1.1   GENERAL

The Toshiba T3100SX is one of the most advanced portable
personal computers available offering high technology, high
speed, and IBM PC AT compatibility.

The T3100SX main features are as follows:

- The central processing unit (CPU) is the 80386SX-16
  32-bit microprocessor, operated at 16 MHz.

- The standard memory has 1 Mbyte of random access
  memory (RAM) with 16-bit data bus width, expandable
  up to 13 Mbytes maximum. There is no parity bit for
  all memories. The RAMs can be used as working
  memory, hard RAM, virtual disk, Lotus/Intel/Microsoft
  expanded memory specification (LIM-EMS).

- The Intel80387SX-16 math co-processor can be
  connected.

- The display supports high resolution plasma display
  panel (PDP) with 640 by 480 pixels (dots) and 16-
  level gray scale, or high resolution liquid crystal
  display (LCD) with 640 by 480 pixels (dots) and 16-
  level gray scale.

- The display controller supports high resolution
  graphics subsystem (HRGS), includes the functions of
  video graphics array (VGA).

- The hard disk drive (HDD) has a capacity of 40 Mbytes
  or 80 Mbytes with 25-millisecond (ms) average access
  time.

- The floppy disk drive (FDD) can support 2DD (720
  Kbytes) and 2HD (1.44 Mbytes) floppy disks.

- The keyboard has 86/88-key keyboard with the keys of
  a subset of the industry standard 101/102-key
  keyboard.

- The universal auto-sensing AC adapter is used for
  world-wide usage.

- The Ni-Cd battery backs up the calendar clock.

- The T3100SX can connect one 16-bit Toshiba internal
  modem slot and built-in modem slot for T1200 style
  modem.

- The interface connector has one PRT/EXT.FDD connector
  (25-pin), two serial connectors (9-pin), one VGA
  connector (15-pin), and numerical keypad connector
  (2-pin).

• The T3100SX is supported by the resume feature by keeping the data and configuration when the T3100SX power is off.

• The real time clock (RTC) continuously keeps the date and time even when the T3100SX power is off.

The T3100SX Personal Computer is shown in figure 1-1, and the configuration of the T3100SX's system unit is shown in figure 1-2.
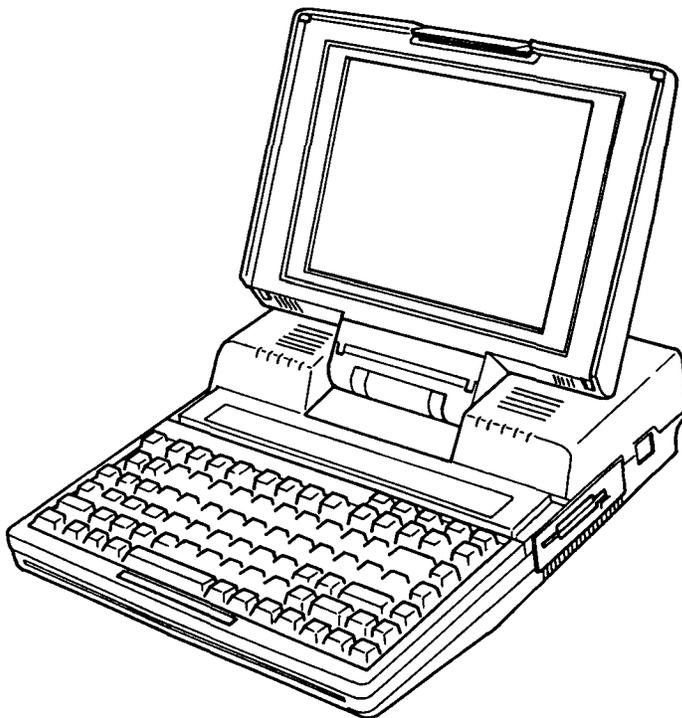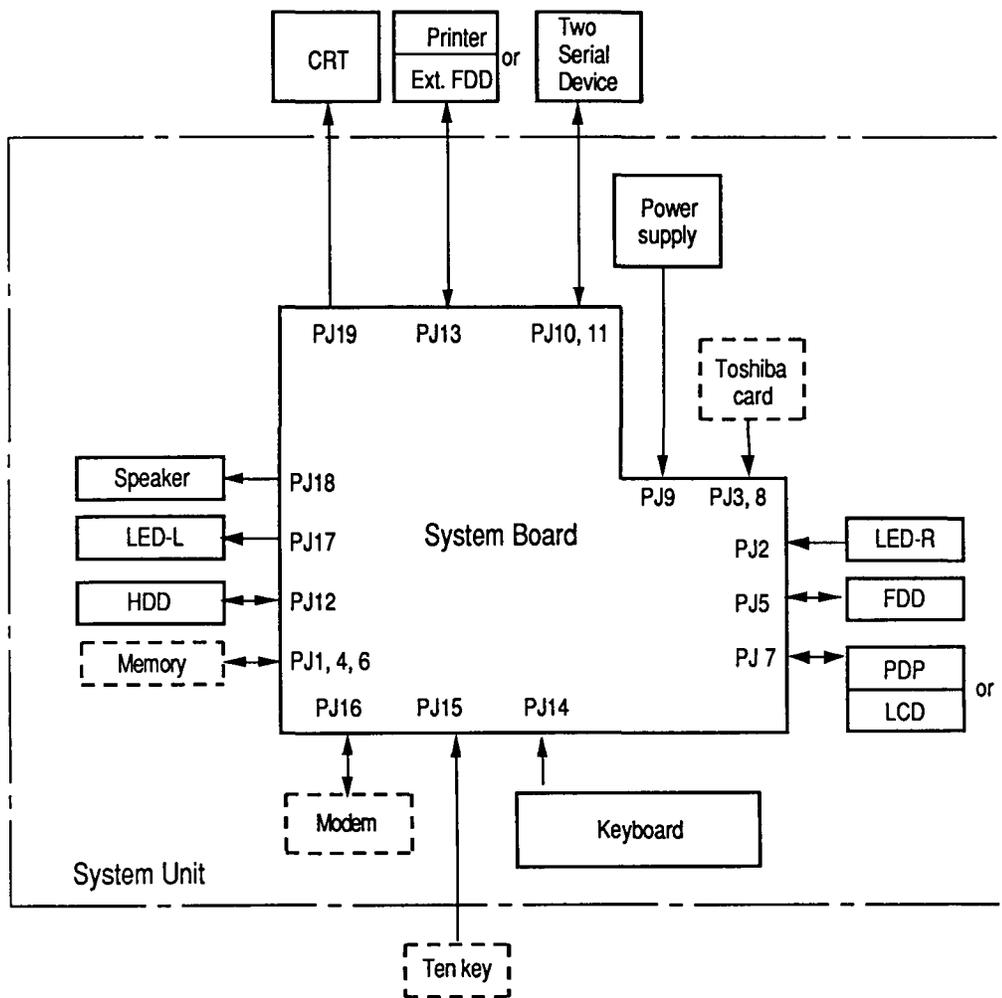
Figure 1-1   T3100SX personal computer

Figure 1-2 System unit configuration

1.2 SYSTEM BOARD

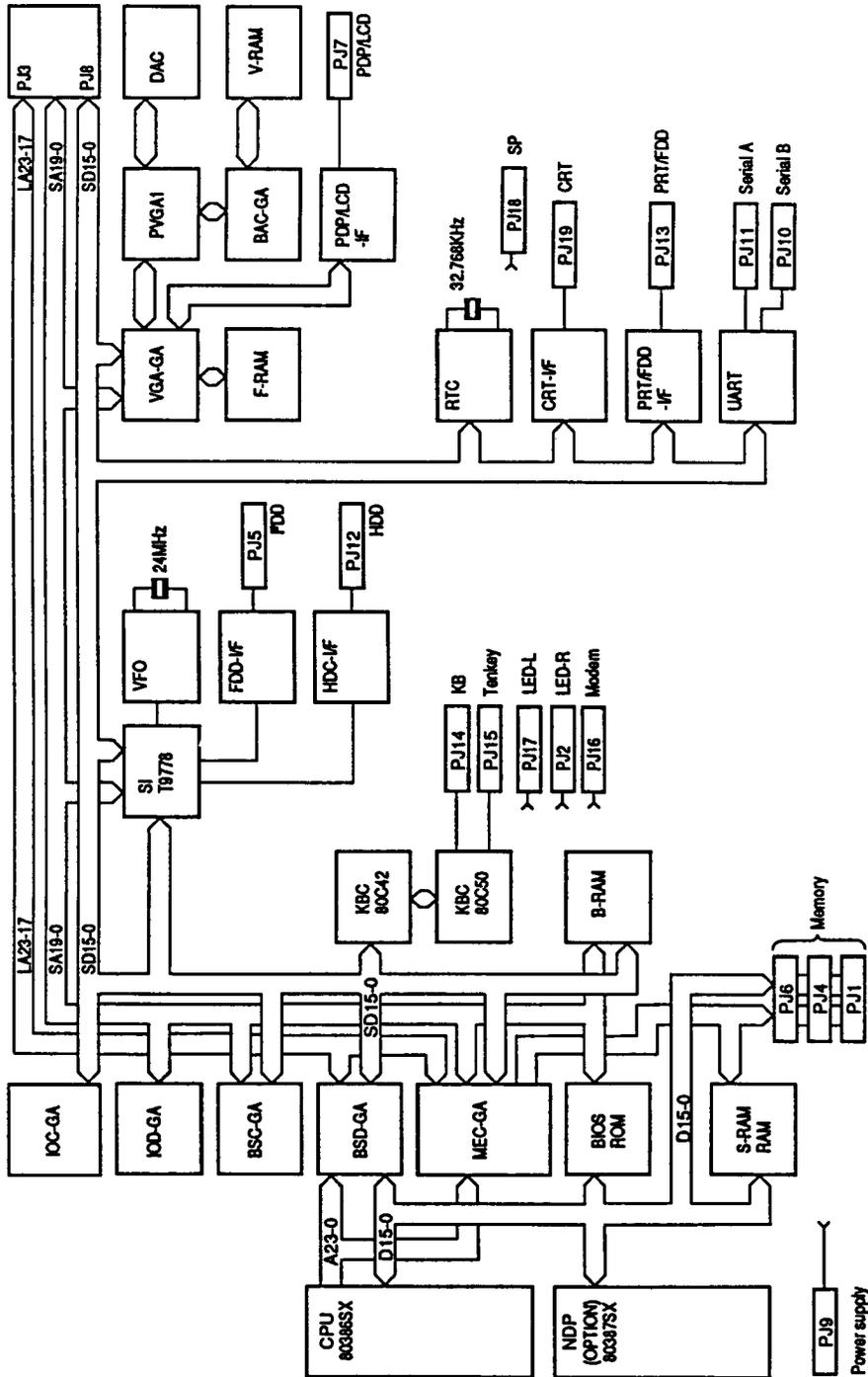Figure 1-3 shows the block diagram of the system unit.

Figure 1-3 Block diagram

The system board is composed of the following components:

- Central processing unit (CPU): 80386SX-16

- Numeric data processor socket for the 80387SX-16 (option)

- Universal asynchronous receive transmitter (UART): 16C450

- Variable frequency oscillator (VFO): T8568

- Keyboard controller (KBC): 80C42

- Keyboard scan controller (SCC): 80C50

- Real time clock (RTC): MC146818AF

- Super integration (SI): T9778

    SI includes the followings:

        Two direct memory access controllers
        (DMACs, equivalent to 82C37)

        Two programmable interrupt controllers
        (PICs, equivalent to 82C59)

        One programmable interval timer
        (PIT, equivalent to 82C54)

        One floppy disk controller
        (FDC, equivalent to TC8565)

        One serial input output
        (SIO, equivalent to TC8570)

- Gate arrays (GAs)

    The following gate arrays are mounted in the system board:

        I/O controller GA (IOC-GA)
        I/O decoder GA (IOD-GA)
        Bus controller GA (BSC-GA)
        Bus driver GA (BSD-GA)
        Memory controller GA (MEC-GA)
        Video graphics array GA (VGA-GA)
        Paradise video graphics array 1 (PVGA1)
        Backup GA (BAC-GA)

- Digital-to-analog converter (DAC)

- Initial program loader (IPL) ROM: 128 Kbytes (96 Kbytes are used.)

  This ROM contains initial reliability test (IRT), system basic input output system (system BIOS), and video BIOS.

- System RAMs: 1 Mbyte

- Backup RAMs: 32 Kbytes

- Video RAMs: 1 Mbyte

- Frame RAMs: 256 Kbytes

- Memory module socket:

  The memory is expandable up to 13 Mbytes maximum.

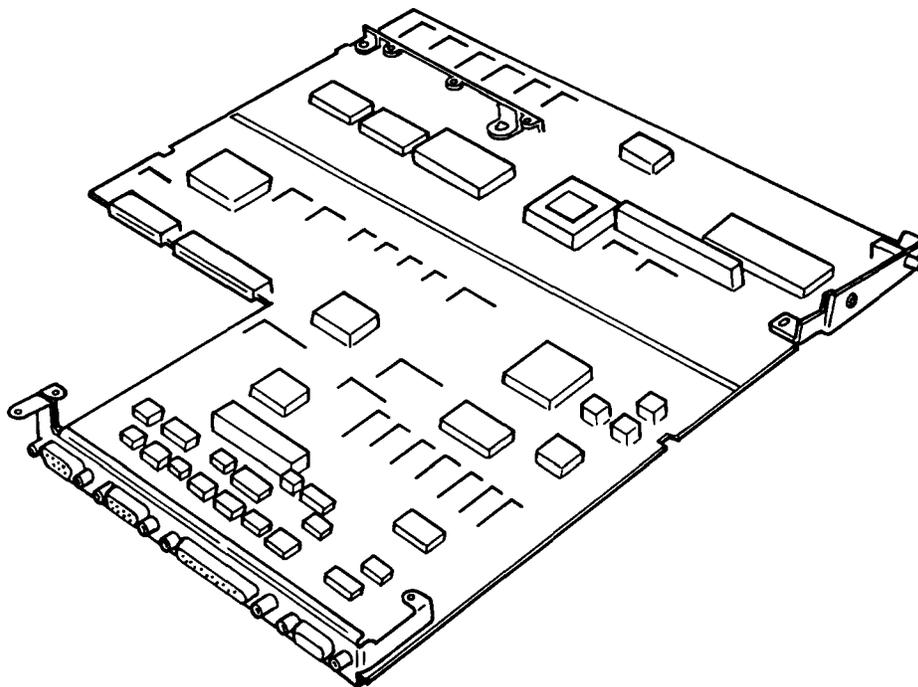The system board is shown in figure 1-4.

Figure 1-4   System board

1.3   3.5-INCH FLOPPY DISK DRIVE

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

The FDD is shown in figure 1-5 and its specifications are
described in table 1-1.
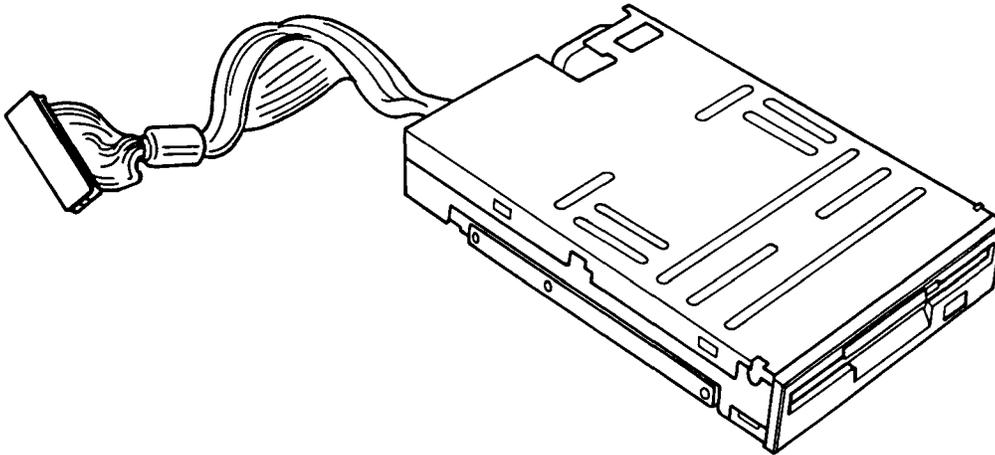
Figure 1-5   3.5-inch FDD

Table 1-1   3.5-inch FDD specifications

Item	2-Mbyte mode	1-Mbyte mode

Storage capacity   (Kbytes)
  Unformatted
  Formatted
	
	2,000
	1,440
		
		1,000
		720

Number of heads	2	2
Number of cylinders	80	80

Access time   (ms)
  1 Track access
  Average
  Head settling time
	
	3
	94
	15
		
		3
		94
		15

Recording density (bit per inch)	135	135
Data transfer rate (Kbytes per second)	500	250
Rotational speed (revolutions per minute)	300	300
Recording method	MFM (Modified Frequency Modulation)	

1.4   3.5-INCH HARD DISK DRIVE

The 80-Mbyte and 40-Mbyte hard disk drive (HDD) is a random access type storage device. It is equipped with non-removal 3.5-inch magnetic disk and mini-winchester type magnetic heads.

The HDD is shown in figure 1-6 and specifications are described in table 1-2.
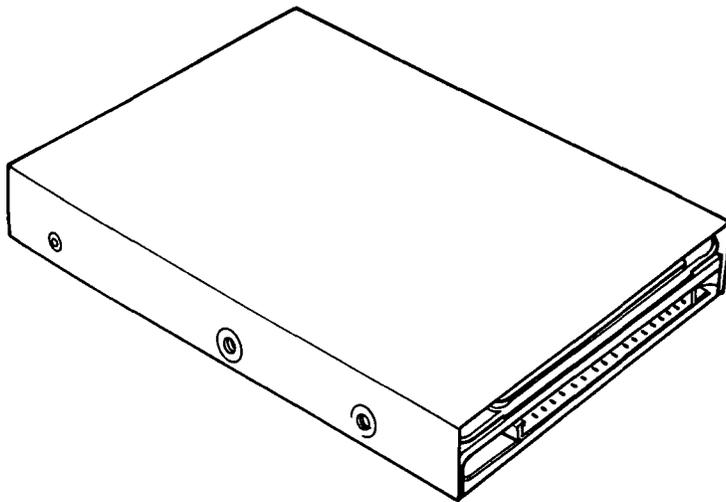
Figure 1-6 3.5-inch HDD

Table 1-2 3.5-inch HDD specifications

Item	80-Mbyte	40-Mbyte
Storage capacity (Mbyte) Formatted	84.84	42.42
Number of heads	4	2
Tracks per surface	862+1	862+1
Sector per track	48	48
Bytes per sector	512	512
Access time (ms) Track to track Average Maximum	8 25 45	8 25 45
Interleave	1:1	1:1
Rotational speed (rpm)		2,332±0.1%
Recording method	2-7 RLL code	

Item	Typical value (W)	
	40-Mbyte	80-Mbyte
Read	3.0	3.2
Write	3.1	3.3
Seek	3.1	3.3
Stand by (motor on)	1.5	1.8
Stand by (motor off)	0.5	0.8
Motor starting (10 sec max.)	6.0	6.0

1.5   KEYBOARD

The 86/88-key keyboard with full size keys and standard
spacing provides full compatibility with standard IBM soft-
ware. The keyboard is connected to the keyboard controller
on the system board through a 27-pin flat cable. The key-
board is shown in figure 1-7.
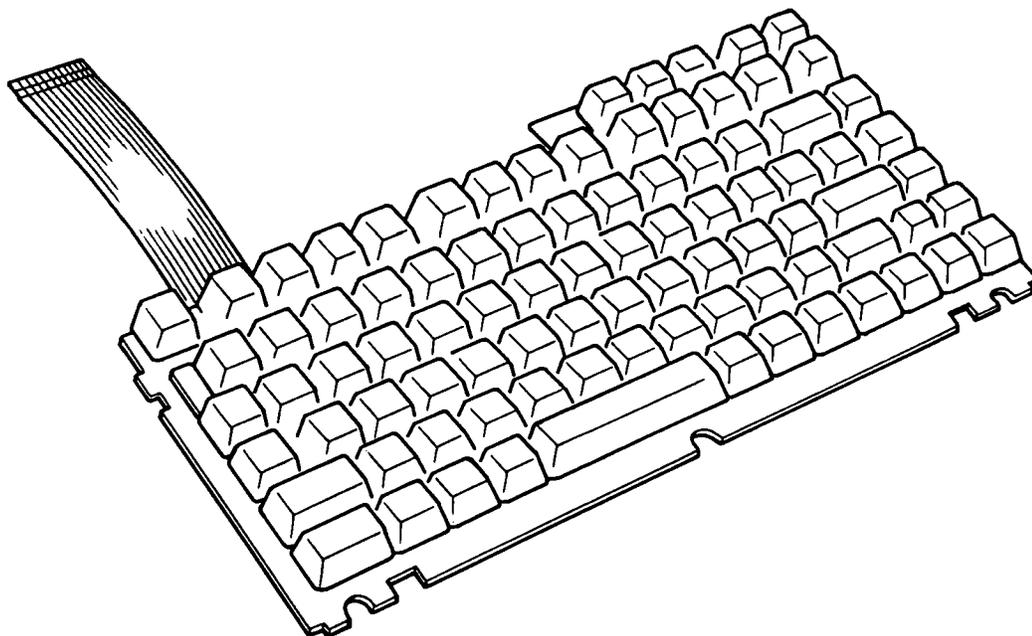
Figure 1-7 Keyboard

1.6   DISPLAY

The display can connect the plasma display or the LCD.

These displays support 640 by 480 pixels with high resolution graphics subsystem (HRGS) and a 16-level gray scale. This HRGS includes the functions of video graphics array (VGA).

The display unit receives vertical and horizontal synchronizing signals, 4-bit data signals, and shift clock for data transmission. All signals are TTL level compatible.

The display (PDP or LCD) is shown in figure 1-8. The specifications are described in table 1-3.
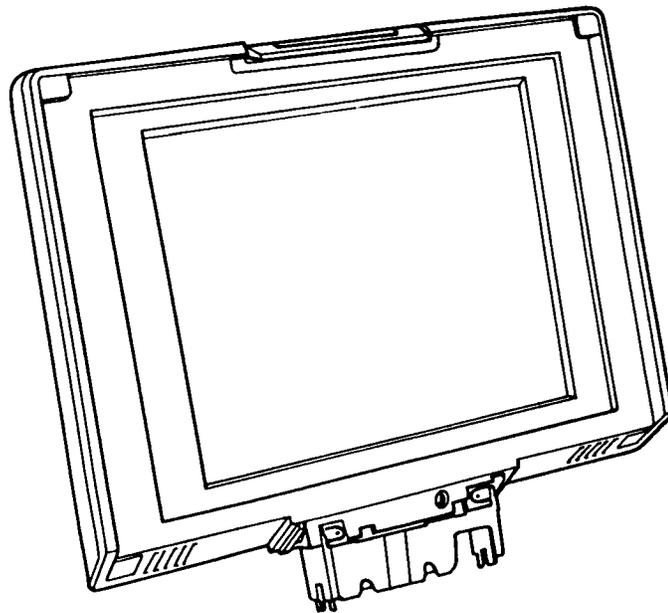
Figure 1-8   Display

Table 1-3   Display specifications

Item	PDP	LCD
Number of dots (dots)	640×480	640×480
Dot dimension (mm)	0.20(W)×0.14(H)	0.28(W)×0.28(H)
Dot pitch (mm)	0.31(W)×0.31(H)	0.31(W)×0.31(H)
Display area (mm)	198.4(W)×148.8(H)	198.4(W)×148.8(H)
Color	Neon-orange	Black & white
Constant ratio	100:1	12:1
Gray scale	16-level	16-level
Power (watts)	15.4	–
Mean time between failure (MTBF) (hours)	20,000	–

1.7   POWER SUPPLY BOARD

The power supply board supplies +5, +12, +18, and -9 VDC to
all the components in the system. It is an intelligent
power supply using two microprocessors and it contains the
following functions:

1. More accurate low battery detection
2. Calculations of remaining battery capacity
3. Over charge protection for battery
4. Over voltage and over current protection for DC
    outputs
5. Over voltage protection for DC input from AC
    adapter
6. Control of DC output regulation

Power supply board is shown in figure 1-9 and output rating
is as shown in table 1-4.
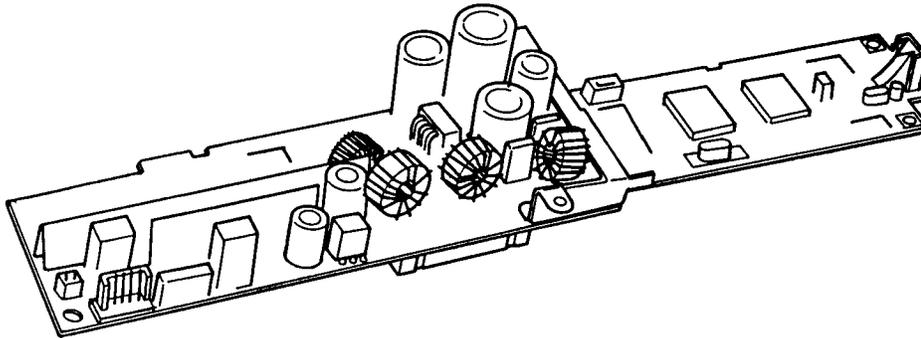
Figure 1-9 Power supply board

Table 1-4 Power supply board output rating

Function	DC Voltage (V)	Regulation tolerance (%)	Maximum current (mA)
System logic, FDD and HDD	+5	±5	2,477
Backup RAM	+5	±5	350
RS-232-C	+12	±5	45.2
Display	+12	±5	1,200
Power supply	+18	±5	10
IO-slot	-9	±5	100
Display brightness volume	0 to +2.5	-	-58 to -75

2.1   GENERAL

The problem isolation procedures described in part 2 are
used to isolate defective FRUs (field replaceable units).
The FRUs covered are:

> 1. Power supply board
> 2. System board
> 3. FDD
> 4. HDD
> 5. Keyboard
> 6. Display

Detailed replacement procedures are described in part 4 and
test and diagnostics program operations are described in
part 3.

The following items are necessary for implementing the prob-
lem isolation procedures.

> 1. T3100SX diagnostics disk
> 2. Phillips head screwdriver
> 3. Tweezers
> 4. 2DD and 2HD formatted work disk (for FDD
>   testing)
> 5. Cleaning disk kit (for FDD testing)
> 6. Printer port LED
> 7. RS-232-C wraparound connector
> 8. Printer wraparound connector

The problem isolation flowchart described in section 2.2 can
be used to determine which isolation procedures are neces-
sary to isolate an T3100SX problem.

2.2   PROBLEM ISOLATION FLOWCHART

The flowchart in figure 2-1 is used as a guide for determining which FRU is defective. Please confirm the followings before performing the flowchart procedures.

1. No disk is in the FDD.
2. All optional equipments are disconnected.
3. A/B/PRT switch is set to "PRT".
4. MS-DOS has been installed in drive C before a trouble happens.

START

Turn the POWER
switch on.

Wait 5 seconds
or more.

Does the Power
indicator come on
when the power is
turned on? — No → Perform power supply board problem isolation procedures in section 2.3.

Yes

An error
message
displayed? — Yes → Perform system board problem isolation procedures in section 2.4.

No

The
"640K Base Memory
XXXXXK Extended"
message displayed? — No → Perform plasma display problem isolation procedures in section 2.8.

Yes

Does the
"640K Base Memory
XXXXXB Extended" message
proceed from 64KB to
Base Memory=640KB
Extended=256KB? — No → Perform system board problem isolation procedures in section 2.4.

Yes

Is the C>
displayed on
the screen? — No → Perform HDD problem isolation procedures in section 2.6.

Yes

1

Figure 2-1 Problem isolation flowchart (2/1)

①

```
┌─────────────────────────┐
│ Insert the diagnostics  │
│ disk into the FDD.      │
└─────────────────────────┘
```

```
┌─────────────────────────┐
│ Type a:T3100SX, then    │
│ press Enter.            │
└─────────────────────────┘
```

Is test and diagnostics program being loaded? (see the part 3) ── No ──> Perform FDD problem isolation procedures in section 2.5.

Yes

Is an error detected when the diagnostics disk program is run? ── Yes ──> After confirming which diagnostics test detected an error, perform the relevant problem isolation procedures, as indicated below.

No

System normal

END

Figure 2-1   Problem isolation flowchart (2/2)

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

2. If an error is detected on the hard disk test, perform the HDD problem isolation procedures in section 2.6.

3. If an error is detected on the keyboard test, perform the keyboard problem isolation procedures in section 2.7.

4. If an error is detected on the floppy disk test, perform the FDD problem isolation procedures in section 2.5.

2.3 POWER SUPPLY BOARD PROBLEM ISOLATION PROCEDURES

This section describes how to determine whether or not the power supply board is defective. Start with PROCEDURE 1 and continue with other procedures as instructed. The procedures described in this section are:

PROCEDURE 1:   DC IN Indicator and AC Adapter Check

PROCEDURE 2:   Connector Check

PROCEDURE 3:   Power Supply Board Replacement

PROCEDURE 1

DC IN Indicator and AC Adapter Check

1. This indicator lights red if power is supplied from AC adapter to the T3100SX when you connect the AC adapters to T3100SX and a wall outlet. If the AC adapter's output voltage is abnormal or the power supply board malfunctions, the indicator labeled "DC IN" blinks red.

> *NOTE:* *When disconnecting the AC adapter to the computer and the DC IN indicator blinks red, the battery is utterly empty. Then plug the AC adapter into the system unit and wall outlet to charge the battery for a few minutes.*

2. If the DC IN indicator blinks red or does not glow when connecting the AC adapter to the computer, unplug the AC adapter from the wall outlet and the system unit. And remove the both battery packs.

   Plug the AC adapter into the system unit and wall outlet again. Then power on the system unit is on.

3. If still its phenomenon remains, the AC adapter may be damaged. Replace a new AC adapter.

4. If still its phenomenon remains, perform the PROCEDURE 2.

PROCEDURE 2

Connector Check

1. The power supply board is connected to the other unit
    by some cables. Remove the top cover. (Refer to
    section 4.3.)

2. Remove the power supply board. (Refer to section
    4.6.)

3. Check that the following cables are connected to power
    supply board correctly.

    • Main battery connector   ---> PJ12

    • Sub battery connector   ---> PJ1

    • Power supply connector   ---> PJ6

    • DC inlet connector   ---> PJ3

4. If these cables are disconnected, connect them.

5. If the phenomenon remains, go to PROCEDURE 3.

PROCEDURE 3

<u>Power Supply Board Replacement</u>

1. Replace the power supply board. (Refer to section 4.6.)

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

3. If normal operation is not restored, the other FRU may be damaged.

2.4   SYSTEM BOARD PROBLEM ISOLATION PROCEDURES

> **CAUTION:** *Before carrying out any of these procedures, make sure that the FDD is empty. Performing these procedures with a floppy disk in the FDD may result in loss of data.*

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

    PROCEDURE 1:   Message Check

    PROCEDURE 2:   Printer Port LED Check

    PROCEDURE 3:   Test Program Execution

    PROCEDURE 4:   System Board Replacement

PROCEDURE 1

Message Check

1. Turn on the power.

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

3. If the following message is displayed on the screen, press the **F2** key. Execute the setup operation. (See the Reference Manual.)

    Invalid configuration information--please run SETUP program. Strike the F1 key to continue, F2 to run the setup utility.

4. If the following message appears, and the status of the printer port LED is F4H to F6H, go to PROCEDURE 4. If not so, press any key. At this time the resumed data will be erased.

    WARNING: RESUME   FAILURE
    PRESS   ANY   KEY   TO   CONTINUE.

    WARNING: DATA   IN   HARD-RAM   WAS   LOST.
    YOU   MUST   FORMAT   HARD-RAM   BEFORE   USE.
    PRESS   ANY   KEY   TO   CONTINUE.

5. If the following message appears after setting the hard-RAM size in the setup program, press any key. If not so, go to PROCEDURE 4.

6. If the following message is displayed on the screen, go to PROCEDURE 4.

    ERROR   INTERRUPT   CONTROLLER   #1

    ERROR   INTERRUPT   CONTROLLER   #2

    MEMORY   VERIFY   ERROR   AT   XXXX:XXXX   FOUND
    XXXX   EXPECTED   XXXX

    ERROR   INTERRUPTS   AND   STUCK   NMI

    ERROR   PROTECT   MODE

    ERROR   PROCESSOR   EXCEPTIONAL   INTERRUPTS

7.   If the following message is displayed on the screen,
       go to HDD problem isolation procedures in section 2.6.

            ERROR ENCOUNTERED INITIALIZING HARD DISK DRIVE

            ERROR INITIALIZING HARD DISK CONTROLLER

8.   If the above message is not displayed and you have a
       printer port LED, go to PROCEDURE 2.

PROCEDURE 2

Printer Port LED Check

1. Plug the printer port LED into the PRT/FDD connector
    on the back of the unit and set the parallel PRT in
    the setup program output port. (Refer to T3100SX
    Reference Manual.)

2. Turn off the power.

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

4. Read the final 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 PROCEDURE 4.

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

Table 2-1 Normal status and error status of the printer
port LED (1/3)

Normal status	Error status	Meaning	Process
00H	C0H	CPU self-test	Halt
01H	81H	CPU test 1 (flag test)	Halt
02H	82H	KBIC IBF/OBF test, video initialization	Halt
03H	83H	KBIC IBF test (0AAH command)	Halt
04H	84H	KBIC OBF test (55H check)	Halt
05H		Reserved	
06H		LSI initialization (DMA, PIT, PIC, RTC)	Continue
07H	87H	CPU test 2 (registers)	Halt
08H		RTC initialization (register B)	Continue
09H	89H	ROM checksum test (64KB)	Halt
0AH	8AH	Video initialization	Halt
0BH		Reserved	
0CH		Reserved	
0DH	8DH	PIT ch2 test and its initialization	Halt
0EH		Reserved	
0FH	8FH	CMOS RAM test	Halt
10H	90H	DMA ch0 test	Halt
11H	91H	DMA ch1 test	Halt
12H	92H	DMA page register test	Halt
13H	93H	KBSC test and its initialization	Halt

Table 2-1 Normal status and error status of the printer
port LED (2/3)

Normal status	Error status	Meaning	Process
14H	94H	Memory refresh test	Halt
	A7H	Backup RAM test	Halt
	14H	Protect mode test	Halt
15H	95H	1st 64KB RAM test	Halt
16H		Interrupt vector setup	Continue
17H	97H	Video option test	Halt
18H	98H	V-RAM test Halt	Halt
19H	99H	PIC ch1 test	3 beeps continue
1AH	9AH	PIC ch2 test	3 beeps continue
1BH	9BH	CMOS battery test	1 beep key wait
1CH		Reserved	Continue
1DH	9DH	Setup RAM size from CMOS (413H)	Continue
1EH	9EH	Size conventional RAM	Continue
1FH	9FH	Conventional RAM test	3 beeps continue
20H	A0H	PIC #1, #2 test	Continue
21H	A1H	NMI check	Continue
22H	A2H	Interrupt process test (INT8)	3 beeps continue
23H	A3H	Protect mode test	3 beeps continue
24H	A4H	Size extended RAM	Continue
25H	A5H	Conventional & extended RAM test	3 beeps continue
26H	A6H	Protect mode exception test	3 beeps continue

NOTE: *If the error occurs on the 19H to 24H normal status, printer port LED status does not halt. Error message remains on the screen, and when the IRT program is finished, these error messages are disappeared.*

Table 2-1 Normal status and error status of the printer
port LED (3/3)

The table below lists the Resume errors and the associated
error status codes.

Status	Explanation
F1h	An FDD was running when power was turned off. Power was turned off while IRT was running. The hardware reset switch was pressed. An external display card was attached when power was turned off. An external expansion memory card was attached when power was turned off.
F2h	An external display card was attached while power was turned off.
F3h	An internal display card was changed while power was turned off
F4h	Backup RAM has been corrupted. The backup RAM checksum, system RAM checksum, VRAM checksum, or expansion memory checksum in backup RAM has been corrupted.
F5h	System RAM has been corrupted.
F6h	VRAM has been corrupted.
F7h	Internal expansion memory has been corrupted.

PROCEDURE 3

<u>Test Program Execution</u>

1.   Execute the following tests on the diagnostic test
      Menu.   (Refer to part 3 Test and Diagnostics.)

            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 system test, memory
      test, ASYNC test, or real timer test, go to PROCEDURE
      4.

3.   If an error is detected during the floppy disk test,
      go to FDD problem isolation procedures in section 2.5.

4.   If an error is detected during the hard disk test, go
      to HDD problem isolation procedures in section 2.6.

5.   If an error is detected during the keyboard test, go
      to keyboard problem isolation procedures in section
      2.7.

6.   If an error is detected during the display test, go to
      display problem isolation procedures in section 2.8.

PROCEDURE 4

System Board Replacement

1. Replace the system board. (Refer to section 4.10.)

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 defective. The defective unit must be isolated by test and diagnostics program and replaced.

2.5   FLOPPY DISK DRIVE PROBLEM ISOLATION PROCEDURES

This section describes how to determine whether or not the floppy disk drive is defective. Start with PROCEDURE 1 and continue with other procedures as instructed. The procedures described in this section are:

PROCEDURE 1:   Message Check

PROCEDURE 2:   Head Cleaning

PROCEDURE 3:   FDD Test Execution

PROCEDURE 4:   FDD Connector Check

PROCEDURE 5:   New FDD Connection

PROCEDURE 1

Message Check

1. Turn off the power.

2. When the power switch is turned on after the MS-DOS
    system disk is inserted into the FDD, message (a) or
    (b) shown below may appear.

    If loading starts normally, go to PROCEDURE 2.

    (a)   **Non-System disk or disk error**
          Replace and press any key when ready

    (b)   **Place system disk in drive**
          Press any key when ready .....

3. If message (a) or (b) is displayed, the content of the
    floppy disk is damaged, or a disk other than the
    MS-DOS system disk has been inserted into the FDD.
    Insert a new MS-DOS system disk into the FDD. If
    loading completes, go to PROCEDURE 2.

PROCEDURE 2

Head Cleaning

1. Remove the MS-DOS system disk from the FDD, then insert the diagnostics disk into the FDD.

2. Type **T3100SX** and press **Enter** key and run the head cleaning on the DIAGNOSTICS MENU. (Refer to part 3 Test and Diagnostics.)

3. If normal operation is restored after cleaning the head, go to PROCEDURE 3.

4. If normal operation is not restored, go to PROCEDURE 4.

PROCEDURE 3

FDD Test Execution

1.   Execute the floppy disk test on the diagnostics test
      menu. (Refer to part 3 Test and Diagnostics.)

2.   Remove the diagnostics disk from the FDD, then insert
      the formatted work disk in.

3.   Run the floppy disk test as indicated on the sub test
      menu.

4.   If an error is generated during the floppy disk test,
      an error code and status will be displayed. The error
      codes are described in table 2-2. Go to PROCEDURE 5.

5.   If no error is generated, the FDD is normal.

Table 2-2 FDD error code

Code	Status
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
80	Time Out Error

PROCEDURE 4

FDD Connector Check

1.   Turn off the power, then unplug the AC adapter and
     remove the battery packs.

2.   Remove the top cover. (Refer to section 4.3.)

3.   Check that the FDD connection (PJ5) is secured.

4.   If the FDD cable is securely connected to the system
     board, go to PROCEDURE 5.

5.   If the FDD cable is not securely connected to the
     system board, secure the connection.

PROCEDURE 5

New FDD Connection

1.   Turn off the power, then unplug the AC adapter and
     remove the battery packs.

2.   Remove the FDD. (Refer to section 4.7.)

3.   Connect a new FDD to the FDD connector without
     installing the new FDD. Then connect all of the FRUs
     removed during FDD removal to their corresponding
     connectors without installing the FRUs.

4.   Turn on the power.

5.   If normal operation is restored, the original FDD is
     probably defective. Reassemble the system.

6.   If normal operation is not restored, the system board
     is probably defective. Refer to section 2.4.

2.6 HARD DISK DRIVE PROBLEM ISOLATION PROCEDURES

This section describes how to determine whether or not the hard disk drive is defective. Start with PROCEDURE 1 and continue with other procedures as instructed. The procedures described in this section are:

PROCEDURE 1:   HDD Indicator Check

PROCEDURE 2:   Message Check

PROCEDURE 3:   Format Execution

PROCEDURE 4:   Hard Disk Test Execution

PROCEDURE 5:   Connector Check

PROCEDURE 6:   New HDD Connection

PROCEDURE 1

<u>HDD Indicator Check</u>

1.   Turn off the power.

2.   If there is a floppy disk in the FDD, take it out.

3.   Wait 5 seconds or more after turning off the power, then turn on the power.

4.   If the HDD indicator blinks briefly, then goes out, go to PROCEDURE 2. If the HDD indicator continues blinking, go to PROCEDURE 4.

5.   If the HDD indicator does not light at all, go to PROCEDURE 5.

PROCEDURE 2

Message Check

1.   If the operating system is loaded normally, go to
      PROCEDURE 4.

2.   If one of the following messages is displayed on the
      screen, go to PROCEDURE 5.

         ERROR ENCOUNTERED INITIALIZING HARD DISK DRIVE

         ERROR INITIALIZING HARD DISK CONTROLLER

3.   If the following message is displayed on the screen,
      go to PROCEDURE 3.

         Place system disk in drive.
         Press any key when ready .....

4.   If the following message is displayed on the screen,
      check that the hard disk type in the setup program is
      set correctly.

         Missing operating system

      If it is set correctly, go to PROCEDURE 3.   (Refer to
      T3100SX Reference Manual.)

PROCEDURE 3

Format Execution

> **CAUTION:** *The contents of the hard disk will be erased when the FORMAT command is run. Before running this test, transfer the contents of the hard disk to floppy disks. This can be done with the MS-DOS BACKUP command. (See the MS-DOS Manual for details.)*

1. Insert the MS-DOS system disk into the FDD.

2. Make partition of the hard disk. (See the MS-DOS Manual for details.)

3. Format the hard disk. (See the MS-DOS Manual for details.) At this time use /S switch to transfer the system program.

4. If normal operation is restored, the HDD is normal.

5. If normal operation is not restored, go to PROCEDURE 6.

PROCEDURE 4

Hard Disk Test Execution

```
┌──────────────────────────────────────────────────┐
│ CAUTION:  The contents of the hard disk will be   │
│ erased when the test program is run.  Before running │
│ this test, transfer the contents of the hard disk to │
│ floppy disks.  This can be done with the MS-DOS BACKUP │
│ command.  (See the MS-DOS Manual for details.)    │
└──────────────────────────────────────────────────┘
```

1.   Execute the hard disk test on the diagnostics test
     menu. (Refer to part 3 Test and Diagnostics.)

2.   If an error is detected during the hard disk test, an
     error code and status will be displayed; go to
     PROCEDURE 6. The error codes are described in table
     2-3.

3.   If no error is generated, the HDD is normal. Enter
     the MS-DOS FDISK command to make partition of the hard
     disk. Then enter the MS-DOS FORMAT command. (See the
     MS-DOS Manual for details.)

Table 2-3 HDD error code

Code	Status
01	Bad command error
02	Bad address mark
04	Record not found
05	HDC not reset
07	Drive not initialize
09	DMA boundary error
0A	Bad sector error
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
F0	Not sense error (HW.code=FF)

PROCEDURE 5

Connector Check

1. Turn off the power, then unplug the AC adapter and remove the battery packs.

2. Remove the top cover. (Refer to section 4.3)

3. Check that the HDC I/F cable (PJ12) is secured.

4. If these cables are securely connected to the system board, go to PROCEDURE 6.

5. If the cables are not securely connected, secure them.

PROCEDURE 6

New HDD Connection

1.   Turn off the power, then unplug the AC adapter and remove the battery packs.

2.   Remove the HDD.   (Refer to section 4.8.)

3.   Connect a new HDD to the system board without installing the HDD.   Then connect all the FRUs removed during HDD removal without installing the FRUs.

4.   If normal operation is restored, the original HDD is probably defective. Reassemble the system.

5.   If normal operation is not restored, the system board is probably defective.   Refer to section 2.4.

2.7 KEYBOARD PROBLEM ISOLATION PROCEDURES

This section describes how to determine whether or not the keyboard is defective. Start with PROCEDURE 1 and continue with other procedures as instructed. The procedures described in this section are:

PROCEDURE 1: Input Check

PROCEDURE 2: Keyboard Test Execution

PROCEDURE 3: Connector Check

PROCEDURE 4: New Keyboard Connection

PROCEDURE 1

Input Check

1.   Insert an MS-DOS system disk into the FDD.

2.   Turn on the power.

3.   When the prompt appears on the screen, press any of
      the white keys on the keyboard (any character or the
      space bar.)

╔══╗
║ *CAUTION*: *Do not type an MS-DOS acceptable command* ║
║ *such as del and format. Such operation may erase your* ║
║ *important program or data.* ║
╚══╝

      If the character you press appears on the screen,
      press **Enter** key. Go to PROCEDURE 2.

4.   If the character does not appear on the screen, go to
      PROCEDURE 3.

      Toshiba Personal Computer MS-DOS Version X.XX
      /(RXXXXX)

      (C) Copyright Toshiba   Corporation 1983,1986
      (C) Copyright Microsoft   Corporation 1981,1986

      Current date is XXX   X_XX_19XX
      Enter new date (mm-dd-yy) : _
      Current time is X:XX:XX,XX
      Enter new time : _

      COMMAND Version X.XX
      A> abcdefghijklmnopqrst.........

PROCEDURE 2

Keyboard Test Execution

1.   Execute the keyboard test on the diagnostics test
      menu. (Refer to part 3 Test and Diagnostics.)

2.   If an error is detected during the test, go to
      PROCEDURE 3.

3.   If no error is detected during the test, the keyboard
      is normal.

PROCEDURE 3

Connector Check

1.   Turn off the power, then disconnect the AC adapter and remove the battery packs.

2.   Lift up the keyboard. (Refer to section 4.2) and check that the keyboard cable (PJ14) is securely connected to the system board. If it is securely connected, go to PROCEDURE 4.

3.   If it is not securely connected, secure it.

PROCEDURE 4

New Keyboard Connection

1.   Turn off the power, then unplug the AC adapter and
      remove the battery packs.

2.   Remove the keyboard. (Refer to section 4.2.)

3.   Connect a new keyboard to the system board without
      installing it.

4.   If normal operation is restored after connecting the
      new keyboard, the original keyboard is probably defec-
      tive. Install the new keyboard.

5.   If normal operation is not restored, the system board
      is probably defective. Refer to section 2.4.

2.8   DISPLAY PROBLEM ISOLATION PROCEDURES

This section describes how to determine whether or not the
display is defective. Start with PROCEDURE 1 and continue
with other procedures as instructed. The procedures
described in this section are:

PROCEDURE 1:   Display Check

PROCEDURE 2:   Display Test Execution

PROCEDURE 3:   Display Connector Check

PROCEDURE 4:   New Display Connection

PROCEDURE 1

<u>Display Check</u>

1.   Turn off the power.

2.   Wait 5 seconds or more and turn on the power. After turning on the power, the following message should be displayed on the upper left-hand corner of the screen:

640K Base Memory, XXXXXK Extended

3.   If the above message appears, go to PROCEDURE 2.

4.   If the above message does not appear, go to PROCEDURE 3.

PROCEDURE 2

<u>Display Test Execution</u>

1.   Execute the display test on the diagnostics test menu.

2.   If an error is detected during the display test, the
     system board is probably defective. Refer to section
     2.4.

3.   If no error is generated, the display is normal.

PROCEDURE 3

Display Connector Check

```
┌─────────────────────────────────────────────────────┐
│ WARNING:   Dangerous high voltage is supplied to the │
│ display panel.  Pay enough attention on handling.    │
└─────────────────────────────────────────────────────┘
```

1.   Turn off the power, then unplug the AC adapter and
      remove the battery packs.

2.   Remove the display without disconnecting the cables
      and check that the cables are securely connected to
      the display board.

3.   If the cable is securely connected, go to PROCEDURE 4.

4.   If the cable is not securely connected, secure it.

PROCEDURE 4

<u>New Display Connection</u>

1.   Connect a new display without installing it.

2.   If normal operation is restored after connecting the new display, the original display is probably defective. Reassemble the system.

3.   If normal operation is not restored, the system board is probably defective. Refer to section 2.4.

2-44

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3.1   GENERAL

This section explains test and diagnostics programs. That
checks the functions of all hardware modules of the T3100SX.
There are 18 programs grouped into two modules: the service
program module (DIAGNOSTICS MENU) and test program module
(DIAGNOSTIC TEST MENU).

The service program module is composed of 7 tasks:

>   HARD DISK FORMAT
>   SEEK TO LANDING ZONE (HDD)
>   HEAD CLEANING
>   LOG UTILITIES
>   RUNNING TEST
>   FDD UTILITIES
>   SYSTEM CONFIGURATION

The test program module is composed of 11 tests:

>   SYSTEM TEST
>   MEMORY TEST
>   KEYBOARD TEST
>   DISPLAY TEST
>   FLOPPY DISK TEST
>   PRINTER TEST
>   ASYNC TEST
>   HARD DISK TEST
>   REAL TIMER TEST
>   NDP TEST
>   EXPANSION UNIT TEST

The following items are necessary for carrying out the test
and diagnostic programs:

1.   T3100SX diagnostics disk
2.   MS-DOS system disk
3.   2HD and 2DD formatted work disk (for FDD test)
4.   Cleaning disk kit (for read cleaning)
5.   Printer wraparound connector (for printer
     wraparound test)
6.   RS-232-C wraparound connector (for ASYNC
     wraparound test)

Service personnel can use these programs to isolate problems
by selecting the appropriate program and operation proce-
dures described in section 3.2.

3.2   OPERATIONS

1.   After running the MS-DOS, insert the diagnostics
      disk in the floppy disk drive.

2.   Type in a:**T3100SX**, then press **Enter**.

3.   The following display will appear:

      **TOSHIBA personal computer T3100SX DIAGNOSTICS
      version X.X (c) copyright TOSHIBA Corp. 1989**

      DIAGNOSTICS MENU :

      1 - DIAGNOSTIC TEST
      2 - HARD DISK FORMAT
      3 - SEEK TO LANDING ZONE (HDD)
      4 - HEAD CLEANING
      5 - LOG UTILITIES
      6 - RUNNING TEST
      7 - FDD UTILITIES
      8 - SYSTEM CONFIGURATION
      9 - EXIT TO MS-DOS
      0 - SETUP

      PRESS [1] - [9] KEY

      Detailed explanations of the service programs
      and the operations are given in sections 3.17 to
      3.23.

NOTE: *To stop the test program:*

*(1) During keyboard operation, press **Ctrl+C**.*

(2) While running the test program, press
      ***Ctrl+Break**.*

---

4. Type in **1**, then press **Enter** and the following display will appear:

TOSHIBA personal computer T3100SX DIAGNOSTICS version X.XX (c) copyright TOSHIBA Corp. 1989

DIAGNOSTIC TEST MENU :

```
 1 - SYSTEM  TEST
 2 - MEMORY  TEST
 3 - KEYBOARD  TEST
 4 - DISPLAY  TEST
 5 - FLOPPY  DISK  TEST
 6 - PRINTER  TEST
 7 - ASYNC  TEST
 8 - HARD  DISK  TEST
 9 - REAL  TIMER  TEST
10 - NDP  TEST
11 - EXPANSION  TEST
88 - FDD & HDD  ERROR  RETRY  COUNT  SET
99 - EXIT  TO  DIAGNOSTICS  MENU
```

PRESS [1] - [9] KEY

Numbers 1 to 11 are diagnostic tests.

Number 88 is for setting the floppy disk drive and hard disk drive error retry count.

Number 99 is for returning to the DIAGNOSTIC MENU.

When selecting the floppy disk test or hard disk test, special sub-messages will appear, as described in sections 3.8 and 3.11.

5. After typing in a test number (1 to 11) of the
    DIAGNOSTIC TEST MENU, pressing **Enter** displays
    as follows:

```
SYSTEM TEST                          XXXXXXX
                                          ┌─────────────────────────────────┐
                                          │ T3100SX  DIAGNOSTIC  TEST  X.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?
```

The screen shown above, for example, appears
when you type **1** and **Enter**.

6. Select a subtest. Type in the subtest number,
    then press **Enter**. The following message will
    appear:

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

┌──┐
│ *NOTE: If you select KEYBOARD TEST, this message* │
│ *will not appear.*   │
└──┘

If you select YES (by typing in **1**, then pressing
Enter):

Each time a test cycle ends, it increments the
pass counter by one and repeats the test cycle.

If you select NO (by typing in **2**, then pressing
Enter):

At the end of a test cycle, the test execution
is terminated and you exit to the subtest menu.

7. Type in **1** or **2**, then press **Enter**. The following message will appear:

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

    If you select YES (by typing in **1**, then pressing **Enter**):

    When an error occurs, the error status is displayed and execution of the test program stops and the operation guide is displayed on the right side of the display screen.

    If you select NO (by typing in **2**, then pressing **Enter**):

    When an error occurs, the error status is displayed then the error counter is incremented by one and you go to the next test.

8. Type in **1** or **2**, then press **Enter** and the test program will run. Each subtest is described in section 3.3.

9. When an error occurs during the test program, the following message will appear (if you answer YES for ERROR STOP question):

    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: Retries the test.

    Error code and error status names are described in section 3.15.

3.3   SUBTEST NAMES

Table 3-1 lists the subtest of each test program.

Table 3-1   Subtest names and execution time (1/2)

No.	Test name	Subtest No.	Subtest item	Time(s)
1	SYSTEM	01 02	ROM checksum HW status	
2	MEMORY	01 02 03 04 05 06 07 08	RAM constant data RAM address pattern data RAM refresh Protected mode Memory module Backup memory RAM on BIOS Hard-RAM	
3	KEYBOARD	01 02	Pressed key display (91/92) Pressed key code display	
4	DISPLAY	01 02 03 04 05 06 07 08 09 10	VRAM read/write Character attributes Character set 80*25 character display 320*200 graphics display 640*200 graphics display 640*400 graphics display Display page "H" pattern display LED/DAC pallet	
5	FDD	01 02 03 04 05	Sequential read Sequential read/write Random address/data Write specified address Read specified address	
6	PRINTER	01 02 03	Ripple pattern Function Wraparound	
7	ASYNC	01 02 03 04 05 06 07 08	Wraparound (board) Board (#1) <=> Board (#2) Point to point (send) Point to point (receive) Card modem loopback Card modem on-line test Dial tester test Interrupt test (IRQ4, 3, 5)	

Table 3-1 Subtest names and execution time (2/2)

No.	Test name	Subtest No.	Subtest item	Time(s)
8	HDD	01	Sequential read	
		02	Address uniquence	
		03	Random address/data	
		04	Cross talk & peak shift	
		05	Write/read/compare (CE)	
		06	Write specified address	
		07	Read specified address	
		08	ECC circuit (CE cylinder)	
		09	Sequential write	
		10	W-R-C specified address	
9	REAL TIMER	01	Real time	
		02	Backup memory	
		03	Real time carry	
10	NDP	01	NDP test	
11	EXPANSION UNIT	01	Box wraparound	
		02	Box mono video RAM	
		03	Wraparound (51-bus)	

3.4   SYSTEM TEST

Subtest 01   ROM checksum

> This test performs the ROM checksum test on the system board
>
> (Test extent: F0000H - FFFFFH 64KB)

Subtest 02   H/W status

> This test reads the system hardware status, then displays the status as shown below. Press **Enter** to return to the system test's SUB-TEST MENU. Table 3-2 describes the hardware status bits. If you want to return to the SYSTEM TEST MENU, press **Enter**.

```
                      76543210
H/W  status  =  10101100

        Bit7  ---                      =
        Bit6  ---  CPU  clock     =  16MHz
        Bit5  ---  Notch  signal  =  2DD
        Bit4  ---  FDD  type      =  2MB
        Bit3  ---                      =
        Bit2  ---  Drive  A/B     =  EXT.=B
        Bit1  ---  External  FDD  =  OFF
        Bit0  ---  Internal  FDD  =  2HD
```

Table 3-2   Hardware status bit

Items	H/W status	1	0
Bit7	Reserved		
Bit6	CPU clock speed	8 MHz	16 MHz
Bit5	Media type	2DD	2HD
Bit4	FDD type	16 MB	2 MB
Bit3	Reserved		
Bit2	Drive A/B	B	A
Bit1	External FDD	ON	OFF
Bit0	Internal FDD	2DD	2HD

3.5   MEMORY TEST

Subtest 01   RAM constant data (in real mode)

This subtest writes constant data to memory, then reads and compares it with the original data.

The constant data is FFFFH, AAAAH, 5555H, 0101H, and 0000H.

Subtest 02   RAM address pattern data (in real mode)

This subtest creates an address pattern by XORing (Exclusive-ORing) the address segment and address offset, writes the address pattern into the segment address and the offset address, then reads and compares it with the original data.

Subtest 03   RAM refresh (in real mode)

This subtest writes 256 bytes of constant data to memory, then reads and compares it with the original data. The constant data is AAAAH and 5555H. There is a delay between the write and the read operations.

Subtest 04   Protected mode

This subtest writes fixed data and address data to memory (address 100000H to the max.) in protected mode, then reads and compares it with the original data.

Subtest 05   Protected mode for the memory module

The same test as the subtest 04 is done for the memory module. Memory module capacity is 2 Mbytes and 4 Mbytes.

After selecting the subtest, the following message will appear:

Memory module size (1:2MB, 2:4MB)?

When the memory module is 2 Mbytes, select the 1.

When the memory module is 4 Mbytes, select the 2.

Subtest 06   Backup memory

This subtest writes constant data (FFFFH, AAAAH, 5555H, 0000H) to memory at addresses E8000H to EFFFFH (32 Kbytes), then reads and compares it with the original data.

Subtest 07   RAM on BIOS

A register controlling the RAM on BIOS function is checked by a write/read/compare algorithm. And, the functions specified by the register are also verified. Then the program compares the copied BIOS code in the RAM with the original code in the ROM.

Subtest 08   Hard-RAM

This subtest writes constant data (FFFFH, AAAAH, 5555H, 0000H) to memory at addresses E0000H to E7FFFH (32 Kbytes), then reads and compares it with the original data.

3.6   KEYBOARD TEST

Subtest 01   Pressed key display (91/92)

```
┌──────────────────────────────────────────────────┐
│NOTE:   Make sure the Num-lock key is off.   If    │
│this key is on, the test cannot be carried out.    │
└──────────────────────────────────────────────────┘
```

When the keyboard layout (as shown below) is
drawn on the display, press any key and check
that the corresponding key on the screen is
changed to the character "*".

When a key is held depressed, the display will
blink designating the auto-repeat function.

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, its 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 when pressed.
>
> The scan codes, character codes and key top
> names are shown in Appendix E.
>
> **KEYBOARD TEST   IN PROGRESS   302000**
>
> **Scan code   = XX**
> **Character code   = XX**
> **Keytop   = XXXX**
> **Ins Lock   Caps Lock   Num Lock   Scroll Lock**
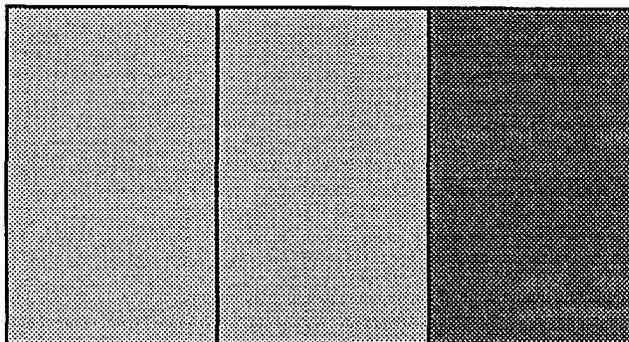> **Alt   Ctrl   Left Shift   Right Shift**
>
> **PRESS [ENTER] KEY**

3.7   DISPLAY TEST

NOTE: The contents of this test differ with the
display mode (VGA-color and VGA-monochrome). This
mode is changed with the SETUP program.

Subtest 01   VRAM read/write

This subtest writes constant data (FFFFH, AAAAH,
5555H, and 0000H) and address data to video RAM
(256 Kbytes), then reads the data written and
compares it with the original data.

Subtest 02   Character attributes

This subtest checks:

Normal display
Intensified display
Reverse display
Blinking display

For color displays, all seven colors used (blue,
red, magenta, green, cyan, yellow, and white)
are displayed. The background and foreground
colors can then be checked for brightness. The
display below appears on the screen when this
test is run.

CHARACTER ATTRIBUTES

NEXT LINE SHOWS NORMAL DISPLAY
        NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

NEXT LINE SHOWS INTENSIFIED DISPLAY
        IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII

NEXT LINE SHOWS REVERSE DISPLAY
        RRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRR

NEXT LINE SHOWS BLINKING DISPLAY
        BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB (Blinks)

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

PRESS [ENTER] KEY

3-17

320*200 GRAPHICS DISPLAY [13]

(black bar)	BLACK
(blue bar)	BLUE
(green bar)	GREEN
(cyan bar)	CYAN
(red bar)	RED
(magenta bar)	MAGENTA
(brown bar)	BROWN
(white bar)	WHITE
(gray bar)	GRAY
(light blue bar)	LIGHT BLUE
(light green bar)	LIGHT GREEN
(light cyan bar)	LIGHT CYAN
(light red bar)	LIGHT RED
(light magenta bar)	LIGHT MAGENTA
(yellow bar)	YELLOW
(intense white bar)	INTENSE WHITE

PRESS [ENTER] KEY

Next, this subtest displays sixteen colors in
mode 13H as shown above.

Subtest 03   Character set

In this subtest the character set of its code
(00H to FFH) is displayed in the 40×25 character
mode as shown below.

CHARACTER SET IN 40X25

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

PRESS [ENTER] KEY

3-18

Subtest 04   80*25 character display

In this subtest, the character string is dis-
played shifting one character line by line in
the 80*25 and 80*30 character mode as shown
below.

80*XX CHARACTER DISPLAY

```
0123456789012345678901234567890123456789012345678901234567890123456789012345 67
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklm
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmn
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop
$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopq
%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqr
&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrs
'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrst
()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstu
)*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuv
*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvw
+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwx
,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxy
-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{
/0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}
123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
23456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~Δ
3456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~Δç
456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~Δçü
```

PRESS [ENTER] KEY

Subtest 05   320*200 graphics display

This subtest displays two of color sets for the
color display in the 320*200 dots graphics mode
(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

> This subtest displays EVEN DOTS, ODD DOTS and
> ALL DOTS in the 640*200 dots graphics mode (Mode
> 6 and E) as shown below:

> **640*200 GRAPHICS DISPLAY [X]**
>
> | EVEN DOTS | ODD DOTS | ALL DOTS |
> |------------|-----------|-----------|
> | DRIVEN | DRIVEN | DRIVEN |

> **PRESS   [ENTER]   KEY**

Subtest 07   640*400 graphics display

> This subtest displays EVEN DOTS, ODD DOTS, ALL
> DOTS in the 640*350 and 640*480 pixels graphics
> mode (Mode 10 and 12) 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 (page 0 to page 7) in the 40*25 character mode.

DISPLAY PAGE 0

```
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
0                                                                             0
0                                                                             0
0                                                                             0
0                                                                             0
0                                                                             0
0                                                                             0
0                                                                             0
0                                                                             0
0                                                                             0
0                                                                             0
0                                                                             0
0                                                                             0
0                                                                             0
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

Subtest 09   "H" pattern display

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

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

Subtest 10   LED/DAC pallet

This subtest displays as follows:

```
DISPLAY TEST      IN PROGRESS      410000
                                          ┌─────────────────────────────────┐
                                          │T3100SX  DIAGNOSTIC  TEST  X.XX   │
                                          │  [Ctrl]+[Break] ;  test  end     │
                                          │  [Ctrl]+[C]       ;  key  stop    │
                                          └─────────────────────────────────┘
SUB-TEST   ; 10
PASS COUNT; 00000      ERROR  COUNT; 00000
WRITE DATA; 00         READ DATA   ; 00
ADDRESS    ; 000000    STATUS      ; 000


[Speed/CRT/Caps/Num/Scroll  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)
   (5)  Press [ Scroll Lock ] key ! ... Scroll  (on/off)
   (6)  Press [ Overlay ] key !      ... Fn  (on/off)


PRESS [ENTER] KEY
```

Check Caps Lock LED, Num Lock LED and Scroll
Lock LED light by pressing **Caps Lock** key, **Num
Lock** key and **Scroll Lock** key. Then, press
Enter key and this subtest writes constant data
(2AH/15H) to DAC registers.

3.8   FLOPPY DISK TEST

> **CAUTION:**   *Before running the floppy disk test,*
> *prepare a formatted work disk and remove the diag-*
> *nostics disk.   Then insert the work disk into the*
> *FDD, because the contents of the floppy disk will be*
> *erased.*

OPERATION

1. When you select the floppy disk test of the
    DIAGNOSTIC TEST MENU, the following message will
    appear under the DIAGNOSTIC TEST MENU:

    Test drive number select (1:FDD1,2:FDD2,0:FDD1&2) ?

2. Select the test drive number, then press the
    Enter. The following message will appear:

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

3. Select the media type of the floppy disk to be
    tested, then press the **Enter.** The following
    message will appear:

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

4. You can select the start track number of the
    floppy disk test.

    When pressing the **Enter** only, the start track
    number will be zero.

    If you desire, select the start track number.
    then the subtest menu of the floppy disk test
    will appear.

5. During the floppy disk test, the message shown
    below will appear. The **ADDRESS** number indi-
    cates that the first **XX** shows a cylinder number,
    the third **X** shows a head number, and the last
    XX shows a sector number.

    The **STATUS** number indicates that the first **X**
    shows a drive number and the last **XX** shows an
    error status code.

FLOPPY DISK   **XXXXXX**

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

CONTENTS

Subtest 01   Sequential read

This subtest performs the cyclic redundancy
check (CRC) with a continuous read operation of
all tracks on a floppy disk.

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

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

The start track can be specified at the previous
stage.

Subtest 02   Sequential read/write

This subtest writes data to all tracks (as
defined above) continuously, and then reads the
data out and compares it with the original data.
(The data pattern is B5ADADH repeated.)

Subtest 03   Random address/data

This subtest writes random data to random
address on all tracks (as defined in subtest 01)
and then reads the data out and compares it with
the original data.

Subtest 04   Write specified address

This subtest writes the specified data on the
specified address that you enter from the key-
board. You can specify the test data, track
number, and head number.

Subtest 05   Read specified address

This subtest performs read operation on the
specified address that you enter from the key-
board. You can specify the track number and
head number.

3.9 PRINTER TEST

> **CAUTION:** *A printer (IBM compatible) must be connected to the system in order to execute the test. Confirm that the A-B-PRT switch is set to PRT position.*

CONTENTS

Subtest 01 Ripple pattern

This subtest prints characters for code 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 out various print type as 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:** *A printer wraparound connector is necessary for executing this test. Wiring diagram of the printer wraparound connector is described in section 3.24.*
>
> *The data, control, and status lines will be checked with the printer wraparound connector.*

OPERATION

1. When you select the subtest 01, 02, or 03, the following message will appear:

    Select the channel number (1-3) ?

    Select the printer channel number, then type in the number. The T3100SX supports three printer channels.

2. After pressing the **Enter**, the subtest is executed.

3.10   ASYNC TEST

In subtest 01 to subtest 05, data transmission is done with the following format:

      Speed: 9600 BPS

      Data: 8 bits and one parity bit (EVEN)

      One stop bit

      Data pattern: 20H to 7EH

Subtest 01   Wraparound (channel 1)

> *NOTE:* *The RS-232-C wraparound connector must be connected to SERIAL A CONNECTOR to execute this test. The wiring diagram of the RS-232-C wraparound connector is described in section 3.24.*

A data send/receive test is performed with the wraparound connector for the channel 1.

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

> *NOTE:* *The RS-232-C direct cable (9-pin to 9-pin) must be connected to channels 1 and 2 to execute this test. The wiring diagram of the RS-232-C direct cable is described in section 3.24.*

The same test as the sub test 01 is performed for the channel #1 <=> #2.

Subtest 03   Point to point (send)

> **NOTE:** *This subtest must be executed in condition that two machines are connected with the RS-232-C direct cable and one side should be set as 'send' and the other set as 'receive'. The wiring diagram of the RS-232-C direct cable is described in section 3.24. The subtest 03 executed in one side and the sub test 04 executed in the other will check the communication capability as follows:*

A block of data (20H to 7EH) is sent from one side to the other, and then returned back. The returned data is compared with the original one. This test is used to check whether the returned data are same as the original ones.

Subtest 04   Point to point (receive)

This subtest is used with the subtest 03 as described above.

Subtest 05   Card modem loopback

> **NOTE:** *If there is no modem card in the system, this test cannot be executed.*

This subtest is used to check whether the data to be sent from the modem card to the RS-232-C line is correct or not. This can be done with the loopback function inside the modem card.

Subtest 06   Card modem on-line test

> **NOTE:** *This test requires two machines which are connected to the PBX (Private Branch Exchange). One side is set as 'send' and the other set as 'receive'. When both sides are ready, you can start the test.*

In this subtest, data are sent from the 'send' side to the 'receive' side through the PBX. This subtest is used to check whether data transmission through a telephone line is done properly or not.

Subtest 07   Dial tester test

> **NOTE:**   *To execute this subtest, a dial tester must be connected to the system.*

This subtest is carried out by sending the pulse dial and tone dial twice automatically.

[Pulse dial]:   "1-2-3-4-5-6-7-8-9-0-1-2"

[Tone dial]:   "1-2-3-4-5-6-7-8-9-*-0-#"

Subtest 08   Interrupt test (IRQ4, 3, 5)

This subtest generates the interrupt request levels 4, 3, and 5 in this order, then checks if this function works correctly.

3.11   HARD DISK TEST

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

OPERATION

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

    Test drive number select (1:HDD,2:HDD2,0:HDD1&2) ?

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

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

3. This message is used to select whether to do retry operation or not when the hard disk controller detects an error. Select yes or no and press the **Enter.** The following message will appear:

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

4. This message is used to select whether to do dump operation or not when data compare error is detected. Select yes or no and press the **Enter.** The following message will appear:

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

5. This message is used to select whether to display the detail status on the screen or not. The detail status are described in section 3.16. Select yes or no and press the **Enter.**

6. During the hard disk test, the message shown below will appear. The **ADDRESS** number indicates that the first **XXX** shows a cylinder number, the fourth **X** shows a head number, and the last **XX** shows a sector number. The **STATUS** number indicates that the first **X** shows a drive number and the last **XX** shows an error status code.

HARD DISK TEST   **XXXXXXX**

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

CONTENTS

Subtest 01   Sequential read

This subtest performs forward reading of contents from track 0 to Max. and then performs reverse reading of the contents from Max. track to track 0.

Subtest 02   Address uniquence

1. Selecting this subtest, the following message will appear:

   Read Sequential select ?

      1 : Forward sequential
      2 : Reverse sequential
      3 : Random

2. Select one of the above and press the **Enter.**

This subtest writes the address data that is different sector by sector at each track, then reads and compares it to the original data. This test is done for all tracks.

Subtest 03   Random address/data

This subtest writes random data to random addresses (cylinder, head, sector) and then reads the data out and compares it to the original data.

3.12   REAL TIMER TEST

Subtest 01   Real time

A new date and time can be input during this subtest when the current date and time are displayed.

Operations for the test are as follows:

1. Selecting the subtest, the following message will appear:

    REAL TIME TEST   **901000**

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

        Enter new date:

    PRESS [ENTER] KEY TO EXIT TEST

2. If current date is not correct, input the current new date. Press the **Enter**, the **Enter new time:** message will appear.

3. If current time is not correct, input the current new time. Press the **Enter**, return to the subtest menu of the REAL TIME TEST.

Subtest 02   Backup memory

This subtest writes data (01H, 02H, 04H,..., 80H, FEH, FBH, FDH, ...7FH, AAH, 55H) to 50 bytes of the backup memory (addresses 0EH to 3FH), and then reads and compares it with the original data.

Subtest 03   Real time carry

┌───┐
│ *CAUTION: When this test is executed, the* │
│ *current date and time is erased.*   │
└───┘

This subtest checks whether the real time clock increments the time displayed correctly (month, day, year, hour, minute, and second).

3.13   NDP   TEST

> **CAUTION:**   *This test cannot be run if there is no*
> *NDP mounted on the system board.*

Subtest 01   NDP test

This test checks the control word, status word,
bus, and addition/multiplication functions.

3.14   EXPANSION UNIT TEST

> **NOTE:**   If there is no expansion unit connected to
> the system, this test cannot be executed.

Subtest 01   Box wraparound (8-bit bus)

> **NOTE:**   As this subtest requires a special tool
> to be executed, it cannot be carried out here.

Subtest 02   Box mono video RAM

> **NOTE:**   If there is no monochrome display card
> in the expansion unit, this test cannot be
> executed.

This subtest writes data (FFH, AAH, 55H, 00H)
into the monochrome display memory (B0000H to
B0F9FH), then reads the data out and compares it
with the original data.

Subtest 03   Wraparound test (51-bus)

> **NOTE:**   As this subtest requires a special tool
> to be executed, it cannot be carried out here.

3.15   ERROR CODE AND ERROR STATUS NAMES

Table 3-3 lists the error code and error status names

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

Device name	Error code	Error status name
EVERYTHING	FF	Compare error
SYSTEM	01	ROM checksum error
MEMORY	01	Parity error
	02	Protected mode not change
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
ASYNC	01	DSR off time out
	02	CTS off time out
	04	RX-enable 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)
PRINTER	01	Time out
	08	Fault
	10	Select line
	20	Out of paper
	40	Power off
	80	Busy line

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

Device name	Error code	Error status name
HDD	01	Bad command error
	02	Bad address mark
	04	Record not found
	05	HDC not reset
	07	Drive not initialize
	09	DMA boundary error
	0A	Bad sector error
	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
	F0	Not sense error (HW.code=FF)
NDP	01	No co-processor
	02	Control word error
	03	Status word error
	04	Bus error
	05	Addition error
	06	Multiple error

3.16   HARD DISK TEST DETAIL STATUS

When an error occurs on the hard disk test, the following
message will appear:

HDC status = XXXXXXXX

Detailed status of the hard disk test error is shown on the
screen by eight-unit number. The first **XXXX** is error status
and the last **XXXX** is not used.

Error status is composed of 2 bytes; the first byte shows
the contents of the HDC status register in hexadecimal form
and the other the error register of the HDC.

These contents are described in the tables 3-4 and 3-5.

Table 3-4   HDC 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
	(Uncorrect-
	able)
		"0" ... There is no uncorrectable
		     data error.
		"1" ... Uncorrectable data error
		     has been detected.

5		Not used.
4	IDNF (Identifica- tion)	"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	TK0
	(Track 0)
		"0" ... The hard disk has found
		     track 0 during a
		     recalibrate command.
		"1" ... The hard disk could not
		     found track 0 during a
		     recalibrate command.

0		Not used.

3.17   HARD DISK FORMAT

There are two types of hard disk formatting:

1.   Physical formatting
2.   Logical formatting

This program is for physical formatting of the hard disk; it can execute the following items.

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 run.   Before running 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.)

3.17.1 Program Description

1.   All track FORMAT

Performs physical formatting of hard disk in the manner shown in table 3-6 below:

Table 3-6   Hard disk formatting manner

Items	40 MB
Sector sequences	1
Cylinders	0 to 775
Heads	0 to 7
Sectors	1 to 33
Sector length	512 bytes per sector
Bad track	Max. 40 tracks

2.   Good track FORMAT

Executes the formatting of a specified cylinder and track as a good track.

3.   Bad track FORMAT

Executes the formatting of a specified cylinder and track as a bad track.

3-40

4. Bad track CHECK

    Checks for bad tracks by performing a read oper-
    ation for all tracks on the hard disk; a list of
    bad tracks is then displayed.

3.17.2 Operations

> **CAUTION:** *After physical formatting is finished, enter the MS-DOS FDISK command, which will set the partition. Then enter the MS-DOS FORMAT command. (See the MS-DOS manual for details.*

---

1. After pressing 2 and Enter in the DIAGNOSTICS MENU, the following display will appear:

   DIAGNOSTIC - 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) When all track FORMAT (1) is selected, the following message will appear:

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

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

   Interleave number (3/1-3) ?

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

    [HDD TYPE] : CYLINDER = XXX
    [HDD TYPE] : HEAD   = X
    [HDD TYPE] : SECTOR   = XX

    [WARNING: Current DISK data will be
              completely destroyed]

    Press [Bad track number (CCCH)] key ?
                  [[cylinder, head = XXX X]]

(4) After pressing the **Enter**, the **[[cylinder, head = XXX X]]** message will appear; then all cylinders of the hard disk are formatted and checked.

(5) After formatting the hard disk, the **Format complete** message will then appear.

(6) Press the **Enter** to return to the HARD DISK FORMAT menu.

3. Good track FORMAT or bad track FORMAT selection

    (1) When 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. Type the drive number and press **Enter**. The following message will appear:

        Interleave number (3/1-3) ?

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

        [HDD TYPE] : CYLINDER = XXX
        [HDD TYPE] : HEAD   = X
        [HDD TYPE] : SECTOR   = XX

        Press [Bad track number (CCCH)] key ?
                      [[cylinder, head = XXX X]]

(4) Type a track number (four digits) and press **Enter.** (The first three digits are the cylinder number and the last digit is the head number.) This executes the formatting of good tracks or bad tracks.

> **NOTE:** *This program can format only one track per operation. If it is desired to format several good tracks or bad tracks, repeat the operation as many times as necessary.*

(5) After formatting the track of the hard disk, the **Format complete** message will appear.

(6) Press the **Enter** to return to the HARD DISK FORMAT menu.

4. Bad track CHECK selection

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

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

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

Interleave number (3/1-3) ?

(3) Select an interleave number (usually select 1). Type the number and press **Enter.** When the following message appears, and bad tracks of the hard disk are checked.

[HDD TYPE] : CYLINDER = XXX
[HDD TYPE] : HEAD   = X
[HDD TYPE] : SECTOR   = XX

[WARNING: Current DISK data will be completely destroyed]

[[cylinder, head = XXX X]]

(4) After checking the bad tracks of the hard disk, the **Format complete** message will appear.

(5) Press the **Enter** to return to the HARTD DISK FORMAT menu.

3.18   SEEK TO LANDING ZONE (HDD)

3.18.1 Program Description

When moving the unit, and HDD head hits a data area
severely, the data will be lost. In order to protect the
data, this program moves HDD heads to safe areas. These
areas are called "landing zone".

> **NOTE:**   *The built-in hard disk drive controls auto-
> matically the heads to move to the landing zone at
> power down.*

3.18.2 Operations

1.   After pressing **3** and **Enter** in the DIAGNOSTICS
     MENU, the program is automatically executed and
     the following message will appear:

     Landing seek completed.   (HDD#1)
     Press [Enter] key.

2.   After pressing **Enter,** the DIAGNOSTICS MENU
     appears.

3.19   HEAD   CLEANING

3.19.1 Program   Description

This program executes head loading and seek/read operations for head cleaning. A cleaning kit is necessary for cleaning the FDD head.

3.19.2 Operations

1. After pressing **4** and **Enter** in the DIAGNOSTICS MENU, the following message will appear:

   DIAGNOSTIC FLOPPY DISK HEAD CLEANING: VX.XX

   Mount cleaning disk(s) on drive(s).
   Press any key when ready.

2. After above message appears, remove the Diagnostics disk, insert the cleaning disk, and press any key.

3. When the **Cleaning start** message appears, FDD head cleaning will begin.

4. When cleaning is finished, the display automatically returns to the DIAGNOSTICS MENU.

3.20   LOG UTILITIES

3.20.1 Program Description

The error information is stored in the RAM, while a test is
in progress. And this program can store the error informa-
tion on a floppy disk or output it to a printer. This
program displays the error information as the following:

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

3.20.2 Operations

          1.   After pressing **5** and **Enter** in the DIAGNOSTICS
               MENU, the error information logged in the RAM or
               on the floppy disk is displayed as shown below:

```
    XXXXX   ERRORS
    CNT     T-NAME     PASS     STS     ADDR     WD    RD     HSTS   [ERROR   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
```

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

2. Error information displayed on the screen can be manipulated with the following key operation:

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

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

The **3** key returns the display to the DIAGNOSTICS MENU.

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

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

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

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

3.21 RUNNING TEST

3.21.1 Program Description

This program automatically runs the following tests in sequence.

1. System test (subtest number 01)
2. Memory test (subtest number 01, 02, 03, 04, 06, 07, 08, 09)
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 (subtest number 02)

When running an FDD test, this system automatically decides whether there are one or two FDDs.

3.21.2 Operations

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

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

2. After pressing **6** and **Enter** in the DIAGNOSTICS MENU, the following message will appear:

    Printer wrap around test (Y/N) ?

3. Select whether to execute the printer wraparound test (Yes) or not (No). Type **Y** or **N** and press **Enter.** (If Y is selected, a wraparound connector must be connected to the printer connector on the back of the unit.) The following message will appear:

    Async#1 wrap around test (Y/N) ?
    Async#2 wrap around test (Y/N) ?

4. Select whether to execute the test (Yes) or not (No). Type **Y** or **N** and press **Enter.** (If Y is selected, an RS-232-C wraparound connector must be connected to the SER. A or SER. B connector on the back of the unit.)

5. This program is repeated continuously. To stop the program, press **Ctrl+Break**.

3.22   FDD   UTILITIES

3.22.1 Program   Description

These programs format and copy floppy disks, and display dump list for both the FDD and the HDD.

1.   FORMAT

> **CAUTION:**   *This program is for only floppy disk drive test.   The program is different from the MS-DOS FORMAT command.*

This program can format floppy disk (5.25-inch/3.5-inch) as follows:

(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 source floppy disk to target floppy disk.

3.   DUMP

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

3.22.2 Operations

1. After pressing **7** and **Enter** key in the
    DIAGNOSTICS MENU, the following display will
    appear before program execution:

    [FDD UTILITIES]

    1 : FORMAT
    2 : COPY
    3 : DUMP
    9 : EXIT TO DIAGNOSTICS MENU

    PRES [1] - [9] KEY

2. FORMAT selection

    (1) When FORMAT is selected, the following mes-
        sage appears:

        DIAGNOSTICS - FLOPPY DISK FORMAT : VX.XX
        Drive number select (1 = A:, 2 = B:) ?

    (2) Select a drive number. Type the number and
        the following message will then appear:

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

    (3) Select a media/drive type number. Type the
        number and the message similar to the below
        will appear:

        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; press any key.

        The following message will appear; format-
        ting is then 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 fol-
        lowing message will appear:

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

(5) If you type **1** and press **Enter** key, the display will return to the message in (3) above. If you type **2** the display will return to the DIAGNOSTICS MENU.

3. COPY selection

   (1) When COPY is selected, the following message will appear.

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

   (2) Select a media/drive type number. Type the number. The following message will then appear:

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

   (3) Remove the diagnostics disk from the FDD and insert the source disk; press any key. The following message will appear, then start the copy to memory.

   [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 and insert the target disk (formatted); press any key. The **[[track, head = XXX X]]** message will appear, then start the copy to target disk. When copying cannot be done with one operation, message (2) is displayed again. Repeat the operation.

   After the floppy disk has been copied, the following message will appear:

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

   (5) If you type **1** the display will return to the message in (1) above. If you type **2** the display will return to the DIAGNOSTICS MENU.

4. DUMP selection

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

      **DIAGNOSTICS - HARD DISK & FLOPPY DISK DUMP :
VX.XX
format type select (0:2DD,1:2D,2:2HD,3:HDD) ?**

   (2) Select a format type number. Type the number. If **3** is selected, the dump lists for the hard disk are displayed automatically.

      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; the following message will then 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. The **Track number ??** message will then appear. Type the track number and press **Enter.**

   (6) The Head number ? message will then appear. Type the head number and press **Enter.**

   (7) The **Sector number ??** message will then appear. Type the sector number and press **Enter.** The dump list for the floppy disk will be displayed.

(8) After a dump list appears on the screen, the
Press number key (1:up,2:down,3:end) ?
message will appear.

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

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

(9) If you type **1** the display will return to the
message shown after (1) above. If you type
2 the display will return to the DIAGNOSTICS
MENU.

3.23   SYSTEM   CONFIGURATION

3.23.1 Program Description

This program displays the following system configuration.

      1.   BIOS ROM version = VX.XX
      2.   Base memory size
      3.   Display type
      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 presents or not
      9.   Expansion memory size

3.23.2 Operations

After pressing **8** and **Enter** key to select from the
DIAGNOSTICS MENU, the following display will appear:

```
        SYSTEM   CONFIGURATION

            * -   BIOS  ROM  VERSION  =  VX.XX
            * -   640KB  MEMORY
            * -   PLASMA  DISPLAY
            * -   1  FLOPPY  DISK  DRIVE(S)
            * -   2  ASYNC  ADAPTER(S)
            * -   1  HARD  DISK  DRIVE(S)
            * -   1  PRINTER  ADAPTER(S)
            * -   0  MATH  CO-PROCESSOR
            * -   00000KB  EXPANSION  MEMORY  SIZE


        PRESS  [ENTER]  KEY
```

Press **Enter** key to return to the DIAGNOSTICS MENU.

3.24   WIRING DIAGRAM

1. Printer wraparound connector

(Pin No.)   Signal name   Signal name   (Pin No.)

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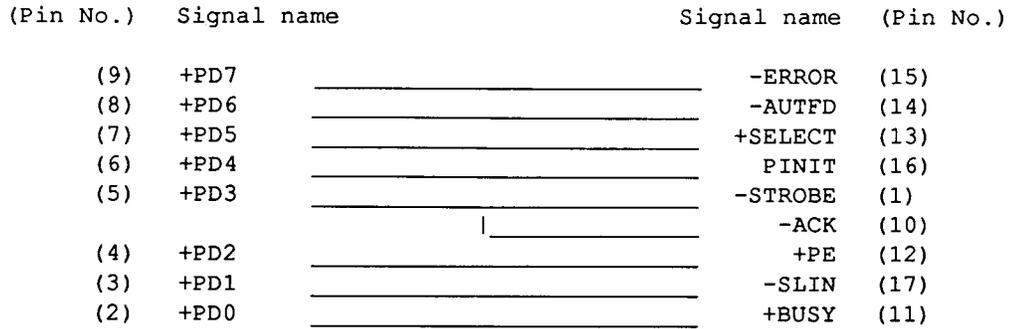
Figure 3-1 Printer wraparound connector

2. RS-232-C wraparound connector

(3)	TRANSMIT DATA		RECEIVE DATA	(2)
(7)	REQUESDT TO SEND		CLEAR TO SEND	(8)
			CARRIER DETECT	(1)
(4)	DATA TERMINAL		DATA SET READY	(6)
	READY		RING INDICATE	(9)

Figure 3-2 RS-232-C wraparound connector

3. RS-232-C direct cable (9-pin to 9-pin)

(3)	TD		RD	(2)
(4)	DTR		DSR	(6)
			CTS	(8)
			RI	(9)
(7)	RTS		CD	(1)
(5)	GND		GND	(5)
(2)	RD		TD	(3)
(1)	CD		RTS	(7)
(6)	DSR		DTR	(4)
(8)	CTS			
(9)	RI			
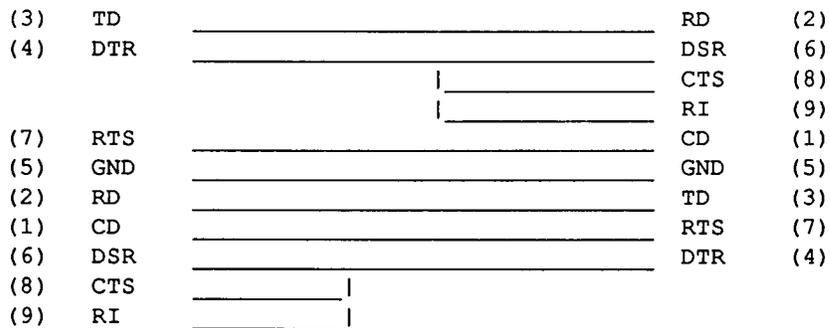
Figure 3-3 RS-232-C direct cable (9-pin to 9-pin)

4. RS-232-C direct cable (9-pin to 25-pin)

```
(1)  CD    _____  RTS   (4)
(2)  RD    _____  TD    (2)
(3)  TD    _____  RD    (3)
(4)  DTR   _____  CTS   (5)
                                     |_____  DSR  (6)
                                     |_____  RI   (22)
(5)  GND   _____  GND   (7)
(7)  RTS   _____  CD    (8)
(6)  DSR   _____  DTR   (20)
(8)  CTS   _____|
(9)  RI    _____|
```
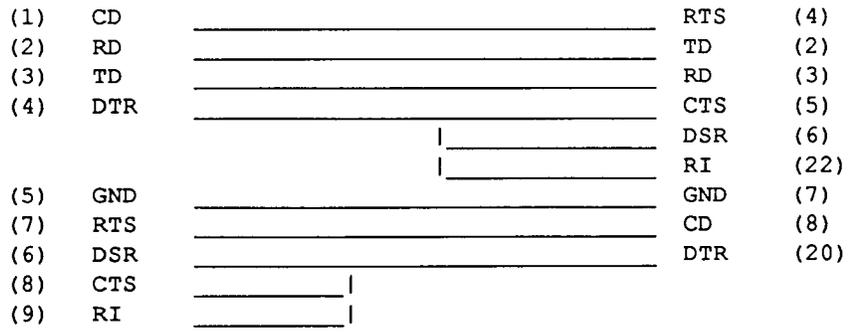
Figure 3-4 RS-232-C direct cable (9-pin to 25-pin)

4.1   GENERAL

This section gives a detailed description of the procedures for removing and replacing FRUs (field replaceable units).

FRUs are listed as follows:

1. Keyboard
2. Top cover
3. LED board
4. Modem case
5. Sub battery
6. Power supply board
7. FDD (floppy disk drive)
8. HDD (hard disk drive)
9. Speaker
10. DC inlet cable
11. System board
12. Plasma display unit

The following points must be kept in mind:

1. The system should never be disassembled unless there is a problem (abnormal operation, etc.)

2. Only approved tools may be used.

3. After deciding the purpose of replacing the unit, and the procedures required, do not carry out any other procedures which are not absolutely necessary.

4. Be sure to turn the POWER switch off before beginning.

5. Be sure to disconnect the AC adapter and all external cables from the system.

6. Follow the only fixed, standard procedures.

7. After replacing a unit, confirm that the system is operating normally.

Tools needed for unit replacement:

1. Phillips head screwdriver

2. Tweezers

4.2   REMOVING/REPLACING THE KEYBOARD

1.   Remove the AC adapter from the unit.

2.   Remove the two battery packs (A).
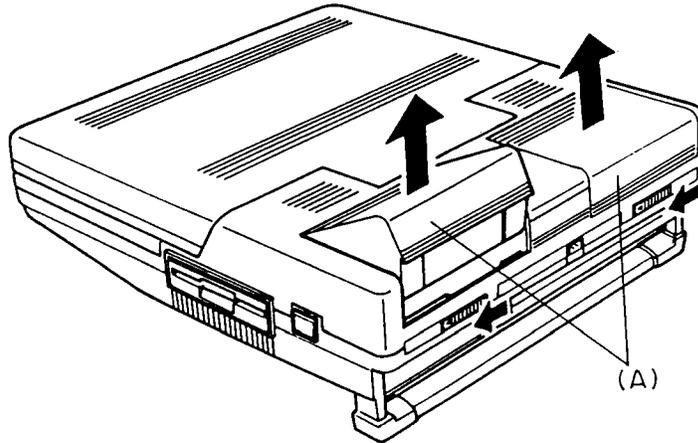
Figure 4-1   Removing the battery packs

3.   Turn the unit upside down and remove the three
      screws (B) from the bottom cover.
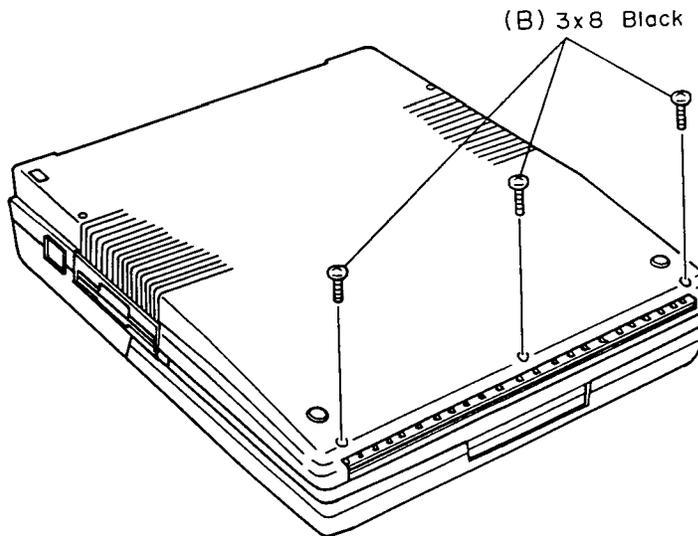
Figure 4-2   Removing the three screws

4. Turn the unit back cover, then open the display.

5. Lift up the front edge of the keyboard unit and place it in front of the computer. At this time, you cannot disconnect the keyboard cable yet.

6. Remove the three screws (C) to remove the shield plate (D) for the system board.

7. Release the pressure plate (E) of the PJ14 (F) on the system board to disconnect the keyboard cable (G) from the system board.
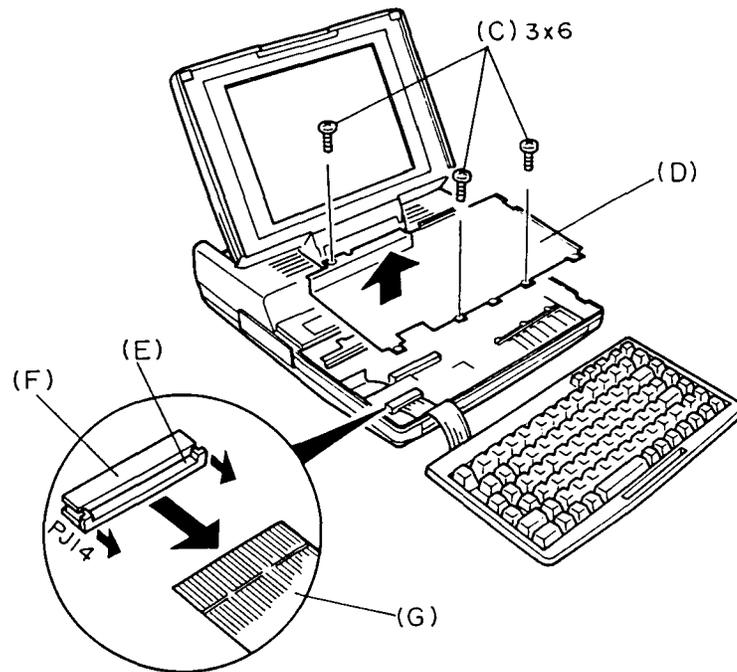
Figure 4-3 Removing the keyboard unit

8. Unlatch the four latches (H) of the keyboard
   mask (I), then pull out the keyboard (J).
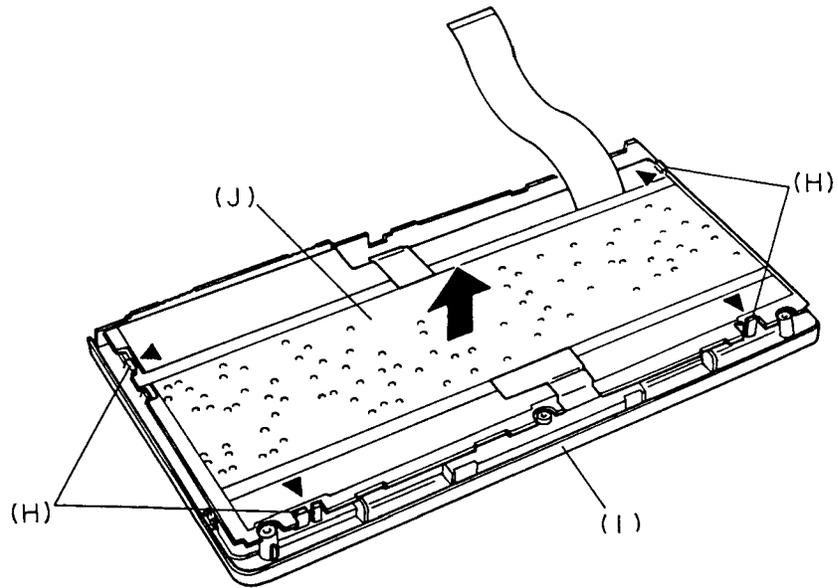
Figure 4-4 Removing the keyboard

9. To install the keyboard, follow the above proce-
   dures in reverse.

4.3   REMOVING/REPLACING THE TOP COVER

1.   Remove the AC adapter from the unit.

2.   Remove the two battery packs as directed in
     section 4.2.

3.   Turn the unit upside down and remove the eight
     screws (A) from the bottom cover.

(A)3x8 Black   (A)3x12 Black
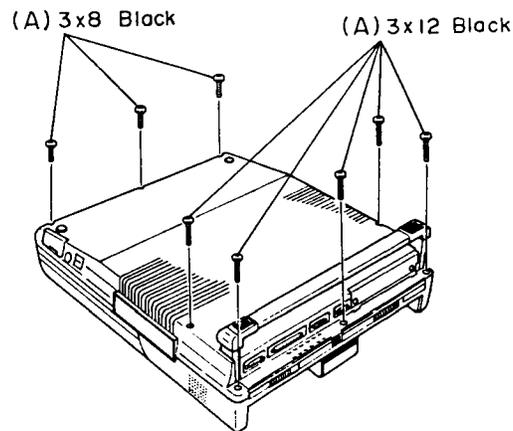
Figure 4-5   Removing the eight screws

4.   Turn the unit back cover. Open the display so
     that it is perpendicular to the system unit.

5.   Open the mask plate and remove the two screws
     (B) to remove the display.

CAUTION: *Pulling out the internal display when it
is not perpendicular to the system unit will damage
the display. Excessive removal and replacement of
the display will prematurely wear its connectors.*

(B)
3x6
Black
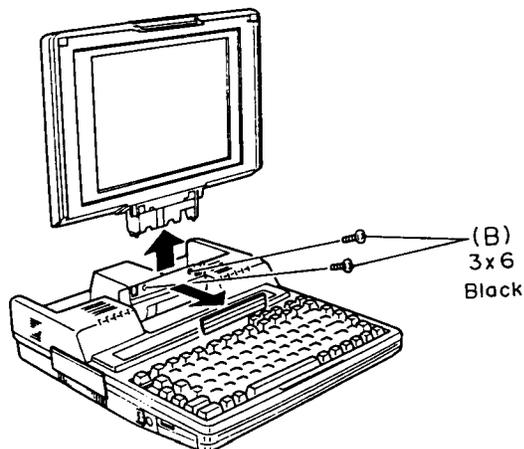
Figure 4-6   Removing the display

6. Remove the keyboard as directed in section 4.2, and remove the five screws (C).

7. Disconnect the display cable (D) from the PJ7 (E) on the system board, then remove the screw (F) from the system board.

8. Disconnect the two LED cables (G) from the PJ2 (H) and the PJ17 (I) on the system board. Then remove the top cover.
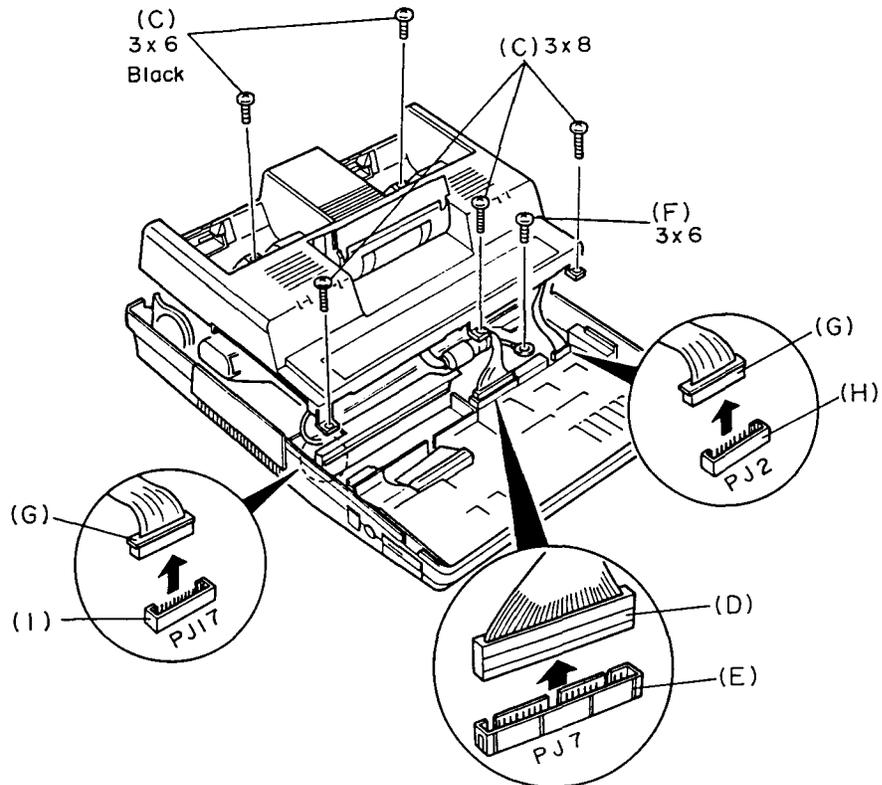
Figure 4-7 Removing the top cover

9. To install the top cover, follow the above procedures in reverse.

4.4   REMOVING/REPLACING THE LED BOARD

1.   Remove the top cover as directed in section 4.3.

2.   Remove the three screws (A) from the top cover, then remove the two LED boards (B).
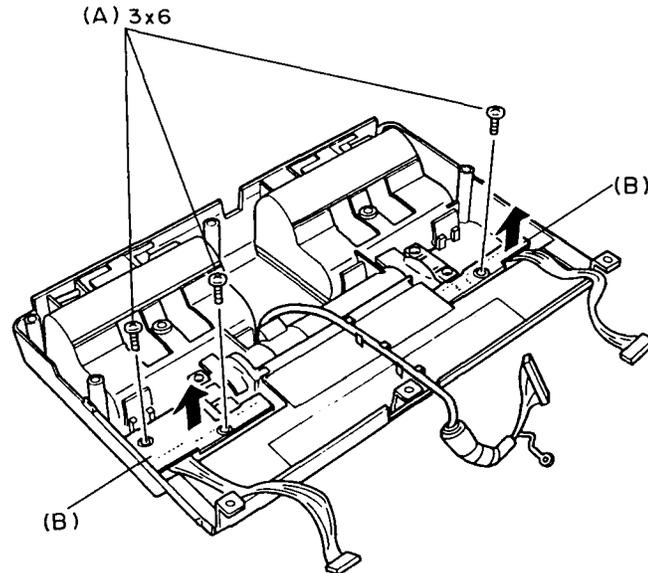
Figure 4-8   Removing the LED unit

3.   Disconnect the two LED cables (C) from the PJ601 (D) and the PJ701 (E) on each LED board (F).
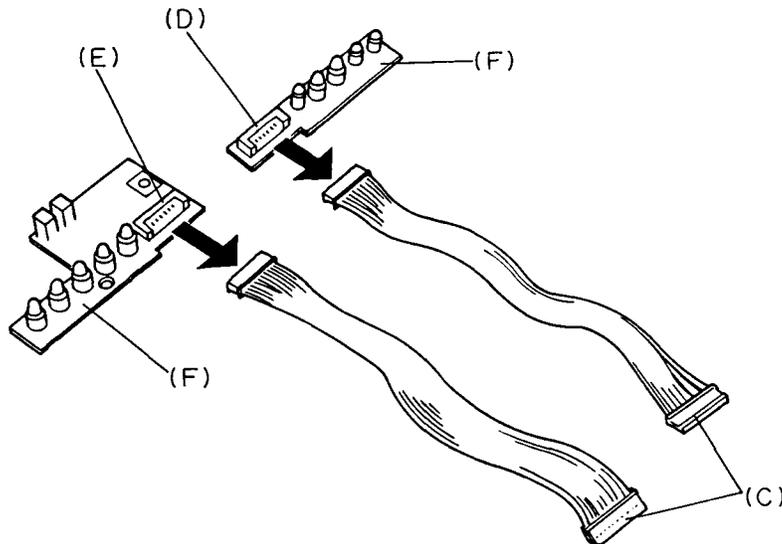
Figure 4-9   Removing the LED board

4.   To install the LED board, follow the above procedures in reverse.

4.5 REMOVING/REPLACING THE MODEM CASE AND THE SUB BATTERY

1. Remove the top cover as directed in section 4.3.

2. Remove the two screws (A), then disconnect the modem cable (B) from the PJ16 (C) on the system board.

   Remove the modem case (D) by lifting it up.
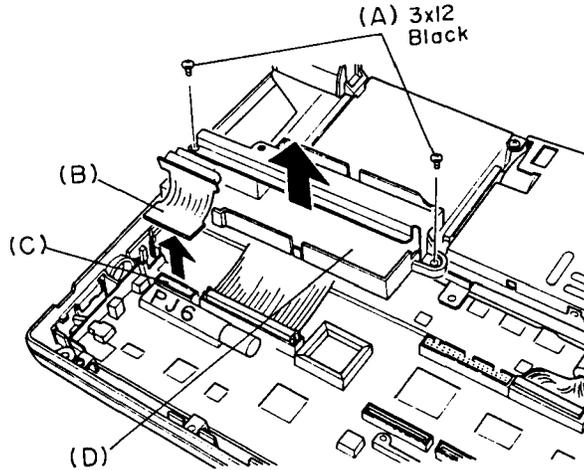
Figure 4-10   Removing the modem case

3. Disconnect the sub battery cable (E) from the PJ1 (F) on the power supply board.

   Remove the screw (G), then slide the sub battery unit (H) to remove it from the HDD/FDD support (I).
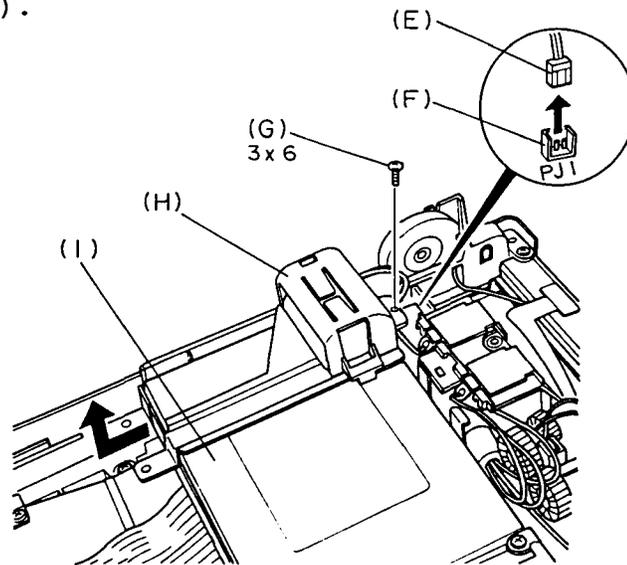
Figure 4-11   Removing the sub battery unit

4. Slide the sub battery holder (J) to remove it
   from the sub battery plate (K).

   Remove the sub battery (L) from the sub battery
   holder.
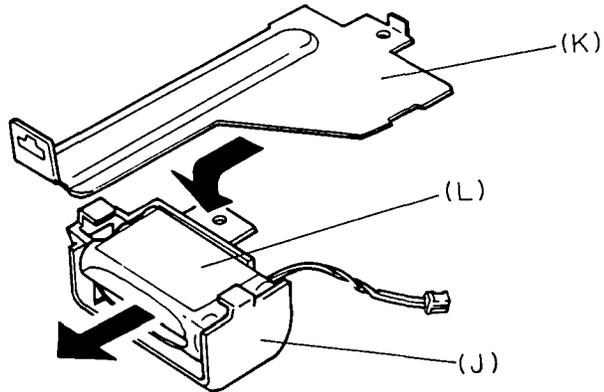
Figure 4-12   Removing the sub battery

5. To install the modem case and the sub battery,
   follow the above procedures in reverse.

4.6   REMOVING/REPLACING THE POWER SUPPLY BOARD

1. Remove the top cover as directed in section 4.3.

2. Remove the six screws (A), and disconnect the DC
    inlet cable (B) and the battery cable (C) from
    the PJ3 (D) and the PJ2 (E) on the power supply
    board.

3. Remove the power supply board (F) by disconnect-
    ing the power supply connector of the PJ6 (G) on
    the system board.
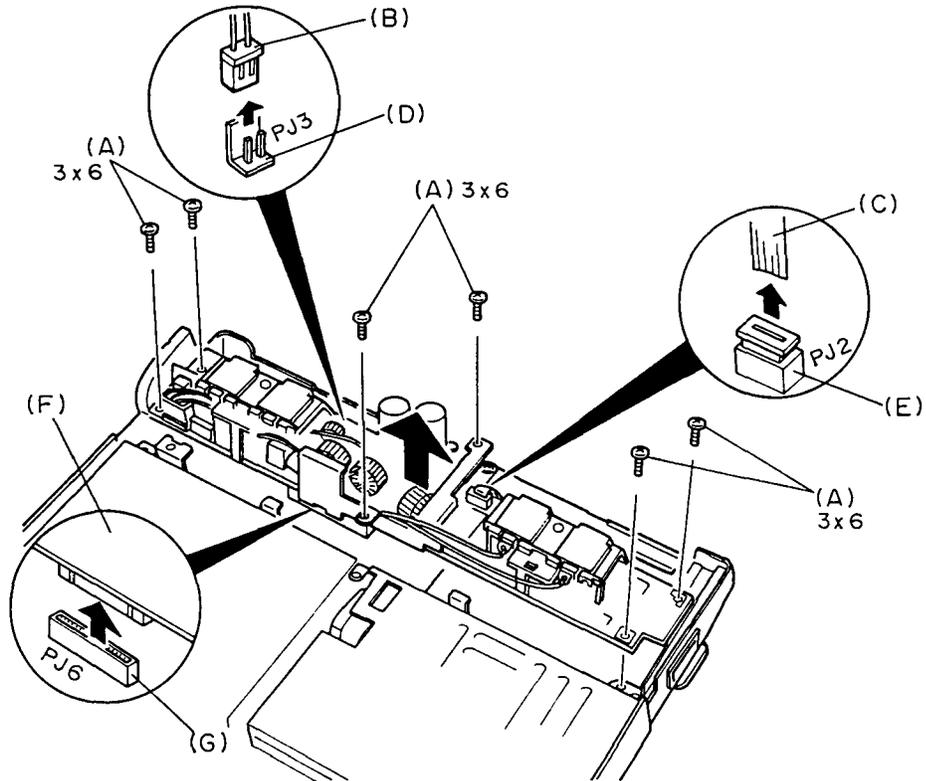
Figure 4-13   Removing the power supply board

4. Disconnect the electrode cable (H) from the PJ12 (I) on the power supply board. Remove the electrode assemblies (J) from the power supply board.
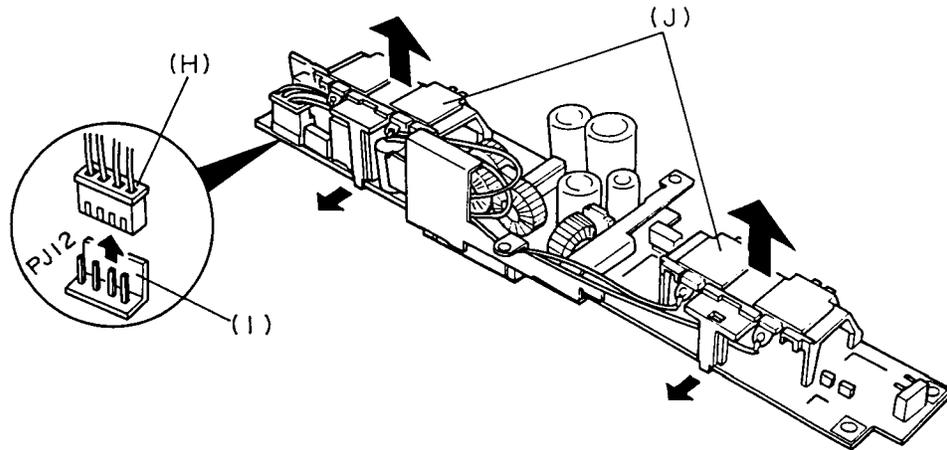
Figure 4-14 Removing the electrode assembly

5. To install the power supply board, follow the above procedures in reverse.

4.7   REMOVING/REPLACING THE FDD

1. Remove the power supply board, the modem case
    and the sub battery as directed in sections 4.5
    and 4.6.

2. Disconnect the HDD cable (A) and the FDD cable
    (B) from the PJ12 (C) and the PJ5 (D) on the
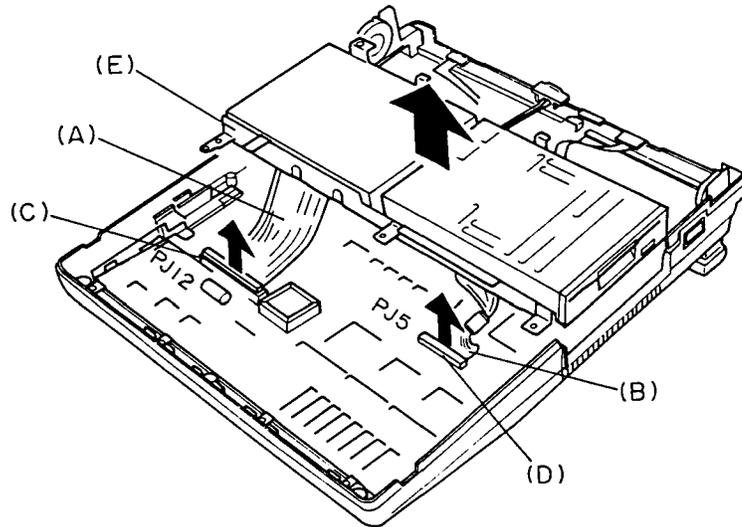   system board, then remove the HDD/FDD unit (E).
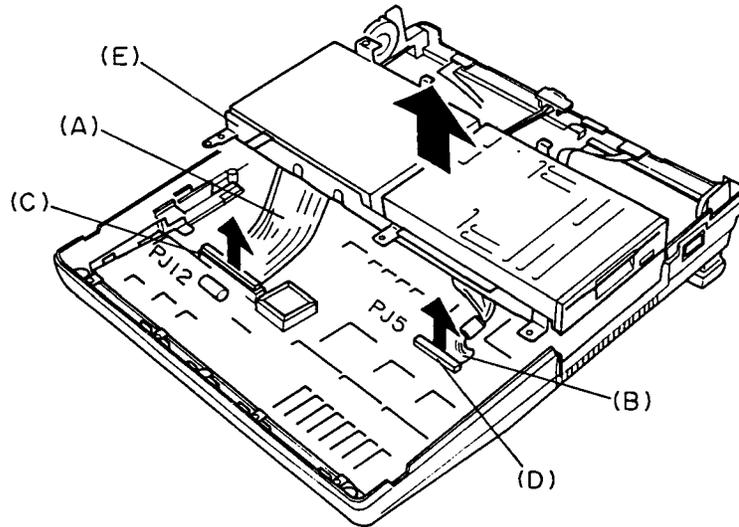
Figure 4-15   Removing the HDD/FDD unit

3. Remove the four screws (F), then remove the FDD
   (G) from the HDD/FDD support (H).
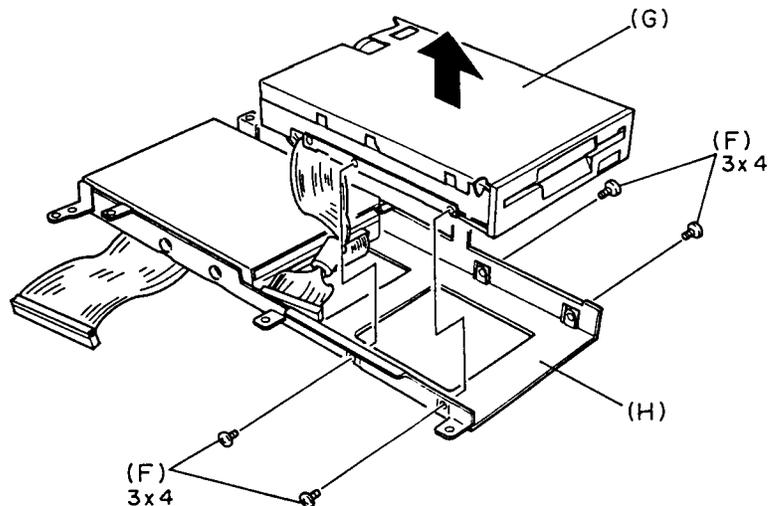
Figure 4-16   Removing the FDD

4. To install the FDD, follow the above procedures
    in reverse.

4.8 REMOVING/REPLACING THE HDD

1. Remove the power supply board, the modem case, and the sub battery as directed in sections 4.5 and 4.6.

2. Disconnect the HDD cable (A) and the FDD cable (B) from the PJ12 (C) and the PJ5 (D) on the system board, then remove the HDD/FDD unit (E).

Figure 4-17   Removing the HDD/FDD unit

3. Remove the four screws (F) to remove the HDD (G) from the HDD/FDD support (H).
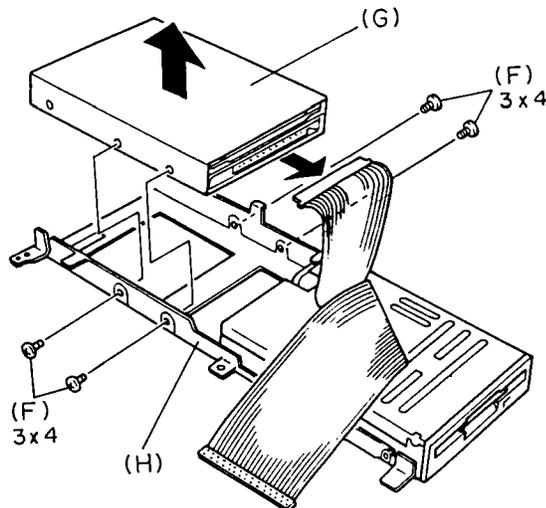
Figure 4-18   Removing the HDD

4. To install the HDD, follow the above procedures in reverse.

4-17

File No. 960-016

4.9   REMOVING/REPLACING THE SPEAKER AND THE DC INLET CABLE

1. Remove the FDD and the HDD as directed in sections 4.7 and 4.8.

CAUTION: *When removing the speaker, the stand must be set up. Otherwise the speaker unit will not be removed.*

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2. Disconnect the speaker cable (A) from the PJ18 (B) on the system board.

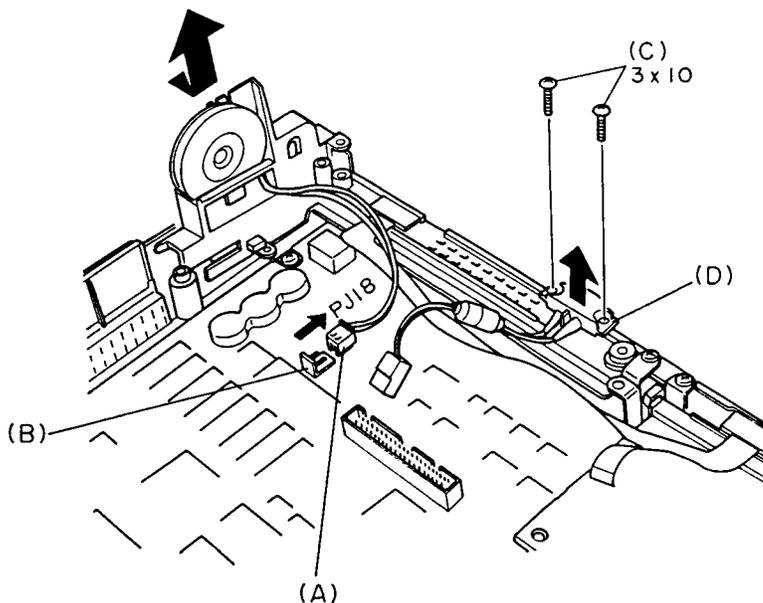   Remove the two screws (C) from the bottom cover, then remove the DC inlet cable (D) from the bottom cover.

Figure 4-19   Removing the speaker unit and the DC inlet cable

4-18

3. Remove the latch of the speaker unit to remove
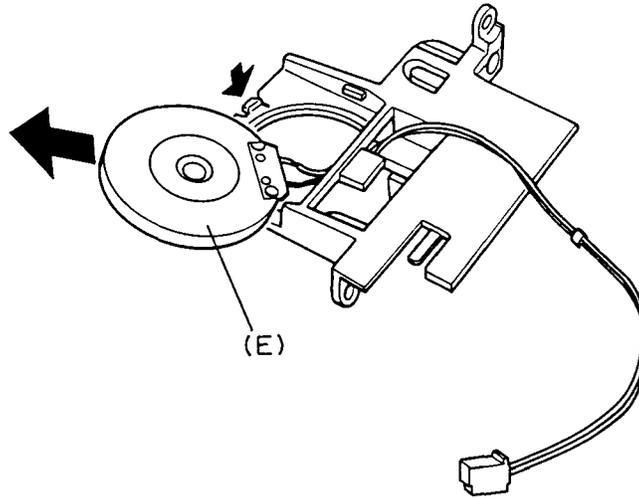   the speaker (E) from the speaker unit.

Figure 4-20 Removing the speaker

4. To install the speaker and the DC inlet cable,
   follow the above procedures in reverse.

4.10 REMOVING/REPLACING THE SYSTEM BOARD

1. Remove the speaker and the DC inlet cable as directed in section 4.9.

2. Remove the 14 screws (A) to remove the system board (B) from the bottom cover.
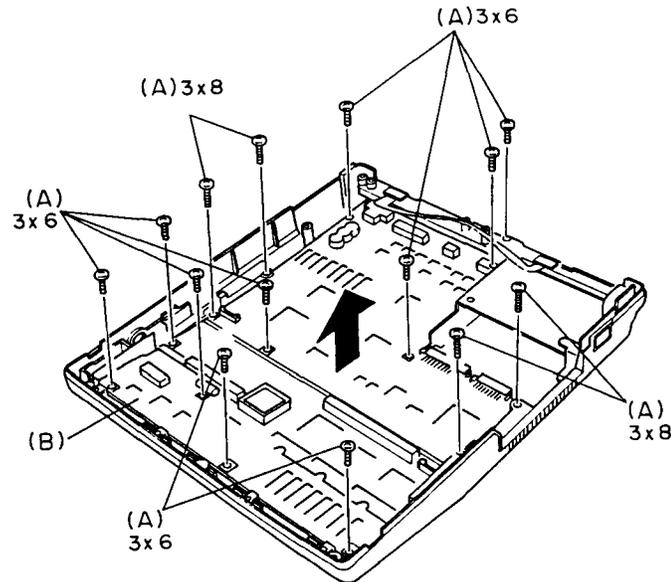

Figure 4-21 Removing the system board unit

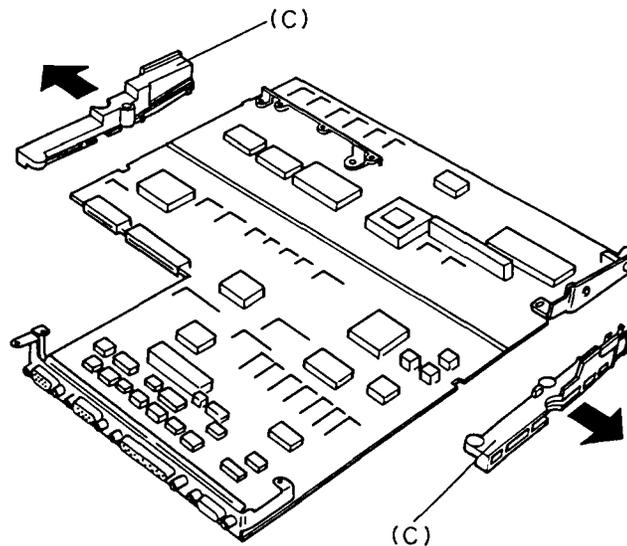3. Remove the system board guide (C) from the system board.

Figure 4-22 Removing the system board

4. To install the system board, follow the above procedures in reverse.

4.11   REMOVING/REPLACING THE PDP UNIT

1. Remove the PDP unit as directed in section 4.3.

2. Remove the two rubbers (A), two labels (B) and the five screws (C) to remove the PDP mask (D) from the PDP unit.
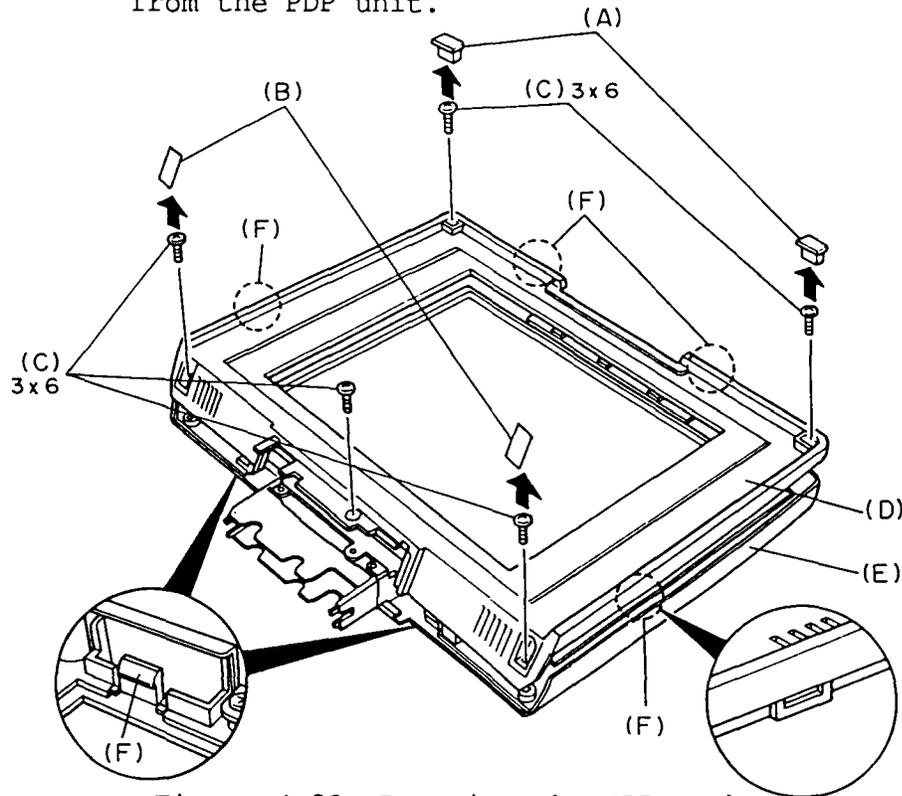
Figure 4-23   Removing the PDP mask

NOTE: *Confirm that the PDP mask is locked into the PDP cover with the six latches (E).*

3. Remove the four screws (E) to remove the PDP.
   Disconnect the PDP cable (F) from the PDP (G).

(E) 3x6

(F)

(G)

3x6

(E)
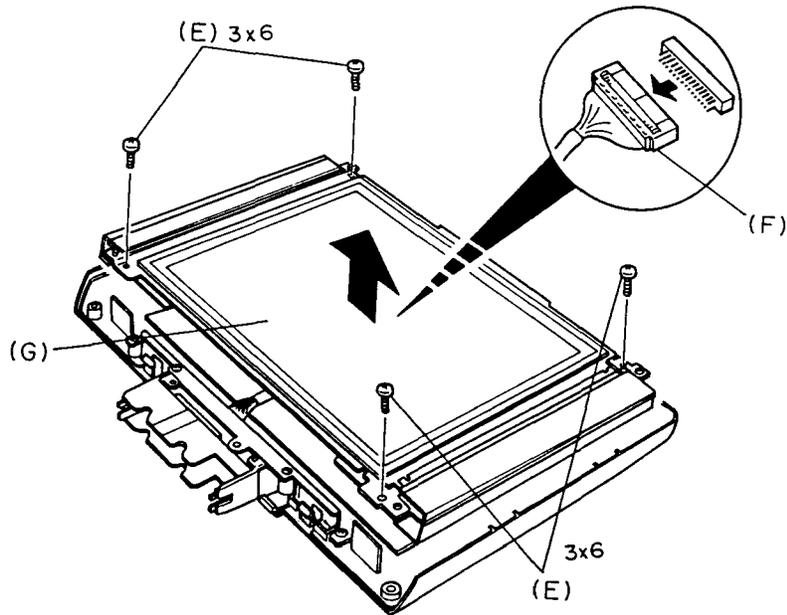
Figure 4-24   Removing the PDP

4. Remove the six screws (H) to remove the
   reinforce plate (I) from the PDP cover assembly
   (J).

(H)3x4

(H)3x6

(H)
3x4

(J)

(I)

Figure 4-25   Removing the PDP cable

5. To install the PDP, follow the above procedures
   in reverse.

4.12   REMOVING/REPLACING THE LCD UNIT

1.   Remove the display as directed in section 4.3.

2.   Remove the two rubbers (A), two labels (B) and
      the five screws (C) to remove the LCD mask (D)
      from the LCD cover assembly (E).
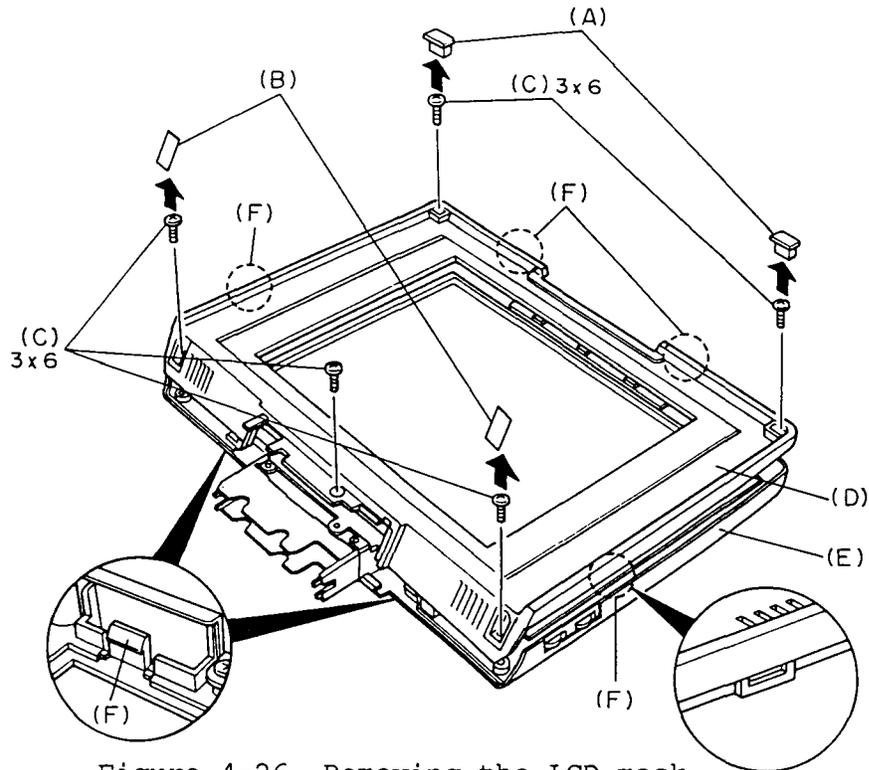
Figure 4-26   Removing the LCD mask

NOTE: Confirm that the LCD mask is locked into the
LCD cover with the six latches (F).

3. Remove the five screws (G) to lift up the LCD unit (H)
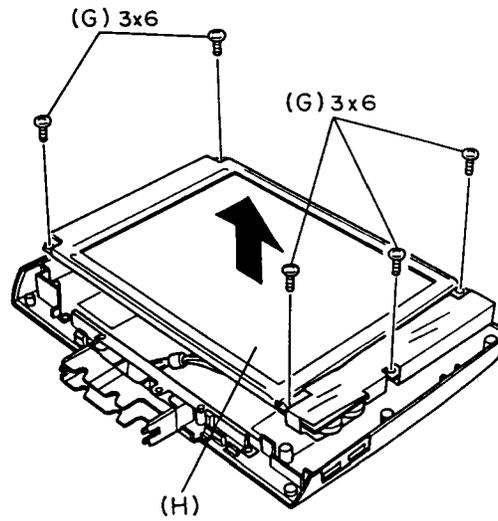
Figure 4-27   Lifting up the LCD unit

4. Remove the six screws (I) to remove the reinforce plate (J) from the LCD cover assembly. Then remove the LCD cable (K) from the LCD cover assembly.
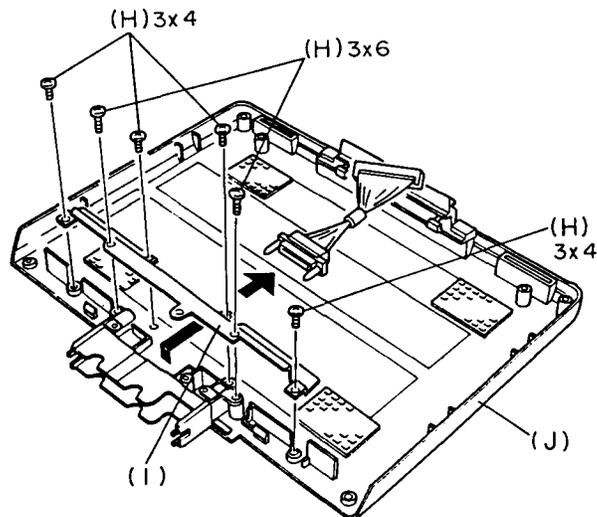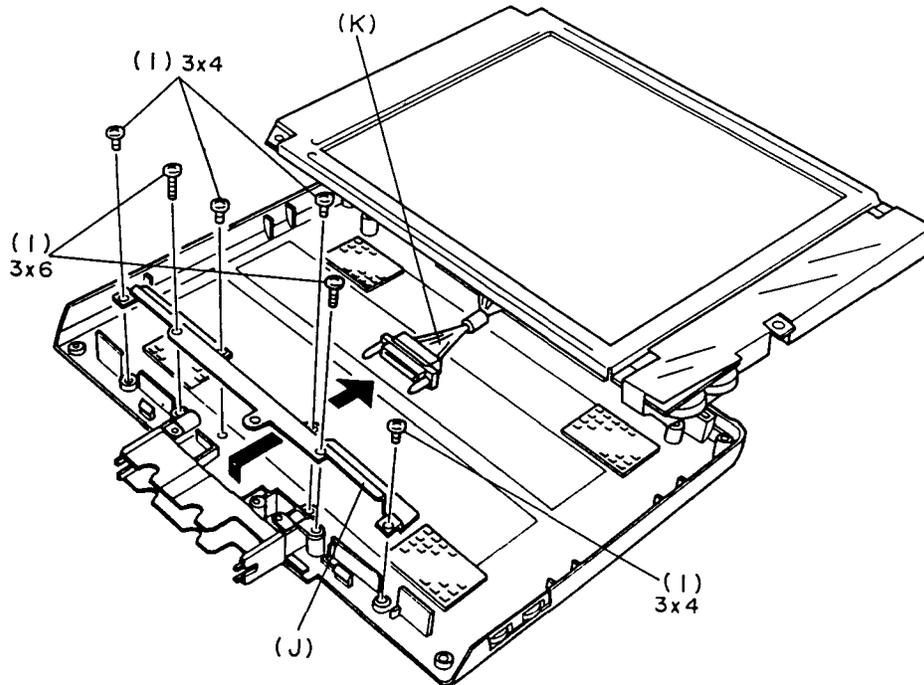
Figure 4-28   Removing the LCD unit

5. To install the LCD unit, follow the above procedure in reverse.

4.13   REMOVING/REPLACING THE LCD

1. Remove the LCD unit as directed in section 4.12.

2. Remove the FL inverter cover (A) from the LCD unit.

3. The FL inverter is held in place by two fasteners (B). Each fastener consists of a pin (C) and a collar (D) as shown in the figure 4-29.

    Push up the tip of a pin, then using tweezers, pull out each pin from above.

4. The collars may come out when you pull out the pins, if not, push up the tip of each collar, then using tweezers, pull out each collar from above.

5. Disconnect the LCD cables (E) from the PJ1, PJ2, PJ3, PJ4, PJ5 (F) on FL inverter. And remove the FL inverter (G).
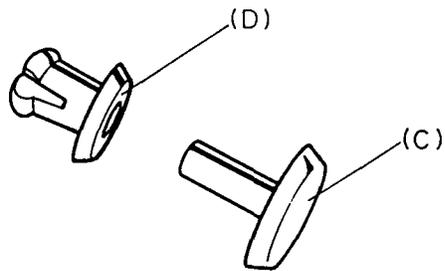
Figure 4-29 Fastener
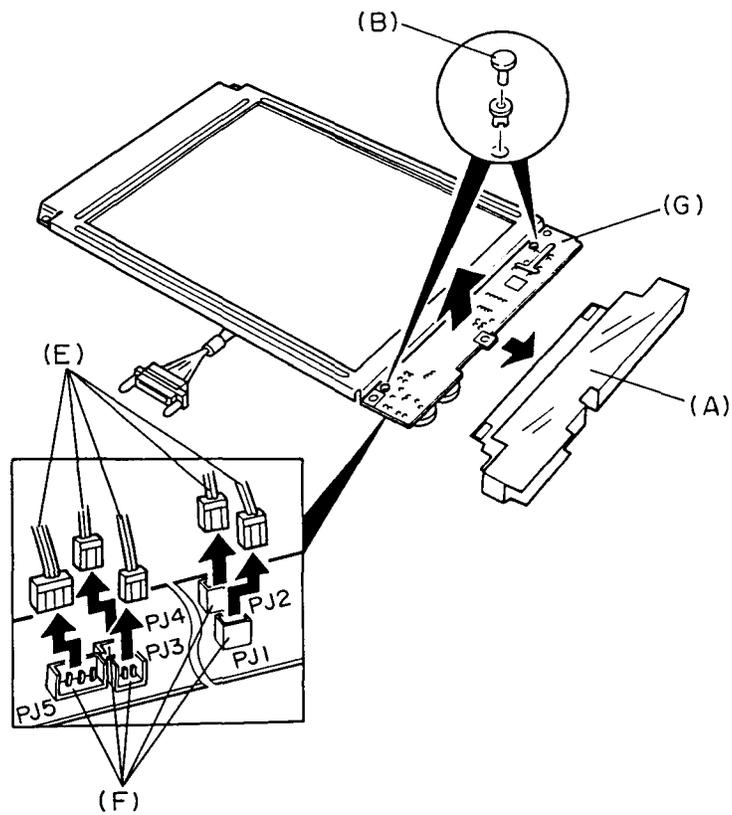
Figure 4-30 Removing the FL inverter

6. Unlatch the two latches (H) and remove the FL backlit assembly (I). And remove the LCD (J).

(H)

(I)

(J)
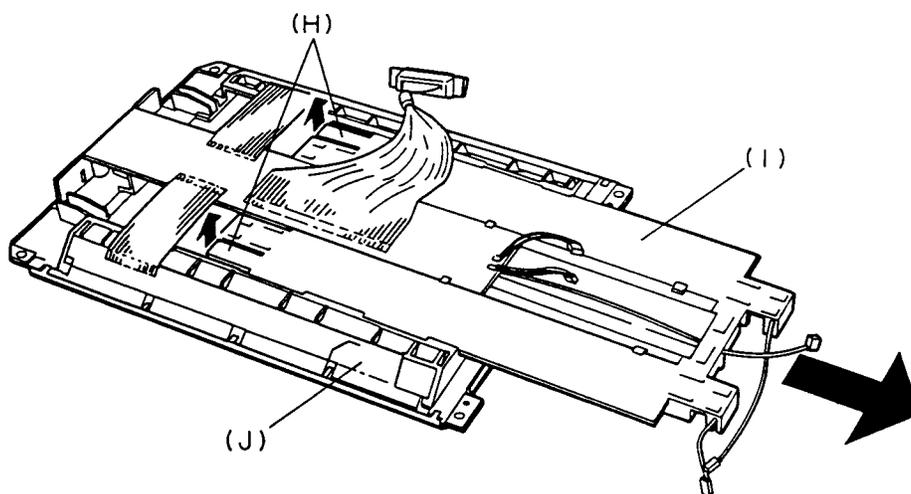
Figure 4-31 Removing the FL backlit assembly

7. To install the LCD, follow the above procedure in reverse.

GENERAL

The appendices include the following parts:

APPENDIX A   BOARD LAYOUT

This parts shows location of the ICs
and connectors on the system board.

APPENDIX B   SYSTEM BOARD PIN ASSIGNMENT

This part describes pin assignments of
the connectors on the system board.

APPENDIX C   DISPLAY CODE

This part shows the display code used
in the T3100SX.

APPENDIX D   KEYBOARD SCAN/CHARACTER CODE

This part shows the scan/character
code of the keyboard used in the
T3100SX.

APPENDIX E   KEY LAYOUT

This part describes key layouts of the
keyboards that are available for the
T3100SX.

APPENDIX A BOARD LAYOUT

A.1 SYSTEM BOARD (ICs)
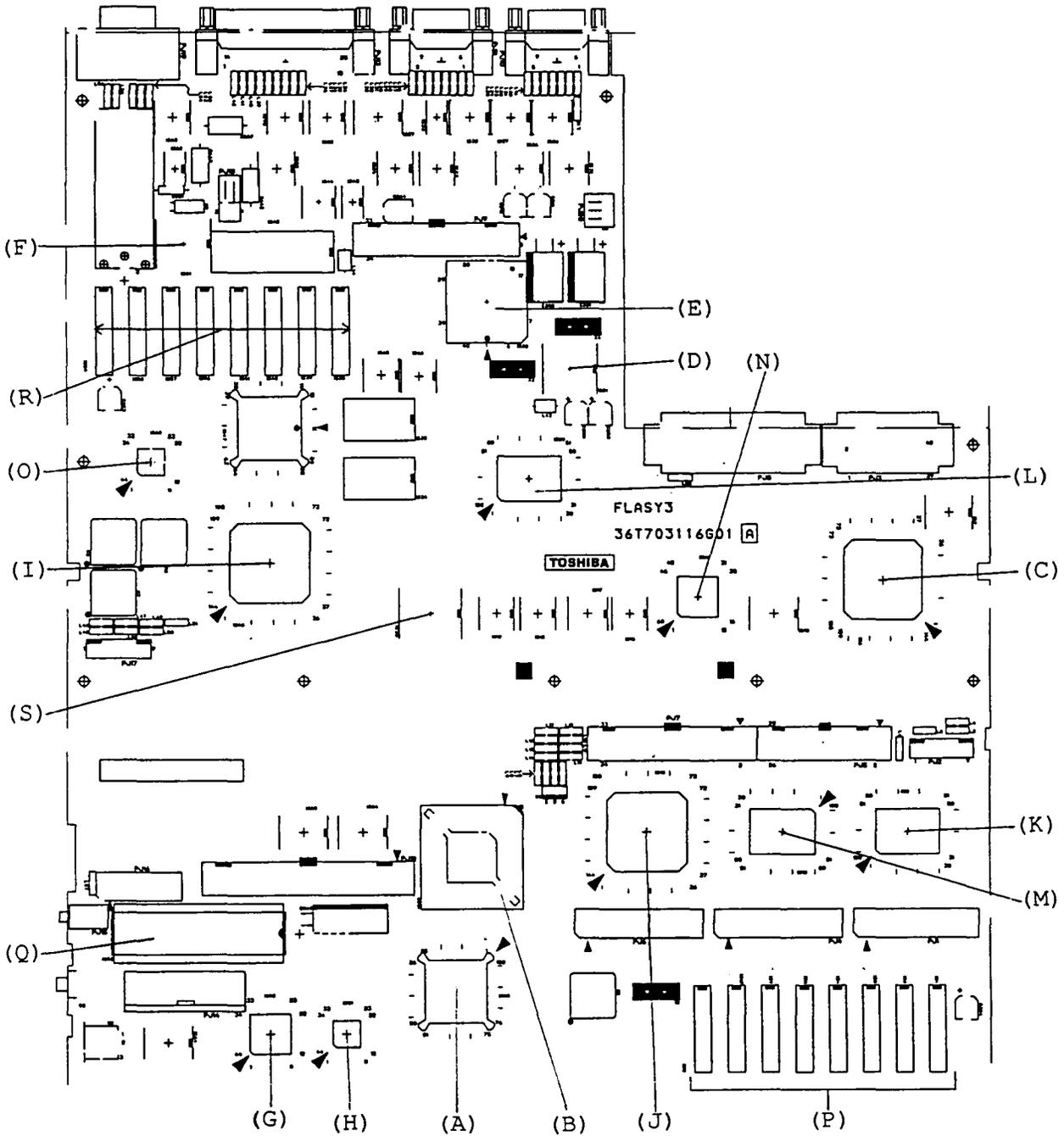
Figure A-1 System board (ICs)

(A) CPU: Central processing unit (80386SX-16)

(B) NPU: Numeric data processing unit

(C) SI: Super integration (T9778)

(D) VFO: Variable frequency oscillator (TC8568AM)

(E) UART: Universal asynchronous receive transmitter

(F) RTC: Real time clock (HD(MC)146818A)

(G) KBS: Keyboard scan controller

(H) KBC: Keyboard controller

(I) H2 GVA-GA: Video graphic gate array

(J) H2 MEC-GA: Memory controller gate array

(K) H2 BSD-GA: Bus driver gate array

(L) H2 IOC-GA I/O controller gate array

(M) H2 BSC-GA: Bus controller gate array

(N) H2 IOD-GA: I/O decoder gate array

(O) H2 BAC-GA: Backup gate array

(P) System RAMs

(Q) BIOS ROM

(R) Video RAMs

(S) Backup RAM

A.2   SYSTEM BOARD (CONNECTORS)
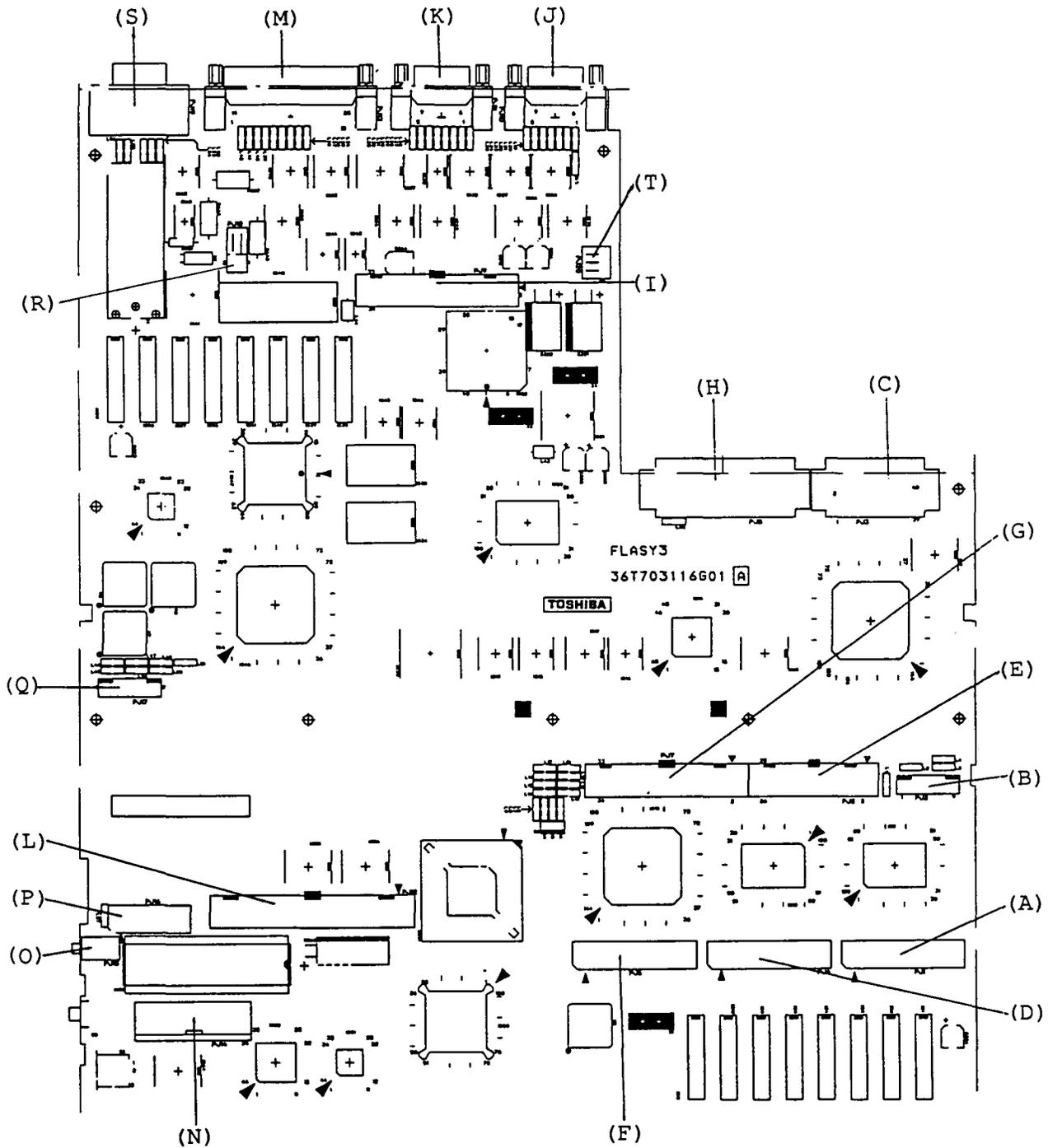
Figure A-2   System board (connectors)

(A)   PJ1   Option memory slot connector C

(B)   PJ2   LED I/F connector (right side)

(C)   PJ3   TOSHIBA slot 40 connector

(D)   PJ4   Option memory slot connector B

(E)   PJ5   FDD I/F connector

(F)   PJ6   Option memory slot connector A

(G)   PJ7   PDP & LCD I/F connector

(H)   PJ8   TOSHIBA slot 60 connector

(I)   PJ9   Power supply I/F connector

(J)   PJ10   Asynchronous I/F connector B

(K)   PJ11   Asynchronous I/F connector A

(L)   PJ12   HDD I/F connector

(M)   PJ13   EXT.FDD & PRT I/F connector

(N)   PJ14   Keyboard I/F connector.

(O)   PJ15   Ten-key I/F connector

(P)   PJ16   Modem I/F connector

(Q)   PJ17   LED I/F connector (left side)

(R)   PJ18   Speaker I/F connector

(S)   PJ19   CRT I/F connector

(T)   PJ20   HDD power supply I/F connector

APPENDIX B   SYSTEM BOARD PIN ASSIGNMENT

B.1   PJ1 OPTION MEMORY SLOT CONNECTOR C (50-PIN)

Table B-1   Option memory slot connector C pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
01	GND		02	D15;100	I/O
03	D14;100	I/O	04	D13;100	I/O
05	D12;100	I/O	06	GND	
07	D11;100	I/O	08	D10;100	I/O
09	D09;100	I/O	10	D08;100	I/O
11	GND		12	MEMWE;002	O
13	CASL;002	O	14	GND	
15	RAS10;000	O	16	GND	
17	RAS11;000	O	18	MA09;102	O
19	MA08;102	O	20	MA00;102	O
21	GND		22	MA07;102	O
23	MA01;102	O	24	MA06;102	O
25	GND		26	GND	
27	MA02;102	O	28	MA05;102	O
29	GND		30	MA03;102	O
31	MA04;102	O	32	RAS12;000	O
33	GND		34	RAS13;000	O
35	GND		36	CASH;002	O
37	D07;100	I/O	38	D06;100	I/O
39	D05;100	I/O	40	D04;100	I/O
41	GND		42	D03;100	I/O
43	D02;100	I/O	44	D01;100	I/O
45	D00;100	I/O	46	GND	
47	RAMV	POWER	48	RAMV	POWER
49	RAMV	POWER	50	RAMV	POWER

B.2   PJ2 LED I/F CONNECTOR (RIGHT SIDE) (9-PIN)

Table B-2   LED I/F connector (right side) pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
01	VCC	POWER	02	GND	
03	CAPLED;100	O	04	NUMLED;100	O
05	SCRLED;100	O	06	OVRLED;100	O
07	DCVMC;100	O	08	DCLED;000	O
09	VCC	POWER			

B.3   PJ3 TOSHIBA SLOT 40 CONNECTOR (40-PIN)

Table B-3   TOSHIBA slot 40 connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
01	IRQ10;100	I	02	IRQ14;100	I
03	SD08;100	I/O	04	SD09;100	I/O
05	IRQ11;100	I	06	SD10;100	I/O
07	SD11;100	I/O	08	SD12;100	I/O
09	IRQ12;100	I	10	GND	
11	SD13;100	I/O	12	SD14;100	I/O
13	IRQ6;100	I	14	SD15;100	I/O
15	LA22;100	O	16	LA23;100	O
17	DRQ2;100	I	18	LA21;100	O
19	LA19;100	O	20	LA20;100	O
21	DACK6;000	O	22	GND	
23	REFMD;000	O	24	LA18;100	O
25	MASTER;000	I	26	LA17;100	O
27	SBHE;000	O	28	IOCHCK;000	I
29	MMCS16;000	I	30	GND	
31	IOCS16;000	I	32	DACK2;000	O
33	DRQ6;100	I	34	DRQ5;100	I
35	DACK5;000	O	36	MERD;000	I/O
37	IRQ4;100	I	38	MEWR;000	I/O
39	IRQ7;100	I	40	GND	

B.4   PJ4 OPTION MEMORY SLOT CONNECTOR B (50-PIN)

Table B-4   Option memory slot connector B pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
01	GND		02	D15;100	I/O
03	D14;100	I/O	04	D13;100	I/O
05	D12;100	I/O	06	GND	
07	D11;100	I/O	08	D10;100	I/O
09	D09;100	I/O	10	D08;100	I/O
11	GND		12	MEMWE;002	O
13	CASL;002	O	14	GND	
15	RAS6;000	O	16	GND	
17	RAS7;000	O	18	MA09;102	O
19	MA08;102	O	20	MA00;102	O
21	GND		22	MA07;102	O
23	MA01;102	O	24	MA06;102	O
25	GND		26	GND	
27	MA02;102	O	28	MA05;102	O
29	GND		30	MA03;102	O
31	MA04;102	O	32	RAS8;000	O
33	GND		34	RAS9;000	O
35	GND		36	CASH;002	O
37	D07;100	I/O	38	D06;100	I/O
39	D05;100	I/O	40	D04;100	I/O
41	GND		42	D03;100	I/O
43	D02;100	I/O	44	D01;100	I/O
45	D00;100	I/O	46	GND	
47	RAMV	POWER	48	RAMV	POWER
49	RAMV	POWER	50	RAMV	POWER

B.5   PJ5 FDD I/F CONNECTOR (26-PIN)

Table B-5   FDD I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
01	VCC		02	INDEX;100	I
03	VCC		04	IDSL;000	O
05	VCC		06	DSKCHG;000	I
07	VCC		08	IRDY;000	I
09	IHMED;000	I	10	IMON;000	O
11	ILOWD;000	O	12	IDIRC;000	O
13	GND		14	ISTEP;000	O
15	GND		16	IWDAT;000	O
17	GND		18	IWEN;000	O
19	GND		20	ITR0;100	I
21	GND		22	IWPR;000	I
23	GND		24	IRDAT;000	O
25	GND		26	ISSEL;000	O

B.6   PJ6 OPTION MEMORY SLOT CONNECTOR A (50-PIN)

Table B-6 Option memory slot connector A pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
01	GND		02	D15;100	I/O
03	D14;100	I/O	04	D13;100	I/O
05	D12;100	I/O	06	GND	
07	D11;100	I/O	08	D10;100	I/O
09	D09;100	I/O	10	D08;100	I/O
11	GND		12	MEMWE;001	O
13	CASL;001	O	14	GND	
15	RAS2;000	O	16	GND	
17	RAS3;000	O	18	MA09;101	O
19	MA08;101	O	20	MA00;101	O
21	GND		22	MA07;101	O
23	MA01;101	O	24	MA06;101	O
25	GND		26	GND	
27	MA02;101	O	28	MA05;101	O
29	GND		30	MA03;101	O
31	MA04;101	O	32	RAS4;000	O
33	GND		34	RAS5;000	O
35	GND		36	CASH;001	O
37	D07;100	I/O	38	D06;100	I/O
39	D05;100	I/O	40	D04;100	I/O
41	GND		42	D03;100	I/O
43	D02;100	I/O	44	D01;100	I/O
45	D00;100	I/O	46	GND	
47	RAMV	POWER	48	RAMV	POWER
49	RAMV	POWER	50	RAMV	POWER

B.7   PJ7 PDP & LCD I/F CONNECTOR (34-PIN)

Table B-7   PDP & LCD I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
01	DSPV	POWER	02	DSPV	POWER
03	DSPV	POWER	04	DSPV	POWER
05	GND		06	GND	
07	PDV0;120	O	08	GND	
09	PDV1;120	O	10	GND	
11	PDV2;120	O	12	GND	
13	PDV3;120	O	14	GND	
15	LP;120	O	16	FP;120	O
17	ENAB;120	O	18	PDP;101	I
19	BRCNTM;100	O	20	COLOR;101	I
21	PDL0;120	O	22	GND	
23	PDL1;120	O	24	GND	
25	PDL2;120	O	26	GND	
27	PDL3;120	O	28	GND	
29	SCLK;020	O	30	GND	
31	GND		32	GND	
33	GND		34	GND	

B.8   PJ8 TOSHIBA SLOT 60 CONNECTOR (60-PIN)

Table B-8   TOSHIBA slot 60 connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
01	GND		02	VCC	POWER
03	N9V	POWER	04	P12V	POWER
05	MDMSL;000	O	06	S14R7M;001	O
07	MIRQ;000	I	08	SPKTON;000	O
09	GND		10	SA00;100	I/O
11	SA01;100	I/O	12	SA02;100	I/O
13	SA03;100	I/O	14	SA04;100	I/O
15	SA05;100	I/O	16	SA06;100	I/O
17	SA07;100	I/O	18	GND	
19	SA08;100	I/O	20	SA09;100	I/O
21	SA10;100	I/O	22	SA11;100	I/O
23	SA12;100	I/O	24	SA13;100	I/O
25	SA14;100	I/O	26	SA15;100	I/O
27	GND		28	SA16;100	I/O
29	SA17;100	I/O	30	SA18;100	I/O
31	SA19;100	I/O	32	SD00;100	I/O
33	SD01;100	I/O	34	SD02;100	I/O
35	SD03;100	I/O	36	GND	
37	SD04;100	I/O	38	SD05;100	I/O
39	SD06;100	I/O	40	SD07;100	I/O
41	SMEW;000	O	42	SMER;000	O
43	GND		44	IOWR;000	I/O
45	IORD;000	I/O	46	TC;100	O
47	BALE;100	O	48	RESET;100	O
49	DACK1;000	O	50	IRQ9;100	I
51	GND		52	VCC	POWER
53	IOCLK;100	O	54	IRQ5;100	I
55	DRQ3;100	I	56	DACK3;000	O
57	AEN;100	O	58	DRQ1;100	I
59	IOCRDY;100	I	60	GND	

B.9 PJ9 POWER SUPPLY I/F CONNECTOR (34-PIN)

Table B-9 Power supply I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
01	VCC	POWER	02	VCC	POWER
03	VCC	POWER	04	N9V	POWER
05	RAMV	POWER	06	RAMV	POWER
07	P12V	POWER	08	P12V	POWER
09	DSPV	POWER	10	DSPV	POWER
11	DSPV	POWER	12	PSSD;100	O
13	GND		14	PSRD;100	I
15	GND		16	INTDSP;000	O
17	GND		18	PCLR;000	I
19	GND		20	INITSW;000	O
21	GND		22	BEEP;000	I
23	DCLED;000	I	24	DCVMC;100	I
25	GND		26	BRCNTM;100	O
27	GND		28	DINUSR;100	O
29	GND		30	DLBR;100	O
31	GND		32	DINUSL;100	O
33	GND		34	DLBL;100	O

B.10 PJ10 ASYNCHRONOUS I/F CONNECTOR B (9-PIN)

Table B-10 Asynchronous I/F connector B pin assignment

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

B.11 PJ11 ASYNCHRONOUS I/F CONNECTOR A (9-PIN)

Table B-11 Asynchronous I/F connector A pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
01	DCD0;100	I	02	RD0;000	I
03	SD0;000	O	04	DTR0;100	O
05	GND		06	DSR0;100	I
07	RTS0;100	O	08	CTS0;100	I
09	GND				

B.12   PJ12 HDD I/F CONNECTOR (44-PIN)

Table B-12   HDD I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
01	RESET;000	O	02	GND	
03	VCC	POWER	04	HSD8;100	I/O
05	HSD6;100	I/O	06	HSD9;100	I/O
07	HSD5;100	I/O	08	HSD10;100	I/O
09	HSD4;100	I/O	10	HSD11;100	I/O
11	HSD3;100	I/O	12	HSD12;100	I/O
13	HSD2;100	I/O	14	HSD13;100	I/O
15	HSD1;100	I/O	16	HSD14;100	I/O
17	HSD0;100	I/O	18	HSD15;100	I/O
19	GND		20	VCC	POWER
21	N/C		22	GND	
23	IOWR;000	O	24	GND	
25	IORD;000	O	26	GND	
27	IOCRDY;100	I	28	BALE;101	O
29	N/C		30	GND	
31	IRQ14;100	I	32	VCC	POWER
33	SA01;100	O	34	N/C	
35	SA00;100	O	36	SA02;100	O
37	HDC0CS;002	O	38	HDC1CS;002	O
39	HDDLED;000	I	40	GND	
41	VCC	POWER	42	VCC	POWER
43	GND		44	GND	

B.13   PJ13 EXT.FDD & PRT I/F CONNECTOR (25-PIN)

Table B-13   EXT.FDD & PRT I/F connector pin assignment

Pin	For PRT 3100e		For EXT.FDD 3100e	
	Signal	I/O	Signal	I/O
01	STROBE;000	I/O	READY;10	I
02	PD0;100	I/O	INDEX;000	I
03	PD1;100	I/O	TRACK0;000	I
04	PD2;100	I/O	WPROTC;000	I
05	PD3;100	I/O	RDDA;000	I
06	PD4;100	I/O	DSKCHG;000	I
07	PD5;100	I/O	–	
08	PD6;100	I/O	–	
09	PD7;100	I/O	–	
10	ACK;000	I/O	SWFDB;000	O
11	BUSY;100	I/O	SWMONB;000	O
12	PE;100	I/O	WRDATA;000	O
13	SELECT;100	I/O	EXFDWE;000	O
14	AUTFD;000	I/O	XRATE0;000	O
15	ERROR;000	I/O	SIDE;000	O
16	PRINT;000	I/O	FDCDRC;000	O
17	SLIN;000	I/O	STEP;000	O
18 to 25	GND		GND	

B.14   PJ14 KEYBOARD I/F CONNECTOR (22-PIN)

Table B-14   Keyboard I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
01	KBOT00;000	O	02	KBOT01;000	O
03	KBOT02;000	O	04	GND	
05	KBOT03;000	O	06	KBOT04;000	O
07	KBOT05;000	O	08	KBOT06;000	O
09	GND		10	KBOT07;000	O
11	KBOT08;000	O	12	KBOT09;000	O
13	KBOT10;000	O	14	KBRT0;102	I
15	KBRT1;102	I	16	KBRT2;102	I
17	KBRT3;102	I	18	GND	
19	KBRT4;102	I	20	KBRT5;102	I
21	KBRT6;102	I	22	KBRT7;102	I

B.15   PJ15 TEN-KEY I/F CONNECTOR (3-PIN)

Table B-15   Ten-key I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
01	GND		02	TENKEY;100	O
03	N/C				

B.16   PJ16 MODEM I/F CONNECTOR (30-PIN)

Table B-16   MODEM I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
01	N9V	POWER	02	BMDMSL;000	O
03	D14R7M;003	O	04	GND	
05	SA00;100	O	06	SA01;100	O
07	SA02;100	O	08	GND	
09	SD07;100	I/O	10	SD06;100	I/O
11	GND		12	GND	
13	SD05;100	I/O	14	SD04;100	I/O
15	SD03;100	I/O	16	GND	
17	SD02;100	I/O	18	SD01;100	I/O
19	GND		20	GND	
21	SD00;100	I/O	22	IOWR;000	O
23	IORD;000	O	24	VCC	POWER
25	RESET;102	O	26	BMPOF;100	O
27	VCC	POWER	28	VCC	POWER
29	BMIRQ;000	I	30	BSPTON;000	O

B.17   PJ17 LED I/F CONNECTOR (LEFT SIDE) (9-PIN)

Table B-17   LED I/F connector (left side) pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
01	VCC	POWER	02	GND	
03	CKHRQ;103	O	04	DINUSL;103	O
05	DLBL;103	O	06	DINUSR;103	O
07	DLBR;103	O	08	HDDLED;103	O
09	FDDLED;103	O			

B.18   PJ18 SPEAKER I/F CONNECTOR (2-PIN)

Table B-18   Speaker I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
01	SPOUT0;100	I	02	SPOUT1;100	O

B.19   PJ19 CRT I/F CONNECTOR (15-PIN)

Table B-19   CRT I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
01	CRED;100	O	02	CGRE;100	O
03	CBLV;100	O	04	N/C	
05	GND		06	GND	
07	GND		08	GND	
09	N/C		10	GND	
11	N/C		12	N/C	
13	PHSNC;102	O	14	PVSNC;102	O
15	N/C				

B.20   PJ20 HDD POWER SUPPLY I/F CONNECTOR (3-PIN)

Table B-20   HDD power supply I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
01	VCC	POWER	02	P12V	POWER
03	GND				

APPENDIX C   DISPLAY CODE

Table C-1   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			î	£	¼	╝	╠	▄	∞	ⁿ
D	♪	↔	—	=	M	]	m	}	ì	¥	¡	╜	═	▌	φ	²
E	♫	▲	.	>	N	^	n	~	Ä	Pt	Ø	╛	╬	▐	∈	■
F	☼	▼	/	?	O	_	o	△	Å	ƒ	»	┐	╧	▀	∩	BLANK FF

APPENDIX D   KEYBOARD SCAN/CHARACTER CODE

Table D-1   Keyboard scan/character code (1/4)

Cap No.	Key top	Lower case	Upper case	Caps lock Base	Caps lock Upper	With (Ctrl)	With (Alt)
1	~ `	2960	297E	2960	297E	----	*2900
2	! 1	0231	0221	0231	0221	----	7800
3	@ 2	0332	0340	0332	0340	0300	7900
4	# 3	0433	0423	0433	0423	----	7A00
5	$ 4	0534	0524	0534	0524	----	7B00
6	% 5	0635	0625	0635	0625	----	7C00
7	^ 6	0736	075E	0736	075E	071E	7D00
8	& 7	0837	0826	0837	0826	----	7E00
9	* 8	0938	092A	0938	092A	----	7F00
10	(9	0A39	0A28	0A39	0A28	----	8000
11	) 0	0B30	0B29	0B30	0B29	----	8100
12	_	0C2D	0C5F	0C2D	0C5F	0C1F	8200
13	+ =	0D3D	0D2B	0D3D	0D2B	----	8300
15	Back space	0E08	0E08	0E08	0E08	0E7F	*0E00
16	Tab	0F09	0F00	0F09	0F00	*9400	*A500
17	Q	1071	1051	1071	1051	1011	1000
18	W	1177	1157	1177	1157	1117	1100
19	E	1265	1245	1265	1245	1205	1200
20	R	1372	1352	1372	1352	1312	1300
21	T	1474	1454	1474	1454	1414	1400
22	Y	1579	1559	1579	1559	1519	1500
23	U	1675	1655	1675	1655	1615	1600
24	I	1769	1749	1769	1749	1709	1700
25	O	186F	184F	186F	184F	180F	1800

Table D-1 Keyboard scan/character code (2/4)

Cap No.	Key top	Lower case	Upper case	Caps lock Base	Caps lock Upper	With (Ctrl)	With (Alt)
26	P	1970	1950	1970	1950	1910	1900
27	{ [	1A5B	1A7B	1A5B	1A7B	1A1B	*1A00
28	}]	1B5D	1B7D	1B5D	1B7D	1B1D	*1B00
29	| \\	2B5C	2B7C	2B5C	2B7C	2B1C	*2B00
30	Caps Lock	----	----	----	----	----	----
31	A	1E61	1E41	1E61	1E41	1E01	1E00
32	S	1F73	1F53	1F73	1F53	1F13	1F00
33	D	2064	2044	2064	2044	2004	2000
34	F	2166	2146	2166	2146	2106	2100
35	G	2267	2247	2267	2247	2207	2200
36	H	2368	2348	2368	2348	2308	2300
37	J	246A	244A	246A	244A	240A	2400
38	K	256B	254B	256B	254B	250B	2500
39	L	266C	264C	266C	264C	260C	2600
40	: ;	273B	273A	273B	273A	----	*2700
41	" '	2827	2822	2827	2822	----	*2800
43	Enter	1C0D	1C0D	1C0D	1C0D	1C0A	*1C00
44	Shift (L)	----	----	----	----	----	----
46	Z	2C7A	2C5A	2C7A	2C5A	2C1A	2C00
47	X	2D78	2D58	2D78	2D58	2D18	2D00
48	C	2E63	2E43	2E63	2E43	2E03	2E00
49	V	2F76	2F56	2F76	2F56	2F16	2F00
50	B	3062	3042	3062	3042	3002	3000
51	N	316E	314E	316E	314E	310E	3100
52	M	326D	324D	326D	324D	320D	3200

Table D-1 Keyboard scan/character code (3/4)

Cap No.	Key top	Lower case	Upper case	Caps lock Base	Upper	With (Ctrl)	With (Alt)
53	< ,	332C	333C	332C	333C	----	*3300
54	> .	342E	343E	342E	343E	----	*3400
55	? /	352F	353F	352F	353F	----	*3500
57	Shift (R)	----	----	----	----	----	----
58	Ctrl (L)	----	----	----	----	----	----
60	Alt (L)	----	----	----	----	----	----
61	Space	3920	3920	3920	3920	3920	3920
62	Alt (R)	----	----	----	----	----	----
+75	Ins	5200 52E0	5200 52E0	5200 52E0	5200 52E0	*92E0	*A200
+76	Del	5300 53E0	5300 53E0	5300 53E0	5300 53E0	*93E0	*A300
+79	←	4B00 4BE0	4B00 4BE0	4B00 4BE0	4B00 4BE0	7300 73E0	*9B00
+80	Home	4700 47E0	4700 47E0	4700 47E0	4700 47E0	7700 77E0	*9700
+81	End	4F00 4FE0	4F00 4FE0	4F00 4FE0	4F00 4FE0	7500 75E0	*9F00
+83	↑	4800 48E0	4800 48E0	4800 48E0	4800 48E0	*8DE0	*9800
+84	↓	5000 50E0	5000 50E0	5000 50E0	5000 50E0	*91E0	*A000
+85	PgUp	4900 49E0	4900 49E0	4900 49E0	4900 49E0	8400 *84E0	*9900
+86	PgDn	5100 51E0	5100 51E0	5100 51E0	5100 51E0	7600 76E0	*A100
+89	→	4D00 4DE0	4D00 4DE0	4D00 4DE0	4D00 4DE0	7400 74E0	*9D00
90	Num Lock	----	----	----	----	----	----
105	-	4A2D	4A2D	4A2D	4A2D	*8E00	*4A00
106	+	4E2B	4E2B	4E2B	4E2B	*9000	*4E00
110	Esc	011B	011B	011B	011B	011B	*0100
112	F1	3B00	5400	3B00	5400	5E00	6800
113	F2	3C00	5500	3C00	5500	5F00	6900
114	F3	3D00	5600	3D00	5600	6000	6A00
115	F4	3E00	5700	3E00	5700	6100	6B00

Table D-1 Keyboard scan/character code (4/4)

Cap No.	Key top	Lower case	Upper case	Caps lock Base	Upper	With (Ctrl)	With (Alt)
116	F5	3F00	5800	3F00	5800	6200	6C00
117	F6	4000	5900	4000	5900	6300	6D00
118	F7	4100	5A00	4100	5A00	6400	6E00
119	F8	4200	5B00	4200	5B00	6500	6F00
120	F9	4300	5C00	4300	5C00	6600	7000
121	F10	4400	5D00	4400	5D00	6700	7100
122	F11	*8500	*8700	*8500	*8700	*8900	*8B00
123	F12	*8600	*8800	*8600	*8800	*8A00	*8C00
125	Scrol Lock	----	----	----	----	----	----
200	Pause Break	----	----	----	----	----	----
201	Print Screen Sys Req	----	----	----	----	*3700	----
202	Fn	----	----	----	----	----	----

APPENDIX E   KEY LAYOUT

E.1   USA VERSION
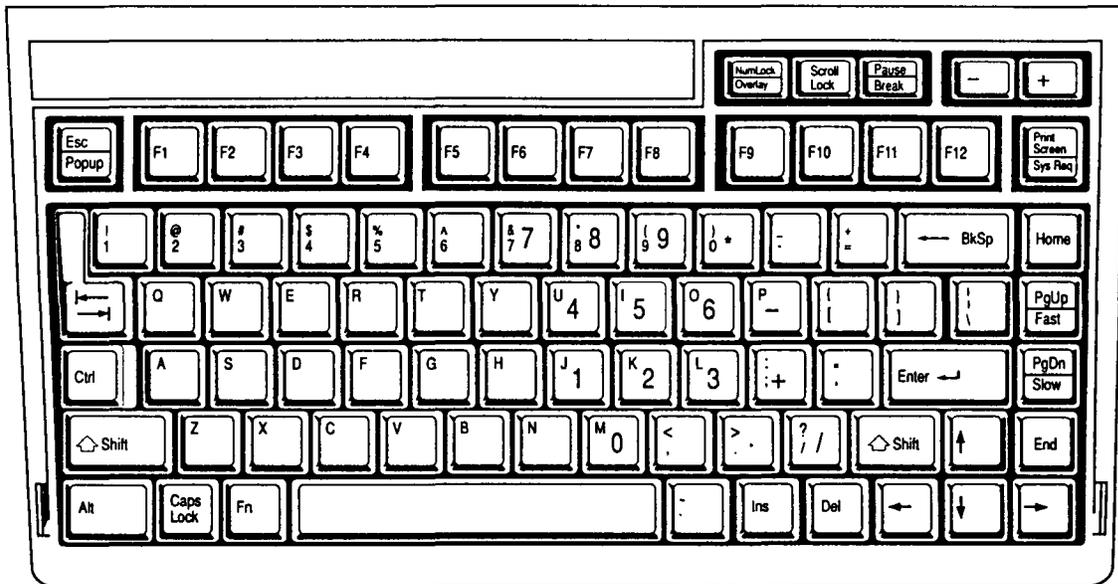
Figure E-1   USA version

E.2   UK VERSION
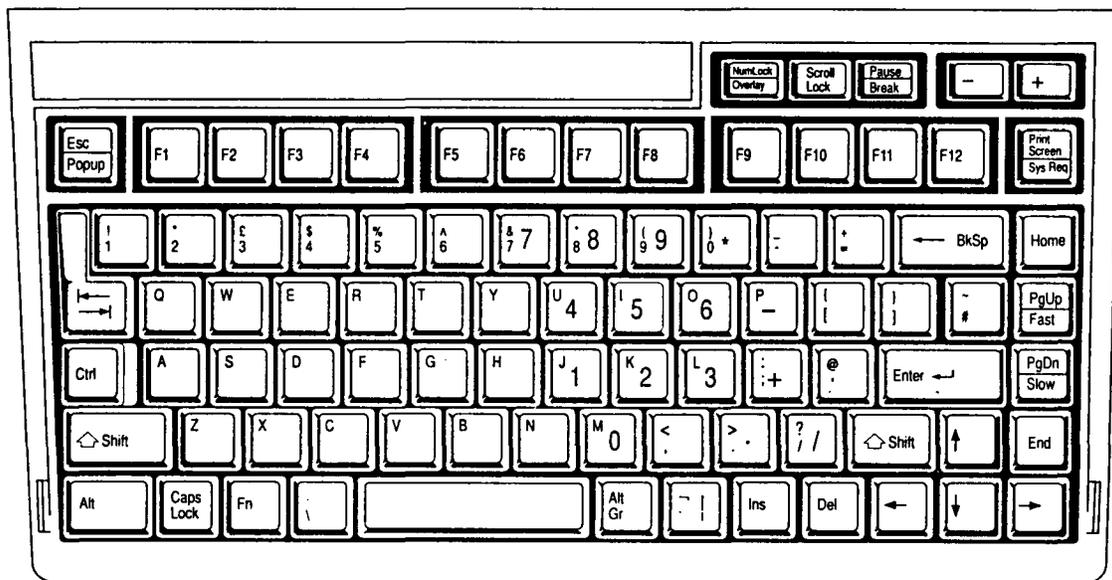
Figure E-2   UK version

E.3   GERMANY VERSION
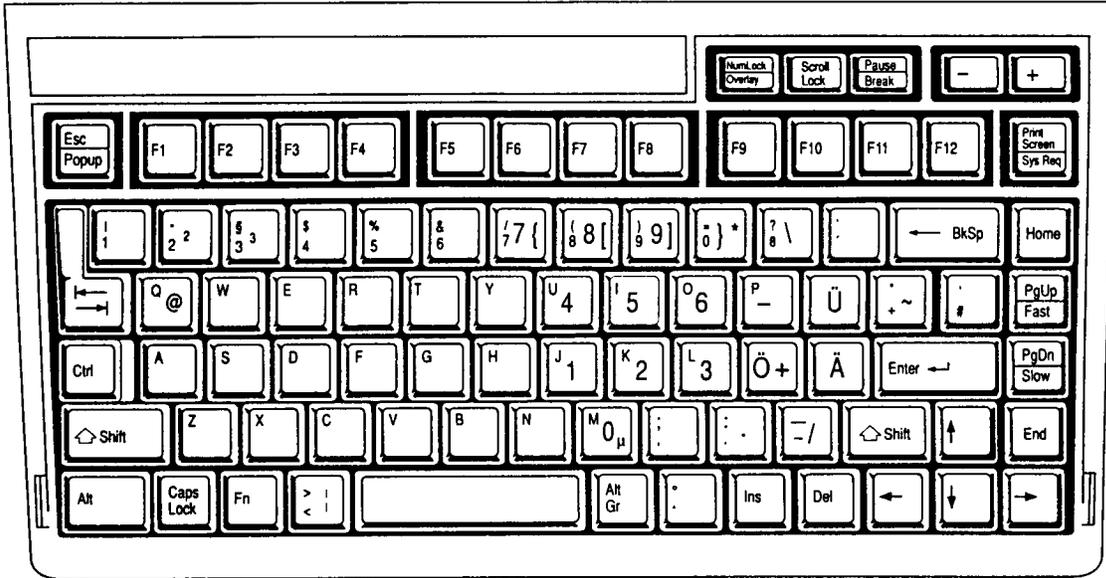
Figure E-3   Germany version

E.4   FRANCE VERSION
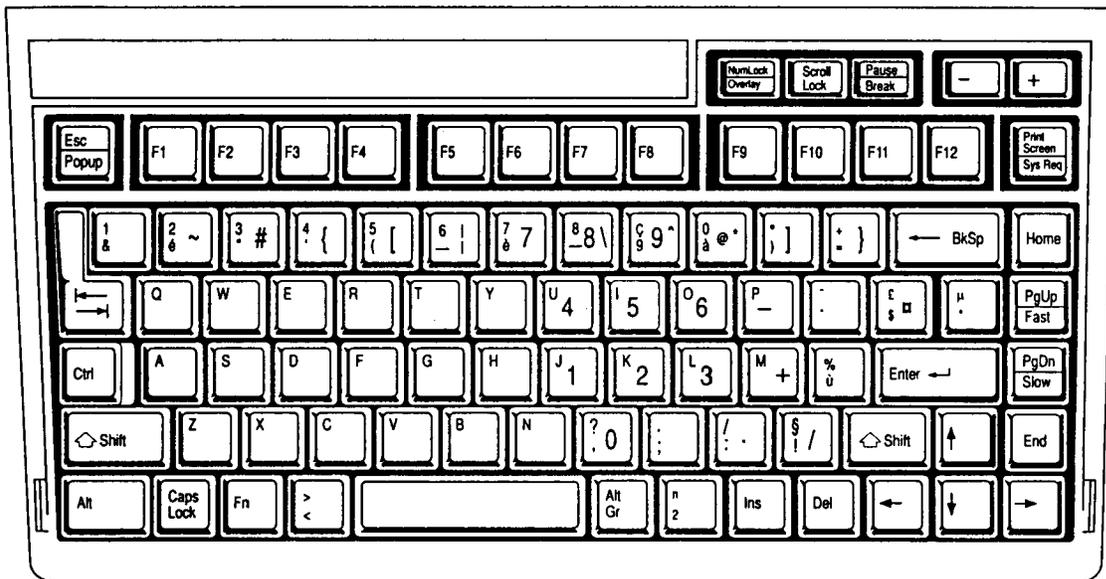
Figure E-4   France version

E.5 SPAIN VERSION
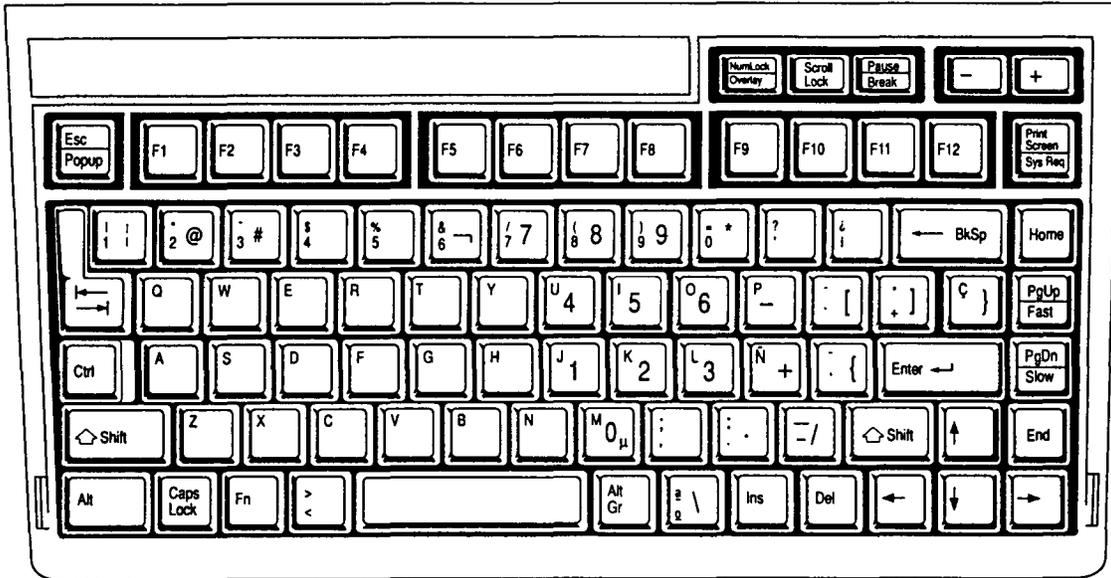
Figure E-5 Spain version

E.6 ITALY VERSION
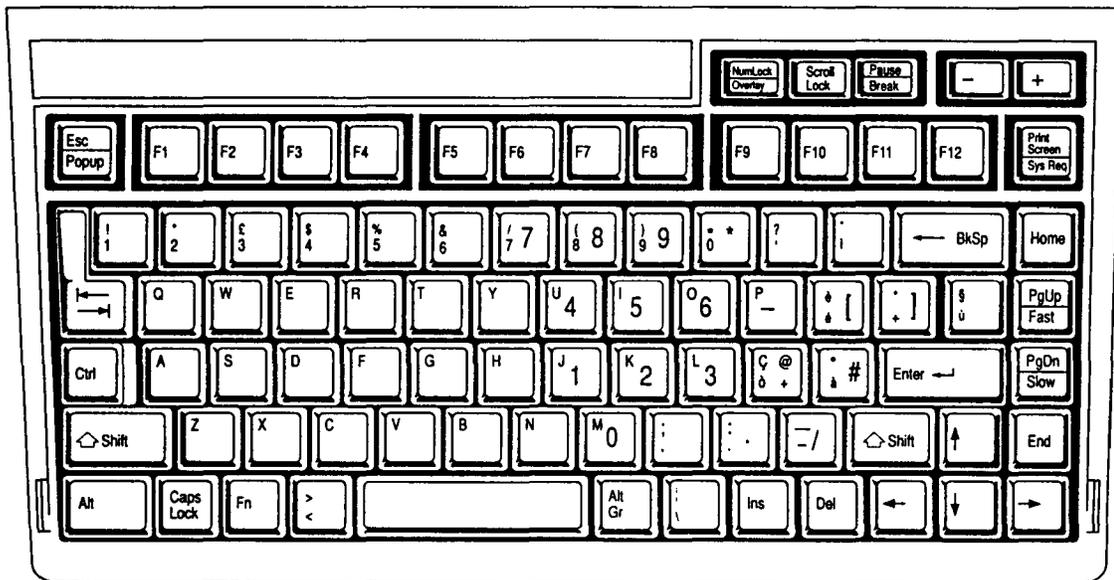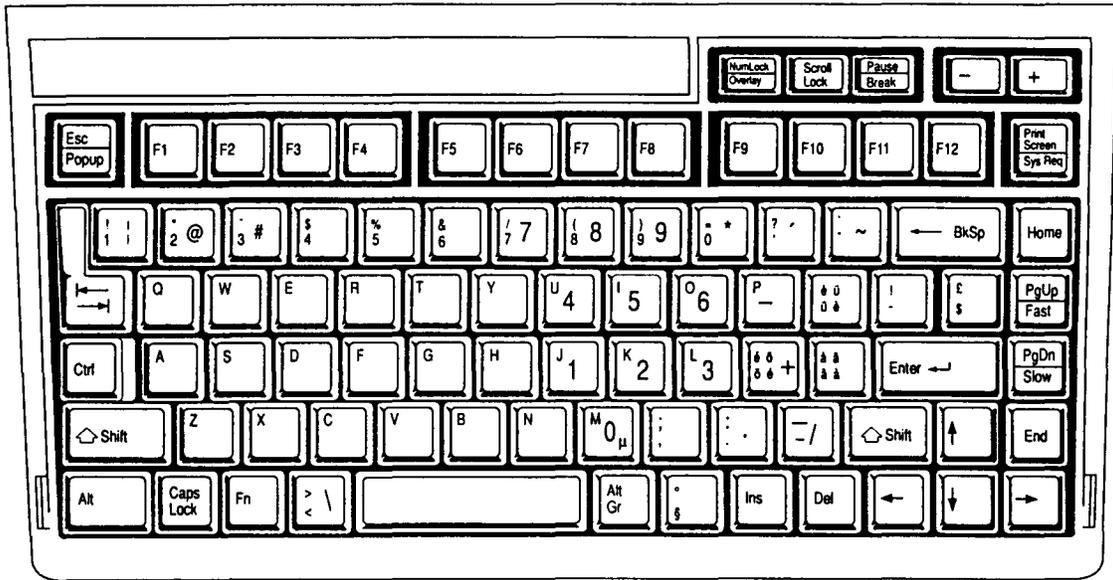

Figure E-6 Italy version

E.7   SWITZERLAND VERSION

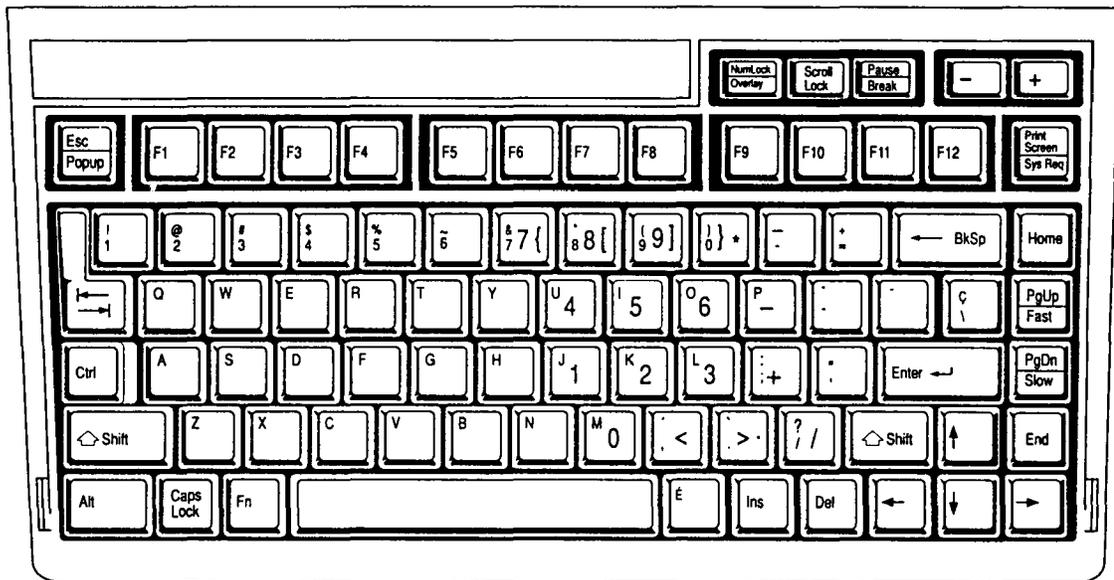Figure E-7   Switzerland version

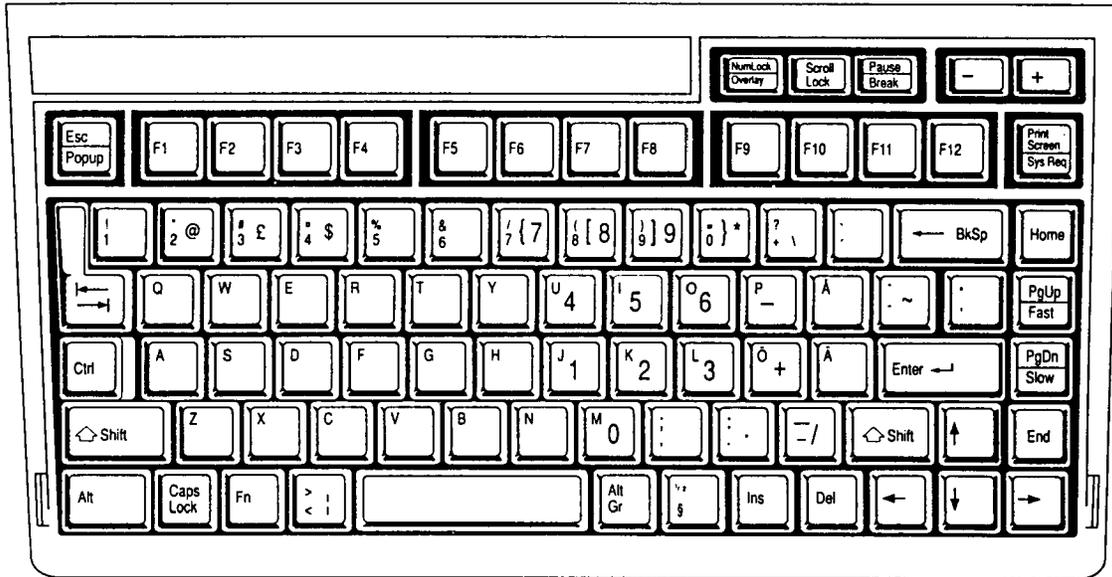## E.8   CANADIAN VERSION

Figure E-8   Canadian version

E.9   SWEDEN VERSION

Figure E-9   Sweden version

E.10   DENMARK VERSION
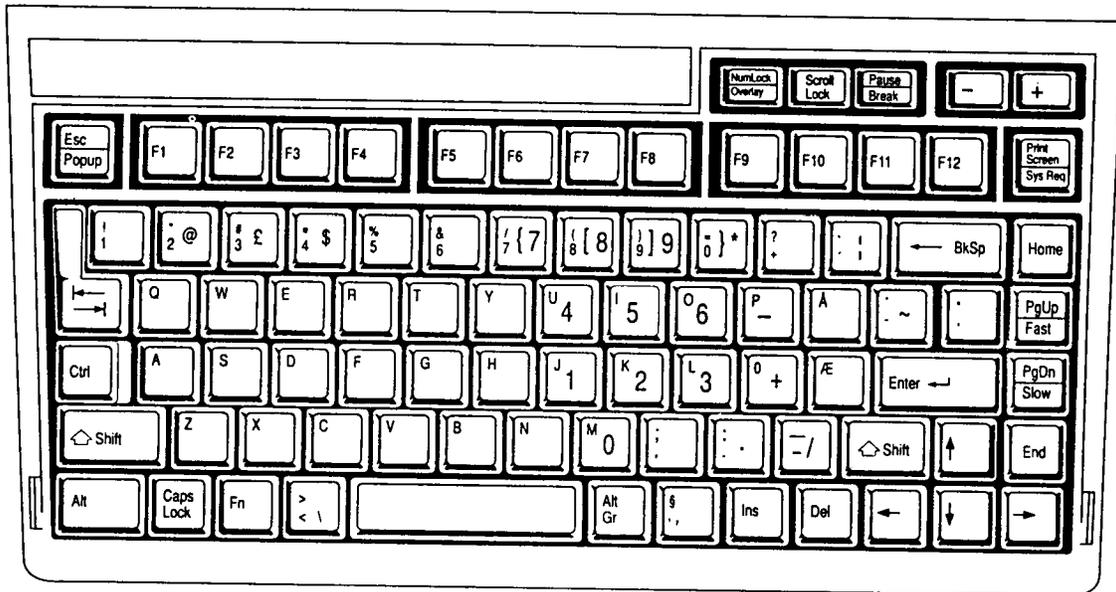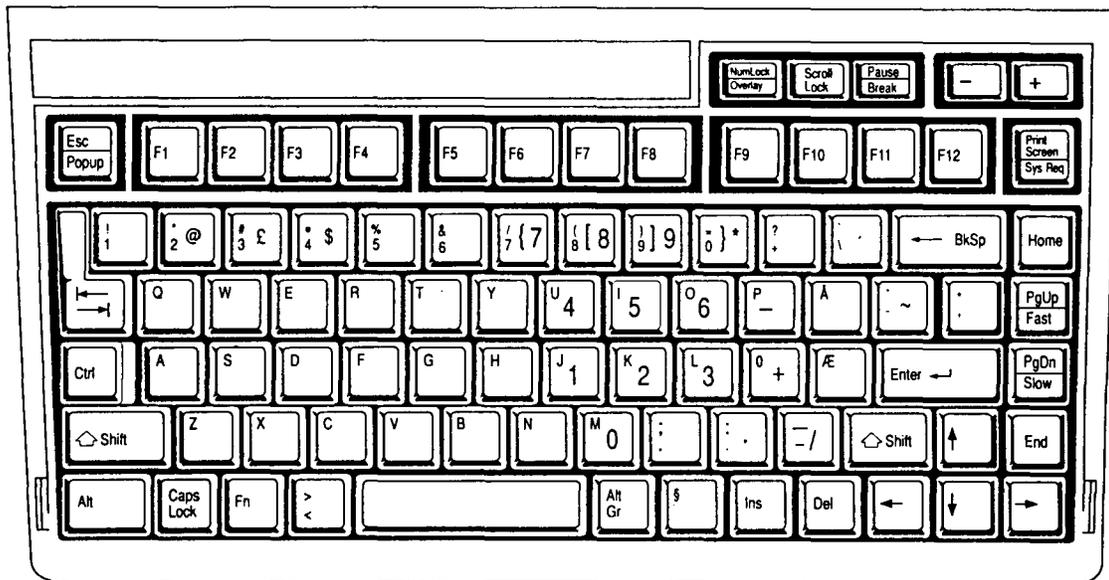

Figure E-10   Denmark version
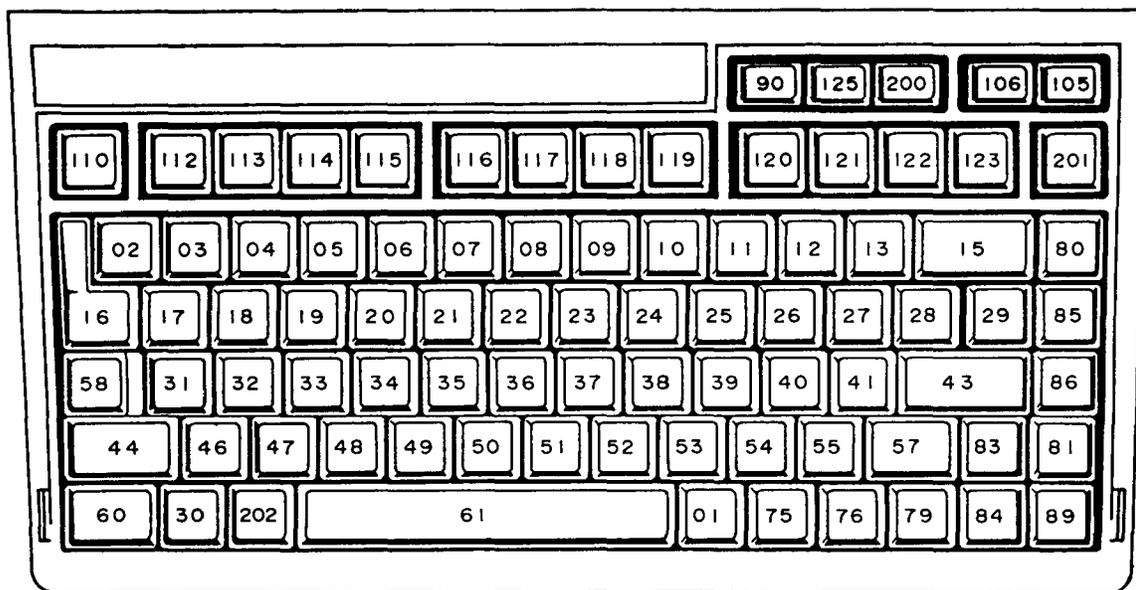
E.11 NORWAY VERSION

Figure E-11 Norway version

E.12 KEYCAP NUMBER

Figure E-12 Keycap number