1.1   General

The Toshiba T4400SXC Personal Computer uses extensive Large Scale Integration (LSI), and Complementary Metal-Oxide Semiconductor (CMOS) technology to provide minimum size and weight, low power usage and high reliability. The T4400SXC incorporates the following features and benefits:

☐ Microprocessor
  The T4400SXC uses an 80486SX-25 microprocessor that operates at 25 MHz.

☐ Math co-processor
  The T4400SXC comes with a built-in socket for an 80486DX-25 which has a Numeric Data Processing Unit (NDP).

☐ Cache memory
  The T4400SXC has an 8 KB cache memory which is stored in the 80486SX microprocessor.

☐ Disk storage
  The T4400SXC has an internal 80 or 120 Megabyte (MB) Hard Disk Drive (HDD) with an average access time of 19 milliseconds. A 3.5-inch Floppy Disk Drive (FDD) supports 2HD floppy disks (1.44 Mbytes) and 2DD floppy disks (720 Kbytes).

☐ Memory
  The T4400SXC comes standard with 4 MB of CMOS Random Access Memory (RAM). This includes 640 KB of conventional memory and 3,456 KB of extended memory which can be utilized as expanded memory compatible with the Lotus/Intel/Microsoft Expanded Memory Specifications (LIM-EMS).

☐ TFT color LCD
  A high resolution Liquid Crystal Display (LCD) 640×480 pixels 512 colors for both graphics and characters.

  The T4400SXC internal display controller supports Video Graphics Adapter (VGA) functions on the internal display devices.

☐ Keyboard
  An easy to use 82/84-key keyboard with full-size keys and standard spacing is compatible with IBM standard software.

☐ Batteries
  The T4400SXC has three different batteries: a main battery, a backup battery, and a Real Time Clock (RTC) battery.

☐ Expansion port
  The T4400SXC has one unique 150-pin expansion port.

☐ Parallel port
  A centronics compatible parallel interface port serves two purposes. The port can be used to connect a centronics compatible printer or an external floppy disk drive.

☐ RS-232-C port
  The T4400SXC has one 9-pin serial interface port.

❏ Tenkey port
The T4400SXC has a tenkey pad interface connector on the left side that can be connected to an external tenkey pad.

❏ Mouse port
The T4400SXC has one 6-pin mouse port on the back that can be connected to an IBM PS/2 mouse.

❏ RGB port
The T4400SXC has one 15-pin RGB port on the back that can be connected to an external video display.

The T4400SXC Personal Computer is shown in figure 1-1. Its system configuration is shown in figure 1-2.
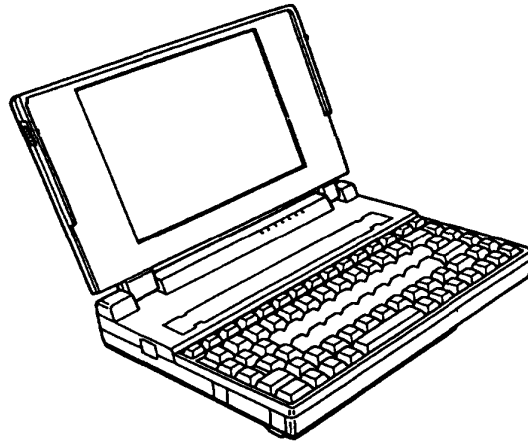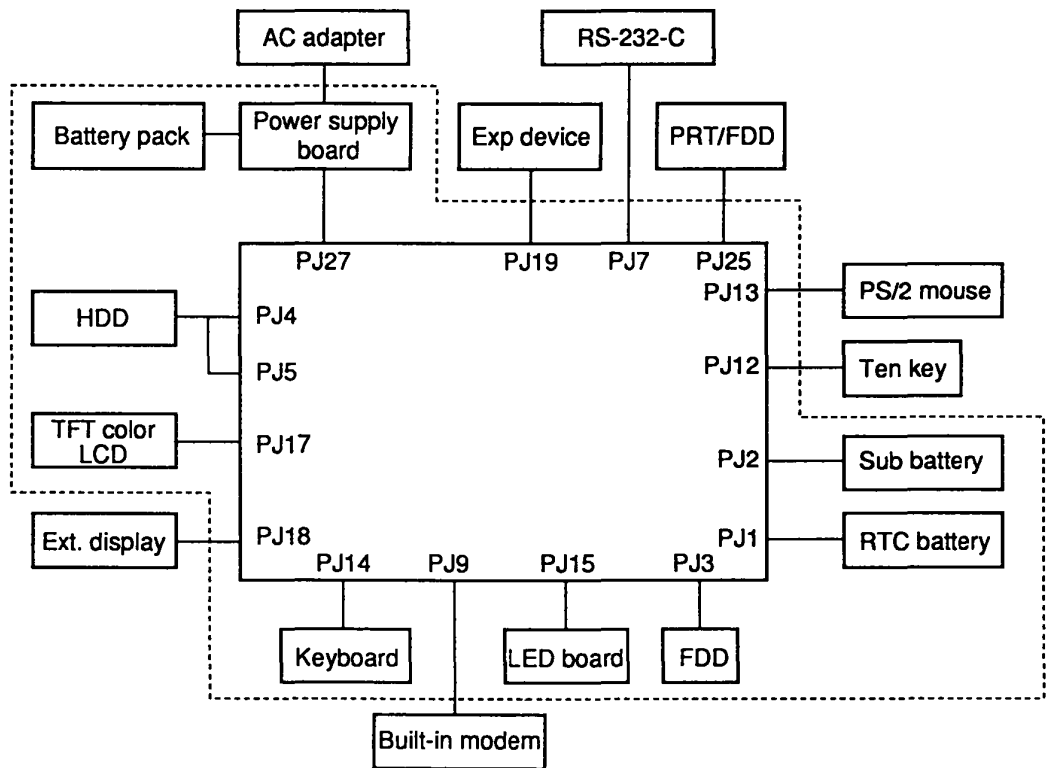

Figure 1-1 T4400SXC system unit

Figure 1-2 System unit configuration

1.2 The System Unit Block Diagram

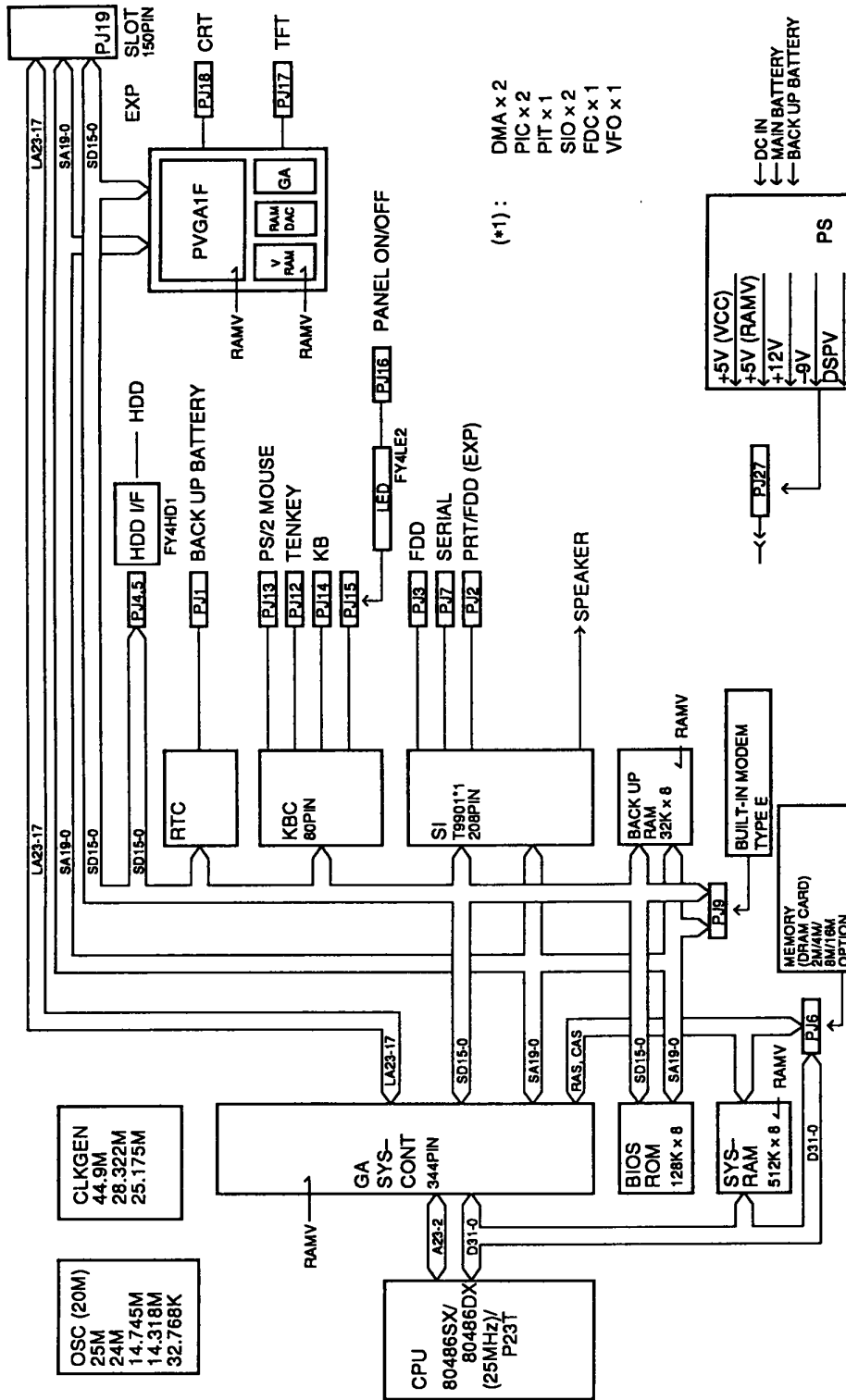Figure 1-3 is a block diagram of the T4400SXC system unit.

Figure 1-3 Block diagram

The T4400SXC system board shown in figure 1-3 is composed of the following major components:

❑ An 80486SX-25 CPU

❑ Super Integration (SI) T9901, which stores the following components:

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

❑ A Real Time Clock (RTC): 146818AF

❑ A KeyBoard Controller (KBC): M37452M4

❑ A Power Supply Controller (PSC): 47C660

❑ The following memories:

Standard RAM:	4 MB
	Cash memory 8 KB (inside CPU)
Backup RAM:	32 KB
BIOS ROM:	128 KB (96 KB are used)
	This ROM contains Initial Reliability Test (IRT), Basic Input/Output System (BIOS), and video BIOS.
Video RAM:	256 KB

Optional memory cards expand memory to a maximum of 20 MB.

❑ System control gate array :   SYS CNT-GA (344-pin)

❑ VGA display controller: PVGA1F: WD90C30 (132-pin)

❑ The following Oscillators (OSC):

- 24 MHz OSC (X1) is used for the FDC and VFO.
- 25.0 MHz OSC (X2) is used for the CPU.
- 14.7456 MHz OSC (X6) is used for the COM.
- 14.31818 MHz OSC (X7) is used for the KBC.
- 32.768 KHz OSC (X8) is used for the RTC.

1.3 The T4400SXC 3.5-inch Floppy Disk Drive

The T4400SXC 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) 3.5-inch floppy disk.

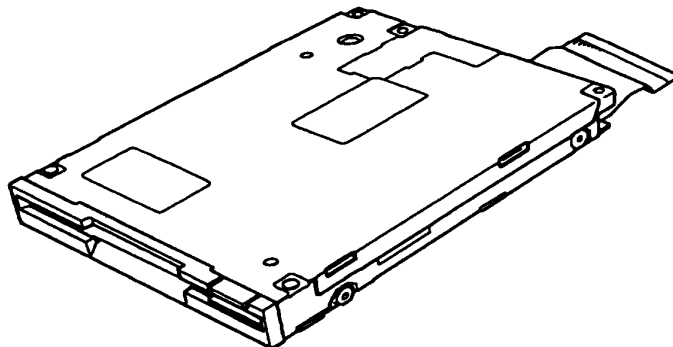The T4400SXC FDD is shown in Figure 1-4. The specifications for the FDD are described in Table 1-1.

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	2,000	1,000
Formatted	1,475	737
Number of heads	2	2
Number of cylinders	80	80
Access time (ms)		
Track to track	3	3
Average	94	94
Head settling time	15	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   The T4400SXC 2.5-inch Hard Disk Drive

The T4400SXC's 80-MB or 120-MB (formatted) 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.

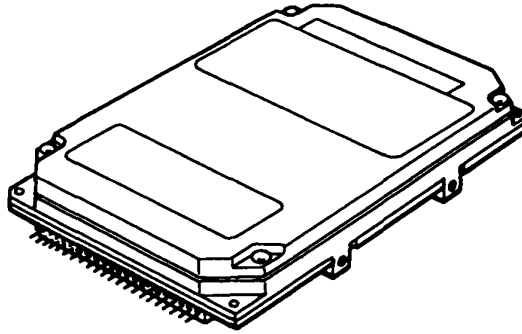The T4400SXC HDD is shown in Figure 1-5. Specifications for the HDD are described in Table 1-2.

Figure 1-5 2.5-inch HDD

Table 1-2 2.5-inch HDD specifications

	80 MB (CP-2084)	120 MB (CP-2124)	120 MB (MK2124FC)
Storage capacity (MB) Formatted	85.4	121.6	130.1
Number of disks	2	2	2
Data heads	4	4	4
Data surfaces	4	4	4
Track per surface	1,097	1,123	1,155
Sectors per track	38 (+1)	53 (+1)	55 (+1)
Bytes per sector	512	512	512
Access time (ms) Track to track Average Maximum	5 19 40	3 16 40	5 17 36
Rotation speed (rpm)	3,486	3,486	3,200
Data transfer rate (bps) To/from media	1.5 M	2.2 M	6.5 M
Interleave	1:1	1:1	1:1
Recording method	2-7 RLL/1-7 RLL	2-7 RLL/1-7 RLL	1-7 RLL

1.5   The Keyboard

The 82-(USA) or 84-(European) keyboard is mounted on the T4400SXC's system unit. The keyboard is connected to the keyboard controller on the system board through 19-pin flat cables. The keyboard is shown in Figure 1-6.

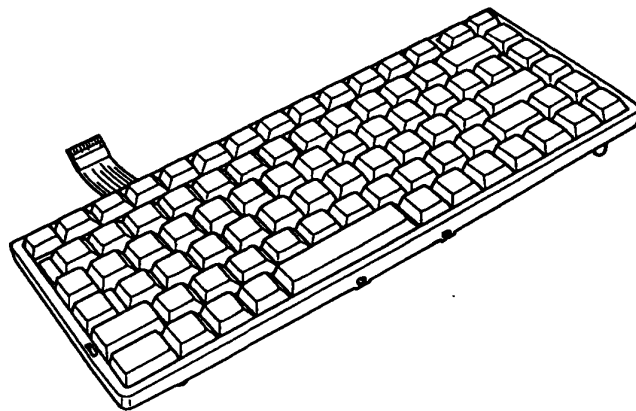See Appendix E for optional keyboard configurations.

Figure 1-6 Keyboard

1.6   TFT Color LCD Display

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

1.6.1   LCD Module

The T4400SXC TFT color LCD is illuminated from the side and supports 640×480 pixels with High Resolution Graphics Subsystem (HRGS) and 512 colors for graphics and charactors. This HRGS includes the functions of Video Graphics Array (VGA).

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

The TFT LCD is shown in Figure 1-7. The specifications for the LCD are described in Table 1-3.
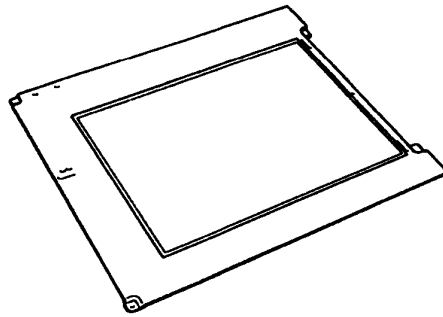

Figure 1-7 TFT LCD

Table 1-3 TFT LCD specifications

Item		Specifications
Number of dots	(dots)	640×480
Dot pitch	(mm)	0.27(W)×0.27(H)
Display area	(mm)	171(W)×130(H)
Contrast		60:1 (typ.)
FL current	(mA)	4.5 to 5.5
FL frequency	(KHz)	20 to 60

1.6.2   Fluorescent 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 FL inverter specifications

Item			Specifications
Input	Voltage	(V)	18
	Power	(W)	5.6
Output	Voltage	(V)	1100 (rms) (Max.)
	Current	(mA)	5.0×2
	Frequency	(KHz)	4.7
	Bounds of current	(mA)	2.8 to 5.0

1.7   Power Supply Board

The power supply board supplies five voltages to the T4400SXC system board. The T4400SXC power supply board has one microprocessor and it operates at 500 KHz.

It contains the following functions:

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

2.   Detects DC output and circuit malfunctions.

3.   Controls the LED indicator panel 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.

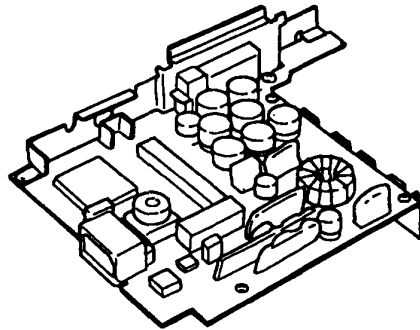The power supply board is shown in figure 1-8 and the output rating is specified in table 1-5.

Figure 1-8 Power supply board

Table 1-5 Power supply board output rating

Items		DC voltage (V)	Regulation tolerance (%)	Maximum current (mA)
System logic, FDD, HDC, HDD	(VCC)	+5	±5	3,500
Backup RAM	(VRAM)	+4.7	±5	440
RS-232-C	(VDD)	+12	±5	15
RS-232-C, Modem	(VEE)	−9	±10	15
TFT LCD	(DSPV)	+12 to +18.9		860

2.1   T4400SXC Troubleshooting

Part 2 describes how to determine if a Field Replaceable Unit (FRU) in the T4400SXC is causing the computer to malfunction. The FRUs covered are:

1. Power supply board
2. System board
3. Floppy Disk Drive
4. Hard Disk Drive
5. Keyboard
6. Display

The following tools are required to perform the T4400SXC troubleshooting steps.

1. A T4400SXC Diagnostics Disk
2. A Phillips head screwdriver (2 mm)
3. An MS-DOS system disk
4. An 2DD or 2HD formatted work disk for floppy disk drive testing
5. A Cleaning disk kit for the 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. External RGB monitor
11. External 5-1/4" floppy disk drive

2.2   Troubleshooting Flowchart

Use the flowchart in figure 2-1 as a guide to determine which FRU testing procedures to execute. Before performing the flowchart steps, make sure all optional equipment is disconnected from the computer and the floppy disk drive is empty.

> *NOTE: If you forget the password and cannot start up the computer, connect the printer port wraparound board (F31PRT), then turn the POWER switch on. The computer will skip the password function.*
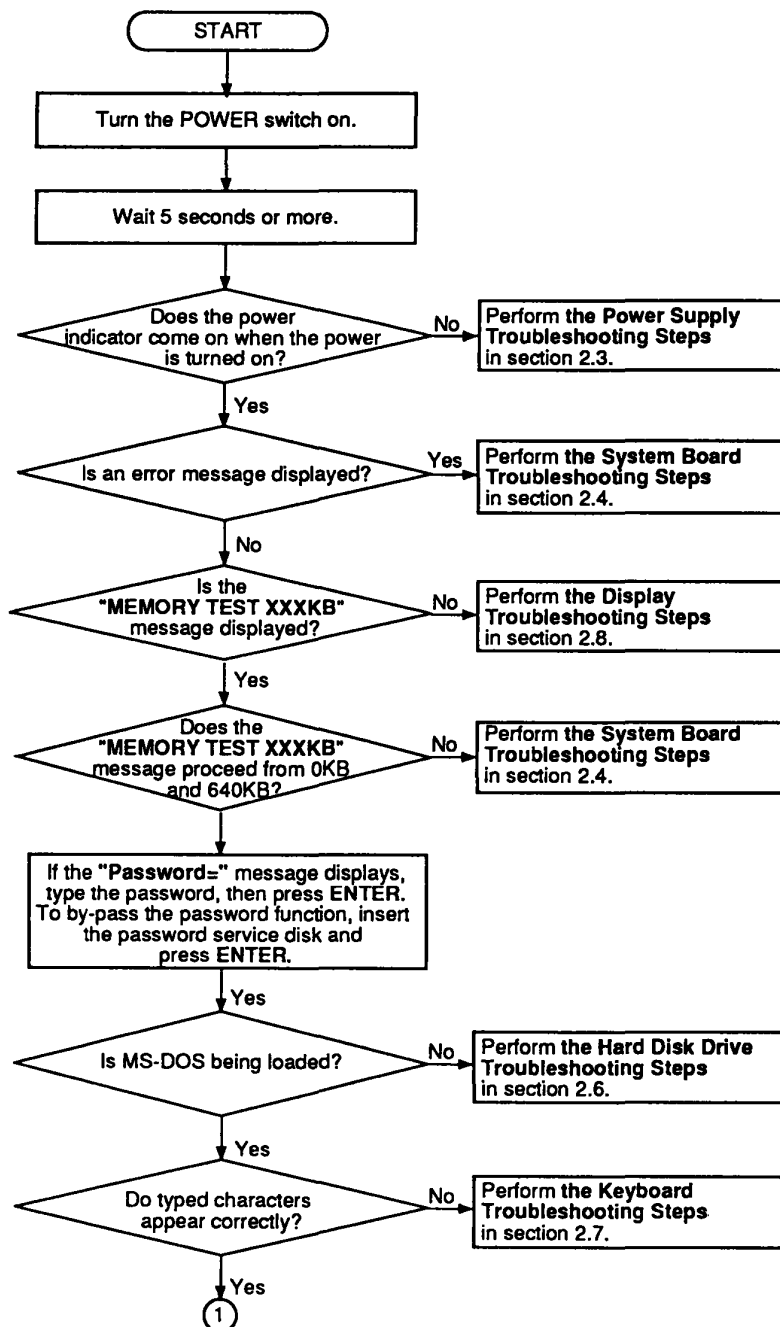

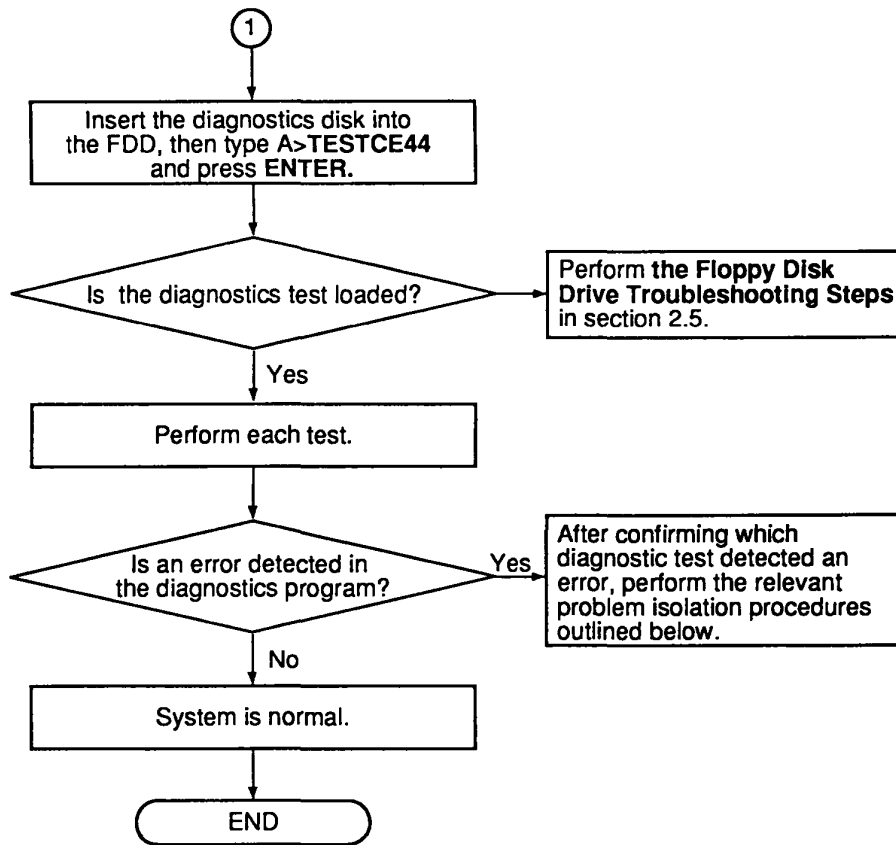Figure 2-1 Troubleshooting flowchart (1/2)

①

```
Insert the diagnostics disk into
the FDD, then type A>TESTCE44
and press ENTER.
```

Is the diagnostics test loaded? ───────→ Perform **the Floppy Disk Drive Troubleshooting Steps** in section 2.5.

Yes

Perform each test.

Is an error detected in the diagnostics program? ──Yes──→ After confirming which diagnostic test detected an error, perform the relevant problem isolation procedures outlined below.

No

System is normal.

END

Figure 2-1 Troubleshooting flowchart (2/2)

If the diagnostics program does not detect any errors, the problem may be an intermittent one. Execute the running test program several times to isolate the problem.

After confirming which diagnostic test detected an error, perform the appropriate troubleshooting steps below:

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 steps in section 2.4.

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

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

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

2.3   Power Supply Board Troubleshooting Steps

The T4400SXC's power supply board controls many functions and components in the T4400SXC. To determine if the power supply board is functioning properly, perform the following checks as required. Start with step 1 and continue with the other steps if you need to.

Step 1:   Battery Indicator Checklist

Step 2:   Power Supply Board Connector Checklist

Step 3:   System Board and Power Supply Board Replacement Checklist

Step 1 Battery Indicator Checklist

The T4400SXC's AC adapter converts AC power to DC and contains a charging circuit which charges T4400SXC's batteries. The adapter connects to the DC IN 21V connector on the back of the computer. When the AC adapter is connected and the T4400SXC power is off, the AC adapter charges the T4400SXC's batteries.

The battery indicator displays the status of the battery pack's charge and whether or not the AC adapter is connected and suppling power. The indicator labeled "**Battery**" glows amber when the AC adapter is charging the T4400SXC's battery pack.

The indicator labeled "**Battery**" lights red if power is supplied from the AC adapter when you connect the AC adapter to the T4400SXC and a wall outlet. If the AC adapter's output voltage is abnormal or the power supply malfunctions, this indicator blinks red or does not glow.

(1) If the battery indicator blinks red, see check 1.

(2) If the battery indicator blinks yellow, see check 2.

(3) If the battery indicator does not glow, see check 3.

Check 1   When turn on the power and battery indicator blinks once on a time on battery operation, main battery will be fully discharged. Charge the main battery, then try again.

When the battery indicator informs the repeatedly blinking, AC adapter, power supply board, or battery will be damaged. The repeatedly blinking is an error status of power supply.

The battery indicator repeatedly informs the 4-bit status that is varied the blinking interval with change of problem.

The battery indicator is put out two seconds at first, and it lights one or a half second with an interval of a half second in turn from bit 0 to bit 3. If the battery indicator glows 1 second, it shows the "1." If the battery indicator glows 0.5 second, it shows the "0."

The following timing chart shows the example, that the status is 5h (0101). Read the timing chart f rom right to left.
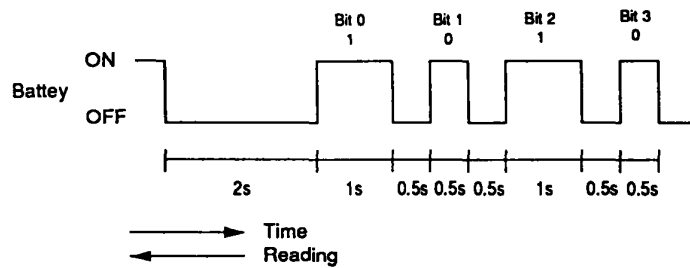
The status and its meaning are described in table 2-1.

However, when the battery indicator blinks at random, the AC adapter or charging circuit may be damaged. In this case, replace the AC adapter with a new one. If the problem still exists, perform PROCEDURE 3.
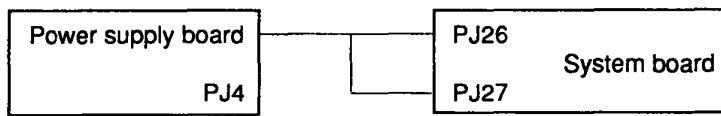
Check 2   When the main battery temperature is abnormal, battery indicator blinks yellow, and the system cannot charge the main battery.

Check 3   Make sure the AC adapter's cable and AC cord are firmly plugged into the DC IN 21 V socket and wall outlet. If these cables are plugged correctly, go to PROCEDURE 2.

Step 2 Power Supply Board Connector Checklist

The power supply board is connected to the system board by one flexible cable. This cable connector can become disconnected from the power supply board causing the T4400SXC to malfunction. To check these connections, it is necessary to disassemble the T4400SXC. Refer to part 4, *Replacing T4400SXC Field Replaceable Units* for more information about how to disassemble the T4400SXC.

When the T4400SXC is disassembled, make sure the following connections are secure and the cables are not disconnected, pinched or broken. Replace any broken or damaged connectors with new ones, connect any disconnected cables and assemble the T4400SXC. Execute the same procedures that were causing the T4400SXC to malfunction. If the computer is still not functioning properly, go to step 3.

Check 1   The following cable connections connect the power supply board to the system board.

```
+------------------------+        +------------------------+
| Power supply board     |------- | PJ26                   |
|                        |  +---- |          System board  |
|                   PJ4  |--+     | PJ27                   |
+------------------------+        +------------------------+
```

Step 3 System Board and Power Supply Board Replacement Checklist

The power supply board is connected to the system board. Power is supplied to the power supply board from the DC IN plug. The power supply board or the system board may be damaged. Replace the power supply board and system board as instructed in checks 1 and 2 below. The procedures for replacing the power supply board and system board are described in part 4, *Replacing T4400SXC Field Replaceable Units* .

Check 1   Replace the power supply board with a new one and restart the system. If the T4400SXC does not function properly, perform check 2.

Check 2   Replace the system board with a new one. If the T4400SXC still does not function properly, other FRUs may be damaged. Perform the T4400SXC's Diagnostics Test to locate the malfunctioning FRU(s).

2.4   System Board Troubleshooting Steps

To determine if the system board is defective or not functioning properly, perform the following set of steps beginning with step 1 and continue with the other steps as required.

Step 1:   Message Checklist

Step 2:   Printer Port LED Checklist

Step 3:   Diagnostic Test Program Execution Checklist

Step 4:   LED Board and RTC Battery Checklist

Step 5:   System Board Replacement Checklist

Step 1 Message Checklist

1.   Turn on the T4400SXC's power.

2.   If the system is loaded normally, go to step 3.

3.   If any of the following messages are displayed on the screen, press the **F1** key to execute the SETUP program. Refer to part 3, *Test and Diagnostics* for more information about the T4400SXC's SETUP program .

```
**** Error in CMOS.  Bad battery ****
Check system.  Then press [F1] key ..

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

**** Error in CMOS.  Bad configuration ****
Check system.  Then press [F1] key ..

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

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

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

4. If the following message is displayed on the screen, turn off the power. Wait five seconds or more, and turn on the power again. If the same message reappears, go to section 2.6, *Hard Disk Drive Troubleshooting Steps*.

```
Insert system disk in drive

Press any key when ready.....
```

5. If any of the following messages are displayed on the screen, go to step 4.

```
CPU ERROR
SYSTEM ROM CHECK SUM ERROR
TIMER CH.2 OUT ERROR
PIT ERROR
MEMORY REFRESH ERROR
FIRST 64KB MEMORY ERROR
RTC ERROR
CRTC ERROR
VRAM ERROR
KBC ERROR
SYSTEM MEMORY ERROR
SYSTEM MEMORY PARITY ERROR
PROTECTED MODE ERROR
CPU EXCEPTION ERROR
EXTENDED MEMORY ERROR
EXTENDED MEMORY PARITY ERROR
EMS PAGE REGISTER ERROR
EXPANDED MEMORY ERROR
EXPANDED MEMORY PARITY ERROR
DMA PAGE REGISTER ERROR
DMAC #1 ERROR
DMAC #2 ERROR
PIC #1 ERROR
PIC M#2 ERROR
KEYBOARD ERROR
KBC ERROR
HDC ERROR
HDD #0 ERROR
HDD #1 ERROR
NO FDD ERROR
FDC ERROR
TIMER INTERRUPT ERROR
RTC UPDATE ERROR
```

6. If none of these messages are displayed and you have a printer port LED, go to step 2.

Step 2 Printer Port LED Checklist

1.   Turn off the power to the T4400SXC.

2.   Plug the printer port LED into the PRT/FDD port on the back of the T4400SXC.

3.   Watch the printer port LED, and turn on the power. The printer port LED will light when the power switch is turned on.

4.   Read the LED status from left to right as a hexadecimal value.

5.   If the final LED status matches any of the error status values in the table 2-1, go to step 4.

6.   If the final LED status is FFH, go to step 3.

Table 2-1 Printer Port LED Error Status (1/2)

Error status	Test Item	Message
01H	Pre-init for warm start test	—
05H	PIT test	`TIMER CH.2 OUT ERROR`

		`PIT ERROR`
		`READ DATA  = XXH`
		`WRITE DATA = XXH`

06H	PIT initialization	—
07H	PIT function test	`MEMORY REFRESH ERROR`
0AH	First 64KB memory test	`FIRST 64KB MEMORY ERROR`
0BH	System memory initialization	—
0DH	Interrupt vector initialization	—

15H	RTC test	`RTC ERROR`
		`READ DATA  = XXH`
		`WRITE DATA = XXH`

15H	CMOS RAM test	`****Error in CMOS.  Bad battery****`
		`****Error in CMOS.  Bad check sum****`
		`****Error in CMOS.  Bad configuration****`
		`****Error in CMOS.  Bad memory size****`
		`****Error in CMOS.  Bad HDD type****`
		`****Error in CMOS.  Bad time function****`
		`Check system.  Then press [F1] key ..`

16H	RTC initialization	—
18H	PIC initialization	—

Table 2-1 Printer Port LED Error Status (2/2)

Error status	Test item	Message
1FH	Display initialization	CRTC ERROR
		VRAM ERROR READ DATA = XXXXXXXXH WRITE DATA = XXXXXXXXH
22H	KBC test	KBC ERROR
25H	System memory test	SYSTEM MEMORY ERROR ADDRESS = XXXXXXXXH READ DATA = XXXXXXXXH WRITE DATA = XXXXXXXXH
		SYSTEM MEMORY PARITY ERROR ADDRESS = XXXX0000H - XXXXFFFFH
30H	Extended memory test	EXTENDED MEMORY ERROR ADDRESS = XXXXXXXXH READ DATA = XXXXXXXXH WRITE DATA = XXXXXXXXH
		EXTENDED MEMORY PARITY ERROR ADDRESS = XXXX0000H - XXXXFFFFH
40H	DMA page register test	DMA PAGE REGISTER ERROR READ DATA = XXH WRITE DATA = XXH
41H	DMAC test	DMAC #1 ERROR READ DATA = XXXXH WRITE DATA = XXXXH
		DMAC #2 ERROR READ DATA = XXXXH WRITE DATA = XXXXH
42H	DMAC initialization	—
4AH	PIC test	PIC #1 ERROR READ DATA = XXH WRITE DATA = XXH
		PIC #2 ERROR READ DATA = XXH WRITE DATA = XXH
54H	Keyboard test	KEYBOARD ERROR
55H	KBC initialization	KBC ERROR
5AH	Mouse initialization	—
60H	HDD initialization	HDC ERROR
		HDD #0 ERROR
		HDD #1 ERROR
65H	FDD initialization	NO FDD ERROR
		FDD ERROR
70H	Printer test	—
80H	RS-232-C test	—
90H	Timer initialization	TIMER INTERRUPT ERROR
		RTC UPDATE ERROR
A0H	NDP initialization	—
A6H	Expansion I/O ROM	—
FFH	Expansion system ROM	—

Step 3 Diagnostic Test Program Execution

1. Execute the following tests from the Diagnostic Test Menu. Refer to part 3, *Test and Diagnostics* for more information about how to perform the T4400SXC's Diagnostic Test.

    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

2. If an error is detected during the memory test, ASYNC test, or printer test, go to step 5.

3. If an error is detected during the floppy disk test, refer to section 2.5, *Floppy Disk Drive Troubleshooting Steps*.

4. If an error is detected during the hard disk test, refer to section 2.6, *Hard Disk Drive Troubleshooting Steps*.

5. If an error is detected during the keyboard test, refer to section 2.7, *Keyboard Trouble- shooting Steps*.

6. If an error is detected during the display test, refer to section 2.8, *Display Troubleshoot- ing Steps*.

7. If an error is detected during the system test or real timer test, go to step 4.

Step 4 LED Board and RTC Battery Checklist

The LED board and the RTC battery are connected to the system board by cable connectors, which can become disconnected from the system board. Disassemble the T4400SXC following the steps in part 4, *Replacement Procedures* to make sure the following cables are not disconnected or damaged.

```
┌─────────────┐           ┌─────────────────┐
│ RTC battery ├──────┐    │ PJ1 system board│
│             │      └────┤                 │
│ LED board   ├──────────┤ PJ15            │
└─────────────┘           └─────────────────┘
```
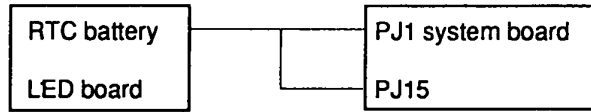
If these cables are disconnected or damaged, connect or replace them as required. If the T4400SXC is still not functioning properly, go to step 5.

Step 5 System Board Replacement

1.   Replace the system boards as described in part 4, *Replacement Procedures*.

2.   If normal operation is restored after replacing the system board, the original system board is probably defective.

3.   If normal operation is not restored, another FRU is probably not functioning correctly. Isolate the malfunctioning FRU by performing the T4400SXC's Test and Diagnostics program.

2.5   Floppy Disk Drive Troubleshooting Steps

This section describes how to determine if the T4400SXC's internal 3.5" floppy disk drive is functioning properly. Perform the steps below starting with Step 1 and continuing with the other steps as required

Step 1:   FDD Head Cleaning Checklist

Step 2:   External 5-1/4" FDD Checklist

Step 3:   Test Program Checklist

Step 4:   Connector Check and Replacement Checklist

Step 1 FDD Head Cleaning Checklist

FDD head cleaning is one of the menus on the test program.

After loading MS-DOS, run the test program and then clean the FDD head using the cleaning kit. If the FDD still does not function properly after cleaning, go to Step 3.

Detailed operation is described in part 3, *"Test and Diagnostics."*

If the test program cannot be run, go to Step 2.

Step 2 External 5-1/4" FDD Checklist

The floppy disk controller on the computer's system board controls the internal and external FDD. To determine if either the system board or the internal FDD is defective, check the following items:

Check 1   Connect the external 5-1/4" FDD to the PRT/FDD port and make sure it functions properly. If it does, perform Check 2. If it doesn't, perform Check 4.

> *NOTE: To use the external 5-1/4" FDD, set the external FDD/PRT option in the SETUP program to FDD A or FDD B.*

Check 2   Disassemble the system unit and make sure the FDD cable is properly connected to PJ4 on the system board 2. If it is, perform Check 3.

Check 3   Replace the internal 3.5" FDD with a new one. If the problem still exists, perform Check 4.

Check 4   Replace the system board with a new one.

Step 3 Test Program Checklist

The Floppy Disk Drive Diagnostic Test program is stored on the T4400SXC Diagnostics Disk. After loading MS-DOS, run the diagnostic program. Refer to part 3, *Test 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

Check 1   If the following message is displayed, disable the write protect tab on the floppy disk. If any other message appears, perform Step 4.

      `Write protected`

Step 4 Connector Check and Replacement Checklist

The 3.5" Floppy Disk Drive is connected to the system unit by the FDD cable. This cable may be disconnected from the system unit or damaged. Disassemble the T4400SXC following the steps described in part 4, *Replacement Procedures* to check the FDD's cable and its connection to the system unit. Follow the checks below when replacing the FDD.

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

```
┌─────────────┐                 ┌───────────────┐
│  FDD cable  ├─────────────────┤  System board │
└─────────────┘                 └───────────────┘
```

If this cable is disconnected or damaged, connect it to the system unit and repeat Step 3. If the FDD is still not functioning properly, perform Check 2.

Check 2   Replace the FDD with a new one. If the FDD is still not functioning properly, perform Check 3.

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

2.6 Hard Disk Drive Troubleshooting Steps

To determine if the hard disk drive is functioning properly, follow the steps below starting with Step 1. Continue with the other steps as required

> Step 1:   Message Checklist
>
> Step 2:   Format Checklist
>
> Step 3:   Test Program and Replacement Checklist

CAUTION: The contents of the hard disk will be erased when the HDD troubleshooting steps are executed. Transfer the contents of the hard disk to floppy disk using the MS-DOS BACKUP command. Refer to the MS-DOS manual for more information about how to perform the BACKUP command.

Step 1 Message Checklist

When the T4400SXC's HDD is not functioning properly, some of the following error messages may appear on the display, start with Check 1 below and perform the other checks as required.

Check 1   If 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 the following messages appear, perform Step 2. If the following messages do not appear, perform Check 3.

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

Check 3   Using the 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 T4400SXC. If the error message still appears
          perform Check 4.

              System transferred

          If an error message appears on the display, refer to *the MS-DOS Manual* for more
          information about the error message and perform Check 4.

Check 4   The HDD is connected to the system board through an HDD interface cable and
          power cable. These cables can become disconnected or damaged. Disassemble
          the T4400SXC as described in part 4, *Replacing T4400SXC Field Replaceable
          Units*. If the HDD is not connected, connect it to the system board. If the HDD is
          connected correctly to the system board, perform Step 2.

Step 2 Format Checklist

The T4400SXC's HDD is formatted using the low level format program and the MS-DOS
format program. To format the HDD, start with Check 1 below and perform the other steps as
required.

Check 1   Using the MS-DOS system disk, make a partition on the hard disk command using
            the FDISK command. Format the hard disk using the FORMAT C:/S 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 messages appear on the display, refer to *the MS-DOS Manual* for
            more information about the error message and perform Check 2.

Check 2   Using the T4400SXC test and diagnostic disk, format the HDD with a low level
            format. Refer to part 3, *Test and Diagnostics* for more information about the test
            and diagnostic program.

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

                      Format complete

            If you cannot format the HDD using the test and diagnostic program, perform Step
            4.

Step 3 Test Program and Replacement Checklist

The HDD test program is stored in the T4400SXC Diagnostics Disk. Perform all of the HDD tests in the Diagnostics Hard Disk Drive Test. If an error is detected during the HDD test, an error code and status will be displayed; perform Check 1. The error code and status are described in table 2-4. If an error code is not generated, the HDD is operating properly. Refer to part 3, *Test and Diagnostics* for more information about the HDD test program.

Table 2-4 Hard disk drive error code and descriptions

Code	Status
01h	Bad command
02h	Bad address mark
04h	Record not found
05h	HDC not reset
07h	Drive not initialize
09h	DMA boundary error
0Ah	Bad sector error
0Bh	Bad track error
10h	ECC error
11h	ECC recover enable
20h	HDC error
40h	Seek error
80h	Time out error
AAh	Drive not ready
BBh	Undefined
CCh	Write fault
E0h	Status error
F0h	Not sense error (HW. code=FF)

Check 1   Replace the HDD unit with a new one following the instructions in part 4, *Replacing T4400SXC Field Replaceable Units.* 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 part 4, *Replacing T4400SXC Field Replaceable Units.*

2.7 Keyboard Troubleshooting Steps

To determine if the T4400SXC's keyboard is functioning properly, perform the following steps. Start with Step 1 and continue with the other steps as required.

Step 1:   Test Program Checklist

Step 2:   Connector and Replacement Checklist

Step 1 Test Program Checklist

Execute the keyboard portion of the Diagnostic Test program. Refer to part 3, *Test and Diagnostics* for more information on how to perform the test program.

If an error occurs, perform Step 2. If an error does not occur, the keyboard is functioning properly.

Step 2 Connector and Replacement Checklist

The keyboard is connected to the system board by a 19-pin flat cable. This cable can become disconnected or damaged. Disassemble the T4400SXC as described in part 4, *Replacement Procedures* and follow the checks below:

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

```
┌─────────────────┐              ┌─────────────────────┐
│ Keyboard cable  ├──────────────┤ System board   PJ14 │
└─────────────────┘              └─────────────────────┘
```
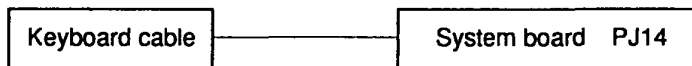
If this cable is damaged, replace it with a new one or connect it if it is disconnected. Perform step 1 again. If the keyboard is still not functioning properly, perform check 2.

Check 2   The keyboard controller on the system board may be damaged. Replace the system board with a new one. Refer to part 4, *Replacement Procedures* for more information about how to replace the system board.

2.8 Display Troubleshooting Steps

This section describes how to determine if the T4400SXC's display is functioning properly. Start with Step 1 and continue with the other steps as instructed. The steps described in this section are:

Step 1:	Brightness Control Checklist
Step 2:	External CRT Checklist
Step 3:	Test Program Checklist
Step 4:	Connector Checklist
Step 5:	Replacement Checklist

Step 1 Brightness Control Checklist

The brightness dial is on the right side of the display unit. Use the dial to adjust the display screen

If the brightness does not change when you adjust it, perform Step 2.

Step 2 External CRT Checklist

Connect the external CRT to T4400SXC's RGB port, then reboot the computer. The computer automatically detects the external CRT.

If the external CRT works correctly, the internal display may be damaged. Perform step 4.

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

Step 3 Test Program Checklist

Using the T4400SXC Diagnostics Disk, perform the display test. The display test checks the display controller on the system board.

If an error is detected, perform step 4. If an error is not detected, the display is functioning properly.

Step 4 Connector Checklist

The display unit has a display module and FL inverter. The display module and FL inverter are connected by three cables. The display module and system board are connected by two signal cables. If these cables are disconnected, connect them to the system board.

Disassemble the display unit and check this connector. Refer to part 4, for more information about how to disassemble the T4400SXC.

```
                                  ┌──────── CN1 FL inverter board
                                  │
        Display module ───────────┼──────── CN2 FL inverter board
                                  │
                                  └──────── CN3 FL inverter board

        System board──────────────┬──────── CN1 LCD module
                                  │
                                  └──────── CN2 LCD module
```
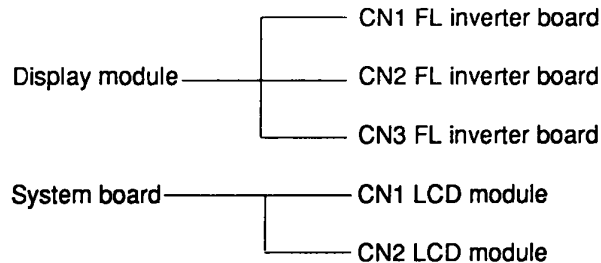
If these connectors are not connected, connect them and perform steps 1 and 2 again. If the problem still exists, perform step 5.

Step 5 Replacement Checklist

The FL inverter, display module and system board are connected to the display circuits. Perform checks 1 through 4.

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

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

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

Check 4   The system board may be damaged. Replace the system board with a new one and test the display.

3.1   The Diagnostic Test

This part explains how to use the T4400SXC's Diagnostic Test program to test the functions of the T4400SXC's hardware modules. The Diagnostics test programs consist of 18 programs that are divided into the Service Program Module (Diagnostic Menu) and the Test Program Module (Diagnostic Test Menu).

The Diagnostic Menu consists of the following eight functions:

1. DIAGNOSTIC TEST
2. HARD DISK FORMAT
3. HEAD CLEANING
4. LOG UTILITIES
5. RUNNING TEST
6. FDD UTILITIES
7. SYSTEM CONFIGURATION
8. SETUP

The Diagnostic Test Menu contains the following ten functional tests:

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

To execute the T4400SXC Diagnostic test programs you will need the following equipment to perform some of the tests:

1. The T4400SXC Diagnostics Disk (all tests)
2. A formatted working disk for the floppy disk drive test (all tests)
3. A cleaning disk kit to clean the floppy disk drive heads (test 3 Head Cleaning)
4. A printer wraparound connector for the printer wrap-around test (test 6 Printer test)
5. An RS-232-C wraparound connector for the RS-232-C port wraparound test (ASYNC test)

3.2   Executing the T4400SXC Diagnostic Test

MS-DOS is required to run the T4400SXC Diagnostic Test. To start the T4400SXC
Diagnostic Test Program follow these steps:

> *NOTE: To execute the test program , version 1.31 or later must be used.*

1. Turn on the T4400SXC. Insert the T4400SXC Diagnostics Test disk in the
    T4400SXC's internal floppy disk drive.

2. At the system prompt change to drive A, type **TESTCE44** and press **Enter**.

The following menu will appear:

```
TOSHIBA personal computer T4400SX DIAGNOSTICS
version X.XX (c) copyright TOSHIBA Corp. 1991, 92

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

PRESS [0] - [9] KEY
```

Sections 3.16 through 3.22 provide detailed descriptions for each of the
T4400SXC Diagnostic Menu options.

> *NOTE: To exit the T4400SXC Diagnostic test program press Ctrl+C. If a test
> program is in progress, press Ctrl+Break to exit the test program.*

3. To execute the Diagnostic Test Menu from the Diagnostics Menu, type **1**, and press **Enter**. The following Diagnostic Test Menu will appear:

```
TOSHIBA personal computer T4400SX DIAGNOSTICS
version X.XX (c) copyright TOSHIBA Corp. 1991, 92

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

     PRESS [1] - [99] KEY
```

Refer to sections 3.4 through 3.13 for detailed descriptions of each Diagnostic Test 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 test number you want to execute and press **Enter**. The following message will appear:

```
SYSTEM TEST                     XXXXXXX
                                     T4400SX DIAGNOSTIC TEST VX.XX
                                     [Ctrl]+[Break] ; test end
                                     [Ctrl]+[C]     ; key stop

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

     SUB-TEST MENU :

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

     SELECT SUB-TEST NUMBER   ?
```

NOTE: The message displayed by your T4400SXC may be slightly different from the one shown above.

---

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

    ```
    TEST LOOP (1:YES/2:NO) ?
    ```

    Selecting **1**, increases the pass counter by one each time the test cycle ends and restarts the test cycle.

    Selecting **2** returns the sub-test menu to the main menu after the test is complete.

6. Select **1** or **2** for the Test Loop and press **Enter**. The following message will appear:

    ```
    ERROR STOP (1:YES/2:NO) ?
    ```

    Selecting **1**, 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
    ```

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

    Selecting **2**, displays the error status, increases the error counter by one and proceeds to the next test.

7. Select **1** or **2**, for the Error stop and press **Enter** to execute the subtest chosen from the subtest menu

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

3.3   Subtest Names

Table 3-1 describes the subtest functions for each test program in the diagnostics test menu.

Table 3-1 Diagnostic test menu subtest names and functions (1/2)

No.	Test name	Subtest No.	Subtest Item
1	SYSTEM	01	ROM checksum
		02	HW status
2	MEMORY	01	RAM constant data
		02	RAM address pattern data
		03	RAM refresh
		04	Protected mode
		05	Memory module
		06	Backup memory
		07	Hard-RAM
		08	Cache memory
3	KEYBOARD	01	Pressed key display (82/84)
		02	Pressed key code display
4	DISPLAY	01	VRAM read/write
		02	Character attributes
		03	Character set
		04	80*25/30 Character display
		05	320*200 Graphics display
		06	640*200 Graphics display
		07	640*350/400/480 Graphics display
		08	Display page
		09	"H" pattern display/Border color
		10	LED/DAC pallet
		11	TFT color display
5	FDD	01	Sequential read
		02	Sequential read/write
		03	Random address/data
		04	Write specified address
		05	Read specified address
6	PRINTER	01	Ripper pattern
		02	Function
		03	Wrap around
7	ASYNC	01	Wrap around (board)
		02	Board (#1) <=> board (#2)
		03	Point to point (send)
		04	Point to point (receive)
		05	Card modem loopback (1200 BPS)
		06	Interrupt test

Table 3-1 Subtest names (2/2)

No.	Test name	Subtest No.	Subtest Item
8	HDD	01	Sequential read
		02	Address uniqueness
		03	Random address/data
		04	Cross talk & peek 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

3.4 System Test

To execute the T4400SXC System Test select 1 from the Diagnostics Test Menu, press **Enter** and follow the directions displayed on the screen. The system test contains two subtests that test the ROM checksum and the Hardware Status of the T4400SXC. Typing 1, and pressing **Enter** executes the ROM checksum test and typing 2, and pressing **Enter** executes the H/W status test.

Subtest 01   ROM checksum

The ROM checksum tests the T4400SXC's system board from address F0000h - FFFFFh (64KB).

Subtest 02   H/W status

This test reads and displays the T4400SXC's hardware status as shown below:

```
                  76543210
H/W status = 10001000

    Bit7 —              =
    Bit6 — CPU clock    = 25MHZ
    Bit5 — Notch signal = 2HD
    Bit4 — FDD type     = 2MB
    Bit3 —              =
    Bit2 — Drive A/B    = Ext. = B
    Bit1 — External FDD = OFF
    Bit0 — Internal FDD = 2HD
```

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

Table 3-2 T4400SXC hardware bit status

Bit	H/W status	1	0
7	Reserved	—	—
6	CPU clock speed	12.5 MHz	25 MHz
5	Media type	2DD	2HD
4	FDD type	1.6 MB	2 MB
3	Reserved	—	—
2	Drive A/B	A	B
1	External FDD	ON	OFF
0	Internal FDD	2DD	2HD

3.5 Memory Test

To execute the T4400SXC Memory Test select, 2 from the Diagnostics Test Menu, press **Enter** and follow the directions displayed on the screen. The Memory test contains seven subtests that test the following T4400SXC memories; RAM constant data, RAM address pattern data, RAM refresh (real mode), protected mode, memory module, backup memory, and Hard-RAM. Select the number corresponding to the subtest you want to execute and press **Enter**.

Subtest 01   RAM Constant Data

The RAM constant data subtest writes constant data FFFFh, AAAAh, 5555h, 0101h, and 0000h to conventional memory (0 to 640KB). The constant data is then read from conventional memory and compared to the original data.

Subtest 02   RAM Address Pattern Data

The RAM address pattern data subtest writes address pattern data created by the eXclusive-ORing (XORing), to the address segment and address offset in conventional memory (0 to 640KB). The address pattern data is then read from conventional memory and compared to the original data.

Subtest 03   RAM Refresh (Real Mode)

The RAM refresh subtest writes a 256-byte unit of constant data (AAAAh and 5555h) to conventional memory (0 to 640KB). This data is then read from conventional memory and compared to the original data.

> *NOTE: The size of the data being read and written to conventional memory causes a short delay between write and read operations.*

Subtest 04   Protected Mode

The protected mode subtest writes constant data FFh, AAh, 55h, 00h and address data to extended memory from addressed 100000h to the maximum address. The data is then read from extended memory and compared to the original data.

Subtest 05   Memory Module

> *NOTE: To execute the this subtest, an optional memory card must be installed in the T4400SXC.*

This subtest is the same as subtest 04, and is used to test an optional memory card. Memory modules for the T4400SXC are available in 2 MB, 4 MB, 8 MB and 16 MB capacities.

When you select subtest five the following message appears:

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

Select the number that corresponds to the memory card size installed in the T4400SXC.

Subtest 06   Backup Memory

This subtest writes constant data 0000h, 5555h, AAAAh, and FFFFh to memory from address E8000h to EFFFFh. The data is then read and compared to the original data.

Subtest 07   Hard-RAM

> *NOTE: To execute this subtest, Hard-RAM must be set on the system.*

The Hard-RAM subtest writes a word unit of constant data 0000h, 5555h, AAAAh, and FFFFh to memory from address E0000h to E7FFFh. The data is then read and compared to the original data. This subtest also executes the paging test for page data.

Subtest 08   Cache Memory

This subtest writes constant data AAh and 55h to the T4400SXC's cache memory. Then it reads the data written to the cache memory and compares it with the original data.

3.6   Keyboard Test

To execute the T4400SXC Keyboard Test, select 3 from the Diagnostics Test Menu, press
Enter and follow the directions displayed on the screen. The Keyboard test contains two
subtests that test the T4400SXC's keyboard actions. Select the number corresponding to the
subtest you want execute and press **Enter**.

Subtest 01   Pressed Key Display (82/84)

> *NOTE: The Num Lock key must be off to execute the pressed key display
> subtest.*

When you execute the pressed key display test, 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.

```
KEYBOARD TEST       IN PROGRESS        301000
```



```
[Print:Alt+SysReq,  Pause:Ctrl+Break]
IF TEST OK, PRESS [DEL] THEN [ENTER] KEY
```

Subtest 02   Pressed Key Code Display

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

```
KEYBOARD TEST        IN PROGRESS        302000

            Scan code        =
            Character code   =
            Keytop           =

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

PRESS [ENTER] KEY
```

3.7 Display Test

To execute the T4400SXC Display Test select 4 from the Diagnostics Test Menu, press **Enter** and follow the directions displayed on the screen. The Keyboard test contains ten subtests that test the T4400SXC's display in various modes. Select the number corresponding to the subtest you want execute and press **Enter**.

Subtest 01   VRAM Read/Write

The VRAM read/write 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 and 13h

The character attributes 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) using black, blue, red, magenta, green, cyan, yellow, and white from the color display. The display below appears on the screen when the character attributes test is run.

```
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
```

After pressing **Enter**, 16 colors of mode 13h appear in 320 X 200 graphics mode as shown below:

```
320*200 GRAPHICS DISPLAY [ 13 ]
```

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

```
PRESS [ENTER] KEY
```


Subtest 03   Character Set

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

```
CHARACTER SET IN 40*25
```

☺☻♥♦♣♠•◘○◙♂♀♪♫☼►◄↕‼¶§▬↨↑↓→←∟↔▲▼! "#$%&'
( )*+,-./ 0123456789 :;<=>?@ ABCDEFGHIJKLMNO
PQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvw
xyz{|}~⌂ÇüéâäàåçêëèïîìÄÅÉæÆôöòûùÿÖÜ¢£¥₧ƒ
áíóúñÑªº¿⌐¬½¼¡«»░▒▓│┤╡╢╖╕╣║╗╝╜╛┐└┴┬├─┼╞╟
╚╔╩╦╠═╬╧╨╤╥╙╘╒╓╫╪┘┌█▄▌▐▀αßΓπΣσµτΦΘΩδ∞φε∩
≡±≥≤⌠⌡÷≈°∙·√ⁿ²■

```
PRESS [ENTER] KEY
```

Subtest 04   80*25/30 Character Display Mode 12

In this subtest, the character string is displayed shifting one character to the right, line by line in the 80*25 and 80*30 character modes as shown below.

```
80*XX CHARACTER DISPLAY
01234567890123456789012345678901234567890123456789012345678901234567
 !"#$%£'()*+,-./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
```

Subtest 05   320*200 Graphics Display Mode 4 and D

This subtest displays the following two color sets for the color display in 320*200 dots graphics mode 4 and D as shown below:

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

GREEN	RED	YELLOW
CYAN	MAGENTA	WHITE

PRESS [ENTER] KEY

Subtest 06   640*200 Graphics Display Mode 6 and E

This subtest displays the even dots, odd dots, and all dots block in 640*200 dots graphics mode 6 and E as shown below.

`640*200 GRAPHICS DISPLAY`

EVEN DOTS	ODD DOTS	ALL DOTS
DRIVEN	DRIVEN	DRIVEN
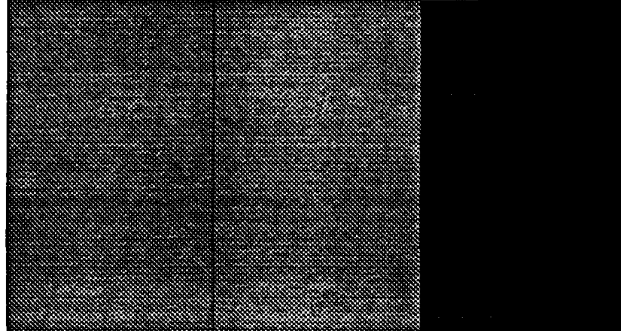
`PRESS [ENTER] KEY`

Subtest 07   640*350/400/480 Graphics Display Mode 10, 12 and 74

This subtest displays the even dots, odd dots, and all dots block in 640*350 and 640*480 dots graphics mode 10, 12 and 74 (PDC mode only) as shown below.

`640*XXX GRAPHICS DISPLAY : [XX]`

EVEN DOTS	ODD DOTS	ALL DOTS
DRIVEN	DRIVEN	DRIVEN

`PRESS [ENTER] KEY`

Subtest 08   Display Page

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

```
DISPLAY PAGE 0

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

Subtest 09   H Pattern Display/Border Color

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

```
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
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HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
HHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHHH
```

Pressing **Enter** displays the following message:

```
Setting the CRT (1:Yes/2:No)
```

If an external CRT display is connected to the T4400SXC, choose **1** to display the following message:

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

Press **Enter** to execute the border color test.

Subtest 10   LED/DAC Pallet

This subtest checks the LED Speed, Caps Lock and Num Lock key operations by writing 2Ah/15h data to 6 bits of 256*3 (RGB). This data is then read and compared to the original data.

```
[ Speed/Caps/Num/Overlay LED test ]

    (1)  Press [ Fn + Pgdn ] key !...Speed    (red)
    (2)  Press [ Fn + Pgup ] key !...Speed    (green)
    (3)  Press [ Caps Lock ] key !...Caps     (on/off)
    (4)  Press [ Num lock  ] key !...Num      (on/off)
    (3)  Press [ Fn        ] key !...Overlay  (on/off)

PRESS [ENTER] KEY
```

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

```
[Processor latch test] =
Processor latchtest (1:256 times, 2:endless) ?
```

Subtest 11   TFT Color Display

This subtest displays the 64 and 256 gray scale about red, green, and blue.

3.8   Floppy Disk Test

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

To execute the T4400SXC Floppy Disk Test, select 5 from the Diagnostics Test Menu, press **Enter** and follow the directions displayed on the screen. The Floppy Disk test contains five subtests that test the T4400SXC's internal floppy disk drive. The following messages will appear after selecting the Floppy Disk Test from the Diagnostics Test Menu. Answer each of the following questions 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 of the floppy disk in the test drive to be tested, and press **Enter**.

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

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

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

4. The subtest menu for the floppy disk test 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

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

    The first three numbers in the ADDRESS number (XXX) indicate which cylinder number is being tested. The fourth number (X) indicates the head number, and the last two numbers (XX) indicate the sector number being tested.

    The first number in the STATUS number (X) indicates the drive number being tested and the last two numbers (XX) indicate the error status code.

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): Track 0 to 39.

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

The start track is specified when the FDD test is started. Refer to step 4 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 1. 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 T4400SXC Printer Test, select **6** from the Diagnostics Test Menu, press **Enter** and follow the directions displayed on the screen. The Floppy Disk test contains three subtests that test the printer output connected to the T4400SXC. The following messages will appear after selecting the Printer Test from the Diagnostics Test Menu Answer each of the following questions with an appropriate response to execute the test.

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

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

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

The printer I/O port address is specified by the XXXXh number. The T4400SXC supports three printer channels. Select the printer channel number, and press **Enter** to start the subtest.

Subtest 01   Ripple Pattern

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

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

Subtest 02   Function

This subtest prints the various print types shown below:

```
   PRINTER TEST
1.   THIS LINES SHOWS NORMAL PRINT.
2.       THIS  LINE  SHOWS  DOUBLE  WIDTH  PRINT.
3.  THIS LINE SHOWS COMPRESSED PRINT.
4.   THIS LINE SHOWS EMPASIZED 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 T4400SXC's printer port. The printer wraparound connector (34M741986G01) wiring diagram is described in Appendix F.*

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

3.10   Async Test

To execute the T4400SXC Async Test, select **7** from the Diagnostics Test Menu, press **Enter** and follow the directions displayed on the screen. The async test contains six subtests that test the T4400SXC's asynchronous communication functions.

Subtests 01 through 04 require the following data format:

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

The following message will appear when subtests 01, 3 to 5 are selected:

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

The serial I/O port address is specified by the XXXXh number.

The T4400SXC supports three serial port channels. Select the serial port channel number, and press **Enter** to start the subtest.

Subtest 01   Wraparound (board)

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

> *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 F.*

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

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

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

Subtest 03   Point to Point (Send)

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

This subtest sends 20h through 7Eh data to the receive side, then receives the sent data and compares it to the original data.

Subtest 04   Point to Point (Receive)

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

Subtest 05   Card Modem Loopback (1200 BPS)

> *NOTE: To execute this subtest, a built-in modem must be installed.*

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

When you select the channel number of the serial port and press **Enter**, the following message appears:

```
Baud rate select (0:110BPS, 1:300BPS, 2:1200BPS) ?
```

Subtest 06   Interrupt Test IRQ 4, 3 and 5

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

3.11   Hard Disk Test

To execute the T4400SXC Hard Disk Test, select **8** from the Diagnostics Test Menu, press **Enter** and follow the directions displayed on the screen. The hard disk test contains ten subtests that test the T4400SXC hard disk drive functions. The following messages will appear after selecting the hard disk test from the Diagnostics Test Menu. Answer each of the following questions with an appropriate response to execute the test

> *CAUTION: The contents of the hard disk will be erased when subtest 02, 03, 04, 05, 06, 08, 09, or 10 is executed. Before running the test, transfer the contents of the hard disk to a floppy disk(s). This can be done with the MS-DOS BACKUP command.*
> *After the test, execute the MS-DOS FDISK command, which will set the partition. Then execute the MS-DOS FORMAT command. Refer to the MS-DOS manual for details.*

1. When you select the hard disk test from the Diagnostic Test Menu, the following message will appear.

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

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

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

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

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

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

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

5. This message is used to select whether or not the HDD status is displayed on the screen. The HDD status is described in section 3.15. Select **1** or **2** and press **Enter**. The subtest menu for the hard disk test will appear.

6. During the hard disk test, the following message will appear:

```
HARD DISK TEST                        XXXXXXX

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

The first three digits of the ADDRESS number are the cylinder number being tested, the fourth digit is the head number and the last two digits are the sector number. The first digit of the STATUS number is the drive number being tested and the last two digits are the error status code.

Subtest 01   Sequential Read

The sequential read test 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

The address uniqueness test 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

The random address/data 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 & Peek 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: B5ADADh, 4A5252h, EB6DB6h, 149249h
63B63Bh, 9C49C4h, 2DB6DBh, D24924h

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 T4400SXC Real time test, select **8** from the Diagnostic Test Menu, press
Enter and follow the directions on the screen. The real timer test contains three subtests that
test the T4400SXC's real timer functions.

Subtest 01   Real Time

A new date and time can be input during the Real Time subtest, when the
current date and time are displayed.
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 Enter new time prompt will appear as shown
below:

```
        Enter new time :
```

3. If the current time is not correct, input the correct time. After pressing
Enter the test returns to the subtest menu in the REAL TIME TEST.

Subtest 02   Backup Memory

This subtest writes 1-bit of "on" data to addresses 01h through 80h, 1-bit of
"off" data to addresses FEh through 7Fh, and AAh through 55h to the RTC 50
bytes backup memory (addressed 0Eh to 3Fh), then reads and compares it with
the original data.

Subtest 03   Real Time Carry

```
| CAUTION: This test erases, the current date and time. |
```

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

```
(month, day, year, hour, minute, and second).
```

3.13   Numeric Data Processor Test

NOTE: To execute this test, the 80486SX CPU must be changed to an 80486DX CPU.

Subtest 01   NDP test

This test checks the following functions of the numeric data processor:

- ☐   Control word
- ☐   Status word
- ☐   Bus
- ☐   Addition
- ☐   Multiplication

This test determines whether or not an NDP is installed by sending 1 bit=1 to the NDP. If the test determines that an NDP is installed, the test is executed.

This test also determines if the CPU is a 486SX without an NDP or a DX with the NDP. If the 486SX is installed, the test isn't executed. If the 486DX is installed, the test is executed.

3.14   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 Change
	14	Memory Read/Write Error
	1B	H-RAM Mapping Error
	1C	H-RAM Read/Write Error
FDD	01	Bad Command
	02	Address Mark Not Found
	03	Write Protected
	04	Record Not Found
	06	Media Removed
	08	DMA Overrun Error
	09	DMA Boundary Error
	10	CRC Error
	20	FDC Error
	40	Seek Error
	60	FDD Not Drive
	80	Time Out Error
	EE	Write Buffer Error
PRINTER	01	Time Out
	08	Fault
	10	Select Line
	20	Out Of Paper
	40	Power Off
	80	Busy Line
ASYNC	01	DSR On Time Out
	02	CTS On Time Out
	04	RX-Ready Time Out
	08	TX-BUFFER Full Time Out
	10	Parity Error
	20	Framing Error
	40	Overrun Error
	80	Line Status Error
	88	Modem Status Error
	33	NO CARRIER (Card Modem)
	34	ERROR (Card Modem)
	36	NO DIAL TONE (Card Modem)

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

Device name	Error code	Error status name
HDD	01	Bad Command Error
	02	Bad Address Mark Error
	04	Record Not Found
	05	HDC Not Reset
	07	Drive Not Initialize
	09	DMA Boundary Error
	0A	Bad Sector
	0B	Bad Track Error
	10	ECC Error
	11	ECC Recover Enable
	20	HDC Error
	40	Seek Error
	80	Time Out Error
	AA	Drive Not Ready
	BB	Undefined
	CC	Write Fault
	E0	Status Error
NDP	01	No CO-PROCESSOR
	02	Control Word Error
	03	Status Word Error
	04	Bus Error
	05	Addition Error
	06	Multiple Error

3.15 Hard Disk Test Detail Status

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

    HDC status = XXXXXXXX

Specific information about the hard disk test error is displayed on the screen by an eight-digit number. The first four digits, XXXX represent the error status number and the last four digits, XXXX 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 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 to transfer data. "1" ----Drive is ready for data transfer.
2	CORR (Corrected data)	"0" ----Otherwise "1" ----Correctable data error is corrected.
1	IDX (Index)	"0" ----Otherwise "1" ----Index is sensed.
0	ERR (Error)	"0" ----Otherwise "1" ----The previous command was terminated with some error.

Table 3-5 Error register contents

Bit	Name	Description
7	BBK (Bad block mark)	"0" ----Otherwise "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" ----Otherwise "1" ----There was no ID field in the requested sector.
3		Not used
2	ABRT (Abort)	"0" ----Otherwise "1" ----Illegal command error or a drive status error occurs.
1	TK09 (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.

3.16 Hard Disk Format

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

- ☐ Low level formatting
- ☐ MS-DOS formatting

This hard disk format program low level formats the hard disk and executes the following hard disk format and checks:

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 program, transfer the contents of the hard disk onto a floppy disk. This can be done with the MS-DOS BACKUP command. See the MS-DOS manual for details.*

3.16.1 Program Description

1. All track FORMAT

    The all track format low level formats all the tracks on the hard disk as shown in Table 3-6 below:

> *NOTE: Before executing the all track format, check for bad tracks using the Bad track CHECK or the bad track level on HDD.*

Table 3-6 Hard disk formatting sequence

Items	80 MB			120 MB	
	(COP2084)	(JDE2085E)	(MK2024FE)	(CP2124)	(MK2124FC)
Sector sequences	1	1	1	1	1
Cylinders	0 to 548	0 to 614	0 to 987	0 to 761	0 to 933
Heads	0 to 7	0 to 15	0 to 9	0 to 7	0 to 15
Sectors	1 to 8	1 to 17	1 to 17	1 to 39	1 to 17
Sector length (bps)	512	512	512	512	512

2. Good track FORMAT

The good track format, formats a specified cylinder and track as a good track. If a good track is formatted as a bad track, use this program to change the track to a good track.

3. Bad track FORMAT

The bad track format, formats a specified cylinder and track as a bad track. If a bad track is detected, use this program to label it as a bad track.

4. Bad track CHECK

The bad track check, 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.

3.16.2 Operations

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

1. 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 - Exit to DIAGNOSTICS MENU

Press [NUMBER] key ?
```

2. All track format selection

(1) Selecting the all track format displays the following message:

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

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

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

(3) Select an interleave number (usually 1) and press **Enter**. The following display will appear:

```
Unlock Format select (1:no,2:yes) ?
```

(4) Press **1**, then **Enter**. Only "1:no" can be selected; "2:yes" is not valid.

The following message will appear:

```
[ HDD TYPE ] : CYLINDER = XXXX
[ HDD TYPE ] : HEAD     = XX
[ HDD TYPE ] : SECTOR   = XX

[ WARNING : Current DISK data will be
        completely destroyed ]

Press [Bad track number (CCCCHH)] key ?
```

(5) Enter the cylinder and head number of the bad tracks on the HDD and press **Enter**. The cylinder number is represented by CCCC and HH is the head number. If the HDD does not have any bad tracks, press **Enter**. The [[cylinder, head = XXXX XX]] message will appear and all the cylinders in the hard disk will be formatted and checked.

(6) After formatting the hard disk, execute the verify check program. When the verify check program is complete, the following message will appear:

```
Format complete
```

(6) Press **Enter** to return to the Hard Disk Format menu.

3. Good track format or bad track format selection

(1) When the good track format or bad track format is selected, the following message will appear.

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

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

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

(3) Select an interleave number (usually 1) and press **Enter**. The following message will appear.

```
[ HDD TYPE ] : CYLINDER = XXXX
[ HDD TYPE ] : HEAD     = XX
[ HDD TYPE ] : SECTOR   = XX

Press [Track number (CCCCHH) key ?
```

(4) Type the four digit track number and press **Enter**. The first three digits are the cylinder number and the last digit is the head number. This formats either good tracks or bad tracks as indicated.

> *NOTE: This program can format only one track per operation. Repeat the operation as many times as necessary to format several good tracks or bad tracks.*

(5) After a track on the hard disk has been formatted the following message will be displayed:

```
Format complete
```

(6) Press **Enter** to return to the Hard Disk Format menu.

4. Bad track check selection

(1) When the bad track check is selected, the following message will appear:

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

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

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

(3) Select an interleave number (usually 1) and press **Enter**. The following message is displayed, and the bad tracks on the hard disk are checked.

```
[ HDD TYPE ] : CYLINDER = XXXX
[ HDD TYPE ] : HEAD     = XX
[ HDD TYPE ] : SECTOR   = XX

[[cylinder, head = XXXX XX]]
```

(4) After checking the bad tracks on the hard disk the following message will appear:

```
Format complete
```

(5) Press **Enter** to return to the Hard Disk Format menu.

3.17 Head Cleaning

3.17.1 Program Description

This program 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.

3.17.2 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 and 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 Diagnostics Menu when the program is finished.

3.18   Log Utilities

3.18.1   Program Description

This program logs error information generated while a test is in progress and stores the results in RAM. This program 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

3.18.2   Operations

1. Selecting 5 and pressing **Enter** in the Diagnostics Menu, logs error information into RAM or on the floppy disk. The error information is displayed in the following format:

```
       XXXXX ERRORS
   CNT T-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]]
[[1:Ne:Prev,3:Exit,4:Clear,5:Print,6:Fdlog read,7:FD log write]]

2. The error information displayed on the screen can be manipulated by the following key operations:

    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," the capital "R" will be placed at the beginning of error status but, is not added to the error count.

3.19 Running Test

3.19.1 Program Description

This running test program automatically executes the following tests in sequence:

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

The system automatically chooses the number of floppy disk drives connected to the T4400SXC for the FDD test.

3.19.2 Operations

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

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

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

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

   Selecting Yes executes the printer wraparound test. A printer wraparound connector must be connected to the PRT/FDD port on the back of the T4400SXC 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 **Yes** executes the ASYNC wraparound test. An RS-232-C wraparound connector must be connected to the RS-232-C port on the back of the T4400SXC to properly execute this test.

4. Select **Y** or **N** and press **Enter** to start the test.

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

3.20   Floppy Disk Drive Utilities

3.20.1   Program Description

The FDD Utilities program formats the FDD, copies the floppy disk and displays the dump list for both the FDD and HDD.

1. FORMAT

   +--+
   | *CAUTION: This program is only for testing a floppy disk drive. The* |
   | *program is different than the MS-DOS FORMAT command.* |
   +--+

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

   (1) 2D: Double-sided, double-density, 48/67.5 TPI, MFM mode, 512 bytes, 9 sectors/track.

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

   (3) 2HD: Double-sided, high-density, double-track, 96/135 TPI, MFM mode, 512 bytes, 18 sectors/track.

2. COPY

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

3. DUMP

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

3.20.2   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

PRESS [1] - [9] KEY
```

2. Format selection

   (1) Selecting format displays the following message:

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

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

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

   ```
   Type select (0:2DD-2DD,1:2D1-2D,2:2D-2HD,3:2HD-2HD) ?
   ```

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

   ```
   Warning : Disk data will be destroyed.

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

   (4) Remove the Diagnostics Disk from the FDD and 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) ?
   ```

   (5) Typing **1**, displays the message from step 3. Typing **2** returns the test to the Diagnostics Menu.

3. Copy selection

   (1) 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) ?
   ```

   (2) 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.
   ```

(3) Remove the Diagnostics Disk from the FDD and 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 ]]
```

(4) Remove the source disk from the FDD, insert a formatted working 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 to large to be copied in one operation the message from step 2 is displayed again. After the floppy disk has been copied, the following message will appear:

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

(5) To copy another disk type **1** and the message from step 1 will be displayed again. Entering **2** returns the test program to the Diagnostics Menu.

4. Dump selection

(1) When dump is selected, the following message appears.

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

(2) Select a format type number. Type the number. If 3 is selected, the display will go to the message (5) below.

```
0: Displays a dump list for a floppy disk (2DD).
1: Displays a dump list for a floppy disk (2D).
2: Displays a dump list for a floppy disk (2HD).
3: Displays a dump list for a hard disk.
```

(3) If 0, 1, or 2 is selected, the following message will appear. If 3 is selected, the dump list will appear.

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

(4) Select an FDD drive number and the following message will appear:

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

(5) Remove the Diagnostics Disk from the FDD and insert a source disk. Press any key and the following message will appear:

```
— Max. address —
    [Track ] = XXXX
    [ Head ] = XX
    [Sector] = XX
    Track  number ??
```

(6) Type the track number and press **Enter**. The following message will appear:

```
Head    number   ?
```

(7) Type the head number and press **Enter**. The following message will appear:

```
Sector number ??
```

(8) Type the sector number and press **Enter**. The dump list will be displayed.

(9) After a dump list appears on the screen, the following message will appear:

```
Press number key (1:up,2:down,3:end)  ?

1:   Displays the next sector dump.
2:   Displays a previous sector dump.
3:   Displays the following message.

Another dump (1:Yes/2:No)  ?
```

(10) If you type **1**, the display will return to the message shown after step 1. If you type **2**, the display will return the test program to the Diagnostics Menu.

3.21　System Configuration

3.21.1　Program Description

The System Configuration program contains the following configuration information for the T4400SXC:

1. BIOS ROM version
2. Base memory size
3. Display mode
4. A number of floppy disk drives
5. A number of ASYNC ports
6. A number of hard disk drives
7. A number of printer ports
8. Co-processor
9. Extended memory size

3.21.2　Operations

Selecting 8 from the Diagnostics Menu and pressing **Enter** displays the following system configuration:

```
SYSTEM CONFIGURATION :

    * - BIOS ROM VERSION = VX.XX
    * - 640KB MEMORY
    * - COLOR/GRAPH(80 Column)
    * - 1 FLOPPY DISK DRIVE(S)
    * - 1 ASYNC ADAPTER
    * - 1 HARD DISK DRIVE(S)
    * - 1 PRINTER ADAPTER
    * - 0 MATH CO-PROCESSOR
    * - XXXXXKB EXTENDED MEMORY

    PRESS [ENTER] KEY ?
```

Press **Enter** to return to the Diagnostic Menu.

3.22   SETUP

3.22.1   Program Description

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

1.   Memory
     (1)   Total
     (2)   Base
     (3)   Extended memory
     (4)   Hard RAM
     (5)   Shadow BIOS ROM

2.   Display (LCD model)
     (1)   Display adapter
     (2)   Display device
     (3)   LCD display mode
     (4)   LCD display colors

3.   Hard disk

4.   Time & date

5.   COM/PRT/FDD
     (1)   Serial port/Built-in modem
     (2)   Built-in modem power
     (3)   External FDD/PRT
     (4)   Printer port type

6.   Power-on password

7.   Others
     (1)   Resume mode
     (2)   Battery save mode
     (3)   Cache
     (4)   Pop-up
     (5)   Speaker
     (6)   Battery alarm

8.   Battery save option
     (1)   Processing speed
     (2)   CPU sleep mode
     (3)   HDD auto off
     (4)   Display auto off
     (5)   LCD brightness

3.22.2 Accessing the SETUP

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

```
                              T4400SX SETUP

  ┌─ MEMORY ──────────────────┐    ┌─COMM/PRT/FDD ─────────────────┐
  │                           │    │ Serial Port      =COM1(IRQ4/3F8H) │
  │ Total        = 4096KB     │    │ Built-in Modem   =COM2 (IRQ3/2F8H) │
  │ Base         =  640KB     │    │                               │
  │ Extended     = 3328KB     │    │ External FDD/PRT =Printer      │
  │ Hard RAM     =    0KB     │    │ Printer Port Type=Output       │
  │ Shadow BIOS ROM =  128KB  │    └───────────────────────────────┘
  └───────────────────────────┘
                                   ┌─ POWER ON PASSWORD ───────────┐
  ┌─ DISPLAY ─────────────────┐    │                               │
  │ Display Adaptor  =VGA Compatible │ Not Registered               │
  │ Display Device   =LCD     │    └───────────────────────────────┘
  │ LCD Display Mode  =Color  │
  │ LCD Display Colors=180K Colors │  ┌─OTHERS────────────────────────┐
  │                           │    │ Resume Mode        = Resume   │
  └───────────────────────────┘    │ Battery Save Mode  = User setting │
                                   │                               │
  ┌─HARD DISK─────────────────┐    │ Cache              = Enable    │
  │ Capacity    = 120MB       │    │ Popup              = Enable    │
  └───────────────────────────┘    │ Speaker            = On        │
                                   │ Battery Alarm      = On        │
  ┌─ TIME & DATE──────────────┐    └───────────────────────────────┘
  │ 00:00:00,  Mon Jan 01, 1991 │
  └───────────────────────────┘
```

↑↓←→: Select items, Spce, BkSp : Change values
Esc: Exit without saving, Home: Set default values, End: Save and reboot

3.22.3   Changing SETUP Values

You can change the setup options automatically or manually.

Automatic Reset

Follow these steps to set the values automatically:

1.   Press **Home**. This instructs the program to reset all the options to their factory preset values.

     The program calculates how much base and extended memory your T4400SXC has, based on whether or not you have expansion memory card installed.

     The T4400SXC SETUP menu displays the new values.

2.   Confirm that the new values are correct. To change any option(s), go to the next item, Manual Reset.

3.   If the new values are correct, press **End** to record the new values in configuration memory.

     4. Go to step 5 of the next item, *Manual Reset*.

Manual Reset

Follow these steps to change any option(s) manually:

1.   Notice the cursor (reverse display highlight bar). This cursor indicates which option is selected for change.

2.   Use the arrow keys to move the cursor between options. You can also select each option group by pressing the character on the keyboard corresponding to the first character of the heading for each option group. For example, if you press **D**, the cursor moves to the top of the option group, DISPLAY.

3.   When the cursor highlights the value of an option you want to change, use the space and backspace keys to select alternate values.

4.   When you finish making changes, press **End** to record the new values in configuration memory.

5.   SETUP displays the following message:

     ```
     Save Settings And Reboot? (Y/N)
     ```

     Review your changes. If you need to make more alterations, press **N** and go back to step 2.

6.   If the new values are correct, press **Y**. They are recorded into CMOS memory and the system restarts.

     In case you registered a power on password on the T4400SXC, SETUP displays this message along with the message above. Refer to the section "Power on Password" in this manual to register a password.

     ```
     Insert Password Disk if necessary.
     ```

If you create a password service disk, insert a disk in drive A before pressing Y. When you press Y, the FDD disk-in-use light glows and the password service disk is created. When the creation of the password service disk is completed, the FDD disk-in-use light goes off and this message appears.

```
Remove the Password Service Disk and press any key.
```

Remove the password service disk from the disk drive and press any key. The new values are recorded into CMOS Memory and the system restarts. Save the password service disk in safe place. The password service disk will help you to startup the computer when you forget the password.

> *CAUTION: You can use either unformatted or formatted disk for a password service disk. Be careful not to use a disk containing data, or you loose all data on the disk.*

3.22.4   SETUP Option Descriptions

This subsection explains the possible values for each SETUP option.

Memory

Total Amount of Built-in Memory

The SETUP program calculates the total amount of memory that is built in to the T4400SXC and displays it. This is only for your information and cannot be changed.

Base Memory

The SETUP program displays the amount of base memory, 640 KB. This is for your information only and cannot be changed. Base memory is also called conventional memory in other sections of this manual.

Extended Memory

The SETUP program calculates the amount of extended memory. This is only for your information and cannot be changed.

Hard RAM

This option configures part of extended memory as Hard RAM. To configure Hard RAM, you can choose from 128 KB to a maximum of 19712 KB in 64 KB increments. The default value is 0 KB.

Shadow BIOS ROM

The SETUP program displays 128 KB of RAM is reserved for the shadow BIOS ROM. This is only for your information and cannot be changed.

---

*NOTE: There is not an option to select expanded memory in **System Configuration Setup**. You need to include the **Expanded Memory Manager (EMM386.EXE)** in your CONFIG.SYS file to emulate expanded memory in extended memory.*

Display

Display Adaptor

This option illustrates how the internal display adaptor is enabled. If you want to enable the internal display adaptor, select VGA Compatible so that the T4400SXC's internal display adaptor is enabled. The following three additional setup options are displayed:

> Display Device
> LCD Display Mode
> LCD Display Colors

If you select **Not Used,** the internal display adaptor is disabled. You can then install any external display controller card in the Desk Station IV. Additional setup options are not displayed.

Display Device

This option selects between using the CRT only (CRT mode), and using both the CRT and the color LCD display simultaneously (dual display mode). In either case, if a CRT is connected to the T4400SXC, the display mode of the color LCD display is set to either color or monochrome, according to the type of the CRT (color or monochrome). In the dual display mode, the display mode of the color LCD display agrees with the mode of the CRT. In this case, the border section of the CRT is not displayed on the color LCD display.

> LCD: Specifies the dual display mode. This is the default setting.
>
> CRT: Specifies the CRT mode.

LCD Display Mode

If there isn't a CRT attached to the T4400SXC, this option selects whether the color LCD display uses monochrome mode or color mode. If there is a CRT attached to the T4400SXC, the display mode of the color LCD display is determined by the type of the CRT (either monochrome or color), and the setting for this option has no effect.

> Color: Displays in color mode. Displays in a maximum of 512 or 180 K colors. This is the default setting.
>
> Monochrome: Displays in the monochrome mode. Displays levels of gray at various intensities.

LCD Display Colors

This option selects whether the color LCD display supports 512 colors or 180K colors. This option appears only if you selected color for the LCD display mode. The default setting is 180K. Select 512 colors if you don't get an adequate display with the default setting.

     180K colors: Supports 180K colors.

     512 colors: Supports 512 colors

Hard Disk

Hard Disk Setting

You choose one of the hard disk settings by using the space and backspace keys.

     Capacity = 80 MB or 120 MB
     No Drive

Time & Date

The System Configuration Setup displays the current time and date values indicated by the calendar clock timer which is T4400SXC battery supplied. You can change these values by using the space and backspace keys.

COM/PRT/FDD

Serial Port/Built-in Modem

This option allows you to select either of COM levels, **COM1** or **COM2**, for the **Serial Port** and the **Built-in Modem**.

The serial port interrupt level (IRQ) and I/O port base address for each COM level are shown below:

COM level	Interrupt level	I/O address
COM1	4	3F8h
COM2	3	2F8h

You can also disable each port by selecting **Not Used**. By doing this you can install an optional card in one of the expansion chassis without any conflict with the COM levels of the serial port of the optional built-in modem.

The COM levels for each of the two option fields must be different.

The SETUP program checks the selected COM level, and selects Not Used if the same COM level is selected for two option fields.

The default settings are:

     Serial Port: COM1
     Built-in Modem: COM2

Built-in Modem Power

This option appears only if a built-in modem is installed.

Use this option to turn the optional built-in modem's power on or off.

On: Turns on the optional built-in modem.
Off: Turns off the optional built-in modem.

External FDD/PRT

This option sets the assignment of the parallel port (PRT/FDD). Set this option to Printer to configure the port for a parallel printer. Set this option to **FDD A** or **FDD B** to use an external 5-1/4" floppy disk drive. Set it to **FDD A** if you want the external drive to be drive A; set it to **FDD B** if you want the external drive to be drive **B**.

This table is a quick reference to the External FDD/PRT setting.

Option setting	External drive ID	Internal drive ID
FDD A	A	B
FDD B	B	A
Printer	None	A

Printer Port Type

This option sets the **PRT/FDD** connector on the rear panel of the T4400SXC to either an output-only or a bi-directional port. This option is valid only when the **External FDD/PRT** option is set to printer. This setting depends on the printer or other parallel devices you attach to the **PRT/FDD** connector.

The options are:

Output
Bi-Directional

When you have a printer connected, you should usually select the **Output**.

Power on Password

This option allows you to set or reset the power on password.

If no power on password has been set, the SETUP program displays *Not Registered*. To set the power on password, follow these steps:

Press the **Space** or **BkSp** key, and the following prompt message appears:

```
Password =
```

Enter a password consisting of up to 10 characters. The character string you enter is displayed as a string of asterisks. For example, if you enter a password consisting of four characters, the display is:

```
Password = ****
```

Press **Enter**, and the following message appears allowing you to verify the password.

```
Verify Password =
```

Re-enter the same character string you just entered and press **Enter**. If the two character strings match, the password is registered and the display changes to:

```
Registered
```

If they do not match, the following message appears along with a beep indicating you must repeat the last two steps.

```
Entry Error!
```

Once the power on password is set, the SETUP program displays Registered. To reset the power on password, follow these steps:

Press the **Space** or **BkSp** key, then the following prompt message appears:

```
Password =
```

Enter the currently registered password. The character string you enter is displayed as a string of asterisks.

```
Password = ****
```

Press **Enter**. If the character string you enter matches the registered password, the password option is reset and the display changes to:

```
Not Registered.
```

If they do not match, the following message appears along with a beep and the display returns to Registered.

```
Entry Error!
```

CAUTION: Be sure not to forget the password. If you forget the password and cannot start up the computer, connect the printer wraparound board (F31PRT), then reboot the computer. The computer will skip the password function.

Others

Resume Mode

You can enable or disable AutoResume. If you disable AutoResume, the system enables boot mode.

> Resume: AutoResume is turned on.
>
> Boot: AutoResume is turned off.

Battery Save Mode

This option is used to select the battery save mode. You can select either of *Automatic (Long Life)* or *User Setting* if you start up the computer without the AC adapter connected or either of *Automatic (Normal Life)* or *User Setting* if you start up the computer with the AC adapter connected.

Automatic (Long Life):   Long life selects a set of battery save parameters

Suitable for long life operation.
If you select this option, a sub-window, **BATTERY SAVE OPTIONS**, appears displaying a set of battery save parameters. This sub-window is for informational purposes only and cannot be changed.

Automatic (Normal Life): Normal Life selects a set of battery save parameters suitable for normal life operation.

If you select this option, a sub-window, **BATTERY SAVE OPTIONS** appears displaying the set of battery save parameters. This sub-window is also, informational purposes only and cannot be changed.

User Setting: By selecting this option, you can set the appropriate battery save parameters on the sub-window, **BATTERY SAVE OPTIONS**.

Cache

This option enables and disables the CPU cache.

Enable: CPU cache is enabled.

Disable: CPU cache is disabled.

Pop-up

This option enables or disables the popup window.

Enable: Enables the popup window. The popup window appears when pressing **Fn+Esc**.

Disable: Disables the popup window.

Speaker

This option enables and disables the system speaker.

On: Enables the system speaker.

Off: Disables the system speaker.

Battery Alarm

This option enables and disables the low battery alarm and the battery pack removal alarm.

On: Enables the alarms.

Off: Disables the alarms.

Password Service Disk

If you forget the password, you can startup the computer using the password service disk which you created when you registered the password on the SETUP screen. Insert the password service disk in drive A and press **Enter**. This message appears:

```
Set Password Again?   (Y/N)
```

If you register a new password, press **Y**. The SETUP screen appears where you can register a new password. After registering a new password, you can startup the computer with the newly registered password.

If you reset the currently registered password and startup the computer, press **N**. This message appears:

```
Remove the disk, and press Enter key.
```

After removing the disk, the computer will startup when you press the **Enter** key.

Battery Save Option

Processing Speed

This option selects the CPU and the system bus speeds. Some option boards are dependent on the system bus speed.

High: High selects the maximum CPU speed and the maximum bus speed.

Low: Low selects the low CPU speed and the low bus speed. This setting makes the T4400SXC bus and CPU speed compatible with the IBM PC/AT.

CPU Sleep Mode

This option enables or disables CPU sleep. This feature works only if you are using battery power.

Enable: CPU sleep is activated.

Disable: CPU sleep is deactivated.

HDD Auto Off

This option enables or disables the HDD automatic power off. When automatic power off is enabled, the duration can be programmed to any of the internals listed below.

Disable: HDD automatic power off is disabled.

xx Min.: HDD automatic power off is enabled.

The HDD is automatically powered off if you do not use it for the duration set here. You can set the duration to: 03, 05, 10, 15, 20 or 30 minutes.

The T4400SXC automatically this option when you attach the AC adapter, but it leaves the setting of the option unchanged. If you use a non-MS-DOS operating system, you must set this option to Disable.

Display Auto Off

This option enables or disables the display automatic power off. When automatic power off is enabled, the duration can be programmed to any of the intervals listed below.

Disable: Display automatic power off is disabled.

xx Min.: Display automatic power off is enabled.

The internal display is automatically powered off if you do not use it for the duration set here. You can set the duration to 03, 05, 10, 15, 20 or 30 minutes.

The default time for this setting on the T4400SXC is 30 minutes when you attach the AC adapter; however, the setting is unchanged. If you use a non-MS-DOS operating system, you must set this option to Disable.

LCD Brightness

This option appears only when your T4400SXC is an LCD mode. This option is issued to select a brightness level for the LCD.

Bright: The maximum brightness level will be used.

Semi-Bright: A slight lower brightness level will be used.

4.1   General

This section explains how to disassemble the T4400SXC and replace Field Replaceable Units (FRUs) in the T4400SXC. It may not be necessary to remove all the FRUs in order to replace one. The chart below is a guide to which FRUs need to be removed in order to remove another. Always start by removing the battery pack, then follow the lines on the chart to find out which FRU you must remove next in order to repair the one you think is causing the T4400SXC to operate improperly.

```
┌───────────────────────┐                    ┌────────────────────────┐
│  ❑  The Battery Pack   ├────────────────────┤  ❑  The TFT Color LCD  │
└───────────┬───────────┘                    └───────────┬────────────┘
            │                                            │
  ┌─────────┴──────────────────────────┐                │
  │  ❑   The Optional Modem Card        │                │
  │  ❑   The Keyboard                   │                │
  │  ❑   The Built-in Modem Assembly    │                │
  │  ❑   The RTC battery                │    ┌───────────┴──────────┐
  │  ❑   The Top Cover ─────────────────┼────┤  ❑   The LED Panel   │
  │  ❑   The Power Supply               │    └───────────┬──────────┘
  │  ❑   The Sub battery                │                │
  │  ❑   The Battery Pack Assembly      │    ┌───────────┴──────────┐
  │  ❑   The Floppy Disk Drive unit     │    │  ❑  The Display Cables│
  │  ❑   The Hard Disk Drive unit       │    └──────────────────────┘
  │  ❑   The System board               │
  └─────────────────────────────────────┘
```
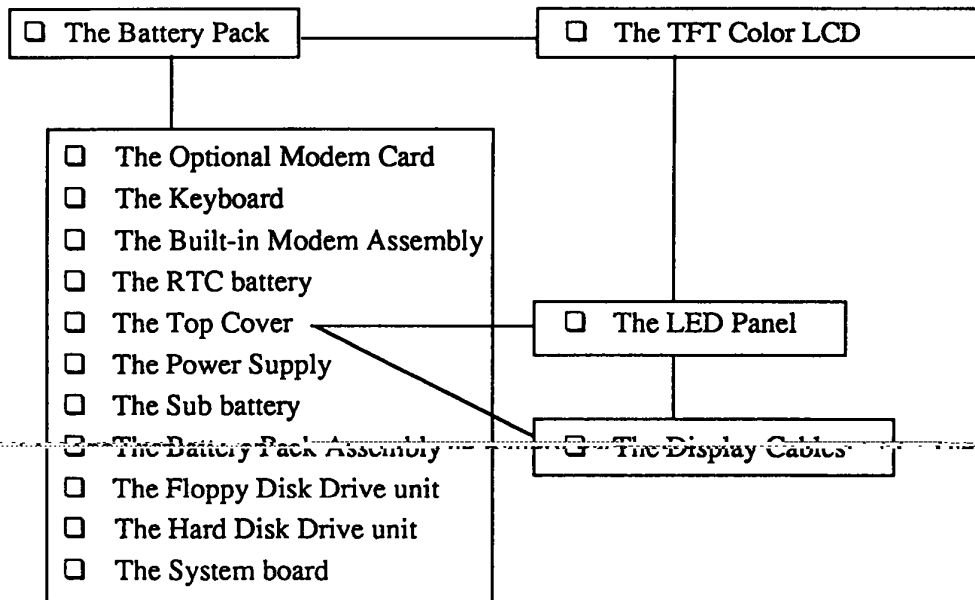
Before You Begin

Look over the procedures in this section before you begin disassembling the T4400SXC. Familiarize yourself with the steps required to disassemble the T4400SXC in order to fix the FRU you think is causing the computer to operate abnormally. Begin each procedure by removing the AC adapter and the battery pack as instructed in section 4.2, Removing the T4400SXC Battery Pack:

1.   Do not disassemble the T4400SXC 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 T4400SXC:

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

4.   Make sure the FRU you are replacing is causing the abnormal operation by preforming the necessary diagnostics test 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 T4400SXC.

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

7. You will remove and replace many screws when you disassemble the T4400SXC. When you remove screws, make sure they are placed in a safe place and identified with the correct parts.

8. When assembling the T4400SXC make sure you use the correct screws to secure the various pieces in place. Screw sizes are listed in the corresponding figures.

9. The T4400SXC contains many sharp edges and corners, so be careful not to injury yourself.

10. After you have replaced an FRU make sure the T4400SXC is functioning properly by performing the appropriate test on the FRU you have fixed or replaced.

Disassembly Procedures

The T4400SXC has two basic types of cable connectors:

❑ Pressure Plate Connecters
❑ Normal Pin Connectors

To disconnect a Pressure Plate connector, lift up the tabs on either side of the plastic connector and slide the cable out of the connector. To connect the cable to a Pressure Plate connector, make sure the sides of the Pressure Plate connector are fully extended and slide the cable into the connector. Secure the cable in place by pushing the sides of the down so it 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 connecter, connect it again making sure the sides of the connector are fully extended when you insert the cable.

The normal pin connectors connect the remaining cables, which can be connected and disconnected by simply pulling them apart or pushing them together.

Assembly Procedures

After you have disassembled the T4400SXC and fixed or repaired the problem that was causing the T4400SXC to operate abnormally you will need to reassemble the T4400SXC. While assembling the T4400SXC, remember the following general points:

❑ Take your time making sure you follow the instructions closely. Most problems arise when you get in a hurry either assembling the T4400SXC.

❑ Make sure all cables and connectors are securely fastened.

❑ Before securing the FRU or other parts, make sure that any cables in the area will not be pinched by the screws or the FRU.

❑ Check that all latches are latched securely in place.

❑ Make sure all the screws are replaced with the correct screws. Using the wrong screw can either damage the threads on the screw or the head of the screw.

After installing an FRU in the T4400SXC confirm that the FRU and the T4400SXC 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 of damaged or destroyed parts. The following equipment is necessary to disassemble and reassemble the T4400SXC:

❑ One M2 Phillips-head 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.

4.2   The T4400SXC Battery Pack

Removing the Battery Pack

To remove the T4400SXC battery pack, follow the steps below and refer to figure 4-1.

1. Turn off the power to the T4400SXC, disconnect the AC adapter, power cord and all cables connected to the T4400SXC.

2. Facing the right side of the computer, push the battery cover release lever up (A) and slide the battery pack cover (B) toward the back of the T4400SXC exposing the battery and its pull tab.
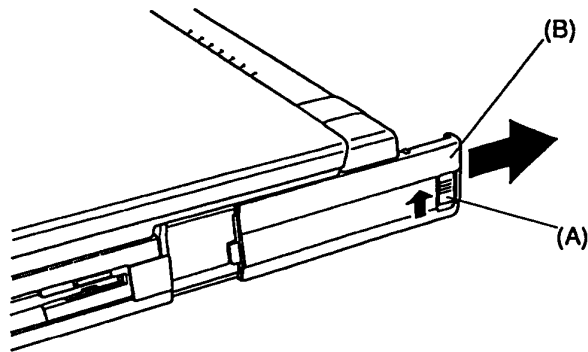
Figure 4-1 Removing the battery pack cover

3. Firmly grasp the battery pack (C) pull tab (D) and pull the battery out of the computer.
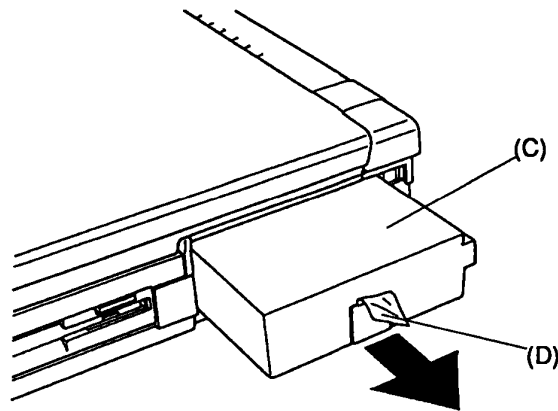
Figure 4-2 Removing the T4400SXC battery pack

Assembling the Battery Pack

To assemble the T4400SXC battery pack follow the steps below:

The battery pack will only fit in the T4400SXC in one direction.

1. Insert the battery making sure the torsue on the battery is properly aligned with groove in the computer.

2. Push the battery in until it locks into place. Replace the battery pack cover and secure its latch.

4.3   The Optional Memory Card

Removing the Optional Memory Card

To remove the T4400SXC's optional memory card, follow the steps below and refer to
figures 4-3 and 4-4.

1. Turn off the power to the T4400SXC and disconnect the AC adapter, power
   cord and all cables connected to the T4400SXC.

2. Turn the T4400SXC over so that its front faces you.

3. Push the notches (B) using narow object such as the tip of a covered ball-point
   pen. Then remove the EXP. MEMORY cover (A) as shown in figure 4-3
   below.
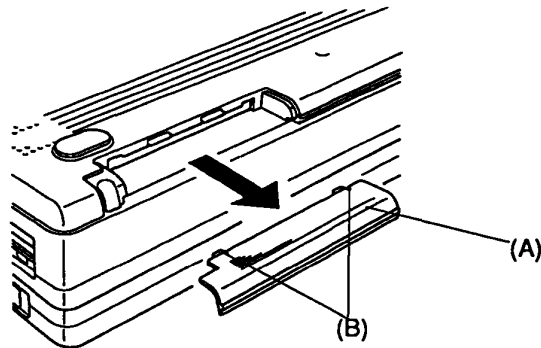
Figure 4-3 Removing the memory card slot cover

4. Remove the optional memory card (C) from the system unit.

NOTE: *Do not touch the connecting edge of the memory card. Debris or oil in or
on the connector may cause memory access problems.*
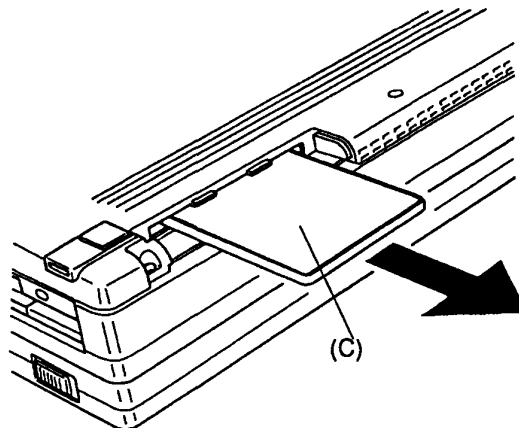
Figure 4-4 Removing the optional memory card

Assembling the Optional Memory Card

To install the T4400SXC optional memory card, follow the steps below:

1. The top of the memory card is marked with the word "insert" and an arrow pointing toward the connecting edge. Orient the memory card face down, with its connecting edge facing the computer. Carefully insert the card into the narrow slot. Make sure the card is firmly connected in the memory card slot.

2. Replace the EXP. MEMORY cover and snap its latches into place.

   The T4400SXC automatically configures all additional memory as extended memory. Use the SETUP program to configure the additional memory.

4.4   The T4400SXC Keyboard

Removing the Keyboard

To remove the T4400SXC's keyboard follow the steps below and refer to figures 4-5 through 4-9:

    1.   Turn off the power to the T4400SXC, disconnect the AC adapter, power cord and all cables connected to the T4400SXC.

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

    3.   Turn the T4400SXC over so that its front faces you.

    4.   Remove the three front screws (A) (M2×16 silver) on the bottom cover if you are only removing the keyboard. If you are also removing the top cover, remove all six screws (A) (B) (M2×6) as shown if figure 4-5 below.
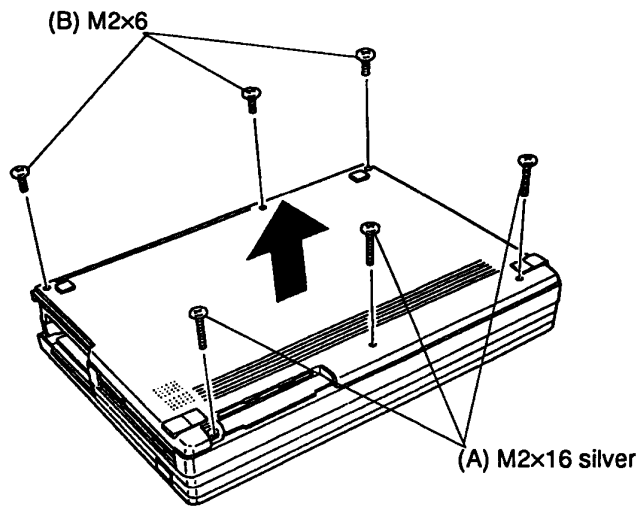
Figure 4-5 Removing the six screws securing the keyboard and top cover

5. Turn the T4400SXC over so that its front faces you.

6. Open the display panel (C).

7. Unsnap the latches (D) securing the keyboard (E) to the chassis. Press on the bottom of the keyboard and rotate the keyboard's front edge toward you to release the latches. Refer to figure 4-6 below.
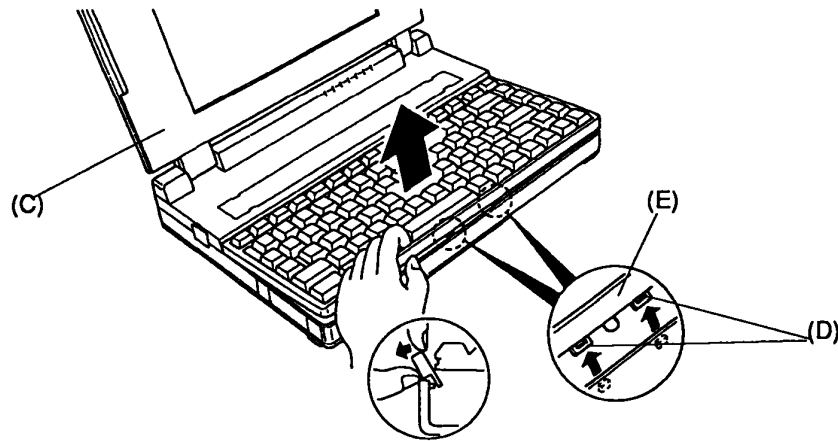
Figure 4-6 Unsnapping the keyboard from the chassis

NOTE: After unsnapping the keyboard latches, lift the front of the keyboard up and lean it against the display panel. The keyboard cable is short and can be damaged if you try to move the keyboard in any other direction before disconnecting it.

8. Lift the keyboard (F) up exposing the metal cover plate (G).

9. Remove the two screws (H) (M2x5 silver) securing the metal plate as shown in figure 4-7 and place the metal plate aside.
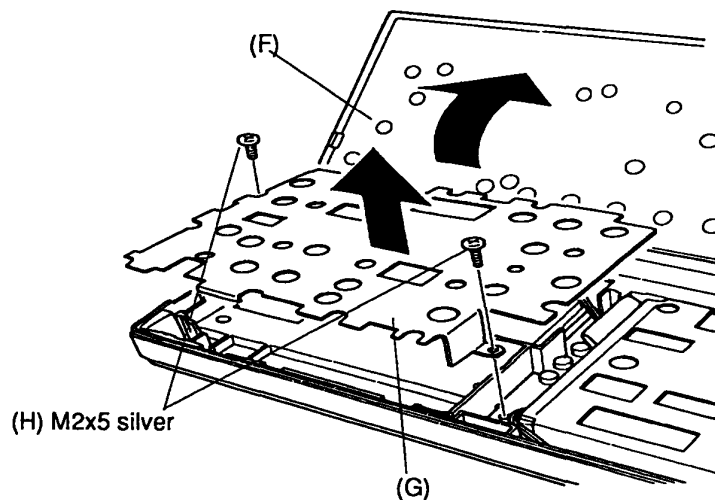
Figure 4-7 Removing the metal plate screw and metal plate

10. Remove the two screws (I) (M2×5 silver) securing the built-in modem case (J)
     and remove the case from the computer and place it aside as shown in figure
     4-8.

(I) M2×5 silver

(J)
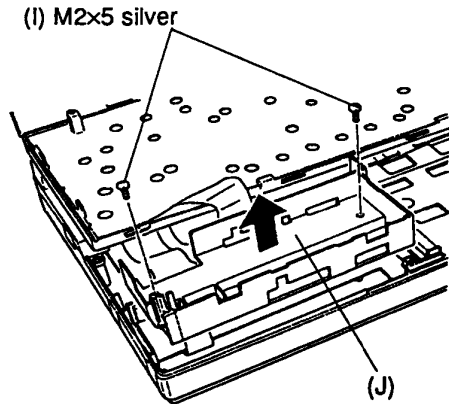
Figure 4-8 Removing the built-in modem case

11. Disconnect the keyboard cable (K) from pressure plate connector PJ19 (L) on
     the system board (M) and place the keyboard aside.

(C)

(K)

(M)

PJ19

(L)
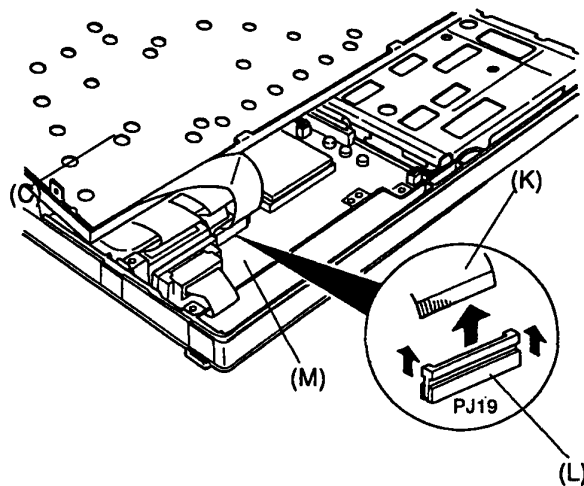
Figure 4-9 Disconnecting the keyboard cables

Assembling the T4400SXC Keyboard

To assemble the keyboard and the associated parts around it follow these steps:

1. Place the keyboard so that the bottom is facing you and lean it against the display panel. Refer to figure 4-9. Connect the keyboard cable to pressure plate connector PJ19 on the system board.

2. Install the built-in modem case, and secure the two screws (M2×5 silver). Refer to step 10 and figure 4-8.

3. Check to make sure you have connected the keyboard cable to the correct places on the system board. Install the metal plate as shown in figure 4-7 and secure the two screws (M2×5 silver) removed in step 9.

4. Lower the keyboard onto the chassis making sure the edges of the keyboard align with the chassis all the way around the keyboard. Secure the latches on the front of the keyboard and recheck the alignment of the keyboard and the chassis. Refer to figure 4-6

5. Close the display panel and turn the T4400SXC over and install either the front three (M2×16 silver) or six (M2×16 silver and M2×6) screws removed in step 4. Refer to figure 4-5.

4.5   The T4400SXC Central Processing Unit

Removing the Central Processing Unit

To remove the T4400SXC's Central Processing Unit (CPU) follow these steps and refer to figures 4-10 and 4-11:

1.   Turn off the power to the T4400SXC, disconnect the AC adapter, power cord and all cables connected to the T4400SXC.

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

3.   Lift the lever (A) on the left side of the CPU socket (B) to release the CPU (C) from its socket. Lift the lever up until you hear a click indicating the lever is fully extended. Refer to figure 4-10.
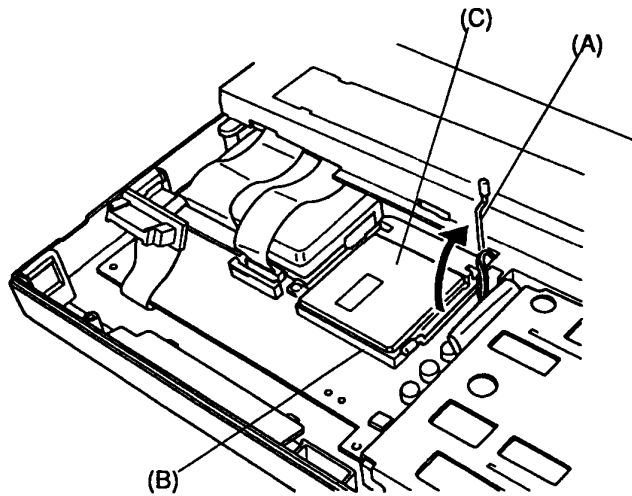
Figure 4-10 Releasing the T4400SXC CPU lever

CAUTION: If the T4400SXC has been in operation recently, prior to disassembling it, the CPU's surface may be hot. Allow it to cool to the touch before attempting to remove it.

4.   Grasp the CPU and lift it out of the T4400SXC exposing the CPU socket.

Assembling the Central Processing Unit

To install the CPU in the T4400SXC follow these steps:

1. Make sure the lever on the CPU socket is fully extended as shown in figure 4-10.

2. Align the CPU with the CPU socket. Note, the small circle (D) on the right front corner of the CPU and the small yellow circle (E) on the system board. These circles indicate the position of the #1 pin on the CPU and the CPU's socket as shown in figure 4-11.

> **CAUTION:** *Misalignment of the number 1 pin will cause the system to fail and will probably damage the CPU.*
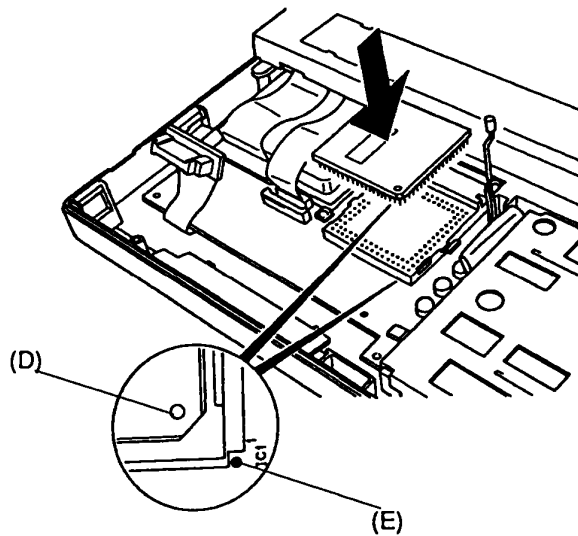
Figure 4-11 Removing the T4400SXC central processor unit

3. Lower the lever on the CPU socket and latch it under the clip on the side of the socket.

4.6   The T4400SXC Top Cover

Removing the Top Cover

To remove the T4400SXC's top cover follow these steps:

1. Turn off the power to the T4400SXC, disconnect the AC adapter, power cord and all cables connected to the T4400SXC.

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

3. If a ground cable is connected to GND screw (A), remove the GND screw and remove the ground cable.

4. Remove the three screws (B) (M2×8) securing the front of the display panel (C) to the chassis and disconnect the LED cable (D) from pressure plate connector PJ15 (E) and display cables (F) from PJ17 (G) on the system board as shown in figure 4-12.

5. Unsnap the GND plate cover (H) on the back of the bottom cover.
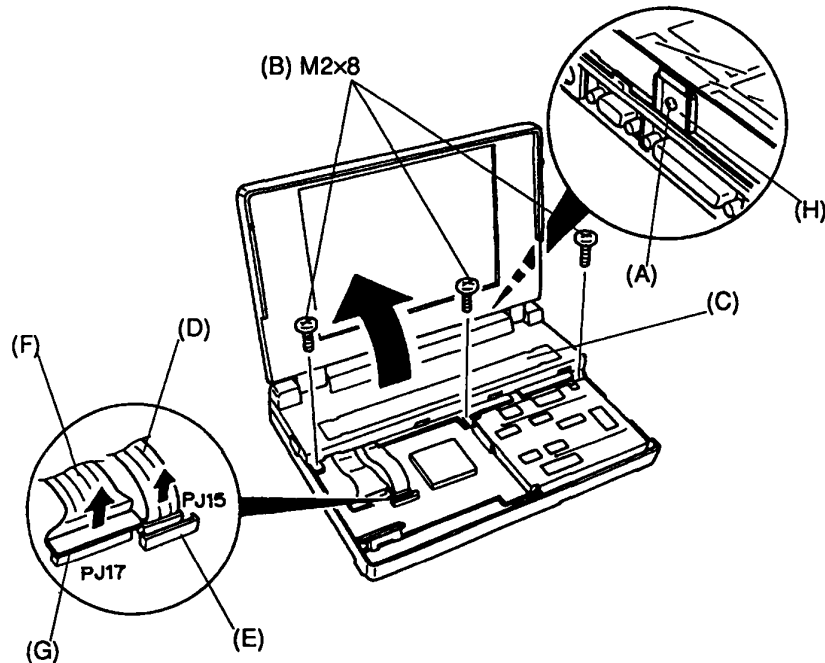
Figure 4-12 Removing the three front top cover screws

6. Lift the top cover away from the chassis and place it aside.

Assembling the Top Cover

To assemble the top cover follow these steps and refer to figure 4.13:

1. Align GND plate (A) with the notch on the back of the top cover. Then align the top cover with the chassis.
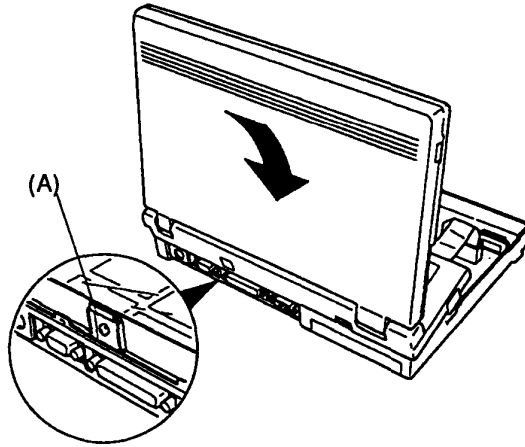
Figure 4-13 Attaching the top cover

2. Install the three front top cover screws and connect the display and LED cables. Refer to figure 4-12 for more information on how to install the three top cover screws.

Removing the LED Board

Once the top cover is removed the LED board can be removed. To remove the LED board follow these steps and refer to figures 4-14 through 18:

1. Turn the top cover over so its bottom faces you.

2. Remove the screw (A) (M2×5 silver) securing the support bridge (B) to the top cover.

3. Carefully pull the plastic cover (C) off to expose the LED holder (D). Separate each flexible cable separately from the plastic cover. Refer to figure 4-14.
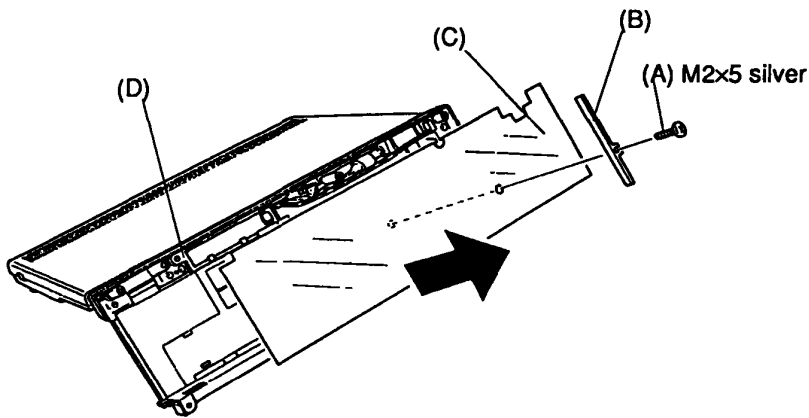
Figure 4-14 Removing the support bridge and plastic cover

4. Remove the two screws (E) (M2×4) (F) (M2.5×4) securing the LED holder to the top cover as shown in figure 4-15.
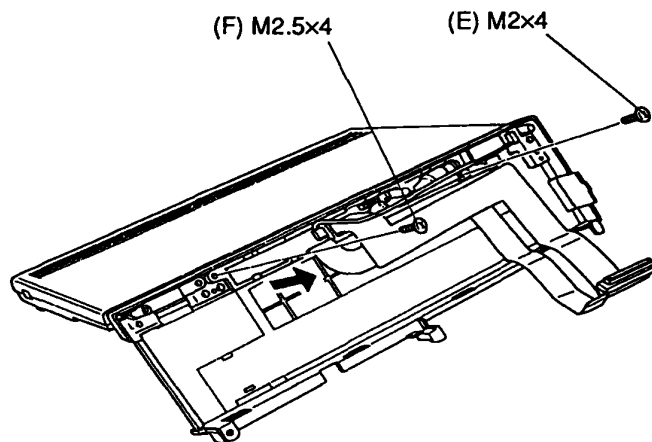
Figure 4-15 Removing the LED holder screws

5. Gently lift the LED holder (G) up and out to disconnect the three display cables (H) and the display power-off switch cable (I) as shown in figure 4-16.
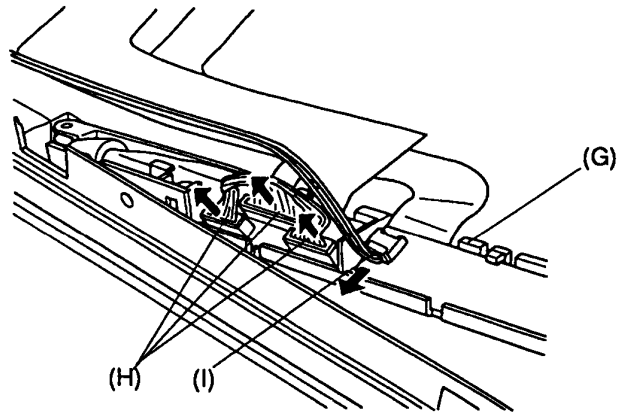
Figure 4-16 Disconnecting the LED cables and the display power-off switch cable

6. Unsnap the latches securing the LED board to the LED holder to remove the LED board (J) from the LED holder.
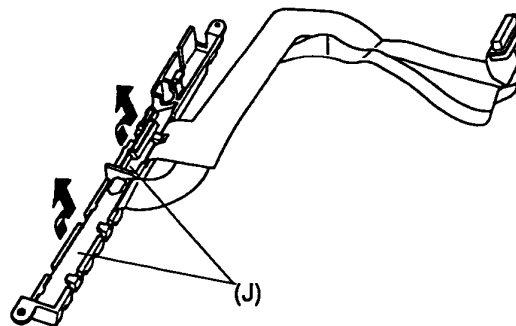
Figure 4-17 Removing the LED board

Assembling the LED Board

To assemble the LED board in the top cover follow these steps:

1. Place the LED board in the LED holder as shown in figure 4-17 and snap the latches securing it in place.

2. Place the LED holder in the top cover as shown in figure 4-16, leaving the display cable connections slightly elevated so you can connect the three display cables and display power-off switch cable to the LED board.

3. Place the LED holder in place as shown in figure 4-15 and secure it with the two screws (M2×4 and M2.5×4) removed in step 4.

4. Place the plastic cover over the bottom of the top cover as shown in figure 4-14 and secure the support bridge with the single screw (M2×5 silver) removed in step 3.

4.7   The T4400SXC Power Supply

Removing the Power Supply

To remove the T4400SXC's power supply follow these steps and refer to figure 4-18:

1. Turn off the power to the T4400SXC, disconnect the AC adapter, power cord and all cables connected to the T4400SXC.

2. Remove the battery pack, optional memory card, keyboard and top cover as described in sections 4.2, 4.3, 4.4 and 4.6.

3. Disconnect the power supply cable (A) from PJ4 (B) on the power supply board (C).

4. Remove the screw (D) (M2×5 silver) in the front left corner of the power supply that secure it to the chassis.
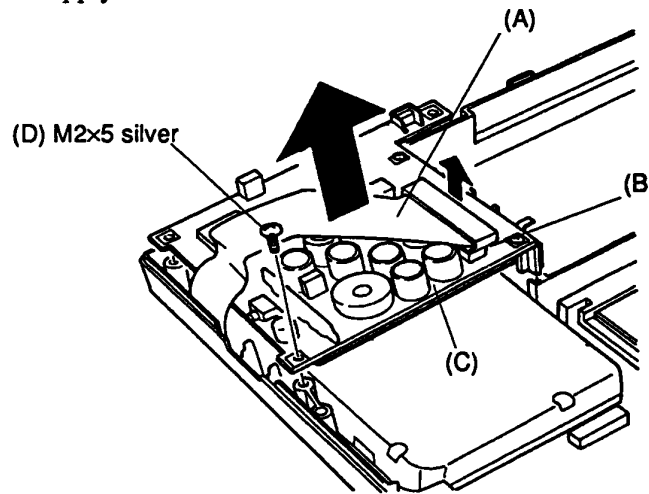
Figure 4-18 Removing the power supply

5. Lift the power supply's front edge out first then rotate it slightly until it clears the EXP port chassis of the system board and place it aside.

Assembling the Power Supply

To install the power supply follow these steps:

1. Place the power supply into position as shown in figure 4-18. Make sure the battery terminal connections are properly inserted in the battery case.

2. Connect the power supply cable to PJ4 on the power supply.

3. Secure the single screw (M2×5 silver) removed in step 4.

4.8   The T4400SXC Battery Pack Case

Removing the Battery Pack Case

To remove the T4400SXC's battery pack case follow these steps and refer to figures 4-19 and 4-20:

1. Turn off the power to the T4400SXC, disconnect the AC adapter, power cord and all cables connected to the T4400SXC.

2. Remove the battery pack, optional memory card, keyboard, top cover and power supply as described in sections 4.2, 4.3, 4.4, 4.6 and 4.7.

3. Disconnect the sub battery (A) from PJ2 (B) on the system board as shown in figure 4-19.
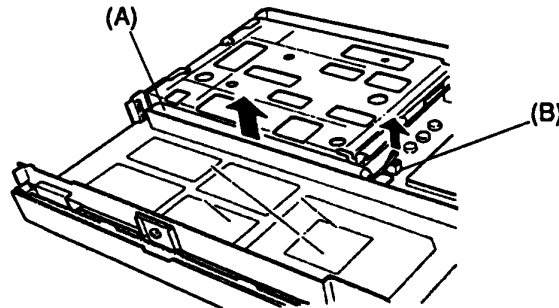
Figure 4-19 Disconnecting the sub battery

4. Remove the two screws (C) (M2×5 silver) securing the battery pack case (D) to the chassis.

> *CAUTION: Before you remove the battery pack case, locate the Tape Automatic Bonding (TAB) type gate array IC2 (E) below the case. Do Not touch this gate array, doing so may cause the gate array to system fail.*

5. A locator notch (F) under the left end of the assemble still secures the case to the chassis. Gently squeeze the assemble to release the locator notch.

6. Lift the battery pack case out of the computer and place it aside.
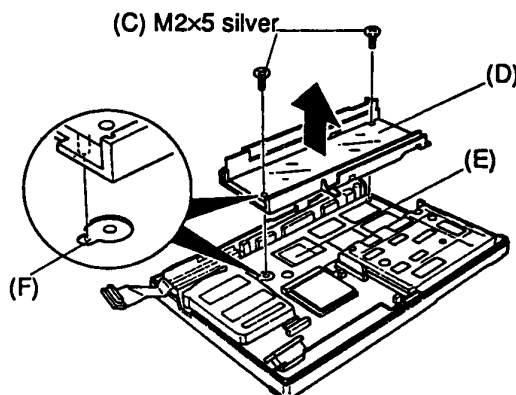
Figure 4-20 Removing the battery pack case

Assembling the Battery Pack Case

To assemble the T4400SXC battery case follow these steps:

1. Align the battery pack case with the chassis as shown in figure 4-20. Set the locator tab into the locator notch on the chassis and press it into place.

2. Secure the battery pack case in place with the two screws (M2×5 silver) removed in step 3. Refer to figure 4-20.

3. Connect the sub battery to PJ2 on the system board and place it into its position on the front of the battery pack case.

4.9 The T4400SXC Floppy Disk Drive

Removing the Floppy Disk Drive

To remove the T4400SXC's floppy disk drive follow these steps and refer to figure 4-21 and 4-22:

1. Turn off the power to the T4400SXC, disconnect the AC adapter, power cord and all cables connected to the T4400SXC.

2. Remove the battery pack, optional memory card, keyboard, top cover, power supply, and battery pack case as described in sections 4.2, 4.3, 4.4, 4.6, 4.7 and 4.8.

3. Remove the Real Time Clock (RTC) battery (A) from the computer and place it aside.

4. Remove the two screws (B) (M2x5 silver) securing the floppy disk drive (C) to the chassis as shown in figure 4-21.

5. Disconnect the FDD cable (D) from pressure plate connector PJ3 (E) on the system board. Refer to figure 4-21.
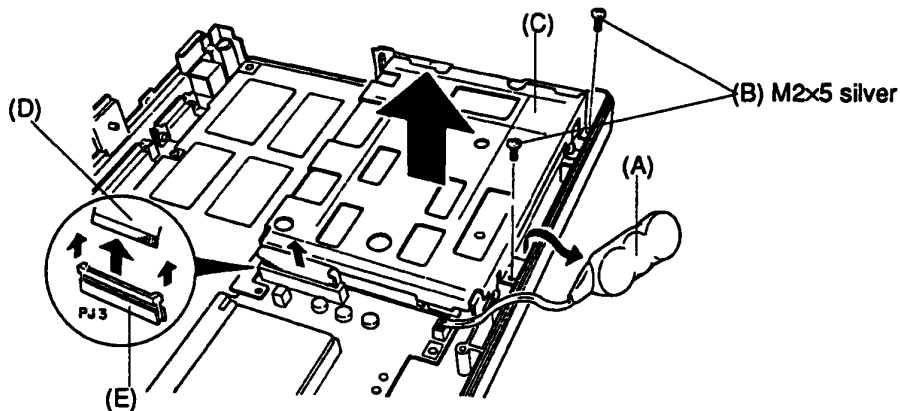
Figure 4-21 Removing the T4400SXC floppy disk drive

6. Lift the FDD out of the computer and place it aside.

7. To remove the FDD bracket (F) from the FDD, remove the four screws (G) (M2.5×4) securing the FDD to the bracket as shown in figure 4-21.
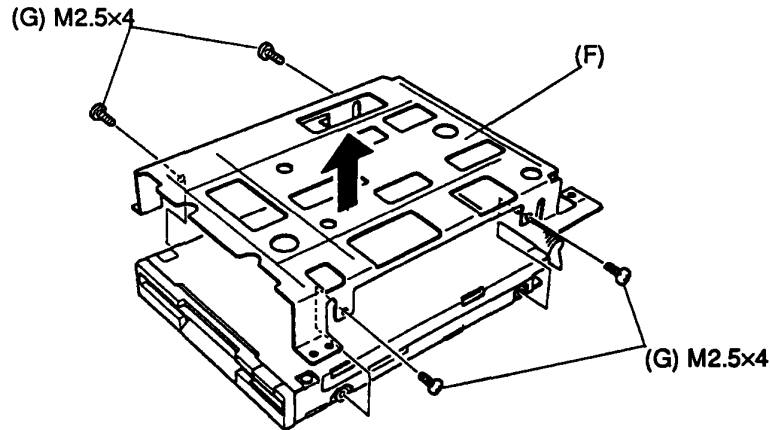
Figure 4-22 Removing the floppy disk drive bracket

8. Separate the bracket from the drive.

Assembling the Floppy Disk Drive

To assemble the floppy disk drive in the T4400SXC follow these steps:

1. Align the FDD bracket with the four holes on the side of the FDD. Refer to figure 4-22.

2. Install the four screws (M2.5×4) removed in step 7 to secure the FDD bracket to the FDD.

3. Place the FDD and its bracket in the T4400SXC. Connect the FDD cable to pressure plate connector PJ3 on the system board.

4. Secure the FDD in place with the two screws (M2×5 silver) removed in step 4.

5. Place the RTC battery in front of the FDD as shown in figure 4-21.

4.10   The T4400SXC Hard Disk Drive

Removing the Hard Disk Drive

To remove the T4400SXC's hard disk drive (HDD) follow these steps and refer to figures 4-23 and 4-24:

1. Turn off the power to the T4400SXC, disconnect the AC adapter, power cord and all cables connected to the T4400SXC.

2. Remove the battery pack, optional memory card, keyboard, top cover, power supply, and battery pack case as described in sections 4.2, 4.3, 4.4, 4.6, 4.7 and 4.8.

3. Remove the four screws (A) (M2x5 silver) securing the HDD bracket (B) to the bottom cover. Refer to figure 4-23

4. Disconnect the HDD cable (C) from the HDD. Refer to figure 4-23.

5. Lift the HDD out of the computer.
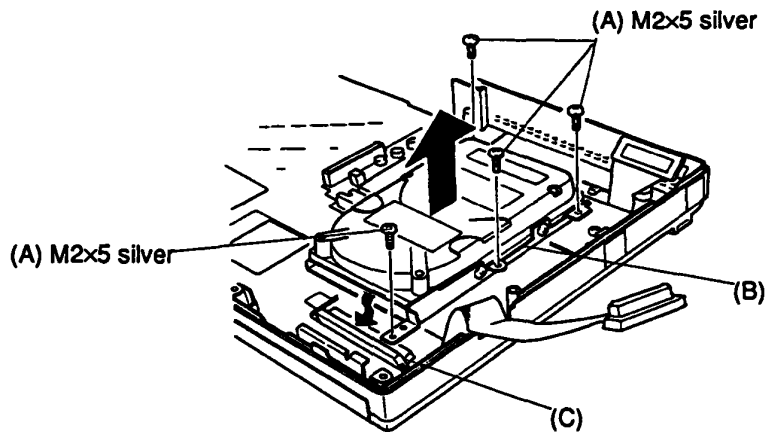
Figure 4-23 Removing the T4400SXC hard disk drive

6. To remove the HDD bracket from the HDD, remove the four screws (D) (M3x4) securing the HDD to the bracket as shown in figure 4-24.
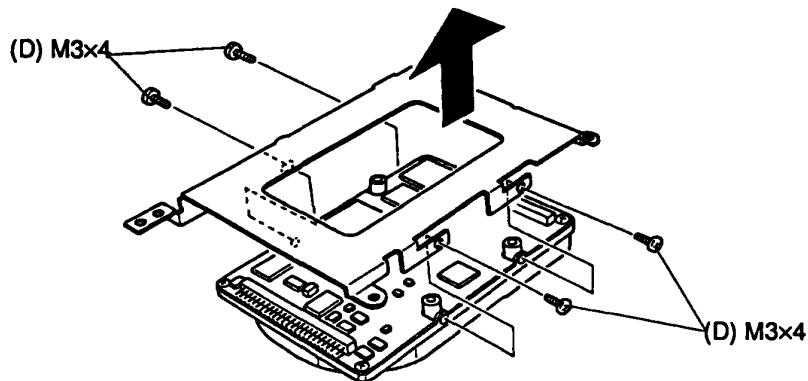
Figure 4-24 Removing the hard disk drive bracket

7. Separate the bracket from the drive.

Assembling the Hard Disk Drive

To install the hard disk drive in the T4400SXC follow these steps:

1. Align the HDD bracket with the four holes on the side of the HDD. Refer to figure 4-24.

2. Install the four screws (M3×4) removed in step 6 to secure the HDD bracket to the HDD.

3. Place the HDD and its bracket in the T4400SXC. Connect the HDD cable to the HDD.

4. Secure the HDD in place with the four screws (M2×5 silver) removed in step 3. Refer to figure 4-23.

4.11　The T4400SXC System Board

Removing the System Board

To remove the T4400SXC's system board follow these steps and refer to figures 4-25 and 4-26:

1. Turn off the power to the T4400SXC, disconnect the AC adapter, power cord and all cables connected to the T4400SXC.

2. Remove the battery pack, optional memory card, keyboard, top cover, power supply, battery pack case, floppy disk drive and hard disk drive as described in sections 4.2, 4.3, 4.4, 4.6, 4.7 4.8, 4.9 and 4.10.

3. Remove the three screws (A) (M2×5 silver) securing the system board to the bottom cover. Refer to figure 4-25.

4. Lift up under the mouse port (C) and under the 150-pin port (D).

5. Gently lift the system board (B) up and slide it toward the front of the computer to release the ports from the chassis and lift the system board out of the computer.
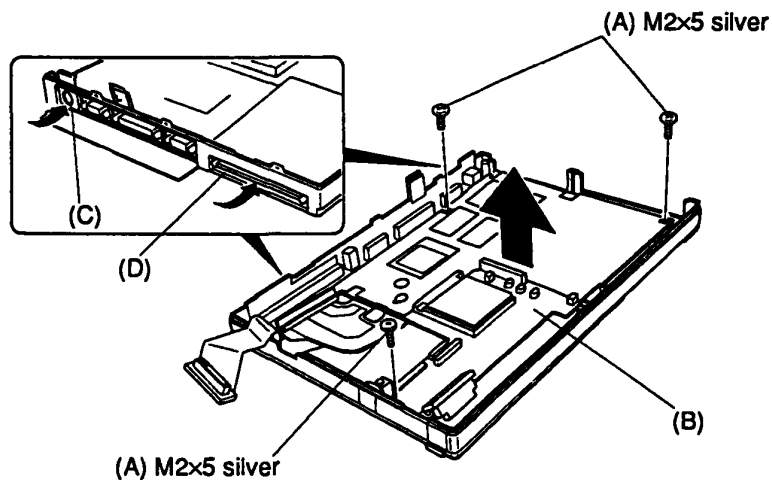
Figure 4-25　Removing the T4400SXC system board

6. Turn the system board over and disconnect the power supply board cables (E) from pressure plate connectors PJ26 (F) and PJ27 (G) and the hard disk cable (H) from pressure plate connectors PJ4 (I) and PJ5 (J). Refer to figure 4-26.
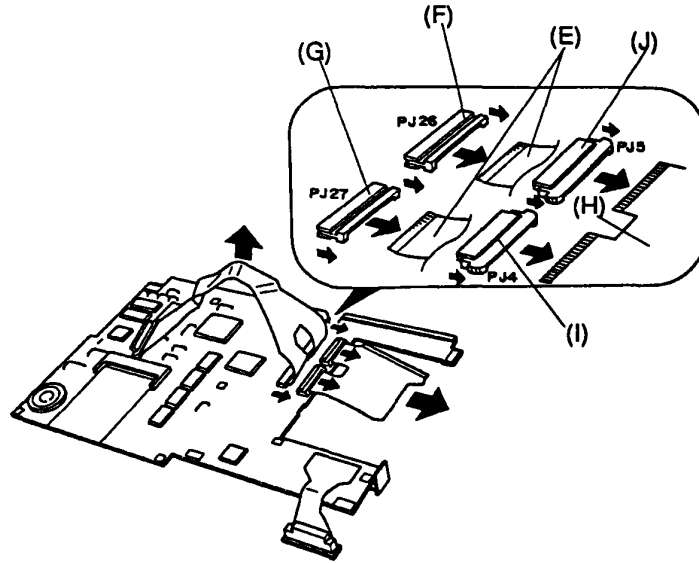
Figure 4-26 Disconnecting the power supply cable and HDD cable

Assembling the System Board

To assemble the system board in the T4400SXC follow these steps:

1. Connect the hard disk drive cable to PJ4 and PJ5 on the bottom of the system board. Refer to figure 4-26.

2. Connect the power supply cable to PJ26 and PJ27 on the bottom of the system board. Refer to figure 4-26.

NOTE: Make sure the HDD and power supply cables are securely connected, if they should become disconnected the T4400SXC would have to be completely disassembled to reconnect them.

3. Place the system board in the T4400SXC making sure the power supply cables and HDD cables are not pinched. Align the system board with the locator pins on the chassis.

4. Secure the system board in place with the three screws (M2×5) removed in step 3. Refer to figure 4-25.

4.12   The Display Mask

Removing the Display Mask

To remove the T4400SXC's display mask, follow these steps and refer to figures 4-27:

1. Turn off the power to the T4400SXC, disconnect the AC adapter, power cord and all cables connected to the T4400SXC.

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

3. Open the display panel.

4. Remove the two stick-on labels (A) from the display supports and the two rubber cushions (B) from the top corners of the display panel to expose the four screws (C) securing the display mask (D). Refer to figure 4-27.

5. Remove the four screws (C) (M2×5 silver) securing the display mask to the display cover.

6. Unsnap the nine latches securing the display cover as shown in figure 3-27.
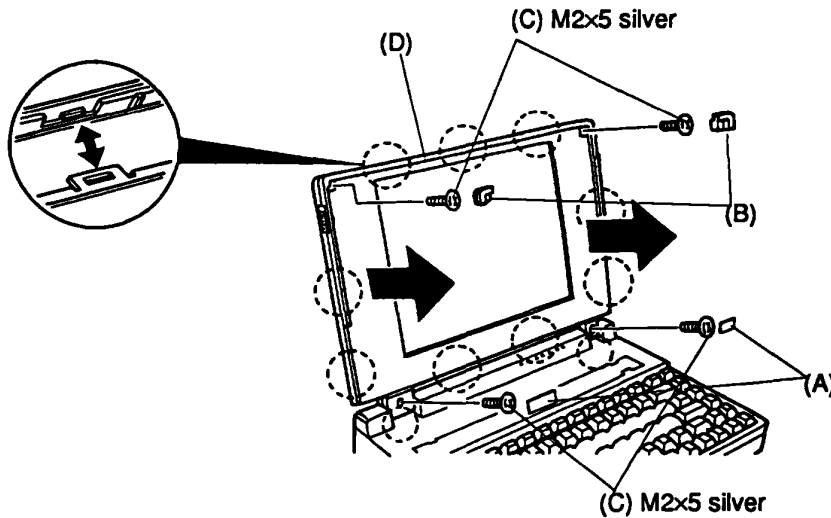
Figure 4-27 Removing the display mask screws

Assembling the Display Mask

To assemble the T4400SXC's display mask follow these steps:

1. Align the mask on the display panel, being careful not to damage the portion of the mask that covers the hinges.

2. Snap the nine latches on the mask in place. Check to make sure the seam between the front and the back of the display is evenly seated around the display.

3. Secure the mask in place with the four screws (M2×5 silver) removed in step 5 and cover the screws with the rubber cushions on the top of the display and the stick-on labels on the bottom of the display.

4.13 TFT Color LCD Display

Removing the TFT Color LCD Display

To remove the T4400SXC's LCD display follow these steps:

1. Turn off the power to the T4400SXC, disconnect the AC adapter, power cord and all cables connected to the T4400SXC.

2. Remove the battery pack and display mask as described in section 4.2 and 4.12.

3. Remove the three screws (A) (M2.5×5) securing the FL inverter board (B).

4. Disconnect the red connectors (C) and (G) from CN2 (E) (red) and CN4 (I), disconnect the white connectors (D) and (H) from CN3 (F) (white) and CN5 (J) (white), and disconnect the cable (K) from CN1 (L).
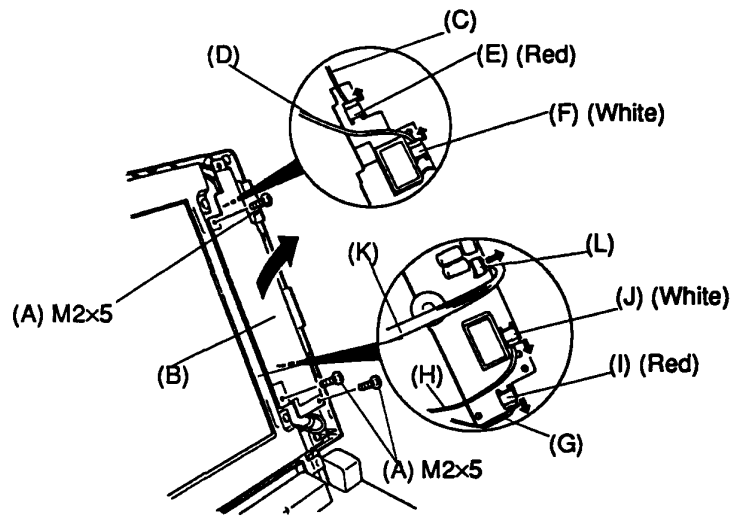
Figure 4-28 Removing the FL inverter board

> **CAUTION:** Be sure to match the red connectors and white connectors. If a red connector is attached to a white connector, the system unit will be damaged.

5. Remove the four screws (M) (M2×5 silver) securing the LCD module (L) to the LCD cover as shown in figure 4-29.
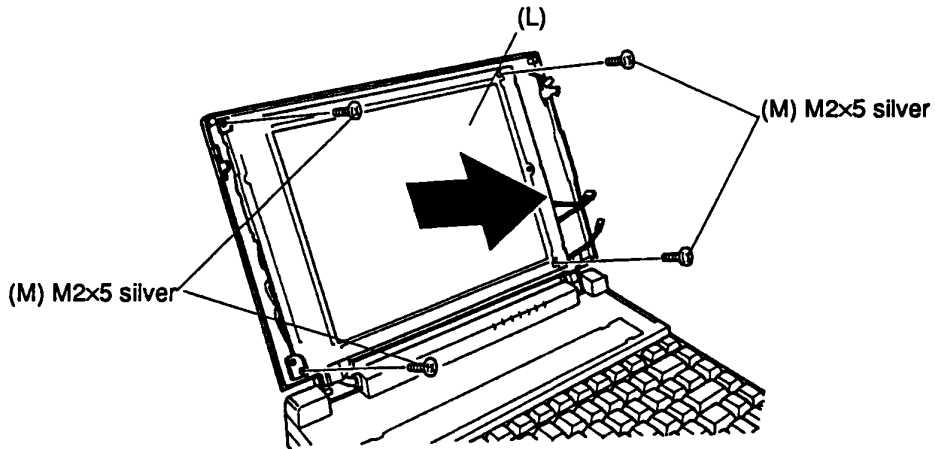
Figure 4-29 Removing the LCD from the back panel cover

6. Rotate the LCD out of the LCD cover (M) and disconnect the LCD cables (Q) from CN1 (O) and CN2 (P) as shown in figure 4-30.
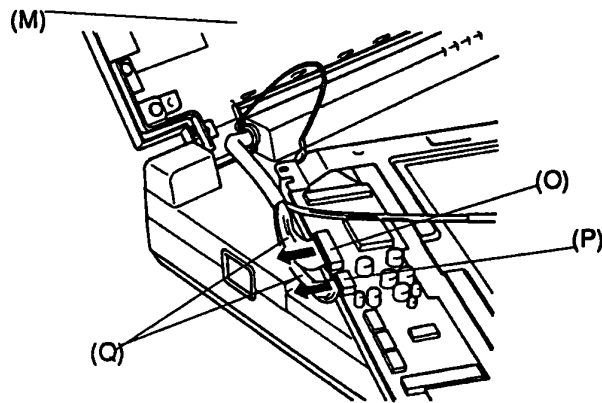
Figure 4-30 Disconnecting the LCD cables

CAUTION: Do not change the switches, SWA, SWB, SWC in the front of the display or the volume in the back of the display.

7. To remove the rear display cover (A), remove the two screws (B) (M2.5×4) from the display support (C) as shown in figure 4-31.
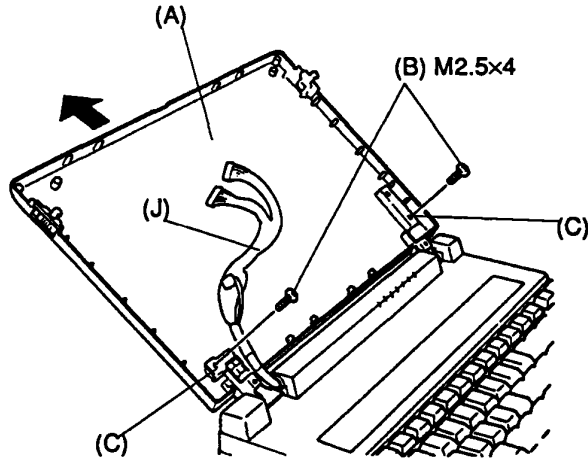
Figure 4-31 Removing the display cover and screw

8. To remove the display cables (E), the top cover and LED holder must also be removed. If you are replacing the display cables remove the top cover following the instructions in section 4.6.

9. Turn the top cover over and remove the screw (F) (M2×5 silver) securing the display cable cover (G), as shown in figure 4-32 below:
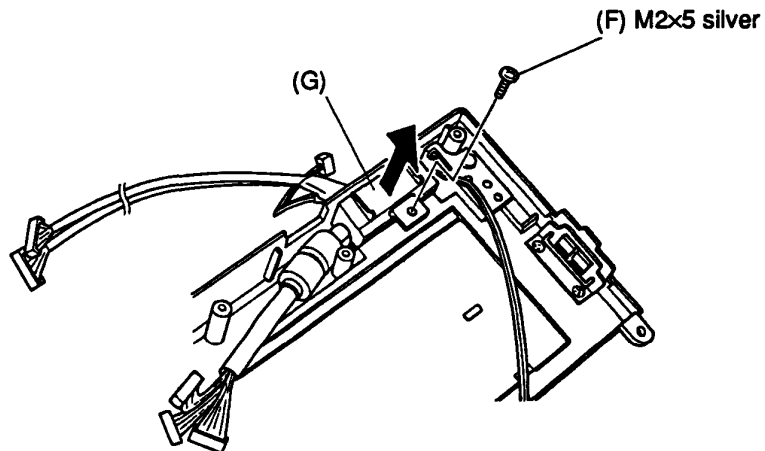
Figure 4-32 Removing the display cable cover

10. Slide the display cables (H) out of the top cover to remove them from the top cover as shown in figure 4-33.
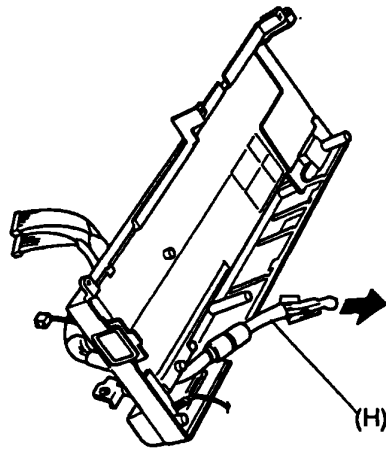
Figure 4-33 Removing the display cables

11. To remove the shut-off switch, remove the two screws (I) (M2.5×4) securing it to the right hinge (J) as shown in figure 4-34.
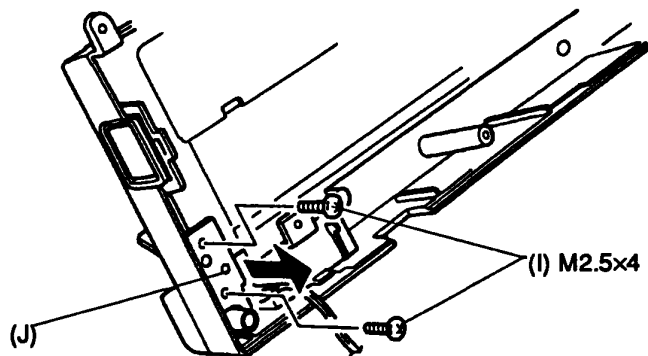
Figure 4-34 Removing the hinge

12. Remove the screw (K) (M2×8) securing the display power-off switch (L) as shown in figure 4-35.
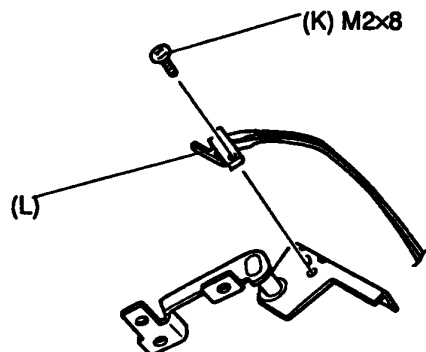
Figure 4-35 Removing the shut-off switch

Assembling the TFT Color Display

To install the TFT color display, follow these steps:

1. Place the display power-off switch on the hinge and secure it with the screw (M2×8) removed in step 10. Refer to figure 4-35.

2. Position the hinge in the top cover as shown in figure 4-34 and secure it with the two screws (M2.5×4) removed in step 9.

3. Route the display cables through the top cover, refer to figure 4-33.

4. Confirm that the display cable (A) is routed correctly in the top cover, as shown in figure 4-36 below, before securing the cover plate in place. The display cable should fit securely under the cable holder.

5. Install the LED holder following the instructions in section 4.6.
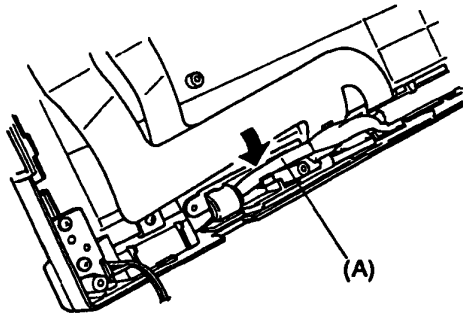
Figure 4-36 Routing the display cable in the top cover

6. Install the display cover of the TFT color LCD display. Secure it with two screws (M2.5×4) to the display support as shown in figure 4-31.

7. Make sure the display cable (B) shown in the figure 4-37 below is routed correctly between the hinge (C) and the display case (D).
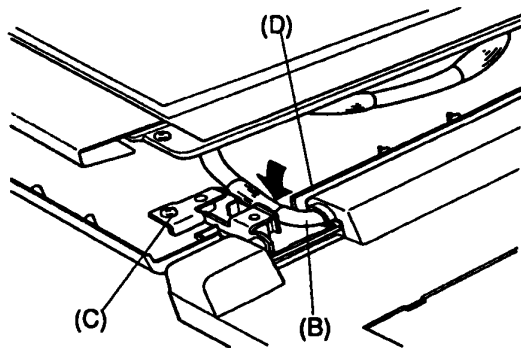
Figure 4-37 Routing the display cable

8. Lay the plasma display face down on the keyboard as shown in figure 4-30 and connect the three display cables to the TFT color LCD display.

9. Align the TFT color LCD display and the display cables on the display cover of the TFT color LCD display and secure it in place with the four screws (M2×5 silver) removed in step 3. Refer to figure 4-28.
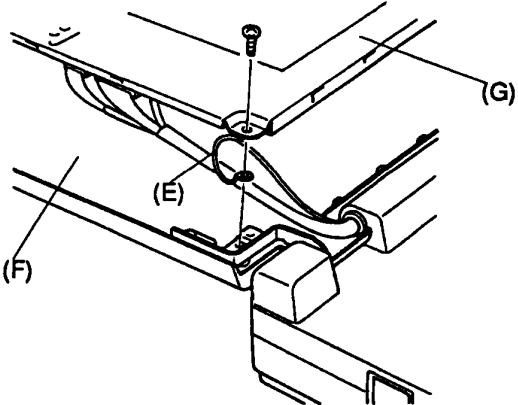
Figure 4-38 Routing the ground cable

4.14 The BIOS ROM

Removing the BIOS ROM

To remove the BIOS ROM, follow these steps:

1. Turn the T4400SXC over. Make sure the display is closed.

2. Remove the single screw (A) (M2×8 silver) to remove the BIOS ROM cover (B).

3. Remove the BIOS ROM cover exposing the BIOS ROM.
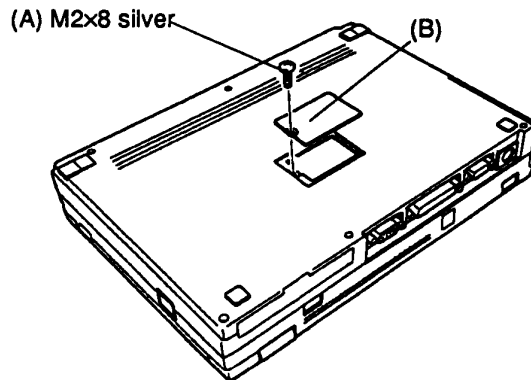
Figure 4-39 Removing the BIOS ROM cover

4. Slide the BIOS ROM plate (C) toward the notch of the BIOS ROM (D) until it clicks, and remove it from the socket.
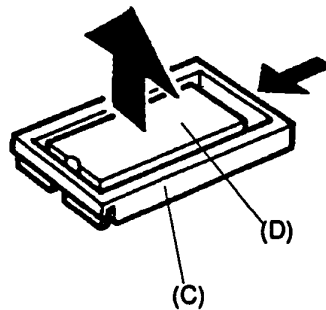
Figure 4-40 Removing the BIOS ROM plate

5. Remove the BIOS ROM from the socket.
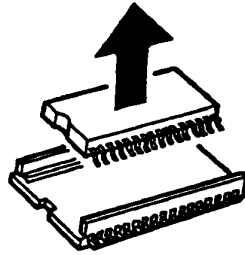
Figure 4-41 Removing the BIOS ROM

Installing the BIOS ROM

To install the BIOS ROM, follow these steps:

1. Align the BIOS ROM (A) with the BIOS ROM socket (B). Note, the notch (C) on the left side of the BIOS ROM and the notch (D) on the BIOS ROM socket. These notches indicate the correct position of the BIOS ROM.

(C)

(A)

(D)

(B)
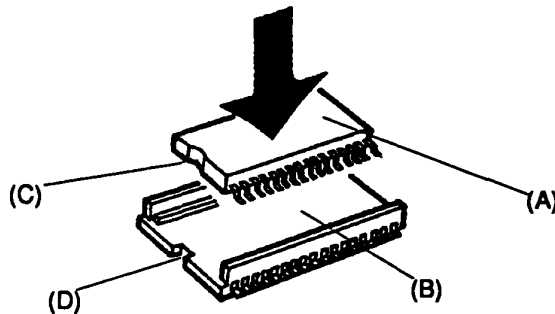
Figure 4-42 Align the BIOS ROM

2. Align the left edge of the plate and socket. Firmly press down the plate until it is seated.
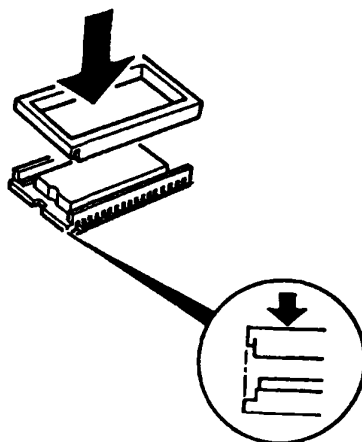
Figure 4-43 Align the plate

Appendix A Board Layout

A.1   System Board FY5SY2 (ICs)

Figure A-1 System board FY5SY2 (ICs) (front)
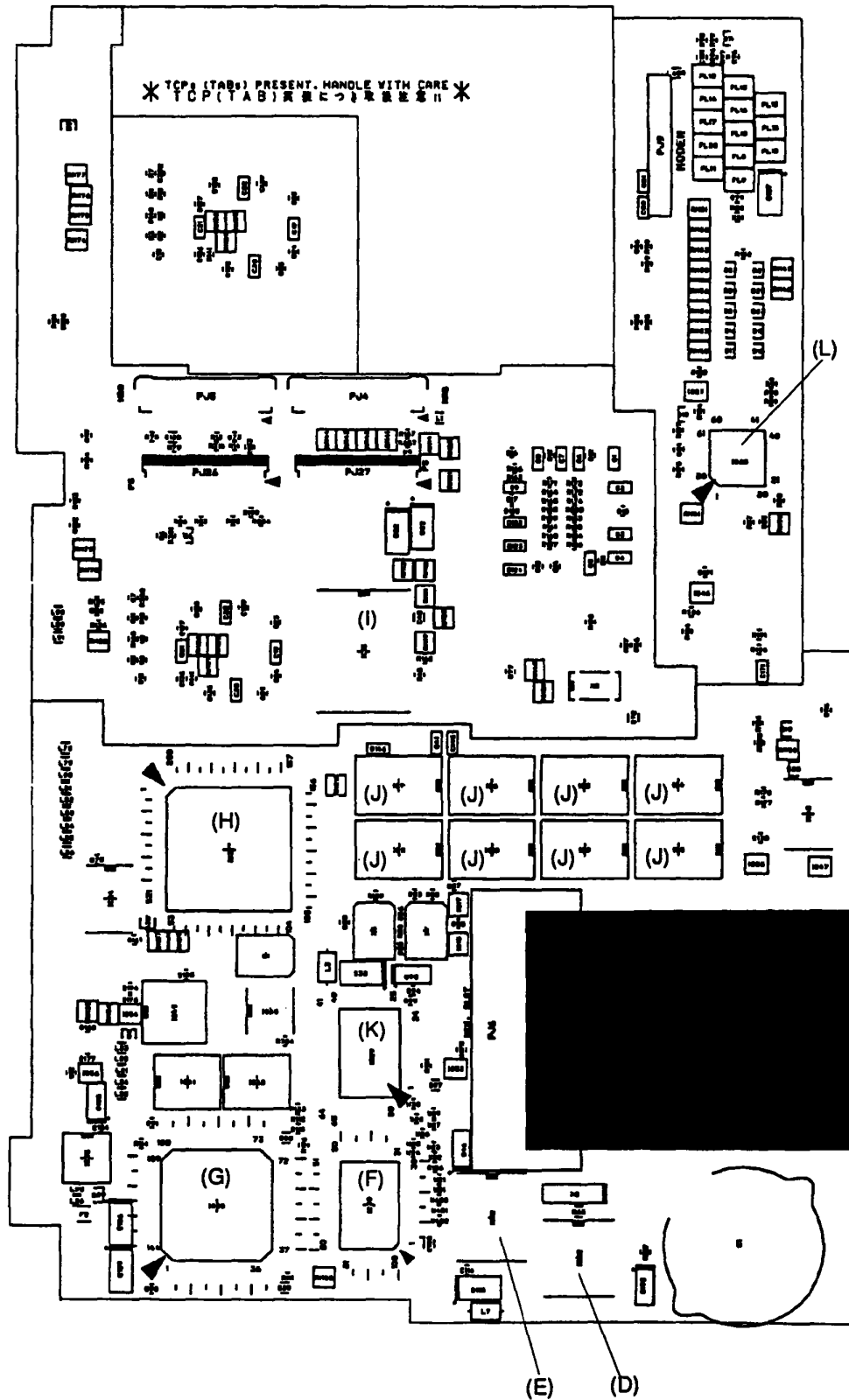
Figure A-2 System board FY5SY2 (ICs) (back)

Table A-1 ICs on the system board FY5SY2

Mark	Number	Name
(A)	IC1	CPU 80486SX
(B)	IC2	System controller gate array
(C)	IC37 to IC40	Video RAM
(D)	IC22	RTC
(E)	IC12	Backup RAM
(F)	IC30	Color gray scale controller gate array
(G)	IC28	PVGA1F
(H)	IC3	Super integration T9901
(I)	IC13	BIOS ROM
(J)	I4 to IC11	System memory
(K)	IC29	EXT. RAMDAC
(L)	IC25	Keyboard controller

A.2   System Board FY5SY2 (Connectors)
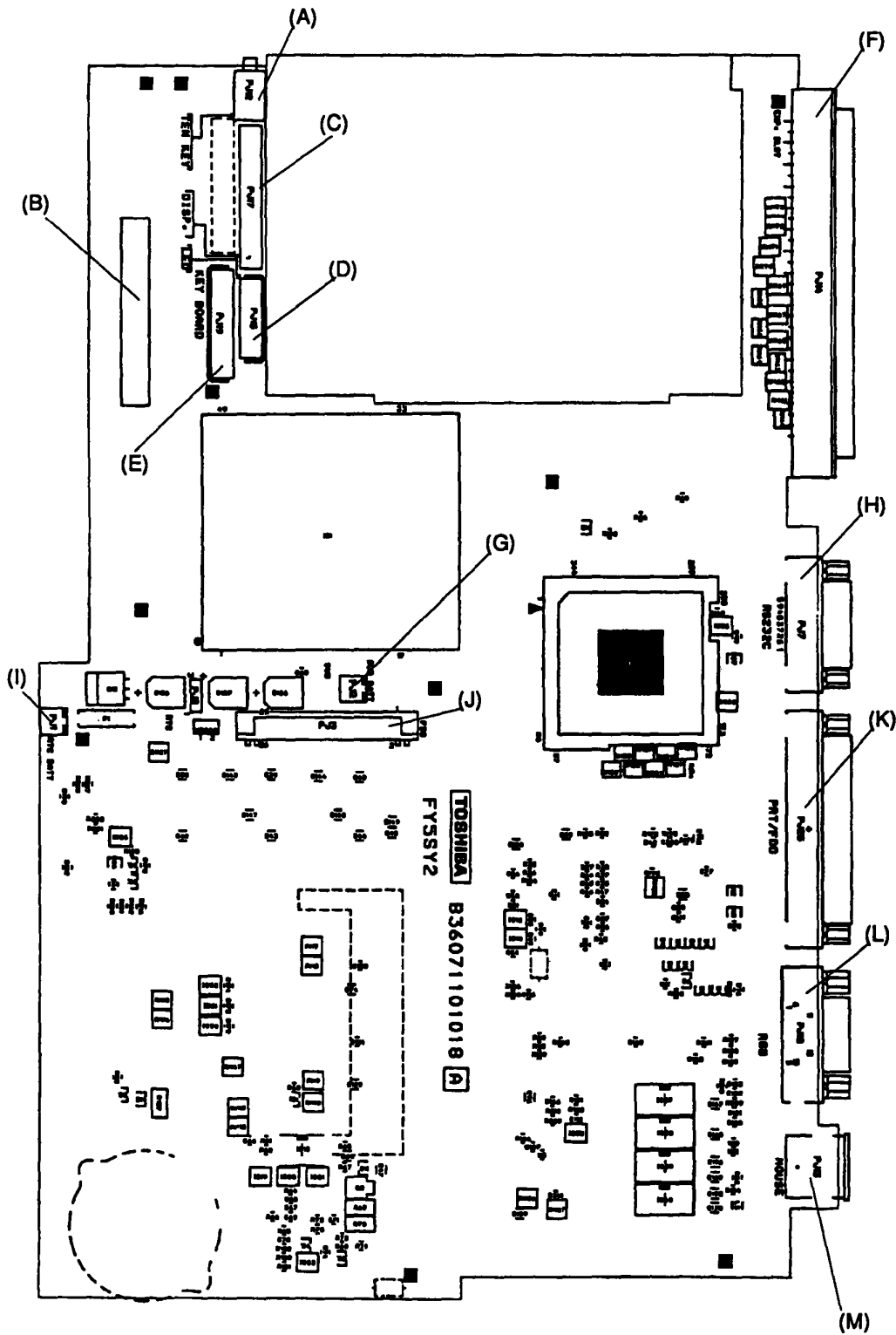
Figure A-3 System board FY5SY2 (connectors) (front)
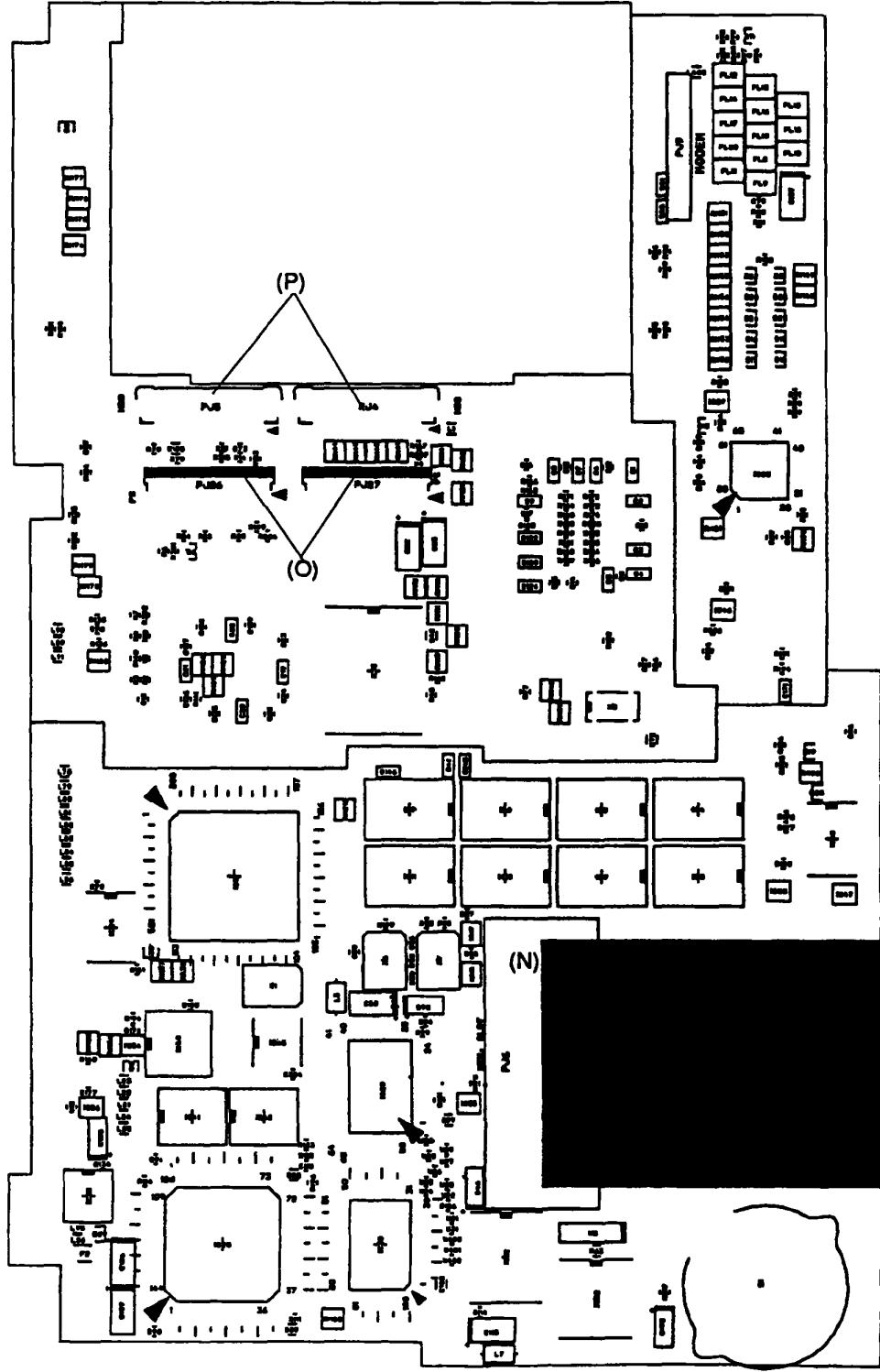
Figure A-4 System board FY4SY2 (connectors) (back)

Table A-2 Connectors on the system board FY5SY2

Mark	Number	Name
(A)	PJ12	Tenkey connector
(B)	PJ9	Built-in modem connector
(C)	PJ17	Display connector
(D)	PJ15	LED connector
(E)	PJ19	Keyboard connector
(F)	PJ14	Expansion slot
(G)	PJ2	Sub battery connector
(H)	PJ7	RS-232-C connector
(I)	PJ1	RTC battery connector
(J)	PJ3	FDD connector
(K)	IPJ25	PRT/FDD connector
(L)	PJ18	RGB connector
(M)	PJ13	Mouse connector
(N)	PJ6	Expansion memory connector
(O)	PJ26, PJ27	Power supply connector
(P)	PJ4, PJ5	HDD connector

Appendix B Pin Assignment

B.1   PJ1 RTC Connectors (2-Pin)

Table B-1 RTC connector pin assignment (2-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	S10.1	I	02	GND	

B.2   PJ2 PS I/F Connectors (2-Pin)

Table B-2 PS I/F connector pin assignment (2-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	SUBBAT	O	02	GND	

B.3   PJ3 FDD (Int) Connectors (26-Pin)

Table B-3 FDD (Int) connector pin assignment (26-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	ISSEL;000	I	14	GND	
02	GND		15	IDIRC;000	O
03	IRDAT;000	I	16	ILOWD;000	O
04	GND		17	IMON;000	O
05	IWPR;000	I	18	IHMED;000	I
06	GND		19	IRDY;000	I
07	ITRO;000	I	20	VCC	
08	GND		21	DSKCHG;000	I
09	IWEN;000	O	22	VCC	
10	GND		23	IDSL;000	O
11	IWDAT;000	O	24	VCC	
12	GND		25	IINDEX;000	I
13	ISTEP;000	O	26	VCC	

B.4   PJ4 HDD I/F Connectors (22-Pin)

Table B-4 HDD I/F connector pin assignment (22-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	RESET;000	O	12	SD11;102	I/O
02	GND		13	SD03;102	I/O
03	SD07;102	I/O	14	SD12;102	I/O
04	SD08;102	I/O	15	SD02;102	I/O
05	SD06;102	I/O	16	GND	
06	GND		17	SD13;102	I/O
07	SD09;102	I/O	18	SD01;102	I/O
08	SD05;102	I/O	19	SD03;102	I/O
09	SD10;102	I/O	20	SD00;102	I/O
10	SD04;102	I/O	21	GND	
11	GND		22	GND	

B.5   PJ5 HDD I/F Connectors (22-Pin)

Table B-5 HDD I/F connector pin assignment (22-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	GND		12	SA00;100	O
02	SD15;102	I/O	13	GND	
03	VCC		14	SA02;100	O
04	IOWR;000	O	15	HDC0CS;000	O
05	GND		16	HDC1CS;000	O
06	IORD;000	O	17	GND	
07	IIRDY;100	I	18	DRVSL;000	I
08	IRQ14;100	I	19	VCC	
09	GND		20	VCC	
10	IIO16;000	I	21	ATSEL;100	O
11	SA01;100	O	22	GND	

B.6   PJ6 Memory Slot Connectors (88-Pin)

Table B-6 Memory slot connector pin assignment (88-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	GND		45	GND	
02	D00;100	I/O	46	D16;100	I/O
03	D01;100	I/O	47	D17;100	I/O
04	D02;100	I/O	48	D18;100	I/O
05	D03;100	I/O	49	D19;100	I/O
06	D04;100	I/O	50	D20;100	I/O
07	D05;100	I/O	51	D21;100	I/O
08	D06;100	I/O	52	D22;100	I/O
09	RAMV		53	D23;100	I/O
10	D07;100	I/O	54	GND	
11	N/C		55	N/C	
12	GND		56	GND	
13	MA00;101	O	57	MA01;101	O
14	MA02;102	O	58	MA03;101	O
15	RAMV		59	MA05;101	O
16	MA04;101	O	60	MA07;101	O
17	N/C		61	MA09;101	O
18	MA06;101	O	62	GND	
19	MA08;101	O	63	GND	
20	MA10;101	O	64	GND	
21	GND		65	RAS1;001	O
22	RAS0;001	O	66	CAS2;011	O
23	CAS0;011	O	67	GND	
24	CAS1;011	O	68	CAS3;011	O
25	N/C		69	RAS3;001	O
26	RAS2;001	O	70	MEMWE;011	O
27	RAMV	O	71	N/C	
28	N/C		72	N/C	
29	N/C		73	GND	
30	N/C		74	N/C	
31	N/C		75	N/C	
32	N/C		76	N/C	
33	GND		77	N/C	
34	D08;100	I/O	78	N/C	
35	N/C		79	GND	
36	D09;100	I/O	80	D24;100	I/O
37	RAMV	O	81	D25;100	I/O
38	D10;100	I/O	82	D26;100	I/O
39	D11;100	I/O	83	D27;100	I/O
40	D12;100	I/O	84	D28;100	I/O
41	D13;100	I/O	85	D29;100	I/O
42	D14;100	I/O	86	D30;100	I/O
43	D15;100	I/O	87	D31;100	I/O
44	GND		88	GND	

B.7 PJ7 Serial I/F Connectors (9-Pin)

Table B-7 Serial I/F connector pin assignment (9-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	DCD1;100	I	06	DSR1;100	I
02	RD1;000	I	07	RTS1;111	O
03	SD1;011	O	08	CTS1;100	I
04	DTR1;111	O	09	RI1;100	I
05	GND				

B.8 PJ9 B-Modem I/F Connectors (30-Pin)

Table B-8 B-modem I/F connector pin assignment (30-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	N9V	O	16	GND	
02	BMDMSL;000	O	17	SD02;103	I/O
03	$14R7M;120	O	18	SD01;103	I/O
04	GND		19	GND	
05	SA00;103	I/O	20	GND	
06	SA01;103	I/O	21	SD00;103	I/O
07	SA02;103	I/O	22	IOWR;003	I/O
08	GND		23	IORD;103	I/O
09	SD07;103	I/O	24	VCC	
10	SD06;103	I/O	25	RESET;110	O
11	GND		26	BMPOF;100	O
12	GND		27	GND	
13	SD05;103	I/O	28	GND	
14	SD04;103	I/O	29	BMIRQ;000	I
15	SD03;103	I/O	30	BSPTON;000	I

B.9 PJ12 Tenkey PAD Connectors (3-Pin)

Table B-9 Tenkey PAD connector pin assignment (3-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	GND		03	N/C	
02	TENKEY;110	I/O			

B.10   PJ12 PS/2 Mouse Connectors (6-Pin)

Table B-10 PS/2 mouse connector pin assignment (6-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	MOUSED;110	I/O	04	MUSED;100	I/O
02	N/C		05	MUSECK;110	I/O
03	GND		06	N/C	

B.11   PJ14 Expansion Connectors (150-Pin)

Table B-11 Expansion connector pin assignment (150-pin) (1/2)

Pin	Signal	I/O	Pin	Signal	I/O
01	DCIN	O	31	SA11;101	I/O
02	DCIN	O	32	SA12;101	I/O
03	DCIN	O	33	SA13;101	I/O
04	DCIN	O	34	SA14;101	I/O
05	CURENT	O	35	SA15;101	I/O
06	CURENT	O	36	GND	
07	CURENT	O	37	SA16;101	I/O
08	CURENT	O	38	SA17;101	O
09	ADPCNT;100	O	39	SA18;101	O
10	GND		40	SA19;101	O
11	RVCC		41	SD00;101	I/O
12	RGND		42	SD01;101	I/O
13	CPCNF;100	I	43	SD02;101	I/O
14	MDMSL;001	O	44	SD03;101	I/O
15	COMCCK;101	O	45	GND	
16	MIRQ;001	I	46	SD04;101	I/O
17	SPKTON;001	I	47	SD05;101	I/O
18	GND		48	SD06;101	O
19	SA00;101	I/O	49	SD07;101	I/O
20	SA01;101	I/O	50	SMEW;001	O
21	SA02;101	I/O	51	SMER;001	O
22	SA03;101	I/O	52	GND	
23	SA04;101	I/O	53	IOWR;001	I/O
24	SA05;101	I/O	54	IORD;001	I/O
25	SA06;101	I/O	55	TC;101	O
26	SA07;101	I/O	56	BALE;101	O
27	GND		57	RESET;101	O
28	SA08;101	I/O	58	DACK1;001	O
29	SA09;101	I/O	59	IRQ9;101	I
30	SA10;101	I/O	60	GND	

Table B-11 Expansion connector pin assignment (150-pin) (2/2)

Pin	Signal	I/O	Pin	Signal	I/O
61	N/C		106	IRQ4;101	I
62	IOCLK;110	O	107	MEWE;001	I/O
63	IRQ5;101	I	108	IRQ7;101	I
64	DRQ3;101	I	109	GND	
65	DACK3;001	O	110	RED;101	O
66	AEN;101	O	111	LGREN;101	O
67	DRQ1;101	I	112	BLUE;101	O
68	IOCRDY;101	I	113	GND	
69	GND		114	PHSYNC;100	O
70	IRQ10;101	I	115	PVSYNC;100	O
71	IRQ14;101	I	116	GND	
72	SD08;101	I/O	117	EKBDAT;100	I/O
73	SD09;101	I/O	118	EKBCLK;100	O
74	IRQ11;101	I	119	TENKEY;100	I/O
75	SD10;101	I/O	120	MOUSED;100	I/O
76	SD11;101	I/O	121	MUSECK;100	I/O
77	SD12;101	I/O	122	GND	
78	IRQ12;101	I	123	STROB;010	I/O
79	GND		124	PDB00;110	I/O
80	SD13;101	I/O	125	PDB01;110	I/O
81	SD14;101	I/O	126	PDB02;110	I/O
82	IRQ6;101	I	127	PDB03;110	I/O
83	SD15;101	I/O	128	PDB04;110	I/O
84	LA22;101	I/O	129	PDB05;110	I/O
85	LA23;101	I/O	130	PDB06;110	I/O
86	DRQ2;101	I	131	PDB07;110	I/O
87	LA21;101	I/O	132	ACK;000	I/O
88	LA19;101	I/O	133	BUSY;100	I/O
89	LA20;101	I/O	134	PE;100	I/O
90	DACK6;001	O	135	SELCT;100	I/O
91	GND		136	AUTFD;000	I/O
92	REFMD;001	I/O	137	ERROR;000	I/O
93	LA18;101	I/O	138	PINT;000	I/O
94	MASTER;001	I	139	SLIN;000	I/O
95	LA17;101	I/O	140	GND	
96	SBHE;001	I/O	141	SD1;000	O
97	IOCHCK;001	I	142	DTR1;100	O
98	MMCS16;001	I	143	RTS1;100	O
99	GND		144	DCD1;100	I
100	IOCS16;001	I	145	RD1;000	I
101	DACK2;001	O	146	DSR1;100	I
102	DRQ6;101	I	147	CTS1;100	I
103	DRQ5;101	I	148	RI1;100	I
104	DACK5;001	O	149	GND	
105	MEMR;001	I/O	150	GND	

B.12   PJ17 LCD Connectors (32-Pin)

Table B-12 LCD connector pin assignment (32-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	GND		17	GND	
02	PLTR0;101	O	18	PLTB2;101	O
03	GND		19	GND	
04	PLTR1;101	O	20	DFLTCK;101	O
05	GND		21	DFP;101	O
06	PLTR2;101	O	22	DLP;101	O
07	GND		23	BANCNT;100	O
08	PLTG0;101	O	24	DENAB;101	O
09	GND		25	PNEL1;100	I
10	PLTG1;101	O	26	GND	
11	GND		27	FLTEN;110	O
12	PLTG2;101	O	28	FLTEN;110	O
13	GND		29	CBLON;000	O
14	PLTB0;101	O	30	DSPV	O
15	GND		31	GND	
16	PLTB1;101	O	32	DSPV	O

B.13   PJ18 LED Connectors (12-Pin)

Table B-13 LED connector pin assignment (12-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	CHG;110	O	07	CAPLED;110	O
02	LB;110	O	08	POWER;100	O
03	HDDLED;100	O	09	SPEED;100	O
04	ALED;100	O	10	PNLOFF;000	I
05	OVRLED;110	O	11	GND	
06	NUMLED;110	O	12	GND	

B.14   PJ18 CRT I/F Connectors (15-Pin)

Table B-14 CRT I/F connector pin assignment (15-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	RED;101	O	09	N/C	
02	LGREN;101	O	10	GND	
03	BLUE;101	O	11	N/C	
04	N/C		12	N/C	
05	GND		13	PHSYNC;100	O
06	GND		14	PVSYNC;100	O
07	GND		15	N/C	
08	GND				

B.15   PJ19 KB I/F Connectors (19-Pin)

Table B-15 KB I/F connector pin assignment (19-pin)

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

B.16 PJ25 PRT/FDD (Ext) Connectors (25-Pin)

Table B-16 PRT/FDD (Ext) connector pin assignment (25-pin)

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

B.17 PJ26 PS I/F Connectors (20-Pin)

Table B-17 PS IF connector pin assignment (20-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	N/C		11	CBLON;000	I
02	PSSTA;000	O	12	THERM	
03	SRBTN;000	I	13	GND	
04	PCLR;000	I	14	SUBBAT	I
05	BEEP;000	I	15	GND	
06	CPCNF;100	O	16	DCIN	O
07	PNLOFF;011	O	17	DCIN	O
08	PSRD;100	O	18	GND	
09	PSSD;100	I	19	CURENT	O
10	ADPCNT;100	I	20	CURENT	O

B.18   PJ27 PS I/F Connectors (20-Pin)

Table B-18 PS IF connector pin assignment (20-pin)

Pin	Signal	I/O	Pin	Signal	I/O
01	GND		11	P12V	I
02	RAMV		12	DSPV	I
03	RAMV		13	DSPV	I
04	GND		14	GND	
05	VCC		15	BRNCNT;100	I
06	VCC		16	CHG;100	I
07	VCC		17	LB;100	I
08	VCC		18	GND	
09	GND		19	N/C	
10	N9V		20	N/C	

Appendix C USA Display Code

Table C-1 USA display code

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	Pt	Ø	╛	╬	▐	∈	∎
F	☼	▼	/	?	O	_	o	△	Å	ƒ	»	┐	╧	▀	∩	BLANK FF

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Appendix D Keyboard Scan/Character Codes

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

Cap No.	Keytop	Code set 1 Make	Code set 1 Break	Code set 2 Make	Code set 2 Break		Note
01	` ~	29	A9	0E	F0	0E	
02	1 !	02	82	16	F0	16	
03	2 @	03	83	1E	F0	1E	
04	3 #	04	84	26	F0	26	
05	4 $	05	85	25	F0	25	
06	5 %	06	86	2E	F0	2E	
07	6 ^	07	87	36	F0	36	
08	7 &	08	88	3D	F0	3D	*2
09	8 *	09	89	3E	F0	3E	*2
10	9 (	0A	8A	46	F0	46	*2
11	0)	0B	8B	45	F0	45	
12	- _	0C	8C	4E	F0	4E	
13	= +	0D	8D	55	F0	55	
15	BkSp	0E	8E	66	F0	66	
16	Tab	0F	8F	0D	F0	0D	
17	Q	10	90	15	F0	15	
18	W	11	91	1D	F0	1D	
19	E	12	92	24	F0	24	
20	R	13	93	2D	F0	2D	
21	T	14	94	2C	F0	2C	
22	Y	15	95	35	F0	35	
23	U	16	96	3C	F0	3C	*2
24	I	17	97	43	F0	43	*2
25	O	13	98	44	F0	44	*2
26	P	19	99	4D	F0	4D	*2
27	[{	1A	9A	54	F0	54	
28	] }	1B	9B	5B	F0	5B	
29 (42)	\ |	2B	AB	5D	F0	5D	*5
30	Caps Lock	3A	BA	58	F0	58	
31	A	1E	9E	1C	F0	1C	
32	S	1F	9F	1B	F0	1B	
33	D	20	A0	23	F0	23	
34	F	21	A1	2B	F0	2B	
35	G	22	A2	34	F0	34	
36	H	23	A3	33	F0	33	
37	J	24	A4	3B	F0	3B	*2
38	K	25	A5	42	F0	42	*2
39	L	26	A6	4B	F0	4B	*2
40	; :	27	A7	4C	F0	4C	*2

Table D-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	
44	Shift (L)	2A	AA	12	F0 12	
45	No.102 key	56	D6	61	F0 61	
46	Z	2C	AC	1A	F0 1A	
47	X	2D	AD	22	F0 22	
48	C	2E	AE	21	F0 21	
49	V	2F	AF	2A	F0 2A	
50	B	30	B0	32	F0 32	
51	N	31	B1	31	F0 31	
52	M	32	B2	3A	F0 3A	*2
53	, <	33	B3	41	F0 41	*2
54	. >	34	B4	49	F0 49	*2
55	/ ?	35	B5	4A	F0 4A	*2
57	Shift (R)	36	B6	59	F0 59	
58	Ctrl	1D	9D	14	F0 14	*3
60	Alt (L)	38	B8	11	F0 11	*3
61	Space	39	B9	29	F0 29	
62	ALT (R)	E0 38	E0 B8	E0 11	E0 F0 11	
75	Ins	E0 52	E0 D2	E0 70	E0 F0 70	*1
76	Del	E0 53	E0 D3	E0 71	E0 F0 71	*1
79	←	E0 4B	E0 CB	E0 6B	E0 F0 6B	*1
80	Home	E0 47	E0 C7	E0 6C	E0 F0 6C	*1
81	End	E0 4F	E0 CF	E0 69	E0 F0 69	*1
83	↑	E0 48	E0 C8	E0 75	E0 F0 75	*1
84	↓	E0 50	E0 D0	E0 72	E0 F0 72	*1
85	PgUp	E0 49	E0 C9	E0 7D	E0 F0 7D	*1
86	PgDn	E0 51	E0 D1	E0 7A	E0 F0 7A	*1
89	→	E0 4D	E0 CD	E0 74	E0 F0 74	*1
110	Esc	01	81	76	F0 76	

Table D-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	3B	05	F0 05	
113	F2	3C	BC	06	F0 06	
114	F3	3D	BD	04	F0 04	
115	F4	3E	BE	0C	F0 0C	
116	F5	3F	BF	03	F0 03	
117	F6	40	C0	0B	F0 0B	
118	F7	41	C1	83	F0 83	
119	F8	42	C2	0A	F0 0A	
120	F9	43	C3	01	F0 01	
121	F10	44	C4	09	F0 09	
122	F11	57	D7	78	F0 78	*3
123	F12	58	D8	07	F0 07	*3
124	PrintSc	*6	*6	*6	*6	*6
126	Pause	*7	*7	*7	*7	*7
202	Fn	—	—	—	—	*4

Notes:
1* Scan codes differ by mode.
2* Scan codes differ by overlay function.
3* Combination with **Fn** key makes different codes.
4* **Fn** key does not generate a code by itself.
5* This key corresponds to key No. 42 in 102-key model.
6* Refer to table D-6, scan code with **Ctrl** key.
7* Refer to table D-7, scan code with **Alt** key.

Table D-2 Scan codes with Shift key

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

Note: The table above shows scan codes with the left shift key. In case of combination with a right shift key, scan codes are changed as below:

	With left shift	With right shift
Set 1	E0 AA ————————	E0 B6
	E0 2A ————————	E0 36
Set 2	E0 F0 12 ————————	E0 F0 59
	E0 12 ————————	E0 59

Table D-3 Scan codes in Numlock mode

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

Table D-4 Scan codes with Fn key

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

Table D-5 Scan codes in overlay mode

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

Table D-6 Scan codes with Ctrl key

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

Table D-7 Scan codes with Alt key

Key top	Shift	Code set 1 Make	Code set 2 Make
Pause	Common	E1 1D 45 E1 9D C5	E1 14 77 E1 F0 14 F0 77
	Ctrl*	E0 46 E0 C6	E0 7E E0 F0 7E

*: This key generates only make codes.
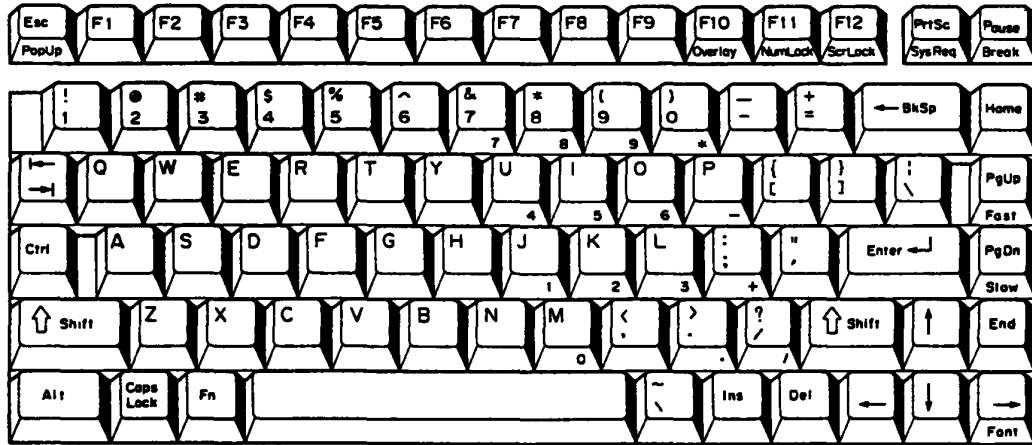
Appendix E Key Layout

E.1 USA Keyboard
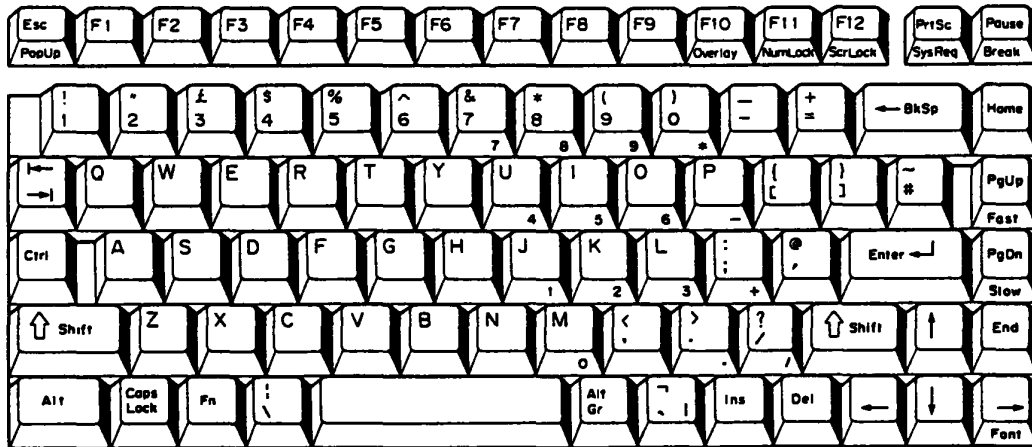

Figure E-1 USA keyboard

E.2 UK Keyboard

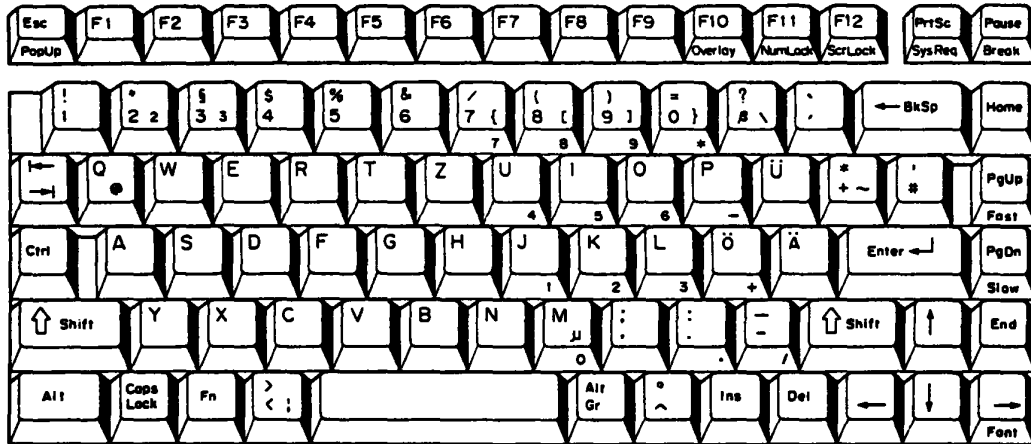**Figure E-2 UK keyboard**

E.3   German Keyboard

Figure E-3 German keyboard

E.4   French Keyboard

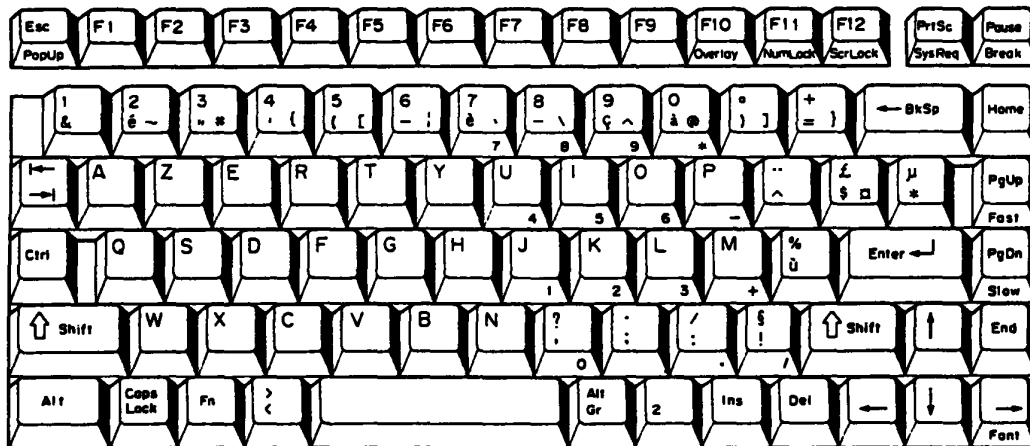**Figure E-4 French keyboard**

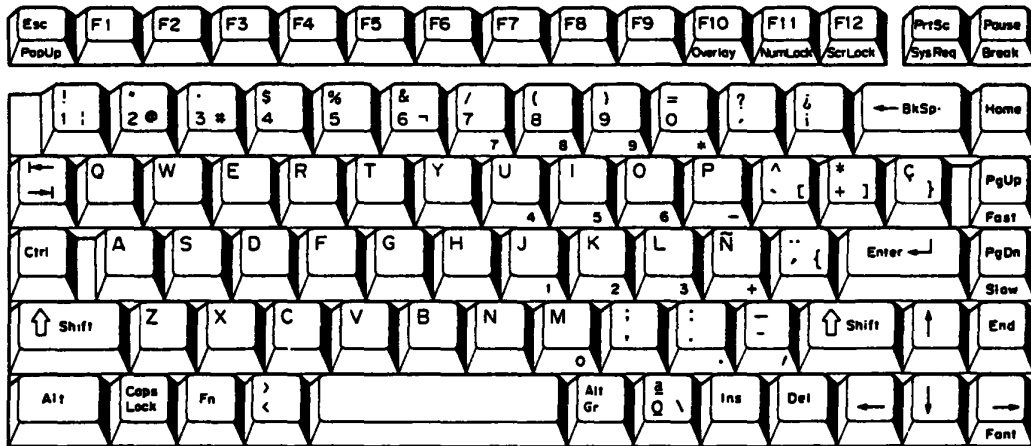## E.5   Spanish and Latin American Keyboard

Figure E-5 Spanish and Latin American keyboard
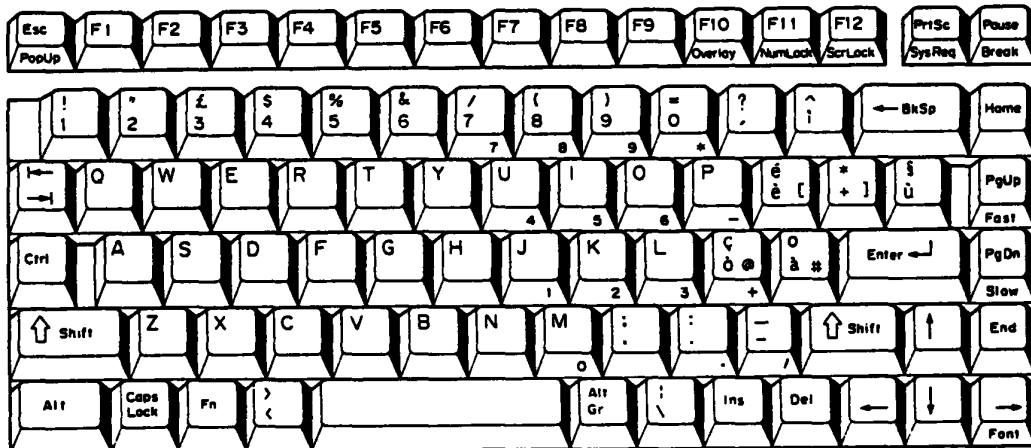
E.6   Italian Keyboard

Figure E-6 Italian keyboard

E.7   Scandinavian (DK, NO, SW) Keyboard
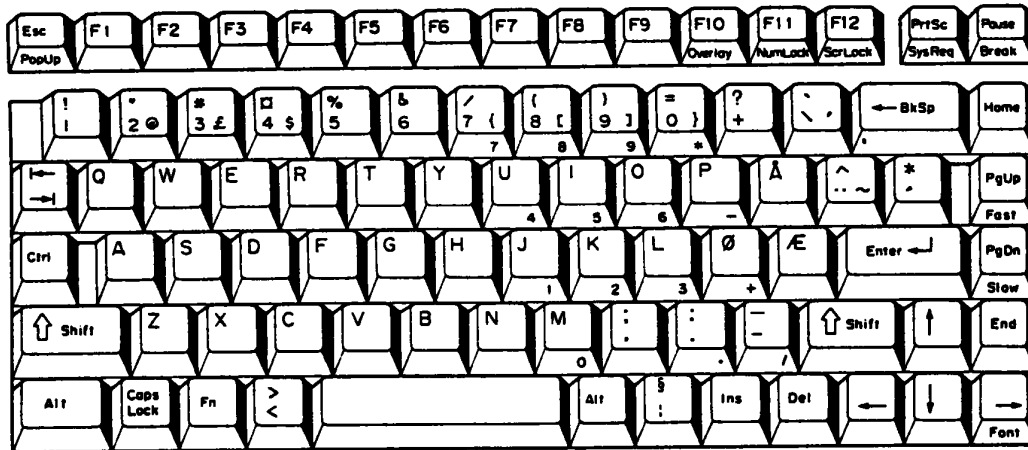
Figure E-7 Scandinavian (DK, NO, SW) keyboard
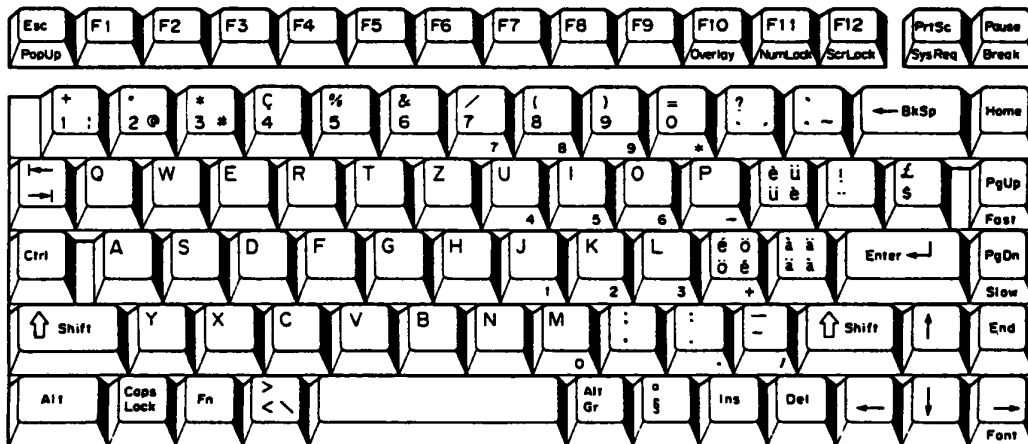
E.8   Swiss (French/German) Keyboard

Figure E-8 Swiss (French/German) keyboard
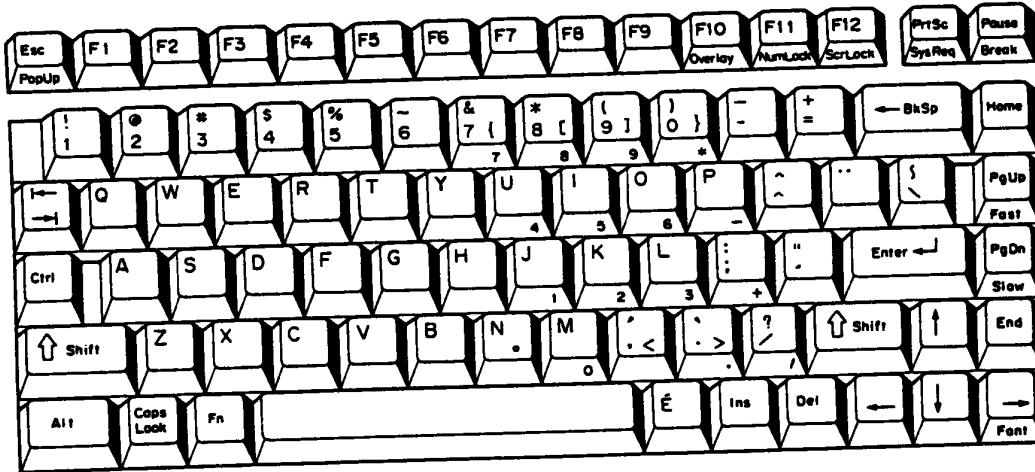
E.9   Canadian Keyboard

Figure E-9 Canadian keyboard

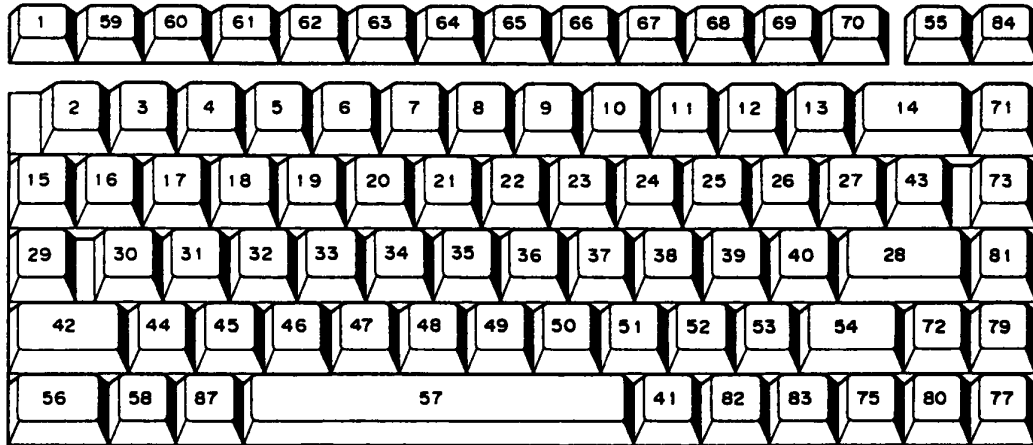## E.10   Keycap Number Keyboard

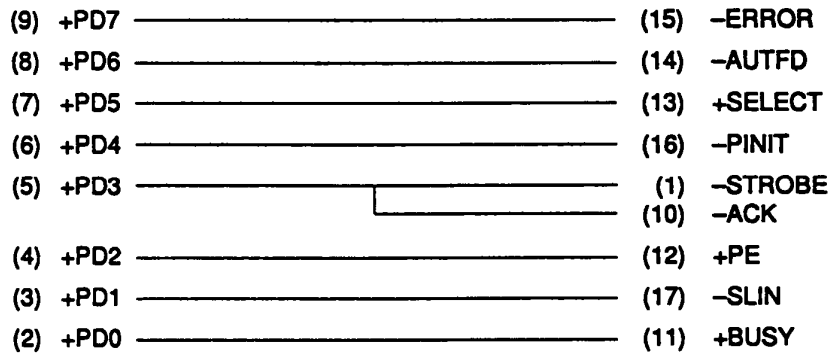**Figure E-10 Keycap number keyboard**

Appendix F Wiring Diagrams

F.1   Printer Wraparound Connector

```
(9)  +PD7 ————————————————————— (15)  -ERROR
(8)  +PD6 ————————————————————— (14)  -AUTFD
(7)  +PD5 ————————————————————— (13)  +SELECT
(6)  +PD4 ————————————————————— (16)  -PINIT
(5)  +PD3 ——————————————┐        (1)   -STROBE
                        └———————— (10)  -ACK
(4)  +PD2 ————————————————————— (12)  +PE
(3)  +PD1 ————————————————————— (17)  -SLIN
(2)  +PD0 ————————————————————— (11)  +BUSY
```

Figure F-1 Printer wraparound connecter

F.2   RS-232-C Wraparound Connector

```
(3)  TD  ————————————————————— (2)  RD
(7)  RTS ——————————————┐        (8)  CTS
                       └———————— (1)  CD
(4)  DTR ——————————————┐        (6)  DSR
                       └———————— (9)  RI
```
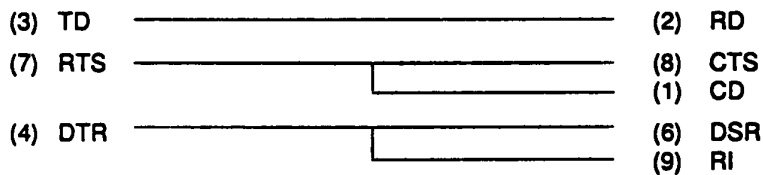
Figure F-2 RS-232-C wraparound connecter

F.3   RS-232-C Direct Cable (9-Pin to 9-Pin)

```
(3)  TD  ————————————————————— (2)  RD
(4)  DTR ——————————————┐        (6)  DSR
                       ├———————— (8)  CTS
                       └———————— (9)  RI
(7)  RTS ————————————————————— (1)  CD
(5)  GND ————————————————————— (5)  GND
(2)  RD  ————————————————————— (3)  TD
(1)  CD  ————————————————————— (7)  RTS
(6)  DSR ——————————————┐        (4)  DTR
(8)  CTS ——————————————┤
(9)  RI  ——————————————┘
```
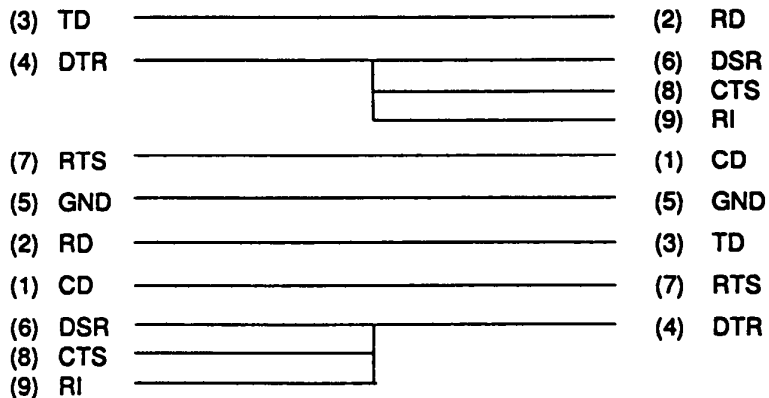
Figure F-3 RS-232-C direct cable (9-pin to 9-pin)

F.4   RS-232-C Direct Cable (9-Pin to 25-Pin)

```
(1)  CD   ───────────────────────────  (4)  RTS
(2)  RD   ───────────────────────────  (2)  TD
(3)  TD   ───────────────────────────  (3)  RD
(4)  DTR  ──────────────┐               (5)  CTS
                        ├──────────     (6)  DSR
                        └──────────     (22) RI

(5)  GND  ───────────────────────────  (7)  GND
(7)  RTS  ───────────────────────────  (8)  CD
(6)  DSR  ──────────────┐               (20) DTR
(8)  CTS  ──────────────┤
(9)  RI   ──────────────┘
```
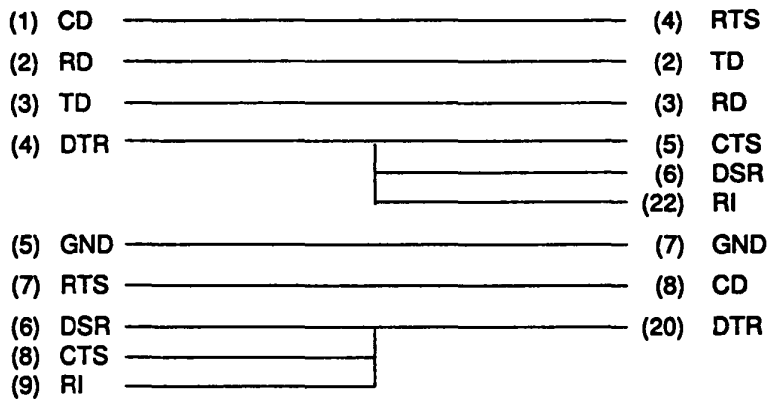
Figure F-4 RS-232-C direct cable (9-pin to 25-pin)