1.1 GENERAL

Toshiba Personal Computer is a compact and advanced portable personal computer. The T5200 is a high-performance system with special features.
The CPU is the 80386-20 32-bit microprocessor, operated at 20 MHz with 32 Kbytes high speed cache memory.
The hard disk drive (HDD) has a capacity of 100 Mbytes (T5200/100 model) or 40 Mbytes (T5200 model).
The floppy disk drive (FDD) can support 2DD (720 Kbytes) and 2HD (1.44 Mbytes) floppy disks.
The standard memory has a capacity of 2 Mbytes, expandable up to 8 Mbytes maximum.
The plasma display supports high resolution video graphics (VGA compatible) with 640 by 480 pixels (dots) and 16-levels of gray scale. The display mode is three mode, CGA mode, VGA-color mode, and VGA-monochrome mode.
The keyboard has 91/92-key with the keys of a subset of the industry standard 101/102-key keyboard. For most applications it can be used exactly like a standard typewriter keyboard.
The universal auto-sensing power supply is used for world-wide usage.
The T5200 includes two internal IBM compatible expansion slots (one full lenge 16-bit slot and one half lenge 8-bit slot) and one Toshiba T3100 size expansion slot.
The interface connector has one PRT/EXT. FDD connector (25-pin), two serial connectors (9-pin), and VGA connector (15-pin).

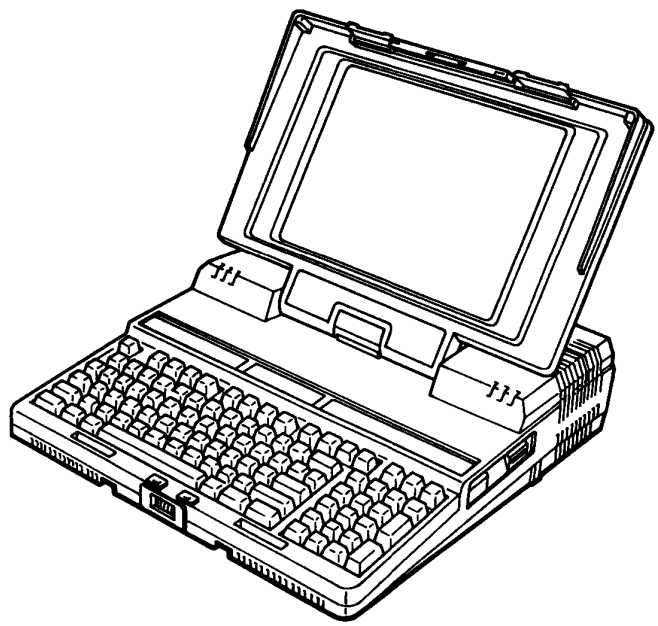


Figure 1-1 T5200 personal computer

SYSTEM UNIT

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

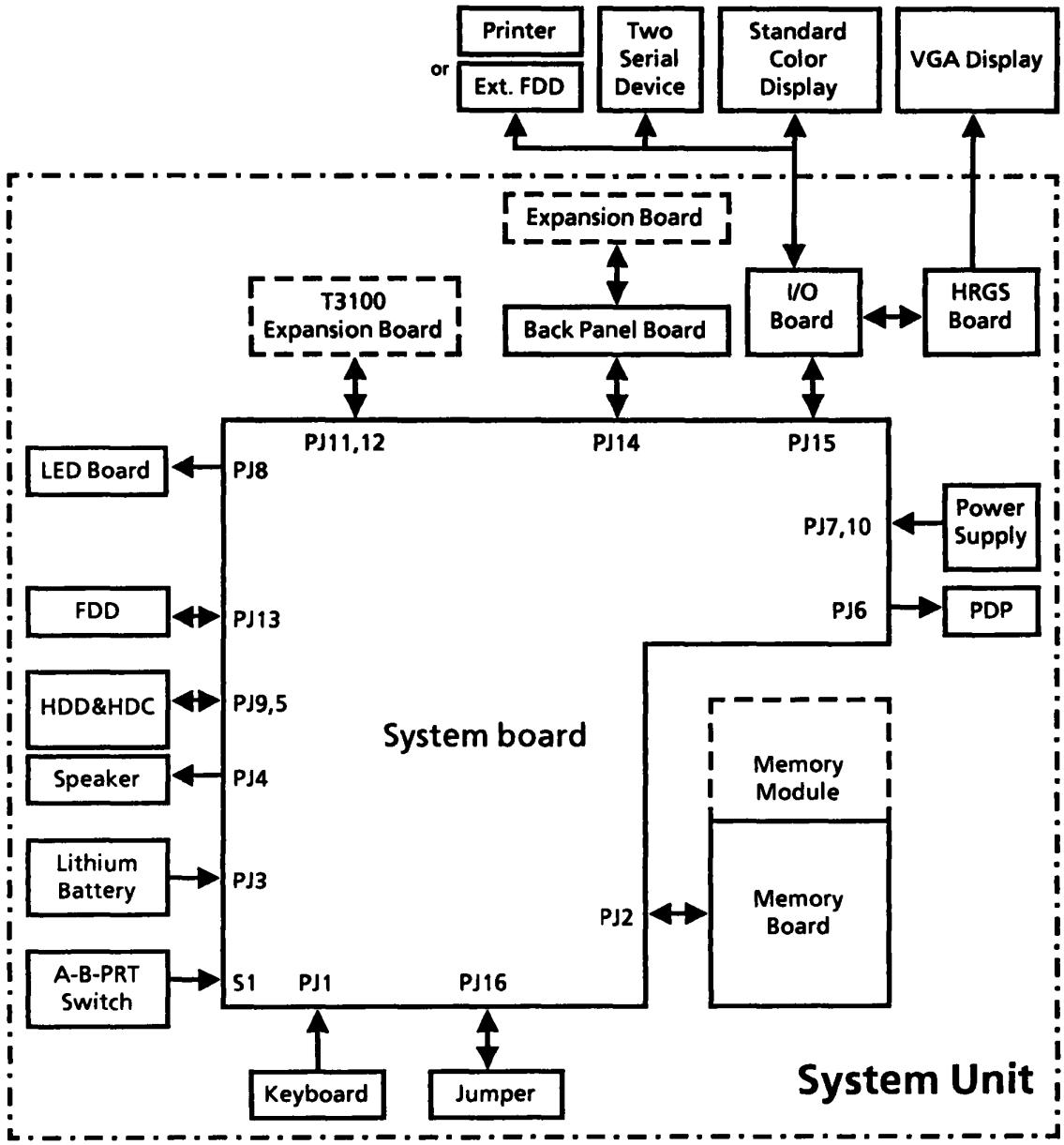


Figure 1-2 System unit configuration

The key features of the system unit are:

- A system board, memory board, I/O board, high resolution graphics subsystem (HRGS) board, back panel board, and LED board.

- An internal 3.5-inch floppy disk drive (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.

- An internal 3.5-inch hard disk drive (HDD) supporting two media types:
  100-Mbyte HDD (T5200/100 model)
  40-Mbyte HDD (T5200 model)

- An internal 91/92-key keyboard.

- An internal 640 X 480 pixel plasma display that has a 16-level gray scale capability. The display quality can be adjusted by contrast controls.

- A universal auto-sensing power supply that can be used world-wide provides +5VDC, +12VDC, -5VDC, and -12VDC power to all the components in the system unit, including the expansion board.
  For the plasma display, power supply provides the regulated +24VDC power to the DC-DC converter. The DC-DC converter converts from +24VDC power to +205VDC power, and provides to the plasma display.
  The power supply's ventilation fan is driven by +12VDC.

- A lithium battery that keeps the data and time in addition to the system configuration parameters even if the system power is switched off.

- The expansion slots can use the three slots types:
  8-bit half-size industry-standard slot
  16-bit full-size industry-standard slot
  16-bit Toshiba standard slot
  One 8-bit half-size industry-standard slot or one 16-bit Toshiba standard slot is used exclusively.

- The various ports are provided at rear of the system unit, such as 25-pin bidirectional parallel/external FDD connector, two 9-pin serial interface (I/F) connectors, and 15-pin VGA I/F connector.

1.2 MAIN BOARDS

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

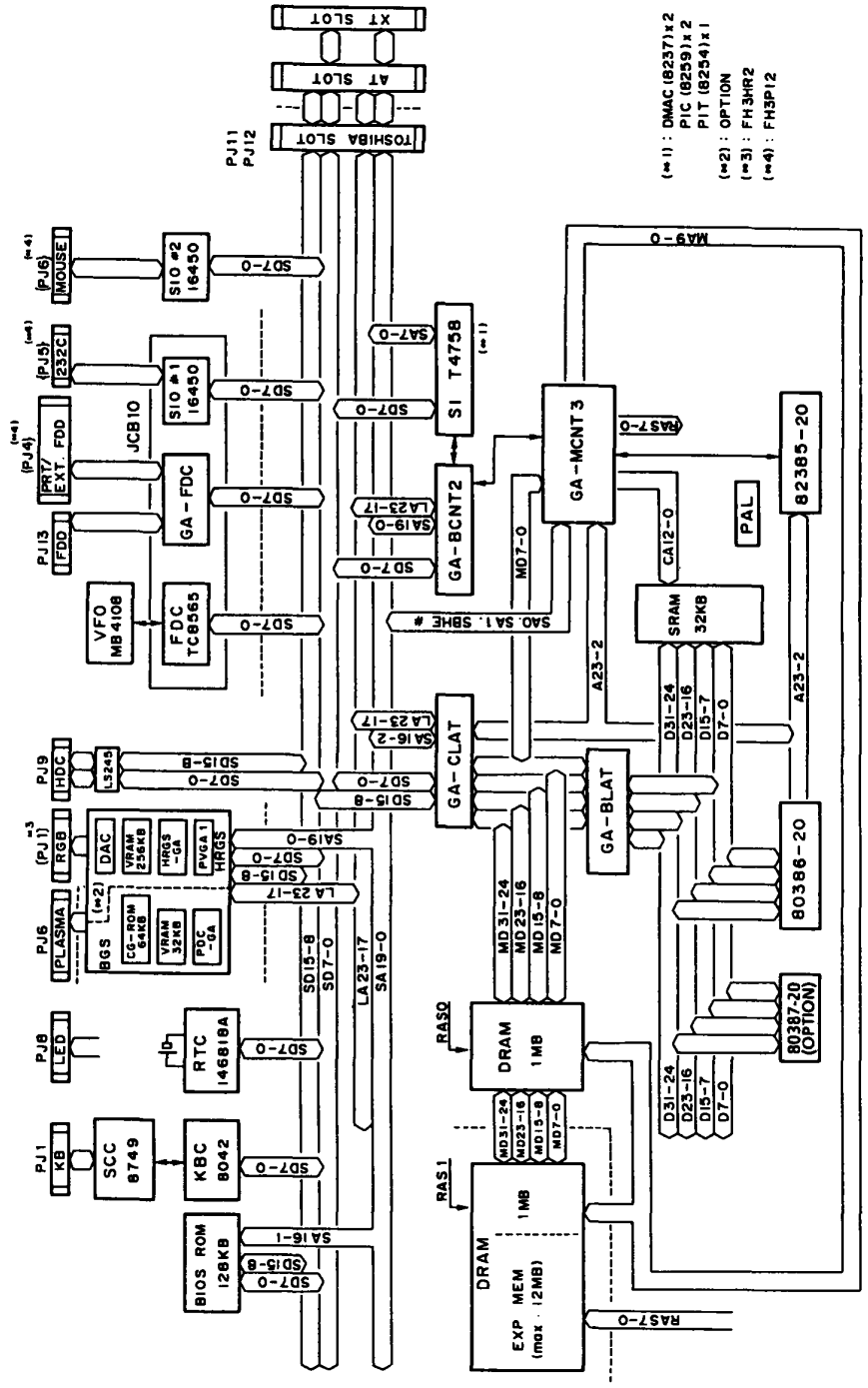


Figure 1-3 Block diagram

1.2.1 System Board

System board is composed of the following components:

- Central processing unit: CPU (80386-20)
  The CPU is a 32-bit microprocessor operated at 20 MHz clock speed.

- Numeric data processor socket for the 80387-20 (optional).

- Real time clock: RTC (MC146818A)
  The RTC continuously keeps the date and time powered by lithium battery.

- Serial input output: SIO (NS16450)
  The SIO controls the serial port.

- Keyboard controller: KBC (8042)

- Keyboard scan controller: SCC (8749)

- Cache memory controller: (82385-20)

- Memory
  Read only memory: ROM 128 Kbytes (system BIOS)
  Static random access memory: SRAM 32 Kbytes (cache memory)

- One super integration: SI (T4758A)
  SI includes the two DMACs (equivalent to 82C37), two PICs (equivalent to 82C59), and one PIT (equivalent to 82C54).

- Gate arrays:
  The following gate arrays are used in the system board.

Memory controller gate array:	GA-MCNT3
Memory bus latch gate array:	GA-BLAT
Compatible bus latch gate array:	GA-CLAT
Bus controller gate array:	GA-BCNT2

1.2.2 Memory Board

Memory board is composed of the following components:

- Memory
  Random access memory: RAM 2 Mbytes
  Memory module socket: three 2-Mbyte memory module sockets

1.2.3 I/O Board and High Resolution Graphics Subsystem (HRGS) Board

I/O board and HRGS board are composed of the following components:

I/O board
- One supper integration: SI (T9761)
  SI includes the floppy disk drive (FDD)/Parallel input and output (PIO) controllers, one FDC (equivalent to TC8565), one SIO (equivalent to NS16450), and I/O decoders.
- Variable frequency oscillator: VFO (MB4108A)
  The VFO chip is used for FDD control logic.
- Basic graphics subsystem: BGS includes of the following ICs.
  - Display controller gate array: PDC-GA (CGA compatible)
  - Video RAM: 32 Kbytes
  - Character Generator ROM: CG-ROM 64 Kbytes
    The CG-ROM supports four character font sets.

HRGS board
- Paradise video graphics array: PVGA1 (VGA compatible)
- High resolution graphics subsystem gate array: HRGS-GA
- Video RAM: 256 Kbytes
- Digital to analogue converter: DAC (IMS G171-35)
- HRGS BIOS ROM: 32 Kbytes

1.3 SYSTEM BOARD JUMPER STRAPS

The system board has two jumper strap (PJ 16, 17) located on the system board as shown in figure 1-4, and a status is listed in table 1-1.

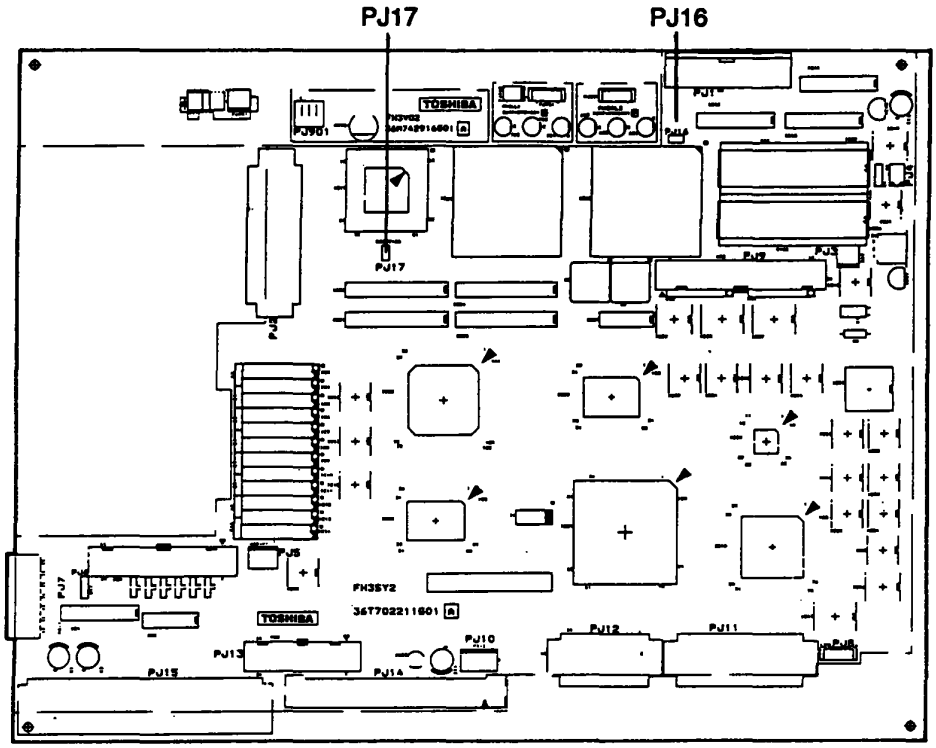


Figure 1-4 System board jumper strap

Table 1-1 System board jumper strap status

PJ No.	Status
16	Open
17	Open

1.4 3.5-INCH FLOPPY DISK DRIVE

The 3.5-inch internal FDD is a high performance, reliable and thin drive that supports 720-Kbyte (formatted) 2DD and 1.44-Mbyte (formatted) 2HD 3.5-inch floppy disks.
The FDD is shown in figure 1-5 and its specifications are described in table 1-2.

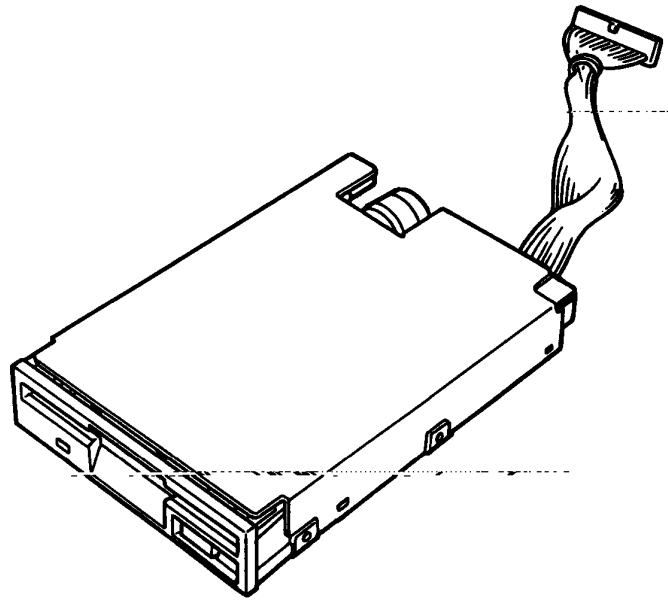


Figure 1-5 3.5-inch FDD

Table 1-2 3.5-inch FDD specifications

Item	Specifications	
	2-Mbyte Mode	1-Mbyte mode
Storage Capacity (Kbytes)		
Unformatted	2,000	1,000
Formatted	1,440	720
No. of Heads	2	2
No. of Cylinders	80	80
Access Time (ms)		
1 Track Access	3	3
Average	94	94
Head Settling Time	15	15
Recording Density (bit per inch)	135	135
Data Transfer Rate (Kbytes per second)	500	250
Rotational Speed (revolutions per minute)	300	300
Recording Method	MFM (Modified Frequency Modulation)	

1.5 3.5-INCH HARD DISK DRIVE

The 100-Mbyte and 40-Mbyte hard disk drive (HDD) is a random access type storage device. It equipped with non-removal 3.5-inch magnetic disk and mini-winchester type magnetic heads.
The HDD is shown in figure 1-6 and specifications are described in table 1-3.

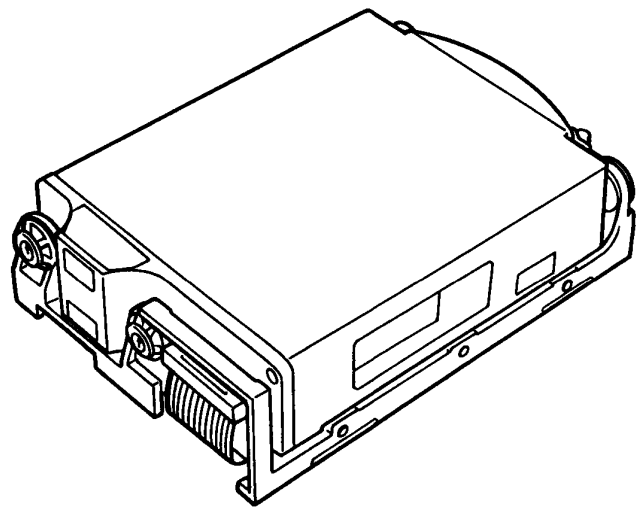


Figure 1-6 3.5-inch HDD

Table 1-3 3.5-inch HDD specifications

Item	Specifications	
	100-Mbyte	40-Mbyte
Storage Capacity (Mbytes) Formatted	104	42.6
Number of Disks	4	2
Number of Heads	8	4
Number of Cylinders	776	805
Track Density (tracks per inch)	1,150	1,000
Track Capacity (bytes) Formatted	16,896	13,312
Number of Sectors per Track (sectors)	33	26
Number of bytes per sector (bytes)	512	512
Access Time (ms)		
Track to Track	8	10
Average	25	29
Maximum	45	50
Average Latency	8.4	8.33
Interleave	1:1	1:1
Rotational Speed (rpm)	3,575	3,600
Data Transfer Rate (Mbytes per second)		
To/From Media	1.25	1.0
To/From Buffer	3.75/4.75	4.0/5.0
Start Time (s)		
Average	15	7
Maximum	20	20
Stop Time (s)		
Average	15	7
Maximum	20	20
Recording Method	2-7 RLL code (Run Length Limited)	
Recording Density (bit per inch)	23,441	21,379

Power Requirements (100-Mbyte)			
Item	+12VDC+5%,	+5VDC+5%,	Power
R/W Mode	350ma	300ma	5.7w
Seeking Mode	260ma	180ma	4.0w
Idle Mode	175ma	160ma	2.9w

Power Requirements (40-Mbyte)			
Item	+12VDC+5%,	+5VDC+5%,	Power
R/W Mode	250ma	250ma	4.25w
Seeking Mode	240ma	150ma	3.6w
Idle Mode	150ma	140ma	2.5w

1.6 HDD JUMPER STRAPS

The HDD has four jumper straps located on the hard disk control board as shown in figure 1-7, and their status is listed in table 1-4.

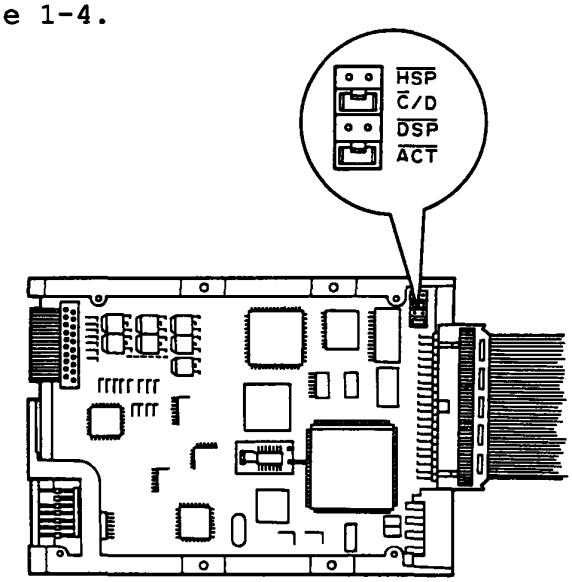


Figure 1-7 HDD jumper straps

Table 1-4 HDD jumper strap status

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

1.7 KEYBOARD

The 91/92-key keyboard with full size keys and standard spacing provides full compatibility with standard IBM software. The keyboard is connected to the keyboard controller on the system board through a 27-pin flat cable. The keyboard shown in figure 1-8.

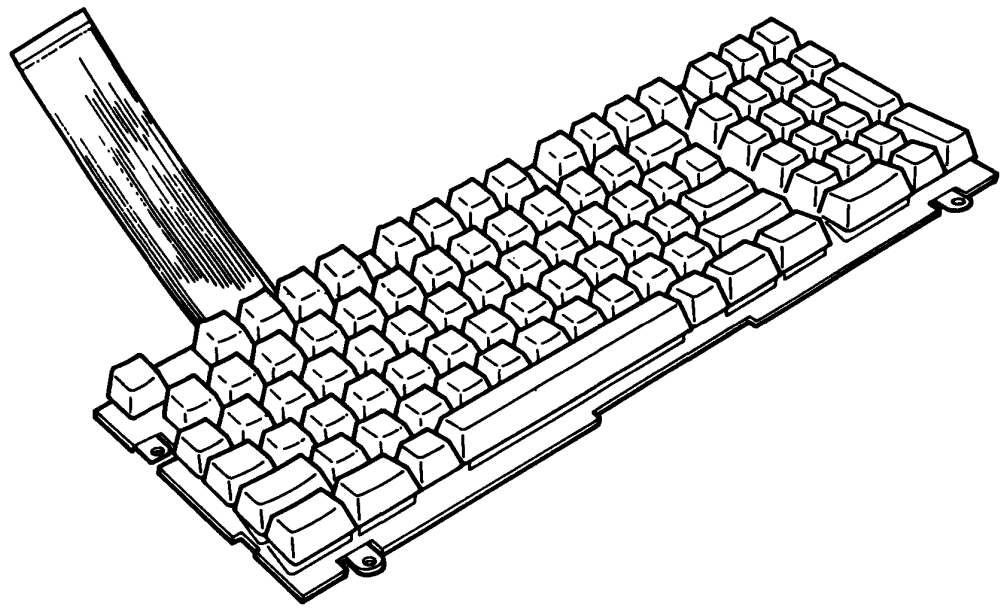


Figure 1-8 Keyboard

1.8 PLASMA DISPLAY

The plasma display is composed of a display panel and driver circuits. It receives vertical and horizontal synchronizing signals, four bit data signals, and shift clock for data transmission. All signals are TTL level compatible. The plasma display has 16-levels of gray scale and the display quality can be adjusted by contrast control. The specifications are described in table 1-5. The plasma display is shown in figure 1-9.

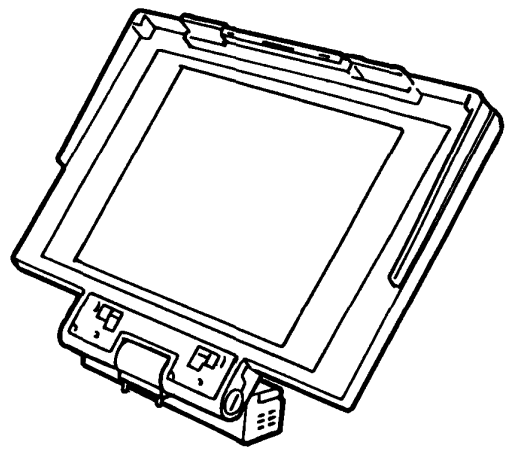


Figure 1-9 Plasma display

Table 1-5 Plasma display specifications

Item	Specifications	
PDP UNIT	D0640FX-008	MD480T640PG3
Number of Dots (dots)	640 x 480	<-----
Dot Dimension (mm)	0.21(W) x 0.21(H)	0.20(W) x 0.24(H)
Dot Pitch (mm)	0.36(W) x 0.36(H)	<-----
Display Area (mm)	230.4(W) x 172.8(H)	<-----
Color	Neon-Orange	<-----
Power Requirement	(VC) 5V ± 0.25V 180 mA (VD) 5V ± 0.25V 4.5 mA (VA) 70V ± 2V 247 mA (VK) 130V + 3V 175 mA	(E1) 5V ± 0.5V 400 mA (E2) 205 V ± 0.5V 200 mA (E3) 5V ± 0.5V 60 mA

Table 1-5 Plasma display specifications (continued)

Item	Specifications	
Mean Time Between Failure (MTBF) (hours)	30,000	20,000
DC/DC Converter	UA0289P10	UA0289P11

1.9 POWER SUPPLY UNIT

The universal auto-sensing power supply can be used world-wide and supplies +5, -5, +12, -12 and +24 VDC to the system.
The power supply unit is housed in the system unit and it supplies the regulated power to:

1) System board
2) Memory board
3) I/O board
4) HRGS board
5) 3.5-inch floppy disk drive
6) 3.5-inch hard disk drive
7) External keyboard
8) Plasma display
9) Option boards
10) Cooling fans

The above 2) through 7), 9) and one of cooling fans receive the power via system board.
The power supply unit includes an input line filter, line fuse, cooling fan, power conversion circuitry and connectors.
Input ratings are:
115 VAC, 1.8 Amps or 230 VAC, 1.2 Amps
The power supply unit is shown in figure 1-10 and the output ratings are specified in table 1-6.

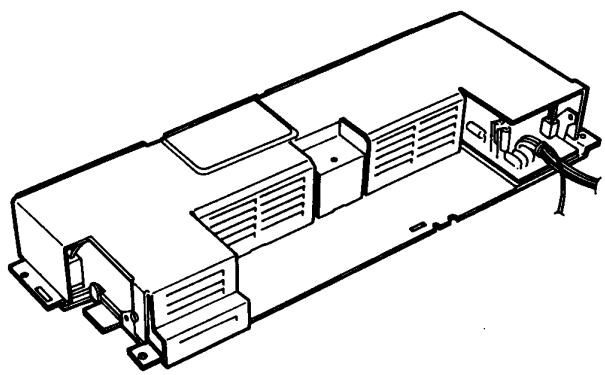


Figure 1-10 Power supply unit

Table 1-6 Power supply unit output rating

DC Voltage (V)	Maximum Current (A)	Regulation Tolerance (%)
+5	6.8	+/- 5
+12	3	+/- 5
-5	0.25	+/- 5
-12	0.3	+/- 10
+24	2.8	+/- 20

2.1 GENERAL

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

1. Power supply unit
2. System board
3. FDD
4. HDD
5. Keyboard
6. Plasma display

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

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

1. T5200 diagnostics disk
2. Phillips head screwdriver
3. Blade head screwdriver
4. Tweezers
5. 2DD and 2HD formatted work disk (for FDD testing)
6. Cleaning disk kit (for FDD testing)
7. Multimeter
8. Printer port LED

The problem isolation flowchart described in section 2.2 can be used to determine which isolation procedures are necessary to isolate a T5200 problem.

2.2 PROBLEM ISOLATION FLOWCHART

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

1. No disk is in the FDD.
2. All optional equipments are disconnected.
3. MS-DOS has been installed in drive C before a trouble happens.

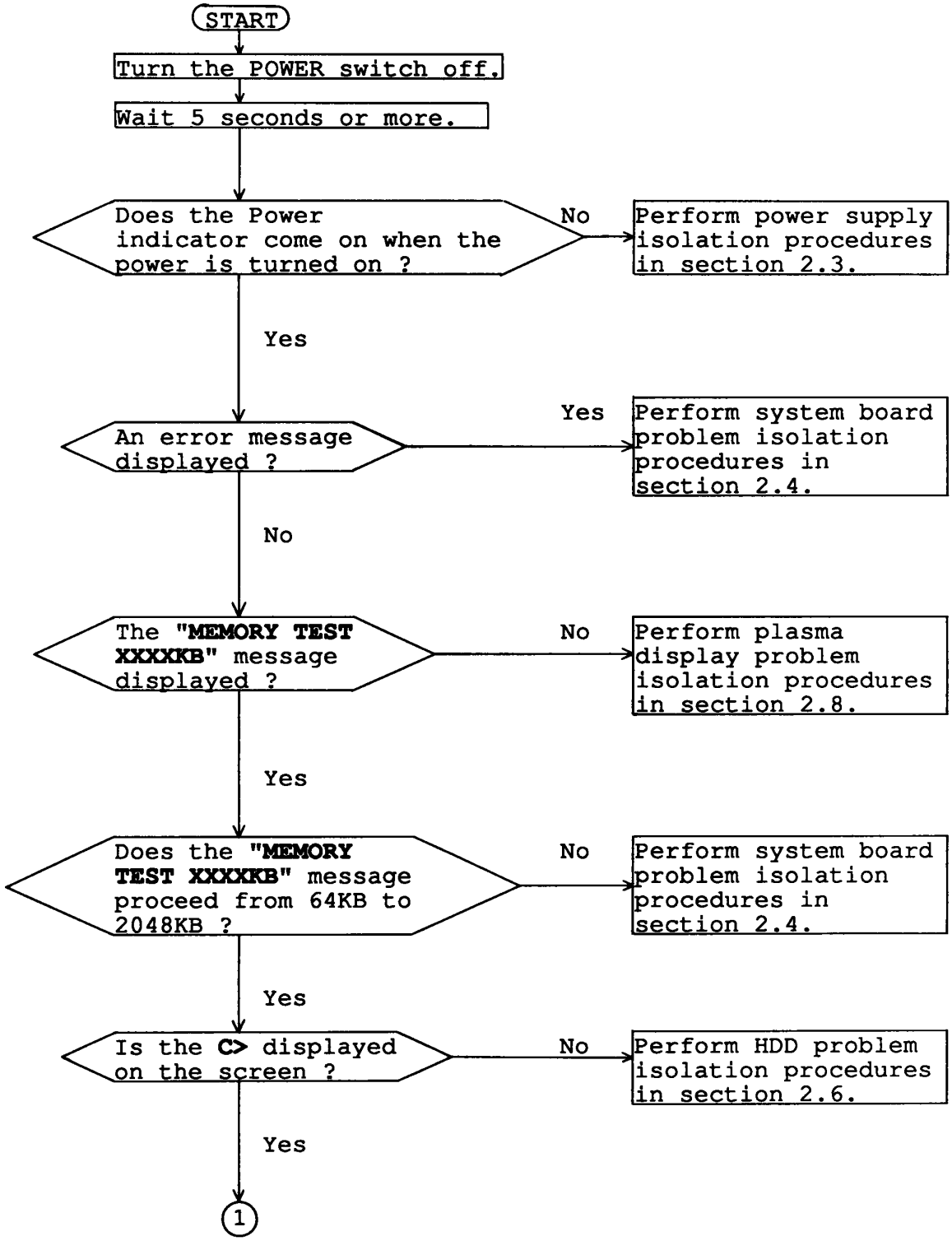


Figure 2-1 Problem isolation flowchart

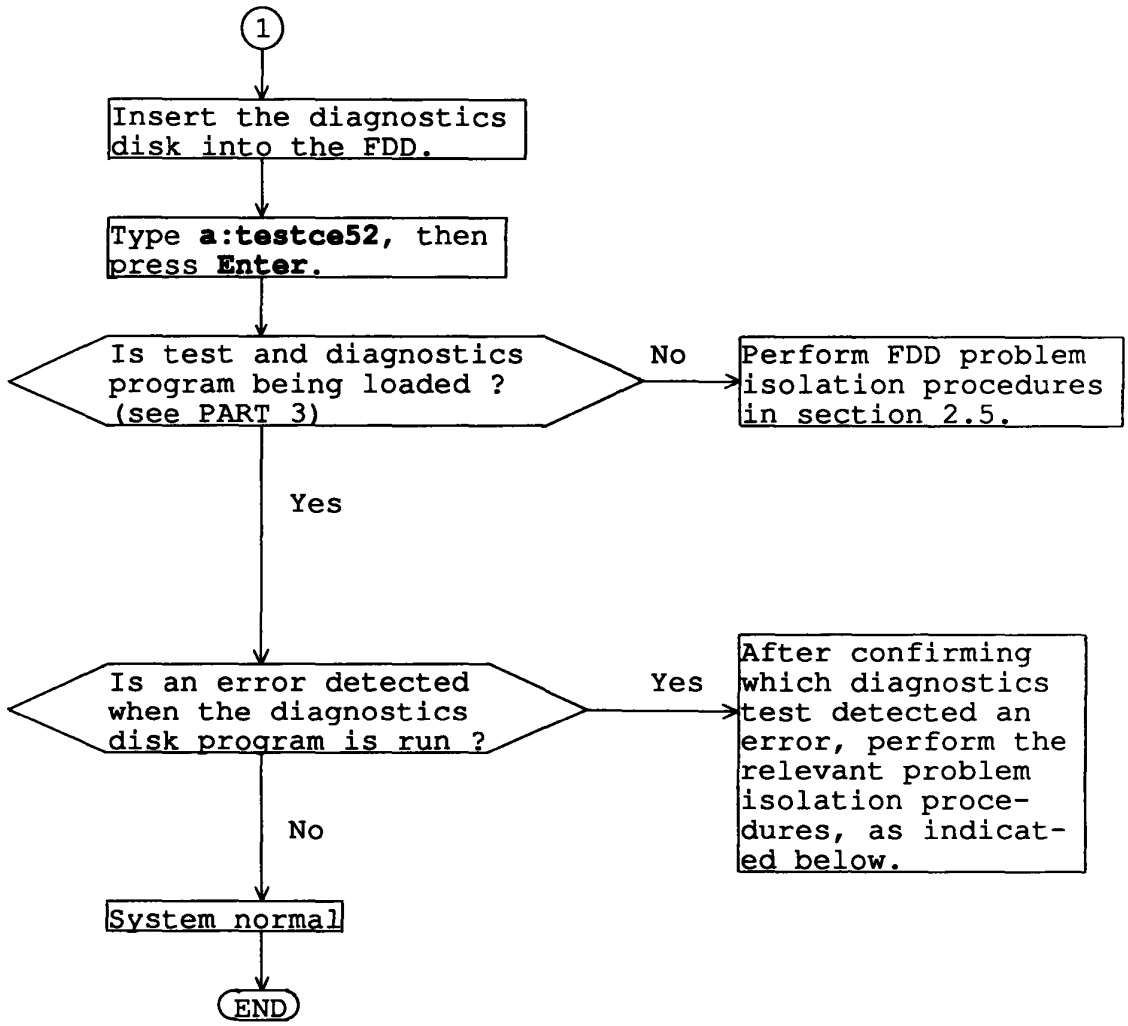


Figure 2-1 Problem isolation flowchart (continued)

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

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

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

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

2.3 POWER SUPPLY UNIT PROBLEM ISOLATION PROCEDURES

WARNING: Dangerous high voltage is supplied to the power supply unit. Pay enough attention on handling. It takes few minutes after power off to discharge the electricity.

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

PROCEDURE 1: Power Indicator Check

PROCEDURE 2: Connector Check

PROCEDURE 3: Output Voltage Check

PROCEDURE 4: 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 should be inserted the standard AC wall outlet and the other end should be connected to the AC IN jack on the back of the system unit.
   If OK, replace the AC power cord.
   After replacing the AC power cord, if the indicator lights, the original cord was probably defective. If the indicator still doesn't light, go to PROCEDURE 2.

PROCEDURE 2

Connector Check

1. Turn off the power, then unplug the AC power cord.
2. Remove the top cover. (Refer to section 4.3.)
3. Remove the power supply unit. (Refer to section 4.9.)
4. If the power supply connector (PJ6 and PJ10) on the system board is connected properly, go to PROCEDURE 3. If it is not connected properly, reconnect it.

PROCEDURE 3

Output Voltage Check

1. Plug the AC power cord to the power supply unit, then turn on the power.

2. Use a multimeter to confirm that the output voltages of the three power supply connectors match to the values in table 2-1.

3. If the voltages are within the range of values given in table 2-1, the power supply unit is normal, but the system board is probably defective. Go to the system board isolation procedures in section 2.4.

4. If the voltages are still not within the range of values given in table 2-1, go to PROCEDURE 4.

Table 2-1 Power supply unit output voltages

Connector	Pin number		Voltage (Vdc)		
	+lead	-lead	Normal	Min	Max
For system board	1	2,4,5	24	19.2	28.8
	3	2,4,5	12	11.4	12.6
	6,7	2,4,5	5	4.75	5.25
For system board	1	3	-12	-13.2	-10.8
	2	3	-5	-5.25	-4.75
For cooling fan	1	2	12	11.4	12.6

PROCEDURE 4

Power Supply Unit Replacement

1. Turn off the power, then unplug the AC power cord.

2. Replace the power supply unit. (Refer to section 4.9.)

3. If normal operation is restored after replacing the power supply unit, the original power supply unit was probably defective.

4. If normal operation is not restored, another FRU is probably defective. The defective unit must be isolated and replaced.

2.4 SYSTEM, MEMORY, AND I/O BOARDS PROBLEM ISOLATION PROCEDURES

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

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

PROCEDURE 1: Message Check

PROCEDURE 2: Printer Port LED Check

PROCEDURE 3: Test Program Execution

PROCEDURE 4: System Board Replacement

PROCEDURE 5: Memory Board Replacement

PROCEDURE 6: I/O Board Replacement

PROCEDURE 1

Message Check

1. Turn on the power.

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

3. If the following message is displayed on the screen, press the **F1** key. Execute the setup operation. (See the 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 on the screen, turn off the power. Wait 5 seconds or more, then turn on the power. If the following message is displayed again, go to HDD 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 on the screen, the system may not be set up correctly. Go to the system setup menu and select the appropriate system configuration. (see the part 3 for details.) If the following message is displayed again, go to PROCEDURE 5.

Video RAM error

CRTC error

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

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
Cache memory verify error
CMOS shutdown byte error
DMA channel 0 error
DMA channel 1 error
DMA page register error
Memory refresh error
1st 64KB memory error
Error interrupt controller 1
Error interrupt controller 2
VRAM error
Memory verify error at X:X found X expanded X
Memory parity error at X:X found X expected X
Error interrupt and stuck NMI
Error interrupts and stuck NMI
Error interrupts and stuck NMI
Error protect mode...
Error sizing expansion memory
Memory verify error at X:X:X found X expected X
Memory verify error at X:X:X found X expected X
Error processor exceptional interrupts...
Refresh timing error
Error encountered initializing hard drive
First 64KB memory error
LIM page register error

7. If none of the above messages are displayed and you have a printer port LED, go to PROCEDURE 2.

PROCEDURE 2

Printer Port LED Check

1. Turn off the power.
2. Plug the printer port LED into the PRT/FDD connector on the back of the unit and set the A-B-PRT switch to PRT position.
3. While watching the printer port LED, turn on the power. The printer port LED will light when the power switch is turned on.
4. Read the final LED status from left to right as a hexadecimal value.
5. If the final LED status matches any of the error status values in the table 2-3, go to PROCEDURE 4.
6. If the final LED status is **32H**, go to PROCEDURE 3.

Table 2-2 Printer port LED normal status

Status	Message
00H	Shutdown process and video initialization
01H	CPU test 1
02H	KBC test 1
03H	KBC test 2
04H	KBC test 3
05H	KBC test 4
06H	LSI initialization
07H	CPU test 2
08H	RTC initialization
09H	ROM checksum test
0AH	Video initialization
0BH	Reserved
0CH	Reserved
0DH	PIT Channel 2 test and initialization
0EH	Cache memory test
0FH	CMOS RAM test
10H	DMA Channel 0 test

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

Status	Message
11H	DMA channel 1 test
12H	DMA page register test
13H	Memory refresh test
14H	First 64KB memory test
15H	Interrupt vector set
16H	PIC 1 mask register test
17H	PIC 2 mask register test
18H	CMOS battery test
19H	CMOS checksum test
1AH	Keyboard initialization 1
1BH	VRAM test
1CH	Video I/O initialization
1DH	System memory size set
1EH	System memory size check
1FH	System memory and extra memory test
20H	PIC test
21H	NMI and parity test
22H	Interrupt process test
23H	Protect mode test
24H	Extended memory size check
25H	Extended memory test
26H	Protect mode exception processing test
27H	ROM copy to RAM
28H	CRT type check
29H	PIT interrupt check
2AH	Hardware interrupt vector set
2BH	Keyboard initialization 2
2CH	FDD initialization
2DH	SIO/Printer initialization
2EH	HDD initialization
2FH	Option ROM check
30H	Timer check
31H	NDP initialization
32H	Prepare for boot

Table 2-3 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
8EH	Cache memory verify 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 64KB memory error	halt
96H	Error interrupt controller 1	halt
97H	Error interrupt controller 2	Continue
9BH	VRAM error	halt
9FH	Memory verify error at X:X	
	found X expanded X	Continue
	Memory parity error at X:X:X	
	found X expected X	Continue
A0H	Error interrupt and stuck NMI	Continue
A1H	Error interrupts and stuck NMI	Continue
A2H	Error interrupts and stuck NMI	Continue
A3H	Error protect mode...	Continue
A4H	Error sizing expansion memory	Continue
A5H	Memory verify error at X:X:X	
	found X expected X	Continue
	Memory parity error at X:X:X	
	found X expected	Continue
A6H	Error processor exceptional interrupts...	Continue
A9H	Refresh timing error	Continue
AEH	Error encountered initializing	
	hard drive	Continue
CEH	Cache memory address error	halt
D4H	First 64KB memory error	halt
EFH	LIM page register error	Continue

PROCEDURE 3

Test Program Execution

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

    1. System test
    2. Memory test
    3. Keyboard test
    4. Display test
    5. Floppy disk test
    6. Printer test
    7. ASYNC test
    8. Hard disk test
    9. Real timer test

2. If an error is detected during the system test, ASYNC (SERIAL B) test, or real timer test, go to PROCEDURE 4.

3. If an error is detected during the memory test, go to PROCEDURE 5.

4. If an error is detected during the ASYNC test (SERIAL A) or printer test, go to PROCEDURE 6.

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

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

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

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

PROCEDURE 4

System Board Replacement

1. Replace the system board. (Refer to section 4.13.)

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

3. If normal operation is not restored, another FRU is probably defective. The defective unit must be isolated by test and diagnostics program and replaced.

PROCEDURE 5

Memory Board Replacement

1. Replace the memory board. (Refer to section 4.11.)

2. If normal operation is restored after replacing the memory board, the original memory board is probably defective.
3. If normal operation is not restored, the system board is probably defective. Go to PROCEDURE 4.

PROCEDURE 6

I/O Board Replacement

1. Replace the I/O board. (Refer to section 4.10.)

2. If normal operation is restored after replacing the I/O board, the original I/O board is probably defective.

3. If normal operation is not restored, the system board is probably defective. Go to PROCEDURE 4.

2.5 FLOPPY DISK DRIVE PROBLEM ISOLATION PROCEDURES

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

PROCEDURE 1:	Test and Diagnostics Program Loading Check
PROCEDURE 2:	Message Check
PROCEDURE 3:	Head Cleaning
PROCEDURE 4:	FDD Test Execution
PROCEDURE 5:	FDD Connector Check
PROCEDURE 6:	New FDD Connection

PROCEDURE 1

Test and Diagnostics Program Loading Check

1. Turn off the power.
2. Insert the diagnostics disk into the FDD.
3. Turn on the power.
4. If loading starts normally, go to PROCEDURE 3. (See section 3.2 to determine if loading has started normally.)
5. If loading has not started normally, go to PROCEDURE 2.

PROCEDURE 2

Message Check

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

   (a) ***** FDD A is not installed *****

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

   (c) **** FDD load error or Bad system disk ****
   Insert system disk in drive
   Press any key when ready .....

2. If message (a) is displayed, check that the A-B-PRT switch is set to PRT. If it is not set to PRT, set it to PRT. If it is set to PRT, go to PROCEDURE 5.

3. If message (b) or (c) is displayed, the contents of the floppy disk is damaged, or a disk other than the MS-DOS system disk has been inserted into the FDD. Insert a new MS-DOS system disk into the FDD. If loading completes, go to PROCEDURE 4. If loading does not complete, go to PROCEDURE 3.

4. If none of the above messages appears, go to PROCEDURE 5.

PROCEDURE 3

Head Cleaning

1. Turn off the power.
2. Insert the cleaning disk into the FDD.
3. Turn on the power.
4. If normal operation is restored after cleaning the head, go to PROCEDURE 4.
5. If normal operation is not restored, go to PROCEDURE 5.

PROCEDURE 4

FDD Test Execution

1. Insert the diagnostics disk into the FDD. Then type **a:testce52** and press **Enter** key.

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

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

4. If an error is generated during the floppy disk test, an error code and status will be displayed. The error codes are described in table 2-4. Go to PROCEDURE 6.

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

Table 2-4 FDD error code

Code	Status
01	Bad Command
02	Address Mark Not Found
03	Write Protected
04	Record Not Found
06	Media Removed
08	DMA Overrun Error
09	DMA Boundary Error
10	CRC Error
20	FDC Error
40	Seek Error
60	FDD Not Drive
80	Time Out Error
EE	Write Buffer Error

PROCEDURE 5

FDD Connector Check

1. Turn off the power, then unplug the AC power cord.
2. Remove the top cover. (Refer to section 4.3.)
3. Check that the FDD connection (PJ14) is secure.
4. If the FDD cable is securely connected to the system board, go to PROCEDURE 6.
5. If the FDD cable is not securely connected to the system board, secure the connection.

PROCEDURE 6

New FDD Connection

1. Turn off the power.
2. Remove the FDD. (Refer to section 4.7.)
3. Connect a new FDD to the FDD connector without installing the new FDD. Then connect all of the FRUs removed during FDD removal to their corresponding connectors without installing the FRUs.
4. Turn on the power.
5. If normal operation is restored, the original FDD is probably defective. Reassemble the system.
6. If normal operation is not restored, the system board is probably defective. Refer to section 2.4.

2.6 HARD DISK DRIVE PROBLEM ISOLATION PROCEDURES

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

PROCEDURE 1: HDD Indicator Check

PROCEDURE 2: Message Check

PROCEDURE 3: Format Execution

PROCEDURE 4: Hard Disk Test Execution

PROCEDURE 5: Connector Check

PROCEDURE 6: HDD Jumper Straps Check

PROCEDURE 7: New HDD Connection

PROCEDURE 1

HDD Indicator Check

1. Turn off the power.
2. If there is a floppy disk in the FDD, take it out.
3. Wait 5 seconds or more after turning off the power, then turn on the power.
4. If the HDD indicator blinks briefly, then goes out, go to PROCEDURE 2. If the HDD indicator continues blinking, go to PROCEDURE 4.
5. If the HDD indicator does not light at all, go to PROCEDURE 5.

PROCEDURE 2

Message Check

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

2. If one of the following message is displayed on the screen, 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: The contents of the hard disk will be erased when the FORMAT command is run. Before running this test, transfer the contents of the hard disk to floppy disks. This can be done with the MS-DOS BACKUP command. (See the MS-DOS Manual for details.)

1. Insert the MS-DOS system disk into the FDD.
2. Make partition of the hard disk 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 is restored, the HDD is normal.
5. If normal operation is not restored, go to PROCEDURE 6.

PROCEDURE 4

Hard Disk Test Execution

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

1. Insert the diagnostics disk into the FDD. Then type **a:testce52** and press **Enter** key and run the hard disk test as indicated on the diagnostic test menu.

2. If an error is detected during the hard disk test, an error code and status will be displayed; go to PROCEDURE 6. The error codes are described in table 2-5.

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

Table 2-5 HDD error code

Code	Status
01	Bad command error
02	Bad address mark
04	Record not found
05	HDC not reset
07	Drive not initialize
09	DMA boundary error
0A	Bad sector error
0B	Bad track error
10	ECC error
11	ECC recover enable
20	HDC error
40	Seek error
80	Time out error
AA	Drive not ready
BB	Undefined
CC	Write fault
E0	Status error
F0	Not sense error (HW.code=FF)

PROCEDURE 5

Connector Check

1. Turn off the power, then unplug the AC power cord.
2. Remove the top cover. (Refer to section 4.8)
3. Check that the HDC signal cable (PJ9) and HDD power cable (PJ5) are secure.
4. If both cables are securely connected to the system board, go to PROCEDURE 6.
5. If the cables are not securely connected, secure them.

PROCEDURE 6

HDD Jumper Straps Check

1. Remove the disk support (Refer to section 4.5.).
2. Check that the jumper straps are set correctly as shown in figure 2-2 and described in table 2-6.
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 2-6 HDD jumper straps functions

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

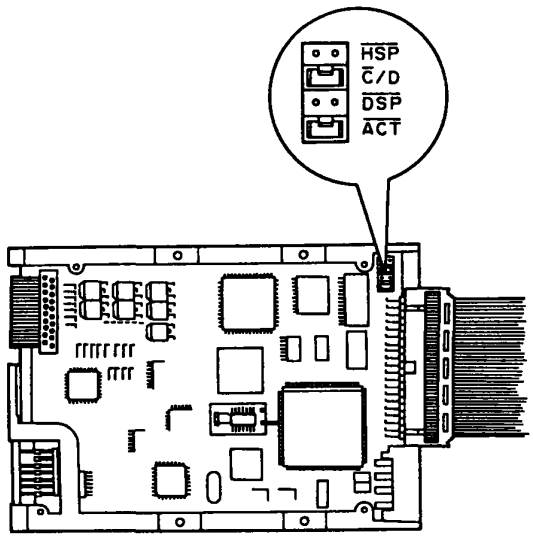


Figure 2-2 HDD jumper straps

PROCEDURE 7

New HDD Connection

1. Turn off the power.

2. Remove the HDD. (Refer to section 4.6.)

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

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

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

2.7 KEYBOARD PROBLEM ISOLATION PROCEDURES

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

PROCEDURE 1: Input Check

PROCEDURE 2: Keyboard Test Execution

PROCEDURE 3: Connector Check

PROCEDURE 4: New Keyboard Connection

PROCEDURE 1

Input Check

1. Insert an MS-DOS system disk into the FDD.
2. Turn on the power.
3. When the prompt appears on the screen, press any of the white keys on the keyboard (any character or the space bar).

> **CAUTION:** Do not type an MS-DOS acceptable command such as del and format. Such operation may erase your important program or data.

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

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

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

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

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

COMMAND Version X.XX
A> abcdefghijilmnopqrst.....
```

PROCEDURE 2

Keyboard Test Execution

1. Insert the diagnostics disk into the FDD. Then type **a:testce52** and press **Enter** key and run the keyboard test as indicated on the diagnostic test menu.

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

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

PROCEDURE 3

Connector Check

1. Turn off the power, then disconnect the AC power cord.
2. Lift up the top cover. (Refer to section 4.3.)
3. Lift up the keyboard and check that the keyboard cable (PJ1) is securely connected to the system board. If it is securely connected, go to PROCEDURE 4.
4. If it is not securely connected, secure it.

PROCEDURE 4

New Keyboard Connection

1. Turn off the power, then unplug the AC power cord.
2. Remove the keyboard. (Refer to section 4.2.)
3. Connect a new keyboard to the system board without installing it.
4. If normal operation is restored after connecting the new keyboard, the original keyboard is probably defective. Install the new keyboard.
5. If normal operation is not restored, the system board is probably defective. Refer to section 2.4.

2.8 PLASMA DISPLAY PROBLEM ISOLATION PROCEDURES

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

PROCEDURE 1: Display Check

PROCEDURE 2: Display Test Execution

PROCEDURE 3: PDP Connector Check

PROCEDURE 4: New PDP Connection

PROCEDURE 1

Display Check

1. Turn off the power.

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

MEMORY TEST XXXXKB

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

4. If the above message does not appear:

   (a) Check that the contrast is correctly adjusted.

   (b) Check that CRT indicator is light. If CRT indicator is light, hold the **Ctrl** key, then press the **Home** key.

   After performing (a) and (b), reperform steps 1 and 2. If the message in step 2 still fails to appear, go to PROCEDURE 3.

PROCEDURE 2

Display Test Execution

1. Insert the diagnostics disk into the FDD. Then type **a:testce52** and press **Enter** key and run the display test as indicated on the diagnostic test menu.

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

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

PROCEDURE 3

PDP Connector Check

WARNING: Dangerous high voltage is supplied to the plasma display panel. Pay enough attention on handling.

1. Turn off the power, then unplug the AC power cord.
2. Remove the PDP without disconnecting the cables (Refer to section 4.5.) and check that the cables are securely connected to the plasma display board (Refer to figure 2-3.)
3. If the cable is securely connected, go to PROCEDURE 4.
4. If the cable is not securely connected, secure it.

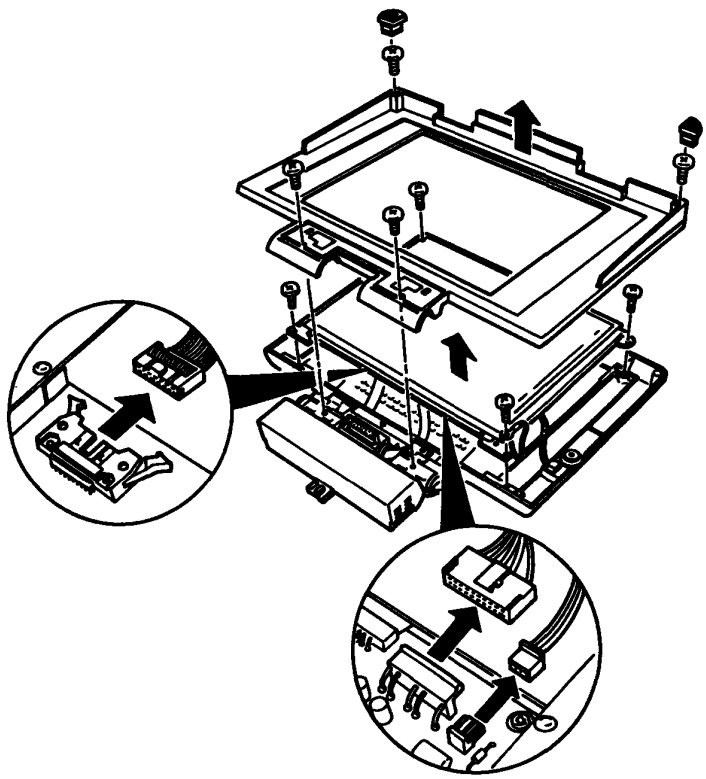


Figure 2-3 PDP connector check

PROCEDURE 4

New PDP Connection

1. Connect a new PDP without installing it.

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

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

3.1 GENERAL

This section explains test and diagnostics programs. That checks the functions of all hardware modules of the T5200.
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 8 tasks:

1. HARD DISK FORMAT
2. SEEK TO LANDING ZONE (HDD)
3. HEAD CLEANING
4. LOG UTILITIES
5. RUNNING TEST
6. FDD UTILITIES
7. SYSTEM CONFIGURATION
8. SET UP

The test program module is composed of 11 tests:

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

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

1. T5200 diagnostics disk
2. MS-DOS system disk
3. Formatted work disk (For FDD test)
4. Cleaning disk kit (For read cleaning)
5. Printer wraparound connector
   (For printer wraparound test)
6. RS-232-C wraparound connector
   (For ASYNC wraparound test)

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

3.2 OPERATIONS

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

2. Type in **a:testce52**, then press **Enter**.

3. The following display will appear:

```
TOSHIBA personal computer T5200 DIAGNOSTICS
version X.XX (c) copyright TOSHIBA Corp. 1988

DIAGNOSTICS MENU :

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

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

Detailed explanations of the service programs and the operations are given in section 3.17 to 3.24.

NOTE: To stop the test program:
(1) During keyboard operation, press **Ctrl** + **C**
(2) While running the test program, press **Ctrl** + **Break**

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

```
TOSHIBA personal computer T5200 DIAGNOSTICS
version X.XX (c) copyright TOSHIBA Corp. 1988
DIAGNOSTIC TEST MENU :
   1 - SYSTEM TEST
   2 - MEMORY TEST
   3 - KEYBOARD TEST
   4 - DISPLAY TEST
   5 - FLOPPY DISK TEST
   6 - PRINTER TEST
   7 - ASYNC TEST
   8 - HARD DISK TEST
   9 - REAL TIMER TEST
  10 - NDP TEST
  11 - EXPANSION TEST
  88 - FDD & HDD ERROR RETRY COUNT SET
  99 - EXIT TO DIAGNOSTICS MENU

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

Numbers, 1 to 11 are diagnostic tests.
Number 88 is for setting the floppy disk drive and hard disk drive error retry count.
Number 99 is for returning to the DIAGNOSTIC MENU.
When selecting the floppy disk test or hard disk test, special sub-messages will appear, as described in sections 3.8 and 3.11.

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

```
TEST NAME                                        XXXXXXX
SUB TEST    : XX
PASS COUNT  : XXXXX       ERROR COUNT : XXXXX
WRITE DATA  : XX          READ DATA   : XX
ADDRESS     : XXXXXX      STATUS      : XXX
SUB-TEST MENU :
01 - ROM CHECKSUM
02 - HW status
99 - Exit to DIAGNOSTIC TEST MENU

SELECT SUB-TEST NUMBER ? _
```

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

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

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

NOTE: If you select KEYBOARD TEST, this message will not appear.

   If you select YES (by typing in **1**, then pressing **Enter**):
   Each time a test cycle ends, it increments the pass counter by one and repeats the test cycle.
   If you select NO (by typing in **2**, then pressing **Enter**):
   At the end of a test cycle, the test execution is terminated and you exit to the subtest menu.

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

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

   If you select YES (by typing in **1**, then pressing **Enter**):
   When an error occurs, the error status is displayed and execution of the test program stops and the operation guide is displayed on the right side of the display screen.
   If you select NO (by typing in **2**, then pressing **Enter**):
   When an error occurs, the error status is displayed then the error counter is incremented by one and you go to the next test.

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

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

   ERROR STATUS NAME **[[HALT OPERATION]]**
   1: Test End
   2: Continue
   3: Retry

   1: Terminates the test program execution and exits to the subtest menu.
   2: Continues the test.
   3: Retries the test.

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

3.3 SUBTEST NAMES

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

Table 3-1 Subtest names and execution time

No.	Test name	Subtest No.	Subtest item	Time(s)
1	SYSTEM	01	ROM checksum	
		02	HW status	
2	MEMORY	01	RAM constant data	
		02	RAM address pattern data	
		03	RAM refresh	
		04	Protected mode	
		05	Memory module	
		06	LIM/EMS (Expanded memory)	
		07	Cache memory	
3	KEYBOARD	01	Pressed key display	
		02	Pressed key code display	
4	DISPLAY	01	VRAM read/write	
		02	Character attributes	
		03	Character set	
		04	80*25 Character display	
		05	Graphics display (color set 0/1)	
		06	640*200 Graphics display	
		07	640*400 Graphics display	
		08	Display page	
		09	"H" pattern display	
		10	LED/DAC pallet	
5	FDD	01	Sequential read	
		02	Sequential read/write	
		03	Random address/data	
		04	Write specified address	
		05	Read specified address	

Table 3-1 Subtest names and execution time (continued)

No.	Test name	Subtest No.	Subtest item	Time(s)
6	PRINTER	01 02 03	Ripple pattern Function Wraparound	
7	ASYNC	01 02 03 04 05 06 07 08	Wraparound (board) Board (#1) <=> board (#2) Point to point (send) Point to point (receive) Card modem loopback Card modem on-line test Dial tester test Interrupt test (IRQ4, 3, 5)	
8	HDD	01 02 03 04 05 06 07 08 09 10	Sequential read Address uniqueness Random address/data Cross talk & peak shift Write/read/compare (CE) Write specified address Read specified address ECC circuit (CE cylinder) Sequential write W-R-C specified address	
9	REAL TIMER	01 02 03	Real time test Backup memory test Real time carry test	
10	NDP	01	NDP test	
11	EXPANSION UNIT	01 02 03 04	Box wraparound test Box mono video RAM test Wraparound test (51-bus) Wraparound test (32-bus)	

3.4 SYSTEM TEST

Subtest 01 ROM checksum

This test performs the ROM checksum test on the system board.
(Test extent : E0000H - FFFFFH 128KB)

Subtest 02 H/W status

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

76543210
H/W status = 10101100

Bit7 --- =
Bit6 --- CPU clock = 20MHz
Bit5 --- Media type = 2DD
Bit4 --- FDD type = 2MB
Bit3 --- =
Bit2 --- Drive A/B = Normal
Bit1 --- External FDD = OFF
Bit0 --- =

Table 3-2 Hardware status bit

Items	H/W status	1	0
Bit7	Reserved		
Bit6	CPU clock	10MHz	20MHz
Bit5	Media Type	2DD	2HD
Bit4	FDD Type	1.6MB	2MB
Bit3	Reserved		
Bit2	Drive A/B	Normal	Change
Bit1	External FDD	ON	OFF
Bit0	Reserved		

3.5 MEMORY TEST

Subtest 01 RAM constant data (in real mode)

This subtest writes constant data to memory, then reads and compares it with the original data. The constant data is FFFFH, AAAAH, 5555H, 0101H, and 0000H.

Subtest 02 RAM address pattern data (in real mode)

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

Subtest 03 RAM refresh (in real mode)

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

Subtest 04 Protected mode

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

Subtest 05 Protected mode for the memory module.

The same test as the subtest 04 is done for the memory module. Total memory module capacity is 2MB, 4MB, 6MB, 10MB or 12MB. After selecting the subtest, the following message will appear.

Extended memory size (1:2MB, 2:4MB, 3:6MB, 4:10MB, 5:12MB)?

Subtest 06 LIM/EMS (Expanded memory, in real mode)

The same test as the subtest 04 is done for expanded memory. Page frame address is D0000H to DFFFF. EMS port is 208H, 218H, 258H or 268H. After selecting the subtest, the following message will appear.

Warning: The contents of the EMS will be destroyed. Press [Enter] key.

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

[EMS port=XXXH, SET#=X, PAGE#=XXXX]
[EMS size Block#1=XXXXXKB, Block#2=XXXXXKB, Block#3=XXXXXKB, Block#4=XXXXXKB]

Subtest 07 Cache memory

This subtest writes constant data (AAH and 55H) to cache memory (32KB), then reads and compares it with the original data. The test does with cache on or off, and judges the total test count for three seconds. It is OK, if: [test count when cache on > test count when cache off.] After selecting the subtest, the following message will appear.

3 second test count:
Cache on = XXXXX
Cache off = XXXXX

3.6 KEYBOARD TEST

Subtest 01 Pressed key display

> **NOTE**: Make sure the Num-lock key is off. If this key is on, the test cannot be carried out.

When the keyboard layout (as shown below) is drawn on the display, press any key and check that the corresponding key on the screen is changed to the character "*".
When a key is held depressed, the display will blink designating the auto-repeat function.

KEYBOARD TEST IN PROGRESS 301000

[SCC Version = VX.XXX : XX Key]
[Print : Alt+SysReq , Pause : Ctrl+Break]
IF TEST OK, PRESS [DEL] THEN [ENTER] KEY

Subtest 02 Pressed key code display

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

```
KEYBOARD TEST      IN PROGRESS          302000

    Scan code       = XX
    Character code  = XX
    Keytop          = XXXX

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

PRESS [ENTER] KEY
```

3.7 DISPLAY TEST

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

Subtest 01 VRAM read/write

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

Subtest 02 Character attributes

This subtest checks:

Normal Display
Intensified Display
Reverse Display
Blinking Display

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

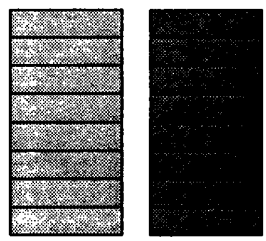
CHARACTER ATTRIBUTES

NEXT LINE SHOWS NORMAL DISPLAY
NNNNNNNNNNNNNNNNNNNNNNNNNNNNNNN

NEXT LINE SHOWS INTENSIFIED DISPLAY
IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII

NEXT LINE SHOWS REVERSE DISPLAY
RRRRRRRRRRRRRRRRRRRRRRRRRRRRRRR

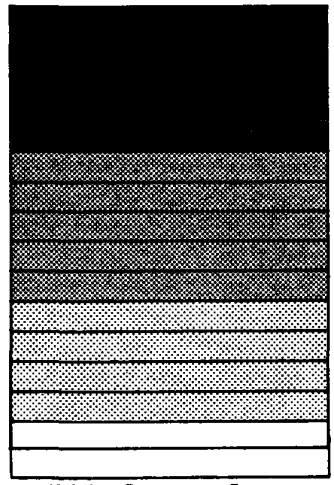
NEXT LINE SHOWS BLINKING DISPLAY
BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB (Blinks)



00 88 ; BLACK
01 89 ; BLUE
04 0C ; RED
05 0D ; MAGENTA
02 0A ; GREEN
03 0B ; CYAN
06 0E ; YELLOW
07 0F ; WHITE

PRESS [ENTER] KEY

320*200 GRAPHICS DISPLAY [13]



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

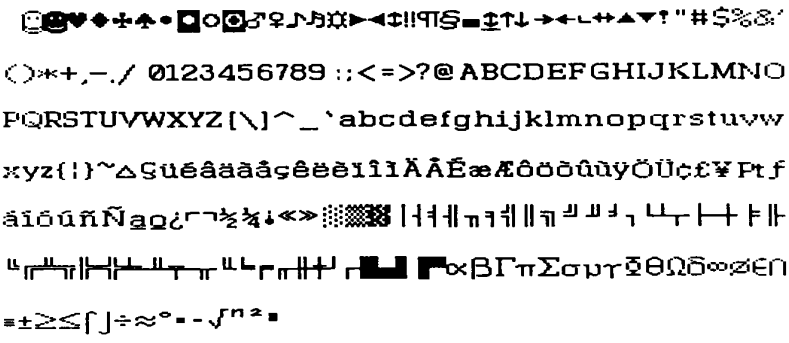
PRESS [ENTER] KEY

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

Subtest 03 Character set

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

CHARACTER SET IN 40X25



PRESS [ENTER] KEY

Subtest 04 80*25 Character display

In this subtest, the character string is displayed shifting one character line by line in the 80*25 character mode as shown below.

80*XX CHARACTER DISPLAY

```
0123456789012345678901234567890123456789012345678901234567890123456789012345678
 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklm
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmn
"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmno
#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnop
$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopq
%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqr
&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrs
'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrst
()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstu
)*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuv
*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvw
+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwx
,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxy
-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz
./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{
/0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|
0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}
123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
23456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~Δ
3456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~Δç
456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~Δçu
```

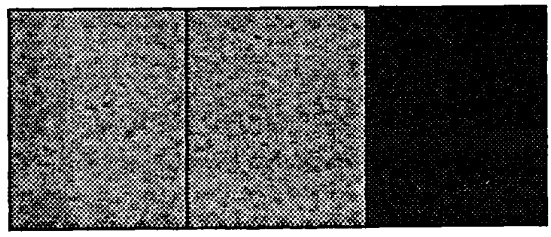
PRESS [ENTER] KEY

Subtest 05 320*200 Graphics display

This subtest displays two of color sets for the color display in the 320*200 dots graphics mode (Mode 4 and D) as shown below.

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

GREEN	**RED**	**YELLOW**
CYAN	**MAGENTA**	**WHITE**



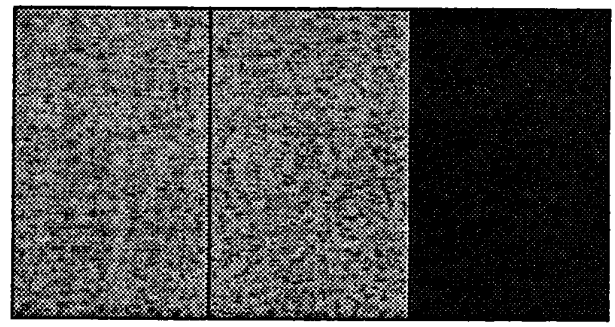
PRESS [ENTER] KEY

Subtest 06 640*200 Graphics display

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

640*200 GRAPHICS DISPLAY [X]

EVEN DOTS DRIVEN	ODD DOTS DRIVEN	ALL DOTS DRIVEN



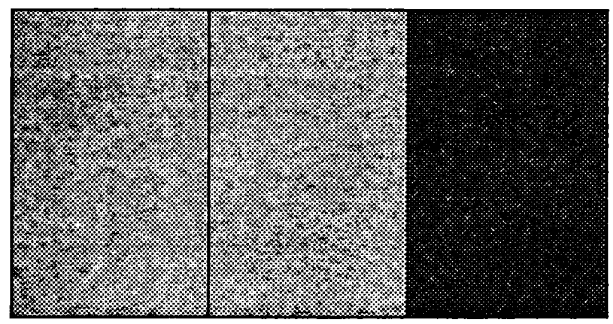
PRESS [ENTER] KEY

Subtest 07 640*350/640*480 Graphics display

This subtest displays EVEN DOTS, ODD DOTS, ALL DOTS in the 640*350 and 640*480 pixels graphics mode (Mode 10/ 12) as shown below.

640*XXX GRAPHICS DISPLAY : [XX]

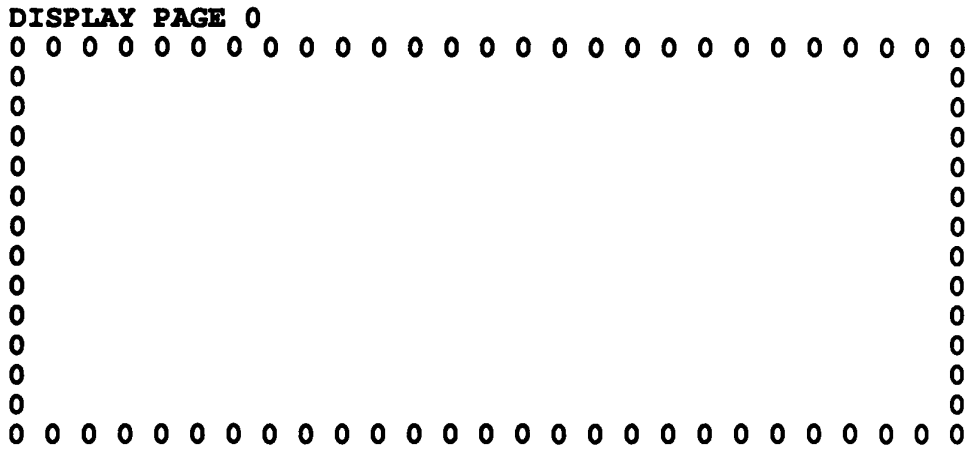
EVEN DOTS DRIVEN	ODD DOTS DRIVEN	ALL DOTS DRIVEN



PRESS [ENTER] KEY

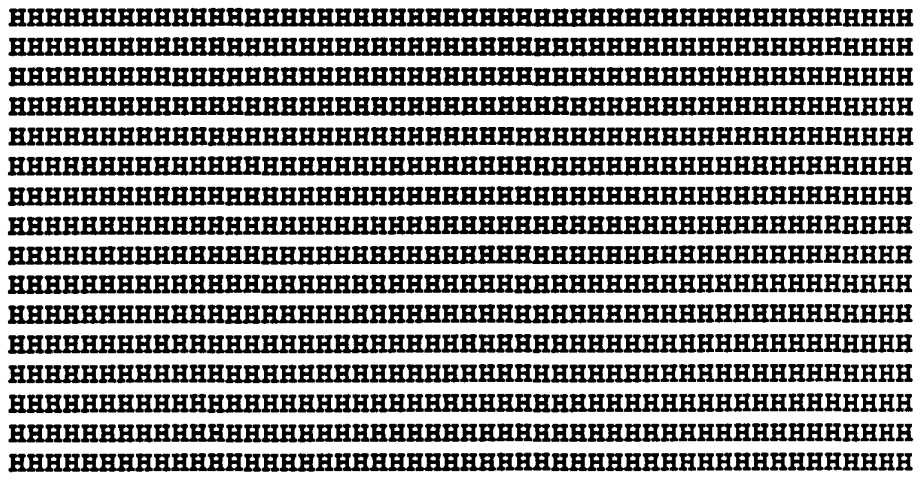
Subtest 08 Display page

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



Subtest 09 "H" pattern display

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



Subtest 10 LED/DAC pallet

This subtest displays as follows:

```
DISPLAY TEST        IN PROGRESS          410000

SUB-TEST    : 10
PASS COUNT  : 00000       ERROR COUNT :  0000
WRITE DATA  : 00          READ DATA   :  00
ADDRESS     : 000000      STATUS      :  000

[ Speed/CRT/Caps/Num/Scroll LED test ]

    (1) Press [ Caps Lock   ] key!  ...Caps   (on/off)
    (2) Press [ Num lock    ] key!  ...Num    (on/off)
    (3) Press [ Scroll lock ] key!  ...Scroll (on/off)


Press [ENTER] KEY
```

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

3.8 FLOPPY DISK TEST

CAUTION: Before running the floppy disk test, prepare a formatted work disk and remove the diagnostics disk. Then insert the work disk into the FDD. Because the contents of the floppy disk will be erased.

OPERATION

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

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

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

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

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

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

4. You can select the start track number of the floppy disk test.
When pressing the **Enter** only, the start track number will be zero.
If you desire, select the start track number. Then the subtest menu of the floppy disk test will appear.

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

FLOPPY DISK **XXXXXXX**

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

CONTENTS

Subtest 01 Sequential read

This subtest performs the CRC (cyclic redundancy check) with a continuous read operation of all tracks on a floppy disk.
2D (Double-sided, double-density): Track 0 to 39.
2DD (Double-sided, double-density, double-track) and 2HD (Double-sided, high-density, double-track): Track 0 to 79.
The start track can be specified at the previous stage.

Subtest 02 Sequential read/write

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

Subtest 03 Random address/data

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

Subtest 04 Write specified address

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

Subtest 05 Read specified address

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

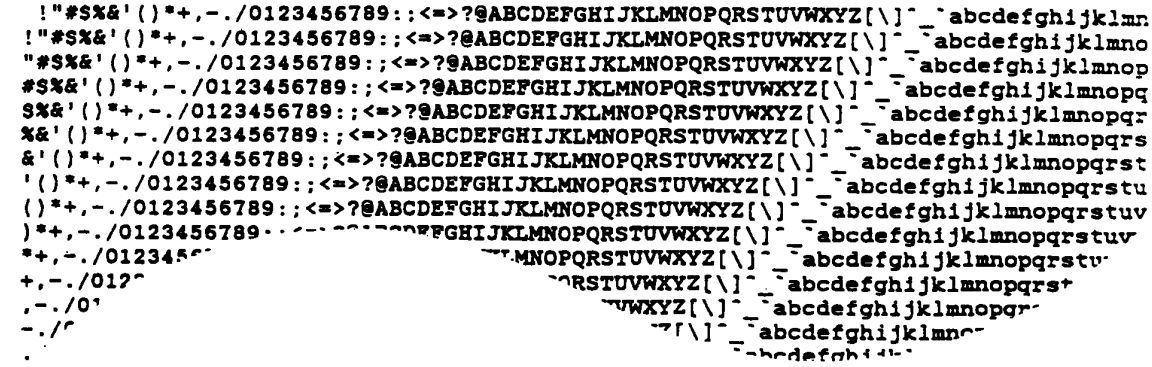
3.9 PRINTER TEST

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

CONTENTS

Subtest 01 Ripple pattern

This subtest prints characters for code 20H through 7EH line by line while shifting one character to the right at the beginning of each new line.



Subtest 02 Function

This subtest prints out various print type as shown below.

```
   PRINTER TEST
1.  THIS LINES SHOWS NORMAL PRINT.
2.     THIS LINE SHOWS DOUBLE WIDTH PRINT.
3. THIS LINE SHOWS COMPRESSED PRINT.
4.  THIS LINE SHOWS EMPASIZED PRINT.
5.  THIS LINE SHOWS DOUBLE STRIKE PRINT.
6.  ALL CHARACTERS PRINT

 !"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmn
opqrstuvwxyz{|}
```

Subtest 03 Wraparound

> **NOTE:** A printer wraparound connector is necessary for executing this test. Wiring diagram of the printer wraparound connector is described in section 3.25.
> The data, control, and status lines will be checked with the printer wraparound connector.

OPERATION

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

   Select the channel number (1-3) ?

   Select the printer channel number, then type in the number. The T5200 supports three printer channels.

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

3.10 ASYNC TEST

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

Speed: 9600 BPS
Data 8 bits and one parity bit (EVEN)
One stop bit
Data pattern: 20H to 7EH

Subtest 01 Wraparound (channel 1)

NOTE: The RS-232-C wraparound connector must be connected to SERIAL A CONNECTOR to execute this test. The wiring diagram of the RS-232-C wraparound connector is described in section 3.25.

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

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

NOTE: The RS-232-C direct cable (9-pin to 9-pin) must be connected to channel 1 and 2 to execute this test. The wiring diagram of the RS-232-C direct cable is described in section 3.25.

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

Subtest 03 Point to point (send)

NOTE: This subtest must be executed in condition that two machines are connected with the RS-232-C direct cable and one side should be set as 'send' and the other set as 'receive'. The wiring diagram of the RS-232-C direct cable is described in section 3.25. The subtest 03 executed in one side and the subtest 04 executed in the other will check the communication capability as follows:

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

Subtest 04 Point to point (receive)

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

Subtest 05 Card modem loopback

> **NOTE:** If there is no modem card in the system, this test can no be executed.

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

Subtest 06 Card modem on-line test

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

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

Subtest 07 Dial tester test

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

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

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

Subtest 08 Interrupt test (IRQ4, 3, 5)

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

3.11 HARD DISK TEST

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

OPERATION

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

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

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

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

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

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

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

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

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

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

HARD DISK TEST **XXXXXXX**

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

CONTENTS

Subtest 01 Sequential read

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

Subtest 02 Address uniqueness

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

Read sequential select ?

1 : Forward sequential
2 : Reverse sequential
3 : Random

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

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

Subtest 03 Random address/data

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

Subtest 04 Cross talk & peak shift

This subtest writes the eight types of worst pattern data (shown below) that is shifted cylinder by cylinder then reads the data out and compares it to the original data.

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

Subtest 05 Write/Read/Compare (CE)

This subtest writes B5ADADH worst pattern data to the CE cylinder and then reads the data out and compares it with the original data.

Subtest 06 Write specified address

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

Subtest 07 Read specified address

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

Subtest 08 ECC circuit (CE cylinder)

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

Subtest 09 Sequential write

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

Subtest 10 W-R-C specified address

This subtest writes specified data to the specified cylinder and head, then read and compare with original data.

3.12 REAL TIMER TEST

Subtest 01 Real time

A new date and time can be input during this subtest when the current date and time are displayed.
Operations for the test are as follows.

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

   REAL TIME TEST **901000**

   Current data: XX-XX-XXXX
   Current time: XX:XX:XX

   Enter new date:

   PRESS [ENTER] KEY TO EXIT TEST

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

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

Subtest 02 Backup memory

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

Subtest 03 Real time carry

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

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

3.13 NDP TEST

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

Subtest 01 NDP test

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

3.14 EXPANSION UNIT TEST

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

Subtest 01 Box wraparound (8 bits bus)

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

Subtest 02 Box mono video RAM

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

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

Subtest 03 Wraparound test (32 bit bus)

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

Subtest 04 Wraparound test (16 bit bus)

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

3.15 ERROR CODE AND ERROR STATUS NAMES

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

Table 3-3 Error code and error status names

Device name	Error code	Error status name
EVERYTHING	FF	Compare Error
SYSTEM	01	ROM Checksum Error
MEMORY	01	Parity Error
	02	Protected Mode Not Change Error
	DD	Cache Memory Error
FDD	01	Bad Command
	02	Address Mark Not Found
	03	Write Protected
	04	Record Not Found
	06	Media Removed
	08	DMA Overrun Error
	09	DMA Boundary Error
	10	CRC Error
	20	FDC Error
	40	Seek Error
	60	FDD Not Drive
	80	Time Out Error
	EE	Write Buffer Error
RS-232-C	01	DSR Off Time Out
	02	CTS Off Time Out
	04	RX-Enable Time Out
	08	TX-Buffer Full Time Out
	10	Parity Error
	20	Framing Error
	40	Overrun Error
	80	Line Status Error
	88	Modem Status Error
	33	No Carrier (CARD MODEM)
	34	Error (CARD MODEM)
	36	No Dial Tone (CARD MODEM)

Table 3-3 Error code and error status names (continued)

Device name	Error code	Error status name
PRINTER	01	Time Out
	08	Fault
	10	Select Line
	20	Out Of Paper
	40	Power Off
	80	Busy Line
HDD	01	Bad Command Error
	02	Bad Address Mark
	04	Record Not Found
	05	HDC Not Reset
	07	Drive Not Initialize
	09	DMA Boundary Error
	0A	Bad Sector Error
	0B	Bad Track Error
	10	ECC Error
	11	ECC Recover Enable
	20	HDC Error
	40	Seek Error
	80	Time Out Error
	AA	Drive Not Ready
	BB	Undefined
	CC	Write Fault
	E0	Status Error
	F0	Not Sense Error (HW.code=FF)
NDP	01	No Co-processor
	02	Control Word Error
	03	Status Word Error
	04	Bus Error
	05	Addition Error
	06	Multiply Error

3.16 HARD DISK TEST DETAIL STATUS

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

HDC status = XXXXXXXX

Detailed status of the hard disk test error is shown on the screen by eight-unit number. The first **XXXX** is error status and the last **XXXX** is not used.
Error status is composed of 2 bytes; the first byte shows the contents of the HDC status register in hexadecimal form and the other the error register of the HDC.
These contents are described in the table 3-4 and 3-5.

Table 3-4 HDC status register contents

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

Table 3-5 Error register contents

Bit	Name	Description
7	BBK (bad block mark)	"0" ... Otherwise "1" ... A bad block mark is detected.
6	UNC (uncorrectable)	"0" ... There is no uncorrectable data error. "1" ... Uncorrectable data error has been detected.
5		Not used.
4	IDNF (identification)	"0" ... Otherwise "1" ... There was no ID field in the requested sector.
3		Not used.
2	ABRT (abort)	"0" ... Otherwise "1" ... Illegal command error or a drive status error occurs.
1	TK0 (track 0)	"0" ... The hard disk has found track 0 during a recalibrate command. "1" ... The hard disk could not found track 0 during a recalibrate command.
0	Not used.	

3.17 HARD DISK FORMAT

There are two types of hard disk formatting:

1. Physical formatting
2. Logical formatting

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

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

CAUTION: The contents of the hard disk will be erased when this program is run. Before running the program, transfer the contents of the hard disk on to a floppy disk. This can be done with the MS-DOS BACKUP command. (See the MS-DOS manual for details.)

3.17.1 Program description

1. All track FORMAT

   Performs physical formatting of hard disk in the manner shown below.

	40MB	100MB
Sector sequences:	1	1
Cylinders:	0 to 804	0 to 775
Heads:	0 to 3	0 to 7
Sectors:	1 to 26	1 to 33
Sector length:	512 bytes per sector	512 bytes per sector
Bad track:	MAX.40 tracks	MAX.50 tracks

2. Good track FORMAT

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

3. Bad track FORMAT

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

4. Bad track CHECK

   Checks for bad tracks by performing a read operation for all tracks on the hard disk; a list of bad tracks is then displayed

3.17.2 Operations

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

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

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

Press [NUMBER] key ?
```

2. All track FORMAT Selection

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

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

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

```
Interleave number (3/1-3) ?
```

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

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


[WARNING : Current DISK data will be
           completely destroyed]

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

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

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

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

3. Good track FORMAT or Bad track FORMAT Selection

(1) When Good track FORMAT or Bad track FORMAT is selected, the following message will appear.

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

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

Interleave number (3/1-3) ?

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

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

Press [track number (CCCH)] key ?

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

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

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

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

4. Bad track CHECK Selection

(1) When Bad track CHECK is selected, the following message will appear.

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

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

Interleave number (3/1-3) ?

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

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

[[cylinder,head = XXX XX]]

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

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

3.18 SEEK TO LANDING ZONE (HDD)

3.18.1 Program description

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

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

3.18.2 Operations

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

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

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

3.19 HEAD CLEANING

3.19.1 Program description

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

3.19.2 Operations

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

   DIAGNOSTIC FLOPPY DISK HEAD CLEANING: VX.XX

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

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

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

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

3.20 LOG UTILITIES

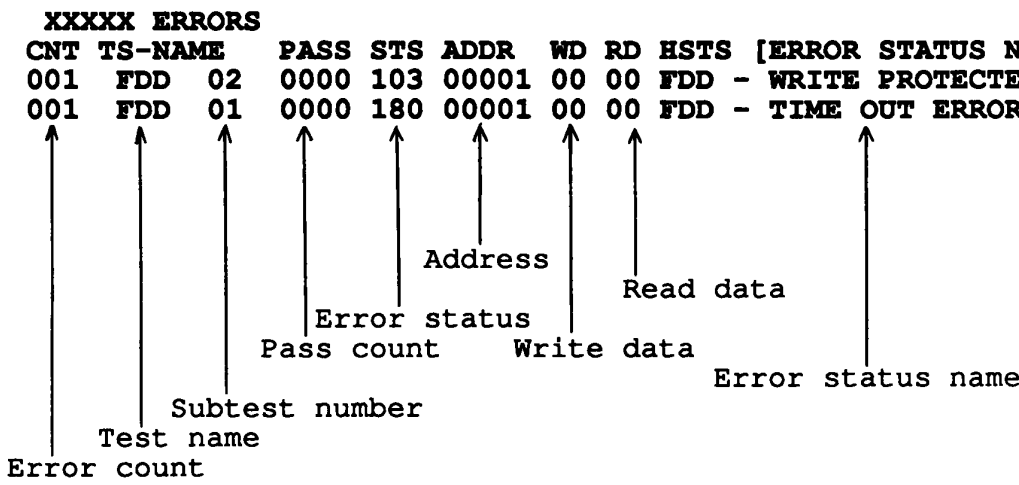
3.20.1 Program description

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

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

3.20.2 Operations

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



[[1:Next,2:prev,3:Exit,4:Clear,5:Print,6:FD LogRead, 7:FD LogWrite]]

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.

3.21 RUNNING TEST

3.21.1 Program description

This program automatically runs the following tests in sequence.

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

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

3.21.2 Operations

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

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

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

   Printer wrap around test (Y/N) ?

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

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

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

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

3.22 FDD UTILITIES

3.22.1 Program description

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

1. FORMAT

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

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

(1) **2D**:Double-sided, double-density, 48/67.5 TPI, MFM mode, 512 bytes, 9 sectors/track.
(2) **2DD**:Double-sided, double-density, double-track, 96/135 TPI, MFM mode, 512 bytes, 9 sectors/track.
(3) **2HD**:Double-sided, high-density, double-track, 96/135 TPI, MFM mode, 512 bytes, 18 sectors/track.

2. COPY

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

3. DUMP

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

3.22.2 Operations

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

[FDD UTILITIES]

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

PRESS [1] - [9] KEY

2. FORMAT Selection

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

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

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

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

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

Warning : Disk data will be destroyed.

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

(4) Remove the diagnostics disk from the FDD and insert the work disk; press any key.
The following message will appear; 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) ?

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

3. COPY Selection

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

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

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

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

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

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

Copy start

[[track, head = XXX XX]]

(4) Remove the source disk from the FDD and insert the target disk (formatted); press any key. The **[[track, head = XXX X]]** message will appear, then start the copy to target disk. When coping cannot be done with one operation, message (2) is displayed again. Repeat the operation. After the floppy disk has been copied, the following message will appear.

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

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

4. DUMP Selection

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

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

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

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

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

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

(4) Select an FDD drive number; the following message will then appear.

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

(5) Remove the diagnostics disk from the FDD and insert a source disk; press any key. The **Track number ??** message will then appear. Type the track number and press **Enter.**

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

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

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

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

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

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

3.23 SYSTEM CONFIGURATION

3.23.1 Program description

This program displays the following system configuration.

1. BIOS ROM VERSION = VX.XX
2. Base memory size
3. Display type
4. A number of floppy disk drives
5. A number of async ports
6. A number of hard disk drives
7. A number of printer ports
8. Co-processor presents or not
9. Extended memory size

3.23.2 Operations

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

SYSTEM CONFIGURATION

***- BIOS ROM VERSION = VX.XX**
***- 640KB MEMORY**
***- PLASMA DISPLAY**
***- 1 FLOPPY DISK DRIVE(S)**
***- 2 ASYNC ADAPTER(S)**
***- 1 HARD DISK DRIVE(S)**
***- 1 PRINTER ADAPTER(S)**
***- 0 MATH CO-PROCESSOR**
***- 0000KB EXTENDED MEMORY**

PRESS [ENTER] KEY

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

3.24 SETUP

3.24.1 Accessing the SETUP

Press:0 followed by **Enter**, and the following screen appears:

```
[[ System setup ]]
1. Hard disk type    =9-Cyl=776,h=8,S/T=33,Cap=100MB
2. Memory size
     System memory   =640KB
     Extended memory=  1MB
     Expanded memory=  0MB+288KB(96KB used as a fast
                       ROM)
3. Display
     Plasma display adaptor =VGA compatible adaptor
     Display device         =Plasma
     Plasma display mode    =Color
     Plasma gray scale      =Normal:Semi-bright
                             Intense:Bright
4. Printer port type        =Output port
5. Serial port
     IRQ SIO base address   =3E8h
     Serial A IRQ level     =4 (I/O base address=3F8h)
     Serial B IRQ level     =3 (I/O base address=2F8h)
     Toshiba modem IRQ level=Not used
6. Bus speed                =High
     ↑↓↵ moves between items, ←→ selects values
     F1 exits, F5 sets default, F10 record changes
```

The menu above shows an example of setup options as they may be currently stored in memory. Since the options shown reflect the previously set options, the display you can see may be different from the one above. The options shown under item 3, "Display", differ depending on the option selected for "Plasma display adaptor".

Notice that selecting the type of diskette drive is not an option. The T5200 automatically determines what type of internal diskette drive is installed. Also, you don't have to run the SETUP of DIAGNOSTICS MENU to use an external 5 1/4" diskette drive.

Press **F1** if the setup options displayed accurately reflect your hardware configuration and no changes are necessary. The system restarts.

Changing Setup Values

You can change the setup automatically or manually.

Automatic Reset

Follow the steps to set the values automatically:

1. Press **F5**. This instructs the program to reset all the options to their factory preset values.
   The program calculates how much conventional, extended and expanded memory your T5200 has, based on whether or not you have memory expansion kits installed.

   Setup stores the value it calculates in configuration memory along with the factory preset values for the other options. The **[[System setup]]** menu displays the new values.

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

3. If the new values are correct, press **F1**. The system restarts.

Manual Reset

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

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

2. Use the up and down arrow keys (or **Enter**) to move the cursor between options.

3. When the cursor highlights the value of an option you want to change, use the left and right arrow keys to select alternate values.
   The possible values for each option are shown in the table below

4. When you are finished making changes, press **F10** to record the new values in configuration memory.

5. SETUP displays this message:

   ARE YOU SURE? (Y/N)

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

6. If the new values are correct, press **Y**. The system restarts.

3.24.2 SETUP Descriptions

This section explains the possible values for each SETUP.

1. Hard Disk Type

As you change the values for this option using the right and left arrow keys, the setup program displays one of the following lines:

```
6 - Cyl=805, H=4, S/T=26, Cap=40MB
7 - Cyl=979, H=5, S/T=17, Cap=40MB
9 - Cyl=776, H=8, S/T=33, Cap=100MB
No drive
```

Drive Table

Abbreviation	Meaning
Cyl	number of cylinders
H	number of heads
S/T	number of sectors per track
Cap	capacity

2. Memory Size

Configuration memory involves selecting how much RAM the system use for each of the three types of memory: System memory, Extended memory, and Expanded memory.

You can change System memory to either 640KB or 512KB. The default value is 640KB.

For the purposes of SETUP, the second and third memory types are interrelated. Use these guidelines set Extended memory first:

> Specify the size of extended memory in 0.5MB increments from 0MB to the maximum available. The maximum memory you have depends on whether or not memory expansion kits are installed. The preset size of extended memory is 1MB.
>
> Each time you change the size of extended memory, you also change the size of expanded memory. Memory not used as extended memory is automatically allocated by the system as expanded memory. Here are two examples of how this procedure works:

Memory Example 1: You do not have the memory expansion kit installed (there's a maximum of 1MB available for extended memory). You specify 0.5MB of extended memory. The system automatically allocates 0.5MB as expanded memory.

Memory Example 2: You have one 2MB memory expansion kit installed (there's a maximum of 3MB available for extended memory). You specify 1MB of extended memory. The system automatically allocates 2MB as expanded memory.

Specify how you want to use the T5200's remaining memory, usually 384KB. Set this value through the Expanded memory value of the Memory size option. You have these choices:

blank — No additional memory is allocated for expanded memory. The only memory used as expanded memory is what was automatically assigned due to your choice for Extended memory. All remaining memory (except conventional memory) is used as extended memory.

288KB — If the display ROM is used, 288KB is allocated for expanded memory, in addition to memory allocated by your choice for Extended memory. The remaining 96KB is reserved for Fast ROM; this choice results in a noticeable increase in the T5200's operating speed. This is the preset value.

320KB — If the display ROM is not used, 320KB is allocated for expanded memory. The remaining 64KB is reserved for Fast ROM. This is another preset value.

384KB — All memory not otherwise allocated is reserved for expanded memory, in addition to memory allocated by your choice for Extended memory.

If you select 512KB conventional memory, the amount of possible expanded memory increases by 128KB. Instead of 0KB, 288KB, 320KB, and 384KB for the values, you have 0KB, 416KB, 448KB, and 512KB, respectively.

These tables summarize the Memory size values:

Extended/Expanded Memory Size Table

Base System Size Extended memory Values		Resulting Expanded Memory Size without expansion kit	with expansion kit
640KB	0MB	1MB	3MB
	0.5MB	0.5MB	2.5MB
	1MB	0MB	2MB
If you installed one 2MB memory expansion kit:			
	1.5MB		1.5MB
	2MB		1MB
	2.5MB		0.5MB
	3MB		0MB

Beginning with the base system on the left, find the amount of extended memory you wish to use in the second column. The third and fourth columns show you how much expanded memory your T5200 will have with and without the memory expansion kit.

Additional Memory/Fast ROM Table

Expanded memory size values	Fast ROM used?	Total Extended used?	Total Expanded Memory
blank	No	384KB*+ value above	0KB value above
288KB*	Yes	Value above	288KB*+ value above
320KB*	Yes	Value above	320KB*+ value above
384KB*	No	Value above	384KB*+ value above

* Selecting the 512KB conventional memory increases these values by 128KB.

The table above shows how much additional extended or expanded memory to add to the expanded memory values in the previous table based on whether or not you use fast ROM.

3. Display

This option defines the setup for the internal display controller. The display setup items differ depending on the type of adaptor selected for the first item, Plasma display adaptor. The Plasma display adaptor has the following options:

-VGA compatible (This is the default setting)
-CGA compatible
-Not used

Plasma display adapter=VGA compatible
When the Plasma display adaptor option is set to VGA compatible, internal display controller is configured as a VGA compatible plasma/CRT controller. In this case the remaining setup options are:

Display device
Plasma display mode
Plasma gray scale

Display device: This option selects between using the CRT only (CRT mode), and using both the CRT and the plasma display simultaneously (dual display mode). In either case , if a CRT is connected to the T5200, the display mode of the plasma display is set to either color or monochrome, according to the type of the CRT (color or monochrome). In the dual display mode, the display mode of the plasma display agrees with the mode of the CRT. In this case, the border section of the CRT is not displayed on the plasma display.

-Plasma: Specifies the dual display mode.this is the default setting.
-CRT: Specifies the CRT mode.

Plasma Display mode: If there isn't a CRT attached to the T5200, this option selects whether the plasma display uses monochrome mode or color mode. If there is a CRT attached to the T5200, the display mode of the plasma display is determined by the type of the CRT (either monochrome or color), and the setting for this option has no effect.

-Color: Displays in color mode.256 colors of color data are converted to 16 intensity levels of gray (orange) for the plasma display. This is the default setting.

-Monochrome: Displays in the monochrome mode.64 intensity levels of gray are converted to 16 intensity levels of gray (orange) for the plasma display.

-Plasma gray scale: This specifies the relationship between the brightness levels for characters displayed in normal and intense display modes. A setting of "Bright" indicates that the maximum brightness level (gray scale level 15) will be used to display characters, while a setting of "Semi-bright" indicates that a slightly lower brightness level (gray scale level 11) will be used.

Normal: Semi-bright Intense: Bright (this is the default setting.)

Normal: Bright Intense: Semi-bright

Plasma display adapter = CGA compatible

When the Plasma display adapter option is set to CGA compatible, the internal display controller is configured as a CGA compatible plasma controller. In this case the remaining setup options are:

Plasma gray scale mode
Plasma font style
plasma font set

Plasma gray scale mode: Select either 2 gray levels (T3100 compatible mode), or 16 gray levels that supports a display of 16 colors.

- T3100 compatible mode: Specifies 2 gray levels. This is the default setting.

- 16 gray scales mode: Specifies 16 gray scale levels.

Plasma font style: Select either single-dot font or double-dot font for both the Normal and the Intense character attributes.

- Normal: Single. Intense: Double. (This is the default value.)

- Normal: Single. Intense: Single. (If you select "16 gray scales mode" above, you must select this option.)

- Normal: Double. Intense: Double.

- Normal: double. INtense: Single.

Plasma font set: Select one of the following character font sets:

- Standard: Specifies the standard North American character set. (This is the default setting.)

- North European: Specifies the North European font.

- Canadian French: Specifies the Canadian french font.

- Reserved.

Plasma display adapter = Not used

The internal display controller is not used. There are no additional display options when this is selected.

4. Printer Port Type

This option sets the **PRT/FDD** connector on the rear panel of the T5200 to either an output-only or a bi-directional port. This option is valid only when the **PRT/FDD** connector is used for the printer, that is , the **A B PRT** switch is set to **PRT**. This setting depends on the printer or other parallel devices you attach to the PRT/FDD connector.

when you have printer connected, you should usually select output-only port.

-Output-only port (This is the default setting.)

-Bi-directional port

5. Serial Port

This option allows you to change the I/O addresses and interrupt levels of the serial ports. The standard T5200 supports two serial ports and one expansion serial port.Since the I/O address of a serial port is automatically established according to its interrupt level, the SETUP program prompts you to specify only the interrupt level. The I/O address of a serial port which is given an interrupt level of 5, however, must be set to one of the two predetermined I/O addresses as shown below.

The relationship between the serial port interrupt levels and I/O addresses is shown below.

Interrupt Level	I/O Address
3	2F8H
4	3F8H
5	3E8H or 2E8H

The first setup item in the serial port setup menu sets the I/O address for the serial port that is to be given an interrupt level of 5.The SETUP program displays one of the following addresses as the possible I/O address:

3E8H 2E8H

You can select the appropriate one with the left and right arrow keys. The second through fourth items in the serial port setup menu set the interrupt level of the serial ports.

When the cursor is positioned on the second serial port setup menu item, the SETUP program displays the menu shown below. From this menu, you can select the interrupt levels to be assigned to the serial ports.

The menu indicates the specified interrupt levels in reverse video. You can select the appropriate ones with the left and right arrow keys. After selecting the interrupt levels, press the up or down arrow key, or the RETURN key. the menu will disappear and the original setup menu will reappear.

[Serial port setup menus]

```
Serial A IRQ level              = 4 3 4 3 4 3 4 3 4 3
Serial B IRQ level              = 3 4 5 5 5 5 - - - -
Toshiba modem IRQ level         = - - - - 3 4 3 4 - -
IRQ4 serial port base address = 3F8H
IRQ3 serial port base address = 2F8H
IRQ5 serial port base address = 3E8H
```

Example 1:when not using an expansion card.

The following serial port interrupt level settings are recommended:

```
Serial A IRQ level = 4
Serial B IRQ level = 3
Toshiba modem IRQ level = -
```

Example 2: When using a Toshiba modem card

You need to set the optional port IRQ level according to the I/O address or interrupt level of the modem card that is specified by the communication software to be used. For example, set the serial port interrupt levels as shown below when the communications software assumes 2F8H as the I/O address of the modem.

Serial A IRQ level = 4

Serial B IRQ level = 5

Toshiba modem IRQ level = 3

or

Serial A IRQ level = 4

Serial B IRQ level = -

Toshiba modem IRQ level = 3

Example 3: When using a modem card for the IBM PC

Check the I/O address of the modem card and make sure that it does not conflict with that of the serial A and B. For example, set the serial port interrupt levels as shown below when the I/O address of the modem card is 2F8H.

Serial A IRQ level = 4

Serial B IRQ level = 5

Toshiba modem IRQ level = -

6. Bus Speed

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

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

-Normal: Normal selects the maximum CPU speed and the low bus speed. this setting makes the T5200 bus compatible with the IBM PC AT bus.

-Low: Low selects the low CPU speed and the low bus speed. This setting makes the T5200 bus and CPU speed compatible with the IBM PC AT.

3.25 WIRING DIAGRAM

1. Printer wraparound connector

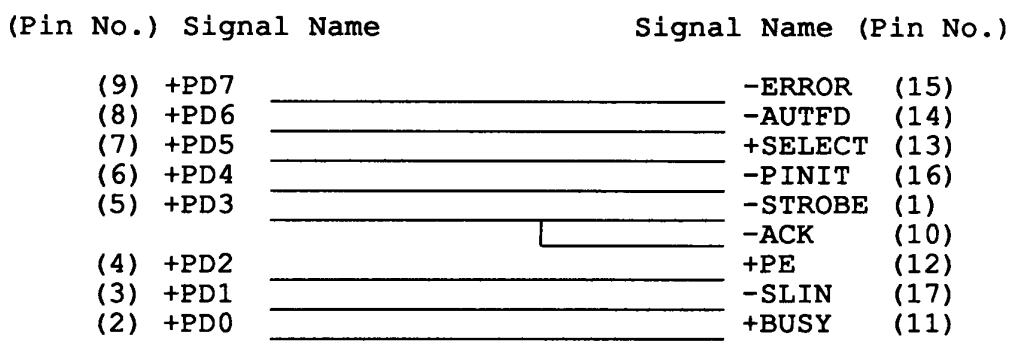


Figure 3-1 Printer wraparound connector

2. RS232C wraparound connector

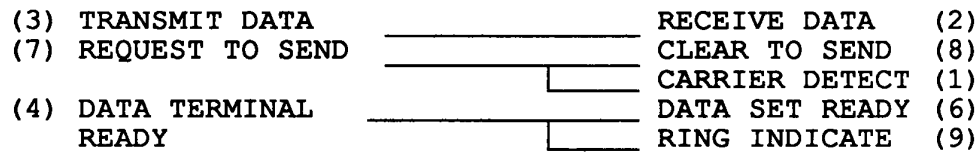


Figure 3-2 RS232C wraparound connector

3. RS232C direct cable (9-pin to 9-pin)

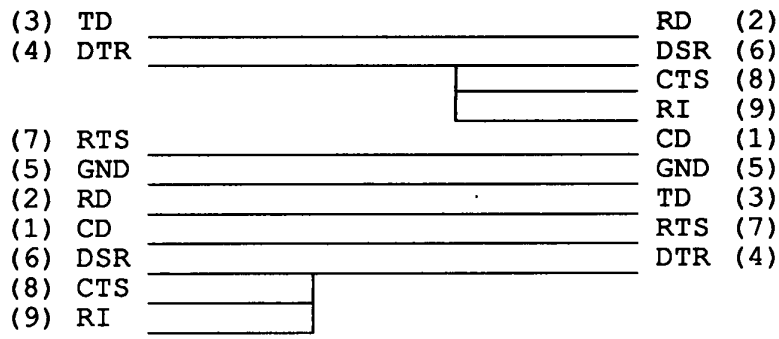


Figure 3-3 RS232C direct cable (9-pin to 9-pin)

4. RS232C direct cable (9-pin to 25-pin)

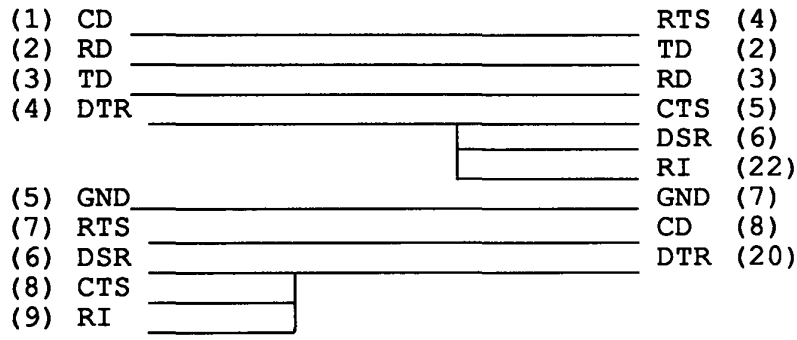


Figure 3-4 RS232C direct cable (9-pin to 25-pin)

4.1 GENERAL

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

FRUs are listed as follows:

1. Keyboard
2. Speaker
3. Top cover
4. Fan
5. LED board
6. Lithium battery
7. Disk support
8. HDD (hard disk drive)
9. FDD (floppy disk drive)
10. Display connector
11. Sensor guide
12. Power supply unit
13. Connector board unit
14. Memory board
15. Expansion connector board
16. System board
17. PDP (plasma display panel) unit
18. Converter board
19. Volume board
20. Latch assembly

The following points must be kept in mind:

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

2. Only approved tools may be used.

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

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

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

6. Follow the only fixed, standard procedures.

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

Tools needed for unit replacement:

1. Phillips head screwdriver

4.2 REMOVING/REPLACING THE KEYBOARD AND THE SPEAKER

1. Remove the AC power cord from the unit.
2. Turn the unit upside down and remove the four screws (A) from the bottom cover.

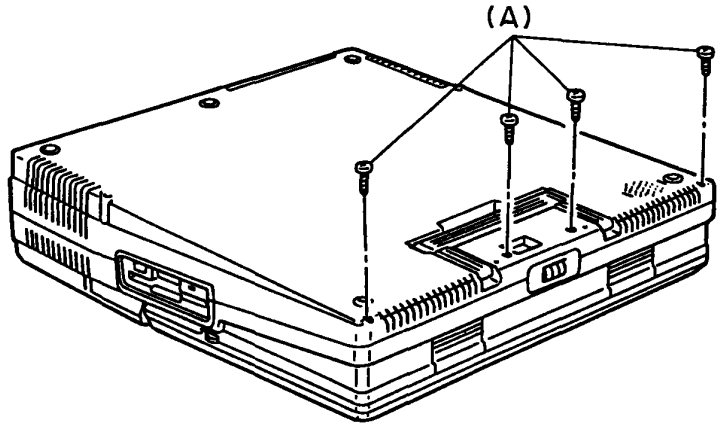


Figure 4-1 Removing the four screws

3. Turn the unit back over then open the display.
4. Lift up the front edge of the keyboard unit (B) and place it front of the computer. At this time, you can not disconnect the keyboard cable.

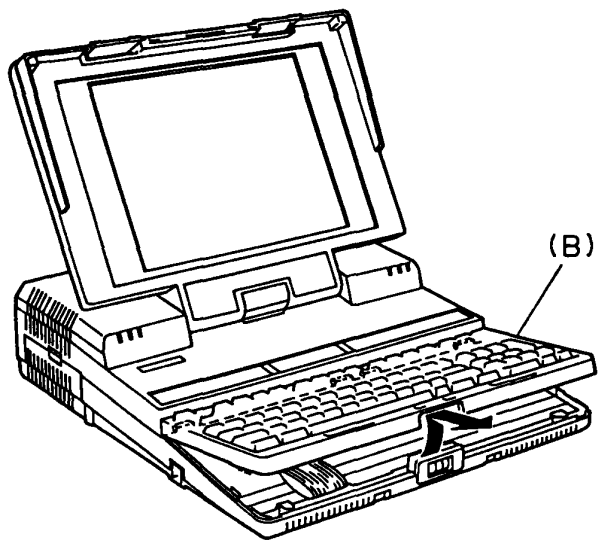


Figure 4-2 Removing the keyboard unit

5. Remove the two screws (C) to remove the shield plate (D) from system board.

6. Release the pressure plate (E) of the keyboard connector PJ1 (F) to disconnect the keyboard cable (G) from the system board (H).

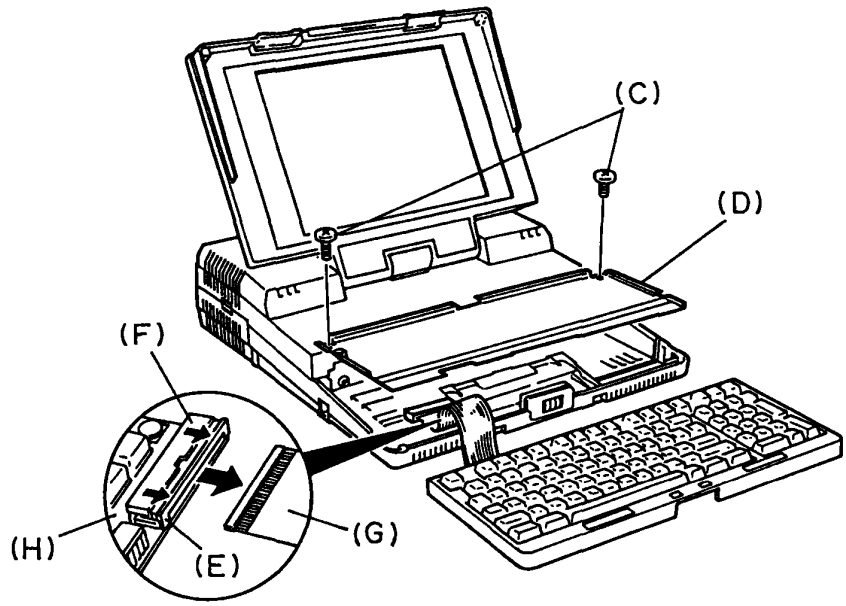


Figure 4-3 Removing the shield plate and disconnect the keyboard cable

7. Unlatch the two latches (I) of the keyboard mask (J), then pull out the keyboard (K).

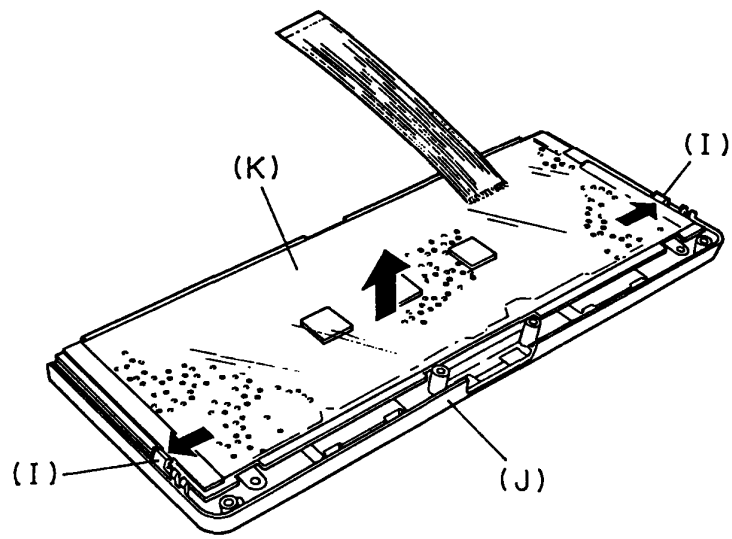


Figure 4-4 Removing the keyboard

8. Disconnect the speaker connector PJ4 (K) from the system board and unlatch the two latches (L) of the bottom cover, then pull out the speaker (M)

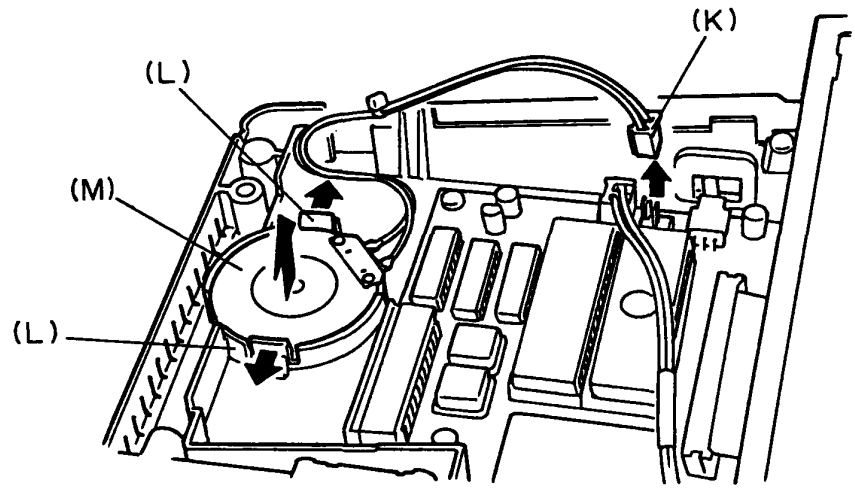


Figure 4-5 Removing the speaker

9. To install the keyboard and the speaker, follow the above procedures in reverse.

4.3 REMOVING/REPLACING THE TOP COVER

1. Remove the AC power cord from the unit.

2. Turn the unit upside down and remove the six screws (A) from the bottom cover.

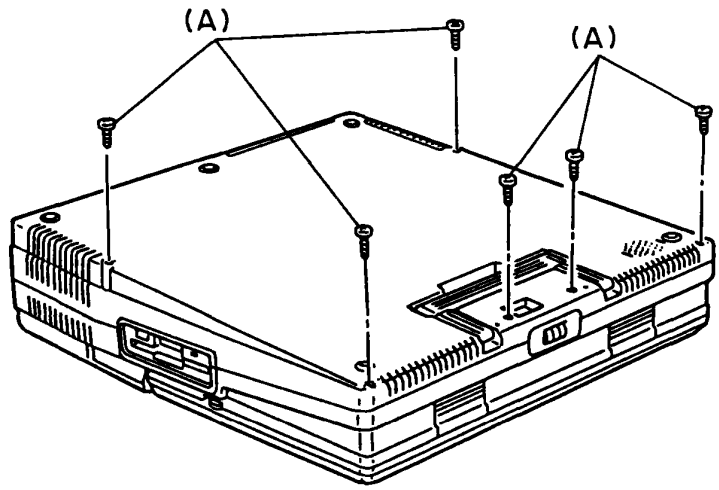


Figure 4-6 Removing the six screws

3. Turn the unit back over then pull out the converter mask panel (B) to remove the two screws (C) from the converter unit (D).

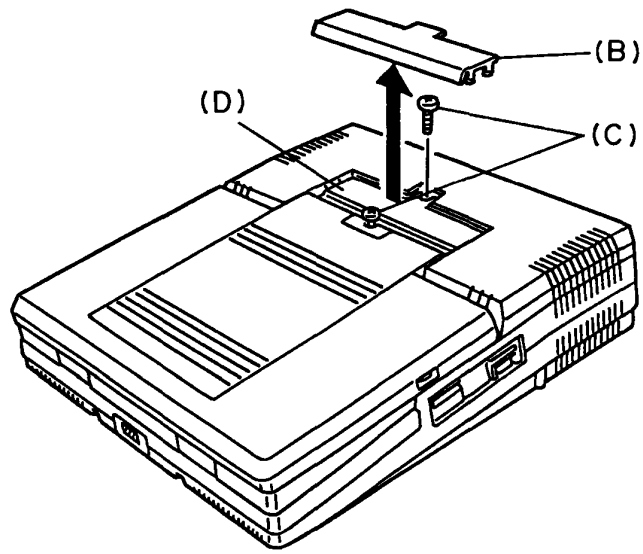


Figure 4-7 Removing the converter mask panel and the screw

4. Open the mask plate (E) to press the both release levers (F) inside and down.

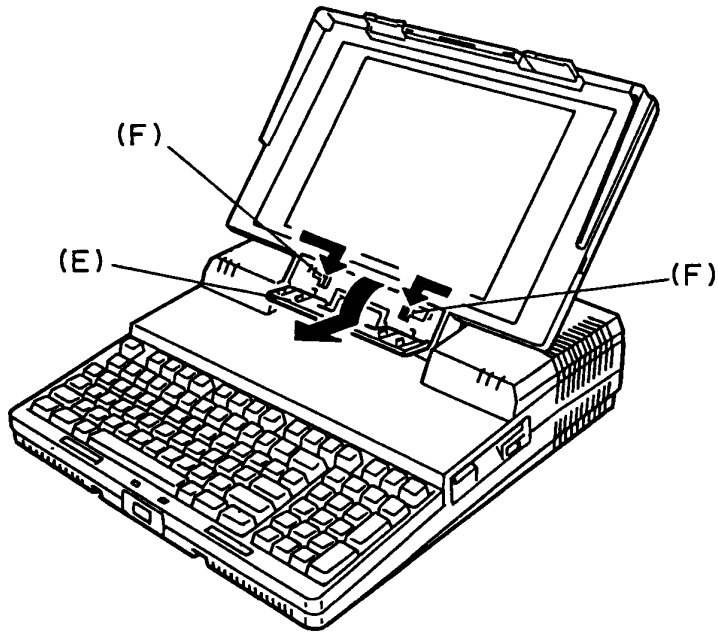


Figure 4-8 unlocking the release levers

5. Unplug the display from display connector (G).

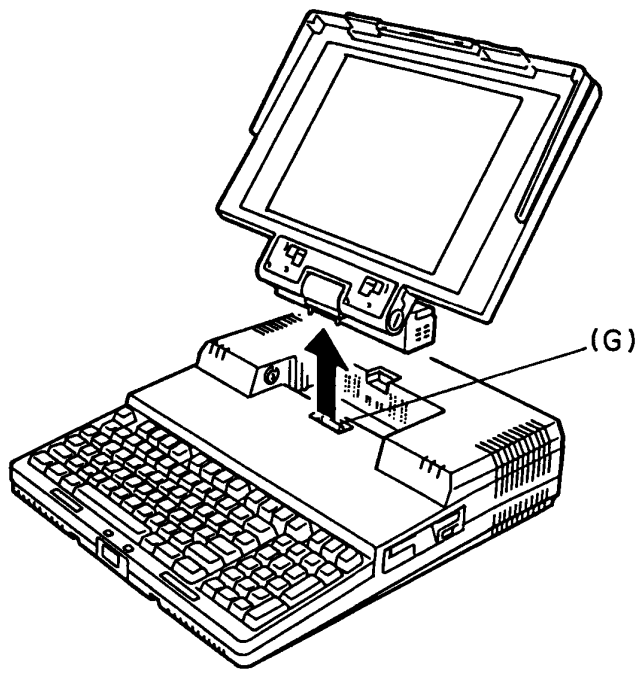


Figure 4-9 Removing the display

6. Remove the keyboard as directed in section 4.2 and remove the screw (H) from top cover (I).

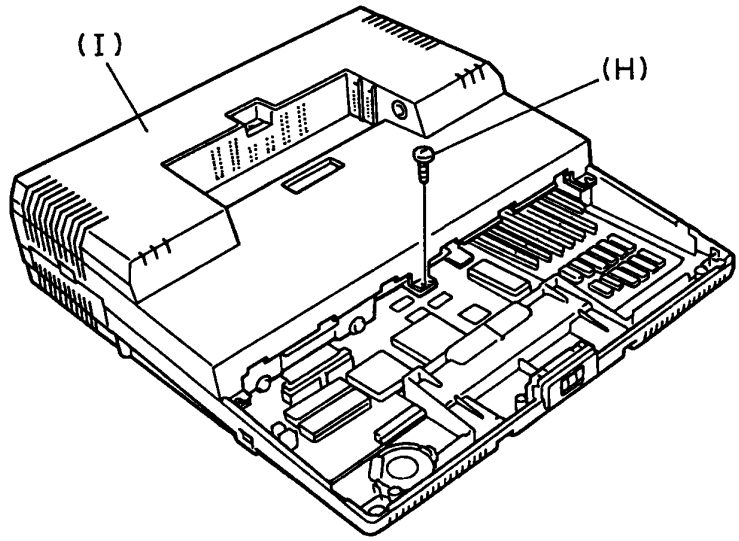


Figure 4-10 Removing the three screws

7. Remove the two screws (J) from the rear panel (K) to remove the rear panel.

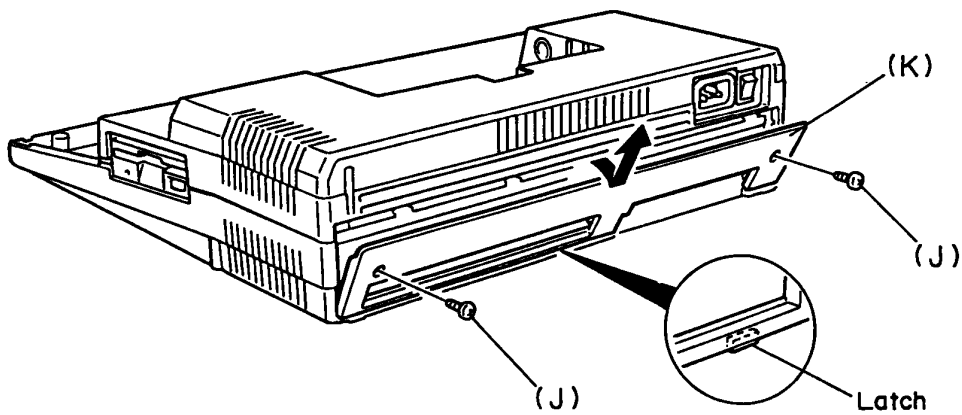


Figure 4-11 Removing the rear panel

8. Remove the two screws (L) from the mask panel (M) and remove the three screws (N) from the rear support (O), to remove the mask panel and the rear support.

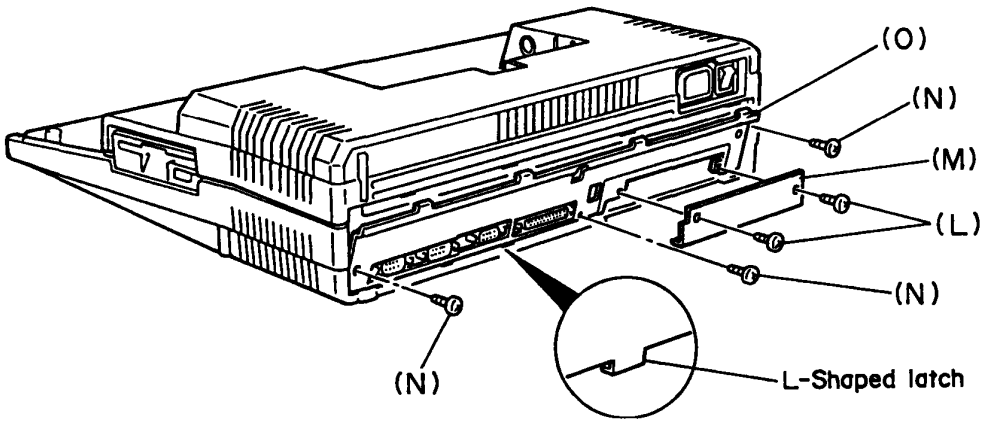


Figure 4-12 Removing the mask panel and the rear support

9. Remove the top cover (P).

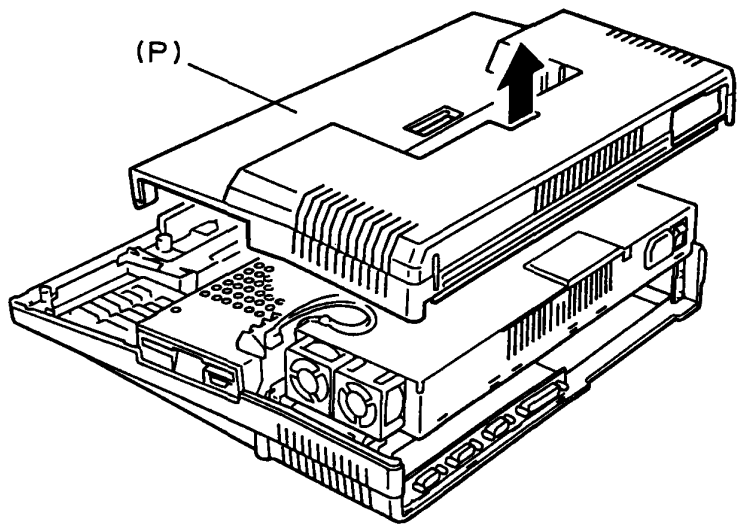


Figure 4-13 Removing the top cover

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

NOTE: Confirm that the rear support is set into the top cover and the bottom cover with L-shaped latches, and confirm that the rear panel is locked into the bottom cover with latches too.

4.4 REMOVING/REPLACING THE FAN, THE LED BOARD AND THE BATTERY

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

2. Remove the two screws (A), (A'), (A") from fan to remove the fan (B), (B'), (B") then disconnect the connector PJ4 (C), PJ3 (C'), PJ702 (C").

3. Disconnect the connector PJ601 (D), PJ701 (D') and pull out the LED case (E), (E').

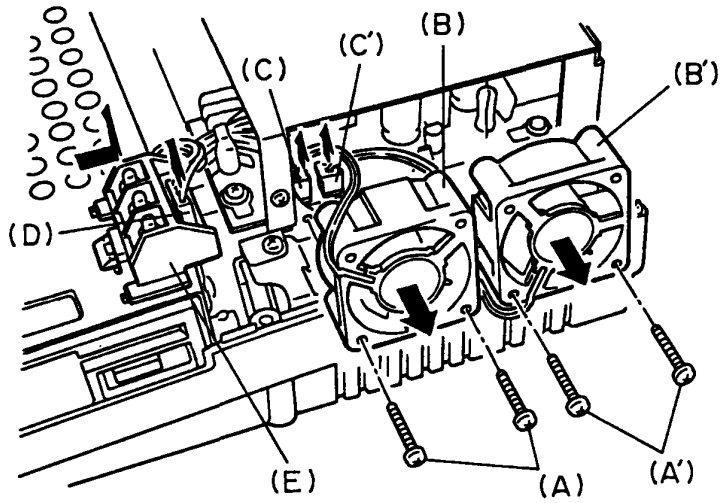


Figure 4-14 Removing the fan and LED case of right side

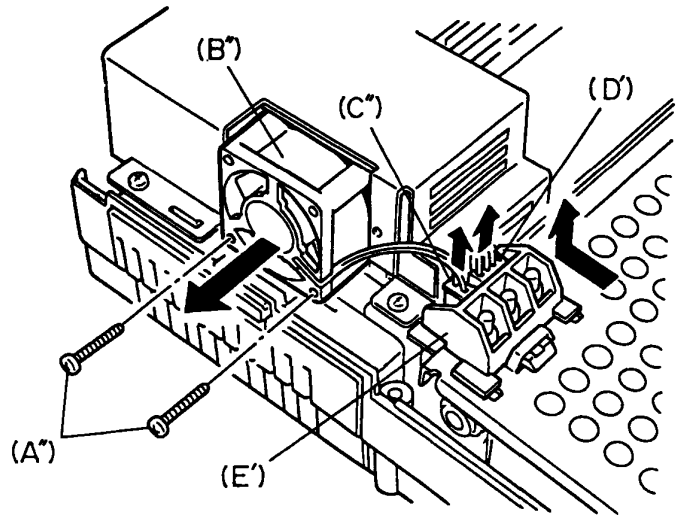


Figure 4-15 Removing the fan and LED case of left side

4. Open (F) part of the LED case, then pull out the LED board (G) from the LED case.

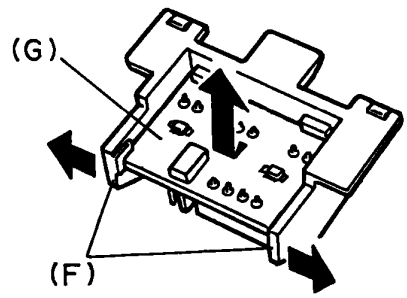


Figure 4-16 Removing the LED board

5. Disconnect the battery connector PJ3 (H) from the system board (I) then pull out the battery (J) through the hole (K) of the disk support (L).

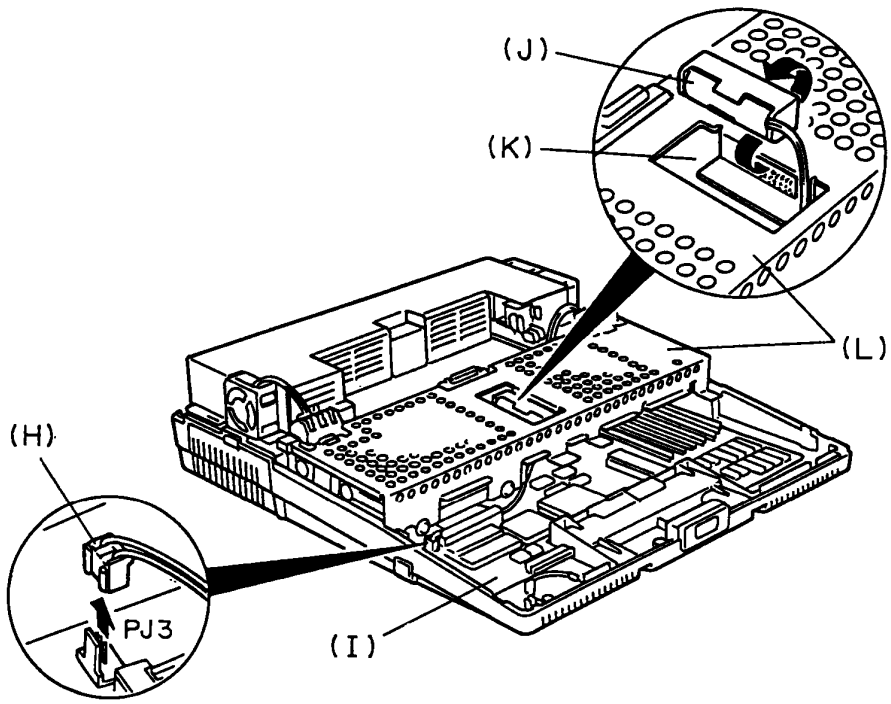


Figure 4-17 Removing the battery

6. To install the fan, the LED board and the battery, follow the above procedures in reverse.

4.5 REMOVING/REPLACING THE DISK SUPPORT

1. Remove the top cover as directed in section 4.3 to disconnect the three connectors PJ601, PJ701, PJ702 (A) from the LED boards (B).

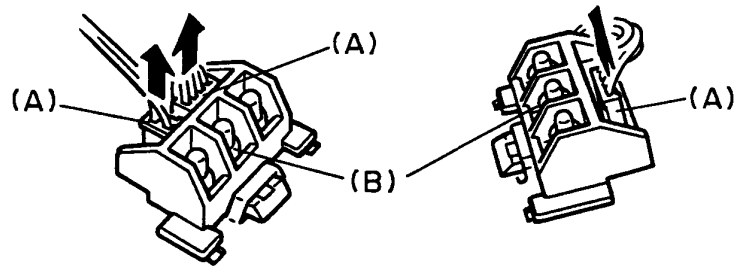


Figure 4-18 Disconnect the three connectors

2. Remove the clear cover (C).

3. Remove the two screws (D) from the disk support (E) to lift up the disk support, then disconnect the five connectors PJ3, PJ5, PJ6, PJ9, PJ13 (F) from the system board (G).

4. Remove the disk support.

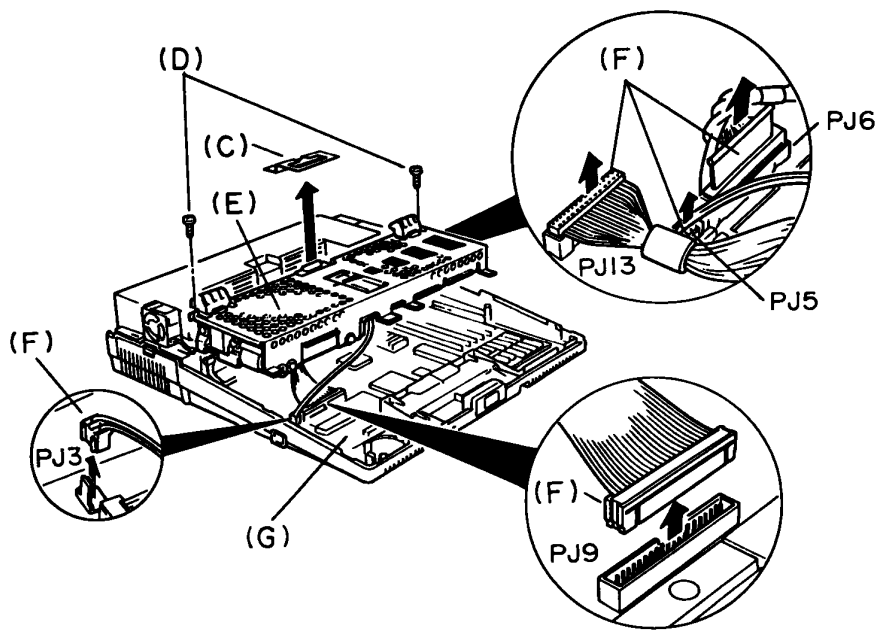


Figure 4-19 Removing the disk support

5. To install the disk support, follow the above procedures in reverse.

4.6 REMOVING/REPLACING THE HDD

1. Remove the disk support as directed in section 4.5.

2. Remove the four screws (A) from disk support then take off the HDD (B) from disk support and disconnect the two connector cables (C) from HDD.

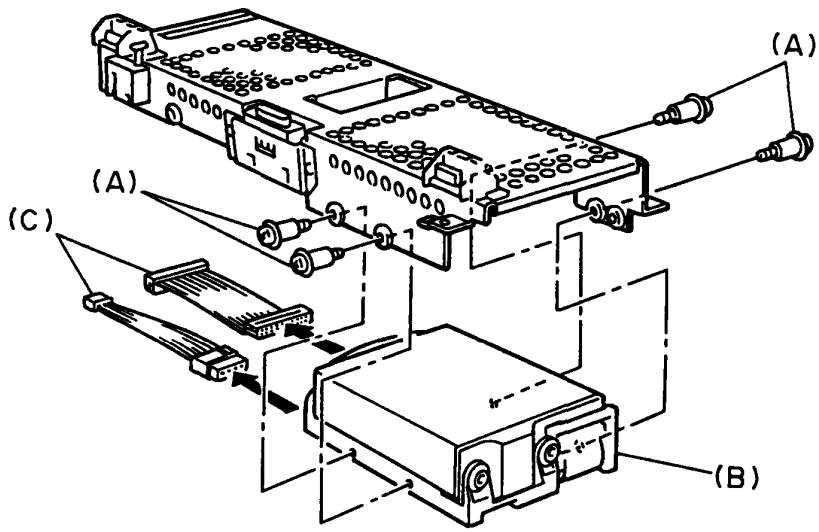


Figure 4-20 Removing the HDD

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

4.7 REMOVING/REPLACING THE FDD

1. Remove the disk support as directed in section 4.5.

2. Remove the four screws (A) from the disk support to take off the FDD (B) from disk support.

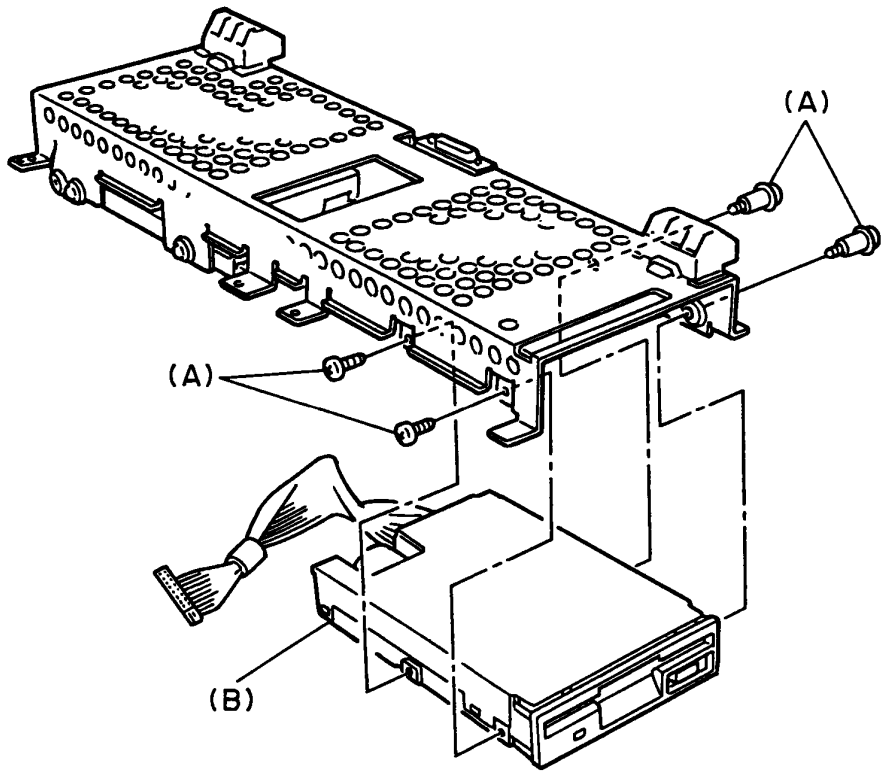


Figure 4-21 Removing the FDD

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

4.8 REMOVING/REPLACING THE DISPLAY CONNECTOR AND THE PLASMA SENSOR

1. Remove the disk support as directed in section 4.5.
2. Remove the four screws (A) from the display connector holder (B) to remove the display connector holder and the display connector (C) from disk support.
3. Remove the screw (D) from the plasma sensor guide (E) to remove the plasma sensor.

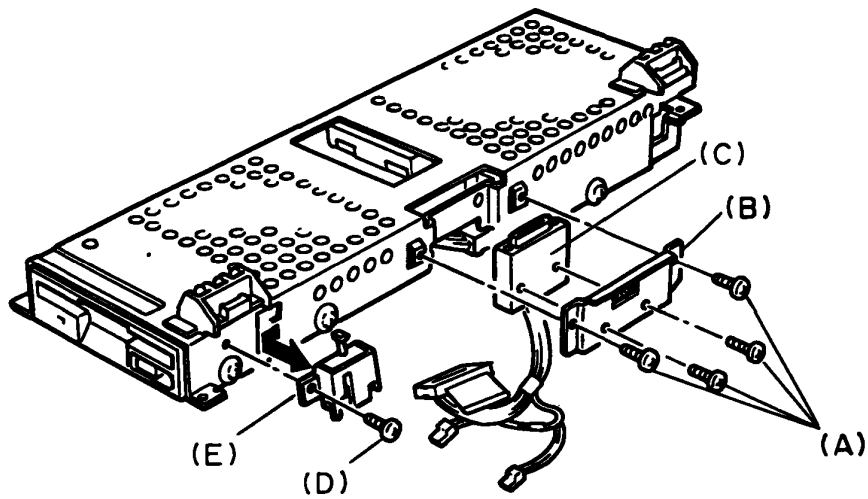


Figure 4-22 Removing the display connector and the sensor guide

4. To install the display connector and the plasma sensor, follow the above procedures in reverse.

4.9 REMOVING/REPLACING THE POWER SUPPLY

1. Remove the disk support as directed in section 4.5 and remove the five screws (A) from the power supply (B).

2. Lift up the power supply then disconnect the two connectors PJ7 and PJ10 (C) from system board (D).

3. Remove the three fans as directed in section 4.4.

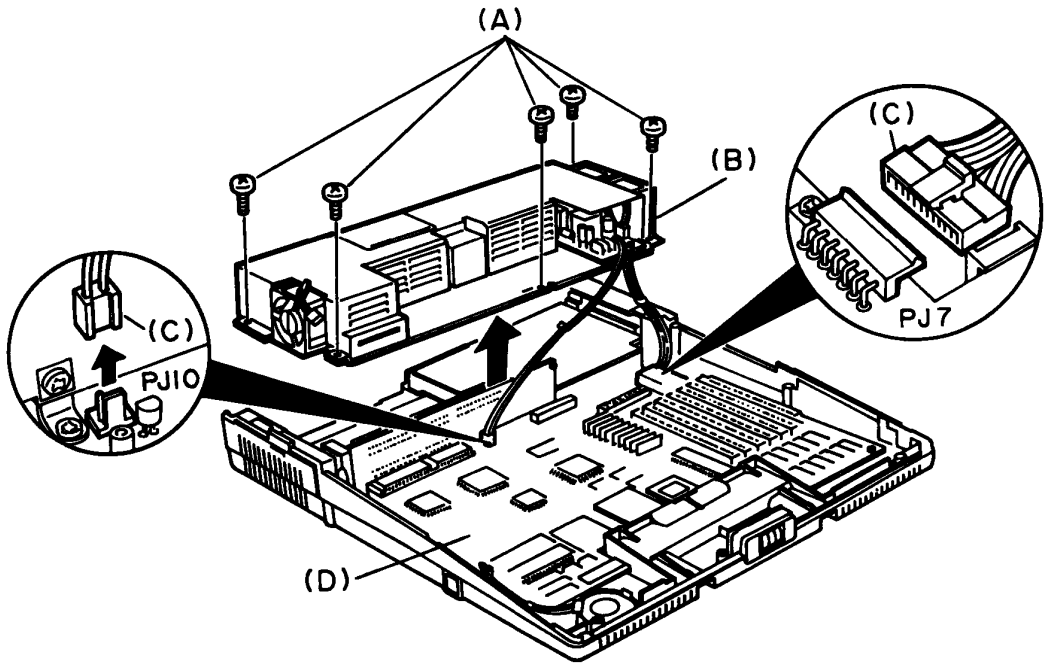


Figure 4-23 Removing the power supply

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

4.10 REMOVING/REPLACING THE CONNECTOR BOARD UNIT

1. Remove the rear support as directed in section 4.3.
2. Pull out the connector board unit (A) from the unit.

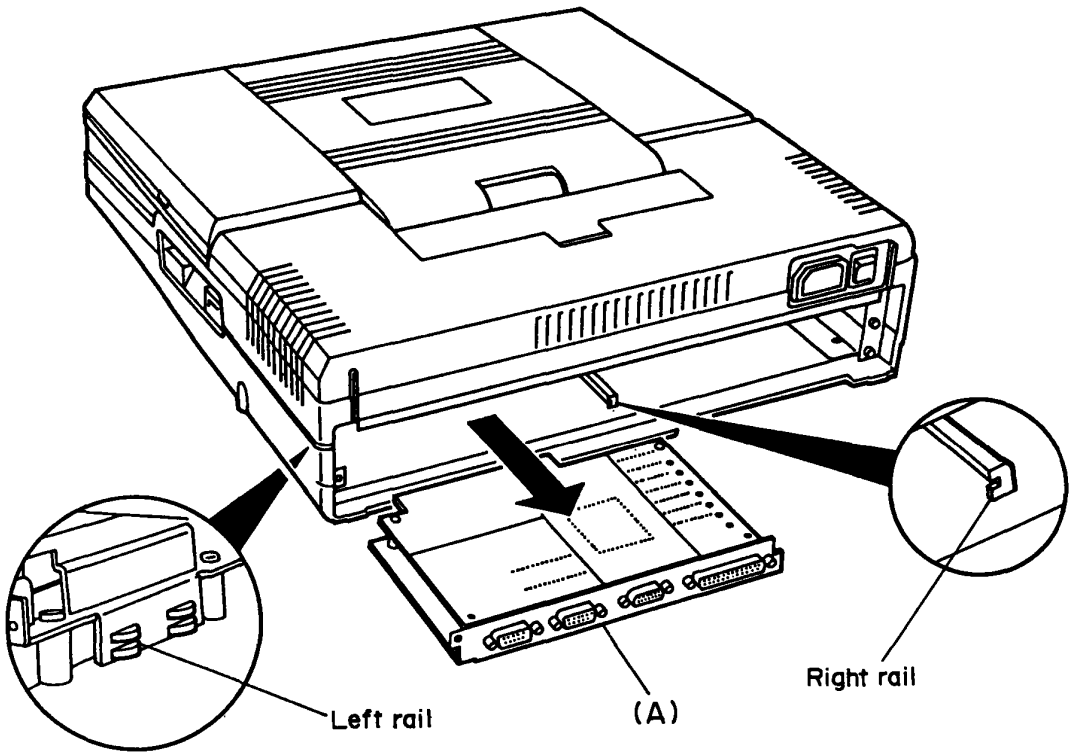


Figure 4-24 Removing the connector board unit

3. To install the connector board unit, follow the above procedures in reverse.

NOTE: Set the lower side board of the Connector board unit properly on the right and left rail, then install the Connector board unit.

4.11 REMOVING/REPLACING THE MEMORY BOARD

1. Remove the keyboard as directed in section 4.2 then remove the three screws (A) from the memory board (B).

2. Move the memory board a little toward the front and pull up to remove.

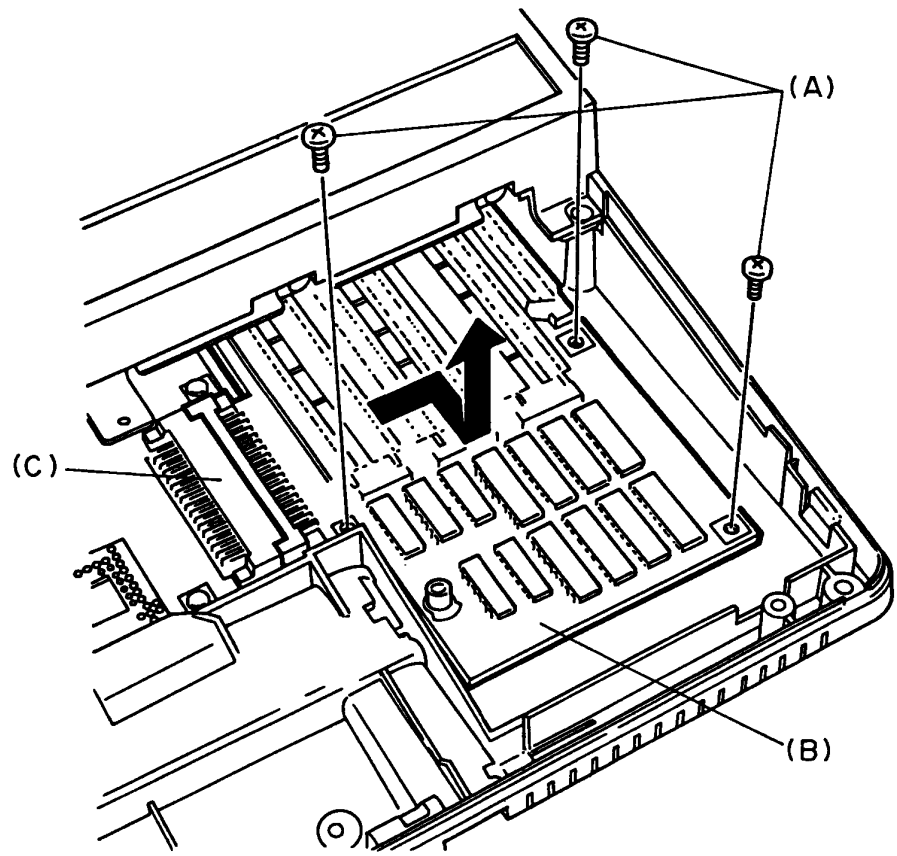


Figure 4-25 Removing the memory board

3. To install the memory board, follow the above procedures in reverse.

4.12 REMOVING/REPLACING THE EXPANSION CONNECTOR BOARD

1. Remove the power supply, the connector board unit and as directed in section 4.9 and 4.10.

2. Remove the two screws (A) from connector panel A and B (B) to remove the connector panel A and B.

3. Remove the screw (C) from expansion connector board (D) and disconnect the connector PJ14 (E) from the system board (F), then remove the expansion connector board.

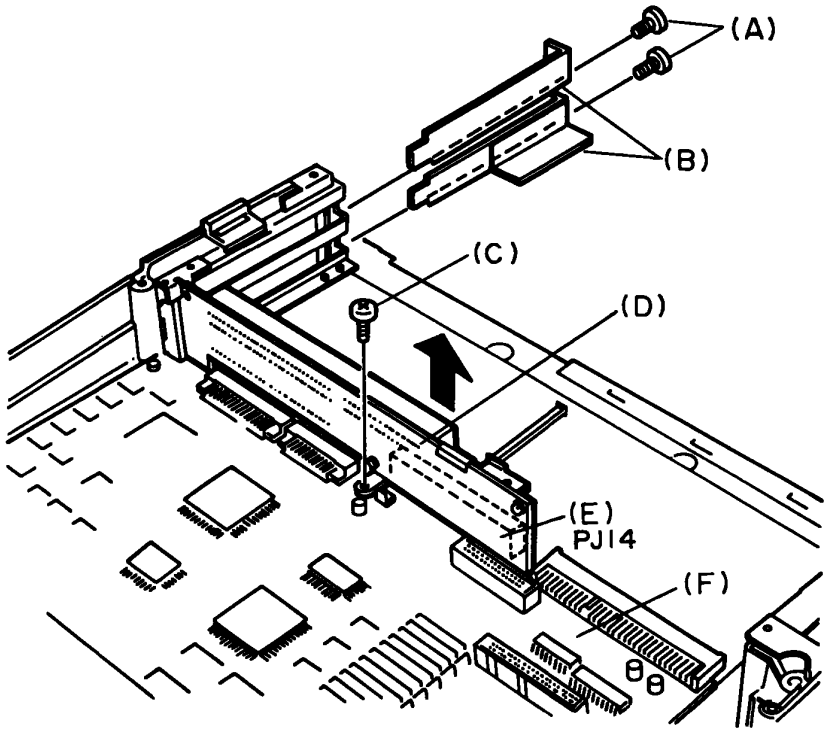


Figure 4-26 Removing the expansion connector board

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

4.13 REMOVING/REPLACING THE SYSTEM BOARD

1. Remove the expansion connector board as directed in section 4.12.

2. Remove the eight screws (A) from the system board and disconnect the speaker connector PJ4 (B), then remove the system board.

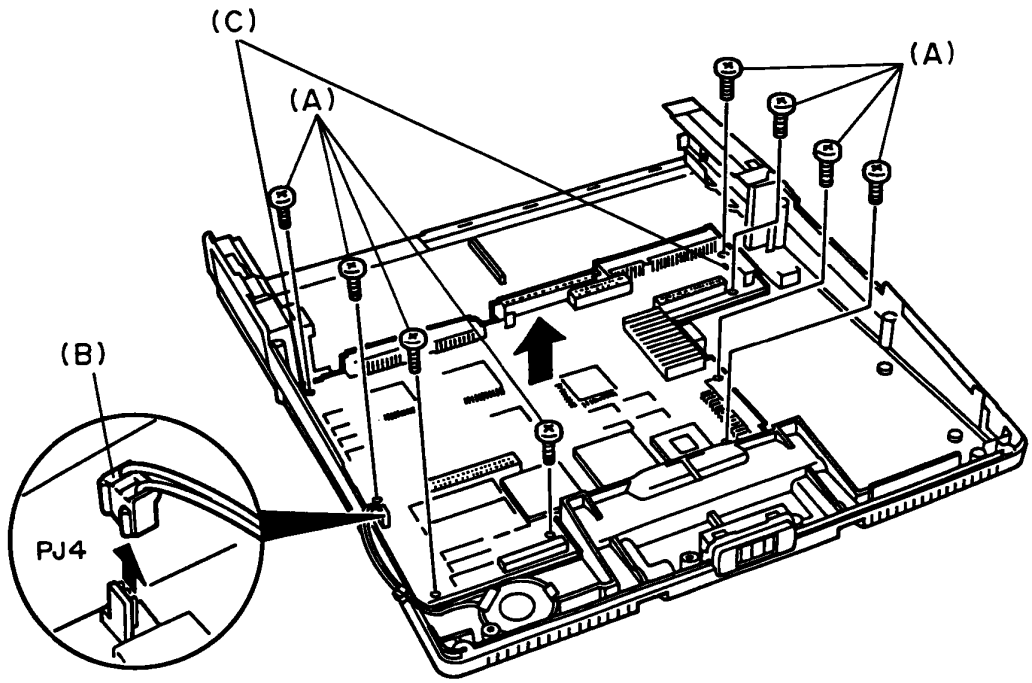


Figure 4-27 Removing the system board

3. To install the system board, follow the above procedures in reverse. There are two guide holes (C) in placing the system board correctly on the bottom case. Using these holes and confirm that the system board is correctly placed before tightening with the screws.

4.14 REMOVING/REPLACING THE PDP UNIT

1. Remove the display as directed in section 4.3 and pull out the two gum cushions (A) from PDP mask (B), then remove the four screws (C) from PDP mask too.

2. Remove the PDP mask (B) from the PDP cover (D) then remove the four screws (E) and the earth rug (F) from the PDP unit (G).

3. Lift up the PDP unit then disconnect the three cables (H) from the plasma display board (I).

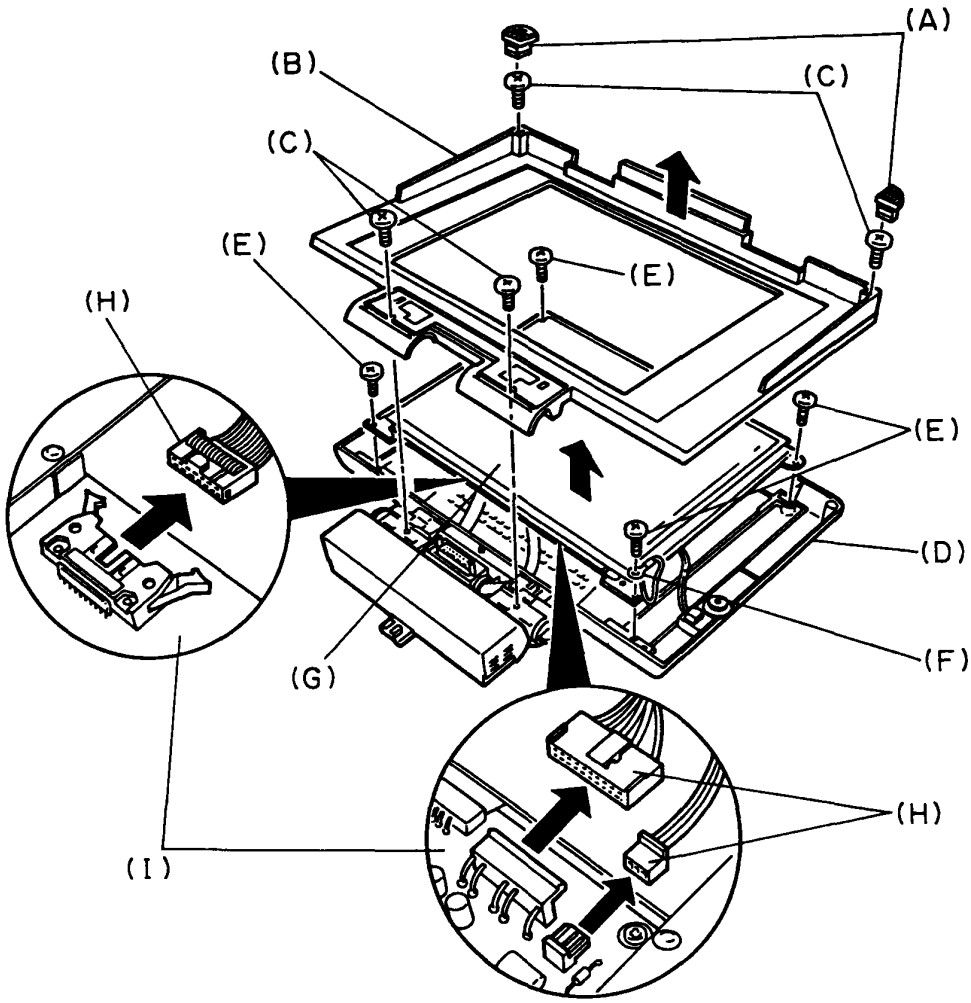


Figure 4-28 Removing the PDP unit

4. To install the PDP unit, follow the above procedures in reverse.

4.15 REMOVING/REPLACING THE CONVERTER BOARD, THE VOLUME BOARD AND THE LATCH ASSEMBLY

1. Remove the PDP unit as directed in section 4.14 in order to remove the four screws (A) from hinge assembly (B).

2. Take off the hinge assembly, then remove the converter unit (C)

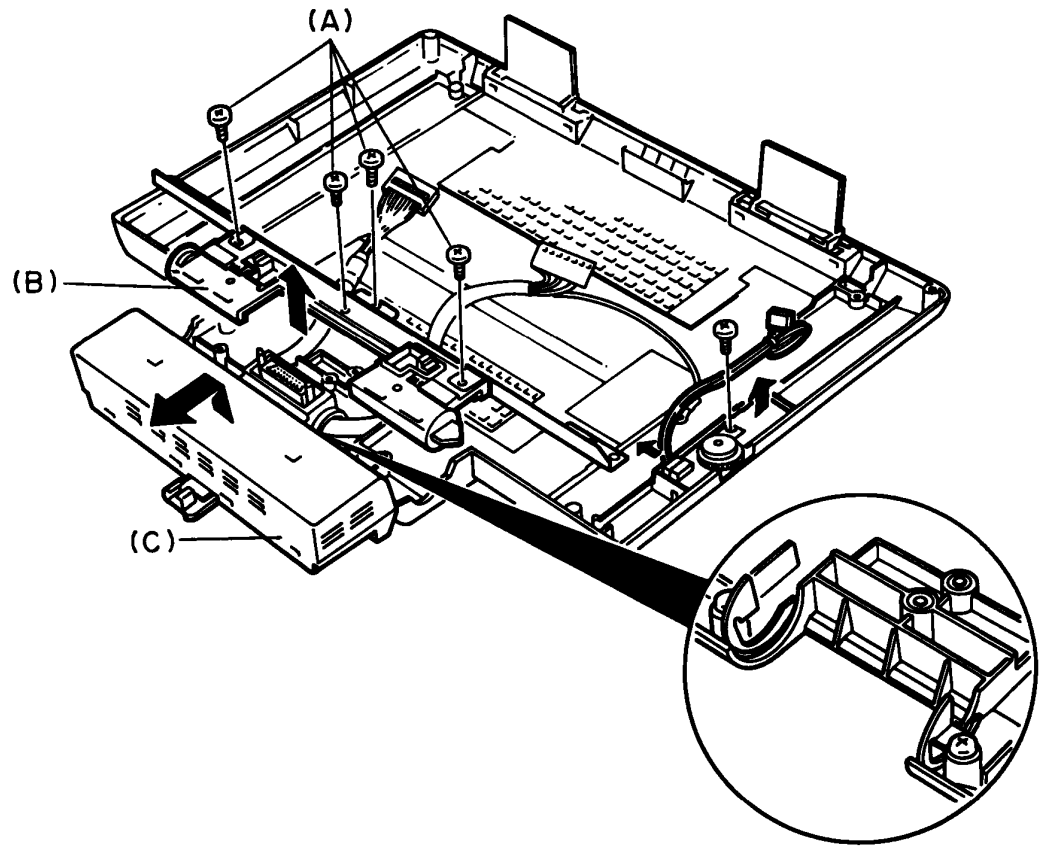


Figure 4-29 Removing the converter unit

3. Take off the metal ring (D) from the connector guide of the converter.

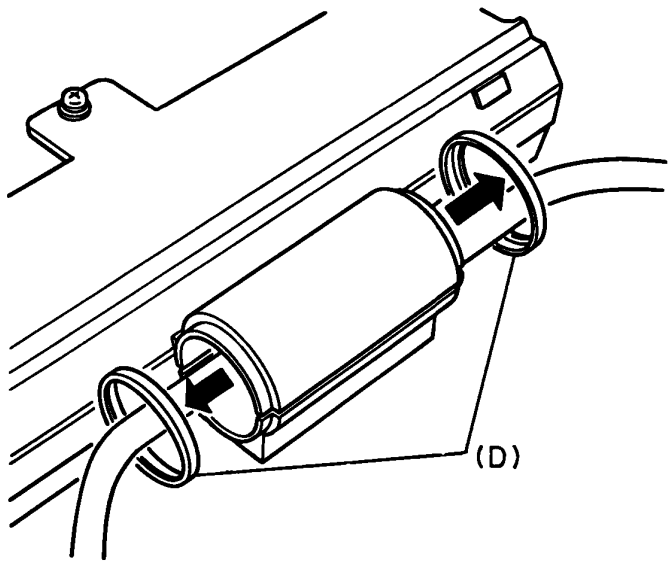


Figure 4-30 Removing the metal ring

4. Release the two latches (E) of the converter cover (F), to remove the converter cover from the converter case (G).

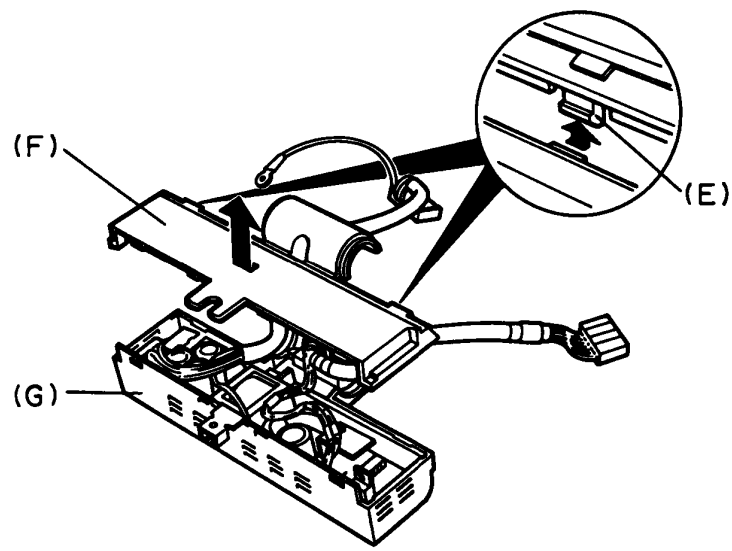


Figure 4-31 Removing the converter cover

5. Remove the three screws (H) from the converter board (I) then lift up the converter board.

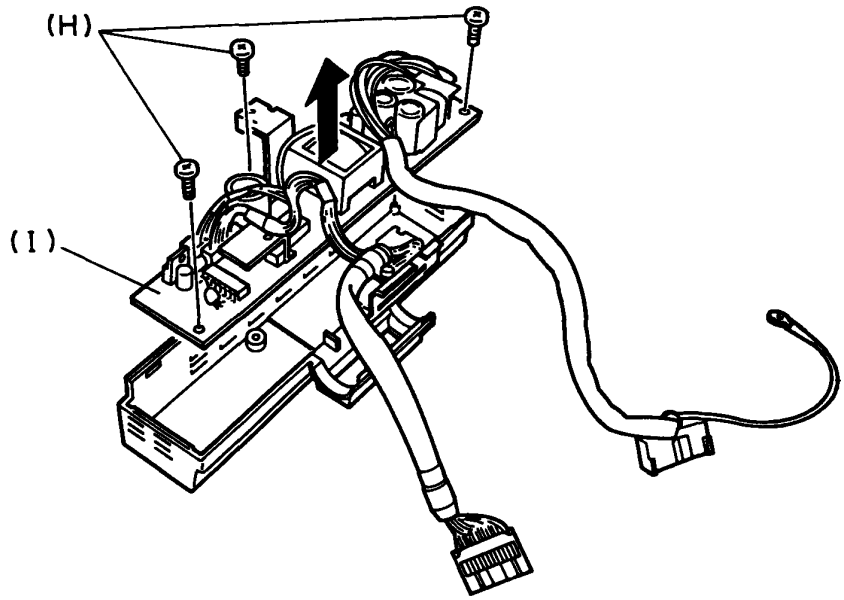


Figure 4-32 Removing the converter board

6. Remove the screw (J) from the volume board (K) to remove it.

7. Pull out the latch assembly (L) form PDP cover.

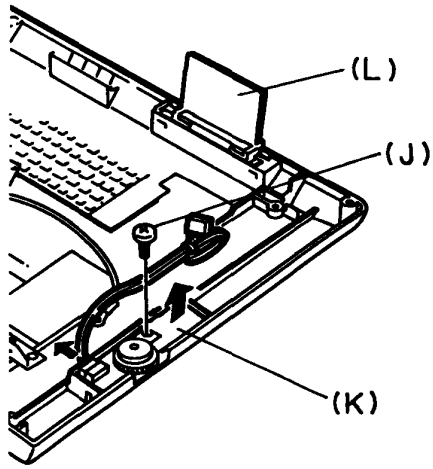


Figure 4-33 Removing the volume board and latch assembly

8. To install the converter board, the volume board and the latch assembly follow the above procedures in reverse.

APPENDIX A

BOARD LAYOUT

1. SYSTEM BOARD (ICs)

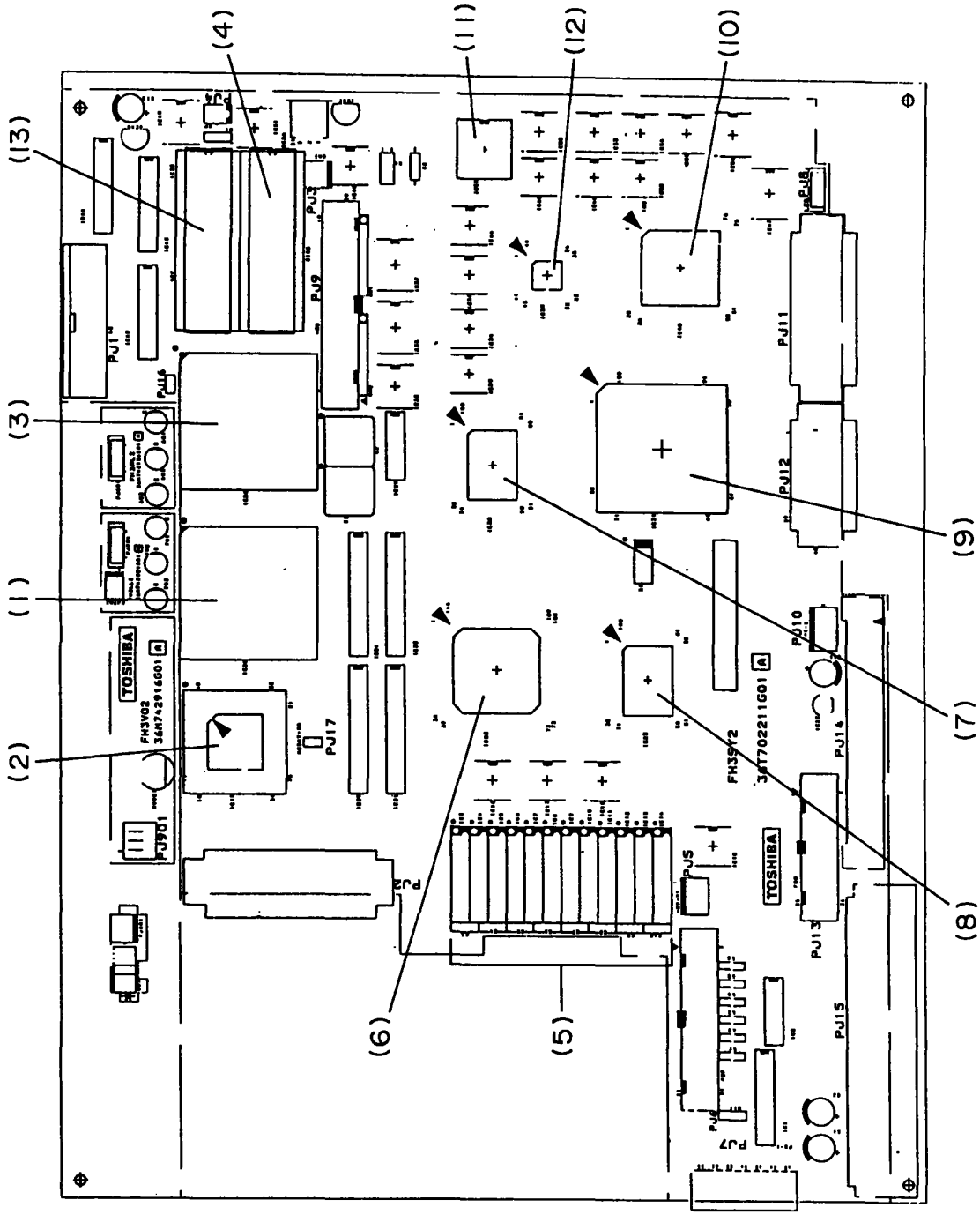


Figure A-1 System board (ICs)

(1) CPU: Control processing unit (80386-20)
(2) NDP Socket: Numeric data processing socket (80387-20)
(3) Cache controller (82385)
(4) System BIOS ROM
(5) System RAMs
(6) GA-MCNT3: Memory controller gate array
(7) GA-BLAT: Memory bus latch gate array
(8) GA-CLAT: Compatible bus latch gate array
(9) GA-BCNT2: Bus controller gate array
(10) SI: Super integration (T4758A)
(11) RTC: Real time clock (MC146818A)
(12) KBC: Keyboard controller (8042)
(13) SCC: Keyboard scan controller (8749)

2.SYSTEM BOARD (CONNECTORS)

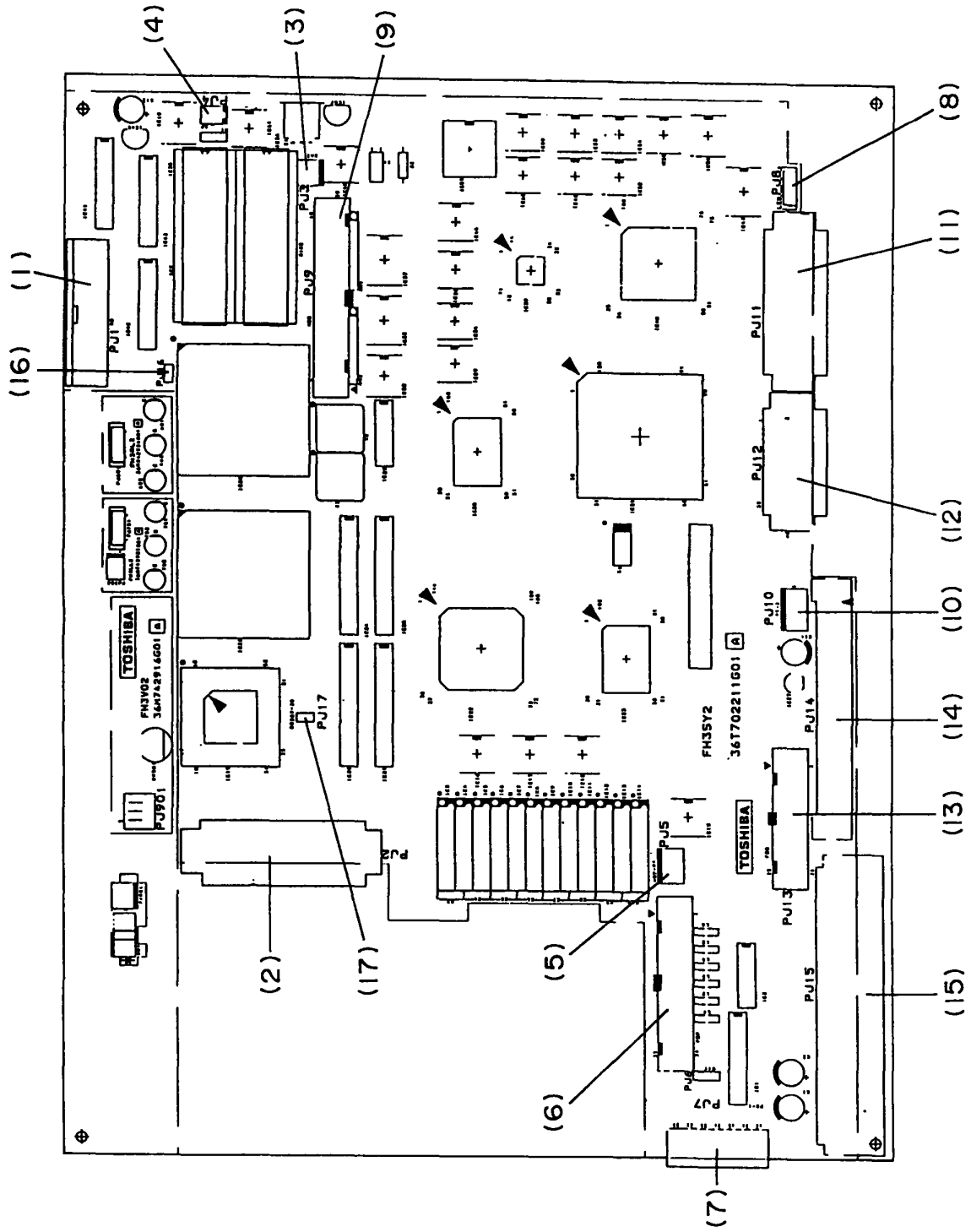


Figure A-2 System board (connectors)

(1) PJ 1: Keyboard connector
(2) PJ 2: Memory board I/F connector
(3) PJ 3: Lithium battery connector
(4) PJ 4: Speaker connector
(5) PJ 5: HDD power connector
(6) PJ 6: PDP I/F connector
(7) PJ 7: Power supply connector
(8) PJ 8: LED I/F connector
(9) PJ 9: HDC I/F connector
(10) PJ10: Power supply connector
(11) PJ11: Expansion bus connector (60 pin)
(12) PJ12: Expansion bus connector (40 pin)
(13) PJ13: FDD connector
(14) PJ14: Back panel I/F connector
(15) PJ15: I/O board I/F connector
(16) PJ16: FDD selection
(17) PJ17: Parity check system selection

3. MEMORY BOARD

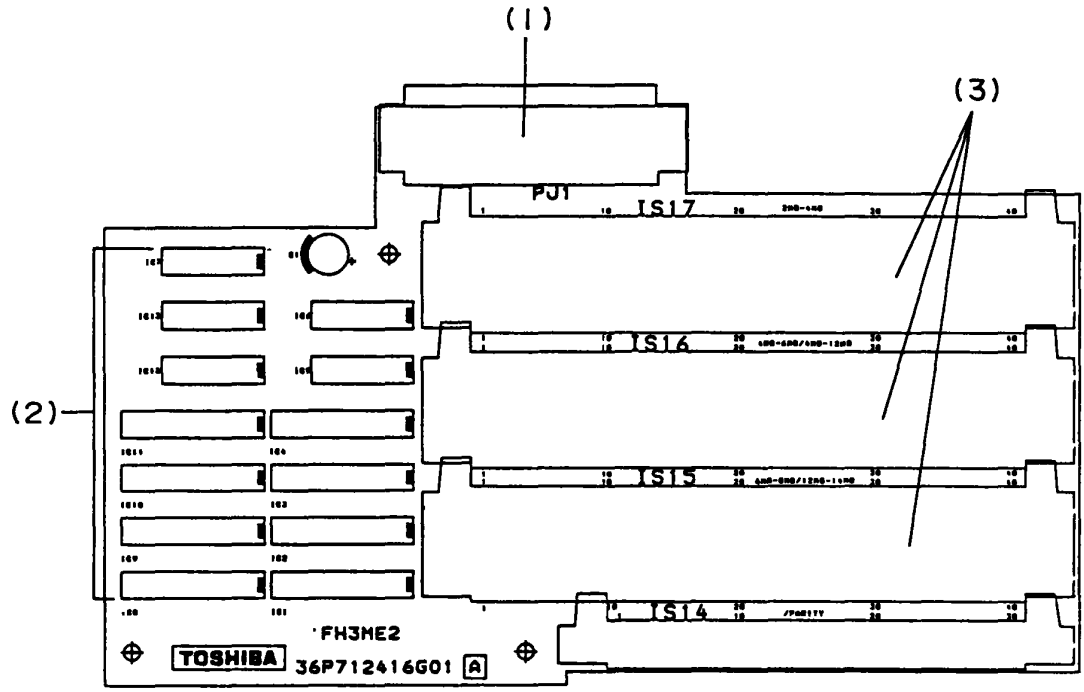


Figure A-3 Memory board

(1) PJ1: System board I/F connector
(2) System RAMs
(3) Memory module connector

4. I/O BOARD

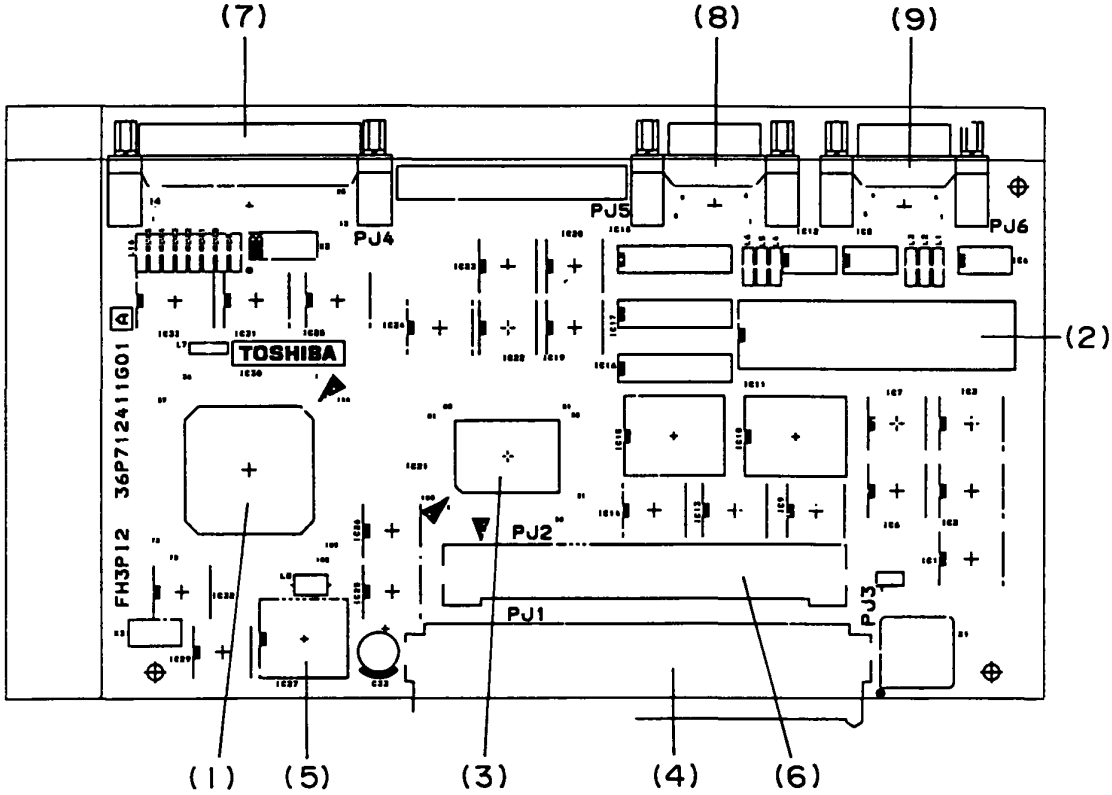


Figure A-4 I/O board

(1) SI: Super integration (JC810)
(2) SIO: Serial input/output controller (TC8570P)
(3) GA-PDC: Plasma display controller gate array
(4) PJ1: System board I/F connector
(5) VFO: Variable frequency oscillator (4108AFP)
(6) PJ2: HRGS I/F connector
(7) PJ4: PRT/Ext. FDD I/F connector
(8) PJ5: SIO I/F connector 1
(9) PJ6: SIO I/F connector 2

5. HRGS BOARD

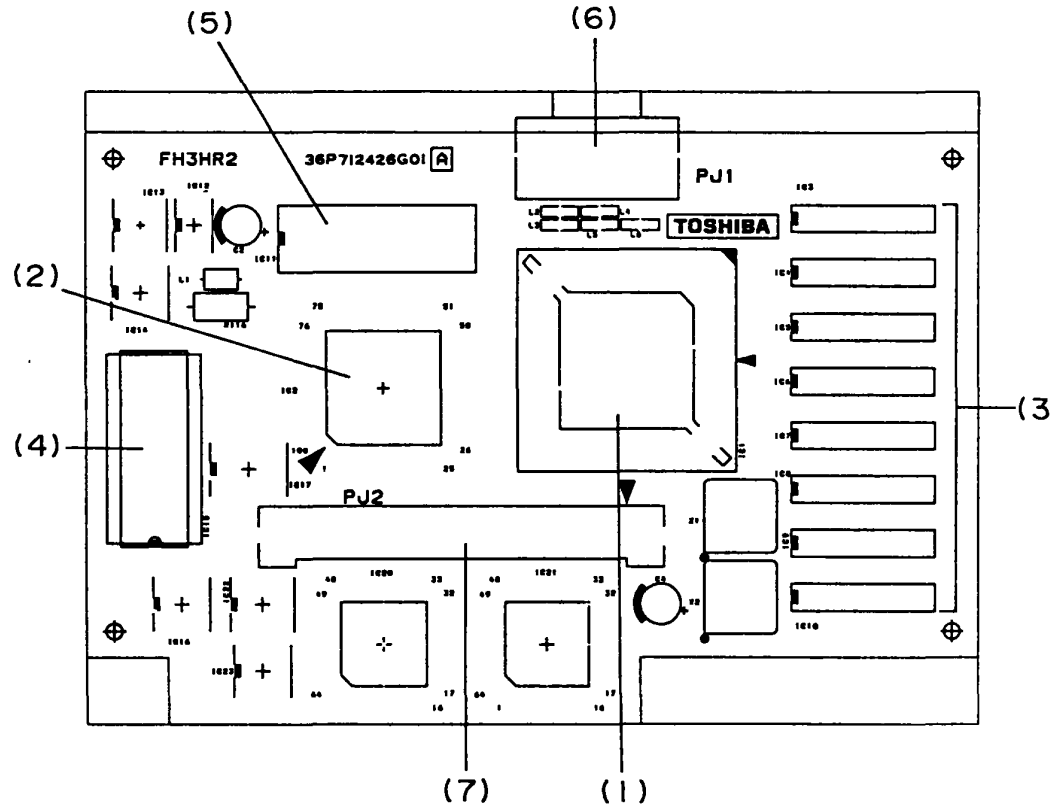


Figure A-5 HRGS board

(1) PVGA1: Paradise video graphics array
(2) HRGS-GA: High resolution graphics subsystem gate array
(3) Video RAMs
(4) HRGS BIOS ROM
(5) DAC: Digital to analogue converter
(6) PJ1: VGA display I/F connector
(7) PJ2: System board I/F connector

6. BACK PANEL BOARD

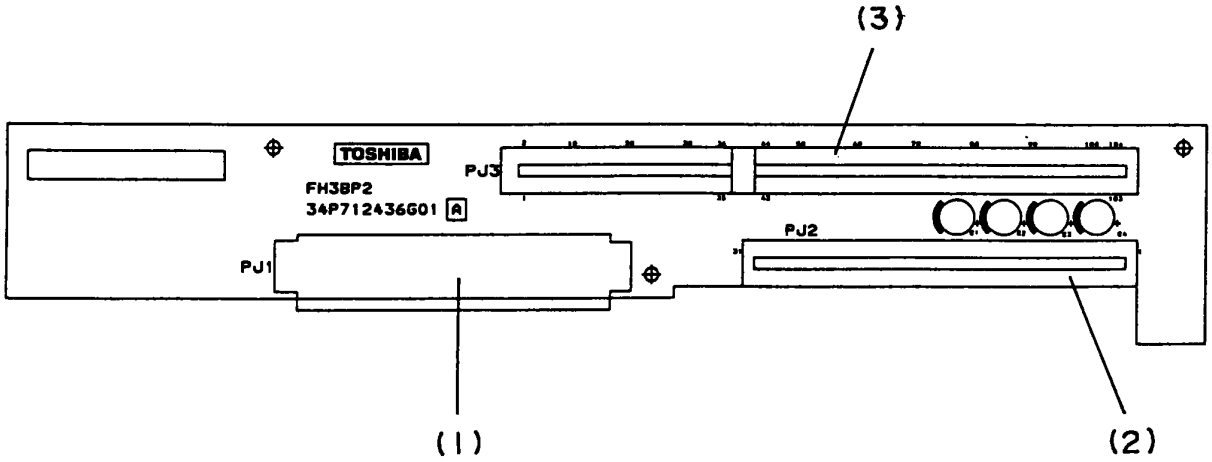


Figure A-6 Back panel board

(1) PJ1: System board I/F connector
(2) PJ2: 8-bit I/F connector
(3) PJ3: 16-bit I/F connector

APPENDIX B

PIN ASSIGNMENT

1. SYSTEM BOARD

1.1 PJ1 Keyboard connector (27-pin)

Table B-1 Keyboard connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	GND		15	KBRTN0:000	I
2	KBSC0:010	O	16	KBRTN1:000	I
3	KBSC1:010	O	17	KBRTN2:000	I
4	KBSC2:010	O	18	KBRTN3:000	I
5	GND		19	GND	
6	KBSC3:010	O	20	KBRTN4:000	I
7	KBSC4:010	O	21	KBRTN5:000	I
8	KBSC5:010	O	22	KBRTN6:000	I
9	KBSC6:010	O	23	KBRNT7:000	I
10	GND		24	KBSC11:010	O
11	KBSC7:010	O	25	KBSC12:010	O
12	KBSC8:010	O	26	N/C	
13	KBSC9:010	O	27	GND	
14	KBSC10:010	O			

1.2 PJ2 Memory board I/F connector (68-pin)

Table B-2 Memory board I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	GND		2	VOC	
3	MD0:100	I/O	4	MD1:100	I/O
5	MD2:100	I/O	6	MD3:100	I/O
7	MD4:100	I/O	8	MD5:100	I/O
9	MD6:100	I/O	10	MD7:100	I/O
11	GND		12	MD8:100	I/O
13	MD9:100	I/O	14	MD10:100	I/O
15	MD11:100	I/O	16	MD12:100	I/O
17	MD13:100	I/O	18	MD14:100	I/O
19	MD15:100	I/O	20	GND	
21	MD16:100	I/O	22	MD17:100	I/O
23	MD18:100	I/O	24	MD19:100	I/O
25	MD20:100	I/O	26	MD21:100	I/O
27	MD22:100	I/O	28	MD23:100	I/O
29	GND		30	MD24:100	I/O
31	MD25:100	I/O	32	MD26:100	I/O
33	MD27:100	I/O	34	MD28:100	I/O
35	MD29:100	I/O	36	MD30:100	I/O
37	MD31:100	I/O	38	VCC	
39	GND		40	MA0:100	O
41	MA1:100	I	42	MA2:100	O

Table B-2 Memory board I/F connector pin assignment (continued)

Pin	Signal	I/O	Pin	Signal	I/O
43	MA3:100	O	44	MA4:100	O
45	MA5:100	O	46	MA6:100	O
47	MA7:100	O	48	MA8:100	O
49	MA9:100	O	50	GND	
51	RAS1:010	O	52	RAS2:010	O
53	RAS3:010	O	54	RAS4:010	O
55	PAS5:010	O	56	RAS6:010	O
57	RAS7:010	O	58	WE:100	O
59	MPD0:100	I/O	60	MPD1:100	I/O
61	MPD2:100	I/O	62	MPD3:100	I/O
63	CAS0:100	O	64	CAS1:100	O
65	CAS2:100	O	66	CAS3:100	O
67	VCC		68	GND	

1.3 PJ3 Lithium battery connector (3-pin)

Table B-3 Lithium battery connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	GND	I	3	BAT36V:100	I
2	N/C				

1.4 PJ4 Speaker connector (2-pin)

Table B-4 Speaker connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	SPKON:000	O	2	SPKVCC:100	O

1.5 PJ5 HDD power connector (4-pin)

Table B-5 HDD power connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	P12V:100	O	3	GND	
2	GND		4	VCC	O

1.6 PJ6 PDP I/F connector (34-pin)

Table B-6 PDP I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	GND		2	PVSYNC:110	O
3	GND		4	PHSYNC:110	O
5	GND		6	PD0:020	O
7	GND		8	PD1:020	O
9	GND		10	PD2:020	O
11	GND		12	PD3:020	O
13	GND		14	DSPE:020	O
15	GND		16	PCLK:120	O
17	COVER:000		18	GND	
19	PDP:000		20	VCC	
21	LEDCAP:010	O	22	LEDNUM:010	O
23	LEDSC4:010	O	24	PDPV:100	
25	GND		26	P24V:100	O
27	GND		28	P24V:100	O
29	GND		30	P24V:100	O
31	GND		32	P24V:100	O
33	GND		34	P24V:100	O

1.7 PJ7 Power supply connector (7-pin)

Table B-7 Power supply connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	P24V:100	I	5	GND	
2	GND		6	VCC	I
3	P12V:100	I	7	VCC	I
4	GND				

1.8 PJ8 LED I/F connector (4-pin)

Table B-8 LED I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	P12V:100		3	DRVBLD:000	
2	DRVALD:100		4	GND	

1.9 PJ9 HDC I/F connector (40-pin)

Table B-9 HDC I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	HRESET:000	O	21	N/C	
2	GND		22	GND	
3	HSD7:100	I/O	23	HIOW:000	O
4	HSD8:100	I/O	24	GND	
5	HSD6:100	I/O	25	HIOR:000	O
6	HSD9:100	I/O	26	GND	
7	HSD5:100	I/O	27	N/C	
8	HSD10:100	I/O	28	N/C	
9	HSD4:100	I/O	29	N/C	
10	HSD11:100	I/O	30	GND	
11	HSD3:100	I/O	31	IRQ14:000	I
12	HSD12:100	I/O	32	HIO16:000	I
13	HSD2:100	I/O	33	HSA1:100	O
14	HSD13:100	I/O	34	N/C	
15	HSD1:100	I/O	35	HSA0:100	O
16	HSD14:100	I/O	36	HSA2:100	O
17	HSD0:100	I/O	37	HDDCS0:000	O
18	HSD15:100	I/O	38	HDDCS1:000	O
19	GND		29	HACT:000	I
20	N/C		40	GND	

1.10 PJ10 Power supply connector (5-pin)

Table B-10 Power supply connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	M12V:000		4	GND	
2	M5V:000		5	PDP:000	
3	GND				

1.11 PJ11 Expansion bus connector (60-pin)

Table B-11 Expansion bus connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	GND		2	VCC	O
3	M9V:000	O	4	P12V:100	O
5	CCMCS2:010	O	6	COMCLK:100	O
7	MIRQ:000	I	8	MDSPK:000	I/O
9	GND		10	SA1:110	I/O
11	SA1:110	I/O	12	SA2:110	I/O
13	SA3:110	I/O	14	SA4:110	I/O
15	SA5:110	I/O	16	SA6:110	I/O
17	SA7:110	I/O	18	GND	
19	SA8:100	I/O	20	SA9:100	I/O
21	SA10:100	I/O	22	SA11:100	I/O
23	SA12:100	I/O	24	SA13:100	I/O
25	SA14:100	I/O	26	SA15:100	I/O
27	GND		28	SA16:100	I/O
29	SA17:100	I/O	30	SA18:100	I/O
31	SA19:100	I/O	32	SD0:100	I/O
33	SD1:100	I/O	34	SD2:100	I/O
35	SD3:100	I/O	36	GND	
37	SD4:100	I/O	38	SD5:100	I/O
39	SD6:100	I/O	40	SD7:100	I/O
41	SMEMW:000	O	42	SMEMR:000	O
43	GND		44	IOW:000	I/O
45	IOR:000	I/O	46	TC:100	O
47	BALE:100	O	48	RESET:100	O
49	DACK1:000	O	50	IRQ9:100	I
51	GND		52	VCC	O
53	SYSCLK:100	O	54	IRQ5:100	
55	DRQ3:100	I	56	DACK3:000	O
57	DMACK:100	O	58	DRQ1:100	I
59	IORDK:100	I	60	GND	

1.12 PJ12 Expansion bus connector (40-pin)

Table B-12 Expansion bus connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	IRQ10:100	I	21	DACK6:000	O
2	IRQ14:100	I	22	GND	
3	SD8:100	I/O	23	REFRSH:000	I/O
4	SD9:100	I/O	24	LA18:000	I/O
5	IRQ11:100	I	25	MASTER:000	I
6	SD10:100	I/O	26	LA17:100	I/O
7	SD11:100	I/O	27	SBHF:000	I/O
8	SD12:100	I/O	28	IOCHK:000	I
9	IRQ12:100	I	29	MEM16:000	I
10	GND		30	GND	
11	SD13:100	I/O	31	IO16:000	I
12	SD14:100	I/O	32	DACK2:000	O
13	IRQ6:100	I	33	DRQ6:100	I
14	SD15:100	I/O	34	DRQ5:100	I
15	LA22:100	I/O	35	DACK5:000	O
16	LA23:100	I/O	36	MEMR:000	I/O
17	DRQ2:100	I	37	TIRQ4:000	I
18	LA21:100	I/O	38	MEMW:000	I/O
19	LA19:100	I/O	39	IRQ7:000	I
20	LA20:100	I/O	40	GND	

1.13 PJ13 FDD connector (26-pin)

Table B-13 FDD connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	VCC		14	STEP:000	O
2	INDEX:000	I	15	GND	
3	VCC		16	WDATA:000	O
4	FDSELA:000	O	17	GND	
5	VCC		18	WGATE:000	O
6	DSKCHG:000	I	19	GND	
7	VCC		20	TRACK0:000	I
8	READY:000	I	21	GND	
9	NOTCH:000	I	22	WPROTC:000	I
10	MONA:000	O	23	GND	
11	LOWDNS:000	O	24	PDDA:000	I
12	FDCDRC:000	O	25	GND	
13	GND		26	SIDE:000	O

1.14 PJ14 Back panel I/F connector (100-pin)

Table B-14 Back panel I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	SA1:100	I/O	2	SA0:110	I/O
3	SD7:100	I/O	4	IOCHK:000	I
5	SA3:110	I/O	6	SA2:110	I/O
7	SD6:100	I/O	8	GND	
9	$14MHz:100	O	10	SA4:100	I/O
11	SD4:100	I/O	12	SD5:100	I/O
13	TC:100	O	14	BALE:100	O
15	SD2:100	I/O	16	SD3:100	I/O
17	IPQ3:100	I	18	DACK2:000	O
19	SD1:100	I/O	20	GND	
21	IRQ5:100	I	22	IRQ4:100	I
23	IORDY:100	I	24	SD0:100	I/O
25	IRQ7:100	I	26	IRQ6:100	I
27	SA19:100	I/O	28	DMACK:100	O
29	REFRSH:000	O	30	SYSCLK:100	O
31	SA18:100	I/O	32	VCC	
33	DACK1:000	O	34	DRQ1:100	I
35	SA16:100	I/O	36	SA17:100	I/O
37	DACK3:000	O	38	DRQ3:100	O
39	SA14:100	I/O	40	SA15:000	I/O
41	IOW:000	I/O	42	IOR:000	I/O
43	SA13:100	I/O	44	GND	
45	SMEMW:000	O	46	SMEMR:000	O
47	SA11:100	I/O	48	SA12:000	I/O
49	DRQ2:100	I	50	N/C	
51	SA9:100	I/O	52	SA10:000	I/O
53	RESET:100	O	54	IRQ9:100	I
55	SA8:100	I/O	55	VCC	
57	SD14:100	I/O	58	SD15:100	I/O
59	SA6:110	I/O	60	SA7:110	I/O
61	SD12:100	I/O	62	SD13:100	I/O
63	SD10:100	I/O	64	SA5:100	I/O
65	MASTER:000	I	66	SD11:100	I/O
67	SD9:100	I/O	68	GND	
69	DACK7:000	O	70	DRQ7:100	I
71	MEMW:000	I/O	72	SD8:100	I/O
73	DACK6:000	O	74	DRQ6:100	I
75	LA17:100	I/O	76	MEMR:000	I/O
77	DACK5:000	O	78	DRQ5:100	I
79	LA18:100	I/O	80	GND	
81	DACK0:000	O	82	DRQ0:100	I
83	LA20:100	I/O	84	LA19:100	I/O
85	IRQ15:100	I	86	IRQ14:100	I
87	LA22:100	I/O	88	LA21:100	I/O
89	IRQ11:100	I	90	IRQ12:100	I
91	LA23:100	I/O	92	VCC	
93	P12V:100		94	IRQ10:100	I
95	PIO16:000	I	96	SBHE:000	I/O
97	M12V:000		98	PMEM16:000	I

Table B-14 Back panel I/F connector pin assignment (continued)

Pin	Signal	I/O	Pin	Signal	I/O
99	M5V:000		100	GND	

1.15 PJ15 I/O board I/F connector (120-pin)

Table B-15 I/O board I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	GND		2	VCC	
3	M12V:000	O	4	FDSELA:000	I
5	MONA:000	I	6	LOWDNS:000	I
7	FDCDRC:000	I	8	STEP:000	I
9	WDATA:000	I	10	WGATE:000	I
11	SIDE:000	I	12	INDEX:000	O
13	DSKCHG:000	O	14	READY:000	O
15	TRAKC0:000	O	16	WPPOTC:000	O
17	RDDA:000	O	18	FSELSW:000	O
19	HSD7:000	I	20	CK16M:100	O
21	SA0:110	O	22	SA1:110	O
23	SA2:110	O	24	SA3:110	O
25	SA4:110	O	26	SA5:110	O
27	SA6:110	O	28	SA7:110	O
29	SA8:100	O	30	SA9:100	O
31	VCC		32	SA10:100	O
33	SA11:100	O	34	SA12:100	O
35	GND		36	SA13:100	O
37	SA14:100	O	38	SA15:100	O
39	SA16:100	O	40	SA17:100	O
41	SA18:100	O	42	SA19:100	O
43	LA17:100	O	44	LA18:100	O
45	LA19:100	O	46	LA20:100	O
47	LA21:100	O	48	LA22:100	O
49	LA23:100	O	50	SD0:100	I/O
51	SD1:100	I/O	52	GND	
53	SD2:100	I/O	54	SD3:100	I/O
55	SD4:100	I/O	56	SD5:100	I/O
57	SD6:100	I/O	58	SD7:100	I/O
59	SD8:100	I/O	60	VCC	
61	SD9:100	I/O	62	SD10:100	I/O
63	SD11:100	I/O	64	SD12:100	I/O
65	SD13:100	I/O	66	SD14:100	I/O
67	SD15:100	I/O	68	PUCLR:000	O
69	GND		70	IOCHR:000	I
71	IORDY:100	I	72	IRQ3:100	I
73	IRQ4:100	I	74	IRQ5:100	I
75	IRQ6:100	I	76	IRQ7:100	I
77	DACK2:000	O	78	TC:100	O
79	DMACK:100	O	80	REFRSH:000	O
81	ICW:010	O	82	IOR:010	O
83	SMEMW:000	O	84	SMEMR:000	O

Table B-15 I/O board I/F connector pin assignment (continued)

Pin	Signal	I/O	Pin	Signal	I/O
85	DRQ2:100	I	86	GND	
87	SYSCLK:100	O	88	N/C	
89	COVER:110	O	90	IRQ9:100	I
91	SBHE:000	O	92	PMEM16:000	I
93	SWFDA:100	I	94	COMCLK:100	I
95	MIRQ:110	O	96	TIRQ4:100	O
97	BIPRT:100	O	98	CCM3CS:000	O
99	CCMCS2:010	I	100	HDDCS0:000	I
101	KPE:000	O	102	SIOSW1:100	O
103	EXTEDD:100	O	104	SIOSW2:100	O
105	SIOSW3:100	O	106	SIOSW4:100	O
107	SIOSW5:100	O	108	PD0:100	I
109	PD1:100	I	110	PD2:100	I
111	PD3:100	I	112	(PD4:100)	I
113	(PD5:100)	I	114	PCLK:100	I
115	DSPE:100	I	116	PVSYNC:000	I
117	P12V:100	O	118	PHSYNC:000	I
119	GND		120	GND	

1.16 PJ16 FDD selection (2-pin)

Table B-16 FDD selection pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	VCC		2	2MB:100	I

2. MEMORY BOARD

2.1 PJ1 System board I/F connector (68-pin)

Table B-17 System board I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	GND		2	VCC	
3	MD0:100	I/O	4	MD1:100	I/O
5	MD2:100	I/O	6	MD3:100	I/O
7	MD4:100	I/O	8	MD5:100	I/O
9	MD6:100	I/O	10	MD7:100	I/O
11	GND		12	MD8:100	I/O
13	MD9:100	I/O	14	MD10:100	I/O
15	MD11:100	I/O	16	MD12:100	I/O
17	MD13:100	I/O	18	MD14:100	I/O
19	MD15:100	I/O	20	GND	
21	MD16:100	I/O	22	MD17:100	I/O
23	MD18:100	I/O	24	MD19:100	I/O
25	MD20:100	I/O	26	MD21:100	I/O
27	MD22:100	I/O	28	MD23:100	I/O
29	GND		30	MD24:100	I/O
31	MD25:100	I/O	32	MD26:100	I/O
33	MD27:100	I/O	34	MD28:100	I/O
35	MD29:100	I/O	36	MD30:100	I/O
37	MD31:100	I/O	38	VCC	
39	GND		40	MA0:100	I
41	MA1:100	I	42	MA2:100	I
43	MA3:100	I	44	MA4:100	I
45	MA5:100	I	46	MA6:100	I
47	MA7:100	I	48	MA8:100	I
49	MA9:100	I	50	GND	
51	RAS1:100	I	52	RAS2:010	I
53	RAS3:100	I	54	RAS4:010	I
55	RAS5:100	I	56	RAS6:010	I
57	RAS7:100	I	58	WE:100	I
59	MPD0:100	I/O	60	MPD1:100	I/O
61	MPD2:100	I/O	62	MPD3:100	I/O
63	CAS0:100	I	64	CAS1:100	I
65	CAS2:100	I	66	CAS3:100	I
67	VCC		68	GND	

2.2 IS17A Memory module connector 1A (40-pin)

Table B-18 Memory module connector 1A pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	VCC		21	CAS3:020	O
2	MD16:100	I/O	22	MPD2:100	I/O
3	MD17:100	I/O	23	GND	
4	MD18:100	I/O	24	MA4:020	O
5	MD19:100	I/O	25	MA5:020	O
6	MA0:020	O	26	MD24:100	I/O
7	MA1:020	O	27	MD25:100	I/O
8	GND		28	MD26:100	I/O
9	MD20:100	I/O	29	MD27:100	I/O
10	MD21:100	I/O	30	GND	
11	MD22:100	I/O	31	MA6:020	O
12	MD23:100	I/O	32	MA7:020	O
13	MA2:020	O	33	MA8:020	O
14	MA3:020	O	34	MA9:020	O
15	GND		35	GND	
16	CAS2:020	O	36	MD28:100	I/O
17	RAS2:010	O	37	MD29:100	I/O
18	MPD3:100	I/O	38	MD30:100	I/O
19	WE:020	O	39	MD31:100	I/O
20	RAS3:010	O	40	VCC	

2.3 IS17B Memory module connector 1B (40-pin)

Table B-19 Memory module connector 1B pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	VCC		21	CAS1:020	O
2	MD0:100	I/O	22	MPD0:010	I/O
3	MD1:100	I/O	23	GND	
4	MD2:100	I/O	24	MA4:021	O
5	MD3:100	I/O	25	MA5:021	O
6	MA0:021	O	26	MD8:100	I/O
7	MA1:021	O	27	MD9:100	I/O
8	GND		28	MD10:100	I/O
9	MA4:100	I/O	29	MD11:100	I/O
10	MD5:100	I/O	30	GND	
11	MD6:100	I/O	31	MA6:021	O
12	MD7:100	I/O	32	MA7:021	O
13	MA2:021	O	33	MA8:021	O
14	MA3:021	O	34	MA9:021	O
15	GND		35	GND	
16	CAS0:020	O	36	MD12:100	I/O
17	RAS2:010	O	37	MD13:100	I/O
18	MPD1:100	I/O	38	MD14:100	I/O
19	WE:021	O	39	MD15:100	I/O
20	RAS3:010	O	40	VCC	

2.4 IS16A Memory module connector 2A (40-pin)

Table B-20 Memory module connector 2A pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	VCC		21	CAS3:021	O
2	MD16:100	I/O	22	MPD2:100	I/O
3	MD17:100	I/O	23	GND	
4	MD18:100	I/O	24	MA4:020	O
5	MD19:100	I/O	25	MA5:020	O
6	MA0:020	O	26	MD24:100	I/O
7	MA1:020	O	27	MD25:100	I/O
8	GND		28	MD26:100	I/O
9	MD20:100	I/O	29	MD27:100	I/O
10	MD21:100	I/O	30	GND	
11	MD22:100	I/O	31	MA6:020	O
12	MD23:100	I/O	32	MA7:020	O
13	MA2:020	O	33	MA8:020	O
14	MA3:020	O	34	MA9:020	O
15	GND		35	GND	
16	CAS2:021	O	36	MD38:100	I/O
17	RAS4:010	O	37	MD29:100	I/O
18	MPD3:100	I/O	38	MD30:100	I/O
19	WE:020	O	39	MD31:100	I/O
20	RAS5:010	O	40	VCC	

2.5 IS16B Memory module connector 2B (40-pin)

Table B-21 Memory module connector 2B pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	VCC		21	CAS1:021	O
2	MD0:100	I/O	22	MPD0:100	I/O
3	MD1:100	I/O	23	GND	
4	MD2:100	I/O	24	MA4:021	O
5	MD3:100	I/O	25	MA5:021	O
6	MA0:021	O	26	MD8:100	I/O
7	MA1:021	O	27	MD9:100	I/O
8	GND		28	MD10:100	I/O
9	MD4:100	I/O	29	MD11:100	I/O
10	MD5:100	I/O	30	GND	
11	MD6:100	I/O	31	MA6:021	O
12	MD7:100	I/O	32	MA7:021	O
13	MA2:021	O	33	MA8:021	O
14	MA3:021	O	34	MA9:021	O
15	GND		35	GND	
16	CAS0:021	O	36	MD12:100	I/O
17	RAS4:010	O	37	MD13:100	I/O
18	MPD1:100	I/O	38	MD14:100	I/O
19	WE:021	O	39	MD15:100	I/O
20	RAS5:010	O	40	VCC	

2.6 IS15A Memory module connector 3A (40-pin)

Table B-22 Memory module connector 3A pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	VCC		21	CAS3:020	O
2	MD16:100	I/O	22	MPD2:100	I/O
3	MD17:100	I/O	23	GND	
4	MD18:100	I/O	24	MA4:020	O
5	MD19:100	I/O	25	MA5:020	O
6	MA0:020	O	26	MD24:100	I/O
7	MA1:020	O	27	MD25:100	I/O
8	GND		28	MD26:100	I/O
9	MD20:100	I/O	29	MD27:100	I/O
10	MD21:100	I/O	30	GND	
11	MD22:100	I/O	31	MA6:020	O
12	MD23:100	I/O	32	MA7:020	O
13	MA2:020	O	33	MA8:020	O
14	MA3:020	O	34	MA9:020	O
15	GND		35	GND	
16	CAS2:020	O	36	MD28:100	I/O
17	RAS6:010	O	37	MD29:100	I/O
18	MPD3:100	I/O	38	MD30:100	I/O
19	WE:020	O	39	MD31:100	I/O
20	RAS7:010	O	40	VCC	

2.7 IS15B Memory module connector 3B (40-pin)

Table B-23 Memory module connector 3B pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	VCC		21	CAS1:020	O
2	MD0:100	I/O	22	MPD0:100	I/O
3	MD1:100	I/O	23	GND	
4	MD2:100	I/O	24	MA4:021	O
5	MD3:100	I/O	25	MA5:021	O
6	MA0:021	O	26	MD8:100	I/O
7	MA0:021	O	27	MD9:100	I/O
8	GND		28	MD10:100	I/O
9	MD4:100	I/O	29	MD11:100	I/O
10	MD5:100	I/O	30	GND	
11	MD6:100	I/O	31	MA6:021	O
12	MD7:100	I/O	32	MA7:021	O
13	MA7:021	O	33	MA8:021	O
14	MA3:021	O	34	MA9:021	O
15	GND		35	GND	
16	CASQ0:020	O	36	MD12:100	I/O
17	RAS6:010	O	37	MD13:100	I/O
18	MPD1:100	I/O	38	MD14:100	I/O
19	WE:021	O	39	MD15:100	I/O
20	RAS7:010	O	40	VCC	

2.8 IS14 Memory module connector 4 (30-pin)

Table B-24 Memory module connector 4 pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	VCC		16	CAS2:021	O
2	GND		17	RAS5:010	O
3	MA0:021	O	18	MPD3:100	I/O
4	MA1:021	O	19	CAS3:021	O
5	MA2:021	O	20	MPD2:100	I/O
6	MA3:021	O	21	GND	
7	GND		22	N/C	
8	CAS0:021	O	23	MA4:021	O
9	RAS4:010	O	24	MA5:021	O
10	MPD1:100	I/O	25	MA6:021	O
11	CAS1:021	O	26	MA7:021	O
12	MPD0:100	I/O	27	MA8:021	O
13	WE:021	O	28	MA9:021	O
14	GND		29	GND	
15	N/C		30	VCC	

3. I/O BOARD

3.1 PJ-1 System board I/F connector (120-pin)

Table B-25 System board I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	GND		2	VCC	
3	M12V:000		4	FDSELA:000	O
5	MONA:000	O	6	LOWDNS:000	O
7	FDCDRC:000	O	8	STEP:000	O
9	WDATA:000	O	10	WGATE:000	O
11	SIDE:000	O	12	INDEX:000	I
13	DSKCHG:000	I	14	READY:000	I
15	TRACKO:000	I	16	WPROTC:000	I
17	RDDA:000	I	18	FSELSW:000	I
19	HSD7:000	O	20	CK16M:000	I
21	SA0:110	I	22	SA1:110	I
23	SA2:110	I	24	SA3:110	I
25	SA4:110	I	26	SA5:110	I
27	SA6:110	I	28	SA7:110	I
29	SA8:110	I	30	SA9:110	I
31	VCC	I	32	SA10:110	I
33	SA11:100	I	34	SA12:100	I
35	GND		36	SA13:100	I
37	SA14:100	I	38	SA15:100	I
39	SA16:100	I	40	SA17:100	I
41	SA18:100	I	42	SA19:100	I
43	LA17:100	I	44	LA18:100	I
45	LA19:100	I	46	LA20:100	I
47	LA21:100	I	48	LA22:100	I
49	LA23:100	I	50	SDO:100	I/O
51	SD1:100	I/O	52	GND	
53	SD2:100	I/O	54	SD3:100	I/O
55	SD4:100	I/O	56	SD3:100	I/O
57	SD6:100	I/O	48	SD7:100	I/O
59	SD8:100	I/O	60	VCC	
61	SD9:100	I/O	62	SD10:100	I/O
63	SD11:100	I/O	64	SD12:100	I/O
65	SD13:100	I/O	66	SD14:100	I/O
67	SD15:100	I/O	68	POCLR:000	I
69	GND		70	IOCRK:000	O
71	IORDY:000	O	72	IRQ3:100	O
73	IRQ4:100	O	74	IRQ5:100	O
75	IRQ6:100	O	76	IRQ7:100	O
77	DACK2:100	I	78	TC:100	I
79	DMACK:100	I	80	REFRSH:000	I
81	IOW:010	I	82	IOR:010	I
83	SMEMW:000	I	84	SMEMR:000	I
85	DRQ2:100	O	86	GND	
87	SYSCLK;100	I	88	N/C	
89	COVER:100	I	90	IRQ9:100	O

Table B-25 System board I/F connector pin assignment (continued)

Pin	Signal	I/O	Pin	Signal	I/O
91	SBHE:100	I	92	PMEM16:000	O
93	SWFDA:100	O	94	COMCLK:100	O
95	MIRQ:110	I	96	TURQ4:100	I
97	BIPRT:100	I	98	CCM3CS:000	I
99	CCMCS2:010	O	100	HDDCSO:000	O
101	KPE:000	I	102	SIOSW1:100	I
103	EXTFDD:100	I	104	SIOSW2:100	I
105	SIOSW3:100	I	106	SIOSW4:100	I
107	SIOSW5:100	I	108	PDP0:100	O
109	PDP1:100	O	110	PDP2:100	O
111	PDP3:100	O	112	PDP4:100	O
113	PDP5:100	O	114	PCLK:100	O
115	DSPE:100	O	116	PVSYNC:000	O
117	P12V:100		118	PHSYNC:000	O
119	VCC		120	GND	

3.2 PJ2 HRGS I/F connector (100-pin)

Table B-26 HRGS I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	GND		2	M12V:000	
3	SA0:110	O	4	SA1:110	O
5	SA2:110	O	6	GND	
7	SA3:110	O	8	SA4:110	O
9	SA5:110	O	10	VCC	
11	GND		12	SA6:110	O
13	SA7:110	O	14	SA8:100	O
15	SA9:100	O	16	GND	
17	SA10:100	O	18	SA11:100	O
19	SA12:100	O	20	VCC	
21	GND		22	SA13:100	O
23	SA14:100	O	24	SA15:100	O
25	SA16:100	O	26	GND	
27	SA19:100	O	28	SA18:100	O
29	SA19:100	O	30	VCC	
31	GND		32	LA17:100	O
33	LA18:100	O	34	LA19:100	O
35	LA20:100	O	36	GND	
37	LA21:100	O	38	LA22:100	O
39	LA23:100	O	40	VCC	
41	GND		42	SD0:100	I/O
43	SD1:100	I/O	44	SD2:100	I/O
45	SD3:100	I/O	46	GND	
47	SD4:100	I/O	48	SD5:100	I/O
49	SD6:100	I/O	50	VCC	
51	GND		52	SD7:100	I/O
53	SD8:100	I/O	54	SD9:100	I/O
55	SD10:100	I/O	56	GND	
57	SD11:100	I/O	58	SD12:100	I/O
59	SD13:100	I/O	60	VCC	
61	GND		62	SD14:000	I/O
63	SD15:100	I/O	64	RESET:100	O
65	IOCHK:000	I	66	GND	
67	IORDY:000	I	68	DMACK:100	O
69	REFRSH:000	O	70	VCC	
71	GND		72	IOW:010	O
73	IOR:010	O	74	SMEMW:000	O
75	SMEMR:000	O	76	GND	
77	COVER:100	O	78	N/C	
79	SBHE:000	O	80	VCC	
81	GND		82	PMEM16:000	I
83	PDP0:100	I	84	PDP1:100	I
85	PDP2:100	I	86	GND	
87	PDP3:100	I	88	PDP4:100	I
89	PDP5:100	I	90	VCC	
91	GND		92	PCCK:100	I
93	DSPE:100	I	94	PVSYNC:000	I
95	PHSYNC:000	I	96	GND	
97	BGSRST:000	I	98	KANJI:000	O

Table B-26 HRGS I/F connector pin assignment (continued)

Pin	Signal	I/O	Pin	Signal	I/O
99	$PDP:100	O	100	VCC	

3.3 PJ4 PRT/Ext. FDD I/F connector (25-pin)

Table B-27 PRT/Ext. FDD I/F connector pin assignment

Pin	(For PRT)		(For Ext. FDD)	
	Signal	I/O	Signal	I/O
1	STROBE;000	O	READY;000	I
2	PD0;120	O	INDEX;000	I
3	PD1;120	O	TRACK;000	I
4	PD2;120	O	WPROTC;000	I
5	PD3;120	O	RDDA;000	I
6	PD4;120	O	DSKCHG;000	I
7	PD5;120	O	N/C	
8	PD6;120	O	N/C	
9	PD7;120	O	N/C	
10	ACK;000	I	SWFDB;100	O
11	BUSY;100	I	SWMONB;000	O
12	PE;100	I	WRDATA;100	O
13	SELECT;100	I	EXFDWE;100	O
14	AUTFD;000	O	XRATE0;100	O
15	ERROR;000	I	SIDE;100	O
16	PRINT;000	O	FDCDRC;100	O
17	SLIN;000	O	STEP;100	O
18~25	GND		GND	

3.4 PJ5 SIO I/F connector 1 (9-pin)

Table B-28 SIO I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	MDCD1:100	I	6	MDDSR1:100	I
2	MDRD1:100	I	7	MDRTS1:100	O
3	MDTD1:110	O	8	MDCTS1:100	I
4	MDDTR1:110	O	9	MDRI1:100	I
5	GND				

3.5 PJ6 SIO I/F connector 2 (9-pin)

Table B-29 SIO I/F connector 2 pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	MDCD2:100	I	6	MDDSR2:100	I
2	MDRD2:100	I	7	MDRTS2:110	O
3	MDTD2:110	O	8	MDCTS2:100	I
4	MDDTR2:110	O	9	MDRJ2:100	I
5	GND				

4. HRGS BOARD

4.1 PJ1 VGA display I/F connector (15-pin)

Table B-30 VGA display I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	Red	O	9	Reserved	
2	Green	O	10	GND	
3	Blue	O	11	Reserved	
4	Reserved		12	Reserved	
5	GND		13	Hsync	O
6	GND		14	Vsync	O
7	GND		15	Reserved	
8	GND				

4.2 PJ2 System board I/F connector (100-pin)

Table B-31 System board I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	GND		2	M12V	
3	SA0:100	I	4	SA1:100	I
5	SA2:100	I	6	GND	
7	SA3:100	I	8	SA4:100	I
9	SA5:100	I	10	VCC	
11	GND		12	SA6:100	I
13	SA7:100	I	14	SA8:100	I
15	SA9:100	I	16	GND	
17	SA10:100	I	18	SA11:100	I
19	SA12:100	I	20	VCC	
21	GND		22	SA13:100	I
23	SA14:100	I	24	SA15:100	I
25	SA16:100	I	26	GND	
27	SA17:100	I	28	SA18:100	I
29	SA19:100	I	30	VCC	
31	GND		32	A17:100	I
33	A18:100	I	34	A19:100	I
35	A20:100	I	36	GND	
37	A21:100	I	38	A22:100	I
39	A23:100	I	40	VCC	

Table B-31 System board I/F connector pin assignment (continued)

Pin	Signal	I/O	Pin	Signal	I/O
41	GND		42	SD0:100	I/O
43	SD1:100	I/O	44	SD2:100	I/O
45	SD3:100	I/O	46	GND	
47	SD4:100	I/O	48	SD5:100	I/O
49	SD6:100	I/O	50	VCC	
51	GND		52	VCC	I/O
53	SD8:100	I/O	54	SD9:100	I/O
55	SD10:100	I/O	56	GND	
57	SD11:100	I/O	58	SD12:100	I/O
59	SD13:100	I/O	60	VCC	
61	GND		62	SD14:100	I/O
63	SD15:100	I/O	64	RESET:100	I
65	IOCHK;000	O	66	GND	
67	IORDY:100	O	68	DMACK:110	I
69	REFRSH:000	I	70	VCC	
71	GND		72	IOW:000	I
73	IOR:000	I	74	SMEMW:000	I
75	SMEMR:000	I	76	GND	
77	DIDPDP:000	I	78	N/C	
79	SBHE:000	I	80	VCC	
81	GND		82	MEM16:000	O
83	PD0:110	O	84	PD1:110	O
85	PD2:110	O	86	GND	
87	PD3:110	O	88	PD4;110	O
89	PD5;110	O	90	VCC	
91	GND		92	PVCK0:110	O
93	ENAB:110	O	94	PVSN0:020	O
95	PHSNC:020	O	96	GND	
97	BGSRST:000	O	98	KANJI:000	I
99	PVCKO:100	I	100	VCC	

5. BACKPANEL BOARD

5.1 PJ1 System board I/F connector (100-pin)

Table B-32 System board I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	SA1:100	I/O	2	SA0:100	I/O
3	SD7:100	I/O	4	IOCHK:000	O
5	SA3:100	I/O	6	SA2:100	I/O
7	SD6:100	I/O	8	GND	
9	CLKCRT:100	I	10	SA4:100	I/O
11	SD4:100	I/O	12	SD5:100	I/O
13	TC:100	I	14	BALE:100	I
15	SD2:100	I/O	16	SD3:100	I/O
17	IRQ3:100	O	18	DACK2:000	I
19	SD1:100	I/O	20	GND	
21	IRQ5:100	O	22	IRQ4:100	O
23	IORDY:100	O	24	SD0:100	I/O
25	IRQ7:100	O	26	IRQ6:100	O
27	SA19:100	I/O	28	DMACK:110	I
29	REFRSH:000	I	30	SYSCLK:110	I
31	SA18:100	I/O	32	VCC	
33	DACK1:000	I	34	DREQ1:100	O
35	SA16:100	I/O	36	SA17:100	I/O
37	DACK3:000	I	38	DREQ3:100	O
39	SA14:000	I/O	40	SA15:100	I/O
41	IOW:000	I/O	42	IOR:000	I/O
43	SA13:100	I/O	44	GND	
45	SMEMW:000	I	46	SMEMR:000	I
47	SA11:100	I/O	48	SA12:100	I/O
49	DREQ2:100	O	50	N/C	
51	SA9:100	I/O	52	SA10:000	I/O
53	RESET:100	I	54	IRQ9:100	O
55	SA8:100	I/O	56	VCC	
57	SD14:100	I/O	58	SD15:100	I/O
59	SA6:100	I/O	60	SA7:100	I/O
61	SD12:100	I/O	62	SD13:100	I/O
63	SD10:100	I/O	64	SA5:100	I/O
65	MASTER:000	O	66	SD11:100	I/O
67	SD9:100	I/O	68	GND	
69	DACK7:000	I	70	DREQ7:100	O
71	MEMW:000	I/O	72	SD8:100	I/O
73	DACK6:000	I	74	DREQ6:100	O
75	A17:100	I/O	76	MEMR:000	I/O
77	DACK5:000	I	78	DREQ5:100	O
79	A18:000	I/O	80	GND	
81	DACK0:000	I	82	DREQ0:100	O
83	A20:100	I/O	84	A19:100	I/O
85	IRQ15:000	O	86	IRQ14:100	O
87	A22:100	I/O	88	A21:100	I/O
89	IRQ11:000	O	90	IRQ12:100	O
91	A23:100	I/O	92	VCC	

Table B-32 System board I/F connector pin assignment (continued)

Pin	Signal	I/O	Pin	Signal	I/O
93	P12V		94	IRQ10:100	O
95	IO16:000	O	96	SBHE:000	I/O
97	M12V		98	MEM16:000	O
99	M5V		100	GND	

5.2 PJ2A 8-Bit I/F connector A (31-pin)

Table B-33 8-Bit I/F connector A pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	IOCHK:000	I	17	SA14:100	I/O
2	SD7:100	I/O	18	SA13:100	I/O
3	SD6:100	I/O	19	SA12:100	I/O
4	SD5:100	I/O	20	SA11:100	I/O
5	SD4:100	I/O	21	SA10:100	I/O
6	SD3:100	I/O	22	SA9:100	I/O
7	SD2:100	I/O	23	SA8:100	I/O
8	SD1:100	I/O	24	SA7:100	I/O
9	SD0:100	I/O	25	SA6:100	I/O
10	IORDY:000	I	26	SA5:100	I/O
11	DMACK:100	O	27	SA4:100	I/O
12	SA19:100	I/O	28	SA3:100	I/O
13	SA18:100	I/O	29	SA2:100	I/O
14	SA17:100	I/O	30	SA1:100	I/O
15	SA16:100	I/O	31	SA0:100	I/O
16	SA15:100	I/O			

5.3 PJ2B 8-Bit I/F connector B (31-pin)

Table B-34 8-Bit I/F connector B pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	GND		17	DACK1:000	O
2	RESET:100	O	18	DREQ1:000	I
3	VCC		19	REFRSH:000	I/O
4	IRQ9:100	I	20	SYSCLK:110	O
5	M5V		21	IRQ7:100	I
6	DREQ2:100	I	22	IRQ6:100	I
7	M12V		23	IRQ5:100	I
8	OWAIT:000	I	24	IRQ4:100	I
9	P12V		25	IRQ3:100	I
10	GND		26	DACK2:100	O
11	SMEMW:000	O	27	TC:100	O
12	SA19:100	O	28	BALE:100	O
13	IOW:000	I/O	29	VCC	
14	IOR:000	I/O	30	CLKCRT:100	O
15	DACK3:000	O	31	GND	
16	DREQ3:000	I			

5.4 PJ3 16-Bit I/F connector (104-pin)

Table B-35 16-Bit I/F connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	SD15:100	I/O	2	GND	
3	SD14:100	I/O	4	MASTER:000	I
5	SD13:100	I/O	6	VCC	
7	SD12:100	I/O	8	DREQ7:100	I
9	SD11:100	I/O	10	DACK7:000	O
11	SD10:100	I/O	12	DREQ6:100	I
13	SD 9:100	I/O	14	DACK6:000	O
15	SD 8:100	I/O	16	DREQ5:100	I
17	MEMW:000	I/O	18	DACK5:100	O
19	MEMR:000	I/O	20	DREQ0:100	I
21	A17:100	I/O	22	DACK0:000	O
23	A18:100	I/O	24	IRQ14:100	I
25	A19:100	I/O	26	IRQ15:100	I
27	A20:100	I/O	28	IRQ12:100	I
29	A21:100	I/O	30	IRQ11:100	I
31	A22:100	I/O	32	IRQ10:100	I
33	A23:100	I/O	34	IO16:000	I
35	SBHE:000	I/O	36	MEM16:000	I
37	N/C		38	N/C	
39	N/C		40	N/C	
41	N/C		42	N/C	
43	SA0:100	I/O	44	GND	
45	SA1:100	I/O	46	CLKCRT:000	O
47	SA2:100	I/O	48	VCC	
49	SA3:100	I/O	50	BALE:100	O
51	SA4:100	I/O	52	TC:100	O
53	SA5:100	I/O	54	DACK2:100	O
55	SA6:100	I/O	56	IRQ3:100	I
57	SA7:100	I/O	58	IRQ4:100	I
59	SA8:100	I/O	60	IRQ5:100	I
61	SA9:100	I/O	62	IRQ6:100	I
63	SA10:100	I/O	64	IRQ7:100	I
65	SA11:100	I/O	66	SYSCLK:110	O
67	SA12:100	I/O	68	REFRSH:000	I/O
69	SA13:100	I/O	70	DREQ1:100	I
71	SA14:100	I/O	72	DACK1:000	O
73	SA15:100	I/O	74	DREQ3:100	I
75	SA16:100	I/O	76	DACK3:000	O
77	SA17:100	I/O	78	IOR:000	I/O
79	SA18:100	I/O	80	IOW:000	I/O
81	SA19:100	I/O	82	SMEMR;000	O
83	DMACK:110	O	84	SMEMW;000	O
85	IORDY:00	I	86	GND	
87	SD0:100	I/O	88	P12V	
89	SD1:100	I/O	90	OWAIT:000	I
91	SD2:100	I/O	92	P12V	
93	SD3:100	I/O	94	DREQ2:100	I
95	SD4:100	I/O	96	M5V	
97	SD5:100	I/O	98	IRQ9:100	I

Table B-35 16-Bit I/F connector pin assignment (continued)

Pin	Signal	I/O	Pin	Signal	I/O
99	SD6:100	I/O	100	VCC	
101	SD7:100	I/O	102	RESET:100	O
103	IOCHK;000	I	104	GND	

6. SENSOR BOARD

6.1 PJ801 Sensor board connector (3-pin)

Table B-36 Sensor board connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	COVER;000	I	3	GND	
2	PDPV;100	O			

7. LED BOARD (RIGHT)

7.1 PJ601 LED board connector (4-pin)

Table B-37 LED board connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	VCC		3	LEDNUM;010	O
2	LEDCAP;010	O	4	LEDSCR;010	O

8. LED BOARD (LEFT)

8.1 PJ701 LED board connector (4-pin)

Table B-38 LED board connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	P12V;100		3	DRVBLD;000	O
2	DRVALD;000	O	4	GND	

8.2 PJ702 Fan connector (2-pin)

Table B-39 Fan connector pin assignment

Pin	Signal	I/O	Pin	Signal	I/O
1	P12V;000			GND	

APPENDIX C

DISPLAY CODE

Table C-1 Display code

HEXA DECIMAL VALUE	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	BLANK (NULL)	►	BLANK (SPACE)	0	@	P	‘	p	Ç	É	á	⁞⁞	┗	┛	α	≡
1	☺	◄	!	1	A	Q	a	q	ü	æ	í	⁞	┏	┓	β	±
2	☻	↕	"	2	B	R	b	r	é	Æ	ó	≋	┃	┃	Γ	≥
3	♥	‼	#	3	C	S	c	s	â	ô	ú		┣	┫	π	≤
4	♦	¶	$	4	D	T	d	t	ä	ö	ñ		┳	┻	Σ	⌠
5	♣	§	%	5	E	U	e	u	à	ò	Ñ		╋		σ	⌡
6	♠	▬	&	6	F	V	f	v	å	û	ª				μ	÷
7	•	↨	’	7	G	W	g	w	ç	ù	º				τ	≈
8	◘	↑	(	8	H	X	h	x	ê	ÿ	¿				Φ	°
9	○	↓	)	9	I	Y	i	y	ë	Ö	⌐				Θ	∙
A	◙	→	*	:	J	Z	j	z	è	Ü	¬				Ω	•
B	♂	←	+	;	K	[	k	{	ï	¢	½			■	δ	√
C	♀	∟	,	<	L	\	l	¦	î	£	¼				∞	n
D	♪	↔	—	=	M	]	m	}	ì	¥	¡				φ	2
E	♫	▲	.	>	N	^	n	~	Ä	Pt	Ø				∈	■
F	☼	▼	/	?	O	_	o	⌂	Å	ƒ	»				∩	BLANK FF

APPENDIX D

Keyboard Scan/Character Code

Table D-1 Keyboard scan/character code

KEY No.	KEY Top	Base	Upper	Caps Lock		Ctrl	Alt
				Base	Upper		
1	ESC	011B	011B	011B	011B	011B	----
	"	"	"	"	"	"	0100
2	!	0231	0221	0231	0221	----	7800
	1	"	"	"	"	----	"
3	@	0332	0340	0332	0340	0300	7900
	2	"	"	"	"	"	"
4	#	0433	0423	0433	0423	----	7A00
	3	"	"	"	"	----	"
5	$	0534	0524	0534	0524	----	7B00
	4	"	"	"	"	----	"
6	%	0635	0625	0635	0625	----	7C00
	5	"	"	"	"	----	"
7	^	0736	075E	0736	075E	071E	7D00
	6	"	"	"	"	"	"
8	&	0837	0826	0837	0826	----	7E00
	7	"	"	"	"	----	"
9	*	0938	092A	0938	092A	----	7F00
	8	"	"	"	"	----	"
10	(	0A39	0A28	0A39	0A28	----	8000
	9	"	"	"	"	----	"
11	)	0B30	0B29	0B30	0B29	----	8100
	0	"	"	"	"	----	"
12	-	0C2D	0C5F	0C2D	0C5F	0C1F	8200
		"	"	"	"	"	"
13	+	0D3D	0D2B	0D3D	0D2B	----	8300
	=	"	"	"	"	----	"
14	BS	0E08	0E08	0E08	0E08	0E7F	----
		"	"	"	"	"	0E00
15	TAB	0F09	0F00	0F09	0F00	----	----
		"	"	"	"	9400	A500
16	Q	1071	1051	1051	1071	1011	1000
		"	"	"	"	"	"
17	W	1177	1157	1157	1177	1117	1100
		"	"	"	"	"	"
18	E	1265	1245	1245	1265	1205	1200
		"	"	"	"	"	"
19	R	1372	1352	1352	1372	1312	1300
		"	"	"	"	"	"
20	T	1474	1454	1454	1474	1414	1400
		"	"	"	"	"	"
21	Y	1579	1559	1559	1579	1519	1500
		"	"	"	"	"	"

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

KEY No.	KEY Top	Base	Upper	Caps Lock		Ctrl	Alt
				Base	Upper		
22	U	1675 "	1655 "	1655 "	1675 "	1615 "	1600 "
23	I	1769 "	1749 "	1749 "	1769 "	1709 "	1700 "
24	O	186F "	184F "	184F "	186F "	180F "	1800 "
25	P	1970 "	1950 "	1950 "	1970 "	1910 "	1900 "
26	{ [	1A5B "	1A7B "	1A5B "	1A7B "	1A1B "	---- 1A00
27	}]	1B5D "	1B7D "	1B5D "	1B7D "	1B1D "	---- 1B00
28	L-E	1C0D "	1C0D "	1C0D "	1C0D "	1C0A "	---- 1C00
29	L-C	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----
30	A	1E61 "	1E41 "	1E41 "	1E61 "	1E01 "	1E00 "
31	S	1F73 "	1F53 "	1F53 "	1F73 "	1F13 "	1F00 "
32	D	2064 "	2044 "	2044 "	2064 "	2004 "	2000 "
33	F	2166 "	2146 "	2146 "	2166 "	2106 "	2100 "
34	G	2267 "	2247 "	2247 "	2267 "	2207 "	2200 "
35	H	2368 "	2348 "	2348 "	2368 "	2308 "	2300 "
36	J	246A "	244A "	244A "	246A "	240A "	2400 "
37	K	256B "	254B "	254B "	256B "	250B "	2500 "
38	L	266C "	264C "	264C "	266C "	260C "	2600 "
39	: ;	273B "	273A "	273B "	273A "	---- ----	---- 2700
40	" '	2827 "	2822 "	2827 "	2822 "	---- ----	---- 2800
41	*2	2960 "	297E "	2960 "	297E "	---- ----	---- 2900
42	L-S	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----
43	*1	2B5C "	287C "	2B5C "	2B7C "	2B1C "	---- 2B00
44	Z	2C7A "	2C5A "	2C5A "	2C7A "	2C1A "	2C00 "
45	X	2D78 "	2D58 "	2D58 "	2D78 "	2D18 "	2D00 "
46	C	2E63 "	2E43 "	2E43 "	2E63 "	2E03 "	2E00 "

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

KEY No.	KEY Top	Base	Upper	Caps Lock		Ctrl	Alt
				Base	Upper		
47	V	2F76 "	2F56 "	2F56 "	2F76 "	2F16 "	2F00 "
48	B	3062 "	3042 "	3042 "	3062 "	3002 "	3000 "
49	N	316E "	314E "	314E "	316E "	310E "	3100 "
50	M	326D "	324D "	324D "	326D "	320D "	3200 "
51	< ,	332C "	333C "	332C "	333C "	---- ----	---- 3300
52	> .	342E "	343E "	342E "	343E "	---- ----	---- 3400
53	? /	352F "	353F "	352F "	353F "	---- ----	---- 3500
54	R-S	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----
55	*	372A "	372A "	372A "	372A "	---- 9600	---- 3700
56	L-A	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----
57	SPC	3920 "	3920 "	3920 "	3920 "	3920 "	3920 "
58	CAP	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----
59	F1	3B00 "	5400 "	3B00 "	5400 "	5E00 "	6800 "
60	F2	3C00 "	5500 "	3C00 "	5500 "	5F00 "	6900 "
61	F3	3D00 "	5600 "	3D00 "	5600 "	6000 "	6A00 "
62	F4	3E00 "	5700 "	3E00 "	5700 "	6100 "	6B00 "
63	F5	3F00 "	5800 "	3F00 "	5800 "	6200 "	6C00 "
64	F6	4000 "	5900 "	4000 "	5900 "	6300 "	6D00 "
65	F7	4100 "	5A00 "	4100 "	5A00 "	6400 "	6E00 "
66	F8	4200 "	5B00 "	4200 "	5B00 "	6500 "	6F00 "
67	F9	4300 "	5C00 "	4300 "	5C00 "	6600 "	7000 "
68	F10	4400 "	5D00 "	4400 "	5D00 "	6700 "	7100 "
69	NUM	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----
70	SCR	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----
71	7 HOM	4700 "	4737 "	4737 "	4700 "	7700 "	* *

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

KEY No.	KEY Top	Base	Upper	Caps Lock Base	Caps Lock Upper	Ctrl	Alt
72	8 UC	4800 "	4838 "	4838 "	4800 "	---- "	* *
73	9 PUP	4900 "	4939 "	4939 "	4900 "	8400 "	* *
74	-	4A2D "	4A2D "	4A2D "	4A2D "	---- 8E00	---- 4A00
75	4 LC	4B00 "	4B34 "	4B34 "	4B00 "	7300 "	* *
76	5	---- 4C00	4C35 "	4C35 "	---- 4C00	---- 8F00	* *
77	6 RC	4D00 "	4D36 "	4D36 "	4D00 "	7400 "	* *
78	+	4E2B "	4E2B "	4E2B "	4E2B "	---- 9000	---- 4E00
79	1 END	4F00 "	4F31 "	4F31 "	4F00 "	7500 "	* *
80	2 DC	5000 "	5032 "	5032 "	5000 "	---- 9100	* *
81	3 PDN	5100 "	5133 "	5133 "	5100 "	7600 "	* *
82	0 INS	5200 "	5230 "	5230 "	5200 "	---- 9200	* *
83	. DEL	5300 "	532E "	532E "	5300 "	---- 9300	---- ----
84	R-A	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----
85	R-C	---- ----	---- ----	---- ----	---- ----	---- ----	---- ----
87	F11	---- 8500	---- 8700	---- 8500	---- 8700	---- 8900	---- 8B00
88	F12	---- 8600	---- 8800	---- 8600	---- 8800	---- 8A00	---- 8C00
89	R-S S-R	---- ----	---- ----	---- ----	---- ----	7200 "	---- ----
90	PUS BRK	---- ----	---- ----	---- ----	---- ----	0000 "	---- ----
91	/	352F E02F	352F E02F	352F E02F	352F E02F	---- 9500	---- A400
92	R-E	1C0D E00D	1C0D E00D	1C0D 300D	1C0D 300D	1C0A 300A	---- A600

Note: BS: Back Space
L-E: Left Enter
L-C: Left Ctlr
L-S: Left Shift
R-S: Right Shift
L-A: Left Alt
SPC: Space
CAP: Caps Lock
NUM: Num Lock
SCR: Scroll Lock
HOM: Home
UC: Up Cursor
PUP: PgUp
RC: Right Cursor
DC: Down Cursor
PDN: PgDn
R-A: Right Alt
R-C: Right Ctrl
R-S: Right Screen
S-R: Sys Req
PUS: Pursue
BRK: Break
R-E: Right Enter

APPENDIX E

KEY LAYOUT

1. USA VERSION

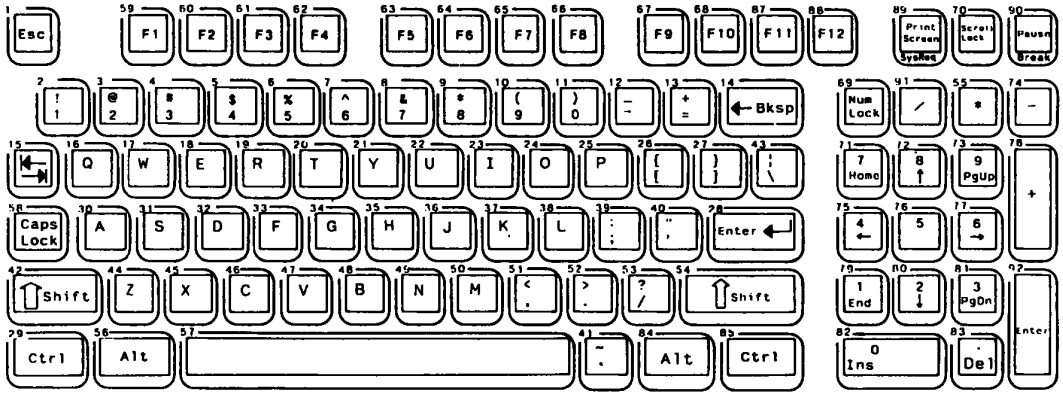


Figure E-1 USA version

2. UK VERSION

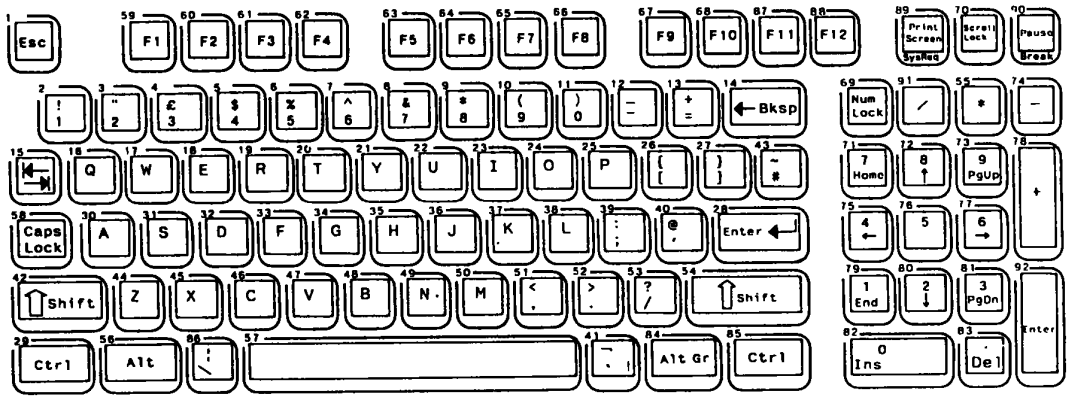


Figure E-2 UK version

3. GERMANY VERSION

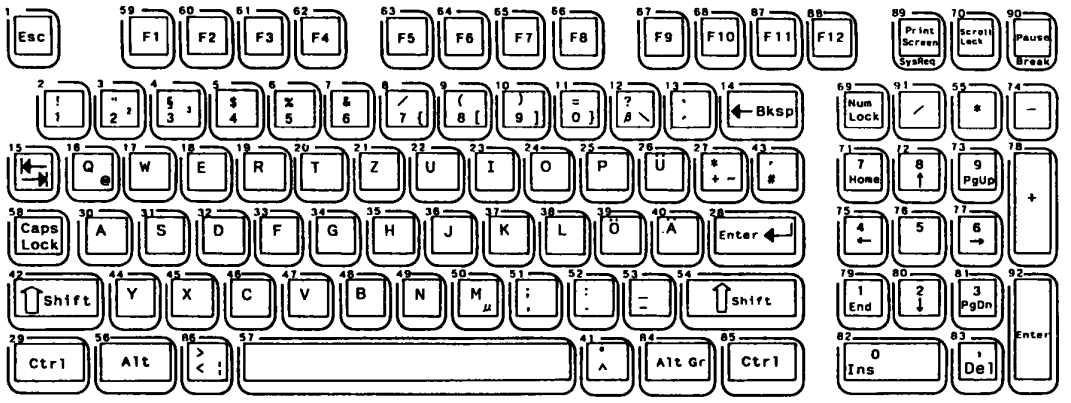


Figure E-3 Germany version

4. FRANCE VERSION

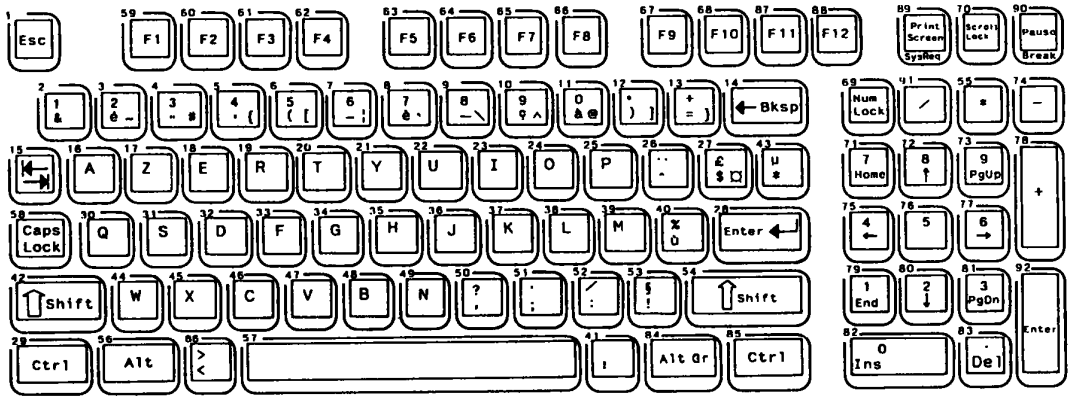


Figure E-4 France version

5. SPAIN VERSION

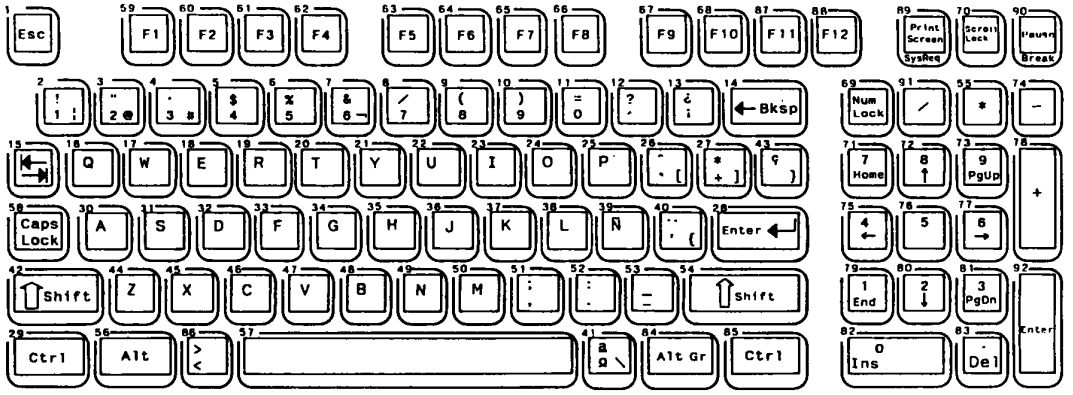


Figure E-5 Spain version

6. ITALY VERSION

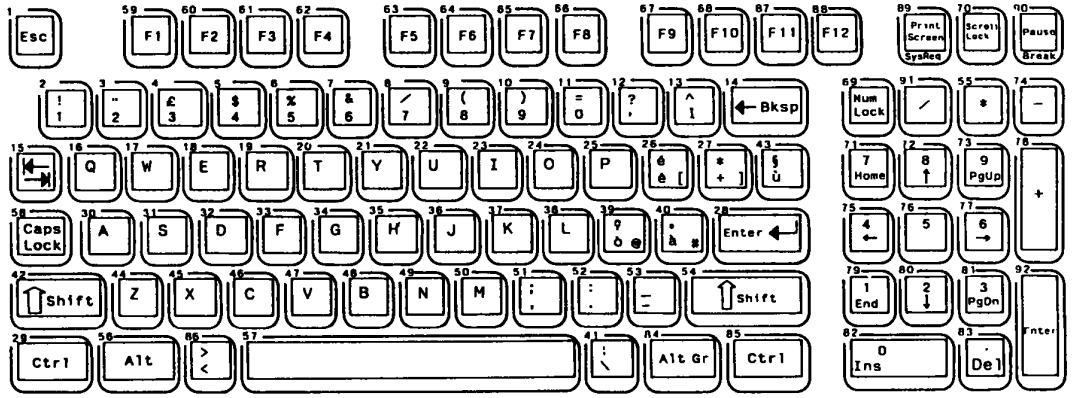


Figure E-6 Italy version

7. SWITZER VERSION

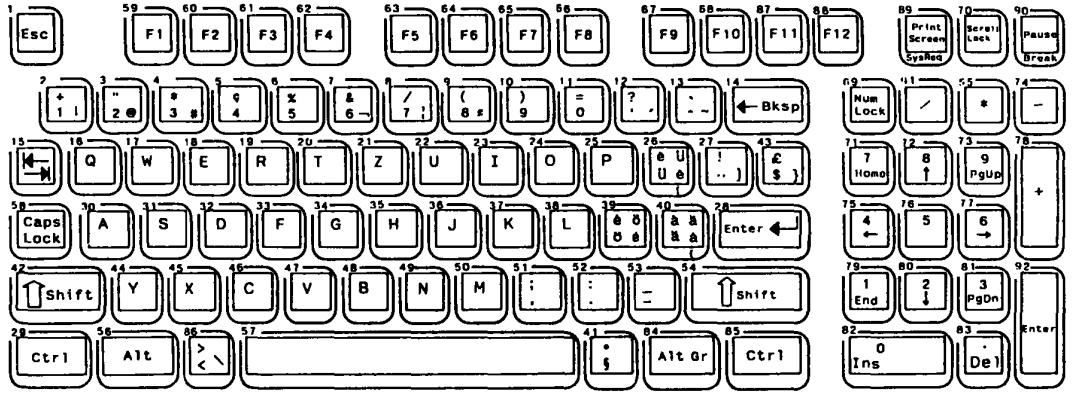


Figure E-7 Switzerland version

8. CANADIAN VERSION

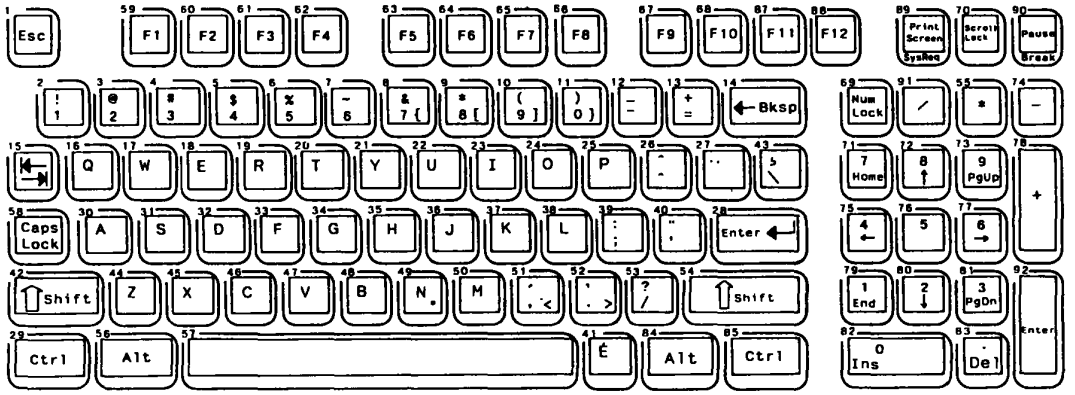


Figure E-8 Canadian version

9. SWEDEN VERSION

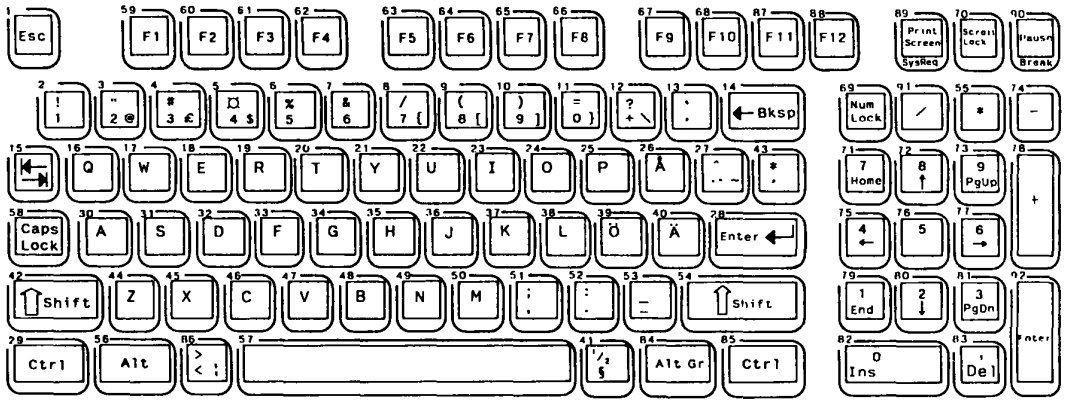


Figure E-9 Sweden version

10. DENMARK VERSION

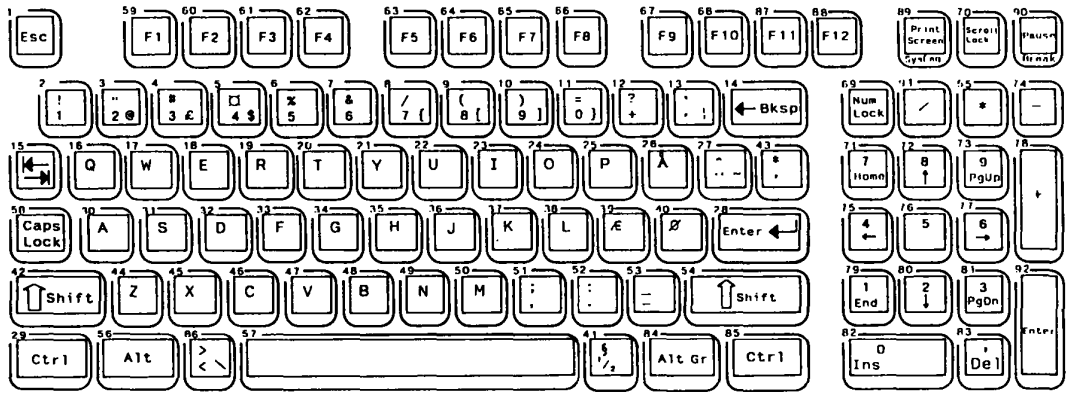


Figure E-10 Denmark version

11. NORWAY VERSION

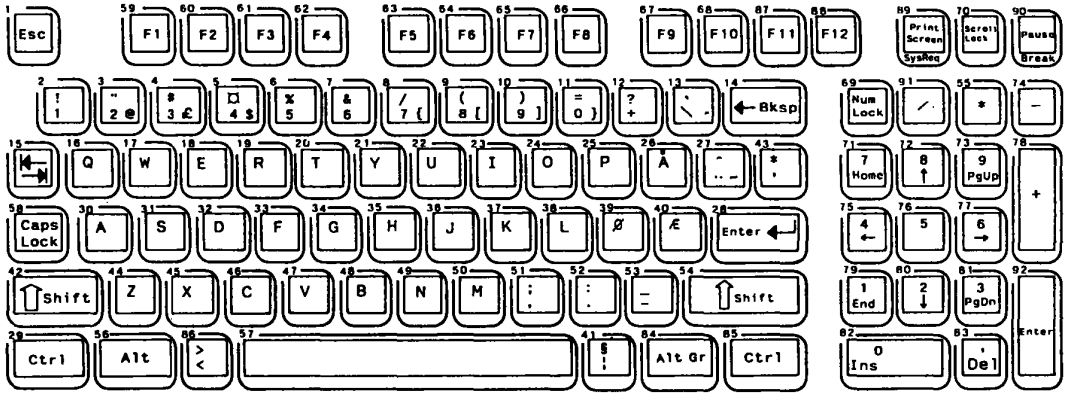


Figure E-11 Norway version