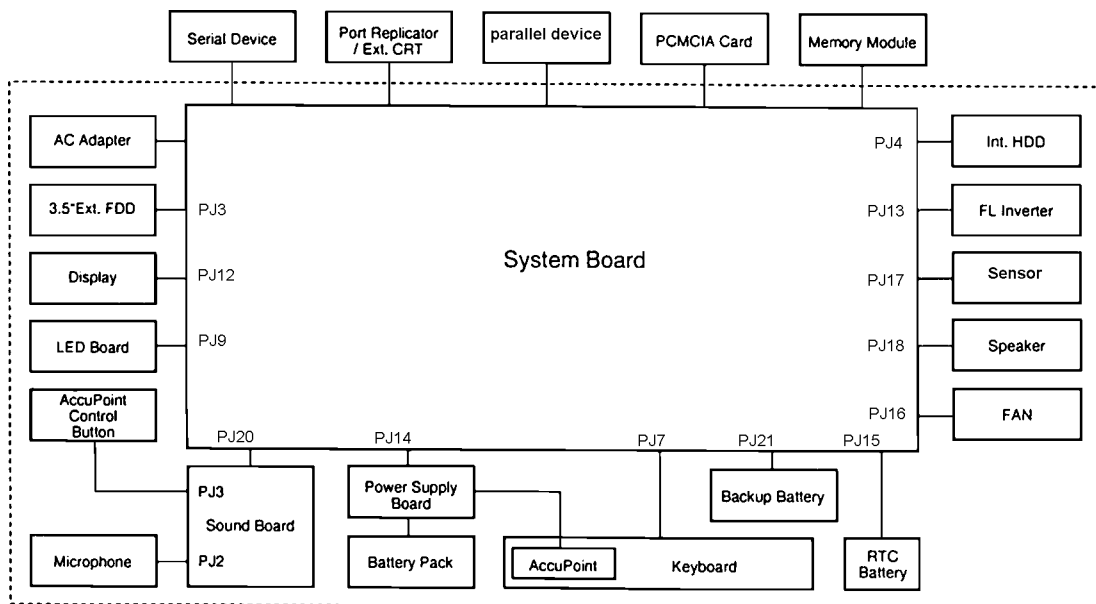
2.5 Floppy Disk Drive Troubleshooting

This section describes how to determine if the 610CT 3.5-inch external floppy disk drive is functioning properly. If the 3.5-inch external FDD is not connected to the computer, connect it and perform the steps below starting with Procedure 1 and continuing with the other procedures as required.

        Procedure 1:   FDD Head Cleaning Check

        Procedure 2:   Diagnostic Test Program Check

        Procedure 3:   Connector Check and Replacement Check

Procedure 1   FDD Head Cleaning Check

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

After loading Toshiba MS-DOS, run the Diagnostic Program and then clean the FDD heads using the cleaning kit. If the FDD still does not function properly after cleaning, go to Procedure 2.

If the test program cannot be executed on the 610CT, go to Procedure 3.

Procedure 2   Diagnostic Test Program Execution Check

The Floppy Disk Drive Diagnostic Test program is stored on the 610CT Diagnostics Disk. After loading Toshiba MS-DOS, run the diagnostic program. Refer to Chapter 3, *Tests and Diagnostics*, for more information about the diagnostics test procedures.

Floppy disk drive test error codes and their status names are described in table 2-3. Make sure 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 2-3 Floppy disk drive error code and status

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

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

```
Write protected
```

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

Procedure 3   Connector Check and Replacement Check

The 3.5-inch Floppy Disk Drive is connected to the system board by the FDD cable. This cable may be damaged or disconnected from the system board. Perform the following checks:

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

```
┌──────────────────────┐                    ┌──────────────────────┐
│  3.5-inch external FDD │────────────────────│    System Board      │
└──────────────────────┘                    └──────────────────────┘
```
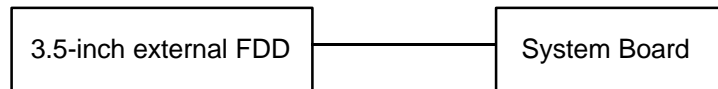
If this cable is disconnected, connect it to the system unit and repeat Procedure 2. If the FDD is still not functioning properly, perform Check 2.

Check 2   The FDD or its cable may be defective or damaged. Replace the FDD and cable with new ones. If the FDD is still not functioning properly, perform Check 3.

Check 3   Replace the system board with a new one following the steps in chapter 4, *Replacement Procedures*.

2.6 Hard Disk Drive Troubleshooting

To determine if the hard disk drive is functioning properly, perform the procedures below 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

CAUTION: The contents of the hard disk will be erased when the HDD troubleshooting procedures are executed. Transfer the contents of the hard disk to a floppy disk(s) using the Toshiba MS-DOS BACKUP command. Refer to the Toshiba MS-DOS Manual for more information about how to perform the BACKUP command.

Procedure 1   Partition Check

Insert the Toshiba MS-DOS system disk and turn the computer on, 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 Display Partition Information from the FDISK menu. If drive C is listed, go to Check 3. If drive C is not listed, return to the FDISK menu and choose the option to create a DOS partition on drive C. Recheck the system. If the problem still exists, go to Procedure 2.

Check 3   If drive C is listed as active in the FDISK menu, go to Check 4. If drive C is not listed as active, return to the FDISK menu and choose the option to set the active partition for drive C. 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 610CT HDD does not function properly, some of the following error messages may appear on the display. Start with Check 1 below and perform the other checks as instructed.

Check 1   If any of the following messages appear, perform Check 2. If the following messages do not appear, perform Check 4:

```
HDC ERROR
```
(After 5 seconds this message will disappear)
                            or
```
HDD #0 ERROR
```
(After 5 seconds this message will disappear)
                            or
```
HDD #1 ERROR
```
(After 5 seconds this message will disappear)

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

```
Insert system disk in drive
Press any key when ready .....
```
                  or
```
Non-System disk or disk error
Replace and press any key
```

Check 3   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. Restart the 610CT. If the error message still appears, perform Check 4.

```
System transferred
```

Check 4   The HDD is connected to the system board. This connection can become damaged or disconnected. Disassemble the 610CT as described in chapter 4, *Replacement Procedures*. If the HDD is not connected to the flexible cable, connect it to the flexible cable and return to Procedure 1. If the flexible cable is not connected to the system board, connect it to the system board and return to Procedure 1. If the HDD and flexible cable are firmly connected to the system board, perform Procedure 3.
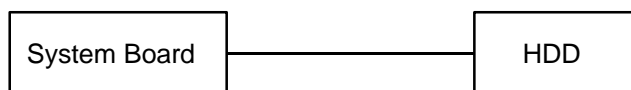
Procedure 3   Format Check

The 610CT HDD is formatted using the low level format program and the MS-DOS FOR-MAT 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 610CT Diagnostic Disk, format the HDD with a low level format option. Refer to Chapter 3, *Tests and Diagnostics,* for more information about the diagnostic program.

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

```
Format complete
```

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

Procedure 4   Diagnostic Test Program Execution Check

The HDD test program is stored in the 610CT 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; perform Check 1. The error codes and statuses are described in table 2-4. If an error code is not generated, the HDD is operating properly.

Table 2-4 Hard disk drive error code and status

Code	Status
01h	Bad command
02h	Bad address mark
04h	Record not found
05h	HDC not reset
07h	Drive not initialized
08	HDC overrun (DRQ)
09h	DMA boundary error
0Ah	Bad sector error
0Bh	Bad track error
10h	ECC error
11h	ECC recover enabled
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 in chapter 4, *Replacement Procedures*. If the HDD is still not functioning properly, perform Check 2.

Check 2   Replace the flexible cable with a new one following the instructions in chapter 4. If the HDD still not functioning properly, replace the system board.

2.7   Keyboard Troubleshooting

To determine if the 610CT keyboard is functioning properly, perform the following proce-
dures. Start with Procedure 1 and continue with the other procedures as instructed.

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

Procedure 1   Diagnostic Test Program Execution Check

Execute the Keyboard Test in the Diagnostic Program. Refer to chapter 3, *Tests and Diag-
nostics*, 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 system board by a 19-pin flat cable. The IPS is connected
to the power supply board by a 5-pin flat cable. These cables may be disconnected or dam-
aged. Disassemble the 610CT 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 system
board.
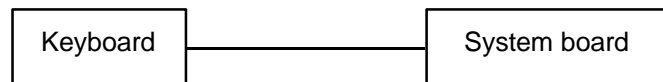
```
+------------+          +---------------+
|  Keyboard  |----------|  System board |
+------------+          +---------------+
```

If this cable is damaged, replace the keyboard with a new one. If the cable is
disconnected, firmly connect it. Perform Procedure 1 again. If the keyboard is
still not functioning properly, perform Check 2.

Check 2   The keyboard controller on the system board may be damaged. Replace the
system board with a new one. Refer to chapter 4 for more information. If the
keyboard is still not functioning properly, perform Check 3.

Check 3   Make sure the IPS cable is not damaged and is connected to the power supply
board.
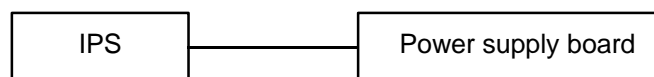
```
+---------+          +---------------------+
|   IPS   |----------|  Power supply board |
+---------+          +---------------------+
```

If this cable is damaged, replace the keyboard with a new one. If the cable is
disconnected, firmly connect it. Perform Procedure 1 again. If the keyboard is
still not functioning properly, perform Check 4.

Check 4   The IPS controller on the power supply board may be damaged. Replace the power supply board with a new one. Refer to chapter 4 for more information. If the keyboard is still not functioning properly, perform Check 5.

Check 5   The accupoint control button contact is connected to the sound board. The accupoint control button contact may be damaged. Replace it with a new one. Refer to chapter 4 for more information. If the keyboard is still not functioning properly, perform Check 6.

Check 6   The sound board may be damaged. Replace the sound board with a new one. Refer to chapter 4 for more information. If the problem still exists, other FRUs may be damaged.

2.8   Display Troubleshooting

This section describes how to determine if the 610CT 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 adapter to the computer's port replicator port and an external monitor to the external monitor adapter, 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 610CT Diagnostic Disk. This program checks the display controller on the system board. After loading Toshiba MS-DOS, run the Diagnostic Program. 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, panel close switch, and FL inverter board. The FL and FL inverter board are connected by cable. The LCD module and system board are connected by signal cable as shown below. Any of these cables may be disconnected.

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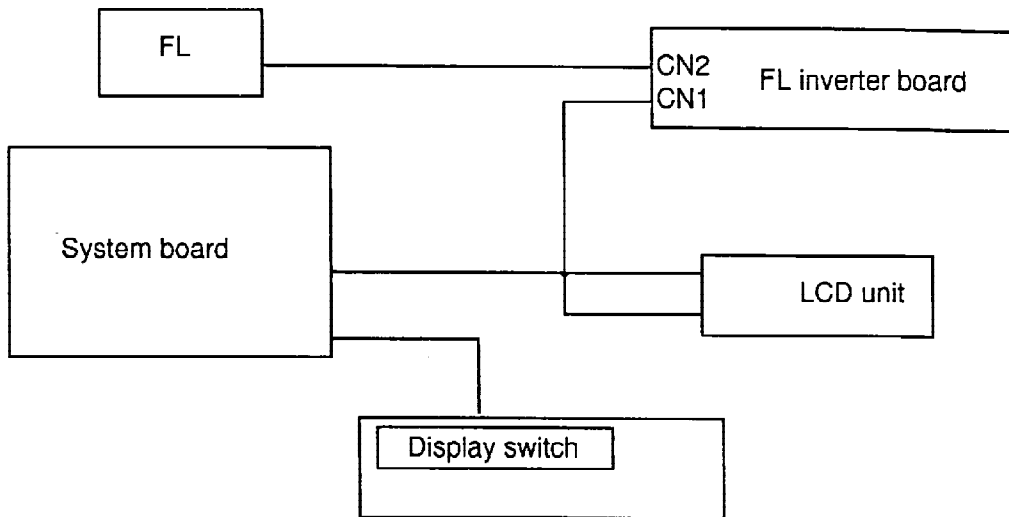
Figure 2-3 Display connection

If any of these cables is not connected, firmly reconnect it 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 unit 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 panel sensor 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.

3.1 The Diagnostic Test

This chapter explains how to use the 610CT Diagnostic Test Program (TEST610) to test the functions of the hardware modules. The Diagnostics Test Program is stored on the Diagnostic Disk. The Diagnostics Test Program consists of 20 programs that are grouped into the Service Program Module (DIAGNOSTICS MENU) and the Test Program Module (DIAGNOSTIC TEST MENU).

The DIAGNOSTICS MENU consists of the following eight functions.
- ❏ DIAGNOSTIC TEST
- ❏ HARD DISK FORMAT
- ❏ HEAD CLEANING
- ❏ LOG UTILITIES
- ❏ RUNNING TEST
- ❏ FDD UTILITIES
- ❏ SYSTEM CONFIGURATION
- ❏ SETUP

The DIAGNOSTIC TEST MENU contains the following 12 functional tests. These are all located within the DIAGNOSTIC TEST function of the DIAGNOSTICS MENU.
- ❏ SYSTEM TEST
- ❏ MEMORY TEST
- ❏ KEYBOARD TEST
- ❏ DISPLAY TEST
- ❏ FLOPPY DISK TEST
- ❏ PRINTER TEST
- ❏ ASYNC TEST
- ❏ HARD DISK TEST
- ❏ REAL TIMER TEST
- ❏ NDP TEST
- ❏ EXPANSION TEST
- ❏ SOUND TEST

You will need the following equipment to perform some of the 610CT Diagnostic Test Program.
- ❏ The 610CT Diagnostics Disk (all tests)
- ❏ A formatted working disk for the floppy disk drive test (all tests)
- ❏ 3.5-inch 2HD/2DD disk for 3.5-inch external FDD
- ❏ A cleaning kit to clean the floppy disk drive heads (Head Cleaning)
- ❏ A PCMCIA wraparound connector for the I/O card test (PCMCIA 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)

The following sections detail the tests within the Diagnostic Test function of the DIAGNOSTIC TEST MENU. Refer to Sections 3.18 through 3.24 for detailed information on the remaining seven Service Program Module functions.

3.2 Executing the Diagnostic Test

Toshiba MS-DOS is required to run the 610CT Diagnostic Test Program. To start the Diagnostic Test Program follow these steps:

1. Insert the 610CT Diagnostics disk in the computer's external floppy disk drive and turn the computer on.

2. At the system prompt, change to drive A and type the test command, and press **Enter**.

The following menu will appear:

```
TOSHIBA personal computer PT610CT 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 menu, press the **Esc** key. If a test program is in progress, press **Ctrl** + **Break** to exit the test program or press **Ctrl** + **C** to stop the test program.*

---

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

```
TOSHIBA personal computer PT610CT DIAGNOSTICS
version X.XX (c) copyright TOSHIBA Corp. 19XX
DIAGNOSTIC TEST MENU :

 1 - SYSTEM TEST
 2 - MEMORY TEST
 3 - KEYBOARD TEST
 4 - DISPLAY TEST
 5 - FLOPPY DISK TEST
 6 - PRINTER TEST
 7 - ASYNC TEST
 8 - HARD DISK TEST
 9 - REAL TIMER TEST
10 - NDP TEST
11 - EXPANSION TEST
12 - SOUND TEST

88 - ERROR RETRY COUNT SET [FDD & HDD]
99 - EXIT TO DIAGNOSTICS MENU


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

Refer to sections 3.4 through 3.15 for detailed descriptions of each Diagnostic Test, 1 through 12. Function 88 sets the floppy disk drive and hard disk drive error retry count. Function 99 exits the submenus of the DIAGNOSTIC TEST MENU and returns to the DIAGNOSTICS MENU.

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

```
SYSTEM TEST    XXXXXXX
                                 ┌──────────────────────────────────┐
                                 │ PT610CT DIAGNOSTIC TEST VX.XX     │
                                 │ [Ctrl]+[Break]; test end          │
                                 │ [Ctrl]+[C]    ; key stop          │
                                 └──────────────────────────────────┘
 SUB-TEST : XX
 PASS COUNT: XXXXX ERROR COUNT: XXXXX
 WRITE DATA: XX  READ DATA : XX
 ADDRESS : XXXXXX STATUS  : XXX

 SUB-TEST MENU :

01 - ROM checksum
02 - HW status
03 - Version check
04 - Fan ON/OFF
05 - Thermistor check
99 - Exit to DIAGNOSTIC TEST MENU
                            ↑↓→←   :  Select items
                            Enter  :  Specify
                            Esc    :  Exit
```

> *NOTE: The menu displayed by your 610CT may be slightly different from the one shown above.*

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

    ```
    TEST LOOP  : YES
    ```

    Selecting YES increases the pass counter by one each time the test cycle ends and then restarts the test cycle.

    Selecting NO returns the subtest menu to the main menu after the test is complete.

6. The following message will appear:

    ```
    ERROR STOP : YES
    ```

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

    Selecting YES 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.

    Selecting NO keeps the test running even if an error is found.

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

    Table 3-1 in section 3.3 describes the function of each test on the subtest menu. Table 3-3 in section 3.16 describes the error codes and error status for each error.

3.3 Subtest Names

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

Table 3-1 Subtest names (1/2)

No.	Test name	Subtest No.	Subtest item
1	SYSTEM	01	ROM checksum
		02	H/W status
		03	Version check
		04	Fan on/off
		05	Thermistor check
2	MEMORY	01	RAM constant data
		02	RAM address pattern data
		03	RAM refresh
		04	Protected mode
		05	Memory module
		06	Cache memory
3	KEYBOARD	01	Pressed key display (82/84)
		02	Pressed key code display
		03	PS/2 Mouse connect check
		04	Pointing Stick check
4	DISPLAY	01	VRAM read/write
		02	Character attributes
		03	Character set
		04	80*25/30 Character display
		05	320*200 Graphics display
		06	640*200 Graphics display
		07	640*350/480 Graphics display
		08	Display page
		09	"H" pattern display/Border color
		10	LED/DAC pallet
		11	Color 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	Wrap around

Table 3-1 Subtest names (2/2)

No.	Test name	Subtest No.	Subtest item
7	ASYNC	01	Wrap around (board)
		02	Board (#1) <=> board (#2)
		03	Point to point (send)
		04	Point to point (receive)
		05	Interrupt test
8	HDD	01	Sequential read
		02	Address uniqueness
		03	Random address/data
		04	Cross talk & peak shift
		05	Write/read/compare (CE)
		06	Write specified address
		07	Read specified address
		08	ECC circuit
		09	Sequential write
		10	W-R-C specified address
9	REAL TIMER	01	Real time
		02	Backup memory
		03	Real time carry
10	NDP	01	NDP test
11	EXPANSION	01	PCMCIA wrap around
12	SOUND	01	CODEC (REC/PLAY)
		02	FM synthesizer
		03	SINE wave playback

3.4 System Test

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

Subtest 01   ROM checksum

The ROM checksum tests the system board from address F0000h to FFFFFh (64KB).

Subtest 02   H/W status

This test reads and displays the hardware status as shown below:

```
CPU clock       =     90MHz[45MHz]
Notch signal    =     2HD  [2DD]
```

Table 3-2 describes the hardware bit status for each bit tested. Pressing **Enter** returns you to the Subtest Menu.

Table 3-2 Hardware Status

CPU clock speed	90 MHz	45 MHz
Media type	2HD	2DD

Subtest 03   Version check

This subtest checks the version of the following four items:

❑ BIOS ROM
❑ BOOT ROM
❑ KBC version
❑ PS microprocessor version

This subtest compares these four items to the reference data stored in the test program. When the read information is lower than the reference data, the speaker beeps, and the test program displays the following screen image. To exit this screen, press the **S** key. When the read information is higher, the display is unchanged.

```
ROM BIOS Version = V1.00 : OK V1.10
BOOT ROM Version = V1.00 : OK V1.00
KBC Version      = V1.26 : NG V1.00
PS Micom Version = V1.35 : OK V1.35
```

Reference data

Current data

Subtest 04   Fan on/off

This subtest checks fan operation.

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

```
*** 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 checks the thermistor that controls CPU temperature. The thermistor cable connects to PJ23 on the system board.

3.5 Memory Test

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

Subtest 01   Constant data

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

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

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

The constant data is AAAAh and 5555h.

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

Subtest 04   Protected mode

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, 24 MB, and 32 MB.

After selecting subtest 05, the following message will appear:

```
Extended memory size (1:8 MB,2:16 MB,3:24 MB,4:32 MB) ?
```

Select the number that corresponds to the memory card installed in the 610CT.

Subtest 06   Cache memory

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

Number of miss hit < Number of hit → OK
Number of miss hit ≥ Number of hit → Fail

3.6   Keyboard Test

To execute the Keyboard Test, select **3** from the DIAGNOSTIC TEST MENU, press **Enter** and follow the directions displayed on the screen. The Keyboard test contains four subtests that test the 610CT keyboard actions. Move the highlight bar to the subtest you want to execute and press **Enter**.

Subtest 01   Pressed key display (82/84)

> *NOTE: The **Numeric** and the **Arrow** modes 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.
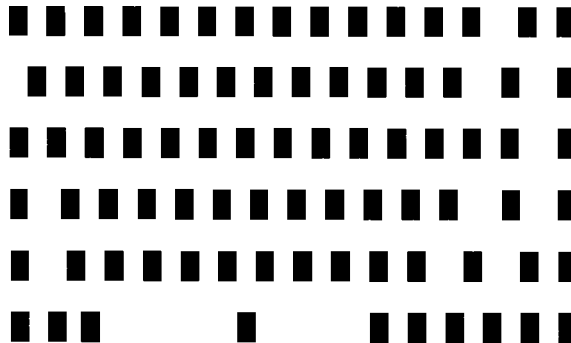
```
       [[   Press Key Display   ]]


       ■■■■■■■■■■■■ ■■
        ■■■■■■■■■■■ ■ ■
       ■■■■■■■■■■■■ ■
       ■ ■■■■■■■■■■ ■ ■
       ■ ■■■■■■■■■ ■ ■■
       ■■■      ■      ■■■■■■

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

Subtest 02   Pressed key code display

When a key is pressed, the scan code, character code, and keytop 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 screen mode when pressed. The scan codes, character codes, and keytop names are shown 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 optional port replicator.*

This subtest checks whether a PS/2 mouse is connected.

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

```
KBD - MOUSE INTERFACE ERROR

                          [[ HALT OPERATION ]]

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

Subtest 04   Ponting Stick Check

NOTE: *To execute the pointing stick check, mouse driver software must be installed.*

This subtest checks the function 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 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 to an arrow as shown below. If an IPS switch is pressed, the <BUTTON> display alternates black and white and appears on the right side of the display. If two IPS switches are pressed or if this test does not detect an error, it returns to the subtest menu.

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

        < POINTING >          < PARAMETER >
                                STATUS:0008h
                                X-RATE:0000h
                                Y-RATE:0000h


                                < BUTTON >

                                (1)        (2)



<<   PRESS BUTTON1 + BUTTON2 THEN END   >>
```
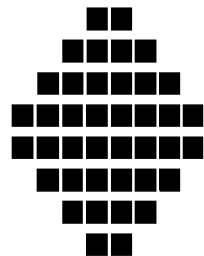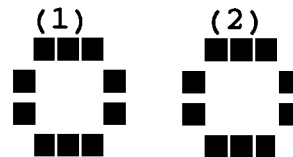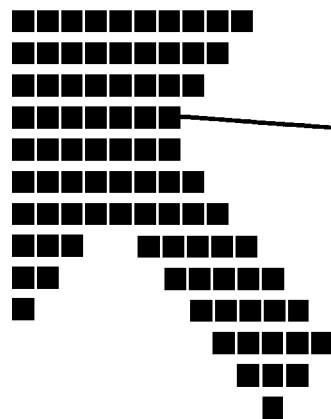
There are eight directions of arrow mark as shown below.
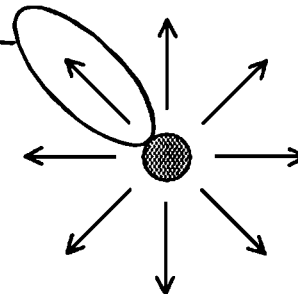
When the button is pressed, it alternates as shown below.
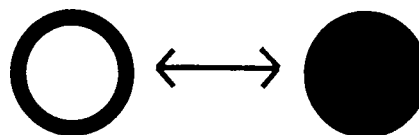
3.7 Display Test

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 eleven subtests that test the 610CT 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 FFFFh, AAAAh, 5555h, 0000h, and address data to video RAM (1MB). This data is then read from the video RAM and compared to the original data.

Subtest 02   Character Attributes

This subtest displays the following character attribute modes; normal, intensified, reverse, and blinking as shown in the display below. The character attribute modes display the foreground color and intensified color (16 colors or 16-level gray scale) using black, blue, red, magenta, green, cyan, yellow, and white from the color display. The display below appears on the screen when this subtest is executed.
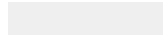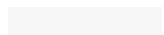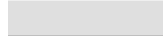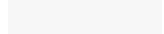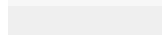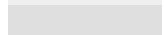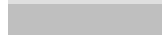
```
CHARACTER ATTRIBUTES

   NEXT LINE SHOWS NORMAL DISPLAY.
    NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

   NEXT LINE SHOWS INTENSIFIED DISPLAY.
    IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII

   NEXT LINE SHOWS REVERSE DISPLAY.
    RRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRR

   NEXT LINE SHOWS BLINKING DISPLAY
    BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB


                              00 08 ; BLACK
                              01 09 ; BLUE
                              04 0C ; RED
                              05 0D ; MAGENTA
                              02 0A ; GREEN
                              03 0B ; CYAN
                              06 0E ; YELLOW
                              07 0F ; WHITE


   PRESS [Enter] KEY
```

After pressing **Enter**, 16 colors or 16 gray scales of mode 13h appear in the 320x200 graphics mode as shown below:

BLACK
BLUE
GREEN
CYAN
RED
MAGENTA
BROWN
WHITE
GRAY
LIGHT BLUE
LIGHT GREEN
LIGHT CYAN
LIGHT RED
LIGHT MAGENTA
YELLOW
INTENSE WHITE

Pressing **Enter** toggles between the two tests.

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

Subtest 03   Character Set

In this subtest, the character set (addressed 00h to FFh) is displayed in the 40*25 character mode as shown below.

CHARACTER SET IN 40*25

☺☻♥♦♣♠•◘○◙♂♀♪♫☼►◄↕‼¶§▬↨↑↓→←∟↔▲▼!"#$%&'

()*+,-./ 0123456789 :;<=>?@ABCDEFGHIJKLMNO

PQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvw

xyz{|}~⌂ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜ¢£¥₧ƒ

áíóúñÑªº¿⌐¬½¼¡«»░▒▓│┤╡╢╖╕╣║╗╝╜╛┐└┴┬├─┼╞╟

╚╔╩╦╠═╬╧╨╤╥╙╘╒╓╫╪┘┌█▄▌▐▀αßΓπΣσµτΦΘΩδ∞φε∩

≡±≥≤⌠⌡÷≈°∙·√ⁿ²■

   Press [Enter] KEY

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

Subtest 04   80x25/30 Character Display (mode 3, 12)

In this subtest, the character string is displayed shifting one character to the right, line by line in the 80x25 and 80x30 character modes as shown below.

```
80*XX CHARACTER DISPLAY
012345678901234567890123456789012345678901234567890123456789012345678901234567
  !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklm
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmn
 "#$%&'()*+,-./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
 -./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
 ./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{
 /0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|
 0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}
 123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
 23456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~•
 3456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~•Ç
 456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~•Çü
PRESS [ENTER] KEY
```

Pressing **Enter** toggles between tests. To exit this subtest and return to the DISPLAY TEST menu, press **Ctrl** + **Break**.

Subtest 05   320x200 Character Display (mode 4,D)

This subtest displays two color sets for the color display in 320x200 dot graphics mode 4 and D. One example is shown below:


```
    GREEN        RED       BROWN
    CYAN      MAGENTA      WHITE
```

Pressing **Enter** toggles between tests. To exit this subtest and return to the DISPLAY TEST menu, press **Ctrl** + **Break.**

Subtest 06   640x200 Character Display (mode 6, E)

This subtest displays even dots, odd dots, and all dots in the 640x200 dot graphics mode 6 and E as shown below:

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

Subtest 07   640x350/480 Character Display (mode 10, 12)

This subtest displays even dots, odd dots, and all dots in the 640x350, and 640x480 dot graphics mode 10, 12 as shown below:

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

Subtest 08   Display Page

This subtest confirms that the pages can be changed in order from page 0
through page 7 in 40*25 character mode.

```
DISPLAY PAGE 0

0000000000000000000000000000000000000000
0                                      0
0                                      0
0                                      0
0                                      0
0                                      0
0                                      0
0                                      0
0                                      0
0                                      0
0                                      0
0                                      0
0000000000000000000000000000000000000000
```

Pressing **Ctrl** + **Break** exits this subtest, after completion of the test, and
returns to the DISPLAY TEST menu.

Subtest 09   H Pattern Display/Border Color

This subtest displays 2000 H characters on the entire screen, as shown below.

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

Pressing **Enter** displays the following message:

```
Setting the color CRT (1:yes/2:no)
```

If an external CRT display is connected to the 610CT, choose **1** to display the
following message:

```
[Border color test (7 times press [Enter] key]
```

Press **Enter** to execute the border color test.
To exit this subtest and return to the DISPLAY TEST menu, press **Ctrl** +
Break.

Subtest 10   LED/DAC Pallet

This subtest checks the indicator icons (Caps Lock, Overlay and Num Lock) by key operation.

```
[ Caps/Num/Overlay LED test ]
(1) Press [ Caps Lock   ] key !...Caps  (on/off)
(2) Press [ Fn + F10    ] key !...Arrow (on/off)
(3) Press [ Fn + F11    ] key !...Num   (on/off)

 PRESS [Enter] KEY
```

Press **Enter** to display the following two messages:

After pressing **Enter**, it writes the '2A' and '15' data to 6 bit of 256x3 (RGB), then reads new data and compares the result with original data.

```
[ DAC pallet W-R-CMP test ]    =   (about 5 seconds)

[  Processor latch test   ]    =

 Processor latch test (1:256 times, 2:endless) ?
```

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

Subtest 11   Color display

This subtest sets the video mode to '13', and displays color code (0 to 63) at the same time, then displays seven screens. The first shows many colors at once, the next three display 64 shades of red, green, and blue successively and the last three display 64 shades of red, green and blue. Also, it sets the video mode '5F', and displays 256 colors.

Press **Enter** to change the display. Press **Ctrl + Break** to exit.

3.8 Floppy Disk Test

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

To execute the Floppy Disk Test, select **5** from the DIAGNOSTIC TEST MENU, press
Enter and follow the directions displayed on the screen. The Floppy Disk test contains five
subtests that test the 610CT external floppy disk drive. The following messages will appear
after selecting the Floppy Disk Test from the DIAGNOSTIC TEST MENU. Answer each
question with an appropriate response to execute the test.

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

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

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

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

3. Select the track you want the test to start on and press **Enter**. Simply pressing
    Enter sets the start track to zero.

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

4. The floppy disk test menu will appear 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
                                  PORTÉGÉ 610CT DIAGNOSTIC TEST VX.XX

                                  [Ctrl]+[Break] ; test end
                                  [Ctrl]+[C]     ; key stop

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

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

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

Subtest 01   Sequential Read

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

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

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

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

Subtest 02   Sequential Read/Write

This subtest continuously writes data pattern B5ADADh to all the specified tracks selected in step 3 above. 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 step 3 above. 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 displayed on the screen. The Printer Test contains three subtests that test the output of the printer connected to the 610CT. The following messages will appear after selecting the Printer Test from the DIAGNOSTIC TEST MENU. Answer each of the following questions with an appropriate response to execute the test.

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

```
        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 PORTÉGÉ 610CT 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[\]^_`abcdefghijklm
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmn
"#$%&'()*+,-./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
```

Subtest 02   Function

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

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

This subtest prints the various print types shown below:

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

Subtest 03   Wraparound

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

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 displayed on the screen. The async test contains five subtests that test the 610CT asynchronous communication functions. Move the highlight bar to the subtest you want to execute and press **Enter**.

Subtests 01 through 04 require the following data format:

Method:	Asynchronous
Speed:	9600BPS
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, 03, 04, and 05 are selected:

```
Channel#1 = XXXXh
Channel#2 = XXXXh
Channel#3 = XXXXh
Select the Channel number (1 - 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 described in Appendix G.*

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

Subtest 02   Board (#1) <=> board (#2)

> *NOTE: To execute this subtest, an RS-232-C cable (9-pin to 9-pin) must be connected to boards 1 and 2. The RS-232-C direct cable wiring diagram is described in Appendix G.*

This subtest checks the data send/receive function through the RS-232-C direct cable.

Subtest 03   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 03) and the other set as "receive" (subtest 04). The wiring diagram for the RS-232-C direct cable is described 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 04   Point to point (Receive)

This subtest is used with subtest 03 described above. This subtest receives the data from the send side, then sends the received data.

Subtest 05   Interrupt Test

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

3.11 Hard Disk Test

To execute the Hard Disk Test, select **8** from the DIAGNOSTIC TEST MENU. Press **Enter,** and follow the directions displayed on the screen. The hard disk test contains 10 subtests that test the 610CT hard disk drive functions. The following messages will appear after selecting the hard disk test from the DIAGNOSTIC TEST MENU. Answer each of the following questions with an appropriate response to execute the test:

CAUTION: 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 a floppy disk(s). This can be done with the Toshiba MS-DOS BACKUP command.

After the hard disk test is completed, execute the Toshiba MS-DOS FDISK command, which will set the partition. Next, execute the Toshiba MS-DOS FORMAT command. Refer to the Toshiba MS-DOS manual for details.

---

1. When you select the hard disk test from the DIAGNOSTIC TEST MENU, the following message will appear:

   ```
   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 will appear:

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

3. This message is used to select the retry operation when the hard disk controller detects an error. Select **1** or **2** and press **Enter**. The following message will appear:

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

4. This message is used to select the error dump operation when a data compare error is detected. Select **1** or **2** and press **Enter**. The following message will appear:

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

5. This message is used to select whether or not the HDD status is displayed on the screen. The HDD status is described in section 3.15. Select **1** or **2** and press **Enter**.

6. The Hard Disk Test message will appear after you respond to the Detail Status prompt. Select the number of the subtest you want to execute and press **Enter**. The following message will appear during each subtest.

```
HARD DISK TEST      XXXXXXX

SUB-TEST : XX
PASS COUNT: XXXXX  ERROR COUNT: XXXXX
WRITE DATA: XX  READ DATA : XX
ADDRESS : XXXXX 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 3-3 in Section 3.16.

Subtest 01   Sequential Read

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

Subtest 02   Address Uniqueness

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

- Forward sequential
- Reverse sequential
- Random

Subtest 03   Random Address/Data

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

Subtest 04   Cross Talk & Peak Shift

This subtest writes eight types of worst pattern data (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 on the screen. The real timer test contains three subtests that test the 610CT real timer functions. Move the highlight bar to the subtest you want to execute and press **Enter**.

Subtest 01   Real Time

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

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

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

Enter new date:

  PRESS [ENTER] KEY TO EXIT TEST
```

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

```
Enter new time :
```

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

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

Subtest 02   Backup Memory

This subtest performs the following backup memory check:

Writes 1-bit of "on" data to address 01h through 80h
Writes 1-bit of "off" data to address FEh through 7Fh
Writes the data pattern AAh through 55h to the RTC 50-byte memory (address 0Eh to 3Fh)

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  : 12-31-1994
Current time  : 23:59:58
```

Pressing **Enter** displays the following:

```
Current date : 01-01-1995
Current time : 00:00:00


  PRESS [Enter] KEY TO EXIT TEST
```

Press **Ctrl** + **Break** to exit.

3.13 NDP Test

To execute the NDP test, select **10** from the DIAGNOSTICS TEST MENU, press **Enter** and follow the directions on the screen. The NDP test contains one subtest that tests the 610CT NDP functions.

Subtest 01   NDP

This test checks the following NDP functions:

❑ Control word
❑ Status word
❑ Bus
❑ Addition
❑ Multiplication

Press **Ctrl** + **Break** to exit.

3.14 Expansion Test

> *NOTE: To execute this subtest, the PCMCIA wraparound card is required.*

Subtest 01 PCMCIA wraparound test

This test checks the following signal lines of the PCMCIA 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 on the screen. The Sound test contains three subtests that test the 610CT series Sound functions.

Subtest 01   CODEC (REC/PLAY)

> *NOTE: To execute this subtest, the internal microphone and internal headphone (or internal speaker) are required.*

Tests the functions of the Codec (ES688) A/D, D/A converter. At the same time, tests the microphone and headphone terminals. When you execute this subtest, the following message is displayed:

```
[Quick REC & PLAY for ES488/688]
Press any key to *** REC ***
```

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

Subtest 02   FM synthesizer

Tests the OPL# (YMF262) functions. Connect the headphone and check the scale for the right and left sides. Also check the sound adjustment volume.

Subtest 03   SINE wave playback

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

3.16 Error Code and Error Status Names

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

Table 3-3 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
Keyboard	01	Mouse Interface Error
	02	IPS Interface Error
	03	Interface Error
	04	Retransmit Error
	05	Mouse Handler Not Supported
	06	PS/2 Mouse & IPS Not
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 Not Drive 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

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

Device name	Error code	Error status name
Async (cont.)	10	Parity Error
	20	Framing Error
	40	Overrun Error
	80	Line Status Error
	88	Modem Status Error
	33	No Carrier (Card Modem)
	34	Error (Card Modem)
	36	No Dial Tone (Card Modem)
HDD	01	Bad Command Error
	02	Bad Address Mark Error
	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 Enabled
	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	Multiply Error
PCMCIA	C1	Address Line Error
	C2	REG# Line Error
	C3	CE#1 Line Error
	C4	CE#2 Line Error
	C5	DATA Line Error
	C6	WAIT Line Error
	C7	BSY# Line Error
	C8	BVD1 Line Error
	CD	No PCMCIA

3.17 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. The last four digits are not used.

The hard disk controller error status is composed of 2 bytes; the first byte displays the contents of the HDC status register in hexadecimal form and the second byte displays the HDC error register.

The contents of the HDC status register and error register are listed in tables 3-4 and 3-5.

Table 3-4 Hard disk controller status register contents

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

Table 3-5 Error register contents

Bit	Name	Description
7	BBK1 (Bad block mark)	"0" Other "1" A bad block mark is detected.
6	UNC (Uncorrectable)	"0" There is no uncorrectable data error. "1" Uncorrectable data error has been detected.
5	——	Not used.
4	IDNF (Identification)	"0" Other "1" There was no ID field in the requested sector.
3	——	Not used
2	ABRT (Abort)	"0" Other "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.

3.18 Hard Disk Format

This command executes hard disk formatting. There are two types of hard-disk formatting:
- ❏ Low-level (physical) formatting
- ❏ MS-DOS (logical) formatting

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

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

CAUTION: The contents of the hard disk will be erased when this program is executed. Before executing the function, transfer the contents of the hard disk onto a floppy disk(s). This can be done with the Toshiba MS-DOS BACKUP command. See the Toshiba MS-DOS manual for details.

3.18.1   Function Description

1. All track FORMAT

   This option performs a low-level format of all the tracks on the hard disk as shown in Table 3-6 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 3-6 Hard disk formatting sequence

Items	IBM DBOA-2720
Cylinders	1,400
Heads	16
Sectors	63
Sector length (bps)	512

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 terminated.

3.18.2   Operations

> *CAUTION*: *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 TEST 2 and pressing **Enter** in the DIAGNOSTIC MENU displays the following messages:

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

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

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

1. All track FORMAT

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

```
[All track FORMAT]

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

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

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

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

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

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

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

```
Unlock format select (1:no/2:yes)
```

(c)　Select whether the disk has an unlock format.

> *NOTE*: *This option appears only when an HDD manufactured by JVC is installed. For JVC HDDs, which are the only disks with unlock formats, you must select 2 (yes). If 1 is selected with a JVC disk, an error will be generated. The system defaults to 1 and this message does not appear when other disks are installed.*

(d)　Bad track register

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

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

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

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

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

(e)　All track format

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

(f)　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 numbers 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 numbers for the drive, interleave, cylinder, and head as indicated in the screen prompt shown below.

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

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

4. Bad track CHECK

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

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

Bad tracks will be displayed in the format shown below.

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

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

3.19 Head Cleaning

3.19.1   Function Description

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

3.19.2   Operations

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

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

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

Press any key when ready.
```

2.   Remove the Diagnostics Disk from the FDD, then insert the cleaning disk and press **Enter**.

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

4.   The display automatically returns to the DIAGNOSTIC MENU when the program is completed.

3.20 Log Utilities

3.20.1   Function Description

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

3.20.2   Operations

1.   Selecting **5** and pressing **Enter** in the DIAGNOSTIC MENU logs error information into RAM or onto a floppy disk. The error information 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.	The error information displayed on the screen can be manipulated by the following number keys:

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

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

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

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

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

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

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

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

3.21 Running Test

3.21.1   Function Description

This function automatically executes the following tests in sequence:

1.   System test (subtest number 01)
2.   Memory test (subtest number 01, 02, 04, 06, 07)
3.   Display test (subtest number 01 to 08)
4.   FDD test (subtest number 02)
5.   HDD test (subtest number 01, 05)
6.   Real timer test (subtest number 02)
7.   Printer test (subtest number 03)
8.   Async test (subtest number 01)

The system automatically detects the number of floppy disk drives connected to the 610CT for the FDD test.

3.21.2   Operations

> *CAUTION: 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 will be displayed:

```
Printer wrap around test (Y/N) ?
```

Selecting **Y (yes)** executes the printer wraparound test. A printer wraparound connector must be connected to the **PRT** port on the back of the 610CT to properly execute this test.

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

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

Selecting **Y (yes)** executes the ASYNC wraparound test. An RS-232-C wraparound connector must be connected to the **serial port** on the back of the 610CT to properly execute this test.

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

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

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

3.22 Floppy Disk Drive Utilities

3.22.1   Function Description

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

1.   FORMAT

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

This program can format a 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 3.5-inch floppy disk and the designated sectors of the hard disk on the display.

3.22.2   Operations

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

```
[ FDD UTILITIES ]

    1 - FORMAT
    2 - COPY
    3 - DUMP
    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 will be displayed:

```
Warning : Disk data will be destroyed.

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

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

The following message will be displayed when the FDD format is executed:

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

Format start

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

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

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

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

3. COPY program

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

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

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

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

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

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

Copy start

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

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

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

(e) To copy another disk, type **1** and the message from step (a) 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 appears:

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

(b) Select a format type number. If 2 is selected, the display will go to step (e).

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

(c) Select a drive number and the following message will be displayed:

```
Format type select (0:2DD, 1:2D, 2:2HD) ?
```

(d) Select a media type number and the following message will appear:

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

(e) Insert a source disk and press any key and the following message will appear:

```
── Max. address ──
    [Track ] = 0079
    [ Head ] = 01
    [Sector] = 09

    Track  number ??
```

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

3.23 System Configuration

3.23.1　Function Description

The System Configuration program contains the following configuration information for the 610CT:

1. BIOS ROM version
2. Boot ROM version
3. KBC version
4. PS Micom 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. CPU type
12. The number of Co-processors

3.23.2　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

        * - 1 MATH CO-PROCESSOR
        * - 639KB MEMORY
        * - XXXXXKB EXTENDED MEMORY
        * - 1 FLOPPY DISK DRIVE(S)
        * - 1 ASYNC ADAPTER
        * - 1 HARD DISK DRIVE(S)
        * - 1 PRINTER ADAPTER
        * - 2 PCMCIA SLOTS
        * - 1 SOUND SYSTEM

        Press [Enter] Key
```

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

3.24 SETUP

3.24.1   Function Description

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

1. Memory
   (a) Total
   (b) Base
   (c) Extended Memory
   (d) Shadow BIOS ROM

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

3. Hard Disk
   (a) HDD Mode

4. I/O Ports
   (a) Serial Port
   (b) Parallel Port
   (c) Sound System

5. Password

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

3.24.2   Accessing the SETUP Program

Selecting **0** from the DIAGNOSTICS MENU and pressing **Enter** displays the following:

```
                          SYSTEM  SETUP          BIOS version = x.xx
          ┌──── MEMORY ────┐              ┌──── COM/PCMCIA/PRT─┐
          │Total        = 8192 KB│        │Serial Port    =  COM1(IRQ4/3F8H)│
          │Base         =  640 KB│        │Parallel Port  =  LPT (378H)│
          │Extended     = 7360 KB│        │Sound System   =  Address/IRQ/DMA│
          │Shadow BIOS ROM  =  192 KB│    └────────────────┘

                                          ┌─ POWER  ON  PASSWORD ─┐
          ┌──── DISPLAY ────┐             │Not Registered│
          │Display Adapter   = VGA compatible│ └────────────────┘
          │LCD Display Mode  = Color│
                                          ┌─ OTHERS ─┐
          │Display Colors    = 16M Colors│  │Power-up Mode       = Boot│
          │Power On Display  = Internal/External│ │CPU Cache           = Enabled│
          │Text Mode Stretch = Enabled│    │Battery Save Mode   = Full Power│
          └────────────────┘              │Alarm Volume        = High│
                                          │System Beep         = Enabled│
          ┌─ HARD DISK ─┐                 │Panel Power On/Off  = Disabled│
          │HDD Mode = Enhanced IDE (Normal)│ │Alarm Power On      = Disabled│
          └────────────────┘              │Keyboard            = Layout/Fn│
                                          │Pointing Devices    = Auto-selected│
                                          │Boot Priority       = FDD → HDD│
                                          └────────────────┘
```

↑↓→← **:** Select items, Space, **BkSp :** Change values

Esc: Exit without saving, **Home:** Set default values, **End:** Save changes and Exit

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 **spacebar** or **BkSp** to change the value.

Accepting Changes and Exiting the SETUP Window

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

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

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

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

    ```
    Are you sure? (Y/N)
    The changes you made will cause the system to
    reboot.
    ```

    The changes you made will cause the system to reboot.

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

3.   To accept the changes, press **Y**.

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

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 press **Y**.

SETUP Options

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

1.   Memory

This group lists the computer's memory allocations. You cannot change these values.

(a)   Total

This field displays the total amount of memory installed and is automatically calculated by the computer.

(b)   Base

This field displays the amount of base (conventional) memory, 640 KB, and is automatically calculated by the computer.

(c)   Extended

This field displays the amount of extended memory the computer has available.

(d)   Shadow BIOS ROM

The TSETUP program displays 192 KB of RAM, which is reserved for the Shadow BIOS ROM.

This field displays the amount of the extended memory used for the shadow BIOS ROM.

2. Display

    This group of options helps you configure the computer's display.

    (a) Display Adapter

         This field displays the internal controller for the VGA internal display. Only **VGA compatible** is displayed. You cannot change it.

    (b) Display Mode

         The LCD displays text in 80 characters by 25 lines and graphics in 640 by 480 pixels for either **Color** or **Monochrome** mode. Use this option to set the computer's display mode to **Color** or **Monochrome**.

Color	Selects color mode. (Default)
Monochrome	Selects monochrome mode. Some software is displayed better in monochrome mode.

    (c) LCD Display Colors

         This option is used to select the color palette of the internal TFT display when the LCD mode is set to **Color**.

16M colors	Displays 256 colors out of 262,144 colors. This value cannot be changed.

    (d) Power On Display

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

Internal/External	Selects an external CRT if one is connected, otherwise it selects the internal LCD.
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 you are using after starting in Resume mode, press **Fn+F5**.*
    >
    > *Pressing **Fn+F5** changes the display setting as follows:*
    >   *internal LCD → simultaneous → external CRT.*

(e)   Text Stretch Mode

Text stretch mode enables a larger display area of 680x480 pixels in text mode. Disabling this function reduces the resolution to the standard 640x400 pixels.

Enabled   Enables the text stretch mode feature. (Default)

Disabled   Disables the text mode stretch feature.

3.   Hard Disk

This item lets you select the hard disk IDE mode.

Enhanced IDE   (Default)
(Normal)

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

4.   I/O ports

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

(a)   Serial Port

This option allows you to set the COM level, **COM1** or **COM2**, for the serial port and PCMCIA slot.

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	3F8h	(Serial port default)
COM4	3	2F8h	
Not used			(Disables port)

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

(b)   Parallel Port

This option sets the address for the parallel port. The options are:

LPT1 (378H):   Sets the address to 378H. (Default)

LPT2 (278H):   Sets the address to 278H.

LPT3 (3BCH):   Sets the address to 3BCH.

When you select one of the above options, except for **Not used**, a subwindow similar to the one below appears to let you set the parallel port mode. The options for this setting are **Output** (default) and **Bi-Directional**.

```
┌──────  Option  ─────────────────┐
│ Mode              =   Output    │
└─────────────────────────────────┘
```

For most printers, the port should be set to **Output**. With some other parallel devices, the setting should be **Bi-Directional**.

(c)   Sound system

This item appears only when an optional sound card is installed. It allows you to enable or disable the sound card ports.

Address/IRQ/DMA: Enables port (Default)

Disabled: Disables port

When **Enabled** is selected, a subwindow similar to the one below appears to let you set the **I/O address**, **Interrupt level,** and **DMA channel** for the sound card.

```
┌──────────────  SOUND SYSTEM  ───────────────┐
│                                             │
│   I/O Address            =    0220H         │
│   Interrupt Level        =    IRQ10         │
│   DMA                    =    Channel       │
│                                             │
└─────────────────────────────────────────────┘
```

I/O address

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

0220h (Default), 0230h, 0240, 0250h

Interrupt level

This option sets the interrupt level for the sound system. The available settings are:

IRQ5, IRQ7, IRQ9, IRQ10 (Default)

> *NOTE: Sound Blaster compatible software uses IRQ7 as the default. If you use such software, try to change the software setting to IRQ10. If you cannot change the software setting, change the hardware setting to IRQ7.*

    (d)   DMA (direct memory access) channel

        Use this option to set the DMA channel. The available settings are:

            Channel 0, Channel 1 (Default), Channel 3

5.   Password

This option allows you to set or reset the password for power on and instant security.

        Registered   The password has been registered.

        Not registered   The password has not been registered.

For details on setting the password refer to the 610CT User's Manual.

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 hotkeys. 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 enable is selected, a subwindow similar to the one below is displayed to let you select the cache write policy. The options for this setting are **Write Policy** (default) and **Write-back**.

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

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

(c)   Battery Save Mode

This option is used to select **Full Power** or **Low Power** or **User Setting** of the **BATTERY SAVE OPTION.**

Full Power   The following shows full power setting.

```
┌──────── COM/PCMCIA/PRT ────────┐
│ Processing  Speed =  High       │
│ CPU Sleep Mode   =  Disabled    │
│ Display Auto Off = 30 Min.      │
│ HDD Auto Off     =  Disabled    │
│ System Auto Off  =  Disabled    │
│ LCD  Brightness  =  Bright      │
│ Cooling  method  =  Performance │
└─────────────────────────────────┘
```

Low Power   The following shows low power setting.

```
┌──────── COM/PCMCIA/PRT ────────┐
│ Processing  Speed    =   High       │
│ 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 appear.* │
└───┘

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

(d)   Alarm Volume

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

Off	Disables 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    =    Enable     │
│  Panel Close Alarm    =    Enable     │
│                                       │
└───────────────────────────────────────┘
```

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

(e)   System Beep

Use this feature to enable or disable the system beep.

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

(f)   Panel Power On/Off

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

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

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

(g)   Alarm Power On

This option lets you set the time for the system to turn on automatically. For
example, if you are expecting to receive a modem transmission at a time
when you are away or asleep, you can set this option to the time of the
transmission. This option does not automatically turn off the system. This
feature operates in either Resume or boot mode.

00:00:00   Sets the power on time (24-hour clock).

Disabled   Disables the alarm.

---

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

(h)   Keyboard

This option lets you change the keyboard layout and set the Fn key equiva-
lent when you are using an external keyboard. Selecting this option displays
the following subwindow.

```
┌─────────────── Keyboard ───────────────┐
│ Int. Keyboard key layout          =    Normal   │
│ Ext. Keyboard "Fn" key equivalent =    Disabled │
└─────────────────────────────────────────┘
```

Int. Keyboard layout

This option lets you select the arrangement of the **Caps Lock, Ctrl,** and **Alt**
keys according to the following illustrations:
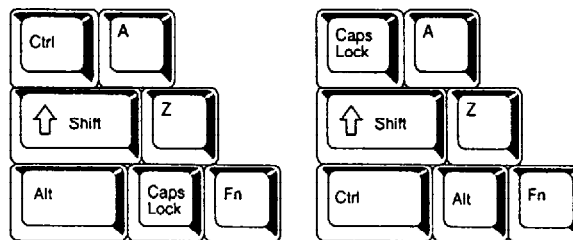
Alternative   Normal (Default)

Ext. 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 "Hotkeys" by pressing the
set combination in place of the **Fn** key.

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

Fn Equivalent   **Left Ctrl b**   +   **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)   Pointing Devices

This option enables or disables the AccuPoint.

Auto selected   The AccuPoint is disabled when a PS/2 mouse or serial mouse is connected, otherwise the Accupoint is enabled. (Default)

Simultaneous   If a PS/2 mouse or serial mouse is connected to an optional port replicator, both the Accupoint and the external mouse are enabled.

(j)   Boot Priority

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

FDD $\rightarrow$ HDD   The computer looks for bootable files first on the FDD and next on the HDD. (Default)

HDD $\rightarrow$ FDD   The computer looks for bootable files first on the HDD and next on the FDD.

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

7.   Battery Save Options

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

(a)   Processing Speed

This feature changes the CPU processing speed.

High   CPU operates at 90 MHz. (Default)

Low   CPU operates at half speed.

(b) CPU Sleep Mode

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

Enabled   Enables sleep mode.

Disabled   Disables sleep mode.

(c) Display Auto Off

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

Disabled   Disables display automatic power off.

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

(d) HDD Auto Off

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

Disabled   Disables HDD automatic power off.

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.

(e) System Auto Off

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

Disabled   Disables system automatic power off.

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

(f)   LCD Brightness

Use this option to set the level of LCD brightness.

Bright   Full brightness for maximum visibility.

Semi-bright   Less than full brightness for saving power.

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 3, 5, 10, 15, 20, or 30 minutes.

(g)   Cooling method

Performance   If the CPU becomes too hot, the fan is turned on automatically. The CPU processing speed does not change. When the CPU temperature falls to a normal range, the fan is turned off.

Quiet   Fan operation is disabled. If the CPU becomes too hot the processing speed is lowered. When the CPU temperature falls to a normal range, the processing speed is increased.

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 lines on the chart to determine which FRU you must remove next in order to repair the one you think is causing the computer to operate improperly.

```
┌──────────────────┐           ┌─────────┐   ┌─────────────────────────┐
│ ❑  Battery Pack  │───────────│ Display │───│ ❑  FL Inverter Board    │
└──────────────────┘           │ Mask    │   │ ❑  TFT Color Display    │
                               └─────────┘   │ ❑  FL                   │
   ┌──────────────────────────────┐          └─────────────────────────┘
   │   ❑    Memory Module         │
   │   ❑    PC Card               │
   │   ❑    Keyboard              │
   │   ❑    Hard Disk Drive       │
   │   ❑    Top Cover ──────────────────┐   ┌─────────────┐
   │   ❑    RTC and Backup Battery │     └───│ LED Board   │
   │   ❑    Membrane Switch        │         │ and Speaker │
   │   ❑    Sound Board            │         └─────────────┘
   │   ❑    Power Supply Board     │
   │   ❑    System Board           │
   └──────────────────────────────┘
```
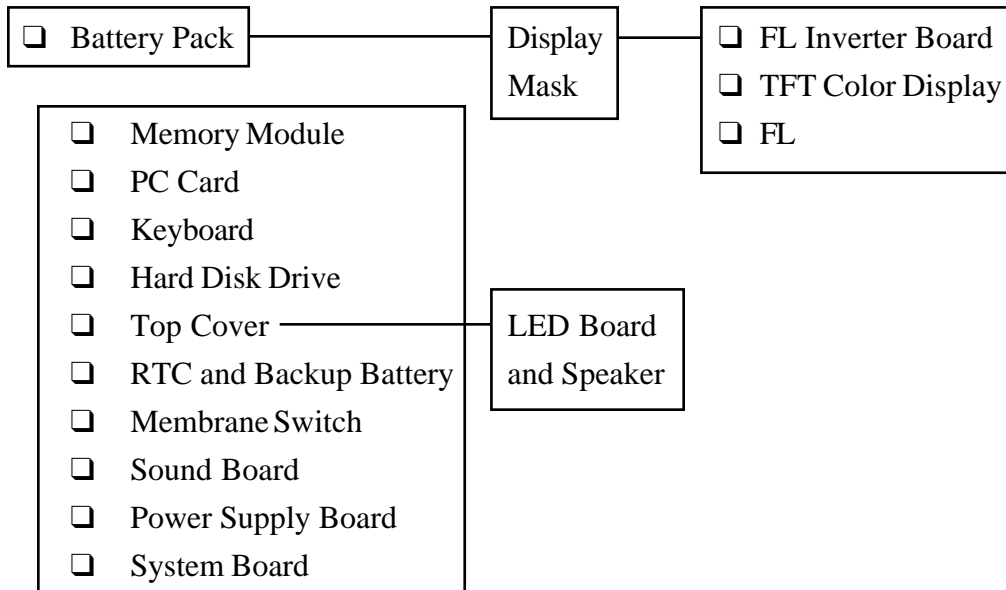
Safety Precautions

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 back-up 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.*
   Do not heat or disassemble the battery pack, as leakage of alkaline solution could result. Do not throw the battery pack into a fire, as that 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 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 during 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.*

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. *Be sure metal objects such as screws or paper clips do not fall into the unit, they can cause short-circuit, fire, or other internal damage.*
3. *Be sure to replace screws with the same size as those removed. Make sure all screws are securely fastened. Loose screws can cause short circuits, resulting in heat, smoke, or fire.*
4. *Before lifting out 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.*
6. *Make sure that all replacement components meet the specifications for the computer and that all cables and connectors are securely fastened.*

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 power cord and the battery pack as instructed in section 4.2, *Battery Pack:*

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

2. Use only the correct and approved tools.

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

   ❏ Dust and 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 described in this manual.

5. Do not perform any operations that are not necessary and use only the described procedures for disassembling and installing FRUs in the computer.

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

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

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

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

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

Assembly Procedures

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

While assembling the computer, keep the following points in mind:

❏ Take your time, making sure you follow the instructions closely. Most problems arise when you hurry to assemble 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 damage either 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 to prevent or minimize ESD event damage to the unit under repair. Proper use of these devices will increase the success rate of your repairs and lower the cost for damaged or destroyed parts. The following equipment is necessary to disassemble and reassemble the computer:

❏ One M2 Phillips screwdriver to remove and replace screws

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

❏ ESD mats for the floor and the table you are working on

❏ An ESD wrist strap or heel grounder

❏ Anti-static carpeting or flooring

❏ Air ionizers in highly static sensitive areas

Screw Tightening Torque

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

❏ 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

4.2 The Battery Pack

Removing the Battery Pack

To remove the battery pack, follow the steps below and refer to Figures 4-1 and 4-2.

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

2. Close the display if it is open.

3. Turn the computer upside down.

4. Slide the **battery lock** to free the **battery release latch**, then slide the battery release latch to pop the **battery pack** out about one centimeter to the left.
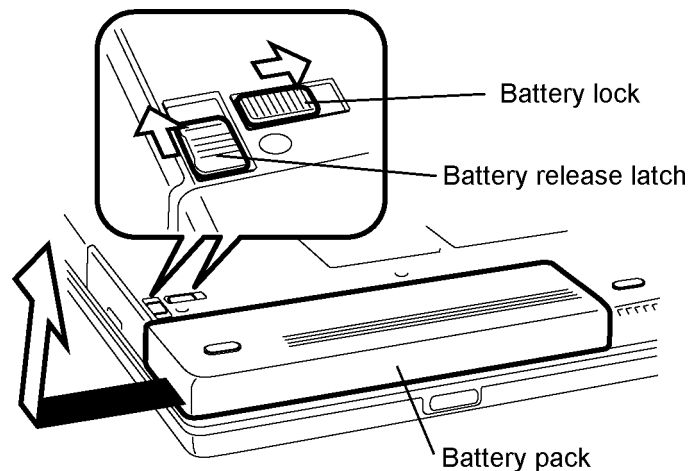
Figure 4-1 Unlocking the battery pack

5. A slight gap will open between the right end of the battery pack and the computer. Slip your fingers into the gap and pull the battery pack to the left until it stops (about 1 cm or half an inch).

6. Grasp the left end of the battery pack and lift it up to remove it.
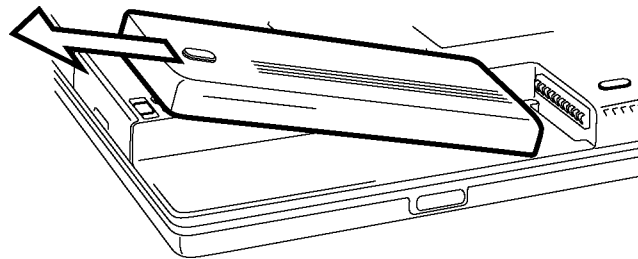
Figure 4-2 Lifting out the battery pack

Installing the Battery Pack

To install the battery pack, follow the steps below and refer to Figures 4-3 back through 4-1.

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

> *NOTE: Check the battery terminals before you install the battery. If they are dirty, wipe them clean with a dry cloth.*

1. Place the right end of the battery pack at the **red line** marked on an alignment guide. The battery pack should seat level with the computer.

Please align the terminal side of The battery unit with this red line then slide the battery into place.
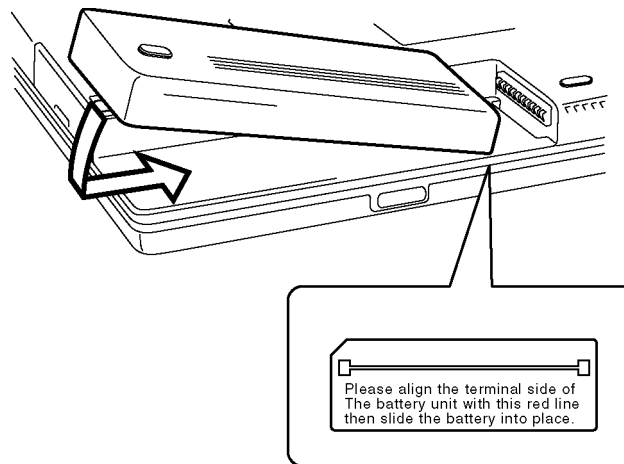
Figure 4-3 Installing the battery pack

2. Gently press down on the center of the battery pack and at the same time push it to the right. When the battery is nearly seated, you will feel a slight resistance. Press the battery in carefully until you feel it click into place, then lock the battery lock.

4.3 Memory Module

Removing the Memory Module

To remove the memory module from the computer, follow the steps below and refer to Figures 4-4 and 4-5.

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

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

3. Turn the computer upside down.

4. Remove **two M2x4 silver screws** securing the **memory module socket cover.**

5. Slide your fingernail or a thin object under the cover and remove it.
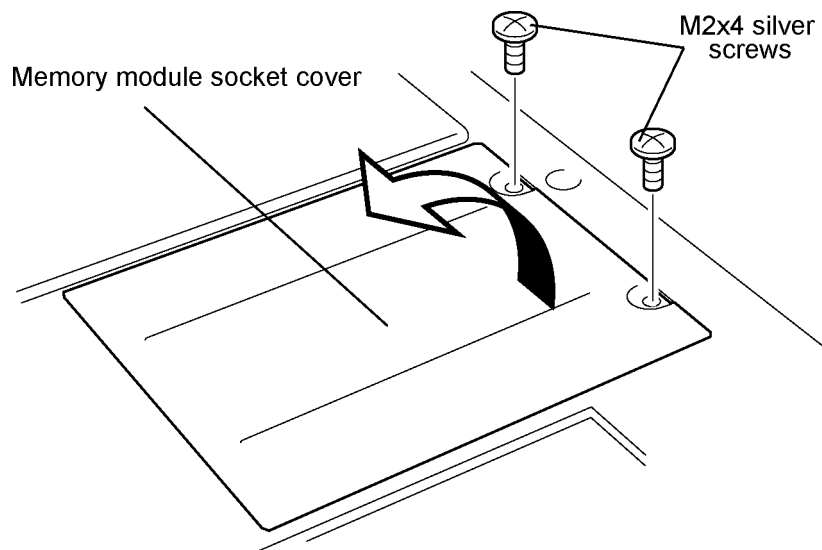
Figure 4-4 Removing the memory module socket cover

6. Remove **two M2x4 silver screws** securing the module to a brace at the center of the module and set them aside.

7. Insert a thin object under the upper edge of the module and lift up to disengage the connector, then grasp the module by the edges and remove it.

> *NOTE: Some memory modules have a plastic tab. If so, simply pull up on the tab to disengage the connector.*
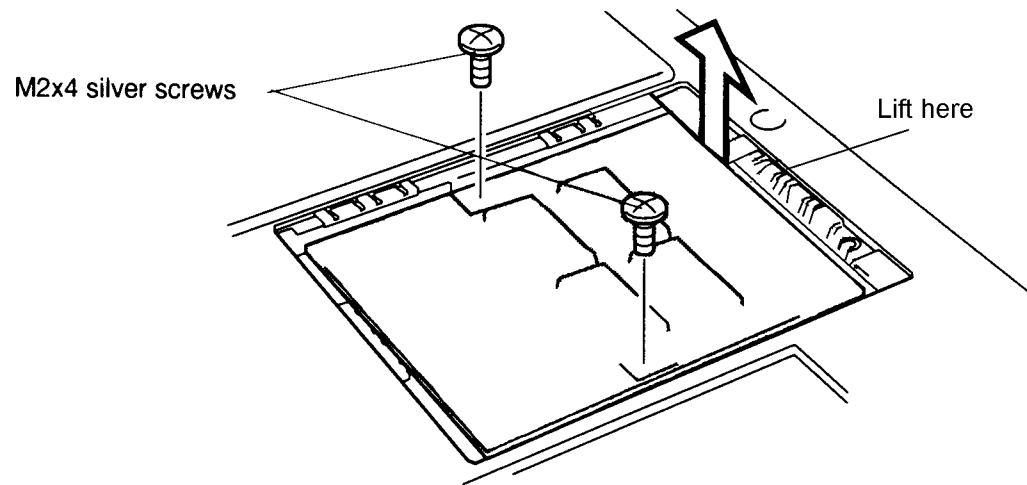
Figure 4-5 Removing the memory module

Installing the Memory Module

To install the memory module in the computer, follow the steps below and refer to Figures 4-6 back through 4-4.

1. Position the connector on the bottom of the module over the corresponding connector on the computer (align the holes on the side of the module over the screw holes on the brace). Place your fingers above the connector and press firmly but gently to assure a solid connection. The module should be seated level.
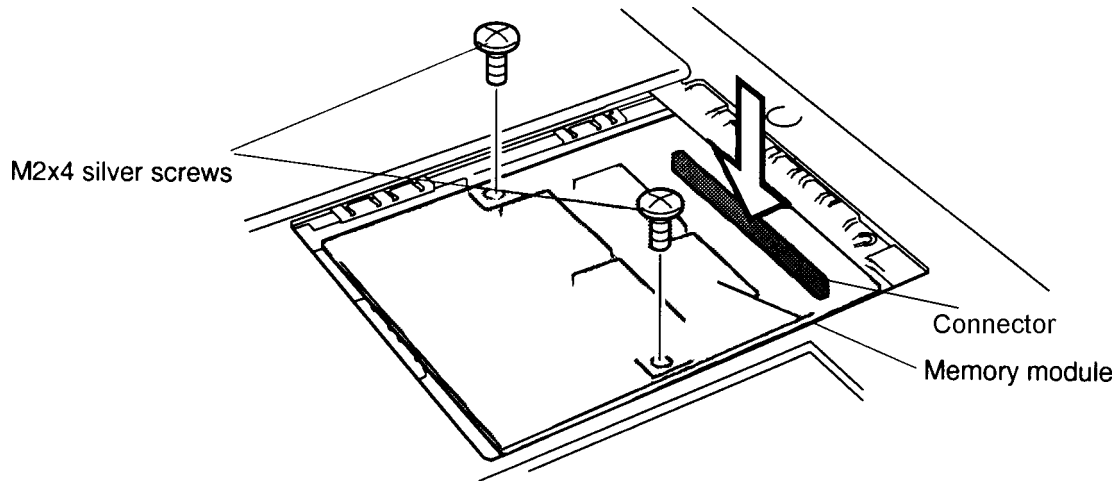
Figure 4-6 Inserting the memory module

2. Secure the module to the brace with **two M2x4 silver screws**.

3. Lay the cover in place. Secure it with **two M2x4 silver screws**. If the memory module has a plastic tab, fold it down first then place the cover.

4. When you turn the computer on, it should automatically recognize the total memory capacity. Verify that the added memory is recognized.

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

4.4 PC Card

Removing the PC Card

To remove the PC card from the computer, follow the steps below and refer to Figure 4-7.

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

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

3. Open the **cover** to the PC card slot.

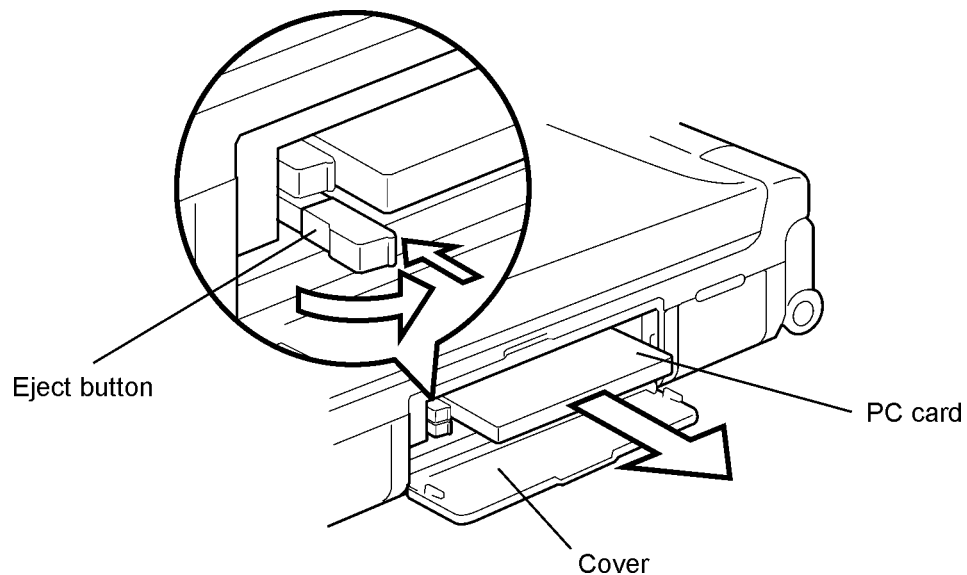4. Pull out the **eject button** for the card you want to remove and press the button. The card will pop out slightly.

Eject button

PC card

Cover

Figure 4-7 Removing the PC card

5. Grasp the **PC card** and pull it out.

Installing the PC Card

To install the PC card in the computer, follow the steps below and refer to Figure 4-8:

1. Insert the **PC card** as shown in Figure 4-8. When the card is almost fully seated, you will feel some resistance. Press gently to assure a firm connection, but do not force the card into position.
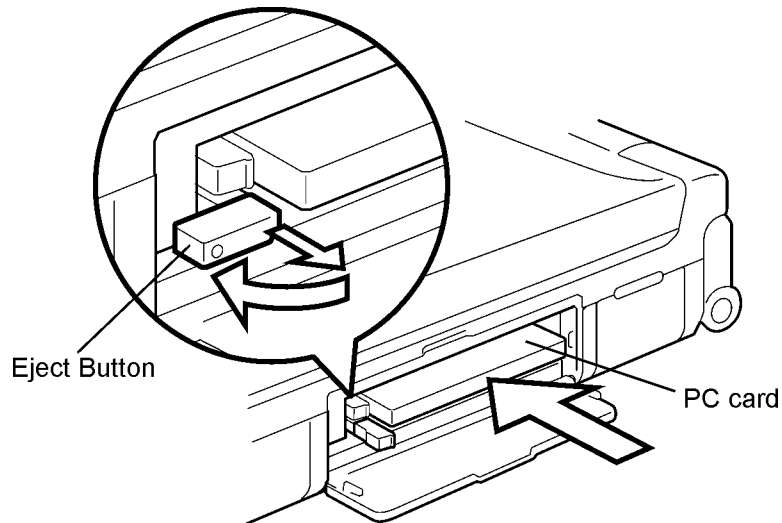

Eject Button

PC card

Figure 4-8 Installing the PC card

2. When the card is fully seated, an **eject button** will pop out; the top button for the top connector and the bottom button for the bottom connector.

3. Pull the eject button slightly and bend it to lock the card.

4. Close the cover.

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

4.5 Keyboard

Removing the keyboard

To remove the keyboard, follow the steps below and refer to Figures 4-9 to 4-12.

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

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

3. Use a case separator to release **12 latches** that secure the **keyboard cover**. Begin with the latches at the front.
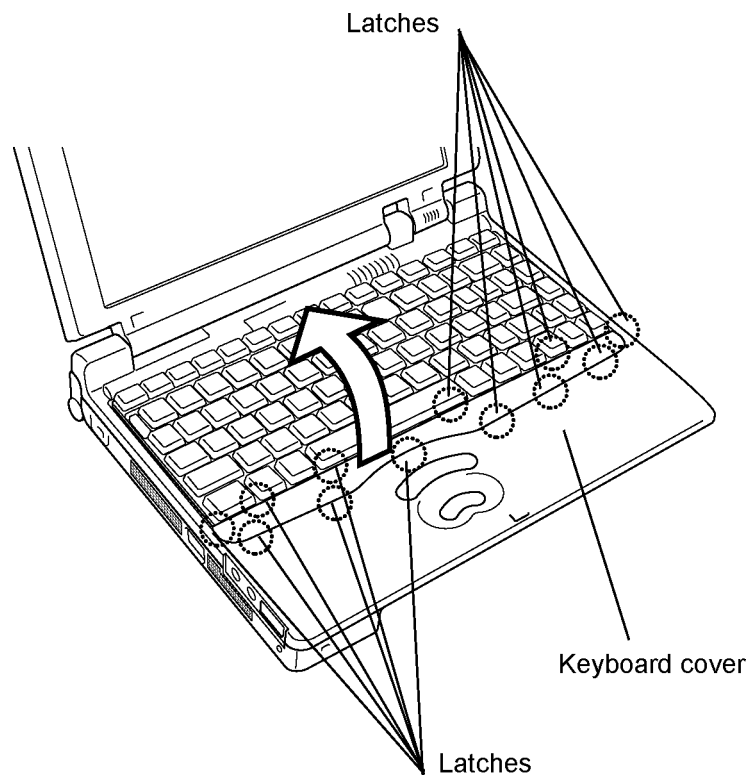

Latches

Keyboard cover

Latches

Figure 4-9 Releasing the keyboard cover

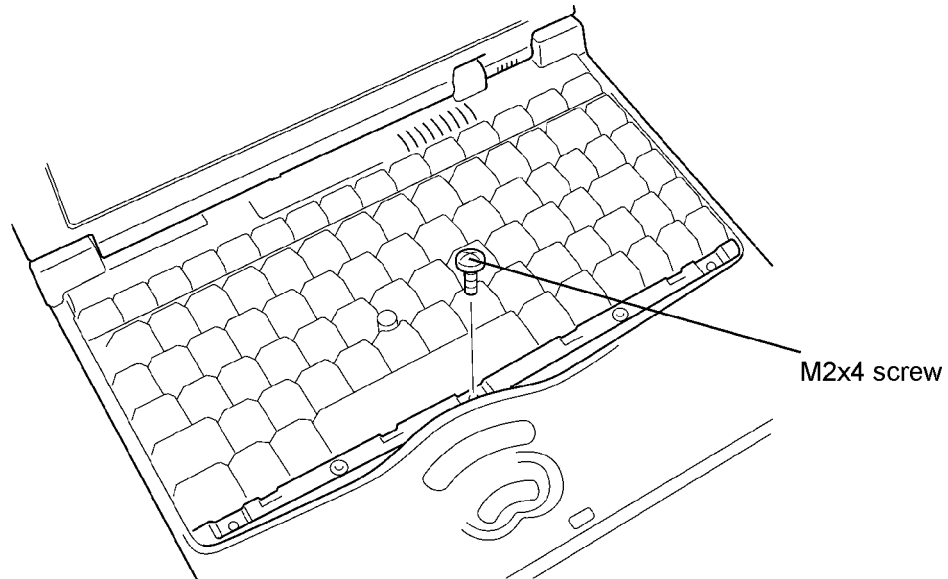4.   Remove **one M2x4 screw with washer** in front of the keyboard.

Figure 4-10 Removing the keyboard screw

5.   Insert a thin object between the keyboard and the top cover to lift up the
     keyboard. Lift up slightly so the extensions at the back of the keyboard clear the
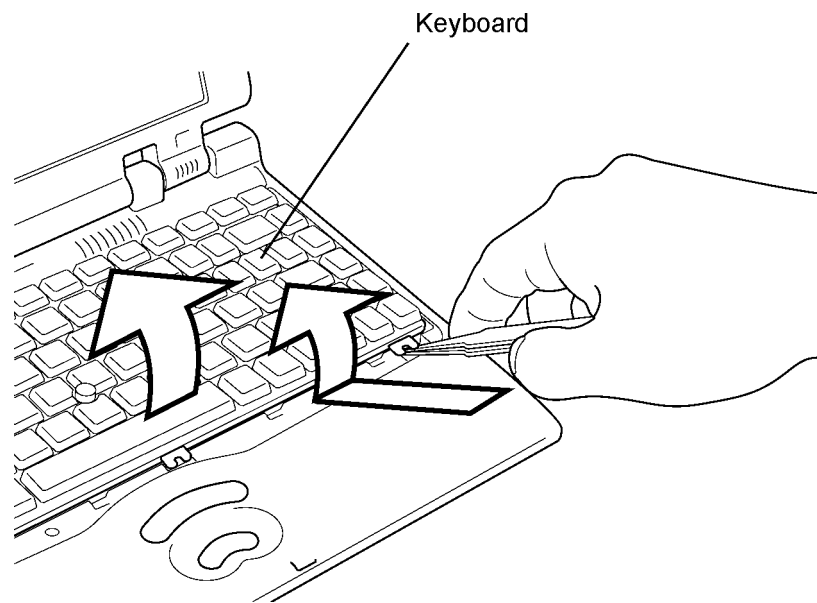   corresponding holes on the top cover. Do not remove the keyboard cable.

Figure 4-11 Removing the keyboard

6. Disconnect the **AccuPoint cable** from **PJ2** and the **keyboard cable** from **PJ7**.
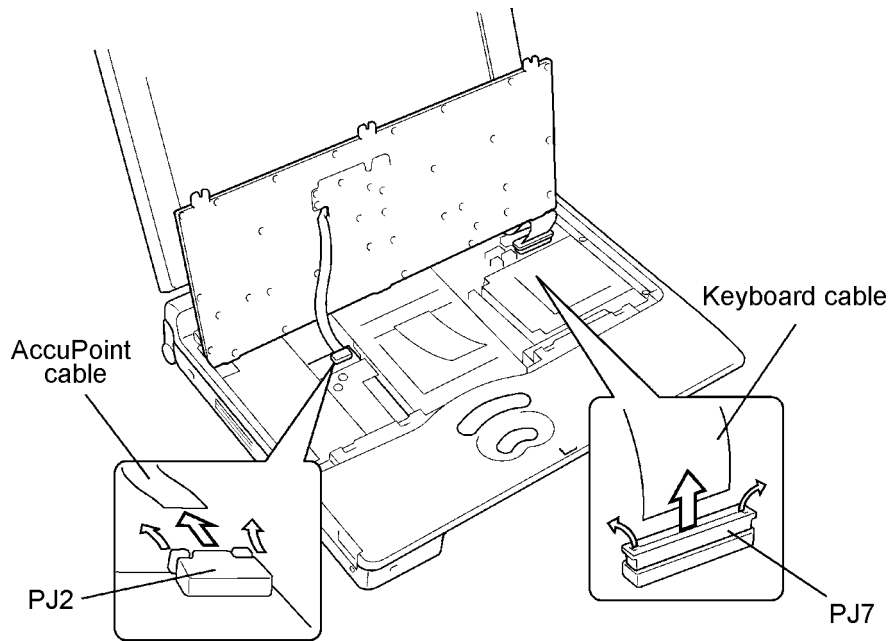

Figure 4-12 Removing the keyboard cable

7. Lift out the keyboard.

Installing the keyboard

To install the keyboard, follow the steps below and refer to Figures 4-12 back through 4-9.

1. Connect the **AccuPoint cable** to **PJ2** and the **keyboard cable** to **PJ7**. Make sure the pressure plate connectors are secure.

2. Replace the keyboard. Fit the extensions on the back of the keyboard into the corresponding holes on the top cover and lay the keyboard in place.

3. Secure **one M2x4 screw with washer** in front of the keyboard.

4. Seat the **keyboard cover** and press firmly to secure **12 latches**.

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

4.6   Hard Disk Drive (HDD)

Removing the HDD

To remove the HDD, follow the steps below and refer to Figures 4-13 and 4-14.

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

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

3. Remove **one M2x4 screw** securing the **HDD bracket**.

4. Lift up on the **plastic tab** on the HDD bracket and lift up the HDD.

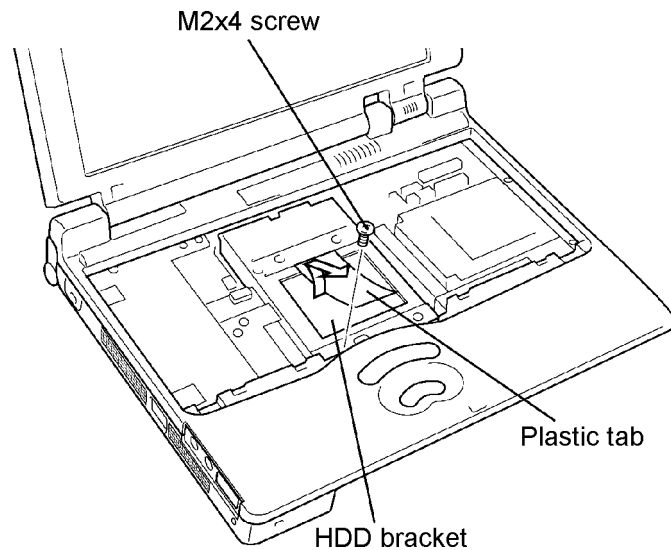5. Carefully pull the HDD to disconnect it from the connector then remove it.

Figure 4-13 Removing the HDD with bracket

6. Remove **four M3x4 flat-head screws** securing the bracket to the **HDD** and remove the **bracket**.
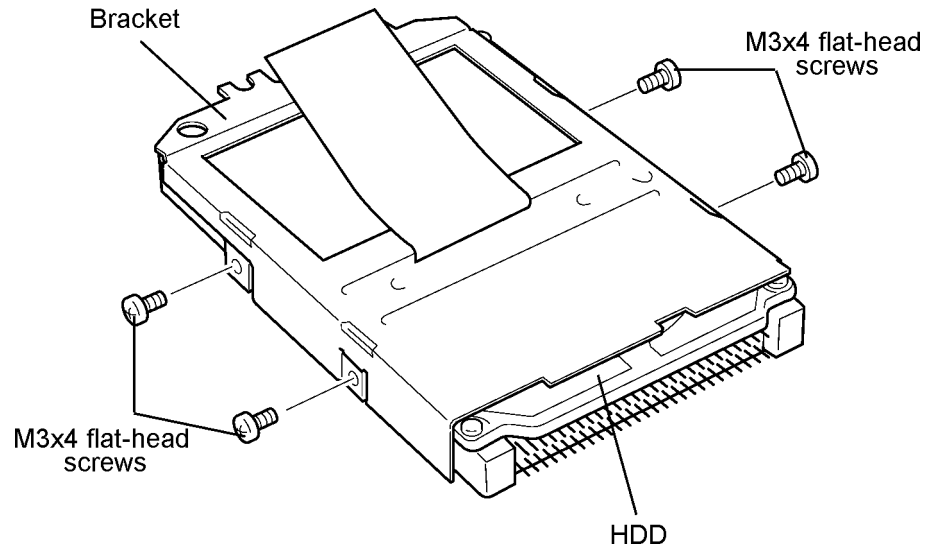
Figure 4-14 Removing the HDD

Installing the HDD

To install the HDD, follow the steps below and refer to Figures 4-14 and 4-13.

1. Seat the **HDD** in its **bracket**.

2. Secure the HDD to the bracket with **four M3x4 flat-head screws**.

3. Seat the HDD into the bottom cover, making sure to align the connectors.

4. Press the HDD gently to secure the connection.

5. Secure the HDD bracket with **one M2x4 screw**.

6. Replace the keyboard, PC card, memory module, and battery pack as described in Sections 4.5 back through 4.2.

4.7 Top Cover and Display Assembly

Removing the Top Cover and Display Assembly

To remove the top cover and display assembly, follow the steps below and refer to Figures 4-15 to 4-17.

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

2. Remove the battery pack, memory module, PC card, keyboard, and HDD as described in Sections 4.2 through 4.6.

3. Close the display and turn the computer upside down.

4. Remove the **fan-hole seal**.

5. Remove **eight M2x8 silver screws** from the bottom of the computer and **two M2x6 silver screws** from the battery seating area. These screws secure the top cover to the bottom cover.
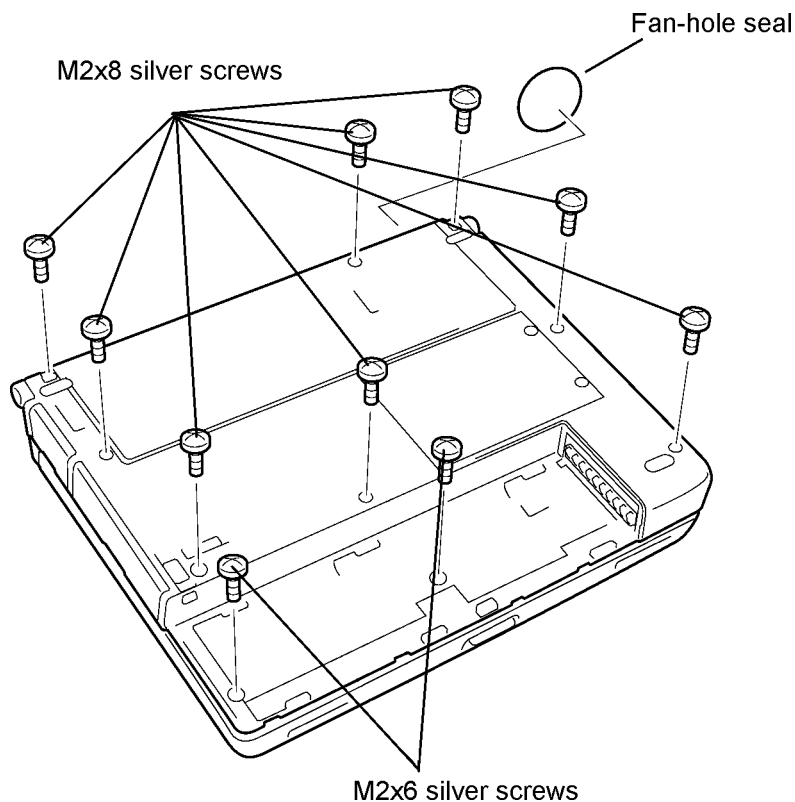
Figure 4-15 Removing the bottom cover screws

> **NOTE:** *If you remove the top cover, be sure to replace the fan hole seal with a new one.*

6. Turn the computer back over and open the display panel. Remove the tape, then disconnect the following cables: **LED** from **PJ9**, **display** from **PJ12**, **speaker** from **PJ18**, **sensor** from **PJ17**, and **microphone** from **PJ2**.

Figure 4-16 Releasing the top cover latches

7. Stand the computer on end as shown in Figure 4-17 and release nine latches securing the top cover. Begin with the latches along the front edge as shown.
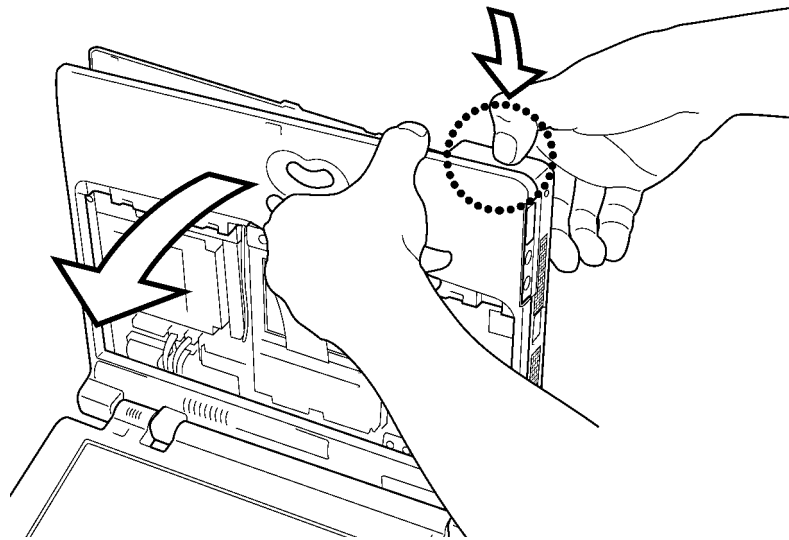
Figure 4-17 Separating the top cover and display assembly

8. Work around to the side latches, then remove the top cover and display assembly.

Installing the Top Cover and Display Assembly

To install the top cover and display assembly, follow the steps below and refer to Figures 4-17 back through 4-15:
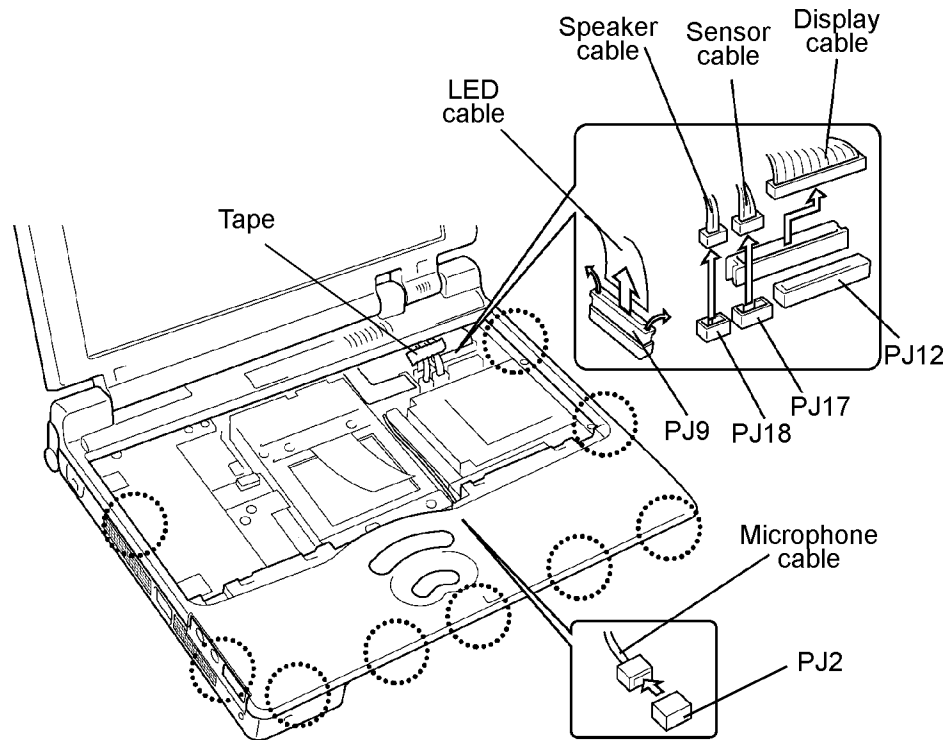
1. Set the top cover in place and secure nine latches. Be sure to keep the speaker cable to the right of the speaker.

2. Connect the following cables: **LED** to **PJ9**, **display** to **PJ12**, **speaker** to **PJ18**, **sensor** to **PJ17**, and **microphone** to **PJ2**.

3. Replace the tape.

4. Close the display and turn the computer upside down.

5. Secure the top cover with **eight M2x8 silver screws** and **two M2x6 silver screws**.

6. Replace the **fan-hole seal** with a new one. Do not reuse the old seal.

7. Replace the HDD, keyboard, PC card, memory module, and battery pack as described in Sections 4.6 back through 4.2.

4.8 RTC and Backup Batteries

Removing the RTC and Backup Batteries

To remove the RTC and backup batteries, follow the steps below and refer to Figure 4-18.

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

2. Remove the battery pack, memory module, PC card, keyboard, top cover and display assembly as described in Sections 4.2 through 4.7.

3. Peel off the **tape** securing the **backup battery cable**.

4. Disconnect the **RTC battery cable** from **PJ15** on the system board.

5. Slide the **RTC battery** and **RTC battery holder** free of the brackets holding it in place and remove the battery and battery holder.

6. Use a thin object to carefully work the RTC battery out of the holder.

7. Disconnect the **backup battery cable** from **PJ21** on the power supply board and lift out the battery. Note that the cable is routed under the clear plastic protector.
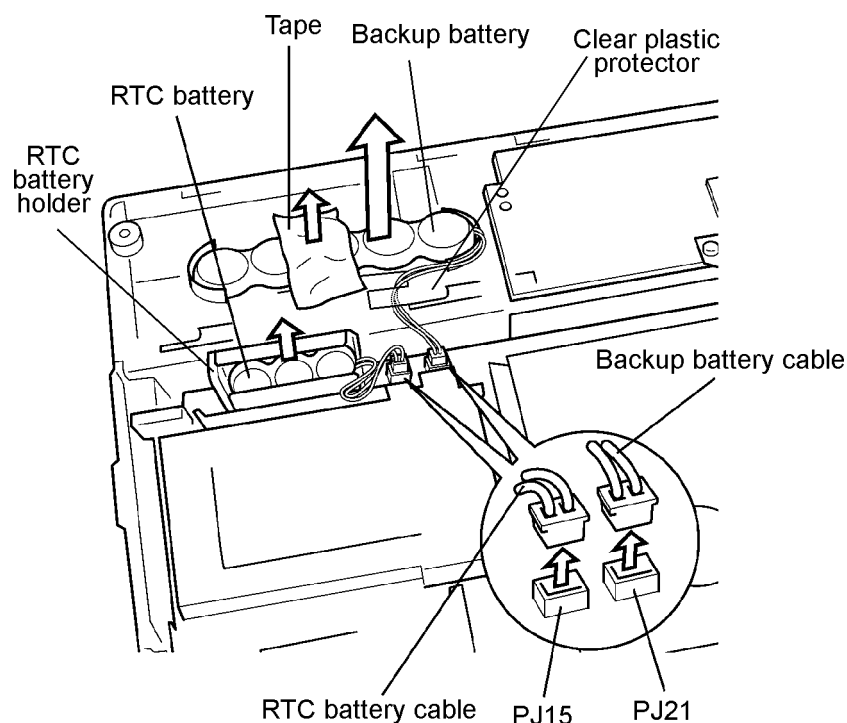
Figure 4-18 Removing the RTC and backup batteries

Installing the RTC and Backup Batteries

> *DANGER: Always use an RTC battery or backup battery that is authorized by Toshiba or compatible with the unit. Since other batteries have different specifications, they may be incompatible with the unit, and may burst or explode.*

To install the RTC and backup batteries, follow the steps below and refer to Figure 4-18.

1. Connect the **backup battery cable** to **PJ21** on the power supply board and replace the battery.

2. Route the cable under the clear plastic protector.

3. Use a multimeter to test the voltage at TP2(+) (from 5.0 to 7.0 V). If the voltage is out of range, replace the backup battery.

4. Replace the **RTC battery** in the **RTC battery holder**.

5. Slide the **RTC battery** and **RTC battery holder** under the brackets on the bottom cover.

6. Connect the **RTC battery cable** to **PJ15** on the system board.

7. Use a multimeter to test the voltage at TP1(+) (from 3.0 to 4.2 V). If the voltage is out of range, replace the RTC battery.

8. Secure the **RTC battery cable** with **tape**.

9. Replace the top cover, keyboard, PC card, memory module, battery pack, and display assembly as described in Sections 4.7 back through 4.2.

4.9   Membrane Switch

Removing the Membrane Switch

To remove the membrane switch, follow the steps below and refer to Figure 4-19.

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

2.   Remove the battery pack, memory module, PC card, keyboard, HDD, top cover and display assembly, RTC battery, and backup battery as described in Sections 4.2 through 4.8.

3.   Remove the tape from the membrane switch cable.

4.   Disconnect the cable from **PJ3** on the sound board and lift off the **membrane switch.**
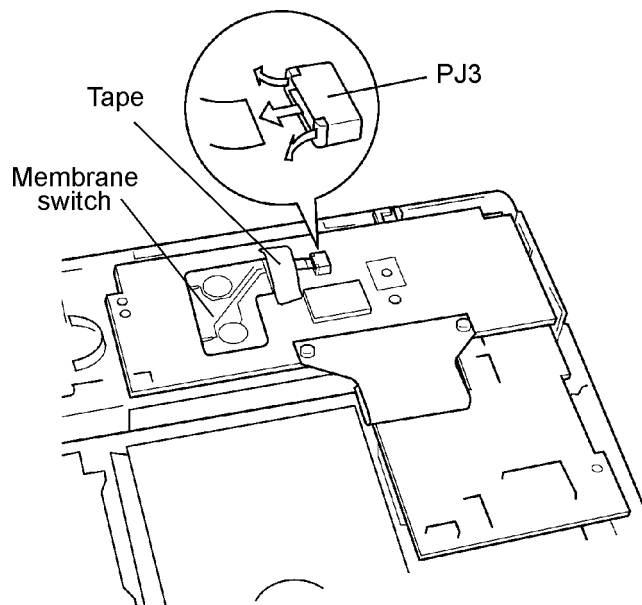
Figure 4-19 Removing the membrane switch

Installing the Membrane Switch

To install the membrane switch, follow the steps below and refer to Figure 4-19.

1.   Lay the **membrane switch** in place. Be sure pins on the sound board stick through the corresponding holes on the membrane switch.

2.   Connect the cable to **PJ3** on the sound board and replace the tape.

3.   Replace the RTC battery, backup battery, top cover and display assembly, keyboard, PC card, memory module, and battery pack as described in Sections 4.8 back through 4.2.

4.10 Sound Board

Removing the Sound Board

To remove the sound board, follow the steps below and refer to Figure 4-20.

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

2. Remove the battery pack, memory module, PC card, keyboard, HDD, top cover and display assembly, RTC battery, backup battery, and membrane switch as described in Sections 4.2 through 4.9.

3. Remove **one M2x4 screw**.

4. Remove the **sound board cover**.

5. Disconnect the **sound board cable** from **PJ20**.

6. Lift out the **sound board**.
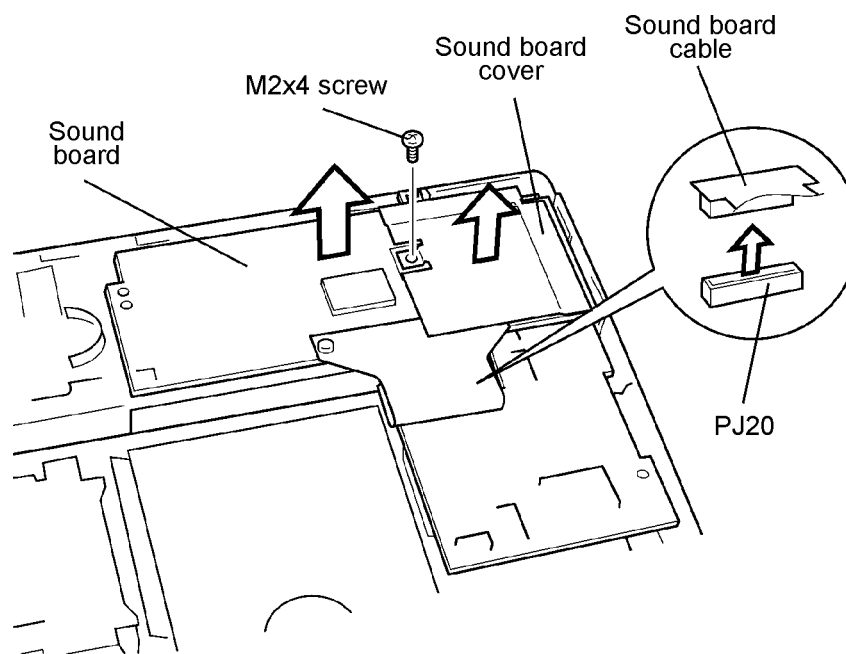
Figure 4-20 Removing the sound board

Installing the Sound Board

To install the sound board, follow the steps below and refer to Figure 4-20.

1. Connect the **sound board cable** to **PJ20**. When you connect the sound board, make sure it lies flat, then press evenly above the connector.

2. Seat the **sound board** and the **sound board cover.**

3. Secure them both with **one M2x4 screw**.

4. Replace the membrane switch, RTC battery, backup battery, top cover and display assembly, HDD, keyboard, PC card, memory module, and battery pack as described in Sections 4.9 back through 4.2.

4.11 Power Supply Board

Removing the Power Supply Board

To remove the power supply board, follow the steps below and refer to Figure 4-21.

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

2. Remove the battery pack, memory module, PC card, keyboard, HDD, top cover and display assembly, RTC battery, backup battery, membrane switch, and sound board as described in Sections 4.2 through 4.10.

3. Lift out the **sound board support**.

4. Disconnect the **power supply board** from **PJ14** on the system board.

5. Lift out the power supply board.
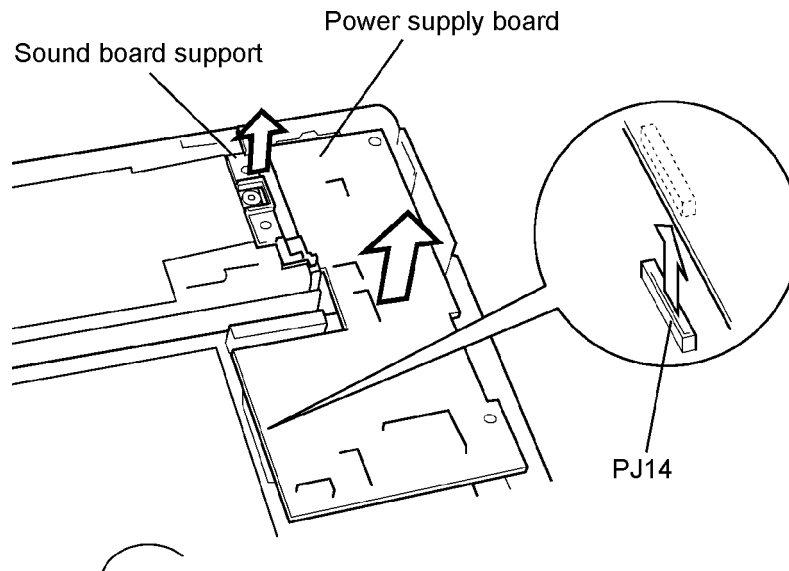
Figure 4-21 Removing the power supply board

Installing the Power Supply Board

To install the power supply board, follow the steps below and refer to Figure 4-21.

1. Seat the **power supply board** in the bottom cover.

2. Connect the **power supply** cable to **PJ14** on the system board.

    > *WARNING: Make sure there is no dust or other debris on the connectors. Dust could cause a short or otherwise damage the boards.*

3. Replace the **sound board support**.

4. Replace the sound board, membrane switch, RTC battery, backup battery, top cover and display assembly, HDD, keyboard, PC card, memory module, and battery pack as described in Sections 4.10 back through 4.2.

4.12 System Board

Removing the System Board

To remove the system board, follow the steps below and refer to Figure 4-22.

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

2. Remove the battery pack, memory module, PC card, top cover and display assembly, HDD, RTC battery, backup battery, membrane switch, sound board, and power supply board as described in Sections 4.2 through 4.11.

3. Remove **five M2x6 screws**.

4. Lift out the **system board.**

5. The system shield assembly will be unattached. Be sure to note its position.

6. Remove the **switch button**.
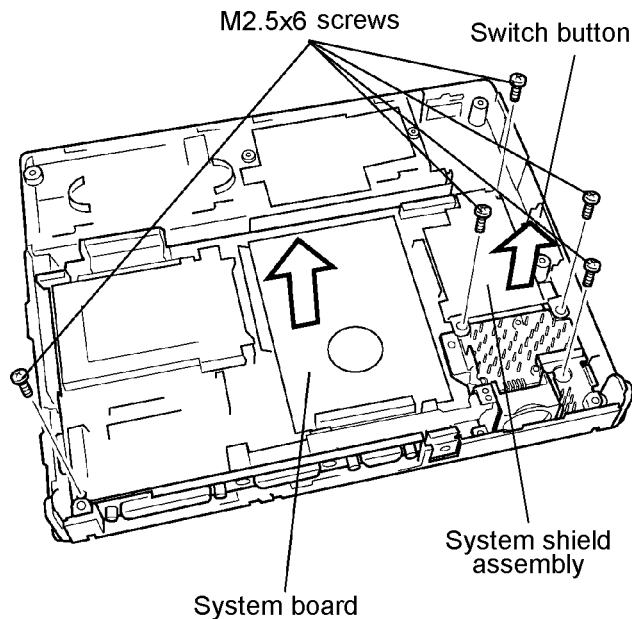
Figure 4-22 Removing the system board

Installing the System Board

To install the system board, follow the steps below and refer to Figure 4-22.

1. Replace the **switch button**.

2. Seat the **system board**.

3. Be sure the system shield assembly is in place.

4. Secure the system board with **five M2x6 screws**.

3. Replace the power supply board, sound board, membrane switch, RTC battery, backup battery, top cover and display assembly, HDD, keyboard, PC card, memory module, and battery pack as described in Sections 4.11 back through 4.2.

4.13 LED Board and Speaker

Removing the LED Board and Speaker

To remove the LED board and speaker, follow the steps below and refer to Figure 4-23 and 4-24.

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

2. Remove the battery pack, memory module, PC card, keyboard, HDD, and top cover and display assembly as described in Sections 4.2 through 4.7.

3. Remove **two M2x4 screws**.

4. Remove the **LED board** and **speaker assembly.**
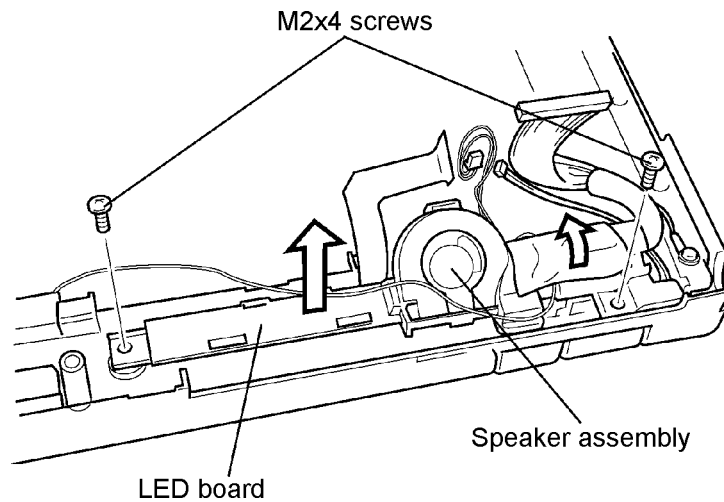
Figure 4-23 Removing the LED board and speaker assembly

5. Release **four latches** to remove the LED board.

6. Release **one latch** to remove the **speaker**.

7. Remove the **protective rubber cover**.
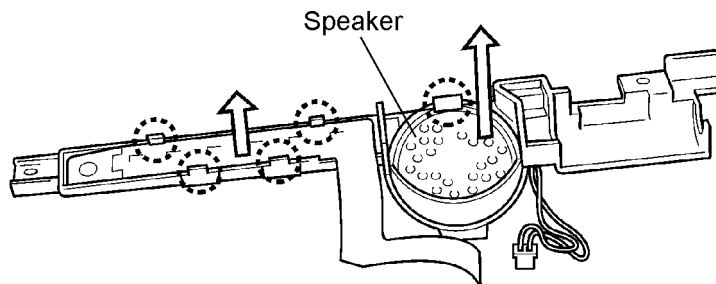
Figure 4-24 Removing the LED board

Installing the LED Board and Speaker

To install the LED board and speaker, follow the steps below and refer to Figure 4-24 and 4-23.

1. Put the **protective rubber cover** on the **speaker**.

2. Place the **speaker** in the speaker assembly and secure **two latches**.

3. Place the **LED board** in the assembly and secure **four latches**.

4. Seat the assembly in the **bottom cover**.

5. Secure **two M2x4 screws**.

6. Replace the top cover and display assembly, HDD, keyboard, PC card, memory module, and battery pack as described in Sections 4.7 back through 4.2.

4.14 Display Mask

Removing the Display Mask

To remove the display mask, follow the steps below and refer to Figures 4-25 and 4-26.

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

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

    > *NOTE: You do not have to remove the top cover and display assembly to remove the display mask.*

3. Remove **two rubber seals** from the display hinges to expose screws securing the display mask.

4. Remove **two M2.5x6 screws** at the bottom corners of the display mask.

    > *NOTE: When you remove the screws, support the back of the display panel with your hand.*

Figure 4-25 Removing the seals and screws

5. Slip your fingers between the top of the display cover and the display mask and pull out gently to release **six latches**. Start with the latches at the center.

6. Continue around the plastic cover to release **four latches** on each side and **five latches** at the bottom.
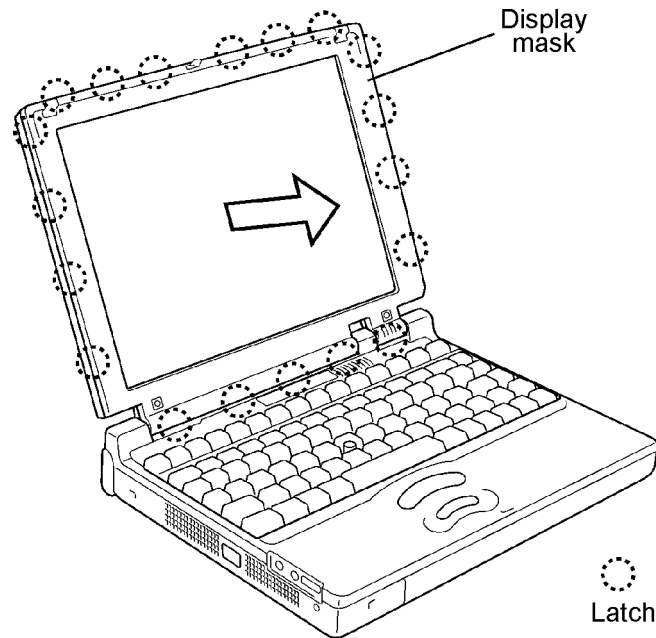
Figure 4-26 Removing the display mask

Installing the Display Mask

To install the display mask, follow the steps below and refer to Figures 4-26 and 4-25.

1. Set the **display mask** in place and press firmly to secure the latches. Start with **five latches** at the bottom, **four latches** on each side, and **six latches** at the top.

2. Secure **two M2.5x6 screws** at the bottom corners of the display cover.

    NOTE: When you secure the screws, support the back of the display panel with your hand.

3. Replace **two rubber seals** covering the screws.

4. Replace the PC card, memory module, and battery pack as described in Sections 4.4, 4.3, and 4.2.

4.15 FL Inverter Board

Removing the FL Inverter Board

> **WARNING:** *If you have to turn on the power to check the FL inverter during disassembly, never touch the exposed areas that carry high-voltage.*

To remove the FL inverter board, follow the steps below and refer to Figure 4-27.

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

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

3. Remove **two M2x6 screws** from the **FL inverter board.** Note the ground wire on the left screw.

> **NOTE:** *When you remove the screws, support the back of the display with your hand.*

4. Turn the board over and disconnect the **FL inverter cable** from **CN1** and the **FL cable** from **CN2**.
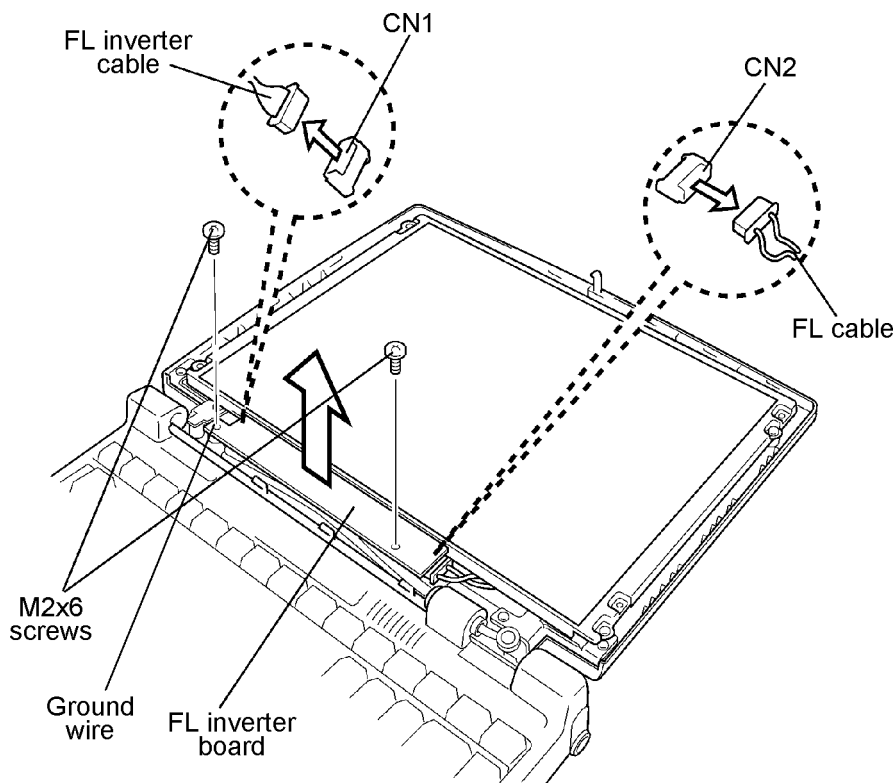
Figure 4-27 Removing the FL inverter board

Installing the FL Inverter Board

To install the FL inverter board, follow the steps below and refer to Figure 4-27.

1. Turn the board over and connect the **FL inverter cable** to **CN1** and the **FL cable** to **CN2**.

2. Secure **two M2x6 screws** on the **FL inverter board**. Be sure the ground wire is attached to the left screw.

    > *NOTE:* *When you remove the screws, support the back of the display with your hand.*

3. Replace the display mask, PC card, memory module, and battery pack as described in Sections 4.4, 4.3, and 4.2.

4.16 TFT Color Display Module

Removing the TFT Color Display Module

To remove the TFT color display module, follow the steps below and refer to Figures 4-28 and 4-29.

> *CAUTION: When you remove the FL unit, be careful that dust or other foreign matter does not contaminate the LCD panel. Any contamination can affect the performance of the unit.*

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

2. Remove the battery pack, memory module, PC card, display mask, and FL inverter board as described in Sections 4.2, 4.3, 4.4, and 4.15.

3. Remove **four M2x6 screws** at each corner of the display module.

> *NOTE: When you remove the screws, support the back of the display with your hand.*

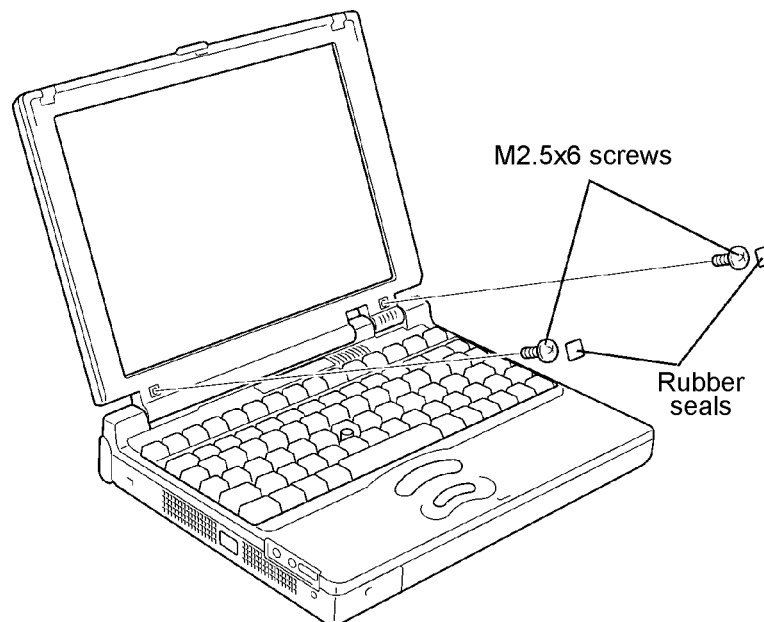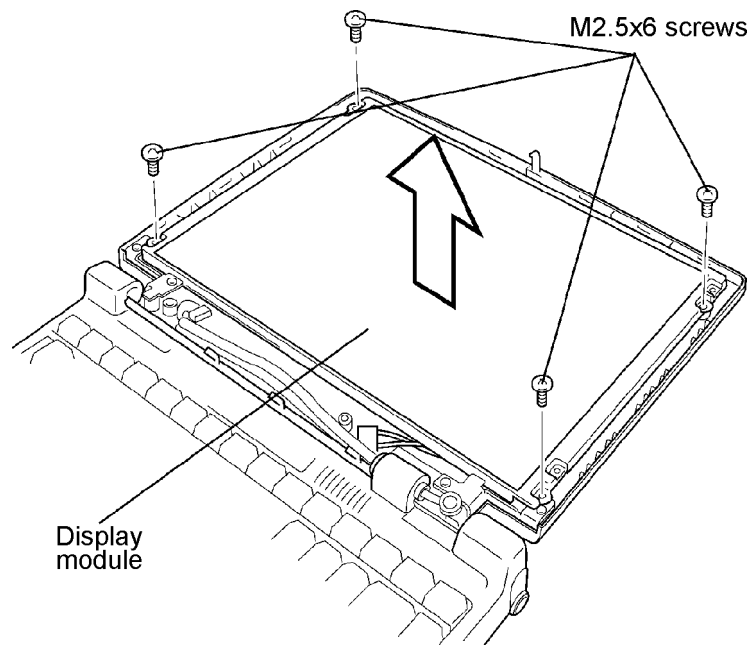*Figure 4-28 Removing the display module screws*

4. Rotate the **display module** partially out of the cover from left to right.

5. Carefully disconnect the **LCD cable** from the display panel.

> *NOTE: When you secure the LCD cable, support the display panel with your hand.*
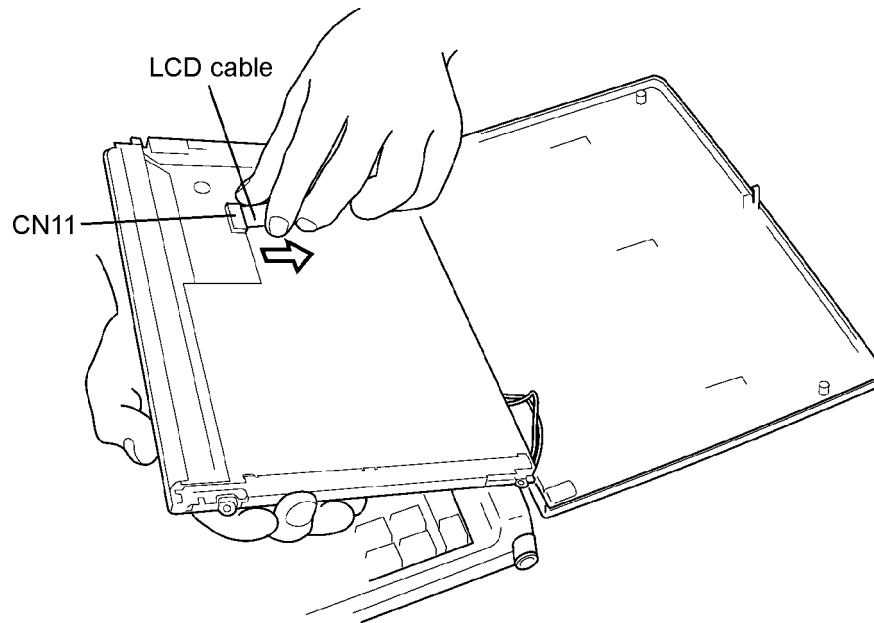
Figure 4-29 Removing the LCD

Installing the TFT Color Display Module

To install the TFT color display module, follow the steps below and refer to Figures 4-29 and 4-28.

1. Connect the **LCD cable** to **CN11**.

> *NOTE: When you secure the LCD cable, support the display panel with your hand.*

2. Seat the **display module** in the display cover and secure **four M2x6 screws**, one at each corner of the panel.

> *NOTE: When you secure the screws, support the back of the display with your hand.*

3. Replace the FL inverter board, display mask, PC card, memory module, and battery pack as described in Sections 4.15, 4.4, 4.3, and 4.2.

4.17 Fluorescent Lamp Unit (FL)

Removing the FL Unit

> *CAUTION: When you remove the FL, be sure no dust or foreign matter contaminates the display panel.*

To remove the FL, follow the steps below and refer to Figures 4-30 to 4-32.

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

2. Remove the battery pack, memory module, PC card, display mask, FL inverter board, and display module as described in Sections 4.2, 4.3, 4.4, 4.15, and 4.16.

3. Place the **display module** face down and remove **two M2x6 flat-head screws** securing the FL unit cover.

4. Carefully slide the cover to the right, then lift up to remove the FL unit cover.

5. Remove the black tape.
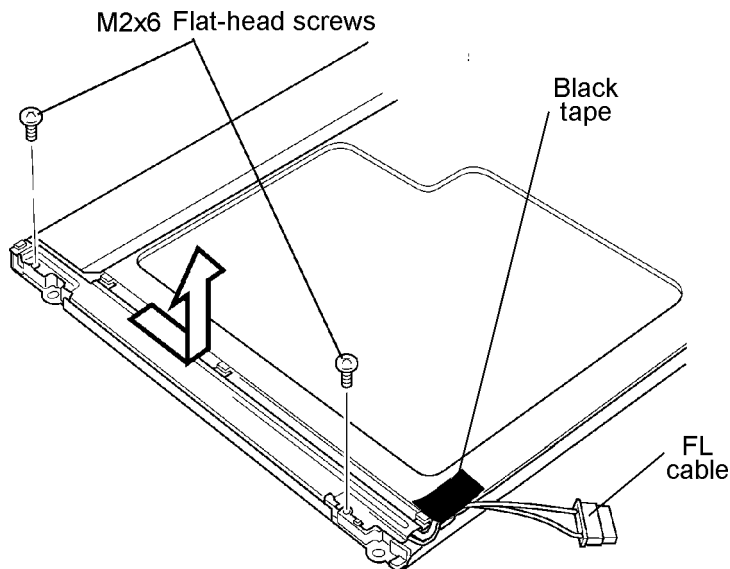
Figure 4-30 Removing the FL unit screws

6. Free the **FL cable unit** and remove it. Note how the FL cable is routed.

7. Remove the **FL unit**.
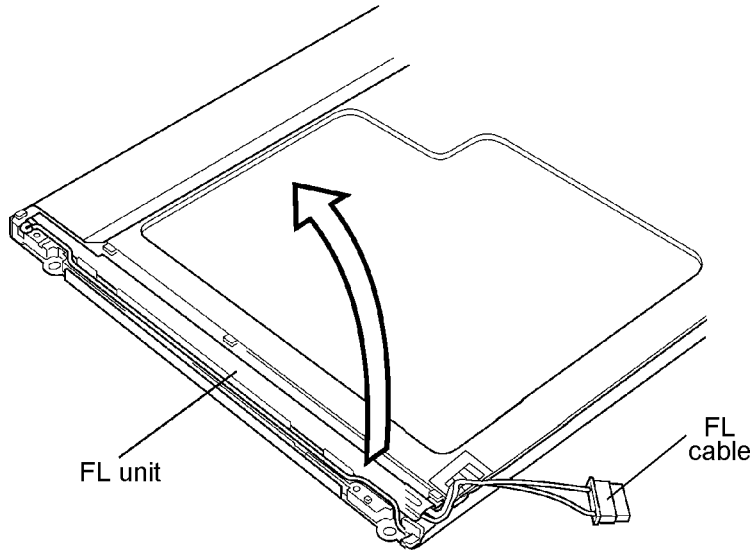
Figure 4-31 Removing the FL unit

8. Remove the **FL**.
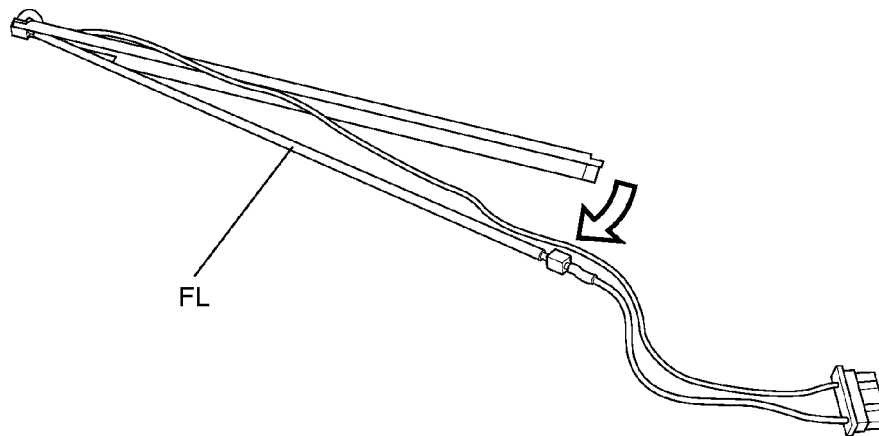
Figure 4-32 Removing the FL

Installing the FL Unit

To install the FL, follow the steps below and refer to Figures 4-32 back through 4-30.

1. Seat the **FL unit**, route the **FL cable**, and replace the **black tape**.

2. Place the **FL unit cover** just to the right of the latches, then slide it to the left to secure it under the latches. Replace **two M2x6 flat-head screws**.

3. Replace the display module, FL inverter board, display mask, PC card, memory module, and battery pack as described in Sections 4.17, 4.16, 4.15, 4.4, 4.3, and 4.2.

4.18 Microphone

Removing the Microphone

To remove the microphone, follow the steps below and refer to Figure 4-33.

1. Turn off the power to the 620CT. Disconnect the AC adapter, power cord, and all external cables connected to the computer.

2. Remove the battery pack, memory module, PC card, display mask, FL inverter board, and display module as described in Sections 4.2 through 4.4, and 4.15 through 4.17.

3. Pinch the **microphone cover** to free it from **two latches**, then remove the cover.

4. Remove the **microphone**.

5. Remove the **protective rubber cover** from the microphone.
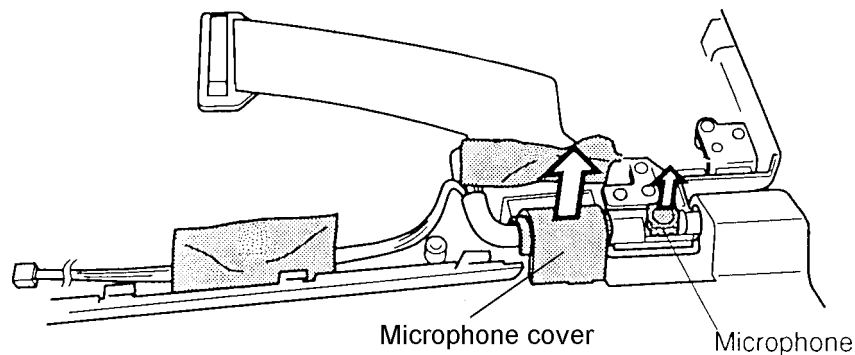
Figure 4-33 Removing the microphone.

Installing the Microphone

To install the microphone, follow the steps below and refer to Figure 4-33.

1. Replace the **protective rubber cover** on the microphone.

2. Seat the **microphone**.

3. Replace the **microphone cover** and secure the two latches.

4. Replace the display module, FL inverter board, display mask, PC card, memory module, and battery pack as described in Sections 4.17 back through 4.15, and 4.4 back through 4.2.

4.19 Display Cable

Removing the Display Cable

To remove the display cable, follow the steps below and refer to Figure 4-34.

1. Turn off the power to the 620CT. Disconnect the AC adapter, power cord, and all external cables connected to the computer.

2. Remove the battery pack, memory module, PC card, display mask, FL inverter board, display module, and microphone as described in Sections 4.2 through 4.4, and 4.15 through 4.18.

3. Remove **four M2.5x5 screws** to release the **cover assembly** from the display assembly.

4. Disconnect the **LCD harness** from the **LCD flex cable** and remove it from the unit.
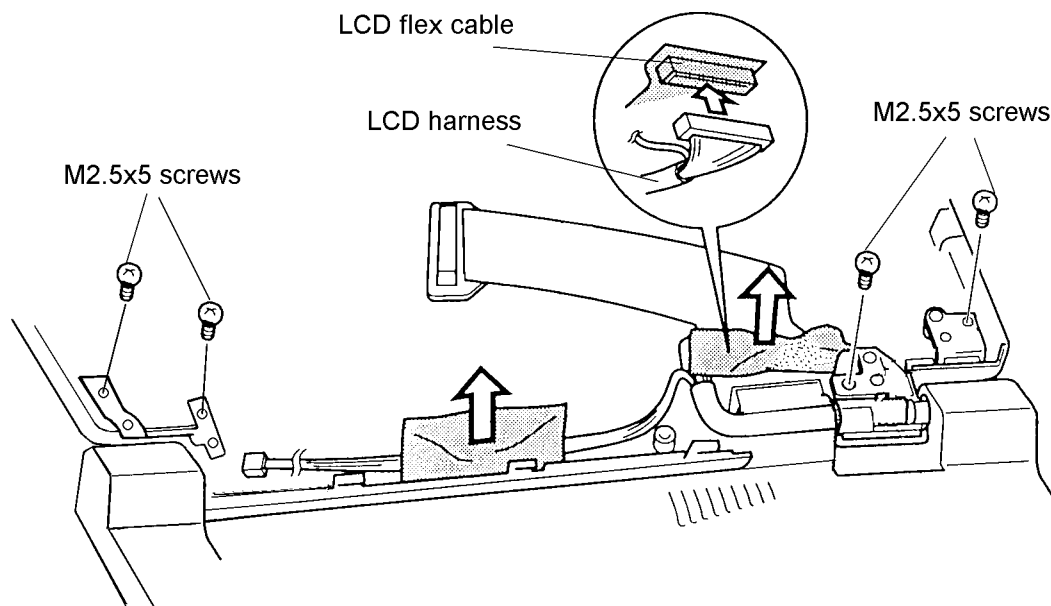
Figure 4-34 Removing the display cable

Installing the Display Cable

To install the display cable, follow the steps below and refer to Figure 4-34.

1. Connect the **LCD harness** to the **LCD flex cable** and replace it in the unit.

2. Seat the cover assembly on the display assembly and secure it with **four M2.5x5 screws**.

3. Replace the microphone, display module, FL inverter board, display mask, PC card, memory module, and battery pack as described in Sections 4.18 back through 4.15, and 4.4 back through 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.
Therefore, please observe the following precautions when handling the LCD 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.
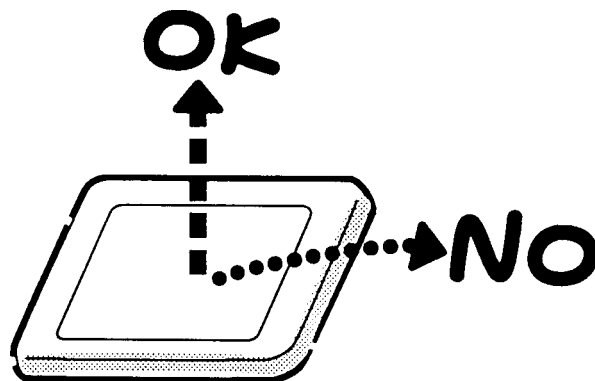
2.   Be careful to align the holes at the four corners of the LCD module with the
      corresponding holes in the LCD cover before securing the module with screws. Do
      not force the module into place, because stress can affect its performance.

      Also, the panel's polarized surface is easily scarred, so be careful when handing 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.
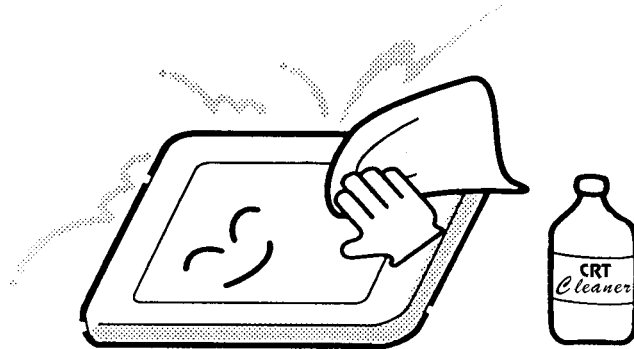
4.   If water or other liquid is left on the panel's surface for a long period, it can change the screen's tint or stain it. Be sure to quickly wipe off any liquid.
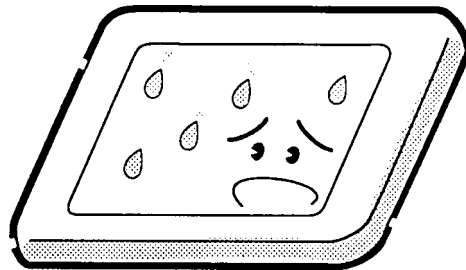
5.   Glass is used in the panel, so be careful not to drop it or let it strike a hard object, which could cause breakage or cracks.
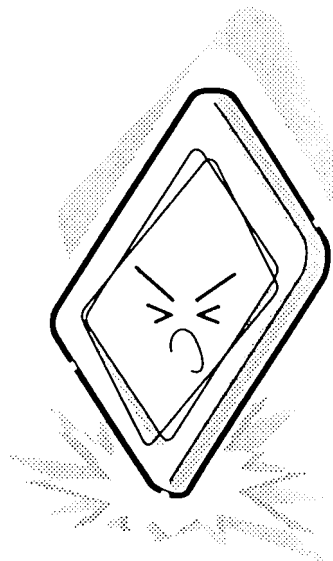
6. CMOS-LSI circuits are used in the module, so guard against damage from electro-static discharge. Be sure to wear a wrist or ankle ground when handling the module.
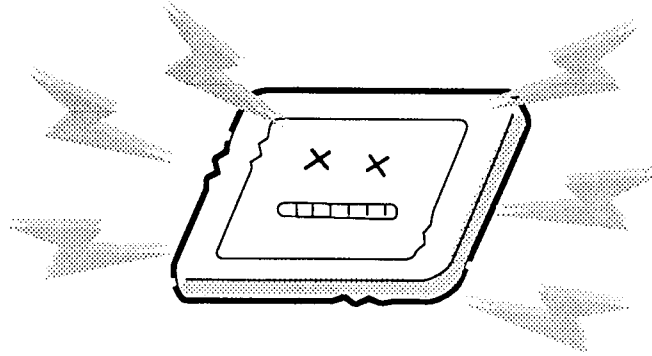
7. Do not expose the module to direct sunlight or strong ultraviolet rays for long periods.
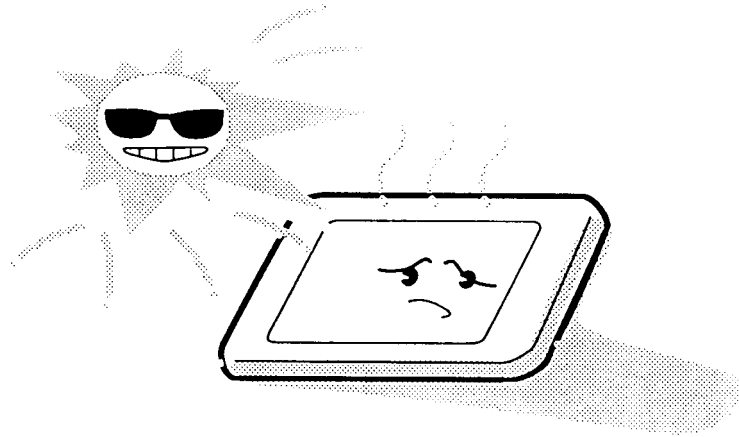
8. Do not store the module at temperatures below specifications. Cold can cause the liquid crystals to freeze, lose their elasticity or otherwise suffer damage.
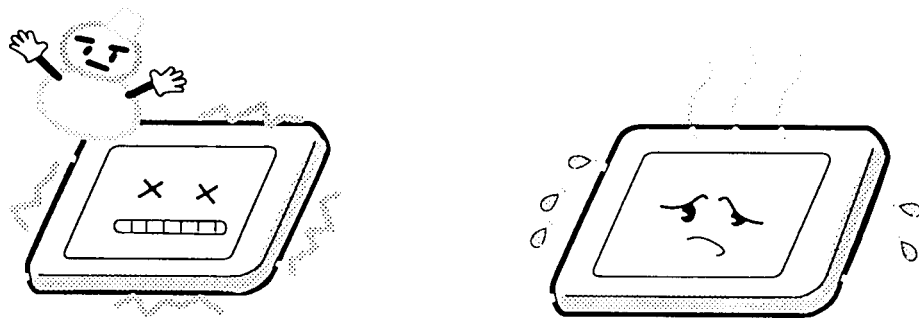
9.   Do not disassemble the LCD module. Disassembly can cause malfunctions.
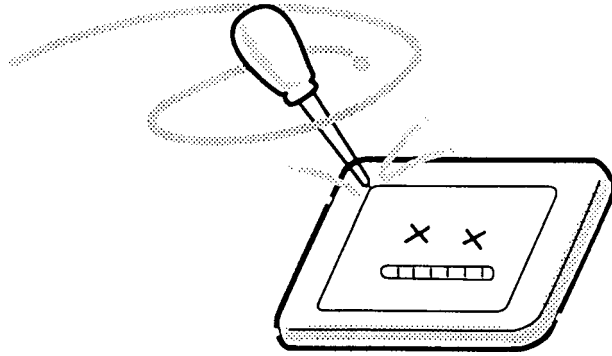
10.   If you transport the module, do not use packing material that contains epoxy resin (amine) or silicon glue (alcohol or oxime). These materials can release gas that can damage the panel's polarization.
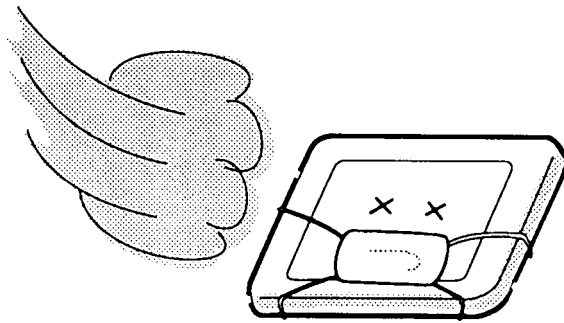
Appendix B Board Layout

B.1   System Board Front View
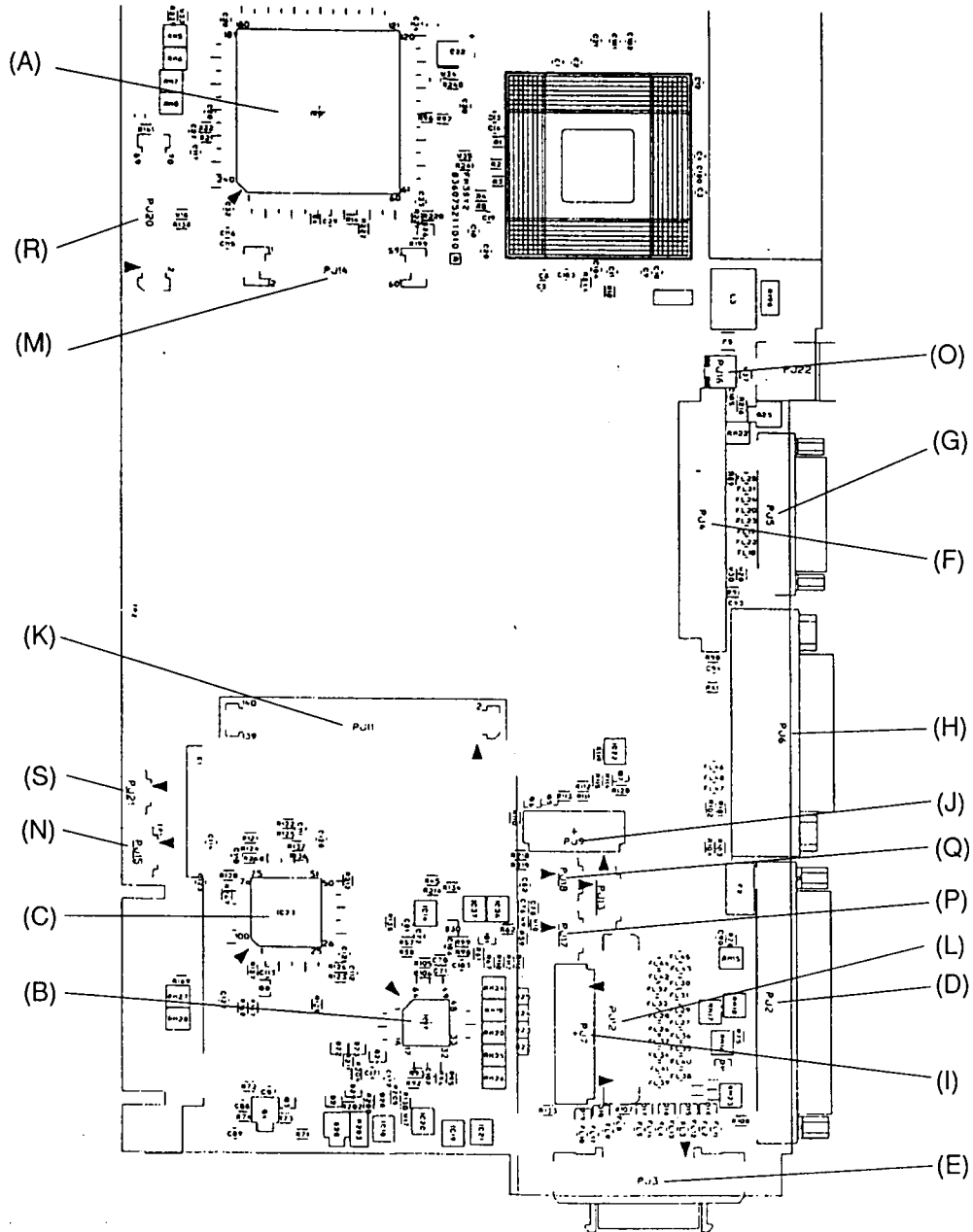
Figure B-1 Board layout (front)

B.2 System Board Back View
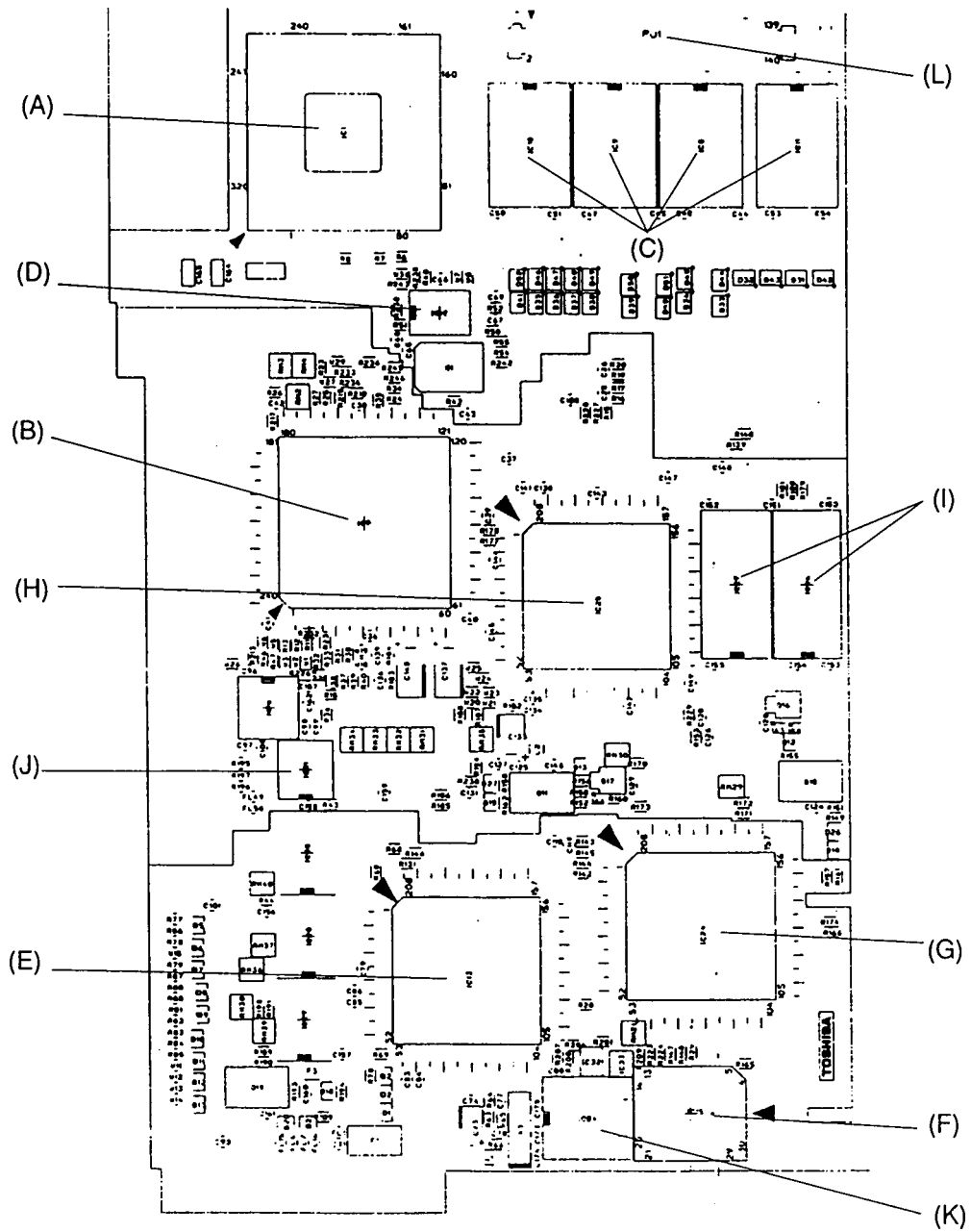
Figure B-2 Board layout (back)

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

Mark	Number	Name
(A)	IC6	SCPCNT GA
(B)	IC17	KBC Controller
(C)	IC23	I/O GA
(D)	PJ2	PRT Connector
(E)	PJ3	FDD Connector
(F)	PJ4	HDD Connector
(G)	PJ5	ASYNC I/F Connector
(H)	PJ6	P-REP Connector
(I)	PJ7	Keyboard Connector
(J)	PJ9	LED Connector
(K)	PJ11	PCMCIA Slot Connector
(L)	PJ12	Internal LCD Connector
(M)	PJ14	Power Supply Board Joint Connector
(N)	PJ15	RTC Battery Connector
(O)	PJ16	FAN Connector
(P)	PJ17	Panel Sensor Connector
(Q)	PJ18	Speaker Connector
(R)	PJ20	Sound I/F Connector
(S)	PJ21	Sub-battery Connector

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

Mark	Number	Name
(A)	IC1	CPU
(B)	IC7	SISCNT GA
(C)	IC8 to IC11	System Memory
(D)	IC12	SYSTEM Clock
(E)	IC13	SI
(F)	IC15	BIOS ROM
(G)	IC24	Video RAM
(H)	IC25	PCMCIA GA
(I)	IC26, IC27	Video RAM
(J)	IC31	RGB
(K)	IC34	RTC
(L)	PJ1	SIMM Connector

Appendix C   Pin Assignments

C.1   PJ1 SIMM Connector (140-pin)

Table C-1 SIMM connector pin assignments (140-pin) (1/2)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
001	B3V	—	002	B3V	—
003	GND	—	004	HD36;100	I/O
005	HD35;100	I/O	006	HD37;100	I/O
007	HD34;100	I/O	008	HD38;100	I/O
009	HD33;100	I/O	010	GND	—
011	B3V	—	012	HD39;100	I/O
013	HD32;100	I/O	014	HD40;100	I/O
015	HD44;100	I/O	016	B3V	—
017	HD45;100	I/O	018	B3V	—
019	GND	—	020	HD42;100	I/O
021	HD46;100	I/P	022	HD43;100	I/O
023	HD47;100	I/O	024	HD16;100	I/O
025	HD20;100	I/O	026	GND	—
027	B3V	—	028	HD17;100	I/O
029	HD21;100	I/O	030	HD18;100	I/O
031	HD22;100	I/O	032	HD19;100	I/O
033	HD23;100	I/O	034	B3V	—
035	GND	—	036	HD24;100	I/O
037	HD28;100	I/O	038	HD25;100	I/O
039	HD29;100	I/O	040	HD26;100	I/O
041	HD30;100	I/O	042	GND	—
043	B3V	—	044	HD27;100	I/O
045	HD31;100	I/O	046	HD00;100	I/O
047	HD04;100	I/O	048	HD01;100	I/O
049	HD05;100	I/O	050	B3V	—
051	HGND	—	052	HD02;100	I/O
053	HD06;100	I/O	054	HD03;100	I/O
055	HD07;100	I/O	056	HD08;100	I/O
057	HD12;100	I/O	058	GND	—
059	B3V	—	060	HD09;100	I/O
061	HD13;100	I/O	062	HD10;100	I/O
063	HD14;100	I/O	064	HD11;100	I/O

Table C-1 SIMM connector pin assignments (140-pin) (2/2)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
065	HD15;100	I/O	066	B3V	—
067	GND	—	068	HD48;100	I/O
069	HD52;100	I/O	070	HD49;100	I/O
071	HD53;100	I/O	072	HD50;100	I/O
073	HD54;100	I/O	074	GND	—
075	B3V	—	076	HD51;100	I/O
077	HD55;100	I/O	078	HD56;100	I/O
079	HD60;100	I/O	080	HD57;100	I/O
081	HD61;100	I/O	082	HD58;100	I/O
083	HD62;100	I/O	084	HD59;100	I/O
085	HD63;100	I/O	086	GND	—
087	CAS1;001	O	088	CAS0;001	O
089	CAS3;001	O	090	CAS2;001	O
091	CAS5;001	O	092	CAS4;001	O
093	CAS7;001	O	094	CAS6;001	O
095	N.C.	—	096	N.C.	—
097	N.C.	—	098	N.C.	—
099	N.C.	—	100	GND	—
101	N.C.	—	102	N.C.	—
103	GND	—	104	N.C.	—
105	ERAS0;001	O	106	ERAS2;001	O
107	ERAS1;001	O	108	ERAS3;001	O
109	N.C.	—	110	N.C.	—
111	N.C.	—	112	N.C.	—
113	N.C.	—	114	N.C.	—
115	N.C.	—	116	N.C.	—
117	GND	—	118	GND	—
119	N.C.	—	120	N.C.	—
121	GND	—	122	GND	—
123	N.C.	—	124	N.C.	—
125	GND	—	126	GND	—
127	MA00;101	O	128	MA01;101	O
129	MA02;101	O	130	MA03;101	O
131	MA04;101	O	132	MA05;101	O
133	GND	—	134	MA06;101	O
135	MA07;101	O	136	MA09;101	O
137	MA08;101	O	138	MA11;101	O
139	MA10;101	O	140	GND	—

C.2   PJ2 PRT Connector (25-pin)

Table C-2 PRT connector pin assignments (25-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
001	STROB;010	O	002	PDB00;110	I/O
003	PDB01;110	I/O	004	PDB02;110	I/O
005	PDB03;110	I/O	006	PDB04;110	I/O
007	PDB05;110	I/O	008	PDB06;110	I/O
009	PDB07;110	I/O	010	ACK;010	I
011	BUSY;110	I	012	PE;110	I
013	SELCT;110	I	014	AUTFD;010	O
015	ERROR;010	I	016	PINT;010	O
017	SLIN;010	O	018	GND	—
019	GND	—	020	GND	—
021	GND	—	022	GND	—
023	GND	—	024	GND	—
025	GND	—			

C.3   PJ3 FDD Connector (26-pin)

Table C-3 FDD connector pin assignments (26-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
001	VCC	—	002	IFINDX;000	I
003	VCC	—	004	IFDASL;000	O
005	VCC	—	006	DSKCHG;000	I
007	VCC	—	008	IFRADY;000	I
009	IFHMED;000	I	010	IFAMON;000	O
011	IFLOWD;000	O	012	IFDIRC;000	O
013	SLFDLD;100	I	014	IFSTEP;000	O
015	GND	—	016	IFWDAT;000	O
017	GND	—	018	IFWEN;000	O
019	GND	—	020	IFTRKO;000	I
021	GND	—	022	IFWPRO;000	I
023	GND	—	024	IFRDAT;000	I
025	GND	—	026	IFSSEL;000	O

C.4   PJ4 HDD Connector (44-pin)

Table C-4   HDD connector pin assignments (44-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
001	RESET;000	O	002	GND	—
003	SD07;100	I/O	004	SD08;100	I/O
005	SD06;100	I/O	006	SD09;100	I/O
007	SD05;100	I/O	008	SD10;100	I/O
009	SD04;100	I/O	010	SD11;100	I/O
011	SD03;100	I/O	012	SD12;100	I/O
013	SD02;100	I/O	014	SD13;100	I/O
015	SD01;100	I/O	016	SD14;100	I/O
017	SD00;100	I/O	018	SD15;100	I/O
019	GND	—	020	N.C.	—
021	N.C.	—	022	GND	—
023	FIOWR;000	O	024	GND	—
025	FIORD;000	O	026	GND	—
027	IOCRDY;100	I	028	N.C.	—
029	N.C.	—	030	GND	—
031	IRQ14;100	I	032	IOCS16;000	I
033	SA01;100	O	034	N.C.	—
035	SA00;100	O	036	SA02;100	O
037	HDDCS0;000	O	038	HDDCS1;000	O
039	HDDLED;000	I	040	GND	—
041	VCC	—	042	VCC	—
043	GND	—	044	Pull Up (47K)	—

C.5   PJ5 Asynchronous Connector (9-pin)

Table C-5   Asynchronous connector pin assignments (9-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
001	DCD1;101	I	002	RXD1;001	I
003	TXD1;011	O	004	DTR1;111	O
005	GND	—	006	DSR1;101	I
007	RTS1;101	O	008	CTS1;101	I
009	RI1;101	I			

C.6 PJ6 P-REP Connector (72-pin)

Table C-6 P-REP connector pin assignments (72-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
001	AGREEN;110	O	002	ABLUE;110	O
003	ARED;110	O	004	AUTFD;000	O
005	PD5;100	I/O	006	PINT;000	O
007	PE;100	I	008	ERROR;000	I
009	IFDASL;000	O	010	DSKCHG;000	I
011	IFRDAT;000	I	012	IFLOWD;000	O
013	IFAMON;000	O	014	MOUSCK;100	I/O
015	EXKBCK;100	I/O	016	CTS1;100	I
017	DSR1;100	I	018	DCIN	O
019	DCIN	O	020	DCIN	O
021	RXD1;000	I	022	DTR1;110	O
023	DCD1;100	I	024	GND	—
025	EXKBDT;100	I/O	026	IFWEN;000	O
027	IFRADY;000	I	028	IFINDX;000	I
029	SELCT;100	I	030	SLIN;000	O
031	GND	—	032	PD2;100	I/O
033	PD0;100	I/O	034	STROB;000	O
035	GND	—	036	VCC	O
037	VCC	O	038	CVSYNC;110	O
039	PD1;100	I/O	040	VCC	O
041	PD3;100	I/O	042	PD6;100	I/O
043	ACK;000	I	044	IFWDAT;000	O
045	IFSTEP;000	O	046	IFWPRQ;000	I
047	GND	—	048	GND	—
049	GND	—	050	GND	—
051	RTS1;110	O	052	VCC	O
053	DCIN	O	054	DCIN	O
055	DCIN	O	056	GND	—
057	TXD1;010	O	058	RT1;100	I
059	MOUSDT;100	I/O	060	GND	—
061	PRCHEK;000	I	062	IFHMED;000	I
063	IFDIRC;000	O	064	IFSSEL;000	O
065	IFTRKO;000	I	066	BUSY;100	I
067	PD7;100	I/O	068	PD4;100	I/O
069	VCC	O	070	VCC	O
071	CHSYNC;110	O	072	VCC	O

C.7 PJ7 KB Connector (19-pin)

Table C-7 KB connector pin assignments (19-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
001	KBOT00;001	O	002	KBOT01;001	O
003	KBOT02;001	O	004	KBRT0;100	I
005	KBRT1;100	I	006	KBRT2;100	I
007	KBRT3;100	I	008	KBRT4;100	I
009	KBRT5;100	I	010	KBRT6;100	I
011	KBRT7;100	I	012	KBOT03;001	O
013	KBOT04;001	O	014	KBOT05;001	O
015	KBOT06;001	O	016	KBOT07;001	O
017	KBOT08;001	O	018	KBOT09;001	O
019	KBOT10;001	O			

C.8 PJ9 LED Connector (12-pin)

Table C-8 LED connector pin assignments (12-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
001	GND	—	002	GND	—
003	GND	—	004	GND	—
005	DCRED;101	O	006	DCGRN;101	O
007	CHGSP;120	O	008	CHHRQ;100	O
009	HDDLED	O	010	CAPLED;101	O
011	ARWLED;101	O	012	NUMLED;101	O

C.9   PJ11 PCMCIA Connector (140-pin)

Table C-9 PCMCIA connector pin assignments (140-pin) (1/2)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
001	GND	—	002	GND	—
003	GND	—	004	GND	—
005	GND	—	006	GND	—
007	CDA2;000	I	008	SDB2;000	I
009	WPA;100	I	010	WPB;100	I
011	CDA10;100	I/O	012	CDB10;100	I/O
013	CDA02;100	I/O	014	CDB02;100	I/O
015	CDA09;100	I/O	016	CDB09;100	I/O
017	CDA01;100	I/O	018	CDB01;100	I/O
019	CDA08;100	I/O	020	CDB08;100	I/O
021	CDA00;100	I/O	022	CDB00;100	I/O
023	BVDA1;100	I	024	BVDB1;100	I
025	CADA00;100	O	026	CADB00;100	O
027	BVDA2;100	I	028	BVDB2;100	I
029	CADA01;100	O	030	CADB01;100	O
031	REGA;000	O	032	REGB;000	O
033	CADA02;100	O	034	CADB02;100	O
035	N.C.	—	036	N.C.	—
037	CADA03;100	O	038	CADB03;100	O
039	WAITA;000	I	040	WAITB;000	I
041	CADA04;100	O	042	CADB04;100	O
043	CRESTA;100	O	044	CRESTB;100	O
045	CADA05;100	O	046	CADB05;100	O
047	N.C.	—	048	N.C.	—
049	CADA06;100	O	050	CADB06;100	O
051	CADA25;100	O	052	CADB25;100	O
053	CADA07;100	O	054	CADB07;100	O
055	CADA24;100	O	056	CADB24;100	O
057	CADA12;100	O	058	CADB12;100	O
059	CADA23;100	O	060	CADB23;100	O
061	CADA15;100	O	062	CADB15;100	O
063	CADA22;100	O	064	CADB22;100	O
065	CADA16;100	O	066	CADB16;100	O
067	MCVPPA	O	068	MCVPPB	O
069	MCVPPA	O	070	MCVPPB	O
071	MCVCCA	O	072	MCVCCB	O

Table C-9 PCMCIA connector pin assignments (140-pin) (2/2)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
073	MCVCCA	O	074	MCVCCB	O
075	CADA21;100	O	076	CADB21;100	O
077	BSYA;000	I	078	BSYB;000	I
079	CADA20;100	O	080	CADB20;100	O
081	WEA;000	O	082	WEB;000	O
083	CADA19;100	O	084	CADB19;100	O
085	CADA14;100	O	086	CADB14;100	O
087	CADA18;100	O	088	CADB15;100	O
089	CADA13;100	O	090	CADB13;100	O
091	CADA17;100	O	092	CADB17;100	O
093	CADA08;100	O	094	CADB08;100	O
095	IOWA;000	O	096	CADB09;100	O
097	CADA09;100	O	098	CADB09;100	O
099	IORA;000	O	100	IORB;000	O
101	CADA11;100	O	102	DADB11;000	O
103	N.C.	—	104	N.C.	—
105	OEA;000	O	106	OEB;000	O
107	CE2A;000	I/O	108	CE2B;000	I/O
109	CADA10;100	I/O	110	CADB10;100	I/O
111	CDA15;100	I/O	112	CDB15;100	I/O
113	CE1A;000	O	114	CE1B;000	O
115	CDA14;100	I/O	116	CDB14;100	I/O
117	CDA07;100	I/O	118	CDB07;100	I/O
119	CDA13;100	I/O	120	CDB13;100	I/O
121	CDA06;100	I/O	122	CDB06;100	I/O
123	CDA12;100	I/O	124	CDB12;100	I/O
125	CDA05;100	I/O	126	CDB05;100	I/O
127	CDA11;100	I/O	128	CDB11;100	I/O
129	CDA04;100	I/O	130	CDB04;100	I/O
131	CDA1;000	I/O	132	CDB1;000	I/O
133	CDA03;100	I/O	134	CDB03;100	I/O
135	GND	—	136	GND	—
137	GND	—	138	GND	—
139	GND	—	140	GND	—

C.10   PJ12 LCD Connector (40-pin)

Table C-10   LCD connector pin assignments (40-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
001	LCDV	O	002	LCDV	O
003	SHFCLK;140	O	004	ENDATA;140	O
005	GND	—	006	PNLD23;140	O
007	GND	—	008	PNLD22;140	O
009	GND	—	010	PNLD03;140	O
011	GND	—	012	PNLD02;140	O
013	GND	—	014	PNLD04;140	O
015	GND	—	016	PNLD05;150	O
017	GND	—	018	PNLD10;140	O
019	GND	—	020	PNLD06;150	O
021	GND	—	022	PNLD11;150	O
023	GND	—	024	PNLD07;140	O
025	GND	—	026	PNLD14;140	O
027	GND	—	028	PNLD12;140	O
029	GND	—	030	PNLD15;140	O
031	GND	—	032	PNLD13;140	O
033	GND	—	034	PNLD18;140	O
035	GND	—	036	PNLD19;140	O
037	GND	—	038	PNLD20;140	O
039	GND	—	040	PNLD21;140	O

C.11   PJ13 LCD Connector (5-pin)

Table C-11   LCD connector pin assignments (5-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
001	DSPV	O	002	DSPV	O
003	GND	—	004	GND	—
005	BRIGHT;100	O			

C.12 PJ14 PS I/F Connector (60-pin)

Table C-12 PS I/F connector pin assignments (60-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
001	VCC	I	002	VCC	I
003	VCC	I	004	VCC	I
005	VCC	I	006	VCC	I
007	IPSSWL;000	I	008	KBCMDT;100	I/O
009	IPSSWR;000	I	010	KBCMCK;100	I/O
011	IPSSEL;100	O	012	MOUSCK;100	I/O
013	SUBBAT	I	014	MOUSDT;100	I/O
015	DCIN	I	016	DCIN	I
017	DCIN	I	018	DCIN	I
019	DCIN	I	020	DCIN	I
021	GND	—	022	GND	—
023	GND	—	024	GND	—
025	GND	—	026	GND	—
027	B5V	I	028	GND	—
029	PVT	I	030	PVT	I
031	PCLR;000	I	032	ACPUTH	I
033	PSBUSY;000	I	034	DCGRN;100	I
035	RCLR;100	I	036	DCRED;100	I
037	PSSMI;000	I	038	GND	—
039	GND	—	040	GND	—
041	GND	—	042	GND	—
043	GND	—	044	GND	—
045	LOBAT;000	I	046	PSRD;100	O
047	ENVCC;000	I	048	SUSSTA;100	O
049	PSBEEP;000	O	050	PNLOF;000	O
051	PSSD;100	I	052	P12V	I
053	B3V	I	054	B3V	I
055	CPUV	I	056	CPUV	I
057	CPUV	I	058	CPUV	I
059	CPUV	I	060	CPUV	I

C.13   PJ15 RTC Battery Connector (3-pin)

Table C-13 RTC battery connector pin assignments (3-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
001	BAT	I	002	N.C.	—
003	GND	—			

C.14   PJ16 Fan Connector (3-pin)

Table C-14 Fan connector pin assignments (3-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
001	FANON;002	O	002	GND	—
003	GND	—			

C.15   PJ17 Panel Sensor Connector (3-pin)

Table C-15 Panel sensor connector pin assignments (3-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
001	PNLOFF;000	O	002	N.C.	—
003	GND	—			

C.16   PJ18 Speaker Connector (2-pin)

Table C-16 Speaker connector pin assignments (2-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
001	SPKP;100	O	002	SPKM;100	O

C.17   PJ20 Sound I/F Connector (70-pin)

Table C-17 Sound I/F connector pin assignments (70-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
001	SA05;100	O	002	SA06;100	O
003	GND	—	004	GND	—
005	SA07;100	O	006	SA08;100	O
007	SA09;100	O	008	AEN;100	O
009	GND	—	010	GND	—
011	SD00;100	I/O	012	SD01;100	I/O
013	SD02;100	I/O	014	SD03;100	I/O
015	SD04;100	I/O	016	SD05;100	I/O
017	SD06;100	I/O	018	SD07;100	I/O
019	GND	—	020	GND	—
021	SA04;100	O	022	SA03;100	O
023	SA02;100	O	024	SA01;100	O
025	SA00;100	O	026	IOWR;000	O
027	IORD;000	O	028	DACK0;000	O
029	DACK1;000	O	030	RESET;100	
031	BLAWR;000	O	032	GND	—
033	GND	—	034	C14R3M;101	O
035	IRQ9;100	I	036	IRQ5;100	I
037	IRQ7;100	I	038	IRQ10;100	I
039	DRQ0;100	I	040	DRQ1;100	I
041	GND	—	042	GND	—
043	SDMUTE;100	O	044	SPKVOL;100	D
045	SPKP;100	O	046	SPKM;100	O
047	GND	—	048	GND	—
049	CSPTON;000	O	050	HKBEEP;100	O
051	PSPNBP;100	O	052	GND	—
053	GND	—	054	GND	—
055	IPSSELL;000	O	056	IPSSELR;000	O
057	GND	—	058	GND	—
059	GND	—	060	GND	—
061	GND	—	062	PVT	O
063	GND	—	064	GND	—
065	GND	—	066	ATBEEP;100	O
067	VCC	O	068	VCC	O
069	VCC	O	070	VCC	O

C.18 PJ21 Sub-battery Connector (2-pin)

Table C-18 Sub-battery connector pin assignments (2-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
001	SUBBAT	I	002	GND	—

C.19 PJ22 DC Jack Connector (3-pin)

Table C-19 DC jack connector pin assignments (3-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
001	DCIN	I	002	GND	—
003	GND	—			

Appendix D   Keyboard Scan/Character Codes

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

Cap No.	Keytop	Code set 1		Code set 2			Note
		Make	Break	Make	Break		
01	' ~	29	A9	0E	F0	0E	
02	1 !	02	82	16	F0	16	
03	2 @	03	83	1E	F0	1E	
04	3 #	04	84	26	F0	26	
05	4 $	05	85	25	F0	25	
06	5 %	06	86	2E	F0	2E	
07	6 ^	07	87	36	F0	36	
08	7 &	08	88	3D	F0	3D	*2
09	8 *	09	89	3E	F0	3E	*2
10	9 (	0A	8A	46	F0	46	*2
11	0)	0B	8B	45	F0	45	
12	- _	0C	8C	4E	F0	4E	
13	= +	0D	8D	55	F0	55	
15	BkSp	0E	8E	66	F0	66	
16	Tab	0F	8F	0D	F0	0D	
17	Q	10	90	15	F0	15	
18	W	11	91	1D	F0	1D	
19	E	12	92	24	F0	24	
20	R	13	93	2D	F0	2D	
21	T	14	94	2C	F0	2C	
22	Y	15	95	35	F0	35	
23	U	16	96	3C	F0	3C	*2
24	I	17	97	43	F0	43	*2
25	O	13	98	44	F0	44	*2
26	P	19	99	4D	F0	4D	*2
27	[{	1A	9A	54	F0	54	
28	] }	1B	9B	5B	F0	5B	
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	Break	Code set 2 Make	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		Code set 2		Note
		Make	**Break**	**Make**	**Break**	
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*   **Fn** key does not generate a code by itself.
5*   This key corresponds to key No. 42 in 102-key model.
6*   Refer to table D-6, scan codes with **Ctrl** key.
7*   Refer to table D-7, scan codes with **Alt** key.

Table D-2 Scan codes with left Shift key

Cap No.	Key top	Code set 1 Make	Code set 1 Break	Code set 2 Make	Code set 2 Break
75	INS	E0 AA E0 52	E0 D2 E0 2A	E0 F0 12 E0 70	E0 F0 70 E0 12
76	DEL	E0 AA E0 53	E0 D3 E0 2A	E0 F0 12 E0 71	E0 F0 71 E0 12
79	←	E0 AA E0 4B	E0 CB E0 2A	E0 F0 12 E0 6B	E0 F0 6B E0 12
80	Home	E0 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 below:*

	With left **Shift**	With right **Shift**
Set 1	E0 AA	E0 B6
	E0 2A	E0 36
Set 2	E0 F0 12	E0 F0 59
	E0 12	E0 59

Table D-3 Scan codes in Numlock mode

Cap No.	Key top	Code set 1 Make	Code set 1 Break	Code set 2 Make	Code set 2 Break
75	INS	E0 2A E0 52	E0 02 E0 AA	E0 12 E0 70	E0 F0 70 E0 F0 12
76	DEL	E0 2A E0 53	E0 D3 E0 AA	E0 12 E0 71	E0 F0 71 E0 F0 12
79	←	E0 2A E0 4B	E0 CB E0 AA	E0 12 E0 6B	E0 F0 6B E0 F0 12
80	Home	E0 2A E0 47	E0 C7 E0 AA	E0 12 E0 6C	E0 F0 6C E0 F0 12
81	End	E0 2A E0 4F	E0 CF E0 AA	E0 12 E0 69	E0 F0 69 E0 F0 12
83	↑	E0 2A E0 48	E0 C8 E0 AA	E0 12 E0 75	E0 F0 75 E0 F0 12
84	↓	E0 2A E0 50	E0 D0 E0 AA	E0 12 E0 72	E0 F0 72 E0 F0 12
85	PgUp	E0 2A E0 49	E0 C9 E0 AA	E0 12 E0 7D	E0 F0 7D E0 F0 12
86	PgDn	E0 2A E0 51	E0 D1 E0 AA	E0 12 E0 7A	E0 F0 7A E0 F0 12
89	→	E0 2A E0 4D	E0 CD E0 AA	E0 12 E0 74	E0 F0 74 E0 F0 12

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 Make						Code set 2 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
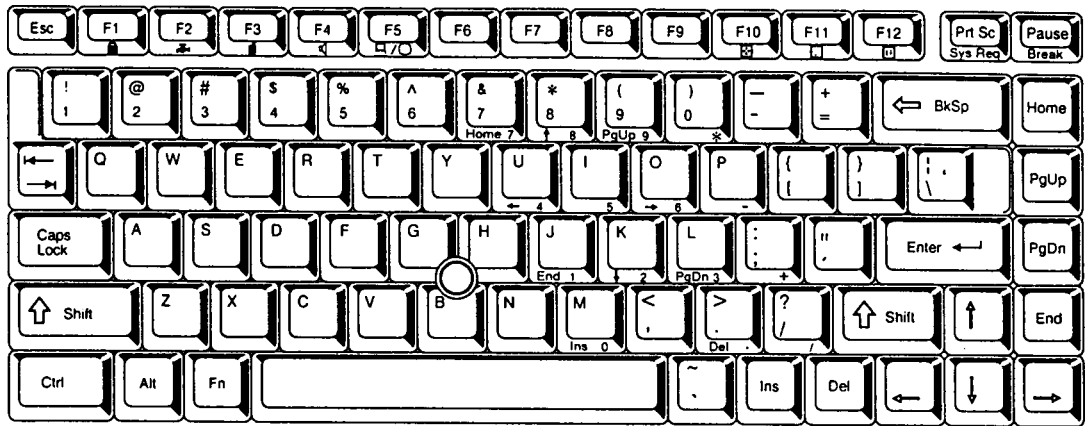
Figure E-1 US keyboard

E.2   United Kingdom (UK) Keyboard
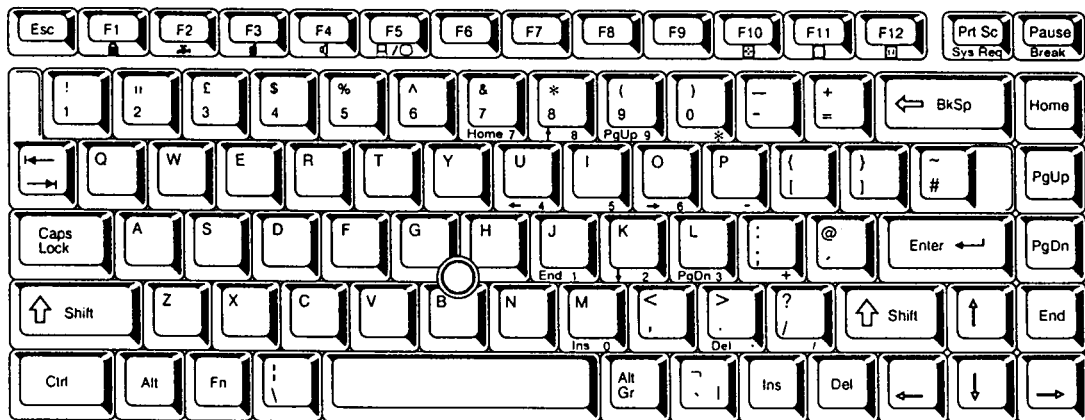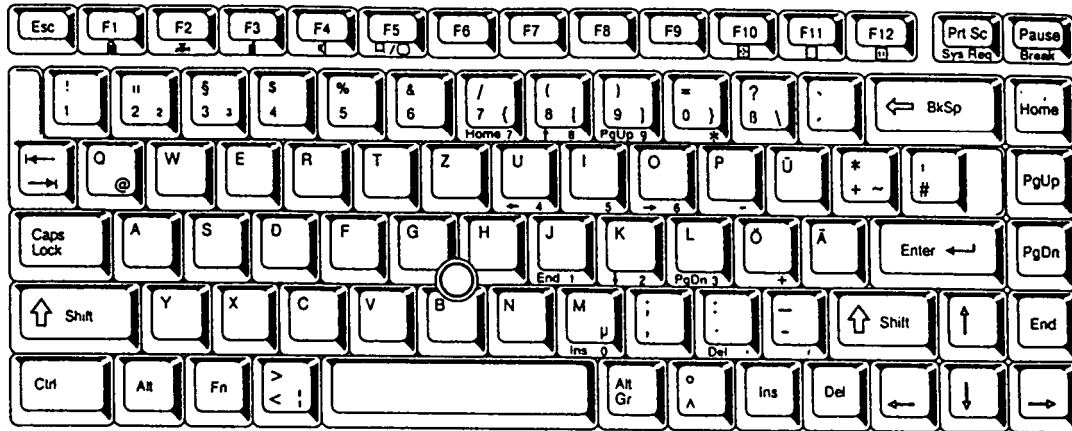

Figure E-2 UK keyboard

E.3　German (GR) Keyboard

Figure E-3　GR keyboard

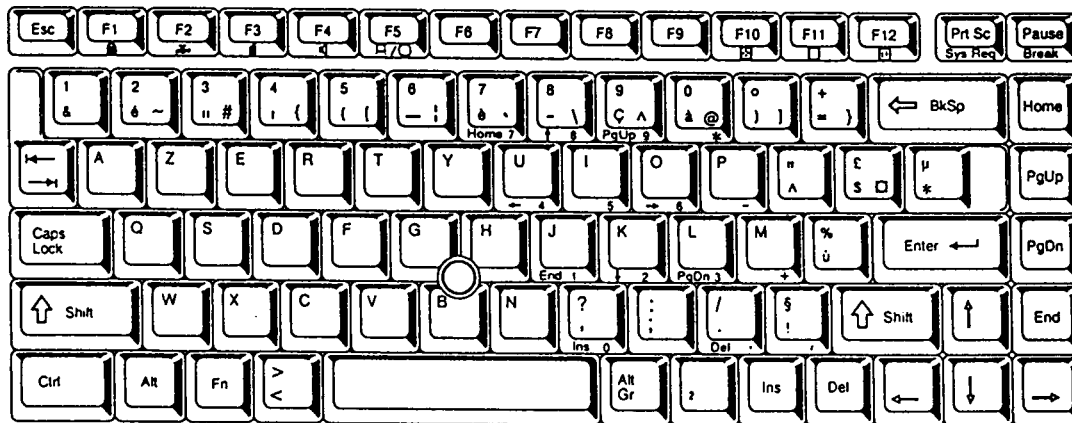## E.4　French (FR) Keyboard

Figure E-4　FR keyboard

E.5 Spanish (SP) Keyboard
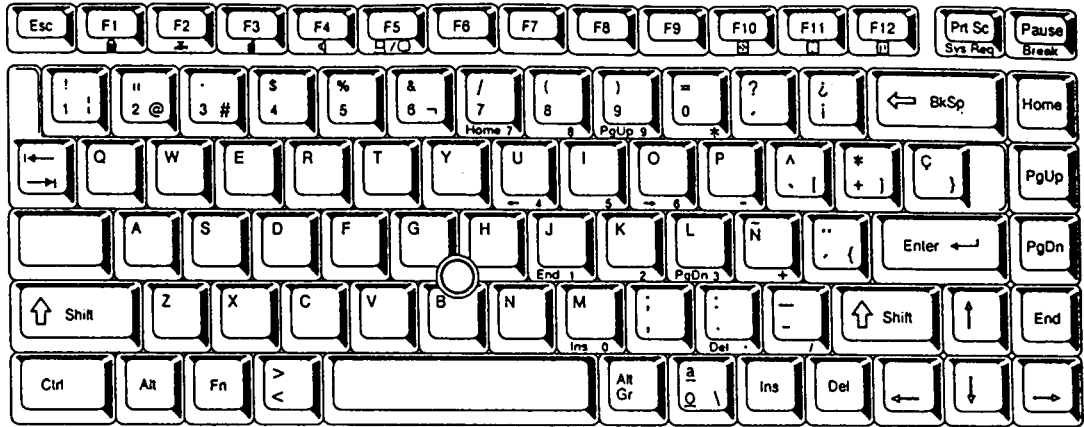

Figure E-5 SP keyboard

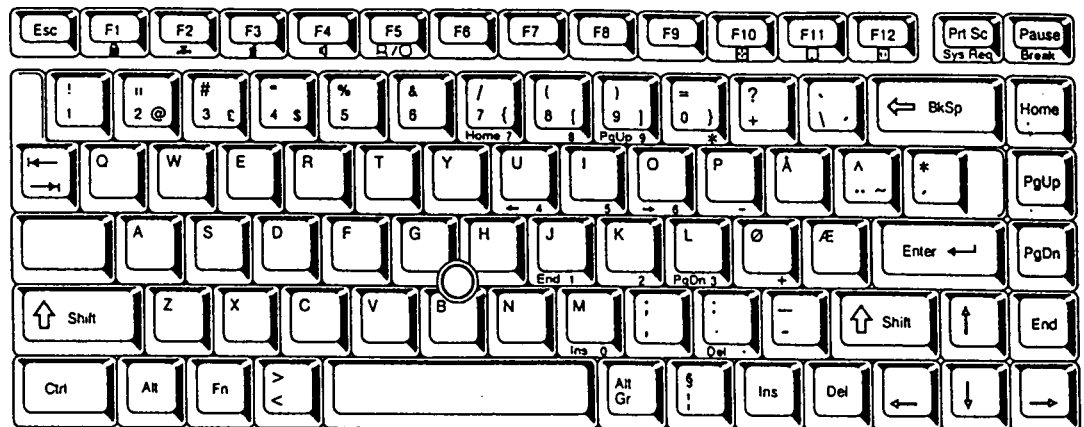## E.6 Italian (IT) Keyboard

Figure E-6 IT keyboard

E.7   Scandinavian (SC) Keyboard
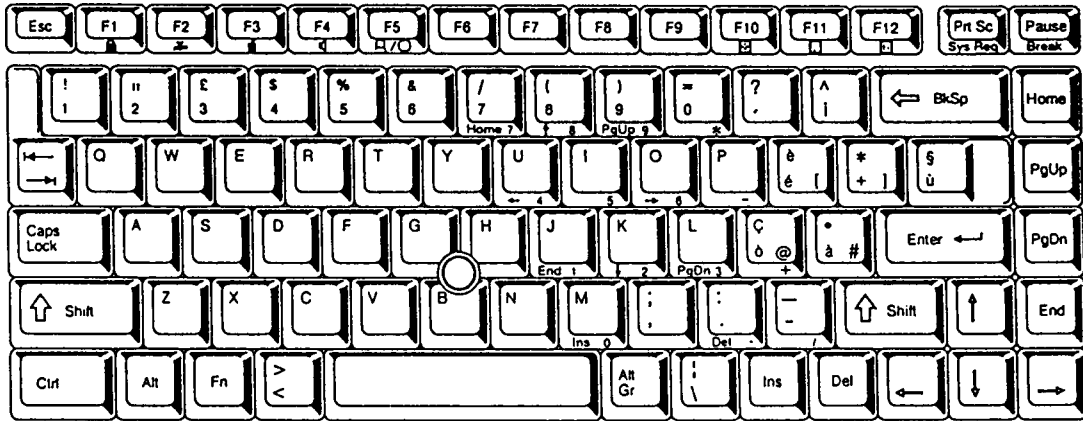

Figure E-7 SC keyboard

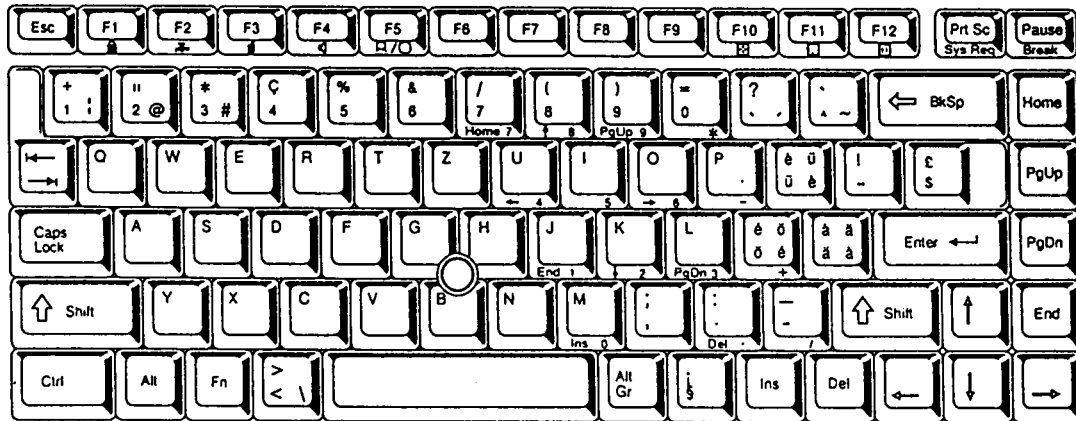## E.8   Swiss-German (SL) Keyboard

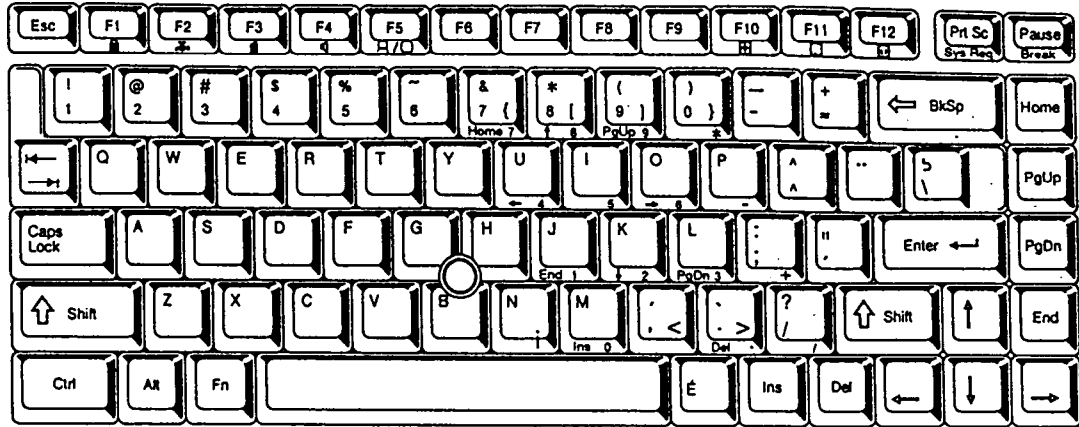*Figure E-8 SL keyboard*

E.9   Canadian (Specialized) Keyboard

Figure E-9 Canadian keyboard

Appendix F Wiring Diagrams
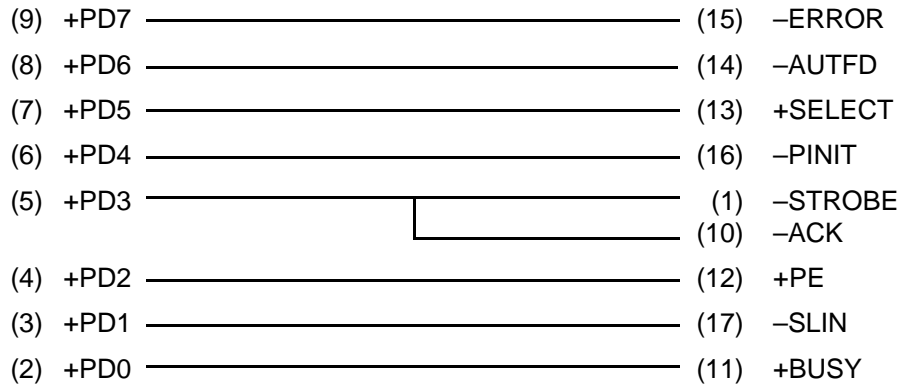
F.1   Printer Wraparound Connector

```
(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
```
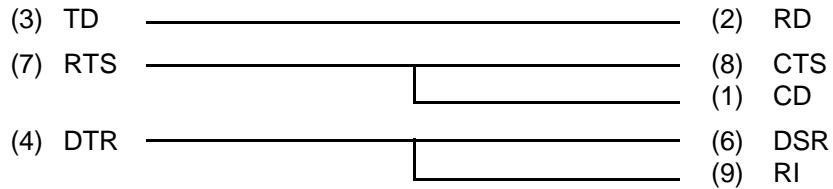
Figure F-2   RS-232-C wraparound connector

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  ──────────────┘
```
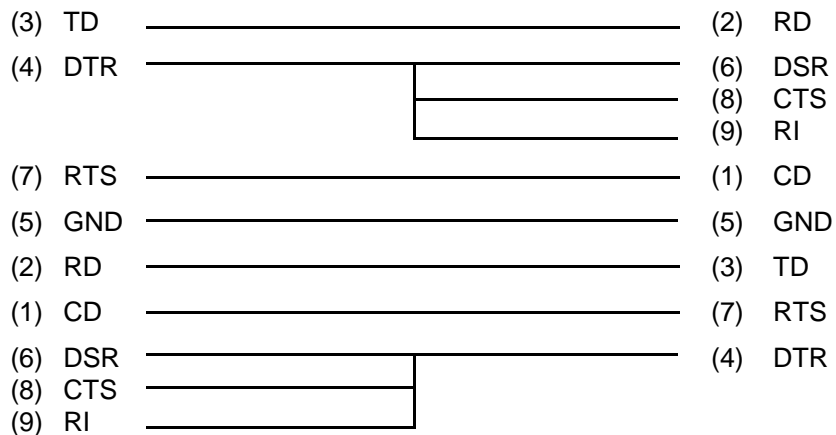
Figure F-3   RS-232-C direct cable (9-pin to 9-pin)

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   ─────────┘────────┘
```
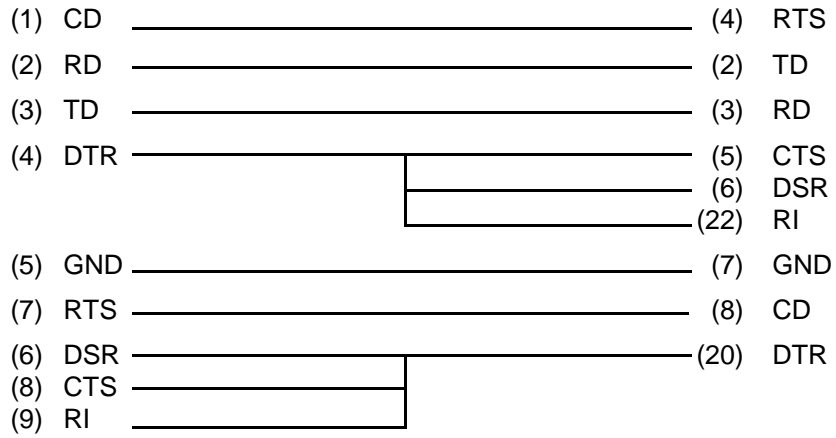
Figure F-4 RS-232-C direct cable (9-pin to 25-pin)

Appendix G BIOS Rewrite Procedures

This Appendix explains how to rewrite the system BIOS program when you update the system BIOS.

Tools

To rewrite the BIOS, you need the following tool:

❏ BIOS rewrite disk for 610CT

Rewriting the BIOS

1. Set the system to Boot Mode.

2. Turn off the power to the 610CT.

3. Remove the external cable and PCMCIA card.

4. Connect the external 3.5-inch floppy disk drive to 610CT.

5. Turn on the power while holding down the **F12** key. (Keep holding down the key until the system speaker sounds a beep.)

6. When the message is displayed, insert the BIOS rewrite disk into the FDD. Press **Enter** key to start the BIOS rewrite.

7. When the BIOS rewrite is finished, eject the BIOS rewrite disk and press the reset switch to restart the system.