1.1 Features

The Toshiba T3400/T3400CT is one of the lightest and most advanced portable computers available. Utilizing advanced technology and high-speed components, the T3400/T3400CT offers excellent display legibility, battery operation and IBM PC/AT compatibility. The T3400/T3400CT system unit consists of the following features:

❏ Microprocessor

The T3400/T3400CT uses an SL Enhanced Intel 486SX-33 microprocessor that operates at 33 MHz, 3.3 Volts.

❏ Cache memory

The T3400/T3400CT has an 8 Kilobyte (KB) cache memory stored in the i486SX microprocessor.

❏ Disk storage

The T3400/T3400CT has an internal 120 Megabyte (MB) Hard Disk Drive (HDD) with an average access time of 17 milliseconds. An external 3.5-inch Floppy Disk Drive (FDD) supports 2HD floppy disks (1.44 MB) and 2DD floppy disks (720 KB).

❏ Memory

The T3400/T3400CT comes standard with 4 MB of CMOS Random-Access Memory (RAM) 3.3 Volts. This includes 640 KB of conventional memory and 3,456 KB of extended memory which can be utilized as expanded memory compatible with Lotus/ Intel/Microsoft-Expanded Memory Specifications (LIM-EMS).

❏ Monochrome LCD (T3400)

A high-resolution, Liquid Crystal Display (LCD) displays 640 x 480 pixels with a 64-level gray scale.
The T3400 internal display controller supports Video Graphics Array (VGA) functions on the internal display and Super VGA (SVGA) functions on the external display.

❏ TFT color LCD (T3400CT)

A high-resolution, Thin-Film Transistor (TFT) full-color LCD displays 640 x 480 pixels. The T3400CT internal display controller supports VGA functions for internal display and Super VGA (SVGA) functions for external display.

❏ Keyboard

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

❏ Batteries

The T3400/T3400CT has three batteries: a main battery, backup battery, and Real-Time Clock (RTC) battery.

❏ Personal Computer Memory Card International Association (PCMCIA) card slot

The T3400/T3400CT has one PCMCIA slot for installation of an MiNC Toshiba card modem or other industry-standard PCMCIA release 2.0 card.

❏ Parallel port

The T3400/T3400CT parallel interface port serves two purposes. The port can be used to connect a Centronics-compatible printer or an external 5.25-inch floppy disk drive.

❏ RS-232C port

The T3400/T3400CT has one 9-pin serial interface port.

❏ External 3.5-inch FDD port

The T3400/T3400CT has one external 3.5-inch FDD port.

❏ Port replicator port

The T3400/T3400CT has one port replicator port which enables connection of an optional port replicator or external monitor adapter. The port replicator allows connection of an optional PS/2 keyboard, PS/2 mouse, and external monitor.

❏ Memory module slot

The T3400/T3400CT has one slot for optional installation of a Toshiba memory module.

❏ Accupoint

The T3400/T3400CT has a pointer control stick in the center of the keyboard.

The T3400/T3400CT Personal Computer is shown in Figure 1-1. T3400/T3400CT system configuration is shown in Figure 1-2.
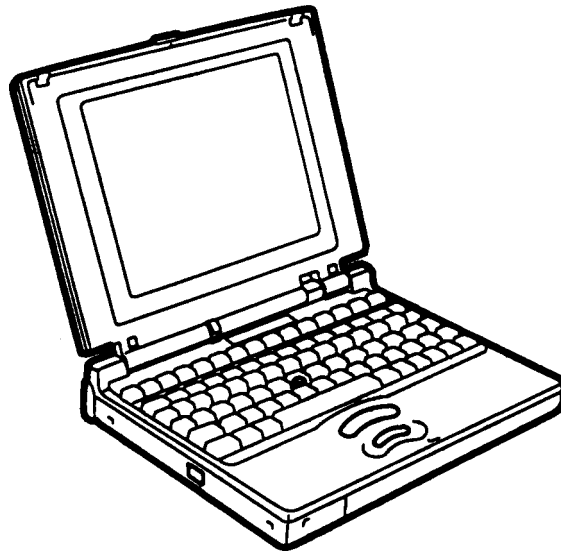

Figure 1-1 T3400/T3400CT Personal Computer

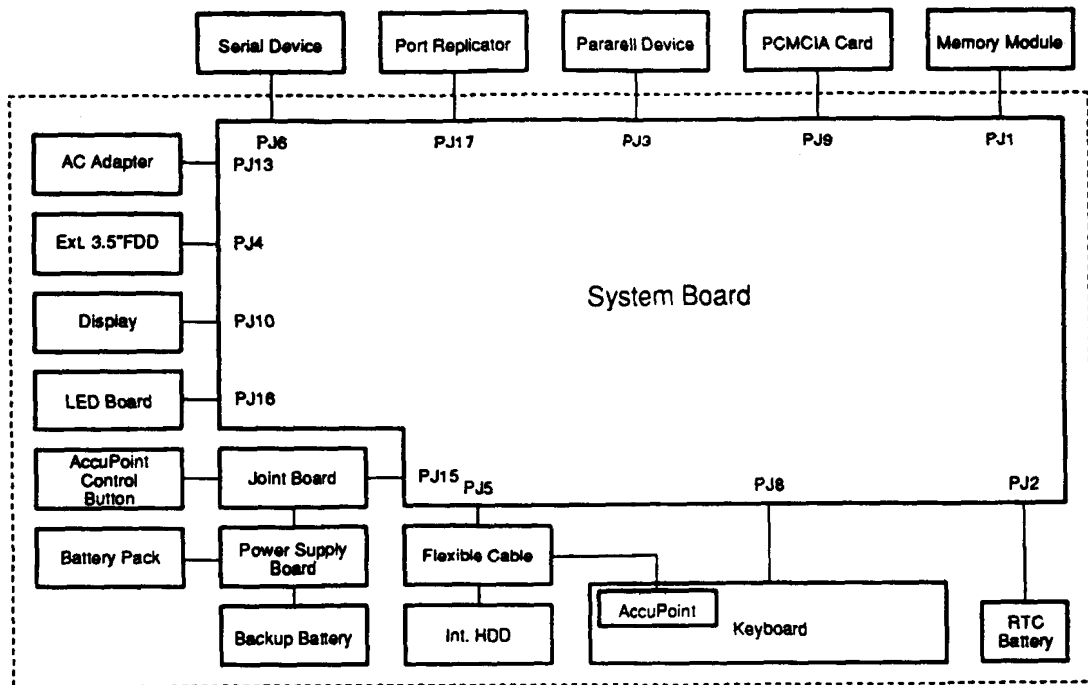*Figure 1-2 T3400/T3400CT System Unit Configuration*

1.2 System Unit Block Diagram

Figure 1-3 is a block diagram of the T3400/T3400CT system unit.
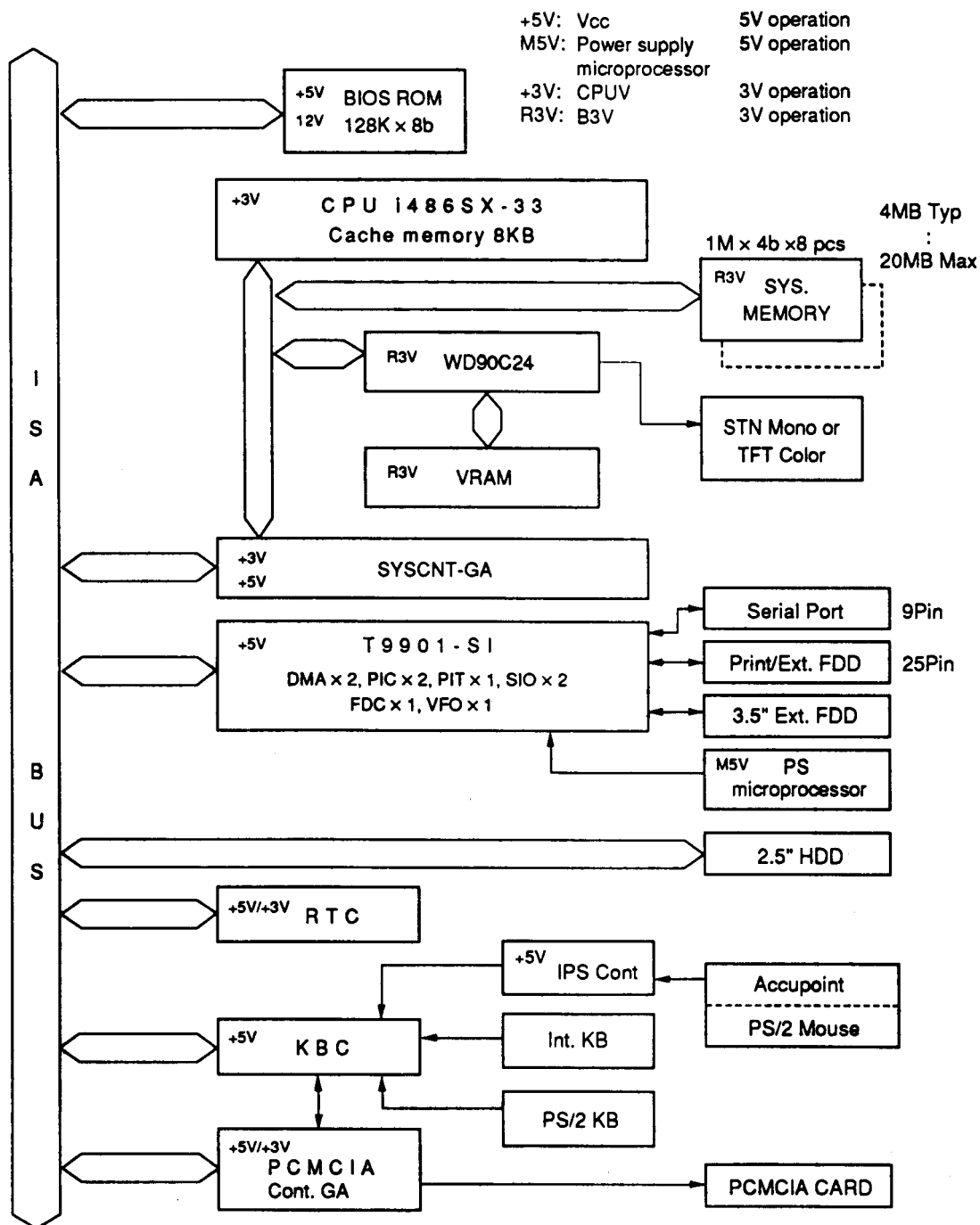

+5V: Vcc   5V operation
M5V: Power supply   5V operation
       microprocessor
+3V: CPUV   3V operation
R3V: B3V   3V operation

Figure 1-3 T3400/T3400CT System Board Block Diagram

The T3400/T3400CT system board includes the following major components:

❑ i486SX-33 CPU

❑ Super Integration (SI) T9901 Gate Array (GA), which houses the following:

- Two Direct Memory Access Controllers (DMAC): 82C37
- Two Programmable Interrupt Controllers (PIC): 82C59
- One Programmable Interval Timer (PIT): 82C54
- One Floppy Disk Controller (FDC): TC8565
- One Serial Input/Output Controller (SIO): TC8570
- One Variable Frequency Oscillator (VFO): TC8568
- One Input/Output (I/O) Controller
- One Printer Port Controller
- One Speaker Controller

❑ RTC

One T9934 chip with 128 bytes of memory is used. Fourteen bytes of memory are used for the calendar and clock, and the remaining 114 bytes for system configuration data.

OSC (X2) generates 32.768 KHz for the RTC.

❑ Keyboard Controller (KBC)

One M37452M4 chip is used. This KBC includes the keyboard scan controller and keyboard interface controller. The KBC controls the internal keyboard, Accupoint (pointer control stick), external keyboard, and PS/2 mouse.

❑ The following memories:

Standard RAM:	4 MB
Cache memory:	8 KB (inside CPU)
BIOS ROM:	128 KB (96 KB are used)
	This ROM contains Initial Reliability Test (IRT), Basic Input Output System (BIOS), and video BIOS.
Video RAM:	256 KB

Optional cards can be used to expand memory to a maximum of 20 MB.

❑ VGA display controller (WD90C24)

This controller controls the internal VGA display and external SVGA- compatible display.

❑ Clock Generator receives 14.31818 MHz (X3) and generates the following frequencies:

- 33 MHz for the CPU
- 14.7477 MHz for the Communications (COM) port
- 24 MHz for the FDC and VFO
- 16 MHz is used for system controller GA
- 14.31818 MHz is used for the SI T9901 GA

❑ Gate Arrays

System Controller GA

This GA has the following functions:

- CPU Controller

- Memory Controller
    - DRAM Controller
    - Compatible Bus Interface Controller

- SMI Controller

- VL Bus Controller

- Bus Controller
    - Compatible Bus Interface Controller
    - Compatible Access Controller
    - DMAC Controller
    - I/O Controller

- Address Latch Controller
    - 32 to 16-Bit Controller
    - Address Latch
    - DMA Address Generator
    - Refresh Address Generator

- I/O Register
    - Compatible I/O Port
    - Saving Register Controller data in AutoResume (resume mode)
    - Toshiba Special Register

- Processing Speed Controller
- Data Bus Change Controller
- Data Latch

PCMCIA Controller GA

This GA has the following functions:

- Memory Card Controller
    - PCMCIA IC Card Controller
    - Toshiba Modem Card Controller

1.3   External 3.5-inch Floppy Disk Drive

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

The FDD is shown in Figure 1-4. Specifications for the FDD are provided in Table 1-1.
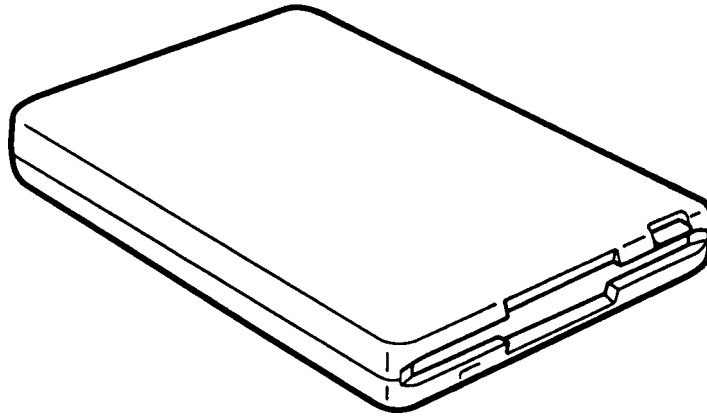
Figure 1-4 3.5-inch FDD

Table 1-1 3.5-inch FDD Specifications

Item	2-MB mode	1-MB mode
Storage capacity (KB) Unformatted Formatted	2,000 1,311	1,000 737
Number of heads	2	2
Number of cylinders	80	80
Access time (ms) Track to track Average Head settling time	3 181 15	3 181 15
Recording track density (tpi)	135	135
Data transfer rate (Kbps)	500	250
Rotation speed (rpm)	300	300
Recording method	Modified Frequency Modulation (MFM)	

1.4   2.5-inch Hard Disk Drive

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

The T3400/T3400CT supports a 120 MB HDD**.**

The HDD is shown in Figure 1-5. Specifications for the HDD are provided in Table 1-2.

Figure 1-5 2.5-inch HDD

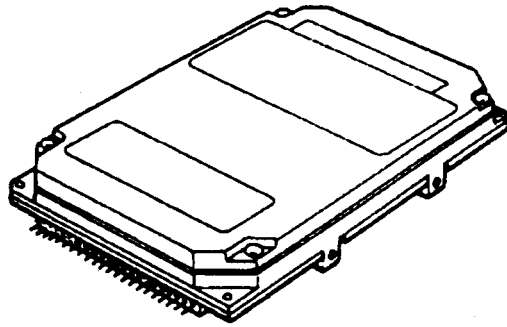*Table 1-2 2.5-inch HDD Specifications*

Items	(CP2124)	(MK2124FC)
Storage capacity (MB) Formatted	121.6	130.1
Number of disks	2	2
Data heads	4	4
Data surfaces	4	4
Tracks per surface	1,123	1,155
Sectors per track	53 (+1)	55 (+1)
Bytes per sector	512	512
Access time (ms) Track to track Average Maximum	10 17 35	5 17 36
Rotation speed (rpm)	3,743	3,200
Data transfer rate (bps) To/from media	18 M	15.3 M
Interleave	1:1	1:1
Recording method	2-7 RLL/ 1-7 RLL	1-7 RLL

1.5 Keyboard

The 82-key (USA) or 84-key (European) keyboard is mounted on the system unit. The keyboard is connected to the KBC on the system board via a 19-pin flat cable. The keyboard is shown in Figure 1-6.

See Appendix F for optional configurations.
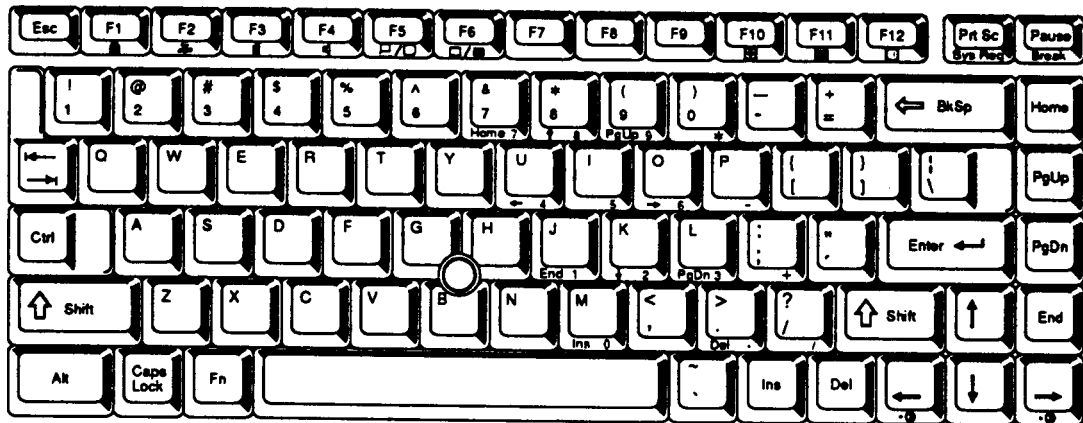
Figure 1-6 Keyboard

1.6   Monochrome LCD

The monochrome LCD is composed of an LCD module, a Fluorescent Lamp (FL), and an FL inverter board.

1.6.1   Monochrome LCD Module

The T3400 monochrome LCD supports 640 x 480 pixels with a video controller and 64 levels of gray. The video controller includes the functions of the VGA and SVGA.

The LCD receives vertical and horizontal synchronizing signals, 8-bit data signals (4-bit upper block data signal and 4-bit lower block data signal), and shift clock for data transmission. All signals are CMOS-level compatible.

The sidelit LCD is shown in Figure 1-7 and its specifications are provided in Table 1-3.
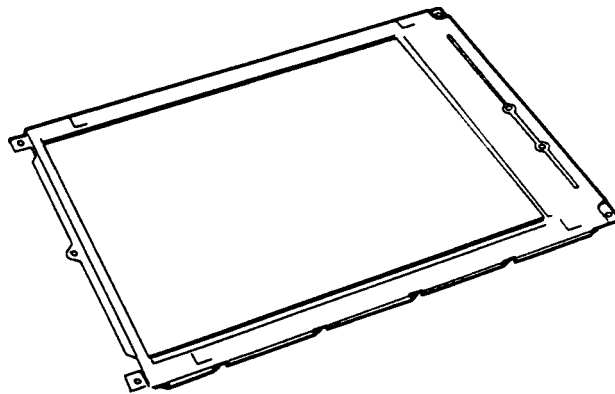
Figure 1-7 Monochrome LCD

Table 1-3 Monochrome LCD Specifications

Item		Specifications
Number of dots	(dots)	640 x 480
Dot pitch	(mm)	0.24 (W) x 0.24 (H)
Display area	(mm)	176.8 (W) x 132.6 (H)
Contrast		18:1 (typically)
FL current	(mA)	4.0 (full-power mode)
FL frequency	(KHz)	44

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1.6.2 Monochrome Fluorescent Lamp (FL) Inverter Board

The FL inverter board supplies the high-frequency current needed to illuminate the FL. Specifications for the FL inverter board are provided in Table 1-4.

Table 1-4 Monochrome FL Inverter Board Specifications

Item			Specifications
Input	Voltage	(VDC)	10
	Power	(W)	3.0
Output	Voltage	(VAC)	1,100 (r.m.s)
	Current	(mA)	5.0 (r.m.s)
	Frequency	(KHz)	44

1.7   TFT Color LCD

The TFT Color LCD contains an LCD module, an FL, and an FL inverter board.

1.7.1   TFT Color LCD Module

The T3400CT TFT color LCD supports 640 x 480 pixels with an internal display controller and 256K colors for graphics and characters. This controller includes the functions of VGA and SVGA for external display.

The T3400CT's LCD receives 9-bit data signals, data-enable signals, and shift clock for data transmission. All signals are CMOS-level compatible.

The TFT LCD is shown in Figure 1-8. Specifications for the LCD are provided in Table 1-5.
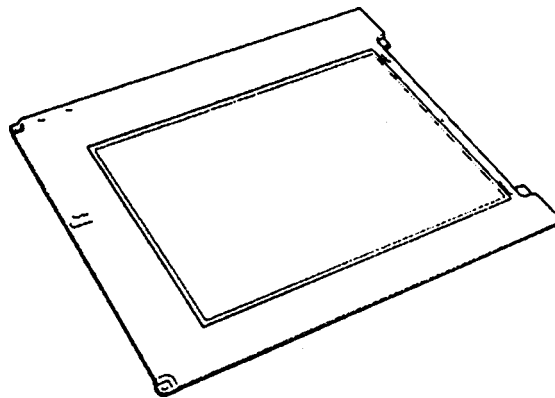
Figure 1-8 TFT Color LCD

Table 1-5 TFT Color LCD Specifications

Item		Specifications
Number of dots	(dots)	640 x 480
Dot pitch	(mm)	0.249 (W) x 0.249 (H)
Display area	(mm)	159.36 (W) x 119.52 (H)
Contrast		55:1 (minimum)
FL current	(mA)	5.0
FL frequency	(KHz)	33

1.7.2 TFT Color Fluorescent Lamp (FL) Inverter Board

The FL inverter board supplies high-frequency current to light the LCD Fluorescent Lamp. Specifications for the FL inverter are provided in Table 1-6.

Table 1-6 FL Inverter Board Specifications

Item			Specifications
Input	Voltage	(VDC)	10
	Power	(W)	3
Output	Voltage	(VAC)	1,100 (r.m.s)
	Current	(mA)	5.0
	Frequency	(KHz)	44

1.8   Power Supply

The power supply provides five kinds of voltages to the system board. The power supply has one microprocessor which operates at 500 Hz and performs the following functions:

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

2.   Detects DC output and circuit malfunctions.

3.   Controls the LED icon and speaker.

4.   Turns the battery charging system on and off.

5.   Determines if the power can be turned on and off.

6.   Determines if the battery is fully charged or low.

7.   Calculates remaining battery capacity.

Power supply output ratings are specified in Table 1-7.

Table 1-7 Power Supply Output Ratings

Use for	Name	DC voltage (V)	Regulation tolerance (%)	Maximum current (mA)	Ripple (mV)
System logic, FDD, HDD,	VCC	+5	±5	3,500	100
Display	DSPV	+10.8/+15	±5	260	150
RS-232-C Flash ROM	12V	+12	±5	70	240
RAM, CPU	B3V	+3.3	±5	1,170	66
RS-232C	-9V	-9	15	15	180

1.9   Batteries

The T3400/T3400CT has three types of batteries:

❏ Main battery pack
❏ Backup battery
❏ RTC battery

Battery specifications are provided in Table 1-8.

Table 1-8 Battery Specifications

Battery name	Material	Output voltage	Capacity
Main battery pack	Lithium-Ion	10.8 V	3,000 mAH
Backup battery	Nickel Metal Hydride	1.2 V	1,200 mAH
RTC battery	Lithium-Vanadium	3.0 V	50 mAH

1.9.1   Main Battery

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

❏   Battery Indicator

The battery indicator is located on the front left of the computer. The indicator color designates status of the removable battery pack and AC adapter.

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 or is connected, but 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 and will not begin charging until a few minutes after the AC adapter is connected.

❍   The AC adapter is not receiving power.

1.9.2   Battery Charging Control

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

❏   **Battery Charging**

When the AC adapter is attached, there are two types of charge: quick charge when the system is powered off and trickle charge when powered on. Table 1-9 gives quick and trickle charging time requirements.

Table 1-9 Time Required For Main Battery Charges

Charge	Charging time
Quick charge (power off)	About 3 hours
Trickle charge (power on)	About 8 hours

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

1.   The main battery pack becomes fully charged.
2.   The main battery pack or AC adapter is removed.
3.   The main battery pack or AC adapter output voltage is abnormal.
4.   The charge current is abnormal.

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

1.9.3   Backup Battery

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

AC adapter > Main battery pack > Backup battery

The backup battery is charged by the main battery pack or AC adapter when the system is powered on. Table 1-10 shows the charging time and data preservation period of the backup battery.

Table 1-10 Backup Battery Charging/Data Preservation Time

Backup Battery		Time
Charging Time	Power On	3 Hours
	Power Off (with AC Adapter)	Doesn't charge
	Power Off (Without AC Adapter)	Doesn't charge
Data preservation period (full charge)		8 Hours

1.9.4   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 1-11 shows the charging time and data preservation period of the RTC battery.

Table 1-11 RTC Battery Charging/Data Preservation Time

RTC Battery		Time
Charging Time	Power On	48 Hours
	Power Off	Doesn't charge
Data preservation period (full charge)		1 month

2.1 Troubleshooting

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

1. Power Supply
2. System Board(s)
3. Floppy Disk Drive
4. Hard Disk Drive
5. Keyboard
6. Display

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

The following tools are necessary for troubleshooting:

1. T3400/T3400CT Diagnostics Disk
2. Phillips-head screwdriver (2 mm)
3. Toshiba MS-DOS system disk(s)
4. 2DD or 2HD formatted work disk for FDD testing
5. Cleaning kit for FDD troubleshooting
6. Printer port LED
7. RS-232-C wraparound connector
8. Printer wraparound connector
9. Multimeter
10. External 5.25-inch FDD
11. External monitor adapter
12. External monitor

2.2 Troubleshooting Flowchart

Use the flowchart in Figure 2-1 as a guide to determine which 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.

❑ Make sure the FDD is empty.
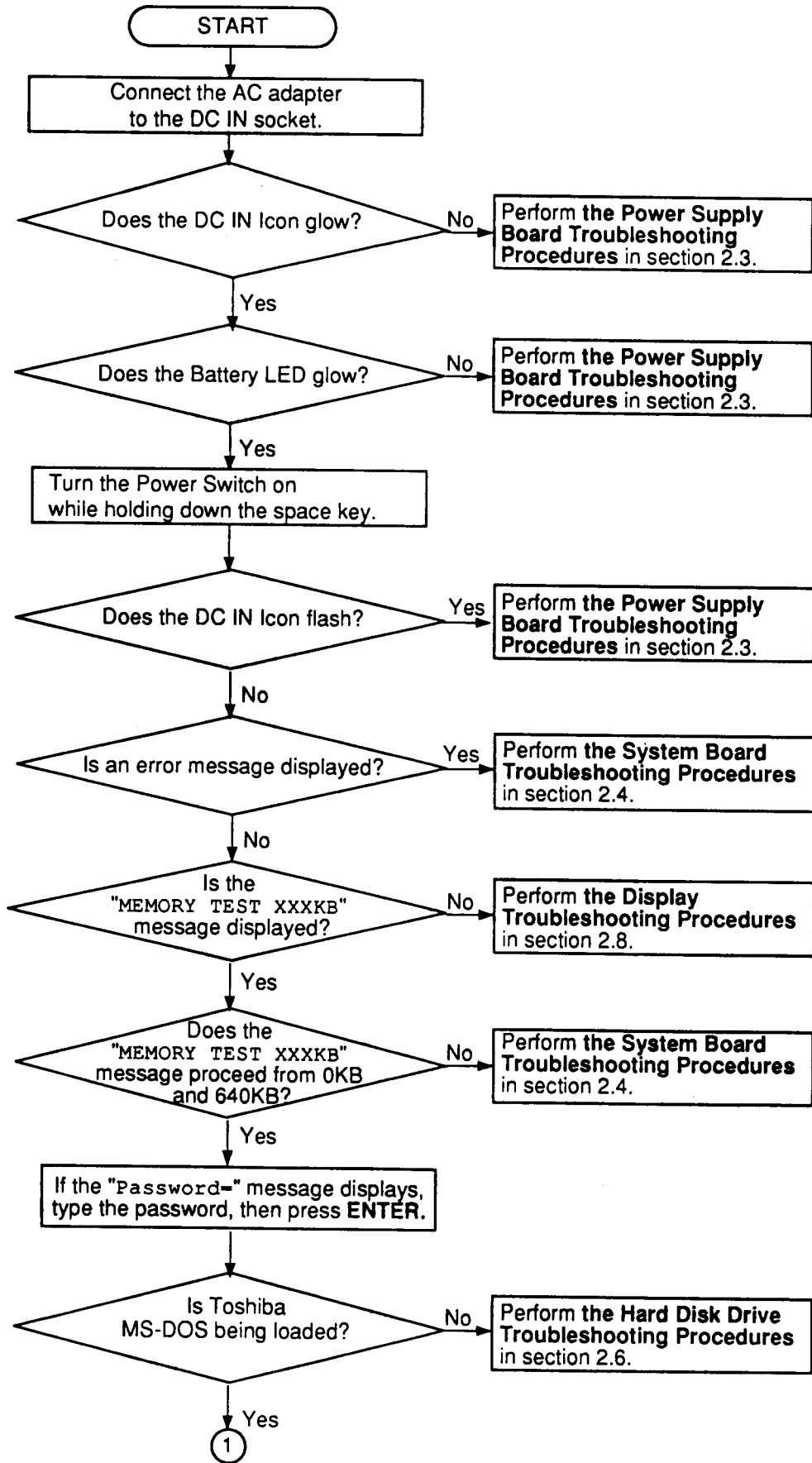
Figure 2-1 Troubleshooting Flowchart
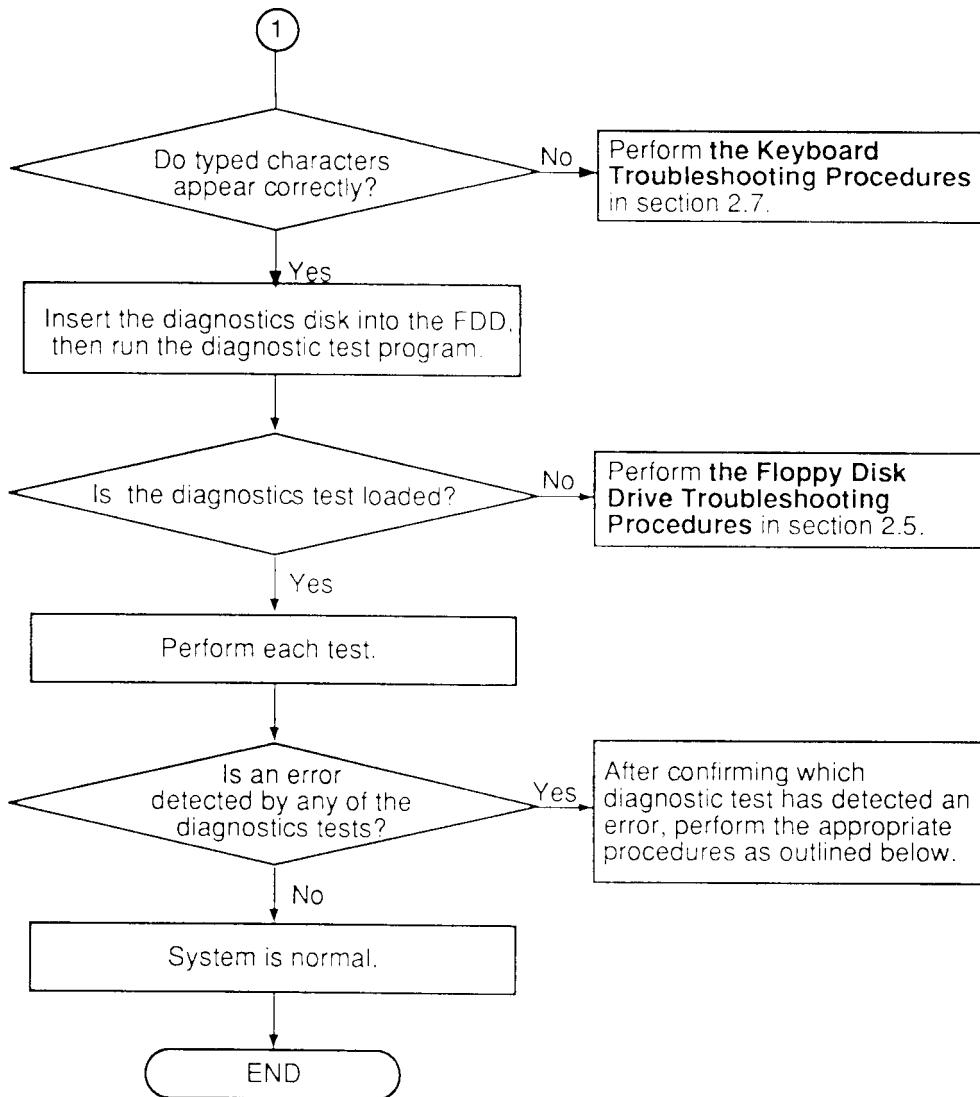
Figure 2-1 Troubleshooting Flowchart (2/2)

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 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. To determine if the power supply is functioning properly, start with Procedure 1 and continue 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 AC adapter converts AC to DC power and contains a charging circuit for charging the batteries. The adapter connects to the DC IN socket connector on the back side of the computer. When the AC adapter is connected and power is 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.

❑ If the DC IN icon does not light, the AC adapter is not supplying power, go to Check 1.

❑ If the DC IN icon is flashing green, the AC adapter 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 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 green when the AC adapter is connected, its voltage output is abnormal. Connect a new AC adapter and turn the T3400/T3400CT on again to verify the indicator condition.

Check 3   The battery pack may be malfunctioning. Replace the battery pack and turn the computer on again. If the problem persists, perform Check 4.

Check 4   Place the T3400/T3400CT in an environment between –20°C and 70°C until at ambient temperature. Repeat the steps which caused abnormal operation. If the same problem persists, perform Procedure 3.

Procedure 2   Battery LED Indicator Check

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

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

❏ If the indicator glows orange, the AC adapter is connected and the battery is being charged.

❏ If the 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 connected correctly, go to Check 2.

Check 2   Make sure the battery pack is installed correctly. Go to Check 3 if it is.

Check 3   Remove the battery pack and check that the battery terminal is clean and not bent.

❏ If the terminal appears dirty, clean gently with a cotton swab dipped in alcohol.

❏ If the terminal looks bent or damaged, replace the bottom of the system board.

❏ If the battery terminal is clean and not bent, go to Check 4.

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

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

Procedure 3   Connection and Replacement Check

The power supply board is interfaced to the system board through the joint board, which may be disconnected or damaged. Disassemble the T3400/T3400CT following the steps described in Chapter 4, *Replacement Procedures*, and perform the following checks.

Check 1   Make sure the power supply, joint, and system boards are firmly attached to their connectors.

```
+---------------------+     +-------------+     +--------------+
| Power Supply Board  |-----| Joint Board |-----| System Board |
+---------------------+     +-------------+     +--------------+
                                                       |
                                                +--------------+
                                                |  AC Adapter  |
                                                +--------------+
```
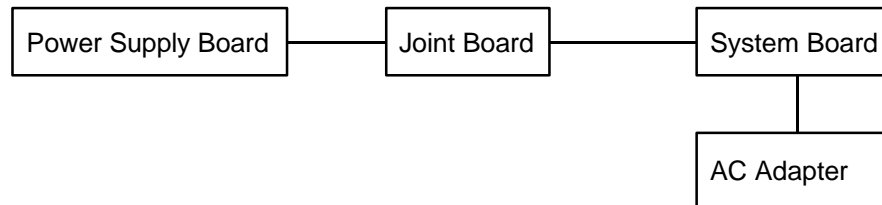
Re-attach any loose equipment. If the system is still not functioning properly, perform Check 2.

Check 2   The power supply board may be defective. Replace the power supply board 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 and restart the system. If the problem persists, go to Check 4.

Check 4   Replace the joint board and restart the system. If the problem persists, other FRUs may be damaged.

2.4   System Board Troubleshooting

This section describes how to determine if a system board is defective. Start with Procedure 1 and continue as instructed. The procedures provided 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 power is turned on, the system performs the Initial Reliability Test (IRT) resident in BIOS ROM. IRT tests and initializes each IC on the system board.

❑ 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 instructed. These errors occur when the system configuration preserved in RTC memory (CMOS-type memory) is not the same as the actual configuration or when data is lost.

Pressing the **F1** key sets the system configuration in the RTC memory configuration to the default setting. If error message (b) appears when 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, press any key.

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

The error message appears when data stored in RAM under the resume function is lost because the battery is 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 (17), (19), (20), (25) or (26), is displayed, replace the system board.

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

❏ If error message (21) or (22) is displayed, go to the HDD Troubleshooting Procedures in Section 2.6.

❏ If error message (23) or (24) 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)    KEYBOARD ERROR
(19)    KBC ERROR
(20)    HDC ERROR
(21)    HDD #0 ERROR
(22)    HDD #1 ERROR
(23)    NO FDD ERROR
(24)     FDD ERROR
(25)      TIMER INTERRUPT ERROR
(26)      RTC UPDATE ERROR
```

Procedure 2   Printer Port LED Check on Boot Mode

The printer port LED displays IRT 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.

> *NOTE: When performing this check, the Ext. FDD/PRT option in the SETUP program must be set to PRT and the computer to boot mode.*

Figure 2-2 Printer Port LED

To use the printer port LED, follow these steps:

1. Turn on the T3400/T3400CT power, then set to boot mode.

2. Turn off the power.

3. Plug the printer port LED into the PRT/FDD connector.

4. Hold down the space bar and turn on the power.

5. Read the LED status from left to right at the back of the computer.

6. Convert the status from binary to hexadecimal notation.

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

8. If 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, the printer port LED displays an error code after the IRT ends. For example, when the printer port LED displays 22 and halts, the IRT has already completed the KBC test. In this instance, the IRT indicated an error was detected during 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 DATA = 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 any of the following error codes is 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.

UPDATE

Procedure 3   Printer Port LED Check on Resume Mode

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

> *NOTE: When performing this check, the Ext. FDD/PRT option in the SETUP program must be set to PRT and the computer to resume mode.*

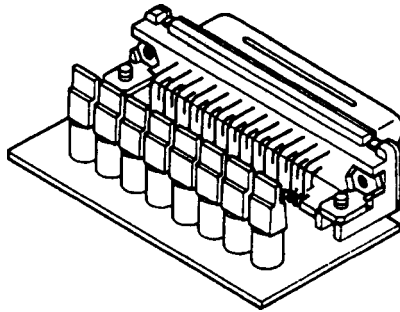To use the printer port LED, follow these steps:

1.   Turn on the T3400/T3400CT power, then set to resume mode.

2.   Turn off the power.

3.   Plug the printer port LED into the PRT/FDD connector.

4.   Turn on the power.

5.   Read the LED status from left to right at 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 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 (The card modem will be removed while the system is in resume, etc.)
FEH	Password error (The password will be erased before it is suspended.)

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 the tests.

1. System test
2. Memory test
3. Printer test
4. ASYNC test
5. Real Timer test
6. PCMCIA test

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

Procedure 5 Replacement Check

The system board may be damaged. Disassemble the T3400/T3400CT following the steps described in Chapter 4, *Replacement Procedures*, and perform the following check:

Check 1 Replace the system board. If the problem persists, other FRUs may be damaged.

2.5 Floppy Disk Drive Troubleshooting

This section describes how to determine if the external 3.5-inch floppy disk drive is functioning properly. Perform the steps below starting with Procedure 1 and continue as required.

Procedure 1:   FDD Head Cleaning Check

Procedure 2:   External 5.25-inch FDD Check

Procedure 3:   Diagnostic Test Program Check

Procedure 4:   Connector Check and Replacement Check

Procedure 1   FDD Head Cleaning Check

FDD head cleaning is one option available in the Diagnostic Program. Detailed procedures are 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 does not function properly after cleaning, go to Procedure 3.

If the test program in Procedure 3 cannot be executed, go to Procedure 2.

Procedure 2   External 5.25-inch FDD Check

The floppy disk controller on the computer system board controls the external 3.5-inch FDD and external 5.25-inch FDD. To determine if the system board or external 3.5-inch FDD is defective, check the following items:

Check 1   Connect the external 5.25-inch FDD to the PRT/FDD port and verify it functions properly. If so, perform Procedure 4. If not, perform Check 2.

> *NOTE: To use the external 5.25-inch FDD, set the Ext. FDD/PRT option in the SETUP program to FDD A or B.*

Check 2   Replace the system board following the steps in Chapter 4, *Replacement Procedures*. If the FDD is still not functioning properly, replace the external 3.5-inch FDD unit.

Procedure 3 Diagnostic Test Program Execution Check

The FDD Diagnostic Test program is stored on the T3400/T3400CT 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.

FDD test error codes and their status names are listed in Table 2-3. Verify that the floppy disk in the FDD is formatted correctly and the write protect tab is disabled. If any other errors occur while the FDD diagnostics test is executing, 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   Verify that the floppy disk is formatted correctly, then go to Procedure 4.

Procedure 4   Connector Check and Replacement Check

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

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

```
┌─────────────────────────┐          ┌──────────────────┐
│   External 3.5-inch FDD  │──────────│   System Board   │
└─────────────────────────┘          └──────────────────┘
```
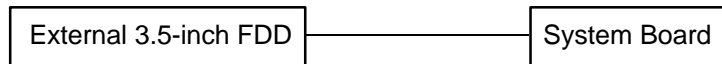
If disconnected, re-attach it and repeat Procedure 3. If the FDD is still not functioning properly, perform Check 2.

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

Check 3   Replace the system board following the steps in Chapter 4, *Replacement Procedures.*

2.6 Hard Disk Drive Troubleshooting

To determine if the HDD is functioning properly, perform the procedures below starting with Procedure 1 and continue 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 on the computer, then perform the following checks:

Check 1   Type **C:** and press **Enter**. Go to Check 2 if the drive will not change to C. Go to Procedure 2 if the drive changes to C.

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. Then 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. Then recheck the system. If the problem still exists, go to Procedure 2.

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

Procedure 2   Message Check

When the HDD does not function properly, some of the following error messages may appear on the display. Start with Check 1 below and perform 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 T3400/T3400CT. If the error message still appears, perform Check 4.

```
System transferred
```

Check 4   The HDD is connected to the system board via the flexible cable. This cable can become disconnected or damaged. Disassemble the T3400/T3400CT as described in Chapter 4, *Replacement Procedures*. If the HDD is disconnected, re-attach it to the flexible cable and return to Procedure 1. If the flexible cable is disconnected from the system board, re-attach it and return to Procedure 1. If the HDD and flexible cable are firmly connected to the system board, perform Procedure 3.

System Board — Flexible Cable — HDD
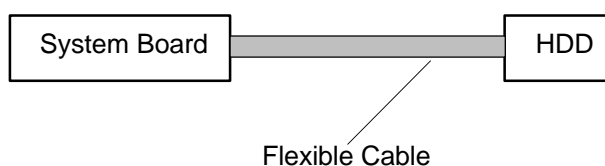
Procedure 3   Format Check

The HDD is formatted using the low-level format program and the MS-DOS FORMAT program. To format the HDD, start with Check 1 below and perform 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 T3400/T3400CT 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 the HDD cannot be formatted using the Test and Diagnostic program, go to Procedure 4.

Procedure 4   Diagnostic Test Program Execution Check

The HDD test program is stored on the T3400/T3400CT 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; per-
form Check 1. Error codes and status are listed 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 enable
20h	HDC error
40h	Seek error
80h	Time out error
AAh	Drive not ready
BBh	Undefined error
CCh	Write fault
E0h	Status error
EEh	Access time out error
FFh	Data compare error

Check 1   Replace the HDD unit 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 following the instructions in Chapter 4, *Replacement
Procedures*. If the HDD is still not functioning properly, replace the system board.

2.7 Keyboard Troubleshooting

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

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

Procedure 1   Diagnostic Test Program Execution Check

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

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

Procedure 2   Connector and Replacement Check

The keyboard is connected to the system board by a 19-pin flat cable. This cable may be disconnected or damaged. Disassemble the T3400/T3400CT 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 cable  |--------------------| System board |
+-----------------+                    +--------------+
```
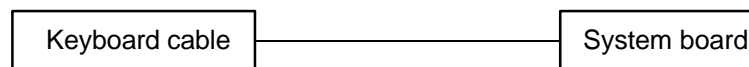
If this cable is damaged, replace the keyboard. If the cable is disconnected, firmly re-attach it. Perform Procedure 1. If the keyboard is still not functioning properly, perform Check 2.

Check 2   The keyboard controller on the system board may be damaged. Replace the system board. Refer to Chapter 4, *Replacement Procedures*, for more information.

2.8 Display Troubleshooting

This section describes how to determine if the display is functioning properly. Start with Procedure 1 and continue 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 port replicator port and 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 T3400/T3400CT 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 cabling as shown below. Any of these cables may be disconnected.

Disassemble the display unit and check the designated cable connections. Refer to Chapter 4, *Replacement Procedures*, for more information about how to disassemble the computer.

```
┌──────┐           ┌─CN2──────────────────────────────┐
│  FL  │───────────│      FL inverter board            │
└──────┘           │ CN1                               │
                   └───────────────────────────────────┘
┌────────────────┐        ┌──────┐        ┌────────────┐
│  System board  │────────┤      ●────────│  LCD unit  │
└────────────────┘        └──────┘        └────────────┘
          ┌─────────────────────┐
          │ Display switch       │
          │         LED Board    │
          └─────────────────────┘
```
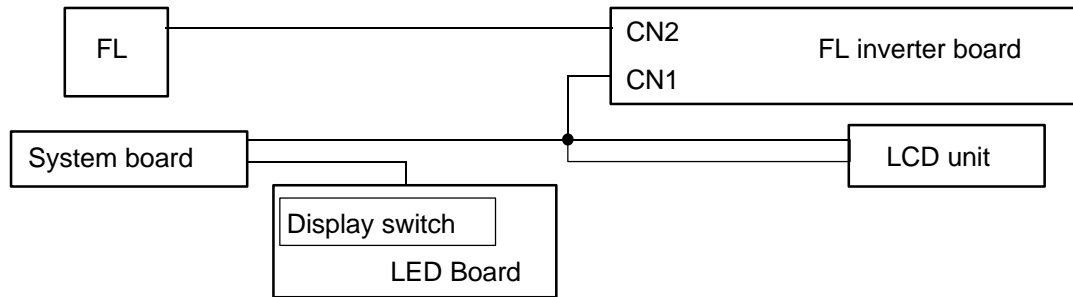
Figure 2-3 Display Connection

Firmly re-attach any disconnected cables 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 disassembly instructions and then perform the following checks:

❑ If the FL does not illuminate, 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 illuminated when the display is closed, perform Check 4.

Check 1   Replace the FL (T3400) or FL unit (T3400CT) and test the display. If the problem persists, perform Check 2.

Check 2   Replace the FL inverter board and test the display. If the problem persists, perform Check 3.

Check 3   Replace the LCD module and test the display. If the problem persists, perform Check 4.

Check 4   Replace the LED board and test the display. If the problem still exists, perform Check 5.

Check 5   Replace the display cable and test the display. If the problem persists, perform Check 6.

Check 6   The system board may be damaged. Replace the system board.

3.1   The Diagnostic Test

This chapter explains how to use the Diagnostic Test program (TESTCE34) to test hardware module functions. The Diagnostics Program is stored on the Diagnostic Disk. The Diagnostic Test consists of 18 programs grouped into the Service Program Module (DIAGNOSTICS MENU) and Test Program Module (DIAGNOSTIC TESTS).

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 TESTS menu contains the following ten functional tests:

- ❏ SYSTEM TEST
- ❏ MEMORY TEST
- ❏ KEYBOARD TEST
- ❏ DISPLAY TEST
- ❏ FLOPPY DISK TEST
- ❏ PRINTER TEST
- ❏ ASYNC TEST
- ❏ HARD DISK TEST
- ❏ REAL TIMER TEST
- ❏ PCMCIA TEST

The following equipment is needed to perform some test programs.

- ❏   T3400/T3400CT Diagnostics Disk (all tests)
- ❏ Formatted working disk for the floppy disk drive test (all tests)
- ❏ 3.5-inch 2HD/2DD disk for internal 3.5-inch FDD
- ❏ 5.25-inch 2D disk for external 5.25-inch FDD
- ❏ Cleaning kit to clean floppy disk drive heads (Head Cleaning)
- ❏ PCMCIA wraparound card for the I/O card (PCMCIA) test
- ❏ Printer wraparound connector for the printer wraparound (Printer) test
- ❏ RS-232C wraparound connector for the RS-232C port wraparound (ASYNC) test

The following sections detail function tests of the DIAGNOSTIC TESTS menu. Refer to sections 3.16 through 3.22 for detailed information on the other Service Program Module functions.

3.2   Executing the DiagnosticTest

Toshiba MS-DOS is required to run the T3400/T3400C DIAGNOSTICS PROGRAM.

NOTE: Diagnostics cannot be run with expanded memory managers such as EMM386 or Quarterdeck QEMM in memory. Attempting to run diagnostics with either program loaded will cause the following message to display:

```
Cannot execute in a virtual 8086 mode.
```

There are two ways to run diagnostics: 1) Booting from Drive A or 2) modifying the CONFIG.SYS file.

Boot from Drive A

1.   Insert a Toshiba operating system diskette into the FDD.

2.   Turn on the computer, then proceed to the "Running the Diagnostics Program" section.

Modify the CONFIG.SYS File

1.   Turn on the computer and allow it to boot.

2.   Deactivate the CONFIG.SYS file line that loads the device driver for the expanded memory manager by using DOS batch command "REM." The CONFIG.SYS file may also be re-named to keep it from executing upon bootup.

3.   Re-boot the computer, then proceed to the "Running the Diagnostics Program" section.

Running the Diagnostics Program

1.   Insert the Diagnostics disk in the internal FDD.

2.   At the system prompt, change to Drive A (if necessary), type **TESTCE34**, and press **Enter**.

The following menu appears:

```
TOSHIBA personal computer T3400XX 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 T3400XX DIAGNOSTIC TEST MENU, press the **Esc** key. Press **Ctrl** + **Break** to exit a test in progress, or **Ctrl** + **C** to stop a test.*

3. To select the DIAGNOSTIC TEST option from the DIAGNOSTICS MENU, set the highlight bar to **1**, and press **Enter**. The following screen appears:

```
TOSHIBA personal computer T3400XX 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 - PCMCIA TEST
88 - ERROR RETRY COUNT [FDD & HDD]
99 - EXIT TO DIAGNOSTICS MENU

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

Refer to Sections 3.4 through 3.14 for detailed descriptions of each Diagnostic Test (1 through 10). Function 88 sets FDD and HDD error retry count. Function 99 exits to the Diagnostic Menu.

4. Select an option to execute and press **Enter**. The following message appears:

```
SYSTEM TEST              XXXXXXX
                        ┌──────────────────────────────┐
                        │T3400XX DIAGNOSTIC TEST        │
                        │VX.XX              [Ctrl] +    │
                        │[Break]            ; test end  │
                        │[Ctrl] + [C]       ; key stop  │
                        └──────────────────────────────┘

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

SUB-TEST MENU :

01 - ROM checksum
02 - HW status
03 - ROM Version check
04 - EEPROM ID check
99 - Exit to DIAGNOSTIC TEST MENU

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

5.   Select a subtest from the menu and press **Enter**. The following messages appear:

```
TEST LOOP    : YES
ERROR STOP   : YES
```

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

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

Selecting **YES** for *ERROR STOP* stops the test 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 test and exits to subtest menu.
2: Continues test.
3: Restarts test from the beginning.

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

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

Table 3-1 in section 3.3 describes each subtest menu test function; Table 3-3 in section 3.14 lists codes and status for each error.

3.3   Subtest Names

Table 3-1 lists subtest names for each test program in the DIAGNOSTIC TESTS 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
2	MEMORY	01	RAM constant data
		02	RAM address pattern data
		03	RAM refresh
		04	Protected mode
		05	Memory module
		06	Backup memory
		08	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*350/400/480 Graphics display
		08	Display page
		09	"H" pattern display/Border color
		10	LED/DAC pallet
		11	64 color display
		12	FDD to VRAM
5	FDD	01	Sequential read
		02	Sequential read/write
		03	Random address/data
		04	Write specified address
		05	Read specified address
6	PRINTER	01	Ripple pattern
		02	Function
		03	Wraparound

Table 3-1 Subtest Names (2/2)

No.	Test name	Subtest No.	Subtest item
7	ASYNC	01	Wraparound (board)
		02	Board (#1) <=> board (#2)
		03	Point to point (send)
		04	Point to point (receive)
		05	Card modem loopback (2400BPS)
		06	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	PCMCIA	01	I/O card test (PCMCIA)

3.4   System Test

To execute the System Test, select **1** from the DIAGNOSTIC TESTS menu, press **Enter** and follow the directions displayed on the screen. Move the highlight bar to a subtest and press **Enter**.

Subtest 01   ROM checksum

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

Subtest 02   H/W status

This test reads and displays hardware status as shown below:

```
               76543210
H/W status = 10001000

   Bit7 —               =
   Bit6 — CPU clock     = 33MHz
   Bit5 — Notch signal  = 2HD
   Bit4 — FDD type      = 2MB
   Bit3 —               =
   Bit2 — Drive A/B     = Ext. = B
   Bit1 — External FDD  = OFF
   Bit0 — Internal FDD  = 2HD
```

Table 3-2 lists hardware bit status for each bit tested. Press **Enter** to return to the Subtest Menu.

Table 3-2 Hardware Bit Status

Bit	H/W status	1	0
7	Reserved	—	—
6	CPU clock speed	16.5 MHz	33 MHz
5	Media type	2DD	2HD
4	FDD type	1.6 MB	2 MB
3	Reserved	—	—
2	Drive A/B	Ext. = A	Ext. = B
1	External FDD	ON	OFF
0	Internal FDD	2DD	2HD

Subtest 03   Version check

This subtest checks versions for the following items:

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

The subtest compares the items to test program reference data. When a read
version is lower than a reference version, the speaker sounds, and the follow-
ing screen image is displayed. Press the **S** key to exit. The display is
unchanged if a read version is higher.

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

Reference data

Current data

3.5 Memory Test

To execute the Memory Test, select **2** from the DIAGNOSTIC TESTS menu, press **Enter** and follow the directions displayed on the screen. Move the highlight bar to a subtest and press **Enter**.

Subtest 01   RAM constant data (real mode)

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

>   Constant data is FFFFh, AAAAh, 5555h, and 0000h.

Subtest 02   RAM address pattern data (real mode)

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

Subtest 03   RAM refresh (real mode)

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

>   Constant data is AAAAh and 5555h.

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

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 original data.

>   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 but is used for testing an optional memory card. Memory module capacity is 2, 4, 8, and 16 MB.

After selecting subtest 05, the following message will appear:

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

Select the number corresponding to the installed memory card.

Subtest 06   Backup Memory

This subtest writes constant data to memory from address C8000h to CFFFFh, then reads new data and compares the result with original data.

Constant data is 0000h, 5555h, AAAAh, and FFFFh.

Subtest 08   Cache memory

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

Number of miss hit < Number of hit $\rightarrow$ OK
Number of miss hit $\geq$ Number of hit $\rightarrow$ Fail

3.6　Keyboard Test

To execute the Keyboard Test, select **3** from the DIAGNOSTIC TESTS menu, press **Enter,** and follow the directions displayed on the screen. Two subtests test keyboard actions. Move the highlight bar to a subtest and press **Enter**.

Subtest 01　　　Pressed key display (82/84)

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

When this subtest is executed, the keyboard layout is drawn on the display as shown below. When a 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 display character to blink.

```
KEYBOARD TEST IN PROGRESS 301000


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


    PrtSc    :     [Alt] + [SysReq]
    Pause    :     [Ctrl]+[Break] to test end


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

Subtest 02   Pressed key code display

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

```
KEYBOARD TEST  IN PROGRESS  302000

          Scan code  =
          Character code =
          Keytop    =

Ins  Caps Lock  Num Lock  Scroll Lock
Alt  Ctrl  Left Shift  Right Shift

PRESS [Enter] KEY
```

Subtest 03   PS/2 mouse connect check

NOTE: *A PS/2 mouse must be connected to the computer to execute the connect check .*

This subtest determines if a PS/2 mouse is connected or not.

If no error is detected, it returns to the subtest menu.
If an error is detected, the following message appears:

```
KBC - MOUSE INTERFACE ERROR

                              [[ HALT OPERATION ]]

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

Subtest 04   Pointing Stick Check

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

This subtest checks pointing stick functions.

If no error is detected, it returns to the subtest menu.

3.7 Display Test

To execute the Display Test, select **4** from the DIAGNOSTIC TESTS menu, press **Enter,** and follow the directions displayed on the screen. Eleven subtests test the display in various modes. Move the highlight bar to a subtest and press **Enter**.

Subtest 01   VRAM Read/Write

This subtest writes constant data FFFFh, AAAAh, 5555h, 0000h and address data to video RAM (256KB). This data is then read from the RAM and compared to original data.

Subtest 02   Character Attributes (mode 1, 13h)

This subtest displays four character attribute modes; normal, intensified, reverse, and blinking. The character attribute modes display foreground 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 following display appears when the 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
```

Pressing **Enter** causes 16 colors or gray scales of mode 13h to appear in the 320x200 graphics mode as shown below:

```
320*200 GRAPHICS DISPLAY [ 13 ]
```
```
                              BLACK
                              BLUE
                              GREEN
                              CYAN
                              RED
                              MAGENTA
                              BROWN
                              WHITE
                              GRAY
                              LIGHT BLUE
                              LIGHT GREEN
                              LIGHT CYAN
                              LIGHT RED
                              LIGHT MAGENTA
                              YELLOW
                              INTENSE WHITE
```
```
   PRESS [Enter] KEY
```

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

To exit to the DISPLAY TEST menu, press **Ctrl + Break**.

Subtest 03   Character Set

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

CHARACTER SET IN 40*25


```
Press [Enter] KEY
```

To exit 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

01234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567
  !"#$%&'()*+,-./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{|}~Δ
 3456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ΔÇ
 456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~ΔÇü

PRESS [ENTER] KEY
```

Pressing **Enter** toggles between tests. To exit 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:

```
320*200 GRAPHICS DISPLAY
COLOR SET X : [X]

        GREEN        RED       BROWN
        CYAN       MAGENTA     WHITE
```



```
PRESS [ENTER] KEY
```

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

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

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

```
320*200 GRAPHICS DISPLAY
COLOR SET X : [X]


            GREEN          RED          BROWN
            CYAN         MAGENTA        WHITE
```
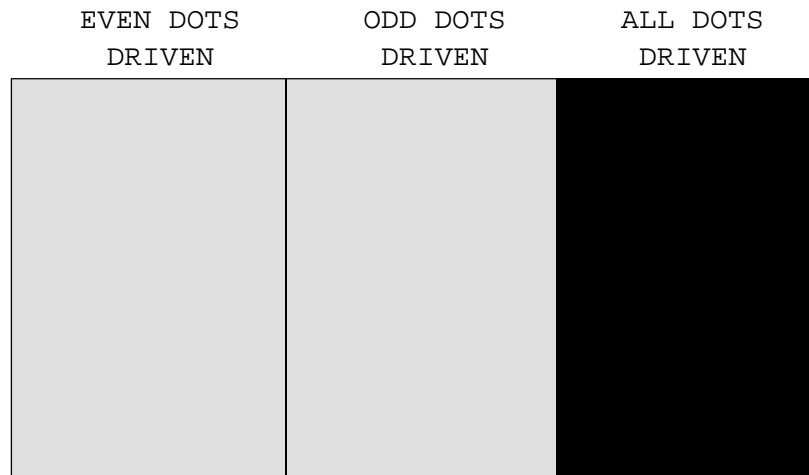
PRESS [ENTER] KEY

To exit to the DISPLAY TEST menu, press **Ctrl + Break.**

Subtest 07   640x350/400/480 Character Display (mode 10, 74, 12)

This subtest displays even, odd, and all dots in 640x350, 640x400 and
640x480 dot graphics mode 10, 74, 12 as shown below:

```
640*XXX GRAPHICS DISPLAY

            EVEN DOTS       ODD DOTS       ALL DOTS
             DRIVEN          DRIVEN         DRIVEN
```

PRESS [Enter] KEY

Press **Enter** to change displayed image size. To exit to the DISPLAY TEST
menu, press **Ctrl + Break.**

Subtest 08   Display Page

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

DISPLAY PAGE 0

```
OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
O                                       O
O                                       O
O                                       O
O                                       O
O                                       O
O                                       O
O                                       O
O                                       O
O                                       O
O                                       O
O                                       O
OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
```

Press **Ctrl + Break** to exit after test completion and return to the DISPLAY
TEST menu.

Subtest 09   H Pattern Display/Border Color

This subtest displays 2400 H characters on the entire screen, as shown below.

```
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
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 is connected to the T3400/T3400CT, choose **1** to display
the following message:

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

Press **Enter** to execute the border color test.
To exit 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 + Num Lock] key !...Num      (on/off)
(3) Press [ Fn           ] key !...Overlay(on/off)

PRESS [Enter] KEY
```

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

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

[  Processor latch test               ]

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

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

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

Subtest 11   64 color display

This subtest sets the video mode to '13', and displays color code (0 to 63) simultaneously, then displays seven screens. The first screen 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.

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 TESTS menu, press **Enter,** and follow the directions displayed on the screen. Five subtests test the internal floppy disk drive. The following messages will appear after the Floppy Disk Test is selected. Answer each question with an appropriate response.

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 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 to start the test on and press **Enter**. Pressing **Enter** alone sets the start track to zero.

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

4. The floppy disk test menu will appear after the start track number is selected. Select a subtest number and press **Enter.** The following message will appear during the test.

    ```
    FLOPPY DISK        XXXXXXX
                                ┌──────────────────────────────┐
                                │ T3400XX 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 the cylinder being tested. The fourth indicates the head, and the last two indicate the sector being tested.

    The first digit in the STATUS number indicates the drive being tested and the last two 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 tracks on a floppy disk. The following tracks are read according to the media type in the FDD:

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.

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

Subtest 02   Sequential Read/Write

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

Subtest 03   Random Address/Data

This subtest writes random data to random addresses on all tracks defined in subtest 01. 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 TESTS menu, press **Enter, and** follow the directions displayed on the screen. Three subtests test printer output. The following messages will appear after selecting Printer Test. Answer each question with an appropriate response.

NOTE: An IBM-compatible printer must be connected to the system to execute this test. Make sure the setup option External FDD/PRT is set to Printer.

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

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

The printer I/O port address is specified by the XXXXh number. The T3400/T3400CT supports three printer channels. Select the appropriate printer channel number, and press **Enter** to execute a subtest.

Subtest 01   Ripple Pattern

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

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

Subtest 02   Function

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

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

This subtest prints the various print types shown below:

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

Subtest 03   Wraparound

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

This subtest checks 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 TESTS menu, press **Enter,** and follow the directions displayed on the screen. Six subtests test asynchronous communication functions. Move the highlight bar to a subtest 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 appropriate number and press **Enter** to start the subtest.

Subtest 01   Wraparound (board)

> *NOTE: To execute this subtest an RS-232C wraparound connector (34M741621G01) must be connected to the RS-232C port. The wrap-around connector wiring diagram is shown 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-232C cable (9-pin to 9-pin) must be connected to boards 1 and 2. The RS-232C direct cable wiring diagram is shown in Appendix G.*

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

Subtest 03   Point to point (Send)

> **NOTE**: *To execute this subtest, two machines must be connected with an RS-232C direct cable. One machine should be set as "send"(subtest 03) and the other as 'receive' (subtest 04). The wiring diagram for the RS-232C direct cable is shown in Appendix G.*

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. This subtest receives data from the send side, then sends the received data.

Subtest 05   Card Modem Loopback (2400BPS)

> **NOTES**:   (1)   *To execute this subtest, a 2400 bps type card modem must be installed.*
> (2)   *It is not necessary to turn on the modem at the Setup option. When this subtest is selected, the modem is powered on automatically.*
> (3)   *Set the PCMCIA Slot to Others in the Setup program to execute.*

This subtest sends data from the RS-232C port to the built-in modem. The same data is then sent back to the RS-232C port and compared to original data.

When the serial port channel number is selected and **Enter** is pressed, the following message appears:

```
Baud rate select (2: 300BPS, 4: 1200BPS, 5: 2400BPS) ?
Mode select (1: BELL, 2: CCITT) ?
```

Select the baud rate and mode for the card modem and press **Enter** to execute the subtest.

Subtest 06   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 TESTS menu, press **Enter,** and follow the directions displayed on the screen. Ten subtests test the HDD functions. The following messages will appear after the hard disk test is selected. Answer each question with an appropriate response.

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. Then execute the Toshiba MS-DOS FORMAT command. Refer to the Toshiba MS-DOS manual for details.

---

1. When the hard disk test is selected, the following message will appear:

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

2. Select the HDD 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 HDD status for display or non-display . HDD status is described in section 3.15. Select **1** or **2** and press **Enter**.

6. The Hard Disk Test message will appear after a response to the Detail Status prompt. Select a subtest to execute and press **Enter**. The following message will appear during each subtest.

```
HARD DISK TEST      XXXXXXX

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

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

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

Subtest 01   Sequential Read

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

Subtest 02   Address Uniqueness

This subtest writes unique address data to each sector 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 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 and compares it with the original data.

Subtest 06   Write specified address

This subtest writes specified data to a specified cylinder and head.

Subtest 07   Read specified address

This subtest reads data written to a specified cylinder and head.

Subtest 08   ECC circuit

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

Subtest 09   Sequential write

This subtest writes specified 2-byte data to all cylinders.

Subtest 10   W-R-C specified address

This subtest writes data to a specified cylinder and head, 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 TESTS menu, press **Enter,** and follow the directions on the screen. Three subtests test the real timer functions. Move the highlight bar to a subtest and press **Enter**.

Subtest 01   Real Time

A new date and time can be input during this subtest. To execute this 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 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 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 real time clock increments, verifying the date and time are
displayed in the following format:

```
        Current date  : 12-31-1992
        Current time  : 23:59:58
```

Pressing **Enter** displays the following

```
        Current date :  01-01-1993
        Current time :  00:00:00


  PRESS [Enter] KEY TO EXIT TEST
```

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

3.13 PCMCIA Test

> *NOTE: The PCMCIA wraparound card is required to execute this subtest.*

Subtest 01   I/O Card Test (PCMCIA)

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

3.14 Error Code and Error Status Names

Table 3-3 lists 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 Support
	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

Table 3-3 Error Codes and Error Status Names (2/2)

Device name	Error code	Error status name
ASYNC	01	DSR On Time Out
	02	CTS On Time Out
	04	RX-READY Time Out
	08	TX-BUFFER Full Time Out
	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 Enable
	20	HDC Error
	40	Seek Error
	80	Time Out Error
	AA	Drive Not Ready
	BB	Undefined Error
	CC	Write Fault
	E0	Status Error
	EE	Access Time Out Error
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

3.15 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 are not used.

HDC error status is composed of 2 bytes; the first byte displays the contents of the HDC status register in hexadecimal form, the second displays the HDC error register.

The contents of the HDC status register and error register are described in Tables 3-4 and 3-5, respectively.

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 was 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 was 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 found track 0 during a recalibrate command. "1" The hard disk could not find track 0 during a recalibrate command.
0	——	Not used.

3.16 Hard Disk Format

This function performs a low-level (physical) hard disk format and also executes the following:

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

CAUTION: The hard disk will be erased when this program is executed. Before executing, transfer hard disk contents onto a backup system. This can be done with the Toshiba MS-DOS BACKUP command. See the Toshiba MS-DOS manual for details on using the BACKUP command.

3.16.1   Function Description

1. All track FORMAT

   This option performs a low-level format of all hard disk tracks as listed 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

Model Name	CP30544 (510 MB)
Sector sequences	1
Cylinders	527
Heads	31
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 for bad tracks by reading data to all tracks. 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 terminated.

3.16.2 Operations

CAUTION: *The hard disk will be erased when this program is executed. Before executing, transfer the contents of the hard disk onto a backup system. This can be done with the Toshiba MS-DOS BACKUP command. See the Toshiba MS-DOS manual for details on using the BACKUP command.*

Select **2** from the DIAGNOSTIC MENU and press **ENTER** to display the following menu:

```
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

Press **1** to select "All track FORMAT," and format the entire disk.

```
[All track FORMAT]

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

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


The following prompts display at the bottom of the screen in succession:

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

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

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

(b) Select an interleave number (1 ~ 8) and press **Enter**. Press **Enter** only to select **1**.

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

(c) Select an unlock format.

NOTE: This option appears only when a JVC HDD is installed. Select **2** *(yes) for JVC HDDs, the only disks with unlock formats. If* **1** *is selected for 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 appears. Enter the bad track cylinder and head numbers and press **Enter**. If there are no bad tracks, press **Enter** only to execute All Track Format as 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 cylinder and head number in the format above in decimal notation. Repeat for each bad track to format.

After entering 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 identified as bad tracks in the Track Verification function described in Item (f) below.

(f) Track Verification

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

2. Good track FORMAT

If a good track has been erroneously formatted as a bad track, use this subtest to reformat it as a good track. Enter the drive, interleave, cylinder, and head numbers 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 drive, interleave, cylinder, and head numbers 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 bad track list. 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 are displayed in the format shown below.

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

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

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

3.17 Head Cleaning

3.17.1   Function Description

This function cleans FDD heads by executing a series of head load/seek and read operations.
A cleaning kit is required.

3.17.2   Operations

1. Select **4** from the DIAGNOSTIC MENU and press **Enter** to display the following
    messages:

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

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

    Press any key when ready.
    ```

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

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

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

3.18 Log Utilities

3.18.1   Function Description

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

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

3.18.2   Operations

1. Select **5** in the DIAGNOSTIC MENU and press **Enter** to log error information into RAM or a floppy disk. Error information is displayed in the following format:

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

 001 FDD 02 0000  103 00001    00 00       FDD - WRITE PROTECTED
 001 FDD 01 0000  180 00001    00 00       FDD - TIME OUT ERROR
   |   |   |   |       |        |  |   |                     |
   |   |   |   |       |     Address      |                  |
   |   |   |   |    Error status          |                  |
   |   |   |  Pass count             HDC status              |
   |   |  Subtest number          Read data                 |
   |  Test name                 Write data                   |
 Error count                                       Error status
 name
```

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

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

> **1** scrolls the display to the next page.
> **2** scrolls the display to the previous page.
> **3** returns to the Diagnostic Menu.
> **4** erases all error log information in RAM.
> **5** outputs the error log information to a printer.
> **6** reads log information from a floppy disk.
> **7** writes 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, but not added to the error count.

3.19 Running Test

3.19.1   Function Description

This function executes the following tests in sequence:

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

The system detects the number of floppy disk drives connected to the T3400/T3400CT for the FDD test.

3.19.2   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 FDD testing.*

1.   Remove the diagnostics disk from the FDD and insert the work disk.

2.   Select **6** from the Diagnostic Menu and press **Enter** to display the following message:

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

    Select **Y (yes)** to execute the printer wraparound test. A printer wraparound connector must be connected to the **PRT/FDD** port on the back of the T3400/T3400CT to execute this test.

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

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

    Select **Y (yes)** to execute the ASYNC wraparound test. An RS-232C wraparound connector must be connected to the **serial port** on the back of the T3400/T3400CT to execute this test.

4.   Select **Yes** or **No** and press **Enter** to display the following message:

```
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.**

3.20 Floppy Disk Drive Utilities

3.20.1 Function Description

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

    1.   FORMAT

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

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

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

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

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

    2.   COPY

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

    3.   DUMP

This program displays floppy disk (both 3.5-inch and 5.25-inch) contents and designated hard disk sectors.

3.20.2 Operations

1.   Select **7** from the DIAGNOSTIC MENU and press **Enter** to display the following message:

```
[ FDD UTILITIES ]

    1 - FORMAT
    2 - COPY
    3 - DUMP
    9 - EXIT TO DIAGNOSTICS MENU
```

2. FORMAT program

   (a) Select FORMAT to display 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** to display a message similar to the one below:

   ```
   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) Type **1** to display the message from step (c) above. Type **2** to return to the DIAGNOSTIC MENU.

3. COPY program

   (a) Select COPY to display the following message:

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

   (b) Select a media/drive type number to 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 indicates 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 data cannot all 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. Enter **2** to return to the DIAGNOSTIC MENU.

4.   DUMP program

(a)   Select dump to display the following message:

```
 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 a track number to dump. The system will access the disk and dump a
      list.

3.21 System Configuration

3.21.1   Function Description

The System Configuration program contains the following information:

1.   BIOS ROM version
2.   Boot ROM version
3.   KBC version
4.   Base memory size
5.   Number of floppy disk drives
6.   Number of ASYNC ports
7.   Number of hard disk drives
8.   Number of printer ports
9.   Extended Memory Size
10.   PS Micom Version

3.21.2   Operations

Select **8** from the DIAGNOSTIC MENU and press **Enter** to display the system configuration menu:

```
SYSTEM CONFIGURATION :

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

Press [Enter] Key
```

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

3.22 Setup

3.22.1 Function Description

This program displays 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) LCD Gray Scale Level (T3400 only)
   (d) LCD Display Colors (T3400CT only)
   (e) Power On Display (T3400CT only)

3. COM/PCMCIA/FDD/PRT
   (a) Serial Port
   (b) PC Card Slot
   (c) Ext. FDD/PRT
   (d) Printer Port Type

4. Hard Disk

5. Power on Password

6. Others
   (a) Power-up Mode
   (b) CPU Cache
   (c) Processing Speed
   (d) Battery Save Mode
   (e) Speaker Volume
   (f) Panel Power On/Off
   (g) Alarm Power On
   (h) Boot Priority
   (i) Pointing Devices
   (j) Hotkey
   (k) Ext. Keyboard "Fn" key equivalent

7. Battery Save Options
   (a) CPU Sleep Mode
   (b) Display Auto Off
   (c) HDD Auto Off
   (d) System Auto Off
   (e) LCD Brightness

3.22.2   Accessing the SETUP Program

Select **0** from the DIAGNOSTICS MENU and press **Enter** to display the following:

```
                              T3400  SETUP        BIOS version = x.xx
         ┌──────── MEMORY ────────┐   ┌── HARD  DISK ──────────────────┐
          Total        = 4096 KB       Capacity = ***MB
          Base         =  640 KB     └────────────────────────────────┘
          Extended     = 3328 KB     ┌─ POWER  ON  PASSWORD ───────────┐
          Shadow BIOS ROM =  128 KB    Not Registered
         └────────────────────────┘  └────────────────────────────────┘
                                      ┌─ OTHERS ────────────────────────┐
         ┌──────── DISPLAY ───────┐    Power-up Mode        = Resume
          Display Adapter  =  VGA compatible  CPU Cache      = Enabled
          LCD Display Mode = Color        Processing Speed   = High
          LCD Gray Scale Level = Normal 64 Levels  Battery Save Mode = Full Power
          Power On Display    = Internal/External  Speaker Volume   = High
         └────────────────────────┘    Panel Power On/Off   = Enabled
                                        Alarm Power On       = Disabled
         ┌──── COM/PCMCIA/FDD/PRT ┐    Boot Priority        = Enabled
          Serial Port  =  COM1(IRQ4/3F8H)  Pointing Devices  = Simultaneous
          PC Card Slot =  PCMCIA          Hotkey             = Enabled
          Ext.FDD/PRT  =  Printer         Ext. Keyboard "Fn" key equivalent
          Printer Port Type  = Output                        = Disabled
         └────────────────────────┘  └─────────────────────────────────┘
          ↑ ↓ → ←:   Select items, Space, BkSp : Change values
          Esc: Exit without saving, Home: Set default values, End: Save changes and Exit
```

> *NOTE: LCD Gray Scale Level does not appear on the T3400CT screen. Power On*
> *Display does not appear on the T3400. Panel Power On/Off appears when either*
> *computer is in Resume mode.*

Moving Within the SETUP Menu and Changing Values

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

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

Accepting Changes and Exiting the SETUP Window

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

    If the changed item does not require a system re-boot, the following message is displayed:

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

    If the changed item requires a system re-boot, the following message is displayed:

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

    Changes made will cause the system to re-boot.

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

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

> *NOTE: Press **Esc** to quit at any time without saving changes. SETUP asks confirmation for not saving changes.*

The Factory Preset Configuration

When SETUP is accessed, the current configuration is displayed.

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

2. To accept default settings, press **End,** then **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 values for computer memory.

   (a) Total

   This field displays the total amount of memory installed and is calculated by the computer. These values may not be changed by the user.

   (b) Base

   This field displays the amount of base (conventional) memory, 640 KB and is calculated by the computer. These values may not be changed by the user.

   (c) Extended Memory

   This field displays the amount of extended memory available. These values may not be changed by the user.

   (d) Shadow BIOS ROM

   The SETUP program displays 128 KB of RAM reserved for Shadow BIOS ROM. These values may not be changed by the user.

2. Display

These options provide configuration display data.

(a) Display Adapter

This field displays the internal adapter for the VGA internal display. Only VGA-compatible is displayed. This field cannot be changed.

(b) LCD Display Mode

This option is not configurable.

Color   Selects 80 x 25 text or 640 x 480 graphics modes. This option also affects a color monitor attached to the external display port. (This is the default.)

Monochrome   Selects monochrome mode. This is also used when a VGA monochrome monitor is attached to the external display port. Note that some software is displayed best in monochrome mode.

NOTE: The LCD Display Mode is automatically set to conform to the CRT being used and cannot be changed.

(c) LCD Gray Scale Level (T3400 only)

Use this option, which appears in SETUP and the Pop-up Window, to switch between normal and reverse video on the T3400. It does not appear on the T3400CT. The options are:

Normal 64 levels   Displays black text on white background with 64 shades of gray.

Reverse 64 levels Displays white text on black background with 64 shades of gray.

(d) LCD Display Colors (T3400CT only)

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

256K colors   Displays 256 of 262,144 colors.
180K colors   Displays 256 of 185,193 colors.
24K colors   Displays 256 of 24,576 colors.
512 colors   Displays 256 of 512 colors.

NOTE: A few colors may not display well at the 256K colors setting. If this is the case, change the setting to 180K colors.

(e)   Power On Display (T3400CT only)

This option is used to select the display when booting up or starting from resume mode.

Internal/External   Uses the internal LCD if an external CRT is not con
                       nected and uses an external CRT if one is connected.
Simultaneous   Uses both the internal LCD and an external CRT if one
                       is connected.

3.   COM/PCMCIA/FDD/PRT
      This option controls settings for serial and parallel ports and the PC card slot.

(a)   Serial Port

Use this option to set the COM level, COM1 or COM2, for the serial port and PC Card slot. The serial port interrupt 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	(PCMCIA default)
Not Used			(Disables port)

If the Serial Port COM level is set to the same level as the Toshiba card modem, the card modem COM level is automatically reset to Not Used**.**

(b)   PC Card Slot

Use this option to select PC Card slot usage:

PCMCIA   Choose this selection when a PCMCIA card is installed.
               (This isthe default.)
Others   Choose this selection when a Toshiba card modem
               (model: PC-22-T24M, or PC-T24SL) is installed.

When *Others* is chosen**,** use the sub-window shown below to control the modem COM Port and power.

```
COM Port  = COM2 (IRQ3/2F8H)
Power     = On
```

Use the COM Port option to select the interrupt (IRQ)/COM level for the Toshiba card modem: COM 1 or COM2 (default). Use the Power option to turn modem power on or off.

When the COM Port option is set to Others, the Power option is displayed in the sub-window. The Power option indicates the setting in CMOS.

(c) Ext. FDD/PRT

Use this option to assign a printer/FDD port function.

Printer   Configures the port for output to a printer or other
            parallel device. (This is the default.)

FDD A   Configures the port for output and input to and from the
            external 5.25-inch diskette drive and assigns the letter A
            to the external drive. The internal drive becomes drive B
            by default.

FDD B   Configures the port for output and input to and from the
            external 5.25-inch diskette drive and assigns the letter B
            to the external drive. By default the internal drive
            remains drive A.

Option Setting	External FDD ID	Internal FDD ID
Printer (default)	None	A
FDD A	A	B
FDD B	B	A

(d) Printer Port Type

This option sets the communication mode for the printer/FDD port to either
output-only or bi-directional. It is effective only when the Ext.FDD/PRT
option is set to printer. If FDD is selected, this setting is ignored and the
mode is set to bi-directional. For most printers, the port should be set to
Output. With some other parallel devices, the setting should be Bi-direc-
tional.

Output   Activates uni-directional operation.
              (This is the default)

Bi-directional   Activates bi-directional operation.

4.   Hard Disk

This option enables or disables the HDD.

120 MB   The hard disk can be accessed. Disk capacity is automatically
            displayed and cannot be changed.

No Drive   The hard disk cannot be accessed.

5. Power On Password

    Use this option to set or reset the power-on password.

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

    For details on setting the power on password refer to the *Password Security* section in the T3400 Series Reference Manual.

6. Others

    Whether it is necessary to configure the computer with these options depends primarily on the kind of software or peripherals used.

    (a) Power-up Modes

         Use this option to choose between AutoResume and boot mode.This option can also be set using the Pop-Up Window.

         Boot   Turns on boot mode. (This is the default.)
         Resume   Turns on the AutoResume feature.

    > *NOTE: AutoResume does not work with the enhanced mode of Microsoft Windows unless WRESUME driver is loaded. Refer to Power-On Modes in Chapter 2 of the T3400 Reference Manual for additional information.*

    (b) CPU Cache

         Use this feature to enable or disable the CPU cache.

         Enabled   Enables the CPU cache. (This is the default.)
         Disabled   Disables CPU cache.

    (c) Processing Speed

         This feature changes CPU processing speed.

         High   CPU operates at 33 MHz. (This is the default.)
         Low   CPU operates at half-speed.

(d) Battery Save Mode

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

Full Power   The following shows full power settings.

```
CPU Sleep Mode   =   Disabled
Display Auto Off =   Disabled (T3400)
                     30 Min.(T3400CT)
HDD Auto Off     =   Disabled
System Auto Off  =   Disabled
LCD Brightness   =   Bright
```

Low Power   The following shows low power settings.

```
CPU Sleep Mode   =   Enabled
Display Auto Off =   03 Min.
HDD Auto Off     =   03 Min.
System Auto Off  =   30 Min.
LCD Brightness   =   Semi-bright
```

> *NOTE: The System Auto Off message does not appear in boot mode.*

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

(e) Speaker Volume

This option disables or sets the speaker volume level. Setting this option to off disables the computer sound function for alarms as well as for application programs. This option can also be set with hot keys.

Off   Disables software use of the speaker.
Low   Sets volume to low.
Medium   Sets volume to medium.
High   Sets volume to high.

When the speaker volume is highlighted, a sub-window is displayed for enabling or disabling certain speaker functions.

```
            System Speaker      =    Enabled
            Low Battery Alarm   =    Enabled
            Panel Close Alarm   =    Enabled
```

Enabled   Enables feature.
Disabled   Disables feature.

(f)   Panel Power On/Off

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

Enabled   Enables feature.
Disabled   Disables feature. (This is the default.)

> **NOTE:** *Do not remove the AC adapter and battery pack at the same time when using this feature, as data saved by AutoResume will be lost. This option must also be reset.*

(g)   Alarm Power On

Use this option to set the time for the system to turn on automatically. This option can be set to expected transmission times for periods of personal absence. The option does not automatically turn off the system, and does not appear when the computer is in 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 using this feature as data saved by AutoResume will be lost. This option must be reset when power is restored.*

(h)   Boot Priority

This option selects disk drive priority for boot up.

FDD → HDD Computer looks for files to boot first on the FDD and next on the HDD. (This is the default.)
HDD → FDD Computer looks for files to boot first on the HDD and next on the FDD.

Reverse the order by holding down the **F10** key while the computer is booting. This procedure does not affect the setting.

(i)   Pointing Devices

This option enables or disables the Accupoint.

Simultaneous   If a PS/2 mouse or serial mouse is connected to an optional port replicator, both the Accupoint and external mouse are enabled. (This is the default.)
Auto selected   Accupoint is disabled when a PS/2 mouse or serial mouse is connected, otherwise Accupoint is enabled.

(j)   Hotkey

This option enables or disables the hotkeys.

Enabled   Enables hotkeys. (This is the default.)
Disabled   Disables hotkeys.

(k)   Ext. Keyboard "Fn" key equivalent

This option sets a key combination on an external keyboard to emulate the Fn key on the internal keyboard. Setting an Fn key equivalent will enable use of "Hotkeys" by pressing the set combination instead of the Fn key.

Disabled   Disables feature. (This is the default.)
Fn Equivalent   Left + Left Alt
                   Right Ctrl + Right Alt
                   Left Alt + Left Shift
                   Right Alt + Right Shift
                   Left Alt + Caps Lock

7.   Battery Save Options

(a)   CPU Sleep Mode

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

Enabled   Enables sleep mode.
Disabled   Disables sleep mode.

(b)   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 illumination off if no entry is made for the set period of time.

Disabled	Disables display automatic power-off.
xx Min.	Automatically turns off power to the LCD panel illumination if the panel is not used for the duration set. Duration xx can be set to 1, 3, 5, 10, 15, 20 or 30 minutes.
Always OFF	Turns off the power to the LCD panel illumination. This option appears only on theT3400.

(c)   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 HDD if it is not used for the duration set. Duration xx can be set to 3, 5, 10, 15, 20 or 30 minutes.

(d)   System Auto Off

Use this option to enable or disable the system automatic-off function when power-up mode is set to Resume. In boot mode, this feature is always disabled and therefore 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. Duration **xx** can be set to 10, 20, 30, 40, 50 or 60 minutes.

(e)   LCD Brightness

Use this option to set the LCD brightness level.

Bright	Full brightness for maximum visibility.
Semi-bright	Less than full brightness for saving power.

4.1 General

This section explains how to disassemble the computer and install Field Replaceable Units (FRUs). It may not be necessary to remove all FRUs in order to replace one. The chart below is a guide to which FRUs need to be removed in order to remove others. Start by disconnecting the AC adapter and removing the battery pack, then follow the lines on the chart to determine which FRU to remove in order to repair another one.

```
┌─────────────────┐
│ ❏ Battery Pack  │
└────────┬────────┘
         │
┌────────┴─────────────────────────────────┐
│  ❏   Optional Memory Card                │
│  ❏   Optional PCMCIA Card                │              ┌──────────────┐
│  ❏   Top Cover          ◄────────────────┼──────────────│  Keyboard    │
│  ❏   Hard Disk Drive                     │              ├──────────────┤
│  ❏   RTC Battery, Backup battery         │              │  LED Board   │
│  ❏   Accupoint Control Button            │              └──────────────┘
│  ❏   System Board                        │
│  ❏   Power Supply Board                  │
│  ❏   FL Inverter Board                   │              ┌──────────────┐
│  ❏   Monochrome LCD Display (T3400)  ────┼──────────────│  FL          │
│  ❏   TFT Color LCD Display (T3400CT)  ───┼──────────────│  FL Unit     │
└──────────────────────────────────────────┘              └──────────────┘
```
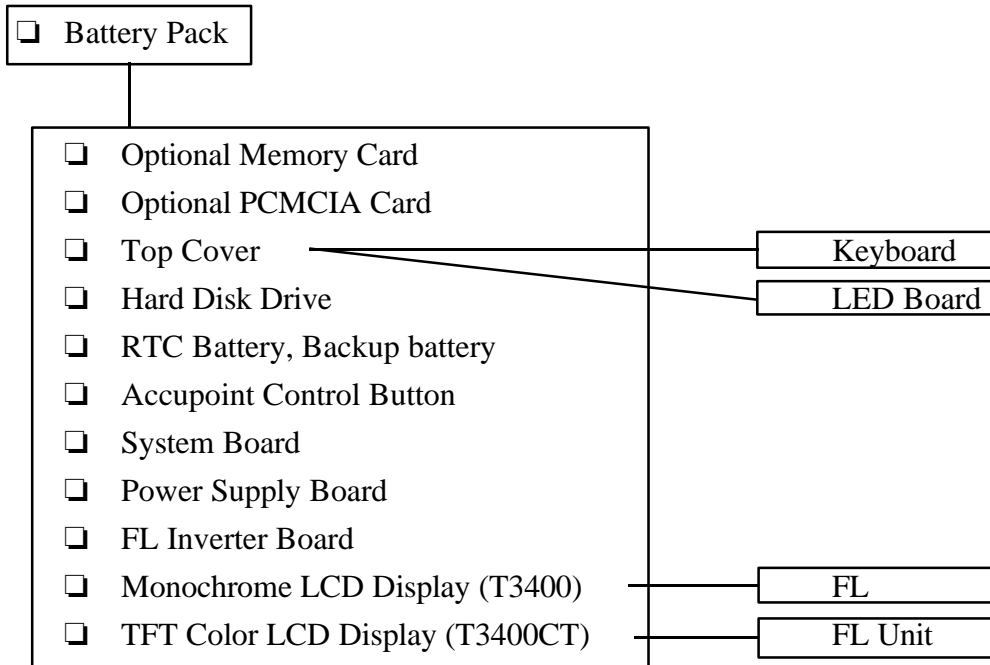
Before Beginning

Look over the procedures in this section before disassembling the computer. Become familiar with disassembly and reassembly steps.

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

2. Use only correct and approved tools.

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

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

4. Verify the FRU being replaced is causing abnormal operation by performing necessary diagnostics tests.

5. Do not perform unnecessary operations and use only described procedures for disassembly and installation.

6. After removing parts, place them in a safe place away from the computer to prevent damage or interference with work.

7. Many screws will be removed and replaced during disassembly, make sure they are in a safe place and identified with the correct parts.

8. When reassembling the computer, make sure to use the correct screws to secure equipment. Screw sizes are shown in the corresponding figures.

9. The computer has many sharp edges and corners, be careful and avoid injury.

10. Make sure the computer is functioning properly by performing the appropriate test on the FRU installed.

> *NOTE: The illustrations in Chapter 4 are based on the appearance of the T3400, unless otherwise noted.*

Disassembly Procedures

The T3400/T3400CT has two basic types of cable connectors:

- ❏ Pressure Plate Connectors
- ❏ Pin Connectors

To disconnect a pressure plate connector cable, lift up the connector tabs on either side and slide the cable out. To attach a cable, make sure the pressure plate is fully lifted then slide the cable in. To secure the cable, push down the sides of the pressure plate until flush with the sides of the connector. Gently pull on the cable to make sure the cable is secure. If the cable is accidentally pulled out, verify that the pressure plate is fully lifted before re-inserting the cable.

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

Assembly Procedures

The computer must be re-assembled after disassembly and repair.   While assembling the computer, remember the following:

❑ Take adequate time, making sure to follow instructions closely. Most problems arise when assembly is done in a hurry.

❑ Make sure cables and connectors are securely fastened.

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

❑ Check that all latches are closed securely.

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

After re-assembly, verify that both the installed FRU and computer are functioning properly.

Tools and Equipment

The use of ElectroStatic Discharge (ESD) equipment is very important for personnel safety. Proper use of these devices will also increase the success rate of repairs and lower the cost for damaged or destroyed parts. The following equipment is necessary to disassemble and re-assemble the computer:

❑ M2 Phillips screwdriver.

❑ Jeweler's screwdriver.

❑ Tweezers to lift out screws.

❑ ESD mats for the floor and the table.

❑ ESD wrist strap or heel grounder.

❑ Anti-static carpeting or flooring.

❑ Air ionizers in highly static-sensitive areas.

❑ LCD support block composed of anti-static foam.

4.2 The Battery Pack

Removal

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

1. Turn off the power and disconnect the AC adapter, power cord, and all external cables.

2. Close the display if open.

3. Turn the computer upside down.

4. Slide the **battery lock** to free the **battery release latch**, then slide the release latch to pop the battery out slightly to the left (Figure 4-1).
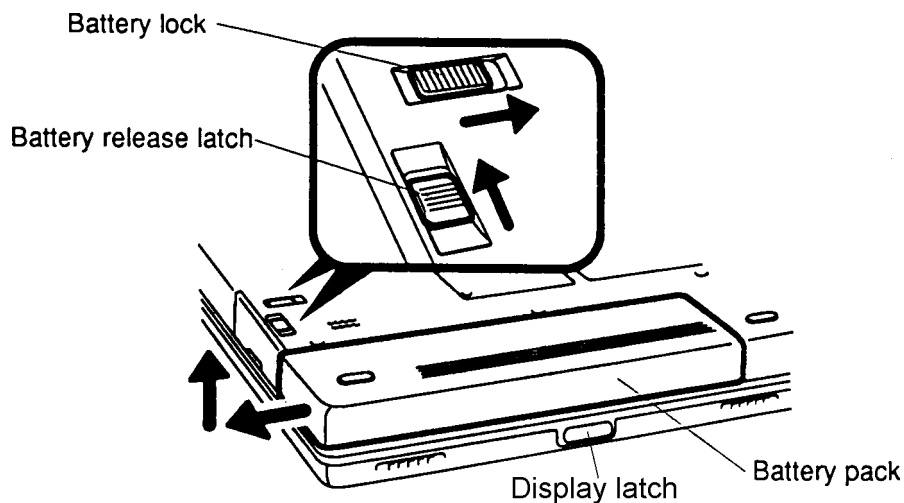
Figure 4-1 Unlocking the Battery Pack

5. A slight gap will open between the right end of the battery pack and the computer. With your left hand, slip your fingers into the gap and pull the battery pack to the left until it stops (about 1 centimeter or 1/2 inch).

6. Grasp the left end of the battery pack and lift up to remove (Figure 4-2).
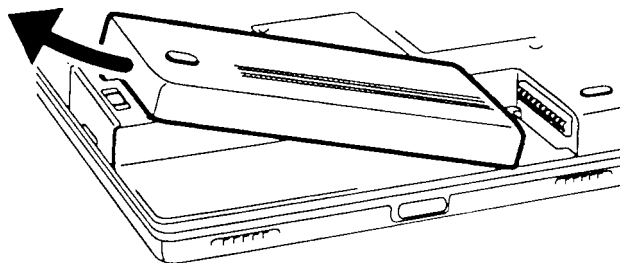
Figure 4-2 Lifting Out the Battery Pack

Installation

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

1. Place the right end of the battery pack about halfway between the display latch and the battery pack terminals.

2. Slide the battery pack to the right until it snaps on. There will still be a gap between the right end of the battery pack and terminals (Figure 4-2).

3. Gently press down on the center of the battery pack and at the same time push it to the right. Slight resistance will be felt when the battery is nearly seated. Press in carefully until it clicks into place, then lock the battery lock (Figure 4-1).

4.3   Optional Memory Card

Removal

To remove an optional memory card, follow the steps below and refer to Figures 4-3 and 4-4.

1.   Turn off the power and disconnect the AC adapter, power cord, and all external cables.

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

3.   Turn the computer upside down.

4.   Remove **two M2.5x4 screws** securing the **memory module socket cover** (Figure 4-3).

5.   Slide a fingernail or other thin object under the notch on the cover and rotate up to remove. Two latches hold the cover in place on the side away from the screws (Figure 4-3).
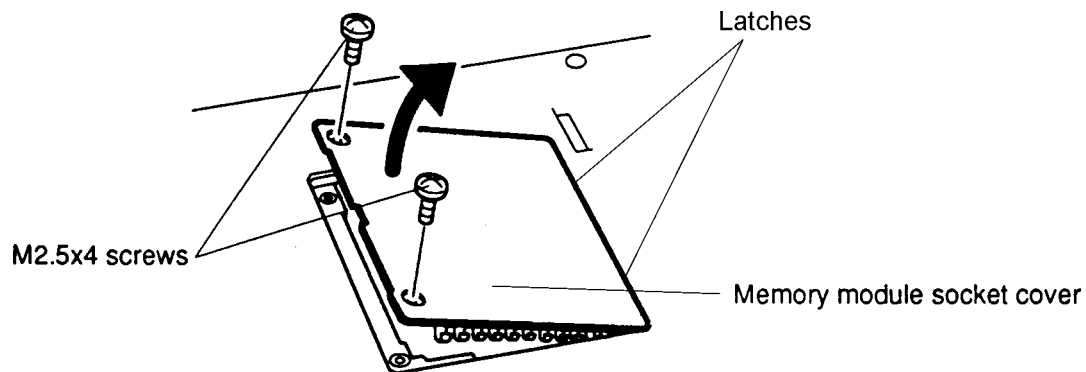
Figure 4-3 Removing the Memory Module Socket Cover

6. **Two latches** on each side of the module hold it in place. Press these to the outside to release the module. The side of the module away from the connector edge will spring up (Figure 4-4).
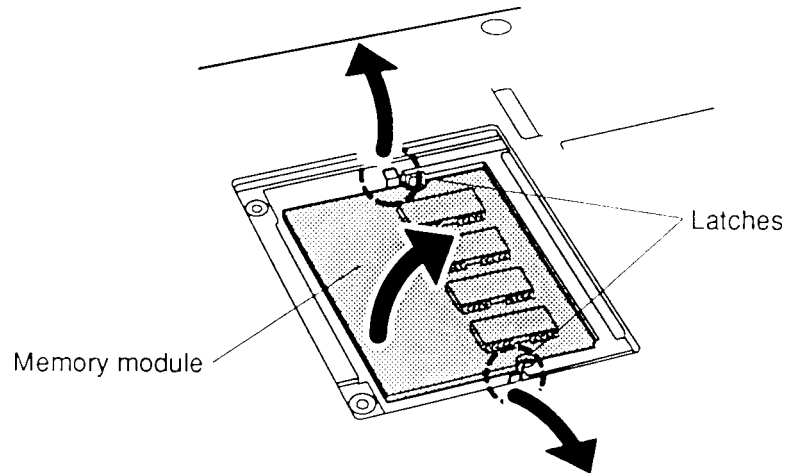
Figure 4-4 Removing the Memory Module

CAUTION: DO NOT touch the connector edge of the memory card. Debris or oil may cause memory access problems.

Installation

To install an optional memory card, follow the steps below and refer to Figures 4-3 through 4-5.

1. Insert the **memory module**, connector edge first, into the computer connectors. The **notch** at the corner of the module should be on the right as the module is inserted (Figure 4-5).
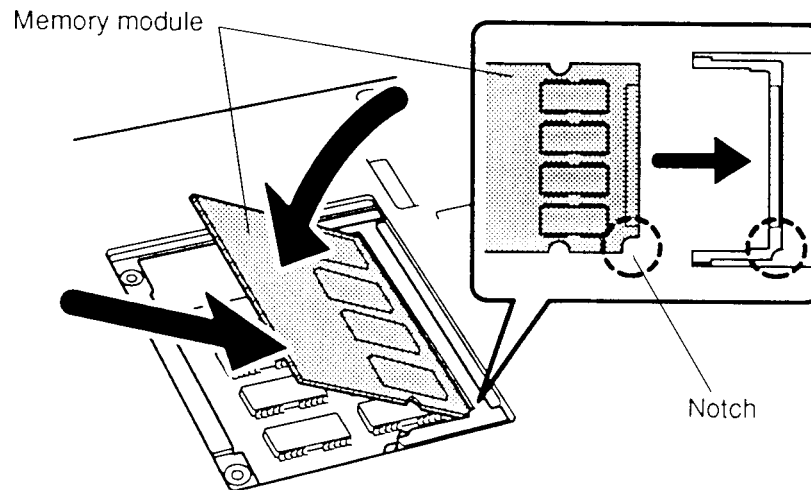
Figure 4-5 Inserting the Memory Module

2. The module is supported by springs in the memory module socket. Gently push the module into place until two latches close over each side (Figure 4-4).

3. Fit the socket cover latches into place and seat the cover (Figure 4-3).

4. Secure the **two M2.5x4 screws** (Figure 4-3).

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

4.4 Optional PCMCIA Card

Removal

To remove an optional PCMCIA card, follow the steps below and refer to Figure 4-6.

1. Turn off the power and disconnect the AC adapter, power cord, and all external cables.

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

3. Snap off the PCMCIA slot **cover** (Figure 4-6).

4. Press the **eject button** to pop the card out slightly (Figure 4-6).

5. Grasp the card edges and remove.
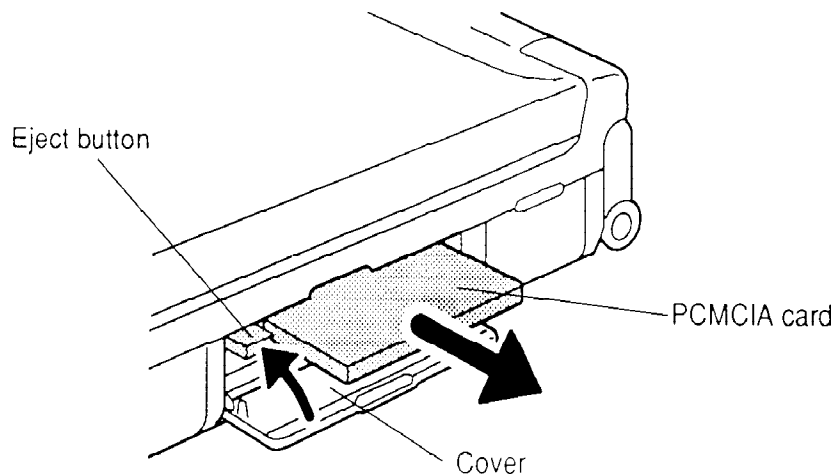
Figure 4-6 Removing the PCMCIA Card

Installation

To install an optional PCMCIA card, follow the steps below and refer to Figure 4-7.

1. Carefully insert the card, contact edge first, making sure it is right side up.

2. Some resistance will be felt when the card is almost seated. Press gently to assure firm connection, but do not force. The eject button will pop out when the card is fully seated (Figure 4-7).
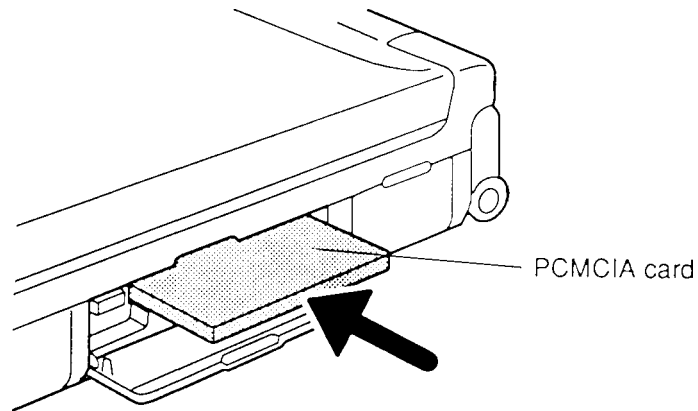
Figure 4-7 Installing the Optional PCMCIA Card

3. Install the battery pack as described in section 4.2.

4.5 Top Cover

Removal

To remove the top cover, follow the steps below and refer to Figures 4-8 through 4-10.

1. Turn off the power and disconnect the AC adapter, power cord, and all external cables.

2. Remove the battery pack, optional memory and PCMCIA cards as described in sections 4.2, 4.3, and 4.4.

3. Remove **seven M2.5x8 silver screws** from the bottom of the computer and **two M2.5x4 screws** from the battery seating area. These screws secure the **top cover** to the bottom cover (Figure 4-8).
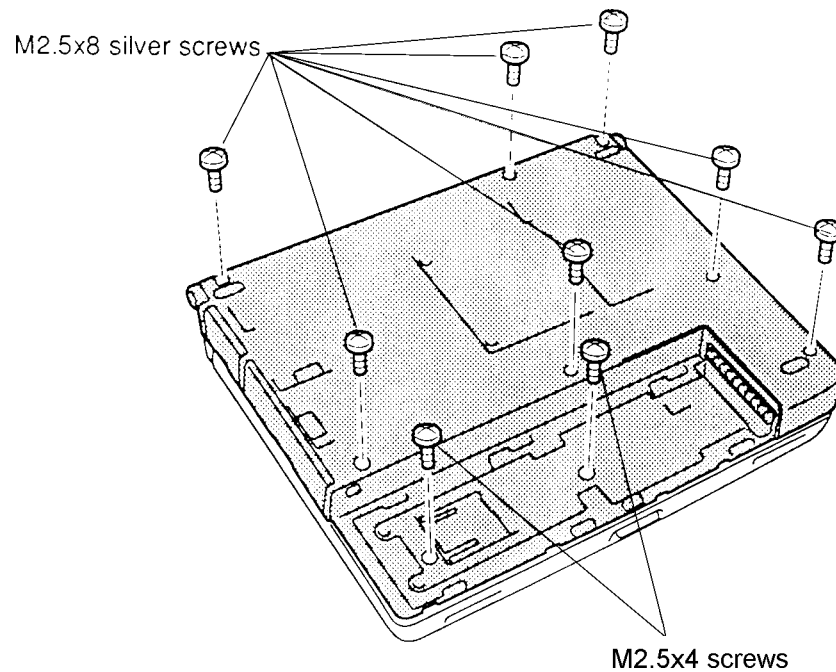
Figure 4-8 Removing the Bottom Cover Screws

4. Slide a thin object between the top and bottom covers at the display latch and gently pry the top cover free, but do not try to completely remove it (Figure 4-9).
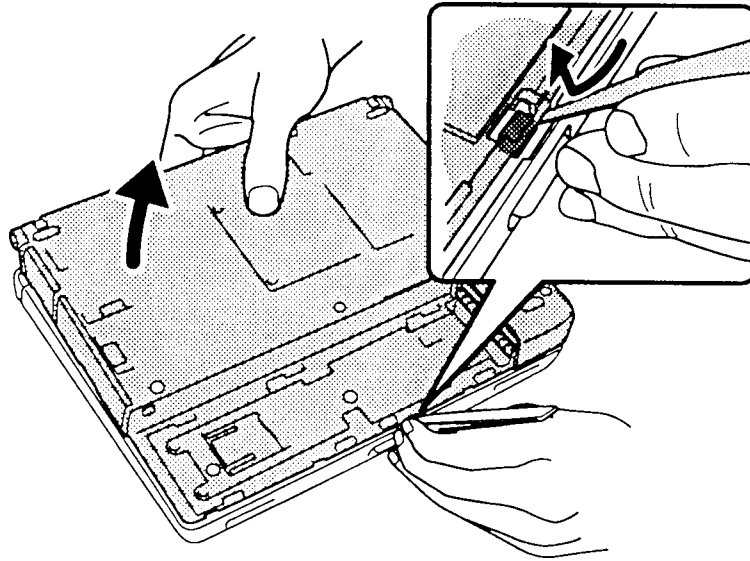
Figure 4-9 Separating the Top Cover

5. Unfold and position the computer so that the display back is flat on the work surface, with the front edge of the bottom facing upward at approximately 45 degrees. Gently pry open the 5 front latches and the 2 latches at either side.

6. Do not try to remove the top cover yet. Turn the computer right side up, and lift up the front edge of the top cover (Figure 4-10).

7. Disconnect the **AccuPoint cable** from **PJ503**, **keyboard cable** from **PJ8**, **LED cable** from **PJ16,** and **display cable** from **PJ10** (Figure 4-10).
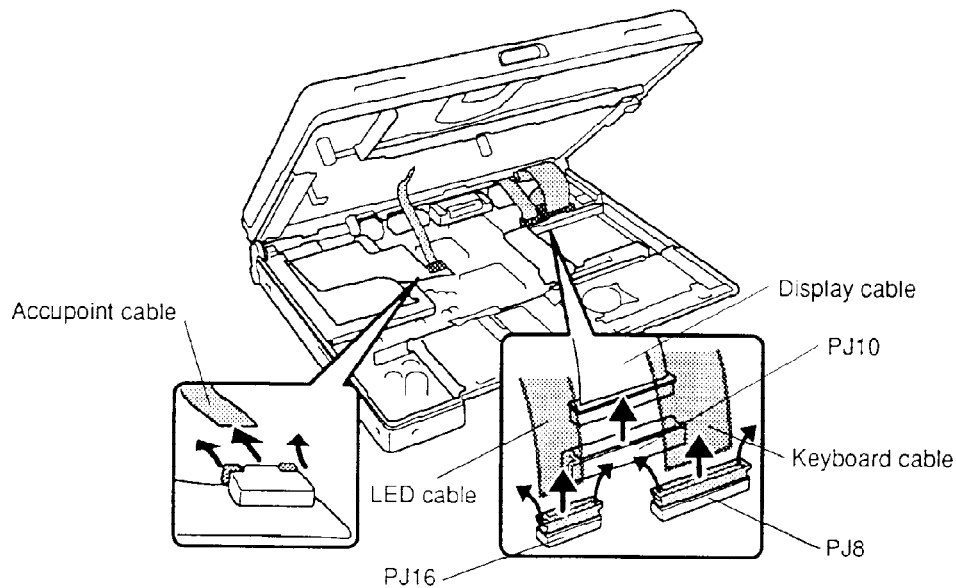
Figure 4-10 Disconnecting the Connectors

8. Lift off the top cover.

Installation

To install the top cover, follow the steps below and refer to Figures 4-8 through 4-10.

1. Set the back edge of the top cover in place and connect the **display cable to PJ10**, **LED cable** to **PJ16**, **keyboard cable** to **PJ8,** and **AccuPoint cable** to **PJ503** (Figure 4-10).

2. Turn the computer upside down and press firmly at the display latch until the bottom and top covers snap into place (Figure 4-9).

3. Close the computer, and secure the top cover with **seven M2.5x8 silver screws** and **two M2.5x4 screws** (Figure 4-8).

4. Replace the optional PCMCIA card, optional memory card, and battery pack as described in sections 4.4 through 4.2.

4.6 Hard Disk Drive

Removal

To remove the HDD, follow the steps below and refer to Figures 4-11 through 4-13.

1. Turn off the power and disconnect the AC adapter, power cord, and all external cables.

2. Remove the battery pack, optional memory card, optional PCMCIA card, and top cover as described in sections 4.2 through 4.5.

3. Remove **one M2.5x6 brass screw** securing the HDD bracket to the bottom cover (Figure 4-11).

4. Disconnect the **HDD flexible cable** from **PJ5** on the system board. (Figure 4-11).

5. Lift out the HDD (Figure 4-11).
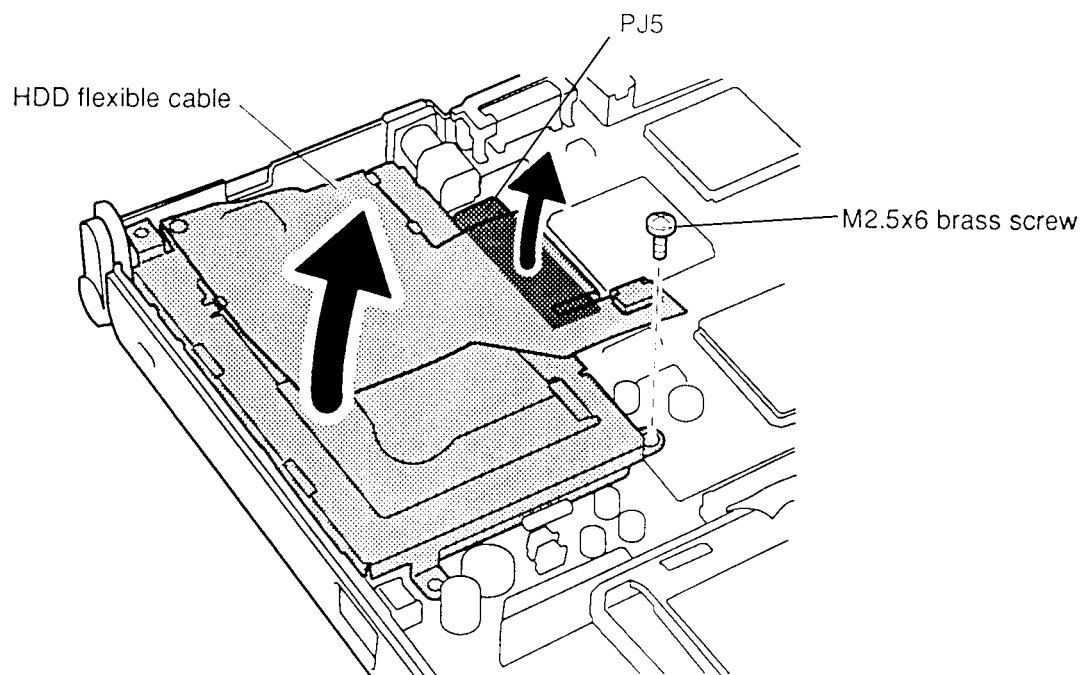
Figure 4-11 Removing the HDD and Bracket

6. Remove **one M2.5x4 brass screw** securing the flexible cable to the HDD (Figure 4-12).

7. Disconnect the **flexible cable** from the HDD (Figure 4-12).

8. Slip the flexible cable out of three latches on the **HDD bracket** to remove the HDD.
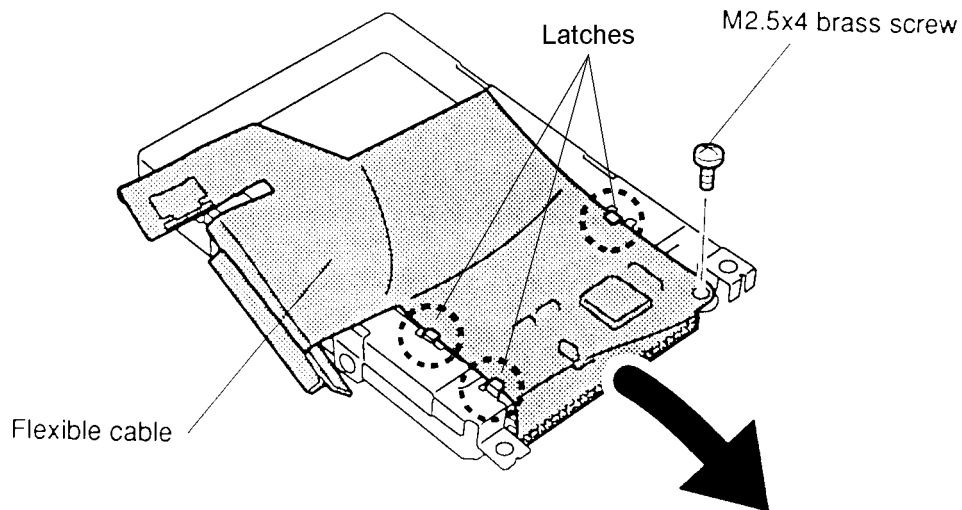
Figure 4-12 Removing the HDD Flexible Cable

9. Remove **four M3x4 flat-head screws** securing the **bracket** to the HDD (Figure 4-13).

10. Remove the bracket (Figure 4-13).
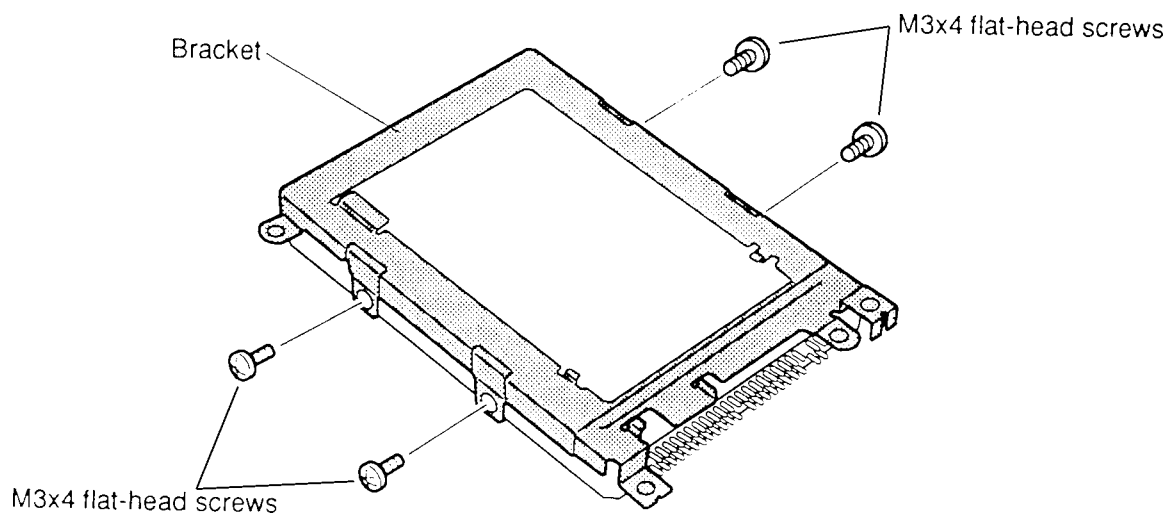
Figure 4-13 Removing the HDD

Installation

To install the HDD, follow the steps below and refer to Figures 4-11 through 4-13.

1. Seat the HDD in its bracket (Figure 4-13).

2. Secure the HDD to the bracket with **four M3x4 flat-head screws** (Figure 4-13).

3. Fit the HDD flexible cable under three latches on the **bracket** (Figure 4-12).

4. Connect the **flexible cable** to the HDD (Figure 4-12).

5. Secure the flexible cable with **one M2.5x4 brass screw** (Figure 4-12).

6. Seat the HDD into the bottom cover (Figure 4-11).

7. Connect the **flexible cable** to **PJ5** on the system board (Figure 4-11).

8. Secure the HDD with **one M2.5x6 brass screw** (Figure 4-11).

9. Replace the top cover, optional PCMCIA card, optional memory card, and battery pack as described in sections 4.5 through 4.2.

4.7   RTC and Backup Batteries

Removal

To remove the RTC and backup batteries, follow the steps below and refer to Figure 4-14.

1.   Turn off the power and disconnect the AC adapter, power cord, and all external cables.

2.   Remove the battery pack, optional memory card, optional PCMCIA card, and top cover as described in sections 4.2 through 4.5.

3.   Disconnect the **RTC battery cable** from **PJ2** on the system board (Figure 4-14).

4.   Slide the **RTC battery** out of the retaining brackets to remove (Figure 4-14).

5.   Disconnect the **backup battery cable** from **PJ1** on the power supply board, lift the backup battery out of the bottom cover, and remove the clear plastic insulator (Figure 4-14).
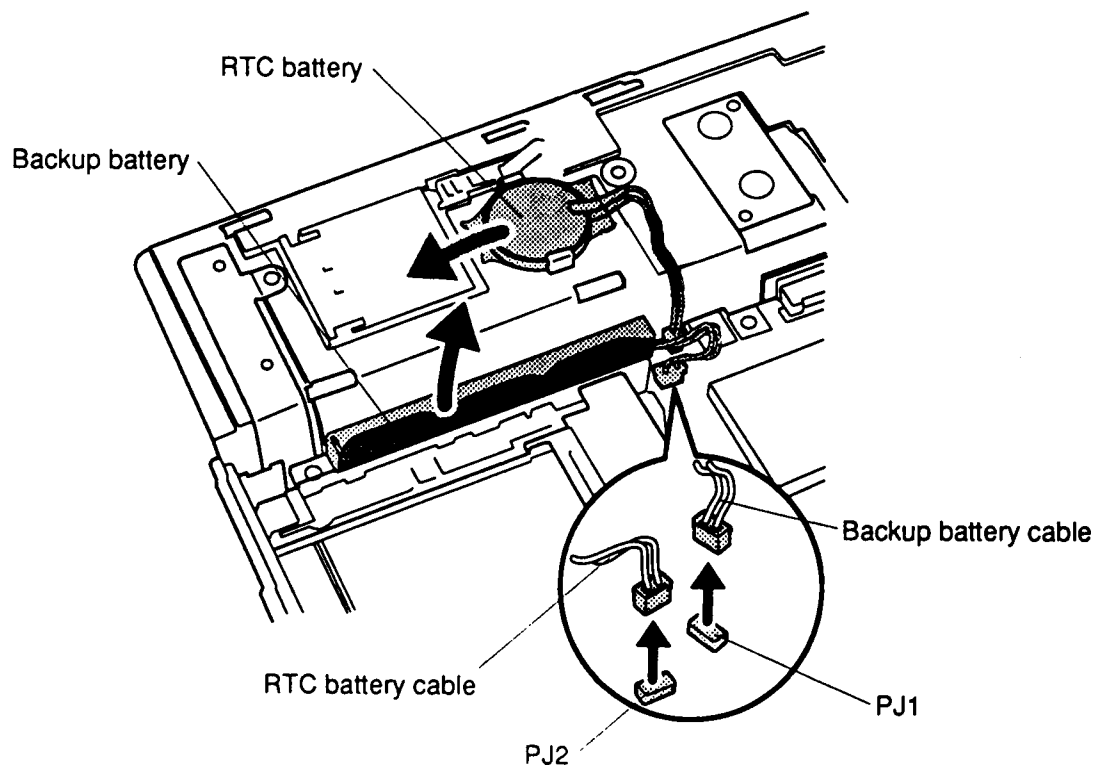

Figure 4-14 Removing the RTC and Backup Batteries

Installation

To install the RTC and backup batteries, follow the steps below and refer to Figure 4-14.

1. Replace the clear plastic insulator on the backup battery (Figure 4-14).

2. Connect the **backup battery cable** to **PJ1** on the power supply board and seat the backup battery in the bottom cover (Figure 4-14).

3. Slide the **RTC battery** under the brackets (Figure 4-14).

4. Route the **RTC battery cable** under the clear plastic insulator, then connect the cable to **PJ2** on the system board (Figure 4-14).

5. Replace the top cover, optional PCMCIA card, optional memory card, and battery pack as described in sections 4.5 through 4.2.

4.8 AccuPoint Control Button

Removal

To remove the AccuPoint control button, follow the steps below and refer to Figure 4-15.

1. Turn off the power and disconnect the AC adapter, power cord, and all external cables.

2. Remove the battery pack, optional memory card, optional PCMCIA card, and top cover as described in sections 4.2 through 4.5.

3. Disconnect the **control button cable** from **PJ801** on the power supply/system joint board (Figure 4-15).

4. Slide the **control button and cable** free of latches on the bottom cover and lift out to remove (Figure 4-15).
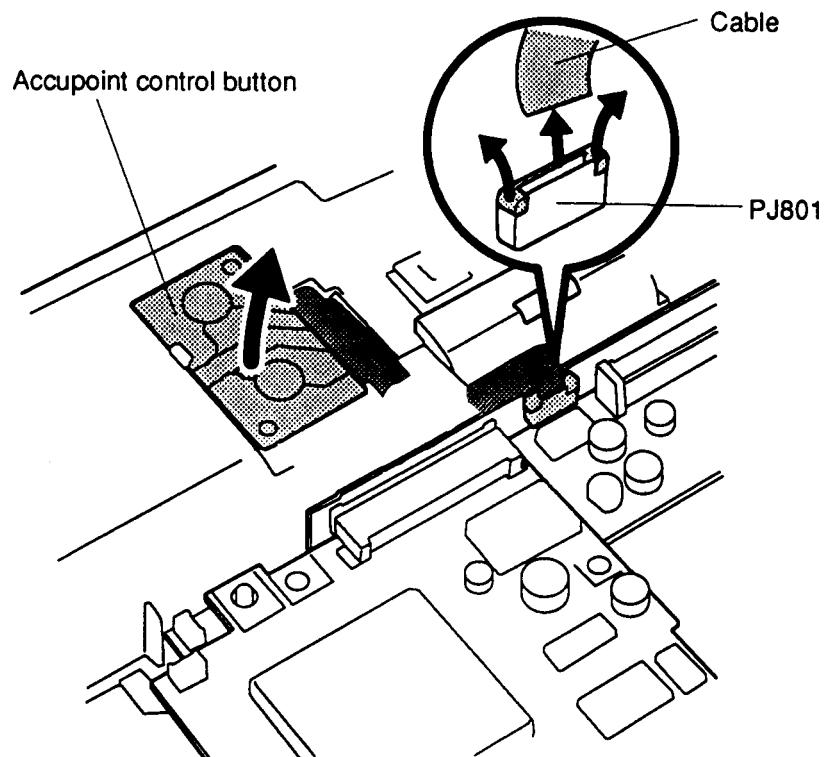
Figure 4-15 Removing the AccuPoint Control Button

Installation

To install the AccuPoint control button, follow the steps below and refer to Figure 4-15.

1.   Slide the **control button** and cable under the latches on the bottom cover (Figure 4-15).

2.   Connect the **control button cable** to **PJ801** on the **power supply/system joint board** (Figure 4-15).

3.   Replace the top cover, optional PCMCIA card, optional memory card, and battery pack as described in sections 4.5 through 4.2.

4.9 System Board

Removal

To remove the system board, follow the steps below and refer to Figure 4-16.

1. Turn off the power and disconnect the AC adapter, power cord, and all external cables.

2. Remove the battery pack, optional memory card, optional PCMCIA card, top cover, HDD, and RTC and backup batteries as described in sections 4.2 through 4.7.

3. Lift up the back (connector) side of the system board slightly (Figure 4-16).

4. Remove one **M2x6 brass screw** securing the system board to the bottom cover.

5. Hold down the **power supply/system joint board** with your thumb and pull the **system board** to disconnect it from the **power supply/system joint board** (Figure 4-16).

6. Lift out the **system board** (Figure 4-16).

NOTE: Be careful with the PCMCIA card eject button, it may be necessary to open the PCMCIA slot cover for the button to clear the bottom cover. Be sure to ease the board carefully from its guide pins.
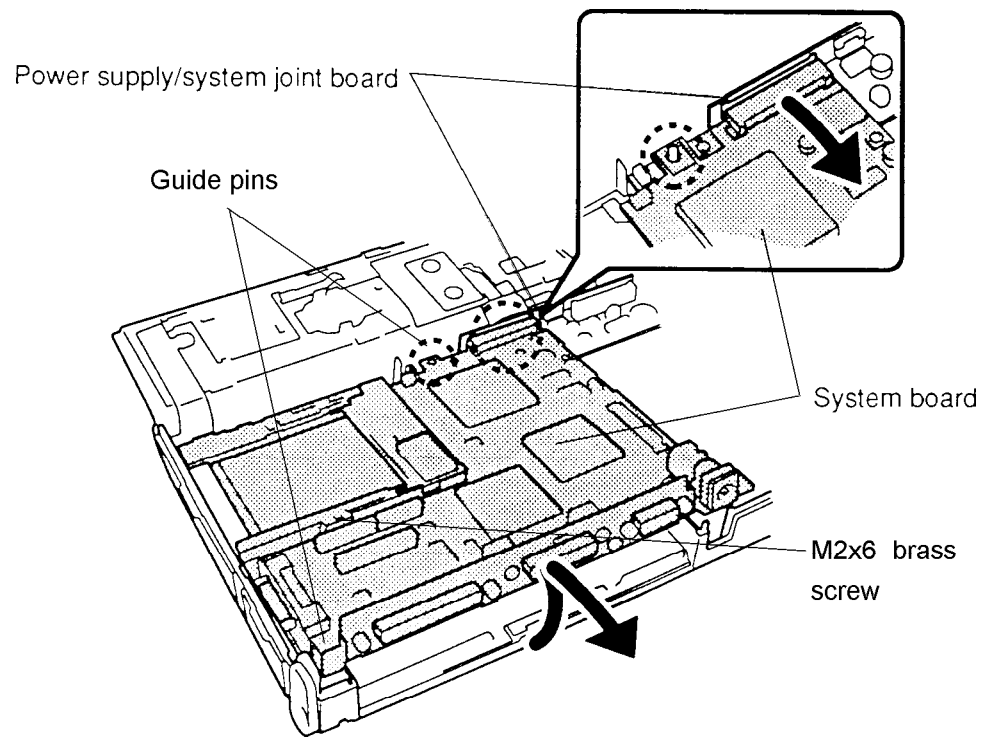
Figure 4-16 Removing the System Board

Installation

To install the system board, follow the steps below and refer to Figure 4-16.

1. Connect the **system board** to the **power supply/system joint board** (Figure 4-16).

2. Seat the **system board** into the bottom cover (Figure 4-16).

NOTE: Be careful with the PCMCIA card eject button, it may be necessary to open the PCMCIA slot cover for the button to clear the bottom cover. Be sure to match the guide pins with the corresponding holes in the board.
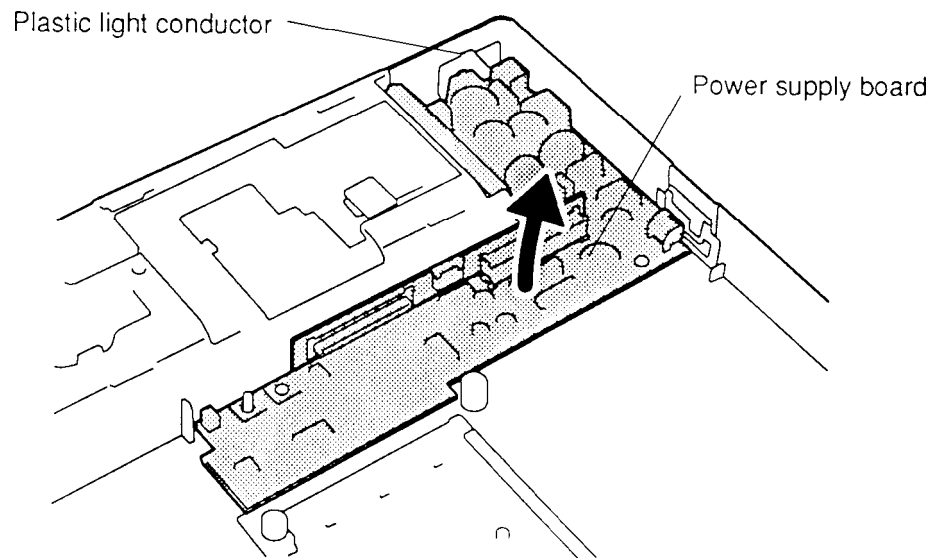
---

3. Secure the system board to the bottom cover with one M2x6 screw.

4. Replace the RTC and backup batteries, hard disk drive, top cover, optional PCMCIA card, optional memory card, and battery pack as described in sections 4.7 through 4.2.
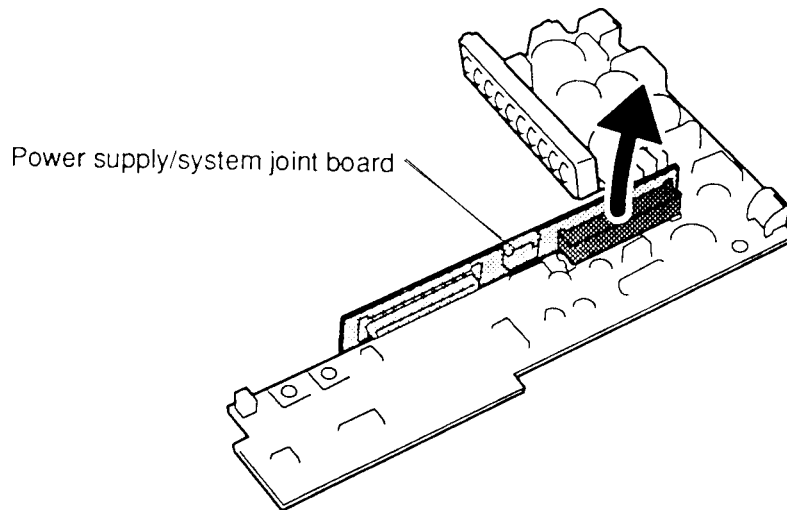
4.10 Power Supply Board

Removal

To remove the power supply board, follow the steps below and refer to Figures 4-17 and 4-18.

1. Turn the power off and disconnect the AC adapter, power cord, and all external cables.

2. Remove the battery pack, optional memory card, optional PCMCIA card, top cover, hard disk drive, RTC and backup batteries, AccuPoint control button, and system board as described in sections 4.2 through 4.9.

3. Lift out the **power supply board**, being careful to clear the **plastic light conductor** for the battery LED indicator (Figure 4-17).

Figure 4-17 Removing the Power Supply Board

4. Disconnect the **power supply/system joint board** from the power supply board (Figure 4-18).

Power supply/system joint board

Figure 4-18 Removing the Joint Board

Installation

To install the power supply board, follow the steps below and refer to Figures 4-17 and 4-18.

1. Connect the **power supply/system joint board** to the power supply board (Figure 4-18).

2. Seat the **power supply board** into the bottom cover, being careful to clear the **plastic light conductor** for the battery LED indicator (Figure 4-17).

3. Replace the system board, AccuPoint control button, RTC and backup batteries, hard disk drive, top cover, optional PCMCIA card, optional memory card, and battery pack as described in sections 4.9 through 4.2.

4.11 Keyboard

Removal

To remove the keyboard, follow the steps below and refer to Figures 4-19 and 4-20.

1. Turn off the power and disconnect the AC adapter, power cord, and all external cables.

2. Remove the battery pack, optional memory card, optional PCMCIA card, and top cover as described in sections 4.2 through 4.5.

3. From the top (keyboard) side, use a thin object to pry up the left and right sides of the plastic panel slightly, then pry open and release the other latches, starting near the ends and working toward the center (Figure 4-19).

Figure 4-19 Unlatching the Plastic Panel

4. Remove **three M2.5x6 brass screws** at the front of the keyboard and lift out.

Figure 4-20 Removing the Keyboard Screws

Installation

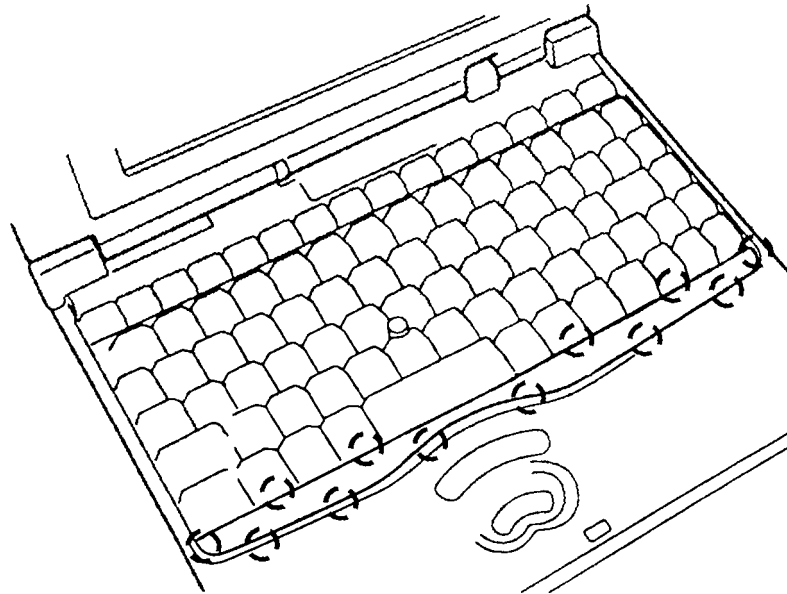To install the keyboard, follow the steps below and refer to Figures 4-19 and 4-20.

1. Seat the keyboard (Figure 4-20).

2. Secure **three M2.5x6 brass screws** at the front of the keyboard (Figure 4-20).

3. Seat the **plastic panel** and press firmly to secure the **latches** (Figure 4-19).

4. Replace the top cover, optional PCMCIA card, optional memory card, and battery pack as described in sections 4.5 through 4.2.
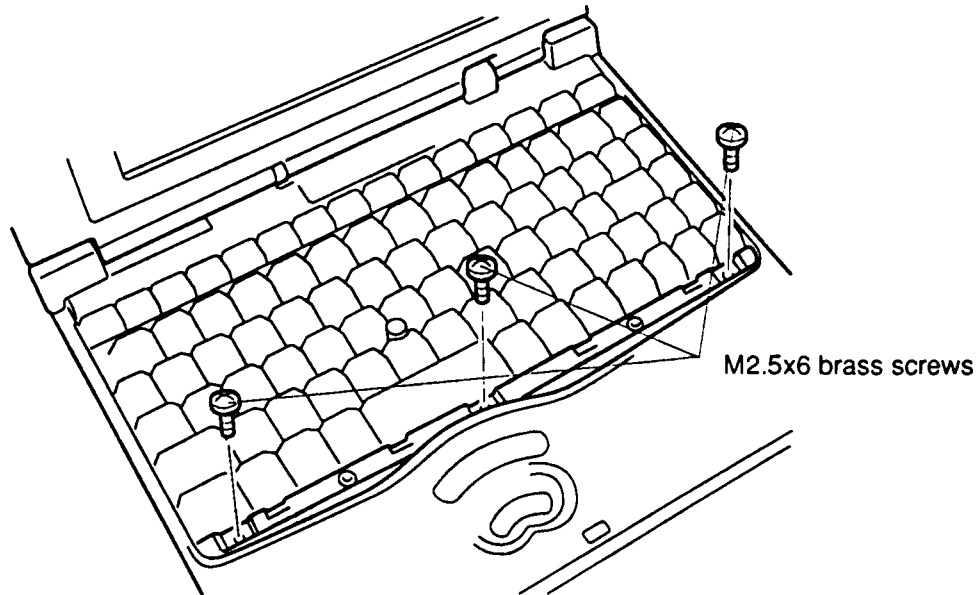
4.12 LED Board

Removal

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

1. Turn off the power and disconnect the AC adapter, power cord, and all external cables.

2. Remove the battery pack, optional memory card, optional PCMCIA card, and top cover as described in sections 4.2, 4.3, 4.4, and 4.5.

3. Remove the **M2.5x4 brass screw** securing the **LED board** (Figure 4-21).

4. Using a thin object to release the two latches on the top cover, pull up gently on the **LED holder** and remove it.

5. Lift out the LED board.

M2.5x4 brass screw

Figure 4-21 Removing the LED Board

Installation

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

1. Seat the **LED board** (Figure 4-21).

2. Seat the **LED holder** on the LED board and press gently to secure the **latches** (Figure 4-21).

3. Secure the **M2.5x4 brass screw** holding the LED board and LED holder (Figure 4-21).

4. Replace the top cover, optional PCMCIA card, optional memory card, and battery pack as described in sections 4.5 through 4.2.
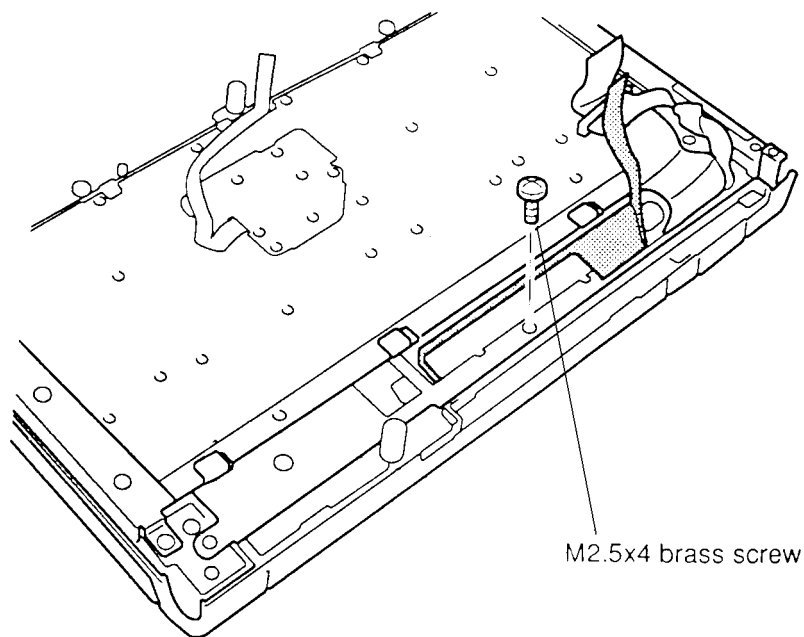
4.13 Display Mask

Removal

To remove the display mask, follow the steps below and refer to Figure 4-22.

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

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

3. Remove **two screw covers** from the display hinges and **two rubber pads** from the top corners of the display (Figure 4-22).

4. Remove **two brass M2.5x6 screws** at the bottom corners of the display mask, and **two brass M2x6 screws** at the top corners (Figure 4-22).

5. Slip your fingers between the display cover and mask and pull out gently to release **one latch** at the top center.

6. Continue around the display cover to release **two more latches** at the top, **four latches** on each side and **five latches** at the bottom (Figure 4-22).
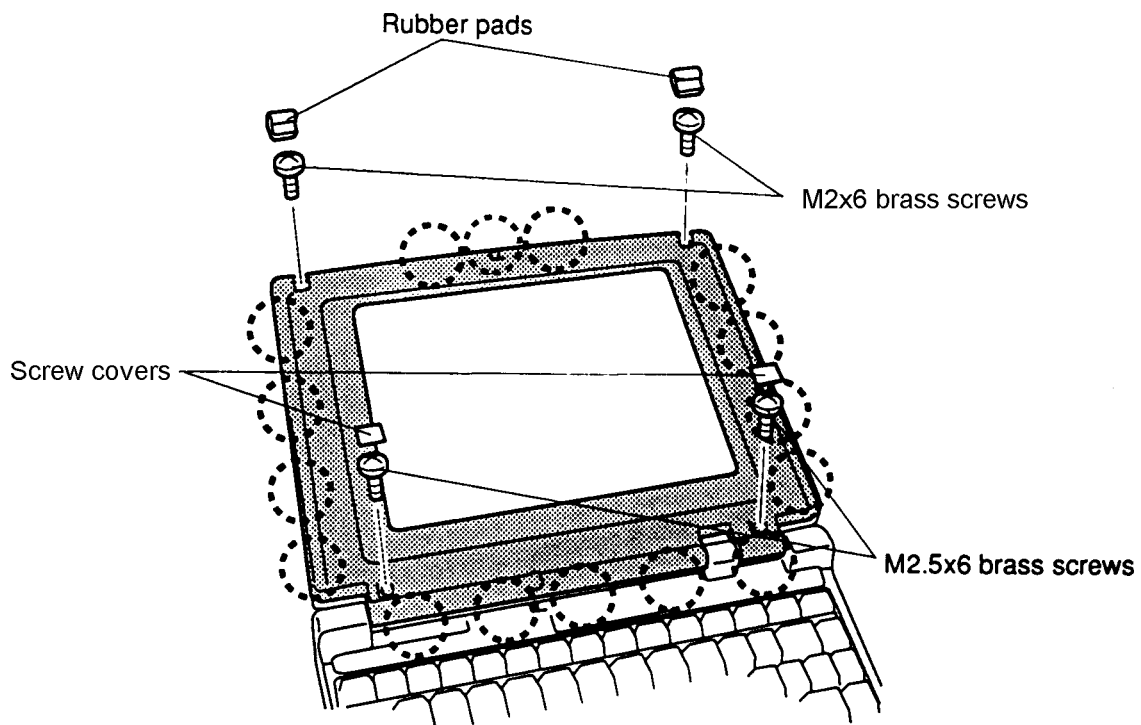
Figure 4-22 Removing the Display Mask

Installation

To install the display mask, follow the steps below and refer to Figure 4-22.

1. Set the **display mask** in place and press firmly to secure the latches. Start at the bottom **five latches** and work your way around the sides (**four latches** at each side) to the **three latches** at the top (Figure 4-22).

2. Secure **two brass M2x6 screws** at the top of the display cover and **two brass M2.5x6 screws** at the bottom (Figure 4-22).

3. Replace the **two rubber pads** and **two screw covers** (Figure 4-22).

4. Replace the battery pack as described in section 4.2.

4.14 FL Inverter Board

Removal

To remove the FL inverter board, follow the steps below and refer to Figure 4-23.

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

2. Remove the battery pack and display mask as described in sections 4.2 and 4.13.

3. Remove **two brass M2x6 screws** from the **FL inverter board**.

4. Turn over the board and disconnect the **FL inverter cable** from **CN1** and the **FL cable** from **CN2**.
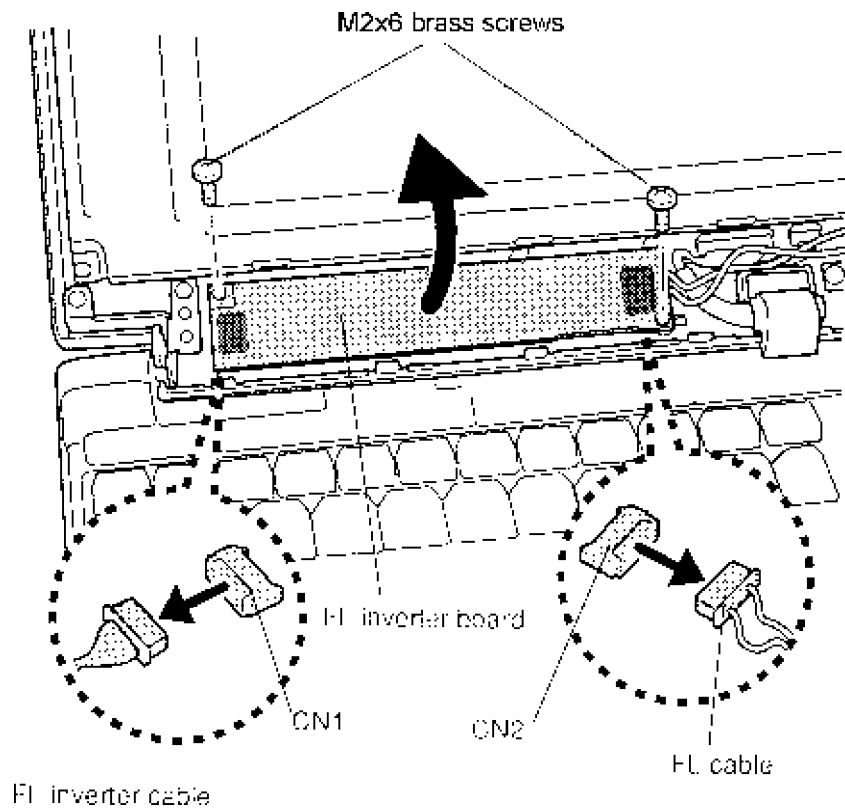
Figure 4-23 Removing the FL Inverter Board

Installation

To install the FL inverter board, follow the steps below and refer to Figure 4-23.

1. Turn the board over and connect the **FL inverter cable** to **CN1** and the **FL cable** to **CN2** (Figure 4-23).

2. Secure **two brass M2x6 screws** holding the the **FL inverter board** (Figure 4-23).

3. Replace the display mask and battery pack as described in sections 4.13 and 4.2.

4.15 Monochrome Display Module

Removal

To remove the monochrome display module, follow the steps below and refer to Figures 4-24 through 4-26.

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

2.   Remove the battery pack, display mask, and FL inverter board as described in sections 4.2, 4.13 and 4.14.

3.   Remove **four brass M2x6 screws** at each corner of the display module. The screw at the bottom right corner also secures the **ground cable** (Figure 4-24).

4.   Rotate the **display panel** out so that it lies flat on an ESD-protected surface (Figure 4-24).
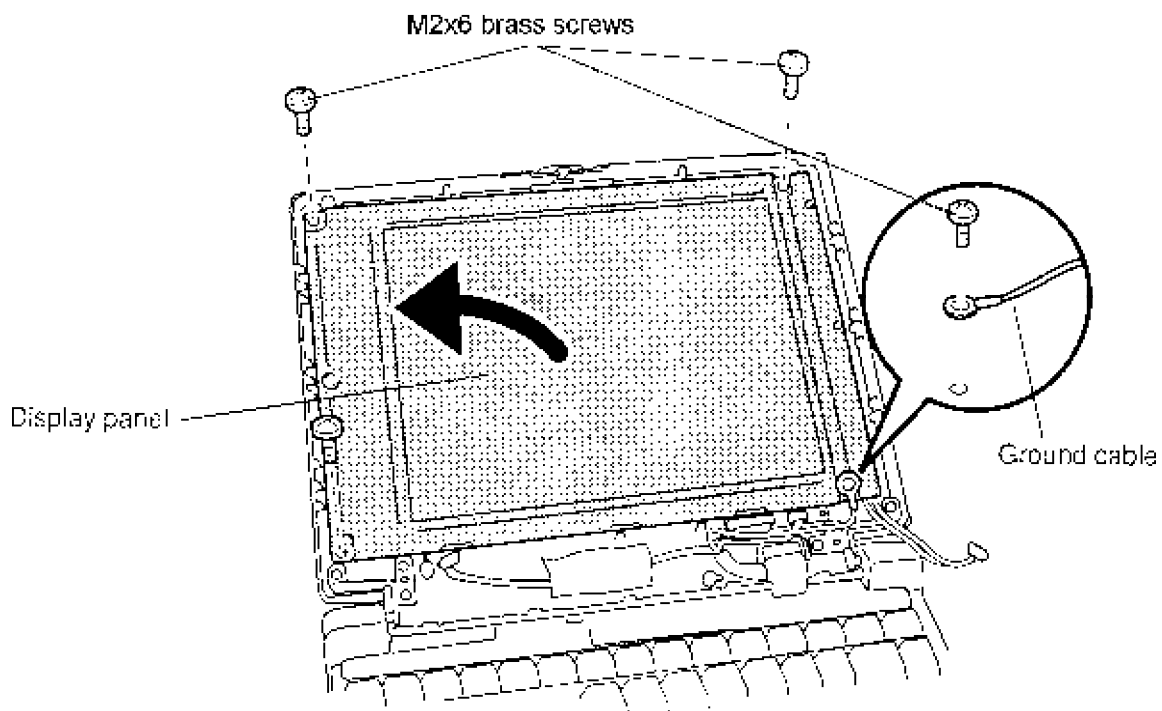
Figure 4-24 Removing the Display Module Screws

5. Disconnect the display's **flat cable** from the display unit (Figure 4-25).
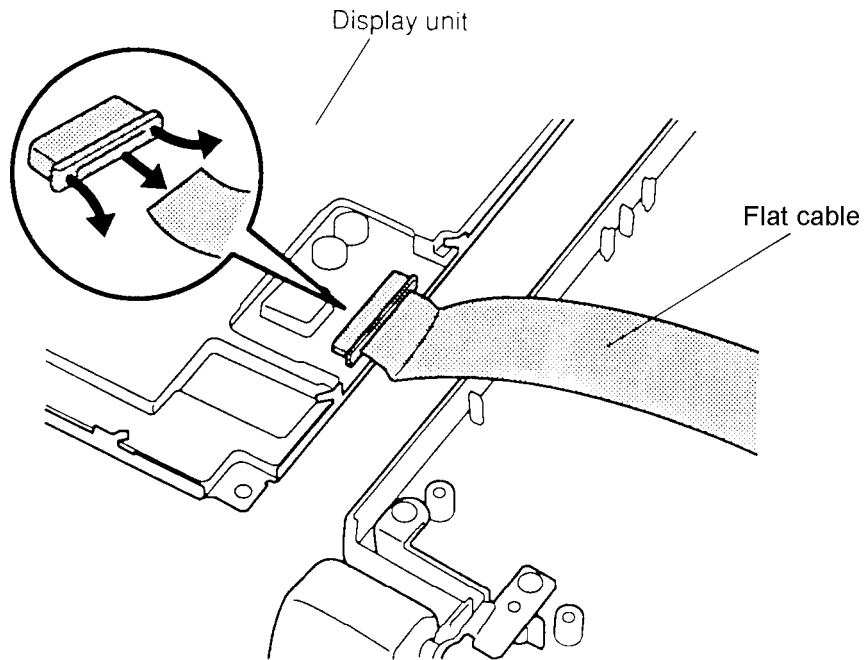
Figure 4-25 Disconnection From the Display Unit

6. Disconnect the other end of the flat cable from the computer's **display cable** (Figure 4-26).
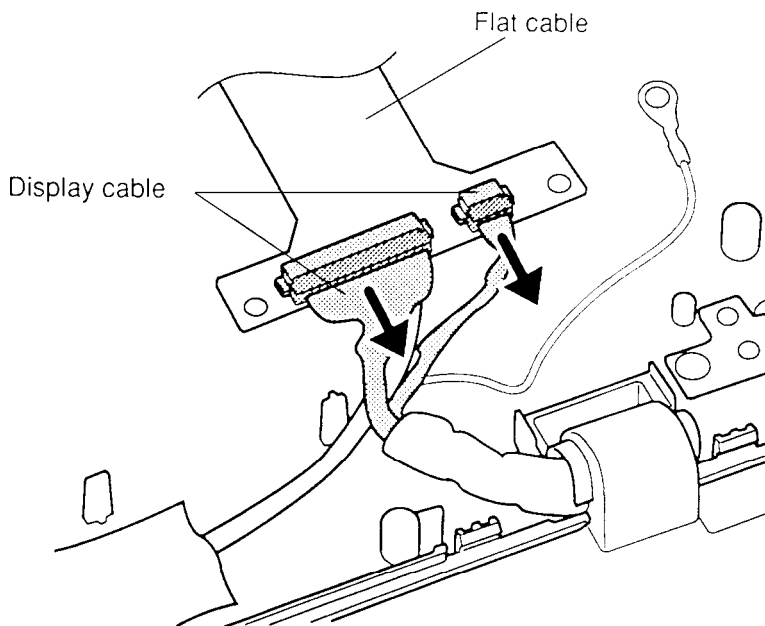
Figure 4-26 Disconnection From the Display Cable

Installation

To install the monochrome display module, follow the steps below and refer to Figures 4-24 through 4-26.

1. Connect the **flat cable** to the **display cable** (Figure 4-26).

2. Connect the **flat cable** to the **display unit** (Figure 4-25).

3. Seat the **display module** in the display cover and secure **four brass M2x6 screws**, one at each corner (Figure 4-24).

   NOTE: Secure the ground cable at the bottom right corner with one of the screws.

4. Replace the FL inverter board, display mask, and battery pack as described in sections 4.14, 4.13, and 4.2.

4.16 Monochrome Fluorescent Lamp

Removal

To remove the fluorescent lamp (FL), follow the steps below and refer to Figures 4-27 and 4-28.

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

2. Remove the battery pack, display mask, FL inverter board, and display module as described in sections 4.2, 4.13, 4.14, and 4.15.

3. Remove **three brass M2x2 flathead screws** securing the **FL cover** (Figure 4-27).

4. Lift out the FL cover.
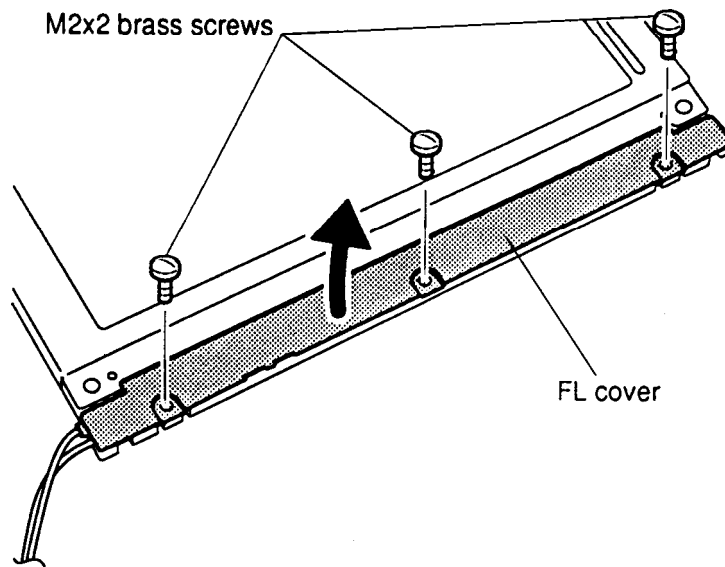
Figure 4-27 Removing the FL Cover Screws

5.   Remove the FL from the display module (Figure 4-28).

Figure 4-28 Removing the FL

Installation

To install the monochrome fluorescent lamp, follow the steps below and refer to Figures 4-27 and 4-28.

1.   Seat the FL (Figure 4-28).

2.   Seat the FL cover and secure it with **three brass M2x2 flat-head screws** (Figure 4-27).

3.   Replace the display module, FL inverter board, display mask, and battery pack as described in sections 4.15, 4.14, 4.13, and 4.2.

4.17 TFT Color Display Module

Removal

To remove the TFT color display module, follow the steps below and refer to Figures 4-29 and 4-30.

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

2. Remove the battery pack, display mask, and FL inverter board as described in sections 4.2, 4.13 and 4.14.

3. Remove **four brass M2x6 screws** at each corner of the display module. The screw at the bottom right corner also secures the **ground cable** (Figure 4-29).

4. Note the ground and display cable routing, then rotate the **display module** out of the display cover from left to right (Figure 4-29).
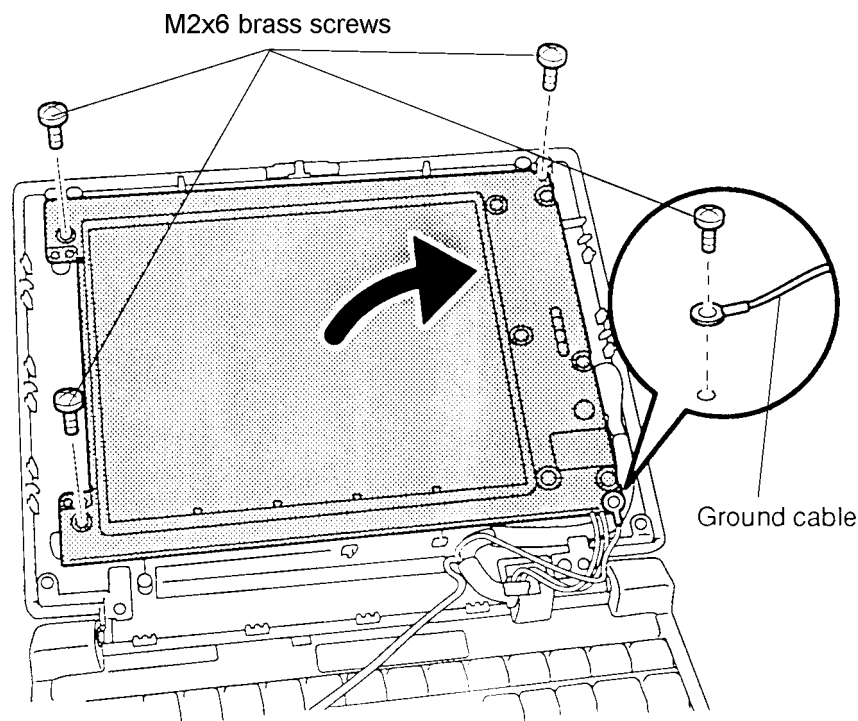
Figure 4-29 Removing the Display Module Screws

5. Disconnect the **display cable** and lift out the **display module** (Figure 4-30).
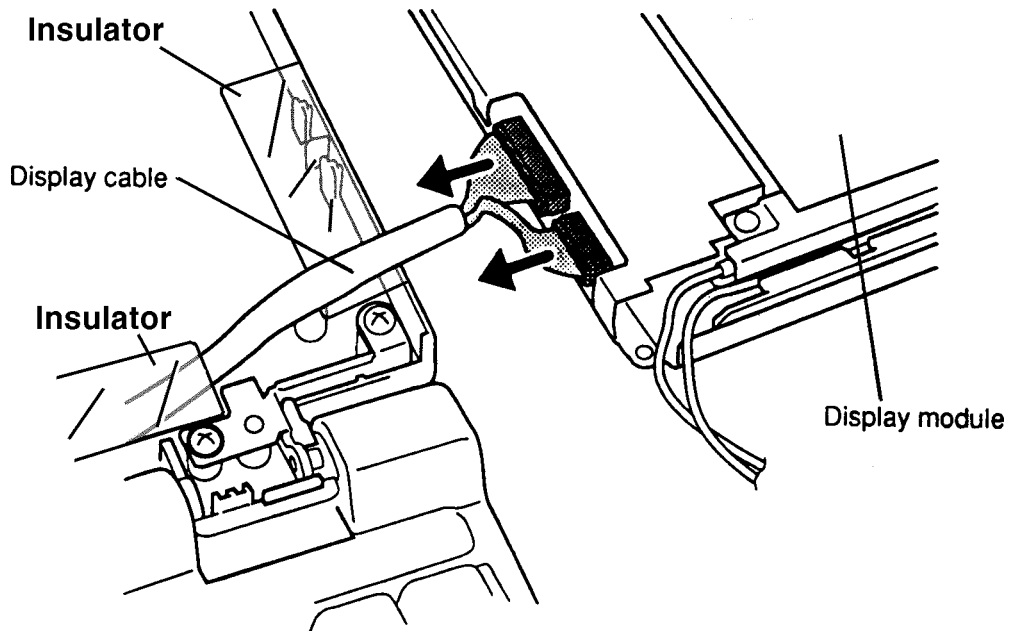
Figure 4-30 Removing the Display Module

Installation

To install the color display module, follow the steps below and refer to Figures 4-29 and 4-30.

1. Connect the **display cable** to the **display module,** routing the cable back under the clear plastic insulator. (Figure 4-30).

2. Seat the **display module** in the display cover and secure **four brass M2x6 screws**, one at each corner of the module (Figure 4-29).

*NOTE: Secure the ground cable at the bottom right corner with one of the screws.*

3. Replace the FL inverter board, display mask, and battery pack as described in sections 4.14, 4.13, and 4.2.

4.18 TFT Color Fluorescent Lamp Unit

Removal

CAUTION: When removing the FL unit, be careful not to let dust or other foreign matter contaminate the display module. Any contamination can affect performance.
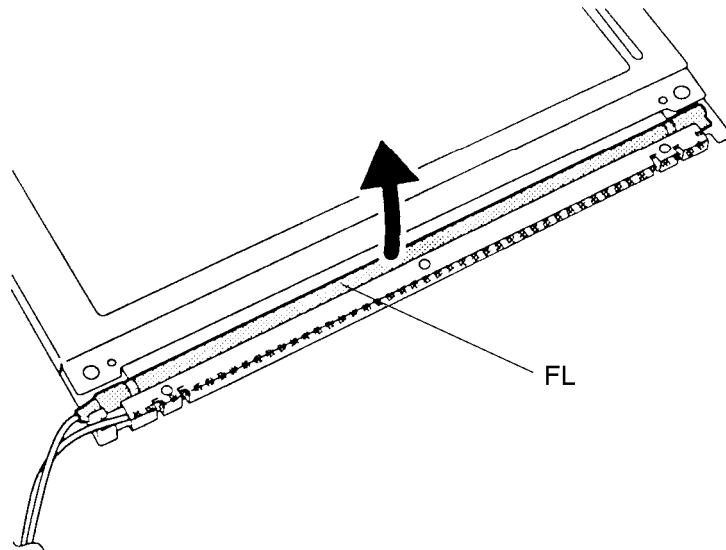

To remove the TFT color fluorescent lamp (FL), follow the steps below and refer to Figure 4-31.

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

2. Remove the battery pack, display mask, FL inverter board, and display module as described in sections 4.2, 4.13, 4.14, and 4.17.

3. Noting display cable routing, place the **FL unit** face down and remove **four M2x4 silver screws** (Figure 4-31).

4. Lift the **FL unit** out of the frame.
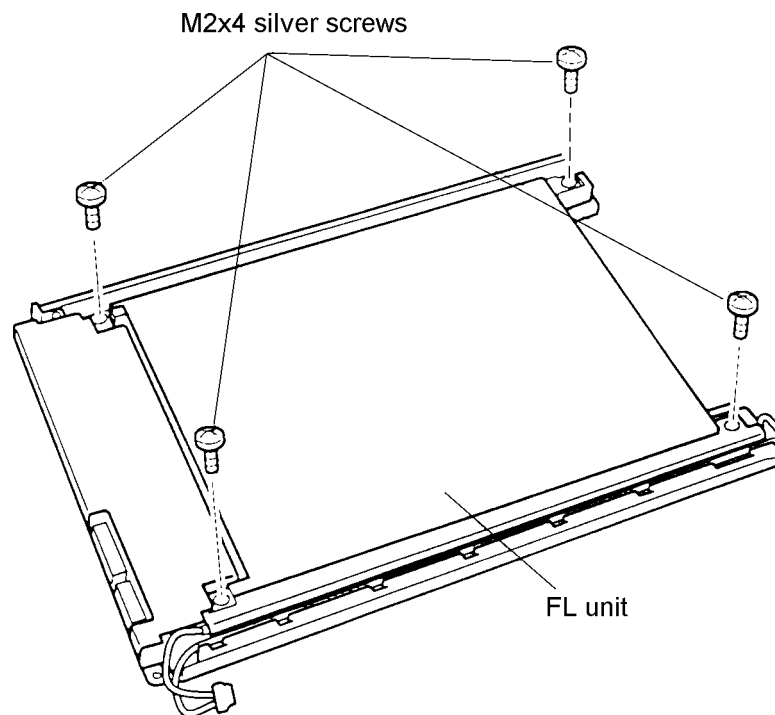
Figure 4-31 Removing the FL Unit Screws

Installation

To install the TFT color fluorescent lamp unit, follow the steps below and refer to Figure 4-31.

1. Noting display cable routing, press into underlying groove, then seat the FL unit in the frame and secure **four M2x4 silver screws** (Figure 4-31).

2. Replace the display module, FL inverter board, display mask, and battery pack as described in sections 4.17, 4.14, 4.13, and 4.2.

Appendix A Handling the LCD Module

Precautions for handling the T3400/T3400CT LCD module

The LCD module can be easily damaged during assembly or disassembly. Observe the following precautions when handling:

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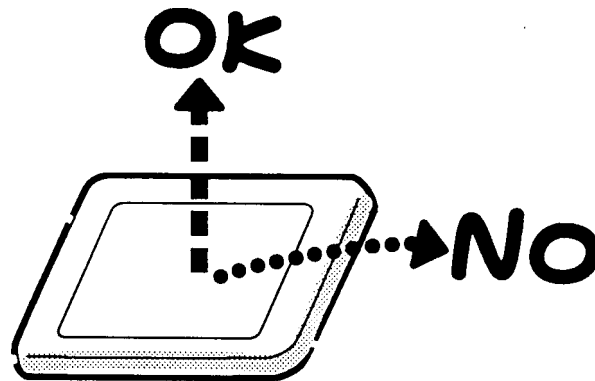
2.   Carefully align the holes at the four corners of the LCD module with corresponding holes in the cover before securing with screws. Do not force the module into place, stress can affect its performance.

     The polarized surface of the panel scars easily, handle carefully.

3.   If the panel surface gets dirty, wipe it with cotton or a soft cloth. If it is still dirty, breathe on the surface to create a light condensate and wipe again.
If the surface is very dirty, we recommend a CRT cleaning agent. Apply the agent to a cloth and then wipe the surface. Do not apply cleanser directly to the panel.
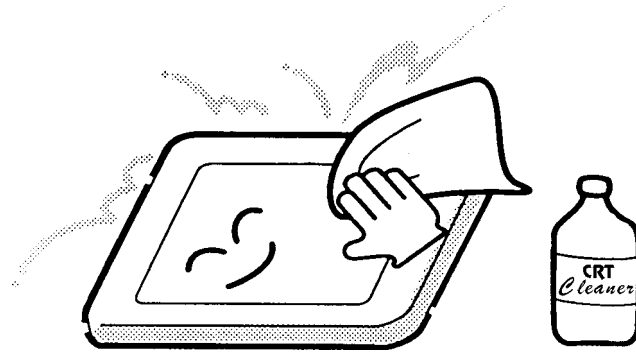
4.   Water or other liquids left on the surface for a long period can change the screen tint or stain the screen. Be sure to quickly wipe off any liquid.
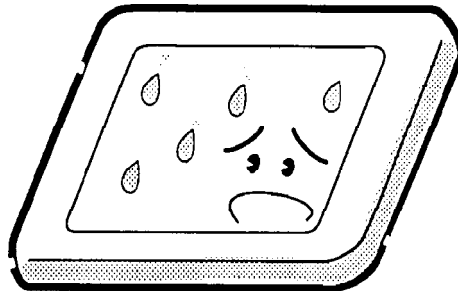
5   Do drop or strike the LCD module with a hard object, glass used in the panel could break or crack.
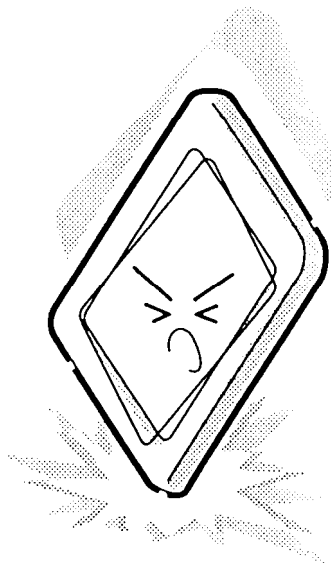
6. Wear a wrist or ankle ground when handling the module to prevent electrostatic discharge damage to the CMOS-LSI circuits.
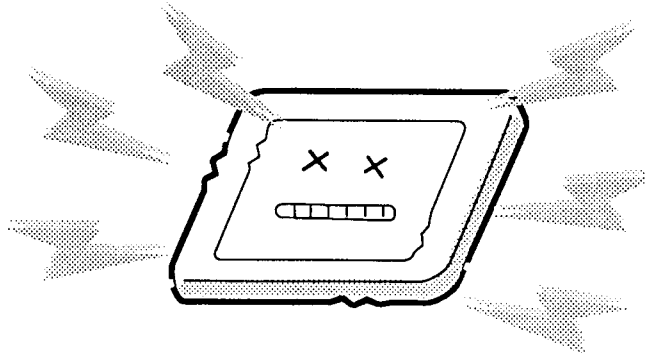
7. Do not expose the module to direct sunlight or strong ultraviolet rays for long periods.
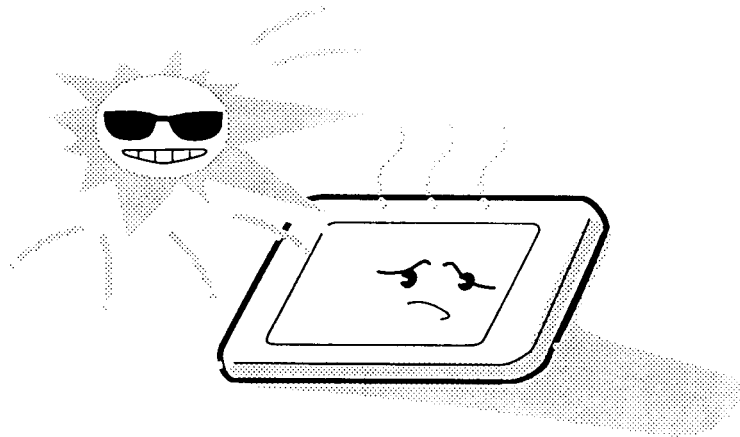
8. Do not store the module at temperatures below specifications. Cold can cause liquid crystals to freeze, lose their elasticity, or otherwise suffer damage.
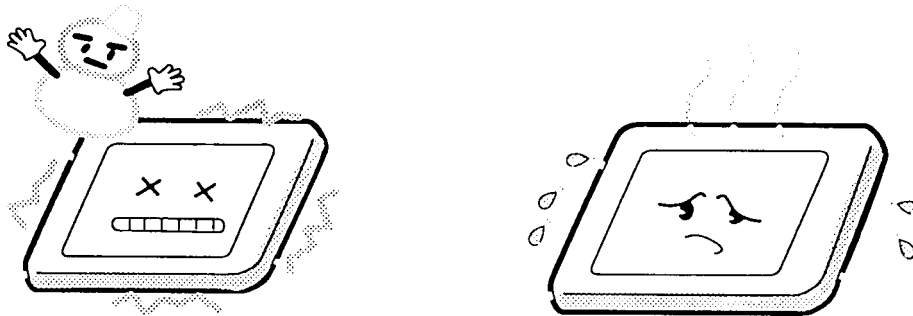
9. Do not disassemble the LCD module except as instructed in Chapter 4. Disassembly beyond the instructions in this manual can cause malfunctions.
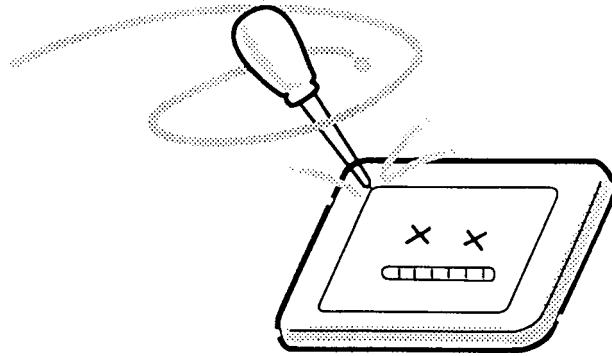
10. If transporting the module, do not use packing materials that contain epoxy resin (amine) or silicon glue (alcohol or oxime). These materials can release gas that can damage panel polarization.

Appendix B Board Layout

B.1   System Board Front View

Figure B-1 Board Layout (Front)
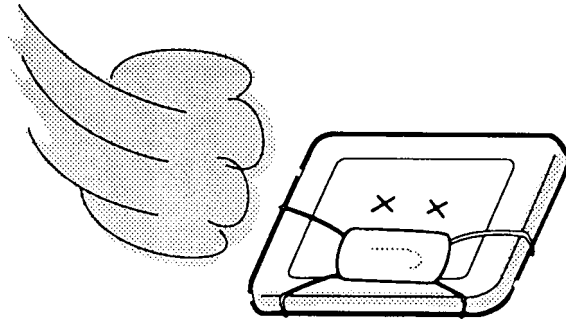
B.2   System Board Back View
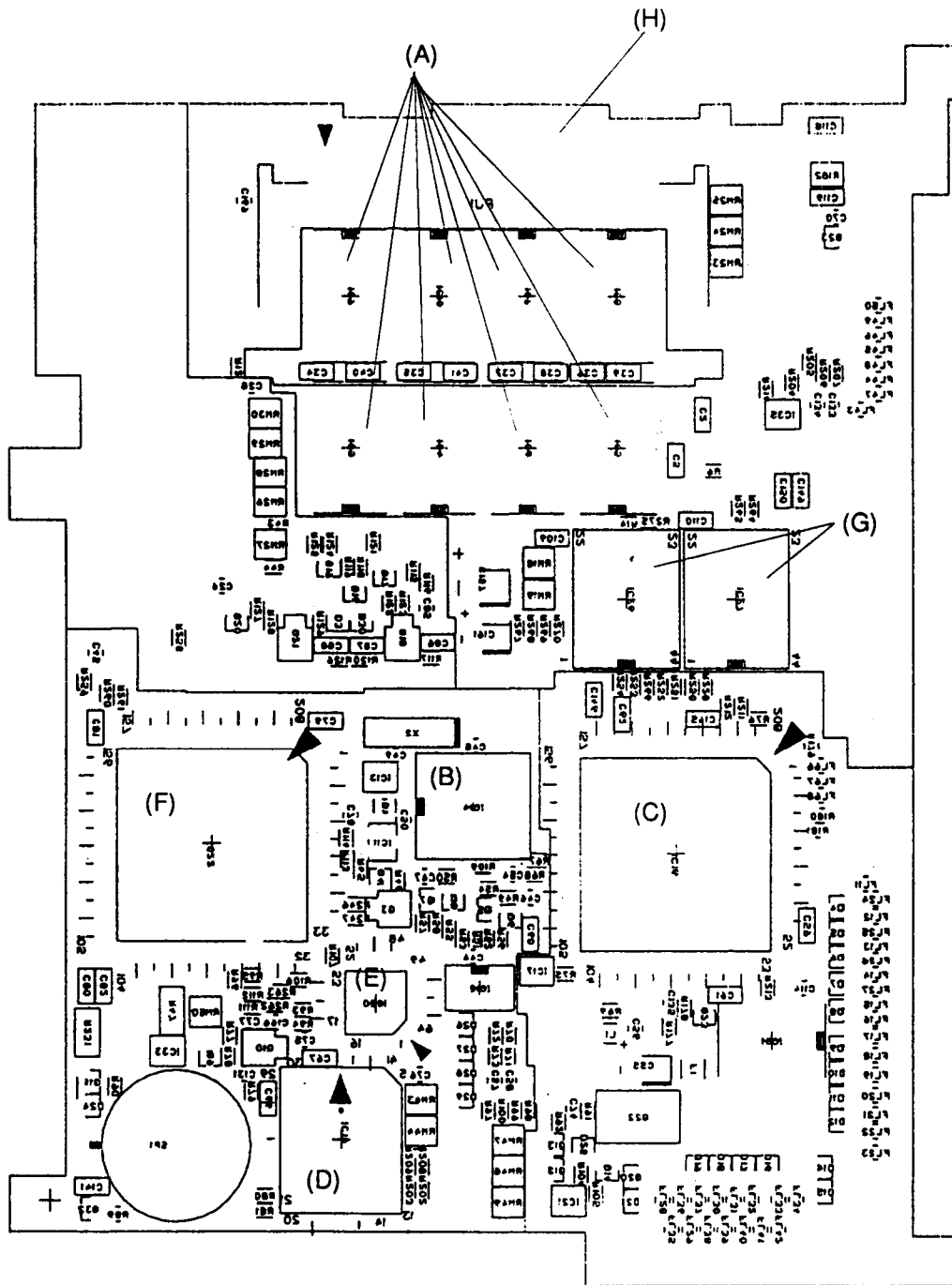
Figure B-2 Board Layout (Back)

Table B-1 System Board ICs and Connectors (Front)

Mark	Number	Name
(A)	IC1	CPU 80486SX
(B)	IC2	System Controller Gate Array
(C)	IC3	Clock Generator
(D)	IC23	Display Controller (WD90C24)
(E)	PJ2	RTC Battery Connector
(F)	PJ3	PRT/FDD Connector
(G)	PJ4	External 3.5-inch FDD Connector
(H)	PJ5	HDD Connector
(I)	PJ6	Serial I/F Connector
(J)	PJ8	Keyboard Connector
(K)	PJ9	PCMCIA Connector
(L)	PJ10	Internal LCD Connector
(M)	PJ15	Power Supply Board Joint Connector
(N)	PJ16	LED Connector
(O)	PJ17	Port Replicator Connector

Table B-2 System Board ICs and Connectors (Back)

Mark	Number	Name
(A)	IC3 to IC10	System Memory
(B)	IC14	Real Time Clock
(C)	IC16	T9901
(D)	IC18	BIOS ROM
(E)	IC 20	Keyboard Controller
(F)	IC 22	PCMCIA Controller Gate Array
(G)	IC 26, IC27	Video RAM
(H)	PJ1	Memory Module Connector

Appendix C Pin Assignments

C.1   PJ1 Memory Slot Connectors (72-Pin)

Table C-1 Memory Slot Connector Pin Assignment (72-Pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	GND	–	37	MD16;100	O
02	MD00;100	I/O	38	MD17;100	O
03	MD01;100	I/O	39	GND	–
04	MD02;100	I/O	40	CAS0;010	O
05	MD03;100	I/O	41	CAS2;010	O
06	MD04;100	I/O	42	CAS3;010	O
07	MD05;100	I/O	43	CAS1;010	O
08	MD06;100	I/O	44	RAS0;010	O
09	MD07;100	I/O	45	RAS1;010	O
10	B3V	–	46	GND	–
11	NC	–	47	MWE2;010	O
12	MA00;110	O	48	GND	–
13	MA01;110	O	49	MD18;100	I/O
14	MA02;110	O	50	MD19;100	I/O
15	MA03;110	O	51	MD20;100	I/O
16	MA04;110	O	52	MD21;100	I/O
17	MA05;110	O	53	MD22;100	I/O
18	MA06;110	O	54	MD23;100	I/O
19	MA10;110	O	55	NC	–
20	NC	–	56	MD24;100	I/O
21	MD08;100	O	57	MD25;100	I/O
22	MD09;100	O	58	MD26;100	I/O
23	MD10;100	O	59	MD28;100	I/O
24	MD11;100	O	60	MD27;100	I/O
25	MD12;100	O	61	B3V	–
26	MD13;100	O	62	MD29;100	I/O
27	MD14;100	O	63	MD30;100	I/O
28	MA07;110	O	64	MD31;100	I/O
29	GND	–	65	NC	–
30	B3V	–	66	NC	–
31	MA08;110	O	67	NC	–
32	MA09;110	O	68	NC	–
33	RAS1;010	O	69	NC	–
34	RAS0;010	O	70	NC	–
35	MD15;100	O	71	NC	–
36	NC	–	72	NC	I/O

C.2 PJ2 RTC Connectors (3-Pin)

Table C-2 RTC Connector Pin Assignment (3-Pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	RTCBAT	–	03	GND	–
02	NC	–			

C.3 PJ3 PRT/FDD Connectors (for Printer) (25-Pin)

Table C-3 PRT/FDD Connector (for Printer) Pin Assignment (25-Pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	STROB;000	I/O	14	AUTFD;000	I/O
02	PDB00;100	I/O	15	ERROR;000	I/O
03	PDB01;100	I/O	16	PINT;000	I/O
04	PDB02;100	I/O	17	SLIN;000	I/O
05	PDB03;100	I/O	18	GND	–
06	PDB04;100	I/O	19	GND	–
07	PDB05;100	I/O	20	GND	–
08	PDB06;100	I/O	21	GND	–
09	PDB07;100	I/O	22	GND	–
10	ACK;000	I/O	23	GND	–
11	BUSY;100	I/O	24	GND	–
12	PE;100	I/O	25	GND	–
13	SELCT;100	I/O			

C.4 PJ3 PRT/FDD (Ext) Connectors (for FDD) (25-Pin)

Table C-4 PRT/FDD (Ext) Connector (for FDD) Pin Assignment (25-Pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	RDY	I	14	LOWD	O
02	INDX	I	15	SSEL	O
03	TRO	I	16	DIRC	O
04	WPR	I	17	STEP	O
05	RDAT	I	18	GND	–
06	DKCH	I	19	GND	–
07	N/C	–	20	GND	–
08	N/C	–	21	GND	–
09	N/C	–	22	GND	–
10	DSL	O	23	GND	–
11	MON	O	24	GND	–
12	WDAT	O	25	GND	–
13	WEN	O			

C.5 PJ4 External 3.5-Inch FDD Connectors (26-Pin)

Table C-5 External 3.5-inch FDD Connector Pin Assignment (26-Pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	VCC	–	14	IFSTEP;010	O
02	IFINDX;000	I	15	GND	–
03	VCC	–	16	IFWDAT;010	O
04	IFDASL;010	O	17	GND	–
05	VCC	–	18	IFWEN;010	O
06	DSKCHG;000	I	19	GND	–
07	VCC	–	20	IFTRK0;000	I
08	IFRADY;000	I	21	GND	–
09	IFHMED;000	I	22	IFWPRO;000	I
10	IFAMON;010	O	23	GND	–
11	IFLOD1;010	O	24	IFRDAT;000	I
12	IFDIRC;010	O	25	GND	–
13	GND	–	26	IFSSEL;010	O

C.6 PJ5 Internal HDD Connectors (50-Pin)

Table C-6 Internal HDD Connector Pin Assignment (50-Pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	RESET;000	I	26	GND	–
02	GND	–	27	IRQ14;100	O
03	SD07;100	I/O	28	IOCS16;000	O
04	SD08;100	I/O	29	SA01;100	I
05	SD06;100	I/O	30	IPSSEL;100	I
06	SD09;100	I/O	31	SA00;100	I
07	SD05;100	I/O	32	SA02;100	I
08	SD10;100	I/O	33	HDCS0;000	I
09	SD04;100	I/O	34	IHDCS1;000	I
10	SD11;100	I/O	35	HDDLED;000	O
11	SD03;100	I/O	36	GND	–
12	SD12;100	I/O	37	VCC	–
13	SD02;100	I/O	38	VCC	–
14	SD13;100	I/O	39	GND	–
15	SD01;100	I/O	40	ATSLCT;100	I
16	SD14;100	I/O	41	VCC	–
17	SD00;100	I/O	42	IPSCLK;110	I
18	SD15;100	I/O	43	IPSDAT;100	O
19	GND	–	44	GND	–
20	GND	–	45	MOUSDT;100	I/O
21	IOWR	I	46	MOUSCK;120	I/O
22	GND	–	47	GND	–
23	IORD	I	48	IPSSWL;000	I
24	GND	–	49	IPSSWR;000	I
25	IOCRDY	O	50	GND	–

C.7 PJ6 Serial I/F Connectors (9-Pin)

Table C-7 Serial I/F Connector Pin Assignment (9-Pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	DCD1;100	I	06	DSR1;100	I
02	RD1;000	I	07	RTS1;100	O
03	SD1;000	O	08	CTS1;100	I
04	DTR1;100	O	09	RI1;100	I
05	GND	–			

C.8 PJ8 KB I/F Connectors (19-Pin)

Table C-8 KB I/F Connector Pin Assignment (19-Pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	KBOT00;001	O	11	KBRT7;100	I
02	KBOT01;010	O	12	KBOT03;010	O
03	KBOT02;010	O	13	KBOT04;010	O
04	KBRT0;100	I	14	KBOT05;010	O
05	KBRT1;100	I	15	KBOT06;010	O
06	KBRT2;100	I	16	KBOT07;010	O
07	KBRT3;100	I	17	KBOT08;010	O
08	KBRT4;100	I	18	KBOT09;010	O
09	KBRT5;100	I	19	KBOT10;010	O
10	KBRT6;100	I			

C.9 PJ9 PC Card Slot Connectors (68-Pin)

Table C-9 PC Card Slot Connector Pin Assignment (68-Pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	GND	–	35	GND	–
02	PCD03;100	I/O	36	PCCD1;000	I
03	PCD04;100	I/O	37	PCD11;100	I/O
04	PCD05;100	I/O	38	PCD12;100	I/O
05	PCD06;100	I/O	39	PCD13;100	I/O
06	PCD07;100	I/O	40	PCD14;100	I/O
07	PCCE1;000	O	41	PCD15;100	I/O
08	PCA10;100	O	42	PCCE2;000	O
09	PCOE;000	O	43	NC	–
10	PCA11;100	O	44	PCIOR;000	O
11	PCA09;100	O	45	PCIOW;000	O
12	PCA08;100	O	46	PCA17;100	O
13	PCA13;100	O	47	PCA18;100	O
14	PCA14;100	O	48	PCA19;100	O
15	PCWE;000	O	49	PCA20;100	O
16	PCBSY;000	I	50	PCA21;100	O
17	MCVCC	–	51	MCVCC	–
18	MCVPP1	–	52	MCVPP2	–
19	PCA16;100	O	53	PCA22;100	O
20	PCA15;100	O	54	PCA23;100	O
21	PCA12;100	O	55	PCA24;100	O
22	PCA07;100	O	56	PCA25;100	O
23	PCA06;100	O	57	NC	–
24	PCA05;100	O	58	PCRST;100	O
25	PCA04;100	O	59	PCWAIT;000	I
26	PCA03;100	O	60	PCINPK;000	I
27	PCA02;100	O	61	PCREG;000	O
28	PCA01;100	O	62	PCBVD2;100	I
29	PCA00;100	O	63	PCBVD1;100	I
30	PCD00;100	I/O	64	PCD08;100	I/O
31	PCD01;100	I/O	65	PCD09;100	I/O
32	PCD02;100	I/O	66	PCD10;100	I/O
33	PCWP;000	I	67	PCCD2;000	I
34	GND	–	68	GND	–

C.10   PJ10 LCD Connectors (40-Pin)

Table C-10 LCD Connector Pin Assignment (40-Pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	DSPV	–	21	GND	–
02	DSPV	–	22	UD2;130	I
03	GND	–	23	GND	–
04	GND	–	24	UD3;130	I
05	BRIGHT;100	I	25	GND	–
06	CNTRST;130	I	26	LD2;130	I
07	PNEL0;100	I/O	27	GND	–
08	GND	–	28	LD1;130	I
09	GND	–	29	GND	–
10	GND	–	30	LD0;130	I
11	GND	–	31	GND	–
12	B0;130	I	32	SCLK;140	I
13	GND	–	33	GND	–
14	B1;130	I	34	FP;130	I
15	GND	–	35	GND	–
16	B2;130	I	36	FR;130	I
17	GND	–	37	LD3;130	I
18	UD1;130	I	38	LP;130	I
19	GND	–	39	LCDV	–
20	UD0;130	I	40	LCDV	–

C.11   PJ13 DC IN Connectors (3-Pin)

Table C-11 DC IN Connector Pin Assignment (3-Pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	DCP	–	03	DCM	–
02	DCM	–			

C.12   PJ15 Power Supply Interface Connectors (50-Pin)

Table C-12 Power Supply Interface Connector Pin Assignment (50-Pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	GND	–	26	PNLOFF;041	I
02	GND	–	27	CDCGRN;100	O
03	DCIN	I	28	PCLR;000	O
04	DCIN	I	29	CDCORG;100	O
05	DCIN	I	30	PSSD;100	O
06	DCIN	I	31	GND	–
07	DCIN	I	32	PSRD;100	O
08	GND	–	33	GND	–
09	GND	–	34	PCV	O
10	B3V	O	35	PCV	O
11	B3V	O	36	GND	–
12	B3V	O	37	VCC	O
13	GND	–	38	VCC	O
14	GND	–	39	VCC	O
15	CPU3V	O	40	VCC	O
16	CPU3V	O	41	VCC	O
17	GND	–	42	GND	–
18	ENVCC	O	43	DSPV	O
19	GND	–	44	DSPV	O
20	SRBTN;000	O	45	GND	–
21	SUSSTA;011	I	46	P+12V	I
22	LOWBAT;100	O	47	CMHDON;000	O
23	PSSMI;000	O	48	N-9V	I
24	PSBUSY;000	O	49	IPSSWL;000	O
25	PSBEEP;000	O	50	IPSSWR;000	O

C.13   PJ16 LED ICON Connectors (12-Pin)

Table C-13 LED Icon Connector Pin Assignment (12-Pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	PNLOFF;000	I	07	CHGSP;120	I
02	GND	–	08	CKHRQ;100	I
03	GND	–	09	HDDLED;130	I
04	GND	–	10	CAPLED;110	I
05	CDCORG;110	I	11	ARWLED;110	I
06	CDCGRN;110	I	12	NUMLED;110	I

C.14 PJ17 Port Replicator Connectors (72-Pin)

Table C-14 Port Replicator Connectors Pin Assignment (72-Pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	AGREEN;110	O	37	VCC	–
02	ABLUE;110	O	38	CVSYNC;120	O
03	ARED;110	O	39	PD1;100	I/O
04	AUTFD;000	I/O	40	VCC	–
05	PD5;100	I/O	41	PD3;100	I/O
06	PINT;000	I/O	42	PD6;100	I/O
07	PE;110	I/O	43	ACK;010	I/O
08	ERROR;010	I/O	44	IFWDAT;000	O
09	IFDASL;000	O	45	IFSTEP;000	O
10	DSKCHG;010	I	46	IFWPRO;010	I
11	IFRDAT;010	O	47	GND	–
12	IFLD01;000	O	48	GND	–
13	IFAMON;000	O	49	GND	–
14	MOUSCK;120	I/O	50	GND	–
15	EXKBCK;110	I/O	51	RTS1;110	O
16	CTS1;110	I	52	VCC	–
17	DSR1;110	I	53	DCIN	I
18	DCIN	I	54	DCIN	I
19	DCIN	I	55	DCIN	I
20	DCIN	I	56	GND	–
21	RXD1;010	I	57	TXD1;010	O
22	DTR1;110	O	58	RI1;110	I
23	DCD1;110	I	59	MOUSDT;100	I/O
24	GND	–	60	GND	–
25	EXKBDT;100	I/O	61	PRCHEK;000	I/O
26	IFWEN;000	O	62	IFHMED;010	I
27	IFRADY;010	I	63	IFDIRC;000	O
28	IFINDX;010	I	64	IFSSEL;000	O
29	SELCT;110	I/O	65	IFTRK0;010	I
30	SLIN;000	I/O	66	BUSY;110	I/O
31	GND	–	67	PD7;100	I/O
32	PD2;100	I/O	68	PD4;100	I/O
33	PD0;100	I/O	69	VCC	–
34	STROB;000	I/O	70	VCC	–
35	GND	–	71	CHSYNC;120	O
36	VCC	–	72	VCC	–

Table D-1 USA Display Codes

HEXA DECIMAL VALUE	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	BLANK (NULL)	►	BLANK (SPACE)	0	@	P	`	p	Ç	É	á	▓	└	╨	α	≡
1	☺	◄	!	1	A	Q	a	q	ü	æ	í	▒	┴	╤	β	±
2	☻	↕	"	2	B	R	b	r	é	Æ	ó	▓	┤	╥	Γ	≥
3	♥	‼	#	3	C	S	c	s	â	ô	ú	│	├	╙	π	≤
4	♦	¶	$	4	D	T	d	t	ä	ö	ñ	┤	┬	╘	Σ	∫
5	♣	§	%	5	E	U	e	u	à	ò	Ñ	╡	├	╒	σ	∫
6	♠	▬	&	6	F	V	f	v	å	û	ª	╢	├	╓	µ	÷
7	•	↨	'	7	G	W	g	w	ç	ù	º	╖	╟	╫	τ	≈
8	◘	↑	(	8	H	X	h	x	ê	ÿ	¿	╕	╚	╪	Φ	°
9	○	↓	)	9	I	Y	i	y	ë	Ö	⌐	╣	╔	┘	θ	∙
A	◎	→	*	:	J	Z	j	z	è	Ü	¬	║	╩	┌	Ω	•
B	♂	←	+	;	K	[	k	{	ï	¢	½	╗	╦	█	δ	√
C	♀	∟	,	<	L	\	l	|	î	£	¼	╝	╠	█	∞	ⁿ
D	♪	↔	−	=	M	]	m	}	ì	¥	¡	╜	═	█	φ	²
E	♫	▲	.	>	N	^	n	~	Ä	Pt	«	╛	╬	█	∈	■
F	☼	▼	/	?	O	_	o	△	Å	ƒ	»	┐	╧	▀	∩	BLANK (FF)

Appendix E Keyboard Scan/Character Codes

Table E-1 Scan Codes (Set 1 and Set 2) (1/3)

Cap No.	Keytop	Code set 1 Make	Code set 1 Break	Code set 2 Make	Code set 2 Break		Note
01	' ~	29	A9	0E	F0	0E	
02	1 !	02	82	16	F0	16	
03	2 @	03	83	1E	F0	1E	
04	3 #	04	84	26	F0	26	
05	4 $	05	85	25	F0	25	
06	5 %	06	86	2E	F0	2E	
07	6 ^	07	87	36	F0	36	
08	7 &	08	88	3D	F0	3D	*2
09	8 *	09	89	3E	F0	3E	*2
10	9 (	0A	8A	46	F0	46	*2
11	0)	0B	8B	45	F0	45	
12	- _	0C	8C	4E	F0	4E	
13	= +	0D	8D	55	F0	55	
15	BkSp	0E	8E	66	F0	66	
16	Tab	0F	8F	0D	F0	0D	
17	Q	10	90	15	F0	15	
18	W	11	91	1D	F0	1D	
19	E	12	92	24	F0	24	
20	R	13	93	2D	F0	2D	
21	T	14	94	2C	F0	2C	
22	Y	15	95	35	F0	35	
23	U	16	96	3C	F0	3C	*2
24	I	17	97	43	F0	43	*2
25	O	13	98	44	F0	44	*2
26	P	19	99	4D	F0	4D	*2
27	[{	1A	9A	54	F0	54	
28	] }	1B	9B	5B	F0	5B	
29 (42)	\		2B	AB	5D	F0	5D	*5
30	Caps Lock	3A	BA	58	F0	58	
31	A	1E	9E	1C	F0	1C	
32	S	1F	9F	1B	F0	1B	
33	D	20	A0	23	F0	23	
34	F	21	A1	2B	F0	2B	
35	G	22	A2	34	F0	34	
36	H	23	A3	33	F0	33	
37	J	24	A4	3B	F0	3B	*2
38	K	25	A5	42	F0	42	*2
39	L	26	A6	4B	F0	4B	*2
40	; :	27	A7	4C	F0	4C	*2

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

Table E-1 Scan Codes (Set 1 and Set 2) (3/3)

Cap No.	Keytop	Code set 1 Make	Code set 1 Break	Code set 2 Make	Code set 2 Break		Note
112	F1	3B	3B	05	F0	05	
113	F2	3C	BC	06	F0	06	
114	F3	3D	BD	04	F0	04	
115	F4	3E	BE	0C	F0	0C	
116	F5	3F	BF	03	F0	03	
117	F6	40	C0	0B	F0	0B	
118	F7	41	C1	83	F0	83	
119	F8	42	C2	0A	F0	0A	
120	F9	43	C3	01	F0	01	
121	F10	44	C4	09	F0	09	
122	F11	57	D7	78	F0	78	*3
123	F12	58	D8	07	F0	07	*3
124	PrintSc	*6	*6	*6	*6		*6
126	Pause	*7	*7	*7	*7		*7
202	Fn	—	—	—	—		*4

Notes:
1*   Scan codes differ by mode.
2*   Scan codes differ by overlay function.
3*   Combination with **Fn** key makes different codes.
4*   **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 E-6, scan codes with **Ctrl** key.
7*   Refer toTable E-7, scan codes with **Alt** key.

Table E-2 Scan Codes with Left Shift Key

Cap No.	Key top	Code set 1		Code set 2	
		Make	**Break**	**Make**	**Break**
75	INS	E0 AA E0 52	E0 D2 E0 2A	E0 F0 12 E0 70	E0 F0 70 E0 12
76	DEL	E0 AA E0 53	E0 D3 E0 2A	E0 F0 12 E0 71	E0 F0 71 E0 12
79	←	E0 AA E0 4B	E0 CB E0 2A	E0 F0 12 E0 6B	E0 F0 6B E0 12
80	Home	E0 A E0 47	E0 C7 E0 2A	E0 F0 12 E0 6C	E0 F0 6C E0 12
81	End	E0 AA E0 4F	E0 CF E0 2A	E0 F0 12 E0 69	E0 F0 69 E0 12
83	↑	E0 AA E0 48	E0 C8 E0 2A	E0 F0 12 E0 75	E0 F0 75 E0 12
84	↓	E0 AA E0 50	E0 D0 E0 2A	E0 F0 12 E0 72	E0 F0 72 E0 12
85	PgUp	E0 AA E0 49	E0 C9 E0 2A	E0 F0 12 E0 7D	E0 F0 7D E0 12
86	PgDn	E0 AA E0 51	E0 D1 E0 2A	E0 F0 12 E0 7A	E0 F0 7A E0 12
89	→	E0 AA E0 4D	E0 CD E0 2A	E0 F0 12 E0 74	E0 F0 74 E0 12

Note: *Table E-2 shows scan codes with the left **Shift** key. In combination with the right **Shift** key, scan codes are changed as listed below:*

	With left **Shift**	With right **Shift**
Set 1	E0 AA	E0 B6
	E0 2A	E0 36
Set 2	E0 F0 12	E0 F0 59
	E0 12	E0 59

Table E-3 Scan Codes in Numlock Mode

Cap No.	Key top	Code set 1		Code set 2	
		Make	**Break**	**Make**	**Break**
75	INS	E0 2A E0 52	E0 02 E0 AA	E0 12 E0 70	E0 F0 70 E0 F0 12
76	DEL	E0 2A E0 53	E0 D3 E0 AA	E0 12 E0 71	E0 F0 71 E0 F0 12
79	←	E0 2A E0 4B	E0 CB E0 AA	E0 12 E0 6B	E0 F0 6B E0 F0 12
80	Home	E0 2A E0 47	E0 C7 E0 AA	E0 12 E0 6C	E0 F0 6C E0 F0 12
81	End	E0 2A E0 4F	E0 CF E0 AA	E0 12 E0 69	E0 F0 69 E0 F0 12
83	↑	E0 2A E0 48	E0 C8 E0 AA	E0 12 E0 75	E0 F0 75 E0 F0 12
84	↓	E0 2A E0 50	E0 D0 E0 AA	E0 12 E0 72	E0 F0 72 E0 F0 12
85	PgUp	E0 2A E0 49	E0 C9 E0 AA	E0 12 E0 7D	E0 F0 7D E0 F0 12
86	PgDn	E0 2A E0 51	E0 D1 E0 AA	E0 12 E0 7A	E0 F0 7A E0 F0 12
89	→	E0 2A E0 4D	E0 CD E0 AA	E0 12 E0 74	E0 F0 74 E0 F0 12

Table E-4 Scan Codes with Fn Key

Cap No.	Keytop	Code set 1		Code set 2	
		Make	**Break**	**Make**	**Break**
43	ENT	E0 1C	E0 9C	E0 5A	E0 F0 5A
58	CTRL	E0 1D	E0 9D	E0 14	E0 F0 14
60	LALT	E0 38	E0 B8	E0 11	E0 F0 11
122	NUML	45	C5	77	F0 77
123	SCRL	46	C6	7E	F0 7E

Table E-5 Scan Codes in Overlay Mode

Cap No.	Keytop		Code set 1		Code set 2	
			Make	**Break**	**Make**	**Break**
08	7	(7)	47	C7	6C	F0 6C
09	8	(8)	48	C8	75	F0 75
10	9	(9)	49	C9	7D	F0 7D
11	0	(≠)	37	B7	7C	F0 7C
23	U	(4)	4B	CB	6B	F0 6B
24	I	(5)	4C	CC	73	F0 73
25	O	(6)	4D	CD	74	F0 74
26	P	(−)	4A	CA	7B	F0 7B
37	J	(1)	4F	CF	69	F0 69
38	K	(2)	50	D0	72	F0 72
39	L	(3)	51	D1	7A	F0 7A
40	;	(+)	4E	CE	79	F0 79
52	M	(0)	52	D2	70	F0 70
53	,	(,)	33	B3	41	F0 41
54		(.)	53	D3	71	F0 71
55	/	(/)	E0 35	E0 B5	40 4A	E0 F0 4A

Table E-6 Scan Codes with Ctrl Key

Key top	Shift	Code set 1		Code set 2	
		Make	**Break**	**Make**	**Break**
Prt Sc	Common	E0 2A E0 37	E0 B7 E0 AA	E0 12 E0 7C	E0 F0 7C E0 F0 12
	Ctrl*	E0 37	E0 B7	E0 7C	E0 F0 7C
	Shift*	E0 37	E0 B7	E0 7C	E0 F0 7C
	Alt*	54	D4	84	F0 B4

Table E-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.

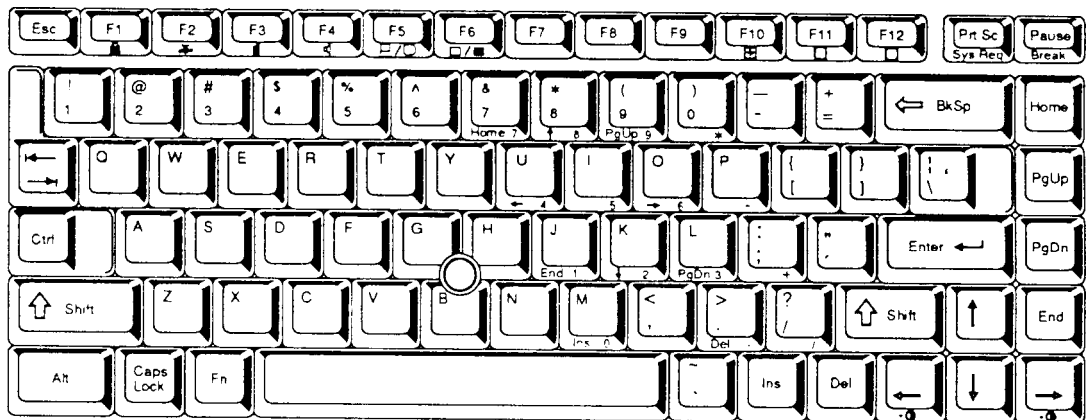# Appendix F Key Layout

F.1   United States (US) Keyboard

Figure F-1 US Keyboard

F.2   United Kingdom (UK) Keyboard
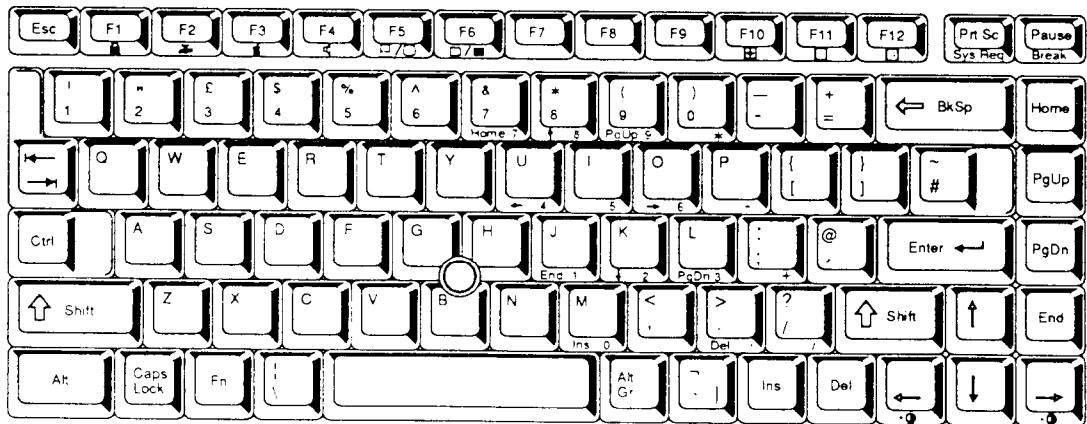
Figure F-2 UK Keyboard
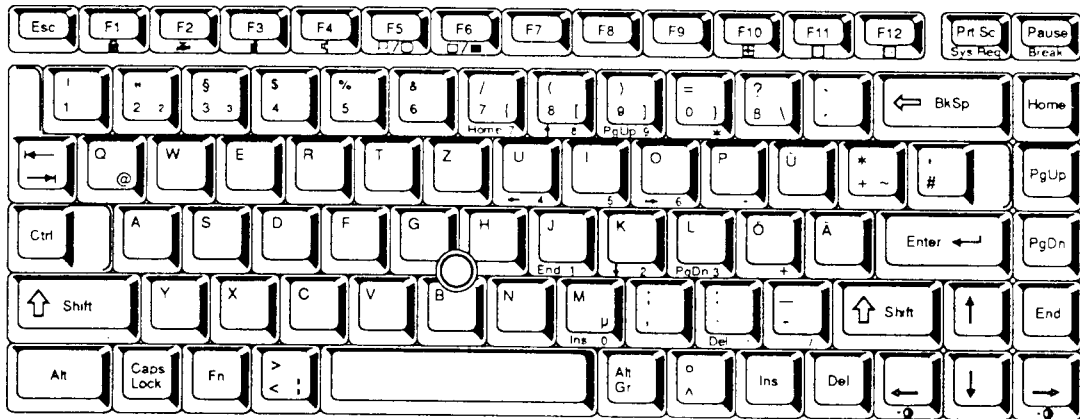
F.3 German (GR) Keyboard

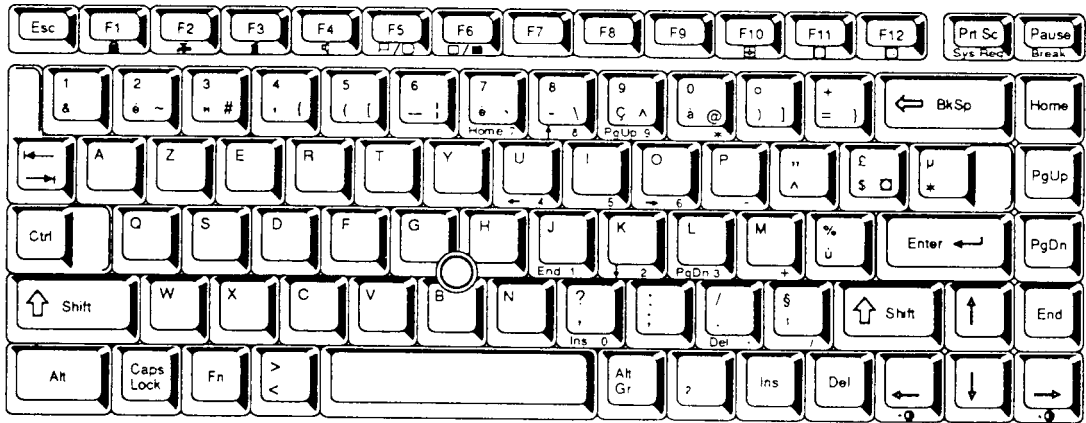
Figure F-3 GR Keyboard

F.4 French (FR) Keyboard

Figure F-4 FR Keyboard

F.5   Spanish (SP) Keyboard

Figure F-5 SP Keyboard

F.6   Italian (IT) Keyboard

Figure F-6 IT Keyboard

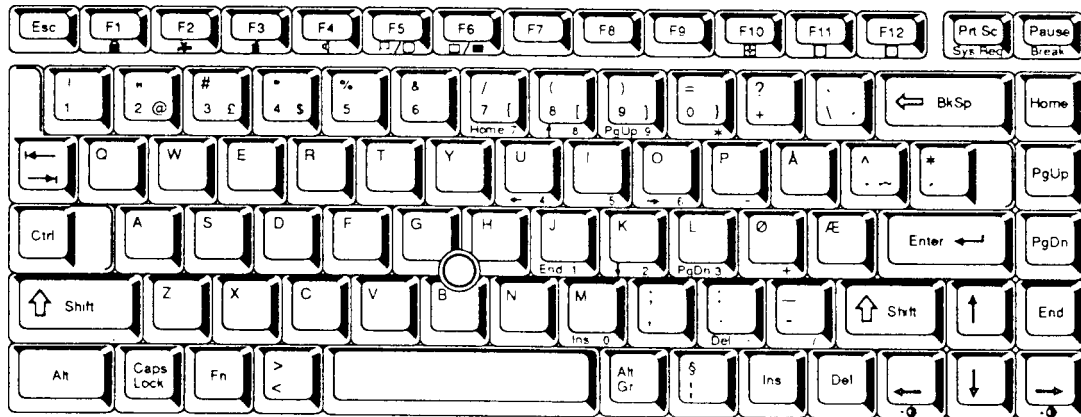## F.7   Scandinavian (SC) Keyboard

Figure F-7 SC Keyboard
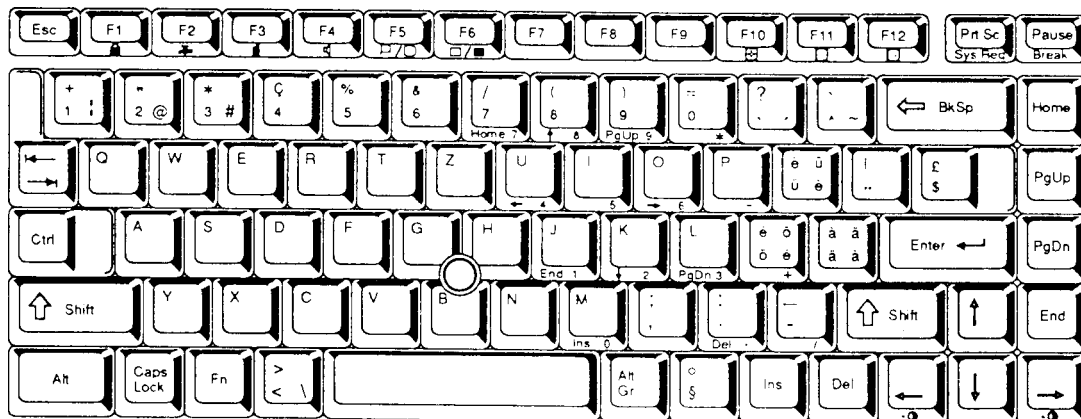
F.8   Swiss-German (SL) Keyboard

Figure F-8 SL Keyboard

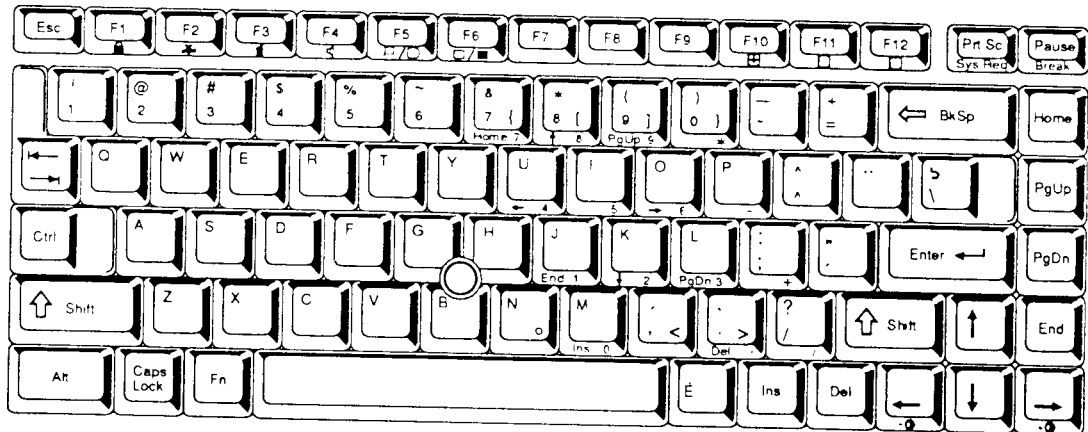## F.9 Canadian (Specialized) Keyboard

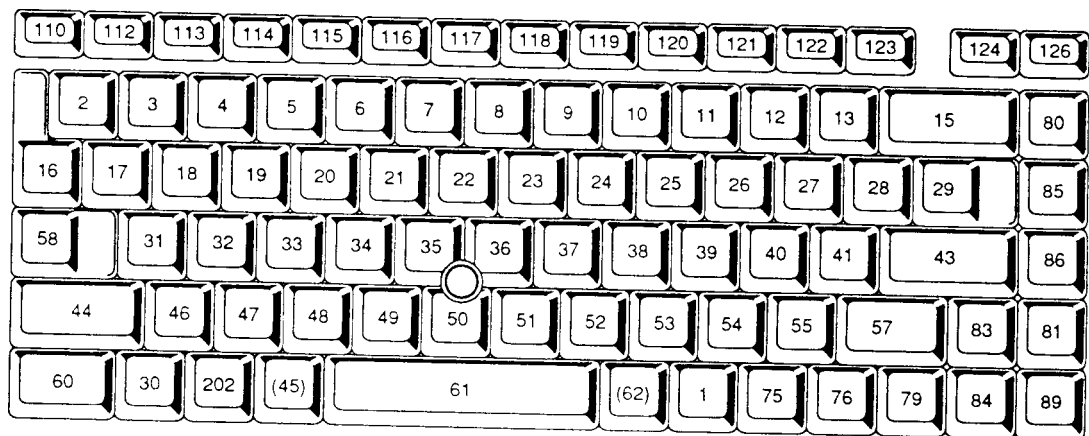*Figure F-9 Canadian Keyboard*

F.10 Keycap Number Keyboard

Figure F-10 Keycap Number Keyboard

Appendix G Wiring Diagrams
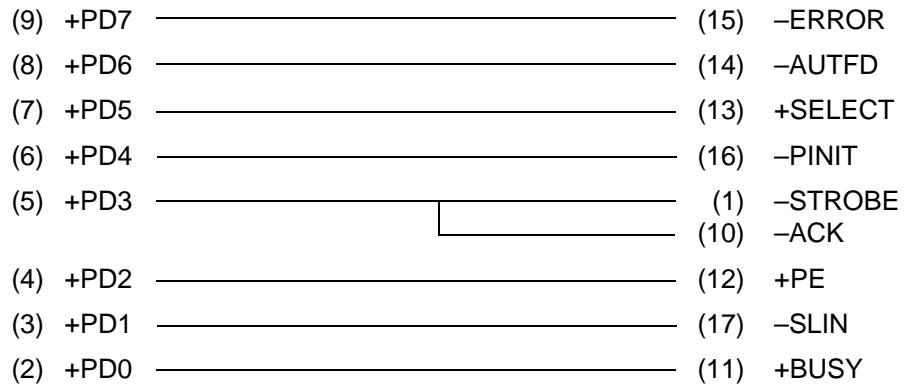
G.1   Printer Wraparound Connector

(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 G-1 Printer Wraparound Connector

G.2   RS-232C Wraparound Connector

(3) TD	————————————	(2) RD
(7) RTS	——————————⌐	(8) CTS
	└———	(1) CD
(4) DTR	——————————⌐	(6) DSR
	└———	(9) RI
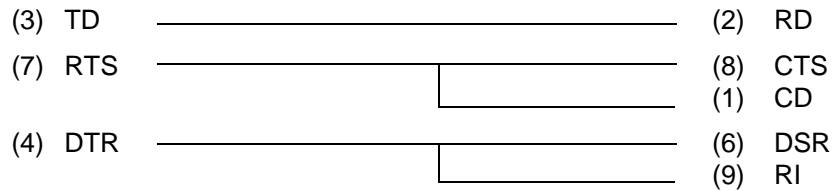
Figure G-2 RS-232C Wraparound Connector

G.3   RS-232C 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	——————┘	
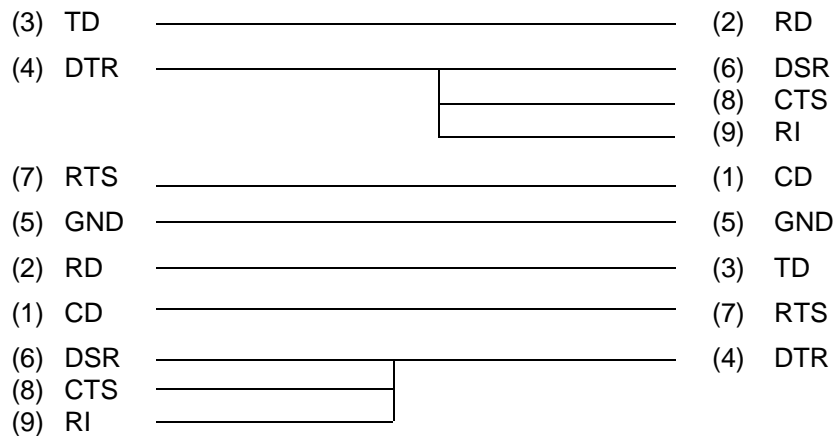
Figure G-3 RS-232C Direct Cable (9-pin to 9-pin)

G.4 RS-232C 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   ──────┴───┘
```
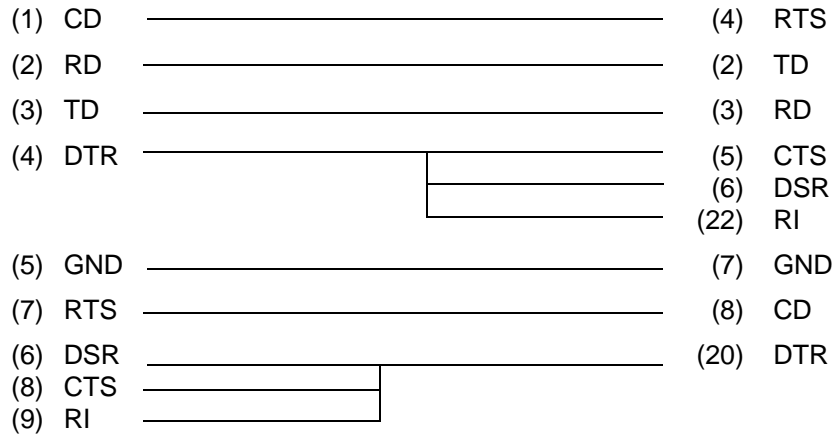
Figure G-4 RS-232C Direct Cable (9-pin to 25-pin)

Appendix H BIOS Rewrite Procedures

This Appendix explains how to rewrite the system BIOS program when updating the system BIOS.

Tools

The following tool is needed to rewrite the BIOS:

❑   BIOS rewriting disk for T3400/3400CT

Rewriting the BIOS

1.   Set the system to Boot Mode.

2.   Turn off power to the T3400/3400CT.

3.   Remove the optional PCMCIA card and all external cables, except the AC adapter.

4.   Connect the external 3.5-inch FDD.

5.   Turn on power while holding down the **F12** key. (Hold down the key until the system speaker beeps.)

6.   When the BIOS update message is displayed, insert the BIOS rewriting disk into the FDD. Press the **Enter** key to start the BIOS rewriting.

7.   When the process is completed, eject the rewriting disk and press the reset switch to restart the system.