

1.1 GENERAL

Toshiba T8500 is one of the most powerful personal computers available, offering high technology, high speed and full IBM PC AT compatibility.

This system unit is composed of Main Board, 3.5-inch floppy disk drive (FDD), 3.5-inch hard disk drive (HDD) and power supply unit.

The system unit has 6 connectors (labeled EX-FDD, PRT, SCSI, RGB, SERIAL1, and SERIAL2), keyboard socket, 3 IBM PC AT compatible slots, and 1 slot compatible with Toshiba size optional card.

The central processing unit (CPU) is the 32-bit 80386-20/25 microprocessor.

The standard memory has a capacity of 2 Mbytes; 1 Mbyte is on the main board and 1 Mbyte is standard memory board.

32 Kbytes (80386-20) or 64 Kbytes (80386-25) of cache memory speeds up the T8500 processing.

The HDD has a capacity of 100 Mbytes. The FDD can support 2DD (720 Kbytes) and 2HD (1.44 Mbytes) floppy disks. The auto-sensing universal power supply is used worldwide, and has one AC-OUT socket for supplying power to your display.

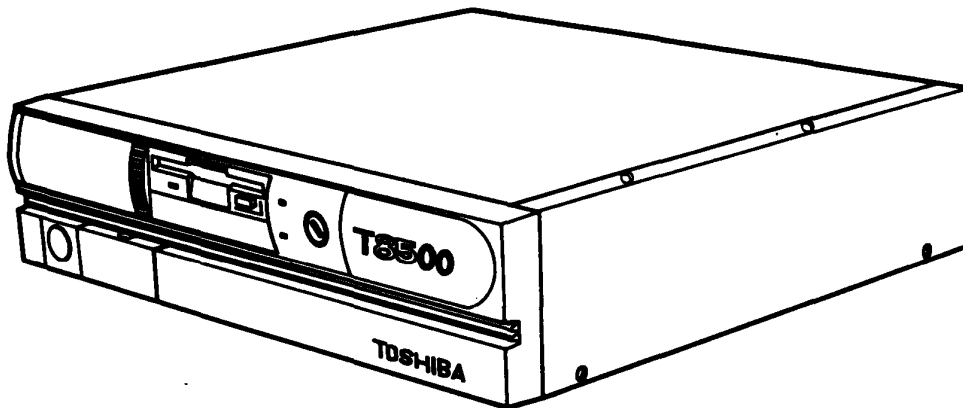


Figure 1-1 T8500 personal computer

1.2 SYSTEM UNIT

The configuration of the system unit is shown in Figure 1-2.

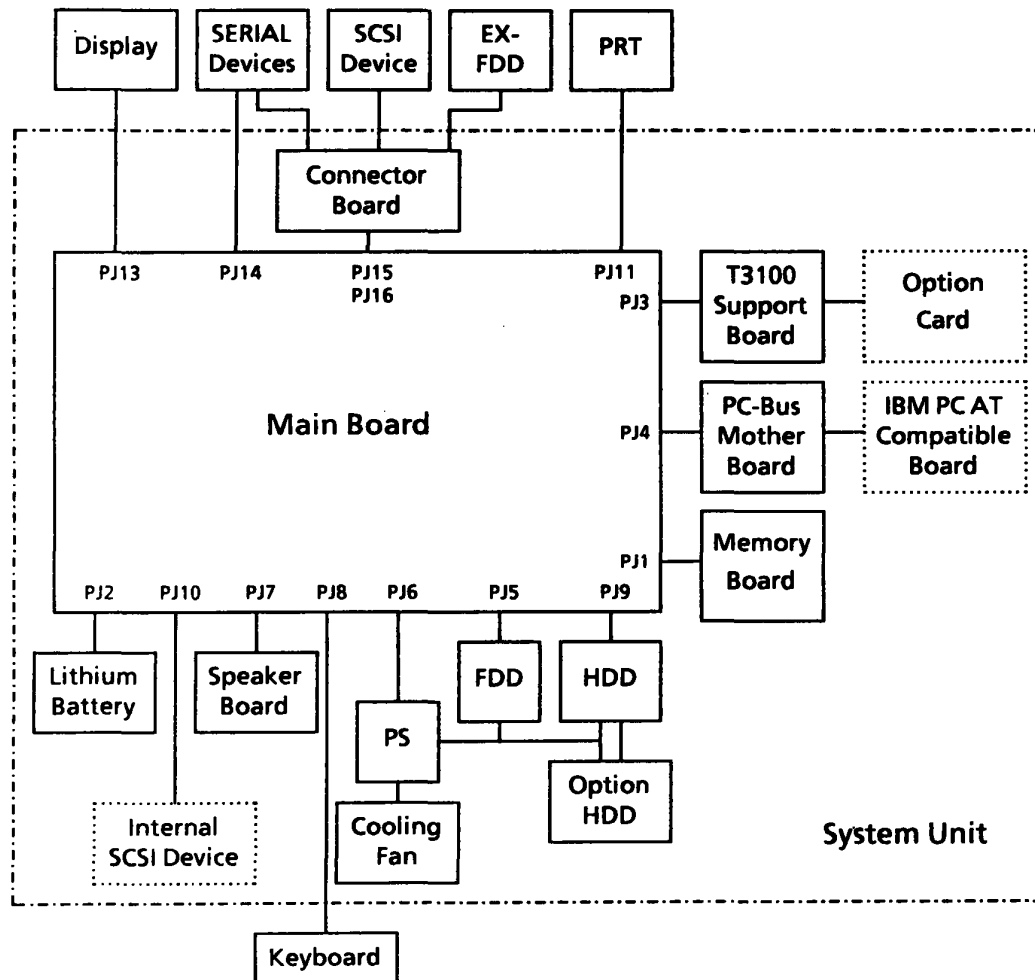


Figure 1-2 System unit configuration

The key features of the system unit are;

- o 1 main board.
- o 1 memory board.
- o 1 speaker board.
- o 1 T3100 support board.
- o 1 PC-bus mother board having three IBM PC AT bus slots and 1 IBM PC/XT bus slot.
- o 1 internal 3.5-inch FDD supporting two media types:
 - 2HD (double-side, high-density, double-track)
 - 2DD (double-side, double-density, double-track)The 2HD and 2DD floppy disks can be formatted with 1.44 Mbytes and 720 Kbytes of storage capacity, respectively.
- o 1 internal 3.5-inch 100-Mbyte HDD.
- o 1 auto-sensing universal power supply that can be used worldwide provides +5 VDC, -5 VDC, +12 VDC and -12 VDC to all the components on the system unit, including optional IBM PC compatible boards and Toshiba size optional card.
- o 1 parallel printer, external FDD, SCSI, RGB, two serial device connectors are located at the rear panel of the system unit. 1 keyboard socket is located at the front panel of the system unit.

1.3 MAIN BOARD

Figure 1-3 shows the block diagram of the main board.

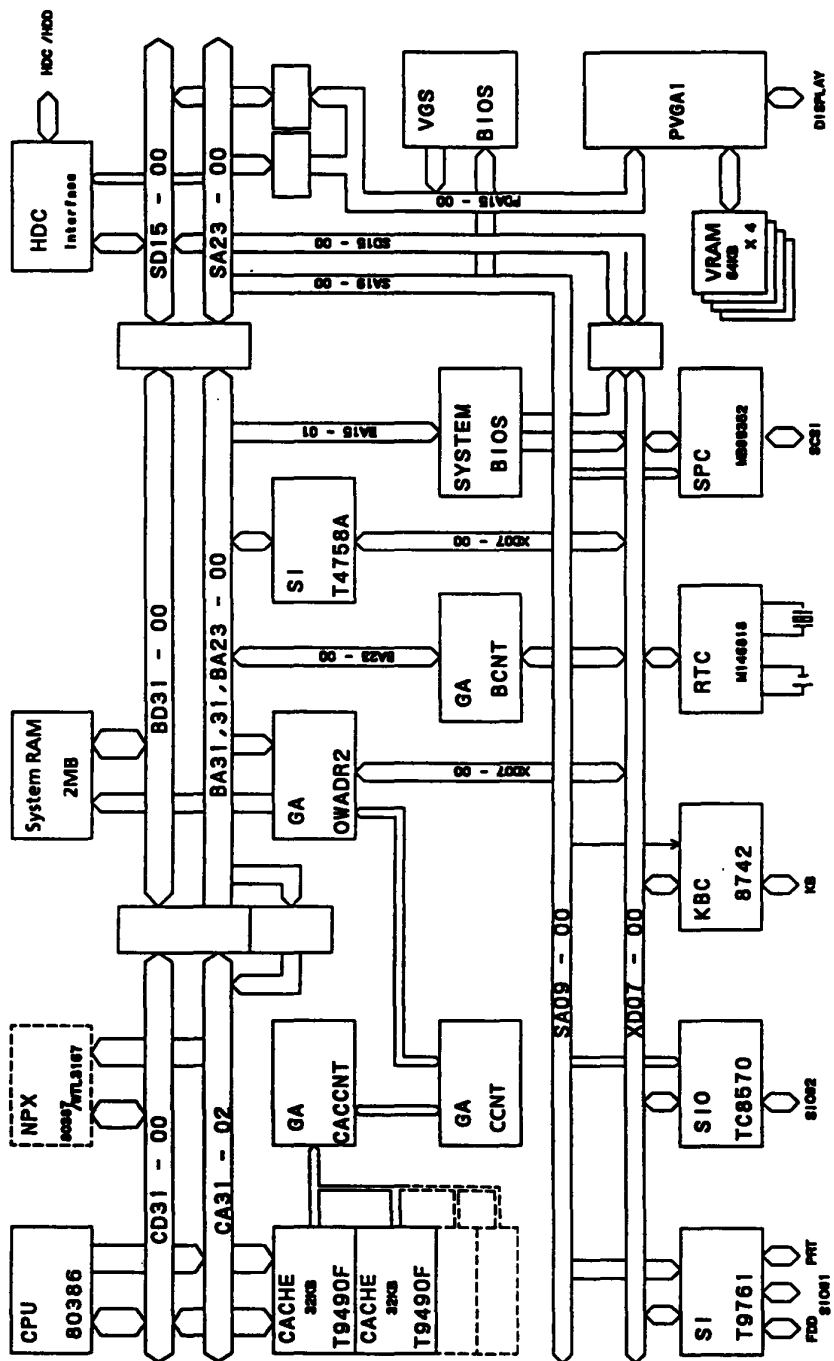


Figure 1-3 Block diagram of main board

Main board is composed of the following components:

- o Central processing unit (CPU) 80386-20 or 80386-25:
The CPU is a 32-bit microprocessor operated at 20 MHz or 25 MHz clock speed.
- o Numeric data processor (NPX) socket for the 80387-20 or 80387-25 and WE3167.
- o Real time clock (RTC) MC146818:
The RTC continuously keeps the data and time backed up by a lithium battery.
- o Serial input output (SIO) TC8570:
The SIO controls the RS-232-C port.
- o Keyboard controller (KBC) (8742):
The KBC controls the serial data from the IBM PC AT compatible keyboard.
- o Cache controller T9490F:
The cache controller T9490F improves memory access operation dramatically with its 32 Kbytes high-speed cache memory. This controller includes the cache memory 32 Kbytes.
- o Memories:
 - System random access memory (RAM) 2 Mbytes; 1Mbyte is on the memory board.
 - System basic input/output read only memory (System BIOS ROM) 64 Kbytes
 - Video graphics subsystem (VGS) BIOS ROM 32 Kbytes
 - Video RAM (VRAM) 256 Kbytes (64 Kbyte X 4)
- o Small computer system interface (SCSI) protocol controller (SPC) MB89352:
The SPC supports the standard SCSI by the software.
- o Super integration (SI) T4758A and T9761:
The T4758A includes 2 direct memory access controller (DMACs, equivalent to 82C37), 2 programmable interrupt controller (PICs, equivalent to 82C59) and 1 programmable interval timer (PIT, equivalent to 82C54). The T9761 includes the floppy disk controller (FDC, equivalent to TC8565), programmable interval timer (PIT, equivalent to 82C54) and serial input output (SIO, equivalent to TC8570).
- o Paradise video graphics array (PVGA1)
The PVGA1 has the following display control modes.
 - Video graphics array (VGA) mode
 - Enhanced graphics adapter (EGA) mode
 - Color/graphics adapter (CGA) mode
 - Monochrome display adapter (MDA) mode
- o Gate arrays:
Gate arrays are used on the main board as follows.

- Bus controller gate array	GA-BCNT	(100-pin)
- Controller gate array	GA-CCNT	(100-pin)
- Address gate array	GA-OWADR2	(100-pin)
- Cache controller gate array	GA-CACCNT	(62-pin)

1.4 MEMORY BOARD

The memory board has 1 Mbyte RAM and three expansion slots (IS1, IS2, and IS3) for the single in-line memory module (SIMM). This SIMM is provided three types, 2 Mbytes, 4 Mbytes, and 8 Mbytes. The SIMM combination is shown in Table 1-1.

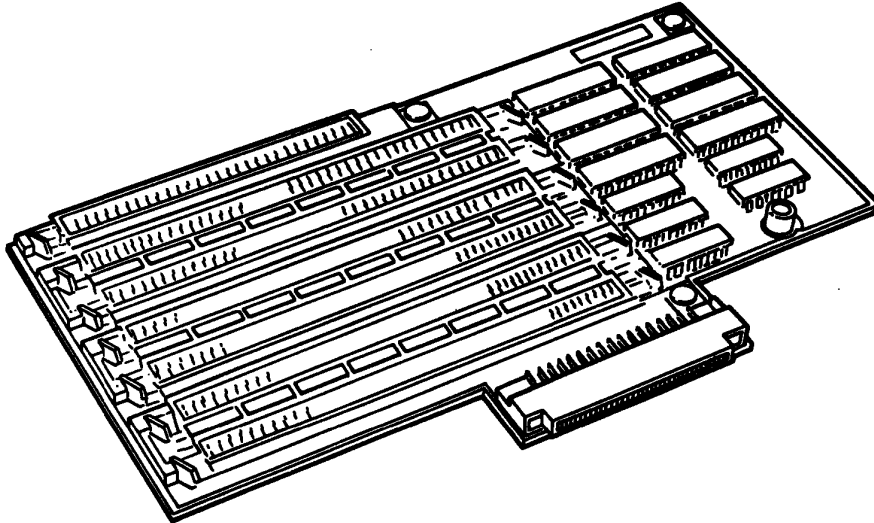


Figure 1-4 Memory board

Table 1-1 SIMM combination

Slots			Total memory capacity
IS1	IS2	IS3	
-	-	-	2 Mbytes
2 Mbytes	-	-	4 Mbytes
2 Mbytes	2 Mbytes	-	6 Mbytes
2 Mbytes	2 Mbytes	2 Mbytes	8 Mbytes
2 Mbytes	4 Mbytes	-	8 Mbytes
2 Mbytes	4 Mbytes	4 Mbytes	12 Mbytes
2 Mbytes	8 Mbytes	-	12 Mbytes
2 Mbytes	8 Mbytes	2 Mbytes	14 Mbytes
2 Mbytes	8 Mbytes	4 Mbytes	16 Mbytes

NOTE: The 4 Mbytes and 8 Mbytes of SIMM will be sold in future.

1.5 SPEAKER BOARD

The speaker board has one speaker, two LEDs and one key switch connector.

One LED is lit green at power on: Its colors (green and red) vary with clock speed (high and low) of CPU. The other LED is lit red when the HDD is in operation.

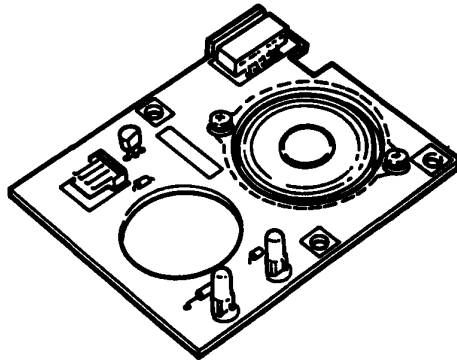


Figure 1-5 Speaker board

1.6 PC-BUS MOTHER BOARD

PC-bus mother board relays the buses of extension boards for IBM PC AT or PC/XT.

This board has three PC AT slots and one PC/XT slot.

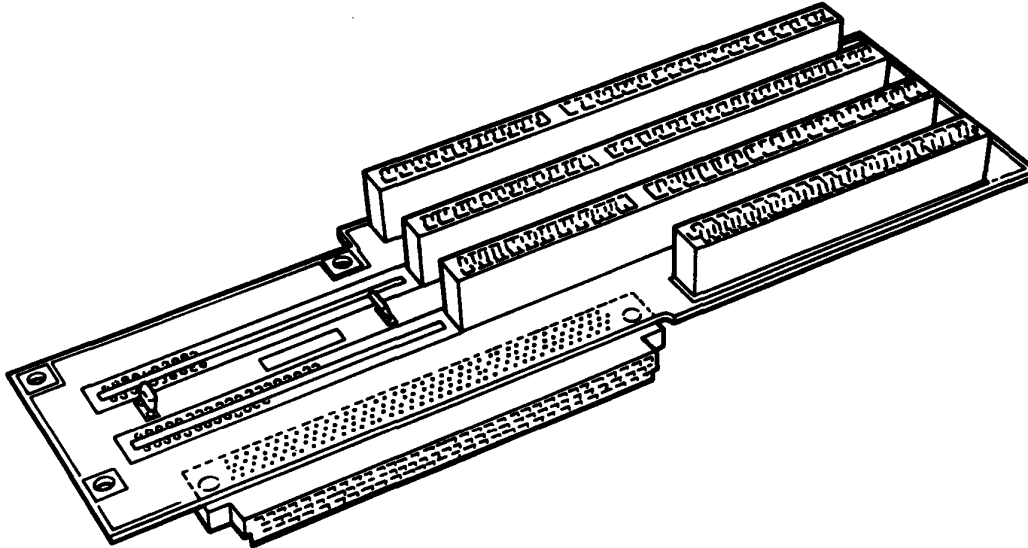


Figure 1-6 PC-bus mother board

1.7 T3100 SUPPORT BOARD

The T3100 support board relays the bus of an option card for T3100.

This board has the connectors with 16 bits for T3100-compatible data and 16 Mbytes for memory address space.

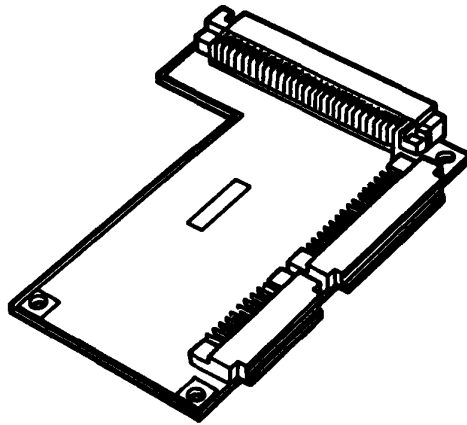


Figure 1-7 T3100 support board

1.8 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 3.5-inch floppy disk, and 1.44-Mbyte (formatted) 2HD 3.5-inch floppy disk.

The FDD is illustrated in Figure 1-8, and its specifications are listed in Table 1-2.

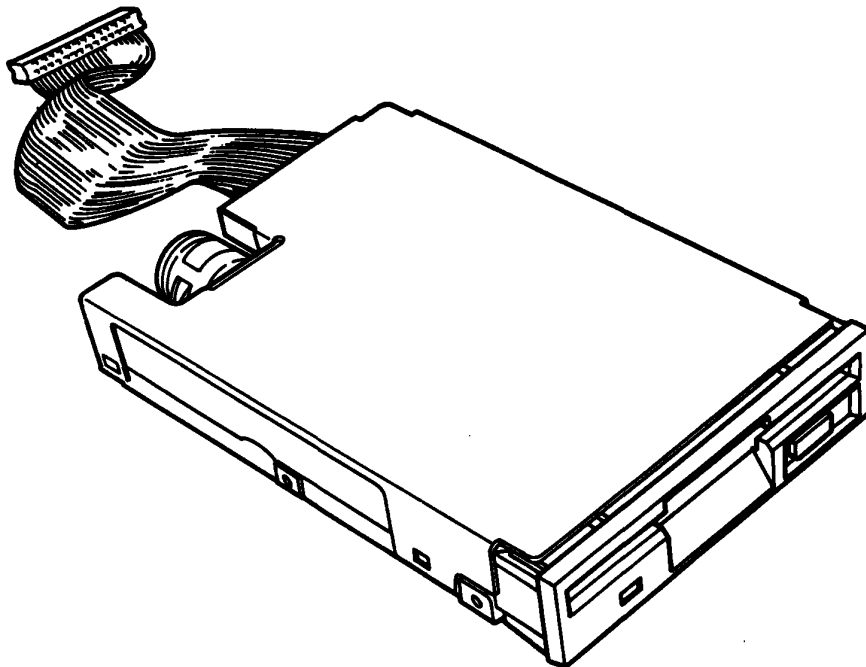


Figure 1-8 3.5-inch FDD

Table 1-2 3.5-inch FDD specifications

Item	2-Mbyte mode	1-Mbyte mode
Storage capacity (Kbyte)		
Unformatted	2000	1000
Formatted	1440	720 (640)
No. of heads	2	2
No. of cylinders	80	80
Access time (ms)		
1 track access	3	3
Average	94	94
Head setting time	15	15
Recording density (bpi)	17434	8717
Track density (tracks/inch)	135	135
Data transfer rate	500	250
(Kbytes/sec)		
Disk rotational speed (rpm)	300	300
Recording method	Modified Frequency Modulation (MFM)	

1.9 3.5-INCH HARD DISK DRIVE

The 100 Mbyte (formatted) HDD is a random access storage device which is provided with nonremovable 3.5-inch magnetic disks and mini-Winchester type magnetic heads. The HDD is illustrated in Figure 1-9, and its specifications are tabulated in Table 1-3.

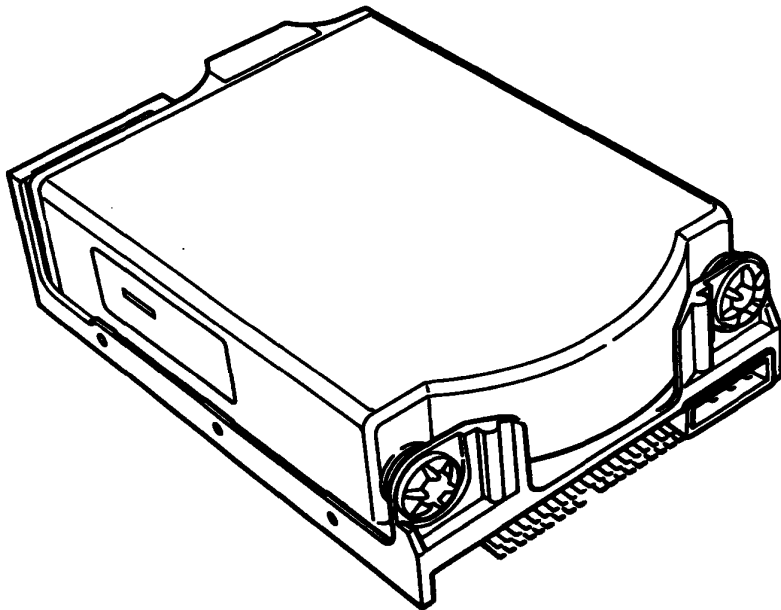


Figure 1-9 3.5-inch HDD

Table 1-3 3.5-inch HDD specifications

Item	Data
Storage capacity (Mbytes)	
Formatted	102.4
Number of disks	4
Number of heads	8
Number of cylinders	776
Number of tracks	6,208
Number of sectors per track	33
Number of bytes per sector	512
Track capacity (bytes)	
Formatted	16,896
Recording density (bit per inch)	23,441
Track density, tracks per inch	1,150
Recording method	2-7 RLL (Run Length Limited)
Data transfer rate,	
(Mbytes per second)	
To/from media	1.25
To/from buffer	4.75, max.
Rotational speed (rpm)	3,575
Access time (ms)	
Track to track	8
Average	25
Maximum	45
Disk setup time (ms)	8.33
Start time (s)	
Average	15
Maximum	20
Stop time (s)	
Average	15
Maximum	20

1.10 POWER SUPPLY UNIT

This auto-sensing universal power supply unit, housed in the system unit, can be used worldwide, and supplies the regulated power of +5, -5, +12 and -12 VDC to the following devices:

- (1) Main board
- (2) Memory board
- (3) Speaker board
- (4) PC-bus mother board
- (5) T3100 support board
- (6) 3.5-inch FDD
- (7) 3.5-inch HDD
- (8) Keyboard
- (9) Optional HDD
- (10) Option boards
- (11) Cooling fan

This power supply unit is provided AC output 120 V or 240 V for the external display. The power supply unit is illustrated in Figure 1-10 and the power supply output ratings are listed in Table 1-4.

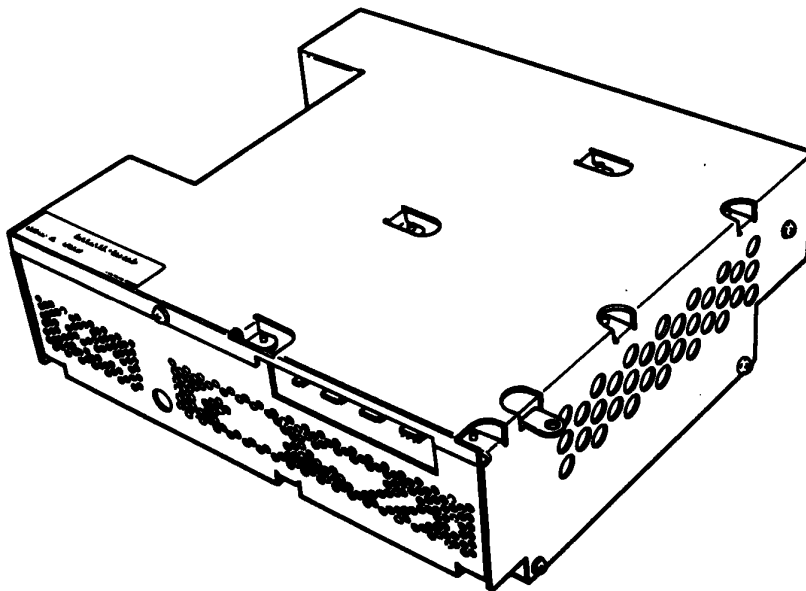


Figure 1-10 Power supply unit

Table 1-4 Power supply unit output ratings

Function	voltage	current	Regulation tolerance
Main board (keyboard and FDD are included)	+5 VDC	4 to 16.5 A	+/-5%
	-5 VDC	0 to 0.3 A	-8%, +10%
	+12 VDC	0.3 to 2.3 A	+/-5%
	-12 VDC	0 to 0.4 A	-9%, +10%
HDD	+5 VDC	4 to 16.5 A	+/-5%
	+12 VDC	0.3 to 2.3 A	+/-5%
Cooling fan	+12 VDC	0.3 to 2.3 A	+/-5%
Display	+120 VAC	less than 2.5 A	+10%, -30%
	+240 VAC	less than 1.4 A	+10%, -22%

1.11 DIP SWITCHES

All DIP switches are initially set to off. Configuration switch settings are summarized in the table below.

Table 1-5 DIP switches

Switch	Setting	Description
1	Off	Assigns IRQ4 to Toshiba-card slot
	On	Assigns IRQ4 to all IBM-compatible-card slots
2	Off	Assigns IRQ3 to Toshiba-card slot
	On	Assigns IRQ3 to all IBM-compatible-card slots
3	Off	Reserved (set to off)
4	Off	Enables internal display controller
	On	Disables internal display controller
5	Off	Unidirectional printer port
	On	Bidirectional printer port
6,7	-	Assigns serial ports
8	Off	Assigns "EX-FDD" port to drive B
	On	Assigns "EX-FDD" port to drive A

Switch 1 assigns the system interrupt request channel IRQ4 to either IBM-compatible or Toshiba expansion cards.

Switch 2 assigns the system interrupt request channel IRQ3 to either IBM-compatible or Toshiba expansion cards.

Switch 3 is reserved for future use. This switch must be set to off.

Switch 4 enables and disables the main board's internal display controller.

Switch 5 controls certain signal convention for printer port. Usually the printer port is used for a parallel printer, which requires the unidirectional setting. A bidirectional setting allows both input and output. This function is provided for future use.

Switch 6 and **Switch 7** assign the port address of the two internal serial ports (Serial 1 and 2). These switch settings are defined as follows:

SW6	SW7	Serial 1	Serial 2
Off	Off	COM1	COM2
Off	On	COM1	COM3
On	Off	COM2	COM1
On	On	COM2	COM3

Switch 8 sets the external FDD drive designation. An external 5.25" disk drive connected to the "EX-FDD" port, is assigned as drive A or drive B with this switch.

1.12 JUMPER STRAPS

1.12.1 PC-Bus Mother Board Strap

The PC-bus mother board has one jumper strap shown in Figure 1-11, and its status is listed in Table 1-6.

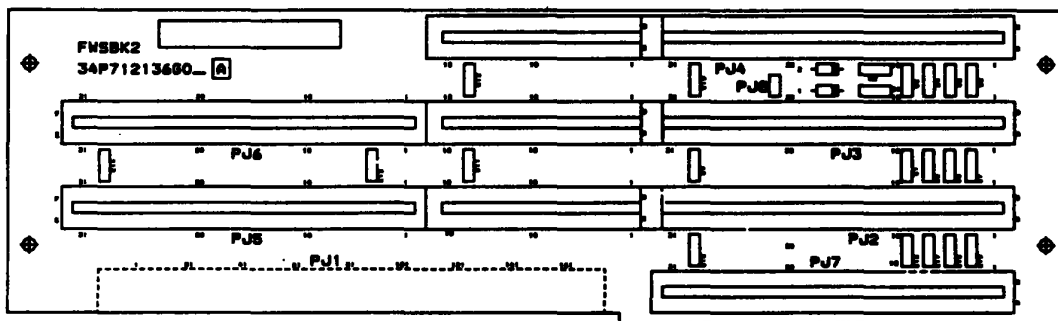


Figure 1-11 PC-bus mother board strap

Table 1-6 PC-bus mother board strap status

PJ8: 2-pin header

Pin No.	Status
1 - 2	Short

(SD6, SD7 pull up)

1.12.2 HDD Jumper Straps

The HDD has three jumper straps located on the hard disk control board as shown in Figure 1-12, and their status is listed in Table 1-7.

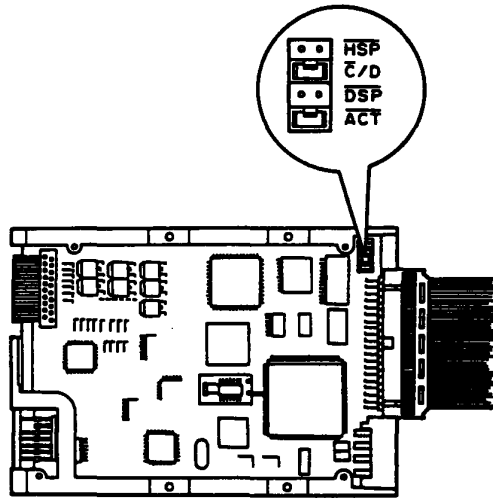


Figure 1-12 HDD jumper straps

Table 1-7 HDD jumper strap status

One-drive system

Signal	Status
HSP	Open
C/D	Short
DSP	Open
ACT	Short

Two-drive system

First

Signal	Status
HSP	Open
C/D	Short
DSP	Short
ACT	Short

Second

Signal	Status
HSP	Open
C/D	Open
DSP	Open
ACT	Short

2.1 GENERAL

PART 2 describes the problem isolation procedures to isolate defective Field Replaceable Units (FRUs).

The FRUs are:

1. Power supply unit
2. Main board/Memory board
3. FDD
4. HDD
5. Keyboard

For detailed replacement procedures, refer to PART 4, and for test program operation, refer to PART 3.

The following items are necessary for implementing the problem isolation procedures.

1. T8500 diagnostics disk
2. MS-DOS system disk
3. Phillips head screwdriver
4. Blade head screwdriver
5. Tweezers
6. Work disk (for FDD testing)
7. Cleaning disk kit (for FDD testing)
8. Multimeter
9. Printer port LED

With the problem isolation flowchart described in section 2.2, you can find which isolation procedures are necessary to isolate a problem.

2.2 PROBLEM ISOLATION FLOWCHART

The flowchart in Figure 2-1 allows you to find which FRU is defective. Before starting this problem isolation procedures, please confirm the following:

1. No disk is put in the FDD.
2. All optional external units are disconnected.

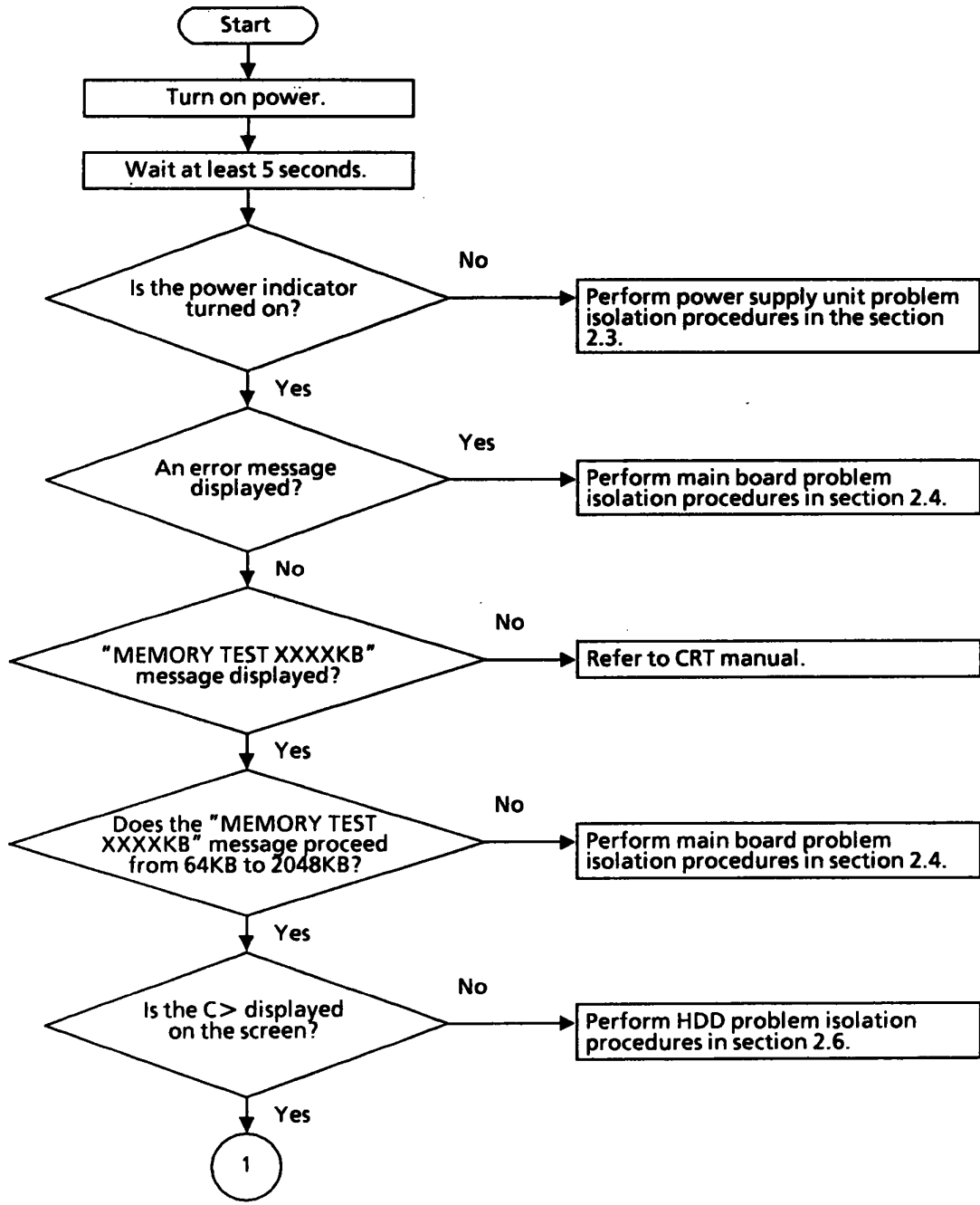


Figure 2-1 Problem isolation flowchart

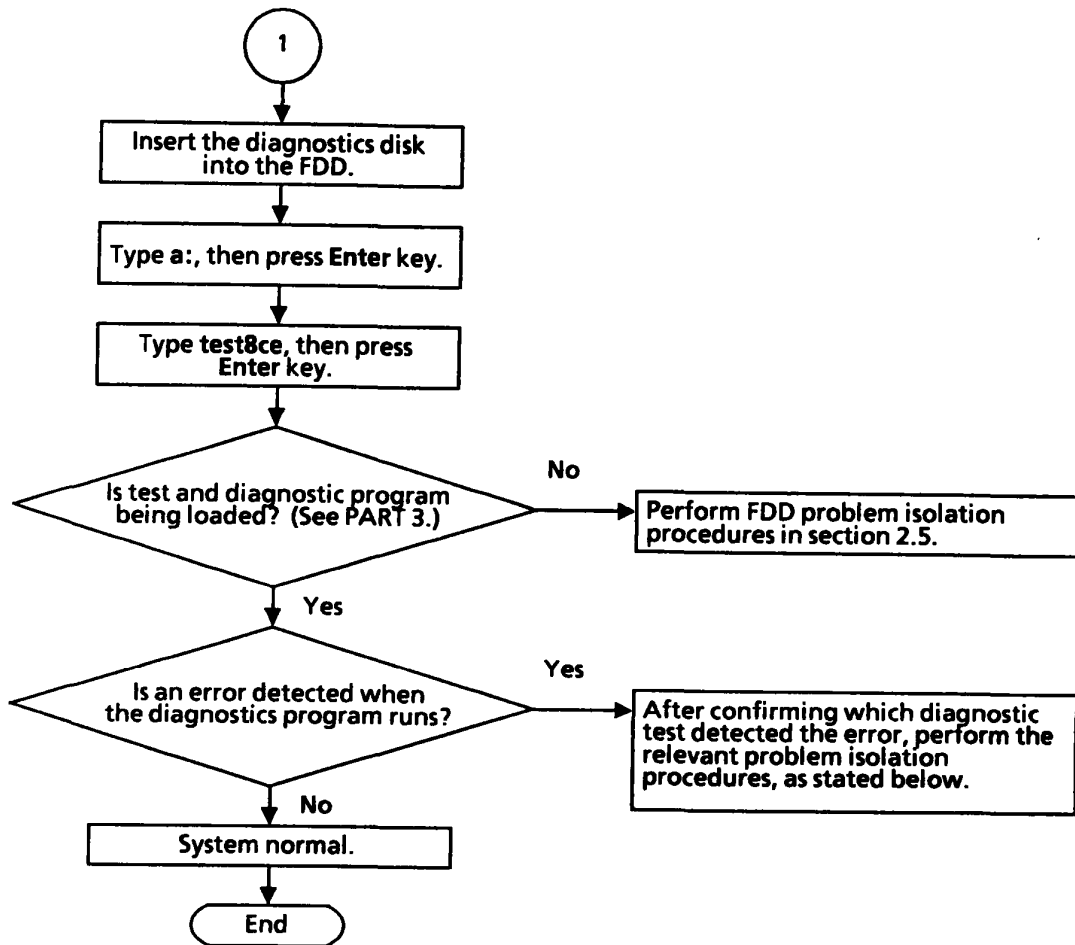


Figure 2-1 Problem isolation flowchart (continued)

1. If any error is detected during the system test, memory test, display test, real timer clock test, or cache memory test, perform the main board isolation procedures in section 2.4.
2. If any error is detected during the hard disk test, perform the HDD problem isolation procedures in section 2.6.
3. If any error is detected during the keyboard test, perform the keyboard problem isolation procedures in section 2.7.
4. If any error is detected during the floppy disk test, perform the FDD problem isolation procedures in section 2.5.

2.3 POWER SUPPLY UNIT PROBLEM ISOLATION PROCEDURES

WARNING: Dangerous high voltage is supplied to the power supply unit, so pay attention to its handling. It takes a few minutes to discharge the electricity after power-off.

With these procedures, you can easily check if the power supply unit is defective. Start with PROCEDURE 1.

- PROCEDURE 1: Power Indicator Check
- PROCEDURE 2: Connector Check
- PROCEDURE 3: Output Voltage Check
- PROCEDURE 4: Power Supply Unit Voltage Adjustment
- PROCEDURE 5: Power Supply Unit Replacement

PROCEDURE 1 Power Indicator Check

1. Turn on the power.
2. If the power indicator lights, go to PROCEDURE 3. If the indicator does not light, check the AC power cord connection: one end of the AC power cord is inserted into AC wall outlet and the other end is connected to AC IN jack on the rear of the system unit. If their connections are OK, replace the AC power cord or speaker board with a new one.
3. After replacing the AC power cord or speaker board, when indicator lights, the original AC power cord or speaker board is probably defective. If the indicator still does not light, go to PROCEDURE 2.

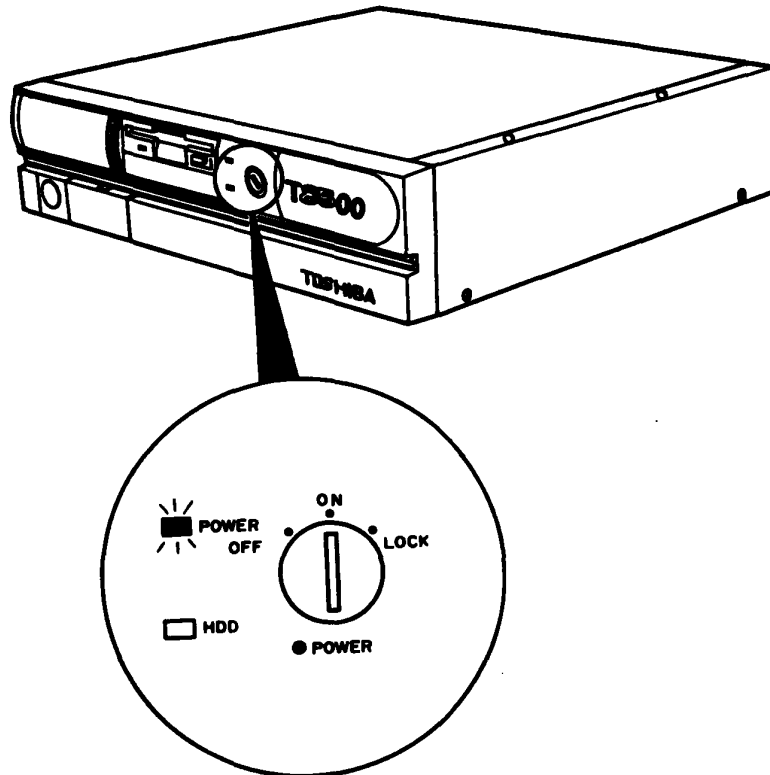


Figure 2-2 Power indicator check

PROCEDURE 2 Connector Check

1. Turn off the power, then unplug the AC power cord.
2. Remove the side cover and top cover. (Refer to section 4.2)
3. Remove the power supply unit. (Refer to section 4.6.)
4. If the power supply connector is properly connected to the main board, go to PROCEDURE 3: otherwise, reconnect it properly.

PROCEDURE 3 Output Voltage Check

1. Turn off the power, then unplug the AC power cord.
2. Remove the side cover and top cover. (Refer to section 4.2)
3. Plug the AC power cord in the power supply unit, then turn on the power.
4. Using a multimeter, confirm that the output voltage for four power supply connectors (HDD1, HDD2, Cooling fan, and main board) are within the range given in Table 2-1.

NOTE: Confirm the power supply output voltage to the main board, using IBM PC AT compatible slot pins (62-pin) on the PC-bus mother board. See Figure 2-3.

5. If the voltages are within the range given in Table 2-1, the power supply unit is normal, but the main board is probably defective. Go to the main board isolation procedures in section 2.4.
6. If the voltages are not within the specified range, turn off the power and go to PROCEDURE 4.

Table 2-1 Power supply unit output voltages

Connector	Pin Number		Voltage (VDC)		
	GND	+,- lead	Normal	Min.	Max.
For main board	B01	B03	+5	+4.75	+5.25
	B01	B05	-5	-4.6	-5.5
	B01	B07	-12	-10.92	-13.2
	B01	B09	+12	+11.4	+12.6
For HDD 1,2	2,3	4	+5	+4.75	+5.25
	2,3	1	+12	+11.4	+12.6
For cooling	2	1	+12	+11.4	+12.6

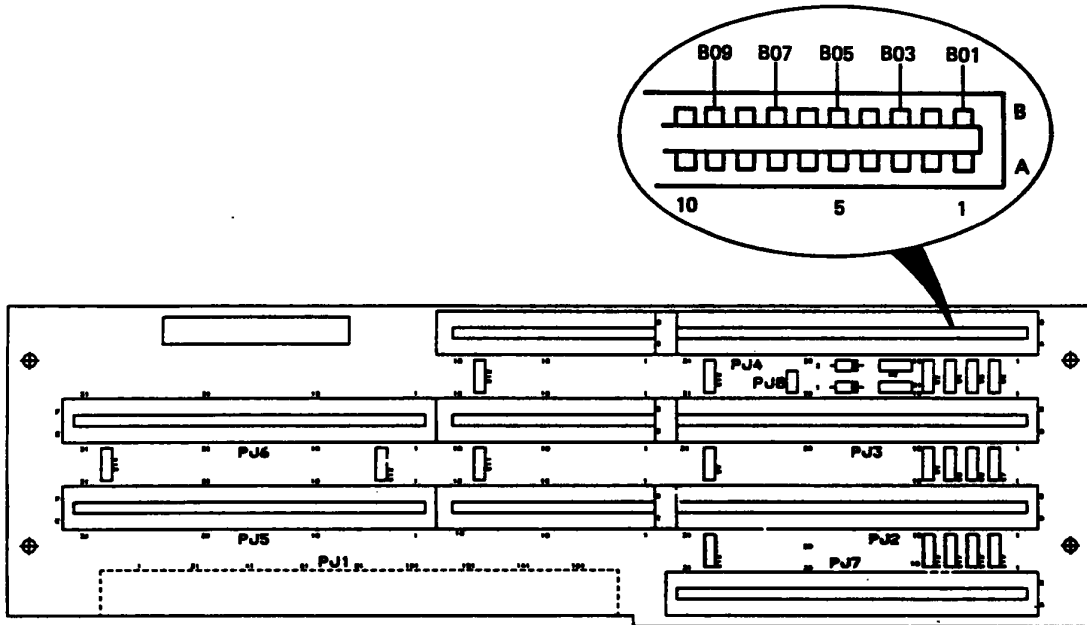


Figure 2-3 Power supply output voltage check

PROCEDURE 4 Power Supply Unit Voltage Adjustment

1. Turn off the power, then unplug the AC power cord.
2. Remove the side cover and top cover. (Refer to section 4.2)
3. Plug the AC power cord into the power supply unit, then turn on the power.
4. Using multimeter, measure the output voltages between IBM PC AT compatible slot pins B01 and B03. If the measured voltage is out of the range shown in Table 2-2, adjust using the +5 V adjusting trimmer on the power supply unit, using a Phillips head screwdriver.

Table 2-2 Adjustment

Slot	Pin number GND + lead	Voltage (VDC)	
		Min.	Max.
IBM PC AT compatible slot (62-pin)	B01 B03	+4.75	+5.25

5. If the voltages are not changed within the specified range, turn off the power and go to PROCEDURE 5.

PROCEDURE 5 Power Supply Unit Replacement

1. Turn off the power, then unplug the AC power cord.
2. Replace the power supply unit with a new one. (Refer to section 4.6.)
3. If normal operation resumes after replacing the power supply unit, the original power supply unit is probably defective.
4. If normal operation does not resume, other FRU(s) is probably defective. Find and replace the defective unit(s).

2.4 MAIN BOARD/MEMORY BOARD PROBLEM ISOLATION PROCEDURES

CAUTION: Before starting these procedures, make sure that no disk is put in the FDD: otherwise, this floppy disk will be erased.

This section describes how to check if the main board is defective. Start with PROCEDURE 1.

- PROCEDURE 1: Message Check
- PROCEDURE 2: Printer Port LED Check
- PROCEDURE 3: Test Program Execution
- PROCEDURE 4: Main Board Replacement

PROCEDURE 1 Message Check

1. Turn on the power.
2. If the system program is loaded normally, go to PROCEDURE 4.
3. If the following message is displayed on the screen, press **F1**. Execute the setup operation. (See PART 3 for details.)

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

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

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

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

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

4. If the following message is displayed, turn off the power. Wait at least 5 seconds, then turn on the power. If the following message is displayed again, go to HDD problem isolation procedures in section 2.6.

**** HDD load error or bad system disk ****
Insert system disk in drive
Press any key when ready

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

5. If the following message is displayed, go to PROCEDURE 5.

CPU FLAG REGISTER ERROR
KBC IBF/OBF ERROR
KBC IBF ERROR
KBC SELF TEST ERROR
KBC OBF ERROR
CPU REGISTER ERROR
ROM CHECKSUM ERROR
PIT CHANNEL 2 ERROR
CMOS SHUTDOWN BYTE ERROR
DMA CHANNEL 0 ERROR
DMA CHANNEL 1 ERROR
DMA PAGE REGISTER ERROR
MEMORY REFRESH ERROR
1ST 64 K MEMORY ERROR
ERROR INTERRUPT CONTROLLER #1...
ERROR INTERRUPT CONTROLLER #2...
ERROR CMOS BATTERY...
ERROR CMOS CHECK SUM...
ERROR INTERRUPTS AND STUCK NMI...
ERROR PROTECTED MODE ...
ERROR SIZING EXPANSION MEMORY
ERROR EXTRA MEMORY PROTECT MODE
MEMORY VERIFY ERROR <Address><Data>
MEMORY PARITY ERROR <Address><Data>
EMS PAGE REGISTER ERROR
KB RESET COMMAND OBF ERROR
KB RESET COMMAND ERROR
CACHE MEMORY ACTION ERROR
ERROR INITIALIZING HARD DISK CONTROLLER 0
ERROR INITIALIZING HARD DISK CONTROLLER 1
ERROR ENCOUNTERED INITIALIZING HARD DRIVE 0
ERROR ENCOUNTERED INITIALIZING HARD DRIVE 1
ERROR PROCESSOR EXCEPTIONAL INTERRUPTS...
ROM COPY ERROR
REFRESH TIMING ERROR

6. If none of the above messages is displayed and a printer port LED is available, go to PROCEDURE 2.

PROCEDURE 2 Printer Port LED Check

1. Turn off the power.
2. Plug the printer port LED into the PRT connector at the rear of the system unit.
3. Turn on the power. At this time, the printer port LED will light.
4. Read the final LED status from left to right as a hexadecimal value.
5. If the final LED status is one of error codes in Table 2-4, go to PROCEDURE 4.
6. If the final LED status is 35H, go to PROCEDURE 3.

Status = 35H
 | |
 |---- B
 ---- A

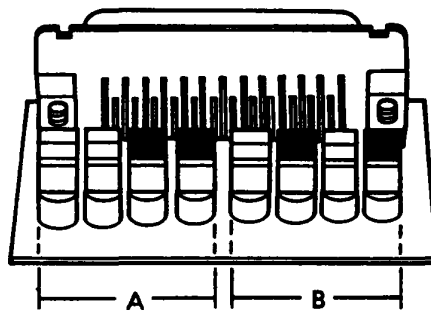


Figure 2-4 Printer port LED

Table 2-3 Printer port LED normal status

Status	Message
00	Shut-down process and video initialization
01	CPU test
02	KBC test 1
03	KBC test 2
04	KBC test 3
05	KBC test 4
06	LSI initialization (NPX, RTC, DMAC, PIO, PIT)
07	CPU test 2
08	RTC initialization
09	ROM checksum test
0A	VIDEO initialization
0B	None
0C	None
0D	PIT CH.2 test
0E	None
0F	CMOS RAM test
10	DMA CH.0 test
11	DMA CH.1 test
12	DMA page register test
13	Memory refresh test
14	First 64KB memory test
15	Interrupt vector set
16	VRAM test
17	VIDEO I/O initialization
18	PIC #1 mask register test
19	PIC #2 mask register test
1A	CMOS battery test
1B	CMOS checksum test
1C	Keyboard initialization-1

Table 2-3 Printer port LED normal status (continued)

Status	Message
1D	System memory size set
1E	System memory size check
1F	System memory test
20	Cache memory test
21	PIC test
22	NMI and parity test
23	Interrupt process test
24	Protect mode test
25	Extended memory size check
26	Extra memory test
27	EMS memory test
28	Extended memory test
29	Protect mode exception processing test
2A	ROM copy
2B	CRT type check
2C	PIT CH.1 check
2D	Hardware interrupt vector set
2E	Keyboard initialization-2
2F	FDD initialization
30	SIO and printer initialization
31	HDD initialization
32	Option ROM check
33	Timer check
34	NPX initialization
35	Prepare for boot

Table 2-4 Printer port LED error status

Status	Error message	Process
81H	CPU FLAG REGISTER ERROR	HALT
82H	KBC IBF/OBF ERROR	HALT
83H	KBC IBF ERROR	HALT
84H	KBC SELF TEST ERROR	HALT
85H	KBC OBF ERROR	HALT
87H	CPU REGISTER ERROR	HALT
89H	ROM CHECKSUM ERROR	HALT
8DH	PIT CHANNEL 2 ERROR	HALT
8FH	CMOS SHUTDOWN BYTE ERROR	HALT
90H	DMA CHANNEL 0 ERROR	HALT
91H	DMA CHANNEL 1 ERROR	HALT
92H	DMA PAGE REGISTER ERROR	HALT
93H	MEMORY REFRESH ERROR	HALT
94H	1ST 64K MEMORY ERROR	HALT
96H	VRAM ERROR	CONT
98H	ERROR INTERRUPT CONTROLLER #1...	CONT
99H	ERROR INTERRUPT CONTROLLER #2...	CONT
9CH	KB RESET COMMAND OBF ERROR	CONT
	KB RESET COMMAND ERROR	CONT
9FH	MEMORY VERIFY ERROR <Address><Data>	CONT
	MEMORY PARITY ERROR <Address><Data>	CONT
A0H	CACHE MEMORY ACTION ERROR	CONT
A1H	ERROR INTERRUPTS AND STUCK NMI...	CONT
A2H	ERROR INTERRUPTS AND STUCK NMI...	CONT
A3H	ERROR INTERRUPTS AND STUCK NMI...	CONT
A4H	ERROR PROTECTED MODE	CONT
A5H	ERROR SIZING EXPANSION MEMORY...	CONT
A6H	ERROR EXTRA MEMORY PROTECT MODE	CONT
	MEMORY VERIFY ERROR <Address><Data>	
	MEMORY PARITY ERROR <Address><Data>	
A8H	ERROR PROTECTED MODE	CONT
	MEMORY VERIFY ERROR <Address><Data>	
	MEMORY PARITY ERROR <Address><Data>	
A9H	ERROR PROCESSOR EXCEPTIONAL	
	INTERRUPTS INTERRUPTS...	CONT
AAH	ROM COPY ERROR	CONT
ACH	REFRESH TIMING ERROR	CONT

Table 2-4 Printer port LED error status (continued)

Status	Error message	Process
B1H	ERROR INITIALIZING HARD DISK CONTROLLER 0	
	ERROR INITIALIZING HARD DISK CONTROLLER 1	
	ERROR ENCOUNTERED INITIALIZING HARD DRIVE 0	
	ERROR ENCOUNTERED INITIALIZING HARD DRIVE 1	
D4H	1ST 64 KB MEMORY ERROR	HALT
E7H	EMS PAGE REGISTER ERROR	CONT
	MEMORY VERIFY ERROR <Address><Data>	
	MEMORY PARITY ERROR <Address><Data>	

NOTE: "HALT" means that the system will halt when the error is detected and the buzzer will sound once. "CONT" means that the system will continue to operate even when the error is detected but the buzzer will sound three times.

PROCEDURE 3 Test Program Execution

1. Execute the following tests on the diagnostic test menu. (Refer to PART 3 for details.)
 1. System test
 2. Memory test
 3. Keyboard test
 4. Display test
 5. Floppy disk test
 6. Hard disk test
 7. Real timer clock test
 8. Cache memory test
2. If any error is detected during the memory test, go to PROCEDURE 4.
If any error is detected during the system test, display test, real timer clock test, or cache memory test, go to PROCEDURE 5.
3. If any error is detected during the floppy disk test, go to FDD problem isolation procedures in section 2.5.
4. If any error is detected during the hard disk test, go to HDD problem isolation procedures in section 2.6.
5. If any error is detected during the keyboard test, go to keyboard problem isolation procedures in section 2.7.

PROCEDURE 4 Memory Board Replacement

1. Replace the memory board with a new one. (Refer to section 4.4.)
2. If normal operation resumes after replacing the memory board, the original memory board is probably defective.
3. If normal operation does not resume, the main board is probably defective. Go to PROCEDURE 5.

PROCEDURE 5 Main Board Replacement

1. Replace the main board with a new one. (Refer to section 4.16.)
2. If normal operation resumes after replacing the main board, the original main board is probably defective.
3. If normal operation does not resume, other FRU(s) is probably defective. Find and replace the defective unit(s).

2.5 FDD PROBLEM ISOLATION PROCEDURES

This section describes how to check if the FDD is defective. Start with PROCEDURE 1.

- PROCEDURE 1: MS-DOS Loading Check
- PROCEDURE 2: Message Check
- PROCEDURE 3: Head Cleaning
- PROCEDURE 4: FDD Test Execution
- PROCEDURE 5: FDD Connector Check
- PROCEDURE 6: Replacing the FDD

PROCEDURE 1 MD-DOS Loading Check

1. Turn off the power.
2. Insert the MS-DOS system disk into the FDD.
3. Turn on the power.
4. When loading starts normally, go to PROCEDURE 3.
5. When loading does not start normally, go to PROCEDURE 2.

PROCEDURE 2 Message Check

1. When the power is turned on after inserting the MS-DOS system disk into the FDD, message (a) or (b) below will appear.
 - (a) **Non-System disk or disk error**
Replace and press any key when ready
 - (b) **** FDD load error or bad system disk ****
Insert system disk in drive
Press any key when ready
2. If message (a) or (b) is displayed, the contents of the MS-DOS system disk have been damaged, or a disk other than the MS-DOS system disk is inserted into the FDD. Insert the new MS-DOS system disk into the FDD. If loading completes, go to PROCEDURE 4. If loading does not complete, go to PROCEDURE 3.
3. If none of the above messages appears, go to PROCEDURE 5.

PROCEDURE 3 Head Cleaning

1. Insert the diagnostics disk into the FDD, and load the test and diagnostic programs. (Refer to PART 3.)
2. Execute the Head Cleaning on the diagnostics menu.
3. If normal operation resumes after cleaning the head, go to PROCEDURE 4.
4. If normal operation does not resume, go to PROCEDURE 5.

PROCEDURE 4 FDD Test Execution

1. Run the floppy disk test on the diagnostic test menu. (Refer to PART 3.)
2. If an error occurs during the floppy disk test, an error code (Table 2-5) and status will be displayed. Go to PROCEDURE 6.
3. If no error occurs, the FDD is sound.

Table 2-5 FDD error status

Code	Status
01	Bad Command
02	Address Mark Not Found
03	Write Protected
04	Record Not Found
06	Media Removed on Dual Attach Card
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 (Not Ready)
EE	Write Buffer Error

PROCEDURE 5 FDD Connector Check

1. Turn off the power, then unplug the AC power cord.
2. Remove the side cover and top cover. (Refer to section 4.2.)
3. Check if the FDD connection is secure.
4. If the FDD cable is securely connected to the main board, go to PROCEDURE 6.
5. If the FDD cable is not securely connected to the main board, secure the connection.

PROCEDURE 6 Replacing the FDD

1. Turn off the power.
2. Remove the FDD and install a new FDD. (Refer to section 4.11.)
3. Turn on the power.
4. If normal operation resumes, the original FDD is probably defective.
5. If normal operation does not resume, the main board is probably defective. Refer to section 2.4.

2.6 HDD PROBLEM ISOLATION PROCEDURES

This section describes how to check if the HDD is defective. Start with PROCEDURE 1.

- 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: HDD Jumper Strap Check
- PROCEDURE 7: Replacing the HDD

PROCEDURE 1 HDD Indicator Check

1. Turn off the power.
2. If a floppy disk is put in the FDD, take it out.
3. Wait at least 5 seconds after turning off the power, then turn on the power.
4. If the HDD indicator blinks briefly, go to PROCEDURE 2. If the HDD indicator blinks continuously, go to PROCEDURE 4.
5. If the HDD indicator does not light, go to PROCEDURE 5.

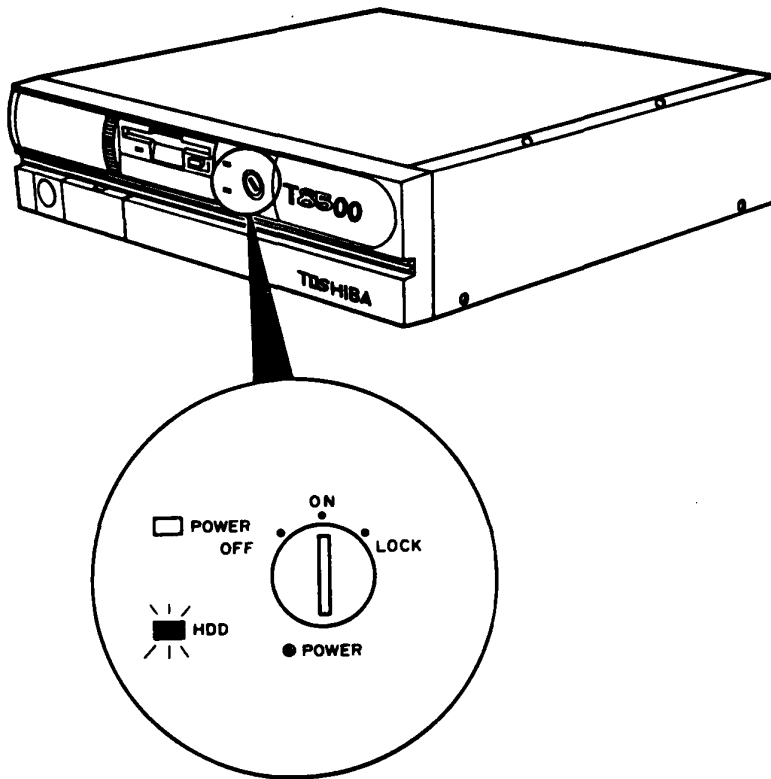


Figure 2-5 HDD indicator check

PROCEDURE 2 Message Check

1. If the operating system is loaded normally, go to PROCEDURE 4.
2. If one of the following message is displayed, go to PROCEDURE 3.

**** HDD load error or bad system disk ****
Insert system disk in drive
Press any key when ready

Check system disk in drive
Press any key when ready

PROCEDURE 3 Format Execution

CAUTION: Before starting this test, copy the programs and data stored on the hard disk to floppy disks because they will be erased when the FORMAT command runs. This can be done with the MS-DOS BACKUP command. (See the MS-DOS Manual for details.)

1. Remove the diagnostics disk from the FDD, then insert the MS-DOS system disk.
2. Make partition of the hard disk by entering the FDISK command. (See the MS-DOS Manual for details.)
3. Format the hard disk by entering the FORMAT command. (See the MS-DOS Manual for details.) At this time, use /S switch to transfer the system program.
4. If normal operation resumes, the HDD is sound.
5. If normal operation does not resume, go to PROCEDURE 6.

PROCEDURE 4 Hard Disk Test Execution

CAUTION: Before starting this test, copy the programs and data stored on the hard disk to floppy disks because they will be erased when the test program runs. This can be done with the MS-DOS BACKUP command. (See the MS-DOS manual for details.)

1. Insert the diagnostics disk into the FDD and load the test and diagnostic programs. (Refer to PART 3.)
2. Run the hard disk test on the diagnostic test menu.
3. If any error is detected during the hard disk test, its error code (Table 2-6) and status will be displayed; go to PROCEDURE 6.
4. If no error occurs, the HDD is sound. 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 2-6 HDD error status

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
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 power cord.
2. Remove the side cover and top cover. (Refer to section 4.2)
3. Check if the HDC signal cable and HDD power cable are secure.
4. If both cables are securely connected to the main board, go to PROCEDURE 6.
5. If the cables are not securely connected, secure them.

PROCEDURE 6 HDD Jumper Strap Check

1. Remove the disk bracket. (Refer to section 4.10.)
2. Check if the jumper straps are set correctly as shown in Figure 2-6 and described in Table 2-7.
3. If the jumper straps are set correctly, go to PROCEDURE 7.
4. If the jumper straps are not set correctly, set them correctly.

Table 2-7 HDD jumper straps

(a) One-drive system

Signal	Status
HSP	Open
$\overline{C/D}$	Short
\overline{DSP}	Open
\overline{ACT}	Short

(b) Two-drive system

First

Signal	Status
HSP	Open
$\overline{C/D}$	Short
\overline{DSP}	Short
\overline{ACT}	Short

Second (option)

Signal	Status
HSP	Open
$\overline{C/D}$	Open
\overline{DSP}	Open
\overline{ACT}	Short

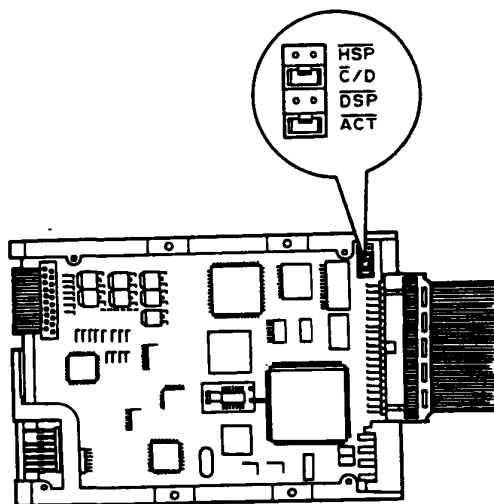


Figure 2-6 HDD jumper straps

PROCEDURE 7 Replacing the HDD

1. Turn off the power.
2. Remove the HDD and install a new HDD. (Refer to section 4.12.)
3. Turn on the power.
4. If normal operation resumes, the original HDD is probably defective.
5. If normal operation does not resume, the main board is probably defective. Refer to section 2.4.

2.7 KEYBOARD PROBLEM ISOLATION PROCEDURES

This section describes how to check if the keyboard is defective. Start with PROCEDURE 1.

- PROCEDURE 1: Input Check
- PROCEDURE 2: Keyboard Test Execution
- PROCEDURE 3: Connector Check
- PROCEDURE 4: Replacing the Keyboard

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 key (character key or space bar).

CAUTION: Do not type an MS-DOS acceptable command such as **del** or **format**, which will erases your important programs and data.

When you press a character key and its character appears on the screen, press **Enter**. Go to PROCEDURE 2.

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

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

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

Current data 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.....

NOTE: Never type any meaningful MS-DOS commands. If you type DEL, FORMAT or other MS-DOS command, you will lose data on the hard disk.

PROCEDURE 2 Keyboard Test Execution

1. Insert the diagnostics disk into the FDD, and load the test and diagnostics programs. (Refer to PART 3.)
2. Run the keyboard test on the diagnostics test menu.
3. If any error is detected during the test, go to PROCEDURE 3.
4. If no error is detected during the test, the keyboard is sound.

PROCEDURE 3 Connector Check

1. Turn off the power.
2. Check if the keyboard cable is securely connected to the front panel of the system unit. If connected securely, go to PROCEDURE 4.
3. If not connected securely, secure it.

PROCEDURE 4 Replacing the Keyboard

1. Turn off the power.
2. Disconnect the keyboard cable from the front panel of system unit.
3. Replace the keyboard with a new one, and plug a new keyboard cable into the front panel (main board).
4. If normal operation resumes after connecting the new keyboard, the original keyboard is probably defective. Install a new keyboard.
5. If normal operation does not resume, the main board is probably defective. Refer to section 2.4.

3.1 GENERAL

This PART explains test and diagnostics programs which check the functions of all hardware modules of the T8500.

There are 19 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 5 tasks:

1. RUNNING TEST
2. DISK UTILITIES
3. LOG UTILITIES
4. SYSTEM CONFIGURATION
5. SETUP

The test program module is composed of 14 tests:

- | | |
|-------------------------|-------------------------------|
| 1. SYSTEM TEST | 11. EXPANSION TEST |
| 2. MEMORY TEST | 12. CACHE MEMORY TEST |
| 3. KEYBOARD TEST | 13. SCSI TEST |
| 4. DISPLAY TEST | 14. CASSETTE STREAMER MT TEST |
| 5. FLOPPY DISK TEST | |
| 6. PRINTER TEST | |
| 7. ASYNC TEST | |
| 8. HARD DISK TEST | |
| 9. REAL TIME CLOCK TEST | |
| 10. NDX TEST | |

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

1. T8500 diagnostics disk
2. MS-DOS system disk
3. Work disk (formatted work disks 2HD and 2DD)
4. Cleaning disk kit
5. Printer wrap around connector
6. RS-232-C wrap around connector (Two)

Service personnel can use these programs to isolate problems by selecting an appropriate program and operation procedures described in section 3.2.

3.2 OPERATION

1. Insert the MS-DOS system disk into the FDD, and turn on the power to boot the T8500.
2. After the MS-DOS is loaded, take out the MS-DOS system disk from the FDD, then insert the diagnostics disk into the FDD.
3. Type **TEST8CE**, then press **Enter**.
4. The following message will appear.

**TOSHIBA PERSONAL BUSINESS SYSTEM DIAGNOSTICS
Version X.XX (c) copyright TOSHIBA Corp. 1988**

[**DIAGNOSTICS MENU**]

1. **DIAGNOSTIC TEST**
2. **RUNNING TEST**
3. **DISK UTILITIES**
4. **LOG UTILITIES**
5. **SYSTEM CONFIGURATION**
6. **SETUP**
7. **DISPLAY ADJUST**
99. **EXIT**

↑↓→←:Selects item Enter:Moves between item Esc:Escape

Detailed explanation of the service programs and the operation are given in sections 3.19 to 3.24.

5. Select the **1. DIAGNOSTIC TEST** by using **↑**, **↓**, **→**, or **←** then press **Enter**, so the following message will appear.

```
[ 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
9. REAL TIMER CLOCK TEST
10. NPX TEST
11. EXPANSION TEST
12. CACHE MEMORY TEST
13. SCSI TEST
14. CASSETTE STREAMER MT TEST
15. FDD & HDD ERROR
    TEST RETRY COUNT SET
99. EXIT TO DIAGNOSTICS MENU
```

Select numbers **1** to **14** for diagnostic tests.
Select number **15** is to set the FDD and HDD error retry count (0 - 225).
Type number **99** to return to the DIAGNOSTICS MENU.
When selecting **FLOPPY DISK TEST**, **HARD DISK TEST**, **SCSI TEST**, or **CASSETTE STREAMER MT TEST** special sub-messages will appear, as described in sections 3.8, 3.11, 3.16, and 3.17.

6. After selecting one of the test numbers (1 to 14) on the diagnostic test menu, press **Enter**. The following message will appear.

```
[ SYSTEM TEST ]  
  
1. ROM checksum  
2. HW status  
3. Power off test  
99. Exit to DIAGNOSTIC TEST MENU
```

7. To select subtest from the subtest menu, then press **Enter**. The following message will appear. Selecting **99** will return you to diagnostic test menu in section 3.2.

```
[ TEST PARAMETER ]  
  
Go to Test  
Test Loop      : YES  
Error Stop     : NO
```

If you select the **Go to Test**, then press **Enter** to run the test program. Each subtest is described in section 3.3.

If you select the **Test Loop**, then press **Enter**, see the subsection 8.

If you select the **Error Stop**, then press **Enter**, see the subsection 9.

8. Select the **Go to Test**, then press **Enter**. The following message will appear.

<p>TEST LOOP</p> <p>YES NO</p>

If you select **YES**: Each time a test cycle ends, it increments the pass counter by one and repeats the test cycle.

If you select **NO**: At the end of a test cycle, the test execution is terminated and you exit to the subtest menu.

9. Select the **Error Stop**, then press **Enter**. The following message will appear.

<p>ERROR STOP</p> <p>YES NO</p>
--

If you select **YES**: When an error occurs, the error status is displayed and the execution of the test program stops. At this time, the operation guide is displayed at the right of the screen.

If you select **NO**: When an error occurs, the error status is displayed then the error counter is incremented by one and you goes to the next test.

10. When an error occurs during the test program, the following message will appear (when ERROR STOP is **YES**).

ERROR STATUS NAME

[HALT OPERATION]

- 1. Test End**
- 2. Continue**
- 3. Retry**

Selecting **1** will terminate the execution of the test program, and exit to the subtest menu.
Selecting **2** will continue the test (execute the next test step).
Selecting **3** will retry the test.

If you select **NO** (by typing **2** and pressing **Enter**):
When an error occurs, the error status is displayed, and the error counter is increased by one. Now you go to the next test.

11. To stop the test:
Hold down **Ctrl** and press **Break**. Also, you can terminate 4 and 5 in RAM test and cache test by pressing any key.

The error codes and error status names are described in section 3.18.

3.3 SUBTEST NAMES

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

Table 3-1 Subtest names

No.	Test name	Subtest No.	Subtest item
1	SYSTEM	1	ROM checksum
		2	HW status
		3	Power off
2	MEMORY	1	RAM constant data
		2	RAM address patter
		3	RAM refresh
		4	Protected mode
		5	Protected mode (2MB - max.)
		6	Extra memory
		7	Inside LIM
		8	Current LIM
3	KEYBOARD	1	Pressed key display
		2	Pressed key code display
		3	Key lock
		4	keyboard test
4	DISPLAY	1	VRAM W/R/C
		2	Character attributes
		3	Character set
		4	80 x 25 character display
		5	320 x 200 graphics display
		6	640 x 200 graphics display
		7	640x400 graphics display
		8	Display page
		9	"H" pattern display
		10	Video DAC register W/R/C
5	FDD (1 unit)	1	Sequential read
		2	Sequential write/read/compare
		3	Random address/data
		4	Write specified address
		5	Read specified address
		6	DMA extend test
6	PRINTER	1	Ripple pattern
		2	Function
		3	Wrap around

Table 3-1 Subtest names

No.	Test name	Subtest No.	Subtest item
7	ASYNC (RS-232-C)	1	Wrap around (channel-1)
		2	Wrap around (channel-2)
		3	Wrap around (channel-3)
		4	Wrap around (channel-4)
		5	Point to point (send)
		6	Point to point (receive)
		7	Card modem loopback
		8	Card modem on-line
		9	Dial tester
8	HDD	1	Sequential read
		2	Address uniqueness
		3	Random address/data
		4	Cross talk & peak shift
		5	Write/read/compare (CE)
		6	Write specified address
		7	Read specified address
		8	ECC circuit (CE cylinder)
		9	Sequential write
		10	W/R/C specified address
9	REAL TIMER	1	Real time test
		2	Backup memory test
		3	Real time carry test
10	NPX	1	NPX (i80387) test
		2	NPX (WTL3167) test
11	EXPANSION	1	XT(8-bit)bus wrap around test
		2	AT(16-bit)bus wrap around test
		3	HS(32-bit)bus wrap around test
		4	T3100 bus wrap around
		5	FDD (expansion) <-> PRT port wrap around test
		6	SCSI <-> PRT port wrap around test
		7	HDD wrap around test
12	CACHE	1	Constant data test
		2	Address pattern test
		3	Increment/decrement test
		4	Bit shift pattern test
		5	Write disturb test
		6	Checker board test
		7	Marching test
		8	Walking data test
		9	Caching data test

Table 3-1 Subtest names

No.	Test name	Subtest No.	Subtest item
13	SCSI	1	Diagnostic test
		2	Direct access device
		3	Sequential access device
		4	Printer device
		5	Processor device
		6	Worm device
		7	Read only device
14	CMT	1	Command test 1
		2	Command test 2
		3	Data write/read compare test
		4	Data read only test

3.4 SYSTEM TEST

Subtest 1 ROM checksum

This test performs the ROM checksum test on the memory board.

(Test extent : F0000H - FFFFFH 64KB)

Subtest 2 HW status

This test always reads the system hardware status, and displays it as shown below. Press any key to return to the subtest menu. Table 3-2 describes the hardware status bits.

```

              76543210
H/W Status   = 10011110
  Bit7 ---   =
  Bit6 --- CPU clock = High
  Bit5 ---   =
  Bit4 --- 2MB FDD   = 1.6MB
  Bit3 --- Internal FDDs = 1
  Bit2 --- Drive A/B = Normal
  Bit1 --- External FDD = ON
  Bit0 --- Internal FDD = 2HD type
    
```

Press any key when end.

Table 3-2 Hardware status

Bit	Item	H/W status	
		1	0
7	Not used	--	--
6	CPU clock	Low	High
5	Not used	--	--
4	2MB FDD	1.6MB	2MB
3	Internal FDDs	1	2
2	Drive A/B	Normal	Change
1	External FDD	ON	OFF
0	Internal FDD	2HD type	2DD type

Subtest 3

Power off

This test confirms that software power is off. When the following message is displayed, turn off the power.

Press power switch !

Confirm the following message on the screen, then press **Enter** to make sure that power goes off.

Power off NMI interrupt
Press [Enter] key

3.5 MEMORY TEST

Subtest 1 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 2 RAM address pattern (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 3 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 read operations.

Subtest 4 Protected mode

This subtest writes fixed data and address data to the memory (address 40000H to 9FFFFH, and 100000H to max, if any) in protected mode, then reads and compares it with the original data.

Subtest 5 Protected mode (2MB - max.)

This subtest writes fixed data and address data to the memory (address 200000H to max.) in protected mode, then reads and compares it with the original data.

Subtest 6 Extra memory

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

Subtest 7 Inside LIM (in real mode)

This subtest similar to subtest 4 writes 64 KB of fixed data and address data to the expanded memory (page frame addresses D0000H to DFFFFH, block = 208H/218H/258H/268H) in real mode, and reads and compares it with the original data.

After selecting the subtest, the following message will appear.

**[EMS port = XXXH, SET# = X, PAGE# = XXXXX]
[EMS size = Block1 = XXXXX kb, Block2 = XXXXX KB]**

Address display in the event of LIM test error:

ADDRESS: XXXXXX

STATUS: XXX

Offset	Status
Upper 1 bit	Page No. (0 - 3)
0: Set 0, 1: Set 1	
Lower 7 bits	
Logical page No. (0 - 127)	

NOTE: Block1 max. size = 2048KB, Block2 max. size = 1024KB

Subtest 8 Current LIM

This subtest writes fixed data and address data to the expanded memory (page frame addresses D0000H to DFFFFH, block = 208H/218H/258H/268H), and reads and compares it with the original data.

After selecting the subtest, the following message will appear.

[EMS port = XXXH, SET# = X, PAGE# = XXXXX]

[EMS size: Set X = XXXXXKB Set X = XXXXXKB]

[EMS size: Set X = XXXXXKB Set X = XXXXXKB]

Subtest 3 Key lock

Turn the keyboards switch to lock position, and you confirm the keyboard lock function.

After selecting the subtest, the following message will appear.

Turn the key to "LOCK".

After turning th keyboard switch to lock, the following message will appear.

**Keyboard is locked.
Press any key and confirm that key is locked.
Then turn the key to "ON".**

After turning the keyboard switch to ON, the following message will appear.

Keyboard is unlocked.

PRESS [ENTER] KEY

Subtest 4 Keyboard test

The LED for Num Lock, Caps Lock, and Scroll Lock on the keyboard is lit in order. After the LED is lit, the following message will appear on the display.

PRESS ANY KEY

Press any key to return to the SUB-TEST MENU of the keyboard test.

3.7 DISPLAY TEST

Subtest 1 VRAM write/read/compare

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

Subtest 2 Character attributes

This subtest checks the following:

- Normal Display
- Intensified Display
- Reverse Display
- Blinking Display

(Monochrome monitor: Mode 7)
(Other monitor: Mode 1)

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

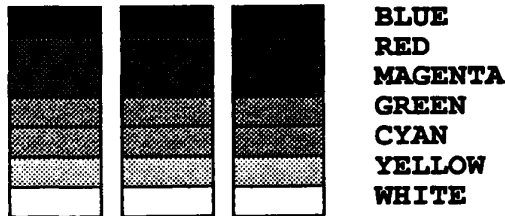
CHARACTER ATTRIBUTES

**NEXT LINE SHOWS NORMAL DISPLAY.
NN**

**NEXT LINE SHOWS INTENSIFIED DISPLAY.
II**

**NEXT LINE SHOWS REVERSE DISPLAY.
RRR**

**NEXT LINE SHOWS BLINKING DISPLAY.
BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB**



PRESS [ENTER] KEY.

Subtest 5

320 x 200 graphics display (modes 4, D and 13)

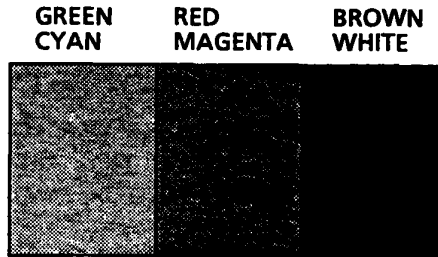
In case of mode 4, this subtest displays the following two color sets on the screen in 320 x 200 dots graphics mode as shown below.

Color set 0: Green, Red, Yellow

Color set 1: Cyan, Magenta, White

320*200 GRAPHICS DISPLAY

COLOR SET X:[4]

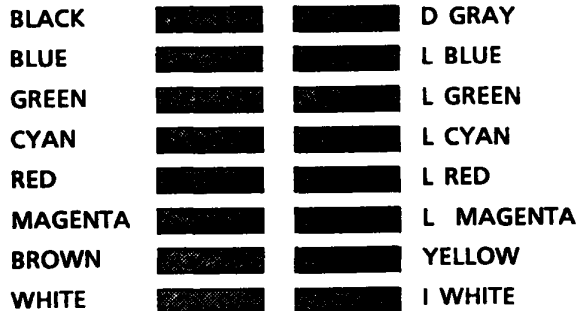


PRESS[ENTER]KEY

In case of mode D, this subtest displays 16 colors (black, blue, green, cyan, red, magenta, brown, white, dark gray, light blue, light green, light cyan, light red, light magenta, yellow and high-brightness white) on the screen.

(For the monochrome monitor, this subtest is not made.)

320*200 GRAPHICS DISPLAY:[D]



PRESS[ENTER]KEY

In case of 13, these subtest displays 64-level scale for red, green, blue, and white.

320*200 GRAPHICS DISPLAY :[13]



PRESS [ENTER] KEY

Subtest 6

640 x 200 graphics display (modes 6 and E)

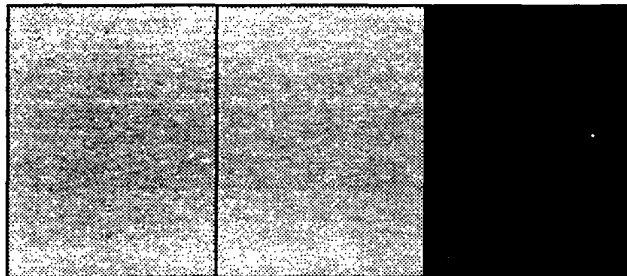
In case of mode 6, this subtest displays three types of dot displays: odd dots driven, even dots driven, and all dots driven in 640 x 200 dot graphics mode on the screen.

640*200 GRAPHICS DISPLAY :[6]

EVEN DOTS
DRIVEN

ODD DOTS
DRIVEN

ALL DOTS
DRIVEN



















PRESS [ENTER] KEY

In case of mode E, this subtest also displays 16 colors (black, blue, green, cyan, red, magenta, brown, white, dark gray, light blue, light green, light cyan, light red, light magenta, yellow and high-brightness white) on the screen.

(For monochrome monitor, this subtest is not made.)

640*200 GRAPHICS DISPLAY : [E]

BLACK			DARK GRAY
BLUE			LIGHT BLUE
GREEN			LIGHT GREEN
CYAN			LIGHT CYAN
RED			LIGHT RED
MAGENTA			LIGHT MAGENTA
BROWN			YELLOW
WHITE			INTENSIFIED WHITE

















PRESS [ENTER] KEY

Subtest 7

640 x 400 graphics display
(modes 10, 74, and 75)

In case of mode 10 (color monitors only), this subtest displays 16 colors (black, blue, green, cyan, red, magenta, brown, white, dark gray, light blue, light green, light cyan, light red, light magenta, yellow and high-brightness white) on the screen.

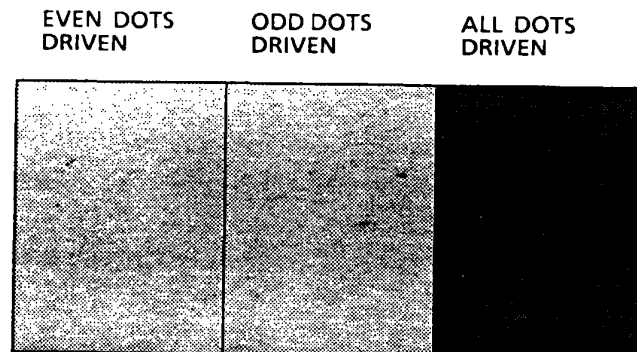
640*350 GRAPHICS DISPLAY :[10]

BLACK			DARK GRAY
BLUE			LIGHT BLUE
GREEN			LIGHT GREEN
CYAN			LIGHT CYAN
RED			LIGHT RED
MAGENTA			LIGHT MAGENTA
BROWN			YELLOW
WHITE			INTENSIFIED WHITE

PRESS [ENTER] KEY

In case of mode 74, this subtest displays three types of dot displays: odd dots driven, even dots driven, and all dots driven in 640 x 400 dot graphics mode on the screen.

640*400 GRAPHICS DISPLAY :[74]



PRESS [ENTER] KEY

Subtest 9 "H" pattern display

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

```
#####  
#####  
#####  
#####  
#####  
#####  
#####
```

Subtest 10 Video DAC test

This subtest writes and reads the 256-byte look up table (PEL address register) in DAC register. The data for PEL data register are 00H, 15H, 2AH, and 3FH.

3.8 FLOPPY DISK TEST

CAUTION: Before running the floppy disk test, remove the diagnostics disk, then put a formatted work disk into the FDD to avoid that the diagnostics disk is erased.

Under MS-DOS, a disk is formatted by the following command.

```
FORMAT/4 ..... 2D
FORMAT/3 ..... 2DD
FORMAT ..... 2HD
```

OPERATION

1. When you select the **FLOPPY DISK TEST** on the DIAGNOSTIC TEST MENU and select a subtest menu of the FLOPPY DISK TEST, the following message will appear.

```
[ TEST PARAMETER ]

Go to Test
Test Loop           : NO
Error Stop          : YES
Test Drive number   : 1
Media mode          : 2DD
Test minimum track number : 0
```

2. If you select the **Go to Test**, then press **Enter** to run the test program.
3. If you select the **Test Loop**, then press **Enter**. The following message will appear.

```
TEST LOOP

YES  NO
```

If you select **YES**: Each time a test cycle ends, it increments the pass counter by one and repeats the test cycle.

If you select **NO**: At the end of a test cycle, the test execution is terminated and you exit to the subtest menu.

4. If you select the **Error Stop**, then press **Enter**. The following message will appear.

```
ERROR STOP
YES NO
```

If you select **YES**: When an error occurs, the error status is displayed and the execution of the test program stops. At this time, the operation guide is displayed on the right side of the display screen.
If you select **NO**: When an error occurs, the error status is displayed then the error counter is incremented by one and you goes to the next test.

5. If you select the **Test Drive number**, then press **Enter**. The following message will appear.

```
[ DRIVE NUMBER ]
1&2 1 2
```

Select the test drive number, then press **Enter**.

6. If you select the **Media mode**, then press **Enter**. The following message will appear.

```
[ MEDIA MODE ]
2D 2DD 2HD
```

Select the media type of a floppy disk to be tested, then press **Enter**.

7. If you select the **Test minimum track number**, then press **Enter**. The following message will appear.

Track number (00-79) ?

You can select the minimum track number of the floppy disk test. When pressing **Enter** only, the minimum track number will be zero. Select the minimum track number to display the subtest menu of the floppy disk test, as you want.

8. During the floppy disk test, the subtest menu will appear.

TEST NAME	XXXXXXXX
SUB-TEST : XX	
PASS COUNT: XXXXX	ERROR COUNT: XXXXX
WRITE DATA: XX	READ DATA : XX
ADDRESS : CCHSS	STATUS : DEE

The address number indicates that the first CC shows a cylinder number, the third H shows a head number, and the last SS shows a sector number. The status number indicates that the first D shows a drive number and the last EE shows an error status code.

CONTENTS

Subtest 1 Sequential read

This test performs Cyclic Redundancy Check (CRC) by reading continuously all tracks (0-39/0-79) on a floppy disk as follows.
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 2 Sequential write/read/compare

This test continuously writes data to all tracks described above, and reads the data and compares it with the original data. (The data pattern "B5ADADH" is repeated.)

Subtest 3 Random address/data

This test writes random data to random address on all tracks described in subtest 1, and reads the data and compares it with the original data.

Subtest 4 Write specified address

This test writes the specified data to the specified tracks and head address, using the keyboard.

Subtest 5 Read specified address

This test reads the specified track and head address which are entered from the keyboard.

Subtest 6 DMA extend test

This test writes and reads the RAM data of more than 1 Mbyte to the FDD and compares it with the original data. Then confirm the DMA function (between fdd and memory of over 1 Mbyte.)

Subtest 3 Wrap around

NOTE: A printer wrap around connector is necessary for executing this test. Wiring diagram of the printer wrap around connector is described in the section 3.26.

This subtest checks data, control and status lines by using a printer wrap around connector.

OPERATION

Subtests 1 and 2

1. When you select the subtest 1 or 2, the following message will appear.

Select the channel number (1-3) ?

Select the printer channel number, then type the selected number. The T8500 supports three printer channels.

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

Subtest 3

1. When you select this subtest, the following message will appear.

Select the channel number (1-3) ?

Select the printer channel number, then type the selected number. The T8500 supports three printer channels.

2. After pressing **Enter**, the following message will appear.

[[[Change DIPSW-5 = ON]]] ?

3. Turn on the DIP switch-5, then press **Enter**. The subtest is executed. Turning on the DIP switch-5 changes the printer port to the input/output mode.

4. After the subtest is completed, the following message will appear.

[[[Change DIP-5 = OFF]]] ?

5. Turn off the DIP switch-5, then press **Enter**.

3.10 ASYNC (RS-232-C) TEST

In subtest 1 to subtest 5, data transmission is done with the following format:

Asynchronous
Speed: 9600 BPS
Data: 8 bits and 1 parity bit (even)
1 stop bit
Data pattern: 20H to 7EH

In subtests 5 to 9, the following message will appear.

Select the channel number (1/2)?

Select the ASYNC channel number, then type the selected number. The T8500 supports two ASYNC channels. After pressing **Enter**, the subtest is executed.

Subtest 1 Wrap around (channel-1)

NOTE: The RS-232-C wrap around connector must be connected to channel 1 to execute this test. The wiring diagram of the RS-232-C wrap around connector is described in section 3.27.

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

Subtest 2 Wrap around (channel-2)

The subtest similar to subtest 1 is performed for the channel 2.

Subtest 3 Wrap around (channel-3)

The subtest similar to subtest 1 is performed for the channel 3.

Subtest 4 Wrap around (channel-4)

The subtest similar to subtest 1 is performed for the channel 4.

Subtest 5 Point to point (send)

NOTE: To execute this subtest, two machines must be connected through the RS-232-C direct cable: one machine being 'send' side and the other being 'receive' side.

The wiring diagram of the RS-232-C direct cable is shown in section 3.25. The subtest 3 executed at one side and the subtest 4 executed at the other side will check the communication capability as follows:

A block of data (20H to 7EH) is sent from one side to the other, and returned back. The returned data is compared with the original one.

This test is used to check whether the returned data is the same as the original one.

Subtest 6 Point to point (receive)

This subtest is used with the subtest 3 as described above.

Subtest 7 300/1200 BPS 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 RS232C line is correct or not. This can be done with the loopback function inside the modem card.

Subtest 8 Card modem on-line test

NOTE: This test requires two machines which are connected to the Private Branch Exchange (PBX). 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 transmission is done in the following mode:

Asynchronous
Speed: 110/300/1200 BPS
Data: 8 bits without parity bit
1 stop bit
Data pattern: 20H to 7EH

In this subtest, data is sent from RS-2332-C at the 'send' side to the card modem at the 'receive' side through the PBX. The 'send' side receives the data returned from the other side for comparison with the original data.

Subtest 9 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-#"

3.11 HARD DISK TEST

CAUTION: The contents of the hard disk will be erased when subtest 2, 3, 4, 6, 8, 9, or 10 runs. Before running the test, transfer the contents of the hard disk to a 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 DIAGNOSTIC TEST MENU and select a subtest menu of the HARD DISK TEST, the following message will appear.

[TEST PARAMETER]

Go to Test
Test Loop : NO
Error Stop : YES
Test Drive number : 1
HDC F/W error retry : YES
Compare error dump : NO
HDC status display : NO

2. If you select the **Go to Test**, then press **Enter** to run the test program.
3. If you select the **Test Loop**, then press **Enter**. The following message will appear.

TEST LOOP

YES NO

If you select **YES**: Each time a test cycle ends, it increments the pass counter by one and repeats the test cycle.

If you select **NO**: At the end of a test cycle, the test execution is terminated and you exit to the subtest menu.

4. If you select **YES**: When an error occurs, the error status is displayed and the execution of the test program stops. At this time, the operation guide is displayed on the right side of the display screen. If you select **NO**: When an error occurs, the error status is displayed then the error counter is incremented by one and you goes to the next test.
5. If you select the **Test Drive number**, then press **Enter**. The following message will appear.

```
[ DRIVE NUMBER ]  
  
1&2  1   2
```

Select the test drive number, then press **Enter**.

6. If you select the **HDC F/W error retry**, then press **Enter**. The following message will appear.

```
[ HDC F/W ERROR RETRY ]  
  
YES   NO
```

This message is used to select whether retry operation is made or not when the hard disk controller detects an error.

Select **YES** or **NO**, and press **Enter**.

7. If you select the **Compare error dump**, then press **Enter**. The following message will appear.

```
[ DATA COMPARE ERROR DUMP ]  
  
YES   NO
```

This message is used to select whether dump operation is made or not when data compare error is detected.

Select **YES** or **NO**, and press **Enter**.

8. If you select the **HDC status display**, then press **Enter**. The following message will appear.

```
[ DETAIL STATUS DISPLAY ]  
  
      YES      NO
```

This message is used to select whether to display the detail status is displayed on the screen or not. The detailed status is described in 3.18. Select **YES** or **NO**, and press **Enter**.

9. During the hard disk test, the message shown below will appear.

```
HARD DISK TEST                                XXXXXXXX  
  
SUB-TEST   : XX  
PASS COUNT : XXXXX          ERROR COUNT : XXXXX  
WRITE DATA : XX           READ DATA  : XX  
ADDRESS    : CCCSS         STATUS     : DSS
```

The ADDRESS number indicates that the first CCC shows a cylinder number, the fourth H shows a head number, and the last SS shows a sector number. The STATUS number (DSS) indicates that the first D shows a drive number and the last SS shows an error status code.

CONTENTS

Subtest 1 Sequential read (CYL.0 - max, CYL.max - 0)

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

Subtest 2 Address uniqueness

1. When 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 three, and press **Enter**.

This subtest writes the address data that is different sector by sector at each track, then reads and compares it with the original data.

This test is done for all tracks.

Subtest 3 Random address/data

This subtest writes random data to random addresses (cylinders, heads and sectors) with random lengths, and reads the data and compares it with the original data.

Subtest 4 Cross talk & peak shift

This subtest writes the eight types of worst pattern data (listed below) while shifting cylinder by cylinder, and reads and compares it.

Worst pattern data

1. B5ADAD
2. 4A5252
3. EB6DB6
4. 149249
5. 63B63B
6. 9C49C4
7. 2DB6DB
8. D24924

Subtest 5 Write/read/compare (CE)

This subtest writes B5ADAD worst pattern data to the CE cylinder and then reads the data out and compares it with the original data.

Subtest 6 Write specified address

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

Subtest 7 Read specified address

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

Subtest 8 ECC check (CE cylinder)

This subtest checks the ECC (Error check and correction) circuit functions to a specified cylinder and head.

Subtest 9 Sequential write

This subtest writes specified data of the two bytes to all cylinder.

Subtest 10 Write/read/compare specified address

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

3.12 REAL TIMER TEST

Subtest 1 Real timer

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

Test procedure is as follows.

1. As this subtest is selected, the following message will appear.

[[[REAL TIMER TEST]]]

Current date: XX-XX-XXXX

Current time: XX:XX:XX

Enter new data:

PRESS [ENTER] KEY TO EXIT TEST

2. If current date is not correct, input a current new date. Press **Enter**, then message **Enter new time:** will appear.
3. If current time is not correct, input a correct current time. Press **Enter** to return to the subtest menu of the REAL TIME CLOCK TEST.

Subtest 2 Backup memory

This subtest writes data (FFH, AAH, 55H and 00H) to 64 bytes of the backup memory, and then reads and compares it with the original data.

Subtest 3 Real time carry

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

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

3.13 NPX TEST

CAUTION: This test cannot be run if NPX is not mounted on the main board.

Subtest 1 NPX (i80387) test

This subtest checks the control word, status word, bus, and addition/multiplication functions for the i80387.

Subtest 2 NPX (WTL3167) test

This subtest checks the control word, status word, bus, and addition/multiplication functions for the WTL3167.

3.14 EXPANSION TEST

CAUTION: If expansion unit is not connected to the system, this subtest cannot be executed.

Subtest 1 XT (8-bit) bus slot wrap around test

To do this subtest, the expansion slot wrap around test card is required to the 8-bit bus.

Using the exclusive board, the following test will be made:

- Clock test (OSC, CLK, ALE)
- Interrupt test (IRQ3.5)
- DMA test (channels 1 and 3, and TC status)
- Data bus test (00H-FFH)
- Address bus test (A0000H - AFFFFH)
- Wait CNT test

Subtest 2 AT (16-bit) bus slot wrap around test

To execute this subtest, the expansion slot wrap around test card is required to the 16-bit bus. This subtest includes subtest 1.

- Clock test (OSC, CLK, ALE, DACKO)
- Interrupt test (IRQ7 ... 3, IRQ14, IRQ12 ... 9)
- DMA#1 test (channel 1 ... 3, TC status)
- Data bus test (00H - FFH)
- Address bus test (A0000H - AFFFFH)
- Memory W/R test
- Wait CNT test
- IO16 test
- MASTER test
- DMA#2 test (channels 5 and 6)
- CCMCS2 test
- MDSPK test (buzzer)
- A17 - 23 test

- Subtest 3 HS (32-bit) bus slot wrap around test
- To do this subtest, the expansion slot wrap around test card is required to the 32-bit bus. This subtest includes the subtest 2.
- Subtest 4 T3100 bus slot wrap around test
- To do this subtest, the T3100 bus test card is required to the option slot.
- Subtest 5 FDD (expansion) <-> PRT port wrap around test
- To do this subtest, the exclusive board is required, so this subtest is not made here.
- Subtest 6 SCSI <-> PRT port wrap around test
- To do this subtest, the exclusive board is required, so this subtest is not made here.
- Subtest 7 HDD wrap around test
- To do this subtest, the exclusive board is required, so this subtest is not made here.

3.15 CACHE MEMORY TEST

Subtest 1 Constant data test

Write, read and compare the following data
(32 Kbytes):

Test data
FFFFH, AAAAH, 5555H, 0101H, 0000H

Subtest 2 Address pattern test

1. Read the 32 Kbytes, and hit it.
2. Write the test data to entire test area.
3. Read and compare the data.

Test data
0000H, 0001H, 0002H 3FFDH, 3FFEH, 3FFFH

Subtest 3 Increment/decrement test

1. Make test using the increment data.
2. Read the 32 Kbytes data, and hit it.
3. Write the test data to the entire test area.
4. Read the data and compare it with original data.
5. Using the decrement data as a test data, execute tests 3 and 4 above.

Test data:
Increment data
00H, 01H, 02H FDH, FEH, FFH
Decrement data
FFH, FEH, FDH 02H, 01H, 00H

Subtest 4 Bit shift pattern test

1. Read the data (32 Kbytes) and hit it.
2. Write the data which shifts 1 bit in increments of 4 bytes.
3. Read the data and compare it with original one.
4. Reverse the bits of the test data, and execute tests 2 and 3.

Subtest 5 Write disturb test

1. Write the background data to the entire area. (FFH)
2. Write the test data to the test area. (00H)
3. Write the background data to areas other than the test area.
4. Read the data from the test area, and compare it with the original one.
5. Write the background data into the test area.
6. Renew the test area, and repeat tests 2 to 5.
7. Using the test data instead of the background data, repeat the tests 1 to 6.

Subtest 6 Checker board test

1. Read the data from all the areas, and hit it.
2. Write the data, which is reversed front/back and left/right (55H and AAH are used alternately each 4 bytes), to all the areas.
3. Read the data and compare it with original one.
4. Reverse the data bits and repeat tests 2 and 3.

Subtest 7 Marching test

1. Read the data (32 Kbytes), and hit it.
2. Write the 00H data to the entire area.
3. Write the 01H data to the test address.
4. Read the data from the test address and compare it with the original one.
5. Write the 00H data to the test address.
6. After adding 1 to the test address, execute the tests 3 and 5.
7. After changing the test data (00H -> 01H, 01H -> 00H), execute tests 3 to 6.

Subtest 8 Walking data test

1. Read the data (32 Kbytes) and hit it.
2. Write the 00H data to the entire area.
3. Write the data whose test bit of the test address is 1 and all other bits are 0, and read and compare the data with the original one.
4. Write the 00H data to the test address.
5. Repeat the tests 3 and 4 above, using each test bit from 0 bit to 7 bit.
6. After adding 1 to the test address, execute the tests 2 to 5 up to the end of address.
7. Reverse the bit of the test data, and execute the tests 2 to 6.

Subtest 9 Caching test

Caching check test

1. Read the data (32 Kbytes) and hit it.
2. Read again the data (32 Kbytes) from the same address, and measure its time length. (Hit all)
3. Read the data (32 Kbytes), which is addressed 2 Kbytes before the test area in 2 above, and measure its time length. (All miss)
4. Compare time lengths in tests 2 and 3 above for judgment (acceptance or rejection).

Cache entry test

1. Using the address of the first 1 byte of one entry (4 bytes), read the data and hit it. (Before this test, it is required to read the data (test address + 32 Kbytes.)
2. Read the remaining 3-byte data.
3. Repeat tests 1 and 2 above 32768 times, and measure its total time length.
4. Make judgment (acceptance or rejection) in comparison with the time length which is preset to be all miss.
5. After adding 1 to the test address (in 1 entry), repeat tests 1 and 4 above.

Cache controller test

1. Write the data in such a manner that miss is caused. (Before this test, it is required to read the data (test address + 32 Kbytes data.) At this time, the data is written to the memory.
2. Read the data. (Miss). The data is written from the memory to cache.
3. Read the data again. (Hit). Read the data from the cache.
4. Judge the data for acceptance or rejection by comparison between data in tests 1 and 3.
5. After adding 1 to the address, repeat tests 1 to 4 above.

3.16 SCSI TEST

CAUTION: This subtest cannot be executed if each SCSI device is not connected to the system unit.

OPERATION

1. When you select the **SCSI TEST** of the **DIAGNOSTIC TEST MENU** and select a subtest menu of the **SCSI TEST**, the following message will appear.

```
[ TEST PARAMETER ]

Go to Test
Test Loop           : YES
Error Stop          : NO
SCSI ID number      : 0
Logical unit number : 0
```

2. If you select the **Go to Test**, then press **Enter** to run the test program.
3. If you select the **Test Loop**, then press **Enter**. The following message will appear.

```
TEST LOOP

YES  NO
```

If you select **YES**: Each time a test cycle ends, it increments the pass counter by one and repeats the test cycle.

If you select **NO**: At the end of a test cycle, the test execution is terminated and you exit to the subtest menu.

4. If you select the **Error Stop**, then press **Enter**. The following message will appear.

<p style="text-align: center;">ERROR STOP</p> <p style="text-align: center;">YES NO</p>
--

If you select **YES**: When an error occurs, the error status is displayed and the execution of the test program stops. At this time, the operation guide is displayed on the right side of the display screen.
If you select **NO**: When error occurs, the error status is displayed then the error counter is incremented by one and you goes to the next test.

5. If you select the **SCSI ID number**, then press **Enter**. The following message will appear.

<p style="text-align: center;">[ID NUMBER]</p> <p style="text-align: center;">0 1 2 3 4 5 6</p>

Select the ID number of the SCSI, then press **Enter**.

6. If you select the **Logical unit number**, then press **Enter**. The following message will appear.

<p style="text-align: center;">[LOGICAL UNIT NUMBER]</p> <p style="text-align: center;">0 1 2 3 4 5 6 7</p>

Select the Logical unit number of the SCSI, then press the **Enter**.

CONTENTS

- Subtest 1 Diagnostic test
- Execute test using the diagnostic command.
- Subtest 2 Direct access device
- Execute test using standard command of this device.
- Applicable standard commands are:
- (1) Test Unit Ready
 - (2) Request Sense
 - (3) Read
 - (4) Write

TEST OPERATION

When the test is executed, the following message will be displayed.

TEST2 DIRECT ACCESS DEVICE

- (1) TUR: Test Unit Ready
- (2) RS : Request Sense
- (3) RD : Read Data
- (4) WRT: Write Data
- (95) Make Write Buffer Data
- (96) RS Data Dump
- (97) Read Buffer Data Dump
- (98) Write Buffer Data Dump
- (99) Exit subtest

COMMAND NUMBER (1 - 4 or 95 - 99)?

After typing the corresponding number of command (1 to 4 or 95 to 99), press **Enter**. Each command can be set.
(Refer to Input Data on Each Command.)
Number 99 is for returning to the SUBTEST MENU.

Subtest 3 Sequential access device

Execute test using standard command of this device.

Applicable standard commands are:

- (1) Test Unit Ready
- (2) Rewind
- (3) Request Sense
- (4) Read
- (5) Write
- (6) Write File Marks

TEST OPERATION

When this test is executed, the following messages will appear.

TEST3 SEQUENTIAL ACCESS DEVICE

- (1) TUR: Test Unit Ready
- (2) REW: Rewind
- (3) RS : Request Sense
- (4) RD : Read
- (5) WRT: Write
- (6) WFM: Write File Marks
- (95) Make Write Buffer Data
- (96) RES Data Dump
- (97) Read Buffer Data Dump
- (98) Write Buffer Data Dump
- (99) Exit subtest

COMMAND NUMBER (1 - 6 or 95 - 99)?

After typing the corresponding number of command (1 to 6 or 95 to 99), press **Enter**. Then each command can be set.

(Refer to Input Data of Each Command.)

Number 99 is for returning to the SUBTEST MENU.

Subtest 4 Printer device

Execute test using standard commands of this device.

Applicable standard commands are:

- (1) Test Unit Ready
- (2) Request Sense
- (3) Print

TEST OPERATION

When this test is executed, the following messages will appear.

TEST 4 PRINTER DEVICE

- (1) **TUR: Test Unit Ready**
- (2) **RS: Request Sense**
- (3) **PRTN: Print**
- (95) **Make Write Buffer Data**
- (96) **RES Data Dump**
- (97) **Read Buffer Data Dump**
- (98) **Write Buffer Data Dump**
- (99) **Exit Subtest**

COMMAND NUMBER (1 - 3 or 95 - 99) ?

After typing the corresponding number of command (1 to 3 or 95 to 99), press **Enter**. Each command can be set.

(Refer to Input Data of Each Command.)
Number 99 is for returning to the SUBTEST MENU.

Subtest 5 Processor Device

Execute test using standard commands of this device.

Applicable standard commands are:

- (1) Test Unit Ready
- (2) Request Sense
- (3) Send

TEST OPERATION

When this test is executed, the following messages will appear.

TEST5 PROCESSOR DEVICE

- (1) TUR : Test Unit Ready
 - (2) RS : Request Sense
 - (3) SEND: Send
 - (95) Make Write Buffer Data
 - (96) RES Data Dump
 - (97) Read Buffer Data Dump
 - (98) Write Buffer Data Dump
 - (99) Exit subtest
- COMMAND NUMBER (1 - 3 or 95 - 99)?

After typing the corresponding number of command (1 to 3 or 95 to 99), press **Enter**. Then each command can be set.

(Refer to Input Data of Each Command.)
Number 99 is for returning to the SUBTEST MENU.

Subtest 6 Worm Device

Execute test using standard commands of this device. Applicable standard commands are:

- (1) Test Unit Ready
- (2) Request Sense
- (3) Read
- (4) Write

TEST OPERATION

When the test is executed, the following messages will appear.

TEST6 WORM DEVICE

- (1) TUR: Test Unit Ready
- (2) RS : Request Sense
- (3) RD : Read Data
- (4) WRT: Write Data
- (95) Make Write Buffer Data
- (96) RES Data Dump
- (97) Read Buffer Data Dump
- (98) Write Buffer Data Dump
- (99) Exit subtest

COMMAND NUMBER (1 - 4 or 95 - 99)?

After typing the corresponding number of command (1 to 4 or 95 to 99), press **Enter** key.

Then each command can be set.

(Refer to Input Data of the Each Command.)
Number 99 is for returning to the SUBTEST MENU.

Subtest 7 Read only device

Execute the test using standard commands of this device. Applicable standard commands are:

- (1) Test Unit Ready
- (2) Request Sense
- (3) Read

TEST OPERATION

When the test is executed, the following messages will appear.

TEST7 READ ONLY DEVICE

- (1) TUR: Test Unit Ready
- (2) RS : Request Sense
- (3) RD : Read Data
- (95) Make Write Buffer Data
- (96) RS Data Dump
- (97) Read Buffer Data Dump
- (98) Write Buffer Data Dump
- (99) Exit subtest

COMMAND NUMBER (1 - 3 or 95 - 99) ?

After typing the corresponding number of command (1 to 3 or 95 to 99), press **Enter**. Then each command can be set. (Refer to Input Data of Each Command.) Number 99 is for returning to the SUBTEST MENU.

Input Data of Each Command

TUR:

Specify the data in response to the following prompt.

CONTROL BYTE (0/0-FF)?

REW:

Specify the on-line or off-line in response to the following prompt.

CONTROL BYTE (0/0-FF)?

ONLINE or OFFLINE (1:ONLINE/2:OFFLINE)?

RS:

Specify the read status data length in response to the following prompt.

CONTROL BYTE (0/0-FF)?

READ STATUS DATA LENGTH (0/0-FF)?

RD, WRT, PRN, SEND:

For devices other than sequential access devices, specify the logical block number and transfer block number in response to the following prompt.

CONTROL BYTE (0/0-FF)?

LOGICAL BLOCK NUMBER (0/0-FFFF)?

TRANSFER BLOCK NUMBER (1/0-FF)?

For sequential access devices, specify the transfer block number in response to the following prompt.

CONTROL BYTE (0/0-FF)?

TRANSFER BLOCK NUMBER HIGH (0/0-FFFF)?

TRANSFER BLOCK NUMBER LOW (1/0-FF)?

WFM:

Specify the file marks number in response to the following prompt.

CONTROL BYTE (0/0-FF)?

FILE MARKS NUMBER (1/0-FF)?

(95) Make Write Buffer Data:

In test 4, **PRINT DATA INPUT** will be displayed.
In test 5, **SEND DATA INPUT** will be displayed.
In other tests, **WRITE DATA INPUT** will be displayed.

After that, the following data will be display.

KIND OF DATA MAKE TYPE
(1:INCREMENT DATA 2:FIXED DATA 3:DATA INPUT) ?

In response to this prompt, specify the data make type.

When specifying "1", the buffer data will be made with "0000" - "FFFF" increment data.

When specifying "2", the buffer data will be made with fixed data, using the data to be specified in response to the following prompt.

FIXED DATA MAKE (0/0 - FFFF) ?

When specifying "3", the data will be input in response to the following prompt, and the buffer data will be generated using this input data at the same time.

DATA INPUT (0/0 - FFFF) ?

Data make will be terminated by pressing **Enter**.

(96) RES Data Dump:

Only 256 bytes of the request sense buffer is dumped. At end of dump, the following message will be displayed.

CONTINUE (C/E)?

To terminate dump, press "**C**", "**E**" or **Enter**.

**(97) Read Buffer Data Dump / (98) Write Buffer Data
Dump:**

Dump read or write buffer in units of 512 bytes.
The following message will be displayed every 512
bytes.

CONTINUE (C/E) ?

Press "C" or **Enter** to dump the next address.
To terminate dump, press "E".
Dump will be displayed up to 64 Kbytes in units of
512 bytes.

3.17 CASSETTE STREAMER MT (CMT) TEST

CAUTION: This test cannot be executed if there is no cassette streamer connected to the system unit.

OPERATION

1. When you select the **CMT TEST** on the **DIAGNOSTIC TEST MENU** and select a subtest menu of the **CMT TEST**, the following message will appear.

[TEST PARAMETER]

Go to Test	
Test Loop	: YES
Error Stop	: NO
CMT ID number	: 0
Logical unit number	: 0
Tape capacity	: 40MB

2. If you select the **Go to Test**, then press **Enter** to run the test program.
3. If you selects the **Test Loop**, then press **Enter**. The following message will appear.

TEST LOOP

YES NO

If you select **YES**: Each time a test cycle ends, it increments the pass counter by one and repeats the test cycle.

If you select **NO**: At the end of a test cycle, the test execution is terminated and you exit to the subtest menu.

4. If you select the **Error Stop**, then press **Enter**. The following message will appear.

<p>ERROR STOP</p> <p>YES NO</p>
--

If you select **YES**: When an error occurs, the error status is displayed and the execution of the test program stops. At this time, the operation guide is displayed on the right side of the display screen. If you select **NO**: When an error occurs, the error status is displayed then the error counter is incremented by one and you goes to the next test.

5. If you select the **CMT ID number**, then press **Enter**. The following message will appear.

<p>[ID NUMBER]</p> <p>0 1 2 3 4 5 6</p>

Select the ID number of the CMT, then press **Enter**.

6. If you select the **logical unit number**, then press **Enter**. The following message will appear.

<p>[LOGICAL UNIT NUMBER]</p> <p>0 1 2 3 4 5 6 7</p>

Select the logical unit number of the CMT, then press the **Enter**.

7. If you select the **tape capacity**, then press **Enter**. The following message will appear.

Tape capacity (XXMB)

Select the capacity number of the CMT, press **Enter**.

CONTENTS

Subtest 1 Command test 1

1. Execute write (WRT) command: writing 16 continuous data blocks with the following data pattern.

1st block	00H
2nd block	01H
3rd block	02H
:	:
16th block	0FH

2. Execute write filemarks (WFM) command: writing 5 pairs of file mark and data block with the following data pattern.

1st block	11H
2nd block	22H
:	:
5th block	55H

3. Execute WFM command with number of filemarks being 00H.
4. Execute WFM command: writing 16 continuous filemark blocks.

5. Execute WRT command: writing 16 continuous data blocks with the following data pattern.

1st block	10H
2nd block	11H
:	:
15th block	1EH
16th block	1FH
6. Execute WFM command: writing 4 continuous filemark blocks.
7. Execute REW command for rewinding.
8. Initialize read buffer as FFH, then read 1 data block by RD command.
9. Confirm that the first data block of read buffer is 00H and the next data block is FFH.
10. Execute space (SP) command, with code as 00 and count as 00H.
11. Execute SP command, with count as 0FH.
12. Execute RD command, reading 1 data block. At this time, confirm that error end (error status 01H) is caused.
13. Execute RD command: reading 1 data block and confirming that the data is 11H.
14. Execute SP command, with code as 01H and count as 00H.
15. Execute SP command, with code as 01H and count as 04H.
16. Execute RD command: reading 1 data block.
17. Confirm that data is 55H.
18. Execute SP command, with code as 10 and count as 00H.
19. Execute SP command, with code as 10 and count as 10H.
20. Execute RD command: reading 16 data blocks.
21. Confirm the data read in 18 above. For the data, refer to 5.

22. Execute SP command, with code at 11 and count as 00H
23. Execute REW command.

Table 3-3 Data used for cassette streamer test

00H 01H 02H : 0DH 0EH 0FH	Data block 16 continuous data blocks
Filemarks (FM) 11H (FM) 22H (FM) 33H (FM) 44H (FM) 55H	5 pairs of file marks and data blocks
(FM) (FM) : (FM) (FM)	16 continuous filemarks
10H 11H : 1EH 1FH	16 continuous data blocks
(FM) (FM) (FM) (FM)	4 continuous filemarks

Subtest 2 Command test 2

1. Lock cassette (LOC) test
 - 1.1 Execute LOC command, with Lock at "1".
At this time, message that confirms the lamp is lit will be displayed, prompting the operator to confirm it.
 - 1.2 Execute LOC command, with Lock at "0".
At this time, the message that confirms the lamp goes off will be displayed, prompting the operator to confirm it.
2. Execute Erase (ERA) command, with Imd at "0".
At end of operation, confirm that operation is finished normally.

TEST OPERATION

1. When you select the subtest 2, the following message will appear.

CHECK Ok? (1:YES/2:NO)

2. You check the LED on the cassette streamer MT. While the LED is lit, select **Yes** (type 1 and press **Enter**). If the LED is not lit, select **No** (type 2 and press **Enter**).

Subtest 3 Data write read compare test

1. Set the block number at the leading 4 bytes of each block, and write 40MB data.
2. Execute REW command, and rewind it.
3. Read the 40MB data, then compare it with the original data.

TEST OPERATION

When you select the subtest 3, set the size of cassette streamer MT.

Subtest 4 Data read only test

Read the 40MB data.

TEST OPERATION

When you select the subtest 4, set the size of cassette streamer MT.

3.18 ERROR CODES AND ERROR STATUS NAMES

CAUTION: This subtest cannot be executed if each SCSI device is not connected to the system unit.

Table 3-4 shows the error codes and error status names.

Table 3-4 Error codes and error status names

Device Name	Error Code	Status Name
COMMON	FF	Compare Error
SYSTEM	01	ROM Checksum Error
MEMORY	01	Parity Error
	02	Protected Mode Not Change Error
FDD	01	Bad Command Error
	02	Address Mark Not Found
	03	Write Protected
	04	Record Not Found
	06	Media Removed On Dual Attach Card
	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 (Not Ready)
EE	Write Buffer Error	

Table 3-4 Error Codes and Error Status Names (Continued)

Device Name	Error Code	Status Name
PRINTER	01	Time Out
	08	Fault
	10	Select Line
	20	Out Of Paper
	40	Power Off
	80	Busy Line
ASYNC (RS-232-C)	01	[DTR ON] Time Out
	02	[CTS ON] Time Out
	04	[RX EMPTY] Time Out
	08	[TX FULL] Time Out
	10	Parity Error
	20	Framing Error
	40	Overrun Error
	80	Line Status Error
	88	Modem Status Error
	33	No Carrier (CARD MODEM)
	34	Error (CARD MODEM)
36	No Dial Tone (CARD MODEM)	
HDD	01	Bad Command Error
	02	Bad Address Mark
	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
	BB	Undefined Error
	CC	Write Fault
	E0	Status Error
F0	Not Sense Error (HW code = FFH)	

Table 3-4 Error Codes and Error Status Names (Continued)

Device Name	Error Code	Status Name
NPX	01	No Co-processor
	02	Control Word Error
	03	Status Word Error
	04	Bus Error
	05	Additional Error
	06	Multiple Error
EXPANSION	01	Data Compare Error
	02	Address Compare Error
	03	Clock Test Error
	04	Interrupt Test Error
	05	DMA T/C Flag Error
	06	Status Error
	07	Signal Check Error
	08	No Interrupt
	FE	Protect Mode Set Error
CACHE	01	Memory Parity Error
	02	Protect Mode Error
	03	Caching Error
SCSI	01	Bad Command or Check Condition
	03	Drive Selection Failed
	04	Target Drive Busy
	05	SCSI Bus Time Out Error
	09	64K Bytes Boundary Error
	0C	Reservation Conflict
CMT	01	Bad Command or Check Condition
	03	Drive Selection Failed
	04	Target Drive Busy
	05	SCSI Bus Time Out Error
	09	64K Bytes Boundary Error
	0C	Reservation Conflict

3.19 RUNNING TEST

3.19.1 Program description

This program automatically runs the following tests in sequence.

1. System test : Subtest 1
2. Memory test : Subtests 1, 2, 3, 4 and 6
3. Display test: Subtests 1 to 8
4. FDD test* : Subtest 2
5. Printer test: Subtest 3 (Wrap around connector is required.)
6. HDD test : Subtests 1 and 5
7. Real timer : Subtest 2
8. SCSI : Subtest 1

In FDD test, the number of the FDDs is judged automatically ("1" = 1 unit and "0" = 2 units).

3.19.2 Operation

1. When you select the **RUNNING TEST** of the **DIAGNOSTICS MENU**, the following message will appear.

**Mount the DIAGNOSTIC disk on the drive,
then press [Enter] key.**

2. Confirm that the diagnostic disk is put in the FDD, then press **Enter**. The following message will appear.

[TEST PARAMETER]

Go to Test
HDD drive number : 1
RS232C CH#1 wrap around : YES
RS232C CH#2 wrap around : YES
Printer wrap around : YES

3. If you select the **Go to Test**, then press **Enter**. The following message will appear.

**Mount the work disk on the drive,
then press [Enter] key.**

Remove the diagnostics disk from the FDD, then insert a work disk into the FDD and press **Enter**. The running test program is executed.

4. If you select the **HDD drive number**, then press **Enter**. The following message will appear.

[DRIVE NUMBER]

1&2 1 2

Select the HDD drive number, then press **Enter**.

5. If you select the **RS232C CH#1 wrap around**, then press **Enter**. The following message will appear.

[RS232C(CH#1) TEST]

YES NO

If you select **YES**: Run the RS-232-C CH#1 wrap around test. (Before selecting **YES**, connect an RS-232-C wrap around connector to the SERIAL1 connector on the rear of the unit.)

If you select **NO**: Skip this test.

6. If you select the **RS232C CH#2 wrap around**, then press **Enter**. The following message will appear.

```
[ RS232C(CH#2) TEST ]  
  
YES NO
```

If you select **YES**: Run the RS-232-C CH#2 wrap around test. (Before selecting **YES**, connect an RS-232-C wrap around connector to the SERIAL2 connector on the rear of the unit.)

If you select **NO**: Skip this test.

7. If you select the **Printer wrap around**, then press **Enter**. The following message will appear.

```
[ PRINTER TEST ]  
  
YES NO
```

If you select **YES**: Run the printer wrap around test. (Before selecting **YES**, connect an printer wrap around connector to the PRT connector on the rear of the unit.)

If you select **NO**: Skip this test.

3.20 DISK UTILITIES

3.20.1 Program description

DISKUTILITIES program include four programs, FDD FORMAT, FDD COPY, HARD DISK FORMAT, and HEAD CLEANING.

(1) FDD FORMAT

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

This program can format floppy disks (5.25-inch/3.25-inch) as follows.

1. 2D: Double-sided, double-density, 48/67.5 TPI, MFM mode, 512 bytes and 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 and 18 sectors/track.

(2) FDD COPY

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

(3) 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: Before running the program, transfer the data stored on the hard disk onto a floppy disk to avoid that data will be erased, using the MS-DOS BACKUP command. (See the MS-DOS manual for details.)

1. **All track format**

Perform physical formatting of hard disk as shown below.

(In the case of 100 MB)

Sector sequences:3

Cylinders: 0 to 775

Heads: 0 to 7

Sectors: 1 to 33

Sector length: 512 bytes/sector

Formatting per bad track: (max. 100 tracks)

2. **Good track format**

Formats the specified cylinders and track as good tracks.

3. **Bad track format**

Formats the specified cylinder and track as bad tracks.

4. **Bad track check** (execution time: 90 seconds)

Checks all the area of the hard disk for bad tracks by reading, and lists the check result.

(4) HEAD CLEANING

This program executes head loading operations to clean the head of the FDD, using an exclusive cleaning disk.

3.20.2 Operation

1. Select **DISK UTILITIES**, then press **Enter**. The following message will appear.

```
[ DISK UTILITIES ]

1. FDD FORMAT
2. FDD COPY
3. HARD DISK FORMAT
4. HEAD CLEANING
99. EXIT TO DIAGNOSTICS MENU
```

2. If you select the **FDD FORMAT**, then press **Enter**. The following message will appear.

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

Select a drive number, press **Enter**. The following message will appear.

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

Select a media-drive type number, then press **Enter**. The message similar to the following will appear.

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

Remove the diagnostics disk from the FDD and insert a work disk; press any key. The following message will appear; formatting 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 following message will appear.

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

If you type 1 and press **Enter**, the display will return to the **Insert target disk into drive A:** message in above. If you type 2, the display will return to the diagnostics menu.

3. If you select the **FDD COPY**, then press **Enter**. The following message will appear.

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

Select a media/drive type number, and type its number. The following message will appear.

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

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

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

Copy start

[[track, head = XXX X]]

Remove the source disk from the FDD, then insert a work disk (formatted) and press any key. The **[[track, head = XXX X]]** message will appear, then copy to the work disk will start. If copy cannot be done by one operation, the **Insert work disk into drive A:** message in above 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) ?

If you type 1, the display will return to the **Insert word disk into drive A:** message in above. If you type 2, the display will return to the diagnostics menu.

4. If you select the **HARD DISK FORMAT**, then press **Enter**. The following message will appear.

```
DIAGNOSTIC - HARD DISK FORMAT[33Stype]: VX.XX
1 - All track FORMAT
2 - Good track FORMAT
3 - Bad track FORMAT
4 - Bad track CHECK
9 - Exit to DIAGNOSTICS MENU
```

```
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.)
```

(A) **1-All track FORMAT** Selection

When **All track FORMAT** (1) is selected, the following message will appear.

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

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

Interleave number (3/1-3) ?

Select an interleave number. (Usually select 3.) 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]]
```

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

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

Press the **Enter** to return to the HARD DISK FORMAT menu.

(B) **2-Good track FORMAT or 3-Bad track FORMAT**
Selection

When **Good track FORMAT** or **Bad track FORMAT** is selected, the following message will appear.

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

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

Interleave number (3/1-3) ?

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

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

Press [track number (CCCH)] key ?

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.

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

Press the **Enter** to return to the HARD DISK FORMAT menu.

(C) **4-Bad track CHECK Selection**

When **Bad track CHECK** is selected, the following message will appear.

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

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

Interleave number (3/1-3) ?

Select an interleave number. (Usually select 3.) Type the number and press **Enter**. Then 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

[[cylinder,head = XXX X]]

After checking the bad tracks of the hard disk, the Format complete message will appear.

Press the **Enter** to return to the HARD DISK FORMAT menu.

5. If you select the **HEAD CLEANING**, then press **Enter**. The following message will appear.

HEAD CLEANING

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

After the above message appears, remove the Diagnostics disk, insert the cleaning disk, and press any key. The following message will appear.

Head cleaning starts with **Cleaning start** displayed on the screen.

After completion of head cleaning, **DIAGNOSTICS MENU**, shown in Section 3.2, will resume on the screen.

3.21 LOG UTILITIES

3.21.1 Program description

This program logs error information generated , while a test is in progress; the information is stored in the RAM. However if the POWER switch is turned off the error information will lost. The error information itself is displayed as the following.

1. Error count (CNT)
2. Test name (TEST)
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. Error status name

This program can store data on a floppy disk or output information to a printer.

Error information equivalent to three screen images can be logged.

3.21.2 Operation

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

XXXX ERRORS										
CNT	TEST	NAME	PASS	STS	ADDR	WD	RD	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

↑ ↑ ↑ ↑ ↑ ↑ ↑ ↑
 Error count Test name Subtest number Pass count Error status Address Write data Read data Error status name

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

NOTE: When the error retry is OK, "R" is prefixed to the error status, but the error count is not increased.

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 DIAGNOSTIC 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.

3.22 SYSTEM CONFIGURATION

3.22.1 Program Description

This program displays the following system configuration.

1. BIOS ROM version
2. Base memory size
3. Number of floppy disk drives
4. Number of asynchronous comms. ports
5. Number of hard disk drives
6. Number of printer ports
7. Expansion memory size
8. Co-processor (i80387) present or not
9. Co-processor (WTL3167) present

3.22.2 Operation

Select **SYSTEM CONFIGURATION** and **Enter** in DIAGNOSTICS MENU.
Then, the following system configuration will be displayed.

```
[ SYSTEM CONFIGURATION ]  
  
* - BIOS ROM VERSION - VX.XX  
* - 640KB MEMORY  
* - 1 FLOPPY DISK DRIVE(S)  
* - 2 ASYNC ADAPTERS  
* - 1 HARD DISK DRIVE(S)  
* - 1 PRINTER ADAPTER  
* - 1024KB EXPANSION MEMORY SIZE  
* - 0 MATH CO-PROCESSOR  
* - 1 MATH WTL3167 CO-PROCESSOR
```

PRESS [ENTER] KEY

NOTE: The 1 MATH WTL3167 CO-PROCESSOR message is displayed when the WTL3167 connect to the main board.

To return to the DIAGNOSTICS MENU, press **Enter**.

3.23 SETUP

3.23.1 Program description

This program displays the current system setup information as listed below, which can be changed automatically or manually.

1. Memory mapping (conventional memory, ROM copy, and expansion memory)
2. Display type
3. Hard disk type

Memory mapping

The **Conventional** option allows you to configure the first Mbyte on the memory map. Each symbol (*, +, .) represents 32 Kbytes of RAM. An * represents conventional memory, + represents expanded memory, and . represents memory not installed or not designated for that area of the memory map. Use ← or → select 640 or 512 Kbytes of conventional memory.

The **ROM copy** option enables or disables the ROM copy function. Use ← or → to toggle between **Y** and **N**. **Y** enables and **N** disables ROM copy for video BIOS and **YY** enables and **NN** disables ROM copy for system BIOS. The .s that appear on the memory map over the **Ys** represent memory reserved for the ROM copy function.

The **ROM copy** option also configures the remaining 384 or 128+384 Kbytes of the first Mbytes of the memory map. There are two options:

1. After disabling ROM copy for video and system BIOS, press ← or →: Configures the remainder of the first Mbyte of the memory map as undesignated and the rest of the memory map as extended memory. The **Expansion** option depicts all extended memory. The **Expansion** option depicts all extended memory and cannot be altered.
2. All other settings: Configures the remainder of the first Mbyte of the memory map as expanded memory. This allows you to configure the rest of the memory map as expanded or extended memory using the **Expansion** option.

The Expansion option configures the extended memory area of the memory map. Each symbol (**V**, **+**, **.**), a unit, represents 512 Kbytes of RAM (**v** represents 384 Kbytes of RAM). All of this memory is initially configured as expanded memory. Each time you press **←** or **→**, a unit of RAM is configured as extended memory, until all memory is extended memory. The next **←** or **→**, you press configures all this memory as expanded memory. Press **←** or **→** again and the next unit of memory is configured as extended memory. **V** and **v** represent extended memory, **+** represents expanded memory, and **.** represents memory not installed.

Display type

The Display type option configures the system to emulate the display protocol for the monitor attached to the T8500's video controller emulates VGA, EGA, CGA, and MDA protocols. Use **←** or **→** to select:

VGA/EGA for an enhanced graphics adapter or video graphics array monitor.

CGA40 for a 40-character-per-line color graphics adapter monitor.

CGA80 for a 80-character-per-line color graphics adaptor monitor.

MDA for a monochrome display adaptor monitor.

Display mode is automatically selected by the T8500.

NOTE: If you use an external display controller, you must disable the internal display controller; use configuration switch 4.

Hard disk type

Hard disk type is automatically selected. The T8500 supports two hard disk. The specifications of your hard disk drive(s) should be displayed. The display is in the form:

= type cap (cyl- heads- sec/trk)

where type is an arbitrary disk number identifying the type of disk drive, cap is the drive's recording capacity, cyl is its number of cylinders, heads is its number of head, and sec/trk is its number of sectors per track. No drive means that a disk drive is not installed. Possible drive types are:

= 0	No Drive
= 6	40MB (805- 4- 26)
= 7	40MB (979- 5- 17)
= 8	48MB (613- 6- 26)
= 9	100MB (776- 8- 33)

At present only type 9 hard disk drives are available for the T8500.

3.23.2 Operation

To select the SETUP program, highlight 0. **SETUP**, by using ← or →, then press **Enter**. The system setup menu will appear:

```
[[ System setup ]]
Memory mapping
      0          512 640      1MB
Conventional *****+...+... (*=Conventional memory)
ROM copy          Y   YY (Y=Yes, N=No)
                  (*=Expanded memory)
Expansion  0 1 2 3 4 5 6 7 8 9 A B C D E F (V,v=Extended memory)
(0.5MB/Col.) --VV..... (. =not installed)
                  (x=not use)

Display type
      *VGA/EGA *CGA40 *CGA80 *MDA      (*CGA-Color Graphics card)
                  (*MDA-Monochrome Display card)

Hard disk type
Unit0 = 9      100MB ( 776- 8- 33)
Unit1 = 0      No Drive

↑↓ moves between items, ←→ selects values
F1 exits, F5 sets default, F10 records changes
```

The system setup menu displays the current memory configuration, and display and hard disk type . The example menu above displays the default values. To return to the diagnostics menu, press **F1**.

Setting

To display the system setup menu type:
TEST8CE, highlight **0. SETUP** by using ← or →, then press
Enter. The system setup menu will appear.

The default values shown on the example system setup menu in the previous section.

To restore default values:

1. Press **F5**. The default values will be displayed on the system setup menu.
2. If these are the values you want to set press **F10**, otherwise continue with step 3. You will be prompted with:

ARE YOU SURE ? (N)

Type **Y**, then press **Enter**. The system will automatically reset with the default values.

3. If you decide not to change the current configuration to default values, press **F1**. You will be returned to the diagnostics menu.

Next we will explain how to change your configuration. Details on each item on the system setup menu will follow.

To select your own configuration:

1. From the MS-DOS prompt type: **TEST8CE**, highlight **0. SETUP**, by using ← or →, then press **Enter**. The system setup menu will appear with the first item on the menu highlighted.
2. Use **Enter**, ← and → to highlight the item you want to change. **Enter** or → moves the highlight to the item above and ← to the item below.
3. Use ← or → to select the value you want to set.

<p>NOTE: At any time if you decide not to make changes, press F1 to return to the diagnostics menu.</p>

4. When you have selected the desired values, press **F10** to implement your changes and recorded the new configuration in RTC memory.
5. The following message is displayed:

ARE YOU SURE ? (N)

If you are sure you want to make the changes you selected, press **Y**. The system is automatically restarted.

If you change your mind, press **N**, and continue with step 2.

If an error occurs, the following message appears:

WARNING : CMOS RAM CHIP MALFUNCTIONING. HIT A KEY TO CONTINUE.

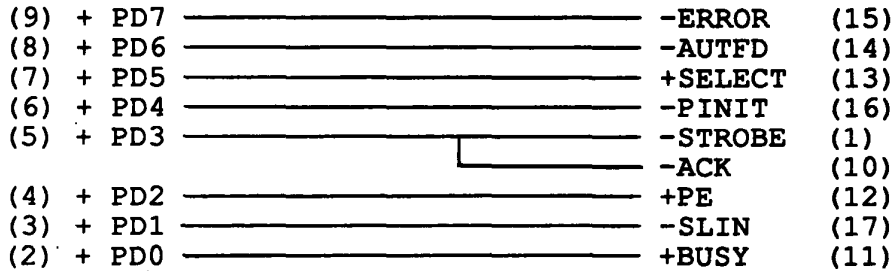
Press any key to continue. The computer should reset.

3.24 DISPLAY ADJUST

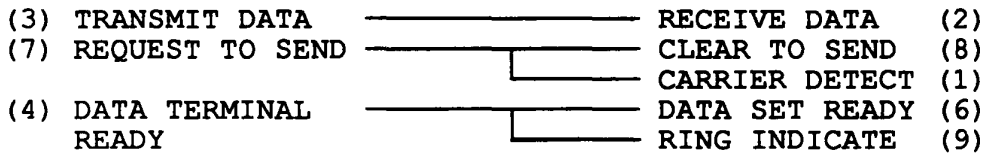
NOTE: This test program doesn't use.

3.25 WIRING DIAGRAM

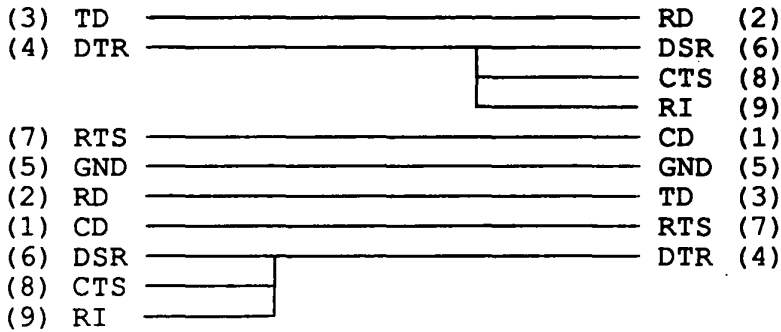
3.25.1 Printer wrap around connector



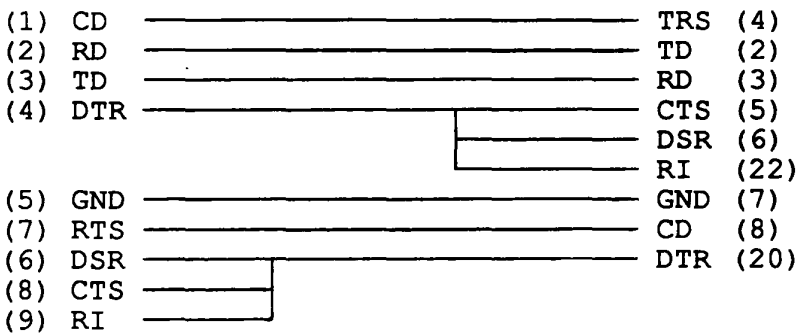
3.25.2 RS-232-C wrap around connector



3.25.3 RS-232-C direct cable (9-pin to 9-pin)



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



**APPENDIX A
BOARD LAYOUT**

1. MAIN BOARD (ICs)

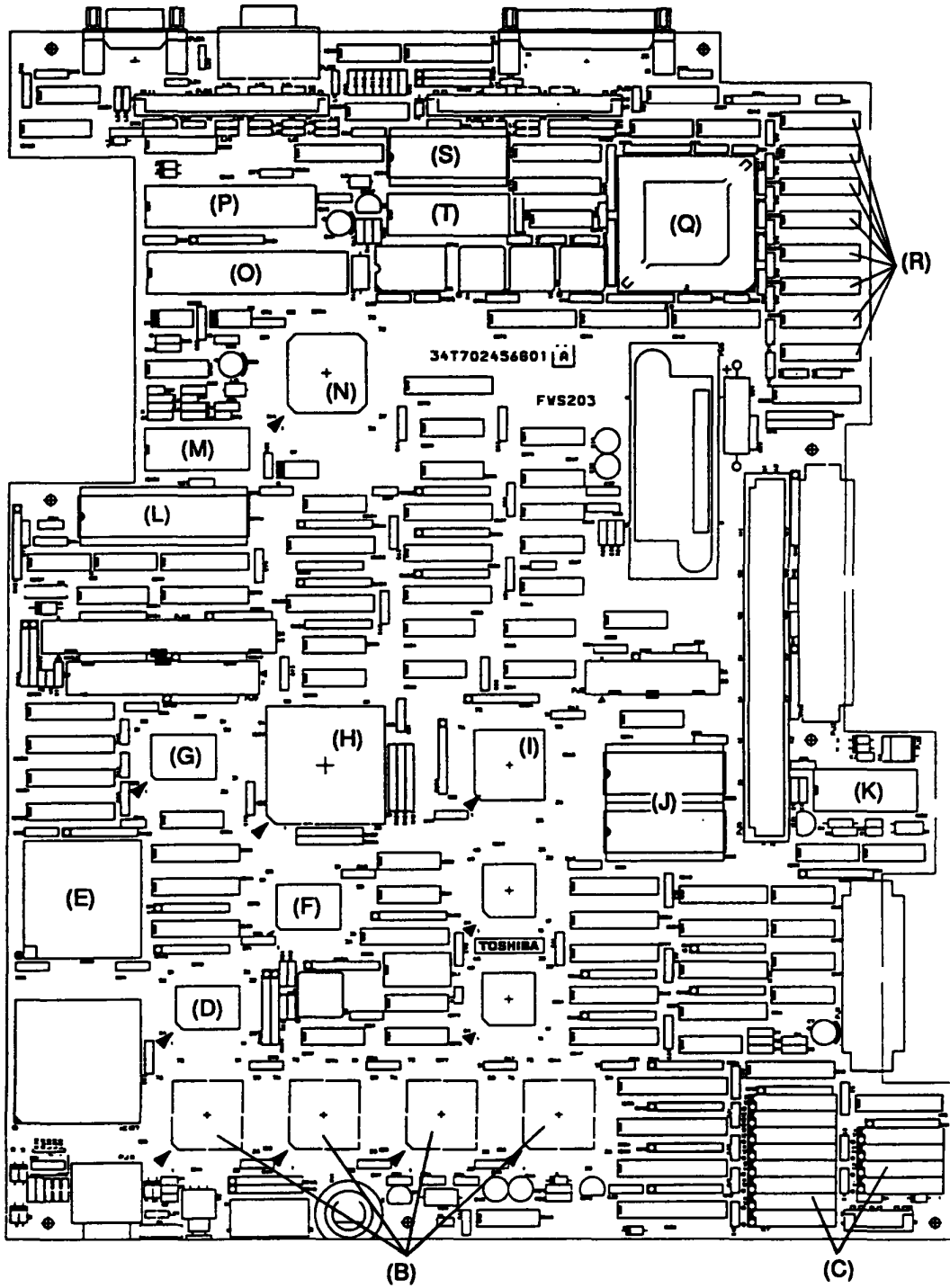


Figure A-1 Main board (ICs)

(A) CPU: Central Processing Unit (A80386-20/25)
(B) CMC: Cache memory controller (T9490)
(C) DRAMs
(D) GA-CACCNT: Cache controller gate array
(E) NPX socket: Numeric Processor Extension socket
(80387-20/25, WTL3167)
(F) GA-CCNT: Controller gate array
(G) GA-BCNT: Bus controller gate array
(H) GA-OWADR2: Address gate array
(I) Supper integration (T4758A)
(J) System BIOS ROMs
(K) RTC: Real time clock (MC146818P)
(L) KBC: Keyboard controller (8742)
(M) VFO: Variable frequency oscillator (MB4108A)
(N) SI: Supper integration (T9761)
(O) SPC: SCSI interface controller (MB89352)
(P) SIO: Serial input/output controller (TC8570)
(Q) PVGA1: Paradise video graphics array
(R) VRAMs
(S) VGA BIOS ROM
(T) D/A converter

2. MAIN BOARD (CONNECTORS)

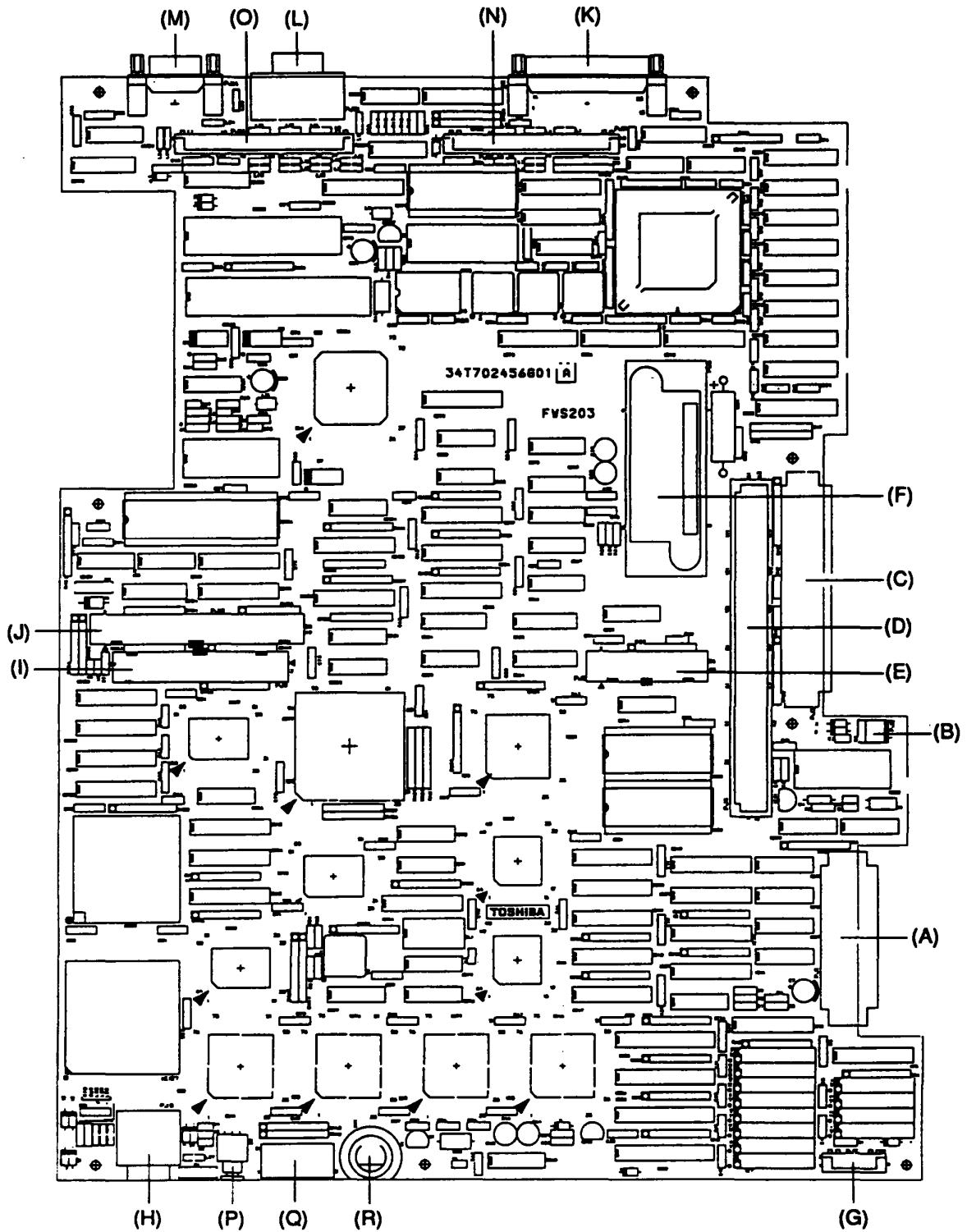


Figure A-2 Main board (connectors)

- (A) PJ1: Expansion memory I/F connector
- (B) PJ2: Lithium battery connector
- (C) PJ3: T3100 bus connector
- (D) PJ4: Mother board connector
- (E) PJ5: FDD connector
- (F) PJ6: Power supply connector
- (G) PJ7: LED/Speaker connector
- (H) PJ8: Keyboard connector
- (I) PJ9: HDC connector
- (J) PJ10: Internal SCSI connector
- (K) PJ11: PRT connector
- (L) PJ13: RGB connector
- (M) PJ14: SERIAL2 connector
- (N) PJ15: Connector board I/F connector 1
- (O) PJ16: Connector board I/F connector 2
- (P) NMI switch
- (Q) DIP switch
- (R) Sound volume

3. PC-BUS MOTHER BOARD

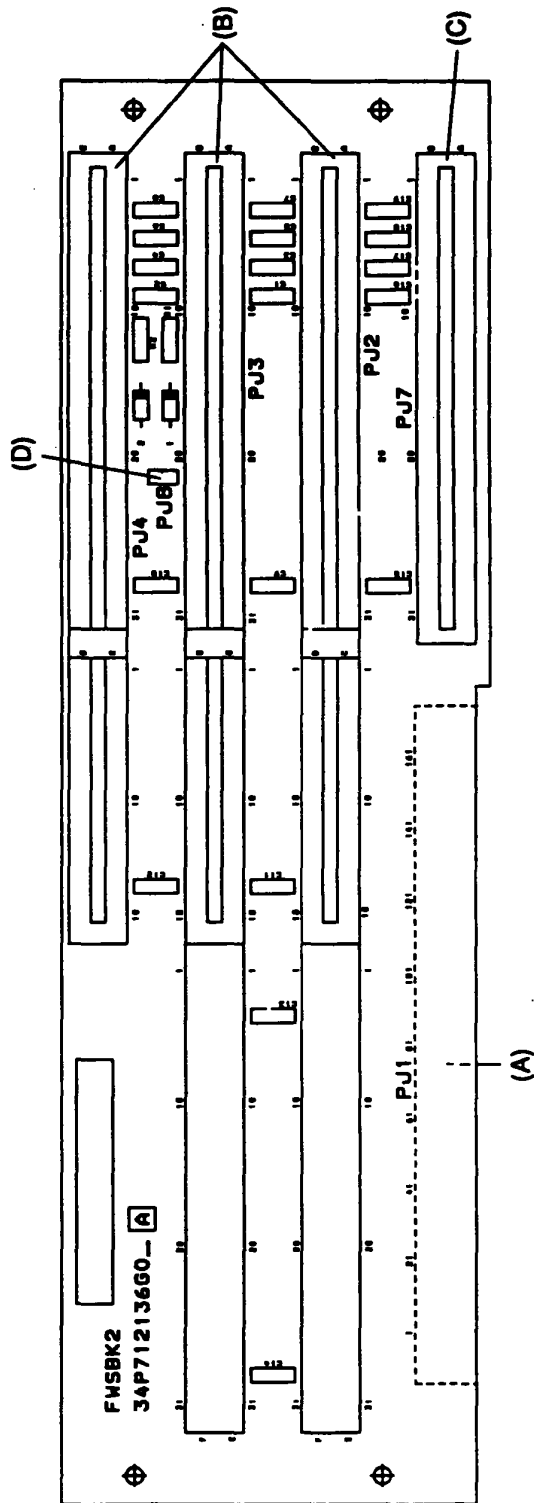


Figure A-3 PC-bus mother board

- (A) PJ1: Mother board connector
- (B) PJ2,3,4: PC AT expansion connector 1 (62 and 36 pin)
- (C) PJ5,6: Expansion connector 2 (62 pin)
- (D) PJ7: PC/XT Expansion Connector (36 pin)
- (E) PJ8: Jumper

4. SPEAKER BOARD

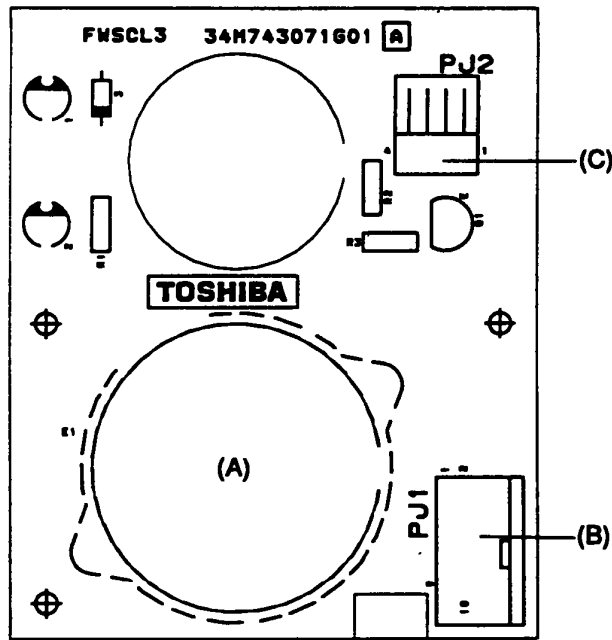


Figure A-4 Speaker board

- (A) Speaker
- (B) PJ1: Speaker board connector
- (C) Key switch connector

5. T3100 SUPPORT BOARD

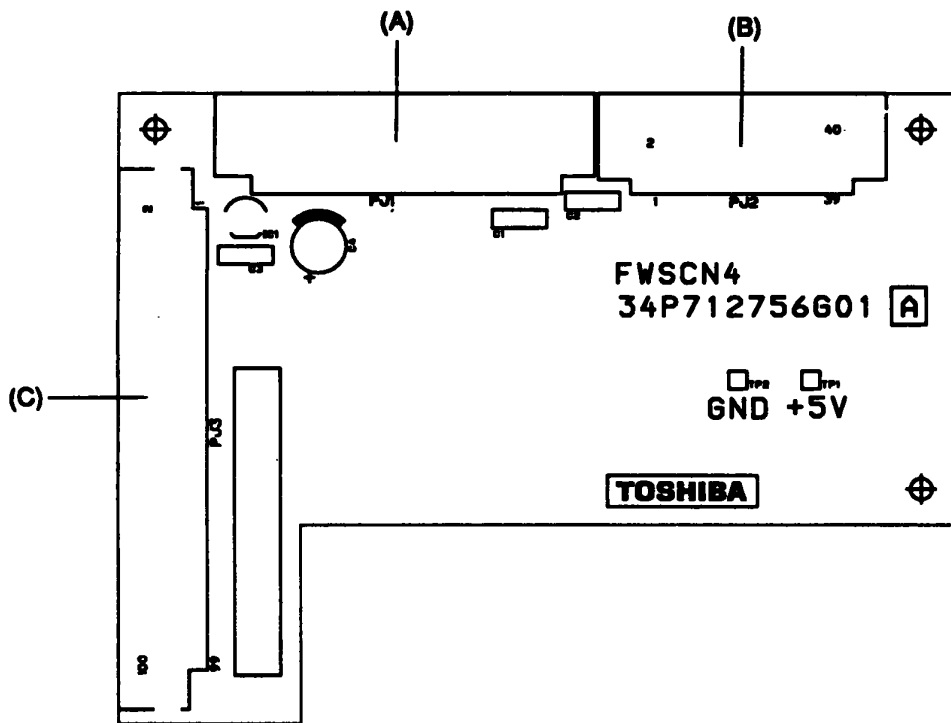


Figure A-5 T3100 support board

- (A) PJ1 :T3100 Expansion bus connector (60 pin)
- (B) PJ2 :T3100 Expansion bus connector (40 pin)
- (C) PJ3 :T3100 bus connector (100 pin)

6. CONNECTOR BOARD

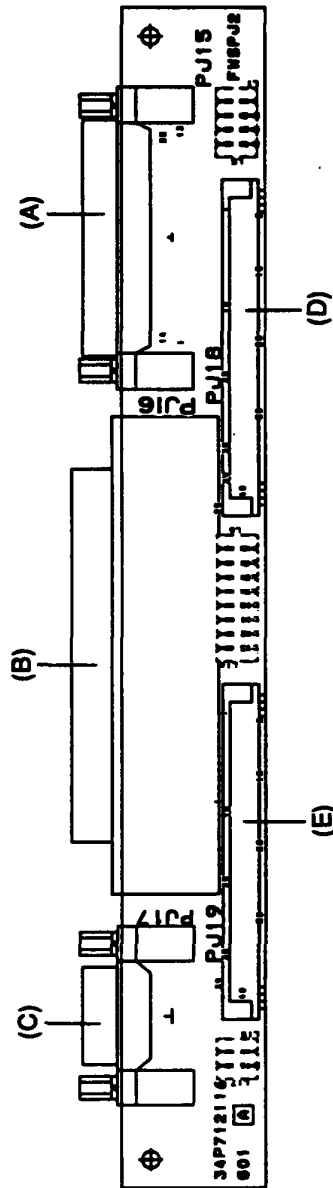


Figure A-6 Connector board

- (A) PJ15: External FDD connector
- (B) PJ16: SCSI connector
- (C) PJ17: SERIAL1 connector
- (D) PJ18: Flexible connector 1
- (E) PJ19: Flexible connector 2

APPENDIX B
PIN ASSIGNMENT

1. MAIN BOARD

Table B-1 PJ1:Memory board I/F connector

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
01		GND	35	I/O	BD29;100
02		VCC	36	I/O	BD30;100
03	I/O	BD00;100	37	I/O	BD31;100
04	I/O	BD01;100	38		VCC
05	I/O	BD02;100	39		GND
06	I/O	BD03;100	40	0	MA00;100
07	I/O	BD04;100	41	0	MA01;100
08	I/O	BD05;100	42	0	MA02;100
09	I/O	BD06;100	43	0	MA03;100
10	I/O	BD07;100	44	0	MA04;100
11		GND	45	0	MA05;100
12	I/O	BD08;100	46	0	MA06;100
13	I/O	BD09;100	47	0	MA07;100
14	I/O	BD10;100	48	0	MA08;100
15	I/O	BD11;100	49	0	MA09;100
16	I/O	BD12;100	50		GND
17	I/O	BD13;100	51	0	RAS1;000
18	I/O	BD14;100	52	0	RAS2;000
19	I/O	BD15;100	53	0	RAS3;000
20		GND	54	0	RAS4;000
21	I/O	BD16;100	55	0	RAS5;000
22	I/O	BD17;100	56	0	RAS6;000
23	I/O	BD18;100	57	0	RAS7;000
24	I/O	BD19;100	58	0	MWE;100
25	I/O	BD20;100	59	0	MPD0;100
26	I/O	BD21;100	60	0	MPD1;100
27	I/O	BD22;100	61	0	MPD2;100
28	I/O	BD23;100	62	0	MPD3;100
29		GND	63	0	CAS0;100
30	I/O	BD24;100	64	0	CAS1;100
31	I/O	BD25;100	65	0	CAS2;100
32	I/O	BD26;100	66	0	CAS3;100
33	I/O	BD27;100	67		VCC
34	I/O	BD28;100	68		GND

Table B-2 PJ3:T3100 bus connector

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
01	O	SIOCS;000	46	O	DACK2;000
02	O	COMCLK;110	47	I/O	SA11;100
03	I	MDSPK;000	48	I/O	SA08;100
04	I	MIRQ;000	49		GND
05	I	IRQ9;100	50	O	BALE;100
06		M12V	51	I/O	SA09;100
07	I/O	SD05;100	52	I/O	SA06;100
08	I/O	SD03;100	53	O	TC;100
09	O	RSTDRV;100	54	I	MEM16;000
10		VCC	55	I/O	SA07;100
11	I/O	SD04;100	56	I/O	SA04;100
12		SD02;100	57		GND
13		VCC	58	I	IRQ10;100
14		P12V	59	I/O	SA05;100
15	I/O	SD06;100	60	I/O	SA02;100
16	I/O	SD01;100	61	I	IO16;000
17		DRQ2;100	62	O	DACK6;000
18	O	SMEMR;000	63	I/O	SA03;100
19	I/O	SD07;100	64	I/O	SD09;100
20	I/O	SD00;100	65	I	DRQ5;100
21	O	SMEMW;000	66		GND
22	I/O	SIOR;000	67	I/O	SD08;100
23	I	IOCHCK;000	68	I/O	SD11;100
24	O	AEN;100	69	I	DRQ6;100
25	I/O	SIOW;000	70	I	MASTER;000
26	I	DRQ3;100	71	I/O	SD10;100
27	I	IOCHRY;100	72	I/O	SD13;100
28	I/O	SA18;100	73		N/C
29	O	DACK3;000	74	I	IRQ11;100
30	I	DRQ1;100	75	I/O	SD12;100
31	I/O	SA19;100	76	I/O	SD15;100
32	I/O	SA16;100	77		GND
33	O	DACK1;000	78		GND
34	O	SYSClk;100	79	I/O	SD14;100
35	I/O	SA17;100	80	I/O	MEMR;000
36	I/O	SA14;100	81	O	DACK5;000
37	I/O	RERESH;000	82		GND
38	I	IRQ6;100	83	I/O	MEMW;000
39	I/O	SA15;100	84	I/O	LA18;100
40	I/O	SA12;100	85	I	IRQ14;100
41	I	IRQ7;100	86	I	IRQ12;100
42	I	TIRQ4;100	87	I/O	LA17;100
43	I/O	SA13;100	88	I/O	LA20;100
44	I/O	SA10;100	89		GND
45	I	IRQ5;100	90		GND

Table B-2 PJ3:T3100 bus connector (continued)

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
91	I/O	LA19;100	96	I/O	SBHE;000
92	I/O	LA22;100	97		GND
93		VCC	98	I/O	SA00;100
94		VCC	99	I/O	LA23;100
95	I/O	LA21;100	100	I/O	SA01;100

Table B-3 PJ2:Lithium battery connector

PIN	I/O	SIG.NAME
01		GND
02		N/C
03	I	BATT;100

Table B-4 PJ4:Mother board connector

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
01	O	BLUE;100	46		GND
02	O	CVDISP;100	47	I/O	LA25;100
03	I/O	SD20;100	48	I/O	LA26;100
04	I/O	SD17;100	49	I	ETRDY;100
05	O	SRED;100	50		GND
06	O	RED;100	51	I/O	LA27;100
07	I/O	SD21;100	52	I/O	LA28;100
08	I/O	SD18;100	53	O	ETHLDA;100
09	O	SGREEN;100	54		VCC
10	O	XGREEN;100	55		GND
11	I/O	SD23;100	56	I/O	LA30;100
12	I/O	SD19;100	57	I	ETHOLD;000
13	O	CLOCK;120	58		GND
14	O	SBLUE;100	59	I/O	LA31;100
15	I/O	SD24;100	60		GND
16	I/O	SD22;100	61		N/C
17		GND	62		GND
18	O	CVSYNC;100	63	I/O	SA01;100
19	I/O	SD25;100	64	I/O	LA23;100
20	I/O	SD16;100	65	I/O	SA00;100
21		GND	66		GND
22		VCC	67	I/O	SBHE;000
23	I/O	SD26;100	68	I/O	LA21;100
24	O	CHSYNC;100	69		VCC
25		GND	70		VCC
26		GND	71	I/O	LA22;100
27	I/O	SD27;100	72	I/O	LA19;100
28		VCC	73		GND
29	I/O	SBE3;000	74		GND
30		GND	75	I/O	LA20;100
31	I/O	SD28;100	76	I/O	LA17;100
32		GND	77	I	IRQ12;100
33	I/O	SBE2;000	78	I	IRQ14;100
34		VCC	79	I/O	LA18;100
35	I/O	SD29;100	80	I/O	MEMW;000
36		VCC	81	I	DRQ0;100
37	I/O	SBE1;000	82	O	DACK5;000
38		GND	83	I/O	MEMR;000
39	I/O	SD30;100	84	I/O	SD14;100
40		SD31;100	85	O	DACK0;000
41	I/O	SBE0;000	86	I	IRQ15;100
42		GND	87	I/O	SD15;100
43	I/O	ETSTB;000	88	I/O	SD12;100
44		LA24;100	89	I	IRQ11;100
45	I/O	SWR;100	90	I	DRQ7;100

Table B-4 PJ4:Mother Board connector (continued)

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
91	I/O	SD13;100	C7	I/O	SA14;100
92	I/O	SD10;100	C8	I/O	SA17;100
93	I	MASTER;000	C9	O	SYSCLK;100
94	I	DRQ6;100	D0	O	DACK1;000
95	I/O	SD11;100	D1	I/O	SA16;100
96	I/O	SD08;100	D2	I/O	SA19;100
97	O	DACK7;000	D3	I	DRQ1;100
98	I	DRQ5;100	D4	O	DACK3;000
99	I/O	SD09;100	D5	I/O	SA18;100
A0	I/O	SA03;100	D6	I	IOCHRY;100
A1	O	DACK6;000	D7	I	DRQ3;100
A2	I	IO16;000	D8	I/O	SIOW;000
A3	I/O	SA02;100	D9	O	AEN;100
A4	I/O	SA05;100	E0	I	IOCHCK;000
A5	I	IRQ10;100	E1	I/O	SIOR;000
A6	O	OSC;100	E2	O	SMEMW;000
A7	I/O	SA04;100	E3	I/O	SD00;100
A8	I/O	SA07;100	E4	I/O	SD07;100
A9	I	MEM16;000	E5	O	SMEMR;000
B0	O	TC;100	E6	I	DRQ2;100
B1	I/O	SA06;100	E7	I/O	SD01;100
B2	I/O	SA09;100	E8	I/O	SD06;100
B3	O	BALE;100	E9		P12V
B4	I	IRQ3;100	F0		M5V
B5	I/O	SA08;100	F1	I/O	SD02;100
B6	I/O	SA11;100	F2	I/O	SD04;100
B7	O	DACK2;000	F3		N/C
B8	I	IRQ5;100	F4	O	RSTDRV;100
B9	I/O	SA10;100	F5	I/O	SD03;100
C0	I/O	SA13;100	F6	I/O	SD05;100
C1	I	IRQ4;100	F7		M12V
C2	I	IRQ7;100	F8	I	IRQ9;100
C3	I/O	SA12;100	F9		VCC
C4	I/O	SA15;100	G0		GND
C5	I	IRQ6;100	G1		GND
C6	I/O	RERESH;000	G2		VCC

Table B-5 PJ5:3.5" FDD connector

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
01		VCC	14	O	STEP;010
02	I	INDEX;000	15		GND
03		VCC	16	O	WRDATA;010
04	O	SWFDA;010	17		GND
05		VCC	18	O	WGATE;000
06	I	DSKCHG;000	19		GND
07		VCC	20	I	TRACK0;000
08	I	READY;000	21		GND
09		VCC	22	I	WPROTC;000
10	O	SWMONA;010	23		GND
11	O	LOWDNS;000	24	I	RDDA;000
12	O	FDCDRC;010	25		GND
13		GND	26	O	SIDE;010

Table B-6 PJ6:Power supply connector

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
01		VCC	09		VCC
02		GND	10		GND
03		VCC	11		P12V
04		GND	12		GND
05		VCC	13		M12V
06		GND	14		GND
07		VCC	15		M5V
08		GND	16		PONO;000

Table B-7 PJ7:LED/Speaker connector

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
01	I	KYLOCK;000	06		VCC
02	I	PSON;000	07	O	SEL8M;010
03		GND	08		GND
04	O	SPKVCC;100	09		VCC
05	I	SPKON;000	10	O	ACTSLV;000

Table B-8 PJ8:Keyboard connector

PIN	I/O	SIG.NAME
01	O	KBCK;100
02	O	KBDATA;100
03	O	KBRST;000
04		GND
05	O	KBPWR;100

Table B-9 PJ9:HDC connector

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
01	O	HRESET;000	21		N/C
02		GND	22		GND
03	I/O	HSD07;100	23	O	HIOW;000
04	I/O	HSD08;100	24		GND
05	I/O	HSD06;100	25	O	HIOR;000
06	I/O	HSD09;100	26		GND
07	I/O	HSD05;100	27		N/C
08	I/O	HSD10;100	28		N/C
09	I/O	HSD04;100	29		N/C
10	I/O	HSD11;100	30		GND
11	I/O	HSD03;100	31	I	IRQ14;100
12	I/O	HSD12;100	32	I	HIO16;000
13	I/O	HSD02;100	33	O	HSA01;100
14	I/O	HSD13;100	34		N/C
15	I/O	HSD01;100	35	O	HSA00;100
16	I/O	HSD14;100	36	O	HSA02;100
17	I/O	HSD00;100	37	O	HDDCS0;010
18	I/O	HSD15;100	38	O	HDDCS1;010
19		GND	39	I	ACTSLV;000
20		N/C	40		GND

Table B-10 PJ10:SCSI connector (internal)

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
01		GND	26	O	TERMPW;100
02	I/O	SCPD0;000	27		GND
03		GND	28		GND
04	I/O	SCPD1;000	29		GND
05		GND	30		GND
06	I/O	SCPD2;000	31		GND
07		GND	32	O	ATN;000
08	I/O	SCPD3;000	33		GND
09		GND	34		GND
10	I/O	SCPD4;000	35		GND
11		GND	36	I/O	BSY;000
12	I/O	SCPD5;000	37		GND
13		GND	38	O	SCACK;000
14	I/O	SCPD6;000	39		GND
15		GND	40		RST;000
16	I/O	SCPD7;000	41	O	GND
17		GND	42	I	MSG;000
18	I/O	SCPDP;000	43		GND
19		GND	44	I/O	SEL;000
20		GND	45		GND
21		GND	46	I	CD;100
22		GND	47		GND
23		GND	48	I	REQ;000
24		GND	49		GND
25		GND	50	I	IO;100

Table B-11 PJ11:PRT connector

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
01	O	STROBE;010	14	O	AUTFD;010
02	O	PD00;120	15	I	PERROR;000
03	O	PD01;120	16	O	PINIT;010
04	O	PD02;120	17	O	SLIN;010
05	O	PD03;120	18		GND
06	O	PD04;120	19		GND
07	O	PD05;120	20		GND
08	O	PD06;120	21		GND
09	O	PD07;120	22		GND
10	I	ACK;000	23		GND
11	I	PBUSY;100	24		GND
12	I	PE;100	25		GND
13	I	SELECT;100			

Table B-12 PJ13:RGB connector

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
01	O	AREDO	09		N/C
02		GND	10		N/C
03	O	AGRENO	11		N/C
04		GND	12		GND
05	O	ABLUEO	13		N/C
06		GND	14	O	AHSCO
07		N/C	15	O	AVSNCO
08		GND			

Table B-13 PJ14:SERIAL2 connector

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
01	I	MDDCD;100	06	O	MDDSR;100
02	I	MDRXD;100	07	O	MDRTS;100
03	O	MDTXD;100	08	O	MDCTS;100
04	O	MDDTR;100	09	I	MDRI;100
05		GND			

Table B-14 PJ15:Connector board I/F connector 1

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
01	I/O	IO;100	21	I	ETRAK0;000
02		GND	22		GND
03	I/O	SEL;000	23	O	EXDRC;000
04		GND	24		GND
05	I/O	MSG;000	25	O	EWPRTC;000
06		GND	26		GND
07	I/O	REQ;000	27	I	ERDDA;000
08		GND	28		GND
09	I/O	CD;100	29	I	EDKCHG;000
10		GND	30		GND
11	O	TERMPW;100	31	O	EXWDT;000
12	O	TERMPW;100	32		GND
13	O	EXRATE;010	33	O	EXMONB;000
14		GND	34		GND
15	I	EREADEY;000	35	O	EXSTEP;000
16		GND	36		GND
17	I	EINDEX;000	37	O	EXFWE;000
18		GND	38		GND
19	O	EXSIDE;010	39	O	EXFDB;000
20		GND	40		GND

Table B-15 PJ16:Connector board I/F connector 2

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
01	O	SDDTR;100	21	I/O	SCID2;110
02		GND	22		GND
03	O	SDRTS;100	23	I/O	SCID3;110
04		GND	24		GND
05	O	SDTD;100	25	I/O	SCID4;110
06		GND	26		GND
07	I	SDRI;100	27	I/O	SCID5;110
08		GND	28		GND
09	I	SDCTS;100	29	I/O	SCID6;110
10		GND	30		GND
11	I	SDRD;100	31	I/O	SCID7;110
12		GND	32		SCIDP;110
13	I	SDDSR;100	33	I/O	BSY;000
14		GND	34		GND
15	I	SDCD;100	35	I/O	RST;000
16		GND	36		GND
17	I/O	SCID0;000	37	I/O	SCACK;000
18		GND	38		GND
19	I/O	SCID1;000	39	I/O	ATN;000
20		GND	40		GND

2. CONNECTOR BOARD

Table B-16 PJ15:External FDD connector

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
01	I	READY;000	14	O	RATE;000
02	I	INDEX;000	15	O	SIDE;000
03	I	TRACK0;000	16	O	DRC;000
04	I	WPROTC;000	17	O	STEP;010
05	I	RDDA;000	18		GND
06	I	DSKCHG;000	19		GND
07		N/C	20		GND
08		N/C	21		GND
09		N/C	22		GND
10	O	FDB;010	23		GND
11	O	MONB;010	24		GND
12	O	WDT;010	25		GND
13	O	WE;010			

Table B-17 PJ16:SCSI connector

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
01		GND	26	I/O	DB00;100
02		GND	27	I/O	DB01;100
03		GND	28	I/O	DB02;100
04		GND	29	I/O	DB03;100
05		GND	30	I/O	DB04;100
06		GND	31	I/O	DB05;100
07		GND	32	I/O	DB06;100
08		GND	33	I/O	DB07;100
09		GND	34	I/O	DBP;000
10		GND	35		GND
11		GND	36		GND
12		GND	37		GND
13		N/C	38	O	TERMPW;100
14		GND	39		GND
15		GND	40		GND
16		GND	41	O	ATN;010
17		GND	42		GND
18		GND	43	I/O	BSY;010
19		GND	44	O	ACK;010
20		GND	45	O	RST;010
21		GND	46	I	MSG;010
22		GND	47	I/O	SEL;010
23		GND	48	I	CD;010
24		GND	49	I	REQ;010
25		GND	50	I	IO;010

Table B-18 PJ17:SERIAL1 connector

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
01	I	DCD;100	06	I	DSR;100
02	I	RD;100	07	O	RTS;110
03	O	DTD;110	08	I	CTS;100
04	O	DTR;110	09	I	RI;100
05		GND			

Table B-19 PJ18:Flexible connector 1

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
01		GND	21		GND
02	O	FDB;000	22	O	SIDE;000
03		GND	23		GND
04	O	WE;000	24	I	INDEX;000
05		GND	25		GND
06	O	STEP;000	26	I	READY;000
07		GND	27		GND
08	O	MONB;000	28	O	RATE;000
09		GND	29	O	TERMPW;100
10	O	WDT;000	30	O	TERMPW;100
11		GND	31		GND
12	I	DSKCHG;000	32	I	CD;100
13		GND	33		GND
14	I	RDDA;000	34	I	REQ;000
15		GND	35		GND
16	I	WPROTC;000	36	I	MSG;000
17		GND	37		GND
18	O	DRC;000	38	I/O	SEL;000
19		GND	39		GND
20	I	TRACK0;000	40	I	IO;100

Table B-20 PJ19:Flexible connector 2

PIN	I/O	SIG.NAME	PIN	I/O	SIG.NAME
01		GND	21		GND
02	O	ATN;000	22	I/O	BD01;100
03		GND	23		GND
04	O	ACK;000	24	I/O	BD00;100
05		GND	25		GND
06	O	RST;000	26	I	DCD;100
07		GND	27		GND
08	I/O	BSY;000	28	I	DSR;100
09	I/O	BDP;100	29		GND
10	I/O	BD07;100	30	I	RD;100
11		GND	31		GND
12	I/O	BD06;100	32	I	CTS;100
13		GND	33		GND
14	I/O	BD05;100	34	I	RI;100
15		GND	35		GND
16	I/O	BD04;100	36	O	DTD;100
17		GND	37		GND
18	I/O	BD03;100	38	O	RTS;100
19		GND	39		GND
20	I/O	BD02;100	40	O	DTR;100

APPENDIX C
DISPLAY CODES

Table C-1 Display codes

HEXA DECIMAL VALUE	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	BLANK (NULL)	▶	BLANK (SPACE)	0	@	P	'	p	Ç	É	á				α	≡
1	☺	◀	!	1	A	Q	a	q	ü	æ	í				β	±
2	☹	↑	"	2	B	R	b	r	é	Æ	ó				Γ	≥
3	♥	!!	#	3	C	S	c	s	â	ô	ú				π	≤
4	♦	¶	\$	4	D	T	d	t	ä	ö	ñ				Σ	∫
5	♣	§	%	5	E	U	e	u	à	ò	Ñ				σ	∫
6	♠	■	&	6	F	V	f	v	â	û	ä				μ	÷
7	•	↓	'	7	G	W	g	w	ç	ù	ö				τ	≈
8	●	↑	(	8	H	X	h	x	ê	ÿ	ï				ϕ	°
9	○	↓	)	9	I	Y	i	y	ë	Ö	Γ				θ	•
A	●	→	*	:	J	Z	j	z	è	Ü	∟				Ω	•
B	♂	←	+	;	K	[	k	{	ï	ç	½				δ	√
C	♀	∟	,	<	L	\	l	!	î	£	¼				∞	n
D	♪	↔	-	=	M	]	m	}	î	¥	i				φ	2
E	♪	▲	.	>	N	^	n	~	Ä	P†	ø				€	■
F	⚙	▼	/	?	O	_	o	Δ	Å	f	»				∩	BLANK FF

APPENDIX D
KEYBOARD SCAN/CHARACTER CODES

Table D-1 Keyboard scan/character codes

KEYBOARD	SCAN/CHARACTER CODE	KEYBOARD	SCAN/CHARACTER CODE
Esc	01/1B	n	31/6E
1	02/31	m	32/6D
2	03/32	,	33/2C
3	04/33	.	34/2E
4	05/34	/	35/2F
5	06/35	.	37/2A
6	07/36	Space	39/20
7	08/37	F1	3B/00
8	09/38	F2	3C/00
9	0A/39	F3	3D/00
0	0B/30	F4	3E/00
-	0C/2D	F5	3F/00
=	0D/3D	F6	40/00
Backspace	0E/08	F7	41/00
Tab	0F/09	F8	42/00
q	10/71	F9	43/00
w	11/77	F10	44/00
e	12/65	F11	85/00
r	13/72	F12	86/00
t	14/74	Home	47/00
y	15/79	Up Arrow	48/00
u	16/75	PgUp	49/00
i	17/69	-	4A/2D
o	18/6F	Left Arrow	4B/00
p	19/70	Center Key	4C/00
[	1A/5B	Right Arrow	4D/00
]	1B/5D	+	4E/2B
Enter	1C/0D	End	4F/00
a	1E/61	Down Arrow	50/00
s	1F/73	PgDn	51/00
d	20/64	Ins	52/00
f	21/66	Del	53/00
g	22/67	Enter	E0/0D
h	23/68	/	E0/2F
j	24/6A	PrtSc	--
k	25/6B	Pause	--
l	26/6C	Home	47/E0
;	27/3B	Up Arrow	48/E0
'	28/27	PageUp	49/E0
'	29/60	Left Arrow	4B/E0
\	2B/5C	Right Arrow	4D/E0
z	2C/7A	End	4F/E0
x	2D/78	Down Arrow	50/E0
c	2E/63	Page Down	51/E0
v	2F/76	Insert	52/E0
b	30/62	Delete	53/E0

Table D-1 Keyboard scan/character codes (continued)

KEYBOARD	SCAN/CHARACTER CODE	KEYBOARD	SCAN/CHARACTER CODE
Shift Esc	01/1B	Shift N	31/4E
Shift !	02/21	Shift M	32/4D
Shift @	03/40	Shift <	33/3C
Shift #	04/23	Shift >	34/3E
Shift \$	05/24	Shift ?	35/3F
Shift %	06/25	Shift .	37/2A
Shift ^	07/5E	Shift Space	39/20
Shift &	08/26	Shift F1	54/00
Shift *	09/2A	Shift F2	55/00
Shift (	0A/28	Shift F3	56/00
Shift)	0B/29	Shift F4	57/00
Shift _	0C/5F	Shift F5	58/00
Shift +	0D/2B	Shift F6	59/00
Shift Backspace	0E/08	Shift F7	5A/00
Shift Tab (Backtab)	0F/00	Shift F8	5B/00
Shift Q	10/51	Shift F9	5C/00
Shift W	11/57	Shift F10	5D/00
Shift E	12/45	Shift F11	87/00
Shift R	13/52	Shift F12	88/00
Shift T	14/54	Shift 7	47/37
Shift Y	15/59	Shift 8	48/38
Shift U	16/55	Shift 9	49/39
Shift I	17/49	Shift -	4A/2D
Shift O	18/4F	Shift 4	4B/34
Shift P	19/50	Shift 5	4C/35
Shift {	1A/7B	Shift 6	4D/36
Shift }	1B/7D	Shift +	4E/2B
Shift Enter	1C/0D	Shift 1	4F/31
Shift A	1E/41	Shift 2	50/32
Shift S	1F/53	Shift 3	51/33
Shift D	20/44	Shift 0	52/30
Shift F	21/46	Shift .	53/2E
Shift G	22/47	Shift Enter	E0/0D
Shift H	23/48	Shift /	E0/2F
Shift J	24/4A	Shift PrtSc	--
Shift K	25/4B	Shift Pause	--
Shift L	26/4C	Shift Home	47/E0
Shift :	27/3A	Shift Up Arrow	48/E0
Shift "	28/22	Shift PgUp	49/E0
Shift `	29/7E	Shift Left Arrow	4B/E0
Shift |	2B/7C	Shift Right	4D/E0
Shift Z	2C/5A	Shift End	4F/E0
Shift X	2D/58	Shift Down Arrow	50/E0
Shift C	2E/43	Shift PgDn	51/E0
Shift V	2F/56	Shift Insert	52/E0
Shift B	30/42	Shift Delete	53/E0

Table D-1 Keyboard scan/character codes (continued)

KEYBOARD	SCAN/CHARACTER CODE	KEYBOARD	SCAN/CHARACTER CODE
Ctrl Esc	01/1B	Ctrl n	31/0E
Ctrl 1	--	Ctrl m	32/0D
Ctrl 2	03/00	Ctrl ,	--
Ctrl 3	--	Ctrl .	--
Ctrl 4	--	Ctrl /	--
Ctrl 5	--	Ctrl	96/00
Ctrl 6	07/1E	Ctrl Space	39/20
Ctrl 7	--	Ctrl F1	5E/00
Ctrl 8	--	Ctrl F2	5F/00
Ctrl 9	--	Ctrl F3	60/00
Ctrl 0	--	Ctrl F4	61/00
Ctrl -	0C/1F	Ctrl F5	62/00
Ctrl =	--	Ctrl F6	63/00
Ctrl Backspace	0E/7F	Ctrl F7	64/00
Ctrl Tab	94/00	Ctrl F8	65/00
Ctrl q	10/11	Ctrl F9	66/00
Ctrl w	11/17	Ctrl F10	67/00
Ctrl e	12/05	Ctrl F11	89/00
Ctrl r	13/12	Ctrl F12	8A/00
Ctrl t	14/14	Ctrl Home	77/00
Ctrl y	15/19	Ctrl Up Arrow	8D/00
Ctrl u	16/15	Ctrl PgUp	84/00
Ctrl i	17/09	Ctrl Keypad-	8E/00
Ctrl o	18/0F	Ctrl Left Arrow	73/00
Ctrl p	19/10	Ctrl Center	8F/00
Ctrl [	1A/1B	Ctrl Right Arrow	74/00
Ctrl]	1B/1D	Ctrl Keypad+	90/00
Ctrl Enter	1C/0A	Ctrl End	75/00
Ctrl a	1E/01	Ctrl Down Arrow	91/00
Ctrl s	1F/13	Ctrl PgDn	76/00
Ctrl d	20/04	Ctrl Ins	92/00
Ctrl f	21/06	Ctrl Del	93/00
Ctrl g	22/07	Ctrl Enter	E0/0A
Ctrl h	23/08	Ctrl /	95/00
Ctrl j	24/0A	Ctrl PrtSc	72/00
Ctrl k	25/0B	Ctrl Break	00/00
Ctrl l	--	Ctrl Home	77/E0
Ctrl ;	--	Ctrl Up	8D/E0
Ctrl ' (left)	--	Ctrl PageUp	84/E0
Ctrl ' (right)	--	Ctrl Left	73/E0
Ctrl \	2B/1C	Ctrl Right	74/E0
Ctrl z	2C/1A	Ctrl End	75/E0
Ctrl x	2D/18	Ctrl Down	91/E0
Ctrl c	2E/03	Ctrl PageDown	76/E0
Ctrl v	2F/16	Ctrl Insert	92/E0
Ctrl b	30/02	Ctrl Delete	93/E0

Table D-1 Keyboard scan/character codes (continued)

KEYBOARD	SCAN/CHARACTER CODE	KEYBOARD	SCAN/CHARACTER CODE
Alt Esc	01/00	Alt z	2C/00
Alt 1	78/00	Alt x	2D/00
Alt 2	79/00	Alt c	2E/00
Alt 3	7A/00	Alt v	2F/00
Alt 4	7B/00	Alt b	30/00
Alt 5	7C/00	Alt n	31/00
Alt 6	7D/00	Alt m	32/00
Alt 7	7E/00	Alt ,	33/00
Alt 8	7F/00	Alt .	34/00
Alt 9	80/00	Alt /	35/00
Alt 0	81/00	Alt	37/00
Alt -	82/00	Alt Space	39/00
Alt =	83/00	Alt F1	68/00
Alt Backspace	0E/00	Alt F2	69/00
Alt Tab	A5/00	Alt F3	6A/00
Alt q	10/00	Alt F4	6B/00
Alt w	11/00	Alt F5	6C/00
Alt e	12/00	Alt F6	6D/00
Alt r	13/00	Alt F7	6E/00
Alt t	14/00	Alt F8	6F/00
Alt y	15/00	Alt F9	70/00
Alt u	16/00	Alt F10	71/00
Alt i	17/00	Alt F11	8B/00
Alt o	18/00	Alt F12	8C/00
Alt p	19/00	Alt Keypad-	4A/00
Alt [	1A/00	Alt Keypad+	4E/00
Alt]	1B/00	Alt Enter	A6/00
Alt Enter	1C/00	Alt /	A4/00
Alt a	1E/00	Alt Print Screen	--
Alt s	1F/00	Alt Pause	--
Alt d	20/00	Alt Home	97/00
Alt f	21/00	Alt Up	98/00
Alt g	22/00	Alt PageUp	99/00
Alt h	23/00	Alt Left	9B/00
Alt j	24/00	Alt Right	9D/00
Alt k	25/00	Alt End	9F/00
Alt ;	27/00	Alt Down	A0/00
Alt '	28/00	Alt PageDown	A1/00
Alt	29/00	Alt Insert	A2/00
Alt \	2B/00	Alt Delete	A3/00