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**Toshiba Personal Computer
Satellite L650
Maintenance Manual**

TOSHIBA CORPORATION

File Number 960-Q08

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Toshiba Personal Computer Satellite L650 Maintenance Manual

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Disclaimer

The information presented in this manual has been reviewed and validated for accuracy. The included set of instructions and descriptions are accurate for the Satellite L650 series at the time of this manual's production. However, succeeding computers and manuals are subject to change without notice. Therefore, Toshiba assumes no liability for damages incurred directly or indirectly from errors, omissions, or discrepancies between any succeeding product and this manual.

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Preface

This maintenance manual describes how to perform hardware service maintenance for the Toshiba Personal Computer Satellite L650 Series.

The procedures described in this manual are intended to help service technicians isolate faulty Field Replaceable Units (FRUs) and replace them in the field.

SAFETY PRECAUTIONS

Four types of messages are used in this manual to bring important information to your attention. Each of these messages will be italicized and identified as shown below.

DANGER: “*Danger*” indicates the existence of a hazard that could result in death or serious bodily injury, if the safety instruction is not observed.

WARNING: “*Warning*” indicates the existence of a hazard that could result in bodily injury, if the safety instruction is not observed.

CAUTION: “*Caution*” indicates the existence of a hazard that could result in property damage, if the safety instruction is not observed.

NOTE: “*Note*” contains general information that relates to your safe maintenance service.

Improper repair of the computer may result in safety hazards. Toshiba requires service technicians and authorized dealers or service providers to ensure the following safety precautions are adhered to strictly.

- ❑ Be sure to fasten screws securely with the right screwdriver. If a screw is not fully fastened, it could come loose, creating a danger of a short circuit, which could cause overheating, smoke or fire.
- ❑ If you replace the battery pack or RTC battery, be sure to use only the same model battery or an equivalent battery recommended by Toshiba. Installation of the wrong battery can cause the battery to explode.

The manual is divided into the following parts:

- Chapter 1 Hardware Overview describes the Satellite L650 system unit and each FRU.
- Chapter 2 Troubleshooting Procedures explains how to diagnose and resolve FRU problems.
- Chapter 3 Test and Diagnostics describes how to perform test and diagnostic operations for maintenance service.
- Chapter 4 Replacement Procedures describes the removal and replacement of the FRUs.
- Appendices The appendices describe the following:
 - Handling the LCD Module
 - Board layout
 - Pin assignments
 - Keyboard scan/character codes
 - Wiring diagrams

Conventions

This manual uses the following formats to describe, identify, and highlight terms and operating procedures.

Acronyms

On the first appearance and whenever necessary for clarification acronyms are enclosed in parentheses following their definition. For example:

Read Only Memory (ROM)

Keys

Keys are used in the text to describe many operations. The key top symbol as it appears on the keyboard is printed in **boldface** type.

Key operation

Some operations require you to simultaneously use two or more keys. We identify such operations by the key top symbols separated by a plus (+) sign. For example, **Ctrl + Pause (Break)** means you must hold down **Ctrl** and at the same time press **Pause (Break)**. If three keys are used, hold down the first two and at the same time press the third.

User input

Text that you are instructed to type in is shown in the boldface type below:

DISK COPY A: B:

The display

Text generated by the computer that appears on its display is presented in the typeface below:

```
Format complete  
System transferred
```

Table of Contents

Chapter 1 Contents

1.1	Features	1
1.2	System Block Diagram	5
1.3	2.5-inch Hard Disk Drive.....	8
1.4	Optical Drive.....	12
1.5	Keyboard.....	19
1.6	TFT Color Display	20
	1.6.1LCD Module With CCFL Backlight.....	20
	1.6.1LCD Module With LED Backlight.....	20
	1.6.2Inverter Board	19
1.7	Power Rails	23
1.8	Batteries	24
	1.8.1Main Battery	24
	1.8.2RTC battery.....	25
1.9	AC Adapter	26

Chapter 2 Troubleshooting Procedures

2.1	Troubleshooting	1
2.2	Troubleshooting Flowchart.....	3
2.3	Power Supply Troubleshooting.....	8
	Procedure 1 Power Status Check	8
	Procedure 2 Connection Check.....	10
	Procedure 3 Charging Check	10
	Procedure 4 Replacement Check	11
2.4	System Board Troubleshooting.....	12
	Procedure 1 Message Check	12
	Procedure 2 Diagnostic Test Program Execution Check	13
	Procedure 3 Replacement Check	13
2.5	USB FDD Troubleshooting	14
	Procedure 1 FDD Head Cleaning Check	14
	Procedure 2 Diagnostic Test Program Execution Check	15
	Procedure 3 Connector Check and Replacement Check.....	16
2.6	2.5" HDD Troubleshooting.....	18
	Procedure 1 Partition Check.....	18
	Procedure 2 Message Check	19
	Procedure 3 Format Check.....	20
	Procedure 4 Diagnostic Test Program Execution Check	21
	Procedure 5 Connector Check and Replacement Check.....	22
2.7	Keyboard Troubleshooting	23
	Procedure 1 Diagnostic Test Program Execution Check	23
	Procedure 2 Connector Check and Replacement Check.....	24
2.8	Touch pad Troubleshooting	25
	Procedure 1 Diagnostic Test Program Execution Check	25
	Procedure 2 Connector Check and Replacement Check.....	26

2.9	Display Troubleshooting.....	27
	Procedure 1 External Monitor Check.....	27
	Procedure 2 Diagnostic Test Program Execution Check	27
	Procedure 3 Connector and Cable Check	28
	Procedure 4 Replacement Check	29
2.10	Optical Disk Drive(Blue-Ray ODD) Troubleshooting.....	30
	Procedure 1 Diagnostic Test Program Execution Check	30
	Procedure 2 Connector Check and Replacement Check.....	30
2.11	Modem Troubleshooting.....	31
	Procedure 1 Diagnostic Test Program Execution Check	31
	Procedure 2 Connector Check and Replacement Check.....	31
2.12	LAN Troubleshooting.....	33
	Procedure 1 Diagnostic Test Program Execution Check	33
	Procedure 2 Connector Check and Replacement Check.....	33
2.13	Wireless LAN Troubleshooting.....	34
	Procedure 1 Transmitting-Receiving Check	34
	Procedure 2 Antennas' Connection Check	35
	Procedure 3 Replacement Check	36
2.14	Sound Troubleshooting.....	37
	Procedure 1 Connector Check.....	37
	Procedure 2 Replacement Check	38
2.15	Camera Troubleshooting.....	39
	Procedure 1 Camera Execution Check.....	39
	Procedure 2 Connector Check and Replacement Check.....	39
2.16	USB Board/eSATA Troubleshooting	40
	Procedure 1 Diagnostic Test Program Execution Check	40
	Procedure 2 Connect Check and Replacement Check	40
2.17	HDMI Troubleshooting Troubleshooting.....	41
	Procedure 1 Connect Check and Replacement Check	41
	Procedure 2 External Monitor Check.....	41
2.18	3 in 1 Card Reader Troubleshooting.....	42

	Procedure 1 Media Card Check	42
	Procedure 2 Connector Check and Replacement Check.....	42
2.19	Bluetooth Troubleshooting	41
	Procedure 1 Connect Check and Replacement Check	43
2.20	3G Troubleshooting	44
	Procedure 1 Connect Check and Replacement Check	44
	Procedure 2 External Monitor Check.....	44

Chapter 3 Diagnostic Programs

3.1	Tests and Diagnostics Software Overview	3-Fehler! Textmarke nicht definiert.
3.2	Executing the Diagnostic Test	3-Fehler! Textmarke nicht definiert.
3.3	Subtest names.....	3-Fehler! Textmarke nicht definiert.
3.4	System Test.....	3-Fehler! Textmarke nicht definiert.
3.5	Memory Test.....	3-13
3.6	Keyboard Test.....	3-17
3.7	Display Test	3-19
3.8	Floppy Disk Test.....	3-34
3.9	Hard Disk Test	3-36
3.10	Real Time Clock Test	3-39
3.11	Cache Memory Test.....	3-41
3.12	High Resolution Display Test.....	3-43
3.13	Multimedia Test	3-49
3.14	MEMORY2 Test.....	3-50
3.15	Error Codes and Error Status Names	3-52
3.16	Running Test.....	3-54
3.17	DMI INFOEMATION	3-55

3.17.1	Check DMI Information	3-55
3.17.2	Write DMI Information.....	3-55
3.18	Log Utilities	3-58
3.18.1	Operations	3-58
3.19	System Configuration	3-60
3.20	OPTION	3-61
3.20.1	Function Description.....	3-61
3.20.2	Operation Description.....	3-61
3.21	Common Tests and Operation	3-63
3.21.1	How to operate a window	3-63
3.21.2	How to Stop the Test Program.....	3-63
3.21.3	Test Status Screen	3-63
3.21.4	Test Stop Display	3-65
3.21.5	How to enter data	3-65

Chapter 4 Replacement Procedures

4.1	Overview.....	4-1
	Safety Precautions.....	4-2
	Before You Begin	4-3
	Disassembly Procedure.....	4-4
	Assembly Procedure	4-5
	Tools and Equipment	4-5
	Screw Tightening Torque	4-6
	Grip Color	4-6
	Screw Notation.....	4-7
4.2	Battery pack	4-8
4.3	HDD/SDD.....	4-11
4.4	Memory module.....	4-15
4.5	Keyboard.....	4-18
4.6	Wireless LAN card	4-21
4.7	Bluetooth module.....	4-23
4.8	3G module card.....	4-25
4.9	Display assembly	4-27
4.10	Top Cover assembly	4-33
4.11	Touch Pad Board.....	4-36
4.12	Modem Board	4-38
4.13	Power Board.....	4-39
4.14	SIM Board.....	4-40
4.15	USB Board	4-41
4.16	Optical disc drive	4-42
4.17	Mother Board/RTC Battery	4-44
4.18	CPU/CPU Heat sink.....	4-48
4.19	LCD unit	4-51
4.20	Web Camera module.....	4-56
4.21	Application for thermal grease on CPU and North Bridge.....	4-60
4.22	Speaker Box	4-62

Appendices

Appendix A	Handling the LCD Module	A-1
Appendix B	Board Layout	B-1
Appendix C	Pin Assignments.....	C-1
Appendix D	Keyboard Scan/Character Codes	D-1
Appendix F	Wiring Diagrams.....	E-1

Chapter 1

Hardware Overview

Chapter 1 Contents

1.1	Features	1
1.2	System Block Diagram	5
1.3	2.5-inch Hard Disk Drive.....	8
1.4	Optical Drive.....	12
1.5	Keyboard.....	19
1.6	TFT Color Display	20
	1.6.1 LCD Module With CCFL Backlight.....	20
	1.6.1 LCD Module With LED Backlight	20
	1.6.2 Inverter Board	19
1.7	Power Rails	23
1.8	Batteries	24
	1.8.1 Main Battery	24
	1.8.2 RTC battery	25
1.9	AC Adapter	26

Figures

Figure 1-1-1	Front of the computer.....	4
Figure 1-2-1	System block diagram for AMD platform	5
Figure 1-3-1	2.5-inch HDD Disk Drive	8
Figure 1-4-1	DVD Super Muti drive.....	12
Figure 1-5-1	Keyboard for US Style.....	19
Figure 1-5-2	Keyboard for UK Style	19
Figure 1-6-1	SAMSUNG LCD Module.....	20

Tables

Table 1-3-1	2.5-inch HDD dimensions	8
Table 1-3-2	2.5-inch HDD specifications.....	9
Table 1-4-1	DVD Super Multi drive outline dimensions	12
Table 1-4-2	HLDS DVD Super Multi drive specifications	13
Table 1-4-3	Panasonic DVD Super Multi drive specifications	14
Table 1-4-4	TSST DVD Super Multi drive specifications	15
Table 1-5-1	LCD module specifications.....	18
Table 1-5-2	FL inverter board specifications	19
Table 1-6-1	Power supply output rating	20
Table 1-7-1	Battery specifications.....	21
Table 1-7-2	Time required for charges of main battery	22
Table 1-7-3	Data retaining time.....	23
Table 1-7-4	Time required for charges of RTC battery.....	24
Table 1-8-1	AC adapter specifications	25

Features

1.1 Features

Satellite L650 (Intel Platform) features are listed below.

□ **Microprocessor**

Microprocessor that is used will be different by the model.

It supports processors as follows

1. Intel Arrandale Mobile Processor

Intel Core i7-620M
Intel Core i5-540M
Intel Core i5-520M
Intel Core i5-450M
Intel Core i3-360M
Intel Core i3-350M
Intel Core i5-430M
Intel Core i3-330M
Intel Pentium P6100
Intel Pentium P6000
Intel (988P) P4500

□ **Memory**

Two DDRIII SO-DIMM (1066MHz specification compliant) used and be up to 4GB which can be upgraded through Memory Module Slot. Maximum upgradeable system memory may depend on the model

□ **VRAM**

Shared with System RAM for Intel HM55, UMA SKU, Discreet VRAM Memory that is used will be different by the model, which support as:512MB, 1GB

□ **HDD**

5400RPM: 250GB, 320GB, 500GB, 640GB internal drives. 2.5 inch x 9.5mm height.

□ **USB FDD (Option)**

Toshiba external USB FDD for option

▣ Display

Aspect ratio 16:9, HD, 1366 x 768, LED&CCFL type, Dimension

LED type 359.8x 210 x 5.8 mm

CCFL type 359.8x 210 x 6.2 mm

▣ CRT

Supported via a RGB connector.

▣ Keyboard

Keyboard module has 104/105/109 keys. It supports Windows keys and application keys.

▣ Card reader

3-in-1 slot .The slot support 16-bit PC cards.

▣ Optical devices

DVD Super Multi (+-R Double Layer)

▣ Battery

The RTC battery is equipped inside the computer.
The main battery is a detachable lithium ion battery.

3 cells (BTO), 2000 mAh

6 cells (BTO), 4400 mAh

6 high capacity cells (BTO), 5600 mAh

12 cells (BTO), 9000 mAh

▣ USB (Universal Serial Bus)

3 USB ports are provided. The ports comply with the USB2.0 standard.

(not support sleep'n charge)

- ❑ One ESATA port is equipped.

- ❑ Sound system

Internal stereo speaker, Internal MIC (Option) external monaural microphone connector, stereo headphone connector.

- ❑ Wireless LAN

The wireless LAN is equipped on the mini card slot.

- ❑ LAN/MODEM

Connectors for LAN and Modem are separately mounted.

- ❑ Bridge media slot

SD/SDXC/SDHC are supported

- ❑ Bluetooth

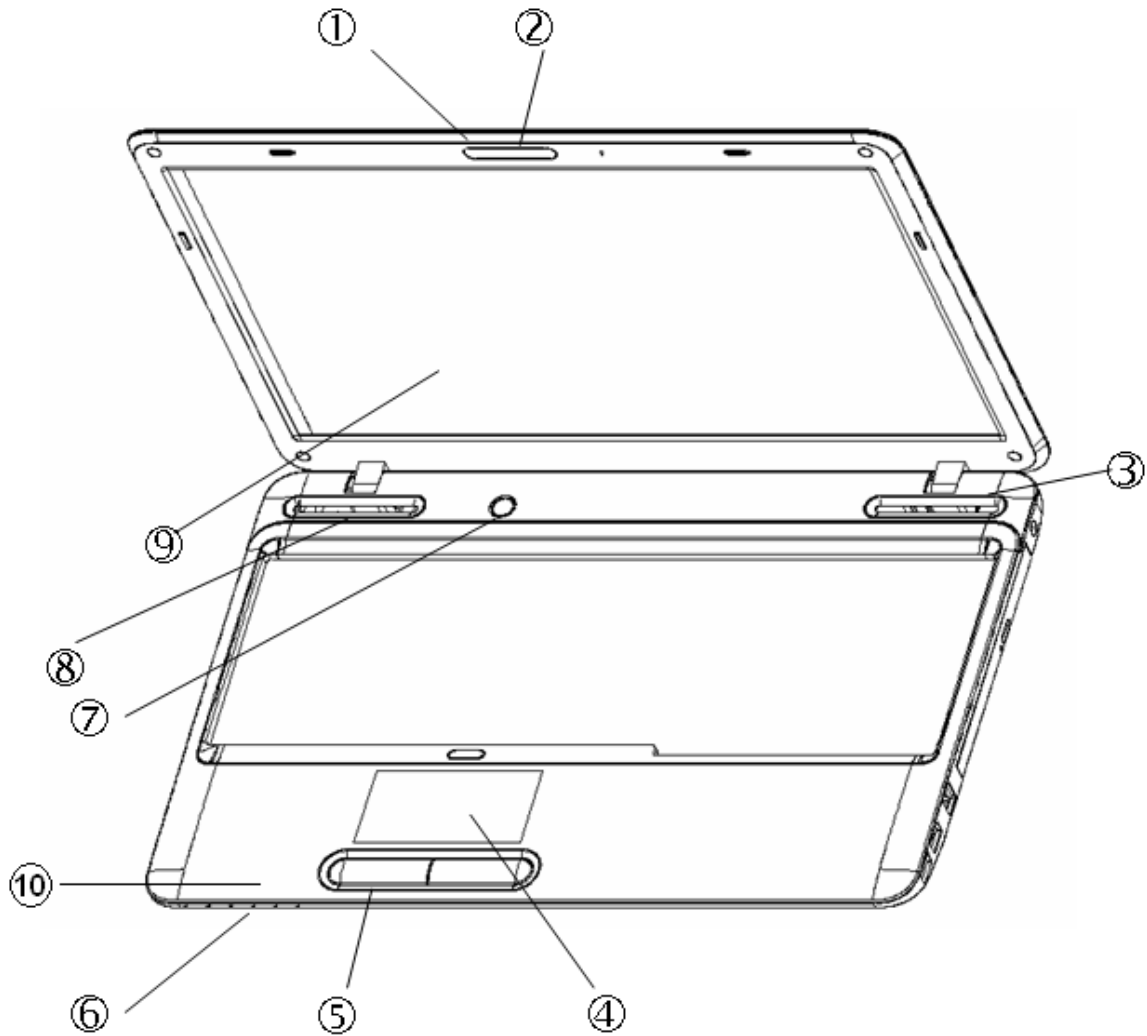
Some computers in this series offer Bluetooth wireless communication functionality. This module is Version 2.1+EDR.

- ❑ Security

Kensington Lock,

- ❑ HDD Password

HDD security function



- | | |
|------------------------------|-------------------|
| 1. Web Camera LED | 2. Web Camera |
| 3. Speaker | 4. Touch Pad |
| 5. Touch Pad Control Buttons | |
| 6. LED Board | 7. Power Button |
| 8. Speaker | 9. Display Screen |
| 10. Hall sensor | |

Figure 1-1 Front of the computer

The PC contains the following components.

□ CPU

Intel Core i7-620M
Intel Core i5-540M
Intel Core i5-520M
Intel Core i5-450M
Intel Core i3-360M
Intel Core i3-350M
Intel Core i5-430M
Intel Core i3-330M
Intel Pentium P6100
Intel Pentium P6000
Intel (988P) P4500

□ Memory

Two memory slots capable of accepting DDRIII-SDRAM, 1GB, 2GB or 4GB memory modules for a maximum of 4GB.

- 204pin Unbuffered SODIMM based on 1Gb F-die
- 1.5V operation

□ BIOS ROM (Flash memory)

- ME BIOS ROM 32Mbit
- EC ROM 4Mbit

□ Chipset (Ibex Peak MOBILE HM55) this gate array has the following and functions.

- DRAM Controller : DDRIII 1066 support
- DMI
- Direct Media Interface (DMI)
- PCI Express
- Serial ATA (SATA) Controller
- PCI Interface
- Low Pin count (LPC) interface
- Serial Peripheral Interface (SPI)
- DMA controller

- Advanced Programmable Interrupt Controller (APIC)
- USB Controllers
- Gigabit Ethernet Controller
- RTC
- GPIO
- Enhanced Power Management
- SMBus 2.0
- High Definition Audio Controller
- FCBGA package
- Package size: 27mm x 25mm
- Ball Count: 1071
- Ball pitch: 0.6mm
- Card Reader controller (RTS5159-VDD-GR)
- 10/100 LAN controller (Antiheros AR8152)
- Giga LAN controller (Antiheros AR8151)

Mini Card

Wireless LAN card (BTO)

2.4 GHz OFDM/CCK/DSSS LAN card is equipped. Conformity with IEEE 802.11/b/g/n

Bluetooth

- Fully supports Bluetooth 2.1 additional Feature:
 - Secure Simple Pairing (SSP)
 - Encryption Pause Resume (EPR)
 - Enhance Inquiry response (EIR)
 - Link Supervision Time Out (LSTO)
 - Sniff SubRating (SSR)
 - Erroneous Data (ED)
 - Packet Boundary Flag (PBF)
 - Support Bluetooth 2.0 and EDR packet type
- Programmable output power control meets Class 2 requirement
- Low power consumption
- Channel quality driven data rate and packet type selection
- Full support for power saving modes
 - Bluetooth standard Park, Hold, and Sniff
 - Deep sleep mode and regulator shutdown

1.3 2.5-inch Hard Disk Drive

A compact, high-capacity HDD with a height of 9.5mm. Contains a 2.5-inch magnetic disk and magnetic heads.

Figure 1-3 shows a view of the 2.5-inch HDD and Tables 1-1 and 1-2 list the specifications.

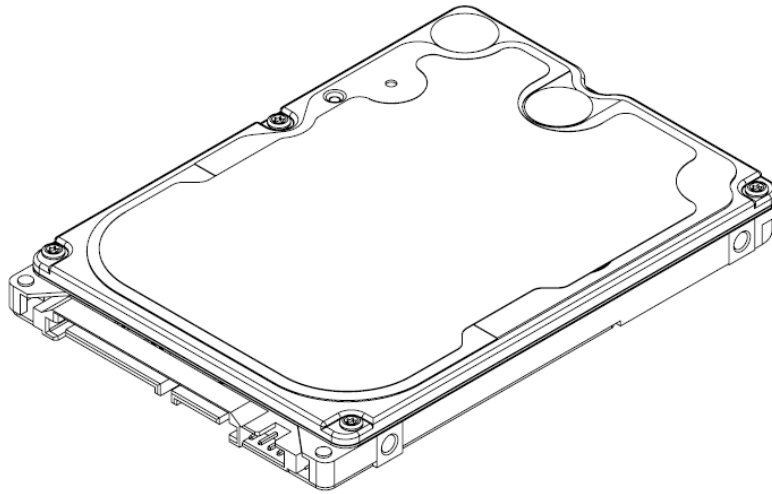


Figure 1-3 2.5-inches HDD

Table 1-3-1 2.5-inch HDD dimensions

Parameter		Standard value			
		TOSHIBA MK2565GSX	TOSHIBA MK3265GSX	TOSHIBA MK5065GSX	TOSHIBA MK6465GSX
Outline dimen sions	Width (mm)	69.85 +/- 0.25			
	Height (mm)	9.5			
	Depth (mm)	100.2 +/- 0.25			
	Weight (g)	98			

Parameter		Standard value		
		Hitachi HTS545025B9A300	Hitachi HTS545032B9A300	Hitachi HTS545050B9A300
Outline dimen	Width (mm)	69.85±0.25	69.85±0.25	
	Height (mm)	9.5±0.2	9.5±0.2	
	Depth (mm)	100.2±0.25	100.2±0.25	

sions	Weight (g)	95 Max	102 Max
-------	------------	--------	---------

Parameter		Standard value			
		Seagate ST9250314AS	Seagate ST9320315AS	Seagate ST9500325AS	Seagate ST9640320AS
Outline dimen sions	Width (mm)	69.85 mm +/- 0.25 mm (2.75 +/- 0.0098 inches)			
	Height (mm)	9.5 +/- 0.2 mm (0.374 +/- .0079 inches)			
	Depth (mm)	100.35 + 0.20 / - 0.25 mm (3.957 + 0.0079 / - 0.0098 inches)			
	Weight (g)	93.5 grams (0.206 lb)			

Parameter		Standard value		
		WD2500BEVT- 26A23T0	WD3200BEVT- 26A23T0	WD5000BEVT- 26A0RT0
Outline dimen sions	Width (mm)	69.85 mm		
	Height (mm)	9.50 mm		
	Depth (mm)	100.20 mm		
	Weight (g)	98 gm		

Table 1-3-2 2.5-inch HDD specifications

Specification				
Parameter	TOSHIBA MK2565GSX	TOSHIBA MK3265GSX	TOSHIBA MK5065GSX	TOSHIBA MK6465GSX
Storage size (formatted)	250 GB	320GB	500GB	640GB
Speed (RPM)	5,400			
Data transfer Rate	464~1148Mbits Media			
- To/From Media	3GBytes Host			
- T0/From Host				
bus transfer rate (MB/s)	1.5Gbps(150MB/s)			
Average random seek time (read) (ms)	12			
Power-on-to-ready (sec)	3.5(typ)/9.5(Max)			

Specification				
Parameter	Seagate ST9250314AS	Seagate ST9320315AS	Seagate ST9500325AS	Seagate ST9640320AS
Storage size (formatted)	250 GB	320GB	500GB	640GB
Speed (RPM)	5,400			
Data transfer Rate	1,175MB/s Max.			
- To/From Media	3Gbps (300MB/s)			
- T0/From Host				
bus transfer rate (MB/s)	3Gbps(300MB/s)			
Average random seek time	12.0ms/14.0ms			
(read) (ms)				
Power-on-to-ready (sec)	3.6 (typ.)			

Specification			
Parameter	Hitachi HTS545025B9A300	Hitachi HTS545032B9A300	Hitachi HTS545050B9A300
Storage size (formatted)	250GB	320GB	500GB
Speed (RPM)	5,400		
Data transfer Rate	875MB/s 3.0Gbps	875MB/s 3.0Gbps	875MB/s 3.0Gbps
- To/From Media			
- T0/From Host			
bus transfer rate (MB/s)	300 (MB/s)		
Average random seek time	12		
(read) (ms)			
Power-on-to-ready (sec)	3.5 sec		

Specification			
Parameter	WD2500BEVT-26A23T0	WD3200BEVT-26A23T0	WD5000BEVT-26A0RT0
Storage size (formatted)	250GB	320GB	500GB
Speed (RPM)	5,400		
Data transfer Rate - To/From Media - T0/From Host	106MB/s Max. 3.0Gbps (BEVT)		
bus transfer rate (MB/s)	1.5Gbps (150MB/s)		
Average random seek time (ms)	Write:12.0ms Read:15.0ms		
Power-on-to-ready (sec)	4.0 (typ)		

1.4 Optical Drive

The DVD Super Multi drive accommodates either 12 cm (4.72-inch) or 8 cm (3.15-inch) CD/DVD-ROM, CD-R/RW, DVD±R/±RW and DVD-RAM. It is a high-performance drive that reads DVD-ROM at maximum 8-speed and CD at maximum 24-speed. Write speed of DVD±R/±RW and DVD-RAM is different depending on the drive.

The DVD Super Multi drive is shown in Figure 1-4. The dimensions and specifications of the DVD Super Multi drive are described in Table 1-3, Table 1-4, Table 1-5, Table 1-6, Table 1-7.

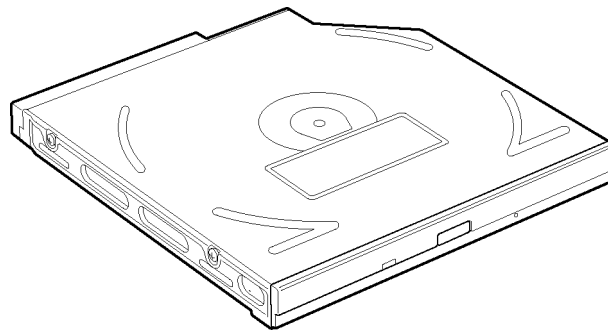


Figure 1-4 DVD Super Multi drive

Table 1-4-1 DVD Super Multi /BD drive outline dimensions

Parameter		Standard value	
Outline dimensions	Maker	HLDS Super Multi GT30N-ATAK7B0	HLDS Super Multi GT30F - ATAK7B0 w/ Label Flash
	Width (mm)	128	
	Height (mm)	12.7	
	Depth (mm)	127	
	Mass (g)	173	

Parameter		Standard value	
Outline dimensions	Maker	TEAC DV-W28S-VTJ(2) w bezel	TEAC DV-W28S-VTK(2) w bezel
	Width (mm)	128	
	Height (mm)	12.7	
	Depth (mm)	127	
	Mass (g)	170	

Parameter		Standard value	
Outline	Maker	Panasonic UJ240EBTJF-A	Panasonic UJ141EBTJF-A
	Width (mm)	128	
	Height (mm)	12.7	
	Depth (mm)	129	
	Mass (g)	185	

Parameter		Standard value	
Outline dimension s	Maker	Panasonic (UJ880ADTJR-A)	Panasonic (UJ880EDTJR-A)
	Width (mm)	128	
	Height (mm)	12.7	
	Depth (mm)	129	
	Mass (g)	180	
Parameter		Standard value	
Outline dimension s	Maker	TSST TS-L633C/TFCF(1)	TSST TS-L633Y/TFCF(1)
	Width (mm)	128	
	Height (mm)	12.7	
	Depth (mm)	127	
	Mass (g)	165	

Table 1-4-2 HLDS DVD Super Multi drive specifications

Parameter		HLDS Drive Specification	
		GT30N-ATAK7B0	GT30F -ATAK7B0
Label Flash Function		No support	Support
Data transfer speed	Read	DVD-R 2x CLV, 4x ZCLV, 8x CAV DVD-R DL2x CLV, 4x ZCLV, 6x PCAV DVD-RW 2x CLV, 4x, 6x ZCLV DVD-RAM 2x, 3x CLV, 5x PCAV(Ver.2.2)(12x Media: Not support) DVD+R 2.4x CLV, 4x ZCLV, 8x CAV DVD+R DL2.4x CLV, 4x ZCLV, 6x PCAV DVD+RW 2.4x, 3.3x CLV, 4x ZCLV, 8x ZCLV(8x Speed disc: 3.3x CLV, 8x ZCLV) CD-R 10x CLV, 16x ZCLV, 24x CAV CD-RW 4x, 10x CLV, 16x ZCLV, 24x ZCLV(High Speed: 10x CLV, Ultra Speed: 24x ZCLV)	
	Write	DVD-R/RW/ROM 8x/8x/8x max. DVD-R DL 8x max. DVD-RAM (Ver.2.2) 2x, 3x, 5x DVD-Video (CSS CompliantDisc) 4xmax.(Single/Dual layer) DVD+R/+RW 8x/8xmax. DVD+R DL 8xmax. CD-R/RW/ROM 24x/24x/24x max. CD-DA (DAE) 24x max.	
	Burst Transfer mode	ATA PIO Mode 0-4 ATA Multi Word DMA Modes 0-2 ATA Ultra DMA Mode 0-5	
Access time (ms) (Random)	CD-ROM	140ms (Typ.)	
	DVD-ROM	160ms (Typ.)	
Buffer memory		1MB	

Table 1-4-3 TSST DVD Super Multi drive specifications

Parameter		TSST Drive Specification	
		TS-L633C/TFCF w bezel	TS-L633Y/TFCF w bezel
Label Flash Function		No support	Support
Data transfer speed	Read	DVD-ROM :Max 8X CAV CD-ROM :Max 24X CAV	
	Write	CD-R :Max24X CAV CD-RW :4X CLV High Speed CD-RW :10XCLV Ultra Speed CD-RW :Max 24X Zone CLV DVD-R :Max.8X CAV DVD-R DL :Max.6X Zone CLV DVD-RW :Max.6X Zone CLV DVD+R :Max.8X CAV DVD+R DL :Max.6X Zone CLV DVD+RW :Max.8X Zone CLV DVD-RAM :Max.3-5X PCAV (4.7GB)	
	Burst Transfer mode	PIO mode4/Multi word mode2/Ultra DMA mode2	
Access time (ms) (Random)	CD-ROM	150ms (Typ.)	
	DVD-ROM	180ms (Typ.)	
Buffer memory		1MB	

Table 1-4-4 Panasonic BD-ROM drive specifications

Parameter		Panasonic Drive Specification	
		UJ240EBTJF-A	UJ141EBTJF-A
Data transfer speed	Read	CD-ROM Max. 24X (3,600 KB/sec) BD-ROM Max.6xCAV(27MB/s) DVD-ROM Max 8X (10,800 KB/sec)	
	Write	CD-R Max. 24X (3,600 KB/sec) P MS CD-RW Max. 4X (600 KB/sec) HS CD-RW Max. 10X (1,500 KB/sec) US CD-RW Max. 16X (2,400 KB/sec) DVD-R DL Max 8X (10,800 KB/sec) DVD-R Max 8X (10,800 KB/sec) DVD-RW Max 6x (8,100KB/sec) DVD+R DUAL Max 4X (5400 KB/sec) DVD-RAM Max 5x PCAV 5X/ CLV3X/2X BD-R MAX 2XCLV,4X ZCLV/PCAV,6X CAV BD-RE MAX ZX	
	Burst Transfer mode	PIO mode4 Multi word mode2 Ultra DMA mode2	
Access time (ms) (Random)	CD-ROM	180ms (Typ.)	
	BD-ROM	300ms (Typ.)	
	DVD-ROM	190ms (Typ.)	
Buffer memory		2MB	

Table 1-4-5 Panasonic Super Multi drive specifications

Parameter		Panasonic Drive Specification	
		UJ880EDTJR-A	UJ880ADTJR-A
Data transfer speed	Read	CD-ROM Max. 24X CAV DVD-ROM Max 8X CAV	
	Write	CD-R Max. 24X CAV CD-RW :4X CLV High Speed CD-RW :10XCLV Ultra Speed CD-RW :Max 24X Zone CLV DVD-R :Max.8X CAV DVD-R DL :Max.6X Zone CLV DVD-RW :Max.6X Zone CLV DVD+R :Max.8X CAV	

		DVD+R DL :Max.6X Zone CLV DVD+RW :Max.8X Zone CLV DVD-RAM :Max.3-5X PCAV (4.7GB)
	Burst Transfer mode	PIO mode4 Multi word mode2 Ultra DMA mode2
Access time (ms) (Random)	CD-ROM	150ms (Typ.)
	DVD-ROM	180ms (Typ.)
Buffer memory		1MB

Table 1-4-6 HLDS Super Multi drive specifications

Parameter		HLDS Drive Specification	
		GT30N-ATAK7N0	GT30F -ATAK7N0
Label Flash Function		No support	Support
Data transfer speed	Read	DVD-ROM :Max 8X CAV CD-ROM :Max 24X CAV	
	Write	CD-R :Max24X CAV CD-RW :4X CLV High Speed CD-RW :10XCLV Ultra Speed CD-RW :Max 16X Zone CLV DVD-R :Max.8X CAV DVD-R DL :Max.4X Zone CLV DVD-RW :Max.6X Zone CLV DVD+R :Max.8X CAV DVD+R DL :Max.4X Zone CLV DVD+RW :Max.8X Zone CLV DVD-RAM :3-5X ZCLV (4.7GB)	
	Burst Transfer mode	PIO mode4/Multi word mode2/Ultra DMA mode2	
Access time (ms) (Random)	CD-ROM	140ms (Typ.)	
	DVD-ROM	160ms (Typ.)	
Buffer memory		1MB	

Table 1-4-7 TEAC DVD Super Multi drive specifications

Parameter		TEAC Drive Specification	
		DV-W28S-VTG(2)	DV-W28S-VTH(2)
Label Flash Function		No support	Support
Data transfer speed	Read	CD-ROM Max. 24X (3,600 KB/sec) CD-R Max. 24X (3,600 KB/sec) CD-RW Max. 24X (3,600 KB/sec) DVD-ROM(SL) Max 8X (10,800 KB/sec) DVD-ROM(DL) Max 8X (10,800 KB/sec) DVD±R DUAL Max 6X (8,100 KB/sec) DVD-RAM Max. 6,750 KB/sec	
	Write	CD-R Max. 24X (3,600 KB/sec) P MS CD-RW Max. 4X (600 KB/sec) HS CD-RW Max. 10X (1,500 KB/sec) US CD-RW Max. 16X (2,400 KB/sec) DVD+R Max 8X (10,800 KB/sec) DVD-R Max 8X (10,800 KB/sec) DVD+RW Max 8X (10,800 KB/sec) DVD-RW Max 6x (8,100KB/sec) DVD+R DUAL Max 4X (5400 KB/sec) DVD-R DUAL Max 4X (5400 KB/sec) DVD-RAM Max 5x P-CAV 5X/ CLV3X/2X	
	Burst Transfer mode	PIO mode4 Multi word mode2 Ultra DMA mode2	
Access time (ms) (Random)	CD-ROM	140ms (Typ.)	
	DVD-ROM	150ms (Typ.)	
Buffer memory		2MB	

1.5 Keyboard

The Satellite Madrid keyboard has two different kinds of placement, one is for US style and the other is for UK style.

Figure 1-5 is a view of the keyboard for US style

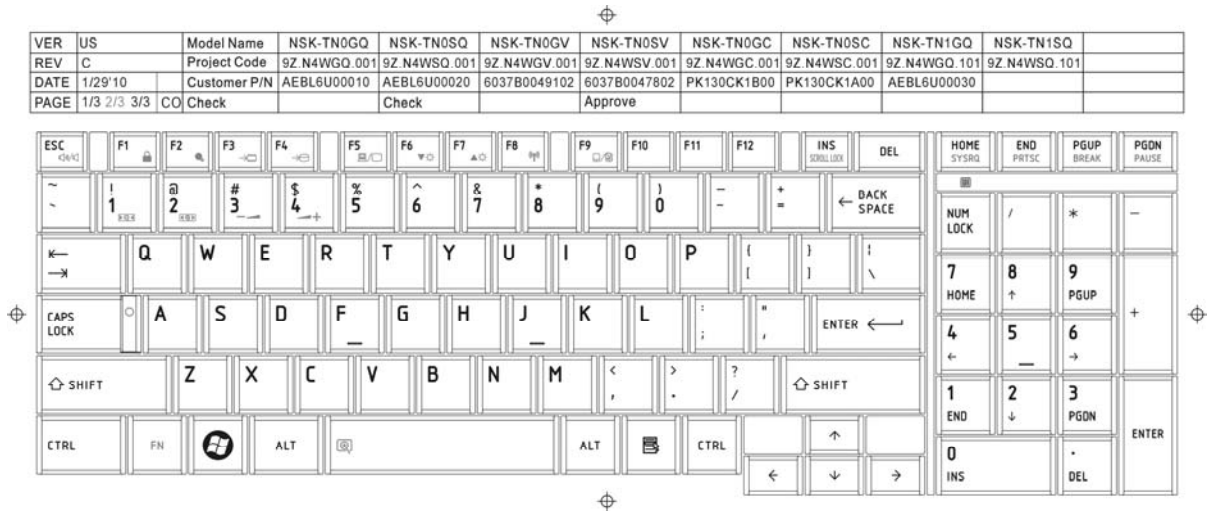


Figure 1-5-1 Keyboard for US style

Figure 1-6 is a view of the keyboard for UK style

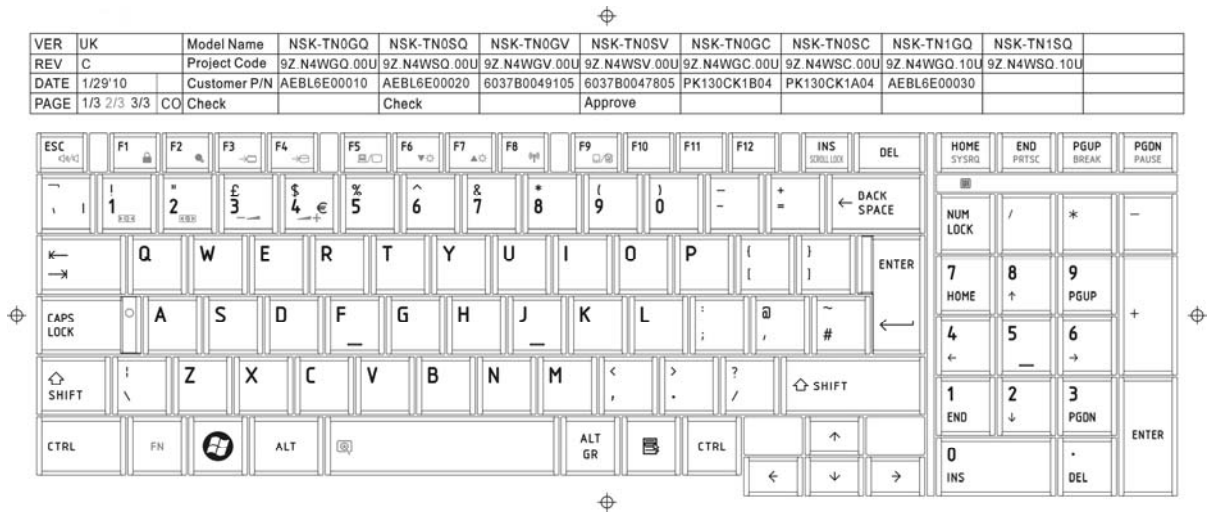


Figure 1-5-2 Keyboards for UK style

1.6 TFT Color Display.

1.6.1 LCD Module with CCFL Backlight

Figure 1-7 shows a view of the CCFL LCD module and Table 1-8 lists the specifications.

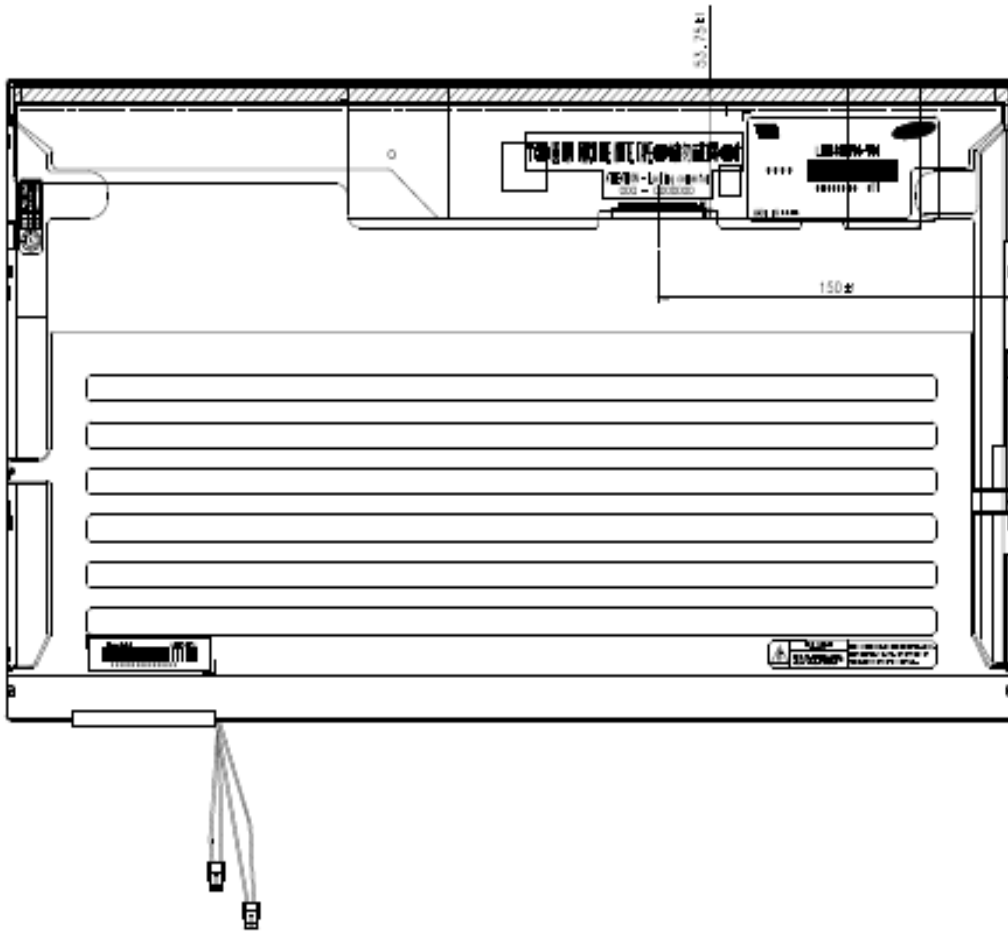


Figure 1-6-1 SAMSUNG LCD Module

Table 1-8 CCFL LCD module specifications

Item	Specifications	
	Samsung LTN156AT01-U01	LG LP156WH1-TLC1
Number of Pixel	1366 x 768	1366 x 768
Dot spacing (mm)	0.252 (H) × 0.252 (V)	0.252 (H) × 0.252 (V)
Display Colors	262,144 colors	262,144 colors

Item	Specifications	
	AUO B156XW01	CMO N156B3-L02
Number of Pixel	1366 x 768	1366 x 768
Dot spacing (mm)	0.252 (H) × 0.252 (V)	0.252 (H) × 0.252 (V)
Display Colors	262,144 colors	262,144 colors

1.6.2 LCD Module with LED Backlight

Figure 1-7 shows a view of the LED LCD module and Table 1-9 lists the specifications.



Figure 1-8 SAMSUNG LCD Module

Table 1-9 LED LCD module specifications

Item	Specifications	
	Samsung LTN156AT05-S01	LG LP156WH2-TLAA
Number of Pixel	1366 x 768	1366 x 768
Dot spacing (mm)	0.2588 (H) × 0.2588 (V)	0.2588 (H) × 0.2588 (V)
Display Colors	262,144 colors	262,144 colors

Item	Specifications	
	AUO B156XW02	CMO N156B6-L06
Number of Pixel	1366 x 768	1366 x 768
Dot spacing (mm)	0.2588 (H) × 0.2588 (V)	0.2588 (H) × 0.2588 (V)
Display Colors	262,144 colors	262,144 colors

1.6.3 Inverter Board

Table 1-10 lists the FL inverter board specifications.

Table 1-6-1 FL inverter board specifications

Item		Specifications	
		Ampower T181095.01	SUMIDA TWS-449-308
Input	Voltage (V)	8~20	8~20
	Power (W)	7.5W	7.5W
Output	Voltage (Vrms)	612~945	612~945
	Current (f=55KHz)(mArms)	2.3±0.4 ~ 6.5±0.3	

1.7 Power Rails

Table 1-11 lists the power rail output specifications of Intel platform.

Table 1-6-1 Intel Power supply output rating

Name	BL6 Power supply (Yes/No)			
	Voltage [V]	Power OFF	Power OFF	No Battery
		Suspend mode	Boot mode	
+5VPCU	5	Yes	Yes	No
+5V	5	No	No	No
+5V_S5	5	No	No	No
+3VPCU	3.3	Yes	Yes	No
+3V_S5	3.3	Yes	No	No
+3V	3.3	No	No	No
+1.5VSUS	1.8	Yes	No	No
+SMDDR_VTERM	1.8	Yes	No	No
+SMDDR_VREF	1.8	Yes	No	No
+1.8V	1.8	No	No	No
+1.5V	1.5	No	No	No
+1.05v	1.05	No	No	No
VCC_CORE	0.1~1.5	No	No	No
+VGPU_CORE	0.9~1.2	No	No	No
+1.5_GPU	1.5	No	No	No

1.8 Batteries

The PC has the following two batteries.

- Main battery
- Real time clock (RTC) battery

Table 1-12 lists the specifications for these two batteries.

Table 1-8-1 Battery specifications

Battery Name		Battery Element	Output Voltage	Capacity
Main battery	6 Cells	Lithium ion	10.8 v	4400mAh/5600mAh
	12 cell		10.8v	9000mAh
Real time clock (RTC) battery	VARTA ML1220	Lithium ion	3V	16mAh

1.8.1 Main Battery

The main battery is the primary power supply for the computer when the AC adapter is not connected. In Standby, the main battery maintains the current status of the computer.

Battery Charging Control

Battery charging is controlled by a power supply microprocessor. The power supply microprocessor controls power supply and detects a full charge when the AC adaptor and battery are connected to the computer.

Battery Charge

When the AC adapter is connected, normal charging is used while the system is turned on and quick charge is used while the system is turned off. Refer to the following Table 1-14.

Table 1-8-2 Time required for charges of main battery

Condition	Charging Time
Power On Charge	About 12 hours-
Power Off Charge	About 4 hours

Charge is stopped in the following cases.

1. The main battery is fully charged
2. The main battery is removed
3. Main battery or AC adapter voltage is abnormal
4. Charging current is abnormal

Data preservation time

When turning off the power in being charged fully, the preservation time is as following Table 1-14.

Table 1-8-3 Data preservation time

Condition		Preservation time
Standby		About 3 days
Hibernation		About 1 month
Battery Pack	6 cell	Approximately 3 days(sleep mode)
	12 cell	Approximately 6 days(sleep mode)
Approximately 1 month(shutdown model, All type of battery pack)		

1.8.2 RTC Battery

The RTC battery provides the power supply to maintain the date, time, and other system information in memory.

Table 1-15 lists the Time required for charges of RTC battery and data preservation time.

Table 1-8-4 Time required for charges of RTC battery

Condition	Time
Power ON(Lights Power LED)	About 24 hours
Data preservation tome (Full-charged)	About a month

1.9 AC Adapter

The AC adapter is used to charge the battery.

Table 1-16 lists the AC adapter specifications.

Table 1-8-5 AC adapter specifications

Parameter	Specification		
With Led	DELTA/ LITE-ON/Chicony	DELTA/ LITE-ON	DELTA/ LITE-ON
Power	65W	75W	90W
Input voltage	AC 100V/240V		
Input frequency	50Hz/60Hz		
Input current	$\leq 1.5A$		
Output voltage	DC 19V		
Output current	3.42A	3.95A	4.74A

Chapter 2

Troubleshooting Procedures

2.1	Troubleshooting	1
2.2	Troubleshooting Flowchart.....	3
2.3	Power Supply Troubleshooting.....	8
	Procedure 1 Power Status Check	8
	Procedure 2 Connection Check.....	10
	Procedure 3 Charging Check	10
	Procedure 4 Replacement Check	11
2.4	System Board Troubleshooting.....	12
	Procedure 1 Message Check	12
	Procedure 2 Diagnostic Test Program Execution Check	13
	Procedure 3 Replacement Check	13
2.5	USB FDD Troubleshooting	14
	Procedure 1 FDD Head Cleaning Check	14
	Procedure 2 Diagnostic Test Program Execution Check	15
	Procedure 3 Connector Check and Replacement Check.....	16
2.6	2.5" HDD Troubleshooting.....	18
	Procedure 1 Partition Check.....	18
	Procedure 2 Message Check	19
	Procedure 3 Format Check.....	20
	Procedure 4 Diagnostic Test Program Execution Check	21
	Procedure 5 Connector Check and Replacement Check.....	22
2.7	Keyboard Troubleshooting	23
	Procedure 1 Diagnostic Test Program Execution Check	23
	Procedure 2 Connector Check and Replacement Check.....	24
2.8	Touch pad Troubleshooting	25
	Procedure 1 Diagnostic Test Program Execution Check	25
	Procedure 2 Connector Check and Replacement Check.....	26

2.9	Display Troubleshooting.....	27
	Procedure 1 External Monitor Check.....	27
	Procedure 2 Diagnostic Test Program Execution Check	27
	Procedure 3 Connector and Cable Check.....	28
	Procedure 4 Replacement Check	29
2.10	Optical Disk Drive(Blue-Ray ODD) Troubleshooting.....	30
	Procedure 1 Diagnostic Test Program Execution Check	30
	Procedure 2 Connector Check and Replacement Check.....	30
2.11	Modem Troubleshooting.....	31
	Procedure 1 Diagnostic Test Program Execution Check	31
	Procedure 2 Connector Check and Replacement Check.....	31
2.12	LAN Troubleshooting.....	33
	Procedure 1 Diagnostic Test Program Execution Check	33
	Procedure 2 Connector Check and Replacement Check.....	33
2.13	Wireless LAN Troubleshooting.....	34
	Procedure 1 Transmitting-Receiving Check	34
	Procedure 2 Antennas' Connection Check	35
	Procedure 3 Replacement Check	36
2.14	Sound Troubleshooting.....	37
	Procedure 1 Connector Check.....	37
	Procedure 2 Replacement Check	38
2.15	Camera Troubleshooting.....	39
	Procedure 1 Camera Execution Check.....	39
	Procedure 2 Connector Check and Replacement Check.....	39
2.16	USB Board/eSATA Troubleshooting	40
	Procedure 1 Diagnostic Test Program Execution Check	40
	Procedure 2 Connect Check and Replacement Check	40
2.17	HDMI Troubleshooting Troubleshooting	41
	Procedure 1 Connect Check and Replacement Check	41
	Procedure 2 External Monitor Check.....	41
2.18	3 in 1 Card Reader Troubleshooting.....	42

	Procedure 1	Media Card Check	42
	Procedure 2	Connector Check and Replacement Check.....	42
2.19		Bluetooth Troubleshooting	41
	Procedure 1	Connect Check and Replacement Check	43
2.20		3G Troubleshooting	44
	Procedure 1	Connect Check and Replacement Check	44
	Procedure 2	External Monitor Check.....	44

2.1 Troubleshooting

Chapter 2 describes how to determine which Field Replaceable Unit (FRU) in the computer is causing the computer to malfunction.

The FRUs covered are:

- | | | |
|-----------------|-----------------------|------------------------|
| 1. Power supply | 7. Display | 13. Camera |
| 2. System Board | 8. Optical Disk Drive | 14. USB Board/eSATA |
| 3. USB FDD | 9. Modem Board | 15. HDMI |
| 4. 2.5" HDD | 10. LAN | 16. 3 in 1 card reader |
| 5. Keyboard | 11. Wireless LAN | 17. Bluetooth |
| 6. Touch pad | 12. Sound | 18. 3G |

The Test Program operations are described in Chapter 3. Detailed replacement procedures are described in Chapter 4.

NOTE: *After replacing the system board or CPU, it is necessary to execute the subtest 01 initial configuration of the 3.3 Setting of the hardware configuration in Chapter 3. Also update with the latest BIOS as described in Appendix G "BIOS Rewrite Procedures"*

After replacing the LCD, update with the latest EC/KBC as described in Appendix H "EC/KBC Rewrite Procedures" to set the SVP parameter.

The implement for the Diagnostics procedures is referred to Chapter 3. Also, following implements are necessary:

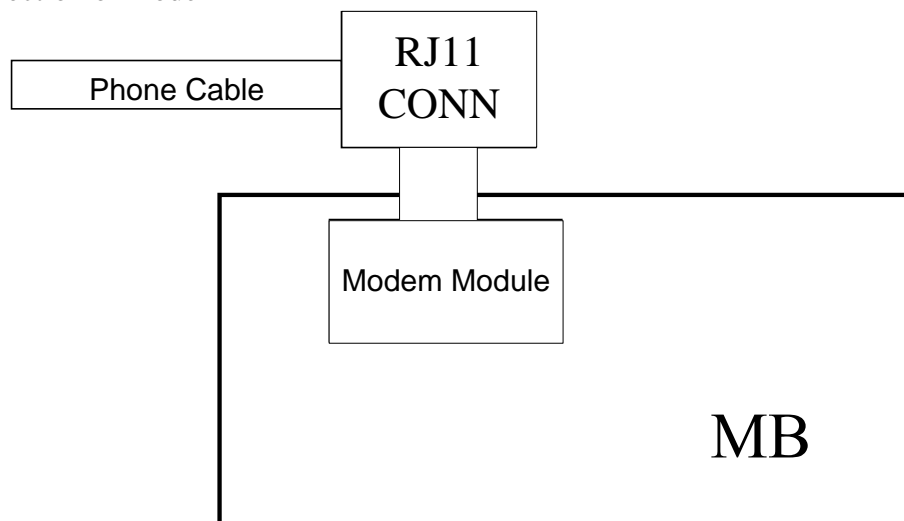
1. Phillips screwdrivers (For replacement procedures)
2. Implements for debugging port check
 - Toshiba Free-DOS system FD

There are following two types of connections in the figure of board and module connection in and after 2.3 Power Supply Troubleshooting.

(1) Cable connection is described in the figure as line.

(2) Pin connection is described in the figure as arrow.

<e.g.> Connection of modem



2.2 Troubleshooting Flowchart

Use the flowchart in Figure 2-1 as a guide for determining which troubleshooting procedures to execute. Before going through the flowchart steps, verify the following:

- Ask customer to enter the password if a password is registered.
- Verify with the customer that Toshiba Windows is installed on the hard disk. Non-Windows operating systems can cause the computer to malfunction.
- Make sure all optional equipment is removed from the computer.

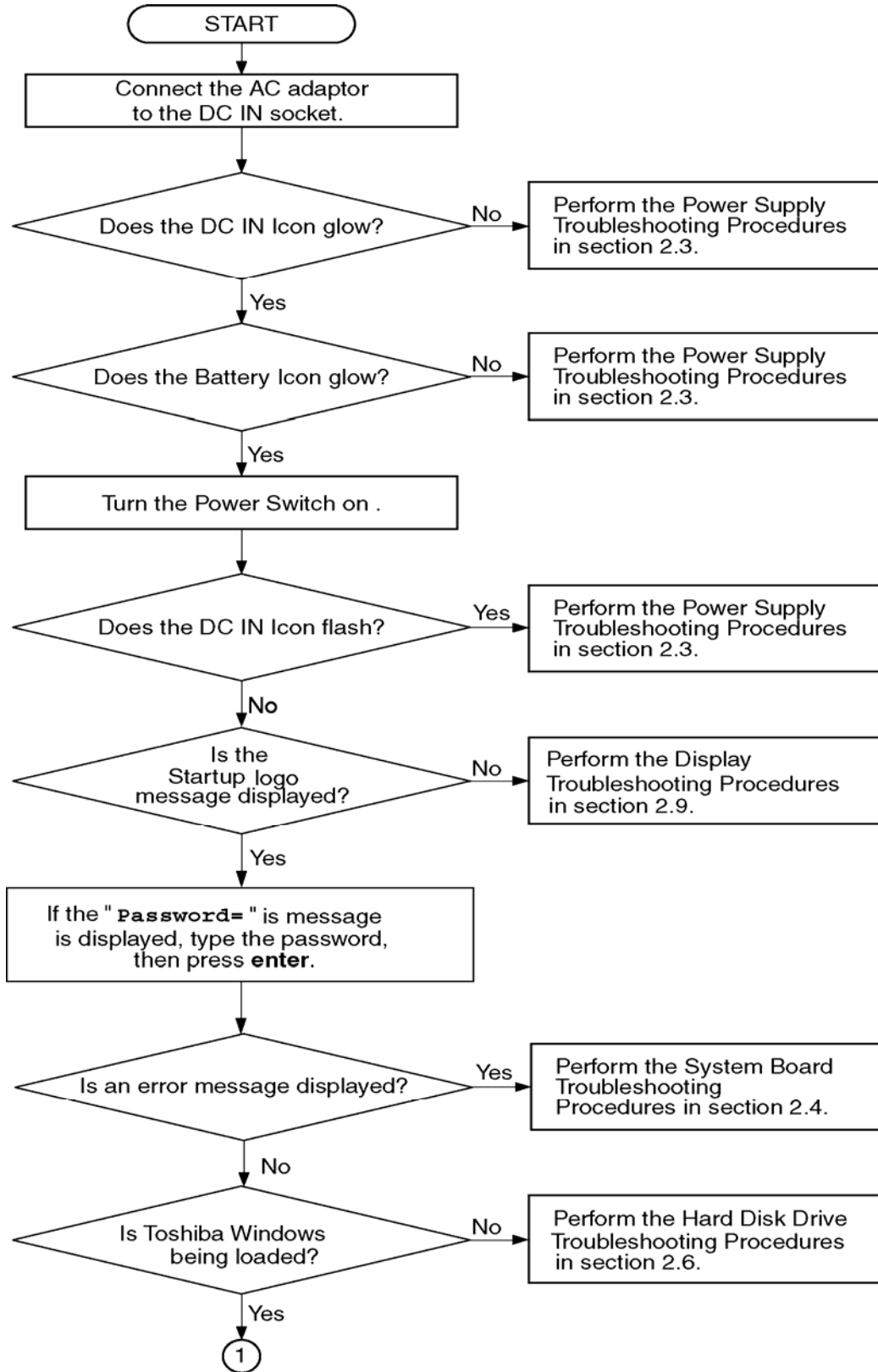


Figure 2-1 Troubleshooting flowchart (1/2)

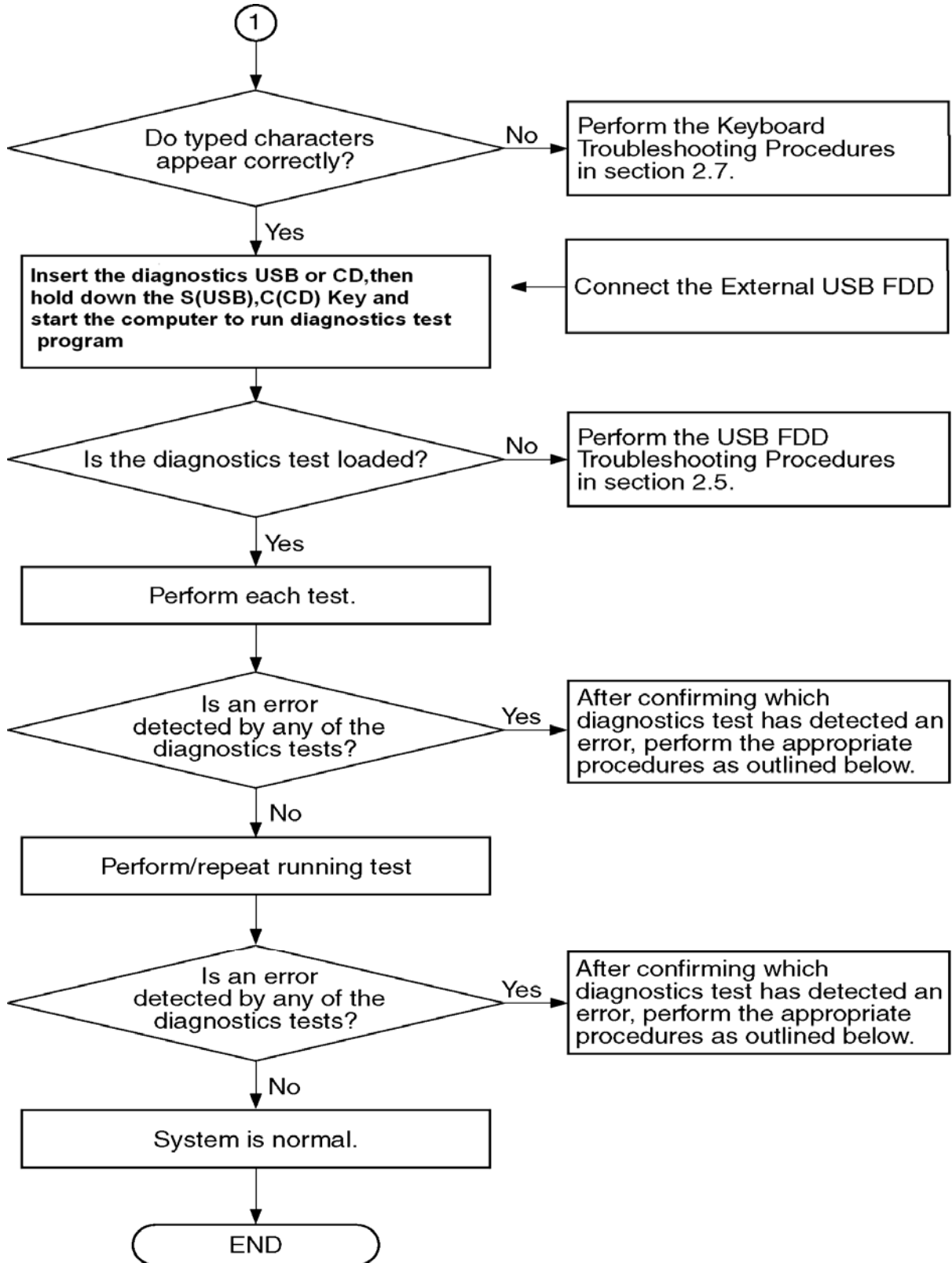


Figure 2-1 Troubleshooting flowchart (2/2)

If the diagnostics program cannot detect an error, the problem may be intermittent. The Test program should be executed several times to isolate the problem. Check the Log Utilities function to confirm which diagnostic test detected an error(s), and then perform the appropriate troubleshooting procedures as follows:

1. If an error is detected on the system test, memory test, display test, CD-ROM/DVD-ROM test, expansion test, real timer test, sound test or Modem/LAN/Bluetooth /IEEE1394 test, perform the System Board Troubleshooting Procedures in Section 2.4.
2. If an error is detected on the floppy disk test, perform the USB FDD Troubleshooting Procedures in Section 2.5.
3. If an error is detected on the hard disk test, perform the HDD Troubleshooting Procedures in Section 2.6.
4. If an error is found on the keyboard test and pressed key display test, perform the Keyboard Troubleshooting Procedures in Section 2.7.
5. If an error is found on the touch pad test, perform the touch pad Troubleshooting Procedures in Section 2.8.
6. If an error is detected on the display test, perform the Display Troubleshooting Procedures in Section 2.9.
7. If an error is detected on the CD-ROM/DVD-ROM test, perform the Optical Disk Drive Troubleshooting Procedures in Section 2.10.
8. If an error is detected on the modem test, perform the Modem Troubleshooting Procedures in Section 2.11.
9. If an error is detected on the LAN test, perform the LAN Troubleshooting Procedures in Section 2.12.
10. If an error is detected on the wireless LAN test, perform the Wireless LAN Troubleshooting Procedures in Section 2.13.
11. If an error is detected on the sound test, perform the Sound Troubleshooting Procedures in Section 2.14.
12. If an error is detected on the Camera test, perform the camera Troubleshooting Procedures in Section 2.15.
13. If an error is detected on the USB board test, perform the USB board Troubleshooting Procedures in Section 2.16.
14. If an error is detected on the HDMI test, perform the HDMI Troubleshooting Procedures in Section 2.17.

2 Troubleshooting Procedures

15. If an error is detected on the 3 in1 card reader test, perform the 3 in1 card reader Troubleshooting Procedures in Section 2.18.
16. If an error is detected on the Bluetooth test, perform the Bluetooth Troubleshooting Procedures in Section 2.19
17. If an error is detected on the 3G module test, perform the 3G module Troubleshooting Procedures in Section 2.20

2.3 Power Supply Troubleshooting

The power supply controller controls many functions and components. To determine if the power supply is functioning properly, start with Procedure 1 and continue with the other Procedures as instructed. The procedures described in this section are:

- Procedure 1: Power Status Check
- Procedure 2: Connection Check
- Procedure 3: Charging Check
- Procedure 4: Replacement Check

Procedure 1 Power Status Check

The following LED indicates the power supply status:

- Battery LED
- DC IN LED

The Power Supply control displays the power supply status with the Battery LED and the DC IN LED as listed in the tables below.

Table 2-1 Battery icon

Battery icon	Power supply status
Lights amber	Battery is charged and the AC adapter is connected. It has no relation with ON/OFF of the system power.
Lights red	Battery is fully charged and the external DC is input. It has no relation with ON/OFF of the system power.
Blinks amber (even intervals)	The battery level is low while the system power is ON.
Blinks amber once (at being switched on)	The system is driven by only a battery and the battery level is low.
Doesn't light	Any condition other than those above.

2 Troubleshooting Procedures

Table 2-2 DC IN icon

DC IN icon	Power supply status
Lights blue	DC power is being supplied from the AC adapter.
Blinks amber	Power supply malfunction ^{*1}
Doesn't light	Any condition other than those above.

*1 When the power supply controller detects a malfunction, the DC IN icon blinks amber.

When the icon is blinking, perform the following procedure.

1. Remove the battery pack and the AC adapter.
2. Re-attach the battery pack and the AC adapter.

If the icon is still blinking after the operation above, check the followings:

Check 1 If the DC IN icon blinks amber, go to Procedure 2.

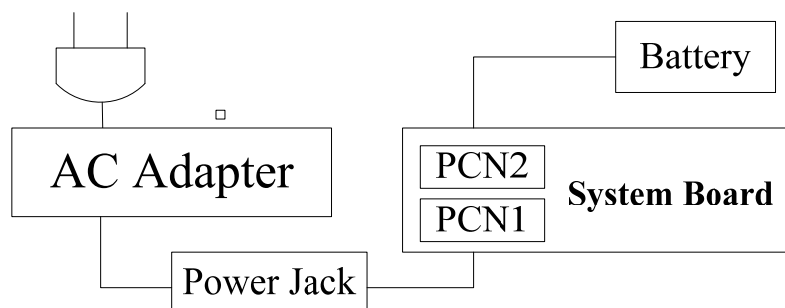
Check 2 If the DC IN icon does not light, go to Procedure 3.

Check 3 If the battery icon does not light orange or green, go to Procedure 4.

NOTE: Use a supplied AC adapter.

Procedure 2 Connection Check

The wiring diagram related to the power supply is shown below:



Any of the connectors may be disconnected. Perform Check 1.

- Check 1 Make sure the AC adapter and the AC power cord is firmly plugged into the DC IN connector and wall outlet. If these cables are connected firmly, go to Check 2.
- Check 2 Replace the AC adapter and the AC power cord with new ones.
- If the DC IN icon does not light, go to Procedure 4.
 - If the battery icon does not light, go to Check 3.
- Check 3 Make sure the battery pack is installed in the computer correctly. If the battery is properly installed and the battery icon still does not light, go to Procedure 4.

Procedure 3 Charging Check

Check if the power supply controller charges the battery pack properly. Perform the following procedures:

- Check 1 Make sure the AC adapter is firmly plugged into the DC IN socket.
- Check 2 Make sure the battery pack is properly installed. If it is properly installed, go to Check 3.
- Check 3 The battery pack may be completely discharged. Wait a few minutes to charge the battery pack while connecting the battery pack and the AC adapter. If the battery pack is still not charged, go to Check 4.
- Check 4 The battery's temperature is too high or low. Leave the battery for a while to adjust it in the right temperature. If the battery pack is still not charged, go to Check 5.
- Check 5 Replace the battery pack with a new one. If the battery pack is still not charged, go to Procedure 4.

Procedure 4 Replacement Check

The power is supplied to the system board by the AC adapter. If either the AC adapter or the system board was damaged, perform the following Checks.

To disassemble the computer, follow the steps described in Chapter 4, *Replacement Procedures*.

When AC adapter is connected;

Check 1 AC adapter may be faulty. Replace the AC adapter with a new one. If the problem still occurs, perform Check 2.

Check 2 System board may be faulty. Replace the system board with a new one.

When AC adapter is not connected ;
(When driving with battery pack)

Check 1 Battery pack may be faulty. Replace it with a new one. If the problem still occurs, perform Check 2.

Check 2 System board may be faulty. Replace it with a new one.

2.4 System Board Troubleshooting

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

Procedure 1: Message Check

Procedure 2: Diagnostic Test Program Execution Check

Procedure 3: Replacement Check

Procedure 1 Message Check

When the power is turned on, the system performs the Power On Self Test (POST) installed in the BIOS ROM. The POST tests each IC on the system board and initializes it.

- If an error message is shown on the display, perform Check 1.
- If there is no error message, go to Procedure 2.
- If Free-DOS or Windows XP is properly loaded, go to Procedure 4.

Check 1 If one of the following error messages is displayed on the screen, press the **F2** key as the message instructs. These errors occur when the system configuration preserved in the RTC memory (CMOS type memory) is not the same as the actual configuration or when the data is lost.

If you press the **F2** key as the message instructs, the **SETUP** screen appears to set the system configuration. If error message (b) appears often when the power is turned on, replace the RTC battery.

Procedure 2 Diagnostic Test Program Execution Check

Execute the following tests from the Diagnostic Test Menu. These tests check the system board. Refer to Chapter 3, *Tests and Diagnostic*, for more information on how to perform these tests.

1. System test
2. Memory test
3. Keyboard test
4. Display test
5. Floppy Disk test
6. VGA test
7. VGA Memory test
8. Hard Disk test
9. CPU Temperature test
10. Main Battery test
11. BIOS test
12. CD-ROM/DVD-ROM test
13. System Status LED test
14. Wireless LAN test
15. LAN/Modem/Sound test
16. UUID test-DMI Information (Write DMI)

If an error is detected during these tests, go to Procedure 3.

Procedure 3 Replacement Check

System board may be faulty. Disassemble the computer following the steps described in Chapter 4, *Replacement Procedures* and replace system board with a new one.

2.5 USB FDD Troubleshooting

To check if the USB FDD is malfunctioning or not, follow the troubleshooting procedures below as instructed.

Procedure 1: FDD Head Cleaning Check

Procedure 2: Diagnostic Test Program Execution Check

Procedure 3: Connector Check and Replacement Check

Procedure 1 FDD Head Cleaning Check

FDD head cleaning is one option available in the Diagnostic Program.

After connecting USB FDD, insert the Diagnostics Disk in the floppy disk drive. Turn on the computer and run the test. And then clean the FDD heads using the cleaning kit. If the FDD still does not function properly after cleaning, go to Procedure 2.

Detailed operation is given in Chapter 3, *Tests and Diagnostics*.

If the test program cannot be executed on the computer, go to Procedure 3.

Procedure 2 Diagnostic Test Program Execution Check

Insert the Diagnostics Disk in the USB FDD, turn on the computer and run the test. Refer to Chapter 3, *Tests and Diagnostics*, for more information about the diagnostics test procedures.

Make sure the floppy disk is formatted correctly and that the write protect tab is disabled. Floppy disk drive test error codes and their status names are listed in Table 2-7. If any other errors occur while executing the FDD diagnostics test, go to Check 1.

Table 2-7 FDD error code and status

Code	Status
01h	Bad command
02h	Address mark not found
03h	Write protected
04h	Record not found
06h	Media replaced
08h	DMA overrun error
09h	DMA boundary error
10h	CRC error
20h	FDC error
40h	Seek error
60h	FDD not drive
80h	Time out error (Not ready)
EEh	Write buffer error
FFh	Data compare error

Check 1 If the following message is displayed, disable the write protect tab on the floppy disk by sliding the write protect tab to “write enable”. If any other message appears, perform Check 2.

Write protected

Check 2 Make sure the floppy disk is formatted correctly. If it is, go to Procedure 3.

Procedure 3 Connector Check and Replacement Check

USB FDD is connected to USB port on system board and US board. US board is also connected to system board by cable. The connection of cable and board may be defective. Otherwise, they may be faulty. Disassemble the computer following the steps described in Chapter 4, *Replacement Procedures* and perform the following checks.

USB FDD can be connected to the following 4 ports on system board.

Check 1 Make sure USB FDD is firmly connected to USB port. If the connection is loose, connect firmly and repeat Procedure 2. If the problem still occurs, go to Check 2.

NOTE: When checking the connection, be sure to check it with care for the followings.

1. Cable can not be disconnected from the connector.
2. Cable is connected straight to the connector.
3. Cable is connected all the way seated in the connector.
4. Cable can not be broken.

Check 2 USB FDD may be faulty. Replace it with a new one. If the problem still occurs, perform Check 3.

Check 3 Connect USB FDD to each port embedded on system board.

If it does not work properly when connected to CN12, CN19, CN20 or all ports, perform Check 4.

Check 4 System board may be faulty. Replace it with a new one following the steps in Chapter 4, *Replacement Procedures*.

2.6 2.5” HDD Troubleshooting

To check if 2.5” HDD is malfunctioning or not, follow the troubleshooting procedures below as instructed.

Procedure 1: Partition Check

Procedure 2: Message Check

Procedure 3: Format Check

Procedure 4: Diagnostic Test Program Execution Check

Procedure 5: Connector Check and Replacement Check

CAUTION: *The contents of the hard disk will be erased when the 2.5” HDD troubleshooting procedures are executed. Transfer the contents of the hard disk to floppy disks or other storage drive(s). For the backup, refer to the User’s Manual.*

Procedure 1 Partition Check

Insert the Toshiba MS-DOS system disk and start the computer. Perform the following checks:

- Check 1 Input **C:** and press **Enter**. If you cannot change to drive C, go to Check 2. If you can change to drive C, go to Procedure 2.
- Check 2 Input **FDISK** and press **Enter**. Choose Display Partition Information from the FDISK menu. If drive C is listed in the Display Partition Information, go to Check 3. If drive C is not listed, return to the FDISK menu and choose the option to create a DOS partition or a logical DOS drive on drive C. If the problem still occurs, go to Procedure 2.
- Check 3 If drive C is listed as active in the FDISK menu, go to Check 4. If drive C is not listed as active, return to the FDISK menu and choose the option to set the active partition for drive C. Then go to Procedure 2.
- Check 4 Remove the system disk from the FDD and reboot the computer. If the problem still occurs, go to Procedure 2. Otherwise, the 2.5” HDD is operating normally.

Procedure 2 Message Check

When the power is turned on, the system performs the Initial Reliability Test (IRT) installed in the BIOS ROM. When the test detects an error, an error message is displayed on the screen.

Make sure no floppy disk is in the FDD. Turn on the computer and check the message on the screen. When an OS starts from the 2.5" HDD, go to Procedure 3. Otherwise, start with Check 1 below and perform the other checks as instructed.

Check 1 If either of the following messages appears, go to Check 3. If the following messages do not appear, perform Check 3.

```
Insert system disk in drive
Press any key when ready .....
```

or

```
Non-System disk or disk error
Replace and press any key when ready
```

Check 2 Using the SYS command of the Free-DOS, transfer the system to the 2.5" HDD. If the system is not transferred, go to Procedure 3. Refer to the Free -DOS Manual for detailed operation.

If the following message appears on the display, the system program has been transferred to the HDD.

```
System Transferred
```

If an error message appears on the display, perform Check 3.

Check 3 2.5" HDD(s) and the connector(s) of system board may be defective (Refer to the steps described in Chapter 4, *Replacement Procedures* for disassembling.). Insert HDD(s) to the connector(s) firmly. If it is (or they are) firmly connected, go to Procedure 3.

Procedure 3 Format Check

The computer's HDD is formatted using the Free -DOS FORMAT program or the physical format program of the test program. To format the HDD, start with Check 1 below and perform the other steps as required.

Refer to the Free -DOS Manual for the operation of Free -DOS. For the format by the test program, refer to the Chapter 3.

Check 1 Format a 2.5" HDD using Free -DOS FORMAT command. Type as **FORMAT C:/S/U**.

 If 2.5" HDD can not be formatted, perform Check 2.

Check 2 Using the Free -DOS FDISK command, set the 2.5" HDD partition. If the partition is not set, go to Check 3. If it is set, format 2.5" HDD using Free -DOS FORMAT command.

Check 3 Using the Diagnostic Disk, format 2.5" HDD with a format option (physical format). If HDD is formatted, set the 2.5" HDD partition using Free -DOS FDISK command.

 If you cannot format 2.5" HDD using the Tests and Diagnostic program, go to Procedure 4.

Procedure 4 Diagnostic Test Program Execution Check

The HDD test program is stored in the Diagnostics Disk. Perform all of the HDD tests in the Hard Disk Drive Test. Refer to Chapter 3, *Tests and Diagnostics*, for more information about the HDD test program.

If an error is detected during the HDD test, an error code and status will be displayed. The error codes and statuses are described in Table 2-8. If an error code is not displayed but the problem still occurs, go to Procedure 5.

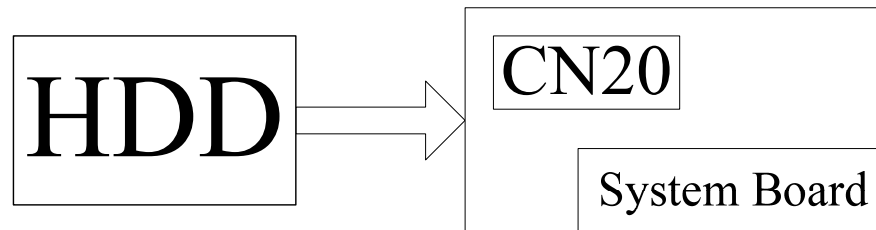
Table 2-8 2.5" Hard disk drive error code and status

Code	Status
01	Bad Command Error
02	Bad Address Mark Error
04	Record Not Found
05	HDC Not Reset Error
07	Drive Not Initialized
09	DMA Boundary Error
0A	Bad Sector
0B	Bad Track Error
10	ECC Error
11	ECC Recover Enabled
20	HDC Error
40	Seek Error
80	Time Out Error
AA	Drive Not Ready
BB	Undefined Error
CC	Write Fault
E0	Status Error
F0	No Sense Error
??	Other Error

Procedure 5 Connector Check and Replacement Check

HDD(s) is/are connected to the connector(s) on the system board. The connection of HDD(s) and board may be defective. Otherwise, they may be faulty. Disassemble the computer following instructions in Chapter 4, *Replacement Procedures* and perform the following checks.

- Check 1 Make sure HDD(s) is/are firmly connected to the connector(s) on the system board.



If any of the connections are loose, reconnect firmly and repeat Procedure 1. If the problem still occurs, go to Check 2.

- Check 2 (One of) HDD(s) may be faulty. Replace it with a new one following the instructions in Chapter 4, *Replacement Procedures* and check the operation. If the problem still occurs, perform Check 3.
- Check 3 System board may be faulty. Replace it with a new one following the instructions in Chapter 4, *Replacement Procedures*.

2.7 Keyboard Troubleshooting

To check if the computer's keyboard is malfunctioning or not, follow the troubleshooting procedures below as instructed.

Procedure 1: Diagnostic Test Program Execution Check

Procedure 2: Connector and Replacement Check

Procedure 1 Diagnostic Test Program Execution Check

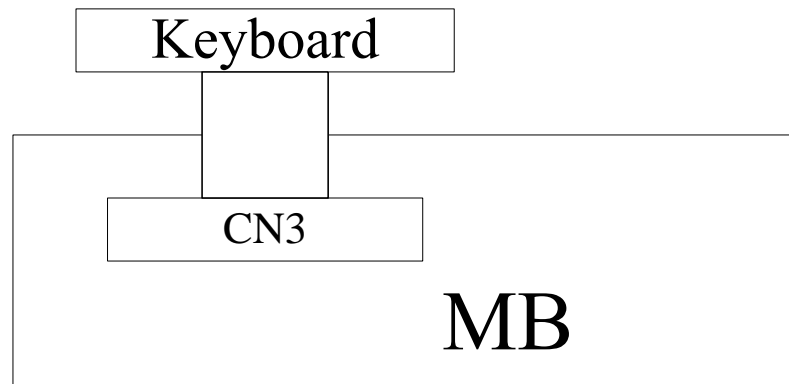
Execute the Keyboard Test (DIAGNOSTIC TEST) and Pressed key display test (ONLY ONE TEST) in the Diagnostic Program. Refer to Chapter 3, *Tests and Diagnostics*, for more information on how to perform the test program.

If an error occurs, go to Procedure 2. If an error does not occur, keyboard is functioning properly.

Procedure 2 Connector and Replacement Check

The connection of cable and board may be defective. Otherwise, they may be faulty. Disassemble the computer following the steps described in Chapter 4, *Replacement Procedures*, and perform the following checks:

Check 1 Make sure keyboard cable is firmly connected to system board.



If the connection is loose, reconnect firmly and repeat Procedure 1. If the problem still occurs, go to Check 2.

Check 2 Keyboard may be faulty. Replace it with a new one following the instructions in Chapter 4, *Replacement Procedures*. If the problem still occurs, perform Check 3.

Check 3 System board may be faulty. Replace it with a new one following the instructions in Chapter 4, *Replacement Procedures*.

2.8 Touch pad Troubleshooting

To check if the computer's touch pad is malfunctioning or not, follow the troubleshooting procedures below as instructed.

Procedure 1: Diagnostic Test Program Execution Check

Procedure 2: Connector and Replacement Check

Procedure 1 Diagnostic Test Program Execution Check

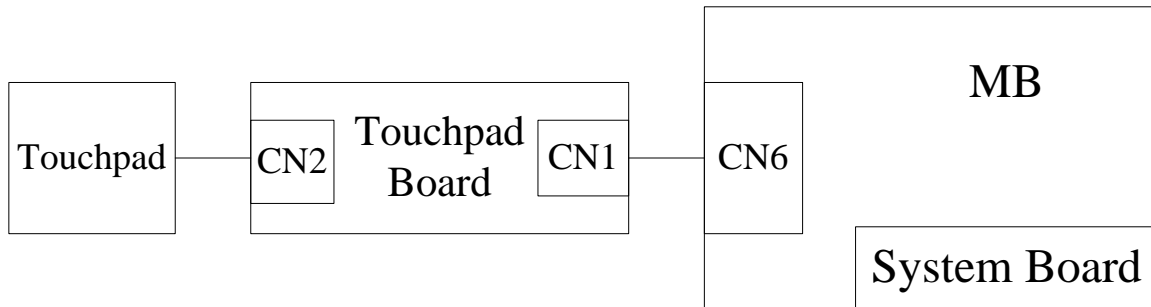
Execute the Touch pad test (ONLY ONE TEST) in the Diagnostic Program. Refer to Chapter 3, *Tests and Diagnostics*, for more information on how to perform the test program.

If an error occurs, go to Procedure 2. If an error does not occur, touch pad is functioning properly.

Procedure 2 Connector and Replacement Check

The connection of cable and board may be defective. Otherwise, they may be faulty. Disassemble the computer following the steps described in Chapter 4, *Replacement Procedures*, and perform the following checks:

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



If the connection loose, reconnect firmly and repeat Procedure 1. If the problem still occurs, go to Check 2.

Check 2 Touch Pad or the cable may be faulty. Replace it with a new one following the instructions in Chapter 4, *Replacement Procedures*. If the problem still occurs, perform Check 3.

Check 3 System board may be faulty. Replace it with a new one following the instructions in Chapter 4, *Replacement Procedures*

2.9 Display Troubleshooting

To check if the computer's display is malfunctioning or not, follow the troubleshooting procedures below as instructed.

Procedure 1: External Monitor Check

Procedure 2: Diagnostic Test Program Execution Check

Procedure 3: Connector and Cable Check

Procedure 4: Replacement Check

Procedure 1 External Monitor Check

Connect an external monitor to the computer's external monitor port, then boot the computer. The computer automatically detects the external monitor.

If the external monitor works correctly, the internal LCD may be faulty. Go to Procedure 3.

If the external monitor appears to have the same problem as the internal monitor, system board may be faulty. Go to Procedure 2.

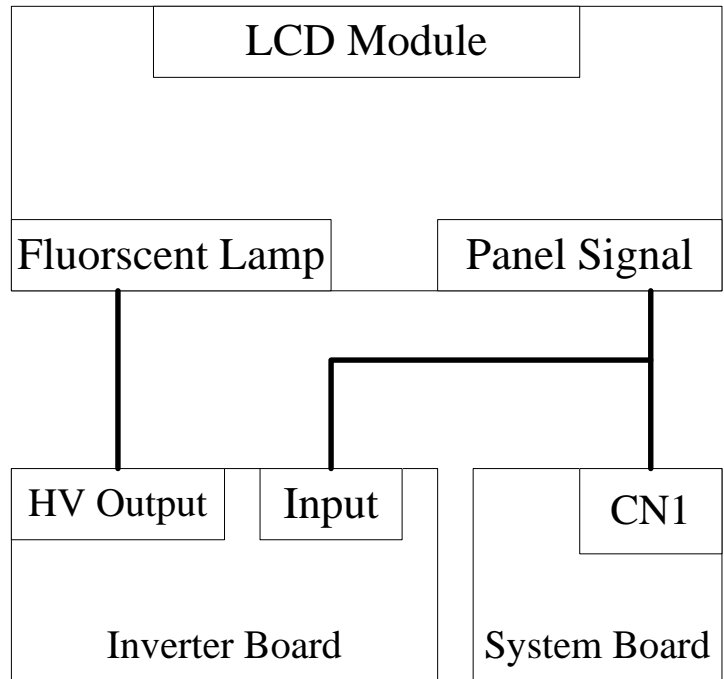
Procedure 2 Diagnostic Test Program Execution Check

The Display Test program is stored in Diagnostics disk. This program checks the display controller on system board. Insert the Diagnostics disk in the USB FDD, turn on the computer and run the test. Refer to Chapter 3, *Tests and Diagnostics* for details. If an error is detected, go to Procedure 3.

Procedure 3 Connector and Cable Check

LCD Module is connected to system board by an LCD/FL cable. FL inverter board is also connected to system board by an LCD/FL cable. And, fluorescent lamp is connected to FL inverter board by HV cable. Their cables may be disconnected from system board or FL inverter board. Disassemble the computer following the steps described in Chapter 4, *Replacement Procedures*.

If the connection is loose, reconnect firmly and restart the computer. If the problem still occurs, go to Procedure 4.



Procedure 4 Replacement Check

Fluorescent lamp, FL inverter, LCD module, HV cable and LCD/FL cable are connected to display circuits. Any of these components may be faulty. Refer to Chapter 4, *Replacement Procedures*, for instructions on how to disassemble the computer and then perform the following checks:

If f LED backlight does not light, perform Check 1.

If characters or graphics on the internal display are not displayed clearly, perform Check 4.

If some screen functions do not operate properly, perform Check 4.

If LED backlight remains lit when the display is closed, perform Check 5.

Check 1 LCD/FL cable may be faulty. Replace FL/LCD cable with a new one following the instructions in Chapter 4, *Replacement Procedure* and test the display again. If the problem still occurs, perform Check 2.

Check 2 FL inverter may be faulty. Replace FL inverter with a new one following the instructions in Chapter 4, *Replacement Procedure* and test the display again. If the problem still occurs, perform Check 3.

Check 3 LCD module may be faulty. Replace LCD module with a new one following the instructions in Chapter 4, *Replacement Procedure* and test the display again. If the problem still occurs, perform Check 4.

Check 4 System board may be faulty. Replace it with a new one following the instructions in Chapter 4, *Replacement Procedure*.

2.10 Optical Disk Drive (Blue-Ray ODD) Troubleshooting

To check if optical disk drive (including Blue-Ray) is malfunctioning or not, follow the troubleshooting procedures below as instructed.

Procedure 1: Diagnostic Test Program Execution Check

Procedure 2: Connector Check and Replacement Check

Procedure 1 Diagnostic Test Program Execution Check

Execute the CD-ROM/DVD-ROM Test in the Diagnostic Program. Refer to Chapter 3, *Tests and Diagnostics* for more information on how to perform the test program.

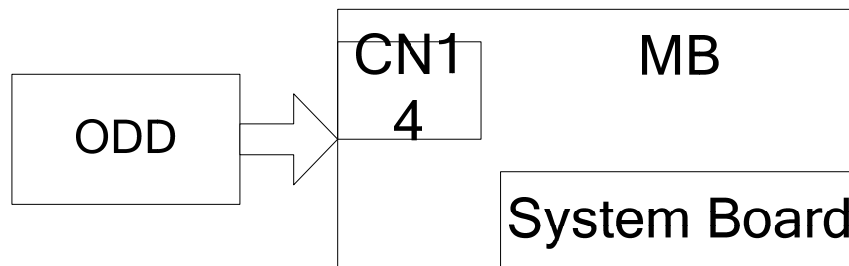
Prepare the tools before the test.

If any error is detected by the test, go to Procedure 2.

Procedure 2 Connector Check and Replacement Check

The connection of optical disk drive and system board may be defective. Otherwise, they may be faulty. Disassemble the computer following the steps described in Chapter 4 and perform the following checks:

Check 1 Make sure optical disk drive is firmly connected to the connector on system board.



If the connection is loose, reconnect it firmly and return to Procedure 2. If the problem still occurs, perform Check 2.

Check 2 Optical disk drive may be faulty. Replace it with a new one following the steps in Chapter 4. If the problem still occurs, perform Check 3.

Check 3 System board may be faulty. Replace it with new one following the instructions in Chapter 4.

2.11 Modem Troubleshooting

To check if modem is malfunctioning or not, follow the troubleshooting procedures below as instructed.

Procedure 1: Diagnostic Test Program Execution Check

Procedure 2: Connector Check and Replacement Check

Procedure 1 Diagnostic Test Program Execution Check

Execute Modem test in the LAN/Modem/Bluetooth/IEEE1394 test program. Refer to Chapter 3, *Tests and Diagnostics* for more information on how to perform the test program.

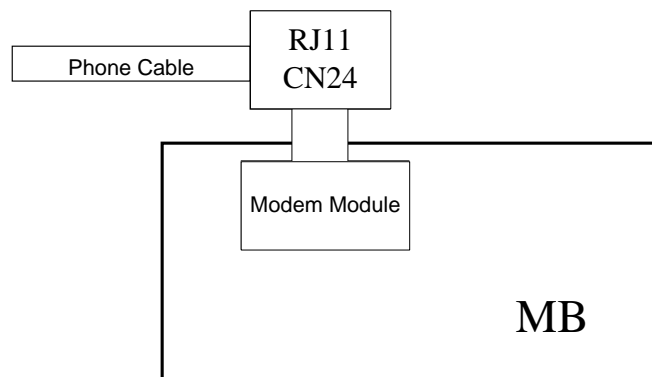
If any error is detected, perform Procedure 2.

Procedure 2 Connector Check and Replacement Check

MDC (Modem Daughter Card) is used as the modem for this computer. MDC is connected to system board by connector CN24. And also, MDC is connected to system and LAN board by modem cable. If modem malfunctions, the connection of cable, board and module may be defective. Otherwise, they may be faulty.

Disassemble the computer following the steps described in Chapter 4 and perform the following checks:

Check 1 Make sure the following connections are firmly connected.



If any connector is disconnected, connect it firmly and return to Procedure 1. If the problem still occurs, perform Check 2.

Troubleshooting Procedures

- Check 2 Modem cable may be faulty. Replace it with a new one. If the problem still occurs, perform Check 3.
- Check 3 MDC may be faulty. Replace it with a new one following the steps in Chapter 4. If the problem still occurs, perform Check 4.
- Check 4 Cable between MDC and system board may be faulty. Replace it with a new one following the instructions in Chapter 4. If the problem still occurs, perform Check 5.
- Check 6 System board may be faulty. Replace it with a new one following the instruction in Chapter 4.

2.12 LAN Troubleshooting

To check if the computer's LAN is malfunctioning or not, follow the troubleshooting procedures below as instructed.

Procedure 1: Diagnostic Test Program Execution Check

Procedure 2: Connector Check and Replacement Check

Procedure 1 Diagnostic Test Program Execution Check

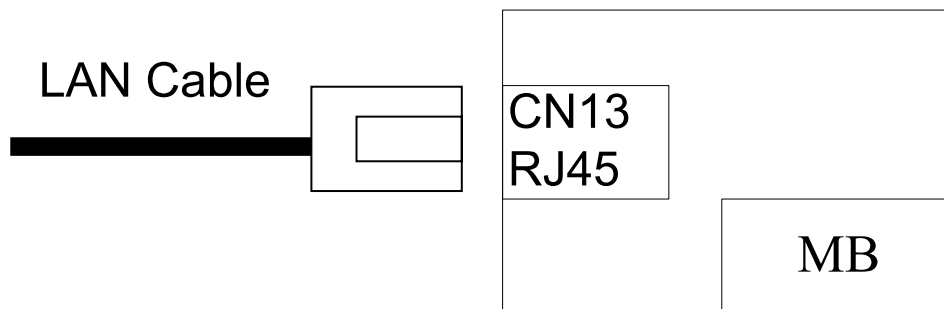
Execute LAN test in the LAN/Modem test program. Refer to Chapter 3, *Tests and Diagnostics* for more information on how to perform the test program.

If any error is detected by the test, go to Procedure 2.

Procedure 2 Connector Check and Replacement Check

The LAN function is embedded on system board. If LAN malfunctions, its connection is defective or LAN cable and system board may be faulty.

Check 1 Make sure LAN cable is firmly connected to the connector CN13. If the problem still occurs, perform Check 2.



Check 2 LAN cable may be faulty. Replace it with a new one. If the problem still occurs, perform Check 3.

Check 3 System board may be faulty. Replace it with a new one following the instruction in Chapter 4.

2.13 Wireless LAN Troubleshooting

To check if the computer's Wireless LAN is malfunctioning or not, follow the troubleshooting procedures below as instructed.

Procedure 1: Transmitting-Receiving Check

Procedure 2: Antennas' Connection Check

Procedure 3: Replacement Check

Procedure 1 Transmitting-Receiving Check

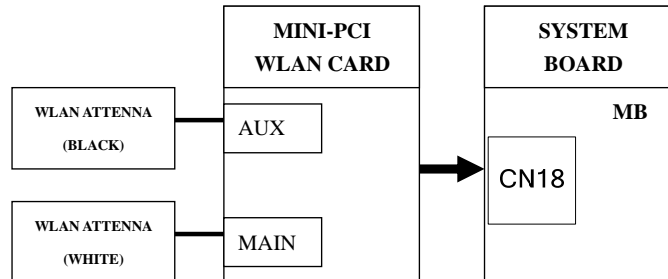
Before starting the test, make sure the wireless communication is Enabled in BIOS setup

Check 1 Execute Wireless LAN test program to check the transmitting-receiving function of wireless LAN. You will need a second computer that can communicate by wireless LAN. Perform the test following the instructions described in Chapter 3.

If the computer passes the test, the function is correctly working. If the computer does not pass the test, perform Procedure 2.

Procedure 2 Antennas' Connection Check

The wireless LAN function-wiring diagram is shown below:



Any of the connections may be defective. Disassemble the computer following the steps described in Chapter 4, *Replacement Procedures*, and perform the following checks:

- Check 1 Make sure the wireless communication is Enabled in BIOS setup.
If the Wireless communication is "Disabled", change it to "Enabled". If the problem still occurs, perform Check 2.

- Check 2 Make sure wireless LAN card (Mini-PCI) is firmly connected to the CN2200 on system board. If the connector is defective, connect it firmly and perform Procedure 1. If the problem still occurs, perform Check 3.

- Check 3 Make sure that wireless LAN antenna cables (black and white) are firmly connected to the connectors on Wireless LAN card. If wireless LAN antenna cables are not connected properly, connect them firmly and perform Procedure 1. If the problem still occurs, go to the procedure 3.

Procedure 3 Replacement Check

Wireless LAN card, wireless LAN antenna or system board may be faulty. Refer to Chapter 4, *Replacement Procedures*, for instructions on how to disassemble the computer and then perform the following checks:

- Check 1 Wireless LAN antenna may be faulty. Replace it with a new one following the instructions in Chapter 4, *Replacement Procedures*. If the problem still occurs, perform Check 2.

- Check 2 Wireless LAN card may be faulty. Replace it with a new one following the instructions in Chapter 4, *Replacement Procedures*. If the problem still occurs, perform Check 3.

- Check3 System board may be faulty. Replace it with a new one following the instructions in Chapter 4, *Replacement Procedures*.

2.14 Sound Troubleshooting

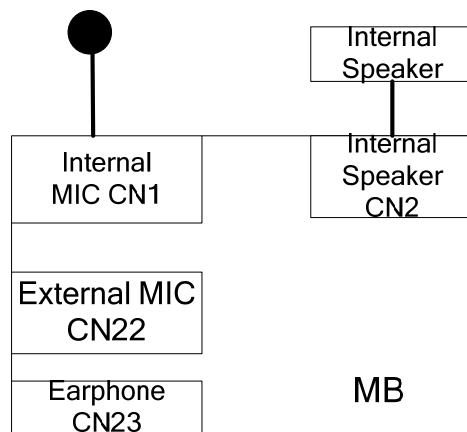
To check if the sound function is malfunctioning or not, follow the troubleshooting procedures below as instructed.

Procedure 1: Connector Check

Procedure 2: Replacement Check

Procedure 1 Connector Check

The connection of sound system is shown in the following figure.



As the connection may be defective, disassemble the PC and check each connection.

If the problem still occurs, go to Procedure 2.

Procedure 2 Replacement Check

- If External microphone/Headphone does not work properly, perform check 1.
- If internal microphone /Speaker do not work properly, perform check 2.
- If HP out does not work properly, perform check 3.
- If Volume control does not work properly, perform check 4.

Check 1 External microphone/Headphone may be faulty. Replace it with a new one following the steps in Chapter 4. If the problem still occurs, perform Check 5.

Check 2 Internal microphone /Speaker may be faulty. Replace it with a new one following the steps in Chapter 4. If the problem still occurs, perform Check 5.

Check 3 HP out may be faulty. Replace it with a new one following the steps in Chapter 4. If the problem still occurs, perform Check 5.

Check 4 Volume control may be faulty. Replace it with a new one following the steps in Chapter 4. If the problem still occurs, perform Check 6.

Check 5 Flat cable between AD board/Speaker and system board may be faulty. Replace it with new cable following the instructions in Chapter 4. If the problem still occurs, perform Check 6.

Check 6 Audio board/System board may be faulty. Replace it with a new one following the instructions in Chapter 4.

2.15 Camera Troubleshooting

To check if the computer's Camera is malfunctioning or not, follow the troubleshooting procedure below as instructed.

Procedure 1: Camera Execution Check

Procedure 2: Connect Check and Replacement Check

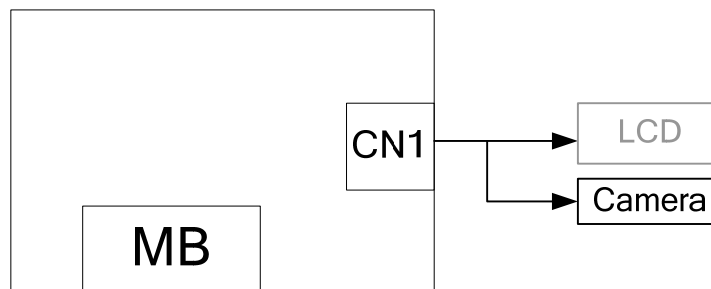
Procedure 1 Camera Execution Check

Open photo/video tool to look if there is an image. If not, go to Procedure 2.

Procedure 2 Connect Check and Replacement Check

The CCD cable is connected to system board integrated with LCD cable. If camera malfunctions, its connection may be defective or LCD/CCD cable and system board may be faulty.

Check 1 Make sure the other side of CCD cable is correctly and firmly inserted to the CN3/CN8 in MB. If the problem still occurs, perform Check 2.



Check 2 CCD cable may be faulty. Replace it with a new one. If the problem still occurs, perform Check 3.

Check 3 Camera may be faulty. Replace it with a new one following the instruction in Chapter 4.

Check 4 System board may be faulty. Replace it with a new one following the instruction in Chapter 4.

2.16 USB Board/eSATA Troubleshooting

To check if the computer's USB/eSATA port is malfunctioning or not, follow the troubleshooting procedures below as instructed.

Procedure 1: Diagnostic Test Program Execution Check

Procedure 2: Connect Check and Replacement Check

Procedure 1 Diagnostic Test Program Execution Check

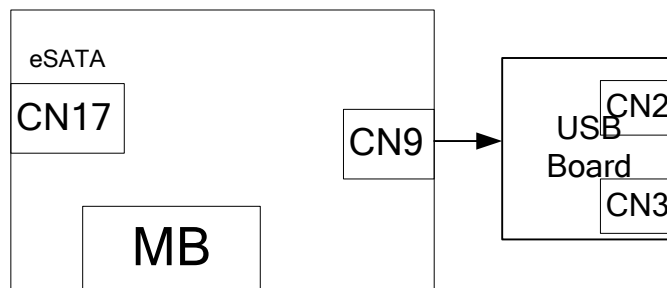
Execute USB test in the USB test program.

If any error is detected by the test, go to Procedure 2.

Procedure 2 Connect Check and Replacement Check

Right side USB port is connected to system board with USB Board by cable. These cables may be disconnected from system board. Disassemble the computer following the steps described in Chapter 4, *Replacement Procedures*.

Check 1 Make sure USB cable is correctly and firmly inserted. If the problem still occurs, perform Check 2.



Check 2 USB board/eSATA may be faulty. Replace it with a new one. If the problem still occurs, perform Check 3.

Check 3 The system board may be faulty. Replace it with a new one following the instruction in Chapter 4.

2.17 HDMI Troubleshooting

To check if the computer's HDMI is malfunctioning or not, follow the troubleshooting procedures below as instructed.

Procedure 1: External HDMI Monitor Check

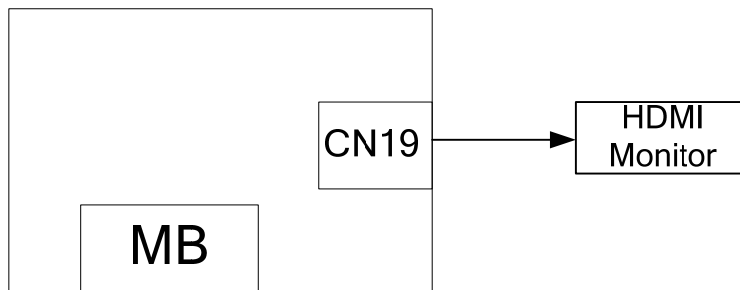
Procedure 2: Connector and Cable Check

Procedure 3: Replacement Check

Procedure 1 Connector Check and Replacement Check

The HDMI port is connected to system board. If HDMI malfunctions, its connection is defective or HDMI cable and system board may be faulty.

Check 1 Make sure HDMI cable is firmly connected to the connector CN19 (system board). If the problem still occurs, perform Procedure 2.



Procedure 2 External Monitor Check

Connect an external monitor to the computer's HDMI port, and then boot the computer. The computer automatically detects the external monitor.

If the external monitor works correctly, the internal LCD may be faulty. Replace it with a new one following the instruction in Chapter 4

If the external monitor appears to have the same problem as the internal monitor, system board may be faulty. Replace it with a new one following the instruction in Chapter 4.

2.18 3 in 1 Card Reader Troubleshooting

To check if the computer's 3 In 1 Card Reader is malfunctioning or not, follows the troubleshooting procedures below as instructed.

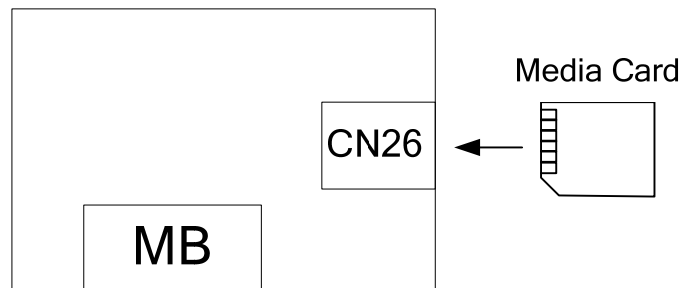
Procedure 1: Media Card Check

Procedure 2: Connector Check and Replacement Check

Procedure 1 Media Card Check

The media Card maybe fault, so please change a new media card and re-test the 3 in 1 card reader to check if the card reader is malfunctioning or not.

If any error is detected, perform Procedure 2.



Procedure 2 Connector Check and Replacement Check

The 3 in 1 card reader function is embedded on system board. If card reader malfunctions, its connection is defective or media card and system board may be faulty.

Check 1 make sure push the media card into card reader absolute. If the problem still occurs, perform Check2

Check 2 System board may be faulty. Replace it with a new one following the instruction in Chapter 4.

2.19 Bluetooth Troubleshooting

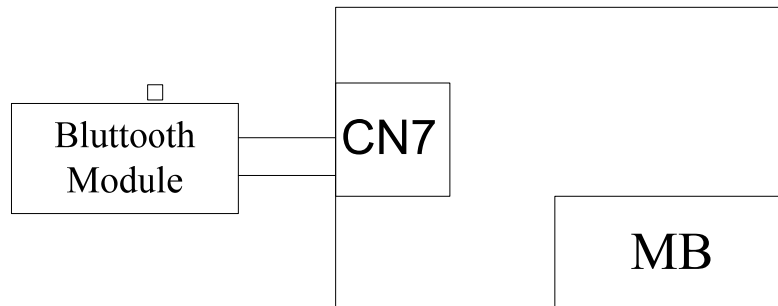
To check if the computer's Bluetooth is malfunctioning or not, follow the troubleshooting procedure below as instructed.

Procedure 1: Connector Check and Replacement Check

Procedure 1 Connector Check and Replacement Check

The Bluetooth function is connected to system board. If Bluetooth malfunctions, its connection is defective or Bluetooth cable and system board may be faulty.

Check 1 Make sure Bluetooth cable is firmly connected to the connector. If the problem still occurs, perform Check 2.



Check 2 Bluetooth cable may be faulty. Replace it with a new one. If the problem still occurs, perform Check 3.

Check 3 Bluetooth may be faulty. Replace it with a new one following the steps in Chapter 4. If the problem still occurs, perform Check 4.

Check 4 System board may be faulty. Replace it with a new one following the instruction in Chapter 4.

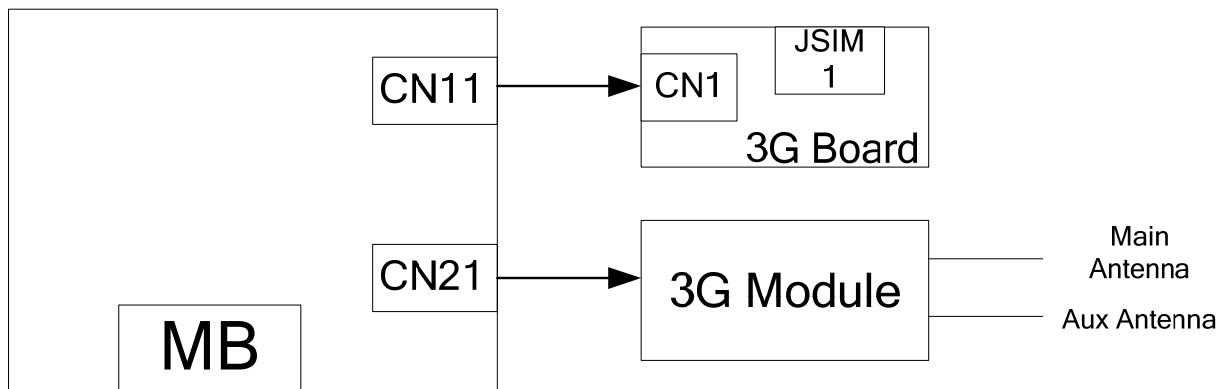
2.20 3G Troubleshooting

To check if the computer's 3G is malfunctioning or not, follow the troubleshooting procedure below as instructed.

Procedure 1 Connector Check and Replacement Check

The 3G module is connected to system board. If 3G malfunctions, its connection is defective or Antenna may be faulty.

Check 1 Make sure 3G is firmly connected to the connector CN17 (system board). If the problem still occurs, perform Check 2.



Check 2 Antenna may be faulty. Replace it with new one. If the problem still occurs, go to procedure 2.

Procedure 2 Diagnostic Test Program Execution Check

Perform "TOSHIBA Wireless Manager" to test 3G module as below:

When starting of "TOSHIBA Wireless Manager", it displays the telecommunications company and receiving level of electric wave.

For the check of the 3G module and a SIM card, please click "System Info" in "About"

When selecting "System Info", it displays following data:

The screenshot shows a 'System Information' dialog box with the following sections and data:

- Mobile Broadband Module**
 - Modem Model: F3607gw
 - Version: KRD 131 15/42 R1J
 - Customized Product: 2/CXC 172 6612/42 R1B01
 - IMEI Number: 353241030004348
 - Firmware Version: R1G05
- Drivers**
 - Driver Package: CXP 901 4701/41 R2N07
- Subscriber**
 - Subscriber Number (IMSI): 440201330273996
 - ICCID: 898120000634xxxxxx
- Numbers**
 - Phone number (to SIM): 08034640640
 - SMS Service Center: +819066xxxxxx

Callouts from the image:

- A blue callout points to the Mobile Broadband Module section: "The information on 3G module is displayed."
- A black callout points to the Mobile Broadband Module section: "When this information is not displayed, please exchange 3G module."
- A blue callout points to the Subscriber section: "The information on SIM module is displayed."
- A black callout points to the Subscriber section: "When this information is not displayed, please exchange MB module"

Chapter 3

Diagnostic Programs

Chapter 3 Contents

3.1	Tests and Diagnostics Software Overview	3-3
3.2	Executing the Diagnostic Test	3-4
3.3	Subtest names.....	3-8
3.4	System Test.....	3-11
3.5	Memory Test.....	3-13
3.6	Keyboard Test.....	3-17
3.7	Display Test	3-19
3.8	Floppy Disk Test.....	3-34
3.9	Hard Disk Test	3-36
3.10	Real Time Clock Test	3-39
3.11	Cache Memory Test.....	3-41
3.12	High Resolution Display Test.....	3-43
3.13	Multimedia Test	3-49
3.14	MEMORY2 Test.....	3-50
3.15	Error Codes and Error Status Names	3-52
3.16	Running Test.....	3-54
3.17	DMI INFOEMATION	3-55
3.17.1	Check DMI Information	3-55
3.17.2	Write DMI Information.....	3-55
3.18	Log Utilities	3-58
3.18.1	Operations	3-58
3.19	System Configuration	3-60
3.20	OPTION.....	3-61
3.20.1	Function Description.....	3-61
3.20.2	Operation Description.....	3-61
3.21	Common Tests and Operation	3-63
3.21.1	How to operate a window	3-63
3.21.2	How to Stop the Test Program.....	3-63
3.21.3	Test Status Screen	3-63
3.21.4	Test Stop Display	3-65
3.21.5	How to enter data	3-65

3.1 Tests and Diagnostics Software Overview

This chapter explains how to use the Tests and Diagnostics Software for the Satellite L650 computer systems.

NOTES: *Before starting the Tests and Diagnostics software:*

- 1. Check all cables for loose connections.*
- 2. Exit any application and close Windows.*

The Diagnostics Menu consists of the following options:

- Diagnostic Test
- Running Test
- DMI Information
- Log Utilities
- System Configuration
- Option

The Diagnostic Test Menu consists of the following functional tests:

- System Test
- Memory Test
- Keyboard Test
- Display Test
- Floppy Disk Test
- Hard Disk Test
- Real Time Clock Test
- Cache Memory Test
- High Resolution Display Test
- Multimedia Test
- Memory2 Test
- FDD & HDD Error Retry Count Set

The following equipment is required to perform some of the diagnostic test programs:

- The Diagnostics Disk (all tests)
- A formatted working disk for the floppy disk drive test (all tests)
- A CD test media (Toshiba Backup CD ROM for the CD-ROM test)

The following sections detail the tests contained within the Diagnostic Test Menu. Refer to Sections 3.18, 3.19, 3.20 and, 3.21 for detailed information on the remaining functions of the Tests and Diagnostics software.

3.2 Executing the Diagnostic Test

Free-DOS is required to run the Diagnostics Program. To start the programs follow these steps:

1. Create a Free-DOS bootable disk and copy all the files from the Tests and Diagnostics software to the disk.
2. Insert the boot disk into the computer's floppy disk drive and turn on the computer.

NOTES: If error message display "Sorry. This Model Type Not Match This Machine":

Please Check :

1. You test disk is match this model , ex. disk is 14" but machine is 13" .
2. The M/B EEPROM project type is math your test disk , if not , please use WDMI3.EXE to modify with right LCD size .

The following screen displays:

```
TOSHIBA Satellite L650 Diagnostics
Version v1.00

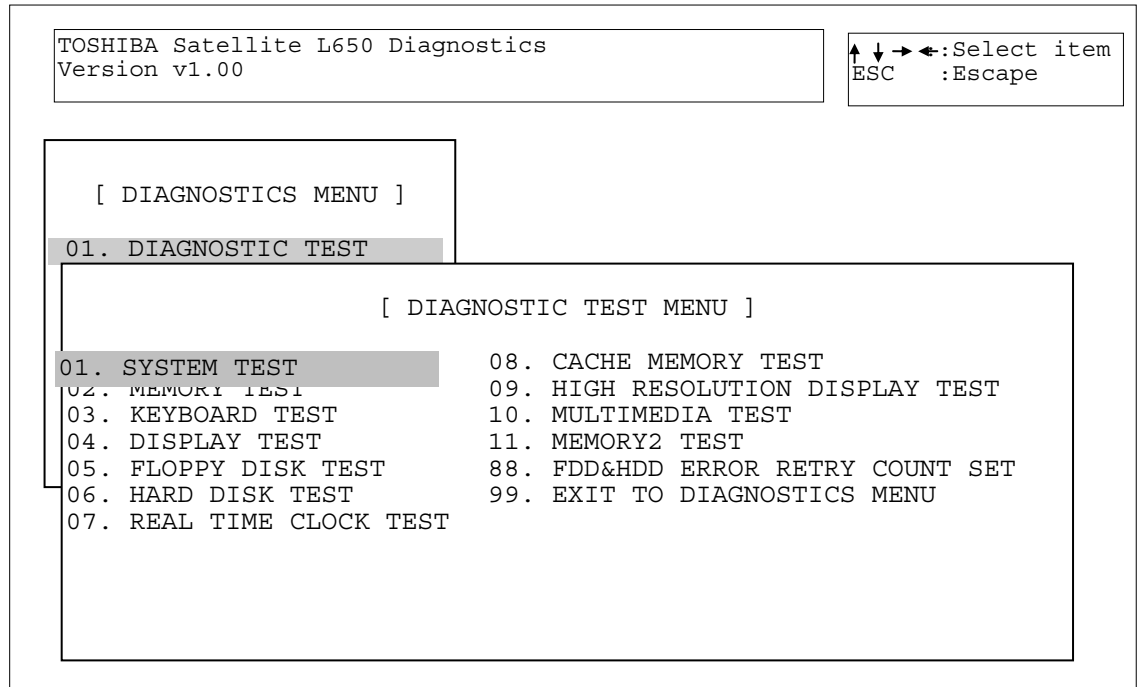
[ DIAGNOSTICS MENU ]

01.DIAGNOSTIC TEST
02.RUNNING TEST
03.DMI INFORMATION
04.LOG UTILITIES
05.SYSTEM CONFIGURATION
06.OPTION
99.EXIT

↑ ↓ → ← : Select item
ESC      : Escape
```

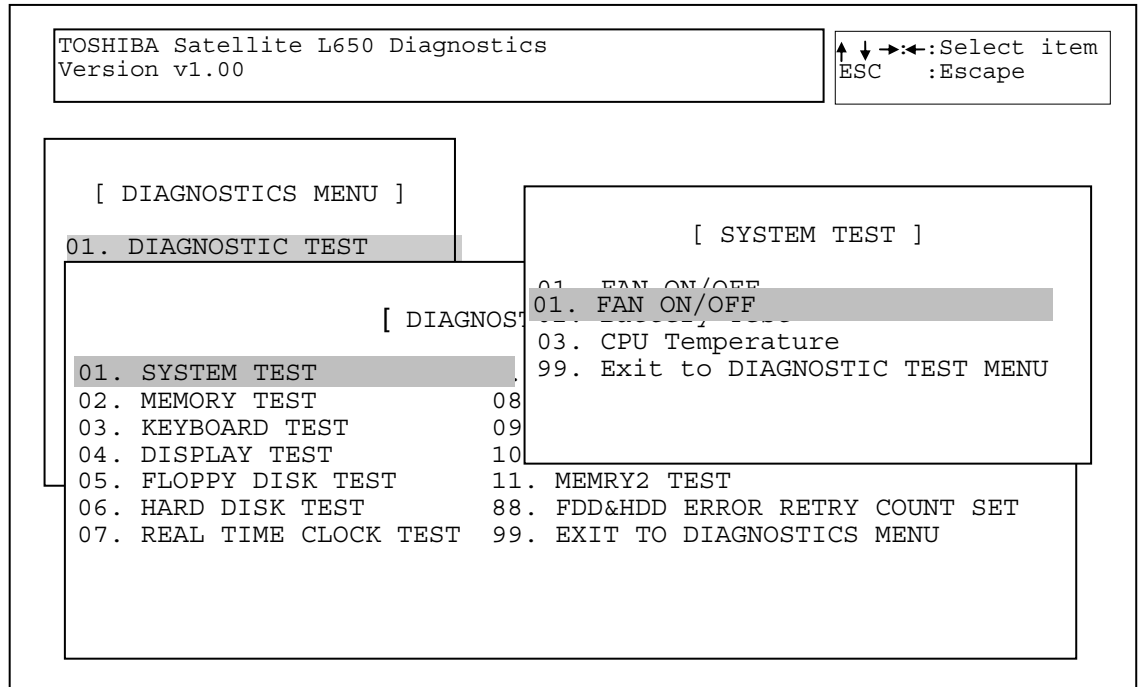
3. To select the Diagnostic Test from the Diagnostics Menu use the arrow keys to set the highlight bar to **01** and press **Enter**.

The following menu displays:

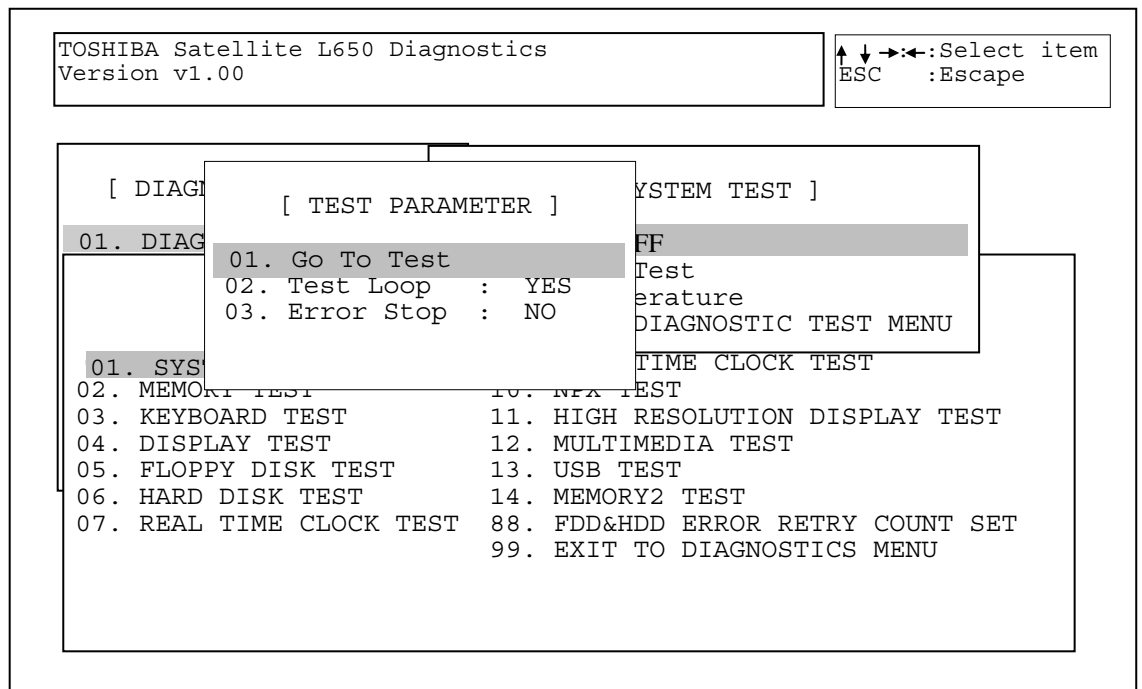


Refer to Sections 3.4 through 3.14 for detailed descriptions of Diagnostics Tests 1 through 11. Item 88 sets the floppy disk drive and hard disk drive error retry count. Item 99 exits the submenu of the Diagnostic Test and returns to the Diagnostics Menu.

4. Select the subtest you want to execute and press **Enter**. The following menu displays:



5. Select the desired test from the subtest menu and press **Enter**. The following Test Parameter menu displays:



Use the arrow keys to highlight the desired option and press **Enter**.

NOTES: *The Item2 and 3 of Test Parameter are not used by some tests.*

Go To Test

Move the highlight bar to *Go To Test* and press **Enter** to start executing the test.

Test Loop

Select **NO** to return the screen to the subtest menu after the test is complete.

Select **YES** to set the test to run continuously until it is halted by the user.

Error Stop

Select **NO** to keep the test running even if an error is found.

Select **YES** to stop the test program when an error is found and display the HALT OPERATION screen as shown below:

```
[ [ HALT OPERATION ] ]  
1: Test end  
2: Continue  
3: Retry
```

These three selections have the following functions:

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

Use the arrow keys to move the cursor to the desired option and press **Enter**.

Table 3-1 in Section 3.3 lists the function of each test on the subtest menu. Table 3-2 in Section 3.15 lists the error codes and error status for each error.

3.3 Subtest names

Table 3-1 lists the subtest names for each test program in the Diagnostic Test menu.

Table 3-1 Subtest Names(1/3)

No.	Test Name	No.	Subtest Name
01	SYSTEM TEST	01	FAN ON/OFF check
		02	Battery TEST
		03	CPU Temperature
02	MEMORY TEST	01	Conventional Memory
		02	Protected Mode
		03	Protected Mode (32MB-MAX)
		04	RAM Refresh
		05	Stress Test
03	KEYBOARD TEST	01	Pressed Key Display [JP KBD]
		02	Pressed Key Display [UK KBD]
		03	Pressed Key Display [US KBD]
		04	PS/2 Mouse (Pointing 2Button)
04	DISPLAY TEST	01	Character Attributes
		02	Character Set
		03	80* 25 Character Display
		04	320* 200 Graphics Display
		05	640* 200 Graphics Display
		06	640* 480 Graphics Display
		07	Display Page
		08	"H" Pattern Display
		09	Video DAC Register W/R/C
		10	Color Graphics Display
		11	Color Attributes Display
		12	Color Tiling

Table 3-1 Subtest Names(2/3)

No.	Test Name	No.	Subtest Name
05	FLOPPY DISK TEST	01	Sequential Read
		02	Sequential W/R/C
		03	Random Address/Data
		04	Write Specified Address
		05	Read Specified Address
06	HARD DISK TEST	01	Sequential Read
		02	Address Uniqueness
		03	Random Address Data
		04	Cross Talk and Peek Shift
		05	Write Specified Address
		06	Read Specified Address
		07	Sequential Write
		08	W-R-C Specified Address
07	REAL TIME CLOCK TEST	01	Real Time Test
		02	Backup Memory Test
		03	Real Time Carry Test
08	CACHE MEMORY TEST	01	Constant Data Test
		02	Address Pattern Test
		03	Increment/Decrement Test
		04	Bit Shift Pattern Test
		05	*Write Disturb Test
		06	Checker Board Test
		07	Marching Test
		08	Working Data Test
09	HIGH RESOLUTION DISPLAY TEST	01	VRAM W/R/C Test
		02	640* 480 Mode Display
		03	800* 600 Mode Display
		04	1024* 768 Mode Display
		05	"H" Pattern Display
		06	Focus Test ("E" Pattern)

Table 3-1 Subtest Names(3/3)

No.	Test Name	No.	Subtest Name
10	MULTIMEDIA TEST	01	Sequential Read Test
		02	Random Read Test
		03	Read Specified Address Test
		04	1 point W/R/C Test
11	MEMORY2	01	All one/zero Test
		02	Walking 1/Walking 0 Test(Left)
		03	Walking 1/Walking 0 Test(Right)
		04	Walking 1/Walking 0 Test(Left /Right)

**This test cannot support.*

3.4 System Test

To execute the System Test select **01** from the Diagnostic Test Menu, press **Enter** and follow the directions on the screen. The System Test contains three subtests. Move the highlight bar to the subtest you want to execute and press **Enter**.

Subtest 01 FAN ON/OFF Checking

Select 1,2,3 to control FAN on/off , 1=Fan on , 2=Fan off , 3=Exit .

[BOIFAN2.EXE] Program Version : 1.0

1: Fan On 2: Fan Off 3: Exit

Fan1 Status On Fan1RPM : 5000 or Fan1 Status OFF Fan1RPM : 0

Fan2 Status On Fan2RPM : 0 or Fan2 Status OFF Fan2RPM : 0

Subtest 02 Battery Test

This will display battery information for check , press [ESC] to exit .

[BOIPCU.EXE] Program Version : 1.1 03-20-2010

voltage	: 12522 mV	Remaining capacity alarm	: 400 mAh
temperature	: 24.4 °C	Remaining time alarm	: 10 min
current	: 1330 mA	Battery mode	: 0
average current	: 1327 mA	AtRate	: 0 mA
relative state of charge	: 93 %	At rate time to full	: 65535 min
absolute state of charge	: 89 %	At rate time to empty	: 65535 min
remaining capacity	: 3546 mAh	At rate O. K.	: FFFF
full charge capacity	: 3800 mAh	Maximun error	: 2 %
run time to empty	: -1 min.	Charging current	: 2800 mA
average time to empty	: -1 min.	Charging voltage	: 12600 mA
average time to full	: 101 min.	Manufacturer name	: SANYO
cycle count	: 10 times	Device name	: NS2P3SZDENVWR
design capacity	: 4000 mAh	Device chemistry	: LION
design voltage	: 11100 mV	Manufacturer data	: 0
specification information	: 2.1	Manufacture date	: 9/13/2005
serial no.	: 32009		
STATUS	: INIT		

Press [ESC] KEY to exit

Subtest 03 CPU Temperature

This will display CPU Temperature for check , press [ESC] to exit .

[CPU_TEMP.EXE] Program Version : 1.3 03-09-2009

CPU Temperature : XX

GPU Temperature : XX

NOTES: *If no external Graphics , GPU not report temperature . when read data is 255 mean no external Graphics .*

3.5 Memory Test

To execute the Memory Test select **02** from the Diagnostic Test Menu, press **Enter** and follow the directions on the screen. The Memory Test contains five subtests that test the computer's memory. Move the highlight bar to the subtest you want to execute and press **Enter**.

***NOTE:** If **NO** is selected for Test Loop on the Test Parameter menu, the Test Status screen displays while the test is executing. When the test is complete the Memory Test menu displays.*

*If **YES** is selected for Test Loop on the Test Parameter menu, the Test Status screen displays while the test is executing. Press **Ctrl + Fn + break** to return to the Memory Test menu.*

Subtest 01 Conventional Memory

This subtest first writes test data patterns to conventional memory (0 to 640 KB), then reads the new data and compares the result with the original data patterns.

If a compare error occurs, the write data, read data, and test address display on the screen. Addresses are displayed in 4KB increments during the test.

Test Process:

1. Byte Enable Test
One bit write/ 8 bit read" is executed and the new data is compared with the original data.
Test data = CCAA5533H, 80000000H
2. Byte Enable Test
"One bit write/16 bit read" is executed and the new data is compared with the original data.
Test data = CCAA5533H, 80000000H
3. Data bus test
"One bit write/16 bit read" is executed and the new data is compared with the original data.
Test data = 1H, 2H, 4H, 8H, 10H, through 80000000H.
4. Fixed data test
"16 bit write/ 16 bit read" is executed and the new data is compared to the original data.

Test data = FFFFFFFFH, 00000000H, 80018001H

5. Address pattern test

“16 bit write and 16 bit read” of address pattern data is executed and the new data is compared with the original data.

Test data = 0000H, 0004H, 0008H, 000CH,...8000H, 8004H, through FFECH

Subtest 02 Protected Mode

This subtest first writes data patterns and address data from 1 to 32 MB, then reads the new data and compares the result with the original data patterns. Addresses are displayed in 64KB increments during the test.

Test Process:

1. Byte Enable Test

“One bit write/ 8 bit read” is executed and the new data is compared with the original data.

Test data = CCAA5533H, 80000000H

2. Byte Enable Test

“One bit write/16 bit read” is executed and the new data is compared with the original data.

Test data = CCAA5533H, 80000000H

3. Data bus test

“One bit write/16 bit read” is executed and the new data is compared with the original data.

Test data = 1H, 2H, 4H, 8H, 10H, through 80000000H.

4. Fixed data test

“16 bit write/ 16 bit read” is executed and the new data is compared to the original data.

Test data = FFFFFFFFH, 00000000H, 80018001H

5. Address pattern test

“16 bit write and 16 bit read” of address pattern data is executed and the new data is compared with the original data.

Test data = 0000H, 0004H, 0008H, 000CH,...8000H, 8004H, through FFECH

Subtest 03 Protected Mode [32MB - MAX]

This subtest first writes data patterns and address data from 32MB to the maximum installed memory, reads the new data, and then compares the result

with the original data patterns. Addresses are displayed in 64KB increments during the test.

Test Process:

1. Byte Enable Test
“One bit write/ 8 bit read” is executed and the new data is compared with the original data.
Test data = CCAA5533H, 80000000H
2. Byte Enable Test
“One bit write/16 bit read” is executed and the new data is compared with the original data.
Test data = CCAA5533H, 80000000H
3. Data bus test
“One bit write/16 bit read” is executed and the new data is compared with the original data.
Test data = 1H, 2H, 4H, 8H, 10H, through 80000000H.
4. Fixed data test
“16 bit write/ 16 bit read” is executed and the new data is compared to the original data.
Test data = FFFFFFFFH, 00000000H, 80018001H
5. Address pattern test
“16 bit write and 16 bit read” of address pattern data is executed and the new data is compared with the original data.
Test data = 0000H, 0004H, 0008H, 000CH,...8000H, 8004H, through FFECH

Subtest 04 RAM Refresh

This subtest writes a data pattern (CCAA5533H) in 4KB from 0 to the maximum installed memory, then waits for a memory refresh cycle (16 ms or more), reads the new data, and compares the result with the original data pattern.

Test Process:

1. Checks the memory size to determine the maximum size of installed memory.
2. Tests memory addresses 0 to the maximum installed.
3. Writes, reads, and compares test data after a memory refresh cycle (16ms or more).

***NOTE:** There may be a short delay between write and read operations, depending on the memory size.*

Subtest 05 Stress Test

This subtest writes the following 16KB data patterns to the Write/Read Buffer in conventional memory.

```
data:  FFFFFFFFFFFFFFFFFF0000000000000000
       5555555555555555AAAAAAAAAAAAAAAA
       CCCCCCCCCCCCCCCC3333333333333333
       0000000000000000FFFFFFFFFFFFFFFF
       AAAAAAAAAAAAAAAAAA55555555555555
       3333333333333333CCCCCCCCCCCCCCCC
       FFFFFFFFFFFFFFFFFF0000000000000000
       0000000000000000FFFFFFFFFFFFFFFF
       5555555555555555AAAAAAAAAAAAAAAA
       AAAAAAAAAAAAAAAAAA55555555555555
       CCCCCCCCCCCCCCCC3333333333333333
       3333333333333333CCCCCCCCCCCCCCCC
```

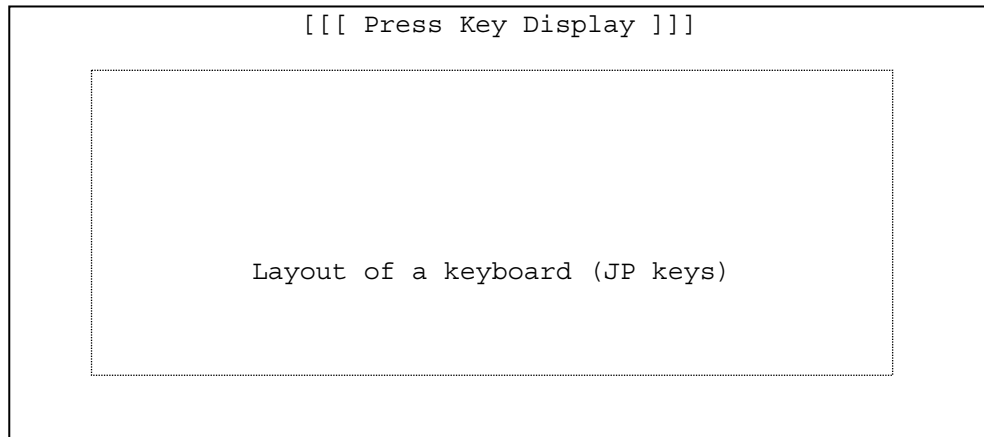
3.6 Keyboard Test

To execute the Keyboard Test select **03** from the Diagnostic Test Menu, press **Enter** and follow the directions on the screen. The Keyboard Test contains four subtests that test the computer's keyboard and mouse actions. Move the highlight bar to the subtest you want to execute and press **Enter**.

***NOTE:** The Test Loop and Error Stop parameters are not enabled for the Keyboard test. When test Fn key need press "Fn + *", " *" is the same "P" key .*

Subtest 01 Pressed Key Display [JP Keyboard] for Japan Keyboard

When you execute this subtest, the keyboard layout is drawn on the display. When any key is pressed, the corresponding key on the screen changes from light to dark. Holding a key down enables the auto-repeat function which causes the key's display character to blink .



Subtest 02 Pressed Key Display [UK Keyboard] for UK Keyboard

This subtest is used for the UK keyboard and functions the same as Subtest 1.

Subtest 03 Pressed Key Display [US Keyboard] for US Keyboard

This subtest is used for the US keyboard and functions the same as Subtest 1.

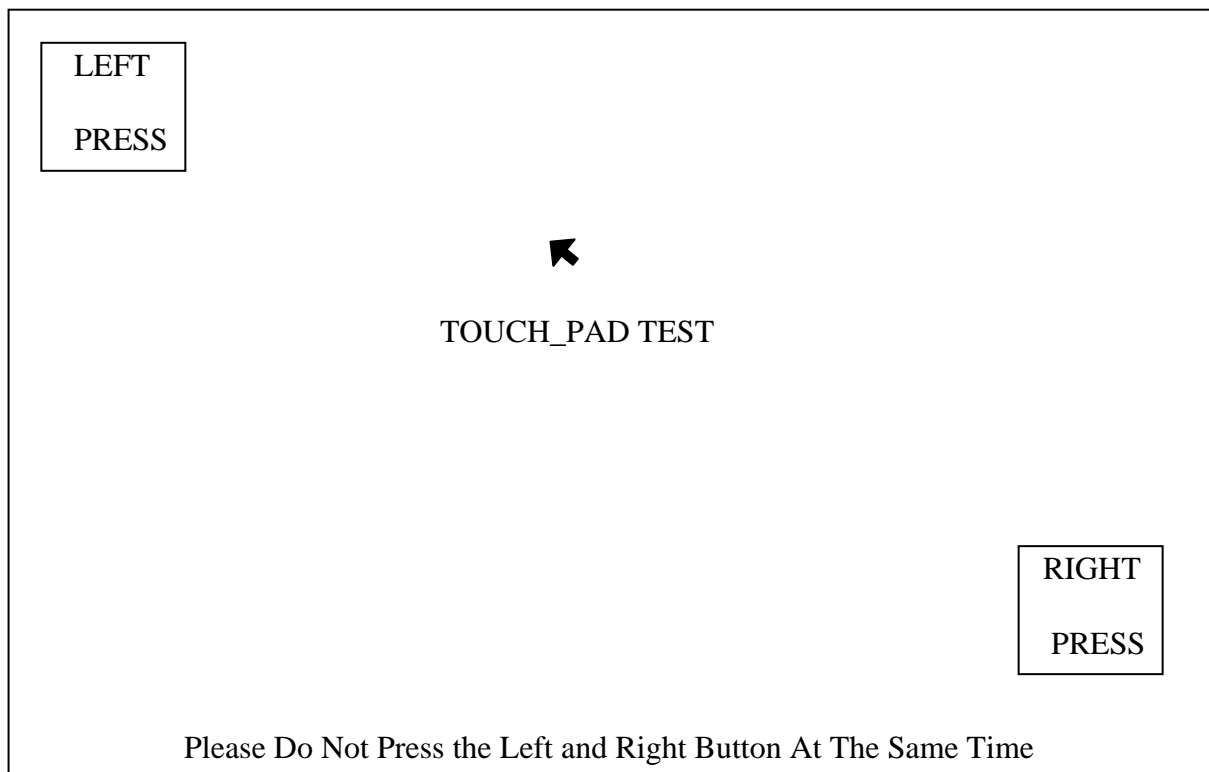
Subtest 04 PS/2 Mouse (Pointing)

This subtest checks the function of mouse as shown below.

- A) Pointing device (mouse)
- B) Mouse buttons

Please move cursor to upper left and press left button , screen will display <PRESS> in left rectangle , move cursor to lower right and press right button , screen will display <PRESS> in right rectangle , the program exit .

If left and right button short , screen will display <Left and Right Button maybe short > , the program exit .



Subtest 03 80 * 25 Character Display

This subtest uses 80*25 video resolution to display character codes 20H - 7EH using Mode 03H (80*25). The data displayed is shifted 1 byte to the left for each line as shown below.

```
80*25 CHARACTER DISPLAY
0123456789012345678901234567890123456789012345678901234567890123456789
!"#$%&'()*+,-./0123456789:;<?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnop
!"#$%&'()*+,-./0123456789:;<?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnop
!"#$%&'()*+,-./0123456789:;<?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopq
!"#$%&'()*+,-./0123456789:;<?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqr
!"#$%&'()*+,-./0123456789:;<?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnopqrs
!"#$%&'()*+,-./0123456789:;<?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnoprst
!"#$%&'()*+,-./0123456789:;<?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnoprstu
!"#$%&'()*+,-./0123456789:;<?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnoprstuv
```

Shifted to the left one letter by one letter.

```
23456789:;<?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnop gh I j k l mnopqrst
3456789:;<?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnop gh I j k l mnopqrst
456789:;<?@ABCDEFGHIJKLMNPOQRSTUVWXYZ[\]^_`abcdefghijklmnop gh I j k l mnopqrst
```

Press [Enter] KEY

To exit this subtest and return to the Display Test menu:

Press **Enter** if **NO** was selected for *Test Loop* on the Test Parameter Menu.
Press **Ctrl + Fn + break** if **YES** was selected for *Test Loop* on the Test Parameter Menu.

Subtest 04 320 * 200 Character Display

This subtest uses 320*200 video resolution to display green, red and yellow followed by cyan, magenta, and white. The screen below shows the displays when this subtest is executed.

320 * 200 GRAPHICS DISPLAY

COLOR SET 0 : [4]

GREEN
CYAN

RED
MAGENTA

YELLOW
WHITE



Press **ENTER** to display the following sixteen colors: black, blue, green, cyan, red, magenta, brown, white, dark gray, light blue, light green, light cyan, light red, light magenta, yellow, and intensified white.

Test Program for Field.

320*200 GRAPHICS DISPLAY : [D]

BLACK	<input type="text"/>	<input type="text"/>	D GRAY
BLUE	<input type="text"/>	<input type="text"/>	L BLUE
GREEN	<input type="text"/>	<input type="text"/>	L GREEN
CYAN	<input type="text"/>	<input type="text"/>	L CYAN
RED	<input type="text"/>	<input type="text"/>	L RED
MAGENTA	<input type="text"/>	<input type="text"/>	L MAGENTA
BROWN	<input type="text"/>	<input type="text"/>	YELLOW
WHITE	<input type="text"/>	<input type="text"/>	I WHITE

Press [Enter] KEY

<input type="text"/>	<input type="text"/>
----------------------	----------------------

Press **ENTER** to display 64 gradations of red, green, blue and white on the screen

320*200 GRAPHICS DISPLAY : [13]

64 gradations of red are displayed.
64 gradations of green are displayed.
64 gradations of blue are displayed.
64 gradations of white are displayed.

Press [Enter] KEY

To exit this subtest and return to the Display Test menu:

Press **Enter** if **NO** was selected for *Test Loop* on the Test Parameter Menu.
Press **Ctrl + Fn + break** if **YES** was selected for *Test Loop* on the Test Parameter Menu.

Subtest 05 640 * 200 Character Display

This subtest uses 640*200 video resolution to display three windows, each window drives a different set of dots: even dots, odd dots and all dots. The screen below displays when this subtest is executed.

640 * 200 GRAPHICS DISPLAY : [6]

EVEN DOTS DRIVEN	ODD DOTS DRIVEN	ALL DOTS DRIVEN

Press **ENTER** to display the following 16 colors: black, blue, green, cyan, red, magenta, brown, white, dark gray, light blue, light green, light cyan, light red, light magenta, yellow, and intensified white.

640*200 GRAPHICS DISPLAY : [E]

BLACK	<input type="text"/>	<input type="text"/>	DARK GRAY
BLUE	<input type="text"/>	<input type="text"/>	LIGHT BLUE
GREEN	<input type="text"/>	<input type="text"/>	LIGHT GREEN
CYAN	<input type="text"/>	<input type="text"/>	LIGHT CYAN
RED	<input type="text"/>	<input type="text"/>	LIGHT RED
MAGENTA	<input type="text"/>	<input type="text"/>	LIGHT MAGENTA
BROWN	<input type="text"/>	<input type="text"/>	YELLOW
WHITE	<input type="text"/>	<input type="text"/>	INTENSIFIED WHITE
	<input type="text"/>	<input type="text"/>	

Press [Enter] KEY

To exit this subtest and return to the Display Test menu:

Press **Enter** if **NO** was selected for *Test Loop* on the Test Parameter Menu.
Press **Ctrl + Fn + break** if **YES** was selected for *Test Loop* on the Test Parameter Menu.

Test Program for Field.

Subtest 06 640 * 480 Character Display

This subtest uses 640*350 video resolution to display 16 colors: black, blue, green, cyan, red, magenta, brown, white, dark gray, light blue, light green, light cyan, light red, light magenta, yellow, and intensified white. The screen below displays when this subtest is executed.

640*350 GRAPHICS DISPLAY : [10]

BLACK	<input type="text"/>	<input type="text"/>	DARK GRAY
BLUE	<input type="text"/>	<input type="text"/>	LIGHT BLUE
GREEN	<input type="text"/>	<input type="text"/>	LIGHT GREEN
CYAN	<input type="text"/>	<input type="text"/>	LIGHT CYAN
RED	<input type="text"/>	<input type="text"/>	LIGHT RED
MAGENTA	<input type="text"/>	<input type="text"/>	LIGHT MAGENTA
BROWN	<input type="text"/>	<input type="text"/>	YELLOW
WHITE	<input type="text"/>	<input type="text"/>	INTENSIFIED WHITE
Press [Enter]	<input type="text"/>	<input type="text"/>	

Press **ENTER** to display the following 16 colors: black, blue, green, cyan, red, magenta, brown, white, dark gray, light blue, light green, light cyan, light red, light magenta, yellow, and intensified white using 640*480 video resolution.

640*480 GRAPHICS DISPLAY : [12]

BLACK	<input type="text"/>	<input type="text"/>	DARK GRAY
BLUE	<input type="text"/>	<input type="text"/>	LIGHT BLUE
GREEN	<input type="text"/>	<input type="text"/>	LIGHT GREEN
CYAN	<input type="text"/>	<input type="text"/>	LIGHT CYAN
RED	<input type="text"/>	<input type="text"/>	LIGHT RED
MAGENTA	<input type="text"/>	<input type="text"/>	LIGHT MAGENTA
BROWN	<input type="text"/>	<input type="text"/>	YELLOW
WHITE	<input type="text"/>	<input type="text"/>	INTENSIFIED WHITE
	<input type="text"/>	<input type="text"/>	

Press [Enter] ~~RET~~

To exit this subtest and return to the Display Test menu:

Press **Enter** if **NO** was selected for *Test Loop* on the Test Parameter Menu.
Press **Ctrl + Fn + break** if **YES** was selected for *Test Loop* on the Test Parameter Menu.

Subtest 10 Color Graphics Display

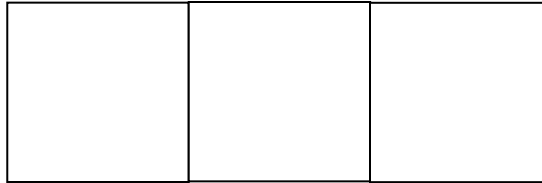
This subtest displays three colors, cyan, white and yellow on the screen as shown below.

640 * 480 GRAPHICS DISPLAY

CYAN

WHITE

YELLOW



To exit this subtest and return to the Display Test menu:

Press **Enter** if **NO** was selected for *Test Loop* on the Test Parameter Menu.

Press **Ctrl + Fn + break** if **YES** was selected for *Test Loop* on the Test Parameter Menu.

Subtest 11 Color Attributes Display

This subtest displays 16 colors: black, blue, green, cyan, red, magenta, brown, white, dark gray, light blue, light green, light cyan, light red, light magenta, yellow, and intensified white. The screen below displays when this subtest is executed.

640*480 COLOR ATTRIBUTE DISPLAY

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

Press [Enter] Key

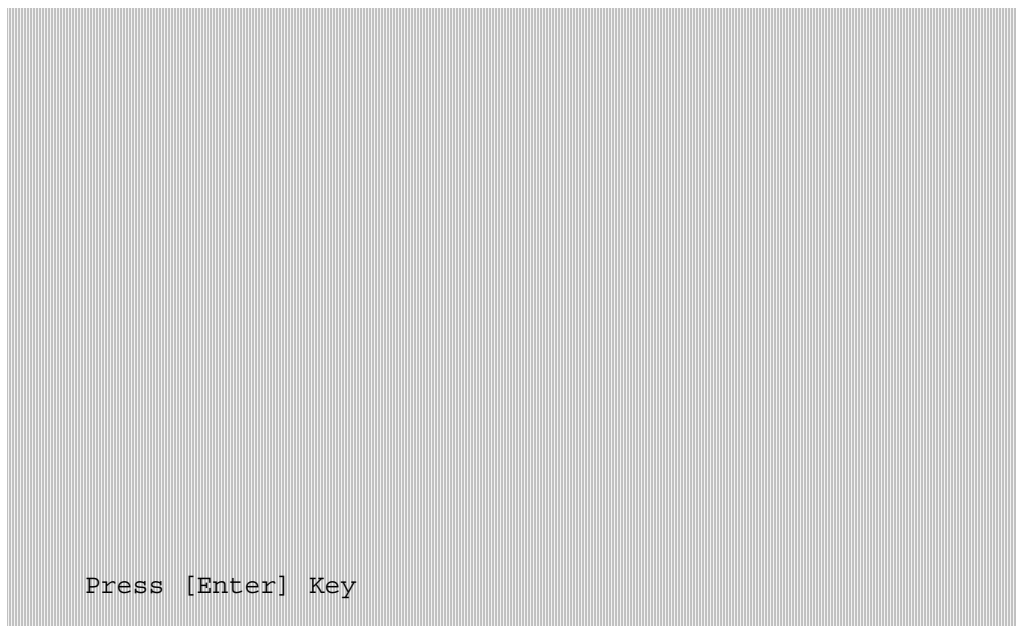
Pressing **Enter** executes VRAM mapping test which indicates vertical lines

Press **Enter** to execute the VRAM mapping test which displays a horizontal line at one dot intervals using Mode 12.

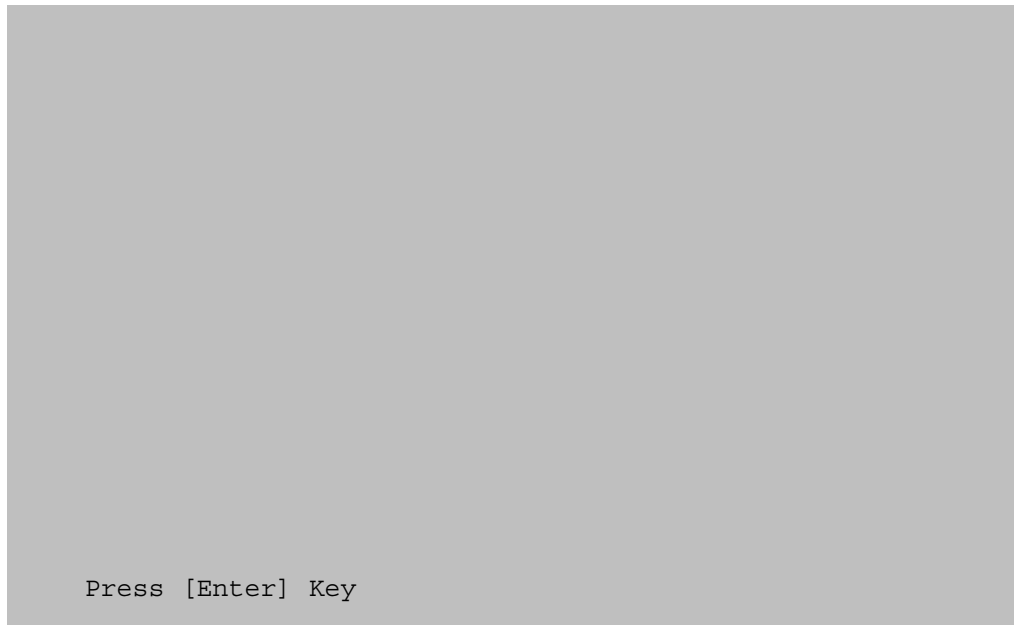
NOTE: *The following screen does not display correctly. It will be amended in the next version.*



Press **Enter** to execute the VRAM mapping test which displays a vertical line at four dot intervals using Mode 12.



Press **Enter** to display VRAM mapping test using the all dots Mode.



To exit this subtest and return to the Display Test menu:

Press **Enter** if **NO** was selected for *Test Loop* on the Test Parameter Menu.
Press **Ctrl + Fn + break** if **YES** was selected for *Test Loop* on the Test Parameter Menu.

Subtest 12 Color Tiling

This subtest displays black, gray, white, and 3 gradations of red, green, and blue as shown in the following display.

Black	Red	Green	Blue
Gray	Red Gradation	Green Gradation	Blue Gradation
White	Red Gradation	Green Gradation	Blue Gradation

To exit this subtest and return to the Display Test menu:

Press **Enter** if **NO** was selected for *Test Loop* on the Test Parameter Menu.
Press **Ctrl + Fn + break** if **YES** was selected for *Test Loop* on the Test Parameter Menu.

3.8 Floppy Disk Test

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

To execute the Floppy Disk Test select **05** from the Diagnostic Test Menu, press **Enter** and follow the directions on the screen. The Floppy Disk Test contains five subtests that test the FDD. Move the highlight bar to the subtest you want to execute and press **Enter**.

Subtest 01 Sequential Read

This subtest sequentially reads all the tracks (Tracks 0 to 79) on the floppy disk.

Subtest 02 Sequential W/R/C

This subtest continuously writes the data pattern B5ADADh to all the specified tracks selected in Subtest 01. The data pattern is then read and compared to the original data.

Subtest 03 Random Address/Data

This subtest writes random data to random addresses on all tracks defined in Subtest 01. The data is then read and compared to the original data.

Subtest 04 Write Specified Address

NOTE: The first two digits of the ADDRESS indicate which track is being tested, the next two digits indicates the head, and the last two digits indicate the sector.

This subtest allows you to verify the errors from Subtest 02. It writes specified data to a specified track and head. Use the Log Utilities (see Section 3.21) to specify the track number and head number where the error(s) occurred during Subtest 02. The following message displays on the screen to enter the test data, track number, and head number.

```
TEST DATA ??  
TRACK NO (00~79) ??  
HEAD NO (0~1) ?
```

Subtest 05 Read Specified Address

This subtest reads data from a specified track and head.

The following message displays on the screen to enter the test track number and head number.

```
TRACK NO (00~79) ??  
HEAD NO (0~1) ?
```


3.9 Hard Disk Test

To execute the Hard Disk Test select **06** from the Diagnostic Test Menu, press **Enter** and follow the directions on the screen. The Hard Disk Test contains eight subtests that test the functions of the hard disk drive. Move the highlight bar to the subtest you want to execute and press **Enter**.

NOTES:** The contents of the hard disk will be erased when subtest 02, 03, 04, 05, 07 or 08 is executed. Before running the test, transfer the contents of the hard disk to other disk. A password is necessary to execute the Hard Disk Test. The password is: **hard disk

Subtest 01 Sequential Read

This subtest sequentially reads all the tracks on the HDD starting at track 0. When all tracks have been read, the test starts at the maximum track and reads sequentially back to track 0.

Subtest 02 Address Uniqueness (This subtest need very long time)

This subtest writes unique address data to each sector of the HDD track-by-track. The data written to each sector is then read and compared with the original data. There are three ways the HDD can be read:

- Forward sequential
- Reverse sequential
- Random

Subtest 03 Random Address Data

This subtest writes random data to 1000 different random addresses on the HDD. This data is then read and compared to the original data.

Subtest 04 Cross Talk and Peak Shift

This subtest writes eight of the most likely to fail data patterns (shown below) to a cylinder on the HDD, then reads the data while moving from cylinder to cylinder.

Data Pattern

B5ADADH
4A5252H
EB6DB6H
149249H
63B63BH
9C49C4H
2DB6DBH
D24924H

Subtest 05 Write Specified Address

NOTE: This subtest is designed to run with the Test Loop set to **NO**. This subtest is a debug tool and the operator should enter the Test Parameters each time.

This subtest allows you to verify the errors from Subtest 01. It writes specified data to a specified LBA. Use the Log Utilities (see Section 3.18) to specify the LBA number where the error(s) occurred during Subtest 01. The following message displays on the screen to enter the test data, and Sector count.

```
TEST DATA          ??  
SECTOR COUNT (01~39) ??  
START ADDRESS (00000000~MAX Address) ?
```

Subtest 06 Read Specified Address

NOTE: This subtest is designed to run with the Test Loop set to **NO**. This subtest is a debug tool and the operator should enter the Test Parameters each time.

This subtest allows you to verify the errors from Subtest 01. It reads specified data (Subtest 06) from a specified LBA. Use the Log Utilities (see Section 3.18) to specify the LBA number where the error(s) occurred during Subtest 01. The following message displays on the screen to enter the test sector count.

```
SECTOR COUNT (01~39) ??  
START ADDRESS (00000000~MAX Address) ?
```

Subtest 07 Sequential Write

This subtest writes specified data to all cylinders on the HDD. The following message displays on the screen to enter the test data.

TEST DATA ???? (=37b3H)

Subtest 08 W-R-C Specified Address

This subtest writes specified data to a specified sector count, then reads and compares the result. The following message displays on the screen to enter the test data, sector count.

TEST DATA ???? (=37b3H)
SECTOR COUNT (01~39) ??
START ADDRESS (00000000~Max Address) ?

3.10 Real Time Clock Test

To execute the Real Time Clock Test select **07** from the Diagnostic Test Menu, press **Enter** and follow the directions on the screen. The Real Time Clock Test contains three subtests that test the computer's real time functions. Move the highlight bar to the subtest you want to execute and press **Enter**.

Subtest 01 Real Time

This subtest allows you to change the date and time. To execute the Real Time Subtest, follow these steps:

1. Select Subtest **01** and the following displays:

```
[ REAL TIME TEST ]  
  
Current date : mm-dd-yyyy  
Current time : hh:mm:ss  
  
Enter new date : mm-dd-yyyy  
Enter new time : hh:mm:ss
```

Press [Enter] key to exit test

2. If the current date is not correct, enter the correct date at the "Enter new date" prompt and press **Enter**. The following prompt displays:

```
Enter new time :
```
3. If the current time is not correct, enter the correct time using a 24-hour format and press **Enter**.

NOTE: If **NO** is selected for Test Loop on the Test Parameter menu, the Real Time Clock Test menu displays.

If **YES** is selected for Test Loop on the Test Parameter menu, the screen above displays and the test is executed again. Press **Ctrl + Fn + break** to return to the Real Time Clock Test menu.

Subtest 02 Backup Memory

This subtest writes 50 bytes of test data (FFH, AAH, 55H, and 00H) to the CMOS 14th address, then reads the new data and compares it to the original data.

Subtest 03 Real Time Carry

<p>CAUTION: <i>When this subtest is executed, the current date and time are reset.</i></p>

This subtest checks the clock's carry function.

```
                [ REAL TIME CARRY TEST ]  
  
Current date : 12-31-1999  
Current time : 23:59:55  
  
Press [Enter] key to exit test
```

The following is the display after the date carry function is executed.

```
                [ REAL TIME CARRY TEST ]  
  
Current date : 01-01-2000  
Current time : 00:00:01  
  
Press [Enter] key to exit test
```

To exit this subtest and return to the Real Time Clock menu:

Press **Enter** if **NO** was selected for *Test Loop* on the Test Parameter Menu.
Press **Ctrl + Fn + break** if **YES** was selected for *Test Loop* on the Test Parameter Menu.

3.11 Cache Memory Test

To execute the Cache Memory Test select **08** from the Diagnostic Test Menu, press **Enter** and follow the directions on the screen. The Cache Memory Test contains eight subtests that test the computer's cache memory. Move the highlight bar to the subtest you want to execute and press **Enter**.

***NOTE:** If **NO** is selected for Test Loop on the Test Parameter menu, the screen will remain blank while the subtest is executing. When the test is complete the Cache Memory Test menu displays.*

*If **YES** is selected for Test Loop on the Test Parameter menu, the Test Status screen displays while the subtest is executing. Press **Ctrl + Fn + break** to return to the Cache Memory Test menu.*

Subtest 01 Constant Data Test

This subtest reads the contents of cache memory and saves it into RAM. The subtest then writes constant data (FFFFH, AAAAH, 5555H, 0101H, 0000H), reads the new data and compares the result with the original data pattern. The original cache memory content is then restored to the cache memory.

Subtest 02 Address Pattern Test

This subtest reads the contents of cache memory and saves it into RAM. The subtest then writes address data patterns (0000H, 0001H, 0002H, through 3FFDH, 3FFEH, 3FFFH), reads the new data and compares the result with the original data. The original cache memory content is then restored to the cache memory.

Subtest 03 Increment/Decrement Test

This subtest reads the contents of cache memory and saves it into RAM. The subtest then writes the increment data (00H, 01H, 02H, through FDH, FEH, FFH), reads the new data and compares the result with the original data. After comparing the incremental data, decrement data (FFH, FEH, FEH, through 02H, 01H, 00H) is written and the new data is read and compared with the original data. The original cache memory content is then restored to the cache memory.

Subtest 04 Bit Shift Pattern Test

This subtest reads the contents of cache memory and saves it into RAM. The subtest then writes the bit shift data patterns (1 bit shifted every 4 bytes), reads the new data and compares the result with the original data. The original cache memory content is then restored to the cache memory.

Subtest 05 Write Disturb Test (We can't support this time)

This subtest reads the contents of cache memory and saves it into RAM. The subtest then writes the "write disturb data," reads the new data and compares the result with the original data. The original cache memory content is then restored to the cache memory.

Subtest 06 Checker Board Test

This subtest reads the contents of cache memory and saves it into RAM. The subtest then writes the "checker board data," (data which is inverted front/back and left/right) reads the new data and compares the result with the original data. The original cache memory content is then restored to the cache memory.

Subtest 07 Marching Test

This subtest reads the contents of cache memory and saves it into RAM. The subtest then writes the "marching data," (00H through 01H and 01H through 00H) reads the new data and compares the result with the original data. The original cache memory content is then restored to the cache memory.

Subtest 08 Working Data Test

This subtest reads the contents of cache memory and saves it into RAM. The subtest then writes the "working data," reads the new data and compares the result with the original data. The original cache memory content is then restored to the cache memory.

3.12 High Resolution Display Test

To execute the High Resolution Display Test select **09** from the Diagnostic Test Menu, press **Enter** and follow the directions on the screen. The High Resolution Display Test contains six subtests that test the computer's high resolution video display. Move the highlight bar to the subtest you want to execute and press **Enter**.

Subtest 01 VRAM W/R/C Test

This subtest writes address and data patterns to Video RAM, then reads the values from the Video RAM and compares them to the original test patterns. During the execution of this test 13 different color screens display: black, green, green, blue, blue, red, red, red, black, white, pink, cyan, and black.

Test Process:

1. Sets the video display to 1024*768 mode
2. Bank change test
Writes 1 byte data in order 0, 1, through Fh, and compares the result, at every bank, to the original data patterns.
3. Bit shift data test
Writes 01h data into addresses A000:0000h through A000:FFFFh for each bank, reads the new data and, then compares the results with the original data. Data is then shifted 1 bit to the left, and all bits (01h, 02h, 04h, 08h, through 80h) are tested again.
4. Fixed data test
Writes test data (in order FFh, AAh, 55h, 00h) into addresses A000:0000h through A000:FFFFh for each bank by, reads the new data and, then compares the results with the original data. Data is then shifted 1 bit to the left, and all bits are tested again

NOTE: *If **NO** is selected for Test Loop on the Test Parameter menu, the screen displays the colors listed above and then the High Resolution Display Test menu displays.*

*If **YES** is selected for Test Loop on the Test Parameter menu, the screen displays the colors listed above. Press **Ctrl + Fn + break** to return to the High Resolution Display Test menu.*

Subtest 02 640*480 Mode Display

This subtest uses 640*480 video resolution to display a high resolution white frame, 256 letter types (8*16 pixels) and 64 gradations of white, red, green, and blue as shown below.

[640*480 256]

Press [Enter] key

256 letter types indication

WHITE	0-----1-----2-----3-----4-----5-----6----- 64 gradations
RED	64 gradations
GREEN	64 gradations
BLUE	64 gradations

To exit this subtest and return to the High Resolution Display Test menu:

Press **Enter** if **NO** was selected for *Test Loop* on the Test Parameter Menu.
 Press **Ctrl + Fn + break** if **YES** was selected for *Test Loop* on the Test Parameter Menu.

Test Program for Field.

Subtest 03 800 * 600 Mode Display

This subtest uses 800*600 video resolution to display a high resolution white frame, 256 letter types (8*16 pixels) and 256 gradations of white, red, green, and blue as shown below.

[800*600 256]

Press [Enter] key

256 letter types indication

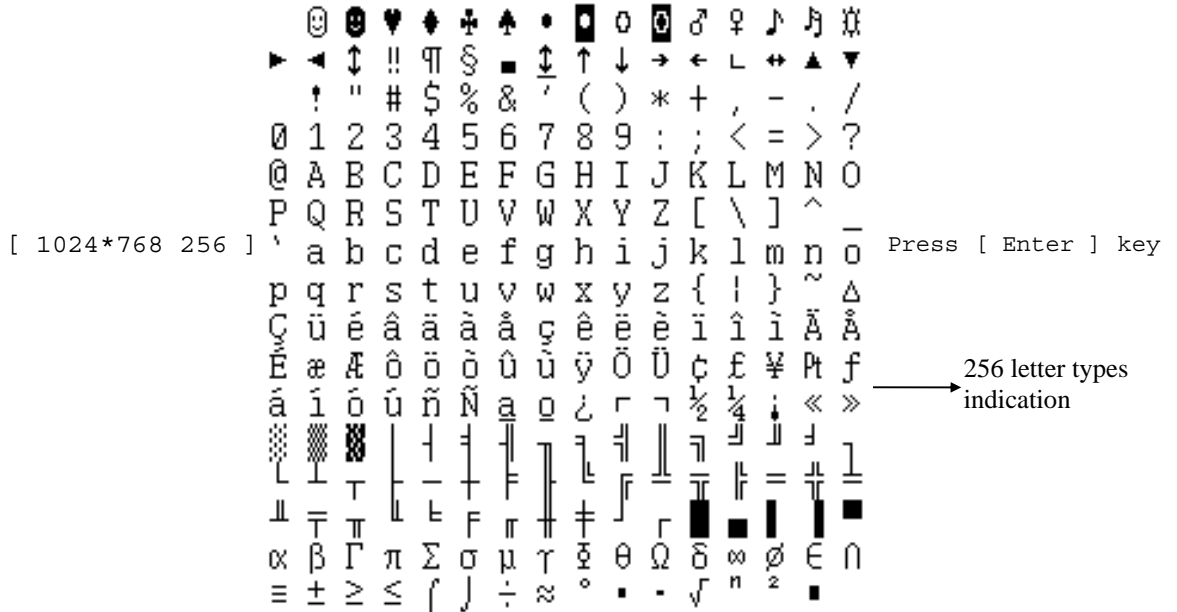
	0---+---1---+---2---+---3---+---4---+---5---+---6---
WHITE	64 gradations
RED	64 gradations
GREEN	64 gradations
BLUE	64 gradations

To exit this subtest and return to the High Resolution Display Test menu:

Press **Enter** if **NO** was selected for *Test Loop* on the Test Parameter Menu.
 Press **Ctrl + Fn + break** if **YES** was selected for *Test Loop* on the Test Parameter Menu

Subtest 04 1024* 768 Mode Display

This subtest uses 1024*768 video resolution to display a high resolution white frame, 256 letter types (8*16 pixels) and 64 gradations of white, red, green, and blue as shown below.



	0-----1-----2-----3-----4-----5-----6----
WHITE	64 gradations
RED	64 gradations
GREEN	64 gradations
BLUE	64 gradations

To exit this subtest and return to the High Resolution Display Test menu:

Press **Enter** if **NO** was selected for *Test Loop* on the Test Parameter Menu.
 Press **Ctrl + Fn + break** if **YES** was selected for *Test Loop* on the Test Parameter Menu.

Subtest 06 Focus Test ("E" Pattern)

This subtest sets the 1024*768 Mode and displays "E" patterns (18*18 dot fonts), at 56 letters *42 lines surrounded by a high resolution white frame.



To exit this subtest and return to the High Resolution Display Test menu:

Press **Enter** if **NO** was selected for *Test Loop* on the Test Parameter Menu.
Press **Ctrl + Fn + break** if **YES** was selected for *Test Loop* on the Test Parameter Menu.

3.13 Multimedia Test

To execute the Multimedia Test select **10** from the Diagnostic Test Menu, press **Enter** and follow the directions on the screen. The Multimedia Test contains four subtests that test the computer's multimedia functions. Move the highlight bar to the subtest you want to execute and press **Enter**.

***NOTE:** Use the Toshiba Backup CD-ROM for Subtests 01, 02, and 03.
Because CDRom driver issue , the Multimedia function can't test , this is limitation .*

Subtest 01 Sequential Read Test

This subtest sequentially reads one block unit (2K bytes) of all logical addresses from the test CD.

***NOTE:** If **NO** is selected for Test Loop on the Test Parameter Menu, the screen will remain blank while the subtest is executing. When the test is complete the Multimedia Test menu displays.
If **YES** is selected for Test Loop on the Test Parameter Menu, the Test Status screen displays while the subtest is executing. Press **Ctrl+Fn+break** to return to the Multimedia Test menu.*

Subtest 02 Random Read Test

This subtest randomly reads all addresses.

Subtest 03 Read Specified Address Test

This subtest reads data from a specified block of addresses.

The following message displays on the screen to enter the start and end block addresses:

```
START BLOCK ADDRESS ?  
END BLOCK ADDRESS  ?
```

Subtest 04 1 Point W/R/C (R/RW Media)

***NOTE:** Use CD-R or CD-RW, the CD-ROM and DVD cannot be used for this subtest, and some DVD-dual can't support this test.*

This subtest writes specified data to a specified block count, then reads and compares the result.

3.14 MEMORY2 Test

To execute the Expansion Test select **11** from the Diagnostic Test Menu, press **Enter** and follow the directions on the screen. The MEMORY2 Test contains four subtests that test the computer's. Move the highlight bar to the subtest you want to execute and press **Enter**.

NOTE: If NO is selected for Test Loop on the Test Parameter menu, the Test Status screen displays while the test is executing. When the test is complete the Memory Test menu displays.

*If YES is selected for Test Loop on the Test Parameter menu, the Test Status screen displays while the test is executing. Press **Ctrl+Fn+break** to return to the Memory Test menu*

Memory Test2 is using burst transfer mode by cache memory .

Subtest 01 All one/All zero test

This subtest performs pseudorandom data read/write. The data consists of “all ones”/”all zero” patterns produced by pseudorandom sequence generator. The test checks address error.

```
FFFFFFFFFFFFFFFFF00000000000000000
0000000000000000FFFFFFFFFFFFFFFFF
```

Subtest 02 Walking 1/Walking 0 test (Left)

This subtest uses “running one”/”running zero” patterns. This test sequence allows also to checking system bus in maximum noise conditions. The following test sequence is written.

```
7FFF7FFF7FFF7FFF8000800080008000
BFFFBFFFBFFFBFFF4000400040004000
```

After all the memory being tested is filled with the pattern, it is read in descending direction and compared with reference data. As the memory is read, the data is replaced with inverse test pattern. After all the memory is read and replaced with inverted pattern, it is read in descending direction and compare with new reference data. As the memory is read, the data is replaced with next pattern, which is like first one shifted to right.

Subtest 03 Walking 1/Walking 0 test (Right)

The test method is the same as Subtest2. However, the data to be used differs.

```
80008000800080007FFF7FFF7FFF7FFF
4000400040004000BFFFBFFFBFFFBFFF
```

Subtest 04 Walking 1/Walking 0 test (Left/ Right)

Tee test method is the same as Subtest2. However, the data to be used differs.

```
7FFF7FFF7FFF7FFF8000800080008000
BBBBBBBBBBBBBBBB4000400040004000
DDDDDDDDDDDDDDDD2000200020002000
```

```
FFFBFFFBFFFBFFFB0004000400040004
FFFDFFFDFFFDFFFD0002000200020002
FFFFFFFFFFFFFFFFE0001000100010001
80008000800080007FFF7FFF7FFF7FFF
4000400040004000BBBBBBBBBBBBBBBB
```

```
0004000400040004FFFBFFFBFFFBFFFB
0002000200020002FFFDFFFDFFFDFFFD
0001000100010001FFFFFFFFFFFFFFFFE
```


3.15 Error Codes and Error Status Names

The following table lists the error codes and error status names for the Diagnostic Tests.

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

Device Name	Error Code	Error Status Name	
(Common)	FF	Data Compare Error	
Memory	02	Protected Mode Not Changed	
	??	Other Error	
FDD	01	Bad Command Error	
	02	Address Mark Not Found	
	03	Write Protected	
	04	Record Not Found	
	06	Media Change Line Error	
	08		DMA Overrun Error
			DMA Boundary Error
	09		
	0C	Select Media Error	
	10	CRC Error	
	20	FDC Error	
	40	Seek Error	
	80	Time Out Error	
??	Other Error		
HDD	01	Bad Command Error	
	02	Bad Address Mark Error	
	04	Record Not Found	
	05	HDC Not Reset Error	
	07	Drive Not Initialized	
	09	DMA Boundary Error	
	0A	Bad Sector	
	0B	Bad Track Error	
	10	ECC Error	
	11	ECC Recover Enabled	
	20	HDC Error	
	40	Seek Error	
	80	Time Out Error	
	AA	Drive Not Ready	

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

Device Name	Error Code	Error Status Name
HDD	BB	Undefined Error
	CC	Write Fault
	E0	Status Error
	F0	No Sense Error
	??	Other Error
Cache Memory	02	Protect Mode Error
	03	Caching Error
	??	Other Error
Multimedia	01	Write Error
	0F	Invalid Drive
	15	Drive Not Ready
	??	Other Error

NOTE: If error status name is **Other Error** , please reference the **Error Code** for error information

3.16 Running Test

NOTES:

1. *You may add or delete subtests using the Running Test Edit Item function, see Section 3.20.*
2. *Do not forget to insert a work disk in the FDD. If a work disk is not inserted an error will be generated during the Floppy Disk Test.*
3. *If the test completes successfully an “PASS” sign with blue letters displays on the screen.*
4. *If the test fails or is interrupted before completion an “FAIL” sign with red letters displays on the screen.*
5. *If running item not select an “NOITEM” sign with green letters display on the screen.*
6. *All errors which occur during execution of the Running Test are logged in the Log File.*
7. *This program is executed according to the Count Loop number selected in the Running Test Edit Item, see Section 3.20. To terminate the program, press **Ctrl + Fn + Break**.*

3.17 DMI INFOEMATION

Select **03** from the Diagnostics Menu and press **Enter** to Check or Write DMI Information Data:

3.17.1 Check DMI Information

The Check DMI Configuration program contains the following configuration information for the computer:

***NOTE:** Please set the media of DVD before starting a test.*

AHCI cannot control under the DOS, Please change SATA Controller Mode to "Compatibility" Mode .

System information (Type 1)

1. Manufacture : TOSHIBA
2. Product Name : Satellite L650
3. Version : PSP50U-123456 (TOSHIBA Part Number)
4. Serial Number : 12345678W (Serial Number)
5. UUID Number: 000B5F7142CADE11B11200238BF9F8FD

OEM Strings (Type 11)

1. OEM String : PSP50U-123456,S123456789,11V

On Board LAN MAC

1. MAC ADR : 001E4C123456

DVD Region Code

1. User Change Time : 5
2. Region Code : 0

3.17.2 Write DMI Information

The Write DMI Information program contains the following information for the computer :

1. Manufacture Name (TOSHIBA)
2. Product Name (Satellite P500)
3. Part Number (PSP50U-123456)
4. Serial Number (12345678W)
5. OEM String (PSP50U-123456,S123456789,11V)
7. Write UUID (000B5F7142CADE11B11200238BF9F8FD)
8. Brightness Write (1A344C769EC5EDFF)
- a. SLP2.0 Build Sig [1]Non OS [2]OS

- b. Wireless LAN ID (001E4C123456)
- c. AC Adapter Select [1]65W [2]75W [3]90W [4]120W

Select 1 ~ c to keyin new data , select 0 to exit program , program will compare input data length with the max length , if over will retry keyin

Note : Please Check New DMI Information After System Restart !! V3.5

- 1. **** Manufacture Name (TOSHIBA) - (32)
- 2. **** Product Name (Satellite P500) - (32)
- 3. **** Part Number (PSP50U-123456) - (26)
- 4. **** Serial Number (12345678W) - (32)
- 5. **** OEM String (PSP50U-123456,S123456789,11V) - (64)
- 7. **** Write UUID (000B5F7142CADE11B11200238BF9F8FD) – (16)
- 8. **** Brightness Write (1A344C769EC5EDFF) – (8)
 - a. **** SLP2.0 Build Sig [1]Non OS [2]OS-(2)
 - b. **** Wireless LAN ID (001E4C123456) –(12)
 - c. **** AC Adapter Select [1]65W [2]75W [3]90W [4]120W [5]180W –(1)
- 0. **** Exit

Please Select (1 ~ c) To Modify DMI String :

Current Data of EEPROM : Toshiba

1. Enter the Manufacture Name : TOSHIBA

Your Keyin is : TOSHIBA This is your keyin data

EEPROM return : TOSHIBA This is read from eeprom back

Press any key to continue

Note : Please Check New DMI Information After System Restart !!

If Keyin length too long will retry :

Current Data of EEPROM : 12345678WU

4. Enter the Serial Number : 12345678901234

Your Keyin String Length Not Correct 14 > 10 !!!

Current Data of EEPROM : 12345678WU

4. Enter the Serial Number :

NOTE: The SLP2.0 is Microsoft SPEC , call “System Locked Pre-Installation” or ”SLP”, It is for OEM pre install Windows and no need to Active , If you select Non OS , then you need to Active your OS before you use .

Function Detail :

7. UUID :

Total is 16 byte data , Front 10 byte is time random data , last 6 byte is LAN MAC .

8. Brightness Table :

It depend on LCD EDID to set different brightness data .

a. SLP2.0 Build Sig :

[1]Non OS : EEPROM fill "MS" for non Microsoft OS , BIOS not load SLP OPROM function .

[2]OS : EEPROM fill Others for Microsoft OS , BIOS load SLP OPROM function .

b. Wireless LAN ID :

If change M/B , but wireless/B not change , need fill wireless MAC into new change M/B .

c. AC Adapter Select :

[1]65W : Machine need 65W AC Adapter .

[2]75W : Machine need 75W AC Adapter .

[3]90W : Machine need 90W AC Adapter .

[4]120W : Machine need 120W AC Adapter .

[5]180W : Machine need 180W AC Adapter .

The AC Adapter request is base on machine power request , some high performance need 120W Adapter , low cost machine maybe only 75W can meet request .

Because AC Adapter do not had HWID for detect , so need key in data by menu .

(1) If machine setting 75W , AC Adapter use 120W , it's OK .

(2) If machine setting 120W , AC Adapter use 75W , because Adapter can't support enough power , it can't charge well .

(3) If machine setting 90W , AC adapter use 90W , Adapter Select 90 W , it's OK .

(4) If machine setting 90W , AC adapter use 90W , Adapter Select 120W , "PHM" and "ECO" utility will display wrong data , power consumption display double data more the machine actual use .

2. Error information displayed on the screen can be manipulated with the following number keys:

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

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

The **3** key returns to the Diagnostics Menu.

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

The **5** key reads the log information from a floppy disk.

The **6** key writes the log information to a floppy disk.

The **7** key save the log information to a floppy disk.

The following are the test abbreviations for each Diagnostics Test.

Test Name	Test Abbreviations
System Test	ROM
Memory Test	RAM
Keyboard Test	KBD
Display Test	CRT
Floppy Disk Test	FDD
Hard Disk Test	HDD
Real Time Clock Test	RTM
Cache Memory Test	CAH
Height Resolution Display Test	KIF
Multimedia Test	MLT
Memory2 Test	RAM

3.19 System Configuration

Select **05** from the Diagnostics Menu and press **Enter** to display the following system configuration:

```
SYSTEM CONFIGURATION :

* - BIOS VER = VX.XX  KBC VER = XXXX
* - MAC ADDRESS : XXXXXXXXXXXXX
* - 0 ASYNC ADAPTER
* - 1 HDD DRIVE(S):XXXXXXXXXXXXXXXXXXXXXXXXXXXX
      FW Rev.:XXXXXXXX
      CUR LBA:XXXXXXXX  ORG LBA:XXXXXXXX
* - BATTERY TYPE:XXXXXXXX
* - XXXMB MEMORY SIZE
* - XXX CPU
* - 1 Vedio Chip XXXXXXXXXXXXXXX
* - 1 ODD DRIVE(S):XXXXXXXX
      FW Rev.:XXXX
```

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

3.20 OPTION

3.20.1 Function Description

Function description lets you add or delete the subtests used to execute the Running Test. The following screen displays after pressing the **Tab** key to edit an item in the Running Test.

KEY OPERATION

↓	Cursor Down
↑	Cursor Up
PgDn	Page Down
PgUp	Page Up
Home	Top of ITEM
End	End of ITEM
Ins	Insert ITEM
Del	Delete ITEM
Enter	End

3.20.2 Operation Description

Select **05** from the Diagnostics Menu and press **Enter** to display the following:

```

                                Test Item Editor                                [RUNNING TEST]
Loop Count (1-65535, 0 = infinity)  Error Stop 

```

T-No	Test Name	S-No	Subtest Name
01	System Test	Subtest 01	ROM Checksum
02	Memory Test	Subtest 01	Conventional Memory
02	Memory Test	Subtest 02	Protect Mode
02	Memory Test	Subtest 03	Protect Mode (32MB Max)
02	Memory Test	Subtest 04	RAM Refresh
04	Display Test	Subtest 01	VRAM W/R/C
04	Display Test	Subtest 02	Character Attribute Set
04	Display Test	Subtest 03	Character Set
04	Display Test	Subtest 04	80 * 25 Character Display
04	Display Test	Subtest 05	320 * 200 Graphics Display
04	Display Test	Subtest 06	640 * 200 Graphics Display
04	Display Test	Subtest 07	640 * 480 Graphics Display
04	Display Test	Subtest 08	Display Page
05	Floppy Disk Test	Subtest 02	Sequential W/R/C
08	Hard Disk Test	Subtest 01	Sequential Read
08	Real Time Clock Test	Subtest 02	Backup Memory Test

Tab: HELP (Key Operation)

1. Enter a **number** or **0** for **Loop Count** and press **Enter**.

Select a number from 1 to 65535 to define the number of times the Running Test executes.

Select 0 to run the test continuously until halted by the user.

2. Select the **NO** or **YES** for **Error Stop** and press **Enter**.

Select **NO** to keep the test running even if an error is found.

Select **YES** to stop the test program when an error is found.

***NOTE:** All errors which occur during execution of the Running Test are logged in the Log File.*

3. Press **Insert** to add a subtest.
4. Press **Delete** to remove the selected subtest.
5. Press **Enter** when you have finished editing the Running Test list.
6. The following message displays:

Do you want to save the data?

Save to disk
Do not save

7. Select the option and press **Enter**.
8. Select **03** from the Diagnostics Menu and press **Enter** to execute the Running Test.

***NOTE:** If press **Ctrl+Fn+break** in the runin process, please press more one any key to exit.*

3.21 Common Tests and Operation

3.21.1 How to operate a window

To input parameters, or open a window use the following keys.

- ↑ ↓ → ← key : to move a highlight bar
- [Enter] key : to select an item at the highlight bar
- [Esc] key : to close the current window and go back to the previous window

3.21.2 How to Stop the Test Program

To stop a test:

[Ctrl]+[Fn]+[Break] Press the Ctrl key and the Break key simultaneously.

3.21.3 Test Status Screen

***NOTE:** The Test Status Screen does not display during all the tests. See the specific test description Sections 3.4 through 3.14.*

The following Test Status screen displays during most tests. See the description of each test Sections 3.4 through 3.14 for specific screen information.

Test Name			
Sub Test	:0101		
Pass Count	:00000	Error Count	:00000
Write Data	:00	Read Data	:00
Address	:00000000	Status	:00

Test Name Displays the name of the test being executed.

Subtest No. Displays the Subtest number in the following format:

ffgg

ff = Subtest No.

gg = Step Number (Will be blank if the test does not have a Step Number.)

Pass Count	Displays the number of times the test has been executed.
Error Count	Displays the number of errors which have occurred during the test.
Write Data	Displays only the test data that has failed to compare during the test while being written during the test.
Read Data	Displays test data that has failed to compare during the test while being read during the test.
Test Address	Displays the Test Address. (The format differs for each test.)
Error Status	Displays the error status.
Error Name	Displays the name of the error.

3.21.4 Test Stop Display

If an error occurs during a Subtest and YES is selected for Error Stop, the following message displays:

```
[HALT OPERATION]

  1. Test end
  2. Continue
  3. Retry
```

* Select 1, 2, or 3

The three selections have the following functions:

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

Use the arrow keys to move the cursor to the desired option and press Enter.

3.21.5 How to enter data

Letters which must be entered are always shown in []. Simultaneous entries are displayed by a “+” mark. For example:

[a] [Enter]

Press the “a” key, then press the [Enter] key.

[Ctrl] + [c]

Press the [Ctrl] key and the “c” key simultaneously.

Chapter 4

Replacement Procedures

Chapter 4 Contents

4.1	Overview.....	4-1
	Safety Precautions.....	4-2
	Before You Begin	4-3
	Disassembly Procedure.....	4-4
	Assembly Procedure	4-5
	Tools and Equipment	4-5
	Screw Tightening Torque	4-6
	Grip Color	4-6
	Screw Notation.....	4-7
4.2	Battery pack	4-8
4.3	HDD/SDD.....	4-11
4.4	Memory module.....	4-15
4.5	Keyboard.....	4-18
4.6	Wireless LAN card	4-21
4.7	Bluetooth module.....	4-23
4.8	3G module card.....	4-25
4.9	Display assembly	4-27
4.10	Top Cover assembly	4-33
4.11	Touch Pad Board.....	4-36
4.12	Modem Board	4-38
4.13	Power Board.....	4-39
4.14	SIM Board.....	4-40
4.15	USB Board	4-41
4.16	Optical disc drive	4-42
4.17	Mother Board/RTC Battery	4-44
4.18	CPU/CPU Heat sink.....	4-48
4.19	LCD unit	4-51
4.20	Web Camera module.....	4-56

4.21 Application for thermal grease on CPU and North Bridge..... 4-60
4.22 Speaker Box 4-62

Figures

Figure 4-2-1 Remove the battery pack..... 4-8
Figure 4-2-2 Install the battery pack 4-10
Figure 4-3-1 Turn the computer upside down 4-11
Figure 4-3-2 Remove the HDD/SDD slot cover 4-12
Figure 4-3-3 Remove the HDD/SDD assembly..... 4-12
Figure 4-3-4 Remove the HDD/SDD.....4-13
Figure 4-4-1 Remove memory slot cover 4-15
Figure 4-4-2 Remove a memory module 4-16
Figure 4-5-1 Remove screws on Battery fillister..... 4-18
Figure 4-5-2 Remove 4 screws for Keyboard..... 4-19
Figure 4-6-1 Remove a wireless LAN card 4-21
Figure 4-7-1 Remove Bluetooth module 4-23
Figure 4-8-1 Remove a 3G module card..... 4-25
Figure 4-9-1 Remove the screws (from bottom side) 4-27
Figure 4-9-2 Remove the screws (from top side) 4-28
Figure 4-9-3 Remove the Wireless Antenna..... 4-29
Figure 4-9-4 Remove the LCD cable from mother board..... 4-29
Figure 4-9-5 Remove the LCD cable from LCD panel 4-30
Figure 4-9-6 Remove the hinge screws 4-31
Figure 4-10-1 Remove the screws (front) and Top cover assembly 4-33
Figure 4-10-2 Disconnect cables 4-34
Figure 4-11-1 Remove the touch pad board FFC cable.....4-36
Figure 4-11-2 Remove screws for Touch pad board.....4-37
Figure 4-12-1 Remove the modem board 4-38
Figure 4-13-1 Remove the power board 4-39
Figure 4-14-1 Remove the SIM board 4-40
Figure 4-15-1 Remove the USB Board..... 4-41

Figure 4-16-1	Remove the ODD.....	4-42
Figure 4-16-2	Installing the Optical disc drive	4-43
Figure 4-17-1	Remove the DC-IN cable.....	4-44
Figure 4-17-2	Remove screws for mother board	4-45
Figure 4-17-3	Remove the RTC battery-step_1.....	4-46
Figure 4-17-4	Remove the RTC battery-step_2.....	4-47
Figure 4-17-5	Install the RTC battery.....	4-47
Figure 4-18-1	Remove the CPU heat sink	4-48
Figure 4-18-2	Remove the CPU	4-49
Figure 4-18-3	Apply silicon grease.....	4-50
Figure 4-19-1	Remove the display mask	4-51
Figure 4-19-2	Remove the LCD unit.....	4-52
Figure 4-19-3	Remove the inverter.....	4-53
Figure 4-19-4	Remove the LCD hinge	4-54
Figure 4-20-1	Remove the connector of Web Camera module	4-56
Figure 4-20-2	Take Web Camera module off.....	4-57
Figure 4-20-3	Camera Module before installing	4-58
Figure 4-20-4	Camera Module after installing	4-59
Figure 4-21-1	Intel &AMD Thermal grease on North Bridge and CPU	4-60
Figure 4-21-2	Apply silicon grease for North Bridge and CPU	4-61
Figure 4-22-1	Removing the securing screws at left side.....	4-62
Figure 4-22-2	Removing the securing screws at right side.....	4-63

4.1 Overview

This chapter describes the procedure for removing and replacing the field replaceable units (FRUs) in the PC. It may not be necessary to remove all the FRUs in order to replace one. The chart below provides a guide as to which other FRUs must be removed before a particular FRU can be removed. The numbers in the chart indicate the relevant section numbers in this manual.

In all cases when removing an FRU, the battery pack must also be removed. When repairing an FRU that is the potential cause of a computer fault, use the chart to determine the order in which FRUs need to be removed.

The tilt stand, if it is installed, can be removed without any other FRUs removed.

4.2 Battery Pack									
4.3 HDD/SSD									
4.4 Memory Module									
4.5 Key board									
4.10 TOP Cover Assembly									
4.16 Optical Disc Drive	4.14 SIM Board	4.11 Touch pad board	4.22 Speaker Box	4.17 Mother Board/RTC Battery		4.9 Display Assembly	4.7 Bluetooth Module	4.15 USB Board	4.13 Power Board
		4.12 Modem Board	4.6 Wireless LAN Card	4.18 CPU/CPU Heat Sink	4.8 3G Module Card	4.19 LCD Unit			
				4.21 Application for Thermal pad and grease on CPU, North Bridge		4.20 WEB Camera Module			

Safety Precautions

Please read the following safety instructions before disassembling the computer and always follow the instructions while working on the computer.

- DANGER:**
- 1. In the case of the battery, always use authentic parts or equivalent parts approved by Toshiba. Other batteries may have different specifications that are incompatible with the computer and may result in fire or explosion.
Due to the risk of alkali fluid leaks, never attempt to heat or disassemble the battery. Similarly, due to the risk of explosion, never expose the battery to flame.*
 - 2. Some parts including the power supply and FL inverter generate high voltages. If you need to turn on the power while disassembling the computer, do not touch any connectors or other components due to the risk of electric shock. Also, do not disassemble individual parts when performing routine maintenance.*

- WARNING:**
- 1. To prevent electric shock, turn off the power unplug the AC adapter from the power source.*
 - 2. As the battery installed to the computer is typically already charged, the risk of electric shock remains even when the AC adapter is unplugged from the socket. To prevent electric shock, always take off any metal jewelry or accessories such as necklaces, bracelets or rings before working on the computer. Never work with wet or moist hands.*
 - 3. Take care not to injury yourself on any edges or corners.*

- CAUTION:**
- 1. Confirm that replacement parts have compatible specifications before replacing on the computer. Never use incorrect parts as these may cause faults on the computer.*
 - 2. To prevent internal damage such as short circuits or burning, do not allow any screws, paper clips, or other metal objects to fall into the computer. When removing screws, always replace with the same size screws. Ensure that all screws are fully tightened. Loose screws may result in short circuits leading to overheating, smoke or flame.*
 - 3. To prevent electric shock, check that you have disconnected all cables from a part before removing the part.*
 - 4. When connecting to the AC power supply, use only an AC adapter and cable approved by Toshiba.*
 - 5. To prevent electric shock, ensure that all replacement parts are compatible with the computer and that all cables and connectors are securely connected.*

Before You Begin

Take note of the following points before starting work. Always remove the AC adapter and battery pack before commencing any of the procedures. The procedure for removing the battery pack is described in section “4.2 Battery Pack”.

1. Do not disassemble the computer unless it is operating abnormally.
2. Use the designated tools.
3. Ensure that the environment for working on and storing parts does not contain any of the following.
 - Dust or dirt
 - Static electricity
 - Extremely hot, cold or humid conditions
4. Perform the diagnostic tests described in Chapter 2 to determine which FRU is the cause of the fault.
5. Do not perform any unnecessary work. Always work in accordance with the disassembly and reassembly procedures in this manual.
6. Keep parts removed from the computer in a safe place away from the computer where they will not be damaged or interfere with your work.
7. Disassembling requires the removal of a large number of screws. Keep removed screws in a safe place such that you can determine which screws belong to which part.
8. When reassembling, ensure that you use the correct screws and fit parts in the correct position. Screw sizes are noted in the text and figures.
9. As all parts have sharp edges and corners, take care not to cut yourself.
10. After replacing an FRU, check that the computer and replaced part operate correctly.

Disassembly Procedure

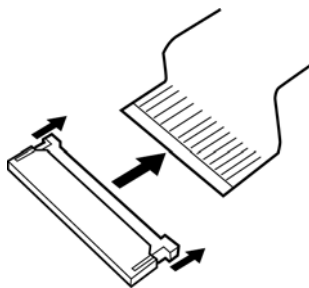
Three main types of cable connector are used.

- Pressure plate connector
- Spring connector
- Normal pin connector

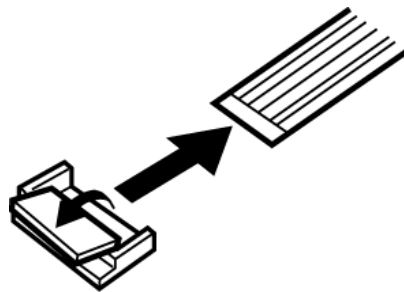
When disconnecting a pressure plate connector, lift up the tag on one side of the plastic pressure plate on the connector and pull the cable out from the connector. When reconnecting a cable to a pressure plate connector, lift up the pressure plate to a suitable height and insert the cable into the connector. Press down on both sides of the pressure plate such that both sides of the plate and connector are at the same height and that the cable is fixed in the correct position. Pull the cable to ensure that it is securely connected. If the cable is disconnected from the connector, reconnect it making sure that you lift the pressure plate high enough to insert fully the cable.

For spring connectors, lifting up the stopper frees the cable and allows it to be pulled out. To reconnect, hold the stopper in the up position and insert the cable, then lower the stopper to secure the cable.

Normal pin connectors are used for all other cables. Simply pull out or push in these connectors to disconnect or reconnect.



Pressure plate connector



Spring connector

Assembly Procedure

After the computer has been disassembled and the part that caused the fault has been repaired or replaced, the computer must be reassembled.

Take note of the following general points when assembling the computer.

- Take your time and follow the instructions carefully. Hurrying the assembly work will only introduce new problems.
- Check that all cables and connectors are securely connected;
- Before fastening FRUs or other parts in place, ensure that no cables are caught on screws or the FRU.
- Check that all latches are securely closed.
- Ensure that you have installed all FRUs correctly and do not have any screws left over. Using an incorrect screw may damage the thread or screw head and result in the FRU not being securely fastened in place.

After installing FRUs, check that the computer operates correctly.

Tools and Equipment

For your safety and the safety of the people around you, it is important that you use Electrostatic Discharge (ESD) equipment. Correctly utilizing of the equipment increases the percentage of successful repairs and saves on the cost of damaged or destroyed parts. The following equipment is required for disassembly and assembly.

- One Philips screwdriver with type 0 bit (for THIN HEAD screws)
- One Philips screwdriver with type 1 bit (for screws other than above)
- Tweezers (for lifting screws)
- ESD mats (lay on work table or floor)
- An ESD wrist strap and heel grounder
- Anti-static carpet or flooring

Screw Tightening Torque

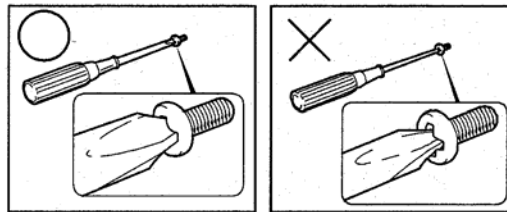
Use the following torque when tightening screws.

CAUTION: *Overtightening may damage screws or parts. Undertightening may allow screws to loosen (and possibly fall out) causing a short circuit or other damage.*

NOTE: *To tighten screws quickly and accurately, an electric screwdriver is recommended.*

- M2 (2mm) 0.167 N· m (1.7 kgf· cm)
- M2.5 (2.5mm) 0.392 N· m(4.0 kgf· cm) for Hinge support

NOTE: *To prevent damage to THIN HEAD screws, press along the axis of the screwdriver while turning the screw. This is because the contact area between the screw and driver is less than for a pan head screw (standard pan-shaped screw head).*



Grip Color

Some screws have a colored grip area to help you determine the length of the screw.

- Even numbered length screws: Brown
- Odd numbered length screws: White
- Special length screw: Blue



“Special length screw” means screws whose length is indicated in an integral number to the first decimal places such as 2.5 mm, 2.8 mm and so on.

Screw Notation

To make maintenance of the computer easier, markings of the kinds of the screws including the types and lengths are indicated on the computer body.

Format:

Screw shape + Screw length (mm)

Screw shape

B: Bind screw

F: Thin head screw

S: Super thin head screw

T: Tapping screw

U: Other screws (Unique screws: pan head, stud, etc.)

Example: B6 ... 6mm bind screw

4.2 Battery Pack

Removing the battery pack

The following describes the procedure for removing the battery pack (See Figure 4-2-1).

CAUTION: Take care not to short circuit the terminals when removing the battery pack. Similarly, do not drop, knock, scratch, disassemble, twist, or bend the battery pack.

1. Turn off the power of the computer.
2. Disconnect the AC adapter and all external devices from the computer.
3. Turn the computer upside down.
4. Slide and hold the battery release latch (2) to free the battery pack after moving the battery release latch (1) into its unlock position – pick the battery pack out of the computer from the filler.

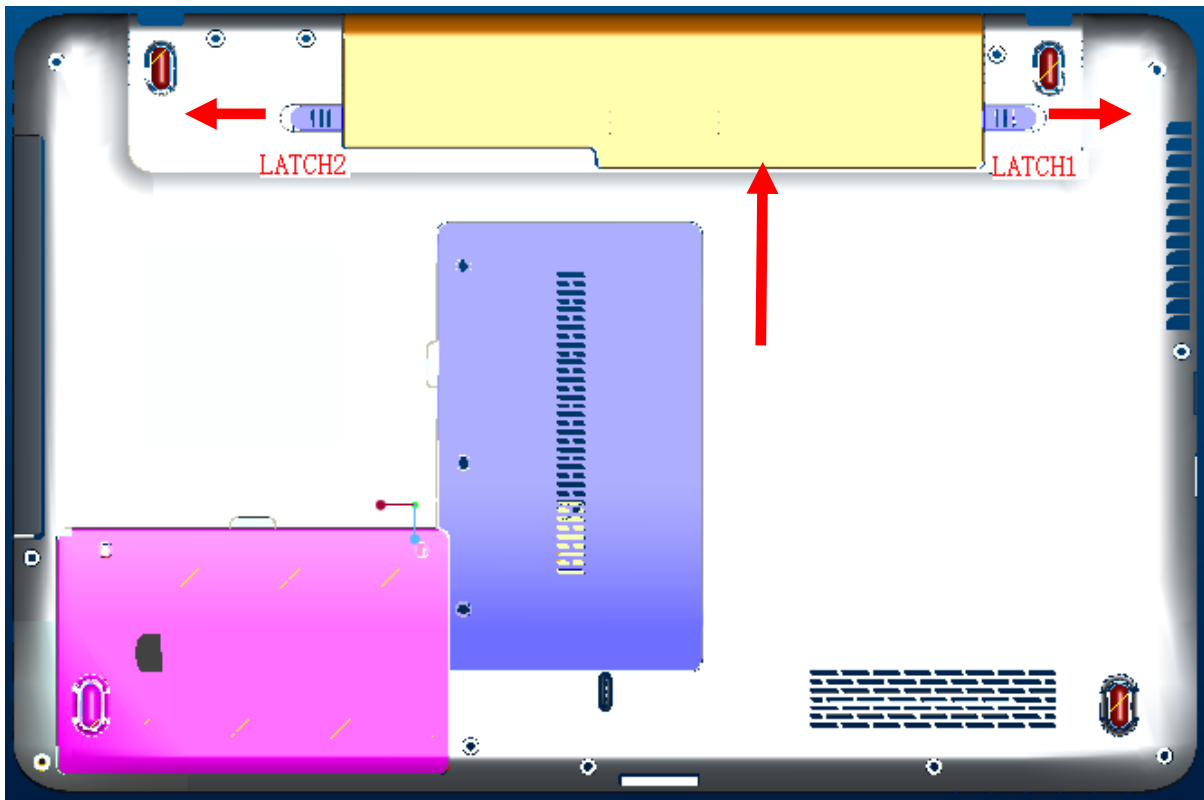


Figure 4-2-1 Remove the battery pack

NOTE: *Dispose of the used battery pack in accordance with the laws and ordinances of your local authority.*

Installing the battery pack

The following describes the procedure for installing the battery pack (See Figure 4-2-2).

CAUTION: *There is a danger that the lithium ion battery pack may explode if not fitted, operated, handled, or disposed correctly. Dispose always the used battery pack in accordance with the laws and ordinances of your local authority. Use only the batteries approved by Toshiba.*

NOTE: *Check visually the battery terminals and clean off any dirt with a dry cloth.*

1. Turn off the power of the computer.
2. Disconnect the AC adapter and all external devices from the computer.
3. Attach the **battery cover** to the **battery pack**.
4. Insert the battery pack.
5. Ensure the battery release latch (2) is moved into its locked position.

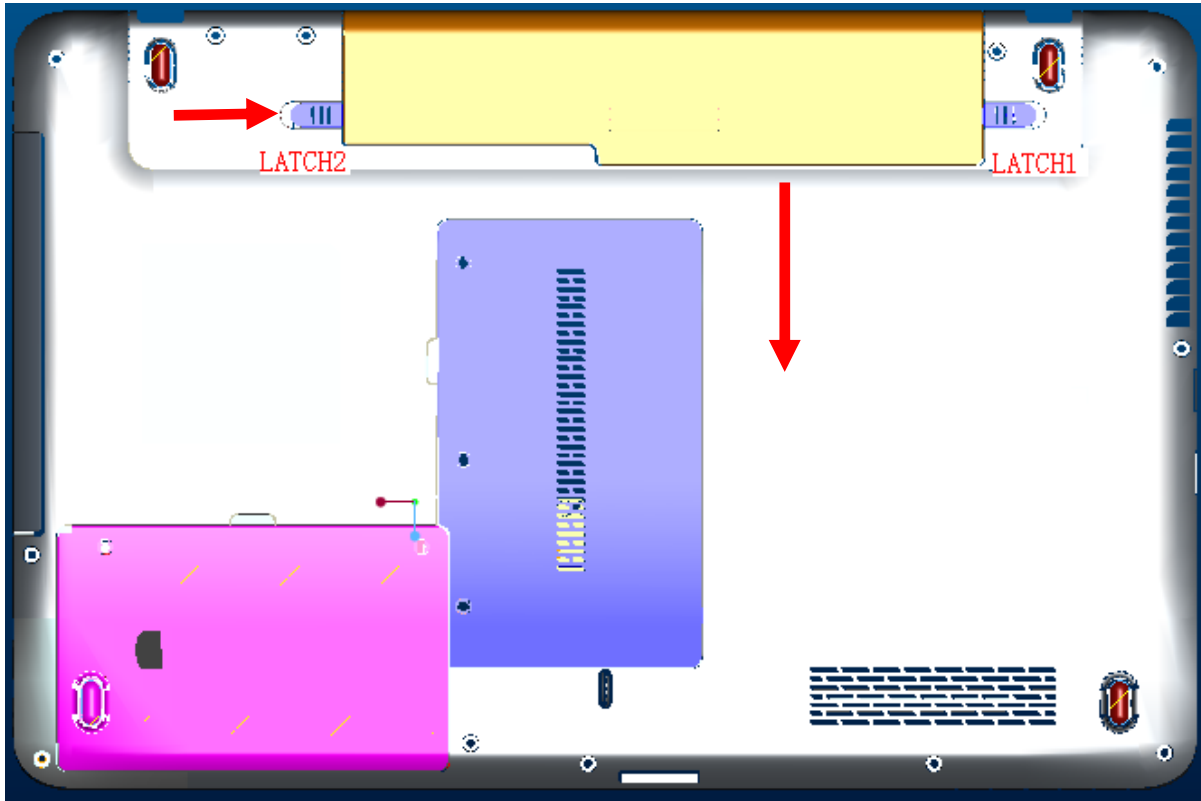


Figure 4-2-2 Install the battery pack

4.3 HDD/SSD

Removing a HDD/SSD

The following describes the procedure for removing the HDD/SSD (See Figure 4-3-1 to 4-3-4).

CAUTION: Take care not to press on the top or bottom of a HDD/SSD. Pressure may cause data loss or damage to the device.

1. Turn the computer upside down.

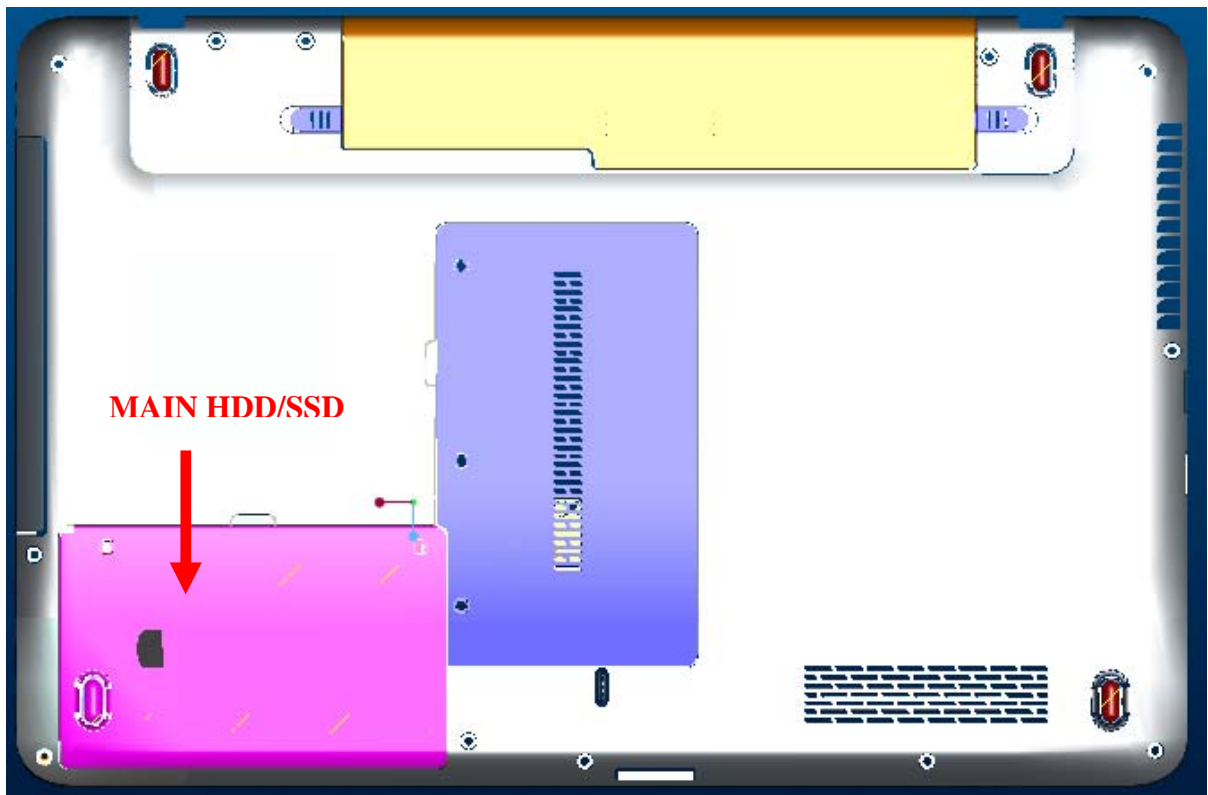


Figure 4-3-1 Turn the computer upside down

2. Remove the following **screws** securing a HDD/SSD slot cover.

- M2.5×4.0B BIND screw x2

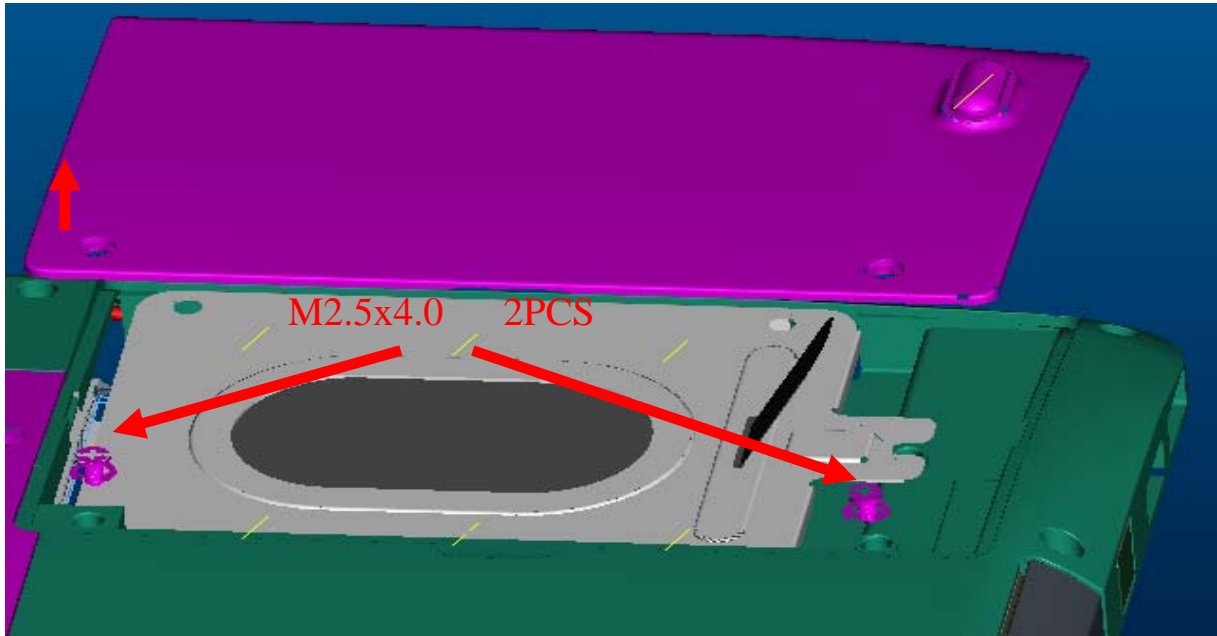


Figure 4-3-2 Remove HDD/SSD slot cover

3. Remove the following screws securing the **HDD/SSD assembly**.

- M2.0 ×3.0B BIND screw x1

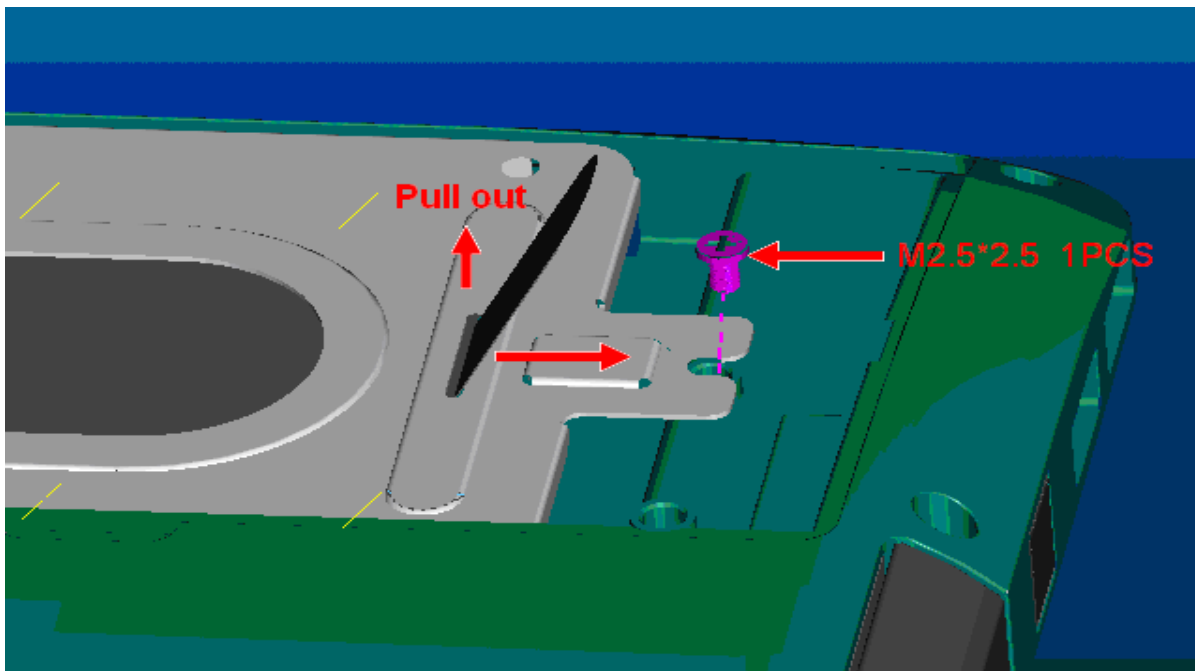


Figure 4-3-3 Remove HDD/SSD assembly

4. Disconnect the **HDD/SSD assembly** from the connector on the system board.

5. Remove the following **screws** securing the HDD/SSD bracket and remove the **HDD /SSD bracket**.

- M3.0×3.0B FLAT BIND screw x2

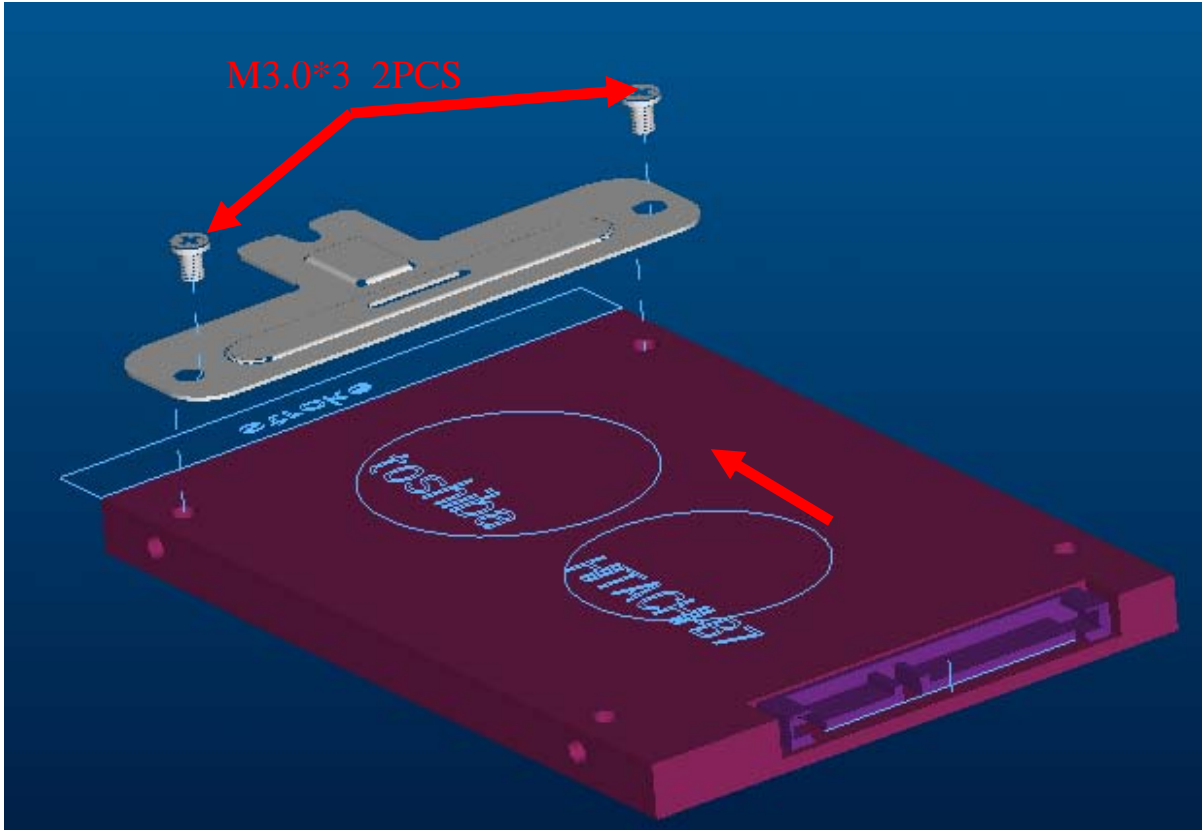


Figure 4-3-4 Remove HDD/SSD

CAUTION: When a HDD/SSD is installed, they are installed in the position as the following figure.

Installing HDD/SSD

The following describes the procedure for installing the main HDD/SSD.

1. Install a HDD to the **HDD/SSD bracket** and secure it with the following **screws**.

- M3.0×3.0F FLAT BIND screw x2

NOTE: *Although they are 3mm head screws, screw torque must be set in 2.5kg-cm for four screws securing the HDD/SSD holder.*

2. Insert the **HDD/SSD assembly** into the HDD/SSD slot and connect it carefully to the **MAIN HDD/SSD** on the system board.
3. Secure the **HDD/SSD assembly** with the following **screw**.
 - M2.0×4.0B BIND screw x2

4.4 Memory Module

CAUTION: The power of the computer must be turned off when you remove a memory module. Remove a memory module with the power on risks damaging the module or the computer itself.

Do not touch memory module terminals. Any dirt on the terminals may cause memory access problems.

Never press hard or bend a memory module.

Removing a memory module

To remove a memory module, confirm that the computer is in boot mode. Then perform the following procedure (See Figure 4-4-1 to 4-4-2).

1. Remove the following screws for securing the **memory slot cover**.

- M2.5 ×4.0B BIND screw x3

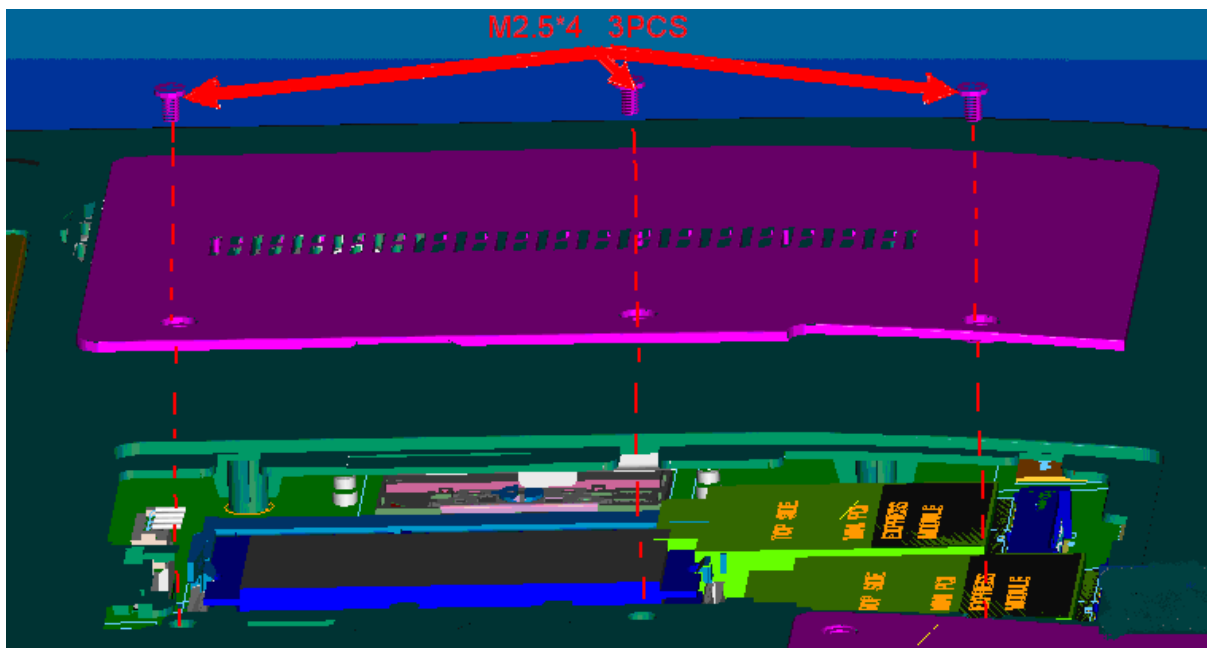


Figure 4-4-1 Remove memory slot cover

2. Remove the **memory slot cover**.
3. Open the left and right **latches** and remove a **memory module**.

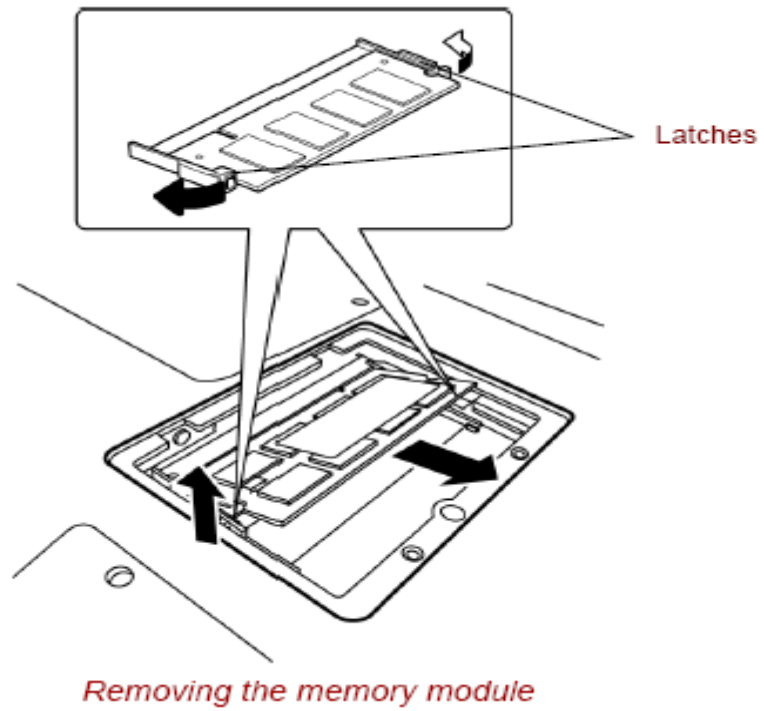


Figure 4-4-2 Remove a memory module

Installing a memory module

To install a memory module, confirm that the computer is in boot mode. Then perform the following procedure (See Figure 4-4-3).

1. Insert a **memory module** into the connector of the computer slantwise (terminal side first) and press it to connect firmly.

CAUTION: *The power must be turned off when you insert a memory module. Inserting a memory module with the power on might damage the module or the computer itself.*

Never press hard or bend a memory module.

2. Install the **memory slot cover** and secure it with the following **screws**.
 - M2.5 ×4.0B BIND screw x3
3. When the power of the computer is turned on, the computer checks automatically the memory size. Confirm that the new memory is detected correctly.
4. If the memory is not detected, check that it is connected correctly.

4.5 Keyboard

Removing the keyboard

The following describes the procedure for removing the keyboard (See Figure 4-5-1 to 4-5-2).

CAUTION: As the keycap may fall out, when handling the keyboard always hold it by the frame and do not touch the keycap.

1. Upside down the computer and remove the battery.
2. Loose the screws on Battery fillister.

● M2.0x5.0B BIND screws x1 PCS

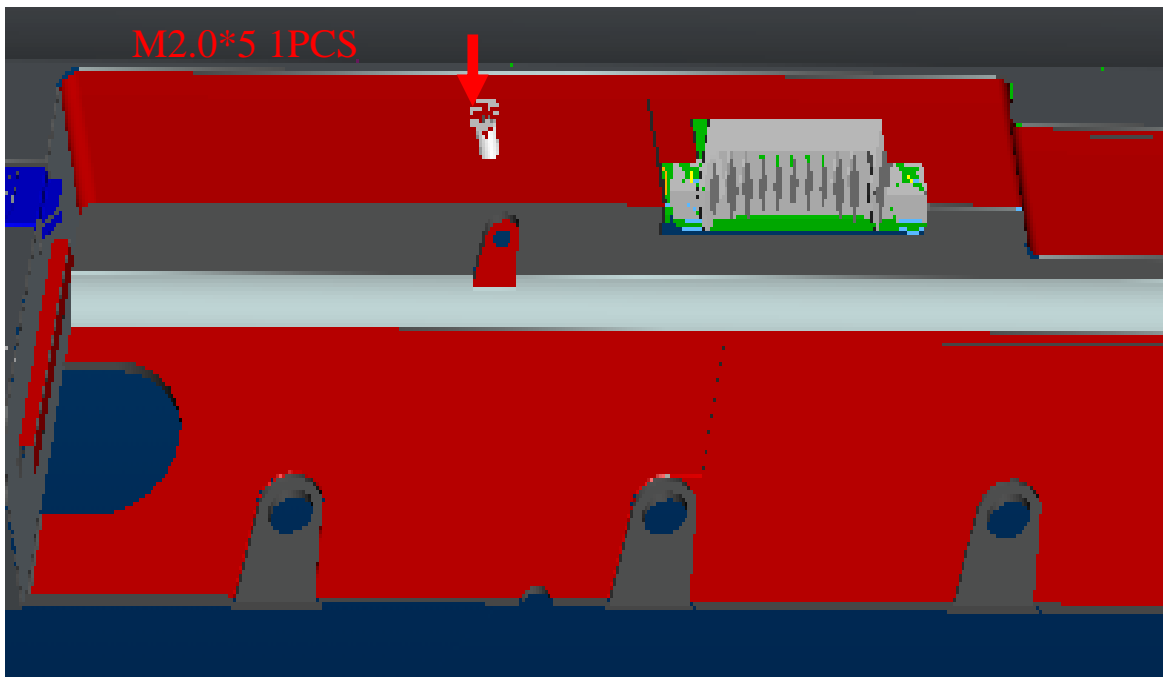


Figure 4-5-1 Remove screws on Battery fillister

3. Open the display.
4. Insert your finger into the slot between the KB holder and the keyboard. Then, lift up the **keyboard holder** to remove it.
5. Loose the **screws** securing Keyboard.

M2.5x3.0B BIND screws x4

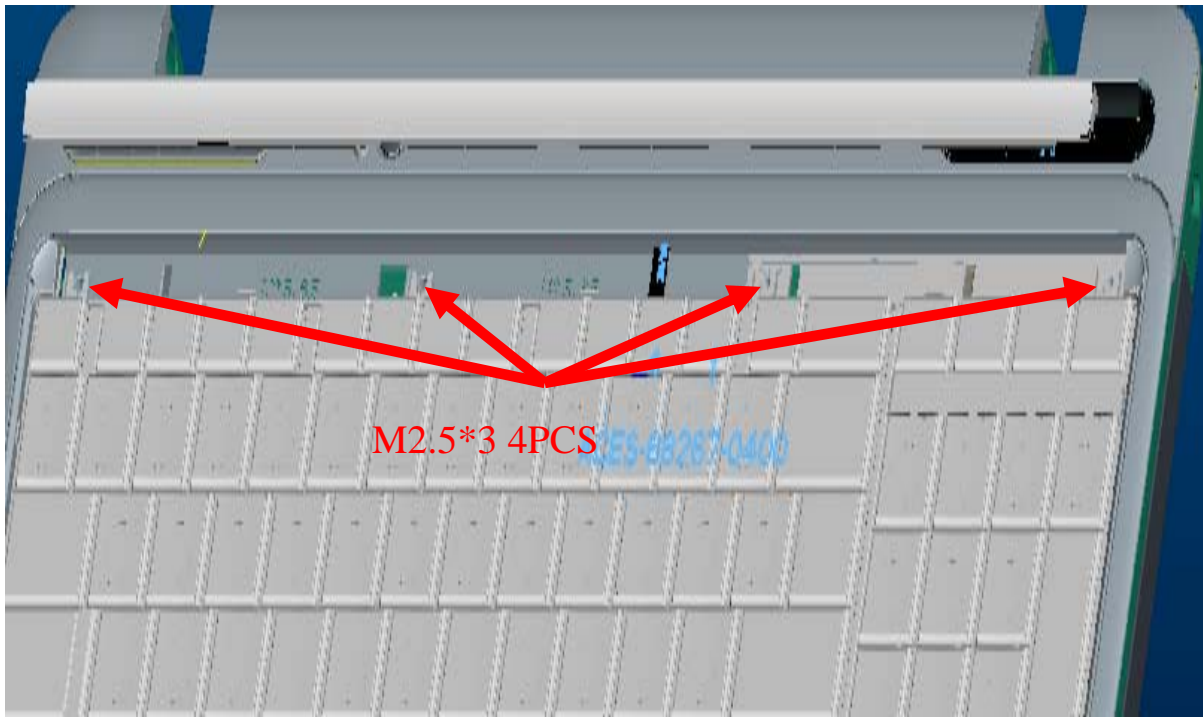


Figure 4-5-2 Remove 4 screws for Keyboard

6. Insert your finger into the slot between keyboard and Top cover Assembly. Then lift up the **keyboard** to remove it.
7. Disconnect keyboard cable.

Installing the keyboard

The following describes the procedure for installing the keyboard.

1. Connect the **keyboard flexible cable** to the connector on the system board.
2. Slide and set the **keyboard** then secure it with the following **screw**.
 - M2.5×3.0B BIND screw x4
3. Install the **K/B holder** by pressing it from the topside.
4. Upside down the computer and secure the **KB holder** with the following screw.
 - M2.0×5.0B BIND screw x1

4.6 Wireless LAN card and

Removing a Wireless LAN card

The following describes the procedure for removing a Wireless LAN card (See Figure 4-6-1).

1. Remove the screws of **wireless LAN card**.

- M2.5x2.5B BIND screw x2

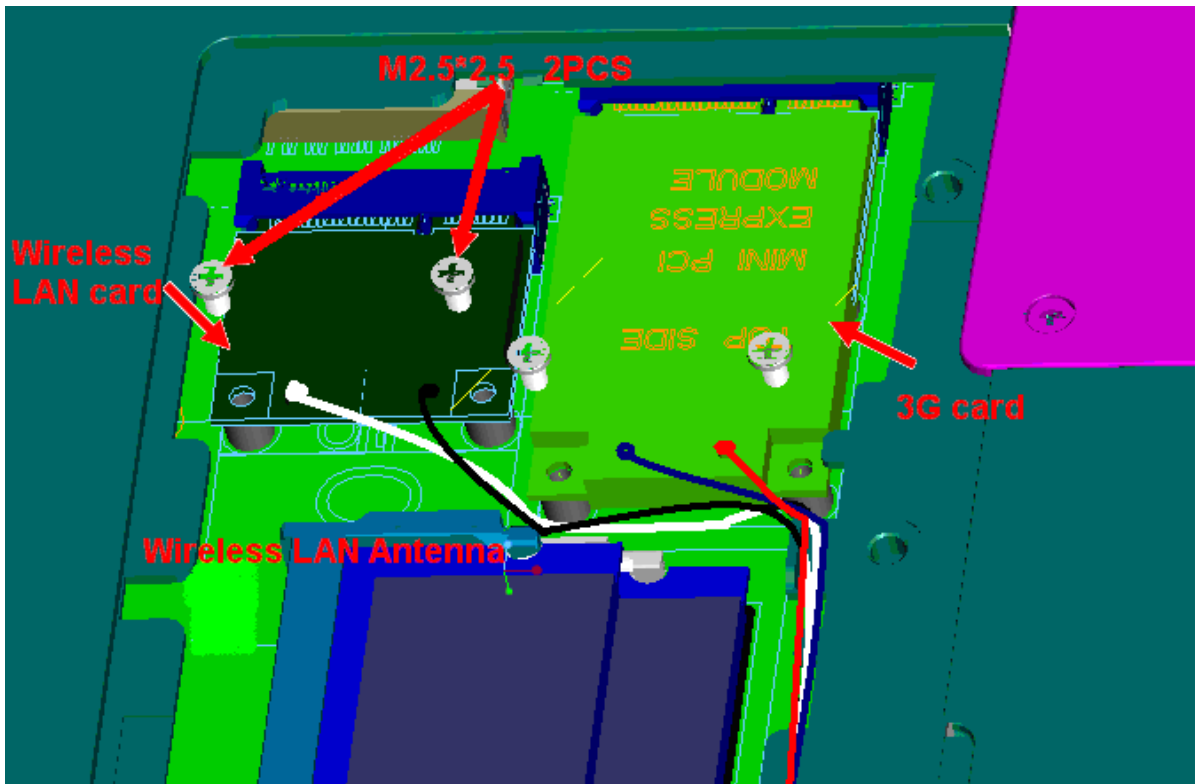


Figure 4-6-1 Remove a wireless LAN card

2. Disconnect the **wireless LAN antenna cable** from the connectors on a wireless LAN card.
3. Remove a **wireless LAN card** from the **connector** on the mother board.

Installing a Wireless LAN card

The following describes the procedure for installing a Wireless LAN card.

1. Insert a **wireless LAN card** terminals slantwise into the connector on the computer and press a wireless LAN card and lock secure it with the following screws.

- M2.5x2.5B BIND screw x2

2. Connect the **wireless LAN antenna cable** to the terminals on a wireless LAN card.

4.7 Bluetooth Module

Removing Bluetooth module

The following describes the procedure for removing Bluetooth module (See Figure 4-7-1)

1. Remove Top cover assembly (see 4.10).
2. Remove following screw for securing Bluetooth module.

- M2.0x3.8B BIND screw x1

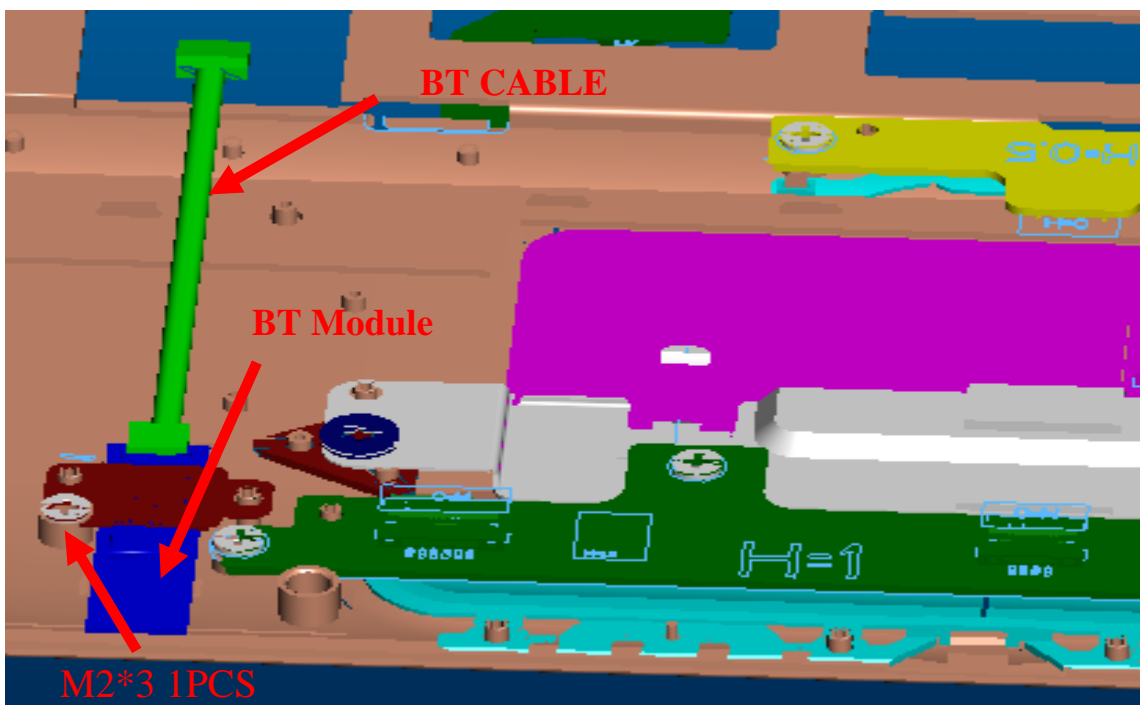


Figure 4-7-1 Remove Bluetooth module

3. Remove Bluetooth bracket.
4. Remove Bluetooth cable from Bluetooth connector.

Installing a Wireless LAN card

The following describes the procedure for installing Bluetooth module

1. Insert Bluetooth cable into Bluetooth connector.
2. Secure the Bluetooth on Top cover assembly with Bluetooth bracket.
3. Secure Bluetooth bracket with following screws.

- M2.0x3.8B BIND screw x1

4.8 3G module card

Removing 3G module card

The following describes the procedure for removing a 3G module card (See Figure 4-8-1).

1. Remove screws of 3G module board.
 - M2.5x2.5 BIND screw x2

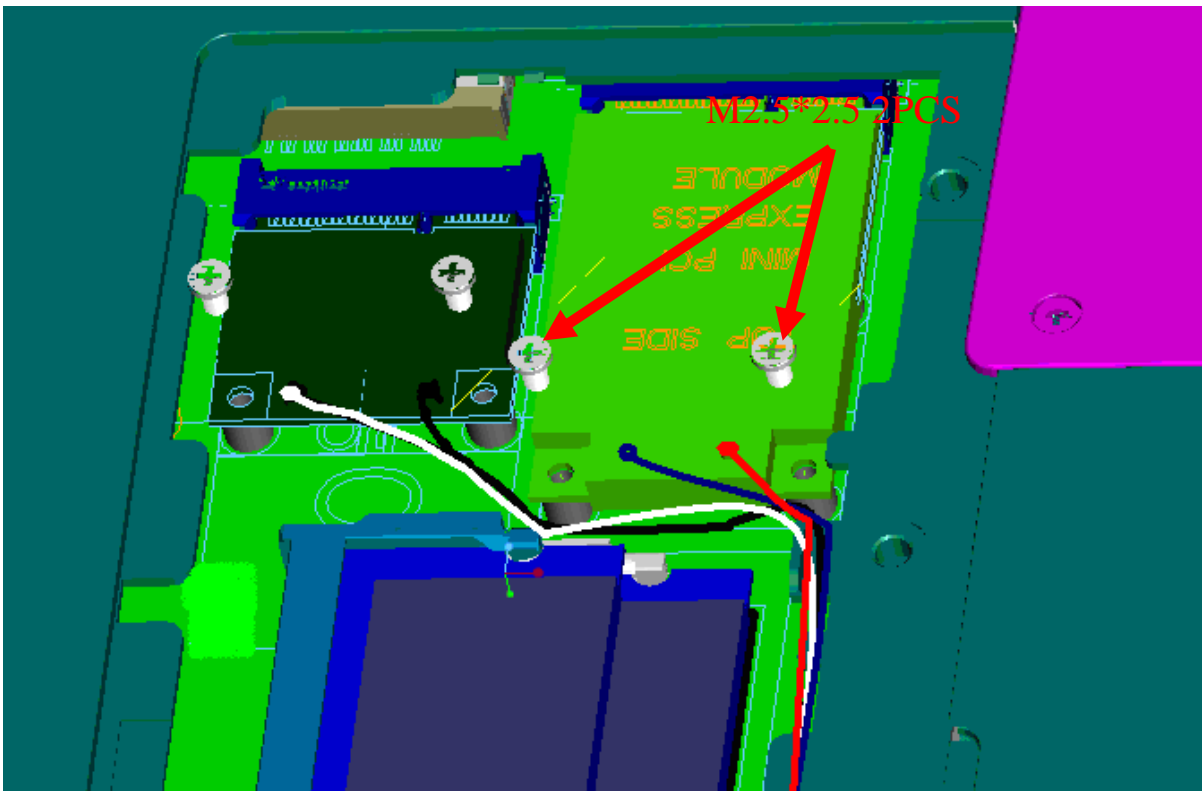


Figure 4-8-1 Remove a 3G module card

2. Disconnect the **3G module antenna cable** from the connectors on a 3G module card
3. Remove a **3G module card** from the **connector** on the mother board.

Installing a 3G module card

The following describes the procedure for installing a 3G module card. (See Figure 4-8-3)

1. Insert a **3G module card** terminals slantwise into the connector on the system board and press a **3G module card** and lock the secure screws.
2. Connect the **3G module antenna cable** to the terminals on a 3G module card.
3. Put the **3G module antenna cable** on the bottom location from the guide.

4.9 Display Assembly

Removing the display assembly

The following describes the procedure for removing the display assembly (See Figure 4-9-1 to 4-9-6).

1. Close the display and turn the computer upside down.
2. Remove the battery pack (See Figure 4-2-1).
3. Remove the screws from the bottom side.

- M2.5×6.5 FLAT BIND screw x12
- M2.5×4.0 FLAT BIND screw x5
- M2.5×3.0 FLAT BIND screw x1
- M2.0×5.0 FLAT BIND screw x1
- M2.0X3.0 FLAT BIND screw x2

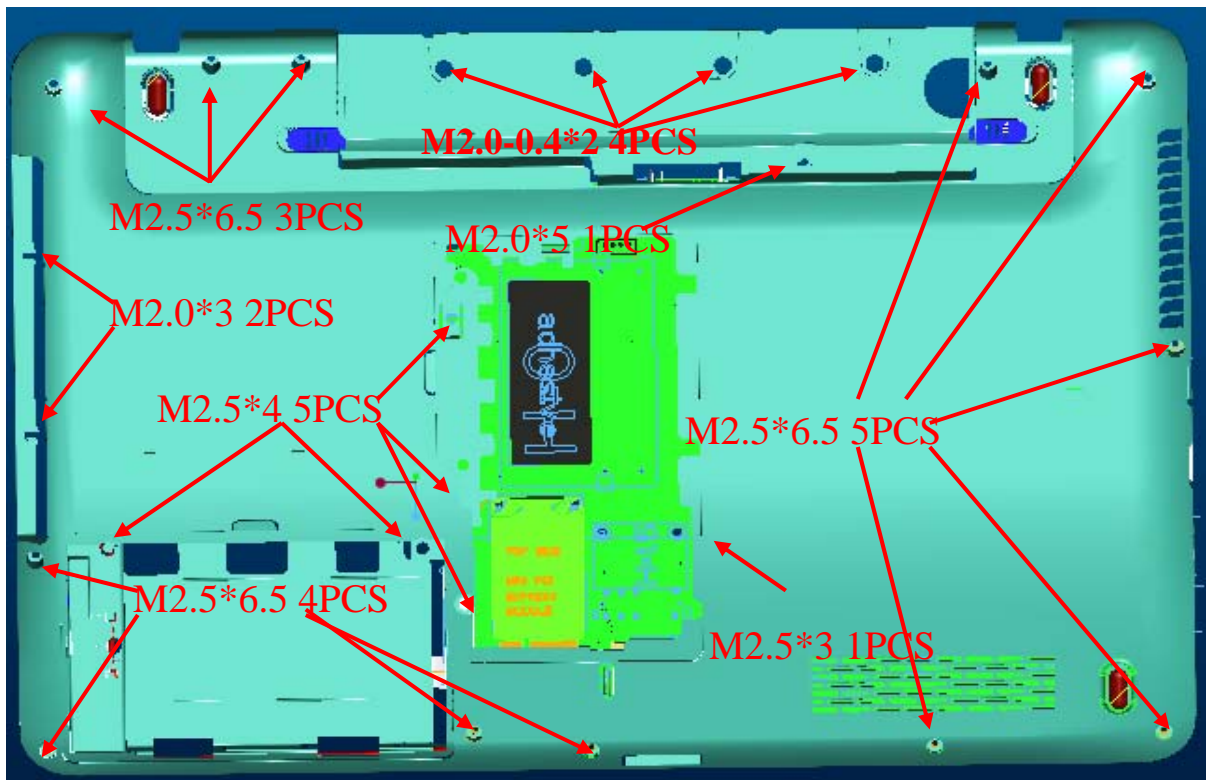


Figure 4-9-1 Remove the screws (from bottom side)

4. Disassemble **KB Holder** and **KB** screw (See Figure 4-5-1).

5. Remove the screws from the top side and remove the cover.

- M2.5×6.5 FLAT BIND screw x9

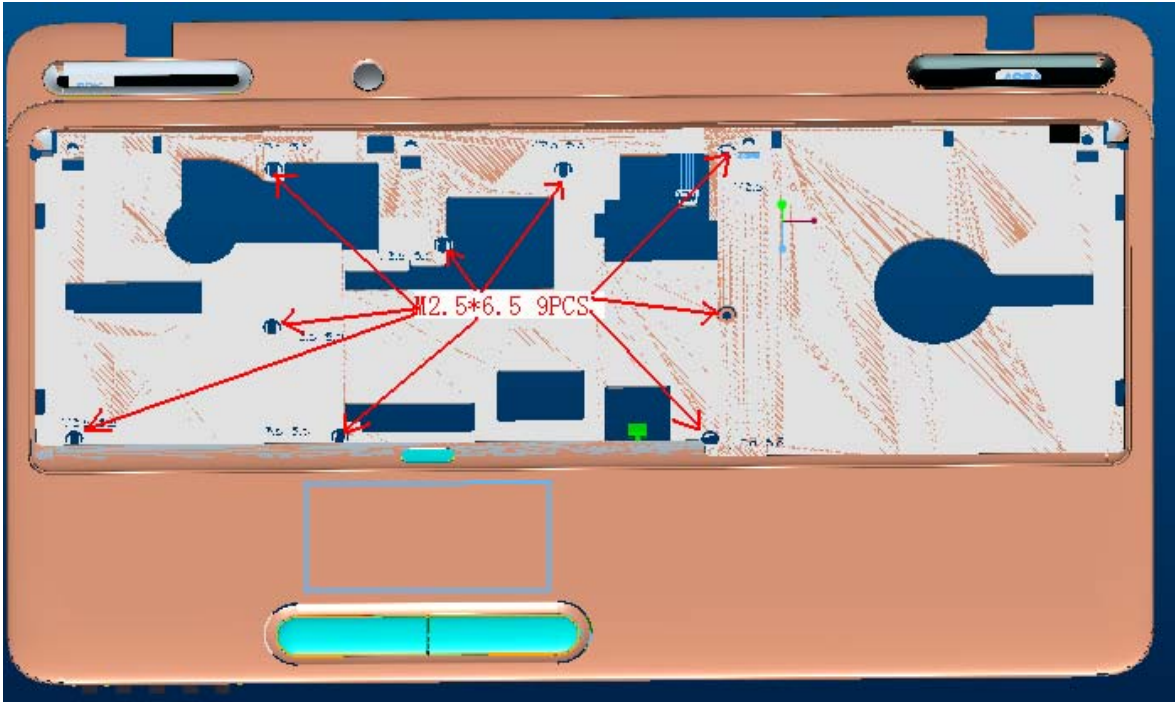


Figure 4-9-2 Remove the screws (from top side)

6. Disconnect the FFC and cables.
7. Disassembly TOP Assembly.
8. Pull out the **wireless LAN antenna** from computer bottom.

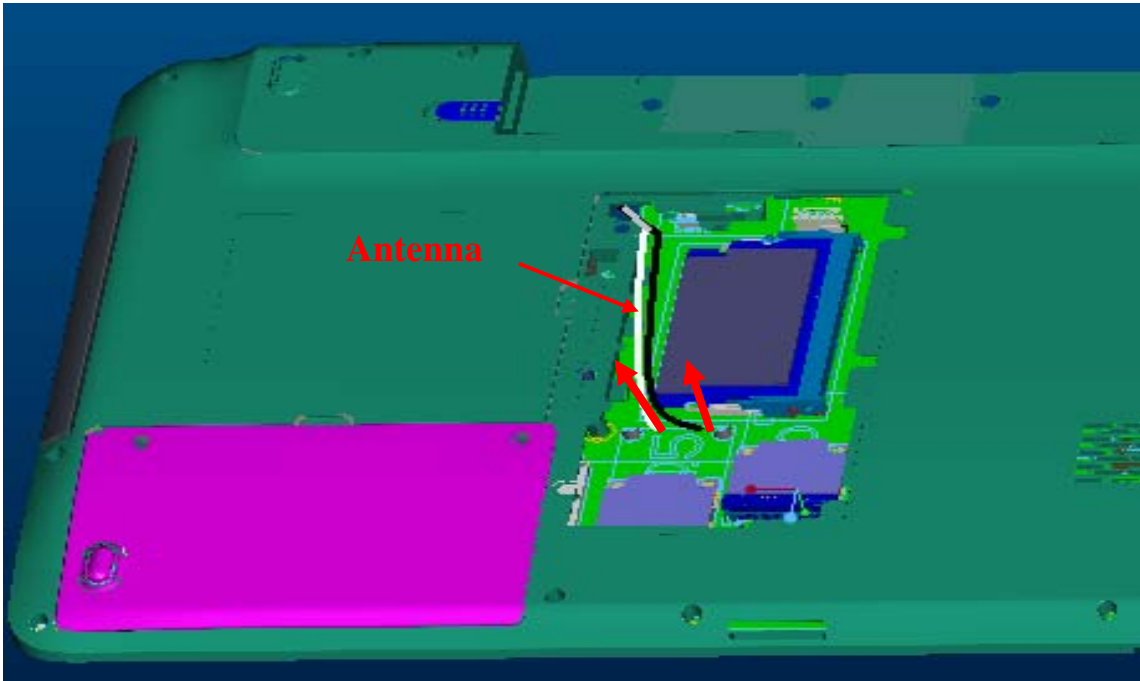


Figure 4-9-3 Remove the Wireless Antenna

9. Pull out the **LCD cables** from the guide of mother board.

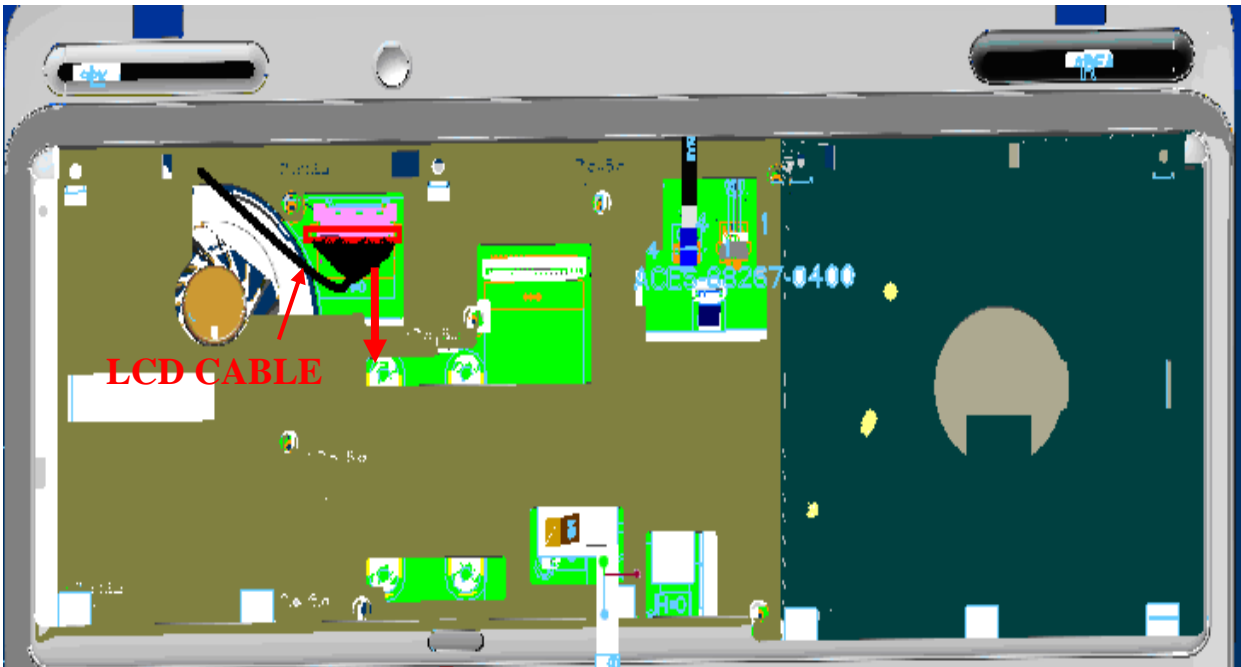


Figure 4-9-4 Remove the LCD cable from mother board

10. Pull out the **LCD cables** from the guide of LCD panel.

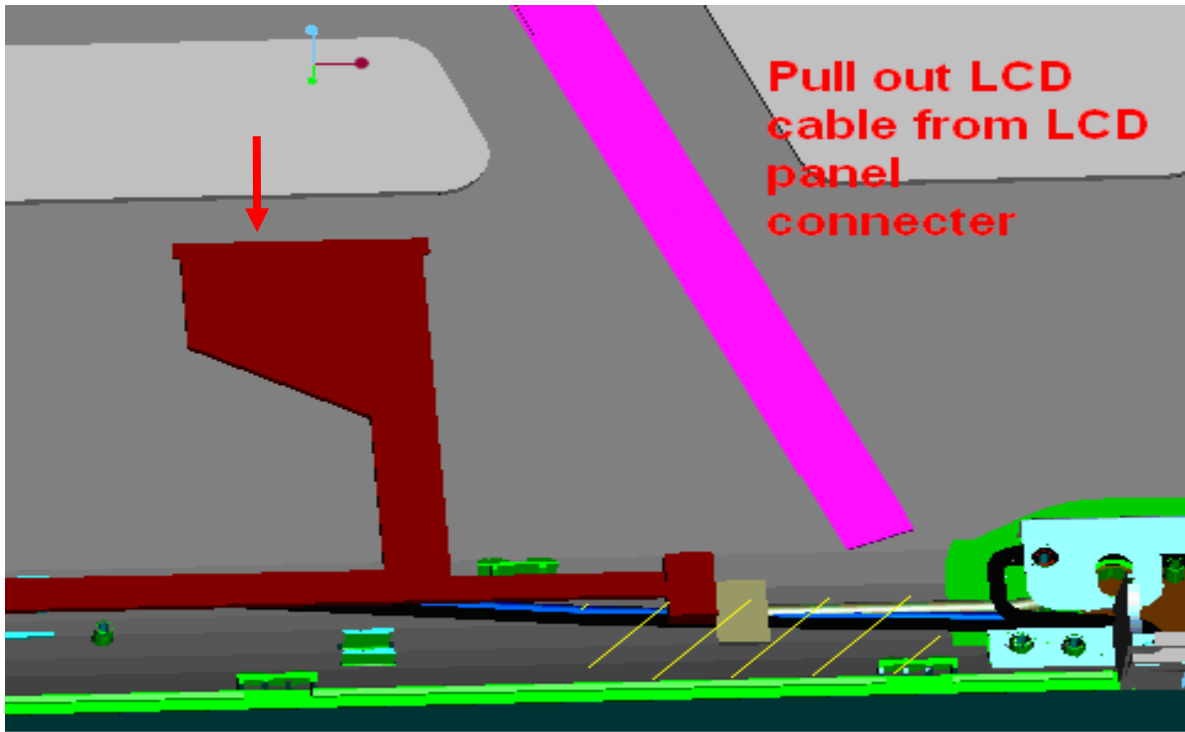


Figure 4-9-5 Remove the LCD cable from LCD panel

11. Opening the display to 135degree, keeping display side by hand and remove the hinge screw.

- M2.5×6.5 FLAT BIND screw x6

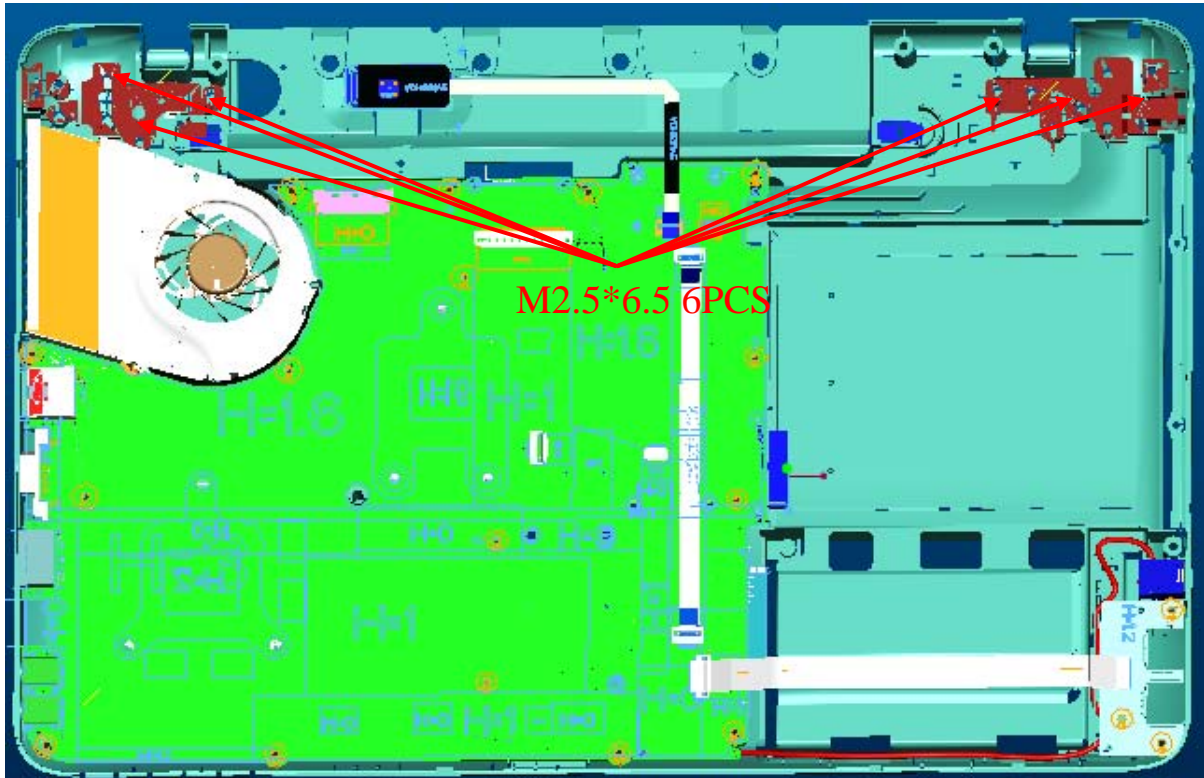


Figure 4-9-6 Remove the hinge screws

12. Remove the **display assembly** with two hands holding from the base assembly.

Installing the display assembly

The following describes the procedure for installing the display assembly.

1. Inserting the **pole of hinge** to the **hole** of hinge assembly, set the **display assembly** with hands on the base assembly.
2. Secure the **hinges** with the following **screws** secure the **display mask** with the following **screws** and stick the **mask seal** on them.

- M2.5×5 FLAT BIND screw x6

***NOTE:** Be sure to apply the locktight to the screws instructed in the figure above.*

3. Connect the **LCD harness** to the connector on the mother board.
4. Arrange the wireless antenna cables along the guide (front) and secure them with **guide**.
5. Pass the cables to the back of computer through the **slot**.
6. Arrange the **Wireless LAN antenna** along the guide and contact with the connector with hands.
7. Install the LAN board and Top cover Assembly of the system.

***NOTE:** If Fingerprint or Dust left on LCD screen during disassembly and assembly LCD units, please follow Appendix A to clean it.*

4.10 Top Cover Assembly

Removing the Top cover assembly

The following describes the procedure for removing the Top cover assembly (See Figure 4-10-1 to 4-10-2).

1. Turn over the computer.
2. Remove the following **screws** securing the Top cover assembly from the back and bottom of computer.

- M2.5×6.5 FLAT BIND screw x12
- M2.0×5.0 FLAT BIND screw x1
- M2.5×4.0 FLAT BIND screw x5
- M2.0X3.0 FLAT BIND screw x2
- M2.5×3.0 FLAT BIND screw x1

3. Remove the following screws securing the Top cover assembly from the front of the computer. Pull up and remove the Top cover assembly from the Base assembly.

- M2.5×6.5 FLAT BIND screw Back x9

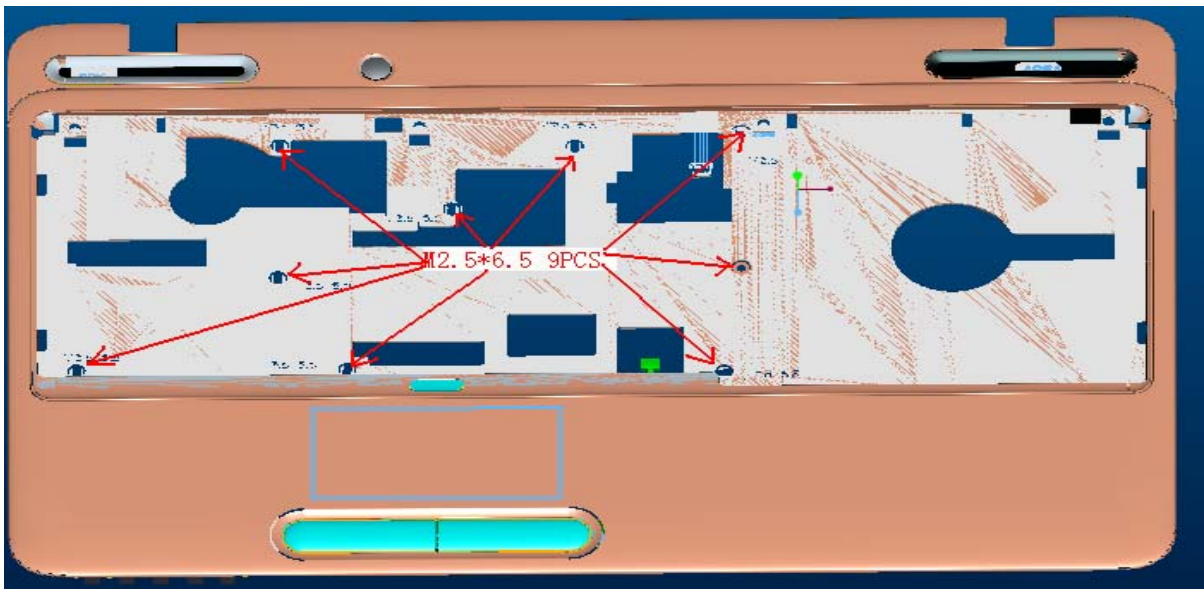


Figure 4-10-1 Remove the screws (front) and Top cover assembly

4. Disconnect the **touch pad flat cable/Bluetooth cable/Speaker cable /LCD cable/power cable** from the connector on the Mother board.

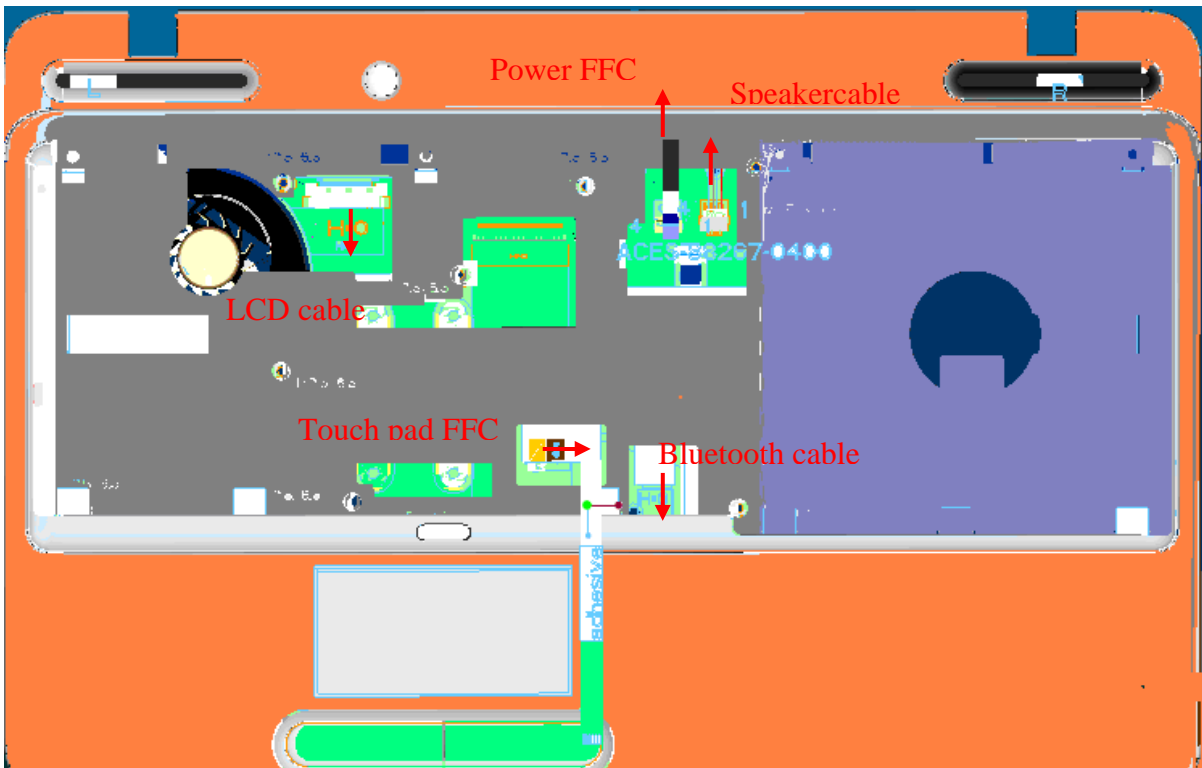


Figure 4-10-2 Disconnect cables

Installing the Top cover assembly

The following describes the procedure for installing the Top cover assembly.

1. Install the **Top cover assembly** to the Base assembly.

NOTE: *Be careful not to catch the cables between Top cover assembly and Base assembly.*

2. Connect the **touch pad flat cable** to the connector on the system board.
3. Secure Top cover assembly on Base with following screws.
 - M2.5×6.5 FLAT BIND screw Back x9
4. Secure the Top cover assembly with the following **screws** from the back and bottom of computer.
 - M2.5×6.5 FLAT BIND screw x12
 - M2.0×5.0 FLAT BIND screw x1
 - M2.5×4.0 FLAT BIND screw x5
 - M2.0X3.0 FLAT BIND screw x2
 - M2.5×3.0 FLAT BIND screw x1
5. Free the cable from cable-drain when through the antenna cable to PCB hole.

4.11 Touch Pad Board

Removing the touch pad board

The following describes the procedure for removing the touch pad (See Figure 4-11-1 to 4-11-3).

1. Peel off the **glass tape** and disconnect the **touch pad board cable**, **TP switch cable**, and **touch pad cable** from the connector on the touch pad.

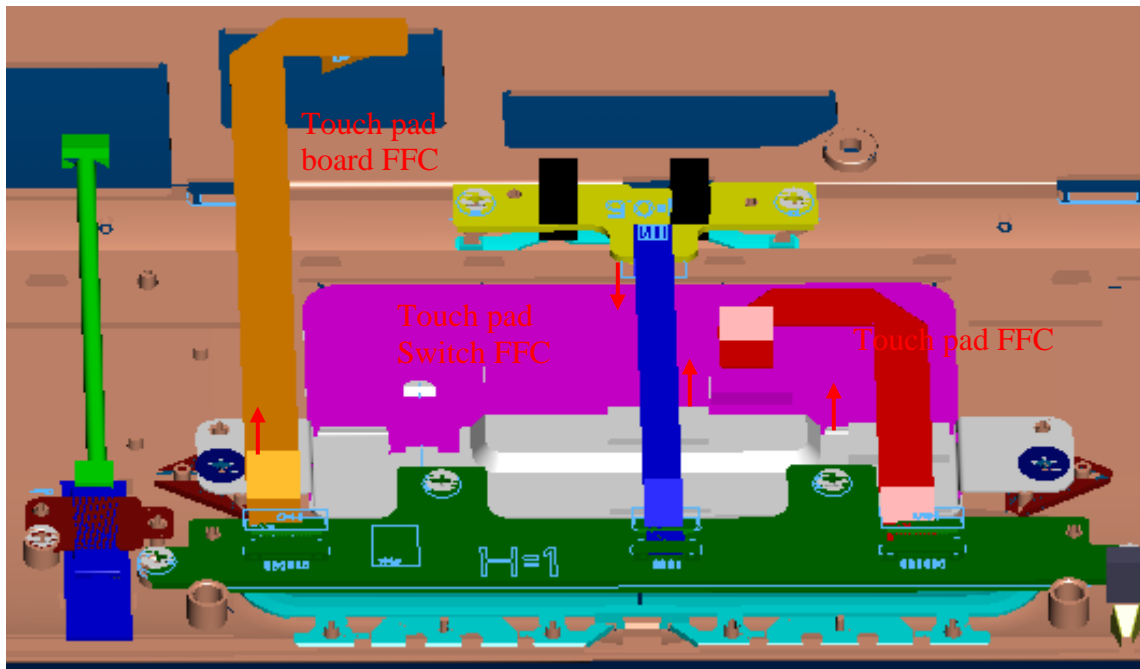


Figure 4-11-1 Remove the touch pad board FFC cable

2. Remove the following **screws** securing the Touch pad plate.
 - M2.0x3.0 SUPER THIN HEAD screw x4

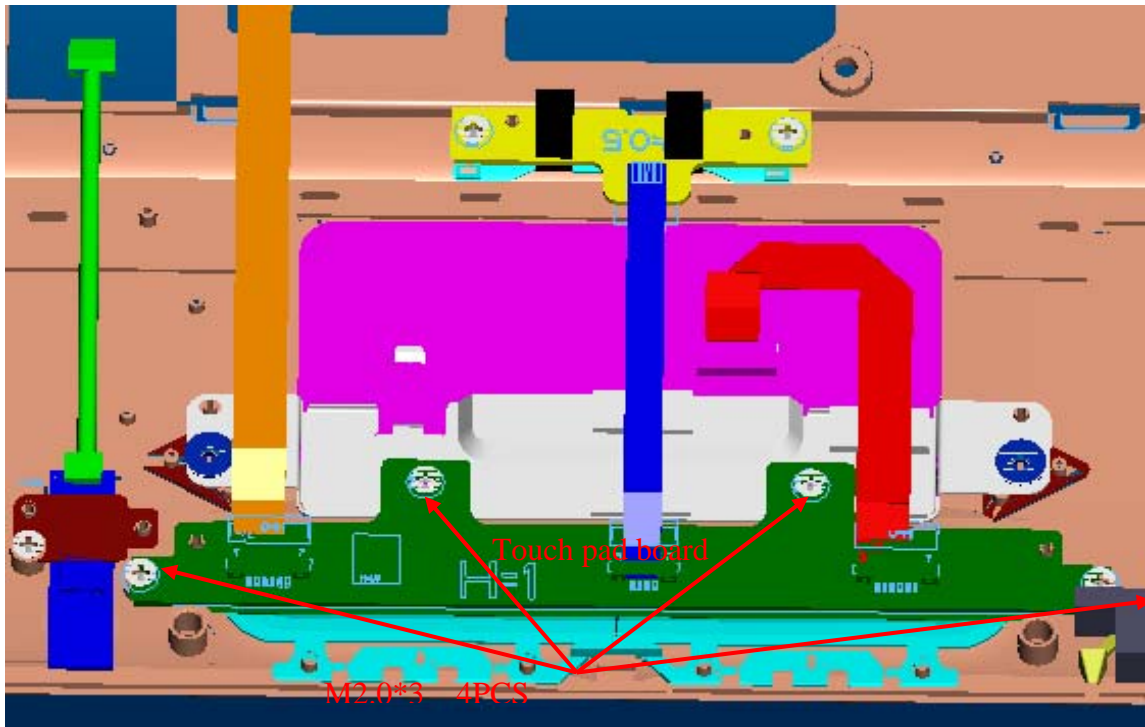


Figure 4-11-2 Remove screws for Touch pad board

3. Remove the touch pad board.

Installing the touch pad board

The following describes the procedure for installing the touch pad board.

1. Stick and install the **touch pad board** on the Top cover assembly.
2. Secure Touch pad board with the following screws.
 - M2.0x3.0 SUPER THIN HEAD screw x4
3. Connect the **touch pad board cable**, **TP switch cable** and **touch pad cable** to the connector and stick the **glass tape**.

4.12 Modem Board

Removing the modem board

The following describes the procedure for removing the modem board (See Figure 4-12-1 to 4-12-3).

1. Remove following screws from modem board.

- M2.5x3.0 FLAT BIND screw x1

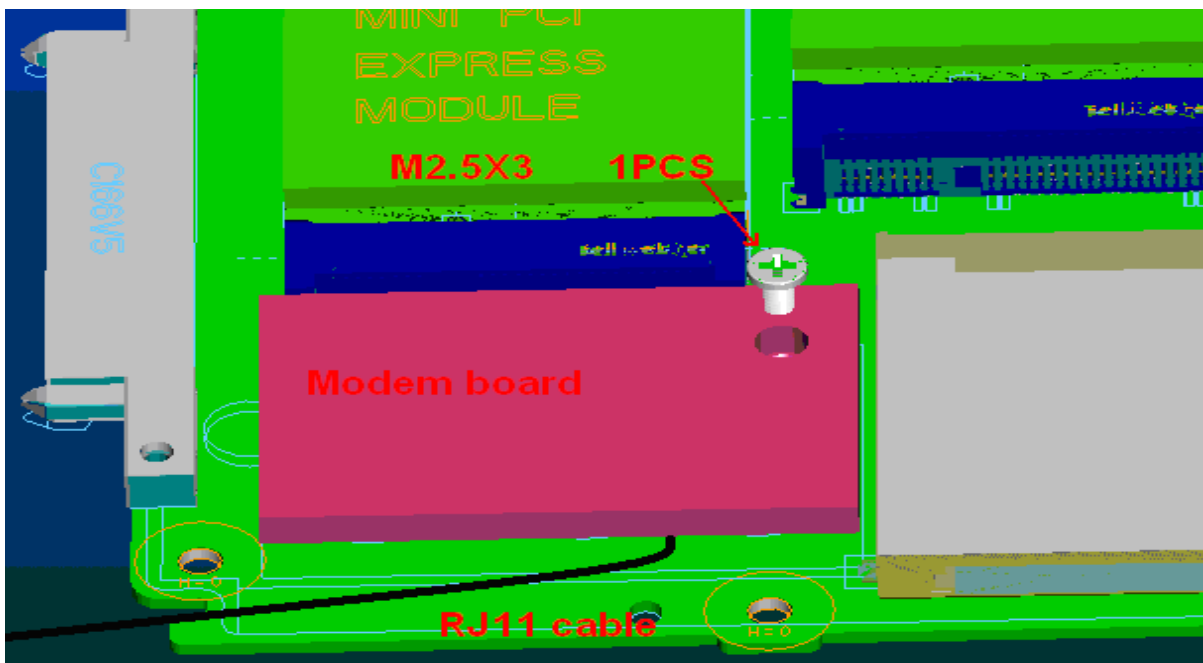


Figure 4-12-1 Remove the modem board

2. Pull out the RJ11 cable from Modem board connector.

Installing the Modem board

The following describes the procedure for installing the modem board.

1. Connect the RJ11 cable to the modem board connector.

2. Secure the modem board with the following screws.

- M2.5x3.0 FLAT BIND screw x1

4.13 Power Board

Removing the Power board

The following describes the procedure for removing the **power board** (See Figure 4-13-1).

1. Disconnect the **power cable** from **motherboard**.
2. Peel off the **glass tape** and remove the Power board from the **BASE** assembly.

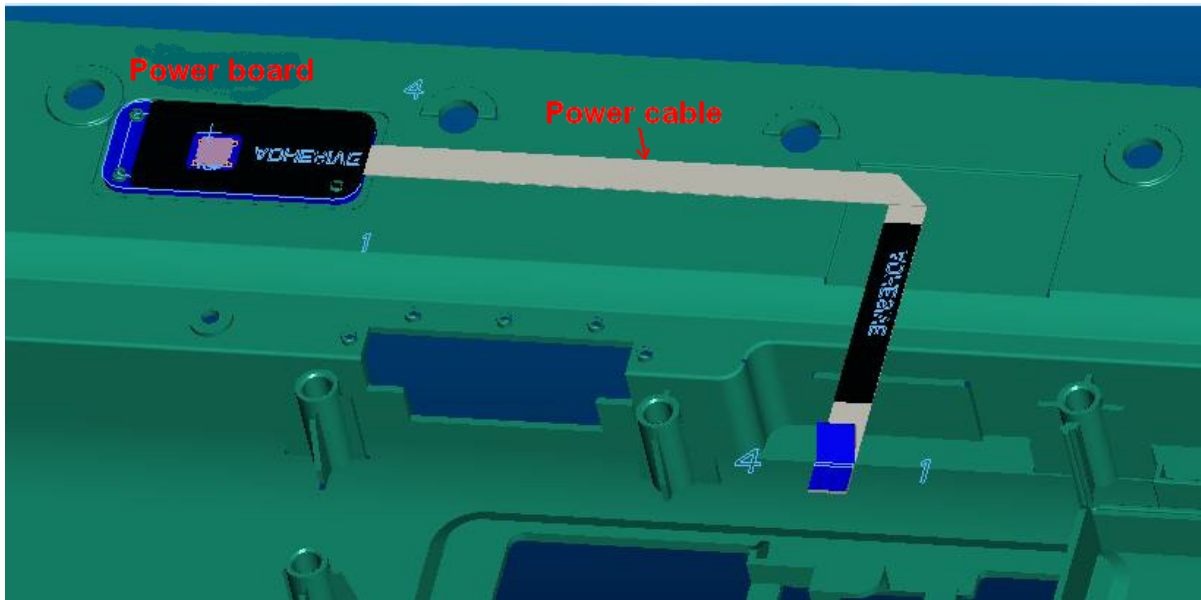


Figure 4-13-1 Remove the power board

Installing the Power board

The following describes the procedure for installing the **power board**.

1. Stick and install the **power board** on **Base assembly**.
2. Connect the **power cable** to the **motherboard** connector.

4.14 SIM Board

Removing the SIM board

The following describes the procedure for removing the **SIM board** (See Figure 4-14-1).

1. Remove the following **screws** securing the SIM board.

- M2.5x3.0 FLAT BIND screw x2

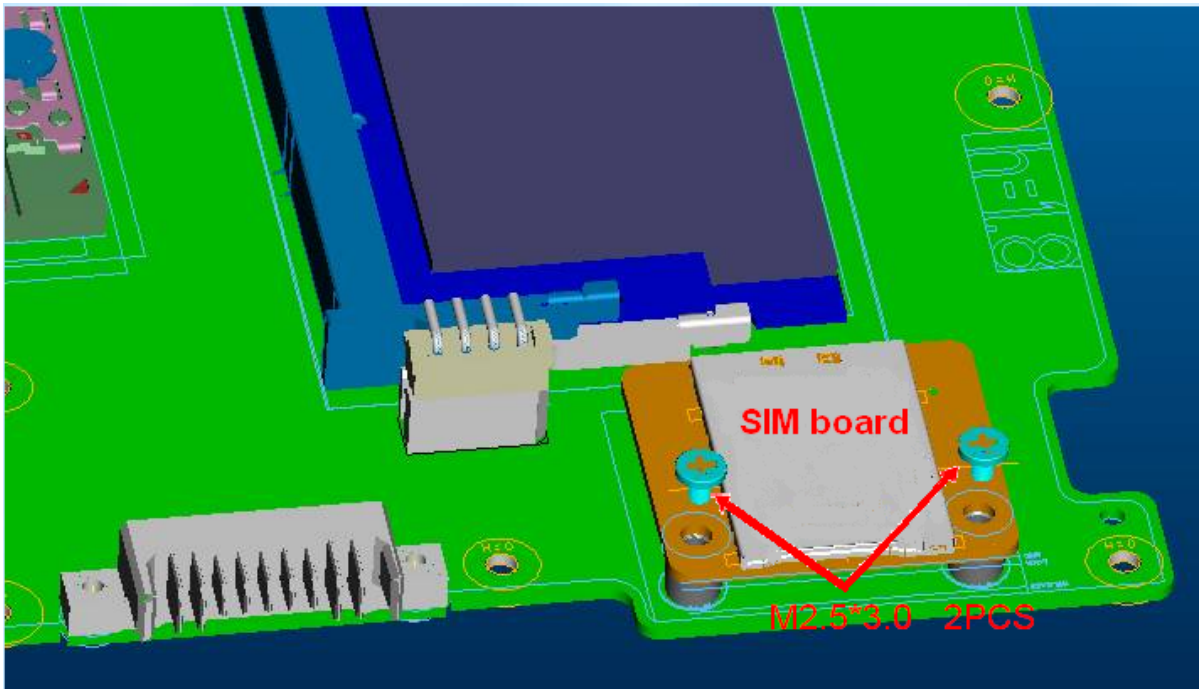


Figure 4-14-1 Remove the SIM board

2. Remove the **SIM board** from motherboard connector.

Installing the SIM board

The following describes the procedure for installing the **SIM board**.

1. Install and connect the **SIM board** to the connector of **motherboard**.
2. Secure **SIM board** with following **screws**.

- M2.5x3.0 FLAT BIND screw x2

4.15 USB Board

The following describes the procedure for removing the USB board (See Figure 4-15-1).

Removing the USB Board

1. Pull out the **USB Board FFC** from USB Board connector
2. Remove following **screws** and **USB Board**

- M2.0x3.0 FLAT BIND screw x2

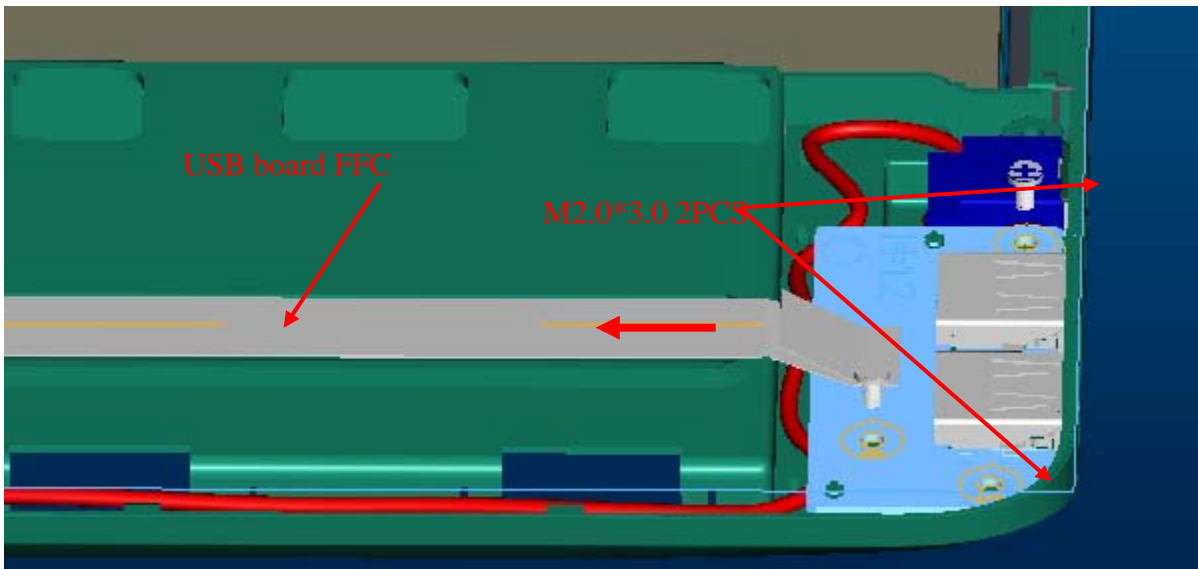


Figure 4-15-1 Remove the USB Board

Installing the USB Board

The following describes the procedure for installing the USB Board

1. Secure the USB Board with following screws.

- M2.0x3.0 FLAT BIND screw x2

2. Connect the **USB Board FFC** to USB Board

NOTE: *Be careful not to catch the cables between Top cover assembly and base assembly.*

4.16 Optical disc drive

The following describes for removing the Optical disc drive (See Figure 4-16-1 to Figure 4-16-2).

Removing the Optical disc drive

1. Upside down computer.
2. Remove the RAM door screws and Optical disc drive screws (see Figure4-9-1).
 - M2.5x3.0 FLAT BIND screw x1
 - M2.5x4.0 FLAT BIND screw x3
3. Pull out Optical disc drive from Base assembly.

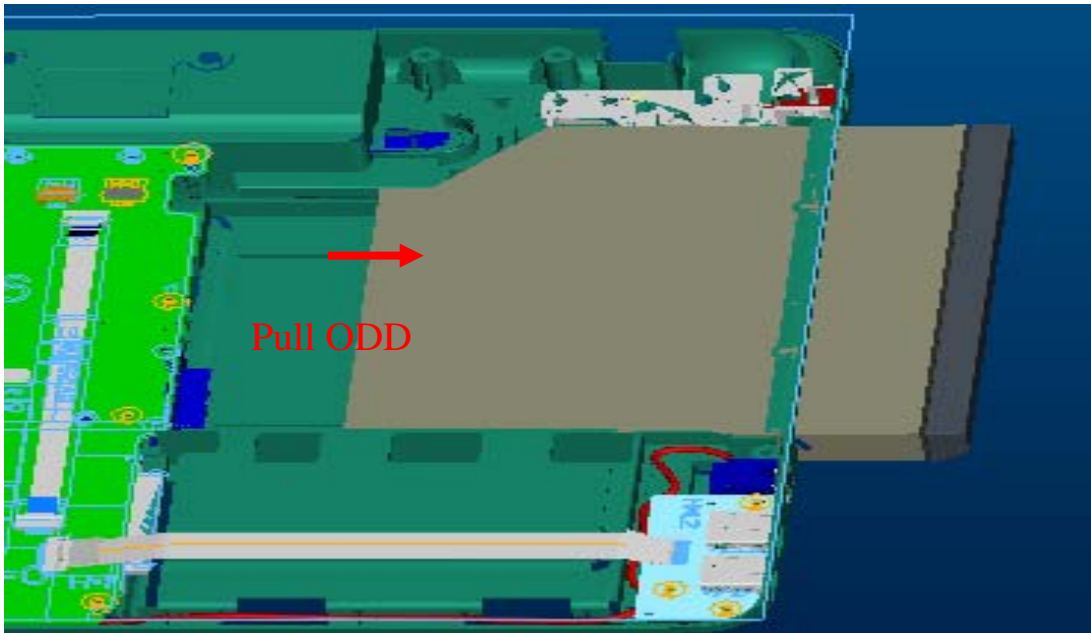


Figure 4-16-1 Remove the ODD

Installing the Optical disc drive

The following describes for installing the Optical disc drive (See Figure 4-16-2).

1. Installing the Optical disc drive.
2. Installing the Optical disc drive into the BASE assembly.



Figure 4-16-2 installing the Optical disc drive

2. Secure Optical disc drive with following screws.
 - M2.5x3.0 FLAT BIND screw x1
3. Secure RAM door with following screws.
 - M2.5x4.0 FLAT BIND screw x3

4.17 Mother Board/RTC Battery

CAUTION: 1. when handling the mother board, always hold by the edges. Do not touch the printed circuit face.
2. if replacing with a new mother board then should use T&D software which is describing in the Chapter 3.

The following describes the procedure for removing the Mother board (See Figure 4-17-1 to Figure 4-17-2).

1. Disconnect the **LCD CABLE, ANTENNA, USB board FFC, BT cable, SIM FFC, TP board FFC, Power Board FFC, DC-IN cable, SIM Board** from the connector on the mother board.

NOTE: Please see Figure 4-9-3 for Antenna; Figure 4-12-1 for USB board FFC; Figure 4-10-2 for BT cable, Power FFC, LCD cable, TP board FFC; Figure 4-14-1 SIM Board.

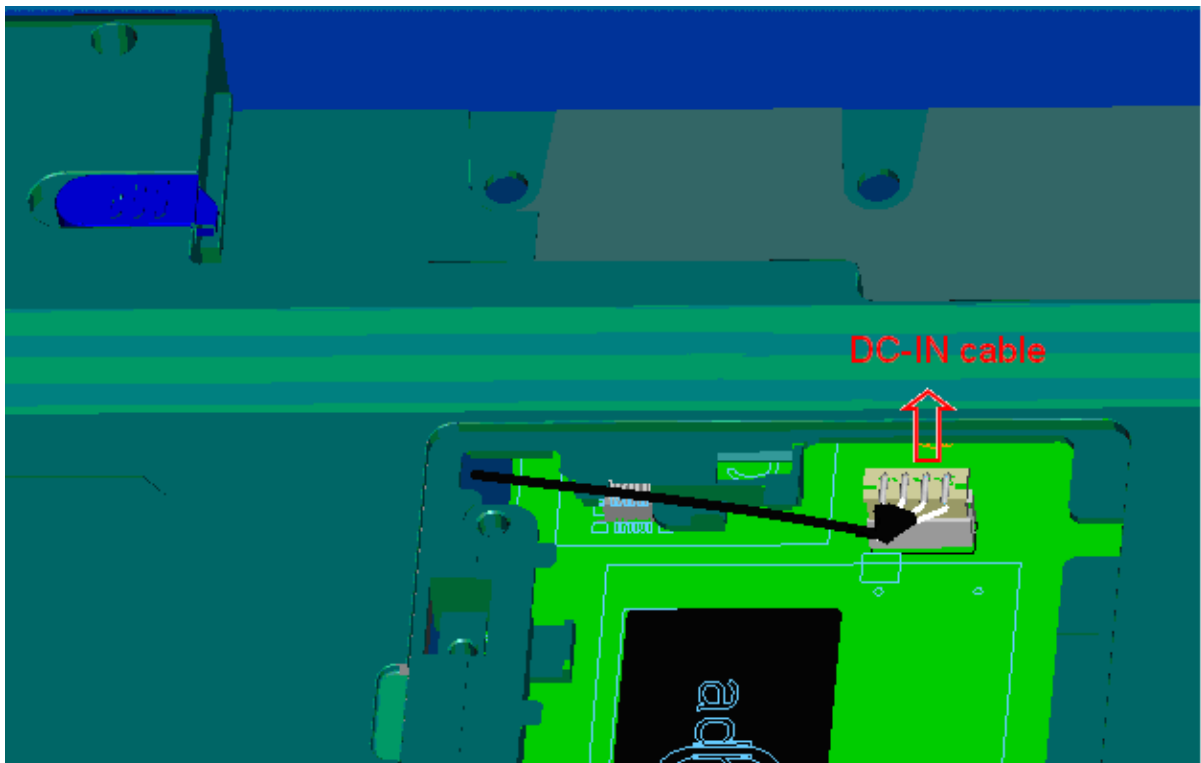


Figure 4-17-1 Remove the DC-IN cable

2. Remove the following **screws** securing the mother board and remove the mother board.

- M2.5×6.5screws x3



Figure 4-17-2 Remove screws for mother board

Installing the Mother board

The following describes the procedure for installing the mother board.

1. Secure the mother board with the following **screws**.
 - M2.5×6.5 screw x3
2. Connect the **LCD CABLE, ANTENNA, USB board FFC, BT wire, SIM FFC, TP board FFC, Power Board FFC, DC-IN cable** to the connector on the mother board.
3. Connect the power cable to the connector on the mother board.

Removing RTC battery

The following describes the procedure for removing the RTC battery unit (See Figure 4-14-3 to 4-14-4).

1. Pull the away the socket of RTC battery and use a clamp to hold RTC battery tightly.

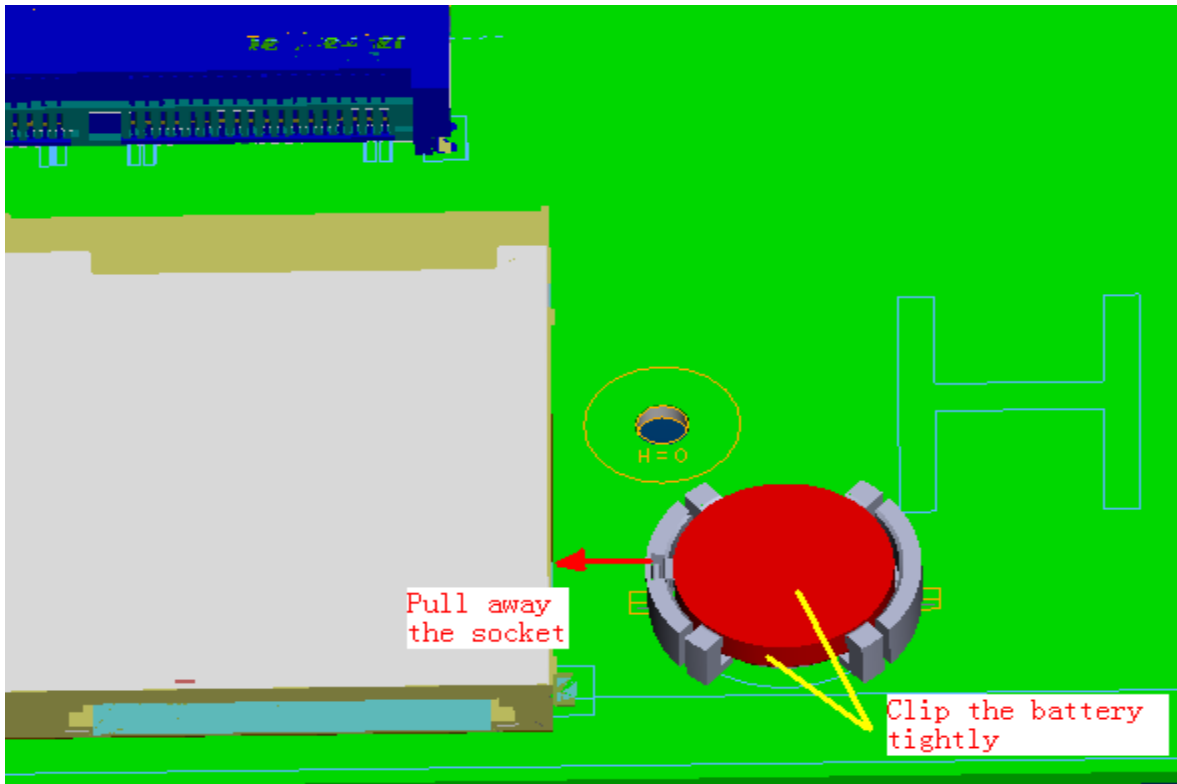


Figure 4-17-3 Remove the RTC battery-step_1

2. Rotate battery through the way then remove it.

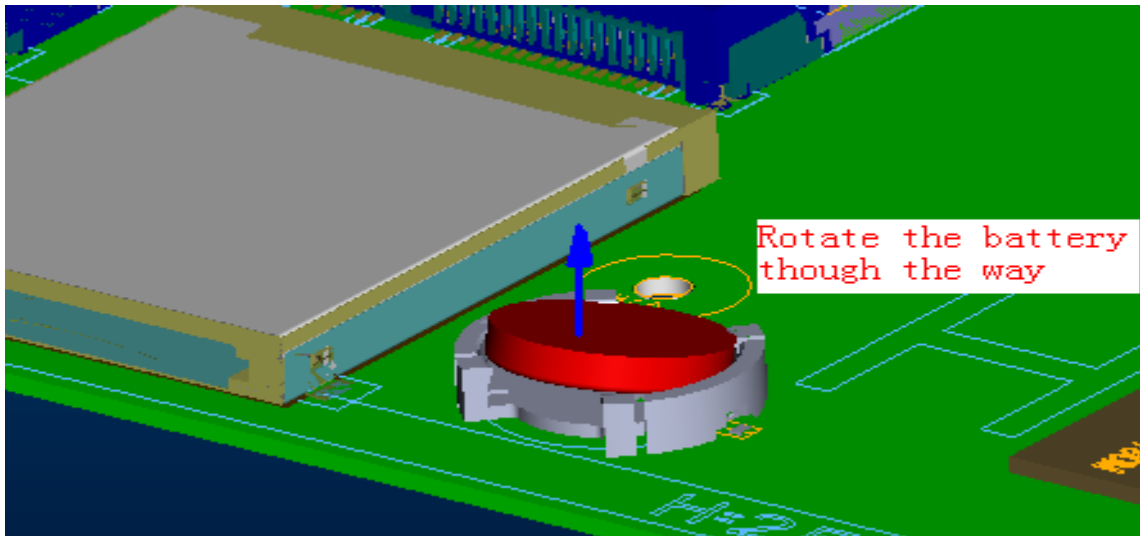


Figure 4-17-4 Remove the RTC battery-step_2

Installing RTC battery

The following describes the procedure for installing the RTC battery unit

(See Figure 4-17-5).

1. Press the force vertically then lock the RTC battery tightly.

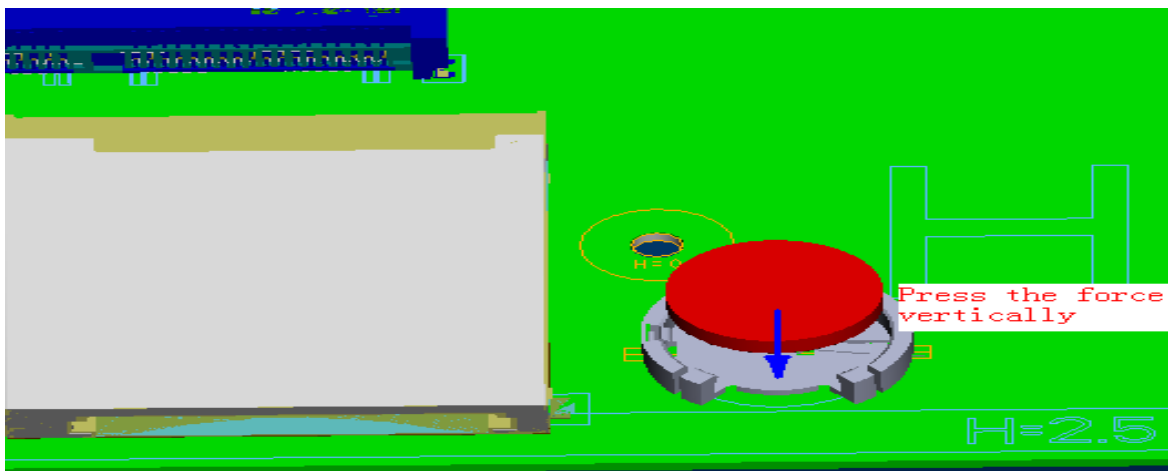


Figure 4-17-5 Install the RTC battery

4.18 CPU /CPU Heat sink

Removing the CPU and CPU heat sink

The following describes the procedure for removing the CPU and CPU heat sink (See Figure 4-18-1 to Figure 4-18-2)

1. Disconnect the **Heat sink cable** from the connector on the mother board.
2. Remove the following **screws** securing the heat sink holder.
 - M2.0x2.0 spring screw x3
 - M2.5X2.0 spring screw x3

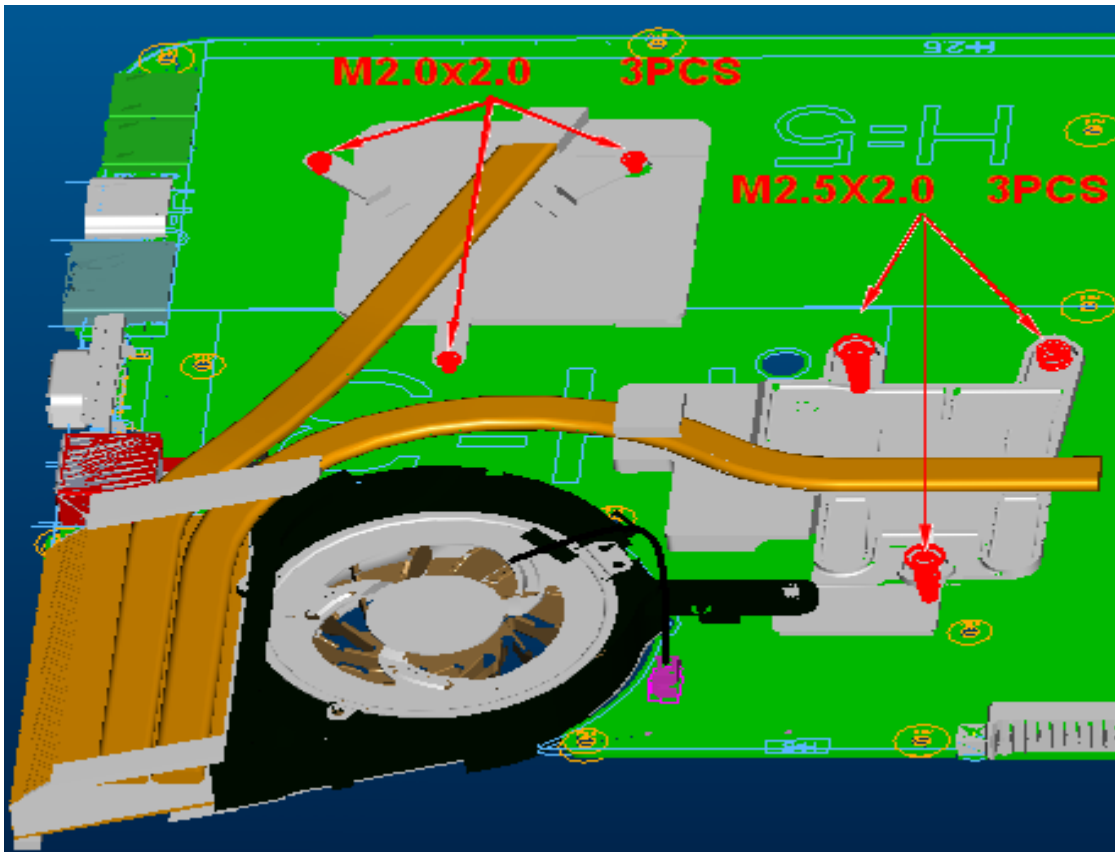


Figure 4-18-1 Remove the CPU heat sink

3. Unlock the **CPU** by rotating the **cam** on the CPU socket 120 degrees to the counterclockwise with a flat-blade screwdriver.
4. Remove the **CPU**.

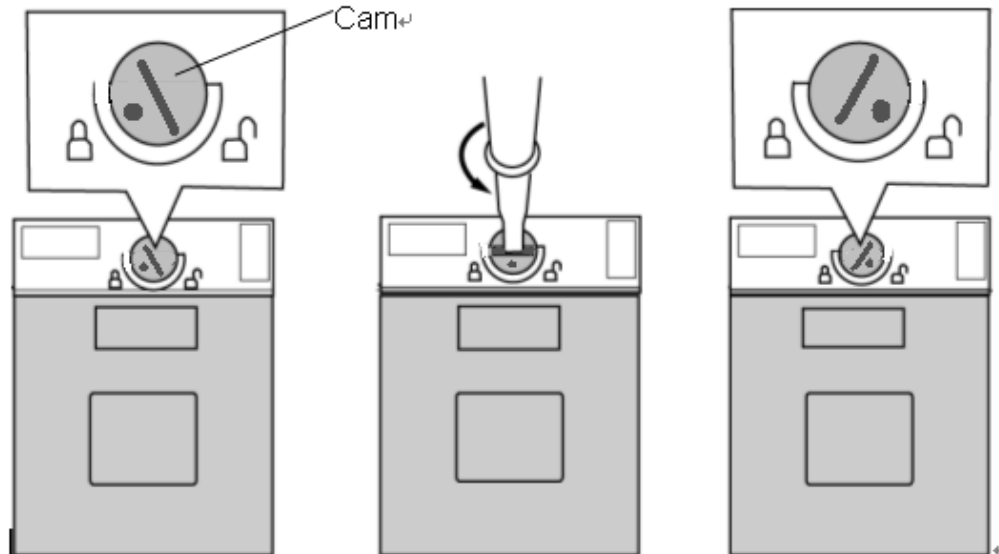


Figure 4-18-2 Remove the CPU

Installing the CPU and CPU heat sink

The following describes the procedure for installing the CPU (see Figure 4-15-3)

1. Check that the mark of cam is in the unlocking position.
2. Attach the **CPU** to the correct position in the **CPU socket**.
3. Fix the **CPU** by rotating the cam 120 degrees to the clockwise with a flat-blade screwdriver.
4. If there is already silicon grease on the CPU, clean it with a cloth.
Using a special applicator, apply silicon grease so that the CPU chip on the CPU is completely covered.
5. Please apply 0.1cc silicon grease (Shinetsu 7762) for each repair. And apply Thermal pad for N-bridge, VGA&V-RAM for each repair

NOTE: Apply the silicon grease enough to cover the chip surface using the special applicator. Thermal pad is fixed for each one, no need special applicator.

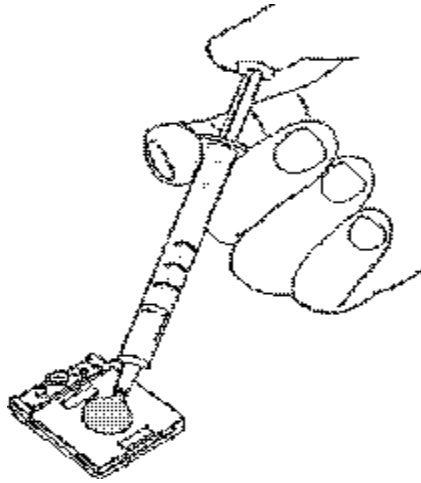


Figure 4-18-3 Apply silicon grease

6. Install the **CPU heat sink** and **heat sink holder** and secure them with the following **screws**.

- M2.0×2.0 spring screw x3
- M2.5X2.0 spring screw x3

7. Connect the **Heat sink cable** to the connector on the system board

NOTE: When securing the heat sink holder, be sure to secure the screws in the order of the number marked on the holder.

4.19 LCD unit

Removing the LCD unit

The following describes the procedure for removing the LCD unit (See Figure 4-19-1 to 4-19-4).

1. Remove Screw MYLAR cover x4
2. Remove the following **screws** securing the display mask
 - M2.5×5 screw x4

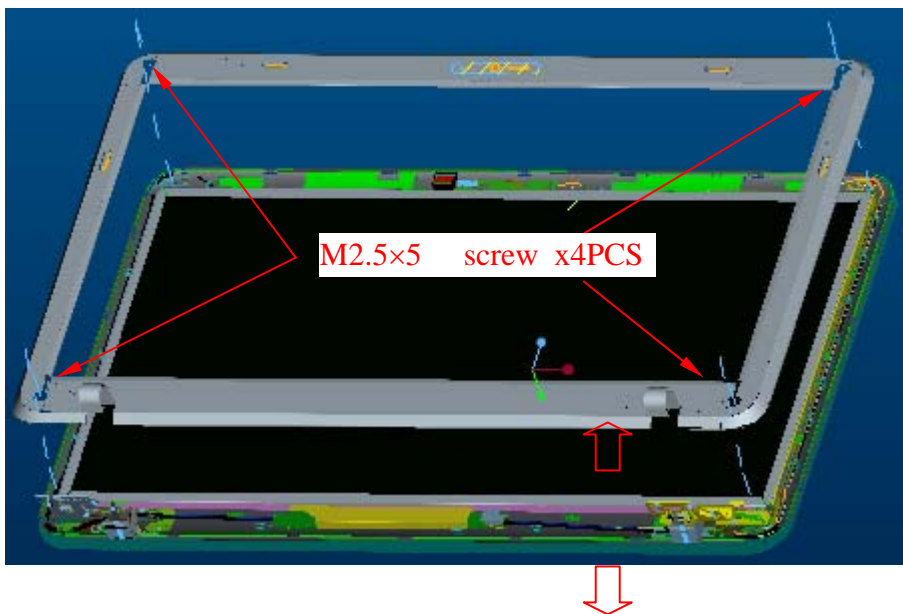


Figure 4-19-1 Remove the display mask

3. Insert your finger between the edge of the display mask and the LCD, and remove the display mask while releasing the latches of display mask. (Note: when removing the display mask, please first remove from top side to the bottom in order to lessen the degree of breaking.)
4. Remove the following **screws** securing the LCD unit.
 - M2.5x5.0 screw x4
 - M2.0x3.0 screw x2

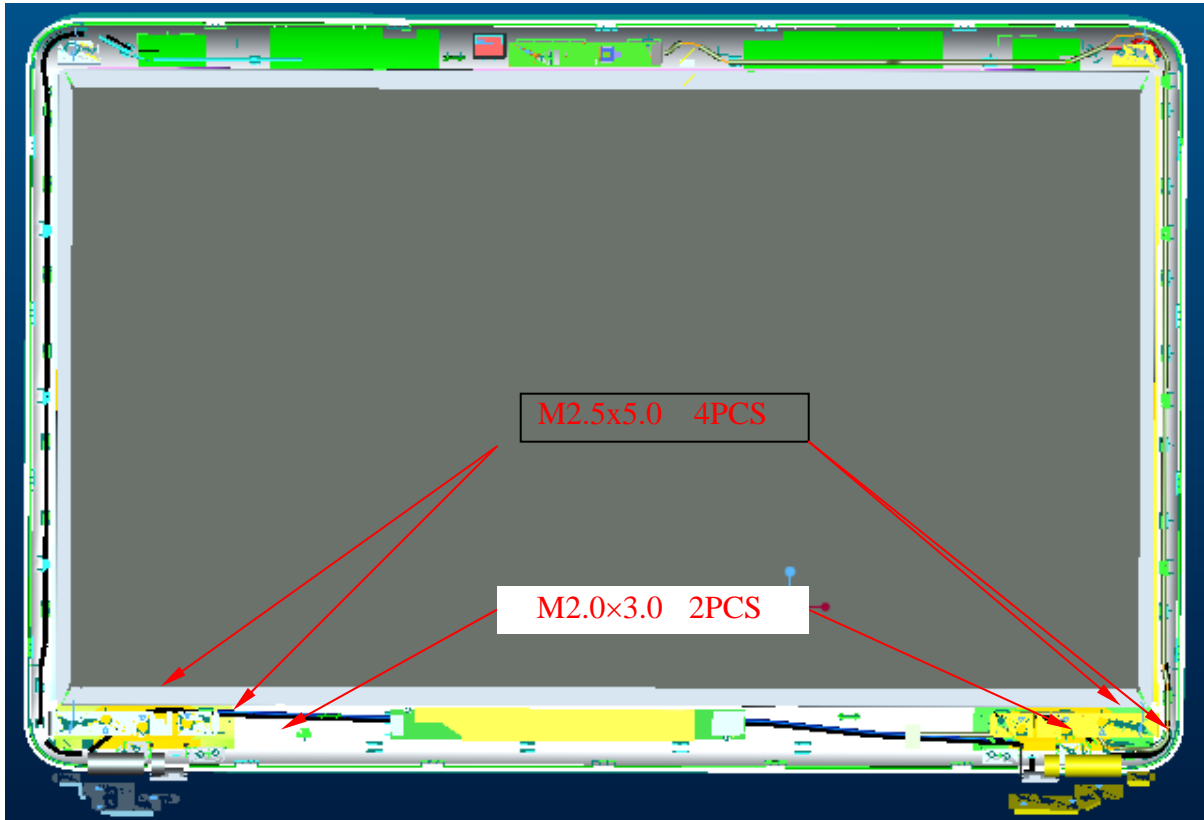


Figure 4-19-2 Remove the LCD unit

5. With the bottom edge of the LCD unit on the display cover, lift only the top edge of the LCD unit. After peeling off the kapton **tape**, disconnect the LCD harness from the connector on the back of the LCD.
6. Remove the **LCD** unit.
7. Pull out one insulator and peel off the other one adhered to the inverter.
8. Disconnect the LCD harnesses from the connectors **CN1** on the inverter.
9. Disconnect the **HV harnesses** from the connectors **CN2** on the inverter.
10. Remove the **FL inverter** while peeling off the **double-sided tape**.

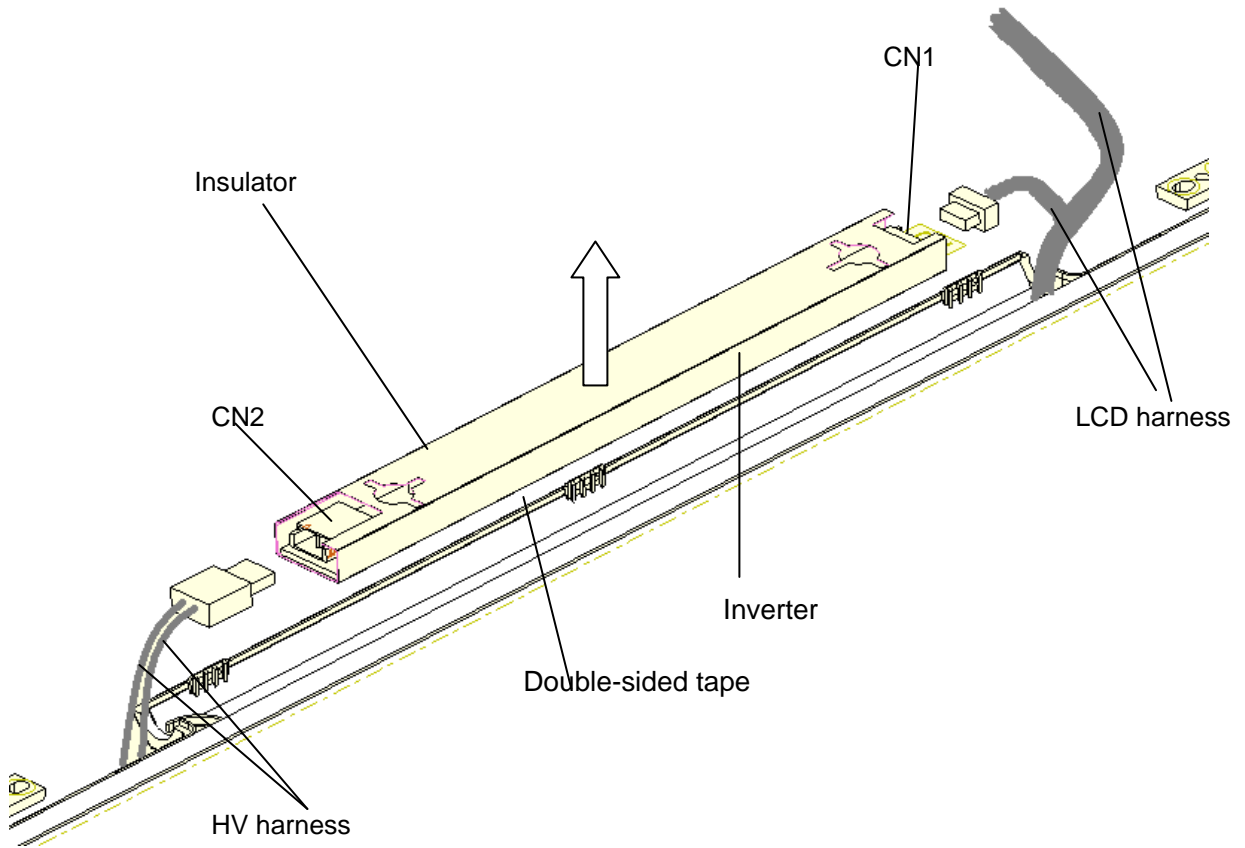


Figure 4-19-3 Remove the inverter

11. Remove the following **screws** securing the LCD support (LCD unit side) and remove the **hinge** from the LCD unit.

- M2.0x3 screw x4

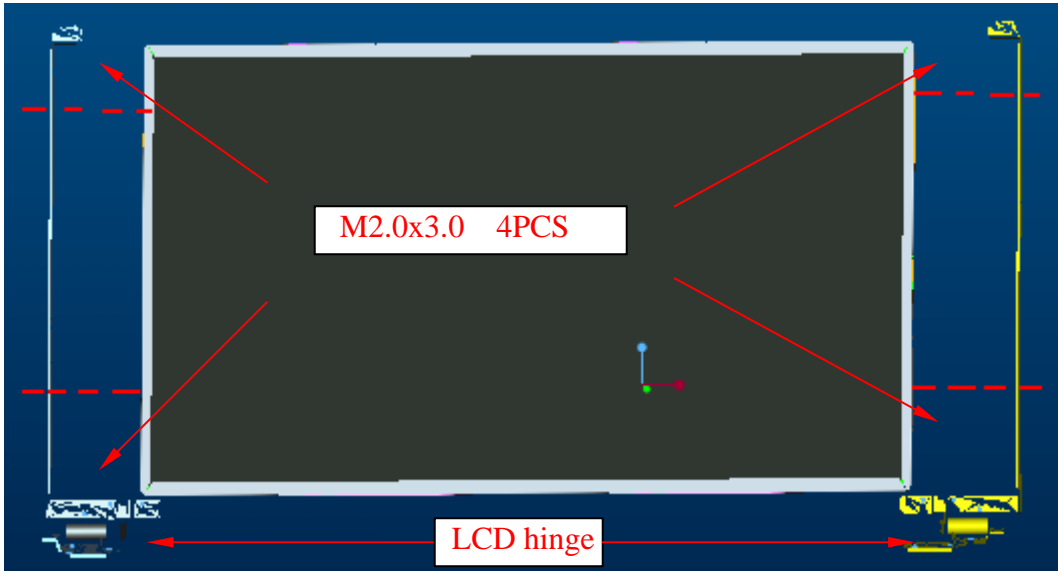


Figure 4-19-4 Remove the LCD hinge

Installing the LCD unit

The following describes the procedure for installing the LCD unit.

1. Install the LCD supports (LCD unit side) and hinge to the LCD and secure them with the following **screws**.

- M2.0×3.0 BINK screw x4

2. Stand the **LCD unit** on the display cover and connect the **LCD harness** to the connector on the back of LCD.

3. Stick the kapton **tape** on the connector of LCD harness.

4. Secure the LCD unit with the following **screws**.

- M2.5x5 screw x4

5. Secure the display mask with following **screws**

- M2. 5×5 screw x4

6. Cover screws with Screw MYLAR cover x4

NOTE: *When installing the display mask, make sure there is no gap between the display mask and the display cover.*

4.20 Web Camera module

Removing Web Camera module

The following describes the procedure for removing the Web Camera module.

(See Figure 4-20-1 to 4-20-2).

1. Pull off the connector of Web Camera module.
2. Release CCD Mylar.

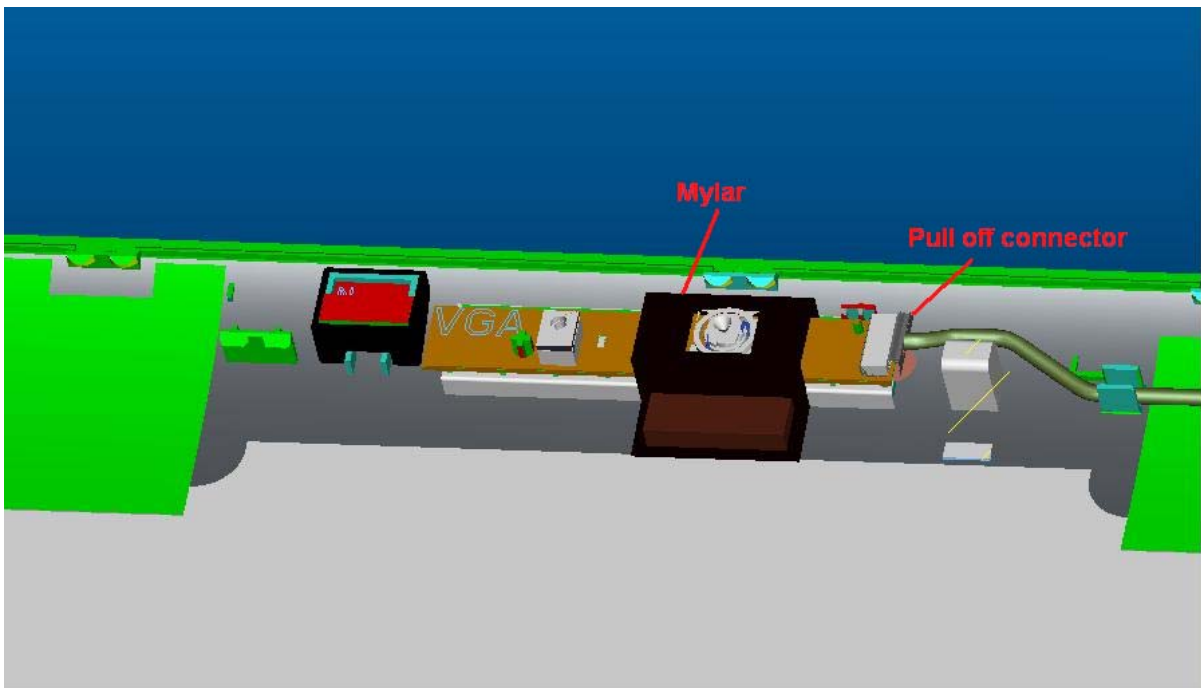


Figure 4-20-1 Remove the connector of Web Camera module

3. Take web camera module off.

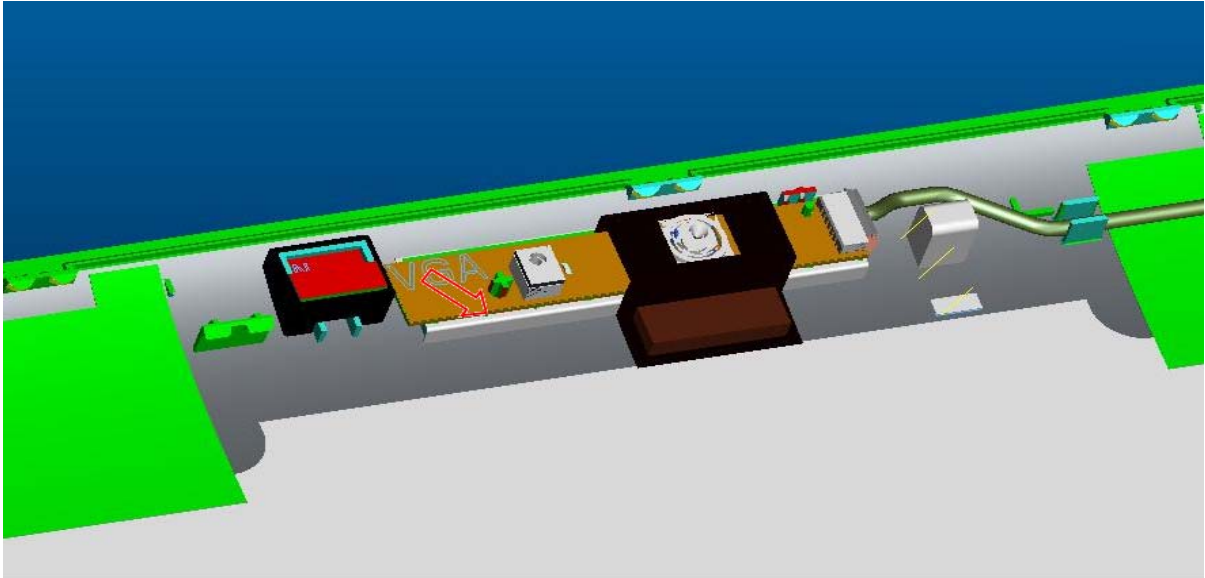


Figure 4-20-2 Take Web Camera module off

Installing Web Camera module

The following describes the procedure for installing the Web Camera module.

1. Put the Camera module on the LCD cover and secure with CCD Mylar.
2. Connect the connector of Web Camera module.

NOTE: *When installing the camera module, don't remove the tape of CCD camera module back side.*



Figure 4-20-3 Camera Module before installing



Figure 4-20-4 Camera Module after installing

4.21 Application for Thermal grease on CPU and North Bridge

I. The thermal grease on North Bridge and CPU(See Figure 4-21-1)

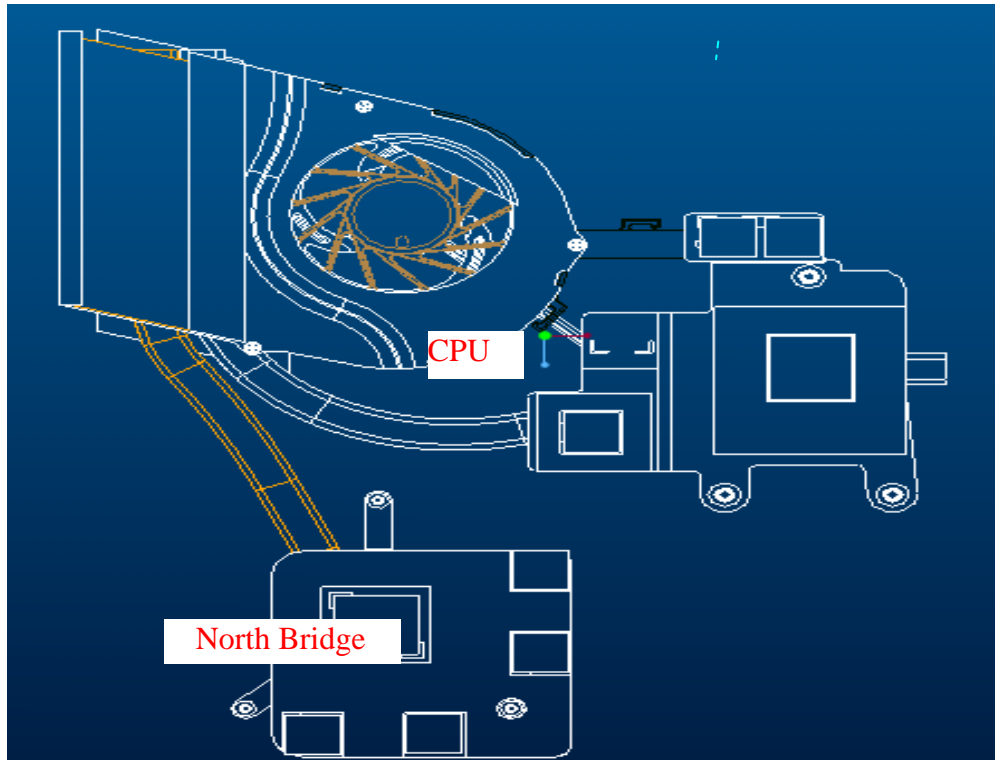


Figure 4-21-1 Intel &AMD Thermal grease on North Bridge and CPU

A000070020	THERMAL GREASE FCR-AS
A000063980	THERMAL MODULE GREASE 7762

II. Use grease on North Bridge and CPU.

0.15cc for one repair.

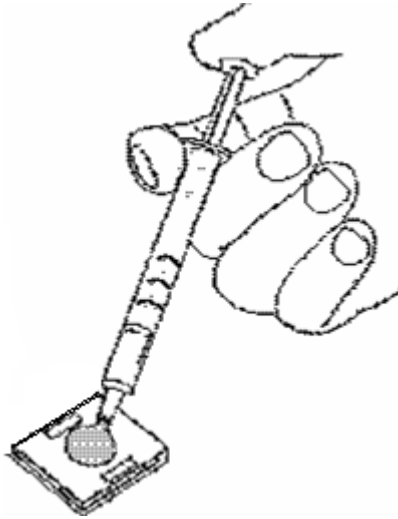


Figure 4-21-2 Apply silicon grease for North Bridge and CPU

4.22 Speaker Box

Removing Speaker Box

The following describes the procedure for removing Speaker Box. (See Figure 4-22-1 to 4-22-3).

1. Remove the following screws securing Speaker Box.
 - M2.0×3.0 screw x 4

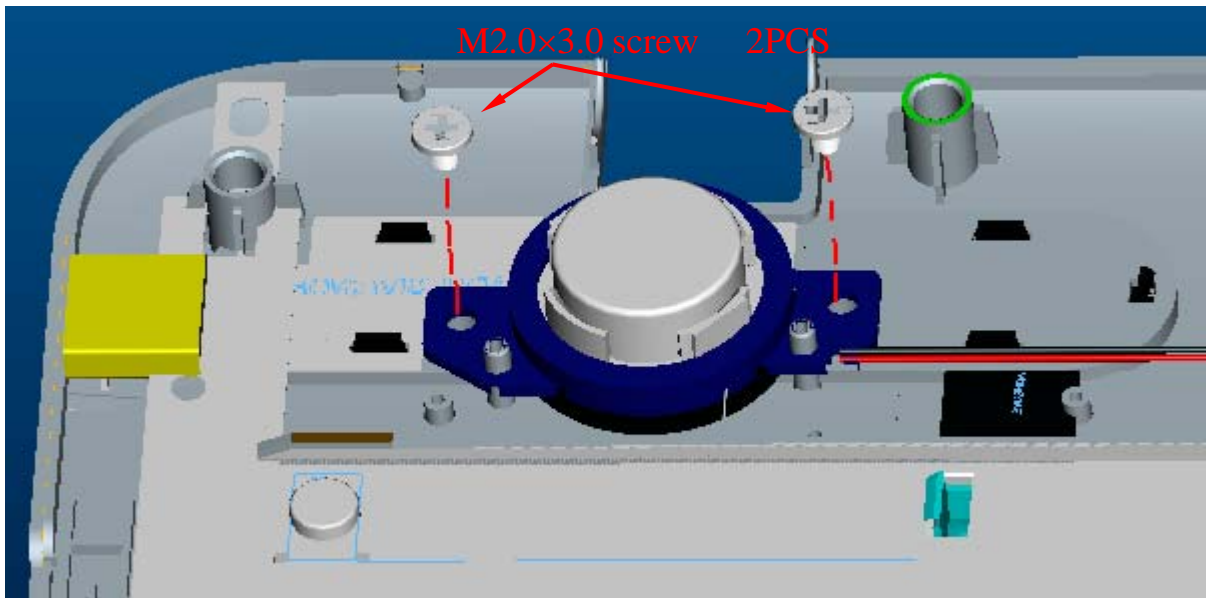


Figure 4-22-1 Removing the securing screws at left side.

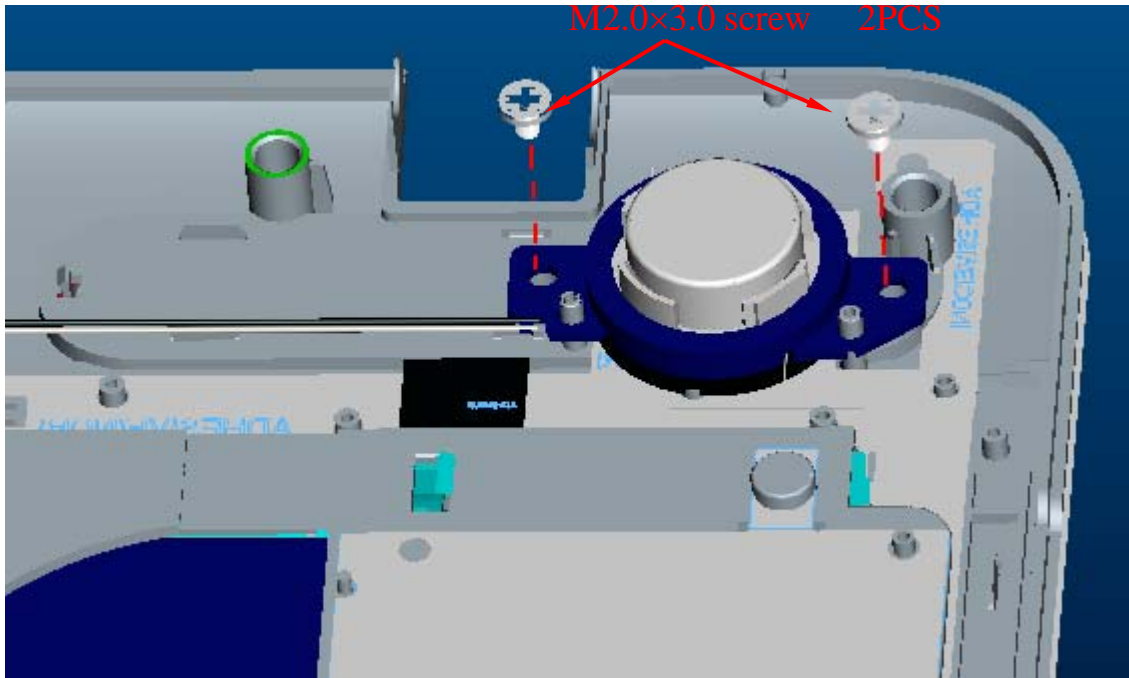


Figure 4-22-2 Removing the securing screws at right side

2. Removing the Speaker Box.

Installing Speaker Box

The following describes the procedure for installing Speaker Box.

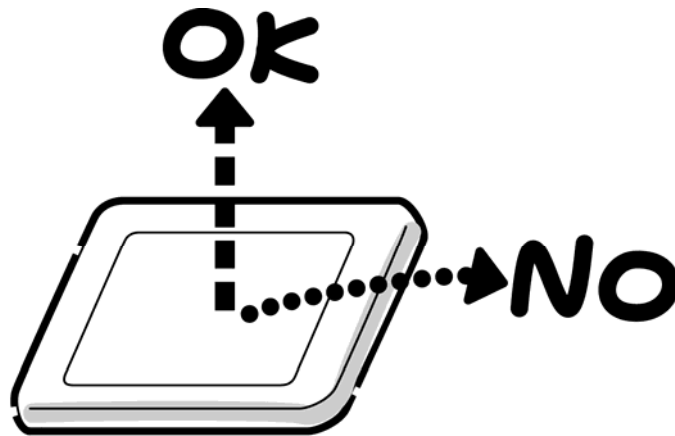
1. Installing the Speaker Box.
2. Securing Speaker Box of following screws.
 - M2.0x3.0 screw x 4

Appendix A Handling the LCD Module

Precautions for handling the LCD module

The LCD module can be easily damaged during assembly or disassembly. Observe the following precautions when handling the LCD module:

1. When installing the LCD module in the LCD cover, be sure to seat it so that it is properly aligned and maximum visibility of the display is maintained.



2. Be careful to align the holes at the four corners of the LCD module with the corresponding holes in the LCD cover before securing the module with screws. Do not force the module into place, because stress can affect its performance.

Also, the panel's polarized surface is easily scarred, so be careful when handling it.



3. If the panel's surface gets fingerprint or dust, put on gloves and wipe it with static electricity cloth. If it is still dirty, drop some cleaning alcohol on the surface and wipe it again.

If the surface is much more fingerprint or dust, we recommend a CRT cleaning agent. Apply the agent to a cloth and then wipe the panel's surface. Do not apply cleanser directly to the panel.

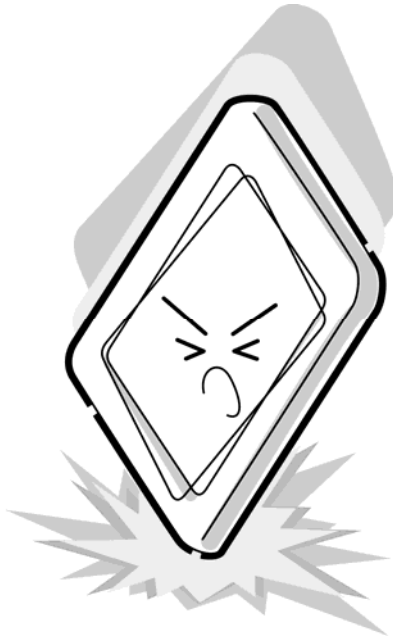
If dust still exists, please use ionic FAN which can avoid static electricity to deal with it.



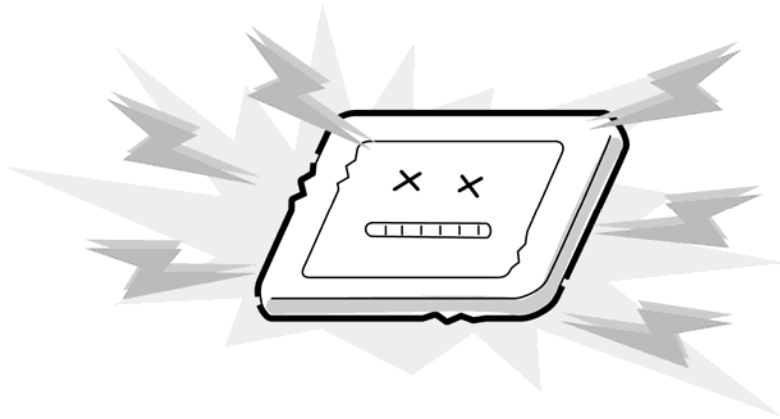
4. If water or other liquid is left on the panel's surface for a long period, it can change the screen's tint or stain it. Be sure to quickly wipe off any liquid with cloth or ionic FAN



5. Glass is used in the panel, so be careful not to drop it or let it strike a hard object, which could cause breakage or cracks.



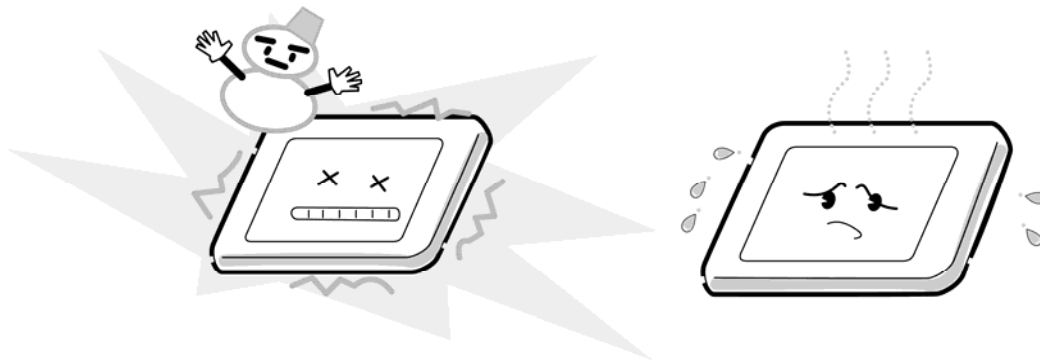
6. CMOS-LSI circuits are used in the module, so guard against damage from electrostatic discharge. Be sure to wear a wrist or ankle ground when handling the module.



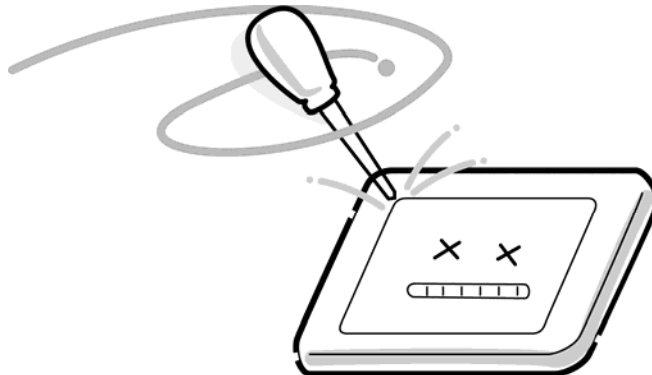
7. Do not expose the module to direct sunlight or strong ultraviolet rays for long periods.



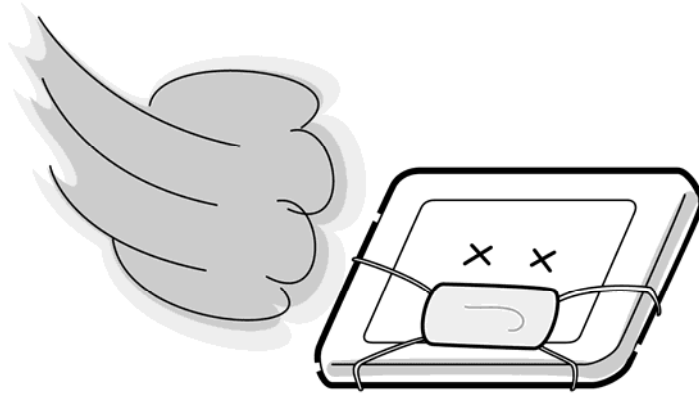
8. Do not store the module at temperatures below specifications. Cold can cause the liquid crystals to freeze, lose their elasticity or otherwise suffer damage.



9. Do not disassemble the LCD module. Disassembly can cause malfunctions.



10. If you transport the module, do not use packing material that contains epoxy resin (amine) or silicon glue (alcohol or oxide). These materials can release gas that can damage the panel's polarization.



Appendix B Board Layout

B.1 System Board

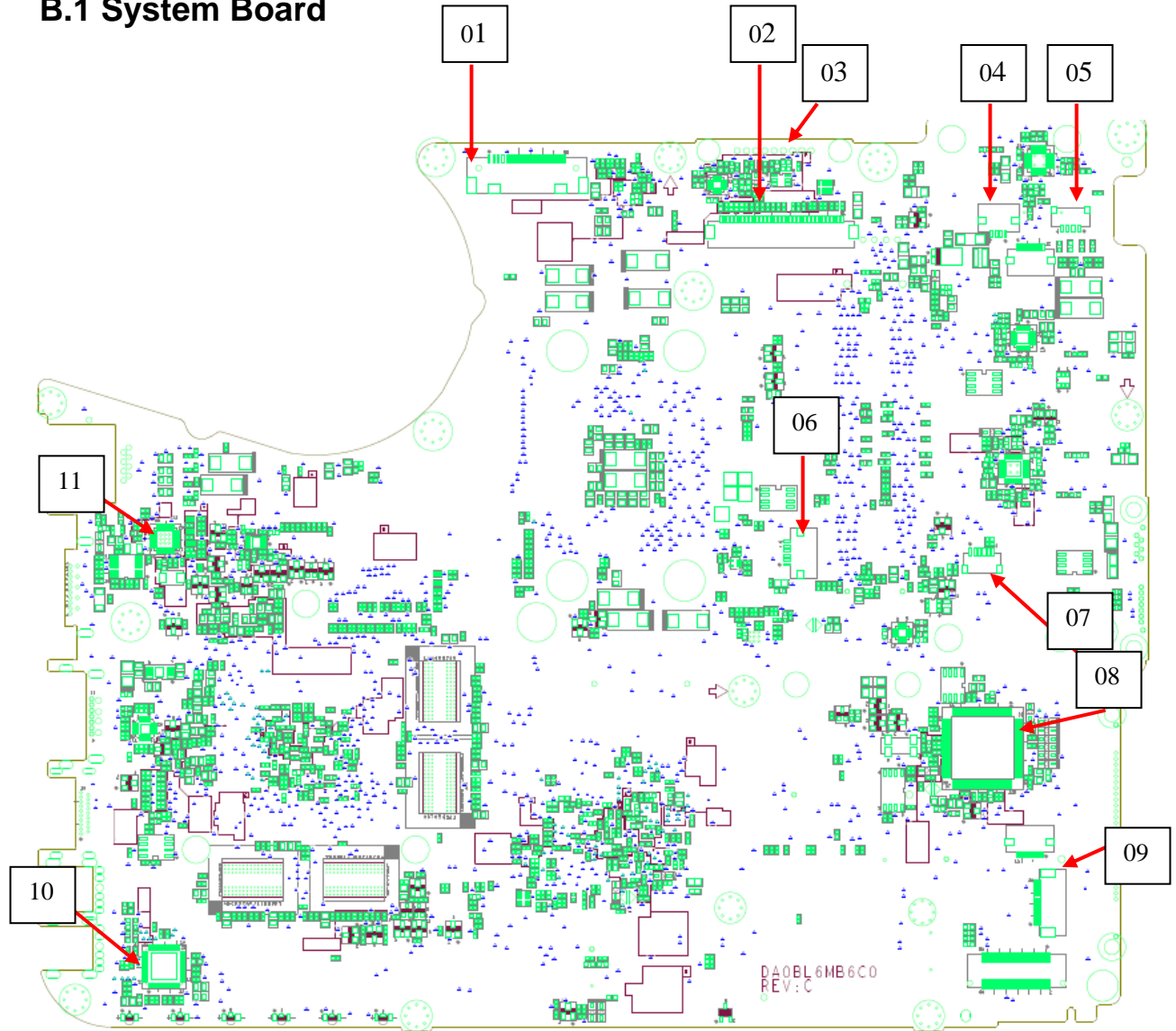


Figure B-1 System board layout (front)

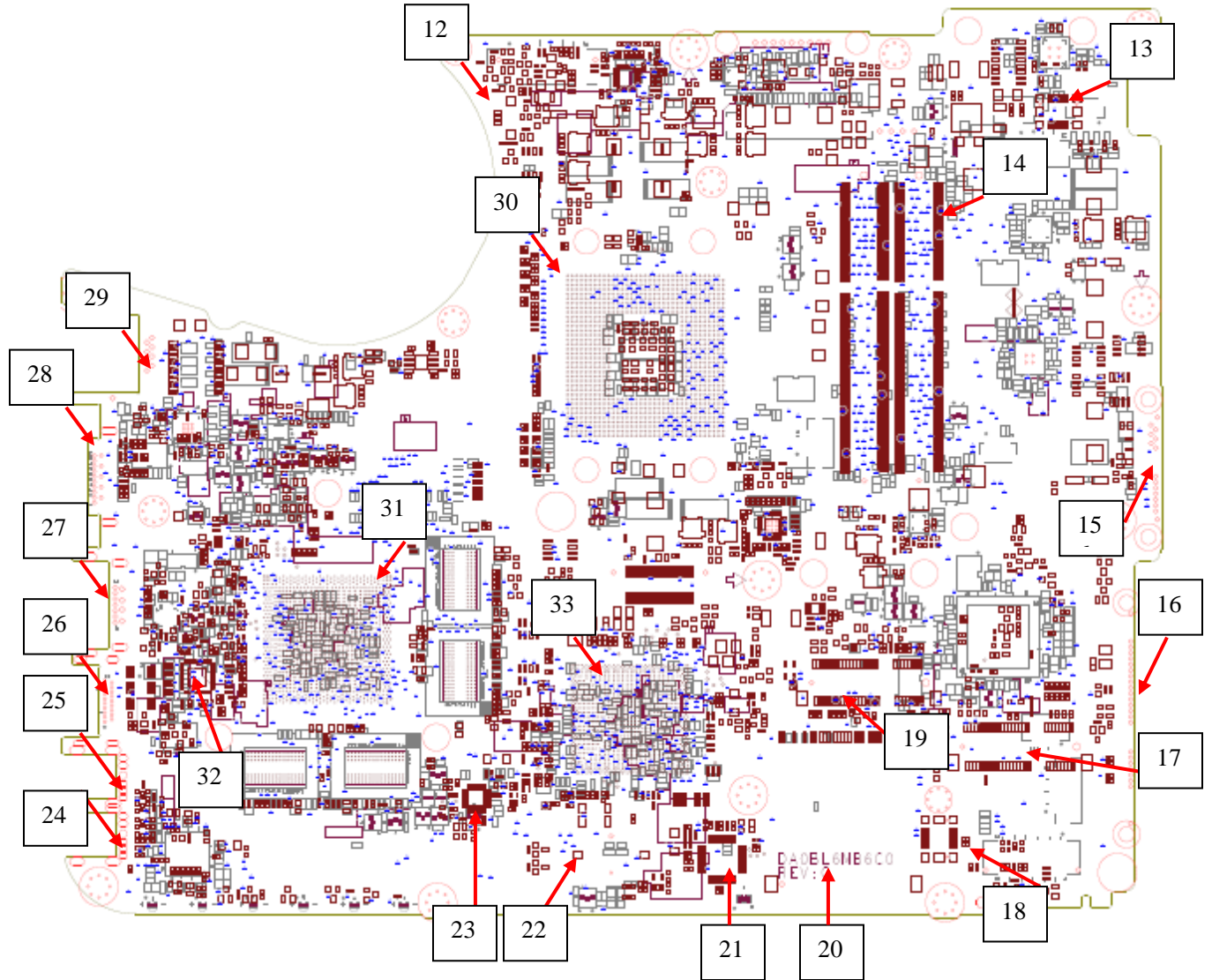


Figure B-2 System board layout (Back)

Table B-1-1 System board ICs and connectors

NUM	Location	Function
(01)	CN1	LVDS CONN
(02)	CN3	KB CONN
(03)	PCN1	BATT CON
(04)	CN4	Power Board CONN
(05)	CN2	Inter Speaker CONN
(06)	CN6	TP board CONN
(07)	CN7	Bluetooth CON
(08)	U8	Embedded Controller IC
(09)	CN9	USB Board CONN
(10)	U13	Audio IC
(11)	U1	LAN IC
(12)	CN12	FAN CONN
(13)	CN11	3G SIM Card CONN
(14)	JDIM	DDR CONN
(15)	CN14	SATA ODD CONN
(16)	CN20	SATA HDD CONN
(17)	CN21	3G Module CONN
(18)	CN24	MDC CONN
(19)	CN18	Wi-Fi CONN
(20)	CN26	Card reader CONN
(21)	U31	Card reader Controller IC/RTS5159

(22)	CN25	RTC BATT CONN
(23)	U29	Clock Generator IC
(24)	CN23	Phone Jack CONN
(25)	CN22	External MIC CONN
(26)	CN19	HDMI CONN
(27)	CN17	ESATA CONN
(28)	CN15	CRT CONN
(29)	CN13	LAN CONN
(30)	U15	CPU
(31)	U20	Discrete VGA
(32)	U24	PCH
(33)	U23	HDMI Level Shift

B.2 Touch Pad Board

<Front layout>

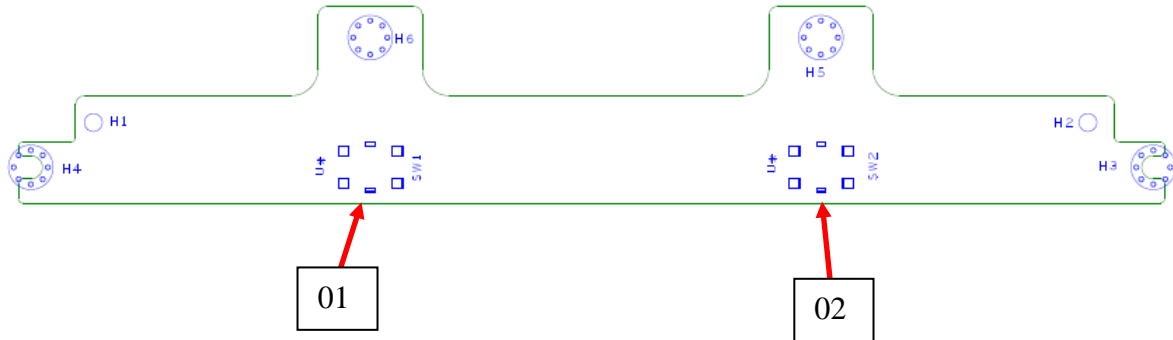


Figure B-2-1 Touch Pad board layout (Front)

Table B-2-1 Touch Pad board connectors

NUM	Location	Function
(01)	SW1	Mouse Button Left key
(02)	SW2	Mouse Button Right key

<Back layout>

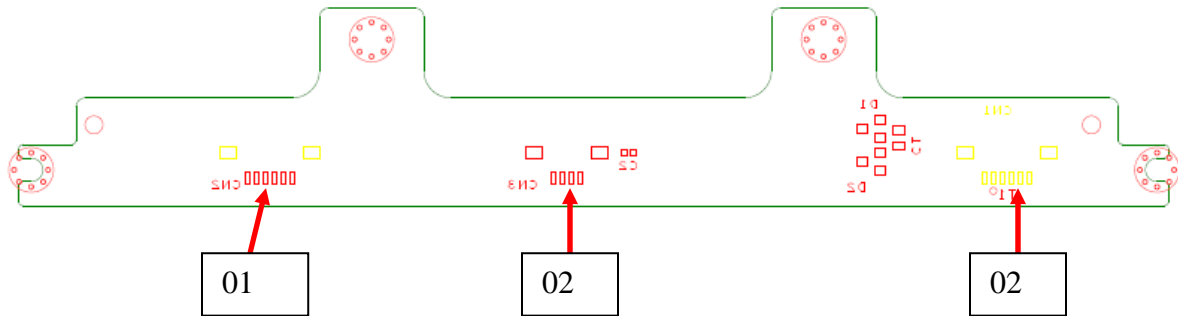


Figure B-2-2 Touch Pad board layout (Back)

Table B-2-2 Touch Pad board connectors

NUM	Location	Function
(01)	CN2	TP Board to TP Module CONN
(02)	CN3	TP Board to TP Switch Board CONN
(02)	T1	TP Board to M/B CONN

Appendix C Pin Assignment

CN1 LCD Panel Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	LCDVCC	---	2	LCDVCC	---
3	+3V	---	4	LCD_EDIDCLK	I/O
5	LCD_EDIDDATA	I/O	6	GND	---
7	LCD_TXLOUT0-	I/O	8	LCD_TXLOUT0+	I/O
9	GND	---	10	LCD_TXLOUT1-	I/O
11	LCD_TXLOUT1+	I/O	12	GND	---
13	LCD_TXLOUT2-	I/O	14	LCD_TXLOUT2+	I/O
15	GND	---	16	LCD_TXLCLKOUT-	I/O
17	LCD_TXLCLKOUT+	I/O	18	GND	---
19	LVDS_VADJ	I/O	20	DISPON	I/O
21	NC	---	22	VIN	---
23	VIN	---	24	VIN	---
25	USBP0+_LCD	I/O	26	USBP0-_LCD	I/O
27	CCD_POWER	---	28	INT_DMIC_CLK (Audio Codec)	I/O
29	INT_DMIC_DATA (Audio Codec)	I/O	30	GND	---

CN2 Internal Speaker Connector

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	INSPKR+N	I/O	2	INSPKR-N	I/O
3	INSPKL-N	I/O	4	INSPKL+N	I/O

CN3 Keyboard Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	K_LED_P	O	2	MY16	O
3	NC	---	4	MY17	O
5	NC	---	6	K_LED_P	O
7	MY2	O	8	MY1	O
9	MY0	O	10	MY4	O
11	MY3	O	12	MY5	O
13	MY14	O	14	MY6	O
15	MY7	O	16	MY13	O
17	MY8	O	18	MY9	O
19	MY10	O	20	MY11	O
21	MY12	O	22	MY15	O
23	MX7	O	24	MX2	O
25	MX3	O	26	MX4	O
27	MX0	O	28	MX5	O
29	MX6	O	30	MX1	O
31	K_LED_P	O	32	CAPSLED	O
33	NC	---	34	NUMLED	O

Pin Assignment

CN4 Power Board Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	NC	---	2	NBSWON#	I
3	NC	---	4	GND	---

CN6 Touchpad Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	+5V_TP	---	2	TPCLK	I/O
3	TPDATA	I/O	4	TP_ON_OFF	I/O
5	NC	---	6	GND	---

CN7 Bluetooth Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	BT_POWER	---	2	USBP2+	I/O
3	USBP2-	I/O	4	BT_RESET	I/O
5	BT_Detect#	I/O	6	GND	---

CN9 USB Board Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
----------------	--------------------	------------	----------------	--------------------	------------

1	+5VPCU	---	2	+5VPCU	---
3	+5VPCU	---	4	+5VPCU	---
5	+5VPCU	---	6	+5VPCU	---
7	NC	---	8	NC	---
9	GND	---	10	GND	---
11	USBP8+	I/O	12	USBP8-	I/O
13	GND	---	14	USBP9+	I/O
15	USBP9-	I/O	16	GND	---
17	USB_EN#1	I/O	18	USBOC#8_9	I/O
19	GND	---	20	GND	---

CN11 3G SIM Card Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	UIM_CLK	---	2	UIM_VPP	---
3	GND	---	4	UIM_PWR	---
5	UIM_DATA	I/O	6	UIM_RST	I
7	GND	---	8	GND	
9	USBP4+	I/O	10	NC	---
11	USBP4-	I/O	12	GND	---

CN12 FAN Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	TH_FAN_POWER1	---	2	GND	---

Pin Assignment

3	FANSIG1	O			
---	---------	---	--	--	--

CN13 LAN Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	X-TX0P	---	2	X-TX0N	---
3	X-TX1P	---	4	X-TX2P	---
5	X-TX2N	---	6	X-TX1N	---
7	X-TX3P	---	8	X-TX3N	---
9	GND	---	10	GND	---

CN14 SATA ODD Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	GND	---	2	SATA_TXP1_C	O
3	SATA_TXN1_C	O	4	GND	---
5	SATA_RXN1_C	I	6	SATA_RXP1_C	I
7	GND	---	8	GND	---
9	+5V_ODD	---	10	+5V_ODD	---
11	NC	---	12	GND	---
13	GND	---	14	GND	---
15	GND	---			

CN15 CRT Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	CRT_R1	---	2	CRT_G1	---
3	CRT_B1	---	4	NC	---
5	GND	---	6	GND	---
7	GND	---	8	GND	---
9	5V_CRT2	---	10	GND	---
11	CRT_SENSE#	---	12	CRTDDAT	I/O
13	CRTHSYNC	---	14	CRTVSYNC	---
15	CRTDCLK	---			

PCN1 Battery Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	MBAT+	---	2	MBAT+	---
3	ID	O	4	B/I	---
5	TEMP_MBAT	O	6	MBDATA	I/O
7	MBCLK	I/O	8	GND	---
9	GND	---	10	GND	---
11	GND	---	12	GND	---
13	GND	---			

CN17 ESATA Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	USBPWR1	---	2	R_BUSBP13-	---
3	R_BUSBP13+	---	4	GND	---
5	GND	---	6	BSATA_TXP5	---
7	BSATA_TXN5	---	8	GND	---
9	BSATA_RXN5	---	10	BSATA_RXP5	---
11	GND	---	12	GND	---
13	GND	---	14	GND	---
15	GND	---			

CN18 Mini Card (Wi-Fi) Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	WLAN_WAKE#	O	2	WIMAX_P	---
3	NC	---	4	GND	---
5	BT_RFCTRL#	---	6	+1.5V	---
7	PCIE_CLK_RQ5#	---	8	LAD0_PCIE	I/O
9	GND	---	10	LAD1_PCIE	I/O
11	CLK_PCIEI_MINI#_	I	12	LAD2_PCIE	I/O
13	CLK_PCIEI_MINI	I	14	LAD3_PCIE	I/O
15	GND	---	16	LFRAME#_PCIE	I
17	NC	---	18	GND	---

19	NC	---	20	RF_EN	I
21	GND	---	22	PLTRST#	I
23	PCIE_RXN5	O	24	+3V_S5	---
25	PCIE_RXP5	O	26	GND	---
27	GND	---	28	+1.5V	---
29	GND	---	30	WL_SMCLK	I/O
31	PCIE_TXN5	I	32	WL_SMDATA	I/O
33	PCIE_TXP5	I	34	GND	---
35	GND	---	36	USBP5-	I/O
37	GND	---	38	USBP5+	I/O
39	WIMAX_P	---	40	GND	---
41	WIMAX_P	---	42	NC	---
43	GND	---	44	NC	---
45	CL_CLK1_MIN	---	46	NC	---
47	PLTRST#_PCIE	---	48	+1.5V	---
49	CL_RST#1_WLAN	---	50	GND	---
51	SERIRQ_debug	I	52	WIMAX_P	---

CN19 HDMI Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	HDMITX2P_R	---	2	GND	---
3	HDMITX2N_R	---	4	HDMITX1P_R	---
5	GND	---	6	HDMITX1N_R	---
7	HDMITX0P_R	---	8	GND	---

Pin Assignment

9	HDMITX0N_R	---	10	HDMICLK+_R	---
11	GND	---	12	HDMICLK-_R	---
13	NC	---	14	NC	---
15	HDMI_CON_DDCCLK	I/O	16	HDMI_CON_DDCDATA	I/O
17	GND	---	18	DDC5V	---
19	HDMI_CON_HP	---	20	GND	---
21	GND	---	22	GND	---
23	GND	---			

CN20 SATA HDD Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	GND	---	2	SATA_TXP0_C	O
3	SATA_TXN0_C	O	4	GND	---
5	SATA_RXN0_C	I	6	SATA_RXP0_C	I
7	GND	---	8	+3.3VSATA1	---
9	+3.3VSATA1	---	10	+3.3VSATA1	---
11	GND	---	12	GND	---
13	GND	---	14	+5V_HDD1	---
15	+5V_HDD1	---	16	+5V_HDD1	---
17	GND	---	18	NC	---
19	GND	---	20	NC	---
21	NC	---	22	NC	---

CN21 3G Module Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O

1	WLAN_WAKE#	O	2	+3V_3G	---
3	NC	---	4	GND	---
5	NC	---	6	+1.5V_3G	---
7	PCIE_CLK_REQ4#	---	8	UIM_PWR_R	---
9	GND	---	10	UIM_DATA_R2	I/O
11	CLK_PCIE_3G#	I	12	UIM_CLK_R	I/O
13	CLK_PCIE_3G	I	14	UIM_RST_R	I/O
15	GND	---	16	UIM_VPP_R	I
17	NC	---	18	GND	---
19	NC	---	20	3G_EN	I
21	GND	---	22	PLTRST#	I
23	PCIE_RXN3	O	24	+3V_S5	---
25	PCIE_RXP3	O	26	GND	---
27	GND	---	28	+1.5V_3G	---
29	GND	---	30	NC	I/O
31	PCIE_TXN3	I	32	NC	I/O
33	PCIE_TXP3	I	34	GND	---
35	GND	---	36	USBP10-	I/O
37	NC	---	38	USBP10+	I/O
39	+3V_3G	---	40	CPUSB#	---
41	+3V_3G	---	42	NC	---
43	GND	---	44	NC	---
45	NC	---	46	NC	---
47	NC	---	48	+1.5V_3G	---
49	NC	---	50	GND	---
51	NC	O	52	+3V_3G	---

Pin Assignment

CN22 External MIC Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	ADOGND	---	2	MIC1_L3	I
3	MIC1_R3	I	4	ADOGND	---
5	Port_B#	I/O	6	NC	---
7	ADOGND	---	8	ADOGND	---
9	ADOGND	---	10	ADOGND	---

CN23 Earphone Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	ADOGND	---	2	HPOUT-L3	O
3	HPOUT-R3	O	4	ADOGND	---
5	Port_A#	I/O	6	NC	---
7	ADOGND	---	8	ADOGND	---
9	ADOGND	---	10	ADOGND	---

CN24 MDC Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	GND	---	2	GND	---
3	GND	---	4	GND	---
5	GND	---	6	GND	---
7	DIB_P	---	8	GND	---
9	DIB_N	---	10	GND	---

11	GND	---	12	GND	---
----	-----	-----	----	-----	-----

CN25 RTC BATT Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	GND	I	2	RTC_NO2	---

CN26 3 IN 1 CARD READER Connectors

PIN No.	Signal name	I/O	PIN No.	Signal name	I/O
1	SD_DAT2/XD_RE#_R	O	2	GND	---
3	SD_DAT3/XD_WE#_R	I	4	VCC_XD	---
5	SD_MS_CLK_RMS	---	6	SD_CMD_R	I/O
7	XD_D7/MS_D3	I/O	8	MS_INS#	I/O
9	GND	---	10	XD_D2/MS_D2	I/O
11	VCC_XD	---	12	SD_DAT0/XD_D6/MS_D0	I/O
13	XD_D3/MS_D1	I/O	14	SD_MS_CLK_R	I/O
15	XD_D5/MS_BS	I/O	16	GND	---
17	GND	---	18	SD_DAT0/XD_D6/MS_D0_R	I/O
19	XD_D4/SD_D1_R	I/O	20	SD_WP_R	I/O
21	SD_CD#_R	I/O	22	GND	---
23	GND	---	---	---	---

Appendix D Display Codes

D.1 Display Codes

Table D-1 Scan codes (set 1 and set 2) (1/4)

Cap No.	Keypop	Code set 1		Code set 2		Note	
		Make	Break	Make	Break		
01	‘ ~	29	A9	0E	F0	0E	
02	1 !	02	82	16	F0	16	
03	2 @	03	83	1E	F0	1E	
04	3 #	04	84	26	F0	26	
05	4 \$	05	85	25	F0	25	
06	5 %	06	86	2E	F0	2E	
07	6 ^	07	87	36	F0	36	
08	7 &	08	88	3D	F0	3D	*2
09	8 *	09	89	3E	F0	3E	*2
10	9 (0A	8A	46	F0	46	*2
11	0)	0B	8B	45	F0	45	
12	- _	0C	8C	4E	F0	4E	
13	= +	0D	8D	55	F0	55	
15	BkSp	0E	8E	66	F0	66	
16	Tab	0F	8F	0D	F0	0D	
17	Q	10	90	15	F0	15	
18	W	11	91	1D	F0	1D	
19	E	12	92	24	F0	24	
20	R	13	93	2D	F0	2D	
21	T	14	94	2C	F0	2C	
22	Y	15	95	35	F0	35	
23	U	16	96	3C	F0	3C	*2
24	I	17	97	43	F0	43	*2
25	O	13	98	44	F0	44	*2
26	P	19	99	4D	F0	4D	*2
27	[{	1A	9A	54	F0	54	
28] }	1B	9B	5B	F0	5B	

Table D-1 Scan codes (set 1 and set 2) (2/4)

Cap No.	Keytop	Code set 1		Code set 2		Note	
		Make	Break	Make	Break		
29	\	2B	AB	5D	F0	5D	*5
30	Caps Lock	3A	BA	58	F0	58	
31	A	1E	9E	1C	F0	1C	
32	S	1F	9F	1B	F0	1B	
33	D	20	A0	23	F0	23	
34	F	21	A1	2B	F0	2B	
35	G	22	A2	34	F0	34	
36	H	23	A3	33	F0	33	
37	J	24	A4	3B	F0	3B	*2
38	K	25	A5	42	F0	42	*2
39	L	26	A6	4B	F0	4B	*2
40	; :	27	A7	4C	F0	4C	*2
41	' "	28	A8	52	F0	52	
43	Enter	1C	9C	5A	F0	5A	*3
44	Shift (L)	2A	AA	12	F0	12	
45	No.102 key	56	D6	61	F0	61	
46	Z	2C	AC	1A	F0	1A	
47	X	2D	AD	22	F0	22	
48	C	2E	AE	21	F0	21	
49	V	2F	AF	2A	F0	2A	
50	B	30	B0	32	F0	32	
51	N	31	B1	31	F0	31	
52	M	32	B2	3A	F0	3A	*2
53	, <	33	B3	41	F0	41	*2
54	. >	34	B4	49	F0	49	*2
55	/ ?	35	B5	4A	F0	4A	*2
57	Shift (R)	36	B6	59	F0	59	

Table D-1 Scan codes (set 1 and set 2) (3/4)

Cap No.	Keytop	Code set 1				Code set 2				Note
		Make		Break		Make		Break		
58	Ctrl	1D		9D		14		F0 14		*3
60	Alt (L)	38		B8		11		F0 11		*3
61	Space	39		B9		29		F0 29		
62	ALT (R)	E0	38	E0	B8	E0	11	E0	F0 11	
75	Ins	E0	52	E0	D2	E0	70	E0	F0 70	*1
76	Del	E0	53	E0	D3	E0	71	E0	F0 71	*1
79	←	E0	4B	E0	CB	E0	6B	E0	F0 6B	*1
80	Home	E0	47	E0	C7	E0	6C	E0	F0 6C	*1
81	End	E0	4F	E0	CF	E0	69	E0	F0 69	*1
83	↑	E0	48	E0	C8	E0	75	E0	F0 75	*1
84	↓	E0	50	E0	D0	E0	72	E0	F0 72	*1
85	PgUp	E0	49	E0	C9	E0	7D	E0	F0 7D	*1
86	PgDn	E0	51	E0	D1	E0	7A	E0	F0 7A	*1
89	→	E0	4D	E0	CD	E0	74	E0	F0 74	*1
110	Esc	01		81		76		F0 76		
112	F1	3B		BB		05		F0 05		
113	F2	3C		BC		06		F0 06		
114	F3	3D		BD		04		F0 04		
115	F4	3E		BE		0C		F0 0C		
116	F5	3F		BF		03		F0 03		
117	F6	40		C0		0B		F0 0B		
118	F7	41		C1		83		F0 83		
119	F8	42		C2		0A		F0 0A		
120	F9	43		C3		01		F0 01		
121	F10	44		C4		09		F0 09		*3

Table D-1 Scan codes (set 1 and set 2) (4/4)

Cap No.	Keytop	Code set 1				Code set 2				Note
		Make		Break		Make		Break		
122	F11	57	D7	78	F0	78			*3	
123	F12	58	D8	07	F0	07			*3	
124	PrintSc	*6	*6	*6	*6				*6	
126	Pause	*7	*7	*7	*7				*7	
202	Fn	—	—	—	—				*4	
203	Win	E0	5B	E0	DB	E0	1F	E0	F0	1F
204	App	E0	5D	E0	DD	E0	2F	E0	F0	2F

Notes:

1. * Scan codes differ by mode.
2. * Scan codes differ by overlay function.
3. * Combined with the **Fn** key makes different codes.
4. * **Fn** key does not generate a code by itself.
5. * This key corresponds to key No. 42 in a 102-key model.
6. * Refer to Table D-6, No. 124 key scan code.
7. * Refer to Table D-7, No. 126 key scan code.

Table D-2 Scan codes with left Shift key

Cap No.	Key top	Code set 1				Code set 2			
		Make		Break		Make		Break	
55	/	E0 AA	E0 35	E0 B5	E0 2A	E0 F0	12 E0 4A	E0 F0	4A E0 12
75	INS	E0 AA	E0 52	E0 D2	E0 2A	E0 F0	12 E0 70	E0 F0	70 E0 12
76	DEL	E0 AA	E0 53	E0 D3	E0 2A	E0 F0	12 E0 71	E0 F0	71 E0 12
79	←	E0 AA	E0 4B	E0 CB	E0 2A	E0 F0	12 E0 6B	E0 F0	6B E0 12
80	Home	E0 AA	E0 47	E0 C7	E0 2A	E0 F0	12 E0 6C	E0 F0	6C E0 12
81	End	E0 AA	E0 4F	E0 CF	E0 2A	E0 F0	12 E0 69	E0 F0	69 E0 12
83	↑	E0 AA	E0 48	E0 C8	E0 2A	E0 F0	12 E0 75	E0 F0	75 E0 12
84	↓	E0 AA	E0 50	E0 D0	E0 2A	E0 F0	12 E0 72	E0 F0	72 E0 12
85	PgUp	E0 AA	E0 49	E0 C9	E0 2A	E0 F0	12 E0 7D	E0 F0	7D E0 12
86	PgDn	E0 AA	E0 51	E0 D1	E0 2A	E0 F0	12 E0 7A	E0 F0	7A E0 12
89	→	E0 AA	E0 4D	E0 CD	E0 2A	E0 F0	12 E0 74	E0 F0	74 E0 12
203	Win	E0 AA	E0 5B	E0 DB	E0 2A	E0 F0	12 E0 1F	E0 F0	1F E0 12
204	App	E0 AA	E0 5D	E0 DD	E0 2A	E0 F0	12 E0 2F	E0 F0	2F E0 12

Note : The table above shows scan codes with the left **Shift** key. In combination with the right **Shift** key, scan codes are changed as listed below:

	With left Shift	With right Shift
Set 1	E0 AA _____	E0 B6
	E0 2A _____	E0 36
Set 2	E0 F0 12 _____	E0 F0 59
	E0 12 _____	E0 59

Table D-3 Scan codes in Numlock mode

Cap No.	Key top	Code set 1				Code set 2			
		Make		Break		Make		Break	
75	INS	E0 2A	E0 52	E0 D2	E0 AA	E0 12	E0 70	E0 F0	70 E0 F0 12
76	DEL	E0 2A	E0 53	E0 D3	E0 AA	E0 12	E0 71	E0 F0	71 E0 F0 12
79	←	E0 2A	E0 4B	E0 CB	E0 AA	E0 12	E0 6B	E0 F0	6B E0 F0 12
80	Home	E0 2A	E0 47	E0 C7	E0 AA	E0 12	E0 6C	E0 F0	6C E0 F0 12
81	End	E0 2A	E0 4F	E0 CF	E0 AA	E0 12	E0 69	E0 F0	69 E0 F0 12
83	↑	E0 2A	E0 48	E0 C8	E0 AA	E0 12	E0 75	E0 F0	75 E0 F0 12
84	↓	E0 2A	E0 50	E0 D0	E0 AA	E0 12	E0 72	E0 F0	72 E0 F0 12
85	PgUp	E0 2A	E0 49	E0 C9	E0 AA	E0 12	E0 7D	E0 F0	7D E0 F0 12
86	PgDn	E0 2A	E0 51	E0 D1	E0 AA	E0 12	E0 7A	E0 F0	7A E0 F0 12
89	→	E0 2A	E0 4D	E0 CD	E0 AA	E0 12	E0 74	E0 F0	74 E0 F0 12
203	Win	E0 2A	E0 5B	E0 DB	E0 AA	E0 12	E0 1F	E0 F0	1F E0 F0 12
204	App	E0 2A	E0 5D	E0 DD	E0 AA	E0 12	E0 2F	E0 F0	2F E0 F0 12

Table D-4 Scan codes with Fn key

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

Table D-5 Scan codes in overlay mode

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

Table D-6 No.124 key scan code

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

Table D-7 No.126 key scan code

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

*: This key generates only make codes.

Appendix E Wiring Diagrams

E.1 RGB Monitor ID Wraparound connector

(1) RED	_____	RED	(1)
(2) GREEN	_____	GREEN	(2)
(3) BLUE	_____	BLUE	(3)
(4) NC	_____	NC	(4)
(5) GND	_____	GND	(5)
(6) GND	_____	GND	(6)
(7) GND	_____	GND	(7)
(8) GND	_____	GND	(8)
(9) 5V	_____	5V	(9)
(10) GND	_____	GND	(10)
(11) NC	_____	NC	(11)
(12) SDA	_____	SDA	(12)
(13) HSYNC	_____	HSYNC	(13)
(14) VSYNC	_____	VSYNC	(14)
(15) SDL	_____	SCL	(15)

Figure F-1 RGB Monitor ID Wraparound connector (15PIN to 15PIN)

E.2 LAN Loopback Connector

(1) BIBAP (TX+)	_____	(3) BIDBP (RX+)
(2) BIDAN (TX-)	_____	(4) BIDBN (RX-)

Figure F-2 LAN loopback connector