MAINTENANCE MANUAL

MODEL:T5200
MODEL:T5200C

CHAP:1 HARDWARE OVERVIEW

SECT:1.1

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).

<fig id=MMS\5200\52001_1.TIF>Figure 1-1</fig> T5200 personal computer

<fig id=MMS\5200\52001_2.TIF>Page 1-2</fig>

SYSTEM UNIT

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

<fig id=MMS\5200\52001_2.TIF>Figure 1-2</fig> System unit configuration

<fig id=MMS\5200\52001_3.TIF>Page 1-3</fig>

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.

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:1 HARDWARE OVERVIEW
SECT:1.2, MAIN BOARDS
DOC_ID:1.2 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52001_4.TIF>Page 1-4</fig>

1.2 MAIN BOARDS

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

<fig id=MMS\5200\52001_4.TIF>Figure 1-3</fig> Block diagram

<fig id=MMS\5200\52001_5.TIF>Page 1-5</fig>

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

<fig id=MMS\5200\52001_6.TIF>Page 1-6</fig>

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

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:1 HARDWARE OVERVIEW
SECT:1.3, SYSTEM BOARD JUMPER STRAPS
DOC_ID:1.3 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52001_7.TIF>Page 1-7</fig>

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.

<fig id=MMS\5200\52001_7.TIF>Figure 1-4</fig> System board jumper strap

Table 1-1 System board jumper strap status

PJ No.	Status
16	Open
17	Open

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:1 HARDWARE OVERVIEW
SECT:1.4, 3.5-INCH FLOPPY DISK DRIVE
DOC_ID:1.4 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52001_8.TIF>Page 1-8</fig>

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.

<fig id=MMS\5200\52001_8.TIF>Figure 1-5</fig> 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	

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:1 HARDWARE OVERVIEW
SECT:1.5, 3.5-INCH HARD DISK DRIVE
DOC_ID:1.5 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52001_9.TIF>Page 1-9</fig>

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.

<fig id=MMS\5200\52001_9.TIF>Figure 1-6</fig> 3.5-inch HDD

<fig id=MMS\5200\52001_10.TIF>Page 1-10</fig>

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

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:1 HARDWARE OVERVIEW
SECT:1.6, HDD JUMPER STRAPS
DOC_ID:1.6 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52001_11.TIF>Page 1-11</fig>

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.

<fig id=MMS\5200\52001_11.TIF>Figure 1-7</fig> HDD jumper straps

Table 1-4 HDD jumper strap status

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

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DOC:MAINTENANCE MANUAL

MODEL:T5200
MODEL:T5200C
CHAP:1 HARDWARE OVERVIEW
SECT:1.7, KEYBOARD
DOC_ID:1.7 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52001_12.TIF>Page 1-12</fig>

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.

<fig id=MMS\5200\52001_12.TIF>Figure 1-8</fig> Keyboard

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:1 HARDWARE OVERVIEW
SECT:1.8, PLASMA DISPLAY
DOC_ID:1.8 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52001_13.TIF>Page 1-13</fig>

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.

<fig id=MMS\5200\52001_13.TIF>Figure 1-9</fig> 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 ñ 0.25V	(E1) 5V ñ 0.5V
	180 mA	400 mA
	(VD) 5V ñ 0.25V	(E2) 205 V ñ 0.5V
	4.5 mA	200 mA
	(VA) 70V ñ 2V	(E3) 5V ñ 0.5V
	247 mA	60 mA
	(VK) 130V + 3V	
	175 mA	

<fig id=MMS\5200\52001_14.TIF>Page 1-14</fig>

Table 1-5 Plasma display specifications (continued)

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

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:1 HARDWARE OVERVIEW
SECT:1.9, POWER SUPPLY UNIT
DOC_ID:1.9 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52001_14.TIF>Page 1-14</fig>

1.9 POWER SUPPLY UNIT

The universal auto-sensing power supply can be used worldwide 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.

<fig id=MMS\5200\52001_14.TIF>Figure 1-10</fig> Power supply unit

<fig id=MMS\5200\52001_15.TIF>Page 1-15</fig>

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

<fig id=MMS\5200\52001_16.TIF>Page 1-16</fig>

File No. : 960-011

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CHAP:2 PROBLEM ISOLATION PROCEDURES
SECT:2.1, GENERAL
DOC_ID:2.1 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52002_1.TIF>Page 2-1</fig>

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.

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:2 PROBLEM ISOLATION PROCEDURES
SECT:2.2, PROBLEM ISOLATION FLOWCHART
DOC_ID:2.2 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52002_2.TIF>Page 2-2</fig>

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.

<fig id=MMS\5200\52002_2.TIF>Page 2-2</fig>

<fig id=MMS\5200\52002_2.TIF>Figure 2-1</fig> Problem isolation flowchart

<fig id=MMS\5200\52002_3.TIF>Page 2-3</fig>

<fig id=MMS\5200\52002_3.TIF>Figure 2-1 (cont.)</fig> Problem isolation flowchart

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.

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DOC:MAINTENANCE MANUAL
MODEL:T5200
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CHAP:2 PROBLEM ISOLATION PROCEDURES
SECT:2.3, POWER SUPPLY UNIT PROBLEM ISOLATION PROCEDURES
DOC_ID:2.3 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52002_4.TIF>Page 2-4</fig>

2.3 POWER SUPPLY UNIT PROBLEM ISOLATION PROCEDURES

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³WARNING: Dangerous high voltage is supplied to the power supply   ³
³unit. Pay enough attention on handling. It takes few minutes    after³
³power off to discharge the electricity.                           ³
ÀÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÙ
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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

<fig id=MMS\5200\52002_5.TIF>Page 2-5</fig>

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.

<fig id=MMS\5200\52002_6.TIF>Page 2-6</fig>

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.

<fig id=MMS\5200\52002_7.TIF>Page 2-7</fig>

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 +lead	Pin number -lead	Voltage (Vdc) 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

<fig id=MMS\5200\52002_8.TIF>Page 2-8</fig>

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.

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:2 PROBLEM ISOLATION PROCEDURES
SECT:2.4, SYSTEM, MEMORY, AND I/O BOARDS PROBLEM ISOLATION PROCEDURES
DOC_ID:2.4 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52002_9.TIF>Page 2-9</fig>

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

ÉÍÍ»
ºCAUTION: Before carrying out any of these procedures, make sure º
ºthat the FDD is empty. Performing these procedures with a floppy º
ºdisk in the FDD may result in loss of data. º
º
ÈÍÍ¼

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

<fig id=MMS\5200\52002_10.TIF>Page 2-10</fig>

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.

   ** BDD 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 .....

   <fig id=MMS\5200\52002_11.TIF>Page 2-11</fig>

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.

<fig id=MMS\5200\52002_12.TIF>Page 2-12</fig>

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

<fig id=MMS\5200\52002_13.TIF>Page 2-13</fig>

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	510/Printer initialization
2EH	HDD initialization
2FH	Option ROM check
30H	Timer check
31H	NDP initialization
32H	Prepare for boot

<fig id=MMS\5200\52002_14.TIF>Page 2-14</fig>

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
BDH	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
ASH	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

<fig id=MMS\5200\52002_15.TIF>Page 2-15</fig>

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.

<fig id=MMS\5200\52002_16.TIF>Page 2-16</fig>

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.

<fig id=MMS\5200\52002_17.TIF>Page 2-17</fig>

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.

<fig id=MMS\5200\52002_18.TIF>Page 2-18</fig>

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.

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:2 PROBLEM ISOLATION PROCEDURES
SECT:2.5, FLOPPY DISK DRIVE PROBLEM ISOLATION PROCEDURES
DOC_ID:2.5 T5200
LANG:ALL

TEXT:

<fig id=MMS\5200\52002_19.TIF>Page 2-19</fig>

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

<fig id=MMS\5200\52002_20.TIF>Page 2-20</fig>

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.

<fig id=MMS\5200\52002_21.TIF>Page 2-21</fig>

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.

<fig id=MMS\5200\52002_22.TIF>Page 2-22</fig>

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.

<fig id=MMS\5200\52002_23.TIF>Page 2-23</fig>

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

```
                  ³ 20 ³ FDC Error             ³
                  ³ 40 ³ Seek Error            ³
                  ³ 60 ³ FDD Not Drive         ³
                  ³ 80 ³ Time Out Error        ³
                  ³ EE ³ Write Buffer Error    ³
                  ÀÄÄÄÄÁÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÙ
```

<fig id=MMS\5200\52002_24.TIF>Page 2-24</fig>

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.

<fig id=MMS\5200\52002_25.TIF>Page 2-25</fig>

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.

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:2 PROBLEM ISOLATION PROCEDURES
SECT:2.6, HARD DISK DRIVE PROBLEM ISOLATION PROCEDURES
DOC_ID:2.6 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52002_26.TIF>Page 2-26</fig>

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

<fig id=MMS\5200\52002_27.TIF>Page 2-27</fig>

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.

<fig id=MMS\5200\52002_28.TIF>Page 2-28</fig>

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  .....
```

<fig id=MMS\5200\52002_29.TIF>Page 2-29</fig>

PROCEDURE 3

Format Execution

```
É͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸»
º CAUTION: The contents of the hard disk will be erased when the  º
º FORMAT command is run. Before running this test, transfer the   º
º contents of the hard disk to floppy disks. This can be done    withº
º the MS-DOS BACKUP command. (See the MS-DOS Manual for details.) º
È͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸¼
```

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.

<fig id=MMS\5200\52002_30.TIF>Page 2-30</fig>

PROCEDURE 4

Hard Disk Test Execution

```
É͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸»
º CAUTION: The contents of the hard disk will be erased when the   º
º test program is run. Before running this test, transfer the      º
º contents of the hard disk to floppy disks. This can be done with º
º the MS-DOS BACKUP command. (See the MS-DOS Manual for details.)  º
º
È͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸͸¼
```

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 25.

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)	

<fig id=MMS\5200\52002_31.TIF>Page 2-31</fig>

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.

<fig id=MMS\5200\52002_32.TIF>Page 2-32</fig>

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 bumper straps functions

Signal	Status
HSP	Open
CD	Short
DSP	Open
ACT	Short

<fig id=MMS\5200\52002_32.TIF>Figure 2-2</fig> HDD jumper straps

<fig id=MMS\5200\52002_33.TIF>Page 2-33</fig>

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.

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:2 PROBLEM ISOLATION PROCEDURES
SECT:2.7, KEYBOARD PROBLEM ISOLATION PROCEDURES
DOC_ID:2.7 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52002_34.TIF>Page 2-34</fig>

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

<fig id=MMS\5200\52002_35.TIF>Page 2-35</fig>

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).

ÚÄÄÄ¿

³ CAUTION: Do not type an MS-DOS acceptable command such as ³
³ del and format. Such operation may erase your important ³
³ program or data. ³
ÀÄÄÙ

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: _

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

<fig id=MMS\5200\52002_36.TIF>Page 2-36</fig>

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.

<fig id=MMS\5200\52002_37.TIF>Page 2-37</fig>

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.

<fig id=MMS\5200\52002_38.TIF>Page 2-38</fig>

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.

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:2 PROBLEM ISOLATION PROCEDURES
SECT:2.8, PLASMA DISPLAY PROBLEM ISOLATION PROCEDURES
DOC_ID:2.8 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52002_39.TIF>Page 2-39</fig>

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

<fig id=MMS\5200\52002_40.TIF>Page 2-40</fig>

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.

<fig id=MMS\5200\52002_41.TIF>Page 2-41</fig>

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.

<fig id=MMS\5200\52002_42.TIF>Page 2-42</fig>

PROCEDURE 3

PDP Connector Check

ÚÄÄ¿
³ WARNING: Dangerous high voltage is supplied to the   plasma³
³ display panel. Pay enough attention on handling.   ³
ÀÄÄÙ

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.

<fig id=MMS\5200\52002_42.TIF>Figure 2-3</fig> PDP connector check

<fig id=MMS\5200\52002_43.TIF>Page 2-43</fig>

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.

<fig id=MMS\5200\52002_44.TIF>Page 2-44</fig>

File No.: 960-011

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.1, GENERAL
DOC_ID:3.1 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_1.TIF>Page 3-1</fig>

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.

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.2, OPERATIONS
DOC_ID:3.2 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_2.TIF>Page 3-2</fig>

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 - HEED 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.

```
ÚÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¿
³NOTE: To stop the test program:                          ³
³(1)  During keyboard operation, press Ctrl + C           ³
³(2)  While running the test program, press Ctrl + Break  ³
ÀÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÙ
```

<fig id=MMS\5200\52003_3.TIF>Page 3-3</fig>

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.

<fig id=MMS\5200\52003_4.TIF>Page 3-4</fig>

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

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

ÚÄÄÄ¿
³NOTE: If you select KEYBOARD TEST, this message will not appear.³
ÀÄÄÄÙ

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.

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.3, SUBTEST NAMES
DOC_ID:3.3 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_5.TIF>Page 3-5</fig>

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	
		01	RAM constant data	
		02	RAM address	
			pattern data	
2	MEMORY	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	
			01	VRAM read/write	
			02	Character attributes	
			03	Character set	
			04	80*25 Character display	
4	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	
			01	Sequential read	
			02	Sequential read/write	
5	FDD		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)
		01	Ripple pattern	
6	PRINTER	02	Function	
		03	Wraparound	
		01	Wraparound (board)	
		02	Board (#1) <=>	
			board (#2)	
		03	Point to point	
			(send)	
7	ASYNC	04	Point to point	
			(receive)	
		05	Card modem loopback	
		06	Card modem on-line test	
		07	Dial tester test	
		08	Interrupt test	
			(IRQ4, 3, 5)	
		01	Sequential read	
		02	Address uniqueness	
		03	Random address/data	
		04	Cross talk & peak shift	
		05	Write/read/compare (CE)	
8	HDD	06	Write specified address	
		07	Read specified address	

		08	ECC circuit (CE cylinder)	
		09	Sequential write	
		10	W-R-C specified address	
		01	Real time test	
		02	Backup memory test	
9	REAL TIME	03	Real time carry test	
10	NDP	01	NDP test	
	EXPANSION	01	Box wraparound test	
11	UNIT	02	Box mono video RAM test	
		03	Wraparound test (51-bus)	
		04	Wraparound test 32-bus	

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.4, SYSTEM TEST
DOC_ID:3.4 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_7.TIF>Page 3-7</fig>

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		

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.5, MEMORY TEST
DOC_ID:3.5 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_8.TIF>Page 3-8</fig>

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)?

<fig id=MMS\5200\52003_9.TIF>Page 3-9</fig>

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-XXXXKB]

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

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.6, KEYBOARD TEST
DOC_ID:3.6 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_10.TIF>Page 3-10</fig>

3.6 KEYBOARD TEST

Subtest 01   Pressed key display

```
ÚÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¿
³NOTE: Make sure the  Num-lock key is off. If this key  is³
³on, the test cannot be carried out.                     ³
ÀÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÙ
```

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

<fig id=MMS\5200\52003_10.TIF>Figure</fig>

<fig id=MMS\5200\52003_11.TIF>Page 3-11</fig>

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
```

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.7, DISPLAY TEST
DOC_ID:3.7 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_11.TIF>Page 3-11</fig>

3.7 DISPLAY TEST

ÚÄÄÄ¿
3NOTE: The contents of the this test differ with the display mode
3
3(VGA-color, VGA-monochrome, CGA). This mode is changed with the
SETUP3
3program.
3

ÀÄÄÄÙ

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.

<fig id=MMS\5200\52003_12.TIF>Page 3-12</fig>

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
NNNNNNNNNNNNNNNNNNNNNNNNNNNN

NEXT LINE SHOWS INTENSIFIED DISPLAY
IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII

NEXT LINE SHOWS REVERSE DISPLAY
RRRRRRRRRRRRRRRRRRRRRRRRRRRRRRRR

NEXT LINE SHOWS BLINKING DISPLAY
BBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBBB (Blinks)

<fig id=MMS\5200\52003_12.TIF>Figure</fig>

<fig id=MMS\5200\52003_13.TIF>Page 3-13</fig>

320*200 GRAPHICS DISPLAY

<fig id=MMS\5200\52003_13.TIF>Figure</fig>

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.

<fig id=MMS\5200\52003_13.TIF>Figure</fig>

<fig id=MMS\5200\52003_14.TIF>Page 3-14</fig>

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

<fig id=MMS\5200\52003_14.TIF>Figure</fig>

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

<fig id=MMS\5200\52003_14.TIF>Figure</fig>

<fig id=MMS\5200\52003_15.TIF>Page 3-15</fig>

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]

<fig id=MMS\5200\52003_15.TIF>Figure</fig>

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]

<fig id=MMS\5200\52003_15.TIF>Figure</fig>

<fig id=MMS\5200\52003_16.TIF>Page 3-16</fig>

Subtest 08   Display page

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

```
DISPLAY PAGE 0
0  0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

0                                                    0

0                                                    0

0                                                    0

0                                                    0

0                                                    0

0                                                    0

0                                                    0

0                                                    0

0                                                    0

0                                                    0

0                                                    0

0                                                    0

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

Subtest 09   "H" pattern display

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

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

<fig id=MMS\5200\52003_17.TIF>Page 3-17</fig>

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.

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.8, FLOPPY DISK TEST
DOC_ID:3.8 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_17.TIF>Page 3-17</fig>

3.8 FLOPPY DISK TEST

ÉÍÍÍ»
ºCAUTION: Before running the floppy disk test, prepare a formatted workº
ºdisk and remove the diagnostics disk. Then insert the work disk into º
ºthe FDD. Because the contents of the floppy disk will be erased. º
ÈÍÍÍ¼

OPERATION

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

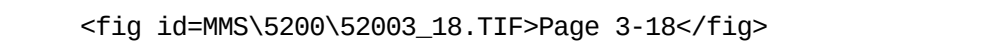
   Test drive number select (1:FDD1,2:FDD2,0:FDD1&2) ?

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

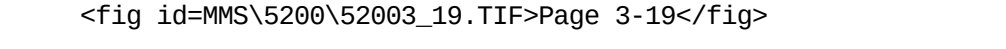
This subtest performs the CRC (cyclic redundancy check) with a continuous read operation of all tracks on a floppy disk.
2D (Double-sided, double-density): Track 0 to 39. 2DD (Double-sided, double-density, double-track) and 2HD (Double-sided, high-density, double-track): Track 0 to 79.
The start track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

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.9, PRINTER TEST
DOC_ID:3.9 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_19.TIF>Page 3-19</fig>

3.9 PRINTER TEST

ÉÍÍÍ»
ºCAUTION: A printer (IBM compatible) must be connected to the system inº
ºorder to execute the test. Confirm that the A-B-PRT switch is set to º
ºPRT position. º

ÈÍÍÍ¼

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.

RIPPLE PATTERN DIAGRAM

<fig id=MMS\5200\52003_19.TIF>Figure</fig>

<fig id=MMS\5200\52003_20.TIF>Page 3-20</fig>

Subtest 02   Function

This subtest prints out various print type as shown below.

PRINTER TEST DISPLAY

<fig id=MMS\5200\52003_20.TIF>Figure</fig>

Subtest 03   Wraparound

ÚÄÄ¿
³NOTE: A printer wraparound connector is necessary for   ³
³executing this test. Wiring diagram of the printer   ³
³wraparound connector is described in section 3.25.   ³
³The data, control, and status lines will be checked   with³
³the printer wraparound connector.   ³
ÀÄÄÙ

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.

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.10, ASYNC TEST
DOC_ID:3.10 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_20.TIF>Page 3-20</fig>

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

<fig id=MMS\5200\52003_21.TIF>Page 3-21</fig>

Subtest 01   Wraparound (channel 1)

ÚÄÄ¿
³ NOTE: The RS-232-C wraparound connector must be connected to   ³
³ SERIAL A CONNECTOR to execute this test. The wiring diagram of   ³
³ the RS-232-C wraparound connector is described in section 3.25. ³
ÀÄÄÙ

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

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

ÚÄÄÄ¿
³ NOTE: The RS-232-C direct cable (9-pin to 9-pin must be connected ³
³ to channel 1 and 2 to execute this test. The wiring diagram of ³
³ the RS-232-C direct cable is described in section 3.25. ³
ÀÄÄÄÙ

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

Subtest 03 Point to point (send)

ÚÄÄÄ¿
³ NOTE: This subtest must be executed in condition that two ³
³ machines are connected with the RS-232-C direct cable and ³
³ one side should be set as `send' and the other set as ³
³ `receive'. The wiring diagram of the RS-232-C direct ³
³ cable is described in section 3.25. The subtest 03 ³
³ executed in one side and the subtest 04 executed in the ³
³ other will check the communication capability as follows: ³
ÀÄÄÄÙ

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.

<fig id=MMS\5200\52003_22.TIF>Page 3-22</fig>

Subtest 05 Card modem loopback

ÚÄÄÄ¿
³ NOTE: If there is no modem card in the system, this test ³
³ cannot be executed. ³
ÀÄÄÄÙ

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

ÚÄÄÄ¿
³ NOTE: This test requires two machines which are connected ³
³ to the PBX (Private Branch Exchange). One side is set as ³
³ `send' and the other set as `receive'. When both sides ³
³ are ready, you can start the test. ³
ÀÄÄÄÙ

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

ÚÄÄ¿
³ NOTE: To execute this subtest, a dial tester must be   ³
³ connected to the system.   ³
ÀÄÄÙ

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.

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.11, HARD DISK TEST
DOC_ID:3.11 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_23.TIF>Page 3-23</fig>

3.11 HARD DISK TEST

ÉÍÍ»
ºCAUTION: The contents of the hard disk will be erased when   subtestº
º02, 03, 04, 06, 08 or 09 is run. Before running the test,   transferº
ºthe contents of the hard disk on the floppy disk. This can be   doneº
ºwith the MS-DOS BACKUP command. After the test, enter the MS-DOS º
ºFDISK command, which will set the partition. Then enter the MS-DOSº
ºFORMAT command. (See the MS-DOS manual for details.)   º
ÈÍÍ¼

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.

<fig id=MMS\5200\52003_24.TIF>Page 3-24</fig>

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.

<fig id=MMS\5200\52003_25.TIF>Page 3-25</fig>

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.

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.12, REAL TIMER TEST
DOC_ID:3.12 T5200

LANG:ALL
TEXT:

3.12 REAL TIMER TEST

Subtest 01 Real time

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

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

   REAL TIME TEST 901000

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

   Enter new date:

   PRESS [ENTER) KEY TO EXIT TEST

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

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

Subtest 02 Backup memory

This subtest writes data (01H, 02H, 04H,..., 80H, 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

³ 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).

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.13, NDP TEST
DOC_ID:3.13 T5200
LANG:ALL

TEXT:

<fig id=MMS\5200\52003_27.TIF>Page 3-27</fig>

3.13 NDP TEST

ÚÄÄ¿
³ CAUTION: This test cannot be run if there is no NDP mounted on ³
³ the system BOARD. ³
ÀÄÄÙ

Subtest 01 NDP test

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

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.14, EXPANSION UNIT TEST
DOC_ID:3.14 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_27.TIF>Page 3-27</fig>

3.14 EXPANSION UNIT TEST

ÚÄÄ¿
³ NOTE: If there is no expansion unit connected to the system, this³
³ test cannot be executed. ³
ÀÄÄÙ

Subtest 01 Box wraparound (8 bits bus)

ÚÄÄ¿
³ NOTE: As this subtest required a special tool to be ³
³ executed, it cannot be carried out here. ³
ÀÄÄÙ

Subtest 02 Box mono video RAM

ÚÄÄ¿
³ NOTE: If there is no monochrome display card in the ³
³ expansion unit, this test cannot be executed. ³
ÀÄÄÙ

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)

ÚÄÄ¿
³ NOTE: As this subtest requires a special tool to be ³
³ executed, it cannot be carried out here. ³
ÀÄÄÙ

Subtest 04   Wraparound test (16 bit bus)

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

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.15, ERROR CODE AND ERROR STATUS NAMES
DOC_ID:3.15 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_28.TIF>Page 3-28</fig>

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	

<fig id=MMS\5200\52003_29.TIF>Page 3-29</fig>

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

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.16, HARD DISK TEST DETAIL STATUS
DOC_ID:3.16 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_30.TIF>Page 3-30</fig>

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.

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.17, HARD DISK FORMAT
DOC_ID:3.17 T5200
LANG:ALL
TEXT:

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.)

<fig id=MMS\5200\52003_32.TIF>Page 3-32</fig>

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.)

<fig id=MMS\5200\52003_33.TIF>Page 3-33</fig>

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]: READ = 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.

<fig id=MMS\5200\52003_34.TIF>Page 3-34</fig>

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]: READ   = X
[HDD TYPE]: SECTOR   = XX

Press [track number (CCCR)] 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.

ÚÄÄ¿
³ NOTE: This program can format only one track per operation. ³
³ If it is desired to format several good tracks or bad   ³
³ tracks, repeat the operation as many times as necessary.   ³
ÀÄÄÙ

(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) ?

<fig id=MMS\5200\52003_35.TIF>Page 3-35</fig>

(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]: READ   = 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.

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.18, SEEK TO LANDING ZONE (HDD)
DOC_ID:3.18 T5200
LANG:ALL

TEXT:

<fig id=MMS\5200\52003_35.TIF>Page 3-35</fig>

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."

ÚÄÄ¿
³ NOTE: The built-in hard disk drive controls automatically the ³
³ heads to move to the landing zone at power down. ³
ÀÄÄÙ

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.

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.19, HEAD CLEANING
DOC_ID:3.19 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_36.TIF>Page 3-36</fig>

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.

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.20, LOG UTILITIES
DOC_ID:3.20 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_36.TIF>Page 3-36</fig>

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

<fig id=MMS\5200\52003_37.TIF>Page 3-37</fig>

3.20.2 Operations

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

XXXXX ERRORS

CNT	TS-NAME	PASS	STS	ADDR	WD	RD	HSTS [ERROR STATUS NAME]
001	FDD 02	0000	103	00001	00	00	FDD - WRITE PROTECTED
001	FDD 01	0000	180	00001	00	00	FDD - TIME OUT ERROR

Address

Read data

```
     ³      ³   ³     ³     Error status  ³                      ³
     ³      ³   ³     Pass count         Write data           ³
     ³      ³   ³                                        Error status
name
     ³      ³   Subtest number
     ³     Test name
     Error count
```

[[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.

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.21, RUNNING TEST
DOC_ID:3.21 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_38.TIF>Page 3-38</fig>

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

```
ÚÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¿
³ CAUTION: Do not forget to load a work disk. If a work disk is    not³
³ loaded, an error will be generated during FDD testing.            ³
ÀÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÙ
```

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.

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.22, FDD UTILITIES
DOC_ID:3.22 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_39.TIF>Page 3-39</fig>

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

```
ÚÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄ¿
³ CAUTION: The program is for only floppy disk drive test. The     ³
³ program is different from the MS-DOS FORMAT command.              ³
ÀÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÄÙ
```

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

        <fig id=MMS\5200\52003_40.TIF>Page 3-40</fig>

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.

<fig id=MMS\5200\52003_41.TIF>Page 3-41</fig>

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-2RD, 3:2RD-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]: READ   = 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,2:2RD,3:HDD) ?
```

<fig id=MMS\5200\52003_42.TIF>Page 3-42</fig>

(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.

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.23, SYSTEM CONFIGURATION
DOC_ID:3.23 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_43.TIF>Page 3-43</fig>

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.

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.24, SETUP
DOC_ID:3.24 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_44.TIF>Page 3-44</fig>

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
     1 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.

<fig id=MMS\5200\52003_45.TIF>Page 3-45</fig>

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.

<fig id=MMS\5200\52003_46.TIF>Page 3-46</fig>

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:

<fig id=MMS\5200\52003_47.TIF>Page 3-47</fig>

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:

<fig id=MMS\5200\52003_48.TIF>Page 3-48</fig>

Extended/Expanded Memory Size Table

Base System Size Extended memory		Resulting Expanded Memory Size without expansion kit	Resulting Expanded Memory Size with expansion kit
Values			
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.

<fig id=MMS\5200\52003_49.TIF>Page 3-49</fig>

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.

<fig id=MMS\5200\52003_50.TIF>Page 3-50</fig>

-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.

<fig id=MMS\5200\52003_51.TIF>Page 3-51</fig>

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

<fig id=MMS\5200\52003_52.TIF>Page 3-52</fig>

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

<fig id=MMS\5200\52003_53.TIF>Page 3-53</fig>

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.

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:3 TESTS AND DIAGNOSTICS
SECT:3.25, WIRING DIAGRAM
DOC_ID:3.25 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52003_54.TIF>Page 3-54</fig>

3.25 WIRING DIAGRAM

1. Printer wraparound connector

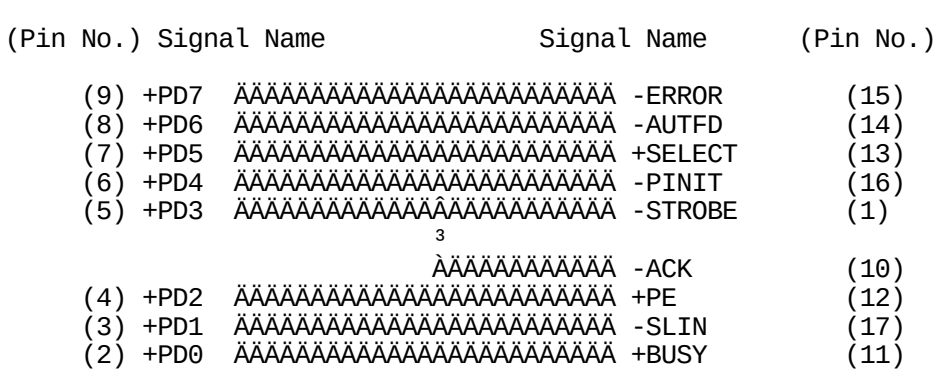


Figure 3-1 Printer wraparound connector

2. RS232C wraparound connector

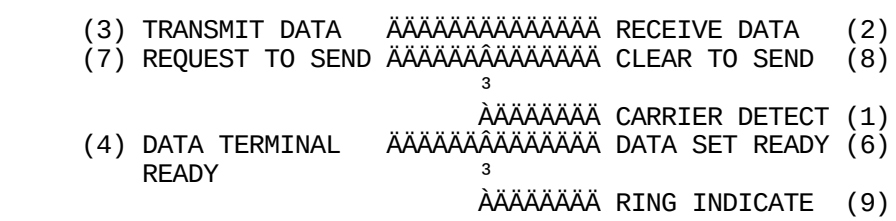


Figure 3-2 RS232C wraparound connector

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

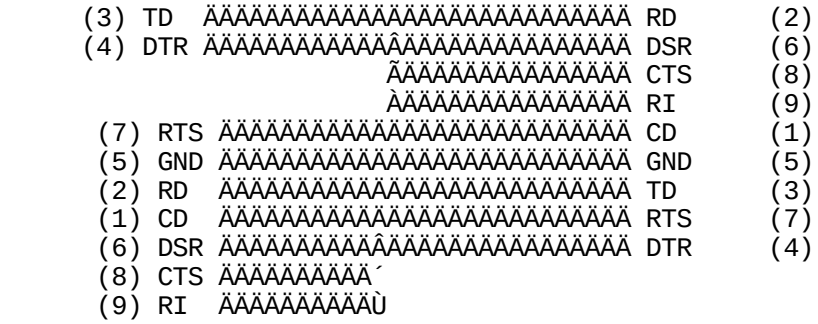


Figure 3-3 RS232C direct cable (9-pin to 9-pin)

<fig id=MMS\5200\52003_55.TIF>Page 3-55</fig>

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

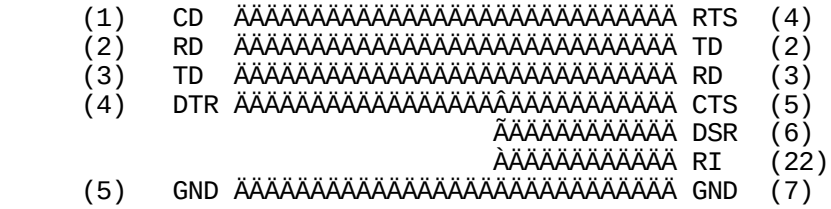


Figure 3-4 RS232C direct cable (9-pin to 25-pin)

<fig id=MMS\5200\52003_56.TIF>Page 3-56</fig>

File No.: 960-011

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:4 REPLACEMENT PROCEDURES
SECT:4.1, GENERAL
DOC_ID:4.1 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52004_1.TIF>Page 4-1</fig>

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

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:4 REPLACEMENT PROCEDURES
SECT:4.2, REMOVING/REPLACING THE KEYBOARD AND THE SPEAKER
DOC_ID:4.2 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52004_2.TIF>Page 4-2</fig>

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.

<fig id=MMS\5200\52004_2.TIF>Figure 4-1</fig> 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.

<fig id=MMS\5200\52004_2.TIF>Figure 4-2</fig> Removing the keyboard unit

<fig id=MMS\5200\52004_3.TIF>Page 4-3</fig>

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)

<fig id=MMS\5200\52004_3.TIF>Figure 4-3</fig> 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).

<fig id=MMS\5200\52004_3.TIF>Figure 4-4</fig> Removing the keyboard

<fig id=MMS\5200\52004_4.TIF>Page 4-4</fig>

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)

<fig id=MMS\5200\52004_4.TIF>Figure 4-5</fig> Removing the speaker

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

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:4 REPLACEMENT PROCEDURES
SECT:4.3, REMOVING/REPLACING THE TOP COVER
DOC_ID:4.3 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52004_5.TIF>Page 4-5</fig>

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.

<fig id=MMS\5200\52004_5.TIF>Figure 4-6</fig> 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).

<fig id=MMS\5200\52004_5.TIF>Figure 4-7</fig> Removing the converter mask panel and the screw

<fig id=MMS\5200\52004_6.TIF>Page 4-6</fig>

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

<fig id=MMS\5200\52004_6.TIF>Figure 4-8</fig> unlocking the release levers

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

<fig id=MMS\5200\52004_6.TIF>Figure 4-9</fig> Removing the display

<fig id=MMS\5200\52004_7.TIF>Page 4-7</fig>

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

<fig id=MMS\5200\52004_7.TIF>Figure 4-10</fig> Removing the three screws

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

<fig id=MMS\5200\52004_7.TIF>Figure 4-11</fig> Removing the rear panel

<fig id=MMS\5200\52004_8.TIF>Page 4-8</fig>

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.

<fig id=MMS\5200\52004_8.TIF>Figure 4-12</fig> Removing the mask panel and the rear support

9. Remove the top cover (P)

<fig id=MMS\5200\52004_8.TIF>Figure 4-13</fig> Removing the top cover

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

ÚÄÄÄ¿
³NOTE: Confirm that the rear support is set into the top cover ³
³and the bottom cover with L-shaped latches, and confirm that the³
³rear panel is locked into the bottom cover with latches too. ³
³
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~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:4 REPLACEMENT PROCEDURES
SECT:4.4, REMOVING/REPLACING THE FAN, THE LED BOARD AND THE BATTERY
DOC_ID:4.4 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52004_9.TIF>Page 4-9</fig>

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').

<fig id=MMS\5200\52004_9.TIF>Figure 4-14</fig> Removing the fan and LED case of right side

<fig id=MMS\5200\52004_9.TIF>Figure 4-15</fig> Removing the fan and LED case of left side

<fig id=MMS\5200\52004_10.TIF>Page 4-10</fig>

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

<fig id=MMS\5200\52004_10.TIF>Figure 4-16</fig> 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)

<fig id=MMS\5200\52004_10.TIF>Figure 4-17</fig> Removing the battery

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

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:4 REPLACEMENT PROCEDURES
SECT:4.5, REMOVING/REPLACING THE DISK SUPPORT
DOC_ID:4.5 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52004_11.TIF>Page 4-11</fig>

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).

<fig id=MMS\5200\52004_11.TIF>Figure 4-18</fig> 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.

<fig id=MMS\5200\52004_11.TIF>Figure 4-19</fig> Removing the disk support

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

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200/100
MODEL:T5200/200
MODEL:T5200C
CHAP:4 REPLACEMENT PROCEDURES
SECT:4.6, REMOVING/REPLACING THE HDD
DOC_ID:4.6 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52004_12.TIF>Page 4-12</fig>

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.

<fig id=MMS\5200\52004_12.TIF>Figure 4-20</fig> Removing the HDD

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

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:4 REPLACEMENT PROCEDURES
SECT:4.7, REMOVING/REPLACING THE FDD
DOC_ID:4.7 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52004_13.TIF>Page 4-13</fig>

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.

<fig id=MMS\5200\52004_13.TIF>Figure 4-21</fig> Removing the FDD

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

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:4 REPLACEMENT PROCEDURES
SECT:4.8, REMOVING/REPLACING THE DISPLAY CONNECTOR AND THE PLASMA SENSOR
DOC_ID:4.8 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52004_14.TIF>Page 4-14</fig>

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.

<fig id=MMS\5200\52004_14.TIF>Figure 4-22</fig> Removing the display connector and the sensor guide

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

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:4 REPLACEMENT PROCEDURES
SECT:4.9, REMOVING/REPLACING THE POWER SUPPLY
DOC_ID:4.9 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52004_15.TIF>Page 4-15</fig>

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.

<fig id=MMS\5200\52004_15.TIF>Figure 4-23</fig> Removing the power supply

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

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:4 REPLACEMENT PROCEDURES
SECT:4.10, REMOVING/REPLACING THE CONNECTOR BOARD UNIT
DOC_ID:4.10 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52004_16.TIF>Page 4-16</fig>

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.

<fig id=MMS\5200\52004_16.TIF>Figure 4-24</fig> Removing the connector board unit

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

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³NOTE: Set the lower side board of the Connector board unit   ³
³properly on the right and left rail, then install the Connector ³

³board unit. ³
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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:4 REPLACEMENT PROCEDURES
SECT:4.11, REMOVING/REPLACING THE MEMORY BOARD
DOC_ID:4.11 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52004_17.TIF>Page 4-17</fig>

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.

<fig id=MMS\5200\52004_17.TIF>Figure 4-25</fig> Removing the memory board

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

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:4 REPLACEMENT PROCEDURES
SECT:4.12, REMOVING/REPLACING THE EXPANSION CONNECTOR BOARD
DOC_ID:4.12 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52004_18.TIF>Page 4-18</fig>

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.

<fig id=MMS\5200\52004_18.TIF>Figure 4-26</fig> Removing the expansion connector board

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

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:4 REPLACEMENT PROCEDURES
SECT:4.13, REMOVING/REPLACING THE SYSTEM BOARD
DOC_ID:4.13 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52004_19.TIF>Page 4-19</fig>

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.

<fig id=MMS\5200\52004_19.TIF>Figure 4-27</fig> 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.

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:4 REPLACEMENT PROCEDURES
SECT:4.14, REMOVING/REPLACING THE PDP UNIT
DOC_ID:4.14 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52004_20.TIF>Page 4-20</fig>

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)

<fig id=MMS\5200\52004_20.TIF>Figure 4-28</fig> Removing the PDP unit

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

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:4 REPLACEMENT PROCEDURES
SECT:4.15, REMOVING/REPLACING THE CONVERTER BOARD, THE VOLUME BOARD AND THE
DOC_ID:4.15 T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\52004_21.TIF>Page 4-21</fig>

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)

<fig id=MMS\5200\52004_21.TIF>Figure 4-29</fig> Removing the converter unit

<fig id=MMS\5200\52004_22.TIF>Page 4-22</fig>

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

<fig id=MMS\5200\52004_22.TIF>Figure 4-30</fig> 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).

<fig id=MMS\5200\52004_22.TIF>Figure 4-31</fig> Removing the converter cover

<fig id=MMS\5200\52004_23.TIF>Page 4-23</fig>

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

<fig id=MMS\5200\52004_23.TIF>Figure 4-32</fig> 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.

<fig id=MMS\5200\52004_23.TIF>Figure 4-33</fig> 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.

<fig id=MMS\5200\52004_24.TIF>Page 4-24</fig>

File No. : 960-011

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:APPENDIX A BOARD LAYOUT
SECT:
DOC_ID:A T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\5200A_1.TIF>Page A-1</fig>

APPENDIX A BOARD LAYOUT

1. SYSTEM BOARD (ICs)

<fig id=MMS\5200\5200A_1.TIF>Figure A-1</fig> System board (ICs)

<fig id=MMS\5200\5200A_2.TIF>Page A-2</fig>

 (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)

<fig id=MMS\5200\5200A_3.TIF>Page A-3</fig>

2. SYSTEM BOARD (CONNECTORS)

<fig id=MMS\5200\5200A_3.TIF>Figure A-2</fig> System board (connectors)

<fig id=MMS\5200\5200A_4.TIF>Page A-4</fig>

 (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

<fig id=MMS\5200\5200A_5.TIF>Page A-5</fig>

3. MEMORY BOARD

<fig id=MMS\5200\5200A_5.TIF>Figure A-3</fig> Memory board

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

<fig id=MMS\5200\5200A_6.TIF>Page A-6</fig>

4. I/O BOARD

<fig id=MMS\5200\5200A_6.TIF>Figure A-4</fig> I/O board

(1) SI: Super integration (JC810)
(2) SIO: Serial input/output controller (TC8570P)
(3) GA-PDC: Plasma display controller gate array
(4) PJI: 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

<fig id=MMS\5200\5200A_7.TIF>Page A-7</fig>

5. HRGS BOARD

<fig id=MMS\5200\5200A_7.TIF>Figure A-5</fig> 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

<fig id=MMS\5200\5200A_8.TIF>Page A-8</fig>

6. BACK PANEL BOARD

<fig id=MMS\5200\5200A_8.TIF>Figure A-6</fig> Back panel board

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

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:APPENDIX B PIN ASSIGNMENT
SECT:B.1 SYSTEM BOARD SECTION 1 of 2
DOC_ID:B T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\5200B_1.TIF>Page B-1</fig>

APPENDIX B PIN ASSIGNMENT 1. SYSTEM BOARD SECTION 1 of 2

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	KBRTNO:000	I
2	KBSC0:010	O	16	KBRTN1:000	I
3	KBSC1:010	O	17	KBRTN2:000	I
4	KBSC2:010	O	1	KBRTN :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	RAS5:010	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	CAS3ù100	O		

67	VCC			68	GND		

1.3 PJ3 Lithium battery connector (3-pin)

Table 3-3 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

<fig id=MMS\5200\5200B_3.TIF>Page B-3</fig>

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	

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:APPENDIX B PIN ASSIGNMENT
SECT:B.1 SYSTEM BOARD SECTION 2 of 2
DOC_ID:B T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\5200B_4.TIF>Page B-4</fig>

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		39	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				

<fig id=MMS\5200\5200B_5.TIF>Page B-5</fig>

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	SD2:10	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		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	

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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	5D11:100	I/O	27	SBHF:000	I/O
8	5D12:100	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	DRQ: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	ND	
5	VCC		18	WGATE:000	O
6	DSKCHG:000	I	19	GND	
7	VCC		20	TRACK0:000	I
8	READY:000	I	21	ND	
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

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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	1PQ3:100	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	A17:100	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	IQR: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	5	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

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³15  ³ TRAKC0:000³ O    ³ 16  ³ WPPOTC:000 ³ O    ³
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³17  ³ RDDA:000  ³ O    ³ 18  ³ FSELSW:000 ³ O    ³
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³19  ³ HSD7:000  ³ I    ³ 20  ³ CK16M:100  ³ O    ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³21  ³ SAO:110   ³ O    ³ 22  ³ SA1:110    ³ O    ³
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³23  ³ SA2:110   ³ O    ³ 24  ³ SA3:110    ³ O    ³
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³25  ³ SA4:110   ³ O    ³ 26  ³ SA5:110    ³ O    ³
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³27  ³ SA6:110   ³      ³ 28  ³ SA7:110    ³ O    ³
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³29  ³ SA8:100   ³ O    ³ 30  ³ SA9:100    ³ O    ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³31  ³ VCC       ³      ³32   ³ SA11:100   ³ O    ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³33  ³ SA11:100  ³ O    ³ 34  ³ SA12:100   ³ O    ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³35  ³ GND       ³      ³36   ³ SA13:100   ³ O    ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³37  ³ 5A14:100  ³ O    ³ 38  ³ SA15:100   ³ O    ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³39  ³ SA16:100  ³ O    ³ 40  ³ SA17:100   ³ O    ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³41  ³ SA18:100  ³ O    ³ 42  ³ SA19:100   ³ O    ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³43  ³ LA17:100  ³ O    ³ 44  ³ LA18:100   ³ O    ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³45  ³ LA19:100  ³ O    ³ 46  ³ LA20:100   ³ O    ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³47  ³ LA21:100  ³ O    ³ 48  ³ LA22:100   ³ O    ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³49  ³ LA23:100  ³ O    ³ 50  ³ SD0:100    ³ I/O  ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³51  ³ SD1:100   ³ I/O  ³ 52  ³ GND        ³      ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³53  ³ SD2:100   ³ I/O  ³ 54  ³ SD3:100    ³ I/O  ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³55  ³ SD4:100   ³ I/O  ³ 56  ³ SD5:100    ³ I/O  ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³57  ³ SD6:100   ³ I/O  ³ 58  ³ SD7:100    ³ I/O  ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³59  ³ SD8:100   ³ I/O  ³ 60  ³ VCC        ³      ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³61  ³ SD9:100   ³ I/O  ³ 62  ³ 5D10:100   ³ I/O  ³
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³63  ³ SD11:100  ³ I/O  ³ 64  ³ SD12:100   ³ I/O  ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³65  ³ 5D13:100  ³ I/O  ³ 66  ³ 5D14:100   ³ I/O  ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³67  ³ SD15:100  ³ I/O  ³ 68  ³ PUCLR:000  ³ O    ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³69  ³ GND       ³      ³ 70  ³ IOCHR:000  ³ I    ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³71  ³ IORDY:100 ³ I    ³ 72  ³ IRQ3:100   ³ I    ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
³73  ³ IRQ4:100  ³ I    ³ 74  ³ IRQ5:100   ³ I    ³
ÃÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄÄÄÄÄÅÄÄÄÄÄÄÄÄ´
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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		

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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	6	TIRQ4:100	O
97	BIPRT:100	O	98	CCM3CS:000	0
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	PDI: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	

1.16P J16 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

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:APPENDIX B PIN ASSIGNMENT
SECT:B.2 MEMORY BOARD
DOC_ID:B T5200
LANG:ALL
TEXT:

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APPENDIX B PIN ASSIGNMENT

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	MD17:10	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	MD28:10	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	RAS1:1 0	I	52	RA 2 10	I
53	RAS3:100	I	54	RA 4:010	I
55	RAS5:100	I	56	RAS6:010	I
57	RAS7:100	I	58	WE:10	I
59	MPD0:100	I/O	60	MPDI:100	I/O
61	MPD2:100	I/O	62	MPD :10	I/O
63	CAS0:100	I	64	A 1:100	I
65	CAS2:100	I	66	CAS3:100	I
67	VCC		68	GND	

2.2 1S17A Memory module connector 1A (40-pin)

Table B-18 Memory module connector 1A pin assignment

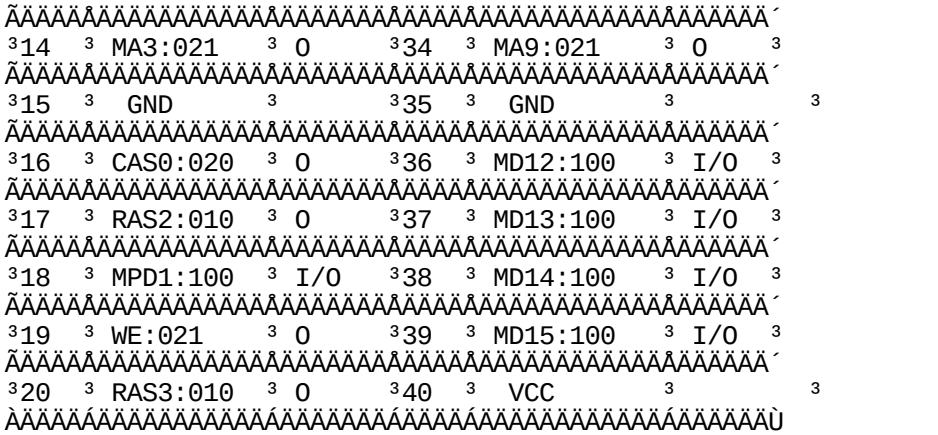
Pin	Signal	I/O	Pin	Signal	I/O
1	VCC		21	CAS3:020	O
2	MD16:100	I/O	22	MPD2:100	I/O
3	MD17:100	I/O	23	GND	
4	MD18:100	I/O	24	MA4:020	O
5	MD19:100	I/O	25	MA5:020	O
6	MA0:020	O	26	MD24:100	I/O
7	MA1:020	O	27	MD25:100	I/O

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	MD 0:100	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	MPDO: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: 21			
13	MA2:021		33	MA8:021	O		



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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	MD38:1 0	I/O
17	RAS4:010	O	37	MD29:100	I/O
18	MPD3:100	I/O	38	MD30:1 0	I/O

19	WE:020	O	39	MD31:100	I/O		
20	RAS5:010	O	40	V			

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	CAS1:21			
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	ND			
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		MD15:100	I/O		
20	RAS5:010	O	40	VCC			

<fig id=MMS\5200\5200B_13.TIF>Page B-13</fig>

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	2	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	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	CASO0:020	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						

<fig id=MMS\5200\5200B_14.TIF>Page B-14</fig>

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		

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:APPENDIX B PIN ASSIGNMENT
SECT:B.3 I/O BOARD
DOC_ID:B T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\5200B_15.TIF>Page B-15</fig>

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	ND		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	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	SD3:100	I/O
57	SD6:100	I	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

Pin	Signal	I/O	Pin	Signal	I/O
85	DRQ2:100	O	86	GND	
87	SYSCLK;100	I	88	N/C	
89	COVER:100	I	90	IRQ9:100	O

<fig id=MMS\5200\5200B_16.TIF>Page B-16</fig>

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

Pin	Signal	I/O	Pin	Signal	I/O
91	SBHE:100	I	92	FMEM16:000	O
93	SWFDA:100	O	94	OMCLK: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	

<fig id=MMS\5200\5200B_17.TIF>Page B-17</fig>

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	CND			
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		

<fig id=MMS\5200\5200B_18.TIF>Page B-18</fig>

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		XRATEO;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				

<fig id=MMS\5200\5200B_19.TIF>Page B-19</fig>

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						

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MODEL:T5200C
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SECT:B.4 HRGS BOARD
DOC_ID:B T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\5200B_20.TIF>Page B-20</fig>

APPENDIX B PIN ASSIGNMENT

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

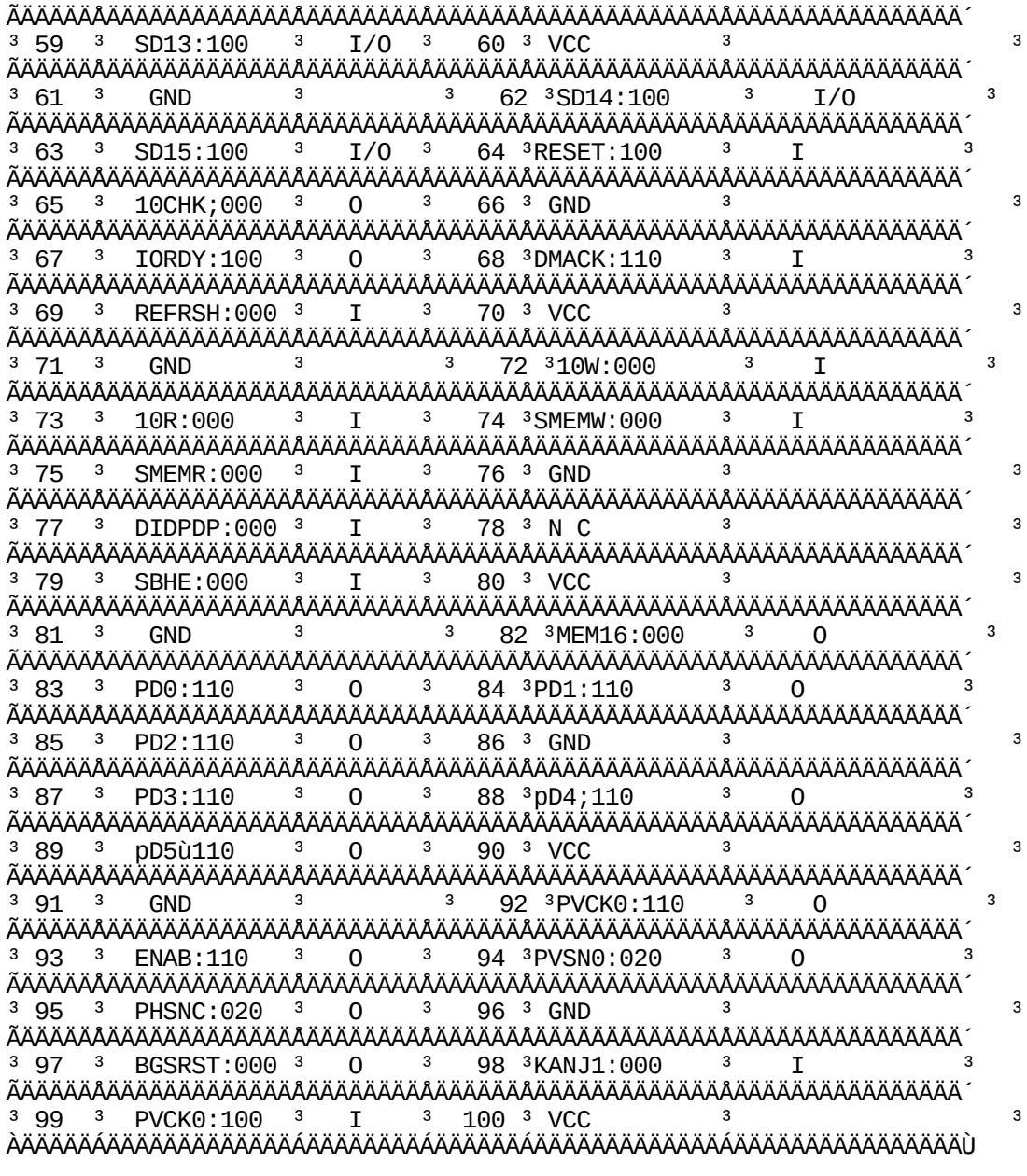
Pin	Signal	I/O	Pin	Signal	I/O
1	GND		2	M12V	
3	SA0:100	I	4	SA1:100	I
5	SA2:100	I	6	GND	

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			

<fig id=MMS\5200\5200B_21.TIF>Page B-21</fig>

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		



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MODEL:T5200C
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SECT:B.5 BACKPANEL BOARD
DOC_ID:B T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\5200B_22.TIF>Page B-22</fig>

APPENDIX B PIN ASSIGNMENT

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	MSV		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					

<fig id=MMS\5200\5200B_24.TIF>Page B-24</fig>

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		

<fig id=MMS\5200\5200B_25.TIF>Page B-25</fig>

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	10CHK;000	I	104	GND	

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:APPENDIX B PIN ASSIGNMENT
SECT:B.6 SENSOR BOARD
DOC_ID:B T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\5200B_26.TIF>Page B-26</fig>

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			

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:APPENDIX B PIN ASSIGNMENT
SECT:B.7 LED BOARD (RIGHT)
DOC_ID:B T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\5200B_26.TIF>Page B-26</fig>

APPENDIX B PIN ASSIGNMENT

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			LEDNUM;010	O
2	LEDCAP;010	O	4	LEDSCR;010	O

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:APPENDIX B PIN ASSIGNMENT
SECT:B.8 LED BOARD (LEFT)
DOC_ID:B T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\5200B_26.TIF>Page B-26</fig>

APPENDIX B PIN ASSIGNMENT

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	

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C

CHAP:APPENDIX C DISPLAY CODE
SECT:
DOC_ID:C T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\5200C_1.TIF>Page C-1</fig>

APPENDIX C DISPLAY CODE

<fig id=MMS\5200\5200C_1.TIF>Table C-1</fig> Display Code

<fig id=MMS\5200\5200C_2.TIF>Page C-2</fig>

File No : 960-011

~~
DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:APPENDIX D KEYBOARD SCAN/CHARACTER CODE
SECT:
DOC_ID:D T5200
LANG:ALL
TEXT:

<fig id=MMS\5200\5200D_1.TIF>Page D-1</fig>

APPENDIX D KEYBOARD SCAN/CHARACTER CODE

Table D-1 Keyboard scan/character code

KEY No.	KEY Top	Base	Upper	Caps Lock	Ctrl	Alt
1	ESC	011B	011B	011B	011B	---
2	1	"	"	"	"	0100
3	!	0231	0221	0231	0221	----
	1	"	"	"	"	----
4	@	0332	0340	0332	0340	0300
	2	"	"	"	"	"
5	#	0433	0423	0433	0423	----
	3	"	"	"	"	----
6	$	0534	0524	0534	0524	----
	4	"	"	"	"	----
7	%	0635	0625	0635	0625	----
	5	"	"	"	"	----
8	^	0736	075E	0736	075E	071E

KEY No.	KEY Top	Base	Upper	Caps Lock	Ctrl	Alt
		"	"	"	"	"
9	&	0837	0826	0837	0826	----
	6	"	"	"	"	----
10	*	0938	092A	0938	092A	----
	7	"	"	"	"	----
11	(	0A39	0A28	0A39	0A28	----
	8	"	"	"	"	----
12	)	0B30	0B29	0B30	0B29	----
	9	"	"	"	"	----
13	_	0C2D	0C5F	0C2D	0C5F	----
	-	"	"	"	"	----
14	+	0D3D	0D2B	0D3D	0D2B	----
	=	"	"	"	"	----
15	BS	0E08	0E08	0E08	0E08	----
		"	"	"	"	----
16	TAB	0F09	0F00	0F09	0F00	----
		"	"	"	"	----
17	Q	1071	1051	1071	1051	1011
		"	"	"	"	"
18	W	1177	1157	1177	1157	1111
		"	"	"	"	"
19	E	1265	1245	1265	1245	1211
		"	"	"	"	"
20	R	1372	1352	1372	1352	1311
		"	"	"	"	"
21	T	1474	1454	1474	1454	1411
		"	"	"	"	"
22	Y	1579	1559	1579	1559	1511
		"	"	"	"	"
23	U	1675	1655	1675	1655	1611
		"	"	"	"	"
24	I	1769	1749	1769	1749	1711
		"	"	"	"	"
25	O	186F	184F	186F	184F	1811
		"	"	"	"	"
26	P	1970	1950	1970	1950	1911
		"	"	"	"	"
27	{	1A5B	1A7B	1A5B	1A7B	----
	[	"	"	"	"	----
28	}	1B5D	1B7D	1B5D	1B7D	----
	]	"	"	"	"	----
29	CR	1C0D	1C0D	1C0D	1C0D	----
		"	"	"	"	----
30	CAPS	3A00	3A00	3A00	3A00	----
		"	"	"	"	----
31	A	1E61	1E41	1E61	1E41	1E11
		"	"	"	"	"
32	S	1F73	1F53	1F73	1F53	1F11
		"	"	"	"	"
33	D	2064	2044	2064	2044	2011
		"	"	"	"	"
34	F	2166	2146	2166	2146	2111
		"	"	"	"	"
35	G	2267	2247	2267	2247	2211
		"	"	"	"	"
36	H	2368	2348	2368	2348	2311
		"	"	"	"	"
37	J	246A	244A	246A	244A	2411
		"	"	"	"	"
38	K	256B	254B	256B	254B	2511
		"	"	"	"	"
39	L	266C	264C	266C	264C	2611
		"	"	"	"	"
40	;	273B	273A	273B	273A	----
	;	"	"	"	"	----
41	"	2827	2822	2827	2822	----
	'	"	"	"	"	----
42	~	2960	297E	2960	297E	----
	`	"	"	"	"	----
43	SHIFT	2A00	2A00	2A00	2A00	----
		"	"	"	"	----
44	|	2B5C	2B7C	2B5C	2B7C	----
	\	"	"	"	"	----
45	Z	2C7A	2C5A	2C7A	2C5A	2C11
		"	"	"	"	"
46	X	2D78	2D58	2D78	2D58	2D11
		"	"	"	"	"
47	C	2E63	2E43	2E63	2E43	2E11
		"	"	"	"	"
48	V	2F76	2F56	2F76	2F56	2F11
		"	"	"	"	"
49	B	3062	3042	3062	3042	3011
		"	"	"	"	"
50	N	316E	314E	316E	314E	3111
		"	"	"	"	"
51	M	326D	324D	326D	324D	3211
		"	"	"	"	"
52	<	332C	333C	332C	333C	----
	,	"	"	"	"	----
53	>	342E	343E	342E	343E	----
	.	"	"	"	"	----
54	?	352F	353F	352F	353F	----
	/	"	"	"	"	----
55	SHIFT	3600	3600	3600	3600	----
		"	"	"	"	----
56	PRTSC	372A	372A	372A	372A	----
	*	"	"	"	"	----
57	ALT	3800	3800	3800	3800	----
		"	"	"	"	----
58	SPACE	3920	3920	3920	3920	----
		"	"	"	"	----
59	CAPS	3A00	3A00	3A00	3A00	----
		"	"	"	"	----
60	F1	3B00	5400	5E00	5E00	6800
		"	"	"	"	"
61	F2	3C00	5500	5F00	5F00	6900
		"	"	"	"	"
62	F3	3D00	5600	6000	6000	6A00
		"	"	"	"	"
63	F4	3E00	5700	6100	6100	6B00
		"	"	"	"	"
64	F5	3F00	5800	6200	6200	6C00
		"	"	"	"	"
65	F6	4000	5900	6300	6300	6D00
		"	"	"	"	"
66	F7	4100	5A00	6400	6400	6E00
		"	"	"	"	"
67	F8	4200	5B00	6500	6500	6F00
		"	"	"	"	"
68	F9	4300	5C00	6600	6600	7000
		"	"	"	"	"
69	F10	4400	5D00	6700	6700	7100
		"	"	"	"	"
70	NUM	4500	4500	4500	4500	----
		"	"	"	"	----
71	SCROLL	4600	4600	4600	4600	----
		"	"	"	"	----
72	HOME	4700	4737	4737	7700	----
	7	"	"	"	"	----
73	↑	4800	4838	4838	8D00	----
	8	"	"	"	"	----
74	PGUP	4900	4939	4939	8400	----
	9	"	"	"	"	----
75	-	4A2D	4A2D	4A2D	4A2D	----
	-	"	"	"	"	----
76	←	4B00	4B34	4B34	7300	----
	4	"	"	"	"	----
77		4C00	4C35	4C35	8F00	----
	5	"	"	"	"	----
78	→	4D00	4D36	4D36	7400	----
	6	"	"	"	"	----
79	+	4E2B	4E2B	4E2B	4E2B	----
	+	"	"	"	"	----
80	END	4F00	4F31	4F31	7500	----
	1	"	"	"	"	----
81	↓	5000	5032	5032	9100	----
	2	"	"	"	"	----
82	PGDN	5100	5133	5133	7600	----
	3	"	"	"	"	----
83	INS	5200	5230	5230	9200	----
	0	"	"	"	"	----
84	DEL	5300	532E	532E	9300	----
	.	"	"	"	"	----
85	SYSRQ	5400	5400	5400	5400	----
		"	"	"	"	----
86		5600	5600	5600	5600	----
		"	"	"	"	----
87	F11	8500	8700	8900	8900	8B00
		"	"	"	"	"
88	F12	8600	8800	8A00	8A00	8C00
		"	"	"	"	"

7	6	"	"	"	"	"	"
	&	0837	0826	0837	0826	----	7E00
8	7	"	"	"	"	----	"
	*	0938	092A	0938	092A	----	7F00
9	8	"	"	"	"	----	"
	(	0A39	0128	0A39	0A28	----	8000
10	9	"	"	"	"	----	"
	)	0B30	0B29	0B30	0B29	----	8100
11		"	"	"	"	----	"
	-	0C2D	0C5F	0C2D	0C5F	0C1F	8200
12		"	"	"	"	"	"
	???	0D3D	0D2B	0D3D	0D2B	----	8300
13	=	"	"	"	"	----	"
	BS	0E08	0E08	0E08	0E08	0E7F	----
14		"	"	"	"	"	0E00
	TAB	0F09	0F00	0F09	0F00	----	----
15		"	"	"	"	9400	A500
	Q	1071	1051	1051	1071	1011	1000
16		"	"	"	"	"	"
	W	1177	1157	1157	1177	1117	1100
17		"	"	"	"	"	"
	E	1265	1245	1245	1265	1205	1200
18		"	"	"	"	"	"
	R	1372	1352	1352	1372	1312	1300
19		"	"	"	"	"	"
	T	1474	1454	1454	1474	1414	1400
20		"	"	"	"	"	"
	Y	1579	1559	1559	1579	1519	1500
21		"	"	"	"	"	"

<fig id=MMS\5200\5200D_2.TIF>Page D-2</fig>

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

KEY No.	KEY Top	Base	Upper	Caps Lock Base	Caps Lock Upper	Ctrl	Alt
	U	1675	1655	1655	1675	1615	1600
22		"	"	"	"	"	"
	I	1769	1749	1749	1769	1709	1700
23		"	"	"	"	"	"

	O	186F	184F	184F	186F	180F	1800
24		"	"	"	"	"	"
	P	1970	1950	1950	1970	1910	1900
25		"	"	"	"	"	"
	{	1A5B	1A7B	1A5B	1A7B	1A1B	----
26	[	"	"	"	"	"	1A00
	}	1B5D	1B7D	1B5D	1B7D	1B1D	----
27	]	"	"	"	"	"	1B00
	L-E	1C0D	1C0D	1C0D	1C0D	1C0A	----
28		"	"	"	"	"	1C00
	L-C	----	----	----	----	----	----
29		----	----	----	----	----	----
	A	1E61	1E41	1E41	1E6l	1E01	1E00
30		"	"	"	"	"	"
	S	1F73	1F53	1F53	1F73	1F13	1F00
31		"	"	"	"	"	"
	D	2064	2044	2044	2064	2004	2000
32		"	"	"	"	"	"
	F	2166	2146	2146	2166	2106	2100
33		"	"	"	"	"	"
	G	2267	2247	2247	2267	2207	2200
34		"	"	"	"	"	"
	H	2368	2348	2348	2368	2308	2300
35		"	"	"	"	"	"
	J	246A	244A	244A	246A	240A	2400
36		"	"	"	"	"	"
	K	256B	254B	254B	256B	250B	2500
37		"	"	"	"	"	"
	L	266C	264C	264C	266C	260C	2600
38		"	"	"	"	"	"
	:	273B	273A	273B	273A	----	----
39	;	"	"	"	"	----	2700
	"	2827	2822	2827	2822	----	----
40	'	"	"	"	"	----	2800
	*2	2960	297E	2960	297E	----	----
41		"	"	"	"	----	2900
	L-S	----	----	----	----	----	----
42		----	----	----	----	----	----
	*1	2B5C	287C	2B5C	2B7C	2B1C	----
43		"	"	"	"	----	2B00

	Z	2C7A	2C5A	2C5A	2C7A	2C1A	2C00
44	"	"	"	"	"	"	"
	X	2D78	2D58	2D58	2D78	2D18	2D00
45	"	"	"	"	"	"	"
	C	2E63	2E43	2E43	2E63	2E03	2E00
46	"	"	"	"	"	"	"

<fig id=MMS\5200\5200D_3.TIF>Page D-3</fig>

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

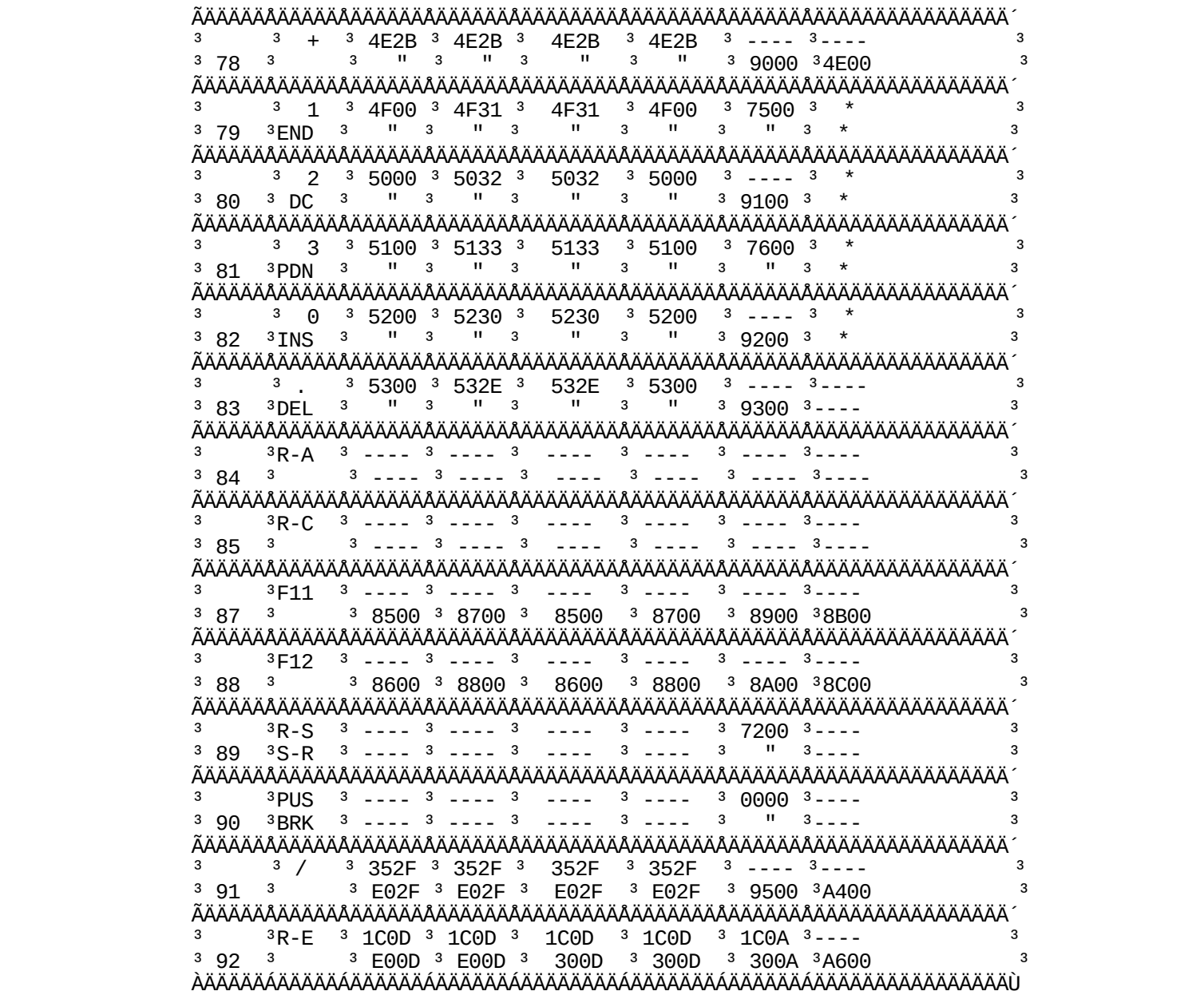
KEY No.	KEY Top	Base	Upper	Caps Base	Lock Upper	Ctrl	Alt
47	V	2F76	2F56	2F56	2F76	2F16	2F00
48	B	3062	3042	3042	3062	3002	3000
49	N	316E	314E	314E	316E	310E	3100
50	M	326D	324D	324D	326D	320D	3200
51	, <	332C	333C	332C	333C	----	----
52	. >	342E	343E	342E	343E	----	3400
53	/ ?	352F	353F	352F	353F	----	3500
54	R-S	----	----	----	----	----	----
55	*	372A	372A	372A	372A	----	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

	F3	3D00	5600	3D00	5600	6000	6A00
61		"	"	"	"	"	"
	F4	3E00	5700	3E00	5700	6100	6B00
62		"	"	"	"	"	"
	F5	3F00	5800	3F00	5800	6200	6C00
63		"	"	"	"	"	"
	F6	4000	5900	4000	5900	6300	6D00
64		"	"	"	"	"	"
	F7	4100	5A00	4100	5A00	6400	6E00
65		"	"	"	"	"	"
	F8	4200	5B00	4200	5B00	6500	6F00
66		"	"	"	"	"	"
	F9	4300	5C00	4300	5C00	6600	7000
67		"	"	"	"	"	"
	F10	4400	5D00	4400	5D00	6700	7100
68		"	"	"	"	"	"
	NUM	----	----	----	----	----	----
69		----	----	----	----	----	----
	SCR	----	----	----	----	----	----
70		----	----	----	----	----	----
	7	4700	4737	4737	4700	7700	*
71	HOM	"	"	"	"	"	*

<fig id=MMS\5200\5200D_4.TIF>Page D-4</fig>

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

KEY No.	KEY Top	Base	Upper	Caps Lock Base	Caps Lock Upper	Ctrl	Alt
	8	4800	4838	4838	4800	----	*
72	UC	"	"	"	"	"	*
	9	4900	4939	4939	4900	8400	*
73	PUP	"	"	"	"	"	*
	-	4A2D	4A2D	4A2D	4A2D	----	----
74		"	"	"	"	8E00	4A00
	4	4B00	4B34	4B34	4B00	7300	*
75	LC	"	"	"	"	"	*
	5	----	4C35	4C35	----	----	*
76		4C00	"	"	4C00	8F00	*
	6	4D00	4D36	4D36	4D00	7400	*
77	RC	"	"	"	"	"	*



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

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DOC:MAINTENANCE MANUAL
MODEL:T5200
MODEL:T5200C
CHAP:APPENDIX E KEY LAYOUT

SECT:
DOC_ID:E T5200
LANG:ALL
TEXT:

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APPENDIX E KEY LAYOUT

1. USA VERSION

<fig id=MMS\5200\5200E_1.TIF>Figure E-1</fig> USA version

2. UK VERSION

<fig id=MMS\5200\5200E_1.TIF>Figure E-2</fig> UK version

<fig id=MMS\5200\5200E_2.TIF>Page E-2</fig>

3. GERMANY VERSION

<fig id=MMS\5200\5200E_2.TIF>Figure E-3</fig> Germany version

4. FRANCE VERSION

<fig id=MMS\5200\5200E_2.TIF>Figure E-4</fig> France version

<fig id=MMS\5200\5200E_3.TIF>Page E-3</fig>

5. SPAIN VERSION

<fig id=MMS\5200\5200E_3.TIF>Figure E-5</fig> Spain version

6. ITALY VERSION

<fig id=MMS\5200\5200E_3.TIF>Figure E-6</fig> Italy version

<fig id=MMS\5200\5200E_4.TIF>Page E-4</fig>

7. SWITZERLAND VERSION

<fig id=MMS\5200\5200E_4.TIF>Figure E-7</fig> Switzerland version

8. CANADIAN VERSION

<fig id=MMS\5200\5200E_4.TIF>Figure E-8</fig> Canadian version

<fig id=MMS\5200\5200E_5.TIF>Page E-5</fig>

9. SWEDEN VERSION

<fig id=MMS\5200\5200E_5.TIF>Figure E-9</fig> Sweden version

10. DENMARK VERSION

<fig id=MMS\5200\5200E_5.TIF>Figure E-10</fig> Denmark version

<fig id=MMS\5200\5200E_6.TIF>Page E-6</fig>

11. NORWAY VERSION

<fig id=MMS\5200\5200E_6.TIF>Figure E-11</fig> Norway version