1.1 Features

The Toshiba T2110/T2130 series is one of the lightest and most advanced portable computers available. Utilizing advanced technology and high-speed components, the T2110/T2130 series offers excellent display legibility, battery operation, and IBM PC/AT compatibility.

References to the T2110/T2130 series models relate directly to the T2110CS, T2115CS, T2130CS, T2130CT, and T2135 models respectively.

The T2110/T2130 series system unit has the following features:

❑ Microprocessor

The SL Enhanced Intel DX4-75 microprocessor operates at 75 MHz, 3.3 Volts.

❑ Math co-processor

The math co-processor is stored in the DX4 microprocessor.

❑ Cache memory

The 16 KB cache memory is stored in the DX4 microprocessor.

❑ Disk storage

The T2110CS has an internal 350 million byte HDD.
The T2130CS/T2130CT has an internal 520 million byte HDD.
A 3.5-inch Floppy Disk Drive (FDD) supports 2HD floppy disks (1.44 Mbytes) and 2DD floppy disks (720 Kbytes).

❑ Memory

Standard memory includes 4 MB of CMOS Random Access Memory (RAM) on the T2110CS, and 8 MB 3.3 Volts on the T2130CS/T2130CT. This includes 640 KB of conventional memory with 3,264 KB of extended memory for the T2110CS and 7,360 KB for the T2130CS/T2130CT, which can be utilized as expanded memory compatible with the Lotus/Intel/Microsoft Expanded Memory Specifications (LIM-EMS).

❑ STN color LCD (T2110CS/T2130CS)

A high-resolution, Supertwist Nematic (STN) color Liquid Crystal Display (LCD) displays 640x480 pixels with 256 colors. The T2110CS/T2130CS internal display controller supports Video Graphics Array (VGA) and Super VGA (SVGA).

❑ TFT color LCD (T2130CT)

A high-resolution, Thin Film Transistor (TFT) full color LCD displays 640x480 pixels with a maximum of 64k colors. The T2130CT internal display controller supports VGA and Super SVGA.

❑ Keyboard

An easy-to-use 82/84-key enhanced keyboard with full-size keys and standard spacing is compatible with IBM standard software. The computer's keyboard supports software that uses a 101- or 102-key enhanced keyboard.

❑ Batteries

The T2110/T2130 series has three different batteries: a main battery, a backup battery, and a Real Time Clock (RTC) battery.

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

The T2110/T2130 series has two PCMCIA slots, which enable you to install a MiNC Toshiba card modem or other industry standard PCMCIA release 2.0 card. The lower slot is 5.0 mm (Type II) or 10.5 mm (Type III). The upper slot is 5.0 mm (Type II).

❑ Parallel port

The Centronics compatible parallel interface port supports the Enhanced Capability Port (ECP) standard. The port can be used to connect a printer or other parallel device.

❑ RS-232-C port

The T2110/T2130 series has one 9-pin serial interface port.

❑ Keyboard port

One 6-pin keyboard port on the back can be connected to an IBM PS/2 keyboard.

❑ Port replicator port

The port replicator port enables connection of a port replicator. The port replicator allows connection of a PS/2 mouse, parallel port, serial port, DC IN socket, PS/2 keyboard, and external monitor.

❏ External monitor port

One 15-pin External monitor port on the back can be connected to an external video display.
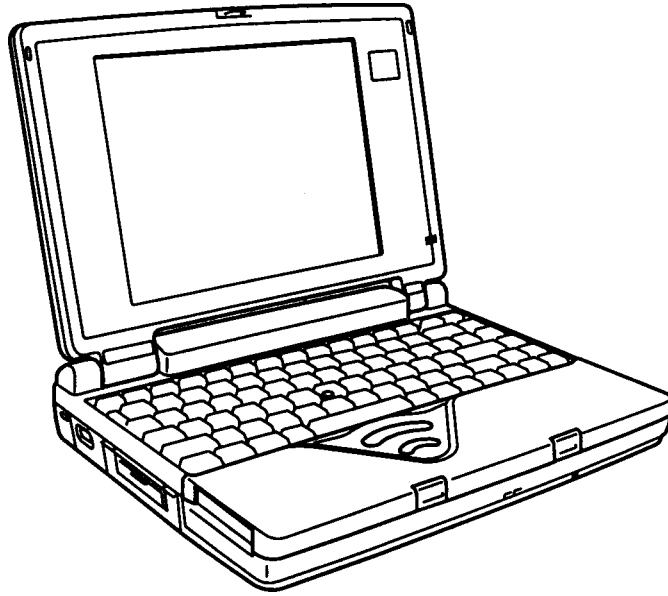
❏ Memory module slot

One Toshiba optional memory slot enables you to install a Toshiba optional memory module.

❏ AccuPoint

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

The T2110/T2130 series Personal Computer is shown in figure 1-1.

Figure 1-1 T2110/T2130 series personal computer

The T2110/T2130 series system configuration is shown in figure 1-2.
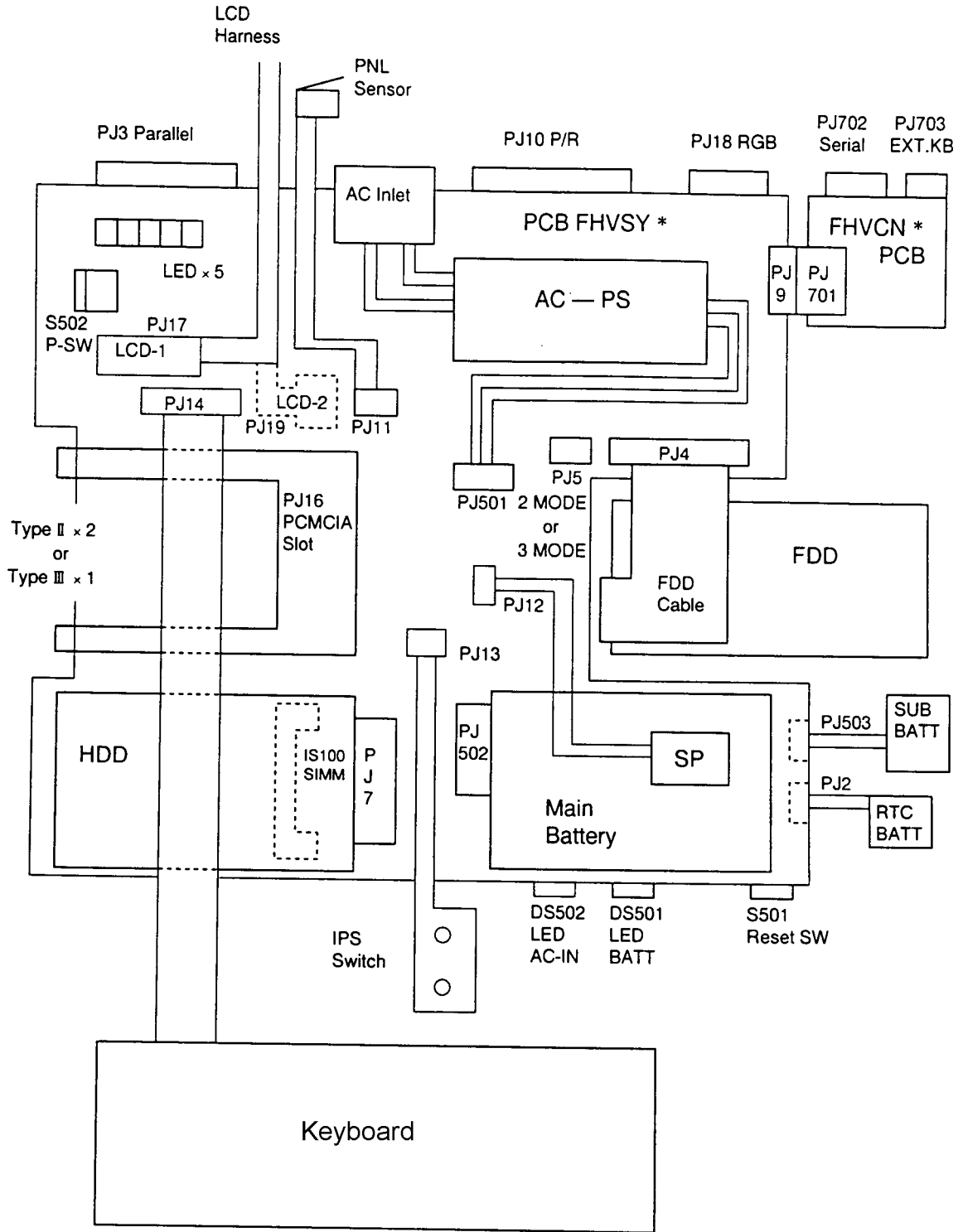

Figure 1-2 T2110/T2130 series system unit configuration

1.2 System Unit Block Diagram

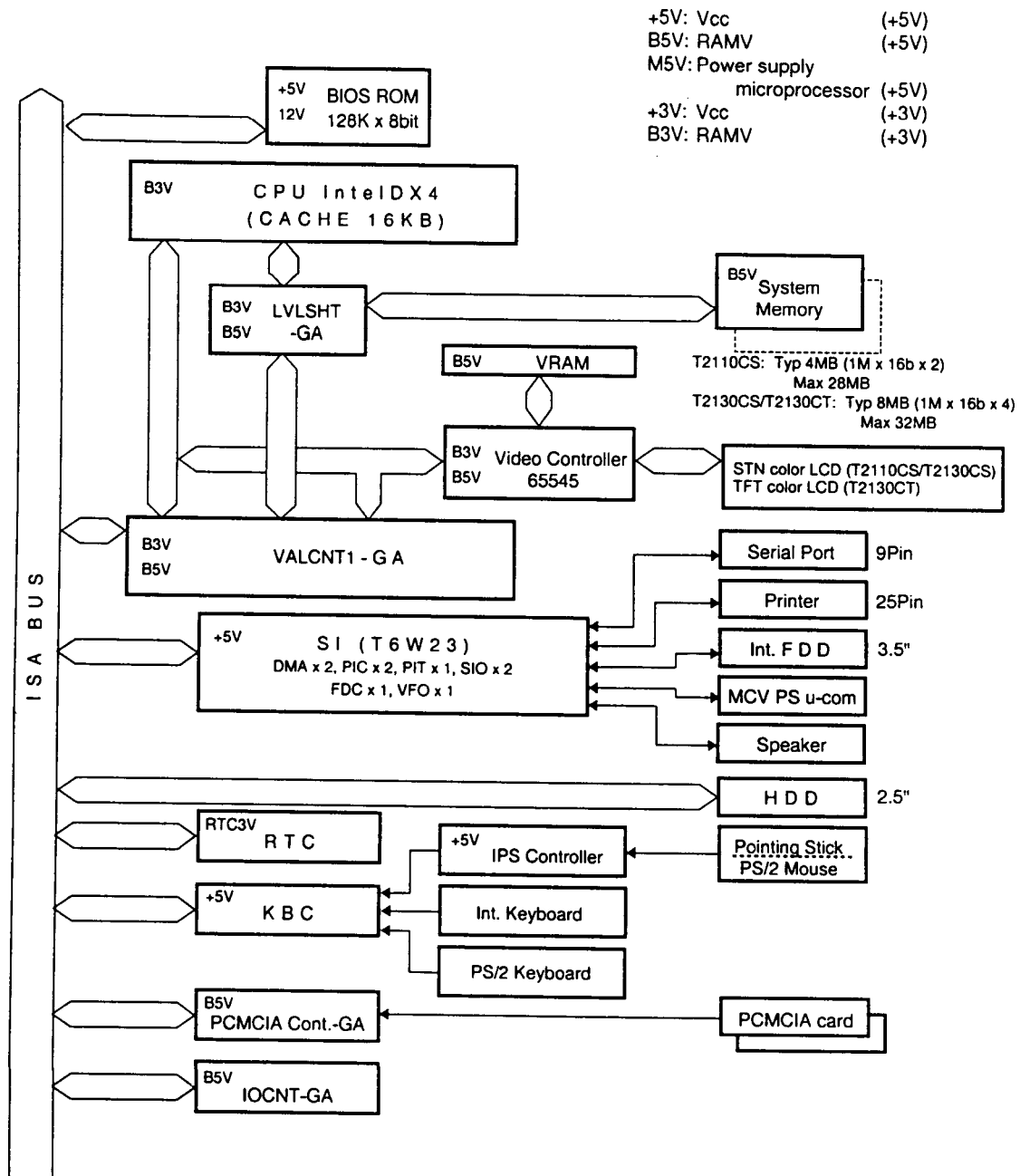Figure 1-3 is a block diagram of the T2110/T2130 series system unit.

Figure 1-3 T2110/T2130 series system board block diagram

The T2110/T2130 series system board has the following functional components:

❑ One Intel DX4-75 32-bit microprocessor
Intel DX4 operates at 75 MHz and 3.3 volts

❑ Standard RAM
4 Mbytes, two 1024x16-bit chips (T2110CS)
8 Mbytes, four 1024x16-bit chips (T2130CS/T2130CT)
No parity bit
5-volt operation
Access time 70 ns
Data transfer is 32-bit width
High-speed page mode access

❑ Cache memory
16 Kbytes of cache memory stored inside the DX4 processor
Four-way set-associative method

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

❑ Video RAM
1 Mbyte, two 256Kx16-bit chips
5-volt operation
Access time 70 ns

❑ Optional memory
One expansion memory slot is available for 4, 8, 16, and 24 Mbyte
memory modules, which consist of 1024Kx16-bit chips with no parity
bit. Maximum memory size is 28 Mbytes for the T2110CS and 32
Mbytes for the T2130CS/T2130CT (if a 24 Mbyte module card is
installed).
5-volt operation
Access time 70 ns
High-speed page mode access

❑ One super integration (SI)
The following components:
- Two DMACs 8237 equivalent
- Two PICs   8259 equivalent
- Two SIOs   16450 equivalent (One SIO is not used)
- One PIT   8254 equivalent
- One FDC   TC8565 equivalent
- One VFO   TC8568 equivalent
- One I/O port decode
- One SIO port control
- One printer port control
- One FDD control
- One speaker control
- One power communication control

❑ System Controller Gate Array (VALCNT-GA)
This gate array has the following functions:
Data Bus driver
CPU data <==> ISA data
Address Bus driver
CPU address <==> ISA address
ISA control
SYCLK, DMCLK generation
ISA cycle control
DMA support control
External master support control
Refresh control
A20 control
RTC control
Clock/Reset/Suspend control
CPU clock control
STPCLK# and INTR/NMI/SMI# adjustment
SMI control
Current pass-through control
Suspend/Resume sequence
Reset generation
DMA control
Timing signal generation for DRAM
Cache control
DRAM address control
Level Shift Gate Array control
VGA chip control

❑ PCMCIA Controller Gate Array
This gate array has the following functions:
PCMCIA (ToPIC) control

❏ IO-CNT GA
This gate array has the following functions:
Hot key control (KBC interface)
BIOS ROM interface
PS interface
NEXUS GA function
Internal communication control
KBC, main CPU communication register file
KBC interrupt control
KBC communication control

❏ Level Shift Gate Array
This gate array has the following functions:
Level shift 5V data bus <==> 3V data bus

❏ Video Controller Gate Array (C&T65545)
The T2110/T2130 series internal display controller (3.3/5 volts operation) controls the internal VGA display and external SVGA compatible display.

❏ Keyboard Controller (KBC)
One M38802 chip is used.
This KBC includes the keyboard scan controller and keyboard interface controller. The KBC controls the internal keyboard, external keyboard port, and PS/2 mouse port.

❏ Real Time Clock (RTC)
One T9934 chip is used. The T9934 has 128 bytes of memory. Fourteen bytes of memory are used for the calender and clock. The remaining 114 bytes are used for the system configuration data.

1.3   3.5-inch Floppy Disk Drive

The T2110/T2130 series 3.5-inch Floppy Disk Drive (FDD) is a thin, high-performance reliable drive that supports 720-KB (formatted) 2DD and 1.44-MB (formatted) 2HD 3.5-inch floppy disks.

The FDD is shown in figure 1-4. The specifications for the FDD are described in table 1-1.
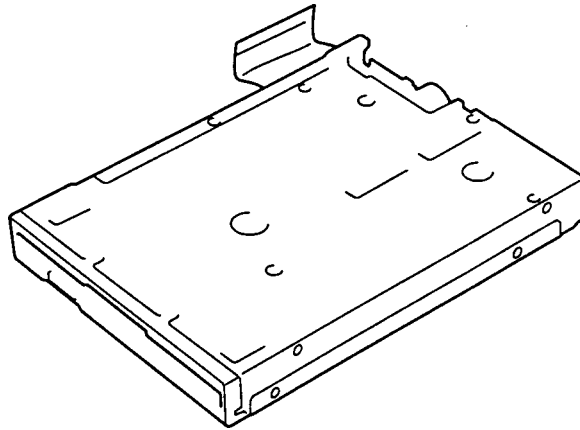
Figure 1-4 3.5-inch FDD

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 Hard Disk Drive (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.

T2110CS supports a 350 MB drive. T2130CS/T2130CT supports a 520 MB drive.

The T2110/T2130 series HDD is shown in figure 1-5. Specifications for the HDD are described in table 1-2.
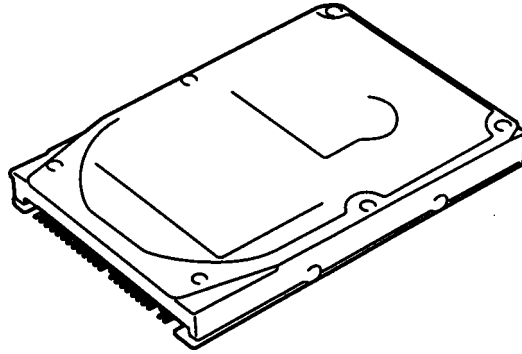
Figure 1-5 2.5-Inch HDD

Table 1-2 2.5-inch HDD specifications

	350 MB	520 MB
	(MK1824FCV)	(MK1924FCV)
Specifications		
Formatted capacity (Mbytes)	352	527
Disks	2	2
Logical heads	16	16
Logical cylinders	628	1,024
Logical sectors	63	63
Bytes per sector	512	512
Cording	1-7 RLL	8-9 RLL
Interleave	1:1	1:1
Performance		
Access time (ms)		
Average	13	13
Track to track	3	3
Maximum stroke	25	25
Rotation speed (rpm)	4,200	4,200
Sectors per track	60 to 106	53 to 95
Rotation speed (rpm)	4,200	4,200
Data transfer rate (bps)	25.0 to 43.75 M	24.7 to 44.9 M
Buffer size (Kbytes)	128	128

1.5 Keyboard

The 82-(USA) or 84-(European) keyboard is mounted on the T2110/T2130 series system unit. The keyboard is connected to the keyboard controller on the system board through a 25-pin flat cable. The T2110/T2130 series pointer control stick, located in the center of the keyboard, provides convenient control of the cursor without requiring desk space for a mouse. The keyboard is shown in figure 1-6.

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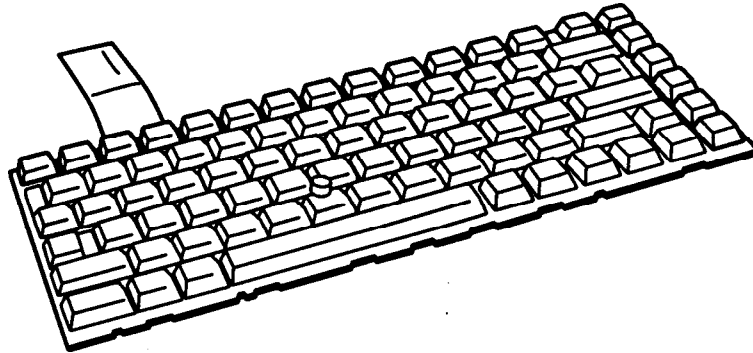
Figure 1-6 Keyboard

1.6   STN Color LCD (T2110CS/T2130CS)

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

1.6.1   STN Color LCD Module

The T2110CS/T2130CS STN color LCD is backlit and supports 640x480 pixels with a Video controller. This video controller includes the functions of Video Graphics Array (VGA).

The T2110CS/T2130CS's LCD receives vertical and horizontal synchronizing signals, 16-bit data signal, 8-bit upper block data signal, 8-bit lower block data signal, and a shift clock for data transmission. All signals are CMOS-level compatible.

The STN LCD is shown in figure 1-7. The specifications for the LCD are described in table 1-3.

Figure 1-7 STN color LCD

Table 1-3 STN color LCD specifications

Item		Specifications
Number of Dots	(dots)	640x480
Dot pitch	(mm)	0.33x0.33
Display area	(mm)	217.2 (W)x164.4 (H)
Contrast	(Typically)	20:1
FL current	(mA)	5.0
FL frequency	(KHz)	40

1.6.2   STN Color Fluorescent Lamp (FL) Inverter Board

The FL inverter board supplies high frequency current to light the LCD's Fluorescent Lamp. The specifications for the FL inverter are described in table 1-4.

Table 1-4 STN color FL inverter board specifications

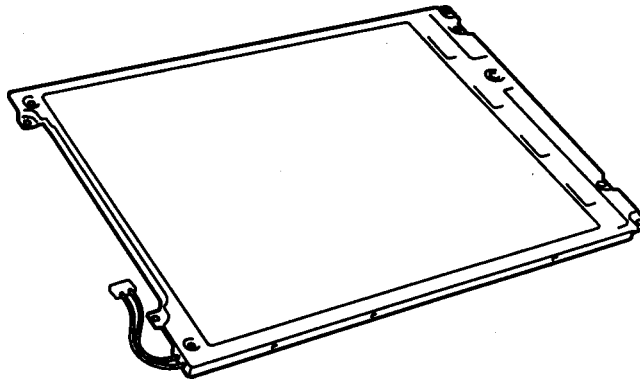|	Item	Specifications	
Input	Voltage	(VDC)	5
	Power	(W)	4.25
Output	Voltage	(VAC)	1,100
	Current	(mA)	5.0
	Frequency	(KHz)	40

1.7 TFT Color LCD (T2130CT)

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

1.7.1 LCD Module

The T2130CT TFT color LCD supports 640x480 pixels with an internal display controller. This controller includes the functions of Video Graphics Array (VGA) and Super VGA (SVGA) for external display.

The T2130CT's LCD receives 12-bit data signals, data enable signals, and a shift clock for data transmission. All signals are CMOS-level compatible.

The TFT LCD is shown in figure 1-8. The specifications for the LCD are described in table 1-5.
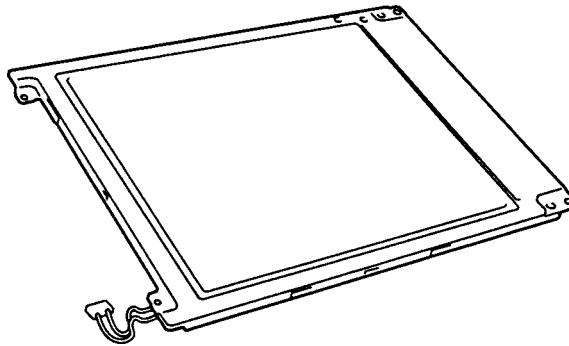
Figure 1-8 TFT color LCD

Table 1-5 TFT color LCD specifications

Item		Specifications
Number of dots	(dots)	640x480
Dot pitch	(mm)	0.33 (W)x0.33 (H)
Display area	(mm)	211.2 (W)x158.4 (H)
Contrast		100:1 (minimum)
FL current	(mA)	4.0
FL frequency	(KHz)	40

1.7.2   Fluorescent Lamp (FL) Inverter Board

The FL inverter board supplies high frequency current to light the LCD's Fluorescent Lamp. The specifications for the FL inverter are described in table 1-6.

Table 1-6 FL inverter board specifications

Item			Specifications
Input	Voltage	(VDC)	5
	Power	(W)	4.25
Output	Voltage	(VAC)	1,100 (r.m.s.)
	Current	(mA)	4.0
	Frequency	(KHz)	40

1.8　Power Supply

The power supply provides five kinds of voltages to the T2110/T2130 series system board. The T2110/T2130 series power supply has one microprocessor, operates at 500 KHz, and performs the following functions:

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

2. Detects DC output and circuit malfunctions.

3. Controls the LED indicator and speaker.

4. Turns the battery charging system on and off and detects a fully charged battery.

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

6. Provides more accurate detection of a low battery.

7. Calculates the remaining battery capacity.

The power supply output rating is specified in table 1-7.

Table 1-7　Power supply output rating

Use for	Name	DC voltage (V)	Regulation tolerance (%)	Maximum current (mA)	Ripple (mV)
System logic, FDD, HDD, Display	VCC	+5	±5	1,400	100
PCMCIA, Flash ROM	P12V	+12	±5	100	240
CPU, GA	B3V	+3.3	±5	1,100	60
VRAM, GA, RAM	B5V	+4.7	±5	650	100

1.9 Batteries

The T2110/T2130 series has three types of batteries:

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

The battery specifications are described in table 1-8.

Table 1-8 Battery specifications

Battery name	Material	Output voltage	Capacity
Main battery	Nickel Metal Hydride	12 V	2,600 mAH
Backup battery	Nickel Metal Hydride	7.2 V	120 mAH
RTC battery	Lithium-Vanadium	3.0 V	50 mAH

1.9.1 Main Battery

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

❏ **Battery Indicator**

The Battery indicator is located on the front of the T2110/T2130 series. The indicator shows the status of the removable battery pack.

The status of each can be determined by color:

Orange   The battery is being charged. (AC power cord is attached.)

Green   The battery is fully charged. (AC power cord is attached.)

Blink orange The battery is low when the power is on.

No light   Under any other conditions, the LED does not light.

1.9.2   Battery Charging Control

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

❑ Quick Battery Charge

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

Table 1-9 Time required for quick charges

	Charging time
Power off	About 2.5 hours (T2110/T2130 series)
Power on	Trickle charge

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

1. The battery becomes fully charged.

2. The battery is removed.

3. The battery or AC output voltage is abnormal.

4. The charge current is abnormal.

❑ Trickle Battery Charge

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

1.9.3   Backup Battery

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

AC power > Main battery > Backup battery

The backup battery is charged by the main battery or AC power cord 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

		Time
Charging Time	Power On	20 H
	Power Off (with AC power)	20 H
	Power Off (Without AC power)	Doesn't charge
Data preservation period (full charge)		5 H

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

		Time
Charging Time	With AC power or main battery	48 H
Data preservation period (full charge)		1 month

2.1 Troubleshooting

Chapter 2 describes how to determine if a Field Replaceable Unit (FRU) in the T2110/T2130 series is causing the computer to malfunction. The FRUs covered are:

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

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

The following tools are necessary for implementing the troubleshooting procedures:

1. A T2110/T2130 series Diagnostics Disk
2. A Phillips head screwdriver (2 mm)
3. A Toshiba MS-DOS system disk(s)
4. A 2DD or 2HD formatted work disk for floppy disk drive testing
5. A cleaning kit for floppy disk drive troubleshooting
6. A printer port LED
7. An RS-232-C wraparound connector
8. A printer wraparound connector
9. A multimeter
10. An external CRT

2.2 Troubleshooting Flowchart

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

❏ Ask the user if a password is registered and, if it is, ask him or her to enter the password. If the user has forgotten the password, connect the printer port wraparound board (F31PRT), then turn the POWER switch on. The computer will override the password function by erasing the current password.

❏ Verify with the customer that Toshiba MS-DOS is installed on the hard disk. Non-Toshiba operating systems can cause the computer to malfunction.

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

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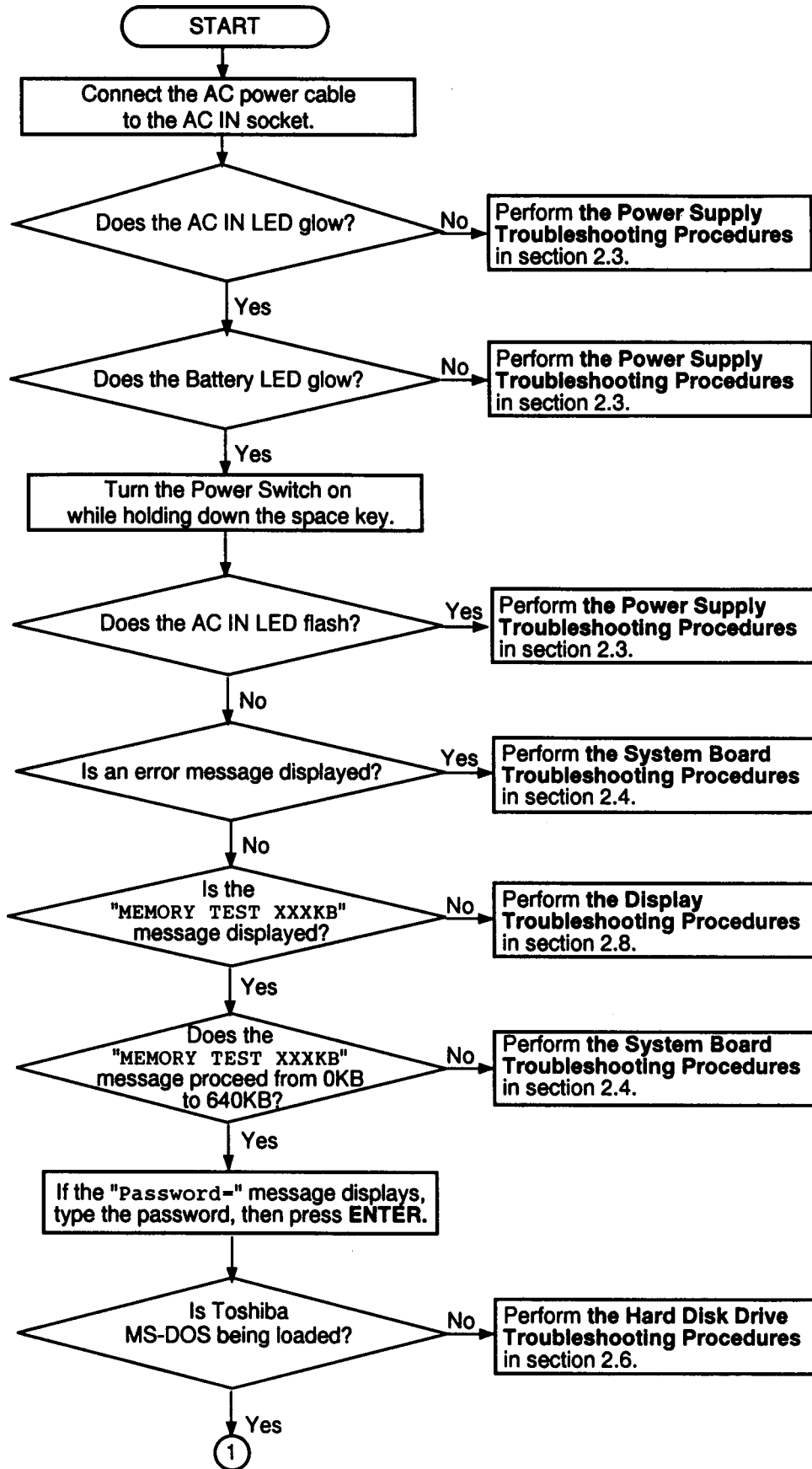
Figure 2-1 Troubleshooting flowchart (2/2)
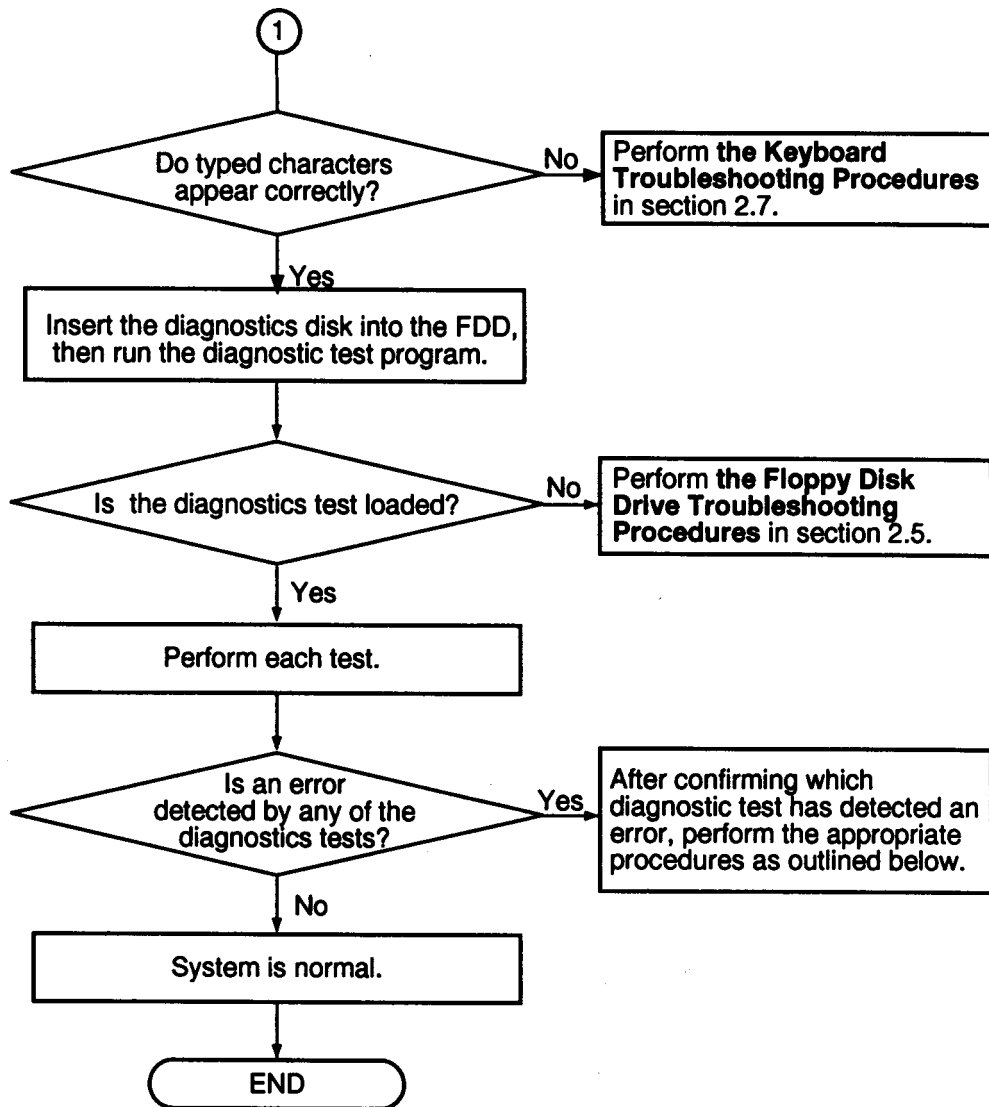
Figure 2-1 Troubleshooting flowchart (2/2)

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

1. If an error is detected on the system test, memory test, display test, ASYNC test, printer test, or real timer test, perform the system board troubleshooting procedures in section 2.4.

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

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

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

2.3 Power Supply Troubleshooting

The T2110/T2130 series power supply controls many functions and components in the T2110/T2130 series. To determine if the power supply is functioning properly, start with Procedure 1 and continue with the other procedures as instructed. The procedures described in this section are:

        Procedure 1:   AC IN LED Indicator Check

        Procedure 2:   Battery LED Indicator Check

        Procedure 3:   AC PS Unit Replacement Check

Procedure 1   AC IN LED Indicator Check

The T2110/T2130 series AC PS unit converts AC power to DC power and contains a charging circuit which charges the T2110/T2130 series batteries. The AC power cord connects to the AC IN socket connector on the back side of the computer. When the AC power cord is connected to the T2110/T2130 series and the power is turned off, the AC charges the batteries.

The AC IN indicator displays whether or not the AC power cord is connected and supplying power.

When the AC IN indicator is green, the AC power cord is connected and supplying power to the T2110/T2130 series.

If the AC IN indicator does not light, the AC power cord is not supplying power to the T2110/T2130 series. If the AC power cord is not attached to the T2110/T2130 series, go to Check 1.

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

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

Check 1   Make sure the correct AC power cord is firmly plugged into the AC IN socket on the back of the computer.

Check 2   If the AC IN indicator flashes orange when the AC power cord is connected, output voltage is abnormal. Connect a new AC power cord and turn the T2110/T2130 series on again to verify the indicator condition.

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

Check 4   Place the T2110/T2130 series in an environment between –20°C and 70°C until the T2110/T2130 series is at the ambient temperature. Repeat the steps which caused the T2110/T2130 series to operate abnormally. If the same problem still occurs, perform Procedure 3.

Procedure 2   Battery LED Indicator Check

The Battery LED indicator shows the battery charging status. The Battery LED is identified by a battery indicator on the front of the computer. The following describes the charging conditions of the T2110/T2130 series battery pack.

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

If the Battery LED indicator glows orange, the AC power cord is connected and the battery is being charged.

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

Check 1   Make sure the AC power cord is firmly plugged into the AC IN socket and the wall outlet. If this cable is connected correctly, go to Check 2.

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

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

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

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

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

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

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

Procedure 3   AC PS Unit Replacement Check

Power is supplied to the AC PS unit through the AC IN plug. If the AC PS unit is damaged, replace it.

Refer to chapter 4 for instructions on how to disassemble the T2110/T2130 series, and then perform the following check:

Check 1   Replace the AC PS unit with a new one and restart the system. If the problem still exists, Go to check 2.

Check 2   Replace the system board with a new one and restart the system. If the problem still exists, other FRU's may be damaged.

2.4   System Board Troubleshooting

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

Procedure 1:   Message Check

Procedure 2:   Printer Port LED Check on Boot Mode

Procedure 3:   Printer Port LED Check on Resume Mode

Procedure 4:   Diagnostic Test Program Execution Check

Procedure 5:   Replacement Check

Procedure 1   Message Check

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

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

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

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

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

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

```
(a) *** Error in CMOS.  Bad HDD type ***
    Check system.  Then press [F1] key ......

(b) *** Error in CMOS.  Bad battery ***
    Check system.  Then press [F1] key ......

(c) *** Error in CMOS.  Bad check sum ***
    Check system.  Then press [F1] key ......

(d) *** Error in CMOS.  Bad memory size ***
    Check system.  Then press [F1] key ......

(e) *** Error in CMOS.  Bad time function ***
    Check system.  Then press [F1] key ......
```

Check 2   If the following error message is displayed on the screen, press any key as the message instructs:

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

This error message appears when data stored in RAM under the resume function is lost because the battery has become discharged or the system board is damaged. Go to Procedure 4.

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), (27), or (28) is
           displayed, replace the system board.

           If error message (21) is displayed, go to the Keyboard Troubleshooting Proce-
           dures in section 2.7.

           If error message (22), (23), or (24) is displayed, go to the HDD Troubleshooting
           Procedures in section 2.6.

           If error message (25) or (26) is displayed, go to the FDD Troubleshooting Proce-
           dures in section 2.5.

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

Procedure 2   Printer Port LED Check on Boot Mode

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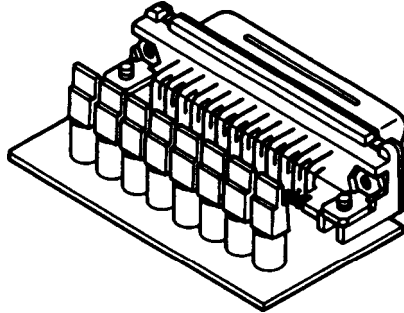
Figure 2-2 Printer port LED

To use the printer port LED follow these steps:

1.   Turn on the T2110/T2130 series power, then set to boot mode.

2.   Turn off the T2110/T2130 series power.

3.   Plug the printer port LED into the T2110/T2130 series parallel port.

4.   Hold down the space bar and turn on the T2110/T2130 series power.

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

6.   Convert the status from binary to hexadecimal notation.

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

8.   If the final LED status matches any of the test status values in table 2-1, perform Check 1.

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

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

LED status	Test item	Message
01H	KBC initialization	
	ROM checksum test	BIOS is damaged! .....
02H	Special register initialization	
	PIT test	PIT ERROR
	PIT initialization	—
	PIT function check	MEMORY REFRESH ERROR TIMER CH.2 OUT ERROR
03H	CMOS check	CMOS CHECKSUM ERROR CMOS BAD BATTERY ERROR
	KB initialization	KBC ERROR
04H	Initialization of memory configuration	—
05H	SM-RAM check	—
06H	Self test check	—
	Read of Power Supply information	—
07H	ROM/RAM copy	—
08H	Initialization of internal VGA	—
0AH	First 64 KB memory test	FIRST 64KB MEMORY ERROR FIRST 64KB MEMORY PARITY ERROR
0BH	System memory initialization	—
0CH	System initialization	—
0DH	Interrupt vector initialization	—
18H	PIC initialization	—
1FH	Display initialization	VRAM ERROR
25H	System memory test	SYSTEM MEMORY ERROR SYSTEM MEMORY PARITY ERROR
30H	Extended memory test	EXTENDED MEMORY ERROR EXTENDED MEMORY PARITY ERROR
40H	DMA page register test	DMA PAGE REGISTER ERROR
41H	DMAC test	DMAC #X ERROR
42H	DMAC initialization	—
4AH	PIC test	PIC #X ERROR
50H	Mouse initialization	—
55H	KBC initialization	KBC ERROR
60H	HDD initialization	HDC ERROR/HDD #0 ERROR
65H	FDD initialization	FDC ERROR/NO FDD ERROR
70H	Printer initialization	—
80H	SIO initialization	—
90H	Timer initialization	RTC UPDATE ERROR TIMER INTERRUPT ERROR
A0H	NDP initialization	—

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

LED status	Test item	Message
A6H	Initialization of expansion ROM	—
C0H	Password check	—
FFH	Setup boot check	*** Error is CMOS. xxxxxx *** Check system. Then press [F1] key.
FFH	Boot load	—

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

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

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

Check 3   If error code 55h is displayed, go to the HDD Troubleshooting Procedures in Section 2.6.

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

Procedure 3   Printer Port LED Check on Resume Mode

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

To use the printer port LED follow these steps:

1.   Turn on the T2110/T2130 series power, then set to resume mode.

2.   Turn off the T2110/T2130 series power.

3.   Plug the printer port LED into the T2110/T2130 series parallel port.

4.   Turn on the T2110/T2130 series power.

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

6.   Convert the status from binary to hexadecimal notation.

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

8.   If the final LED status matches any of the test status values in table 2-2, perform Procedure 5.

Table 2-2 Printer port LED resume mode error status

Error status	Meaning of status
F1H	RAM BIOS error
F2H	The system has optional ROM, or optional card (CGA, MDA)
F5H	Main memory checksum error
F6H	Video RAM checksum error
F7H	Extended memory checksum error

Procedure 4   Diagnostic Test Program Execution Check

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

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

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

Procedure 5   Replacement Check

The system board(s) may be damaged. Disassemble the T2110/T2130 series following the steps described in chapter 4, *Replacement Procedures,* and perform the following check:

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

2.5 Floppy Disk Drive Troubleshooting

This section describes how to determine if the T2110/T2130 series internal 3.5-inch floppy disk drive is functioning properly. Perform the steps below starting with Procedure 1 and continuing with the other procedures as required.

Procedure 1:   FDD Head Cleaning Check

Procedure 2:   Diagnostic Test Program Execution Check

Procedure 3:   Connector Check and Replacement Check

Procedure 1   FDD Head Cleaning Check

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

After loading Toshiba MS-DOS, run the Diagnostic Program and then clean the FDD heads using the cleaning kit. If the FDD still does not function properly after cleaning, go to Procedure 3.

If the test program cannot be executed on the T2110/T2130 series, go to Procedure 2.

Procedure 2   Diagnostic Test Program Execution Check

The Floppy Disk Drive Diagnostic Test program is stored on the T2110/T2130 series Diagnostics Disk. After loading Toshiba MS-DOS, run the diagnostic program. Refer to Chapter 3, *Tests and Diagnostics*, for more information about the diagnostics test procedures.

Floppy disk drive test error codes and their status names are described in table 2-3. Make sure the floppy disk in the FDD is formatted correctly and that the write protect tab is disabled. If any other errors occur while executing the FDD diagnostics test, go to Check 1.

Table 2-3 Floppy disk drive error code and status

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

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

```
Write protected
```

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

Procedure 3   Connector Check and Replacement Check

The 3.5-inch Floppy Disk Drive is connected to the system board by the FDD cable. This cable may be damaged or disconnected from the system board. Disassemble the T2110/ T2130 series, following the steps described in chapter 4, *Replacement Procedures,* and perform the following checks:

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

```
┌──────────────┐           ┌──────────────────┐
│              │           │                  │
│     FDD      │───────────│     PJ4          │
│              │           │     System board │
└──────────────┘           └──────────────────┘
```
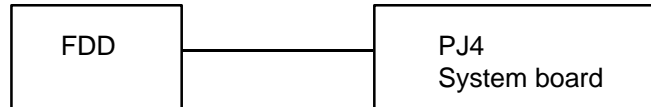
If this cable is disconnected, connect it to the system unit and repeat Procedure 3. If the FDD is still not functioning properly, perform Check 2.

Check 2   The FDD or its cable may be defective or damaged. Replace the FDD with a new one following the steps in chapter 4. If the FDD is still not functioning properly, perform Check 3.

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

2.6   Hard Disk Drive Troubleshooting

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

Procedure 1:   Partition Check

Procedure 2:   Message Check

Procedure 3:   Format Check

Procedure 4:   Diagnostic Test Program Execution Check

CAUTION: *The contents of the hard disk will be erased when the HDD troubleshoot-
ing procedures are executed. Transfer the contents of the hard disk to a floppy disk(s)
using the BACKUP command in the Toshiba companion utility. Refer to the User's
Manual for more information about how to perform the BACKUP.*

Procedure 1   Partition Check

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

Check 1   Type **C:** and press **Enter**. If you cannot change to drive C, go to Check 2. If you
can change to drive C, go to Procedure 2.

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

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

Procedure 2   Message Check

When the T2110/T2130 series HDD does not function properly, some of the following error messages may appear on the display. Start with Check 1 below and perform the other checks as instructed.

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

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

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

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

Check 3   Using the Toshiba MS-DOS system disk, install a system program on the hard disk using the SYS command.

If the following message appears on the display, the system program has been transferred to the HDD. Restart the T2110/T2130 series. If the error message still appears, perform Check 4.

```
System transferred
```

Check 4   The HDD is connected to the system board directly. This connection can become disconnected or damaged. Disassemble the T2110/T2130 series as described in chapter 4, *Replacement Procedures*. If the HDD is not connected, connect it to the system board and return to Procedure 1. If the HDD is firmly connected to the system board, perform Procedure 3.

```
+---------------+                    +-------+
| System Board  |--------------------|  HDD  |
+---------------+                    +-------+
```
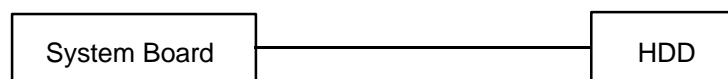
Procedure 3   Format Check

The T2110/T2130 series HDD is formatted using the low level format program and the MS-DOS FORMAT program. To format the HDD, start with Check 1 below and perform the other steps as required.

Check 1   Using the Toshiba MS-DOS system disk, partition the hard disk using the FDISK command. Format the hard disk using **FORMAT C:/S/U** to transfer the system program to the HDD. If the following message appears on the display, the HDD is formatted.

```
Format complete
```

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

Check 2   Using the T2110/T2130 series 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 com-mand.

```
Format complete
```

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

Procedure 4   Diagnostic Test Program Execution Check

The HDD test program is stored in the T2110/T2130 series Diagnostics Disk. Perform all of the HDD tests in the Hard Disk Drive Test. Refer to chapter 3, *Tests and Diagnostics*, for more information about the HDD test program.

If an error is detected during the HDD test, an error code and status will be displayed; perform Check 1. The error codes and statuses are described in table 2-4. If an error code is not generated, the HDD is operating properly.

Table 2-4 Hard disk drive error code and status

Code	Status
01h	Bad command
02h	Bad address mark
04h	Record not found
05h	HDC not reset
07h	Drive not initialized
08	HDC overrun (DRQ)
09h	DMA boundary error
0Ah	Bad sector error
0Bh	Bad track error
10h	ECC error
11h	ECC recover enabled
20h	HDC error
40h	Seek error
80h	Time out error
AAh	Drive not ready
BBh	Undefined error
CCh	Write fault
E0h	Status error
EEh	Access time out error
FFh	Data compare error

Check 1   Replace the HDD unit with a new one following the instructions in chapter 4, *Replacement Procedures*. If the HDD is still not functioning properly, perform Check 2.

Check 2   Replace the system board with a new one following the instructions in chapter 4.

2.7 Keyboard Troubleshooting

To determine if the T2110/T2130 series keyboard is functioning properly, perform the following procedures. Start with Procedure 1 and continue with the other procedures as instructed.

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

Procedure 1 Diagnostic Test Program Execution Check

Execute the Keyboard Test in the Diagnostic Program. Refer to chapter 3, *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 flat cable. This cable may be disconnected or damaged. Disassemble the T2110/T2130 series 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	PJ14 System board
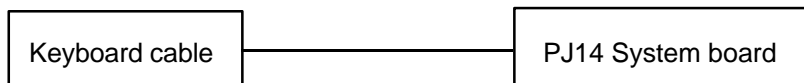
If this cable is damaged, replace the keyboard with a new one. If the cable is disconnected, firmly connect it. Perform Procedure 1 again. If the keyboard is still not functioning properly, perform Check 2.

Check 2 The keyboard controller on the system board may be damaged. Replace the system board with a new one. Refer to chapter 4 for more information.

2.8   Display Troubleshooting

This section describes how to determine if the T2110/T2130 series display is functioning properly. Start with Procedure 1 and continue with the other procedures as instructed.

Procedure 1:   Contrast Control Check (T2110CS/T2130CS only)

Procedure 2:   External CRT Check

Procedure 3:   Diagnostic Test Program Execution Check

Procedure 4:   Connector Check

Procedure 5:   Replacement Check

Procedure 1   Contrast Control Check (T2110/T2110CS/T2130CS only)

Contrast is changed by the contrast dial. If the display is blank, go to Check 1. If you cannot change the brightness and contrast, go to Procedure 2.

Procedure 2   External CRT Check

Connect the external CRT to the T2110/T2130 series external monitor port, then boot the computer. The computer automatically detects the external CRT even if Resume mode is enabled.

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

If the external CRT appears to have the same problem as the internal LCD, the display controller may be damaged. Go to Procedure 3.

Procedure 3   Diagnostic Test Program Execution Check

The Display Test program is stored on the T2110/T2130 series 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 4. If an error is not detected, the display is functioning properly.

Procedure 4   Connector Check

The Display unit has an LCD module, FL, Display switch, and FL inverter board. The FL and FL inverter board are connected by two cables. The LCD module and system board are connected by two signal cables as shown below. Any of these cables may be disconnected.

Disassemble the display unit and check the following cable connections. Refer to chapter 4. *Replacement Procedures*, for more information about how to disassemble the computer.
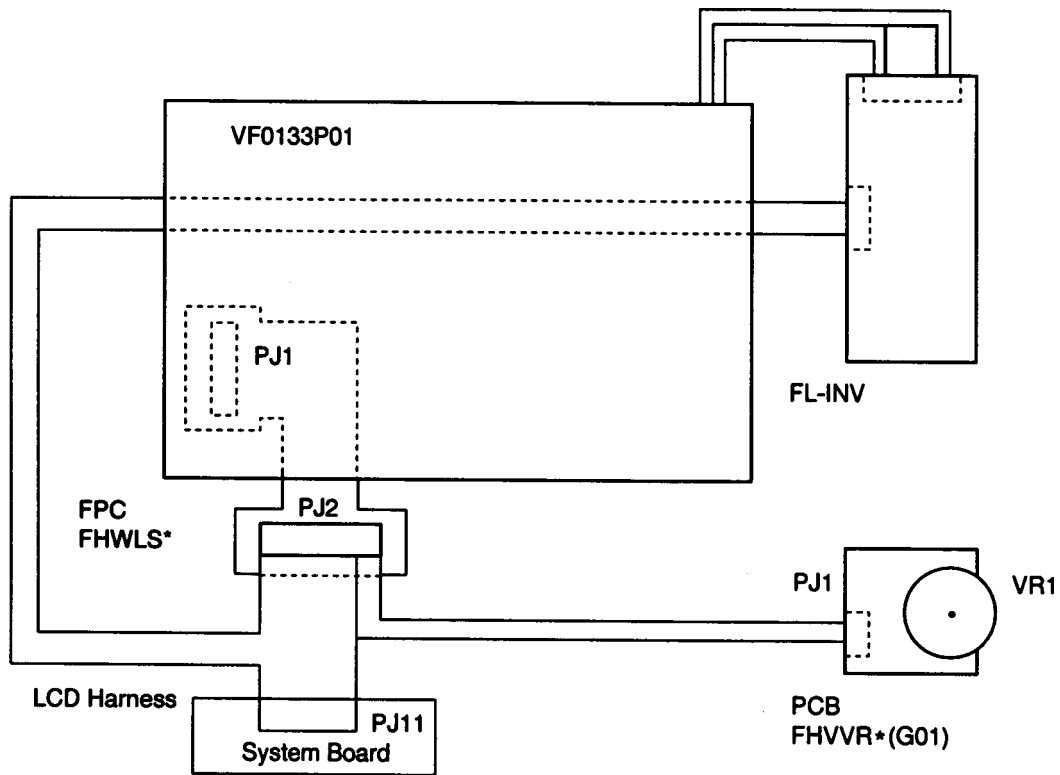
Figure 2-3 T2110/T2110CS/T2130CS display connection
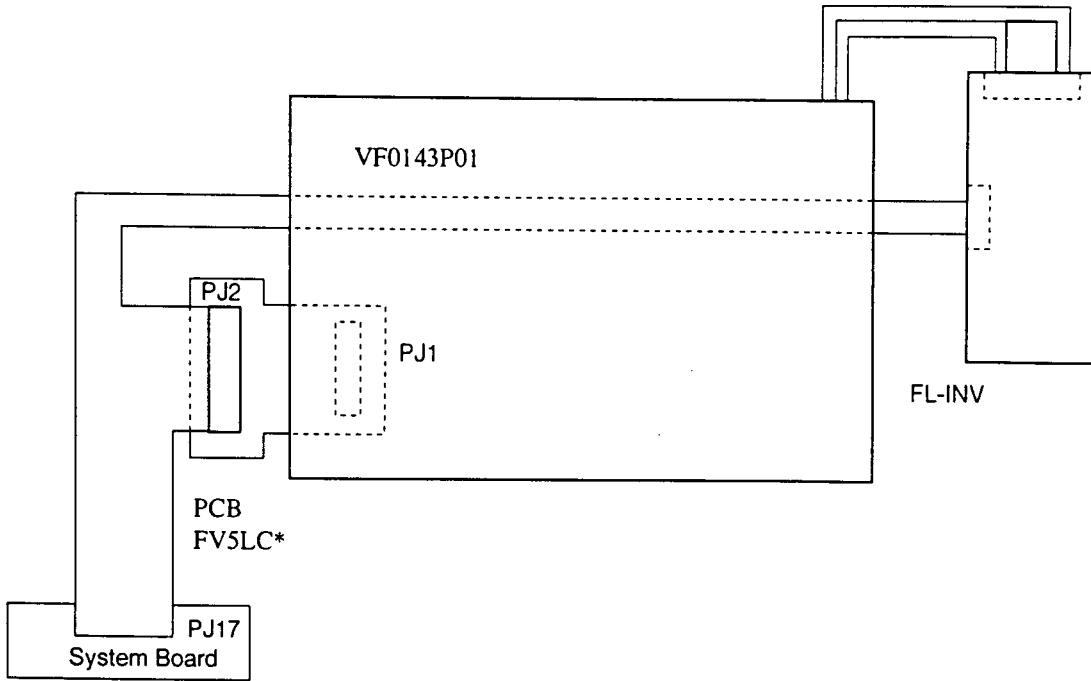
Figure 2-4 T2130CT display connection

If any of these cables is not connected, firmly reconnect it and repeat Procedures 1 and 2. If the problem still exists, perform Procedure 5.

Procedure 5   Replacement Check

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

>   If the FL does not light, perform Check 1.
>
>   If characters are not displayed clearly, perform Check 3.
>
>   If some screen functions do not operate properly, perform Check 3.
>
>   If the FL remains lit when the display is closed, perform Check 4.

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

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

Check 3   Replace the LCD module with a new one and test the display again. If the problem still exists, perform Check 6.

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

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

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

3.1 The Diagnostic Test

This chapter explains how to use the T2110/T2130 series Diagnostic Test program to test the functions of the T2110/T2130 series hardware modules. The Diagnostics Program is stored on the T2110/T2130 series Diagnostic Disk. The Diagnostic Test consists of 20 programs that are grouped into the Service Program Module (DIAGNOSTIC TEST MENU) and the Test Program Module (DIAGNOSTIC TEST).

NOTES: To start the diagnostics, follow these steps:
1. *Check all cables for loose connections.*
2. *Exit any application you may be using and close Windows.*
3. *Be sure the computer is not in virtual 86 mode. The test will not run in that mode. If you try to run the test in virtual 86 mode, the following message will be displayed:*
    ```
    Cannot execute in a virtual 8086 mode.
    ```
    If the preceding message is displayed, remove memory managersfrom your config.sys file. See your MS-DOS documentation for information on the config.sys file.
4. *Go to drive C and at the DOS prompt C:\>, type TDIAGS. MS-DOS loads the diagnostic test and displays the following screen:*
    ```
    TOSHIBA personal computer xxxx DIAGNOSTICS
    version x.xx (c) copyright TOSHIBA Corp. 19xx
    Test the DIAGNOSTICS (Y/N)
    ```
5. *To execute the program, type Y; to exit, type N.*

The DIAGNOSTIC TEST MENU consists of the following eight functions. These are all located within the Diagnostic test function of the DIAGNOSTIC TEST MENU.

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

The DIAGNOSTIC TEST MENU contains the following eleven functional tests:

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

You will need the following equipment to perform some of the T2110/T2130 series Diagnostic test programs.

- ❏ The T2110/T2130 series Diagnostics Disk (all tests)
- ❏ A formatted working disk for the floppy disk drive test (all tests)
- ❏ 3.5-inch 2HD/2DD disk for internal 3.5-inch FDD
- ❏ A cleaning kit to clean the floppy disk drive heads (Head Cleaning)
- ❏ A PCMCIA wraparound connector for the I/O card test (PCMCIA test)
- ❏ A printer wraparound connector for the printer wraparound test (Printer test)
- ❏ An RS-232-C wraparound connector for the RS-232-C port wraparound test (ASYNC test)

The following sections detail the tests within the Diagnostic Test function of the DIAGNOSTIC TEST MENU. Refer to Sections 3.17 through 3.23 for detailed information on the remaining seven Service Program Module functions.

3.2 Executing the Diagnostic Test

Toshiba MS-DOS is required to run the T2110/T2130 series DIAGNOSTICS PROGRAM.
To start the DIAGNOSTIC PROGRAM follow these steps:

1. Turn on the computer, and allow it to boot. Insert the T2110/T2130 series Diagnostics disk in the computer's internal floppy disk drive.

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

```
TOSHIBA personal computer xxxxx 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 T2110/T2130 series DIAGNOSTIC TEST MENU, press the* **Esc** *key. If a test program is in progress, press* **Ctrl** *+* **Break** *to halt the test . If you have selected a subtest, but have not pressed* **Enter** *to begin execution, you can deselect the subtest by pressing* **Ctrl** *+* **C.** *If a test program is in progress, press* **Ctrl** *+* **C** *to stop the test program.*

---

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

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

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

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

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

Refer to sections 3.4 through 3.14 for detailed descriptions of Diagnostic Tests 1 through 10. Function 88 sets the floppy disk drive and hard disk drive error retry count. Function 99 exits the submenus of the Diagnostic Test and returns to the Diagnostic Menu.

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

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

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

    SUB-TEST MENU :

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

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

> *NOTE: The menu displayed by your T2110/T2130 series may be slightly different from the one shown above.*

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

   ```
   TEST LOOP  : YES
   ```

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

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

6. The following message will appear:

   ```
   ERROR STOP : YES
   ```

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

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

   ```
   ERROR STATUS NAME    [[ HALT OPERATION ]]

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

   These three selections have the following functions:

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

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

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

   Table 3-1 in section 3.3 describes the function of each test on the subtest menu.
   Table 3-3 in section 3.15 describes the error codes and error status for each error.

3.3 Subtest Names

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

Table 3-1 Subtest names (1/2)

No.	Test name	Subtest No.	Subtest item
1	SYSTEM	01	ROM checksum
		02	H/W status
		03	Version check
2	MEMORY	01	Constant data
		02	Address pattern data
		03	Refresh
		04	Protected mode
		05	Memory module
		06	Cache memory
3	KEYBOARD	01	Pressed key display (82/84)
		02	Pressed key code display
		03	PS/2 Mouse connect check
		04	Pointing stick
4	DISPLAY	01	VRAM read/write
		02	Character attributes
		03	Character set
		04	80*25/30 Character display
		05	320*200 Graphics display
		06	640*200 Graphics display
		07	640*350/480 Graphics display
		08	Display page
		09	"H" pattern display/Border color
		10	LED/DAC pallet
		11	TFT color display (T2130CT only)
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	Interrupt test
8	HDD	01	Sequential read
		02	Address uniqueness
		03	Random address/data
		04	Cross talk & peak shift
		05	Write/read/compare (CE)
		06	Write specified address
		07	Read specified address
		08	ECC circuit
		09	Sequential write
		10	W-R-C specified address
9	REAL TIMER	01	Real time
		02	Backup memory
		03	Real time carry
10	NDP	01	NDP test
11	EXPANSION	01	PCMCIA wraparound

3.4 System Test

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

Subtest 01   ROM checksum

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

Subtest 02   H/W status

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

```
CPU clock      = 75MHz
Notch signal  = 2HD
```

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

Table 3-2 Hardware bit status

H/W status		
CPU clock speed	50 MHz	75 MHz
Media type	2HD	2DD

Subtest 03   Version check

This subtest checks the version of the following four items:

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

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

```
ROM-BIOS           = 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 TEST MENU, press **Enter** and follow the directions displayed on the screen. Move the highlight bar to the subtest you want to execute and press **Enter**.

Subtest 01   Constant data (real mode)

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

Subtest 02   Address pattern data (real mode)

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

Subtest 03   Refresh (real mode)

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

           The constant data is AAAAh and 5555h.

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

Subtest 04   Protected mode

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

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

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

Subtest 05   Memory module

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

This subtest functions the same as subtest 04, except it is used for testing an optional memory card. Memory module capacity is 4 MB, 8 MB, 16 MB, and 24 MB.

After selecting subtest 05, the following message will appear:

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

Select the number that corresponds to the memory card installed in the T2110/T2130 series.

Subtest 06   Cache memory

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

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

3.6 Keyboard Test

To execute the Keyboard Test, select **3** from the DIAGNOSTIC TEST MENU, press **Enter** and follow the directions displayed on the screen. The Keyboard test contains two subtests that test the T2110/T2130 series keyboard actions. Move the highlight bar to the subtest you want to execute and press **Enter**.

Subtest 01   Pressed key display (82/84)

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

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

```
     [[[   Press Key Display   ]]]

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

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

Subtest 02   Pressed key code display

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

```
KEYBOARD TEST  IN PROGRESS  302000

               Scan code       =
               Character code  =
               Keytop          =

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

PRESS [Enter] KEY
```

Subtest 03   PS/2 mouse connect check

> *NOTE*: *To execute the PS/2 mouse connect check, a PS/2 mouse must
> be connected to the port replicater.*

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

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

```
KBD - MOUSE INTERFACE ERROR

                            [[ HALT OPERATION ]]

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

Subtest 04   Pointing Stick

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

a) IPS stick pressure sensing direction and parameter.
b) IPS switch function check.

This test reports the pointing stick response from the IPS and IPS switch by displaying the location parameters. When the stick is pressed towards the upper left, the <POINTING> display changes to an arrow as shown below. If an IPS switch is pressed, the <BUTTON> display alternates black and white and appears on the right side of the display. If two IPS switches are pressed, it returns to the subtest menu.

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


                           < BUTTON >

                           (1)      (2)




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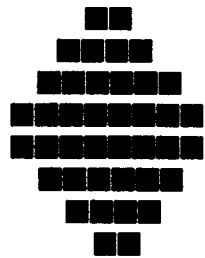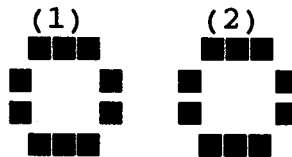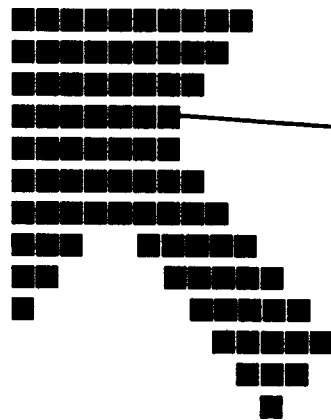
There are eight directions of arrow mark as shown below.
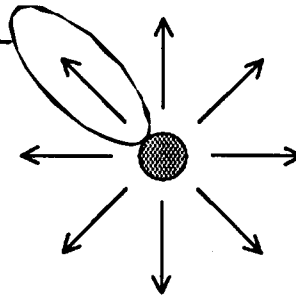
When the button is pressed, it alternates as shown below.

3.7 Display Test

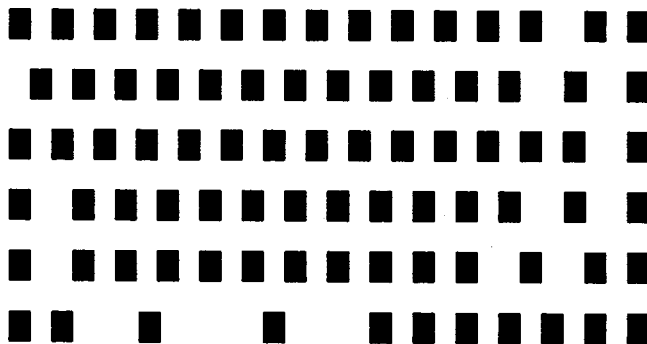To execute the Display Test, select **4** from the DIAGNOSTIC TEST MENU, press **Enter** and follow the directions displayed on the screen. The Display test contains ten subtests that test the T2110/T2130 series display in various modes. Move the highlight bar to the subtest you want to execute and press **Enter**.

Subtest 01   VRAM Read/Write

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

Subtest 02   Character Attributes (mode 1, 13h)

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

```
CHARACTER ATTRIBUTES

  NEXT LINE SHOWS NORMAL DISPLAY.
   NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

  NEXT LINE SHOWS INTENSIFIED DISPLAY.
   IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII

  NEXT LINE SHOWS REVERSE DISPLAY.
   RRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRR

  NEXT LINE SHOWS BLINKING DISPLAY.
   BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB
```

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

  PRESS [Enter] KEY
```

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

BLACK
BLUE
GREEN
CYAN
RED
MAGENTA
BROWN
WHITE
GRAY
LIGHT BLUE
LIGHT GREEN
LIGHT CYAN
LIGHT RED
LIGHT MAGENTA
YELLOW
INTENSE WHITE
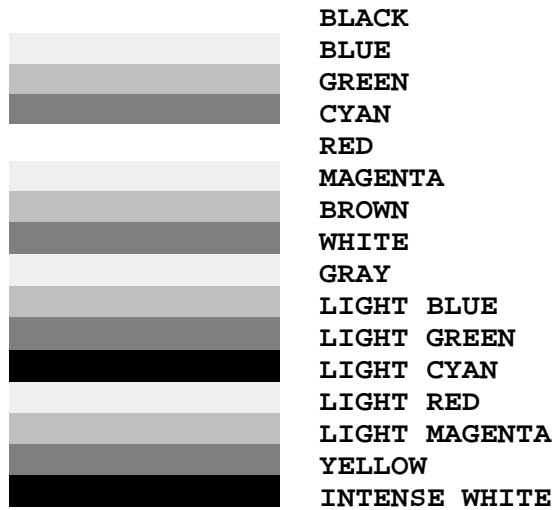
Pressing **Enter** toggles between the two tests.

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

Subtest 03   Character Set

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

CHARACTER SET IN 40*25
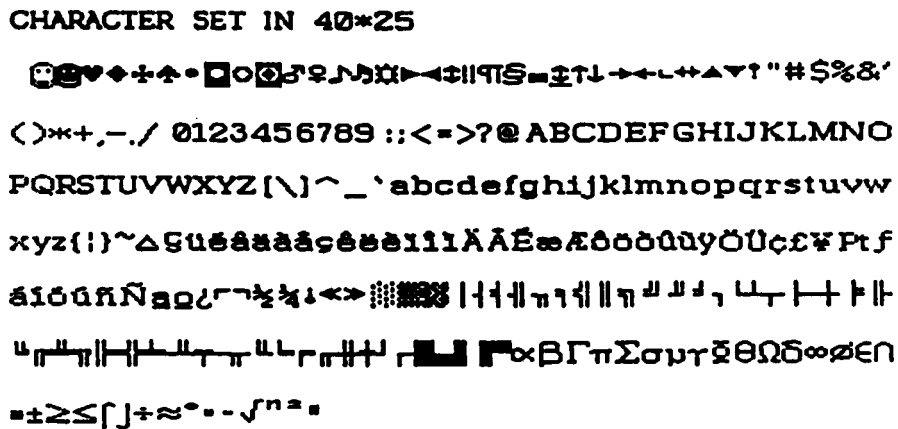
Press [Enter] KEY

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

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

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

```
80*XX CHARACTER DISPLAY
012345678901234567890123456789012345678901234567890123456789012345678901234567
  !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklm
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmn
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnop
$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopq
%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqr
&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrs
'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrst
()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrstu
)*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrstuv
*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrstuvw
+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrstuvwx
,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrstuvwxy
-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrstuvwxyz
./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrstuvwxyz{
/0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrstuvwxyz{|
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrstuvwxyz{|}
123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrstuvwxyz{|}~
23456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrstuvwxyz{|}~•
3456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrstuvwxyz{|}~•Ç
456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_'abcdefghijklmnopqrstuvwxyz{|}~•Çü
PRESS [ENTER] KEY
```
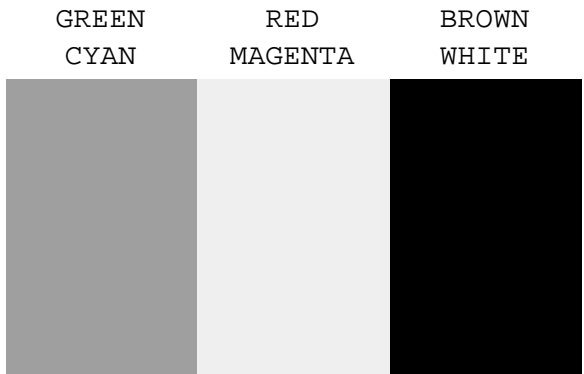
Pressing **Enter** toggles between tests. To exit this subtest and return to the DISPLAY TEST menu, press **Ctrl + Break**.

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

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


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

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

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

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

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

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

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

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

Subtest 08   Display Page

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

DISPLAY PAGE 0

```
OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
O                                      O
O                                      O
O                                      O
O                                      O
O                                      O
O                                      O
O                                      O
O                                      O
O                                      O
O                                      O
O                                      O
OOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOOO
```

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

Subtest 09   H Pattern Display/Border Color

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

```
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
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HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
```

Pressing **Enter** displays the following message:

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

If an external CRT display is connected to the T2110CS/T2130CS/T2130CT, choose **1** to display the following message:

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

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

Subtest 10   LED/DAC Pallet

This subtest checks the LED indicator (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 two messages:

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

```
[ DAC pallet W-R-CMP test ] =  (about 1 seconds)

[ Processor latch test    ] =

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

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

Subtest 11   TFT color display (T2130CT only)

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

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

3.8 Floppy Disk Test

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

To execute the Floppy Disk Test, select **5** from the DIAGNOSTIC TEST MENU, press **Enter** and follow the directions displayed on the screen. The Floppy Disk test contains five subtests that test the T2110CS/T2130CS/T2130CT's internal floppy disk drive. The following messages will appear after selecting the Floppy Disk Test from the DIAGNOSTIC TEST MENU. Answer each question with an appropriate response to execute the test.

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

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

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

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

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

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

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

    ```
    FLOPPY DISK      XXXXXXX
                          xxxxx DIAGNOSTIC TEST VX.XX
                          [Ctrl]+[Break]  ; test end
                          [Ctrl]+[C]      ; key stop
    ```

Subtest 01   Sequential Read

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

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

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

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

Subtest 02   Sequential Read/Write

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

Subtest 03   Random Address/Data

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

Subtest 04   Write Specified Address

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

Subtest 05   Read Specified Address

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

3.9 Printer Test

To execute the Printer Test, select **6** from the DIAGNOSTIC TEST MENU, press **Enter** and follow the directions displayed on the screen. The Printer Test contains three subtests that test the output of the printer connected to the T2110/T2130 series. The following messages will appear after selecting the Printer Test from the DIAGNOSTIC TEST MENU. Answer each of the following questions with an appropriate response to execute the test.

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

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 T2110/T2130 series supports three printer channels. Select the printer channel number, and press **Enter** to execute the selected subtest.

Subtest 01   Ripple Pattern

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

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

Subtest 02   Function

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

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

This subtest prints the various print types shown below:

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

Subtest 03   Wraparound

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

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

3.10 Async Test

To execute the Async Test, select **7** from the DIAGNOSTIC TEST MENU, press **Enter** and follow the directions displayed on the screen. The async test contains six subtests that test the T2110/T2130 series asynchronous communication functions. Move the highlight bar to the subtest you want to execute and press **Enter**.

Subtests 01 through 04 require the following data format:

Method:	Asynchronous
Speed:	9600BPS
Data:	8 bits and one parity bit (EVEN)
Data pattern:	20h to 7Eh

The following message will appear at the bottom of the screen when subtests 01, 03, 04, and 05 are selected:

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

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

Subtest 01   Wraparound (board)

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

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

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

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

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

Subtest 03   Point to point (Send)

> **NOTE**: *To execute this subtest, two machines must be connected with an RS-232-C direct cable. One machine should be set as "send" (subtest 03) and the other set as 'receive' (subtest 04). The wiring diagram for the RS-232-C direct cable is described in Appendix 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 described above. This subtest receives the data from the send side, then sends the received data.

Subtest 05   Interrupt Test

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

3.11 Hard Disk Test

To execute the Hard Disk Test, select **8** from the DIAGNOSTIC TEST MENU. Press **Enter,** and follow the directions displayed on the screen. The hard disk test contains 10 subtests that test the T2110/T2130 series hard disk drive functions. The following messages will appear after selecting the hard disk test from the DIAGNOSTIC TEST MENU. Answer each of the following questions with an appropriate response to execute the test:

CAUTION: The contents of the hard disk will be erased when subtest 02, 03, 04, 05, 06, 08, 09, or 10 is executed. Before running the test, transfer the contents of the hard disk to a floppy disk(s). This should be done with the BACKUP command in the Toshiba Companion Utility.

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

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

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

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

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

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

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

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

5. This message is used to select whether or not the HDD status is displayed on the screen. The HDD status is described in section 3.16. Select **1** or **2** and press **Enter**.

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

```
HARD DISK TEST     XXXXXXX

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

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

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

Subtest 01   Sequential Read

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

Subtest 02   Address Uniqueness

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

- Forward sequential
- Reverse sequential
- Random

Subtest 03   Random Address/Data

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

Subtest 04   Cross Talk & Peak Shift

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

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

Subtest 05   Write/read/compare (CE)

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

Subtest 06   Write specified address

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

Subtest 07   Read specified address

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

Subtest 08   ECC circuit

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

Subtest 09   Sequential write

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

Subtest 10   W-R-C specified address

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

3.12 Real Timer Test

To execute the Real Timer Test, select **9** from the DIAGNOSTIC TEST MENU, press **Enter** and follow the directions on the screen. The real timer test contains three subtests that test the T2110/T2130 series real timer functions. Move the highlight bar to the subtest you want to execute and press **Enter**.

Subtest 01   Real Time

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

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

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

Enter new date:

PRESS [ENTER] KEY TO EXIT TEST
```

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

```
Enter new time :
```

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

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

Subtest 02   Backup Memory

This subtest performs the following backup memory check:

Writes 1-bit of "on" data to address 01h through 80h
Writes 1-bit of "off" data to address 0Eh through 80h
Writes the data pattern AAh through 55h to the RTC 114-byte memory (address 0Eh to 7Fh)

Then the subtest reads and compares this data with the original data.

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

Subtest 03   Real Time Carry

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

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

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

Pressing **Enter** displays the following

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


  PRESS [Enter] KEY TO EXIT TEST
```

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

3.13 NDP Test

To execute the NDP test, select **10** from the DIAGNOSTICS TEST MENU, press **Enter** and follow the directions on the screen. The NDP test contains one subtest that tests the T2110/T2130 series NDP functions.

Subtest 01   NDP

        This test checks the following functions of NDP:

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

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

3.14 EXPANSION Test

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

Subtest 01   PCMCIA wraparound

This test checks the following signal line of the PCMCIA slot:

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

This subtest is executed in the following order:

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

3.15 Error Code and Error Status Names

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

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

Device name	Error code	Error status name
(COMMON)	FF	Data Compare Error
SYSTEM	01	ROM Checksum Error
Memory	01	Parity Error
	02	Protected Mode Not Changed
	14	Memory Read/Write Error
	DD	Cache Memory Error
Keyboard	01	Mouse Interface Error
	02	IPS Interface Error
	03	Interface Error
	04	Retransmit Error
	05	Mouse Handler Not Supported
	06	PS/2 Mouse & IPS Not
FDD	01	Bad Command
	02	Address Mark Not Found
	03	Write Protected
	04	Record Not Found
	06	Media Removed
	08	DMA Overrun Error
	09	DMA Boundary Error
	10	CRC Error
	20	FDC Error
	40	Seek Error
	60	FDD Not Drive Error
	80	Time Out Error
	EE	Write Buffer Error
Printer	01	Time Out
	08	Fault
	10	Select Line
	20	Out Of Paper
	40	Power Off
	80	Busy Line
ASYNC	01	DSR On Time Out
	02	CTS On Time Out
	04	RX-READY Time Out
	08	TX-BUFFER Full Time Out
	10	Parity Error

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

Device name	Error code	Error status name
ASYNC (cont.)	20	Framing Error
	40	Overrun Error
	80	Line Status Error
	88	Modem Status Error
	33	No Carrier (Card Modem)
	34	Error (Card Modem)
	36	No Dial Tone (Card Modem)
HDD	01	Bad Command Error
	02	Bad Address Mark Error
	04	Record Not Found
	05	HDC Not Reset Error
	07	Drive Not Initialized
	08	HDC Overrun (DRQ)
	09	DMA Boundary Error
	0A	Bad Sector
	0B	Bad Track Error
	10	ECC Error
	11	ECC Recover Enabled
	20	HDC Error
	40	Seek Error
	80	Time Out Error
	AA	Drive Not Ready
	BB	Undefined Error
	CC	Write Fault
	E0	Status Error
	EE	Access Time Out Error
NDP	01	No Co-Processor
	02	Control Word Error
	03	Status Word Error
	04	Bus Error
	05	Addition Error
	06	Multiply Error
PCMCIA	C1	Address Line Error
	C2	REG# Line Error
	C3	CE#1 Line Error
	C4	CE#2 Line Error
	C5	DATA Line Error
	C6	WAIT Line Error
	C7	BSY# Line Error
	C8	BVD1 Line Error
	CD	No PCMCIA

3.16 Hard Disk Test Detail Status

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

```
HDC status = XXXXXXXX
```

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

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

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

Table 3-4 Hard disk controller status register contents

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

Table 3-5 Error register contents

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

3.17 Hard Disk Format

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

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

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

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

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

3.17.1   Function Description

1.   All track FORMAT

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

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

Table 3-6 Hard disk formatting sequence

	350 MB	520 MB
	(MK1824FCV)	(MK1924FCV)
Number of cylinders	682	1023
Number of heads	16	16
Number of sectors	63	63
Number of bytes per sector (sector length)	512	512

2.   Good track FORMAT

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

3. Bad track FORMAT

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

4. Bad track CHECK

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

3.17.2   Operations

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

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

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

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

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

1. All track FORMAT

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

```
[All track FORMAT]

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

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

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

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

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

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

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

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

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

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

(d)   Bad track register

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

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

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

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

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

(e)   All track format

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

(f)   Track verification

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

2.   Good track FORMAT

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

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

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

3.   Bad track FORMAT

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

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

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

4.   Bad track CHECK

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

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

Bad tracks will be displayed in the format shown below.

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

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

3.18 Head Cleaning

3.18.1   Function Description

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

3.18.2   Operations

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

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

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

    Press any key when ready.
    ```

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

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

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

3.19 Log Utilities

3.19.1   Function Description

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

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

3.19.2   Operations

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

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

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

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

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

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

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

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

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

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

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

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

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

3.20 Running Test

3.20.1 Function Description

This function automatically executes the following tests in sequence:

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

The system automatically detects the number of floppy disk drives connected to the T2110/T2130 series for the FDD test.

3.20.2 Operations

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

1. Remove the diagnostics disk from the floppy disk drive and insert the work disk.

2. Select **6** from the Diagnostic Menu and press **Enter**. The following message will be displayed:

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

   Selecting **Y (yes)** executes the printer wraparound test. A printer wraparound connector must be connected to the **parallel** port on the back of the T2110/T2130 series to properly execute this test.

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

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

   Selecting **Y (yes)** executes the ASYNC wraparound test. An RS-232-C wraparound connector must be connected to the **serial port** on the back of the T2110/T2130 series to properly execute this test.

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

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

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

3.21 Floppy Disk Drive Utilities

3.21.1   Function Description

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

1.   FORMAT

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

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

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

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

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

2.   COPY

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

3.   DUMP

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

3.21.2   Operations

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

```
[ FDD UTILITIES ]

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

2. FORMAT program

    (a) Selecting FORMAT displays the following message:

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

     Drive number select (1:A, 2:B) ?
    ```

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

    ```
     Type select (0:2DD-2DD,1:2D-2D,2:2D-2HD,3:2HD-2HD) ?
    ```

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

    ```
     Warning : Disk data will be destroyed.

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

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

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

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

     Format start

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

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

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

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

3. COPY program

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

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

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

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

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

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

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

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

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

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

4.   DUMP program

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

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

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

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

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

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

(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, press any key, and the following message will appear:

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

    Track  number ??
```

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

3.22 System Configuration

3.22.1   Function Description

The System Configuration program contains the following configuration information for the T2110/T2130 series:

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

3.22.2   Operations

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

```
SYSTEM CONFIGURATION :

   * - BIOS ROM VERSION = VX.XX
   * - BOOT ROM VERSION = VX.XX
   * - KBC VERSION       = VX.XX
   * - PS MICOM VERSION = VX.XX
   * - 639KB MEMORY
   * - 1 FLOPPY DISK DRIVE(S)
   * - 1 ASYNC ADAPTER
   * - 1 HARD DISK DRIVE(S)
   * - 1 PRINTER ADAPTER
   * - XXXXXKB EXTENDED MEMORY
   * - 1 MATH CO-PROCESSOR
   * - CPU CLOCK        = 75MHz

Press [Enter] Key
```

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

3.23 SETUP

3.23.1   Function Description

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

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

2. Display
    (a) Display Adaptor
    (b) LCD Display Mode
    (c) LCD Display Colors
    (d) Power on display
    (e) Text Mode Stretch

3. Battery
    (a) Battery Save Modes
    (b) Manual set of battery level

4. Hard disk

5. COM/PRT/SCSI/SOUND
    (a) Serial port
    (b) Parallel Port

6. Power on Password

7. Others
    (a) Power-up Modes
    (b) CPU Cache
    (c) Processing Speed
    (d) Speaker Volume
    (e) Panel Power On/Off
    (f) Alarm Power On
    (g) Keyboard
    (h) Pointing Devices
    (i) Boot Priority

3.23.2 Accessing the SETUP Program

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

```
                           SYSTEM  SETUP        BIOS version = x.xx
        MEMORY                           I/O  PORTS
 Total           = 8192 KB       Serial Port      = COM1 (IRQ4/3F8H)
 Base            =  640 KB       Parallel Port    = LPT1 (378H)
 Extended        = 7360 KB
 Shadow BIOS ROM =  192 KB
                                          PASSWORD
        DISPLAY                  Not Registered
 Display Adapter   = VGA compatible
 LCD Display Mode  = Color
                                          OTHERS
 LCD Display Colors= 256Kcolors  Power-up Mode       = Resume
 Power On Display  = Internal/External  CPU Cache       = Enabled
 Text Mode Research= Enabled     Processing Speed    = High
                                 Speaker Volume      = High
        BATTERY                  Panel Power On/Off  = Disabled
 Battery Save Mode = Full Power  Alarm Power On      = Disabled
 Battery Level     = E  ???  F   Keyboard            = Layout/Fn
                                 Pointing Devices   = Auto selected
       HARD  DISK                Boot Priority       = FDD→HDD
 HDD Mode = Enhanced IDE (Normal)
```

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

 Esc: Exit without saving;   Home: Set default values;  End: Save changes and Exit
```

NOTES: 1.   *The T2110/T2110CS comes with standard 4096KB of memory.
                  The MEMORY total item displays the actual memory installed.*
            2.   *The Panel Power On/Off item appears only when the* T2110/
                  T2130 series *computer is in Resume mode.*
            3.   *The Battery Level option appears only when the system cannot
                  detect the battery charge. For example, when the battery is
                  replaced.*

Changing Values in the SETUP Menu

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

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

Accepting Changes and Exiting SYSTEM SETUP Windw

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

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

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

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

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

The changes you made will cause the system to reboot.

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

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

NOTE: *You can press **Esc** to quit at any time without saving changes. TSETUP asks you to confirm that you don't want to save your changes. When you access TSETUP, the current configuration is displayed.*

Factory Preset Configuration

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

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

Setup Options

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

NOTE: *The functions described in this section can also be changed using Toshiba's Hardware Setup program in Windows. You can access this program in the Toshiba Utilities group in Windows Program Manager.*

---

1. Memory

   This group provides information on the computer's memory. The values cannot be changed.

   (a) Total

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

(b) Base

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

(c) Extended Memory

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

(d) Shadow BIOS ROM

This field displays 192KB of RAM, which is reserved for the Shadow BIOS ROM.

2. Display

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

(a) Display Adaptor

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

(b) LCD Display Mode

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

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

(c) LCD Display Colors

Use this option to select a color palette of the T2130CT's internal TFT and the T2110CS/T2130CS's STN display when the LCD Display mode is set to "Color."

T2130CT TFT display

256K Colors	Displays 256 colors out of 262,144 colors. (Default)

T2110CS/T2130CS STN display

222K Colors	Displays 256 colors out of 226,981 colors. (Default)
4096 Colors	Displays 256 colors out of 4096 colors.

> *NOTE: If the screen flickers with a certain LCD Display Colors setting, select a setting that has a lower number of colors.*

(d)   Power On Display

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

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

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

> *NOTE: When starting the computer in Resume mode, the last configuration is remembered. If data does not appear on the display you are using after starting in Resume mode, press **Fn + F5**.*

(e)   Text Mode Stretch

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

Enabled   Enables the text mode stretch feature. (Default)

Disabled   Disables the text mode stretch feature.

3.   Battery

These options let you set battery save functions for optimum performance or battery power conservation. You can also set the battery charge level when necessary.

(a)   Battery Save Mode

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

Full Power   The following shows full power settings:

```
┌──────────── BATTERY SAVE OPTIONS ────────────┐
│                                               │
│ CPU Sleep Mode      =     Disabled            │
│ Display Auto Off    =     Disabled (T2110CS/T2130CS
│                           30 min. (T2130CT)   │
│ HDD Auto Off        =     Disabled            │
│ System Auto Off     =     Disabled            │
│ LCD Brightness      =     Bright              │
│                                               │
└───────────────────────────────────────────────┘
```

Low Power   The following shows low power settings:

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

┌───┐
│   │
│ *NOTE: In boot mode, System Auto Off is not displayed.*   │
│   │
└───┘

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

(b)   User Setting Options

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

CPU Sleep Mode

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

Enabled   Enables sleep mode.

Disabled   Disables sleep mode.

Display Auto Off

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

Disabled   Disables display automatic power off.

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

HDD Auto Off

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

Disabled   Disables HDD automatic power off.

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

System Auto Off

Used to enable or disable the system automatic off function when the 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. The duration xx can be set to 10, 20, 30, 40, 50, or 60 minutes.

<u>LCD Brightness</u>

This option sets the LCD's brightness level.

> *Bright*   Sets the LCD to bright.

> *Semi-Bright*   Sets the LCD to semi-bright.

(c)   Battery Level

When you use the computer for the first time or when you install a new or recharged battery, the charge level is unknown to the system. In this case the Battery Level options will be displayed to enable you to set the charge level to 100%, 75%, 50%, or 25%.

E ▭▭▭▭ F   100% charge
E ▭▭▭ F   75% charge
E ▭▭ F   50% charge
E ▭ F   25% charge
E ???   F   Charge is unknown (Displayed in TSETUP)

4.   Hard Disk

This item displays the mode of the HDD for information only. It cannot be changed.

```
Enhanced IDE      (Normal)
```

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

5.   I/O Ports

This option controls settings for serial and parallel ports.

(a)   Serial Port

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

The serial port interrupt request level (IRQ) and I/O port base address for each COM level is shown below.

COM level	Interrupt level	I/O address	
COM1	4	3F8h	(Serial Port default)
COM2	3	2F8h	
Not Used			(Disables Port)

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

(b) Parallel Port

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

LPT1 (378H)	Sets the address to 378H. (Default)
LPT2 (278H)	Sets the address to 278H.
LPT3 (3BCH)	Sets the address to 3BCH.
Not Used	Disables the port.

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

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

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

6. Password

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

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

For details on setting the password, refer to the T2110/T2130 series Reference Manual.

7. Others

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

(a) Power-up Mode

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

Boot	Turns on boot mode. (Default)
Resume	Turns on the AutoResume feature.

(b)   CPU Cache

Use this feature to enable or disable the CPU cache.

Enabled   Enables the CPU cache. (Default)

Disabled   Disables the CPU cache.

(c)   Processing Speed

This feature changes the CPU processing speed.

High   CPU operates at 75 MHz. (Default)

Low   CPU operates at half speed.

(d)   Speaker Volume

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

Off   Disables software use of the speaker.

Low   Sets the volume of the speaker to low.

Medium   Sets the volume of the speaker to medium.

High   Sets the volume of the speaker to high. (Default)

When Speaker Volume is selected, the subwindow below is displayed to let you enable or disable certain speaker functions.

```
┌─────────── SPEAKER VOLUME OPTIONS ───────────┐
│                                              │
│   System Speaker      =      Enabled         │
│                                              │
│   Low Battery Alarm   =      Enabled         │
│                                              │
│   Panel Close Alarm   =      Enabled         │
│                                              │
└──────────────────────────────────────────────┘
```

Enabled   Enables the feature. (Default)

Disabled   Disables the feature.

(e)   Panel Power On/Off

This option allows you to automatically turn your T2110/T2130 series computer on or off by opening or closing the display panel. If this feature is enabled when the computer is in Resume mode, the system is automatically powered off when the display panel is closed and powered on when the panel is opened. This option is not displayed when the computer is in boot mode.

Enabled   Enables the feature.

Disabled   Disables the feature. (Default)

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

(f)   Alarm Power On

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

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

Disabled   Disables the alarm. (Default)

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

(g)   Keyboard

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

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

Int. Keyboard key layout

This option lets you select the arrangement of the CapsLock, Ctrl, and Alt keys according to the following illustrations:
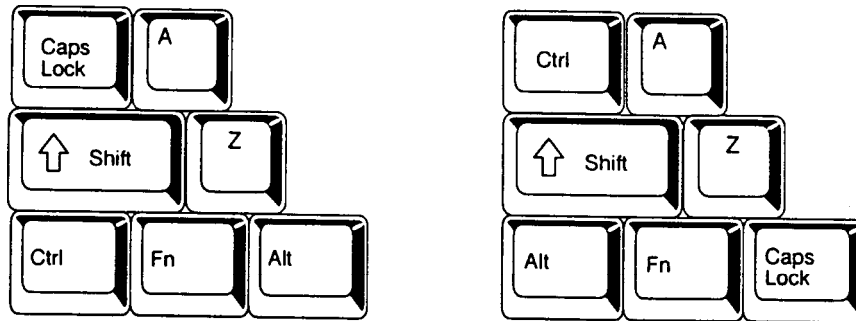
Normal (default)   Alternative

Ext.Keyboard "Fn" key equivalent

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

Disabled	No Fn key equivalent. (Default)
Fn Equivalent	Left Ctrl + Left Alt
	Right Ctrl + Right Alt
	Left Alt + Left Shift
	Right Alt + Right Shift
	Left Alt + Caps Lock

---

*NOTE: If you select **Left Ctrl + Left Alt** or **Right Ctrl + Right Alt** for this option, you cannot use the selected keys to reboot the computer in combination with the **Del** key. For example, if you select **Left Ctrl + Left Alt**, you must use **Right Ctrl, Right Alt** and **Del** to reboot the computer. **Left Ctrl, Left Alt** and **Del** cannot be used.*

(h)   Pointing Devices

Use this option to enable or disable the AccuPoint.

Simultaneous	If a PS/2 mouse is connected to an optional port replicator, both the AccuPoint and the external mouse are enabled.
Auto-Selected	The AccuPoint is disabled when a PS/2 mouse is connected, otherwise it is enabled. (Default)

(i) Boot Priority

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

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

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

You can reverse the order by holding down the F10 key while the computer is booting. This procedure does not affect the setting.

4.1 General

This section explains how to disassemble the T2110/T2130 series and replace Field Replace-able Units (FRUs). It may not be necessary to remove all the FRUs in order to replace one. The chart below is a guide to the FRUs that need to be removed in order to remove others. Always start by removing the battery pack, then follow the lines on the chart to determine which FRU you must remove next in order to repair the one you think is causing the T2110/T2130 series to operate improperly.

❏ Optional PCMCIA Card
❏ Optional Memory Module
❏ Battery Pack
❏ Keyboard
❏ Hard Disk Drive
❏ Top Cover
and Display Assembly ——— LCD Module ——— ❏ Display Mask
❏ Floppy Disk Drive   ❏ T2110CS/T2130CS FL
❏ AC Power Adapter   Inverter Board
❏ System Board   ❏ T2110CS/T2130CS LCD
                                                                     Module
                                                                     ❏ T2110CS/T2130CS FL
                                                                     ❏ T2130CT FL Inverter Board
                                                                     ❏ T2130CT LCD Module
                                                                     ❏ T2130CT FL

Before You Begin

Look over the procedures in this section before you begin disassembling the T2110/T2130 series. Familiarize yourself with the disassembly and reassembly steps. Begin each procedure by removing the AC power cord and the battery pack as instructed in section 4.2, *The Battery Pack:*

1. Do not disassemble the T2110/T2130 series unless it is operating abnormally.

2. Use only the correct and approved tools.

3. Make sure the working environment is free from the following elements whether you are using or storing the T2110/T2130 series:

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

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

5. Do not perform any operations that are not necessary and use only the described procedures for disassembling and installing FRUs in the T2110/T2130 series.

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

7. You will remove and replace many screws when you disassemble the T2110/T2130 series. When you remove screws, make sure they are placed in a safe place and identified with the correct parts.

8. When assembling the T2110/T2130 series make sure you use the correct screws to secure the various pieces in place. Screw sizes are listed in the corresponding figures.

9. The T2110/T2130 series contains many sharp edges and corners, so be careful not to injure yourself.

10. After you have replaced an FRU make sure the T2110/T2130 series is functioning properly by performing the appropriate test on the FRU you have fixed or re-placed.

Disassembly Procedures

The T2110/T2130 series has two basic types of cable connectors:

❑ Pressure Plate Connectors
❑ Normal Pin Connectors

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

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

Assembly Procedures

After you have disassembled the T2110/T2130 series and fixed or repaired the problem that was causing the T2110/T2130 series to operate abnormally, you will need to reassemble the T2110/T2130 series.

While assembling the T2110/T2130 series, remember the following general points:

❑ Take your time, making sure you follow the instructions closely. Most problems arise when you hurry to assemble the T2110/T2130 series.

❑ Make sure all cables and connectors are securely fastened.

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

❑ Check that all latches are closed securely in place.

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

After installing an FRU in the T2110/T2130 series confirm that the FRU and the T2110/T2130 series are functioning properly.

Tools and Equipment

The use of ElectroStatic Discharge (ESD) equipment is very important for your safety and the safety of those around you. Proper use of these devices will increase the success rate of your repairs and lower the cost for damaged or destroyed parts. The following equipment is necessary to disassemble and reassemble the T2110/T2130 series:

❑ One M2 Phillips screwdriver to remove and replace screws.

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

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

❑ An ESD wrist strap or heel grounder.

❑ Anti-static carpeting or flooring.

❑ Air ionizers in highly static sensitive areas.

Screw Tightening Torque

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

❑ M2   0.22 N·m (2.2 kgf·cm)

❑ M2.5   0.36 N·m (3.5 kgf·cm)

❑ FDD   0.22 N·m (2.2 kgf·cm)

❑ HDD   0.3 N·m (3.1 kgf·cm) or less

4.2 The Battery Pack

Removing the Battery Pack

To remove the T2110/T2130 series battery pack, follow the steps below and refer to figures 4-1 to figure 4-3.

1. Turn the T2110/T2130 series power off.

2. Remove all cables connected to the computer and open the display panel.
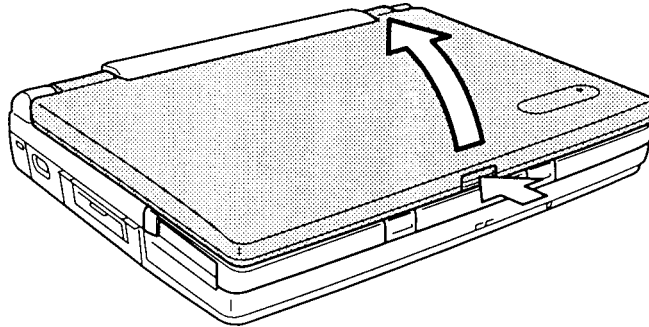
Figure 4-1 Removing all the cables

3. Push up on two latches on the front of the palm rest until you feel them click.

4. Carefully slide the palm rest forward about one centimeter (less than half an inch).
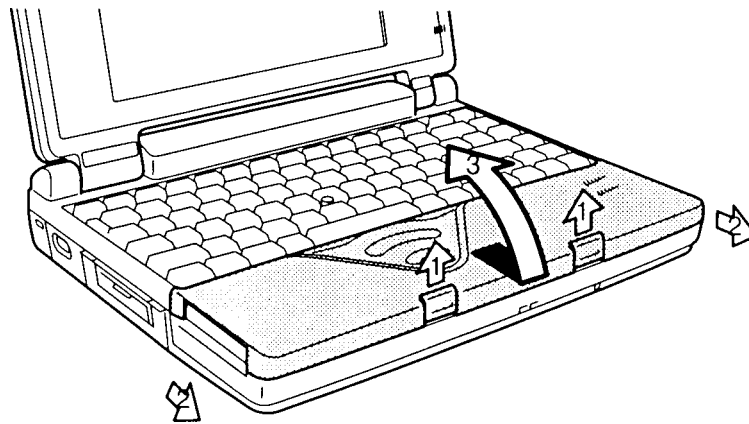
Figure 4-2 Unlatching the palm rest

5. Lift the palm rest up gently to expose the battery pack.

6. Pull up on the plastic tab at the right side of the battery pack to lift the battery pack up slightly. Be careful not to pull too hard or try to lift the battery pack more than about a finger's width.

7. Grasp the battery pack and lift it out.
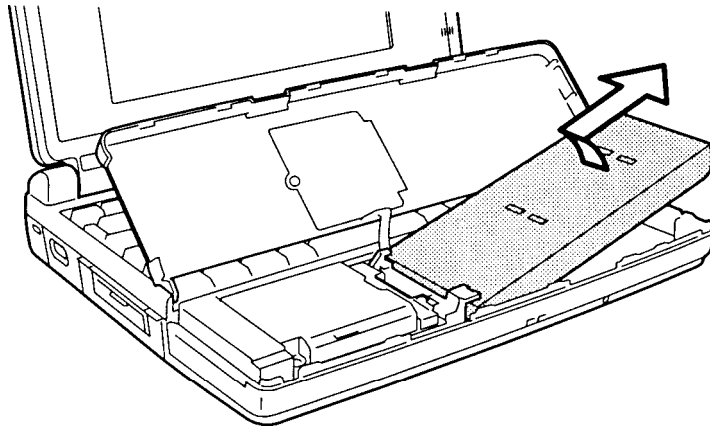
Figure 4-3 Removing the battery pack

Installing the Battery Pack

> *CAUTION: There is danger of explosion if the battery is incorrectly replaced. Use only the same or equivalent battery recommended by Toshiba. Return spent batteries to your dealer for environmentally safe disposal.*

To install a battery pack, follow the steps below and refer to figures 4-1 to 4-3.

1. Turn the computer's power off.

2. Carefully insert the new or recharged battery pack. Set the grooved end against the battery contacts first, then lay the battery in place. Be sure the end of the plastic tab lies on top of the battery (figure 4-1).

> *CAUTION: When you close the palm rest, cables to the AccuPoint buttons are exposed.   Be careful not to apply tension to these cables or to pinch them when you close the palm rest.*

3. Close the palm rest and gently push it into position (figure 4-2).

4. Push the latches back into place. Press gently until you feel them click (figure 4-1).

5. Turn the computer back on and continue working.

4.3 Optional Memory Module

Removing the Optional Memory Module

To remove an optional memory module from the T2110/T2130 series, follow the steps below and refer to figures 4-4 and 4-5.

1. Turn off the power to the T2110/T2130 series. Disconnect the AC power cord and all external cables connected to the T2110/T2130 series.

2. Remove the battery pack as described in section 4.2, *Battery Pack*.

3. Close the palm rest and turn the computer upside down.

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

5. Slide your fingernail or a thin object under the notch on the cover and rotate the cover up to remove it. Two latches hold the cover in place on the side away from the screws.
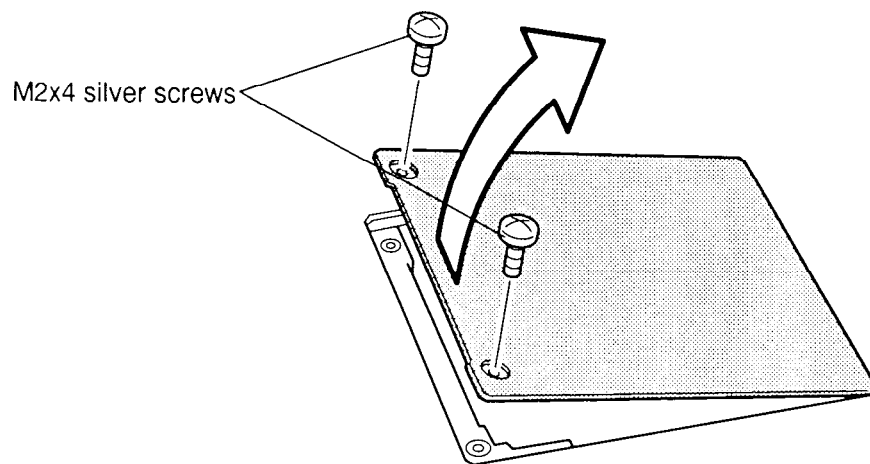
Figure 4-4 Removing the memory module socket cover

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 connectors will spring up.

7. Gently work the module out of the connector and remove it from the unit.

Latches
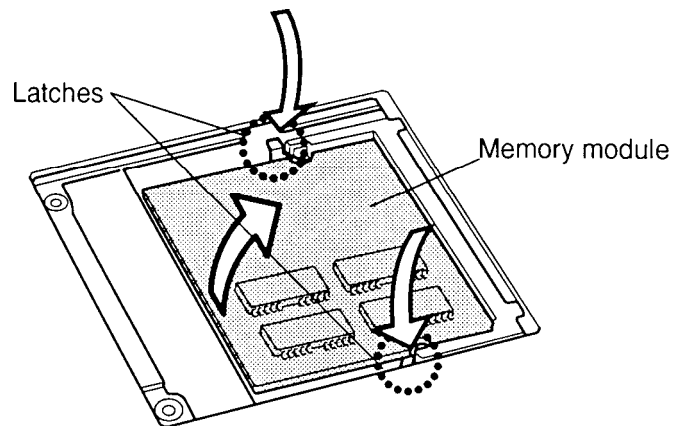
Memory module

Figure 4-5 Removing the memory module

CAUTION: DO NOT touch the connecting edge of the memory module. Debris or oil in or on the connector may cause memory access problems.

Installing the Optional Memory Module

To install an optional memory module in the T2110/T2130 series, follow the steps below and refer to figure 4-6.

1. Insert the **memory module**, connectors first, into the computer's connectors. Note the notch at the corner of the module. This notch should be on the right as you insert the module (figure 4-6).
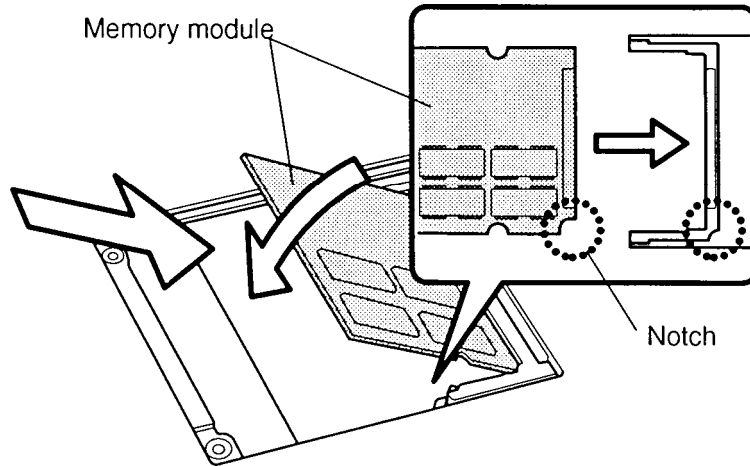
Figure 4-6 Inserting the memory module

2. The module is held up by springs in the computer's socket. Gently push the module into place until two latches close over each side.

3. Fit the socket cover's latches into place and seat the cover (figure 4-5).

4. Secure **two M2x4 silver screws** (figure 4-4).

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

6. The T2110/T2130 series automatically configures all additional memory as extended memory.

4.4   Optional PCMCIA Card

Removing an Optional PCMCIA Card

To remove an optional PCMCIA card from the T2110/T2130 series, follow the steps below
and refer to figure 4-7 and 4-8.

1. Turn the computer's power off. Disconnect the AC power code and all external
    cables connected to the T2110/T2130 series.

2. Remove the battery pack and optional memory module as described in sections 4.2
    and 4.3.

3. Pull open the **slot cover** (figure 4-7).
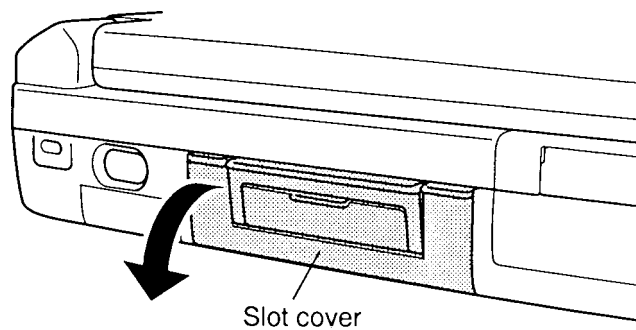
Figure 4-7 Opening the PCMCIA slot Cover

4. Press the **eject button** to pop the card out slightly and remove it (figure 4-8).
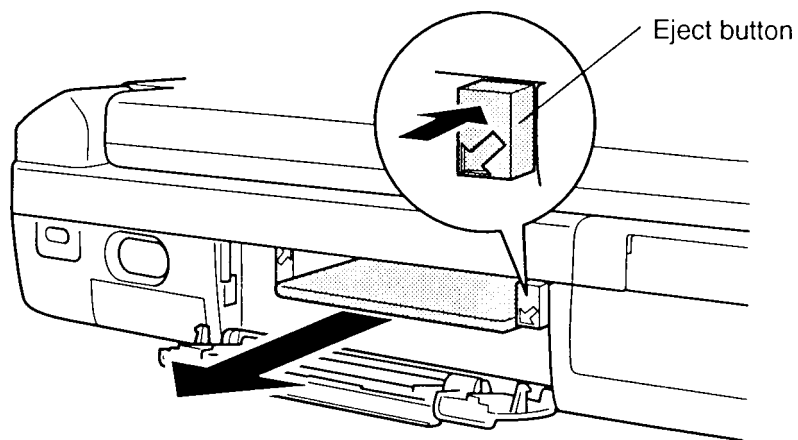
Figure 4-8 Removing the PCMCIA card

Installing an Optional PCMCIA Card

To install an optional PCMCIA card in the T2110/T2130 series, follow the steps below and refer to figure 4-9.

1. To install a **PCMCIA card**, carefully insert it making sure the card is right side up and the contact surface is inserted first (figure 4-9).

2. When the card is almost fully seated, you will feel some resistance. Press gently to assure a firm connection, but do not force the card into position.

3. Close the slot cover.
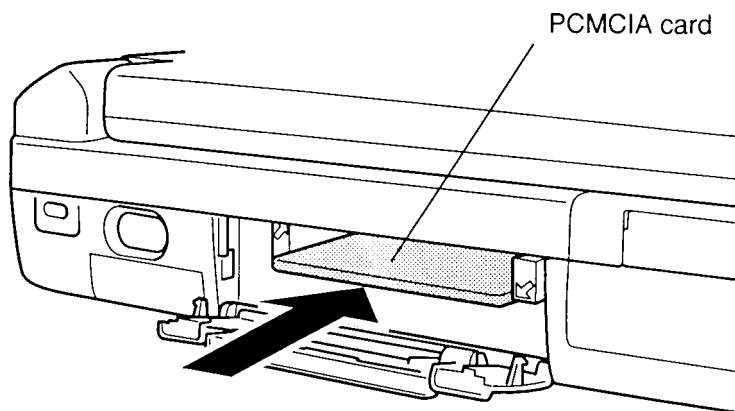
Figure 4-9 Installing the optional PCMCIA card

4. Install the battery pack and optional memory module as described in sections 4.3 and 4.2.
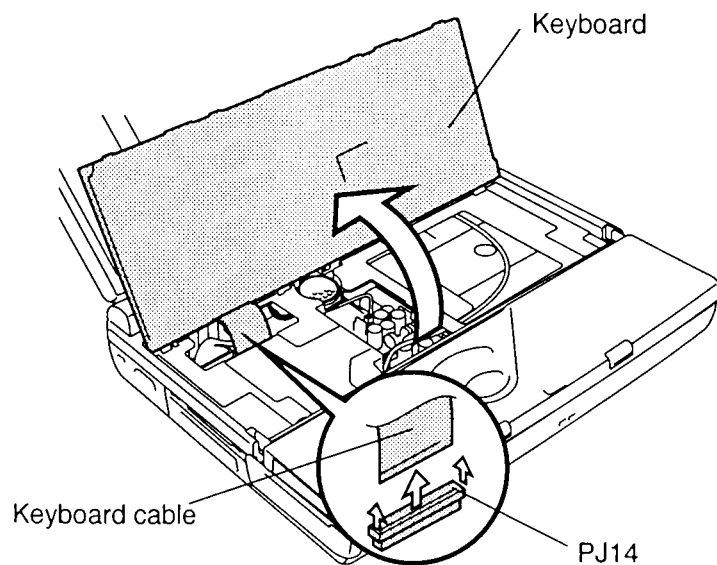
4.5   Keyboard

Removing the Keyboard

To remove the T2110/T2130 series keyboard, follow the steps below and refer to figures 4-10 and 4-11.

1.   Turn the computer's power off. Disconnect the AC power cord and all external cables connected to the T2110/T2130 series.

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

3.   Release **five latches** on the **keyboard brace** and slide it out. Be careful not to damage the AccuPoint cables.
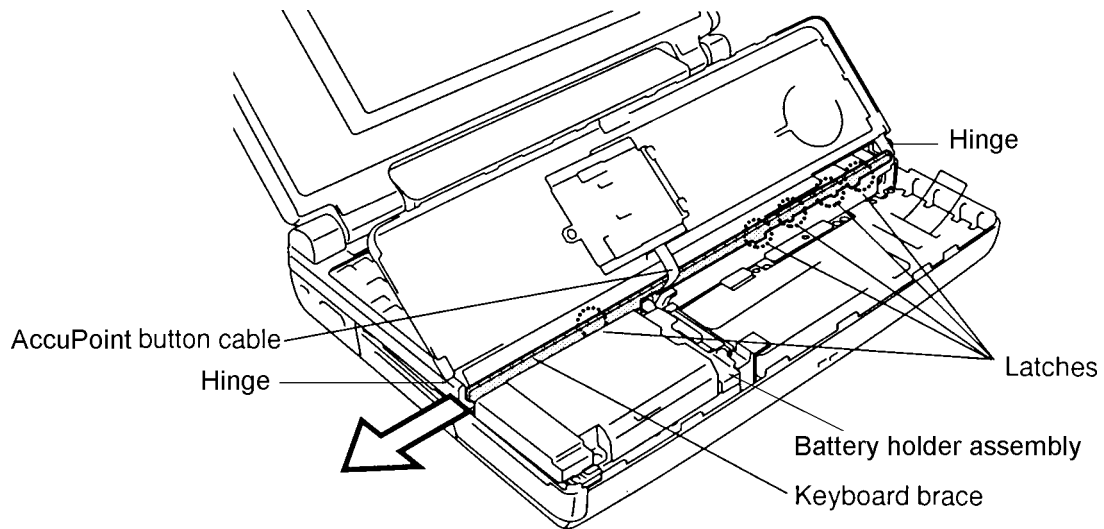
Figure 4-10 Removing the keyboard base

4. Carefully lift up the **keyboard** to expose the **keyboard connector** (figure 4-11).

5. Disconnect the **keyboard cable** from the **pressure-plate connector (PJ14)** on the system board (figure 4-11).

Figure 4-11 Removing the keyboard

Installing the Keyboard

To install the T2110/T2130 series keyboard, follow the steps below and refer to figures 4-10 and 4-11.

1. Connect the **keyboard cable** to the **pressure plate connector (PJ14)** on the system board (figure 4-11).

2. Replace the **keyboard**. Fit notches on the back of the keyboard into corresponding holes on the computer and lay the keyboard in place (figure 4-11).

3. Insert the **keyboard base** between the **AccuPoint cable** and the underside of the keyboard (figure 4-10).

4. Secure **five latches** on the keyboard base (figure 4-10).

5. Install the optional PCMCIA card, optional memory module, and battery pack as described in sections 4.2 through 4.4.

4.6 Hard Disk Drive

Removing the Hard Disk Drive

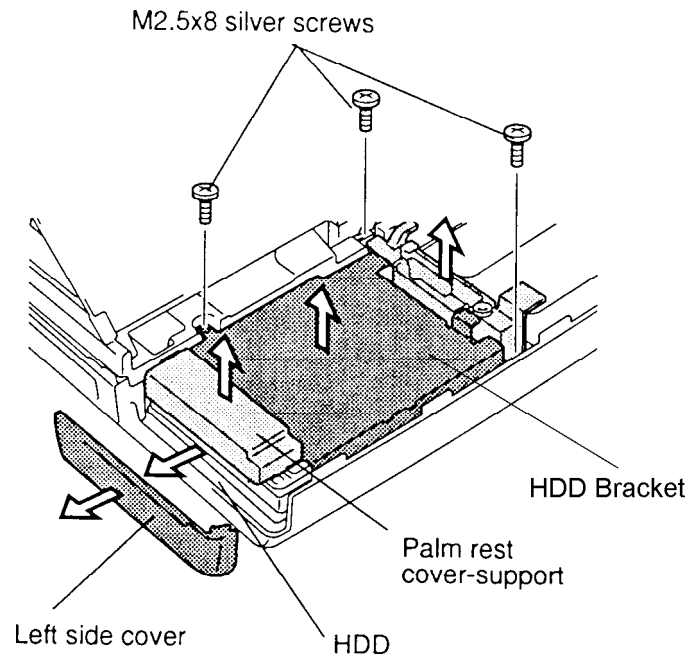To remove the T2110/T2130 series hard disk drive, follow the steps below and refer to figures 4-12 and 4-13.

1. Turn the computer's power off. Disconnect the power cable and all external cables connected to the T2110/T2130 series.

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

3. Turn the computer over and remove **four pan-head M3x6 screws** on the bottom (figure 4-12).
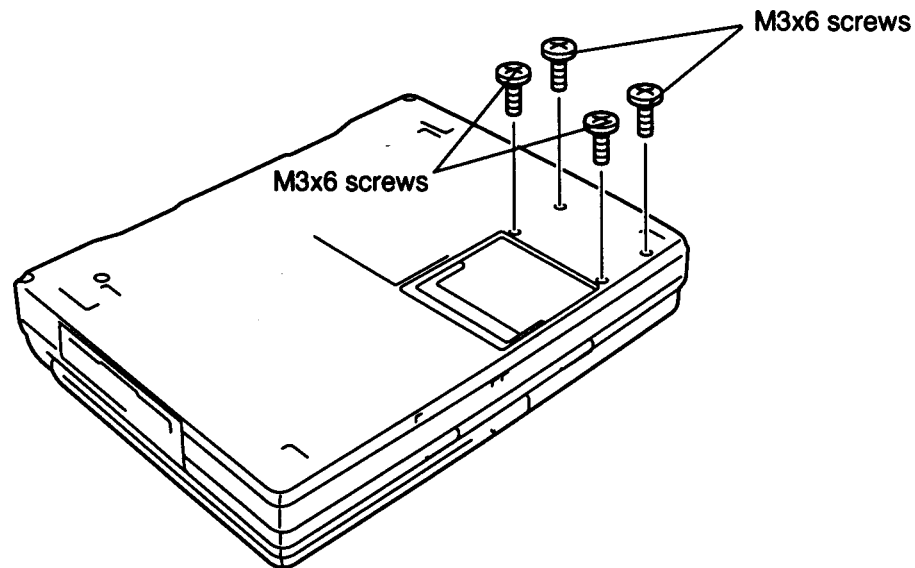
Figure 4-12 Removing four screws

4. Turn the computer back over and open the display.

5. Disconnect the **AccuPoint cable** from **PJ13** on the system board. Press in on the hinge at either side to remove the palm rest, then lift out the battery holder assembly (figure 4-10).

6. Remove **three M2.5x8 silver screws** from the **HDD** and lift off the left side cover.

7. Put your finger between the **HDD bracket** and the **HDD cover** and push the **HDD** out to remove it (figure 4-13).

8. Remove the **HDD cover**, **HDD bracket,** and **palm rest cover-support** (sound connector cover) (figure 4-13).

Figure 4-13 Removing the HDD with bracket

Installing the Hard Disk Drive

To install the T2110/T2130 series hard disk drive, follow the steps below and refer to figures 4-12 and 4-13.

1. Replace the **HDD cover**, **HDD bracket, palm rest cover-support** (sound connector cover), and **battery holder assembly** (figures 4-10 and 4-13).

2. Insert the **HDD**. Make sure it is firmly seated (figure 4-13).

3. Secure the **HDD bracket** with **three M2.5x8 silver screws** (figure 4-13).

4. Secure the **left side cover** (figure 4-13).

5. Turn the computer over and secure the bottom cover with **four pan-head M3x6 screws** (figure 4-12).

6. Install the keyboard, optional PCMCIA card, optional memory module, and battery pack as described in sections 4.5 back through 4.2.

4.7 Top Cover and Display Assembly

Removing the Top Cover and Display Assembly

To remove the T2110/T2130 series top cover, follow the steps below and refer to figures 4-14 to 4-16.

1. Turn the computer's power off. Disconnect the power cable and all external cables connected to the T2110/T2130 series.

2. Remove the battery pack, optional memory module, optional PCMCIA card, keyboard, and hard disk drive as described in sections 4.2 through 4.6.

3. Turn the computer over and remove **three M2.5x8 silver screws** securing the cover of the T2110/T2130 series (figure 4-14).
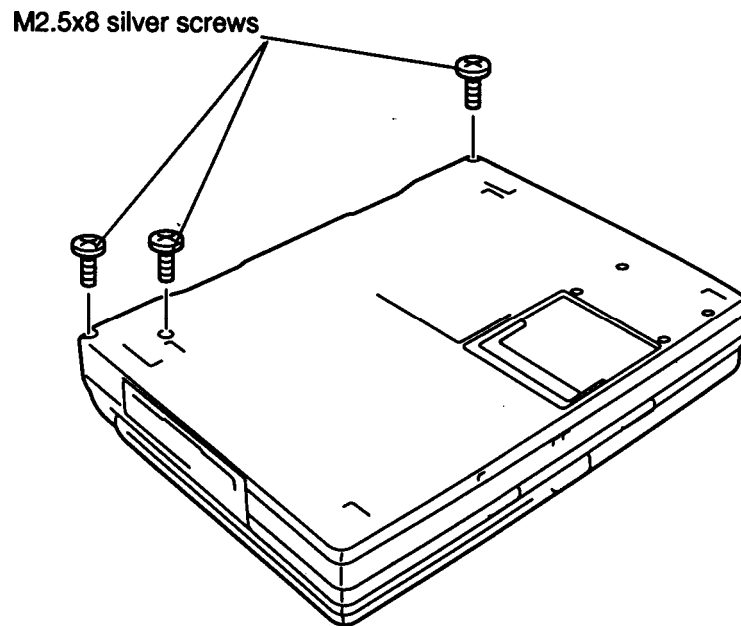
Figure 4-14 Removing three screws

4.   Turn the computer so the front faces you and open the display. Place a book or other support behind the computer to support the display.

5.   Disconnect the **AccuPoint cable** from **PJ13** on the system board and remove the palm rest (figure 4-10).

6.   Lift the **battery mylar insulator,** remove **four flat-head screws** on the **battery pack frame** and lift it out of the unit (figure 4-15).

7.   Remove **two M2.5x8 silver screws** on the top cover (figure 4-15).
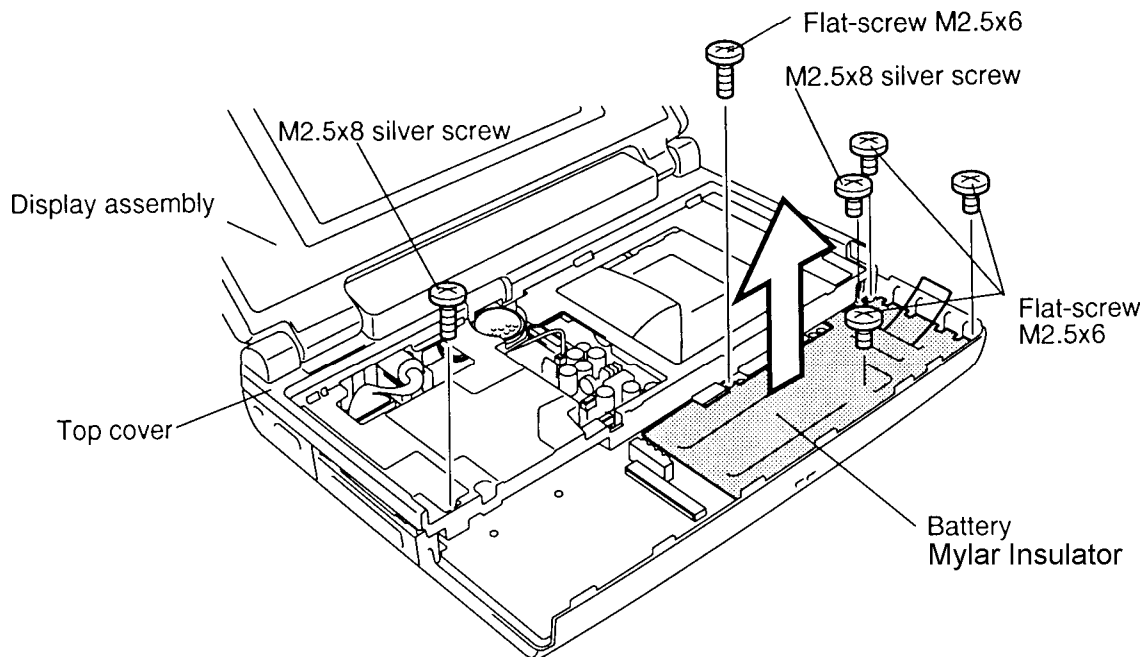
Figure 4-15 Removing six screws

8. Unsnap six **latches** securing the **top cover** to the base assembly (figure 4-16).

9. Disconnect the **display sensor switch cable** from **PJ11** on the system board (figure 4-16).

10. Disconnect the **display cable** from **PJ14** on the system board (figure 4-16).

11. On the T2130CS, disconnect the **microphone cable** from **PJ12** on the system board.

12. Lift off the **top cover** with **display assembly** (figure 4-16).
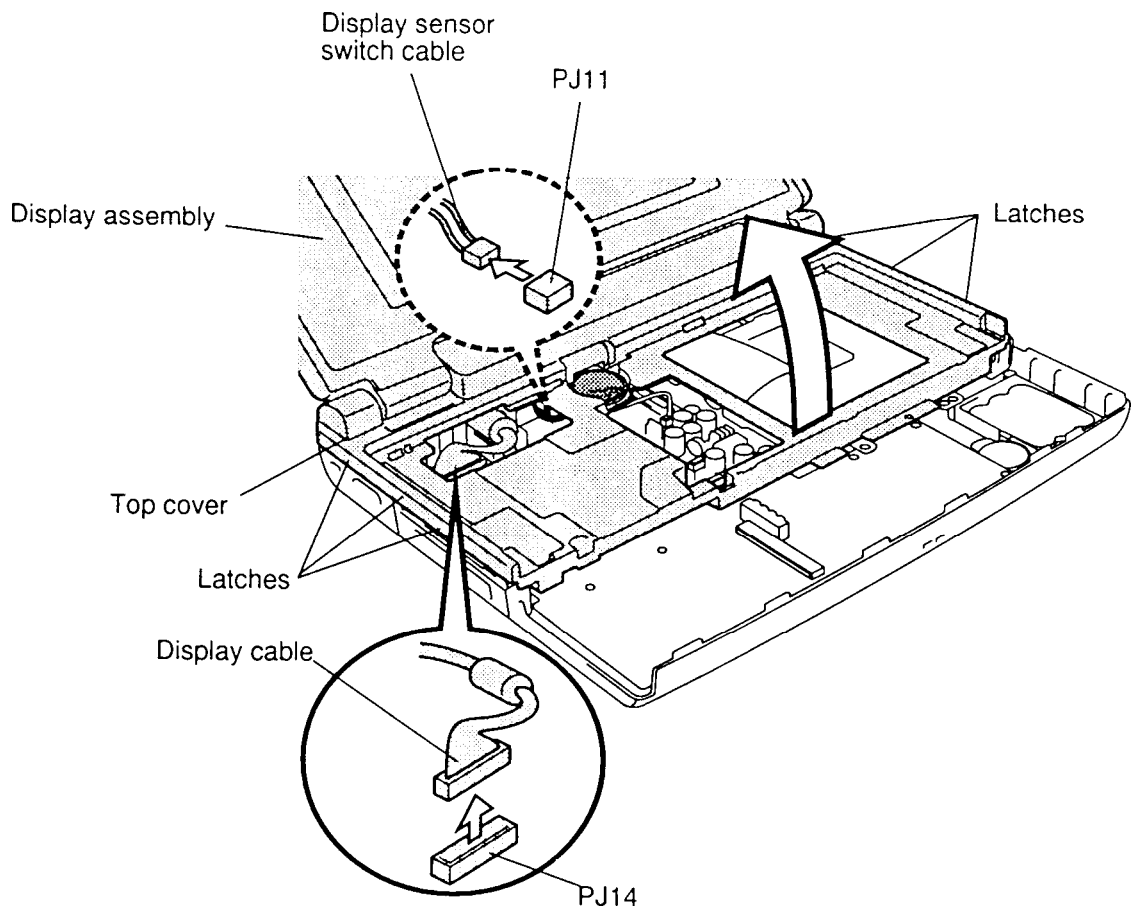
Figure 4-16 Removing the top cover and display assembly

Installing the Top Cover and Display assembly

To install the T2110/T2130 series top cover follow the steps below and refer to figures 4-14 to 4-16.

1.   Seat the **top cover** with **display assembly** (figure 4-16).

2.   Connect the **display cable** to **PJ14** on the system board (figure 4-16).

3.   Connect the **display sensor switch cable** to **PJ11** on the system board (figure 4-16).

4.   Begin at the back and snap the **top cover** into place (figure 4-16).

5.   Secure **two M2.5x8 silver screws** on the top cover (figure 4-15).

6.   Seat the **battery pack cover** and secure **four flat-head M2.5x6 screws**. Be sure to insert the plastic tab through the opening in the battery mylar insulator. (Figure 4-15.)

7.   Connect the **AccuPoint cable** to **PJ13** on the system board and secure the palm rest (figure 4-10).

8.   Connect the **microphone cable** to **PJ12** on the system board (T2130CS only).

9.   Close the display and turn the computer over so the back faces you.

10. Secure **three M2.5x8 silver screws** on the bottom of the computer (figure 4-14).

11. Install the hard disk drive, keyboard, optional PCMCIA card, optional memory module, and battery pack as described in sections 4.6 back through 4.2.

4.8 Floppy Disk Drive

Removing the Floppy Disk Drive

To remove the T2110/T2130 series floppy disk drive, follow the steps below and refer to figures 4-17 and 4-18.

1. Turn the computer's power off. Disconnect the AC power cord and all external cables connected to the T2110/T2130 series.

2. Remove the battery pack, optional memory module, optional PCMCIA card, keyboard, hard disk drive, top cover and display assembly as described in sections 4.2 through 4.7.

3. Disconnect the **FDD cable** from **PJ4** on the system board and remove **three M2.5x6 screws** on the **FDD bracket** (figure 4-17).

4. Remove the **FDD front cover** and lift the FDD out of the system unit (figure 4-17).
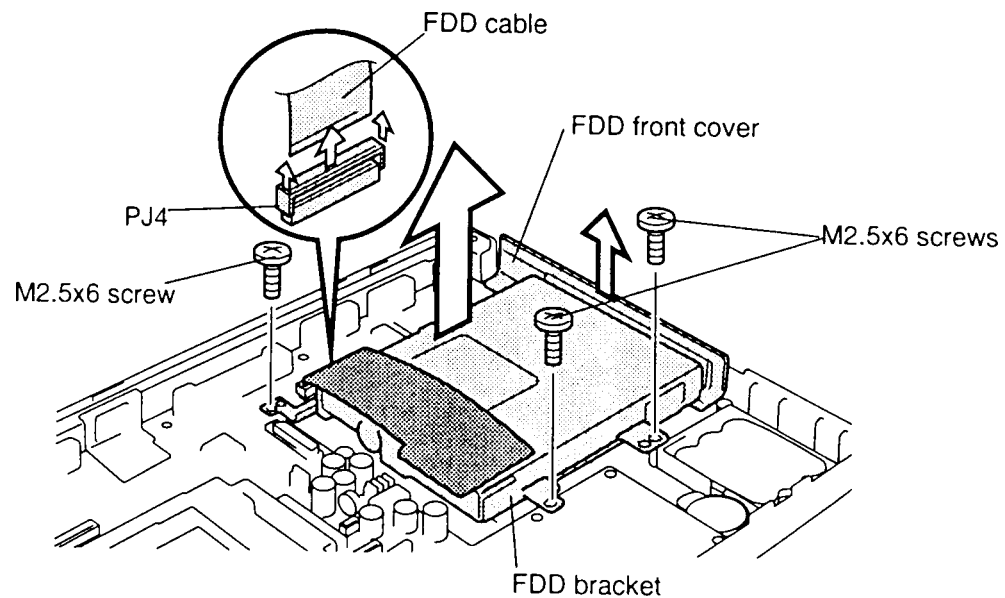
Figure 4-17 Removing the FDD with bracket

5. Remove **four M2x3 silver screws** securing the bracket to the FDD and slip off the bracket (figure 4-18).
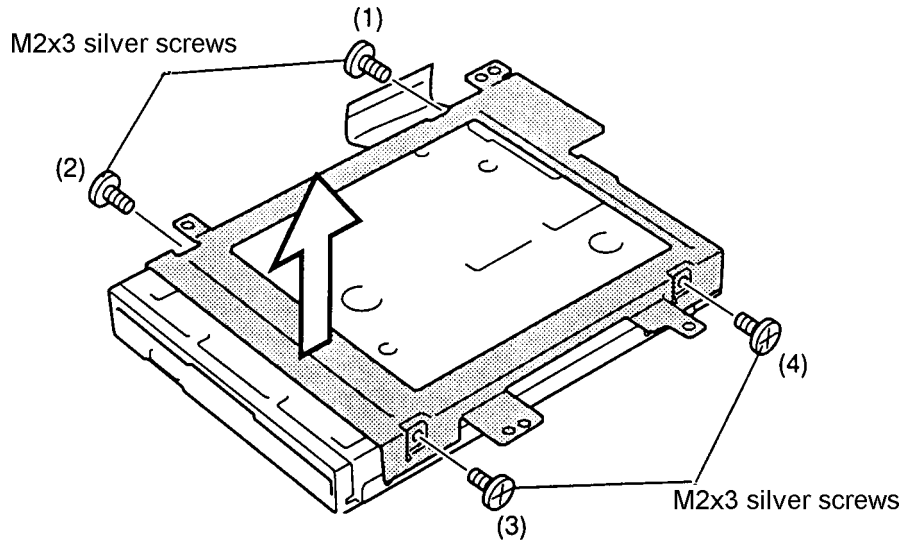
Figure 4-18 Removing the HDD

Installing the Floppy Disk Drive

To install the T2110/T2130 series floppy disk drive, follow the steps below and refer to figures 4-17 and 4-18.

1. Secure the bracket with **four M2x3 silver screws** in the numbered order: 1 to 4 (figure 4-18). Tighten screws 1 to 4 to a torque of less than 2.2 kgfcm.

2. Replace the front cover (figure 4-17).

3. Place the FDD assembly into the computer, and connect the **FDD cable** to **PJ4** on the system board. Secure the **FDD bracket** to the computer with **three M2.5x6 screws** (figure 4-17).

4. Install the top cover and display assembly, hard disk drive, keyboard, optional PCMCIA card, optional memory module, and battery pack as described in sections 4.7 back through 4.2.

4.9   AC PS Unit

Removing the AC PS Unit

To remove the T2110/T2130 series AC PS unit, follow the steps below and refer to figure 4-19.

1.   Turn the computer's power off. Disconnect the AC power cord and all external cables connected to the T2110/T2130 series.

2.   Remove the battery pack, optional memory module, optional PCMCIA card, keyboard, hard disk drive, top cover, and display assembly as described in sections 4.2 through 4.7.

3.   Disconnect **one M2.5x10 screw** on the **AC PS unit** (figure 4-19).

4.   Disconnect **three M2.5x8 silver screws** on the **LED cover** (figure 4-19).

5.   Disconnect the **power supply cable** from **PJ501** and remove the **AC PS unit** with **AC power socket** from the system unit (figure 4-19).

6.   Press in the **power switch** to free the **power switch frame** and remove the **LED cover/power switch frame** from the system unit.
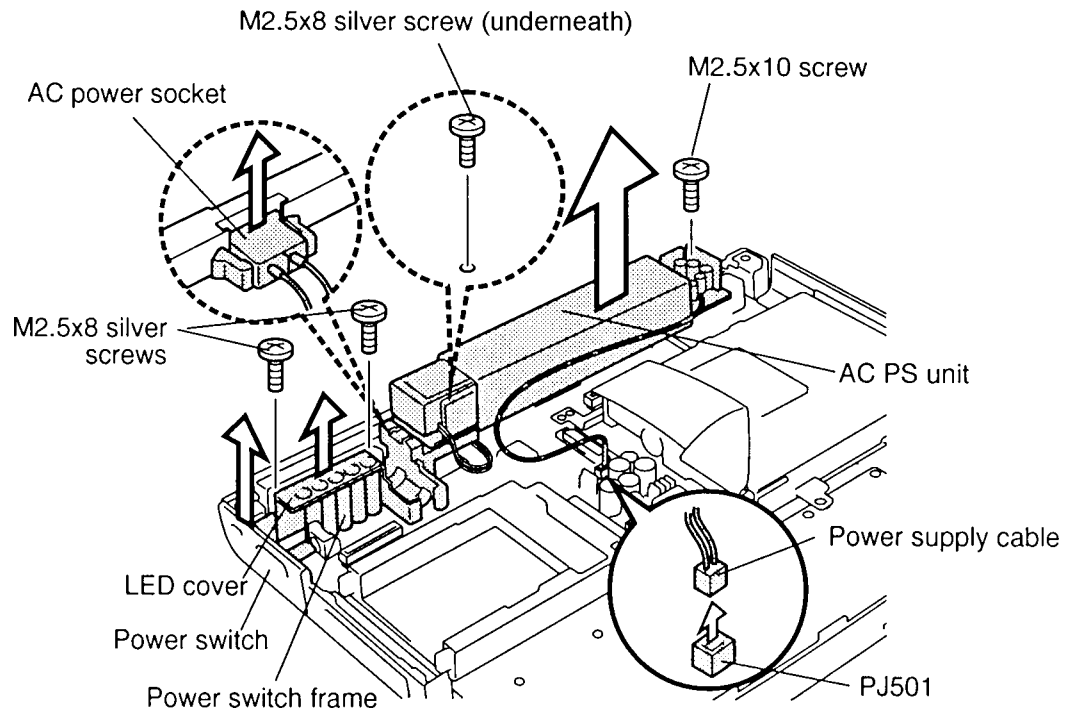
Figure 4-19 Removing the AC PS unit

Installing the AC PS unit

To install the T2110/T2130 series AC PS unit, follow the steps below and refer to figure 4-19.

1. Seat the **LCD cover/power switch frame** on the system unit (figure 4-19).

2. Seat the **AC PS unit** with **AC power socket** on the system unit and connect the **power supply cable** to **PJ501** on the system board (figure 4-19).

3. Secure **three M2.5x8 silver screws** on the **LED cover/power switch frame** (figure 4-19).

4. Secure **one M2.5x10 screw** on the AC PS unit (figure 4-19).

5. Install the battery pack, optional PCMCIA card, optional memory module, keyboard, hard disk drive, top cover, and display assembly as described in sections 4.7, back through 4.2.

4.10 System Board and Backup/RTC Battery

Removing the System Board and Backup/RTC Battery

To remove the T2110/T2130 series system board and backup/RTC battery, follow the steps below and refer to figure 4-20.

1. Turn the computer's power off. Disconnect the AC power cord and all external cables connected to the T2110/T2130 series.

2. Remove the battery pack, optional memory module, optional PCMCIA card, keyboard, hard disk drive, top cover and display assembly, floppy disk drive, and AC PS unit as described in sections 4.2 through 4.9.

3. Remove **two M2.5x6 screws** on the system board (figure 4-20).

4. Push in the I/O port and system board to clear the frame, then lift up the system board with its cover (figure 4-20).

5. Disconnect the **RTC battery cable** from **PJ2** and lift out the **RTC battery** (figure 4-20).

6. Disconnect the **backup battery cable** from **PJ503** and lift out the **backup battery** (figure 4-20).
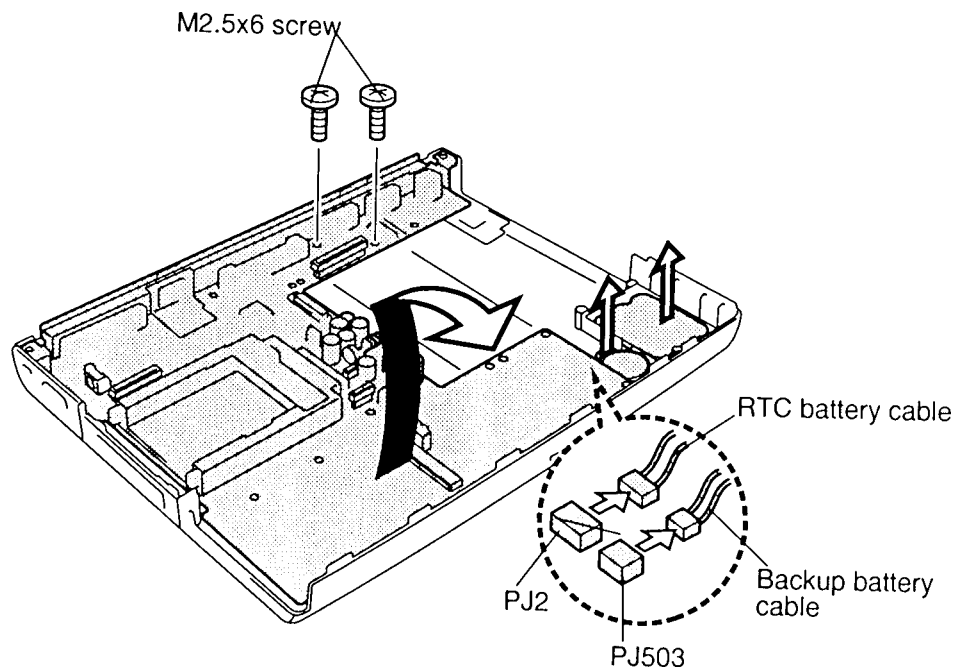
Figure 4-20 Removing the system board

Installing the System Board and Backup/RTC Battery

> *WARNING:* *If you replace the backup battery and RTC battery, be sure to use only the same model battery or an equivalent battery recommended by Toshiba. Installation of the wrong battery can cause the battery to explode.*

To install the T2110/T2130 series system board and backup/RTC battery, follow the steps below and refer to figure 4-20.

1. Place the system board on the bottom cover.

2. Connect the **backup battery cable** to **PJ503** on the system board (figure 4-20).

3. Connect the **RTC battery cable** to **PJ2** on the system board (figure 4-20).

4. Secure **two M2.5x6 screws** on the system board (figure 4-20).

5. Install the AC PS unit, floppy disk drive, top cover and display assembly, keyboard, optional PCMCIA card, optional memory module, and battery pack as described in sections 4.9 back through 4.2.

4.11 Display Mask

Removing the Display Mask

To remove the T2110/T2130 series display mask, follow the steps below and refer to figure 4-21.

1. Turn the computer's power off. Disconnect the AC power cord and all external cables connected to the T2110/T2130 series.

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

NOTE: It is not necessary to remove the display assembly.

---

3. Remove **two rubber seals** from the display hinges to expose **two screws** securing the **display mask** (figure 4-21).

4. Remove the **two M2.5x6 screws** that were covered by the rubber seals (figure 4-21).

5. Carefully insert your fingers between the mask and the LCD panel and pry open the latches. Start with the **six latches** across the top of the display mask (figure 4-21). Be aware that the LCD latch on the front cover may slip out.

6. Continue unlatching the mask along the **sides** (**four latches** on each side), at the bottom (**three latches)** and display supports (figure 4-21).   One latch at the smaller display support and three latches at the larger display support are not indicated in the illustration.
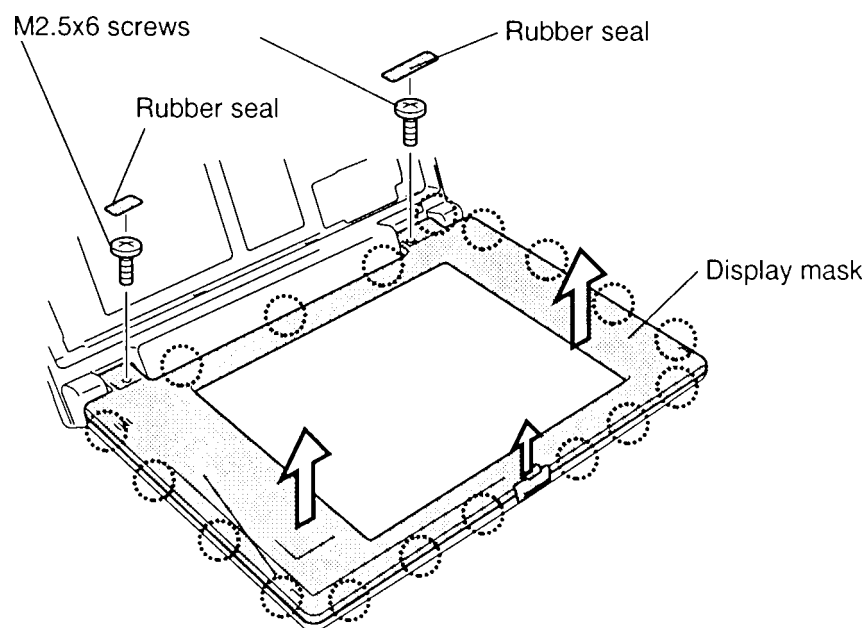
Figure 4-21 Removing the display mask

Installing the Display Mask

To install the T2110/T2130 series display mask, follow the steps below and refer to figure 4-21.

1. Set the **display mask** in place and secure the latches beginning with the display supports (figure 4-21).

2. Continue along the bottom of the display (**three latches**), along the sides (**four latches**) and across the top (**six latches**) (figure 4-21).

3. Secure the display mask with **two M2.5x6 screws** at the display hinges (figure 4-21). If necessary, replace the LCD latch for the front cover.

4. Attach the **two rubber seals** at each display hinge to cover the screws (figure 4-21).

5. Install the optional PCMCIA card, optional memory card, and battery pack as described in sections 4.4, 4.3, and 4.2.

4.12 T2110CS/T2130CS Fluorescent Lamp (FL) Inverter Board

Removing the T2110CS/T2130CS FL Inverter Board

To remove the T2110CS/T2130CS's FL inverter board, follow the steps below and refer to figure 4-22.

1. Turn the computer's power off. Disconnect the AC power cable and all external cables connected to the T2110CS/T2130CS.

2. Remove the battery pack, optional memory card, optional PCMCIA card, and display mask as described in 4.2, 4.3, 4.4, and 4.11.

3. Remove the **two M2.5x6 screws** securing the **FL inverter board** (figure 4-22).

4. Carefully rotate the **FL inverter board** from left to right and disconnect the **FL cables** and **FL inverter cable** from **CN1** and **CN2** on the FL inverter board (figure 4-22).

5. Remove the **FL inverter board** from the system base.

6. Remove **one M2.5x6 screw** securing the **volume board** (figure 4-22).

7. Disconnect the **volume cable** from the connector on the **volume board** (Figure 4-22).

8. Remove the volume board from the system base.
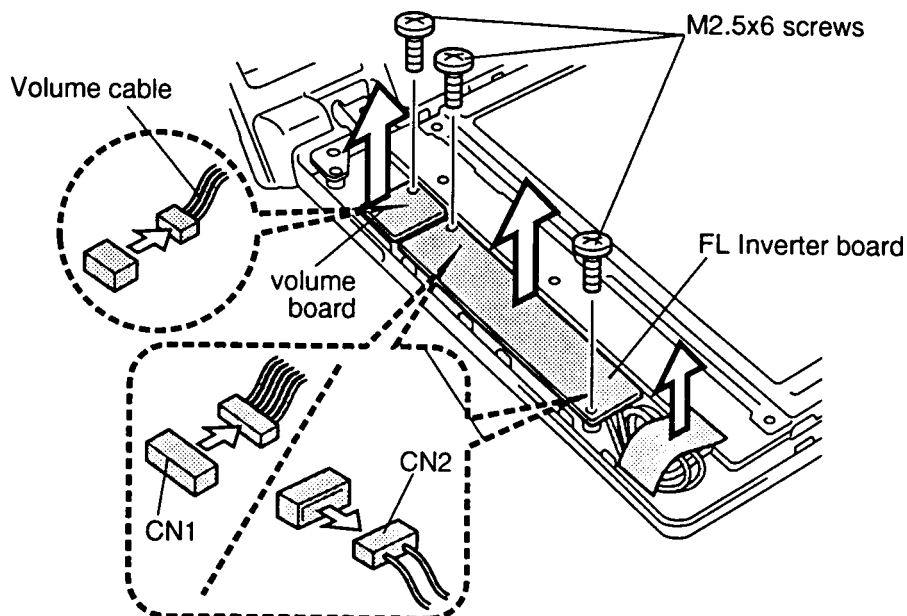
Figure 4-22 Removing the FL inverter and volume board

Installing the FL Inverter Board

To install the T2110CS/T2130CS's FL inverter board, follow the steps below and refer to figure 4-22.

1. Connect the **volume cable** to the volume board (figure 4-22).

2. Secure the **volume board** with **one M2.5x6 screw** (figure 4-22).

3. Connect the **FL inverter cable** and **FL cable** to **CN1** and **CN2** on the FL inverter board (figure 4-22).

4. Rotate the **FL inverter board** into the system base and route the **cables** so they will not be pinched by the display cover or other component.

5. Secure the **FL inverter board** with **two M2.5x6 screws** (figure 4-22).

6. Install the display mask, optional PCMCIA card, optional memory card, and battery pack as described in 4.11, 4.4, 4.3, and 4.2.

4.13 T2110CS/T2130CS Liquid Crystal Display (LCD) Module

Removing the T2110CS/T2130CS Color LCD Module

To remove the T2110CS/T2130CS's color LCD module, follow the steps below and refer to figure 4-23.

1. Turn off the power to the T2110CS/T2130CS. Disconnect the AC power cord and all external cables connected to the T2110CS/T2130CS.

2. Remove the battery pack, optional memory module, optional PCMCIA card, display mask, and FL inverter board as described in sections 4.2,4.3, 4.4, 4.11, and 4.12.

3. Remove **four M2.5x6 screws** (two of them with **ground cables**), securing the **LCD module** to the LCD cover (figure 4-23).

4. Carefully rotate the **LCD module** from left to right out of the display cover and disconnect the **display cable** from the LCD module (figure 4-23).
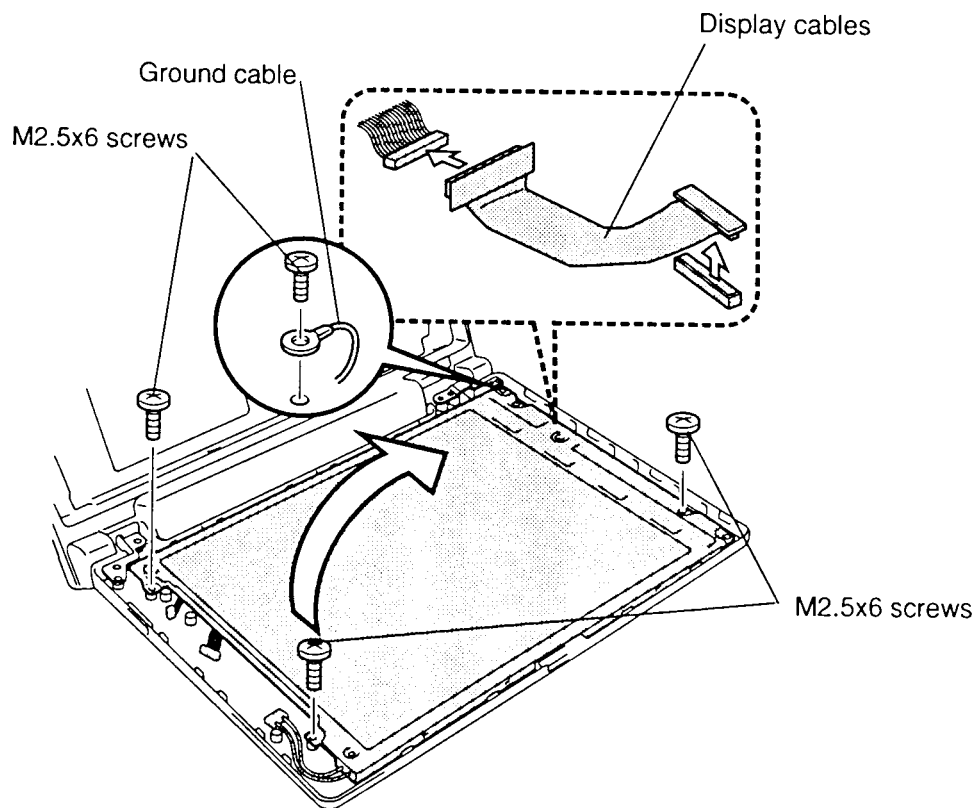
Figure 4-23 Removing the LCD module

CAUTION: Metal edges on the LCD module are sharp, so be careful not to cut yourself.

Installing the T2110CS/T2130CS LCD Module

To install the T2110CS/T2130CS's LCD module, follow the steps below and refer to figure 4-25.

1. Connect the **display cable** to the **LCD module**, and carefully rotate the LCD module into the LCD cover (figure 4-23).

2. Secure **four M2.5x6 screws** with **ground cable** on the **LCD module** (figure 4-23).

3. Install the FL inverter board, display mask, optional PCMCIA card, optional memory module, and battery pack as described in sections 4.12, 4.11, 4.4, 4.3, and 4.2.

4.14 T2110CS/T2130CS FL

*CAUTION: When you remove the **FL**, be careful not to let any dust or other foreign matter enter the display panel components.*

Removing the T2110CS/T2130CS FL

To remove the T2110CS/T2130CS's FL, follow the steps below. Refer to figures 4-24 through 4-27.

1. Turn off the power to the T2110CS/T2130CS. Disconnect the AC power cable and all external cables connected to the T2110CS/T2130CS.

2. Remove the battery pack, optional memory module, optional PCMCIA card, display mask, FL inverter board, and LCD module as described in sections 4.2, 4.3, 4.4, 4.11, 4.12, and 4.15.

3. Carefully unbend **11 latches** securing the **LCD module** to its frame (figure 4-24).

4. Turn the **LCD module** over and remove **four screws** (figure 4-24). (Note that the two screws on the FL inverter cable side are smaller.)
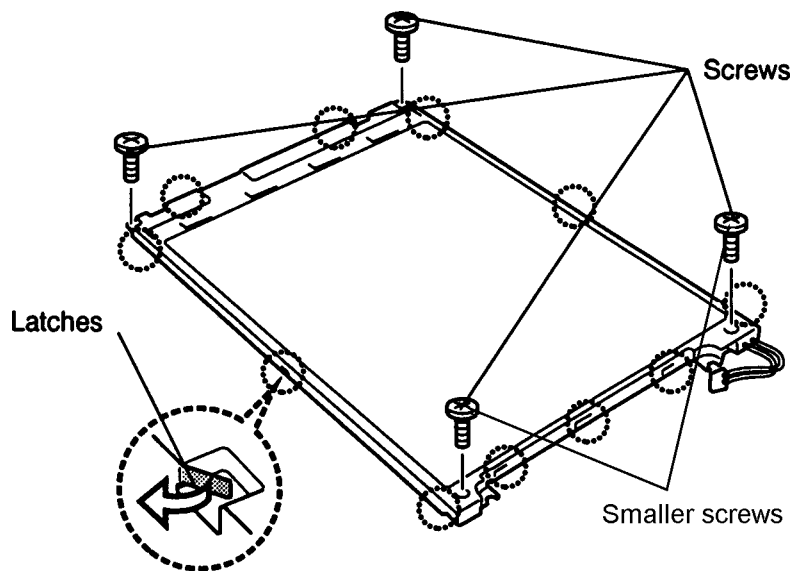
Figure 4-24 Unbending the color LCD module latches

5. Lift the LCD module out of the frame.

6. Gently grip the **FL cable connector** with a pair of needle nose pliers and disconnect the **FL cable**. Be very careful not to damage the connector and cable (figure 4-25).

7. Remove **four M2x4 screws** securing the **SEG board.** Remove the strip of protective black tape and rotate the board out so that it lies flat. Be sure no dust or debris contaminates the unit (figure 4-25).
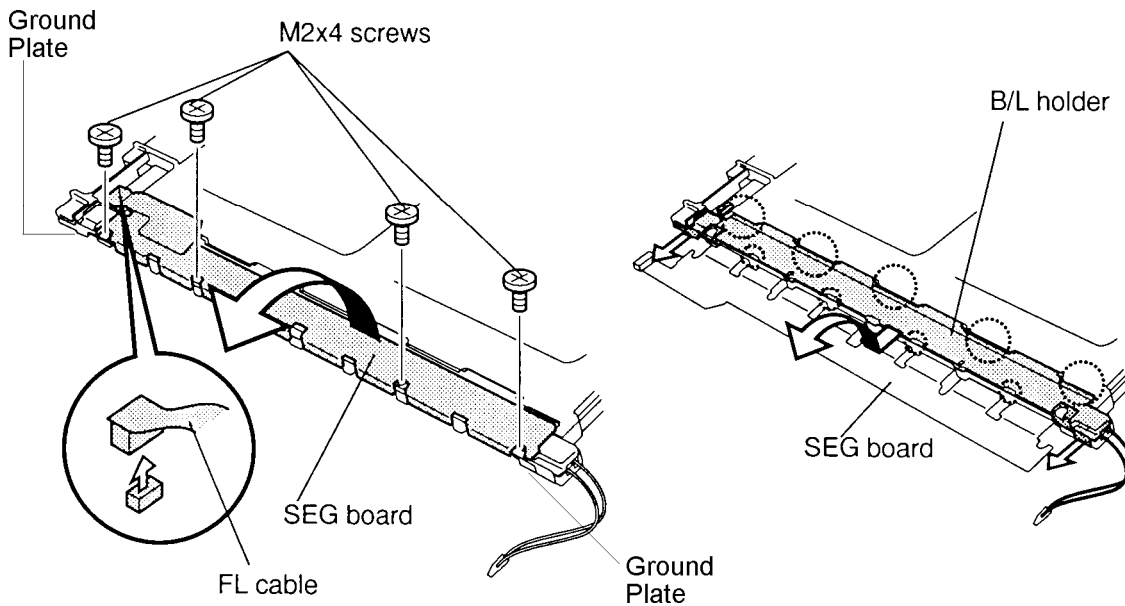
Figure 4-25 Removing screws

8. Remove the **ground plates** at each end of the **SEG board** (figure 4-25).

9. Slip your finger under the **P chassis** and release the latch securing it to the **B/L holder**. Gently hold down the LCD module and lift one side of the **B/L holder** as shown in figure 4-29. As you lift the B/L holder the P chassis securing the holder will rotate out.

10. When the **B/L holder** is free, lift it out. Be careful not to apply pressure to the **P chassis** (figure 4-26).
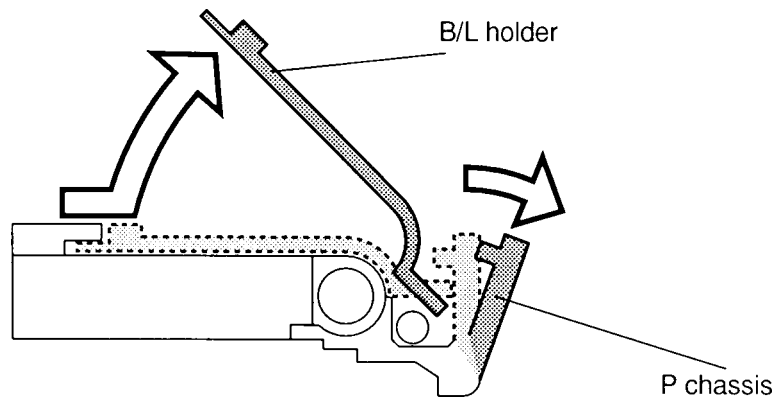
Figure 4-26 Disconnecting the B/L holder

11. Lift the end of the reflector sheet covering the FL and lift out the FL. Be careful not to pull or apply tension to the reflector sheet.
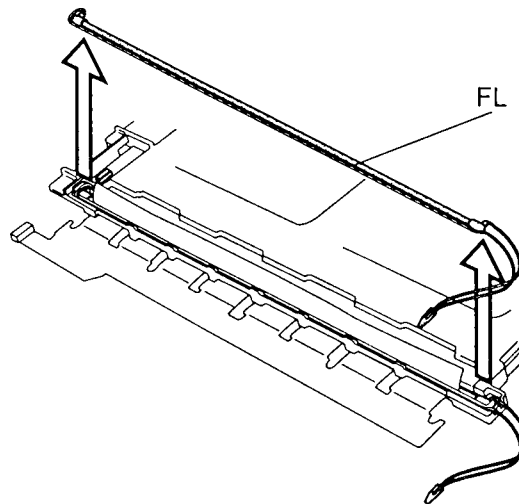
Figure 4-27 Lifting the end of the reflector sheet

Installing the T2110CS/T2130CS FL

To install the T2110CS/T2130CS's FL unit, follow the steps below and refer to figures 4-24 to 4-27.

1. Seat the **FL**, gently press it securely in place and cover it with the end of the reflector sheet. Be careful not to pull or apply tension to the reflector sheet.

2. Gently pull back the **P chassis** and place the **B/L holder** between the reflector sheet and the P chassis.

3. Rotate the **B/L holder** and **P chassis** into place and gently press the P chassis to secure the latch.

4. Replace the two **ground plates**.

5. Rotate the **SEG board** back into place.

6. Replace the protective black tape.

7. Secure the **SEG board** with **four screws**.

8. Set the **LCD module** in its frame and secure it with **four screws**. (Be sure to place the two smaller screws on the FL inverter cable side.)

9. Turn the module over and secure the **11 latches** of the frame.

4.15 T2130CT FL Inverter Board

Removing the T2130CT FL Inverter Board

To remove the T2130CT's FL inverter board, follow the steps below and refer to figure 4-28.

1. Turn off power to the T2130CT. Disconnect the AC power cable and all external cables connected to the T2130CT.

2. Remove the battery pack, optional memory module, optional PCMCIA card, and display mask as described in sections 4.2, 4.3, 4.4, and 4.11.

3. Remove **two M2.5x6 screws** securing the **FL inverter board**.

4. Rotate the FL inverter board out of its seating and disconnect the **FL inverter cable** from **CN1** and **the FL cable** from **CN2** on the **FL inverter board** (figure 4-28).
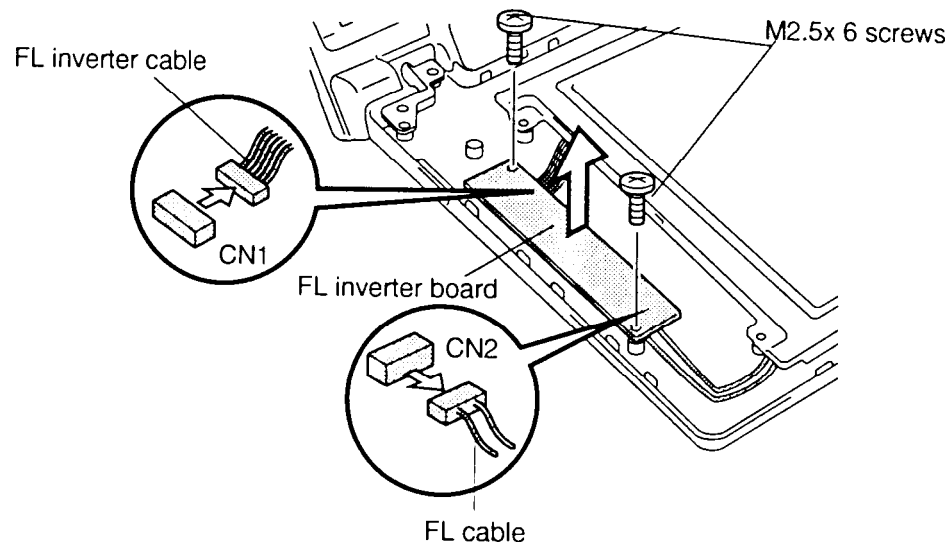
Figure 4-28 Disconnecting the FL inverter board

Installing the T2130CT FL Inverter Board

To install the T2130CT's FL inverter board, follow the steps below and refer to figure 4-28.

1. Connect the **FL inverter cable** to **CN1** and the **FL cable** to **CN2** on the FL inverter board (figure 4-28).

2. Seat the **FL inverter board** and route the **cables** so they will not be pinched by the display cover or other component.

3. Secure the **FL inverter board** with **two M2.5x6 screws** (figure 4-28).

4. Install the display mask, optional memory module, optional PCMCIA card, and battery pack as described in sections 4.11, 4.4, 4.3, and 4.2.

4.16 T2130CT LCD Module

Removing the T2130CT LCD Module

> *CAUTION: The T2130CT LCD module is easily damaged. Before removing the module, refer to Appendix A for precautions on handling.*

To remove the T2130CT's LCD Module, follow the steps below and refer to figure 4-29.

1. Turn off the power to the T2130CT. Disconnect the AC power cable, and all external cables connected to the T2130CT.

2. Remove the battery pack, optional memory module, optional PCMCIA card, display mask, and FL inverter board as described in sections 4.2, 4.3, 4.4, 4.11, and 4.15.

3. Remove **four M2.5x6 screws,** with **ground cables,** securing the LCD module to the back frame of the computer (figure 4-29). Be careful not to confuse these screws with the screws that secure the metal cover to the LCD panel.

4. Rotate the **LCD module** from left to right to remove it from the cover (figure 4-29).

5. Disconnect the **display cable board** from **LCD module** (figure 4-29).

6. Pull off the insulator attached by double-sided tape.

7. Disconnect the **display cables** from the **display cable board** to remove the board (figure 4-29).
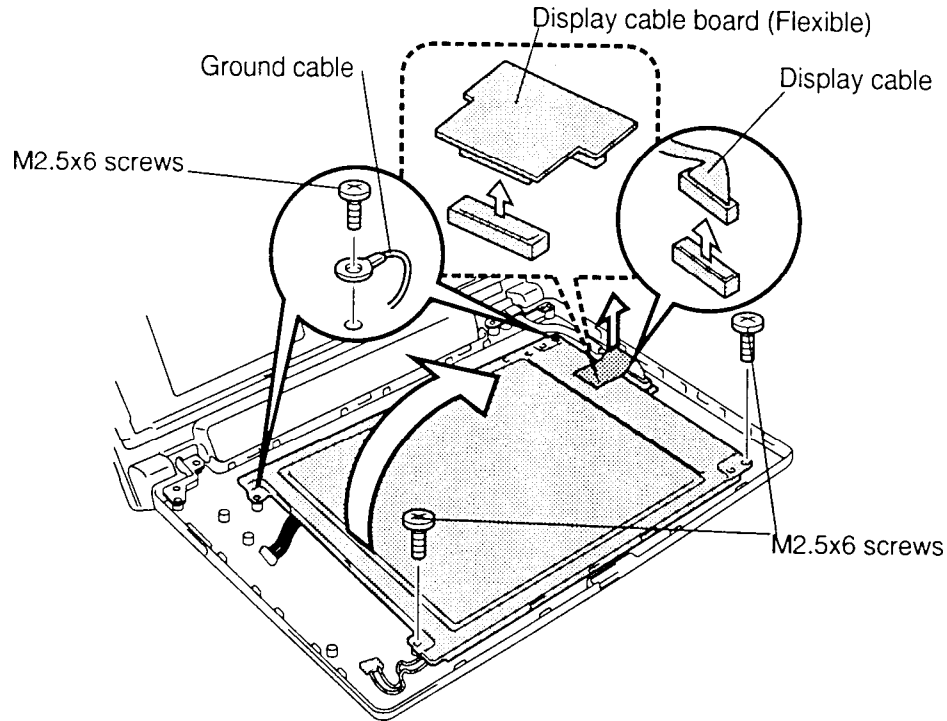
Figure 4-29 Removing the display cable board

Installing the T2130CT LCD Module

To install the T2130CT's liquid crystal display module, follow the steps below and refer to figure 4-29.

1. Connect the **display cable board** to the **display cable** (figure 4-29).

2. Connect the **display cable board** to the **LCD module** (figure 4-29).

3. Secure the insulator to the board, pressing gently to secure the tape (figure 4-29).

4. Place the **LCD module** in the cover and route the **cables** so they will not be pinched by the display panel or other components (figure 4-29).

5. Secure the panel with **four M2.5x6 screws** (figure 4-29).

6. Install the FL inverter board, display mask, optional memory module, optional PCMCIA card, and battery pack as described in sections 4.15, 4.11, 4.4, 4.3, and 4.2.

4.17 T2130CT FL

Removing the FL

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

To remove the T2130CT's FL, follow the steps below and refer to figure 4-30.

1. Turn off the power to the T2130CT. Disconnect the AC power cord and all external cables connected to the computer.

2. Remove the battery pack, optional memory module, optional PCMCIA card, display mask, FL inverter board, and display module as described in sections 4.2,4.3, 4.4, 4.11, 4.15, and 4.16.

3   Remove **one flat-top screw** securing the **FL** (figure 4-30).

4. Stand the **LCD module** on edge so the **FL** is at the top (figure 4-30).

5. Hold the **LCD module's** frame at the screw hole with one hand and slide the **FL** out of the frame.
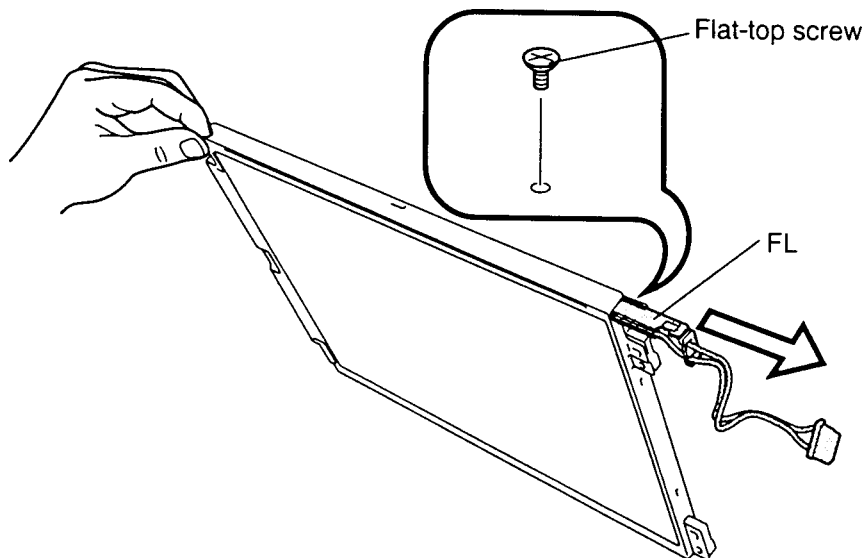
Figure 4-30 Removing the LCD module screws

Installing the FL

To install the T2130CT's FL, follow the steps below and refer to figures 4-31.

1. Stand the **FL module** on edge so the FL side is at the top.

2. Insert the tip of the **FL** into its slot (figure 4-31).

NOTE: When you insert the FL, be very careful to align the U-shaped optical shield with the optical diffusion plate. The shield should fit on either side of the bar. If the shield is not aligned or if it covers the bar slightly the display brightness will be diminished.

Diffusion plate
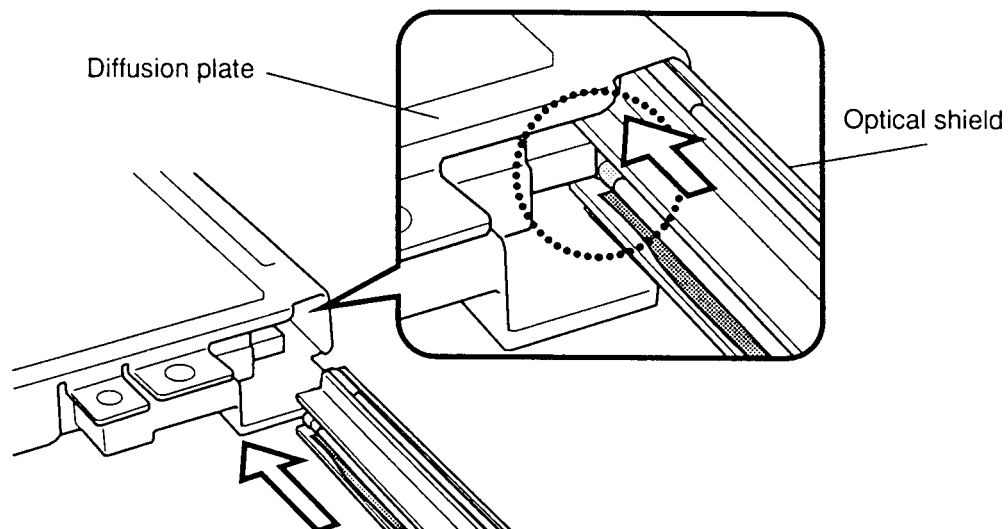
Optical shield

Figure 4-31 Inserting the FL

3. When you are sure the **optical shield** and **diffusion bar** are aligned, slide the **FL** fully into the **LCD module** and secure it with **one flat-top screw** (figure 4-30).

4. Replace the display module, FL inverter board, display module, optional memory card, optional PCMCIA card, and top cover, and battery pack as described in sections 4.16, 4.15, 4.11, 4.4, 4.3, and 4.2.

Appendix A   Handling the LCD Module

Precautions for Handling the LCD Module

The computer's LCD module can be easily damaged during assembly or disassembly. Therefore, please observe the following precautions when handling the LCD module.

1. When installing the LCD module in the LCD cover, be sure to seat it so that it is properly aligned and maximum visibility of the display is maintained.
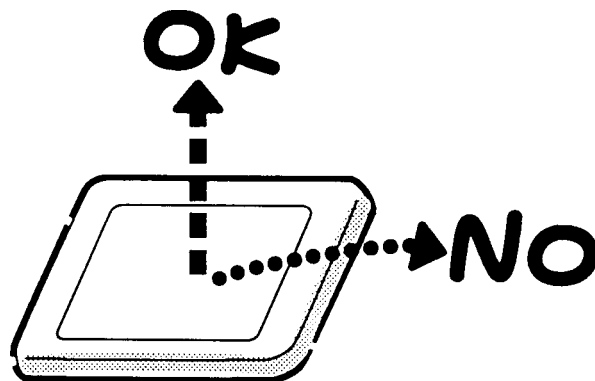
2. Be careful to align the holes at the four corners of the LCD module with the corresponding holes in the LCD cover before securing the module with screws. Do not force the module into place, because stress can affect its performance.

   Also, the panel's polarized surface is easily scarred, so be careful when handing it.

> *Caution: Metal edges on the LCD module are sharp, so be careful not to cut yourself.*

3.   If the panel's surface gets dirty, wipe it with cotton or a soft cloth. If it is still dirty, try breathing on the surface to create a light condensate and wipe it again.

If the surface is very dirty, we recommend a CRT cleaning agent. Apply the agent to a cloth and then wipe the panel's surface. Do not apply cleanser directly to the panel.
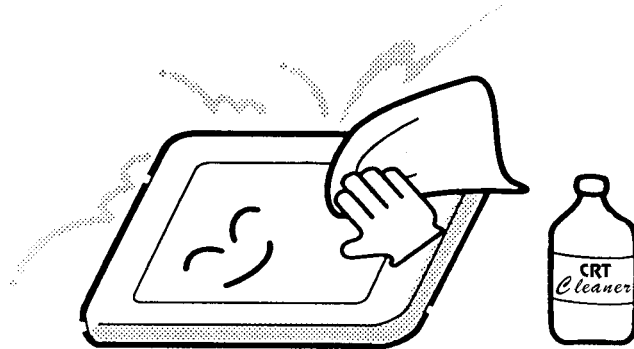
4.   If water or other liquid is left on the panel's surface for a long period, it can change the screen's tint or stain it. Be sure to quickly wipe off any liquid.
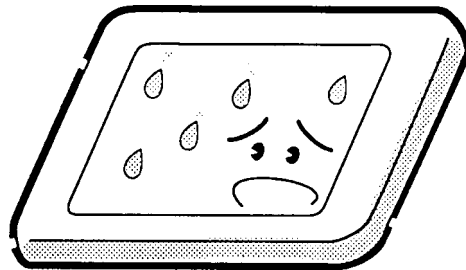
5.   Glass is used in the panel, so be careful not to drop it or let it strike a hard object, which could cause breakage or cracks.
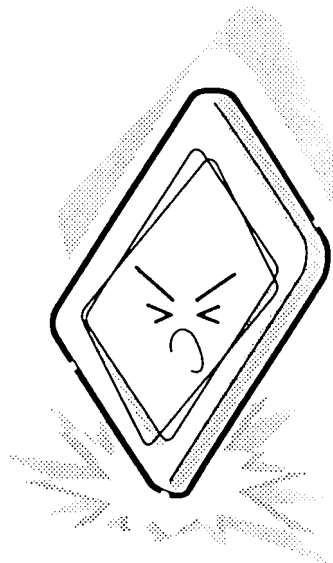
6. CMOS-LSI circuits are used in the module, so guard against damage from electrostatic discharge. Be sure to wear a wrist or ankle ground when handling the module.
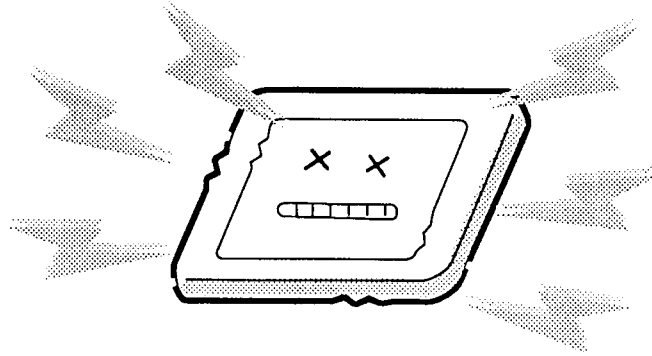
7. Do not expose the module to direct sunlight or strong ultraviolet rays for long periods.
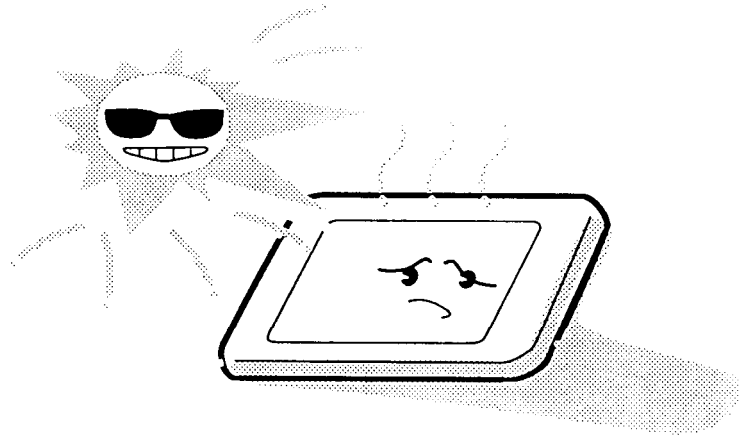
8. Do not store the module at temperatures below specifications. Cold can cause the liquid crystals to freeze, lose their elasticity or otherwise suffer damage.
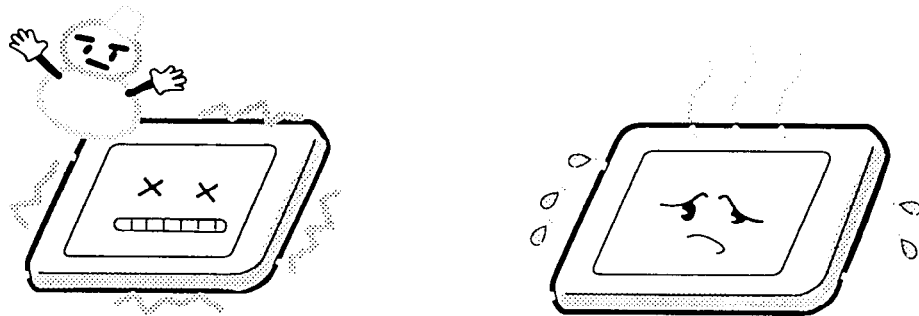
9. Do not disassemble the LCD module. Disassembly can cause malfunctions.
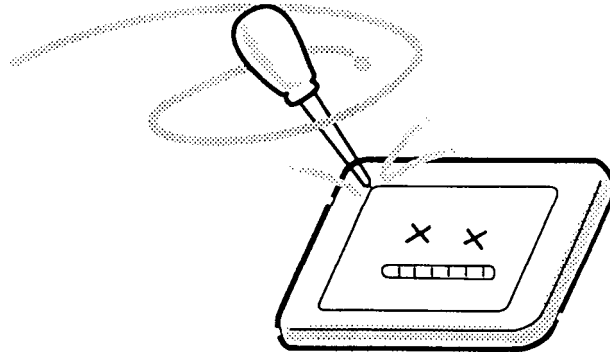
10. If you transport the module, do not use packing material that contains epoxy resin (amine) or silicon glue (alcohol or oxime). These materials can release gas that can damage the panel's polarization.
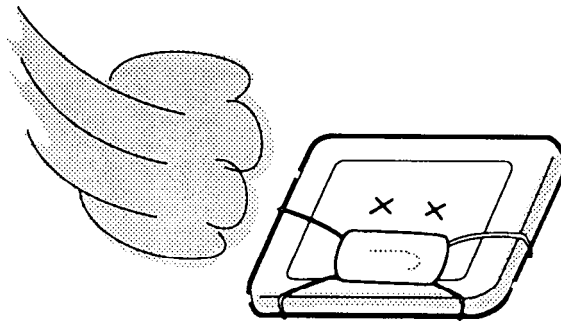
Appendix B Board Layout

B.1   FHVSY* System Board
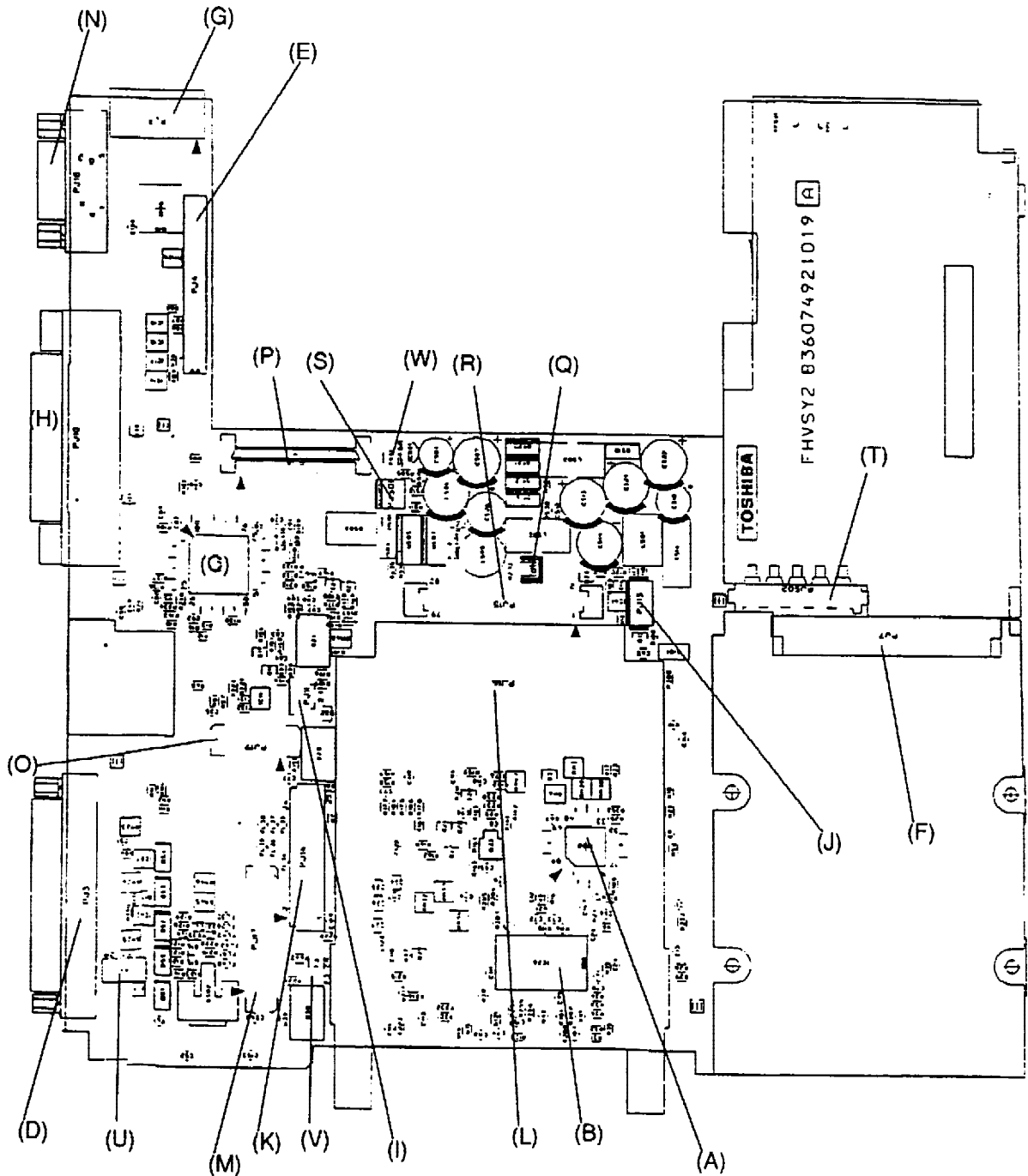
Figure B-1 FHVSY* system board (front)
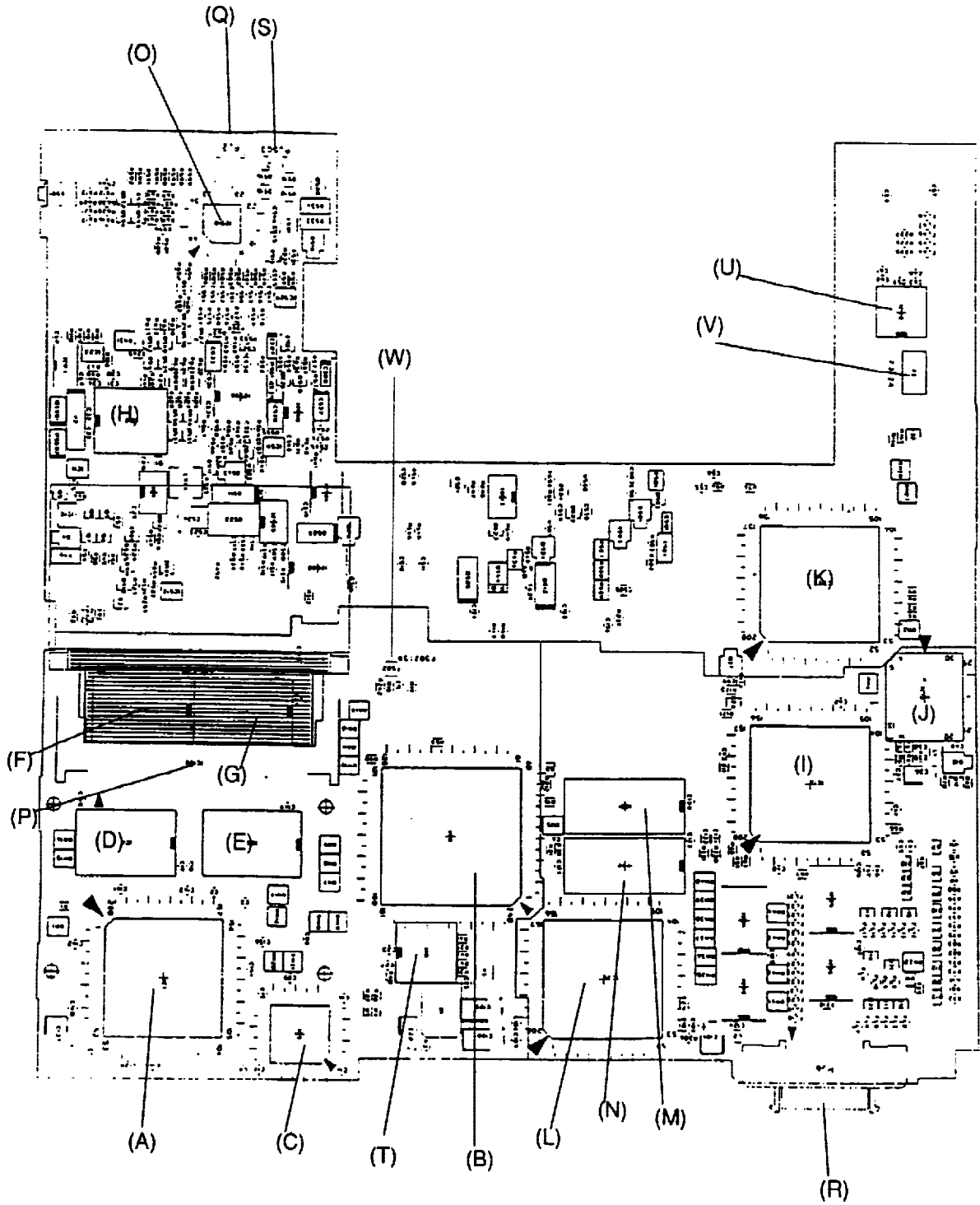
Figure B-2 FHVSY* system board (back)

Table B-1 FHVSY* system board ICs and connectors (front)

Mark	Number	Name
(A)	IC22	Keyboard Controller
(B)	IC26	IPS Controller
(C)	IC28	I/O Controller Gate Array
(D)	PJ3	PRT Connector
(E)	PJ4	Internal FDD Connector
(F)	PJ7	HDD Connector
(G)	PJ9	ASYNC Interface Connector
(H)	PJ10	P-REP Connector
(I)	PJ11	Display Sensor Switch Connector
(J)	PJ13	IPS Switch Connector
(K)	PJ14	Keyboard Connector
(L)	PJ16	PCMCIA Slot Connector
(M)	PJ17	LCD Connector
(N)	PJ18	RGB Connector
(O)	PJ19	LCD Connector
(P)	PJ8	CD-ROM Interface Connector
(Q)	PJ12	SYSTEM SPEAKER Connector
(R)	PJ15	SOUND Interface Connector
(S)	PJ501	AC PS Connector
(T)	PJ502	Main Battery Connector
(U)	F1	2A Fuse (Slow Blow)
(V)	F3	2A Fuse
(W)	F501	3.15A Fuse

Table B-2 FHVSY* system board ICs and connectors (back)

Mark	Number	Name
(A)	IC1	CPU
(B)	IC2	System Controller Gate Array
(C)	IC3	Level Shift Gate Array
(D)	IC4	DRAM
(E)	IC5	DRAM
(F)	IC6	DRAM
(G)	IC7	DRAM
(H)	IC12	RTC
(I)	IC13	Super Integration
(J)	IC15	BIOS ROM
(K)	IC29	PCMCIA Controller Gate Array
(L)	IC30	Display Controller Gate Array
(M)	IC31	VRAM
(N)	IC32	VRAM
(O)	IC510	Power Supply Microprocessor
(P)	IC100	SIMM Connector
(Q)	PJ2	RTC Battery Connector
(R)	PJ6	External FDD Connector
(S)	PJ503	Sub Battery Connector
(T)	IC8	Clock Generator
(U)	IC20	ASYNC Controller
(V)	F2	2A Fuse (Slow Blow)
(W)	F502	5A Fuse

Appendix C Pin Assignments

C.1   PJ2 RTC Connectors (3-pin)

Table C-1   RTC connector pin assignments (3-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	TP1	–	02	NC	–
03	GND	–			

C.2   PJ3 PRT Connectors (25-pin)

Table C-2 PRT connector pin assignments (25-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	STROB;000	O	02	PD00;100	I/O
03	PD01;100	I/O	04	PD02;100	I/O
05	PD03;100	I/O	06	PD04;100	I/O
07	PD05;100	I/O	08	PD06;100	I/O
09	PD07;100	I/O	10	ACK;000	I
11	BUSY;100	I	12	PE;100	I
13	SELCT;100	I	14	AUTFD;000	O
15	ERROR;000	I	16	PINT;000	O
17	SLIN;000	O	18	GND	–
19	GND	–	20	GND	–
21	GND	–	22	GND	–
23	GND	–	24	GND	–
25	GND	–			

C.3   PJ4 Internal FDD Connectors (26-pin)

Table C-3   Internal FDD connector pin assignments (26-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	IFSSEL;000	O	02	GND	–
03	IFRDAT;000	I	04	GND	–
05	IFWPRO;000	I	06	GND	–
07	IFTR0;000	I	08	GND	–
09	IFWEN;000	O	10	GND	–
11	IFWDAT;000	O	12	GND	–
13	IFSTEP;000	O	14	NC	–
15	IFDIRC;000	O	16	IFLOWD;000	O
17	IFAMON;000	O	18	IFHMED;000	I
19	IFRADY;000	I	20	VCC	–
21	DSKCHG;000	I	22	VCC	–
23	IFDASL;000	O	24	VCC	–
25	IFINDX;000	I	26	VCC	–

C.4   PJ6 External FDD Connectors (26-pin)

Table C-4   External FDD connector pin assignments (26-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	VCC	–	02	IFINDX;000	I
03	VCC	–	04	IFDASL;000	O
05	VCC	–	06	DSKCHG;000	I
07	VCC	–	08	IFRADY;000	I
09	IFHMED;000	I	10	IFAMON;000	O
11	IFLOWD;000	O	12	IFDIRC;000	O
13	SLFDLD;100	I	14	IFSTEP;000	O
15	GND	–	16	IFWDAT;000	O
17	GND	–	18	IFWEN;000	O
19	GND	–	20	IFTRK0;000	I
21	GND	–	22	IFWPRO;000	I
23	GND	–	24	IFRDAT;000	I
25	GND	–	26	IFSSEL;000	O

C.5 PJ7 HDD Connectors (44-pin)

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

Pin	Signal	I/O	Pin	Signal	I/O
01	RESET;000	O	02	GND	–
03	SD07;100	I/O	04	SD08;100	I/O
05	SD06;100	I/O	06	SD09;100	I/O
07	SD05;100	I/O	08	SD10;100	I/O
09	SD04;100	I/O	10	SD11;100	I/O
11	SD03;100	I/O	12	SD12;100	I/O
13	SD02;100	I/O	14	SD13;100	I/O
15	SD01;100	I/O	16	SD14;100	I/O
17	SD00;100	I/O	18	SD15;100	I/O
19	GND	–	20	NC	–
21	NC	–	22	GND	–
23	IOWR;000	O	24	GND	–
25	IORD;000	O	26	GND	–
27	IOCRDY;100	I	28	NC	–
29	NC	–	30	GND	–
31	IRQ14;100	I	32	IOCS16;000	I
33	SA01;100	O	34	NC	–
35	SA00;100	O	36	SA02;100	
37	HDCS0;000	O	38	HDCS1;000	O
39	HDDLED;000	I	40	GND	–
41	VCC	–	42	VCC	–
43	GND	–	44	VCC	–

C.6 PJ9 ASYNC Interface Connectors (15-pin)

Table C-6   ASYNC interface connector pin assignments (15-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	DTR1;110	O	02	TXD1;010	O
03	RTS1;110	O	04	DCD;100	I
05	DSR1;100	I	06	RXD1;000	I
07	CTS1;100	I	08	RI1;100	I
09	GND	–	10	GND	–
11	GND	–	12	EXKBDT;100	I/O
13	EXKBCK	I/O	14	VCC	–
15	VCC	–			

C.7   PJ10 Port Replicator Connectors (120-pin)

Table C-7   Port replicator connector pin assignments (120-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	GND	–	02	GND	–
03	IFLOWD;000	O	04	IFWDAT;000	O
05	IFSSEL;000	O	06	IFDIRC;000	O
07	IFSTEP;000	O	08	IFWEN;000	O
09	IFAMON;000	O	10	NC	–
11	NC	–	12	GND	–
13	AUTFD;000	O	14	PINT;000	O
15	GND	–	16	MOUSDT;100	I/O
17	EXKBDT;100	I/O	18	GND	–
19	SD00;100	I	20	SD02;100	I
21	SD04;100	I	22	SD06;100	I
23	JOYR;000	O	24	GND	–
25	CVSYNC;110	O	26	GND	–
27	AGREEN;100	O	28	ABLUE;100	O
29	GND	–	30	GND	–
31	GND	–	32	GND	–
33	SLFDLD;100	I	34	DSKCHG;000	I
35	IFRADY;000	I	36	IFINDX;000	I
37	IFTRK0;000	I	38	IFWPRO;000	I
39	IFRDAT;000	I	40	IFDASL;000	O
41	IFHMED;000	I	42	GND	–
43	ERROR;000	I	44	SLIN;000	O
45	GND	–	46	MOUSCK;100	I/O
47	EXKBCK;100	I/O	48	GND	–
49	SD01;100	I	50	SD03;100	I
51	SD05;100	I	52	SD07;100	I
53	JOYW;000	O	54	GND	–
55	CHSYNC;110	O	56	GND	–
57	ARED;100	O	58	GND	–
59	GND	–	60	GND	–
61	DCIN	I	62	DCIN	I
63	NC	–	64	NC	–
65	NC	–	66	DSR1;100	I
67	DCD1;100	I	68	CTS1;100	I
69	RXD1;000	I	70	GND	–
71	STROB;000	O	72	PD0;100	I/O

Pin	Signal	I/O	Pin	Signal	I/O
73	PD2;100	I/O	74	PD4;100	I/O
75	PD6;100	I/O	76	ACK;000	I
77	PE;100	I	78	GND	–
79	NC	–	80	PRDT1;000	I
81	VCC	–	82	VCC	–
83	VCC	–	84	MSI;100	I
85	GND	–	86	GND	–
87	LOUTRP	O	88	LOUTRM	O
89	LINRM	I	90	LINRP	I
91	DCIN	I	92	DCIN	I
93	NC	–	94	NC	–
95	NC	–	96	DTR1;110	O
97	RI1;100	I	98	RTS1;110	O
99	TXD1;010	O	100	GND	–
101	ENEXFD;000	O	102	PD1;100	I/O
103	PD3;100	I/O	104	PD5;100	I/O
105	PD7;100	I/O	106	BUSY;100	I
107	SELCT;100	I	108	GND	–
109	NC	–	110	PRDT2;000	I
111	SDMUTE;100	O	112	VCC	–
113	HPVC	I	114	MSO;100	O
115	GND	–	116	GND	–
117	LOUTLP	O	118	LOUTLM	O
119	LINLM	I	120	LINLP	I

C.8   PJ11 Panel Sensor Connectors (2-pin)

Table C-8   Panel sensor connector pin assignments (2-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	PNLOFF;000	I	02	GND	–

C.9   PJ12 System Speaker Connectors (2-pin)

Table C-9   System speaker connector pin assignments (2-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	SPKVOL;100	O	02	GND	I

C.10   PJ13 IPS Switch Connectors (4-pin)

Table C-10   IPS Switch connector pin assignments (4-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	GND	–	02	SWL	I
03	GND	–	04	SWR	I

C.11   PJ14 KB Connectors (25-pin)

Table C-11   KB connector pin assignments (25-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	KBRT6;100	I	02	KBRT2;100	I
03	KBRT5;100	I	04	KBRT0;100	I
05	KBRT1;100	I	06	KBRT3;100	I
07	KBRT7;100	I	08	KBRT4;100	I
09	KBOT02;000	O	10	KBOT09;000	O
11	KBOT11;000	O	12	KBOT03;000	O
13	KBOT04;000	O	14	KBOT05;000	O
15	KBOT06;000	O	16	KBOT07;000	O
17	KBOT08;000	O	18	KBOT01;000	O
19	KBOT00;000	O	20	IPSY;100	I
21	GND	–	22	IPSX;100	I
23	IPSY;100	I	24	VCC	–
25	IPSX;100	I			

C.12   PJ17 LCD Connectors (40-pin)

Table C-12   LCD connector pin assignments (40-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	GND	–	02	PANELO;100	I
03	GND	–	04	PANELI;100	I
05	GND	–	06	NC	–
07	GND	–	08	RESET;000	O
09	PNLD02;111	O	10	PNLD00;111	O
11	PNLD03;111	O	12	PNLD01;111	O
13	VCC	–	14	VCC	–
15	SHFCLK;111	O	16	PNLD04;111	O
17	ENDATA;111	O	18	PNLD05;111	O
19	FP;111	O	20	PNLD06;111	O
21	LP;111	O	22	PNLD07;111	O
23	PNLD10;111	O	24	PNLD14;111	O
25	PNLD08;111	O	26	PNLD11;111	O
27	PNLD12;111	O	28	PNLD15;111	O
29	PNLD09;111	O	30	PNLD13;111	O
31	DSPV	–	32	DSPV	–
33	NC	–	34	BRIGHT;100	O
35	GND	–	36	GND	–
37	GND	–	38	GND	–
29	GND	–	40	GND	–

C.13   PJ18 RGB I/F Connectors (15-pin)

Table C-13 RGB I/F connector pin assignments (15-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	ARED;100	O	02	AGREEN;100	O
03	ABLUE;100	O	04	NC	–
05	GND	–	06	GND	–
07	GND	–	08	GND	–
09	NC	–	10	GND	–
11	NC	–	12	NC	–
13	CHSYNC;110	O	14	CVSYNC;110	O
15	NC	–			

C.14   IS100 SIMM Connectors (72-pin)

Table C-14   SIMM connector pin assignments (72-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	GND	–	02	MD00;101	I/O
03	MD01;101	I/O	04	MD02;101	I/O
05	MD03;101	I/O	16	MD04;101	I/O
07	MD05;101	I/O	08	MD06;101	I/O
09	MD07;101	I/O	10	VCC	–
11	NC	–	12	MA00;101	O
13	MA01;101	O	14	MA02;101	O
15	MA03;101	O	16	MA04;101	O
17	MA05;101	O	18	MA06;101	O
19	MA10;101	O	20	NC	–
21	MD08;101	I/O	22	MD09;101	I/O
23	MD10;101	I/O	24	MD11;101	I/O
25	MD12;101	I/O	26	MD13;101	I/O
27	MD14;101	I/O	28	MA07;101	O
29	MA11;101	O	30	VCC	–
31	MA08;101	O	32	MA09;101	O
33	RAS5;001	O	34	RAS4;001	O
35	MD15;101	I/O	36	RAS6;001	O
37	MD16;101	I/O	38	MD17;101	I/O
39	GND	–	40	CAS0;001	O
41	CAS2;001	O	42	CAS3;001	O
43	CAS1;001	O	44	RAS2;001	O
45	RAS3;001	O	46	GND	–
47	MWE2;001	O	48	GND	–
49	MD18;101	I/O	50	MD19;101	I/O
51	MD20;101	I/O	52	MD21;101	I/O
53	MD22;101	I/O	54	MD23;101	I/O
55	NC	–	56	MD24;101	I/O
57	MD25;101	I/O	58	MD26;101	I/O
59	MD28;101	I/O	60	MD27;101	I/O
61	VCC	–	62	MD29;101	I/O
63	MD30;101	I/O	64	MD31;101	I/O
65	RAS7;001	O	66	NC	–
67	NC	–	68	NC	–
69	NC	–	70	NC	–
71	NC	–	72	GND	–

C.15 PJ501 DC IN Connectors (2-pin)

Table C-15   DC IN connector pin assignments (2-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	DCIN	–	02	GND	–

C.16 PJ502 Main Battery Connectors (5-pin)

Table C-16 Main battery connector pin assignments (5-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	PVBAT	–	02	THBAT	–
03	SBAT	–	04	GND	–
05	GND	–			

C.17 PJ503 Sub Battery Connectors (2-pin)

Table C-17 Sub battery connector pin assignments (2-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	TP501	–	02	GND	–

C.18 PJ702 ASYNC Connectors (9-pin)

Table C-18 ASYNC connector pin assignments (9-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	DCD1;101	I	02	RXD1;001	I
03	TXD1;011	O	04	DTR1;111	O
05	GND	–	06	DSR1;101	I
07	RTS1;111	O	08	CTS1;101	I
09	RI1;101	I			

C.19 PJ703 PS/2 KB Connectors (6-pin)

Table C-19 PS/2 KB connector pin assignment (6-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	EXKBDT;102	I/O	02	NC	–
03	GND	–	04	VCC	–
05	EXKBCK;102	I/O	06	NC	–

Appendix D   USA Display Codes

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	|	↑	£	¼			■	∞	ⁿ
D	♪	↔	—	=	M	]	m	}	ì	¥	¡			■	φ	2
E	♫	▲	.	>	N	^	n	~	Ä	₧	«			■	∈	■
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	*2
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

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

Cap No.	Keytop	Code set 1 Make	Code set 1 Break	Code set 2 Make	Code set 2 Break	Note
41	' "	28	A8	52	F0 52	
43	Enter	1C	9C	5A	F0 5A	*3
44	Shift (L)	2A	AA	12	F0 12	
(45)		56	D6	61	F0 61	*5
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	*5
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		Code set 2		Note
		Make	Break	Make	Break	
112	F1	3B	BB	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	*3
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. (Numeric, Arrow Mode)
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. 45 and No. 62 in 102-key model.
6*   Refer to table E-6, Scan Code for Cap No. 124.
7*   Refer to table E-7, Scan Code for Cap No. 126.

Table E-2 Scan codes with left Shift key

Cap No.	Key top	Code set 1 Make	Code set 1 Break	Code set 2 Make	Code set 2 Break
55	/	E0 AA E0 35	E0 B5 E0 2A	E0 F0 12 E0 4A	E0 F0 4A E0 12
75	INS	E0 AA E0 52	E0 D2 E0 2A	E0 F0 12 E0 70	E0 F0 70 E0 12
76	DEL	E0 AA E0 53	E0 D3 E0 2A	E0 F0 12 E0 71	E0 F0 71 E0 12
79	←	E0 AA E0 4B	E0 CB E0 2A	E0 F0 12 E0 6B	E0 F0 6B E0 12
80	Home	E0 AA E0 47	E0 C7 E0 2A	E0 F0 12 E0 6C	E0 F0 6C E0 12
81	End	E0 AA E0 4F	E0 CF E0 2A	E0 F0 12 E0 69	E0 F0 69 E0 12
83	↑	E0 AA E0 48	E0 C8 E0 2A	E0 F0 12 E0 75	E0 F0 75 E0 12
84	↓	E0 AA E0 50	E0 D0 E0 2A	E0 F0 12 E0 72	E0 F0 72 E0 12
85	PgUp	E0 AA E0 49	E0 C9 E0 2A	E0 F0 12 E0 7D	E0 F0 7D E0 12
86	PgDn	E0 AA E0 51	E0 D1 E0 2A	E0 F0 12 E0 7A	E0 F0 7A E0 12
89	→	E0 AA E0 4D	E0 CD E0 2A	E0 F0 12 E0 74	E0 F0 74 E0 12

Note 1: *In the case of Key No. 55 overlay mode only.*

Note 2: *The table above shows scan codes with the left* **Shift** *key. In combination with the right* **Shift** *key, scan codes are changed as below:*

	With left **Shift**	With right **Shift**
Codeset 1	E0 AA	E0 B6
	E0 2A	E0 36
Codeset 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 Make	Code set 1 Break	Code set 2 Make	Code set 2 Break
75	INS	E0 2A E0 52	E0 02 E0 AA	E0 12 E0 70	E0 F0 70 E0 F0 12
76	DEL	E0 2A E0 53	E0 D3 E0 AA	E0 12 E0 71	E0 F0 71 E0 F0 12
79	←	E0 2A E0 4B	E0 CB E0 AA	E0 12 E0 6B	E0 F0 6B E0 F0 12
80	Home	E0 2A E0 47	E0 C7 E0 AA	E0 12 E0 6C	E0 F0 6C E0 F0 12
81	End	E0 2A E0 4F	E0 CF E0 AA	E0 12 E0 69	E0 F0 69 E0 F0 12
83	↑	E0 2A E0 48	E0 C8 E0 AA	E0 12 E0 75	E0 F0 75 E0 F0 12
84	↓	E0 2A E0 50	E0 D0 E0 AA	E0 12 E0 72	E0 F0 72 E0 F0 12
85	PgUp	E0 2A E0 49	E0 C9 E0 AA	E0 12 E0 7D	E0 F0 7D E0 F0 12
86	PgDn	E0 2A E0 51	E0 D1 E0 AA	E0 12 E0 7A	E0 F0 7A E0 F0 12
89	→	E0 2A E0 4D	E0 CD E0 AA	E0 12 E0 74	E0 F0 74 E0 F0 12

Table E-4 Scan codes with Fn key

Cap No.	Keytop (side)	Code set 1 Make		Code set 1 Break		Code set 2 Make		Code set 2 Break		
43	ENTER	E0	1C	E0	9C	E0	5A	E0	F0	5A
58	CTRL	E0	1D	E0	9D	E0	14	E0	F0	14
60	LALT	E0	38	E0	B8	E0	11	E0	F0	11
121*	ARROW	45		C5		77		F0	77	
122*	NUMERIC	45		C5		77		F0	77	
123	ScrollLock	46		C6		7E		F0	7E	

> ***Note**: Code generated only when the mode is changed to Numeric or Arrow Mode.*

Table E-5 Scan codes in overlay mode (Numeric, Arrow Mode)

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

Table E-6 Scan Code for Cap No. 124

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

Table E-7 Scan Code for Cap No. 126

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			

> ***Note**: This key generates only make codes.*

Appendix F Key Layout

F.1   United States (US) Keyboard
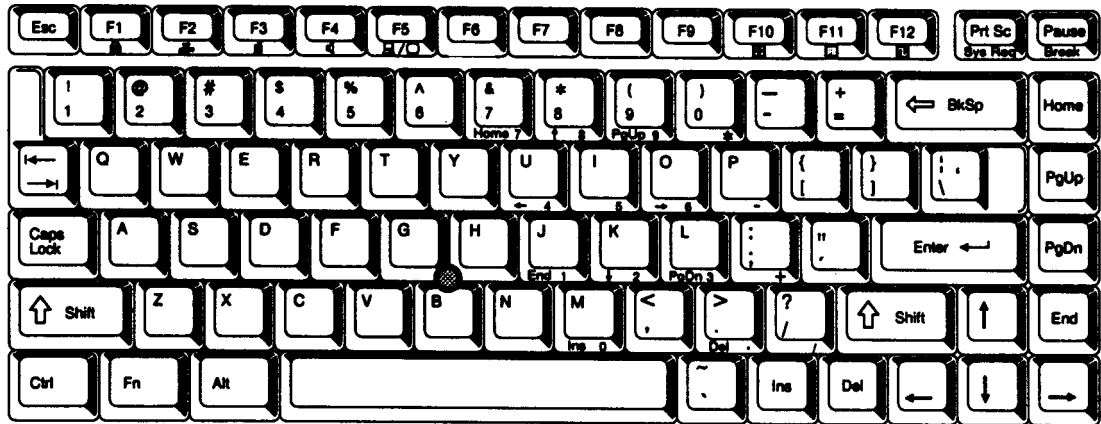
Figure F-1   US keyboard

F.2   United Kingdom (UK) Keyboard
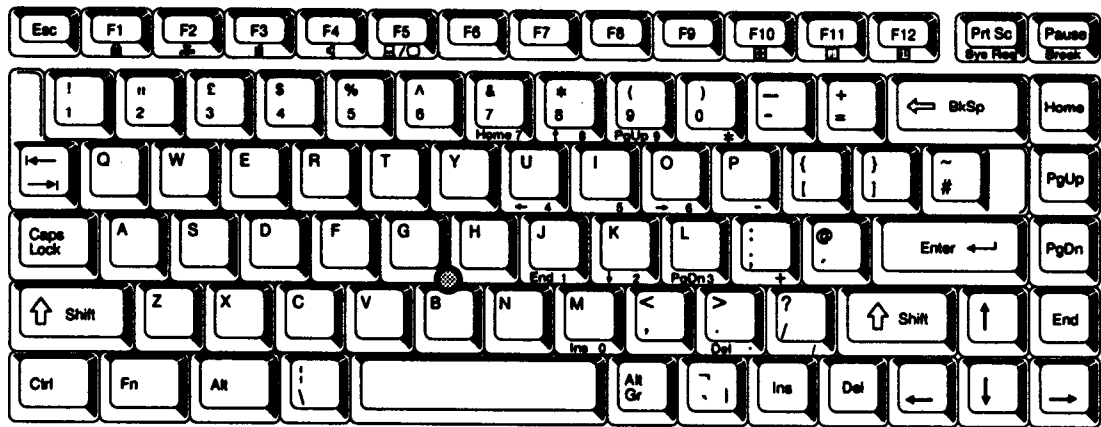
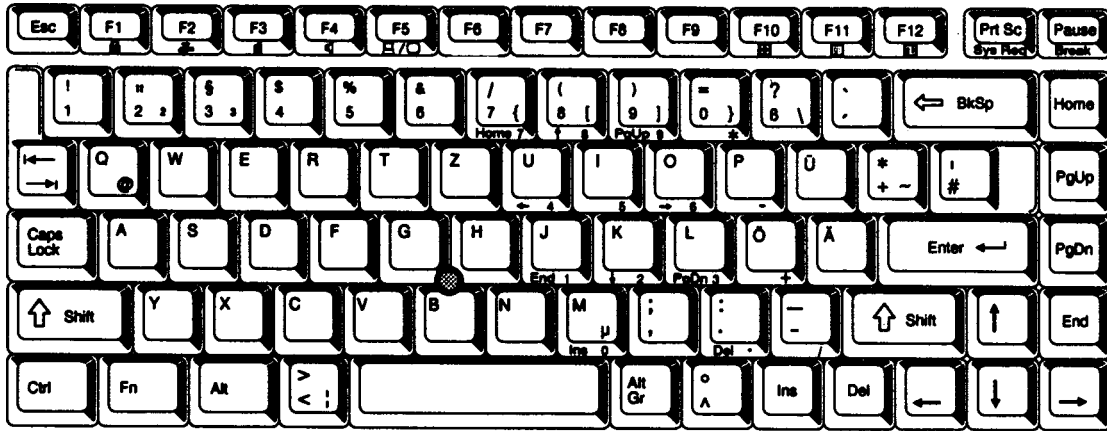*Figure F-2   UK keyboard*

F.3 German (GR) Keyboard
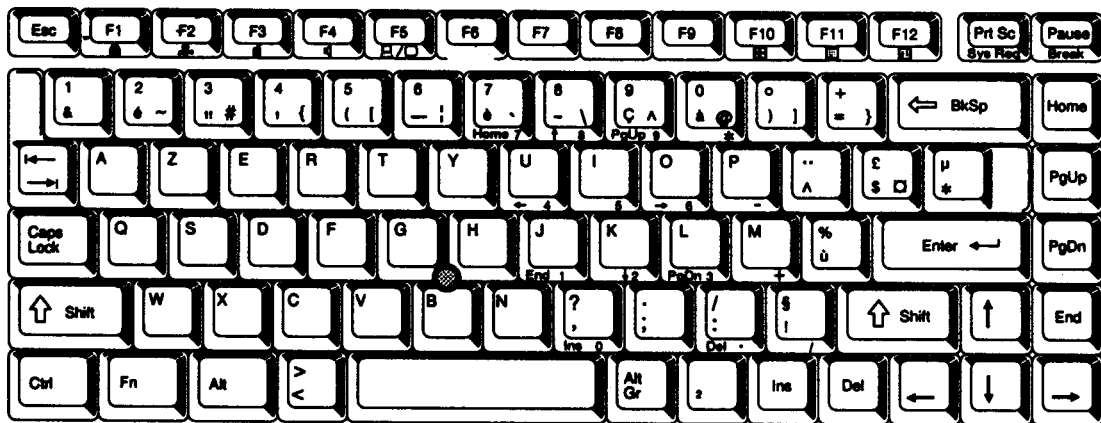

Figure F-3 GR keyboard

F.4 French (FR) Keyboard

Figure F-4 FR keyboard
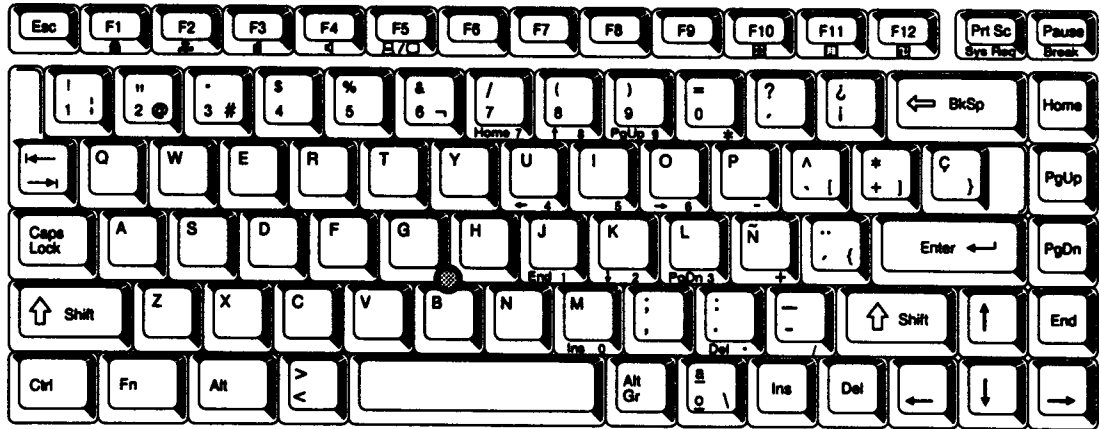
F.5   Spanish (SP) Keyboard

Figure F-5 SP keyboard

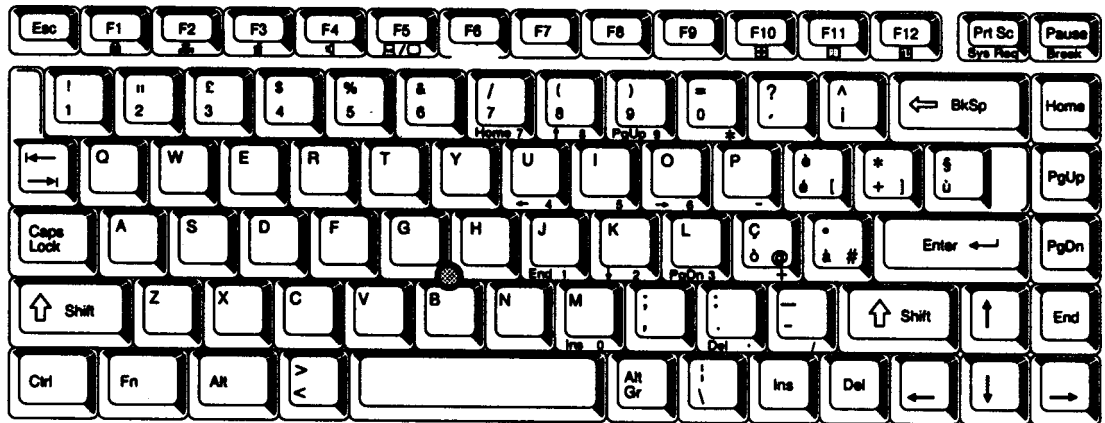## F.6   Italian (IT) Keyboard

Figure F-6 IT keyboard
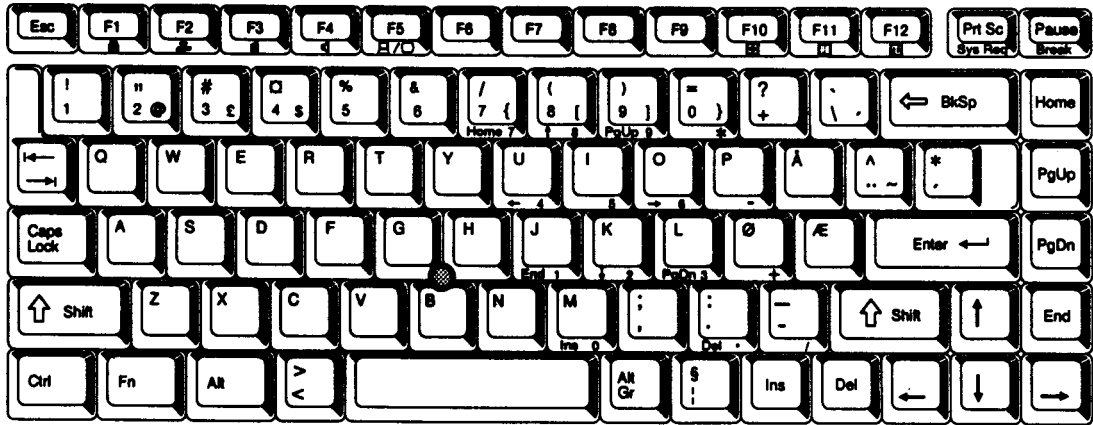
F.7   Scandinavian (SC) Keyboard

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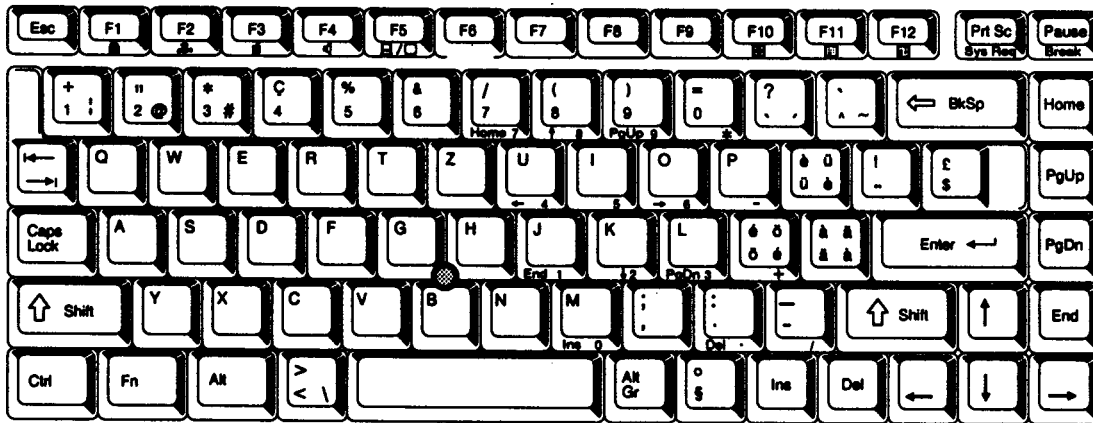
F.8   Swiss-German (SL) Keyboard

Figure F-8 SL keyboard

Appendix G Wiring Diagrams
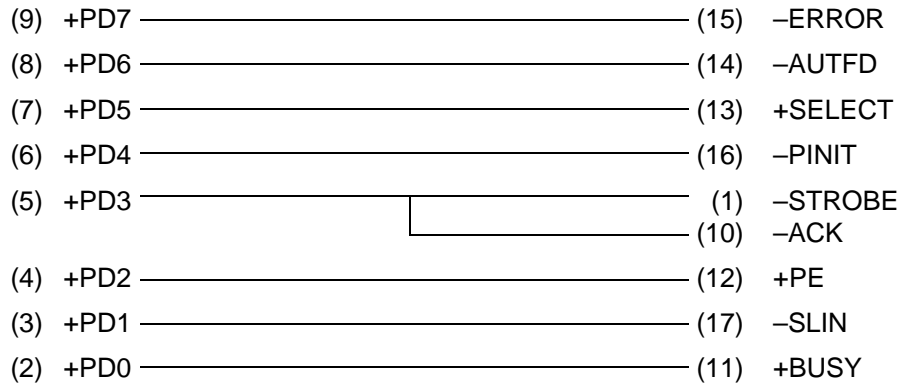
G.1 Printer Wraparound Connector

```
(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-232-C Wraparound Connector

```
(3)  TD  ──────────────────────── (2)  RD
(7)  RTS ─────────────┐            (8)  CTS
                      └────────── (1)  CD
(4)  DTR ─────────────┐            (6)  DSR
                      └────────── (9)  RI
```
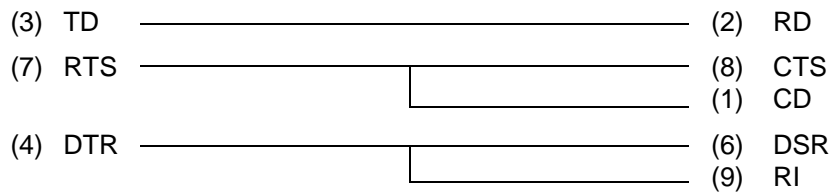
Figure G-2 RS-232-C wraparound connector

G.3 RS-232-C Direct Cable (9-Pin to 9-Pin)

```
(3)  TD  ──────────────────────── (2)  RD
(4)  DTR ─────────────┐            (6)  DSR
                      ├────────── (8)  CTS
                      └────────── (9)  RI
(7)  RTS ──────────────────────── (1)  CD
(5)  GND ──────────────────────── (5)  GND
(2)  RD  ──────────────────────── (3)  TD
(1)  CD  ──────────────────────── (7)  RTS
(6)  DSR ─────────────┐            (4)  DTR
(8)  CTS ─────────────┤
(9)  RI  ─────────────┘
```
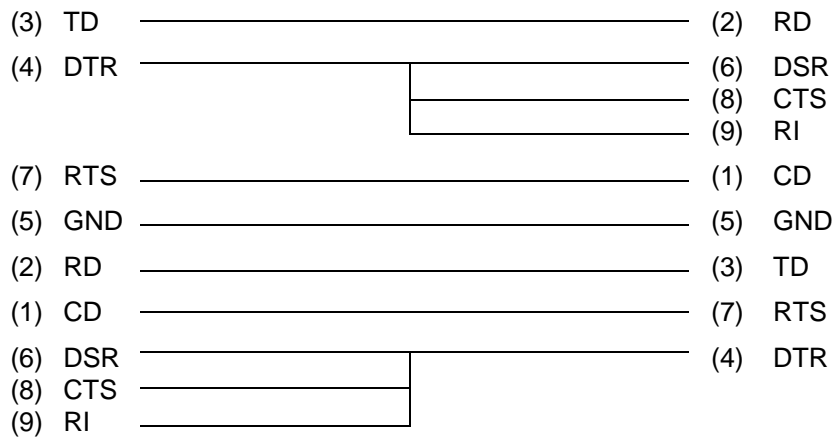
Figure G-3 RS-232-C direct cable (9-pin to 9-pin)

G.4 RS-232-C Direct Cable (9-Pin to 25-Pin)

```
(1) CD   ───────────────────────────  (4)  RTS
(2) RD   ───────────────────────────  (2)  TD
(3) TD   ───────────────────────────  (3)  RD
(4) DTR  ──────────────┐              (5)  CTS
                       ├────────────  (6)  DSR
                       └────────────  (22) RI

(5) GND  ───────────────────────────  (7)  GND
(7) RTS  ───────────────────────────  (8)  CD
(6) DSR  ──────────────┐              (20) DTR
(8) CTS  ──────────────┤
(9) RI   ──────────────┘
```
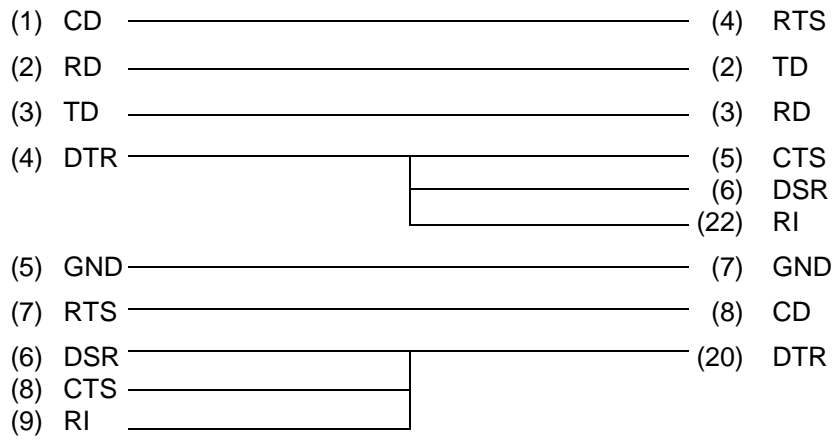
Figure G-4 RS-232-C direct cable (9-pin to 25-pin)

Appendix H BIOS Rewrite Procedures

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

Tools

To rewrite the BIOS, you need the following tool:

❑   BIOS rewrite disk for T2110/T2130 series

Rewriting the BIOS

1.   Set the system to Boot Mode.

2.   Turn off the power to the T2110/T2130 series.

3.   Remove the external cable and PCMCIA card.

4.   Turn on the power while holding down the **F12** key. (Keep holding down the key until the system speaker sounds a beep.)

5.   When the message is displayed, insert the BIOS rewrite disk into the FDD. Press the **Enter** key to start BIOS rewrite.

6.   When the BIOS rewrite is finished, eject the BIOS rewrite disk and press reset switch to restart the system.