Toshiba Personal Computer

Satellite P20-25 Series

Maintenance Manual

TOSHIBA CORPORATION

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Toshiba Personal Computer Satellite P20-25 Series Maintenance Manual

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Preface

This maintenance manual describes how to perform hardware service maintenance for the Toshiba Personal Computer Satellite P20 Series, referred to as the P20-25 Series in this manual.

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 P20-25 Series 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
- ❑ Key layout
- ❑ Screw torque list
- ❑ Reliability

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:

DISKCOPY A: B:

The display

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

```
Format complete
System transferred
```

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Chapter 1

Hardware Overview

Chapter 1   Contents

1.1   Features

The Satellite P20-25 Series Personal Computer uses extensive Large Scale Integration (LSI), and Complementary Metal-Oxide Semiconductor (CMOS) technology extensively to provide compact size, minimum weight and high reliability. This computer incorporates the following features and benefits:

❑ CPU

> Intel Desktop P4 up to 2.4GHZ or Northwood upgradable

❑ Chipset

- Intel DT Springdale (865 PE)
- Intel 82801 EB I/O Controller HUB5(ICH5)
- PC87591L for Keyboard Controller, Battery Management Unit and RTC
- T7L58XB for CardBus and SD Controller
- nVIDIA NV34M Graphics Controller
- Cirrus logic ALC202 for AC97 CODEC
- OZ168 for Direct CD Play Controller
- 8101L for LAN Controller

❑ Memory

- On board with two 200-pin +2.5V SO-DIMM connectors, supporting DDR RAM cards. Maximum upgradable to 1GB by two 512MB SO-DIMM modules
- 256 KB/512KB L2 Cache on CPU
- External 64MB VGA DDR RAM

❑ BIOS

- 512KB Flash ROM for system BIOS.
- Suspend to RAM/Disk.
- Password protection (System).
- Windows XP ready with PnP
- Various hot key for system control.
- Refreshable
- Complete ACPI 1.0B Function

❑ Power

- 12 cells Li-Ion 18650 size smart battery Pack with 95Wh capacity
- 2.0 hours operation as running battery mark 2001 version 1.0/+ program
- 12 hours charging time to 100% capacity on Li-Ion Battery (System on)
- Brightness Minimum plus 3 steps
- RTC battery (Sanyo ML1220T128 3.3V/15mAH Lithium) backs up the Real Time Clock and CMOS memory

❑ HDD
- One 2.5", 9.5mm hard disk with capacity 30GB/40GB/60GB/80GB
- Bus Master IDE
- 9.5mm, 2.5"HDD support
- Support Ultra 100 synchronous DMA

❑ FDD / DVD Devices
One of the following:
- 12.7mm, 1.44MB FDD device
- 5.25" 12.7mm height DVD-R/RW device
- 5.25" 12.7mm height DVD-ROM device
- 5.25" 12.7mm height DVD multi-drivedevice
- 5.25" 12.7mm height combo device

❑ Keyboard
An easy-to-use 87-key keyboard provides a numeric keypad overlay for fast numeric data entry or for cursor and page control. It supports software that uses a 101- or 102-key enhanced keyboard. Includes one Windows$^{®}$ key and one Application key.

❑ TouchPad
This pointing control device, located in the center of the keyboard palm-rest, provides convenient control of the cursor without requiring desk space for a mouse. The TouchPad incorporates two mouse buttons.

❑ Display
The following types of display are available:

- 17.0-inch WXGA TFT screen, 1440×900 pixels, Response time 31ms (typ.); Contrast ratio 350:1 (typ.); Brightness 150 Nit (typ.)
- 17.1-inch WXGA TFT screen, 1440×900 pixels, Response time 31ms (typ.); Contrast ratio 300:1 (typ.); Brightness 160 Nit (typ.)

❑ Optional devices
- 64MB/128MB/256MB/512MB SO-DIMM modules
- MINI PCI module(802.11b wireless LAN module)
- Modem with MDC solution module

❑ I/O Ports
  - One 25-pin parallel port, EPP/ECP capability
  - One 15-pin CRT port, supports DDC 2B
  - One TV-out connector
  - One MIC-in port
  - One line-in port
  - One headphone-out
  - One 2-pin AC adapter jack
  - One type III or two type II PCMCIA card bus slots
  - Four 4-pin USB ports
  - One RJ11/RJ45 port
  - VR for volume control
  - IEEE1396 (i.Link / FireWire) port
  - CIR port

❑ Universal Serial Bus (USB)
  The computer comes with four USB ports that comply with Universal Host Controller
  Interface (UHCI). The USB enables daisy-chain connection of up to 127 USB-
  equipped devices. It is designed for easy configuration by a Plug-and-Play operating
  system and provides hot insertion/ejection capability.

❑ Parallel port
  A 25-pin parallel port enables connection of a printer or other parallel device. The
  port supports Extended Capabilities Port (ECP) conforming to IEEE-1284 and is
  Enhanced Parallel Port (IEEE 1284) compliant. It features ChiProtect circuitry for
  protection against damage due to printer power-on.

❑ External monitor port
  A 15-pin CRT port supporting DDC 2B enables connection of an external monitor,
  which is recognized automatically by Video Electronics Standards Association
  (VESA) Display Data Channel (DDC) compatible functions.

❑ PC Card Slot
  The PC Card Slot accommodates two 5mm cards (Type II) or one 10.5mm (Type III)
  card and supports SRAM, OTPROM, FLASH ROM, and mask ROM memory cards
  up to 64MB as well as MODEM/LAN cards, ATA cards and Card bus cards. ACPI
  1.0b compliant.

❑ Sound system
   A Cirrus logic ALC202 for AC97 codec audio subsystem offers industry leading
   mixed signal technology to enhance the computer's multimedia capability. The
   sound system is equipped with stereo speakers and jacks for headphone and external
   microphone.

❑ TV-out port
   This video-out mini-jack enables transfer of NTSC or PAL data (video and right/left
   audio) to external devices such as a TV.

❑ LAN port
   The computer comes with an RJ-45 Local Area Network (LAN) port. The LAN port
   provides connectivity for LAN.

❑ CD/Digital Mode Button and audio/video control buttons
   Unlock the control buttons by pressing the CD/Digital Mode Button for three seconds.
   When unlocked, the CD or Digital LED will light on the front panel. When unlocked,
   press the CD/Digital Mode Button briefly to switch between CD mode and digital
   mode. CDs can be played with the computer turned off. Pressing play in digital mode
   will start the computer and launch the digital music player application.

1.2   System Unit

The system unit is composed of the following major components:

❑ Processor
- Intel Desktop P4 up to 2.4GHZ or Northwood upgradable
    - mPGA478 package CPU
    - FSB533 Northwood CPU 2.53G/2.66G/2.8G w/o HT
    - FSB533 Northwood CPU 3.06G w/HT
    - FSB800 Northwood CPU 2.4G/2.6G/2.8G/3.0G/3.2G w/HT

❑ System Logic
- Intel chipset MCH Springdale PE
- Integrated DRAM controller
- Accelerated Graphics Port (AGP) Interface
- Hub Interface to Intel ICH5
- Power Management Functions

❑ Fixed Disk Interface
- Intel 82801 EB I/O Controller HUB5 (ICH5)

❑ KBC/EC (Keyboard Controller/Embedded Controller)
- One PC87591 chip functions as both KBC and EC.
- KBC has the following functions:
    - Scan controller to check status of keyboard matrix
    - Interface controller between the keyboard scan controller and the system
    - Control of switching and simultaneous operation of the accupoint/external PS/2 mouse and of the internal keyboard/external PS/2 keyboard
- EC has the following functions:
    - Power supply sequence control
    - Thermal conditions control
    - LEDs control
    - Beep control
    - Devices ON/OFF control
    - FAN revolutions rate control
    - General Input/Output port control
    - Docker power supply control
    - Battery capacity check
    - Flash rewriting
    - Detection of abnormal condition
    - EC I/F
    - I2C Communication
    - EC access

❑ Memory
  - System DRAM
  - Two JEDEC standard 200-pins SO-DIMM memory support +2.5V 64/128/256MB/512MB.
  - System & KB Combine ROM BIOS
  - 512KB Flash ROM

❑ Video Subsystem
  - nVIDIA NV34M Graphics Controller)
  - Microsoft-DX9 & OpenGL-2.0 (with NVIDIA extensions) Graphics APIs hardware support
  - 50 million triangles per second setup engine
  - 1000 million pixels per second fill rate
  - 256-bit 3D and 2D graphics accelerator, with full 32/64/128-bit color with 32-bit z/stencil (24+8 bit) support
  - Complete pipeline support for 128-bit color for ultimate rendering quality
  - NVIDIA Accuview+ anti-aliasing technology for full Quincunx AA capability –even for high-resolution UXGA panels
  - Raw Peak memory bandwidth of 8.0 GB/second
  - Supports 128-bit DDR SDRAM, driven by a twin memory channel architecture, for maximizing memory bandwidth utilization to enhance rendering performance while minimizing power-consumption as well.
  - DirectX and S3TC texture compression support
  - AGP8x (with Fast Writes & Side-band-Signaling support) - for enhanced host interface bandwidth up-to 2.1Gbytes/second; with AGP4x, 2x support as well
  - Enhanced nView+ multi-display technology supporting any combination of notebook LCD, desktop VGA monitor, DVI display or TV set; with new user & applications control & interface support capabilities
  - Dual CRTC/Simultaneous Dual Display (same or different surfaces)
  - Integrated dual LVDS Transmitter supporting LCD panels up to 2048x1536 @60Hz
  - Integrated 400 MHz Palette-DAC for analog VGA monitors up to 2048x1536 @85Hz refresh
  - Integrated NTSC/PAL TV encoder supporting resolutions up to 1024x768 without the need for panning, with built-in Macrovision(7.1.L1) copy-protection
  - Integrated TMDS transmitter for Digital Visual Interface support with scaling and filtering for flat panels up to 1600x1200 @60Hz
  - DVD- and HDTV-ready MPEG-2 decoding up to 1920x1080i resolutions
  - Most comprehensive MPEG-2 hardware decode functionality, including Inverse Quantization, Inverse Discrete Cosine Transform, Motion Compensation and Color-Space-Conversion
  - VIP1.1 interface support for Analog Video In/Out functionality

- Dual 12-bit or Single 24-bit configurable DVO ports for up-to 333Mpixels/sec transfer rates
- Improved visual quality for all display planes (desktop or overlay) over all display devices (LCD, CRT, TV) – enabled by improved filtering, adaptive de-interlacing & per-pixel gamma-correction hardware circuitry
- Full support for all Windows (ME, 2K, XP), MAC OSX & Linux operating systems
- PowerMizer3.0 technology for further maximizing battery life, while minimizing performance compromises - through dynamic intelligent powering down of currently unused functional blocks
- Advanced TSMC 0.15 micron with 8-layer metals process, for maximizing performance while minimizing power – a critical mobile combination
- 31x31mm, 701 EPBGA package

❑ Audio subsystem
- Cirrus logic ALC202 for AC97 codec
  - Ac 97 2.1 Compatible
  - 20-bit Stereo Digital-to-Analog Converters.
  - 18-bit Stereo Analog-to- Digital Converters.
  - Sample Rate Converters
  - Four Analog Line-level Stereo Inputs for LIN_IN,CD,VIDEO, and AUX
  - Two Analog Line-level Mono Inputs for Modem and Internal PC Beep
  - Dual Stereo Line-level Outputs for LINE_OUT and ALT_LINE_OUT
  - Dual Microphone Inputs
  - High Quality Pseudo-Differential CD Input
  - Extensive Power Management Support
  - Meets or Exceeds the Microsoft® PC 99 Audio Performance Requirements
  - S/PDIF Digital Audio Output
  - CrystalClear ® 3D Stereo Enhancement

❑ Super I/O
- One LPC47N227 chip is used.
- This gate array has the following features:

  - Floppy Disk Controller

  - Parallel Port Controller

1.3   2.5-inch Hard Disk Drive

The internal HDD is a random access non-volatile storage device. It has a non-removable 2.5-inch magnetic disk and mini-Winchester type magnetic heads. The computer supports a 30 / 40 / 60 / 80GB HDD.

1.4   Removable Drives

The module compartments can accommodate the following removable modules:
- Battery pack
- Secondary hard disk drive
- TV tuner
- Floppy disk drive
- DVD-R/-RW drive
- DVD-ROM drive
- DVD multi-drive drive
- Combo drive

1.4.1 3.5-inch Floppy Disk Drive

The 3.5-inch FDD is a thin, high-performance reliable drive that supports 720KB (formatted) 2DD and 1.44MB (formatted) 2HD disks. The specifications for the FDD are listed in the table below.

Item	2MB mode	1MB mode
Storage capacity (KB) Unformatted Formatted	2,000 1,440	1,000 720
Number of heads	2	2
Number of cylinders	80	80
Recording method	Modified Frequency Modulation (MFM)	

1.4.2 DVD-R/-RW Drive

The DVD-R/-RW drive (Toshiba SD-R6112) accommodates either 12cm (4.72-inch) or 8cm (3.15-inch) CDs or DVDs.

Read speeds

DVD-ROM	Maximum 8 times faster rotational speed
DVD-RAM	Standard rotational speed
CD-ROM	Maximum 24 times faster rotational speed

Write speeds

CD-R	4,16 times faster rotational speed
CD-RW	4 times faster rotational speed
High-Speed CD-RW	4,10 times faster rotational speed
DVD-R	1, 2 times rotational speed
DVD-RW disc	1 times rotational speed

Access Speed

Average Random Access Time	DVD-ROM:	115 ms (3.3-8X)
	CD-ROM:	105 ms (10.3-24X)
	DVD-RAM:	170 ms (4.7GB 1X)
Average Random Seek Time	DVD-ROM:	105 ms (3.3-8X)
	CD-ROM:	100 ms (10.3-24X)
	DVD-RAM:	120 ms (4.7GB 1X)
Average Full Stroke Access Time	DVD-ROM:	195 ms (3.3-8X)
	CD-ROM:	180 ms (10.3-24X)
	DVD-RAM:	350 ms (4.7GB 1X)

Buffer capacity   2 Mbytes (Max)

Supported formats

Applicable Write Formats:	CD	CD-R/RW
	DVD	DVD-R
		DVD-RW
Applicable Write Disc:	CD	CD-R/RW [CD-DA, CD+(E)G, CD-MIDI, CD-ROM, CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo-CD, Video-CD), Multisession CD (Photo-CD, CD-EXTRA, Portfolio)]
	DVD	DVD-RW
		DVD-R
Applicable Read Disc:	CD	CD-DA, CD+(E)G, CD-MIDI, CD-TEXT, CD-ROM, CD-ROM XA, CD-I, CD-I Bridge (Photo-CD, Video-CD) Multisession CD (Phto-CD, CD-EXTRA, CD-R, CD-RW, Portfolio), CD-R, CD-RW
	DVD	DVD-ROM [DVD-5, DVD-9, DVD-10, DVD-18]
		DVD-R
		DVD-RW
		DVD-RAM

1.4.3 DVD-ROM Drive

The DVD-ROM drive (Toshiba SD-C2612 or Matsushita SR-8177) accommodates either 12cm (4.72-inch) or 8cm (3.15-inch) CDs or DVDs.

Transfer rates

Matsushita SR-8177: The DVD-ROM drive is able to read CD-ROM, CD-R data at 10.3X to 24X CAV mode speed and CD-RW data at 5.1X to 12X CAV mode speed. The drive has a transfer rate of max. 3 600 kbyte/s for CD-ROM data, CD-R and max. 1 800 kbyte/s for CD-RW data. The drive is able to read DVD disc at CAV mode speed. The drive has a transfer rate of max. 11.08 Mbyte/s for DVD data.

Toshiba SD-C2612: Max.8X (DVD-ROM) / Max. 24X (CD-ROM)/2X (DVD-RAM Ver.1.0)/1X (DVD-RAM Ver.2.1) Max. 10,820 KByte/s (DVD-ROM)/Max. 3,600KByte/s (CD-ROM) Sustained Transfer Rate

Buffer capacity

Matsushita SR-8177: 256 Kbytes (Max)
Toshiba SD-C2612   192 Kbytes (Max)

Supported formats

CD:	CD-Audio	CD-ROM (mode 1 and mode 2)	CD-ROM XA (mode 2, form 1 and form 2)
	CD-I Bridge	CD-I (mode 2, form 1 and form 2)	CD-TEXT
	Video CD	CD-RW	Photo CD
	CD-WO**	Enhanced Music CD (CD Plus)**	CD-I Ready**
	CD+(E)G*	CD-MIDI*	CD-R*

DVD:	DVD-5	DVD-9	DVD-10
	DVD-18*	DVD-RAM (2.6G/4.7G)	DVD-R (3.95G/4.7G)
	DVD-RW		

    *   Toshiba SD-C2612 only
    **   Matsushita SR-8177only

1.4.4 DVD Multi-Drive

The Matsushita UJ-811B DVD multi-drive is capable of driving either 12cm (4.72-inch) or 8cm (3.15-inch) DVDs and CDs without using an adaptor.

Read speed
DVD-ROM	Max 8X CAV (MAX 10800 kB/s)
CD-ROM	Max 24X CAV (MAX 3600 kB/s)

Write speed
CD-R :	Max16X Zone CLV
CD-RW	4X CLV
High Speed CD-RW	8XCLV
DVD-R	2XCLV
DVD-RW	1X CLV
DVD-RAM	2X ZCLV (4.7GB)

Access Speed
DVD-ROM	180ms (Typ.) (Random)
CD-ROM	150ms(Typ.) (Random)

ATAPI Interface
PIO mode	16.6 MB/s :PIO mode4
DMA mode	16.6 MB/s :Multi word mode2
Ultra DMA mode	33.3 MB/s :Ultra DMA mode2

Buffer Memory   2MB

Supported formats

CD:	CD-DA	CD-ROM	CD-R/W
	CD-R	CD-ROMXA	CD-I Ready
	Video CD	PhotoCD(multi-session)	Cd-Extra(CD+)
	CD-TEXT		

DVD:	DVD-Video	DVD-ROM	DVD-R(3.9GB, 4.7GB)
	DVD-RAM	DVD-RW(Ver.1.1)	

1.4.5 Combo Drive

The CD-RW/DVD-ROM combo drive (Toshiba SD-R2412 or TEAC DW-224E-85) is capable of driving either 12cm (4.72-inch) or 8cm (3.15-inch) DVDs and CDs without using an adaptor.

Read speeds

DVD-ROM	Maximum 8 times faster rotational speed
DVD-RAM	Standard rotational speed
CD-ROM	Maximum 24 times faster rotational speed

Write speeds

CD-R	4,8,16,24 times faster rotational speed
CD-RW	4 times faster rotational speed
High-Speed CD-RW	4,10 times faster rotational speed

Access Speed

Average Random Access Time	DVD:	100 ms typ (Toshiba SD-R2412)
		110 ms typ (TEAC DW-224E-85)
	CD:	90 ms typ (10.3-24X)
	DVD-RAM:	170 ms*
Average Random Seek Time	DVD:	85 ms typ*
	CD:	80 ms typ (10.3-24X)*
	DVD-RAM:	130 ms typ*
Average Full Stroke Access Time	DVD:	170 ms typ*
	CD:	160 ms typ (10.3-24X)*
	DVD-RAM:	300 ms*

                                                                 * Toshiba SD-R2412

Buffer capacity   2 Mbytes (Max)

Supported formats

Applicable Write Formats:	CD	CD-R CD-RW
Applicable Write Disc:	CD	CD-R CD-RW [CD-DA, CD+(E)G, CD-MIDI, CD-TEXT, CD-ROM, CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo-CD, Video-CD), Multisession CD (Photo-CD, CD-EXTRA, Portfolio)]
Applicable Read Disc:	CD	CD-DA, CD+(E)G, CD-MIDI, CD-TEXT, CD-ROM, CD-ROM XA, MIXED MODE CD, CD-I, CD-I Bridge (Photo-CD, Video-CD), Multisession CD (Photo-CD, CD-EXTRA, Portfolio, CD-R, CD-RW), CD-R, CD-RW
	DVD	DVD-ROM [DVD-5, DVD-9, DVD-10, DVD-18] DVD-R DVD-RW DVD-RAM

1.5   Power Supply

The power supply supplies seven different voltages to the system board and performs the following functions:

1. A/D conversion

    The EC uses 10-bit sampling for A/D conversion to determine the following values:

    - AC adaptor current
    - Battery and temperature

2. AC adaptor and battery check

    The EC checks the following by A/D converted values:

    - Battery installed

    The EC checks the following by GPIO values:

    - AC adaptor connected

3. Abnormal check

    The EC determines whether the condition is abnormal, and if so, stores an error code into the error register.

4. Input port management

    The EC monitors the following input signal status:

    - System power ON/OFF status
    - Direct CD power ON/OFF status

5. Beep and LED control

    Beep is caused by the low battery status.

    The EC controls the following two kinds of LED

    DC IN LED (one color: green)

    - Green = indicates AC adaptor is connected

    Battery LED (two colors: orange and green)

    - Green solid = The battery is fully charged.

- Orange = The computer is quick-charging the battery / The battery is low.

6. Power ON/OFF sequence

When power is turned on or off, the EC starts the power on or off sequence.

- SQ0-4 = power ON sequence
- SQ5-B = power OFF sequence

7. Battery charging control

The EC controls the following.

- The quick charging ON/OFF
- The detection of full charge

8. Detection of the low battery

The EC detects the low battery point by the gas gauge.

- LB10M= The system will be driven by the battery for 12 more minutes.
- LB0   = The battery won't be able to drive the system after 3 minutes.
- LB1   = The battery can drive the system only during the suspend process.
- LB2   = The battery cannot drive the system.

9. New battery installation

When a new battery is installed, the EC communicates with the E^2PROM in the battery to read information of the newly installed battery.

10. Battery capacity calculation

The EC reads battery remaining and percentage capacity from the battery through SMBus.

1.6   Batteries

The computer has two types of battery:

❑ Main battery pack (18650 size)

❑ RTC battery

The removable main battery pack is the computer's main power source when the AC adaptor is not attached.

The battery specifications are listed in the table below.

Battery name	Material	Output voltage	Capacity
Main battery	Lithium-Ion	14.8 V	6450mAH
RTC battery	Lithium	3.3 V	15 mAh

1.6.1 Main Battery

Battery charging is controlled by a power supply microprocessor that is mounted on the system board. The power supply microprocessor controls whether the charge is on or off and detects a full charge when the AC adaptor and battery are attached to the computer. The system charges the battery using quick charge or trickle charge.

❑ Quick Battery Charge

When the AC adaptor is attached, there are two types of quick charge: quick charge when the system is powered off and normal charge when the system is powered on.

The times required for charges are listed in the table below.

Status	Charging time
Normal charge (power on)	12 hours or longer
Quick charge (power off)	About 4 hours

> **NOTES**
>
> *1.   The time required for normal charge is affected by the amount of power the system is consuming. Use of the fluorescent lamp and frequent disk access diverts power and lengthens the charge time.*
>
> *2.   Using quick charge, the power supply microprocessor automatically stops the charge after eight hours regardless of the condition of the battery. Overcharging could cause the battery to explode.*

If any of the following occurs, the battery quick charge process stops.

1. The battery becomes fully charged.

2. The AC adaptor or battery is removed.

3. The battery or output voltage is abnormal.

4. The battery temperature is abnormal.

5. The battery SMBus communication fails.

6. The battery cell is bad.

❑ Detection of full charge
> A full charge is detected from the battery pack through SMBus when the battery is charging.

1.6.2 RTC battery

The RTC battery provides power to keep the current date, time and other setup information in memory while the computer is turned off. The table below lists the charging time and data preservation period of the RTC battery. The RTC battery is charged by the adaptor or main battery, while the computer is powered on.

Status	Time
Charging Time (power on)	About 48 hours
Data preservation period (full charge)	2 month

Chapter 2

Troubleshooting Procedures

Chapter 2   Contents

Figures

Tables

2.1   Troubleshooting Introduction

Chapter 2 describes how to determine if a Field Replaceable Unit (FRU) in the computer is causing the computer to malfunction. The FRUs covered are:

1. Display
2. Floppy Disk Drive
3. Keyboard
4. USB ports
5. TV-out port

6. Printer (parallel) port
7. TouchPad
8. Speaker
9. Optical drive
10. Modem

11. PCMCIA unit
12. IEEE 1394 port
13. Wireless LAN system
14. Bluetooth

The Diagnostics Disk operations are described in Chapter 3. Detailed replacement procedures are given in Chapter 4.

The following tools are necessary for implementing the troubleshooting procedures:

1. Diagnostics Disk (Repair and Sound Repair)
2. Phillips screwdriver (2 mm)
3. 6mm nut driver (for the helix screw nuts on the rear ports for CPU door)
4. 2DD or 2HD formatted work disk for floppy disk drive testing
5. Printer port loopback connector
6. Sycard (PCMCIA test card)
7. Cleaning kit for floppy disk drive troubleshooting
8. Cleaning kit for optical drive troubleshooting
9. Multimeter
10. External monitor
11. USB compatible keyboard
12. Multimedia sound system with line-in and line-out ports
13. Headphones
14. USB test module and USB cable
15. Music CD

2.2   Troubleshooting Flowchart

If you know the location of the malfunction, turn directly to the appropriate section of this chapter. If the problem is unspecified, use the flowchart in Figure 2-1 as a guide for determining which troubleshooting procedures to execute. Before performing any troubleshooting procedures, verify the following:

●   Ask the user if a password is registered and, if it is, ask him or her to enter the password.

●   Verify with the customer that Toshiba Windows XP is installed on the hard disk. Operating systems that were not preinstalled by Toshiba can cause the computer to malfunction.

●   Make sure all optional equipment is removed from the computer.

●   Make sure the floppy disk drive if installed is empty. If no FDD module is installed, you should use an external FDD to run the diagnostics tests

START

Connect the AC adapter to the DC-IN socket

Is the DC-IN LED on? —No→ Perform the Power Supply Troubleshooting procedures in section 2.3

Yes

Is the Battery LED on? —No→ Perform the Power Supply Troubleshooting procedures in section 2.3

Yes

Turn the Power switch on

Yes

Is the Power On LED on? —No→ Perform the Power Supply Troubleshooting procedures in section 2.3

Yes

Is the "Toshiba" logo message display? —No→ Perform the Display Troubleshooting procedures in section 2.4

Yes

If the "password" message displays, type the password, then press Enter.

Is Toshiba Windows being loaded? —No→ Perform diagnostics program. Run CM165.EXE and select the HARD DISK item.

Yes

A

Figure 2-1 Troubleshooting flowchart (1/2)

A

Does typed characters appear correctly? —No→ Perform the Keyboard Troubleshooting procedures in section 2.6

Yes

Insert the diagnostics disk into the FDD. Then run the diagnostics test program.

Yes

Is the diagnostics test loaded? —No→ Perform the FDD Troubleshooting procedures in section 2.5

Yes

Allow each test to perform automatically

Is an error detected by any of the diagnostics tests? —Yes→ After confirming which diagnostics test has detected an error, perform the appropriate procedure as outlined below.

No

System is normal

End

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. When a problem has been located, perform the appropriate troubleshooting procedures as follows:

1. If an error is detected by the battery test, perform the Power Supply Troubleshooting procedures in Section 2.3.

2. If an error is detected by the display test, perform the Display Troubleshooting procedures in Section 2.4.

3. If an error is detected by the floppy disk test, perform the FDD Troubleshooting procedures in Section 2.5.

4. If an error is detected by the keyboard test, perform the Keyboard Troubleshooting procedures in Section 2.6.

5. If an error is detected by the printer (parallel) port test, perform the Printer Port Troubleshooting procedures in Section 2.9.

6. If an error is detected by the TouchPad test, perform the TouchPad Troubleshooting procedures in Section 2.10.

7. If an error is detected by the audio test, perform the Speaker Troubleshooting procedures in Section 2.11 and the Optical Drive Troubleshooting Procedures in Section 2.12.

8. If an error is detected by the modem test, perform the Modem Troubleshooting Procedures in Section 2.13.

Other problems that are not covered by the diagnostics program may be discovered by a user.

1. If an error is detected when using an external USB device, perform the External USB Devices Troubleshooting procedures in Section 2.7.

2. If an error is detected when using the TV-out connection, perform the TV-Out Failure Troubleshooting procedures in Section 2.8.

3. If an error is detected when using the speakers, perform the Speaker Troubleshooting procedures in Section 2.11.

4. If an error is detected when using the modem, perform the Modem Troubleshooting procedures in Section 2.13.

5. If an error is detected when using the PCMCIA unit, perform the PCMCIA Troubleshooting procedures in Section 2.14.

6. If an error is detected when using the IEEE1394 device, perform the IEEE1394 device Troubleshooting procedures in Section 2.15.

7. If an error is detected when using the Wireless LAN, perform the Wireless LAN Troubleshooting procedures in Section 2.16.

8. If an error is detected when using the Bluetooth, perform the Bluetooth Troubleshooting procedures in Section 2.17.

2.3   Power Supply Troubleshooting

```
                        ┌─────────────┐
                        │    START    │
                        └──────┬──────┘
                               │
                               ▼
                    ┌──────────────────────┐
                    │ Check Power Supply    │
                    │ Status                │
                    │ (Procedure 1)         │
                    └──────────┬───────────┘
                               │
                               ▼
                          ◇─────────◇
                     Are the DC-IN and        No    Replace adaptor / battery
                     Battery LEDs lit?     ────────►      (Procedure 2)
                          ◇─────────◇
                             Yes
                               │
                               ▼
                    ┌──────────────────────┐
                    │ Check power supply    │
                    │ connections           │
                    │ (Procedure 3)         │
                    └──────────┬───────────┘
                               │
                               ▼
                          ◇─────────◇
                      Can you turn the        Yes    Run diagnostic program
                      computer on?        ────────►      (Procedure 4)
                          ◇─────────◇
                             No
                               │
                               ▼
                          ◇─────────◇
                     Are the internal power    No    Perform internal connection
                     connections secure?   ────────►      check
                          ◇─────────◇                (Procedure 5)
                             Yes
                               │
                               ▼
                    ┌──────────────────────┐
                    │ Replace system board  │
                    └──────────┬───────────┘
                               │
                               ▼
                        ┌─────────────┐
                        │     END     │
                        └─────────────┘
```
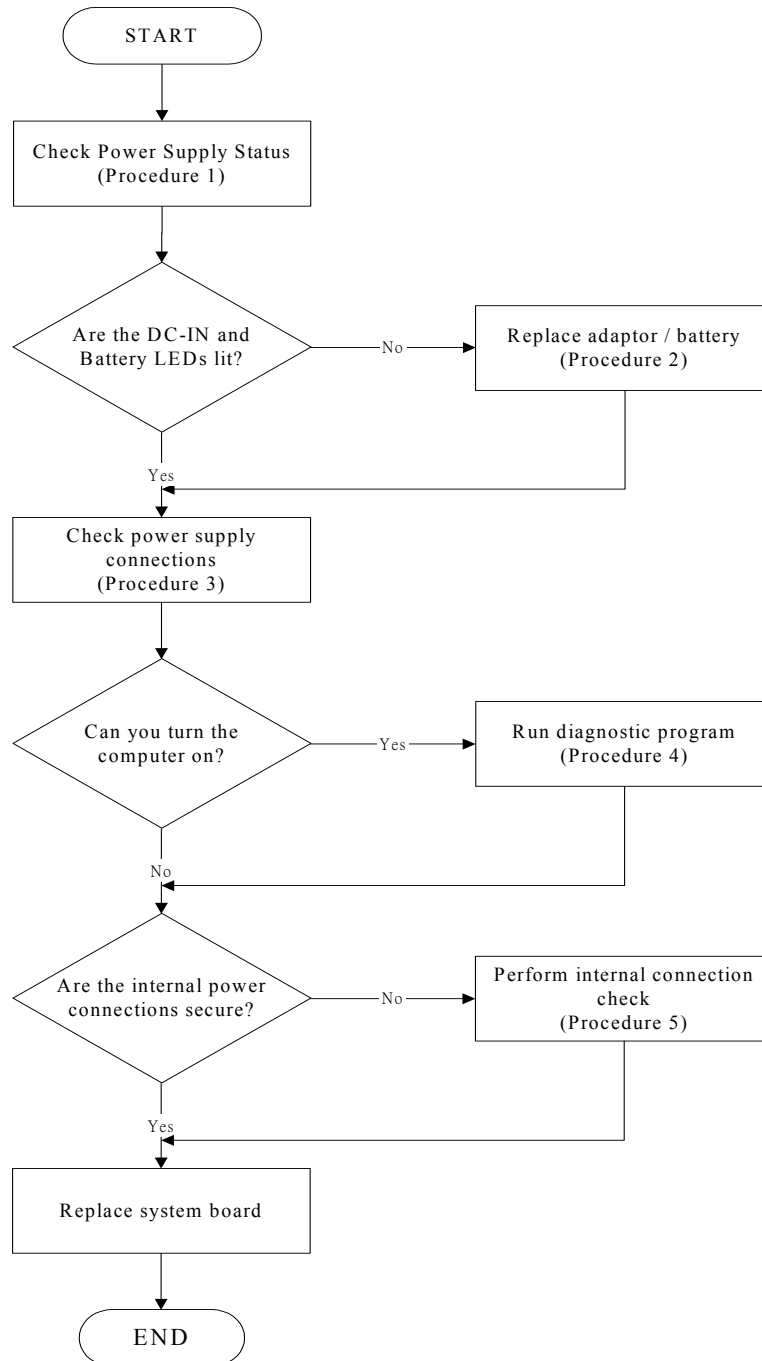
Figure 2-2 Power Supply Troubleshooting Process

The power supply 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 flowchart in Figure 2-2 gives a summary of the process. The procedures described in this section are:

Procedure 1:   Power status check

Procedure 2:   Adaptor / battery replacement

Procedure 3:   Power supply connection check

Procedure 4:   Diagnostic check

Procedure 5:   Internal connection check

Procedure 1   Power Status Check

The following LEDs indicate the power supply status:

▭   Battery LED

⚡   DC-IN LED

The power supply controller displays the power supply status through the Battery and the DC-IN LEDs as listed in the tables below.

Table 2-1 Battery LED

Battery State	LED colors	Definition
Charging	Amber, solid on	Battery charging with AC .
	Green, solid on	Battery fully charged by AC
	Green color off	Battery abnormal stop charging with AC (Bad cell/ Overheated)
Discharging	Amber, blinking (LED on for 1 second every 4 seconds)	Battery within low state: 12 minutes remaining
	Amber, blinking (LED on for 1 second every 2 seconds)	Battery within critical low state: 3 minutes remaining. The system is protected and cannot be re-powered on without the AC power connected.
	Amber color off	Battery not in low or critical low state; It's in discharging state

Table 2-2 DC-IN LED

AC-IN LED	Power supply status
Solid on	AC power exists (LED is solid green).
Off	No AC power exists.

To check the power supply status, install a battery pack and connect an AC adaptor to the DC-IN port on the computer and to a power supply.

If the DC-IN LED or Battery LED is not lit, go to Procedure 2.

Procedure 2   Adaptor / battery replacement

A faulty adaptor may not supply power or may not charge the battery. Perform Check 1.

Check 1   Connect a new AC adaptor. If the problem is not resolved, go to Check 2.

Check 2   Insert a new battery. If the problem is still not resolved, go to Procedure 3.

Procedure 3   Power supply connection check

The power supply wiring diagram is shown below:

AC adaptor cord

AC power cord

| AC adaptor | | System board | | Battery |
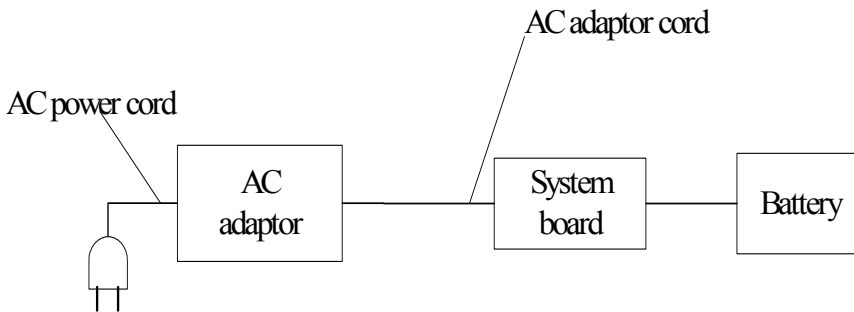
Any of the connectors may be disconnected. Perform Check 1.

Check 1   Disconnect the AC power cord from wall outlet. Check the power cable for breaks. If the power cord is damaged, connect a new AC power cord. If there is no damage, go to Check 2.

Check 2   Make sure the AC adaptor cord and AC power cord are firmly plugged into the DC-IN socket, AC adaptor inlet and wall outlet. If these cables are connected correctly, go to Check 3.

Check 3   Make sure that the DC-IN input port socket is firmly secured to the system board of the computer.
- If the DC-IN input socket is loose, go to Procedure 5.
- If it is not loose, go to Check 4.

Check 4   Use a multi-meter to make sure that the AC adaptor output voltage is close to 19 V. If the output is several percent lower than 19 V, go to Check 5. If the output is close to 19 V, go to Check 6.

Check 5   Connect a new AC adaptor or AC power cord.
- If the DC-IN LED does not light, go to Procedure 4.
- If the battery LED does not light, go to Check 6.

Check 6   Make sure the battery pack is installed in the computer correctly. If the battery is properly installed and the battery LED still does not light, go to Procedure 4.

Procedure 4   Diagnostic check

The power supply may not charge the battery pack. Perform the following procedures:

1. Reinstall the battery pack.

2. Attach the AC adaptor and turn on the power. If you cannot turn on the power, go to Procedure 5.

3. Run the Diagnostic test following the procedures described in Chapter 3, Tests and Diagnostics. If no problem is detected, the battery is functioning normally.

Procedure 5   Replacement check

The system board may be disconnected or damaged. Disassemble the computer following the steps described in Chapter 4, *Replacement Procedures*. Check the connection between the AC adaptor and the system board. After checking the connection, perform Check 1:

Check 1   Use a multi-meter to make sure that the fuses on the system board are not blown. If a fuse is not blown, go to Check 2. If a fuse is blown, go to Check 3.

Check 2   Make sure that the battery cable is firmly connected to the system board. If it is connected firmly, go to Check 3.

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

2.4   **Display Troubleshooting**

```
                          ┌─────────────────┐
                          │     START       │
                          └─────────────────┘
                                   │
                                   ▼
                    ┌──────────────────────────────┐
                    │ Perform external display check│
                    │        (Procedure 1)          │
                    └──────────────────────────────┘
                                   │
                                   ▼
                          ╱─────────────╲
                         ╱ Does the external╲
                         ╲ display function ok?╱
                          ╲─────────────╱
                           │           │
                         Yes          No
                           │           │
                           │           ▼
                           │  ┌──────────────────────────┐
                           │  │ Perform diagnostic check  │
                           │  │      (Procedure 2)        │
                           │  └──────────────────────────┘
                           │           │
                           │           ▼
                           │    ╱─────────────╲
                           │   ╱  Was a display ╲        No     ┌────────────────────────┐
                           │   ╲ problem detected?╱─────────────│ Display is not         │
                           │    ╲─────────────╱                 │ faulty. Continue       │
                           │           │                        │ troubleshooting-       │
                           │          Yes                       │ refer to Figure 2.1    │
                           │           │                        └────────────────────────┘
                           │           ▼
                           │  ┌──────────────────────────┐
                           └─▶│ Perform connector and     │
                              │ replacement check         │
                              │      (Procedure 3)        │
                              └──────────────────────────┘
                                         │
                                         ▼
                              ┌──────────────────────────┐
                              │  Replace system board     │
                              └──────────────────────────┘
                                         │
                                         ▼
                              ┌──────────────────┐
                              │      END         │
                              └──────────────────┘
```
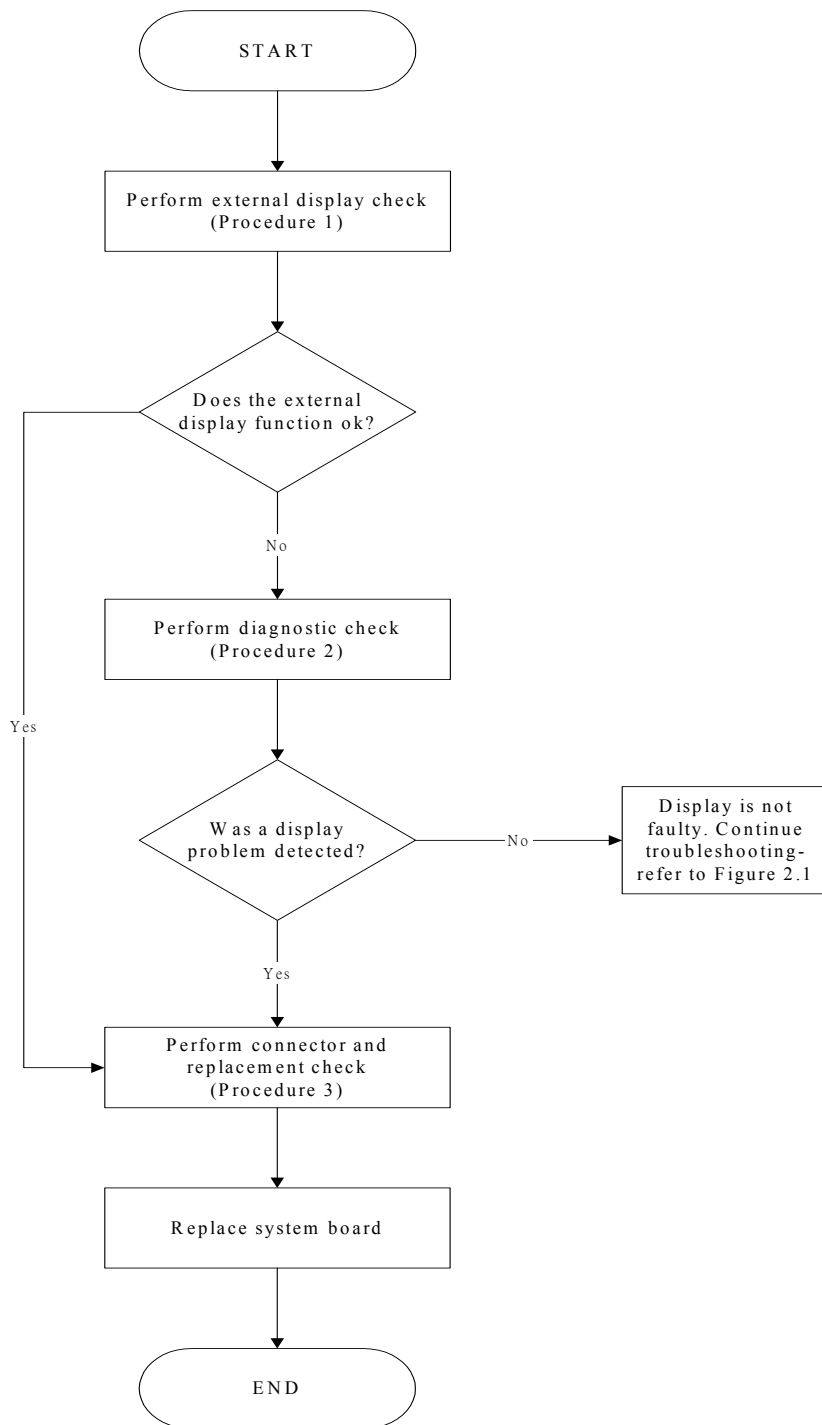
Figure 2-3 Display troubleshooting process

This section describes how to determine if the computer's display is functioning properly. The process is outlined in Figure 2-3. Start with Procedure 1 and continue with the other procedures as instructed.

> Procedure 1:   External display check
>
> Procedure 2:   Diagnostic check
>
> Procedure 3:   Connector and replacement check

Procedure 1   External display check

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

If the external display works correctly, the internal LCD may be damaged. Go to Procedure 3.

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

Procedure 2   Diagnostic check

The Display Test program is stored on the computer's Diagnostics disk. This program checks the display controller on the system board. Insert the Diagnostics disk in the computer's floppy disk drive, 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. If an error is not detected, the display is functioning properly.

Procedure 3 　Connector and replacement check

The FL inverter board, LCD module, and system board are connected to the display circuits. Any of these components may be damaged. Refer to Chapter 4, *Replacement Procedures,* for instructions on how to disassemble the computer and then perform the following checks:

Check 1　　Make sure the DDR RAM module is seated properly. Test display again. If the problem still exits, replace the DDR RAM module. If the problem still exists, perform Check 2.

Check 2　　Replace the FL inverter board with a new one and test display again. If the problem still exists, perform Check 3.

Check 3　　Replace the LCD module with a new one and test display again. If the problem still exists, perform Check 4.

Check 4　　Replace the LCD/FL cable with a new one and test display again. If the problem still exists, perform Check 5.

Check 5　　Replace the CPU with another of the same specifications. If the problem still exists, perform Check 6.

Check 6　　The system board may be damaged. Replace it with a new one.

2.5 FDD Troubleshooting

```
                          ┌──────────────┐
                          │    START     │
                          └──────┬───────┘
                                 │
                                 ▼
                   ┌─────────────────────────────┐
                   │ Perform FDD headcleaning check│
                   │       (Procedure 1)          │
                   └─────────────┬───────────────┘
                                 │
                                 ▼
                   ┌─────────────────────────────┐
                   │ Perform diagnostic check     │
                   │       (Procedure 2)          │
                   └─────────────┬───────────────┘
                                 │
                                 ▼
                        Was a FDD            No      FDD is not faulty.
                     problem detected? ──────────►   Continue
                                                     troubleshooting-
                                 │                   refer to Figure 2.1
                                Yes
                                 ▼
                   ┌─────────────────────────────┐
                   │ Perform connector and replacement│
                   │           check              │
                   │       (Procedure 3)          │
                   └─────────────┬───────────────┘
                                 │
                                 ▼
                   ┌─────────────────────────────┐
                   │  Replace system board        │
                   └─────────────┬───────────────┘
                                 │
                                 ▼
                          ┌──────────────┐
                          │    END       │
                          └──────────────┘
```
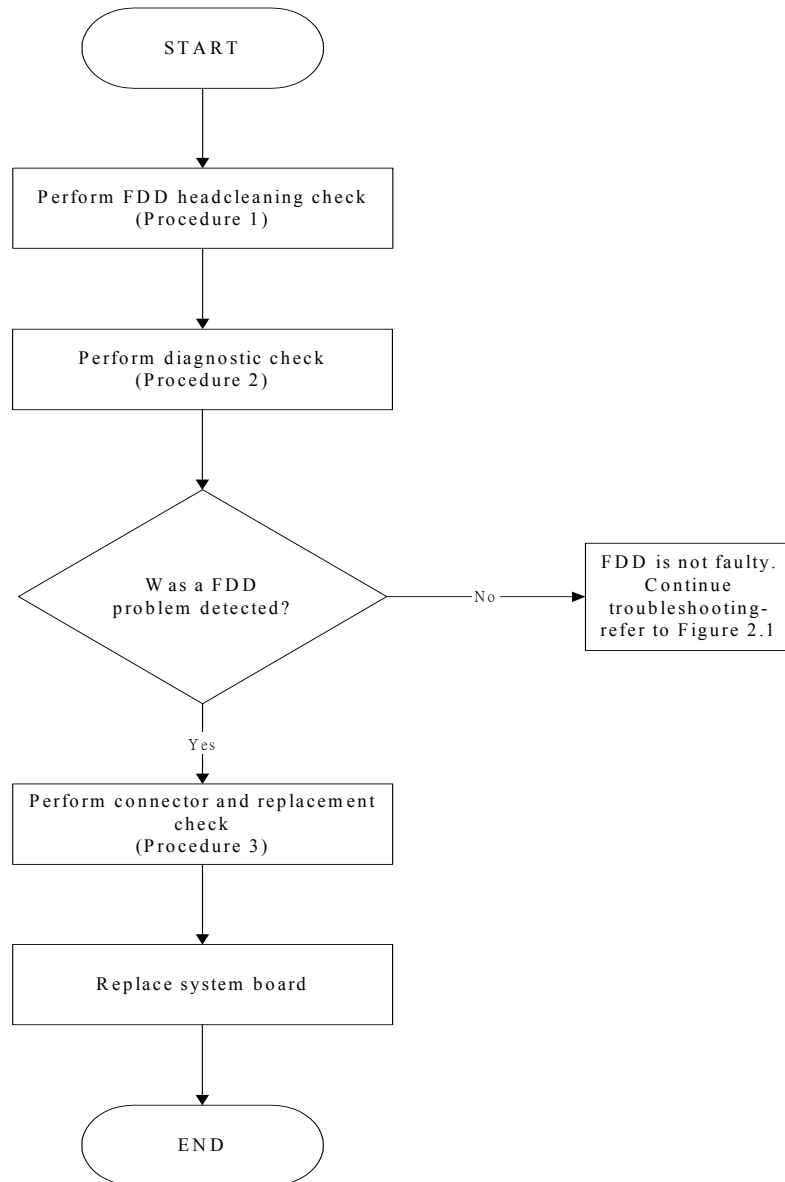
Figure 2-4 FDD troubleshooting process

This section describes how to determine if the removable FDD module is functioning properly. Perform the steps below starting with Procedure 1 and continuing as required. Figure 2-4 gives an outline of the process.

        Procedure 1:   FDD head cleaning check

        Procedure 2:   Diagnostic check

        Procedure 3:   Connector check and replacement check

Procedure 1   FDD head cleaning check

The FDD heads can become dirty over time, affecting their performance. Use an FDD cleaning kit to clean the heads. If the FDD still does not function properly after cleaning, go to Procedure 2.

Procedure 2   Diagnostic check

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

If no FDD problem is detected by the diagnostic test, the FDD is functioning normally. If an error occurs, go to Procedure 3.

Procedure 3   Connector check and replacement check

The 3.5-inch FDD is connected to the system board. Refer to Chapter 4, *Replacement Procedures,* for instructions on how to disassemble the computer and then perform the following checks:

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

           If any of the connections are loose, reconnect firmly and repeat Procedure 2. If any of the connections is damaged, or there is still an error, go to Check 2.

Check 2   The FDD unit or FDD flexible cable may be defective or damaged. Replace each with a new one following the steps in Chapter 4. If the FDD is still not functioning properly, perform Check 3.

Check 3   Replace the system board with a new one following the steps in Chapter 4.
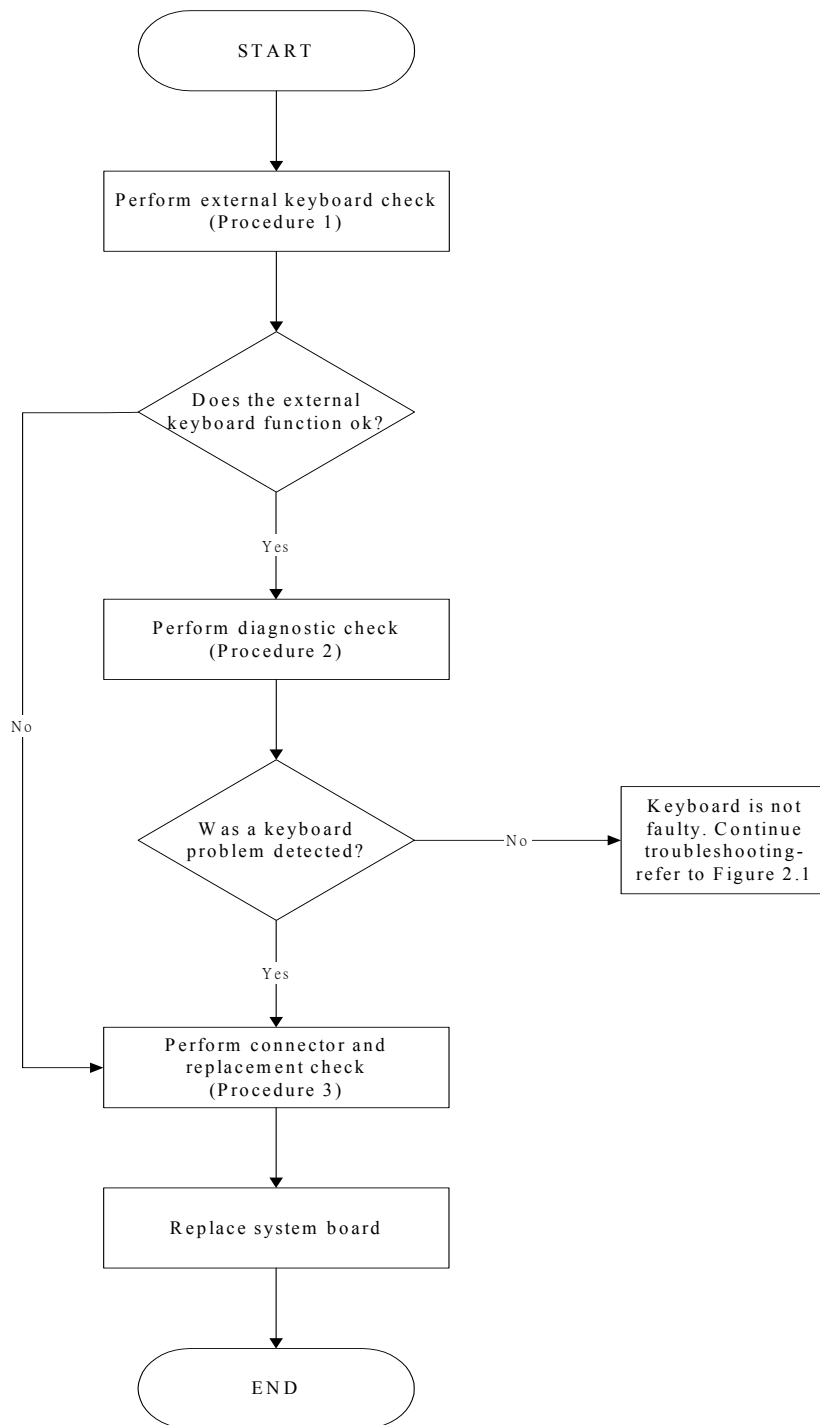
2.6   **Keyboard Troubleshooting**

Figure 2-5   Keyboard troubleshooting process

To determine if the computer's keyboard is functioning properly, perform the following procedures. Figure 2-5 outlines the process. Start with Procedure 1 and continue with the other procedures as instructed.

Procedure 1:   External keyboard check

Procedure 2:   Diagnostic check

Procedure 3:   Connector and replacement check

Procedure 1   External keyboard check

Connect a USB keyboard to one of the computer's USB ports, then boot the computer. The computer automatically detects the external keyboard.

If the external keyboard works correctly, the internal keyboard or its connections may be faulty. Go to Procedure 2.

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

Procedure 2   Diagnostic check

Run the Diagnostic Program, which will automatically execute the Keyboard Test. Refer to Chapter 3, *Tests and Diagnostics* for more information on how to run the program.

If an error is located, go to Procedure 3. If an error does not occur, the keyboard is functioning properly.

Procedure 3   Connector and replacement check

The keyboard and/or system board may be disconnected or damaged. Disassemble the computer following the steps described in Chapter 4, *Replacement Procedures* and perform the following checks.

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

If the connection is loose, reconnect firmly and repeat Procedure 2. If there is still an error, go to Check 2.

Check 2   The keyboard may be damaged. Replace it with a new one following the instructions in Chapter 4.

If the problem still exists, perform Check 3.

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

2.7   External USB Devices Troubleshooting

```
                              ┌─────────────────┐
                              │     START       │
                              └─────────────────┘
                                      │
                                      ▼
                         ┌──────────────────────────┐
                         │ Perform external device and│
                         │   connection check        │
                         │    (Procedure 1)          │
                         └──────────────────────────┘
                                      │
                                      ▼
  ┌──────────────┐              ◇──────────────────◇
  │ Check USB port│◄── Yes ──   Does the device function
  │  connection   │             when connected  to a
  └──────────────┘              different USB port?
        │                            ◇──────────────────◇
        │                                  │ No
        │                                  ▼
        │                       ◇──────────────────◇          ┌──────────────┐
        │                       Does an alternative USB ── Yes ─►│ Original USB  │
        │                       device function correctly?      │ device is faulty│
        │                       ◇──────────────────◇          └──────────────┘
        │                             │ No
        │                             ▼
        │              ┌──────────────────────────┐
        └─────────────►│  Replace system board     │
                       │    (Procedure 2)          │
                       └──────────────────────────┘
                                      │
                                      ▼
                              ┌─────────────────┐
                              │      END        │
                              └─────────────────┘
```
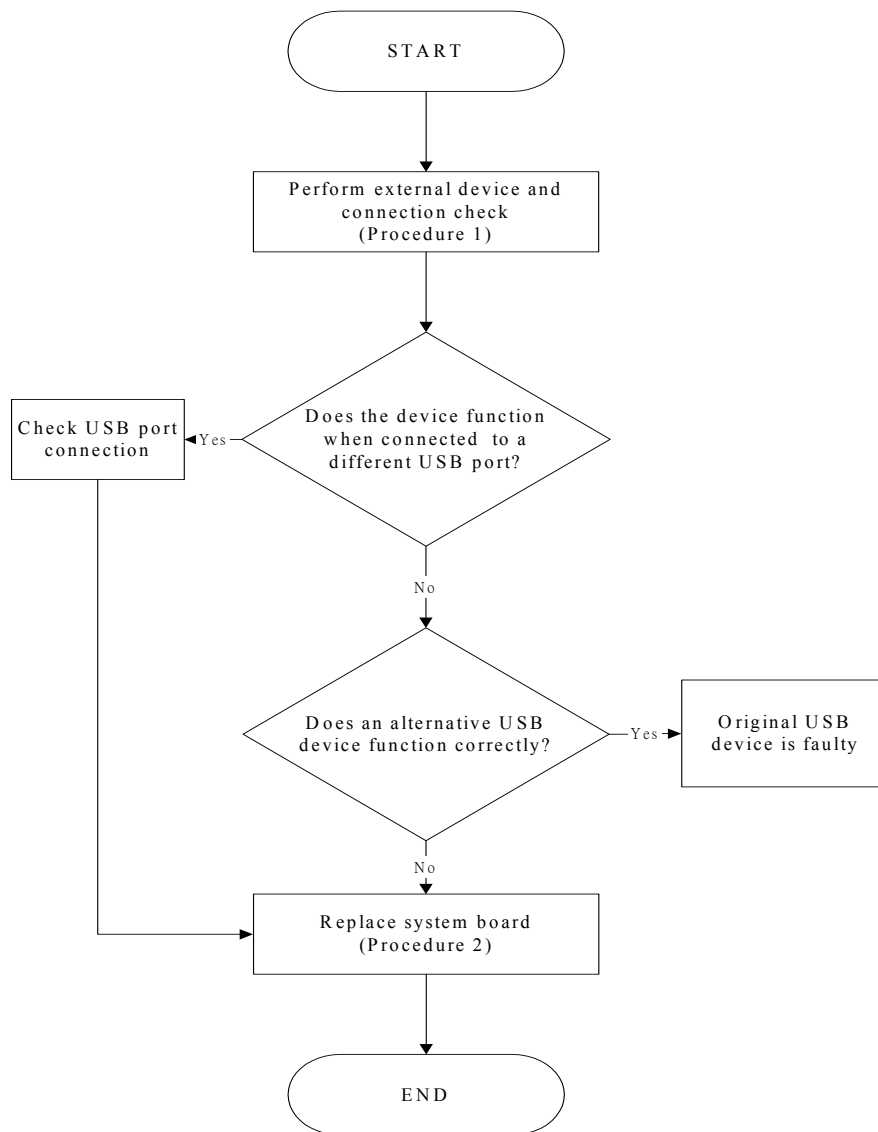
Figure 2-6 External USB device troubleshooting process

To determine if the computer's external USB devices are functioning properly, perform the following procedures. Figure 2-6 outlines the process. Start with Procedure 1 and continue as instructed.

Procedure 1:   External device and connection check

Procedure 2:   Replace system board

Procedure 1   External device and connection check

The USB device may be damaged or the connection may be faulty. Perform Check 1.

Check 1   Make sure USB device cable is firmly plugged into one of the USB sockets. If the cable is connected correctly, go to Check 2.

Check 2   Plug the USB device into another USB socket (there are three in all). If the USB device still does not work, go to Check 4.

If the device functions correctly when connected to another USB port, go to Check 3.

Check 3   Make sure that the USB socket is firmly secured to the system board of the computer. If the malfunction remains, the system board may be damaged. Go to Procedure 2.

Check 4   Connect an alternative USB device to one of the computer's USB ports, and then boot the computer. The computer automatically detects the external device.

If the alternative USB device works correctly, the original device may be damaged and should be replaced.

If the alternative USB device appears to have the same problem as the original device, the system board may be damaged. Go to Procedure 2.

Procedure 2   Replace system board

If the error persists, the system board may be damaged. Replace it with a new one following the instructions in Chapter 4.

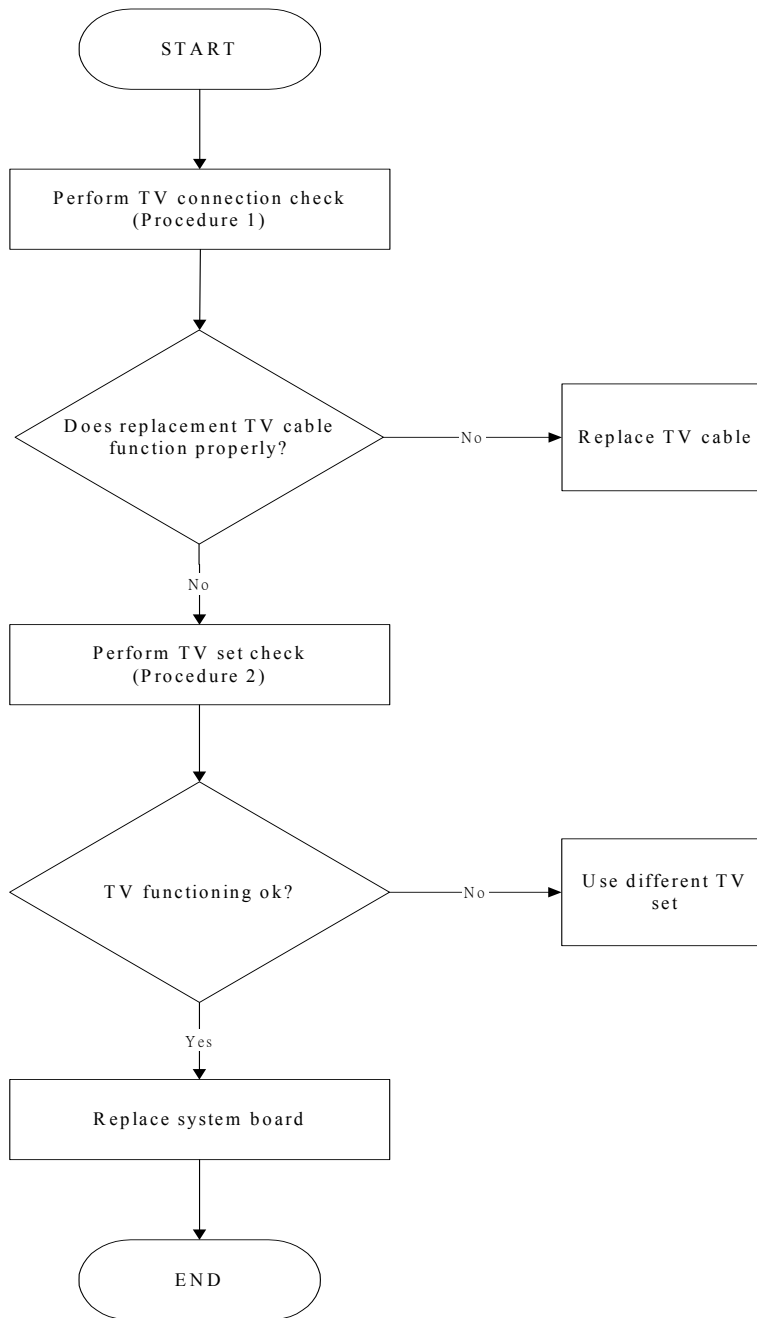## 2.8 TV-Out Failure Troubleshooting

Figure 2-7 TV-out troubleshooting process

To determine if the computer's TV-out port is functioning properly, perform the following procedures. Figure 2-7 outlines the process. Start with Procedure 1 and continue as instructed.

> Procedure 1:   TV connection check
>
> Procedure 2:   TV set check

Procedure 1   TV connection check

The TV cable may be damaged or the connections may be loose. Perform Check 1:

Check 1   Make sure TV cable is firmly plugged into both the TV set and the TV-out port of the computer. If the cable is connected correctly, go to Check 2.

Check 2   Make sure the TV-out port is firmly secured to the system board of the computer. If the malfunction remains, go to Check 3.

Check 3   The TV cable may be damaged. Replace with a good cable. If the malfunction remains, go to Procedure 2.

Procedure 2   TV set check

The TV set may be faulty. Perform Check 1:

Check 1   Try using the set for television reception. If it does not work, the set may be damaged. If the set does work, perform Check 2.

Check 2   Try connecting a different television to the computer. If the replacement television works, the original set may be damaged. If the replacement set does not work the system board may be damaged. Replace it with a new one following the instructions in Chapter 4.
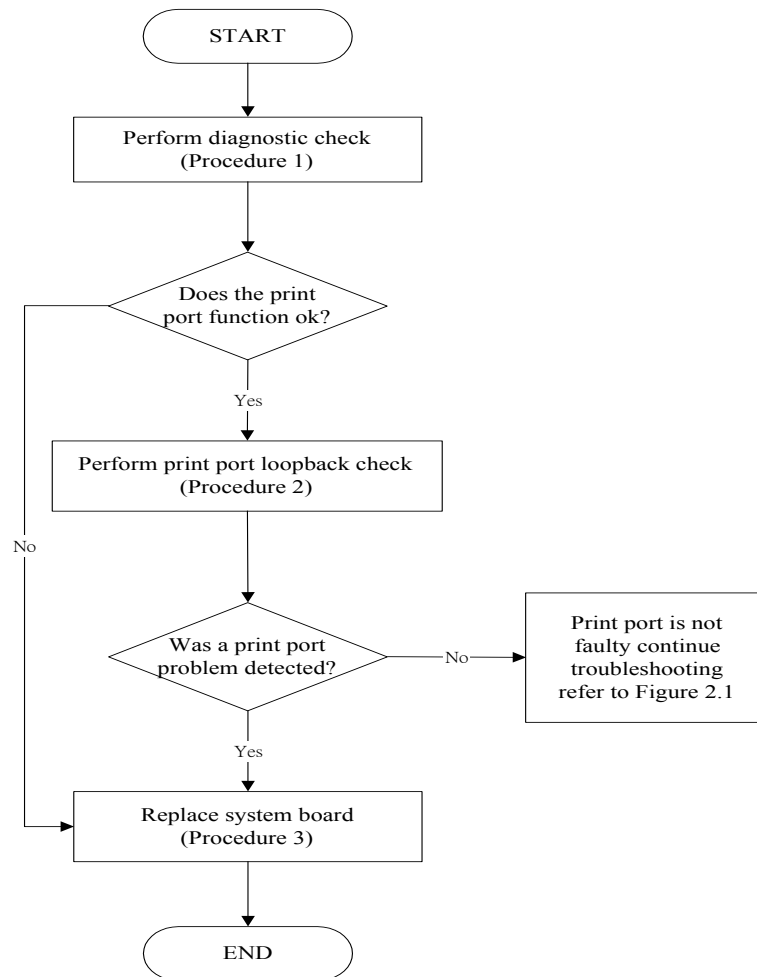
2.9 **Printer Port Troubleshooting**

```
                        ┌───────────────┐
                        │     START     │
                        └───────┬───────┘
                                │
                    ┌───────────▼───────────┐
                    │ Perform diagnostic check│
                    │     (Procedure 1)       │
                    └───────────┬───────────┘
                                │
                         ╱─────▼─────╲
                        ╱ Does the print╲
                        ╲ port function ok?╱
                         ╲─────┬─────╱
                               │ Yes
                    ┌──────────▼──────────────┐
                    │ Perform print port loopback check│
                    │        (Procedure 2)     │
                    └──────────┬──────────────┘
                               │
                        ╱──────▼──────╲           ┌────────────────┐
                       ╱ Was a print port╲   No   │ Print port is not│
                       ╲ problem detected?╱──────▶│ faulty continue │
                        ╲──────┬──────╱           │ troubleshooting │
                               │ Yes              │ refer to Figure 2.1│
                    ┌──────────▼──────────┐       └────────────────┘
                    │ Replace system board │
                    │     (Procedure 3)    │
                    └──────────┬──────────┘
                               │
                        ┌──────▼──────┐
                        │     END     │
                        └─────────────┘
```

Figure 2-8 Printer port troubleshooting process

To determine if the computer's printer (parallel) port is functioning properly, perform the following procedures. Figure 2-8 outlines the process. Start with Procedure 1 and continue as instructed.

Procedure 1:   Diagnostic check

Procedure 2:   Printer port loopback check

Procedure 3:   Replace system board

Procedure 1   Diagnostic check

Attach the printer port loopback connector firmly to the printer port and run the Diagnostic Program. See Chapter 3 for details. If the printer port test passes, there may be a problem with the printer. Go to Procedure 2. If the printer port test fails, go to Procedure 3.

Procedure 2   Printer port loopback check

The printer may be faulty or not connected properly. Perform Check 1.

Check 1   Make sure printer cable is firmly plugged into both the printer and the printer port of the computer. If the cable is connected correctly, go to Check 2.

Check 2   Make sure the printer port is firmly secured to the system board of the computer. If the malfunction remains, go to Check 3.

Check 3   The printer cable may be damaged. Replace with a good cable. If the malfunction remains, go to Check 4.

Check 4   The printer may be faulty. Replace it with a good printer or connect it to a different computer.

If the replacement printer works or the original printer does not work on a different computer, the printer should be replaced.

If the replacement printer does not work either, or the original printer functions normally on a different computer, go to Procedure 3.

Procedure 3   Replace system board

The system board may be damaged. Replace it with a new one following the instructions in Chapter 4.
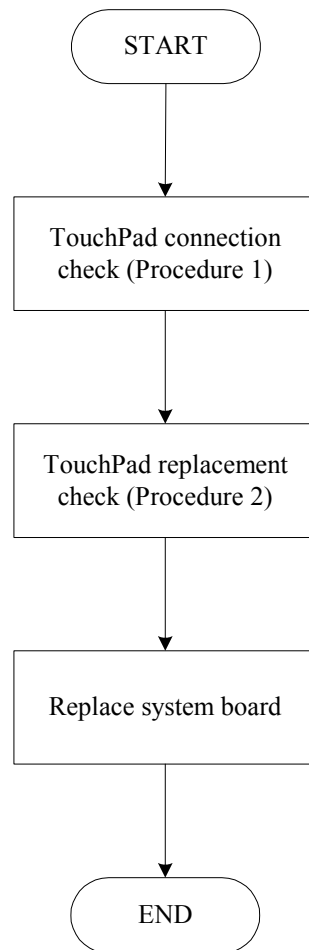
2.10 TouchPad Troubleshooting

```
                          ╭─────────────╮
                          │    START    │
                          ╰─────────────╯
                                 │
                                 ▼
                   ┌───────────────────────────┐
                   │   TouchPad connection     │
                   │    check (Procedure 1)    │
                   └───────────────────────────┘
                                 │
                                 ▼
                   ┌───────────────────────────┐
                   │   TouchPad replacement    │
                   │    check (Procedure 2)    │
                   └───────────────────────────┘
                                 │
                                 ▼
                   ┌───────────────────────────┐
                   │   Replace system board    │
                   └───────────────────────────┘
                                 │
                                 ▼
                          ╭─────────────╮
                          │     END     │
                          ╰─────────────╯
```
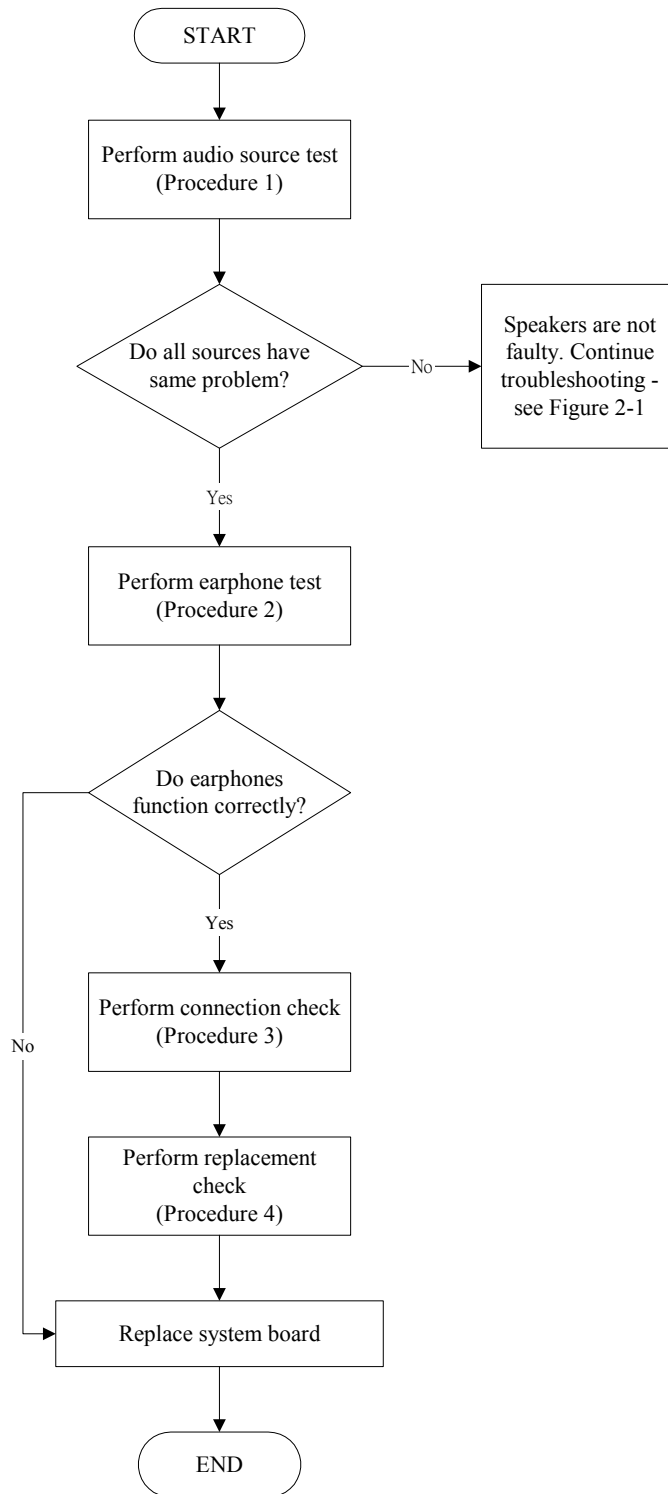
Figure 2-9 TouchPad troubleshooting process

To determine if the computer's built-in TouchPad is functioning properly, perform the following procedures. Figure 2-9 outlines the process. Start with Procedure 1 and continue as instructed.

Procedure 1:   TouchPad connection check

Procedure 2:   TouchPad replacement check

Procedure 1   TouchPad connection check

The TouchPad is connected via the TouchPad FPC to the system board. Make sure the TouchPad FPC cable is firmly connected to the TouchPad and system board. Refer to Chapter 4, *Replacement Procedures,* for instructions on how to disassemble the computer and then perform the following checks.

If any of the connections are loose, reconnect firmly. If any of the connections is damaged, or there is still an error, go to Procedure 2.

Procedure 2   TouchPad replacement check

The TouchPad unit or FPC may be defective or damaged. Replace each with a new one following the steps in Chapter 4. If the FDD is still not functioning properly, replace the system board with a new one following the steps in Chapter 4.

2.11 Speaker Troubleshooting

```
                          ┌─────────┐
                          │  START  │
                          └─────────┘
                               │
                               ▼
                  ┌──────────────────────────┐
                  │ Perform audio source test│
                  │      (Procedure 1)       │
                  └──────────────────────────┘
                               │
                               ▼
                          ╱─────────╲                ┌──────────────────┐
                        ╱  Do all     ╲              │ Speakers are not │
                       ╱ sources have   ╲   No       │ faulty. Continue │
                       ╲ same problem?  ╱───────────▶│ troubleshooting -│
                        ╲             ╱              │  see Figure 2-1  │
                          ╲─────────╱                └──────────────────┘
                               │
                              Yes
                               ▼
                  ┌──────────────────────────┐
                  │  Perform earphone test   │
                  │      (Procedure 2)       │
                  └──────────────────────────┘
                               │
                               ▼
                          ╱─────────╲
                        ╱  Do earphones ╲
                       ╱   function      ╲
                       ╲   correctly?    ╱
                        ╲             ╱
                          ╲─────────╱
            No                 │
                              Yes
                               ▼
                  ┌──────────────────────────┐
                  │ Perform connection check │
                  │      (Procedure 3)       │
                  └──────────────────────────┘
                               │
                               ▼
                  ┌──────────────────────────┐
                  │   Perform replacement    │
                  │         check            │
                  │      (Procedure 4)       │
                  └──────────────────────────┘
                               │
                               ▼
                  ┌──────────────────────────┐
                  │   Replace system board   │
                  └──────────────────────────┘
                               │
                               ▼
                          ┌─────────┐
                          │   END   │
                          └─────────┘
```

Figure 2-10 Speaker troubleshooting process

To determine if the computer's built-in speakers are functioning properly, perform the following procedures. Figure 2-10 outlines the process. First adjust the speaker volume to an appropriate level. Start with Procedure 1 and continue as instructed.

Procedure 1: Audio source test

Procedure 2: Earphone test

Procedure 3: Connection check

Procedure 4: Replacement check

Procedure 1 Audio source test

Try different audio sources (e.g. an audio CD and digital music file) to determine whether the fault is in the speaker system or not. If not all sources have sound problem, the problem is in the source devices. If all have the same problem, continue with Procedure 2.

Procedure 2 Earphone test

Connect a set if earphones or external speakers. If these function correctly, go to Procedure 3. If they do not function correctly, the system board may be defective or damaged. Replace it with a new one.

Procedure 3 Connection check

Disassemble the computer following the steps described in Chapter 4, *Replacement Procedures* and make sure the speaker cable is firmly connected to the audio board. If the stereo speakers are still not functioning properly, go to Procedure 4.

Procedure 4 Replacement check

If the stereo speakers don't sound properly, the stereo speakers may be defective or damaged. Replace them with new ones. If the stereo speakers still do not work properly, try replacing in turn the audio board and system board.

2.12 Optical Drive Troubleshooting
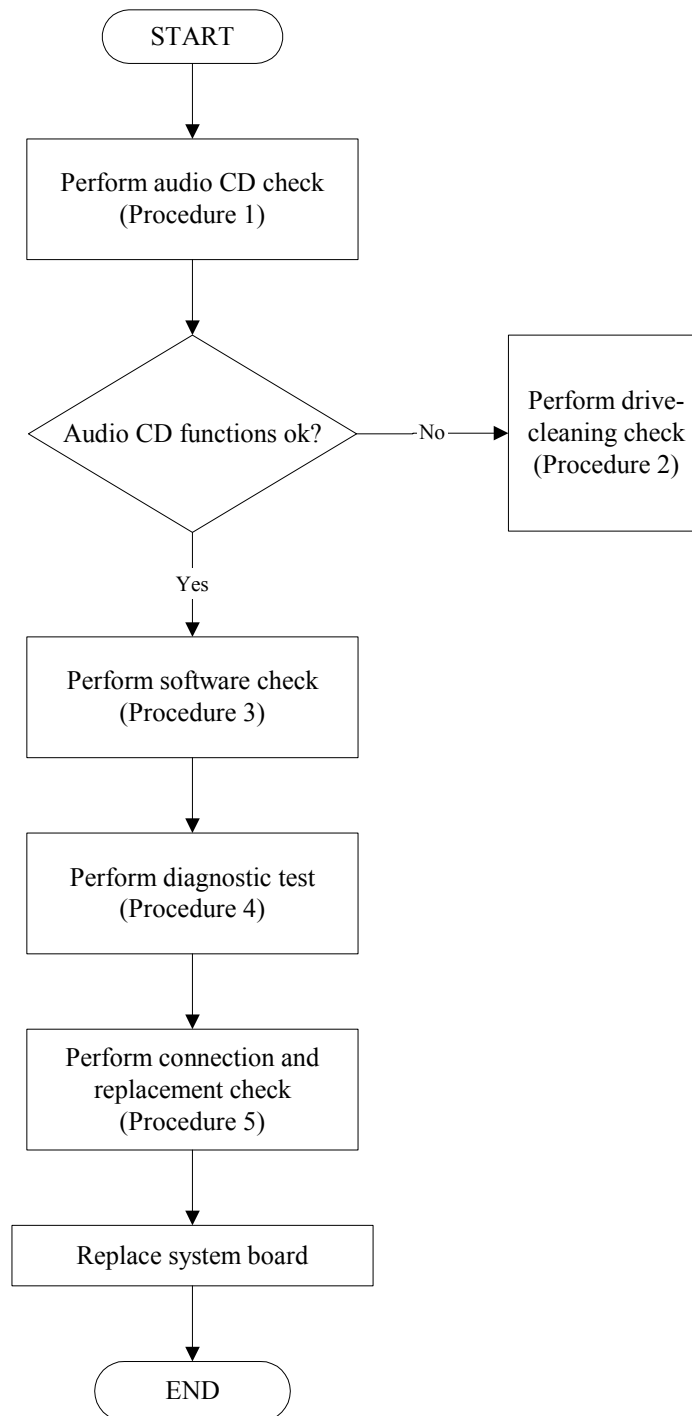
Figure 2-11 Optical drive troubleshooting process

This section describes how to determine if the computer's internal optical drive is functioning properly. The Satellite P20 module bays can accommodate the following optical drives:

- DVD-R/RW device
- DVD-ROM device
- DVD Multi-drive device
- COMBO device

Figure 2-11 outlines the process. Perform the steps below starting with Procedure 1 and continue with the other procedures as required.

        Procedure 1:   Audio CD test

        Procedure 2:   Drive cleaning check

        Procedure 3:   Software check

        Procedure 4:   Diagnostic test

        Procedure 5:   Connection and replacement check

Procedure 1   Audio CD check

First, insert an audio CD into the CD/DVD drive. If it works, the problem is not with the drive. Go to Procedure 3. If the audio CD does not work, go to Procedure 2. If the CD/DVD LED on the front panel does not light when the disc is played and the drive gives no response, go straight to Procedure 3.

Procedure 2   Drive cleaning check

Insert a CD/DVD drive-cleaning disk into the drive clean according to the drive-cleaning product instructions. If the problem persists, go to Procedure 3.

Procedure 3   Software check

Ensure that the appropriate driver has been installed on the computer for the CD/DVD drive.

Procedure 4   Diagnostic test

The audio test program stored in the Diagnostics Disk will test the drive's ability to play an audio CD. See Chapter 3 for details.
If any errors occur while executing the diagnostic program, go to Procedure 5.

Procedure 5   Connection check and replacement check

The optical drive connects to the system board. The drive may be disconnected, or the drive or system board may be damaged. Disassemble the computer following the steps described in Chapter 4, *Replacement Procedures*, and perform the following checks:

Check 1   Make sure the drive is firmly connected to the system board. If the connection is good and there is still an error, go to Check 2.

Check 2   The drive or drive cable may be defective or damaged. Replace each with a new one following the steps in Chapter 4, *Replacement Procedures*. If the drive is still not functioning properly, perform Check 3.

Check 3   The system board may be damaged. Replace it with new one following the instructions in Chapter 4, Replacement Procedures.

2.13 Modem Troubleshooting

```
                    ┌─────────────┐
                    │    START    │
                    └─────────────┘
                           │
                           ▼
              ┌──────────────────────────┐
              │ Perform telephone line   │
              │   connection check       │
              │     (Procedure 1)        │
              └──────────────────────────┘
                           │
                           ▼
                        ╱─────╲                    ┌──────────────────┐
                      ╱         ╲                   │  Check / replace │
                    ╱ Computer unable╲     Yes      │ telephone line and│
                    ╲ to detect telephone ╲────────▶│   connections    │
                      ╲ signal?  ╱                   └──────────────────┘
                        ╲─────╱                              │
                           │                                 │
                          No                                 │
                           ▼                                 │
              ┌──────────────────────────┐                  │
              │ Perform connection check │◀─────────────────┘
              │     (Procedure 2)        │
              └──────────────────────────┘
                           │
                           ▼
              ┌──────────────────────────┐
              │  Perform replacement     │
              │        check             │
              │     (Procedure 3)        │
              └──────────────────────────┘
                           │
                           ▼
              ┌──────────────────────────┐
              │   Replace system board   │
              └──────────────────────────┘
                           │
                           ▼
                    ┌─────────────┐
                    │     END     │
                    └─────────────┘
```
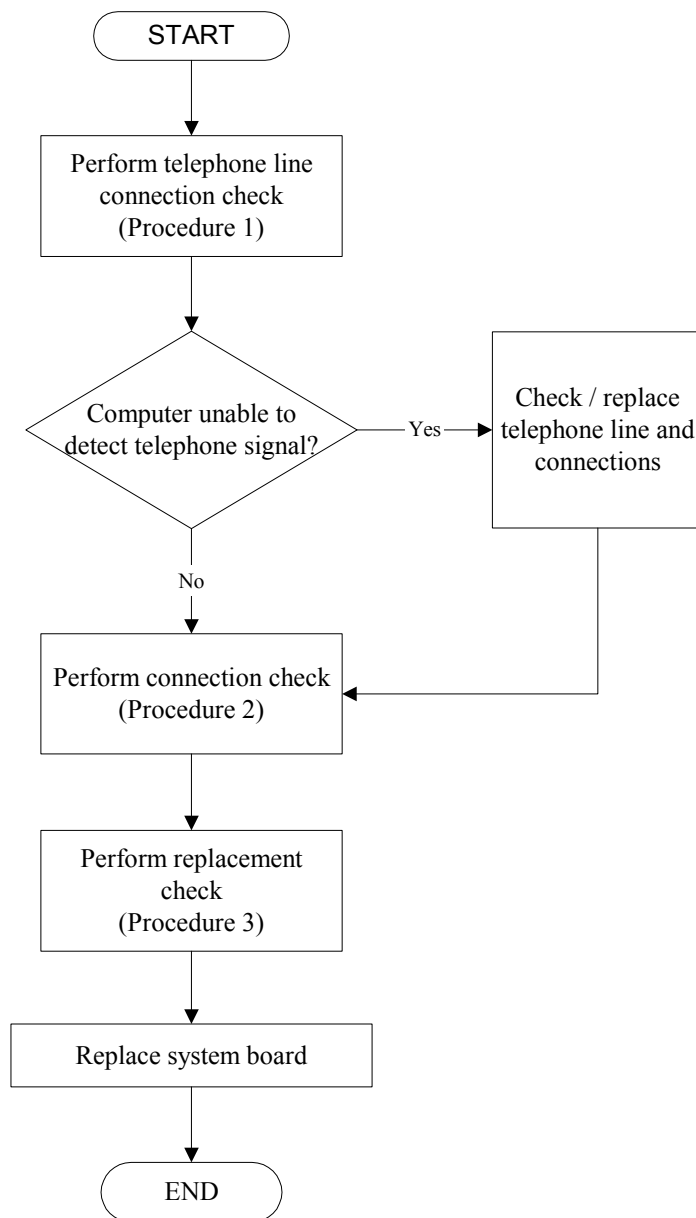
Figure 2-12 Modem troubleshooting process

This section describes how to determine if the computer's modem is functioning properly. Figure 2-12 outlines the process. Perform the steps below starting with Procedure 1 and continuing with the other procedures as required.

Procedure 1: Telephone line connection check

Procedure 2: Modem card connection check

Procedure 3: Modem card replacement check

Procedure 1   Telephone line connection check

The telephone cable may be damaged or the connections may be loose. Attempt to connect the computer to a network through using the modem. If the modem does not function at all, go to Procedure 3. If the attempt fails because the computer detects no telephone signal, the fault may be in the telephone cable, the wall socket or the modem port. Perform Check 1:

Check 1   Make sure telephone cable is firmly plugged into both the telephone wall socket and the modem port of the computer. If the cable is connected correctly, go to Check 2.

Check 2   Make sure the modem port is firmly secured to the system board of the computer. If the malfunction remains, go to Check 3.

Check 3   The telephone cable may be damaged. Replace with a good cable. If the malfunction remains, go to Procedure 2.

Procedure 2   Modem card connection check

Disassemble the computer following the steps described in Chapter 4, *Replacement Procedures* and ensure that the modem card is well connected to the system board. If the problem persists, perform Procedure 3.

Procedure 3   Modem replacement check

The modem card or RJ-11 jack may be faulty. Try replacing them. If the problem persists, the system board may be defective or damaged. Replace the System Board with a new one following the steps in Chapter 4, *Replacement Procedures*.

2.14 PCMCIA Troubleshooting

```
                          ┌─────────────┐
                          │    START    │
                          └─────────────┘
                                 │
                                 ▼
                    ┌──────────────────────┐
                    │  Perform SYCARD test  │
                    │    (Procedure 1)      │
                    └──────────────────────┘
                                 │
                                 ▼
                         ◇                        ┌──────────────┐
                 Do errors occur during      No   │ PCMCIA unit is│
                    SYCARD test?       ──────────▶│  not faulty.  │
                         ◇                        └──────────────┘
                                 │
                                Yes
                                 │
                                 ▼
                    ┌──────────────────────┐
                    │ Perform PCMCIA socket │
                    │  replacement check    │
                    │    (Procedure 2)      │
                    └──────────────────────┘
                                 │
                                 ▼
                    ┌──────────────────────┐
                    │  Replace system board │
                    └──────────────────────┘
                                 │
                                 ▼
                          ┌─────────────┐
                          │     END     │
                          └─────────────┘
```
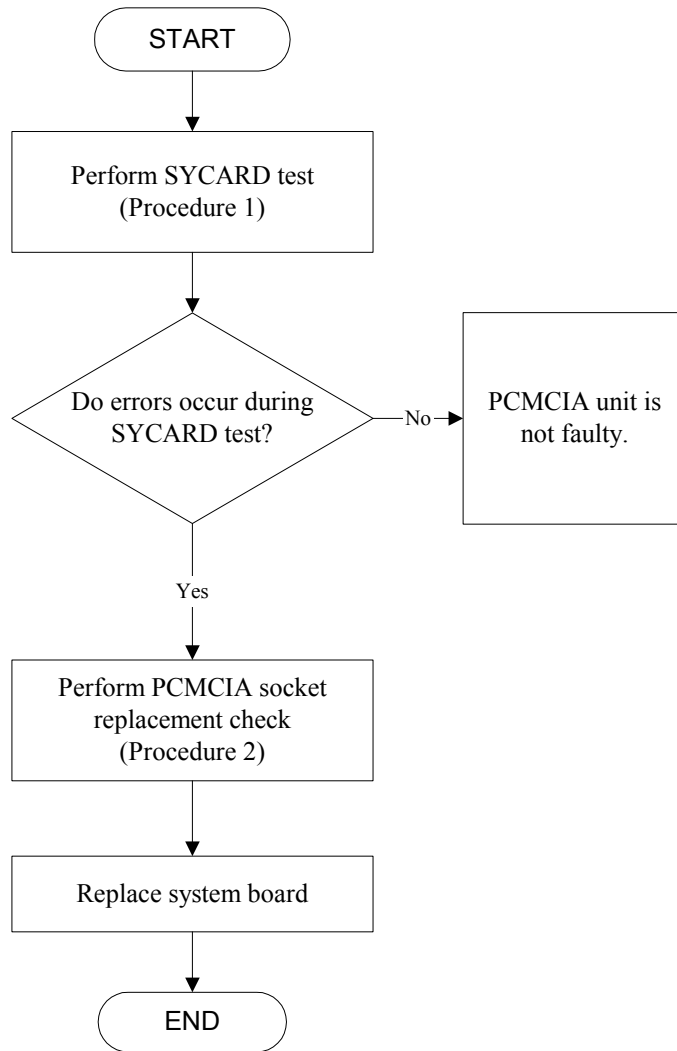
Figure 2-13 PCMCIA troubleshooting process

This section describes how to determine if the PCMCIA card player is functioning properly. The process is summarized in Figure 2-13. Perform the steps below starting with Procedure 1 and continuing with the other procedures as required.

Procedure 1:   Sycard test

Procedure 2:   PCMCIA socket replacement check

Procedure 1   SYCARD test

The SYCARD test card contains a PCMCIA test program. Ensure the card in fully inserted into the socket before running the program.
If an error occurs during the SYCARD test, perform Procedure 2. If no error occurs, it is likely that the original PC card was faulty.

Procedure 2   PCMCIA socket replacement check

The PCMCIA socket may be damaged or defective, for instance the socket pins can be bent. Disassemble the computer following the steps described in Chapter 4, Replacement Procedures and replace the socket. If the problem persists, the system board may be defective or damaged. Replace the system board with a new one following the steps in Chapter 4.

2.15 IEEE 1394 Troubleshooting

```
                          ┌─────────────┐
                          │    START    │
                          └──────┬──────┘
                                 │
                                 ▼
                   ┌───────────────────────────┐
                   │ Perform IEEE 1394 device   │
                   │ check (Procedure 1)        │
                   └─────────────┬──────────────┘
                                 │
                                 ▼
                        Is IEEE 1394 transmission ok?
                                 │ Yes
                                 ▼
                   ┌───────────────────────────┐
                   │ Perform diagnostic check   │
                   │ (Procedure 2)              │
                   └─────────────┬──────────────┘
```
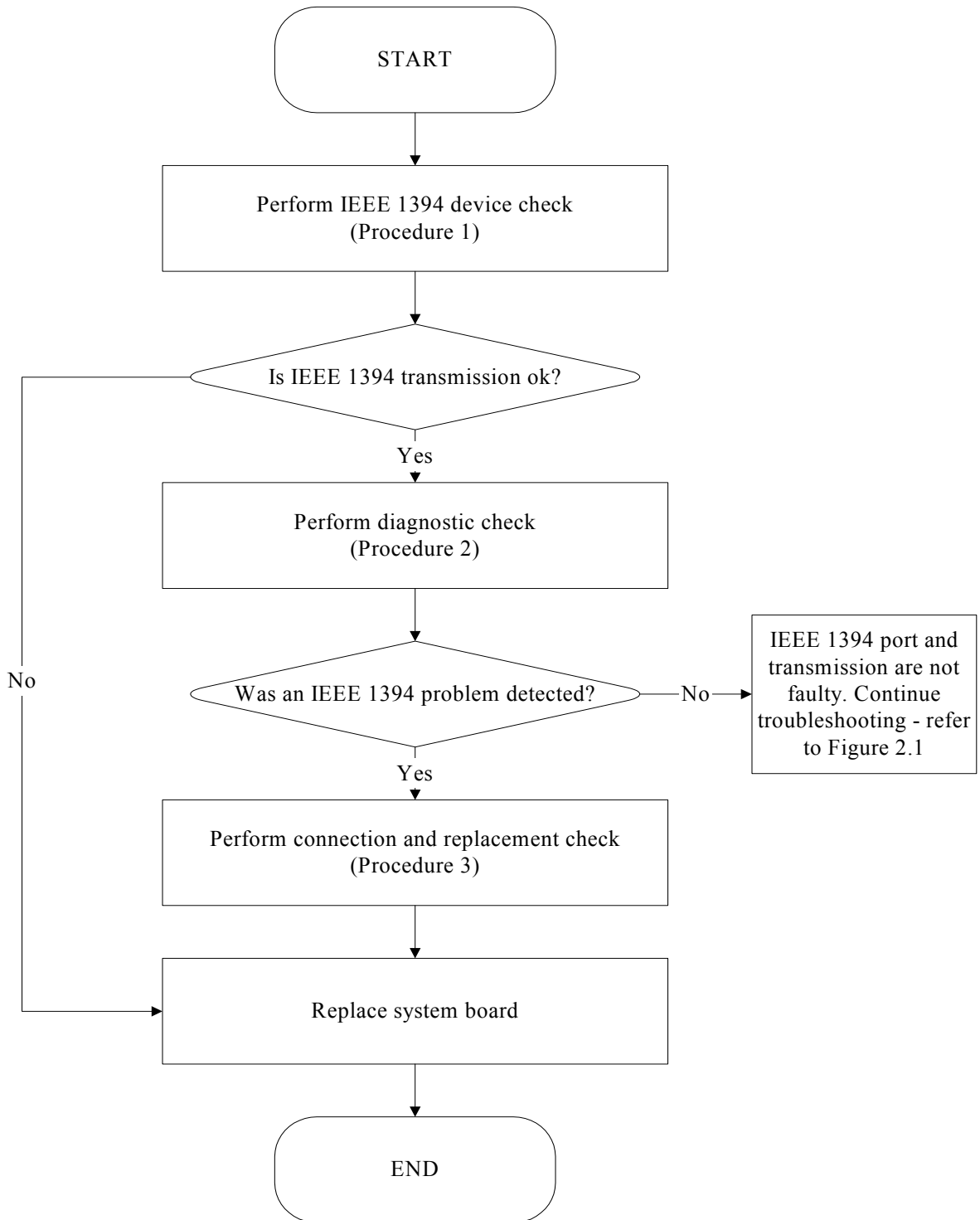
Figure 2-14 IEEE 1394 troubleshooting process

To determine if the computer's IEEE 1394 system is functioning properly, perform the following procedures. Figure 2-14 outlines the process. Start with Procedure 1 and continue with the other procedures as instructed.

       Procedure 1:   IEEE 1394 device check

       Procedure 2:   Diagnostic check

       Procedure 3:   Connection and replacement check

Procedure 1   IEEE 1394 device check

Connect an IEEE 1394 device to the computer's IEEE 1394 port, then boot the computer for Windows XP. The computer should automatically detect the 1394 device. Check whether the device can transmit data to the computer.
If the device is able to communicate with the computer, the problem may be intermittent or connections may be faulty. Go to Procedure 2.
If communication is impaired, there may be a faulty connection. Go to Procedure 3.

Procedure 2   Diagnostic check

Run the Diagnostic Program, which will automatically execute the IEEE 1394 port test for transmission. Refer to Chapter 3, Tests and Diagnostics for more information on how to run the program.
If an error is located, go to Procedure 3. If an error does not occur, the 1394 port is functioning properly.

Procedure 3   Connection and replacement check

The transmission cable may be damaged or the connections may be loose. Perform Check 1:

Check 1   Make sure the transmission cable is firmly plugged into both the IEEE 1394-compatible device and the IEEE 1394 port of the computer. If the cable is connected correctly, go to Check 2.

Check 2   Make sure the IEEE 1394 port is firmly secured to the system board of the computer. If the malfunction persists, go to Check 3.

Check 3   The transmission cable may be damaged. Replace with a good cable. If the malfunction persists, go to Check 4

Check 4   The system board may be damaged. Replace it with a new one following the instructions in Chapter 4.

2.16 Wireless LAN Troubleshooting

START

Perform diagnostic test
(Procedure 1)

Was a wireless LAN problem delected? —No→ Wireless LAN system is not faulty. Continue troubleshooting - refer to Figure 2.1

Yes

Perform connector and replacement check
(Procedure 2)

Replace wireless LAN antenna/unit

Replace system board

END
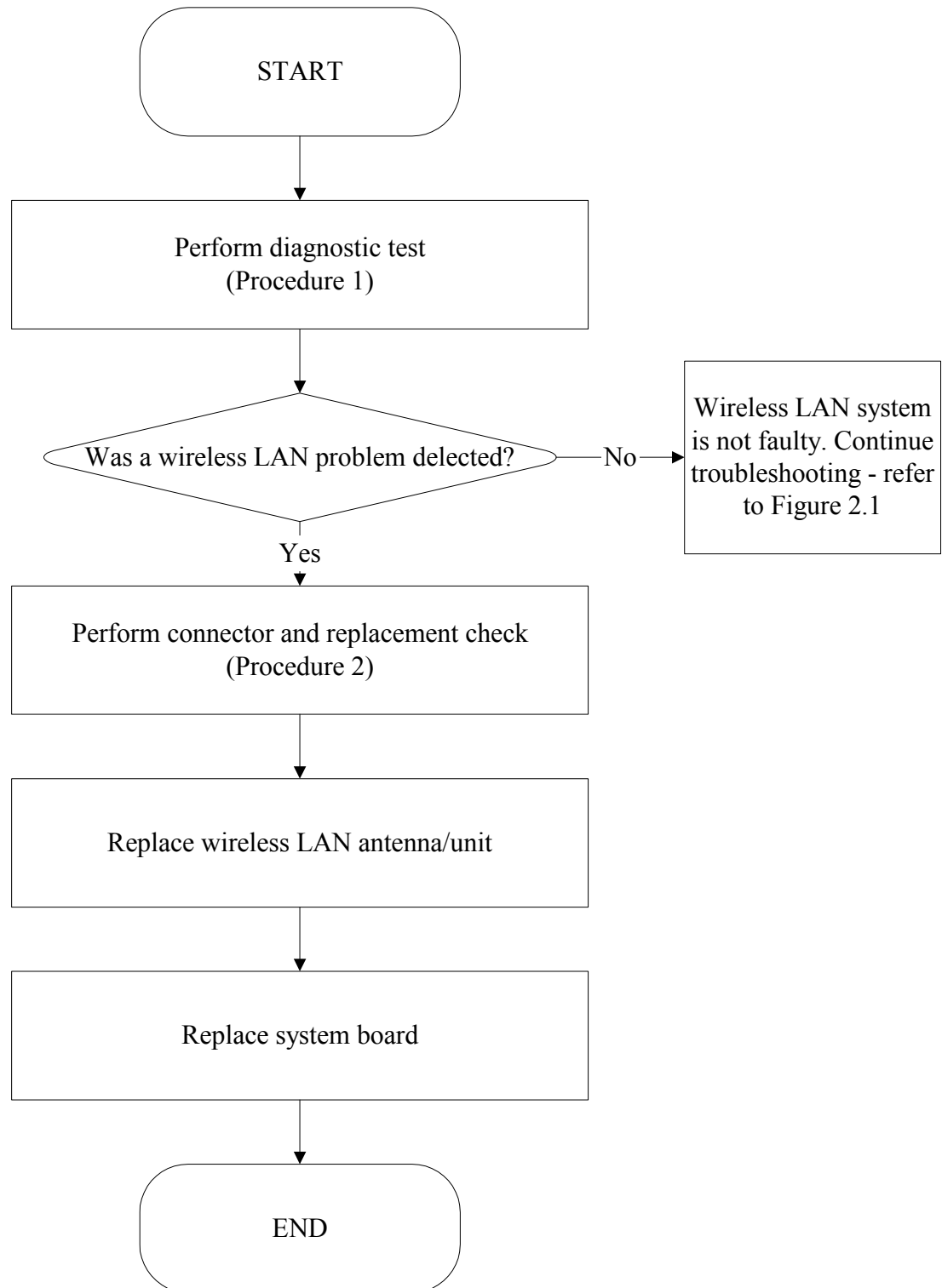
Figure 2-15 Wireless LAN troubleshooting process

The wireless LAN antenna wire, wireless LAN unit or system board may each be the source of a wireless LAN fault. Any of these components may be damaged. To determine if the computer's wireless LAN system is functioning properly, perform the following procedures. Figure 2-15 outlines the process. Start with Procedure 1 and continue with the other procedures as instructed.

> Procedure 1:   Diagnostic test
>
> Procedure 2:   Connector and replacement check

Procedure 1   Diagnostic test

Run the Diagnostic Program, which will automatically execute the wireless LAN test. Refer to Chapter 3, Tests and Diagnostics for more information on the program.
If an error is located, go to Procedure 2. If an error is not located, the wireless LAN system is functioning properly.

Procedure 2   Connector and replacement check

The wireless LAN antenna, wireless LAN unit or system board may be disconnected or damaged. Disassemble the computer following the steps described in Chapter 4, *Replacement Procedures*, and perform the following checks.

Check 1   Make sure that the wireless LAN antenna is firmly connected to the wireless LAN unit (refer to Chapter 4 for instructions) and that the wireless LAN unit is securely slotted into the system board. If the problem persists, go to Check 2.

Check 2   Check that the wireless communication switch is turned to "On", then make sure that the wireless communication LED on the front panel is lit. If the LED is lit but the wireless LAN function is still faulty, the antenna may be damaged. Replace with a new antenna following the steps in Chapter 4, *Replacement Procedures*. If the problem persists, or if the wireless LAN LED is not lit when the wireless communication switch is turned to "On", go to Check 3.

Check 3   The wireless LAN unit may be damaged. Replace it with a new one following the instructions in Chapter 4. If the problem still exists, perform Check 4.

Check 4   The system board may be damaged. Replace it with a new one following the instructions in Chapter 4.

2.17 Bluetooth Troubleshooting
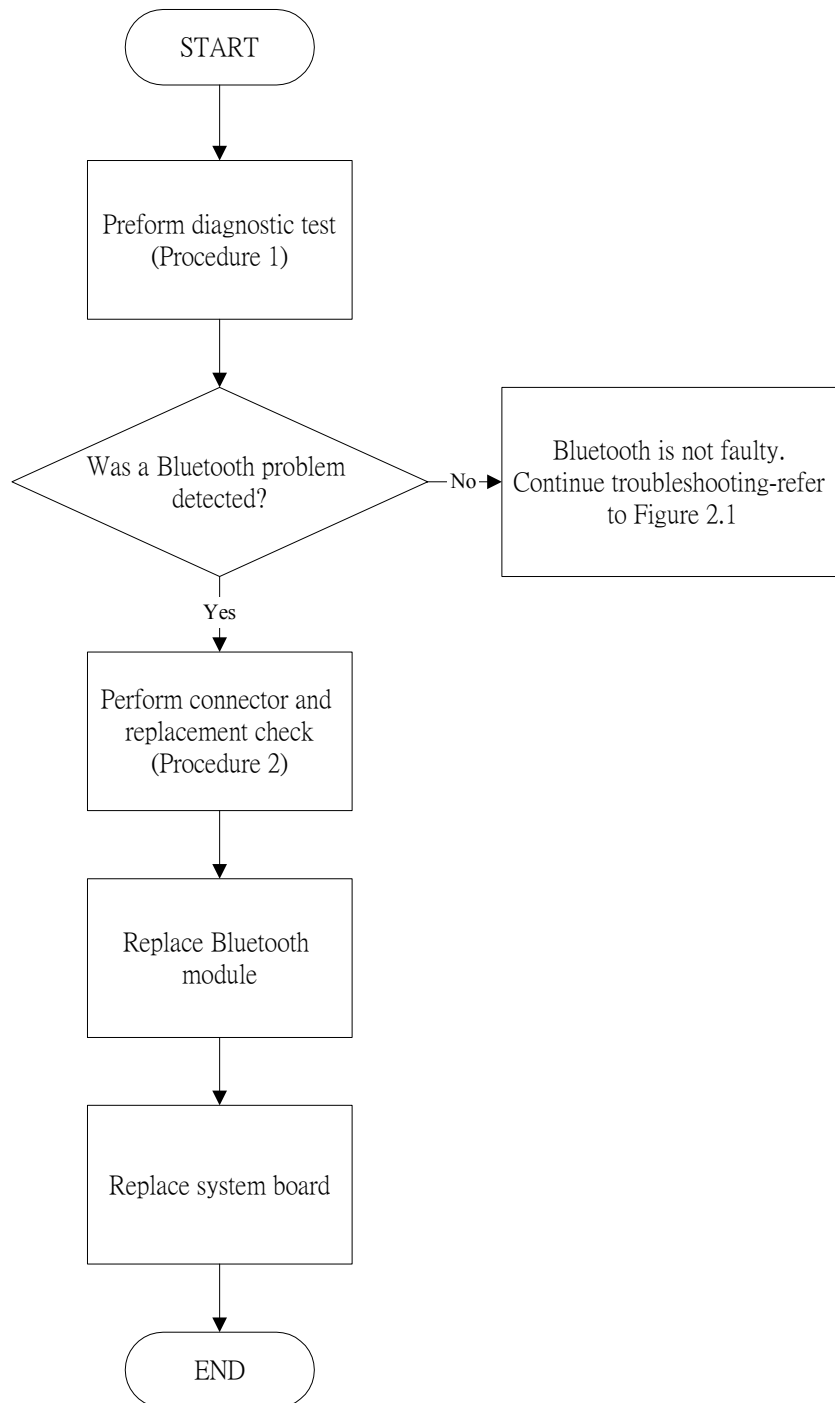
Figure 2-16 Bluetooth troubleshooting process

The Bluetooth antenna wire, Bluetooth module or system board may be the source of a Bluetooth fault. Any of these components may be damaged. To determine if the computer's Bluetooth system is functioning properly, perform the following procedures. Figure 2-16 outlines the process. Start with Procedure 1 and continue as instructed.

Procedure 1:   Diagnostic test

Procedure 2:   Connector and replacement check

Procedure 1   Diagnostic test

Run the Diagnostic Program, which will automatically execute the Bluetooth test. Refer to Chapter 3, Tests and Diagnostics for more information on the program.
If an error is located, go to Procedure 2. If an error is not located, the Bluetooth system is functioning properly.

Procedure 2   Connector and replacement check

The Bluetooth, antenna module or system board may be disconnected or damaged. Disassemble the computer following the steps described in Chapter 4, *Replacement Procedures*, and perform the following checks.

Check 1   Make sure that the Bluetooth antenna is firmly connected to the Bluetooth module (refer to Chapter 4 for instructions) and that the Bluetooth FFC is securely slotted into the system board. If the problem persists, go to Check 2.

Check 2   Check that the communication switch is turned to "On", then make sure that the communication LED on the left panel is lit. If the LED is lit but the Bluetooth function is still faulty, the antenna module may be damaged. Replace with a new antenna following the steps in Chapter 4, *Replacement Procedures*. If the problem persists, or if the Bluetooth communication LED is not lit when the Bluetooth communication switch is turned to "On", go to Check 3.

Check 3   The Bluetooth module may be damaged. Replace it with a new one following the instructions in Chapter 4. If the problem still exists, perform Check 4.

Check 4   The system board may be damaged. Replace it with a new one following the instructions in Chapter 4.

Chapter 3

Tests and Diagnostics

Contents

3.1 The Diagnostic Test

This chapter explains how to use the Test & Diagnostic program to test the functions of the computer's hardware modules. The Test & Diagnostic Program is stored on the T&D diskettes. The program consists of a series of tests that run automatically when the Diagnostics Program items are selected and executed.

NOTES:To start the diagnostics, follow these steps

1. Check all cables for loose connections.

2. Exit this program when you are at Main Menu.

The TEST & DIAGNOSTIC PROGRAM contains the following functional tests:

- ❑ CONFIG CHECK TEST
- ❑ DMI CHECK TEST
- ❑ PIO LOOPBACK TEST
- ❑ IEEE1394 TEST
- ❑ SPEAKER AUDIO TEST
- ❑ FAN ON/OFF TEST
- ❑ MAIN BATTERY CHARGE TEST
- ❑ FDD TEST
- ❑ CD-ROM TEST
- ❑ KEYBOARD TEST
- ❑ MOUSE(PAD) TEST
- ❑ LCD PIXELS MODE TEST
- ❑ LID SWITCH TEST
- ❑ HDD R/W TEST
- ❑ LAN TEST
- ❑ RTC TEST

You will need the following equipment to perform some of the Diagnostic test programs.

- ❑ The diagnostics diskette (2 pcs)
- ❑ A printer loopback connector (PIO Loopback Test)
- ❑ A formatted working diskette for the floppy disk drive test (Floppy Disk Drive Test)
- ❑ A data CD disc (CD-ROM Test)
- ❑ A LAN loopback connector (LAN Test)
- ❑ IEEE1394 Link Cable

The following sections explain how to execute the Test & Diagnostic Program and detail the tests within the program.

3.2   **Executing the Diagnostic Test**

Toshiba MS-DOS is required to run the DIAGNOSTICS PROGRAM. To start the DIAGNOSTIC PROGRAM, follow these steps:

1. Insert the diagnostics diskette #1 in the floppy disk drive and turn on the computer. (The diagnostics diskette contains the MS-DOS boot files.) And then follow the instructions to swap with the diagnostics diskette #2 for T&D program installed in RAM driver.

> **NOTE**: *To execute the CD test, make sure the CD is installed in the CD/DVD-ROM drive.*

The T&D Program can run by single test item when you press corresponsive English letter of test item, or run two or more test items what you like if you choose them by "Arrow cursors" and "Space Bar" – the wonderful thing is you can setup test loop by "Enter" button. And it also asks you if you like to copy test log file to diskette as reference at the end of test(s).

The test list is as the following:

        A. CONFIG CHECK TEST
        B. DMI CHECK TEST
        C. PIO LOOPBACK TEST
        D. IEEE1394 Test
        E. SPEAKER AUDIO TEST
        F. FAN ON/OFF TEST
        G. MAIN BATTERY CHARGE TEST
        H. FDD TEST
        I. CD-ROM TEST
        J. KEYBOARD TEST
        K. MOUSE (PAD) TEST
        L. LCD PIXELS MODE TEST
        M. LID SWITCH TEST
        N. HDD R/W TEST
        O. LAN TEST
        P. RTC TEST

The below display will show up at the beginning of T&D program.

```
SAPPORO 300 DOS MODE  F/T  T&D  DISKETTE MENU  V1.00(2003/06/12)

A.CONFIG CHECK TEST        ►< NO >  M.LID SWITCH TEST        ►< NO >
B.DMI CHECK TEST           ►< NO >  N.HDD R/W TEST           ►< NO >
C.PIO LOOPBACK TEST        ►< NO >  O.LAN TEST               ►< NO >
D.RTC TEST                 ►< NO >  P.N/A                    ►< NO >
E.SPEAKER AUDIO TEST       ►< NO >  Q.N/A                    ►< NO >
F.FAN ON/OFF TEST          ►< NO >  R.N/A                    ►< NO >
G.MAIN BATTERY CHARGE TEST ►< NO >  S.N/A                    ►< NO >
H.FDD TEST                 ►< NO >  T.N/A                    ►< NO >
I.CD-ROM TEST              ►< NO >  U.N/A                    ►< NO >
J.KEYBOARD TEST            ►< NO >  V.N/A                    ►< NO >
K.MOUSE (PAD) TEST         ►< NO >  W.ALL FUNCTION TEST      ►< NO >
L.LCD PIXELS MODE TEST     ►< NO >  X.COPY LOG TO FDD        ►< NO >

*[A-X]=Unit Item Test      *Space=Change Option    *↑↓→←=Move Cursor
*Enter=Set Loop Count      *Press Esc To Quit

MESSAGE:
                                                    LOOP:_____
```

If the test result passes, the following display will show up:

```
PASS

Press any key to continue . . .
```

If an error is detected and a test fails, the following message displays:

```
FAIL

Press any key to continue . . .
```

Then press any key for next actions – the below display presented if copying test log file onto diskette is necessary. This action will be executed when "**Y**" key pressed.

```
SAPPORO 300 DOS MODE  F/T  T&D  DISKETTE MENU  V1.00(2003/06/12)

A.CONFIG CHECK TEST        ►< OK >  M.LID SWITCH TEST        ►< NO >
B.DMI CHECK TEST           ►< OK >  N.HDD R/W TEST           ►< NO >
C.PIO LOOPBACK TEST        ►< OK >  O.LAN TEST               ►< NO >
D.RTC TEST                 ►< OK >  P.N/A                    ►< NO >
E.SPEAKER AUDIO TEST       ►< OK >  Q.N/A                    ►< NO >
F.FAN ON/OFF TEST          ►< OK >  R.N/A                    ►< NO >
G.MAIN BATTERY CHARGE TEST ►< OK >  S.N/A                    ►< NO >
H.FDD TEST                 ►< NO >  T.N/A                    ►< NO >
I.CD-ROM TEST              ►< NO >  U.N/A                    ►< NO >
J.KEYBOARD TEST            ►< NO >  V.N/A                    ►< NO >
K.MOUSE (PAD) TEST         ►< NO >  W.ALL FUNCTION TEST      ►< NO >
L.LCD PIXELS MODE TEST     ►< NO >  X.COPY LOG TO FDD        ►< NO >

*[A-X]=Unit Item Test      *Space=Change Option    *↑↓→←=Move Cursor
*Enter=Set Loop Count      *Press Esc To Quit

MESSAGE:
                                                        LOOP:_____
```

It will skip this process if "N" key pressed.

And then it will check if it's necessary to leave this program. Program will quit when "**Y**" key pressed and it will go back main menu for next test if "**N**" key pressed.

```
SAPPORO 300 DOS MODE  F/T  T&D  DISKETTE MENU  V1.00(2003/06/12)

A.CONFIG CHECK TEST          ►< OK >  M.LID SWITCH TEST         ►< NO >
B.DMI CHECK TEST             ►< OK >  N.HDD R/W TEST            ►< NO >
C.PIO LOOPBACK TEST          ►< OK >  O.LAN TEST                ►< NO >
D.RTC TEST                   ►< OK >  P.N/A                     ►< NO >
E.SPEAKER AUDIO TEST         ►< OK >  Q.N/A                     ►< NO >
F.FAN ON/OFF TEST            ►< OK >  R.N/A                     ►< NO >
G.MAIN BATTERY CHARGE TEST   ►< OK >  S.N/A                     ►< NO >
H.FDD TEST                   ►< NO >  T.N/A                     ►< NO >
I.CD-ROM TEST                ►< NO >  U.N/A                     ►< NO >
J.KEYBOARD TEST              ►< NO >  V.N/A                     ►< NO >
K.MOUSE (PAD) TEST           ►< NO >  W.ALL FUNCTION TEST       ►< NO >
L.LCD PIXELS MODE TEST       ►< NO >  X.COPY LOG TO FDD         ►< NO >

*[A-X]=Unit Item Test       *Space=Change Option    *↑↓→←=Move Cursor
*Enter=Set Loop Count       *Press Esc To Quit

MESSAGE:
              Do you copy log to floppy ? (y/n)   LOOP:_____
```

NOTE: Press **Pause** *to pause a test and* **Enter** *to resume.*

3.3   Config Check Test

The config check test checks unit configuration. It includes:

- ◆   CPU type

- ◆   System memory size

- ◆   ODD type

- ◆   HDD type & capacity

- ◆   BIOS version

This test needs input unit Part Number by manual to make comparison with known SKU data.

*NOTE: To execute this test, you must input unit **Part Number** as "**Uppercase Character**".*

Then it will show its configuration is correct (in **green** color) or failed (in **red** color).

The screen should display as below, indicating whether the test is passed or failed after comparison.

```
<Neil Fu> <2002/6/18> <Ver 1.0>
Command Line: cfgchk TabFileName SKU
Example     : cfgchk btw10tab.txt PS110E-0002S-GR


             Please input the SKU: PSP20UFZ000F

CURRENT SPEC IS :
P4800 2800 1.00A ID7 32MB 256 DVDR/RW HDD 60010 MODEM_LAN NoWEP NO_BT FIR 12cell

Press any key to continue . . .
```

3.4   DMI Check Test

This test will check if the computer's Desktop Management Interface (DMI) is correct.

DMI includes:

- ◆   Manufacturer

- ◆   Production Name

- ◆   Version

- ◆   Serial Number

- ◆   UUID

- ◆   OEM String

It needs to input unit Part Number by manual, then show this unit DMI information and makes comparison with SKU data.

NOTE: *To execute this test, you must input unit* **Part Number** *as "**Uppercase Character**".*

The screen should display as below, indicating whether the test is passed or failed after comparison.


```
■ Compal DMI String R/W Utility V2.4.7 ■

Manufacturer(Type1, Offset04h) : TOSHIBA
Product Name(Type1, Offset05h) : Satellite P20
Version(Type1, Offset06h)      : PSP20UFZ000F
Serial Number(Type1, Offset07h): 63015307CU
UUID(Type1, Offset08h)         : 9659BE79-8FB6-11D7-B9ED-00023F811022
OEM Strings(Part Number,SW Number)(Type11, Offset05h):
=>PSP20UFZ000F,PSP20UFZ000F




Press any key to continue . . .
```

3.5   PIO Loopback Test

The PIO loopback test will check below items through PIO loopback connector.

- ◆   External Interrupt

- ◆   External Loopback

  - including Pattern test, Data Pin test, Control register test & Control pin/ Status
    pin test.

NOTE: Remember to connect a PIO loopback connector to the computer's printer port
before test begins.

The screen should display as below, indicating whether the test is passed or failed when
finished.

```
***** Parallel Port Test Program !! *** V1.0 10/16/00 **

Testing LPT1 Internal Loopback: Testing patterns...FF FF [ PASS ]
Testing LPT1 External Interrupt...[ PASS ]
Testing LPT1 External Loopback...
  1. Data Pin (p2~p9) & Err Pin (p15) Test ..[ PASS ]
  2. Control Register Test ..[ PASS ]
  3. Control Pin & Status Pin Test ..[ PASS ] [ PASS ]


Press any key to continue . . .
```
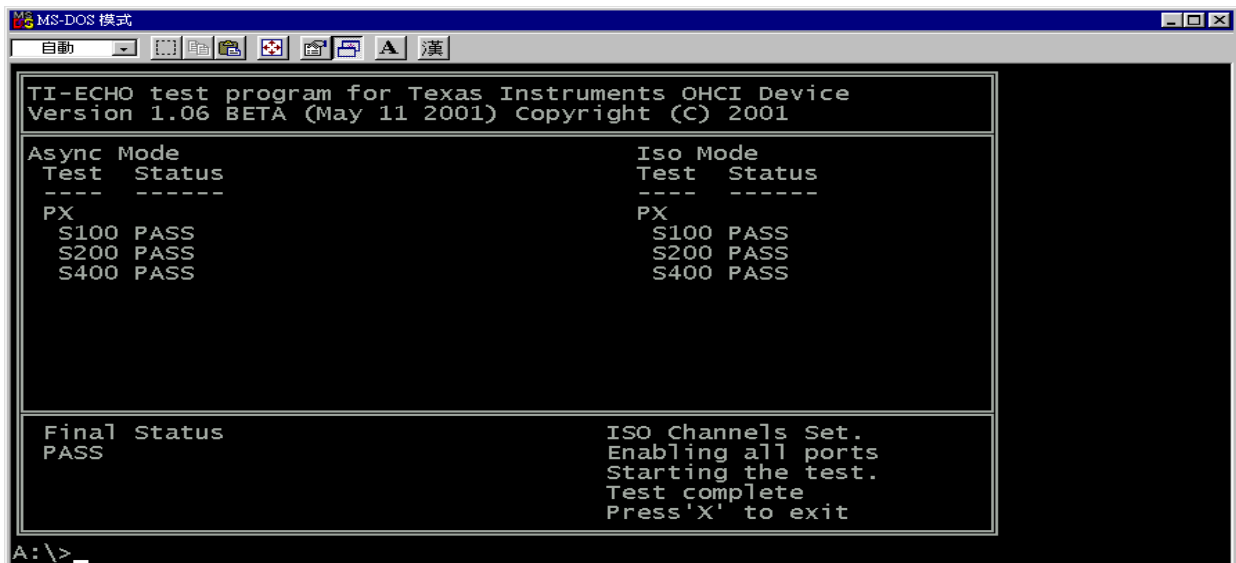
3.6   IEEE 1394 Test

The IEEE 1394 port test checks transmission between the computer and a secondary device along an IEEE 1394 line. An IEEE 1394 transmission line must be firmly connected between the computer and the device before the test is started. The test requires:

1. An IEEE 1394-compatible device

2. An IEEE 1394 transmission line

To perform the test:

1. Copy the following files from the BTR20.RAR file on the diagnostics disk to a bootable diskette

    ◆   1394M.bat

    ◆   TI.exe

    ◆   TI1394.exe

2. Insert the disk, then boot the computer

3. Make sure the machines are firmly connected by the IEEE 1394 transmission line

4. Execute 1394M.bat on the computer

5. Select the IEEE 1394 transmission test for the test device

6. Start data transmission and complete check

```
MS-DOS 模式                                                    _ □ ✕
 自動         ▢▤▥▣  ▣▤ A 漢

 TI-ECHO test program for Texas Instruments OHCI Device
 Version 1.06 BETA (May 11 2001) Copyright (c) 2001

 Async Mode                            Iso Mode
  Test  Status                          Test  Status
  ----  ------                          ----  ------
 PX                                    PX
   S100 PASS                             S100 PASS
   S200 PASS                             S200 PASS
   S400 PASS                             S400 PASS




  Final Status                         ISO Channels Set.
  PASS                                 Enabling all ports
                                       Starting the test.
                                       Test complete
                                       Press'X' to exit

 A:\>_
```

3.7   **Speaker Audio Test**

The speaker audio test allows the user to aurally confirm the speaker functions. And check both speakers if they are OK within 3 times "Beep" sound generated.

*NOTE: Remember to tune up the volume as "**Maximum**" before this test starts.*

The screen should display as below, indicating whether the test is passed or failed after the question.

```
** FATBUZER test version 1.07 **
Please listen for speaker being sound
         1.0 Sec  by   3 times

Test over, no errors found



Do you hear Beep sound ?
[Y,N]?
```

3.8   Fan ON/OFF Test

The fan test allows the user to test aurally whether the fan is working. And follow the below procedures for this test:

- ◆   The computer will let the fan be "ON" after any key pressed. Listen to check whether the fan is working.

NOTE: *Remember to approach fan outlet that is near right side of unit whether fan is* *"ON".*

- ◆   The computer will stop the fan working after any key pressed. Listen to check if the fan is "OFF" – it means no rotating sound.

The screen should display as below, indicating whether the test is passed or failed after the question.

```
** Fan ON/OFF Test ,Please Listen To The FAN Sound !!
 Press Any Key To Start Test ..
 FAN On Test  :

 FAN Off Test :


 Do you hear FAN rotating sound?


[Y,N]?
```

3.9   Main Battery Charge Test

> *NOTE: The AC adaptor (**120W, 19V**) should be connected to successfully run this test.*

This test shows and measures the main battery:

- ◆ Battery type (Ni-MH / Lion)

- ◆ Manufacturer (Sony / Sanyo)

- ◆ Remain charge capacity (0 ~ 100%)

- ◆ Charge function (PASS/FAIL)

     - "Battery Is Full" showed when "remain charge capacity" is 100%

The screen should display as below, indicating whether the test is passed or failed when finished.

```
ONLY FOR 87591 T&D Series Battery Test Program.[591] V1.0 2002/07/23
MAIN Battery

Battery Type: Ni-MH
Manufacturer: Panasonic
Remain charge capacity : 91.8%

Charge Test-> [ PASS ]


Press any key to continue . . .
```

3.10 FDD Test

NOTE: Before running the FDD test, prepare a formatted work diskette (1.44 MB). Remove the diagnostics diskette and insert the work diskette into the FDD. The contents of the floppy diskette maybe erased.

The Floppy Disk Test includes three subtests of the:

1. Sequential seek/verify function (Range: Track 0 ~ 79)

2. Funnel code seek/verify function (Range: Track 0 ~ 79)

3. Write/Read/Compare pattern function (Range: Track 75 ~ 79)

NOTE: The write-protected device of this formatted diskette should be "Disable".

The subtests run automatically.

NOTE: Press "Esc" key can skip the current subtest.

The screen should display as below, indicating whether the subtests pass or fail when finished.

```
***** Fdd Test Program V1.3  *****

Testing Driver A: [1.44 MByte (Cyl:80, Head:2, Sec:18)]...

Testing Seq. seek/verify... Head: 01, Track: 79...  [ PASS ]

Testing Fun. seek/verify... Head: 01, Track: 06...
```

3.11 CD-ROM Test

The CD-ROM test allows a user to aurally confirm the CD-ROM functions.

NOTE: *A CD disc (including data file) must be inserted into the CD-ROM drive before this test starts.*

The CD-ROM test includes two subtests of the:

1. Random read/partial sequential read function

2. Sequential read function (for all surface)

Each item can be chosen by manual. When each test item finished, the CD-ROM tray will open. Check whether the tray can open automatically.

NOTE: *Press "**Esc**" key can skip the current subtest.*

The screen should display as below, indicating whether the subtests pass or fail when finished.

```
          CDROM Utility (for Testing only)  Ver 1.0
--------------------------------------------------------------------------------
     Testing CDROM Information ..... Press [ESC] key to skip testing
--------------------------------------------------------------------------------
CD ROM Drive Z:, MSCDEX ver.: 2.23, Driver name: TSYCD1  , Vol.: 020329_1105
Total 198960 sectors(2352 bytes/sector) = 467953920 bytes
Testing CD ROM reset function...

       Partial sequential read ..... 198950

       Random  read ............... 95496        PASS


       Please remove CD Media, then close CD tray ...



Press any key to continue . . .
```

3.12 Keyboard Test

The keyboard test checks the all keys function.

---

*NOTE: The **Num Lock** and the **Overlay** mode must be off to execute the keyboard test.*

Before keyboard test starts, the keyboard matrix code should be chosen as below display:

  1. **K** (UK, for Europe)

  2. **S** (US, for America)

  3. **J** (JP, for Japan)

When you execute this test, the keyboard layout is drawn on the display. When any key is pressed, the corresponding key on the screen changes to black as shown below.

It will indicate whether the subtest is passed or failed after the question.

---

*NOTE: The "**Fn**" key cannot be tested in the keyboard test. To determine whether the "**Fn**" key is working correctly, press "**Fn+F6**　" or "**Fn+F7**　" keys to check if LCD display brightness change gradually.*
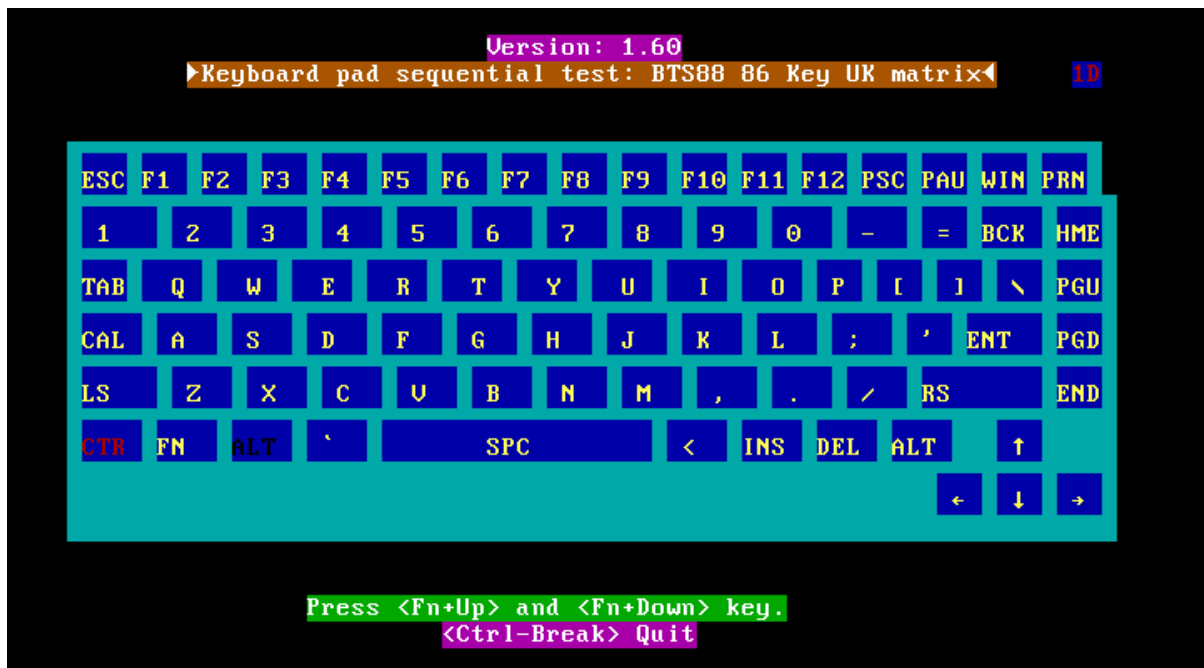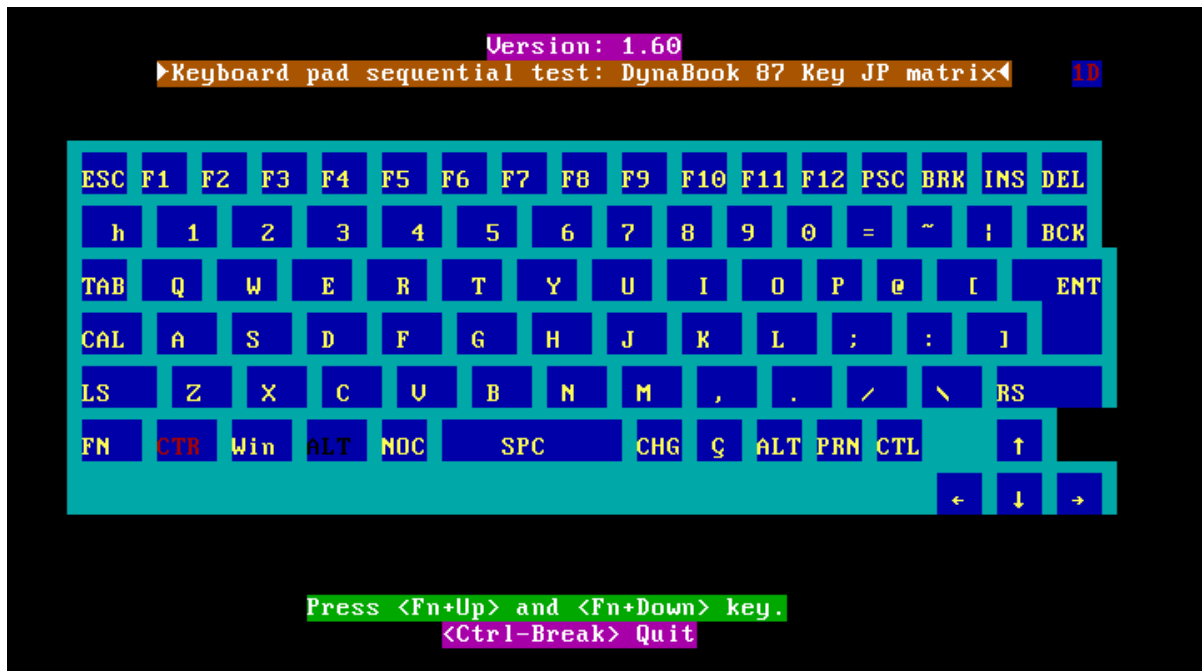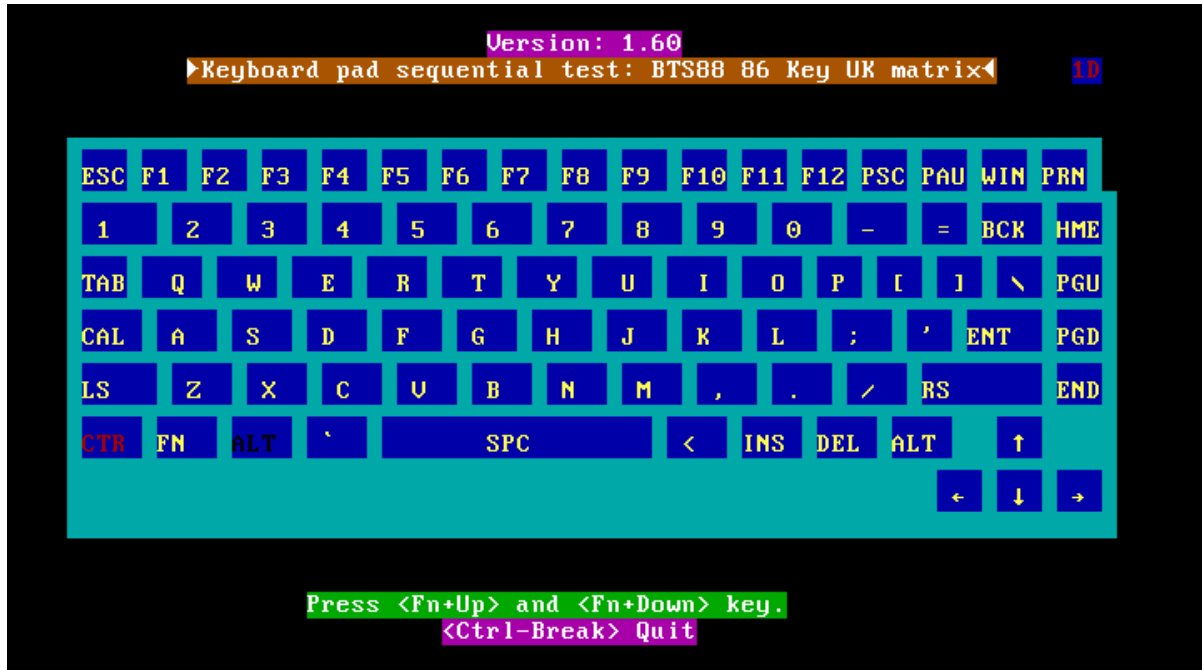
Pressing a key also reveals that key's **scan codes** in the upper right hand corner of the screen. When the key is depressed, its **make code** is displayed. When the key is released, the **break code** is shown.

3.13 Mouse (Pad) Test

The Mouse test allows the user to select and assign values to the following, using the Touch Pad or "***Tab***" key to move between selections:

      1.   Mouse Speed (on a scale from slow to fast)

      2.   Acceleration (Off, Low, Medium, High)

      3.   Button Assignments (Left + Right / Right button, either Unassigned or Drag Lock)

      4.   Swap Buttons (Left /Right)

NOTE: *The Touch Pad test cannot be used to test an external USB mouse.*

The Touch Pad button subtest allows users to test their Touch Pad buttons. If the buttons are clicked, the cursors should appear in the corresponding box of the button figure that is displayed on the screen as below.

After checking T/Pad buttons and cursor's function, use "Tab" key or use T/Pad cursor to click the "OK" column will end this test.

   It will indicate whether the subtests pass or fail after three questions.

NOTE: *The above figure has three compartments although the Touch Pad installed may only have two buttons. In this case, the central compartment in the figure does not correspond to any button.*

3.14 LCD Pixels Mode Test

This LCD pixels mode test checks whether video display is fine.

This test includes two modes of the test:

1. Text Mode

    - including 40*25 (16 colors) and 80*25 (2/16colors).

2. VGA Mode

    - including 320*200 (4/16/256 colors), 640*200 (2/16 colors), 640*350 (2/16 colors), 640*480 (2/16/256 colors), 800*600 (256 colors) and 1024*768 (256 colors).

The screen should display as below, indicating whether the test is passed or failed after the question.
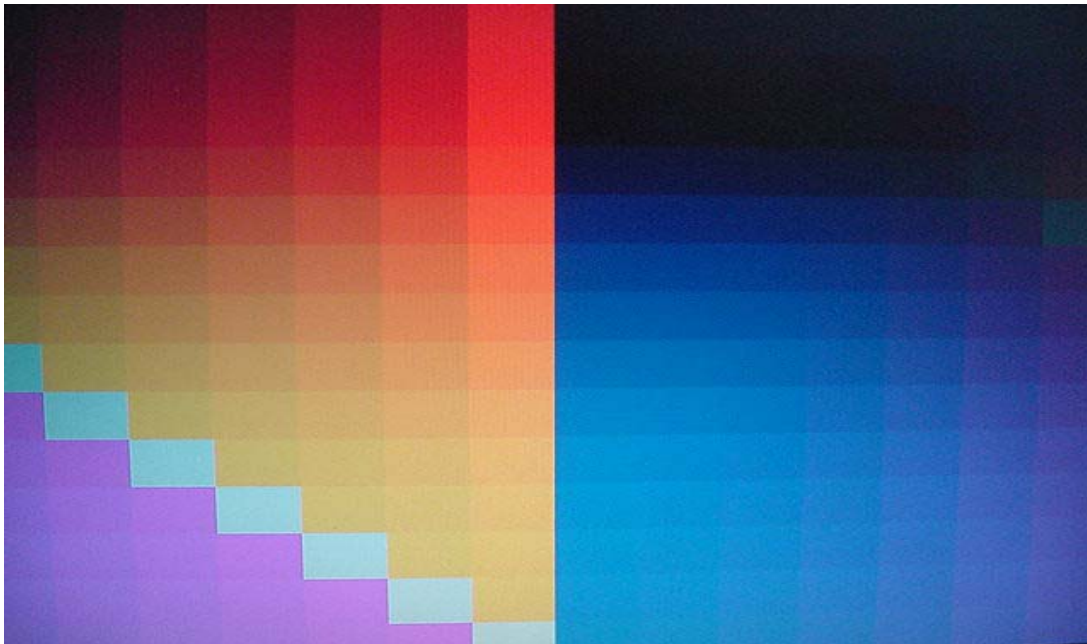
3.15 Lid Switch Test

The lid switch test checks the lid function of the unit. When LCD cover closed, the lid should enable to turn off the display.

NOTE: *Remember to tune up the volume as "**Maximum**" before this test starts.*

Follow below steps to run this test:

1. Close the LCD cover.

2. Heard 3 "Beep" sound happened during LCD closed.

3. Open the LCD.

Then it will indicate whether the test is passed or failed.

```
***** Lid Switch Test Program V1.1 2002/08/15 *****
Please Close LCD,Continue 3 Sec ,Or keyin <ESC> To Quit !!
```

3.16 HDD R/W Test

The HDD R/W test allows the user to test aurally HDD read/write function. For data security concern, it is necessary to input password - "**TOSHIBA**" before HDD write test starts.

The HDD test includes three subtests of the:

     1. Sequential read (all surface)

     2. Sequential write (all surface)

     3. Partial W/R + Random W/R

After the choice is made, HDD information will show as below:

- Model name

- Firmware revision

- Serial number

- CHR (Cylinder High Register) mode – including cylinders, heads, sectors and sizes.

- LBA (Logical Block Addressing) mode – including sectors and sizes.

- Support Ultra DMA Mode

- Support PIO Mode

```
            HDD Utility (for Testing only)  Ver 1.0

--------------------------------------------------------------------------
    Testing HDD Information ..... Press Ctrl+Break keys to stop testing
--------------------------------------------------------------------------
       Model name              = IC25N030ATCS04-0
       Firmware revision       = CA30A71A
       Serial number           =      CSL304D5CARPWA
       CHR Mode cylinders      = 16383
       CHR Mode heads          = 16
       CHR Mode sectors        = 63
       CHR Mode sizes          = 8063 MB
       LBA Mode sectors        = 58605120
       LBA Mode sizes          = 28615 MB
       Support Ultra DMA Mode  = 3f
       Support PIO Mode        = 1f
--------------------------------------------------------------------------

       Begin Testing ..... Sequential read (all surface)
       ---> Testing of Sectors = 13300947
```

NOTE: *Press "**Ctrl + Break**" keys can terminate the current subtest.*

The screen should display as previous picture, indicating whether the subtest is passed or failed when finished.

NOTE: *The AC adaptor should be connected to successfully run this test.*

3.17 LAN Test

The LAN test checks the LAN full-duplex environment.

NOTE: LAN loopback needs to plug in before test begins.

And LAN information will show on the test screen:

- ◆ IO Base – Port: 3000H

- ◆ IRQ – AH, it's "IRQ 10".

- ◆ Node – it is "MAC Address".

- ◆ Line Frame – 1514 Bytes.

- ◆ Line Speed – 100Mbps or 10 Mbps.

- ◆ Bus ID – it's "4".

The LAN test includes two subtests of the:

1. Speed100

   - including Ethernet_802.2, Ethernet_II, Ethernet_SNAP and Ethernet_802.3. All test items are in LSB mode.

2. Speed10

   - including Ethernet_802.2 in LSB mode.

The subtests run automatically.

The screen should display as below, indicating whether the subtests pass or fail when finished.

```
2.N_Way_Test=false          none
3.Boot_Rom=false            none
4.Speed100=true             testing
5.Speed10=true              testing




                                              Press any key to exit


Realtek RTL8139(A/B) Fast Ethernet MLID  v3.62 (000112)
(c) Copyright 1999, by Realtek Semiconductor Corp. All rights reserved.

Fullduplex environment,  IRQ 10, Port 3000, Node Address 23F7993AA L
Max Frame 1514 bytes, Line Speed 100 Mbps, Bus ID 4
Board 1, Frame ETHERNET_802.2, LSB Mode
Board 2, Frame ETHERNET_II, LSB Mode
Board 3, Frame ETHERNET_SNAP, LSB Mode
Board 4, Frame ETHERNET_802.3, LSB Mode
```

3.18 RTC Test

Checks the computer's RTC (Real Time Clock) and calendar functions by comparing the DOS and CMOS values.

The test runs automatically.

The screen should display as below, indicating whether the test is passed or failed when finished.

```
======RTC TEST======


Please Check the result after test.


Press any key to continue . . .



Wait for zero counter...
Testing...
DOS TIME = 22:33:48.04(8122804), CMOS TIME = 22:33:48(8122800)
DOS DATE: 09/19/2002, CMOS DATE: 09/19/2002
DATE & TIME test [ PASS ]




Press any key to continue . . .
```

3.19 CD Control Button Test

The CD control button test allows the user to manually test each of the five CD control buttons.

The figure below will be displayed:

```
BTS88 Button/LED Test Program For Lower Use !!

                       TV   WWW  Mail
        3E

                       MODE  ◄◄   ►►   ►   ■


                    *** Keyin <ESC> To Quit ***
```

Press each of the buttons on the front panel in turn. A yellow bar will appear on the relevant section of the figure if the button passes the test.

Press **Esc** to quit the test.

Chapter 4

Replacement Procedures

Chapter 4   Contents

4.1   General

This chapter explains how to disassemble the computer and replace Field Replaceable Units (FRUs). It may not be necessary to remove all the FRUs in order to replace one. The chart below is a guide to which FRUs need to be removed in order to remove others. Always start by removing the battery pack, next, optional items such as the optional PC Card, then follow the chart downward removing only those FRUs necessary to reach the one you think is causing the computer to operate improperly. Refer to the example on the following page.

Battery pack														
					Main Module			HDD		Keyboard				
PC Card	Wireless LAN Unit	Expansion Memory Module	CPU	Modem / Bluetooth Unit	Top Cover									
					Display Assembly									
System Board					Display Mask	Direct Play Button Board	CIR Board	Audio Board	Speakers	LED / Power Button Board	Function Key Board	TouchPad		
					FL Inverter Board									
Fan Set					LCD Module									

The example below shows FRUs to be removed before the LED / power button board can be removed and repaired or replaced. The LED / power button board is overlapped by the top cover which must be removed before the LED / power button board can be reached. The top cover is in turn overlapped by the removable main module, HDD and keyboard. Always starts the disassembly process by removing the battery pack.

Battery pack														
PC Card	Wireless LAN Unit	Expansion Memory Module	CPU	Modem / Bluetooth Unit	Main Module			HDD		Keyboard				
					Top Cover									
					Display Assembly									
System Board					Display Mask	Direct Play Button Board	CIR Board	Audio Board	Speakers	LED / Power Button Board	Function Key Board	TouchPad		
					FL Inverter Board									
Fan Set					LCD Module									

Safety Precautions

Before you begin disassembly, read the following safety precautions and observe them carefully as you work.

DANGER:

1. *Always use the lithium ion battery pack or backup battery that is authorized by Toshiba or compatible with the unit. Since other battery packs have different specifications, they may be incompatible with the unit, and may burst or explode. Heating or disassembling the battery pack could cause leakage of alkaline solution. Throwing the battery pack into a fire could cause the battery pack to explode.*

2. *The power supply, FL inverter and other components carry high voltages. To avoid the risk of electric shock when you need to turn on the power of a partially disassembled computer to check its operation, be very careful not to touch connectors or components. Also, do not disassemble individual components in first-level maintenance.*

WARNING: To avoid the risk of electric shock or other injury:

1. *Always turn the power off and disconnect the AC adaptor from the power source.*

2. *Remove any metal jewelry or accessories such as necklaces, bracelets, or rings. Batteries in the computer retain an electrical charge so there is danger of electrical shock even when the computer is disconnected from an AC power source.*

3. *Never work with wet or damp hands.*

4. *The computer contains sharp edges and corners: be careful not to injure yourself.*

5. *Make sure that all replacement components meet the specifications for the computer and that all cables and connectors are securely fastened.*

CAUTION: To avoid damage to the computer:

1. *When you change a component, be sure the replacement component meets the required specifications. Never use foreign parts.*

2. *Metal objects such as screws or paper clips which fall into the unit can cause a short-circuit, fire, or other internal damage.*

3. *When assembling the computer, make sure you use the correct screws to secure the various pieces in place. Screw sizes are listed in their corresponding figure. Make sure all screws are securely fastened. Loose screws can cause short circuits, resulting in heat, smoke, or fire.*

4. *Before removing an FRU or other component, make sure all cables to the component have been disconnected.*

5. *If you use AC power, be sure to use the cable that came with the computer or one recommended by Toshiba.*

Before You Begin

Look over the procedures in this section before you begin disassembling the computer. Familiarize yourself with the disassembly and reassembly steps. Begin each procedure by removing the AC adaptor and the battery pack as instructed in section 4.2.

1. Do not disassemble the computer unless it is operating abnormally.

2. Use only the correct and approved tools.

3. Make sure the working environment is free from the following elements whether you are using or storing the computer.

    ❑ Dust and contaminates
    ❑ Static electricity
    ❑ Extreme heat, cold and humidity

4. Make sure the FRU you are replacing is causing the abnormal operation by performing the necessary troubleshooting and diagnostics tests described in chapters 2 and 3 of this manual.

5. Do not perform any operations that are not necessary and use only the described procedures for disassembling and installing FRUs in the computer.

6. After removing parts from the computer, place them in a safe place away from the computer so they will not be damaged and will not interfere with your work.

7. You will remove and replace many screws when you disassemble the computer. When you remove screws, make sure they are placed in a safe place and identified with the correct parts.

8. When assembling the computer make sure you use the correct screws to secure the various pieces. Screw sizes are listed in their corresponding figures.

9. The computer contains many sharp edges and corners, so be careful not to injure yourself.

10. After you have replaced an FRU, make sure the computer is functioning properly by performing the appropriate test on the FRU you have fixed or replaced.

Disassembly Procedures

The computer has two basic types of cable connectors:

- ❑ Pressure Plate Connectors
- ❑ Standard Pin Connectors

To disconnect a Pressure Plate connector, lift up the tabs on either side of the connector's plastic pressure plate and slide the cable out of the connector. To connect the cable to a Pressure Plate connector, make sure the pressure plate is fully lifted and slide the cable into the connector. Secure the cable in place by pushing the sides of the pressure plate down so the plate is flush with the sides of the connector. Gently pull on the cable to make sure the cable is secure. If you pull out the connector, connect it again making sure the connector's pressure plate is fully lifted when you insert the cable.

Standard pin connectors are used with all other cables. These connectors can be connected and disconnected by simply pulling them apart or pushing them together.

Assembly Procedures

After you have disassembled the computer and fixed or repaired the problem that was causing the computer to operate abnormally, you will need to reassemble the computer.

Install all the removed FRUs following the steps described in the corresponding sections in this chapter.

While assembling the computer, remember the following general points:

- ❑ Take your time, making sure you follow the instructions closely. Most problems arise when you get in a hurry assembling the computer.

- ❑ Make sure all cables and connectors are securely fastened.

- ❑ Before securing the FRU or other parts, make sure that no cables will be pinched by screws or the FRU.

- ❑ Check that all latches are closed securely.

- ❑ Make sure all the correct screws are used to secure all FRUs. Using the wrong screw can either damage the threads on the screw or the head of the screw and may prevent proper seating of an FRU.

After installing an FRU in the computer, confirm that the FRU and the computer are functioning properly.

Tools and Equipment

The use of Electrostatic Discharge (ESD) equipment is very important for your safety and the safety of those around you. Proper use of these devices will increase the success rate of your repairs and lower the cost for damaged or destroyed parts. The following equipment is necessary to disassemble and reassemble the computer:

❑ One M2 Phillips screwdriver to remove and replace screws.

❑ One T5 security screwdriver.

❑ Tweezers, to lift out screws that you cannot grasp with your fingers.

❑ ESD mats for the floor and the table you are working on.

❑ ESD wrist strap or heel grounder.

❑ Anti-static carpeting or flooring.

❑ Air-ionizers in highly static sensitive areas.

4.2   Battery

Removing the Battery Pack

To remove the battery pack from the 2nd module bay, follow the steps below.

1.   Turn the computer upside down.

2.   Unlock the **2nd module bay lock**.

3.   Slide the **2nd module bay latch** to release it then pull the **battery pack** out from the bay.
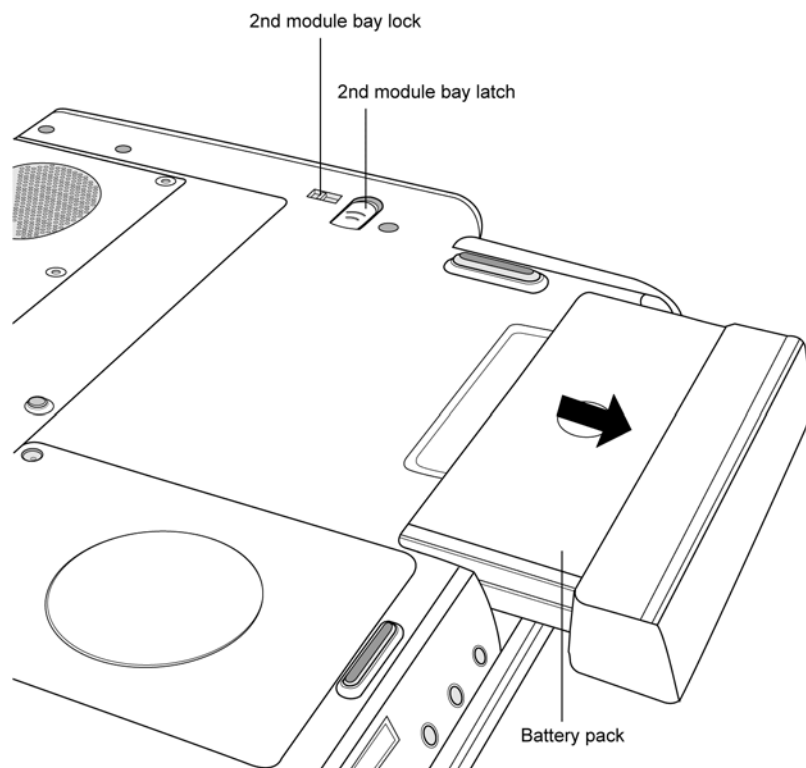
Fig 4-1: Removing the battery pack

NOTE: For environmental reasons, do not throw away a spent battery pack. Please return spent battery packs to Toshiba.

Installing the Battery Pack

To install the battery pack in the 2nd module bay, follow the steps below and refer to the figure in the preceding section.

> *WARNING:* *The battery is a lithium ion battery and can explode if not properly replaced, used, handled or disposed of. Use only batteries recommended by Toshiba as replacements.*

1. Slide the **battery pack** into the **2nd module bay**. The **2nd module bay latch** will click automatically and secure the **battery pack** in position.

2. Engage the **2nd module bay lock**.

4.3   PC Card

Removing a PC Card

To remove a PC Card, follow the steps below.

1. Push the **eject button** for the card you want to release. The button will pop out when you release it.
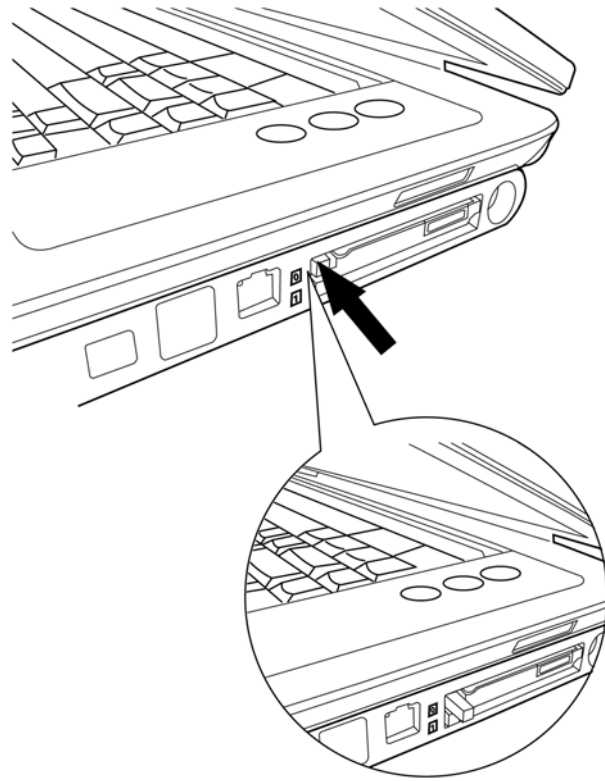
Fig 4-2: Pressing the eject button

2. Push the **eject button** once more to pop the **PC Card** out slightly.

3. Grasp the **PC Card** and remove it.
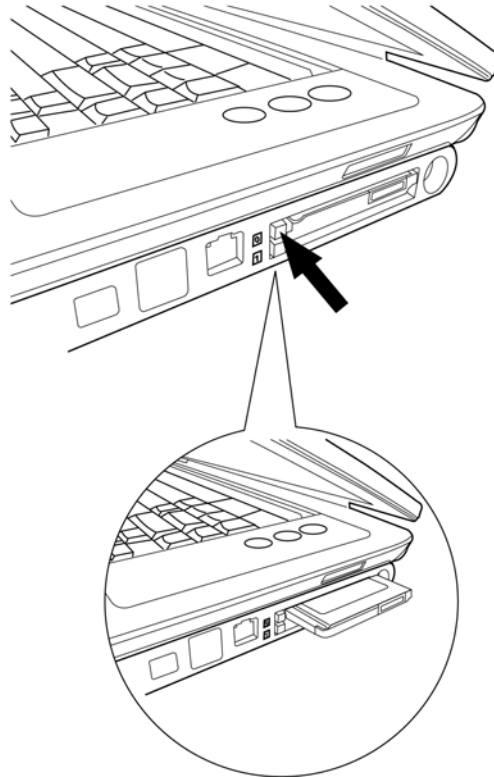
Fig 4-3: Removing the PC Card

4. Push the **eject button** back into place, if necessary.

Installing the PC Card

To install the PC Card, follow the steps below and refer to the figures in the preceding section.

1. Make sure the **two eject buttons** do not stick out.

2. Insert the **PC Card** and press gently to ensure a firm connection.

4.4   Removable modules

The Satellite P20 features two bays for the insertion of removable modules. The main module bay may house an optical drive, a second HDD or an FDD. The 2nd module bay is generally used for the removable battery, but it may also be used with a second Optical Media Drive or a TV tuner module.

This section covers removal and installation of devices from the main module bay. For removal and installation of devices from the 2nd module bay, refer to Section 4.2, *Battery*.

Disassembly and assembly procedures for the optical drive, TV tuner, removable HDD and FDD are given in later sections.

Removing the Main Module

To remove the main module, follow the steps below:

1.   Turn the computer upside down.

2.   Unlock the **main module bay lock**.

3.   Slide the **main module bay latch** to release it then pull the **main module** out from
      the bay.
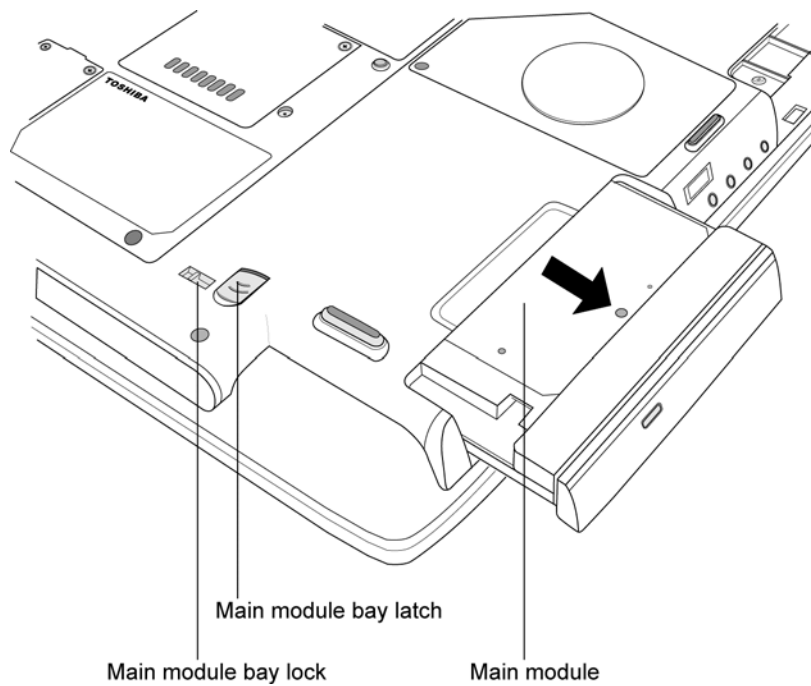
Fig 4-4: Removing the main module

Installing the Main Module

To install a device in the main module bay, follow the steps below and refer to the figure in the preceding section.

1. Slide the device into the **main module bay**. The **main module bay latch** will click automatically and secure the device in position.

2. Engage the **main module bay latch lock**.

4.5　Optical Drive

The Satellite P20 may be fitted with a:　DVD-R/-RW device
　　　　　　　　　　　　　　　　　　DVD-ROM device
　　　　　　　　　　　　　　　　　　DVD Multi-drive device
　　　　　　　　　　　　　　　　　　Combo device

Disassembling the Optical Drive

To disassemble the optical drive, first remove the drive from its module bay, then follow the steps below.

1. Remove **three black M2×8 screws** and **one silver M2×4 screw** securing the **back bracket plate**. Lift off the **back bracket plate**.

2. Remove **four silver M2×4 screws** (two from each side of the drive) securing the **main bracket**. Lift off the **main bracket**.
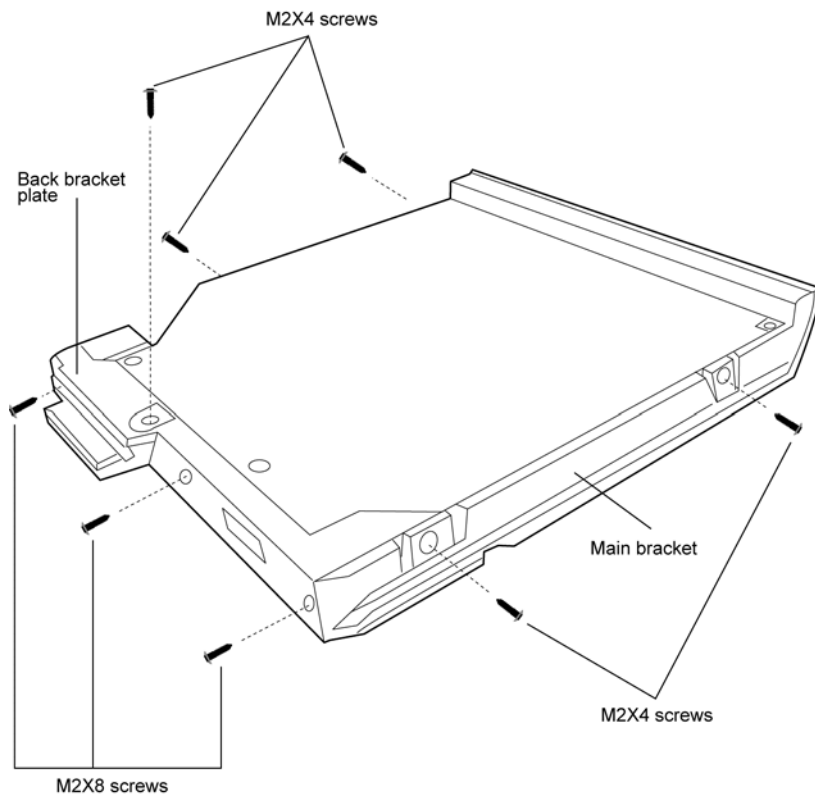
Fig 4-5: Removing the bracket screws

3. Pull the **optical drive board** from the rear of the drive.

Reassembling the Optical Drive

To reassemble an optical drive, follow the steps below and refer to the figure in the preceding section.

1. Fit the **optical drive board** to the rear panel of the **optical drive**.

2. Place the drive in the **main bracket** and secure with **four silver M2×4 screws** (two from each side of the drive).

3. Position the **back bracket plate** and secure with **three black M2×8 screws** and **one silver M2×4 screw**.

4.6   TV Tuner

Disassembling the TV Tuner

To disassemble the TV tuner, first remove the tuner from its module bay, then follow the steps below.

1. Remove **seven M2×8 screws** securing the **TV tuner case**.

2. Lift the lid off the **TV tuner case** and lift out the **TV tuner board** (if appropriate, detach the **TV tuner transfer assembly FPC**).
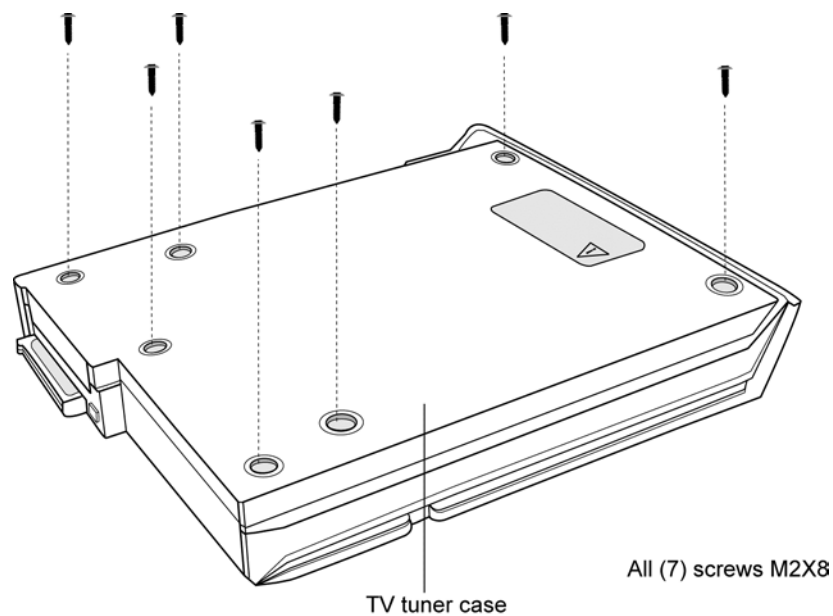
Fig 4-6: Removing the TV tuner case screws

Reassembling the TV Tuner

To reassemble a TV tuner, follow the steps below and refer to the figure in the preceding section.

1. Position the **TV tuner board** in the **TV tuner case** and, if appropriate, attach the **TV tuner transfer assembly FPC**.

2. Secure the lid of the **TV tuner case** with **seven M2×8 screws**.

4.7   Removable HDD

Disassembling the Removable HDD

To disassemble the removable HDD, first remove the drive from its module bay, then follow the steps below.

1. Release the **lid latch** of the **removable HDD container** and open the HDD container lid.

2. Ease the **HDD** out of the container.

Lid latch   Removable HDD container
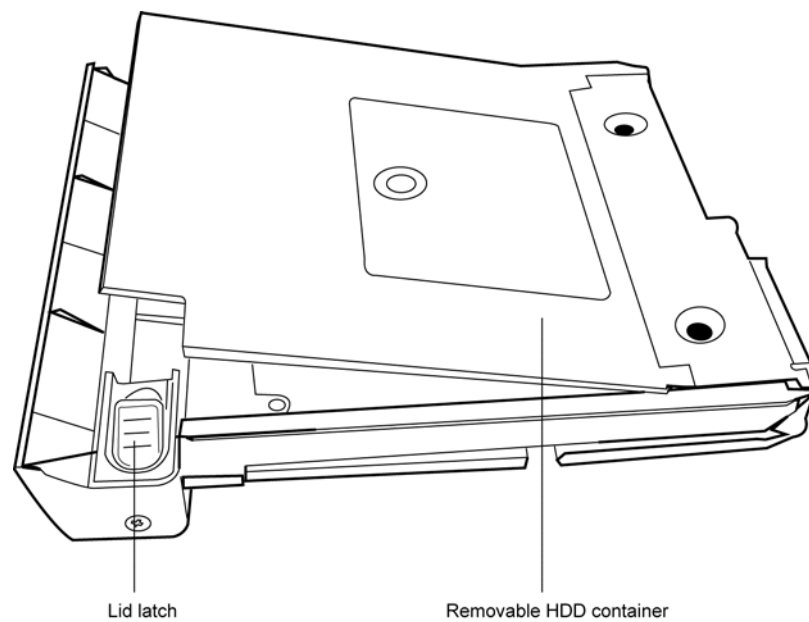
Fig 4-7: Opening the removable HDD container

CAUTION: When handling the HDD, do not press the top surface as shown by the arrow. Hold it by the sides.
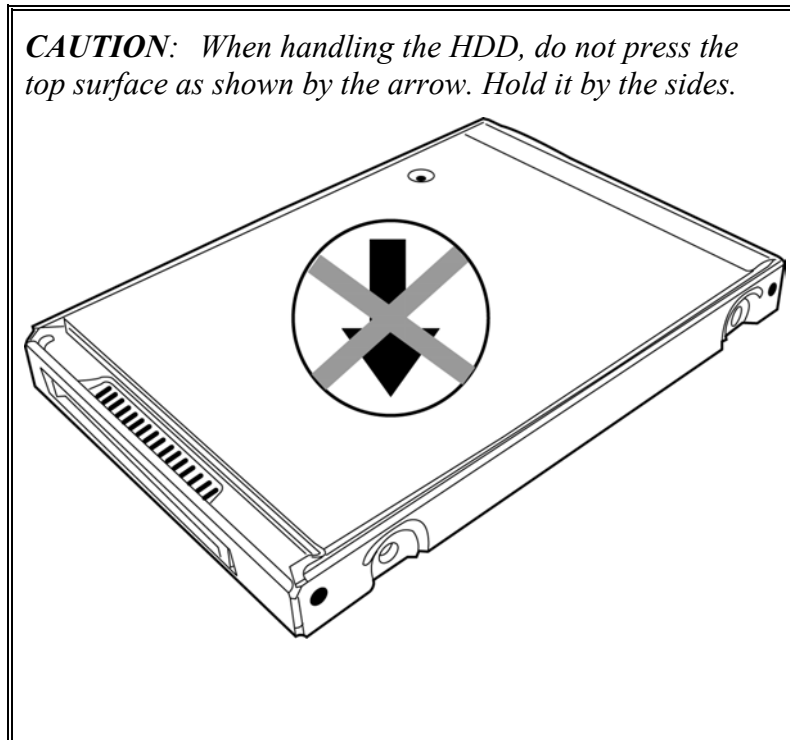
3. Remove the **four M3×3 screws** that secure the **HDD case** to the **HDD**.

4. Lift off the **HDD case**.
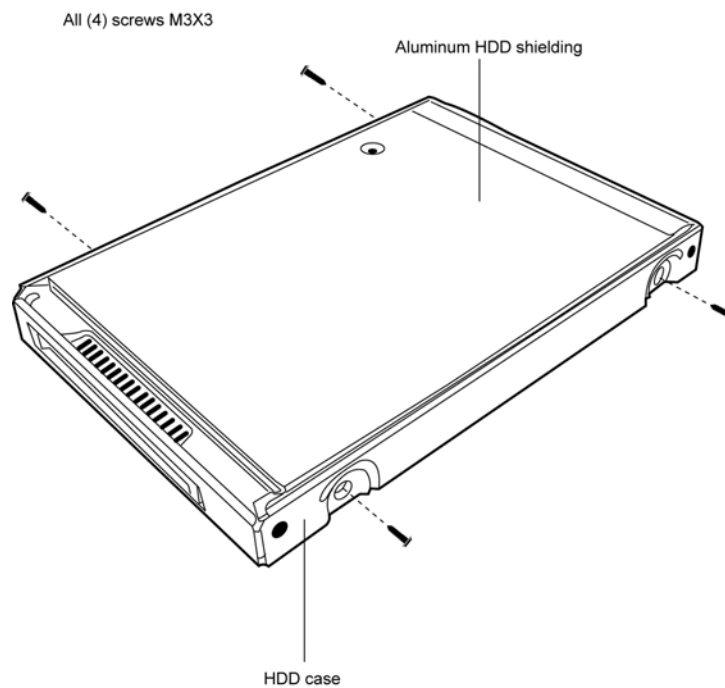
Fig 4-8: Removing the HDD case screws

5. Grasp the **HDD** and peel off the **aluminum HDD shielding**.

6. Gently pull the **HDD connector** off the **HDD**.

Reassembling the Removable HDD

To reassemble the removable HDD, follow the steps below and refer to the figure in the preceding section.

1. Attach the **HDD connector** to the **HDD**.

2. Wrap the **HDD** in the **aluminum HDD shielding** ensuring that the circuit board face of the drive is covered by the black part of the shielding. The circuit board must not come into contact with the silver portion of the shielding.

3. Seat the **HDD** in the **HDD case** and secure with **four M3×3 screws**.

4. Slide the **HDD** into the **HDD container**.

5. Close the **HDD container lid** and lock it with the latch.

4.8   Removable FDD

Disassembling the Removable FDD

To disassemble the removable FDD, first remove the drive from its module bay, then follow the steps below.

1. Remove **two M2.5×4 screws** from each side of the drive and **three M2.5×4 screws** securing the rear panel.

2. Lift off the **FDD bracket**.
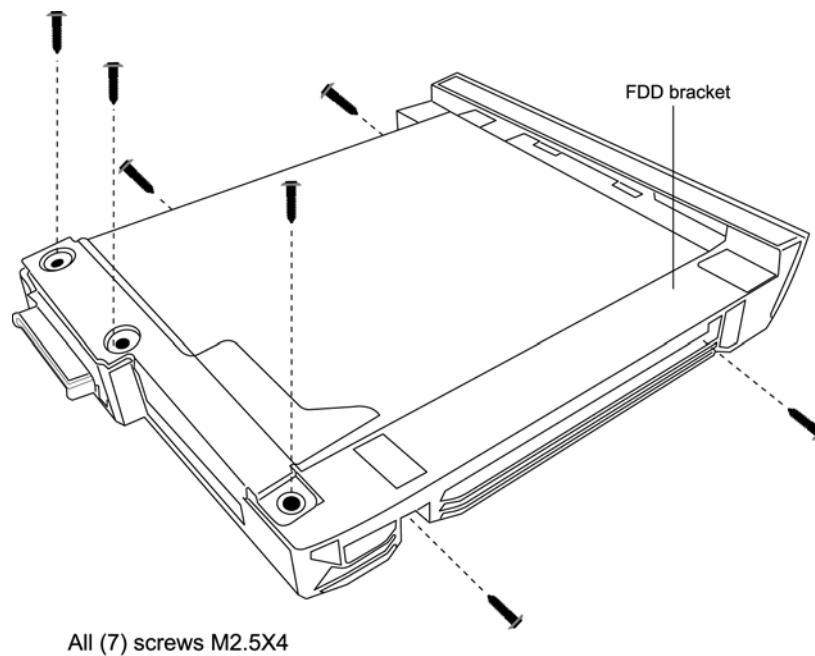
Fig 4-9: Removing the FDD bracket screws

3. Release the **FDD FPC** and remove.

Reassembling the Removable FDD

To reassemble a FDD, follow the steps below and refer to the figure in the preceding section.

1. Attach the **FDD FPC**.

2. Place the **FDD** in the **FDD bracket** and secure with **two M2.5×4 screws** on each side of the drive and **three M2.5x4 screws** on the rear panel.

4.9   Wireless LAN Unit

Removing the Wireless LAN Unit

To remove the **wireless LAN unit**, first remove the battery pack then follow the steps below.

1. Turn the computer upside down and loosen **two embedded screws** securing the **wireless LAN compartment cover**.

2. Lift off the **wireless LAN compartment cover**.
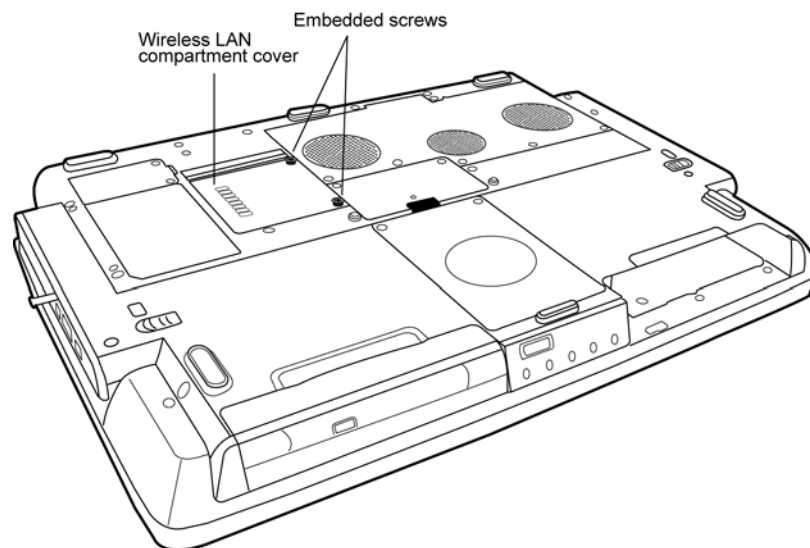
Fig 4-10: Removing the wireless LAN compartment cover

3. Detach the two ends of the **wireless LAN antenna**.

4. Gently press out on the **latches**. One end of the **wireless LAN unit** will pop up.

5. Grasp the **wireless LAN unit** and pull it out.
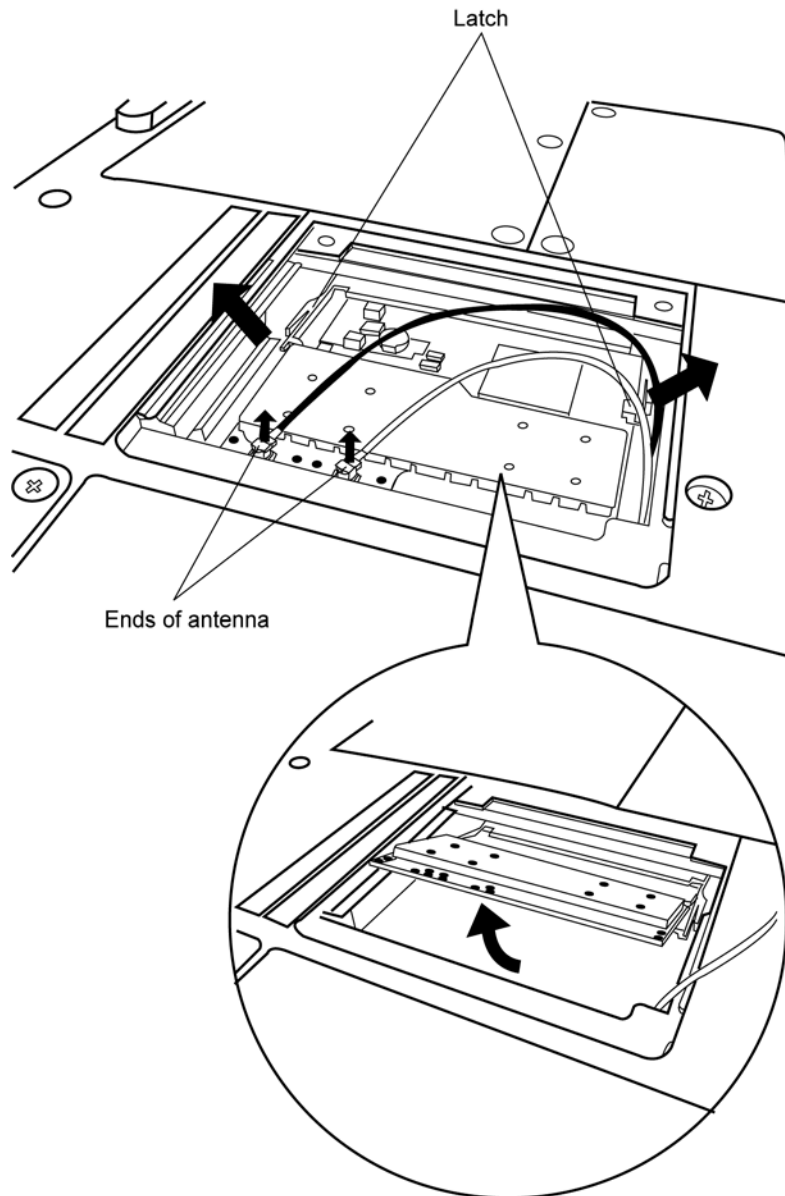
Fig 4-11: Removing the wireless LAN unit

CAUTION: *Do not touch the connectors on the wireless LAN unit or on the computer. Debris on the connectors may cause malfunction.*

Installing the Wireless LAN Unit

To install the wireless LAN unit, follow the steps below and refer to the figures in the preceding section.

1. Turn the computer upside down and loosen **two embedded screws** securing the **wireless LAN compartment cover**.

2. Lift off the **wireless LAN compartment cover**.

3. Fit the **wireless LAN unit's** connectors into the computer's connectors and press carefully to ensure firm contact.

> *CAUTION: Do not touch the connectors on the wireless LAN unit or on the computer. Debris on the connectors may cause malfunction.*

4. Gently, push the **wireless LAN unit** down until the **latches** engage the unit to hold it in place.

5. Attach the ends of the **wireless LAN antenna**. The **black antenna cable** should be attached to the connector nearer the rear side of the computer, the **white antenna cable** to the connector closer to the front panel.

6. Seat the **wireless LAN compartment cover** and secure it with the **two embedded screws**.

4.10 Expansion Memory

Removing the Expansion Memory

To remove the expansion memory, first remove the battery pack, then follow the steps below.

1. Turn the computer upside down.

2. Remove **two embedded screws** securing the **expansion memory cover**.

3. Lift off the **expansion memory cover**.
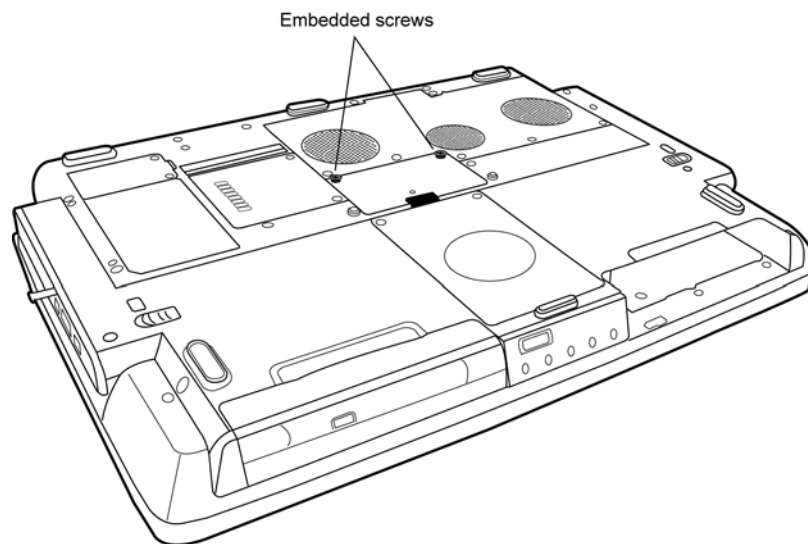
Fig 4-12: Removing the expansion memory cover

4. Gently press out on the **latches**. One end of the **expansion memory** will pop up.

5. Grasp the **expansion memory** and pull it out.
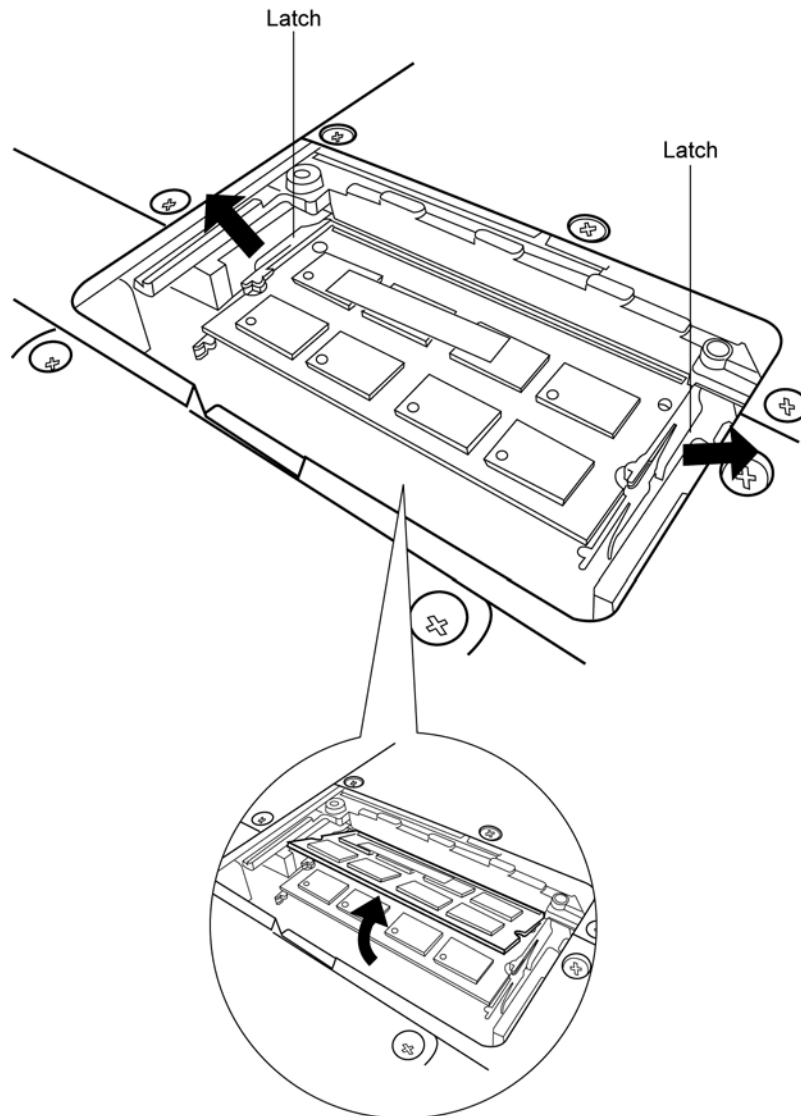
Fig 4-13: Removing the expansion memory

CAUTION*: Do not touch the connectors on the expansion memory or on the computer. Debris on the connectors may cause memory access problems.*

Installing the Expansion Memory

To install the expansion memory, follow the steps below and refer to the figures in the preceding section.

1. Turn the computer upside down.

2. Remove the **two embedded screws** securing the **expansion memory cover**.

3. Lift off the **expansion memory cover**.

4. Fit the **expansion memory**'s connectors into the computer's connectors and press carefully to ensure firm contact.

CAUTION: Do not touch the connectors on the expansion memory or on the computer. Debris on the connectors may cause memory access problems.

5. Gently, push the **expansion memory** down until **latches** on either side engage the **expansion memory** to hold it in place.

6. Seat the **expansion memory cover** in place and secure it with **two embedded screws**.

4.11 Modem / Bluetooth Unit

Optional modem and Bluetooth units occupy the same connector so only one can be fitted at a time. The removal and installation procedures are the same for both.

Removing the Modem / Bluetooth Unit

To remove the installed modem or Bluetooth unit, first remove the battery pack, then follow the steps below.

1. Turn the computer upside down.

2. Remove **two embedded screws** securing the **modem / Bluetooth unit cover**.

3. Lift off the **modem / Bluetooth unit cover**.
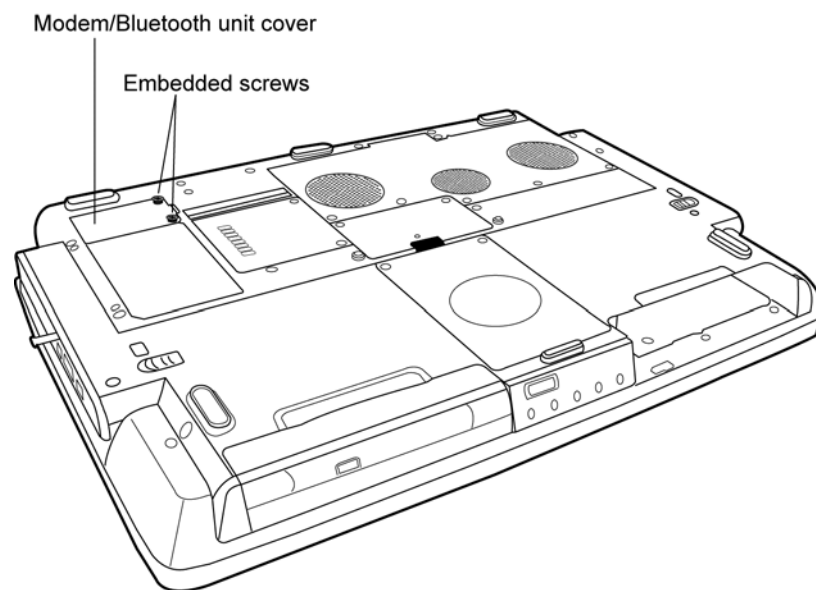
Fig 4-14: Removing the modem / Bluetooth unit cover

4. Remove **two M2.5×3 screws** securing the **modem / Bluetooth unit**.
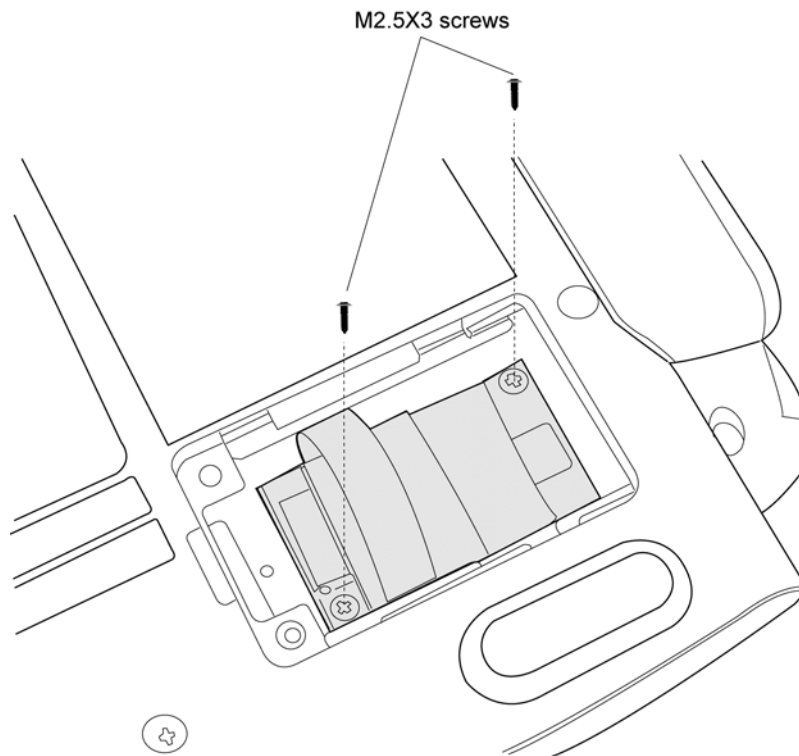
Fig 4-15: Removing the modem / Bluetooth unit screws

5. Carefully lift the unit off its connector.

6. If a **modem** is being removed, disconnect its **power cable** from the **system board**. If a **Bluetooth unit** is being removed, disconnect its **FPC cable** from the **system board**.

Installing the Modem / Bluetooth Unit

To install a modem or Bluetooth unit, follow the steps below and refer to the figures in the preceding section.

1. Turn the computer upside down.

2. Remove **two embedded screws** securing the **modem / Bluetooth unit cover**.

3. Lift off the **modem / Bluetooth unit cover**.

4. If a **modem** is being fitted, connect the **power cable**.
   If a **Bluetooth unit** is being fitted, connect the **FPC cable**.

5. Fit the **modem / Bluetooth unit** onto its connector and secure with **two M2.5×3 screws**.

6. Replace the **modem / Bluetooth unit cover** and secure with **two embedded screws**.

4.12 CPU

Removing the CPU

To remove the CPU, first remove the battery pack, then follow the steps below.

1. Turn the computer upside down and remove **five embedded security screws** securing the **CPU compartment cover**. Remove the **CPU compartment cover**.
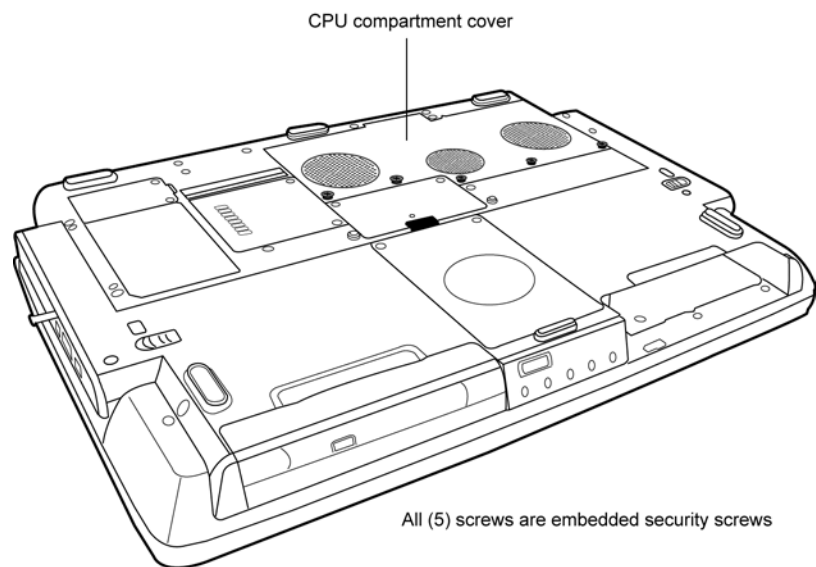
Fig 4-16: Removing the CPU compartment cover

2. Remove **four screws** securing the **heat sink**.

3. Lift off the **heat sink**. In the event that the heat sink is stuck to the CPU, insert a small flathead screwdriver into the **hole** on the heat sink to gently lever it off).
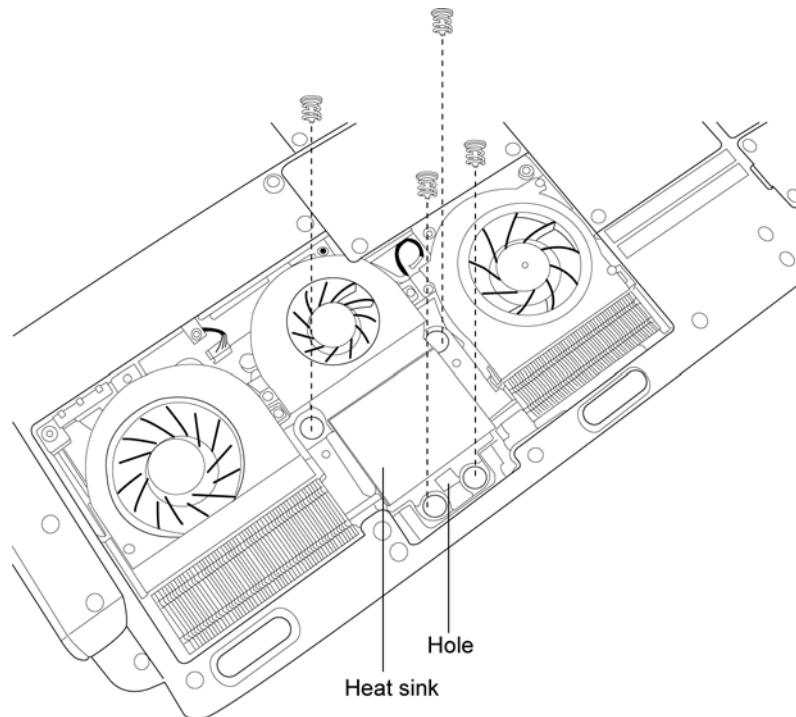
Fig 4-17: Removing the heat sink

CAUTION: *If you remove the heat sink, you should use the CPU grease tool to remove the grease on the CPU and heat sink. Reapply fresh grease before replacing the heat sink.*

4. Turn the **cam** on the **CPU socket** with a flat-blade screwdriver so that the notch on the **cam** is aligned with the *open* side of the **CPU socket** to unlock the **CPU**.
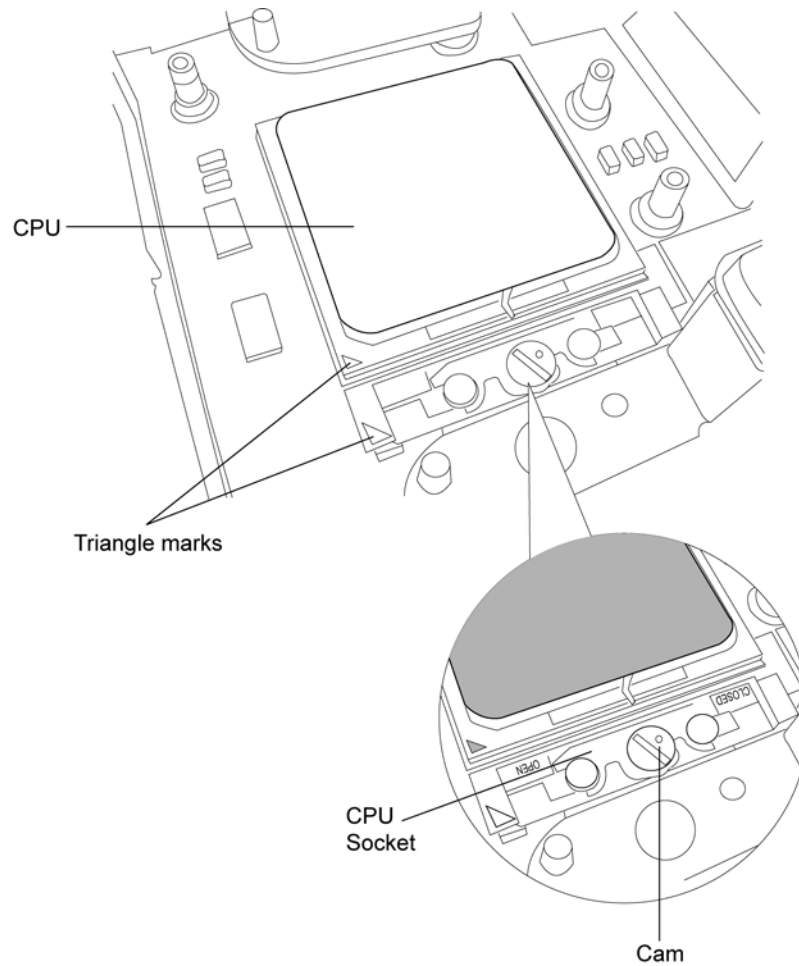
Fig 4-18: Removing the CPU

5. Gently lift out the **CPU**.

Installing the CPU

To install the CPU, follow the steps below and refer to the figures in the preceding section.

CAUTION: *If you remove the heat sink, you should use the CPU grease tool to remove the grease on the CPU and heat sink. Reapply fresh grease before installing the heat sink.*

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1. Make sure that the notch on the **cam** is aligned with the *open* position.

2. Seat the **CPU** to align the triangle mark on the **CPU** with the one on the **CPU socket**. Make sure the alignment is exact to avoid damaging pins on the **CPU**.

3. Press the **CPU** softly with your fingers and turn the **cam** on the **CPU socket** to the *closed* position with a flat-blade screwdriver to secure the **CPU**.

4. Seat the **heat sink** over the **CPU** and secure with four screws in the order indicated on the heat sink (1,2,3,4).

5. Secure the **CPU compartment cover** with the **five embedded security screws**.

4.13 HDD

CAUTION: When handling the HDD, do not press the top surface as shown by the arrow. Hold it by the sides.
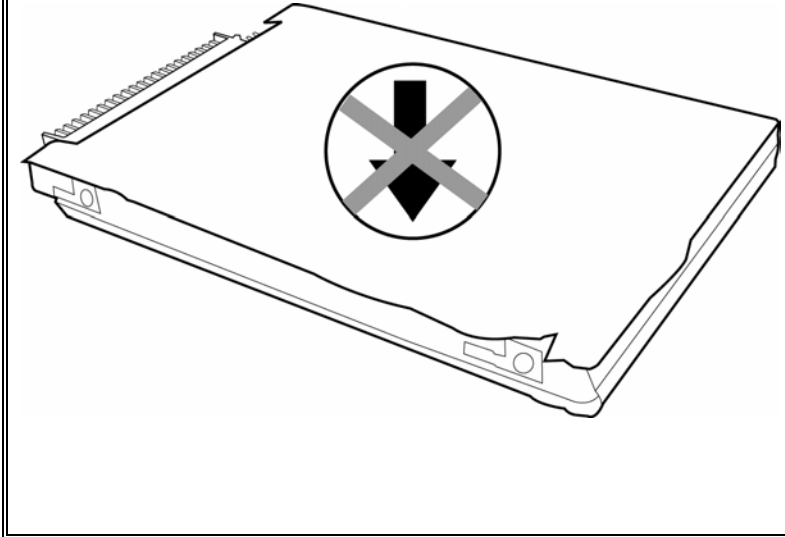
Removing the HDD

To remove the HDD, first remove the battery pack, then follow the steps below.

1. Turn the computer upside down.

2. Remove **two M2.5×4 black screws** securing the HDD and lift out the **HDD unit**.
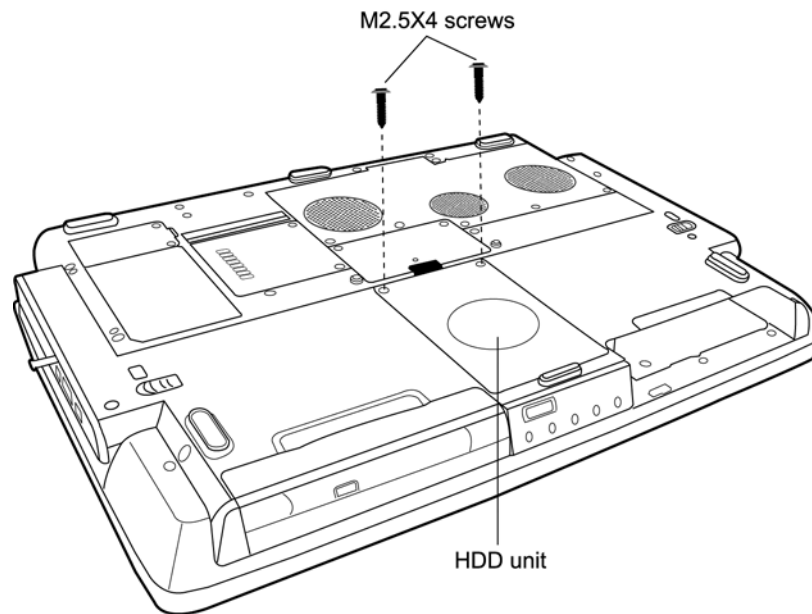

Fig 4-19: Removing the HDD unit cover screws

NOTE: *It is not necessary to remove the HDD case unless you are going to replace the HDD.*

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3. Remove the **four M3×3 screws** that secure the **HDD case** to the **HDD**.
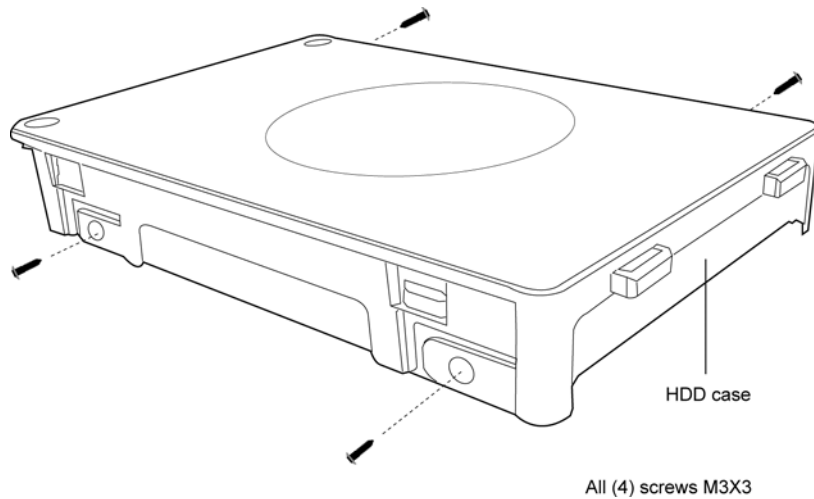
Fig 4-20: Removing the HDD unit case screws

4. Lift off the **HDD case**.

5. Grasp the **HDD** at the side and peel off the **aluminum HDD shielding**.

6. Gently pull the **HDD connector** off the **HDD**.
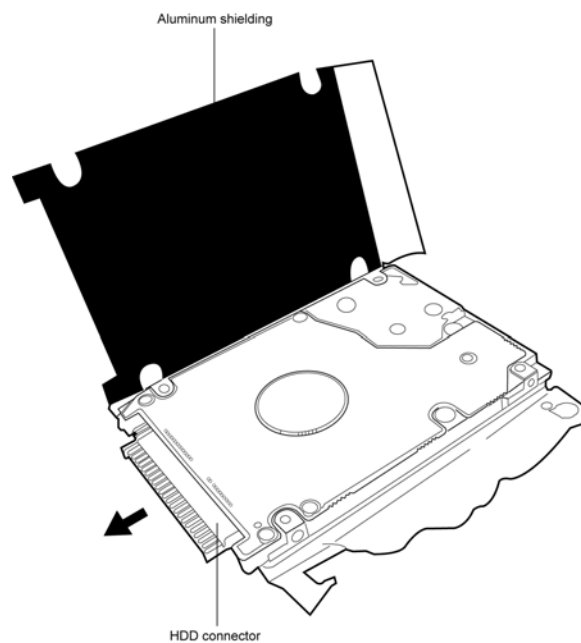
Fig 4-21: Removing the aluminum HDD shielding and connector

Installing the HDD

To install the HDD, follow the steps below and refer to the figures in the preceding section.

1. Slide the **HDD connector** firmly into place on the **HDD**, being careful not to damage the connector pins.

2. Wrap the **HDD** in the **HDD shielding** ensuring that the circuit board face of the drive is covered by the black part of the shielding. The circuit board must not come into contact with the silver portion. .

3. Seat the **HDD** in the **HDD case** and secure with **four M3×3 screws**.

4. Seat the **HDD unit** in the HDD slot and secure it with **two M2.5×4 black screws**.

4.14 Keyboard

Removing the Keyboard

To remove the keyboard, first remove the battery pack, then follow the steps below.

1. Open the **display panel**.

2. Insert a thin tool into each of the narrow holes in the **strip cover** and lever the **strip cover** up to release its latches.
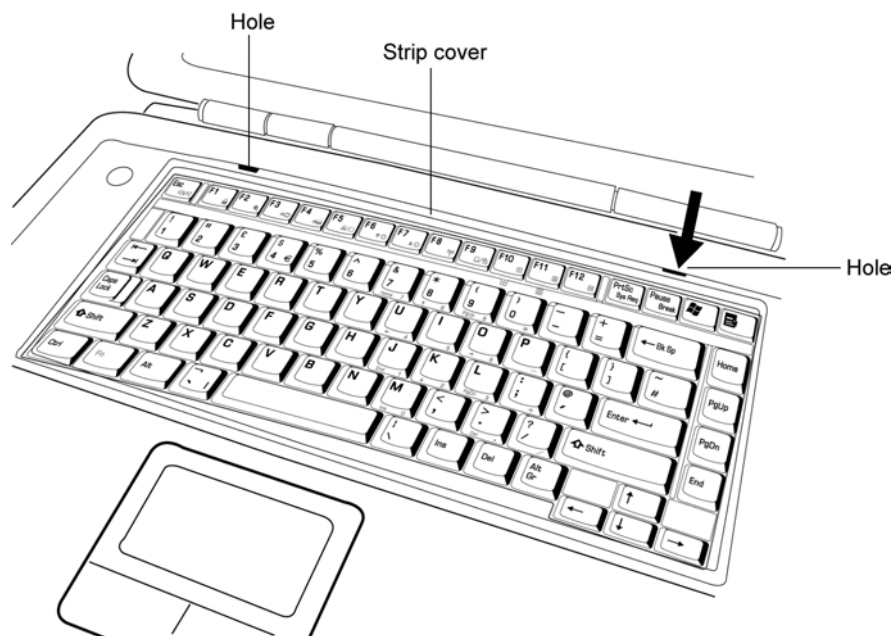

Fig 4-22: Removing the strip cover

3. Remove **two M2.5×3 silver screws** securing the **keyboard**.

4. Lift the **keyboard** out and place over the display hinges, revealing the keyboard cable.

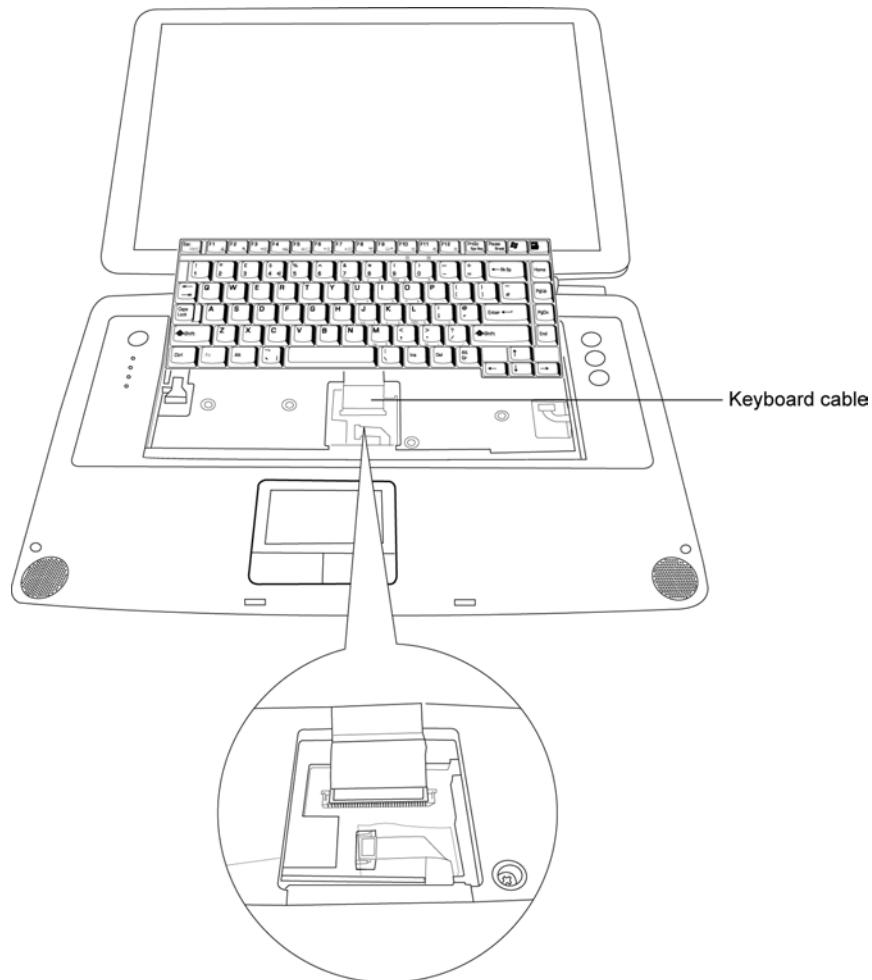5. Disconnect the **keyboard cable** and remove the **keyboard**.

Fig 4-23: Removing keyboard cable and keyboard

Installing the Keyboard

To install the keyboard, follow the steps below and refer to the figures in the preceding section.

1. Connect the **keyboard cable** to the system board.

2. Set the keyboard in place and secure it with **two M2.5×3 silver screws**.

3. Seat the **strip cover** and press down to ensure the strip cover latches engage, locking it in place.

4.15 Top Cover

Removing the Top Cover

To remove the top cover, first remove the battery pack, then follow the steps below.

1. Remove the **keyboard**, **HDD** and **main module**.

2. Remove **seven M2.5×6 screws** from the keyboard tray securing the **top cover**.

3. Detach the following three cables:
   - LED / power button board FPC
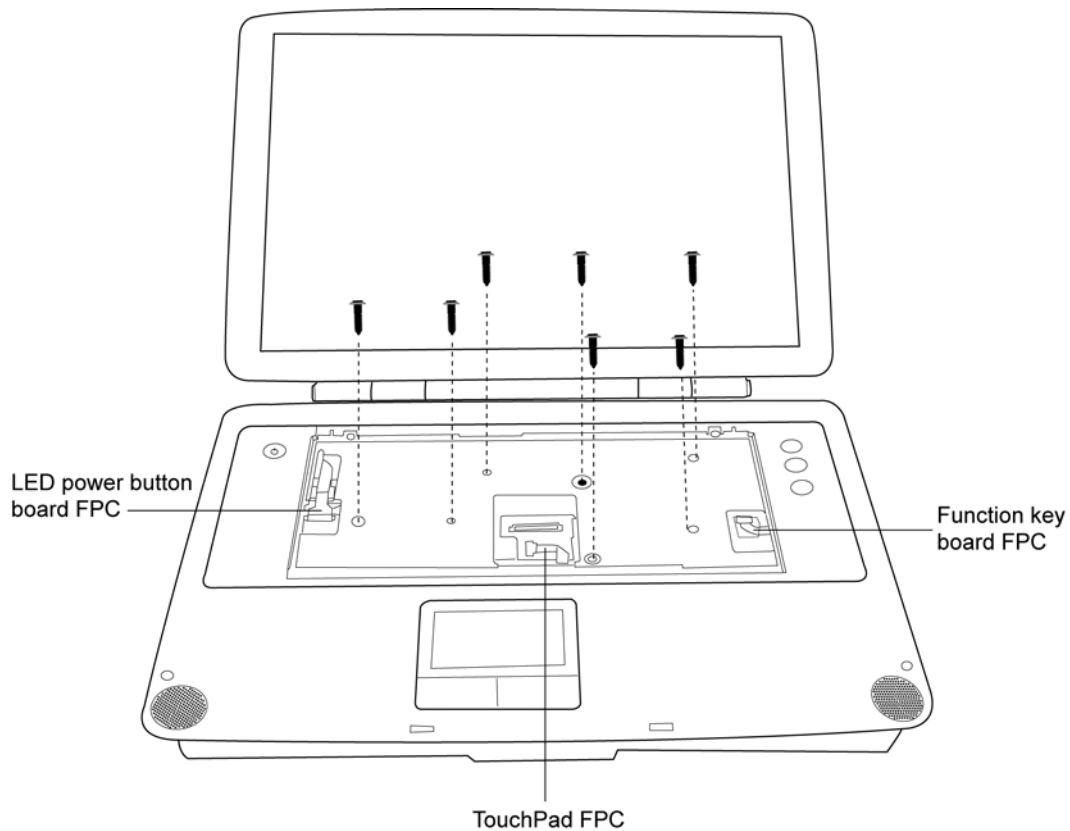   - Function key board FPC
   - TouchPad FPC

Fig 4-24: Removing the top cover screws and cables

4. Turn the computer upside down and remove the following **sixteen screws**:
   - Three M2.5×3 silver screws
   - Two M2.5×4 black screws
   - Five M2.5×6 black screws
   - Six M2.5×14 black screws

Fig 4-25: Removing the screws from the computer underside

5. Turn the computer upright, open the display cover and lift off the **top cover**.

Installing the Top Cover

To install the top cover, follow the steps below and refer to the figures in the preceding section.

1. Seat the **top cover** and secure the following three cables:
   - LED / power button board FPC
   - Function key board FPC
   - TouchPad FPC

2. Secure the top cover with **seven M2.5×6 screws**.

3. Turn the computer upside down and secure the following **sixteen screws**:
   - Three M2.5×3 silver screws
   - Two M2.5×4 black screws
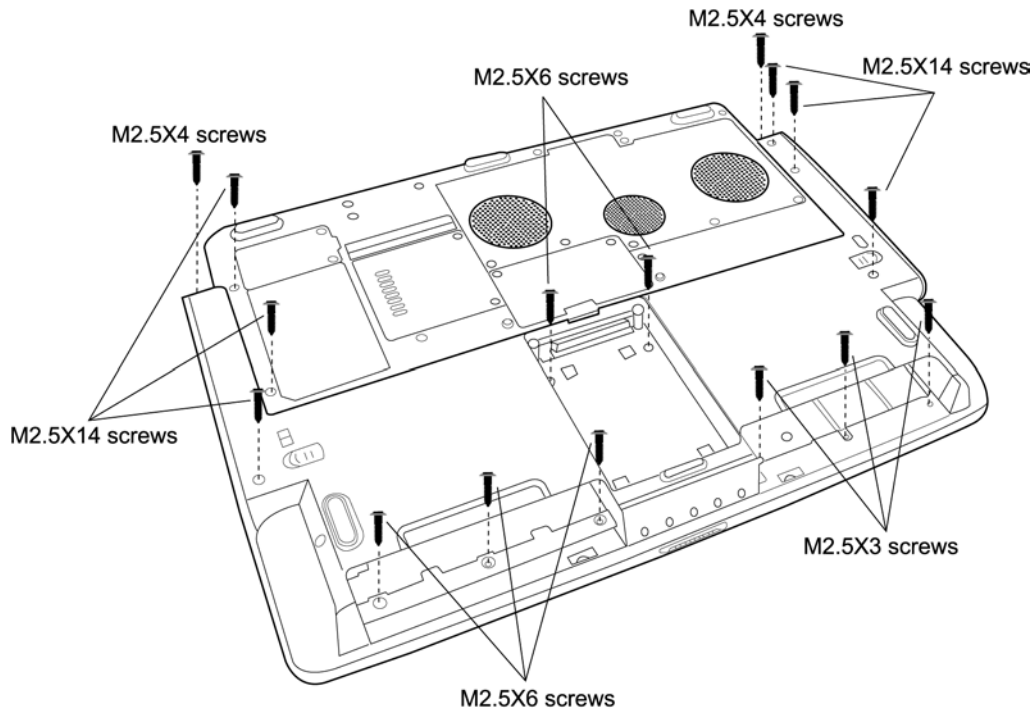   - Five M2.5×6 black screws
   - Six M2.5×14 black screws

4.16 Function Key Board

Removing the Function Key Board

To remove the Function Key Board, first remove the battery pack, then follow the steps below.

1. Remove the **keyboard**, **HDD**, **main module** and **top cover**.

2. Place the **top cover** face down.

3. Remove **two M2.5×3 silver screws** securing the **function key board**. Remove **function key board**.
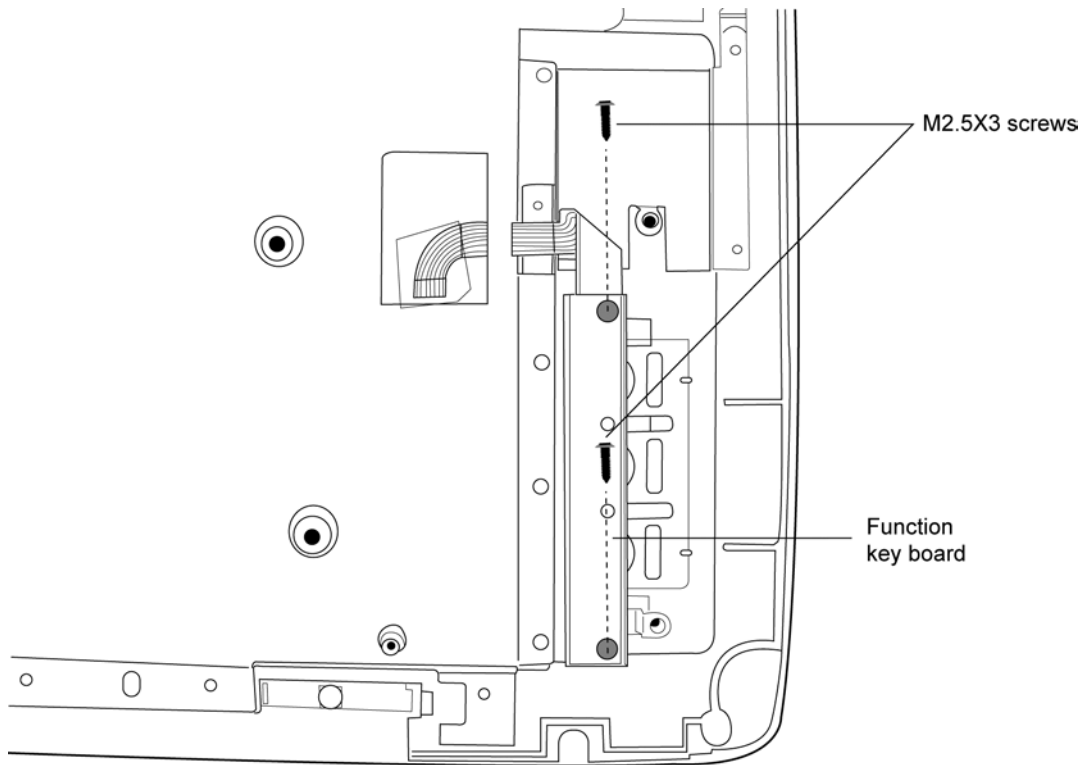
Fig 4-26: Removing the function key board

Installing the Function Key Board

To install the Function Key Board, follow the steps below and refer to the figure in the preceding section.

1. Feed the **function key board FPC** through the top cover.

2. Position the **function key board** and secure with **two M2.5×3 silver screws**.

4.17 LED / Power Button Board

Removing the LED / Power Button Board

To remove the LED / Power Button Board, first remove the battery pack, then follow the steps below.

1. Remove the **keyboard**, **HDD**, **main module** and **top cover**.

2. Place the **top cover** face down.

3. Remove **four M2.5×3 silver screws** securing the **LED / power button board**. Remove **LED / power button board**.
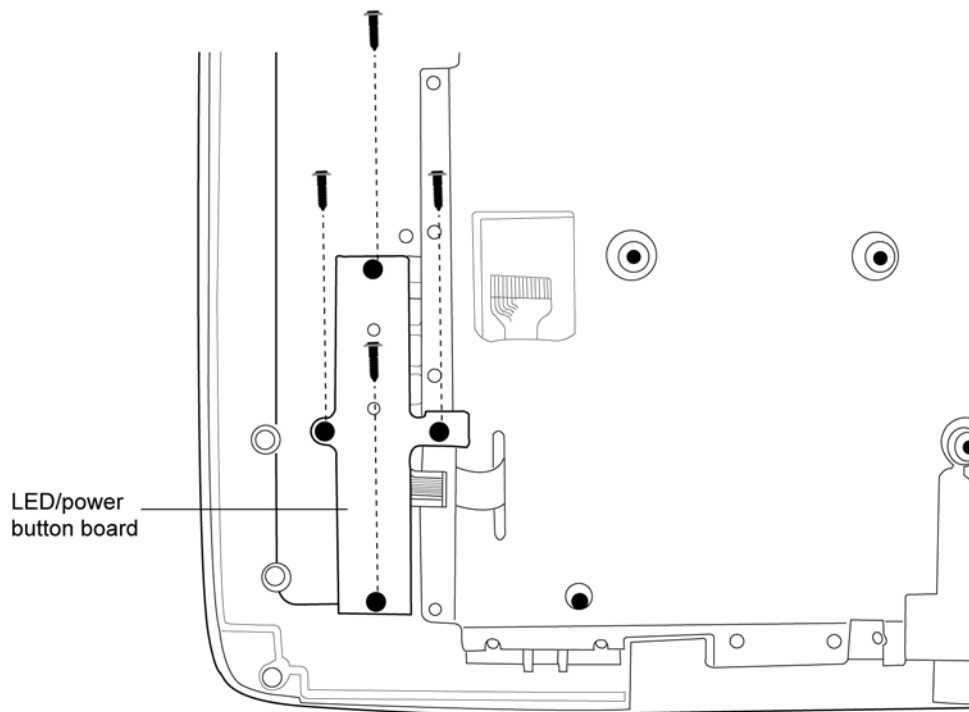

Fig 4-27: Removing the LED/power button board

Installing the LED / Power Button Board

To install the LED / Power Button Board, follow the steps below and refer to the figure in the preceding section.

1. Feed the **LED / power button board FPC** through the top cover.

2. Position the **LED / power button board** and secure with **four M2.5×3 silver screws**.

4.18 TouchPad

Removing the TouchPad

To remove the TouchPad, first remove the battery pack, then follow the steps below.

1. Remove the **keyboard**, **HDD**, **main module** and **top cover**.

2. Place the **top cover** face down.

3. Disconnect the **TouchPad board FPC cable** from both the **TouchPad button board** and the **TouchPad**.

4. Remove **five M2.5×3 silver screws** securing the **TouchPad cover**.

5. Lift out the **TouchPad cover** followed by the **TouchPad**.

6. If you need to replace the **TouchPad button board**, remove **two M2.5×3 silver screws** securing it, then lift it out.
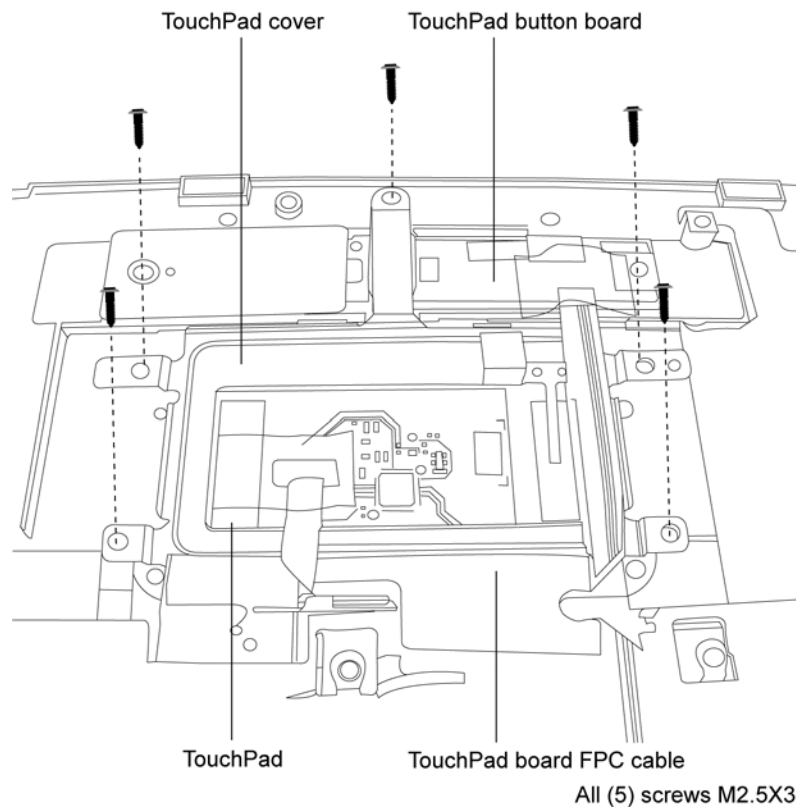
Fig 4-28: Removing the TouchPad button board

Installing the TouchPad

To install the TouchPad, follow the steps below and refer to the figure in the preceding section.

1. With the **top cover** upside down, place the **TouchPad** and **TouchPad Button Board** in position. Secure the **TouchPad Button Board** with **two M2.5×3 silver screws**.

2. Position the **TouchPad cover** and secure with **five M2.5×3 silver screws**.

3. Connect the **TouchPad board FPC cable** to both the **TouchPad button board** and the **TouchPad**.

4.19 Display Assembly

Removing the Display Assembly

To remove the display assembly, first remove the battery pack, then follow the steps below.

1. Turn the computer upside down and loosen **two embedded screws** securing the **wireless LAN compartment cover**.

2. Lift off the **wireless LAN compartment cover**.
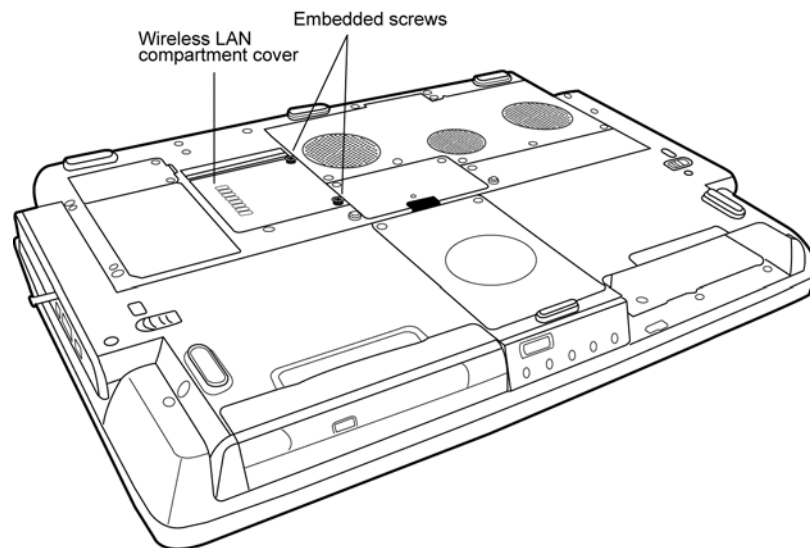
Fig 4-29: Removing the wireless LAN compartment cover

3. Detach the two ends of the **wireless LAN antenna**.

4. Remove the **keyboard**, **HDD**, **main module** and **top cover**.

5. Feed the **wireless LAN antenna** through the **system board**.

6. Remove **two M2×4 screws** from the rear of the hinges and two **M2.5×6 screws** from the **I/O cover**.
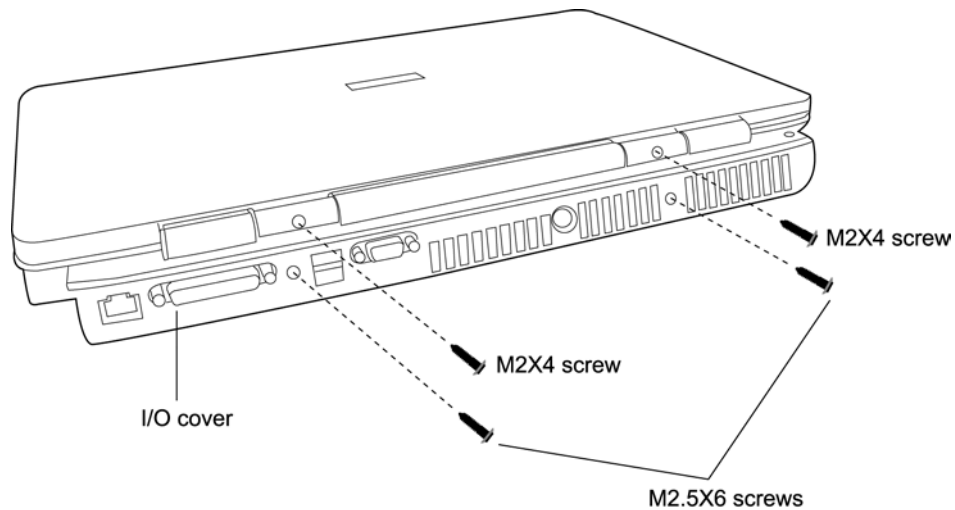
Fig 4-30: Removing the wireless LAN compartment cover

7. Remove **one m2.5×12 screw** securing the left end of the hinge cover and **one m2.5×3 silver screw** securing the right end.

8. Lift off the **hinge cover**.
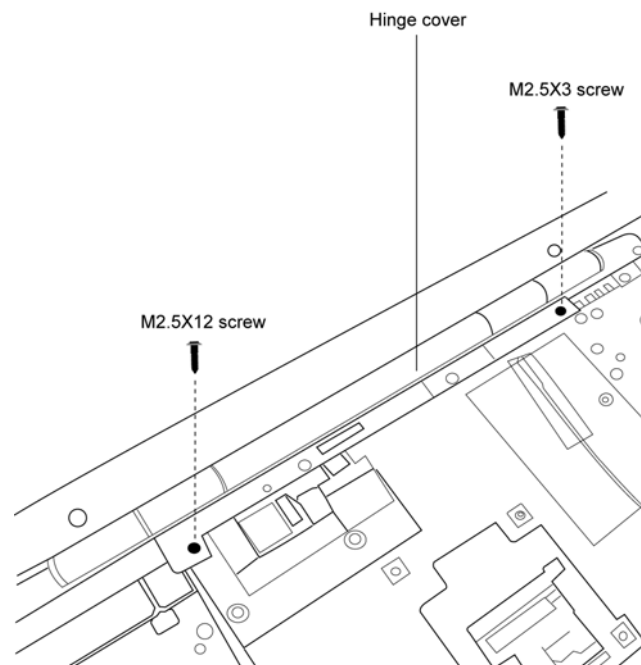
Fig 4-31: Removing the hinge cover

9. Remove **two M2.5×6 screws** from the hinges and release the **display cable**.

10. Pull on the attached handle to detach the **display cable** from the **system board**.

11. Lift the **display assembly** off the computer chassis.

Installing the Display Assembly

To install the display assembly, follow the steps below and refer to the figures in the preceding section.

1. Seat the display assembly taking care not to crush to the **LCD display cable** or **wireless LAN antenna**.

2. Feed the **wireless LAN antenna** through the system board into the **wireless LAN compartment**.

3. If a **wireless LAN card** is installed, remove the **wireless LAN compartment cover** and attach the ends of the **wireless LAN antenna** to the card. The **black antenna cable** should be attached to the connector nearer the rear side of the computer, the **white antenna cable** to the connector closer to the front panel.

4. Secure the hinges with **two M2.5×6 screws**. Use the same screw to secure the **display cable** to the left side hinge.

5. Attach the **display cable** to its connector on the **system board**.

6. Seat the **hinge cover** and secure its top-side with **one m2.5×12 screw** at the left end and **one m2.5×3 silver screw** at the right end.

7. Secure the **hinge cover** with **one M2×4 screw** at the rear of the each hinge.

8. Secure the display assembly with two **M2.5×6 screws** on the **I/O cover**.

4.20 System Board

Removing the System Board

To remove the system board, first remove the battery pack, then follow the steps below.

1. Turn the computer upside down and remove **five embedded security screws** securing the **CPU compartment cover**. Remove the **CPU compartment cover**.
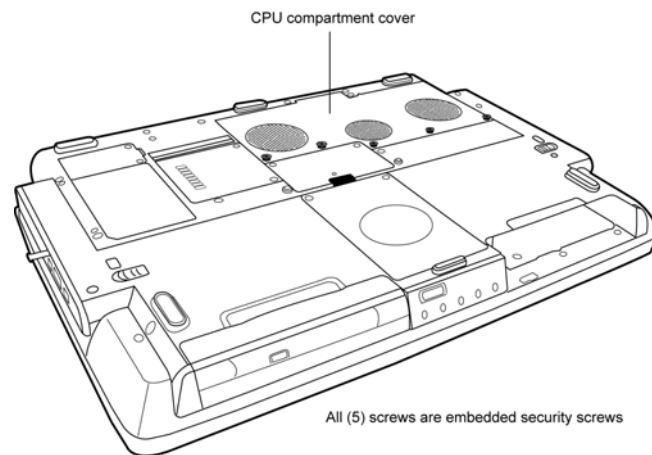
Fig 4-32: Removing the CPU compartment cover

2. Disconnect the **three fan cables**.
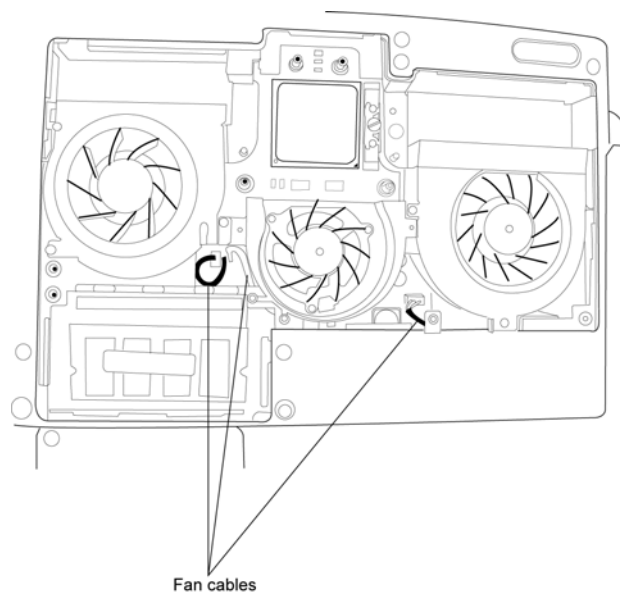
Fig 4-33: Removing the fan cables

3. Remove the **keyboard**, **HDD**, **main module, CPU, modem** or **Bluetooth unit**, **expansion memory cards**, **wireless LAN cards**, **PC card(s), top cover** and **display assembly**.

4. Remove **nine M2.5×4 screws** securing the **low I/O cover** (five from the top, two from the rear, and two from the base).

5. Remove the **four hexagonal port screws**.
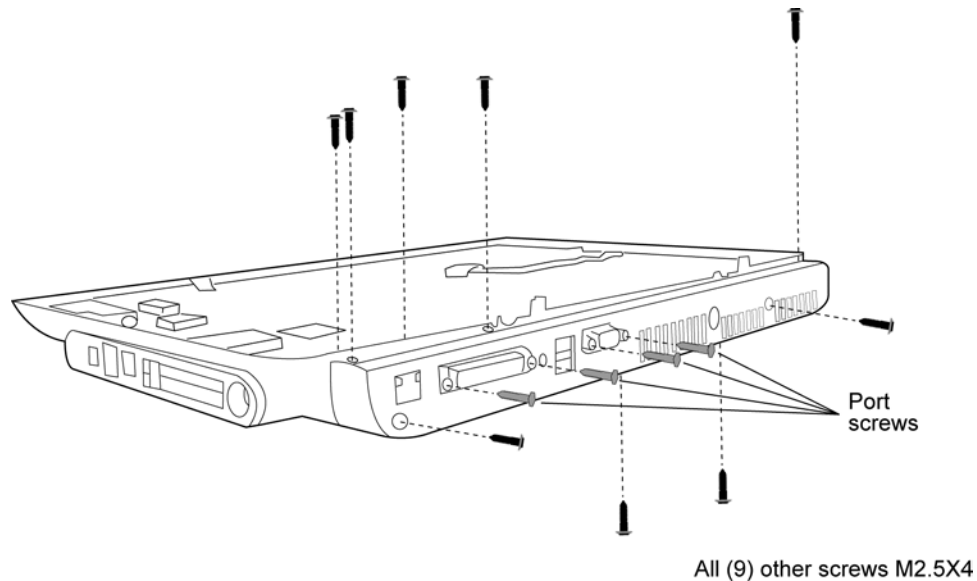
Fig 4-34: Removing the hexagonal port screws

6. Remove the **low I/O cover**.

7. Remove the **three M2.5×6 screws** securing the **system board** to the computer chassis.

8. Detach the following **five cables** from the system board:
    - Right-side speaker cable
    - Direct play LED FPC cable
    - CIR FFC cable
    - Direct play button FFC
    - Audio board FFC cable
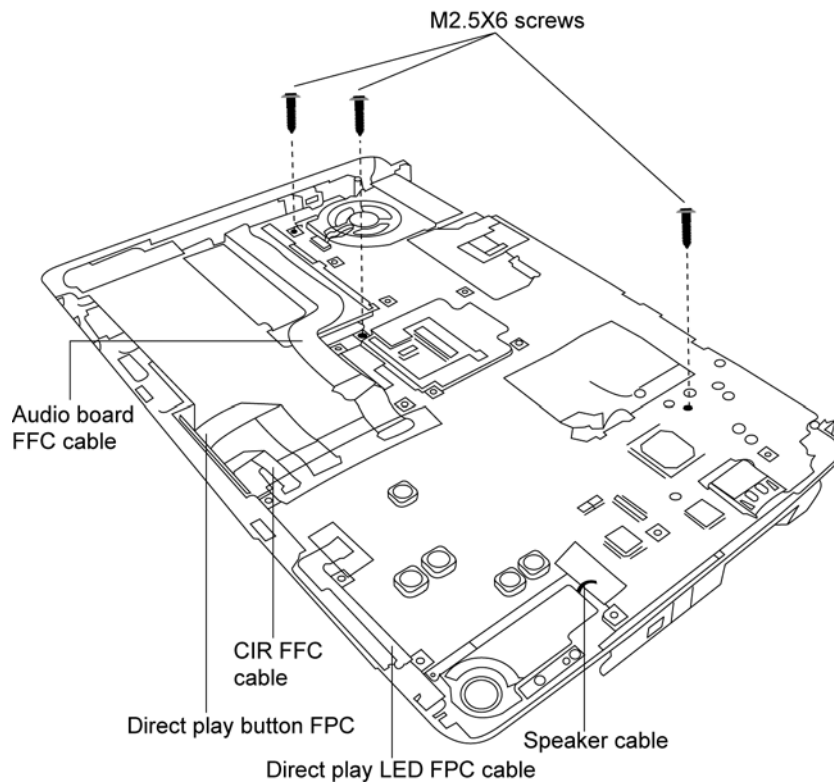
Fig 4-35: Removing the system board screws and cables

Installing the System Board

To install the system board, follow the steps below and refer to the figures in the preceding section.

1. Seat the **system board** and secure with **three M2.5×6 screws**.

2. Secure the following **five cables** to the system board:
    - Right-side speaker cable
    - Direct play LED FPC cable
    - CIR FFC cable
    - Direct play button FFC
    - Audio board FFC cable

3. Position the **low I/O cover**.

4. Secure the parallel port and external monitor port with **two hexagonal port screws** each.

5. Secure the **low I/O cover** with **nine M2.5×4 screws** (five to the top, two to the rear, and two to the base).

6. Replace the other removed FRUs - **keyboard**, **HDD**, **main module, CPU, modem or Bluetooth unit**, **expansion memory cards**, **wireless LAN cards**, **PC card(s)** and **top cover**- remembering to reattach the three fan cables.

4.21 Direct Play Button Board

Removing the Direct Play Button Board

To remove the direct play button board, first remove the battery pack, then follow the steps below.

1.   Remove the **keyboard**, **HDD**, **main module** and **top cover**.

2.   Release the **direct play button FFC** from the **system board**.

3.   Remove **two M2.5×6 screws** securing the **direct play cover assembly**.

4.   Ease the **direct play cover assembly** forward through the front panel.
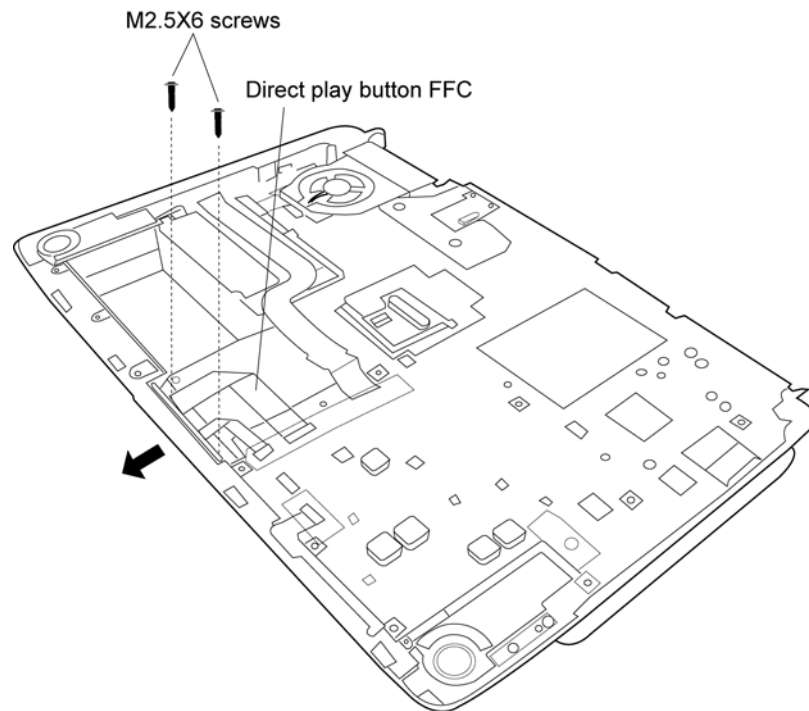
Fig 4-36: Removing the Direct Play cover assembly

5.   Remove **one M2×3 screw** securing the **direct play button board**.

6.   Remove **two M2×3 screws** securing the **button board** to the **bracket**. Lift off the **button board**.

Installing the Direct Play Button Board

To install the direct play button board, follow the steps below and refer to the figure in the preceding section.

1. Secure the **direct play button board** to the **bracket** with **two M2×3 screws**.

2. Secure the combined unit to the **direct play cover assembly** with **one M2×3 screw**.

3. Seat the **direct play cover assembly** and secure with **two M2.5×6 screws**.

4. Attach the **direct play button FFC** to the **system board**.

4.22 CIR Board

Removing the CIR Board

To remove the CIR board, first remove the battery pack, then follow the steps below.

1. Remove the **keyboard**, **HDD**, **main module** and **top cover**.

2. Release the **CIR FFC** and **direct play button FFC** from the **system board**.

3. Remove **two M2.5×6 screws** securing the **direct play cover assembly**.

4. Ease the **direct play cover assembly** forward through the front panel.

5. Remove **one M2.5×6 screw** securing the **CIR board**. Lift out the **CIR board**.
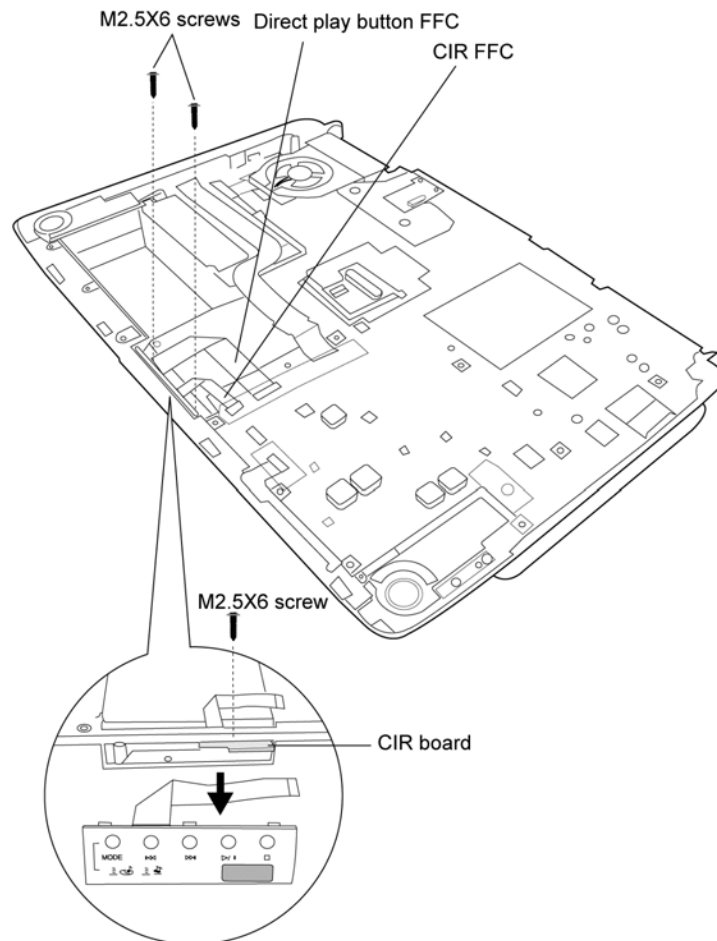
Fig 4-37: Removing the CIR board

Installing the CIR Board

To install the CIR board, follow the steps below and refer to the figure in the preceding section.

1. Seat the **CIR board** and secure with **one M2.5×6 screw**.

2. Seat the **direct play cover assembly** and secure with **two M2.5×6 screws**.

3. Attach the **CIR FFC** and **direct play button FFC** to the **system board**.

4.23 Direct play LED board

Removing the Direct Play LED Board

To remove the direct play LED board, first remove the battery pack, then follow the steps below.

1. Remove the **keyboard**, **HDD**, **main module** and **top cover**.

2. Release the **direct play LED FPC** from the **system board**.

3. Peel the **direct play LED board** off the chassis and lift out.
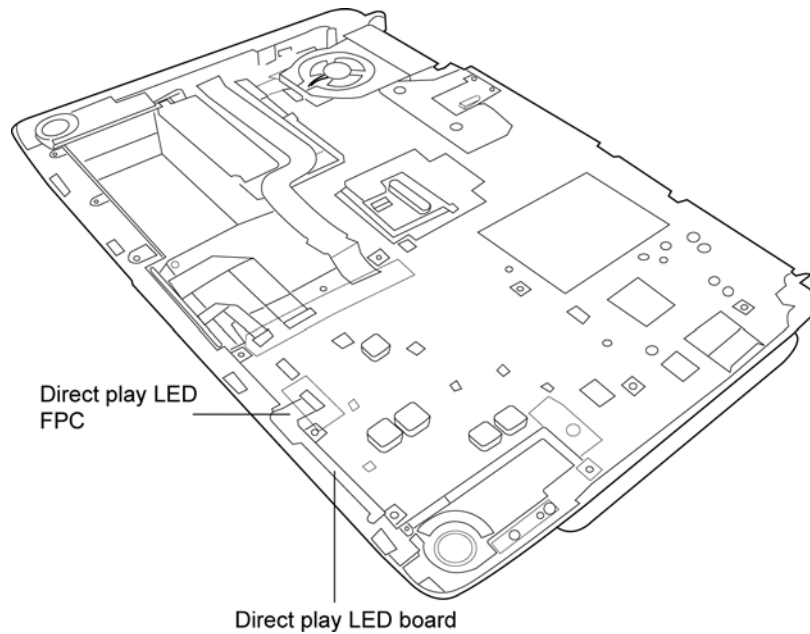
Fig 4-38: Removing the direct play LED board

Installing the Direct Play LED Board

To install the direct play LED board, follow the steps below and refer to the figure in the preceding section.

1. Stick the **direct play LED board** to the tape on the chassis.

2. Secure the **direct play LED FPC** to the **system board**.

4.24 Audio Board

Removing the Audio Board

To remove the audio board, first remove the battery pack, then follow the steps below.

1. Remove the **keyboard**, **HDD**, **main module** and **top cover**.

2. Detach the left-side **speaker cable** and **audio board FFC cable** from the **audio board**.

3. Remove **two M2.5×6 screws** securing the audio board.
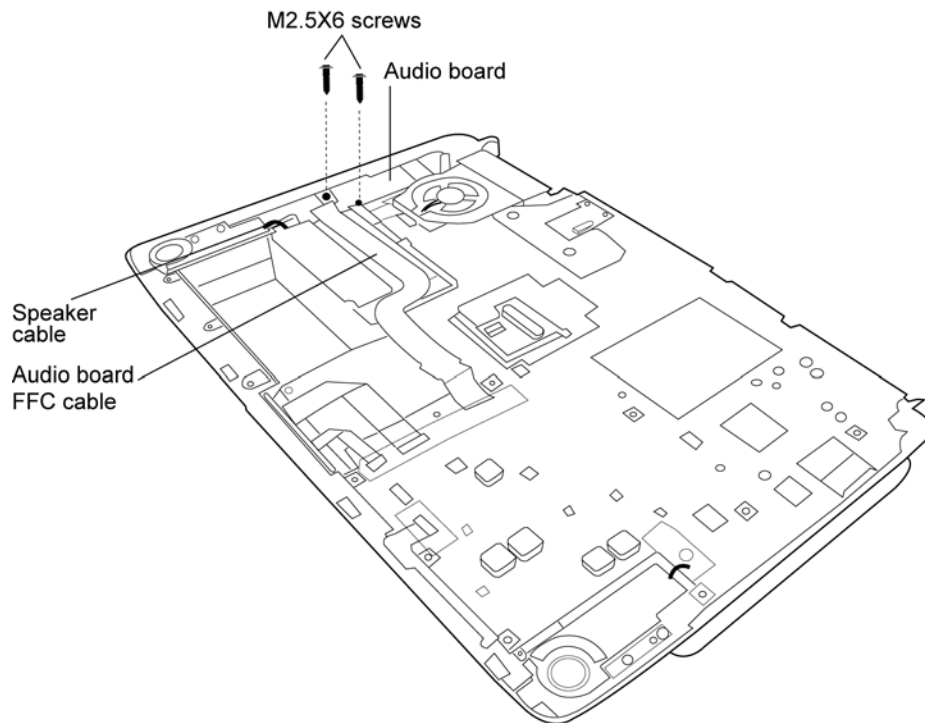
Fig 4-39: Removing the audio board screws

Installing the Audio Board

To install the audio board, follow the steps below and refer to the figure in the preceding section.

1. Seat the **audio board** and secure with **two M2.5×6 screws**.

2. Attach the left-side **speaker cable** and **audio board FFC cable**.

4.25 Speakers

Removing the Speakers

To remove the speakers, first remove the battery pack, then follow the steps below.

1. Remove the **keyboard**, **HDD**, **main module** and **top cover**.

2. Turn the computer upside down and remove **one M2.5×4 screw** securing each **speaker**.
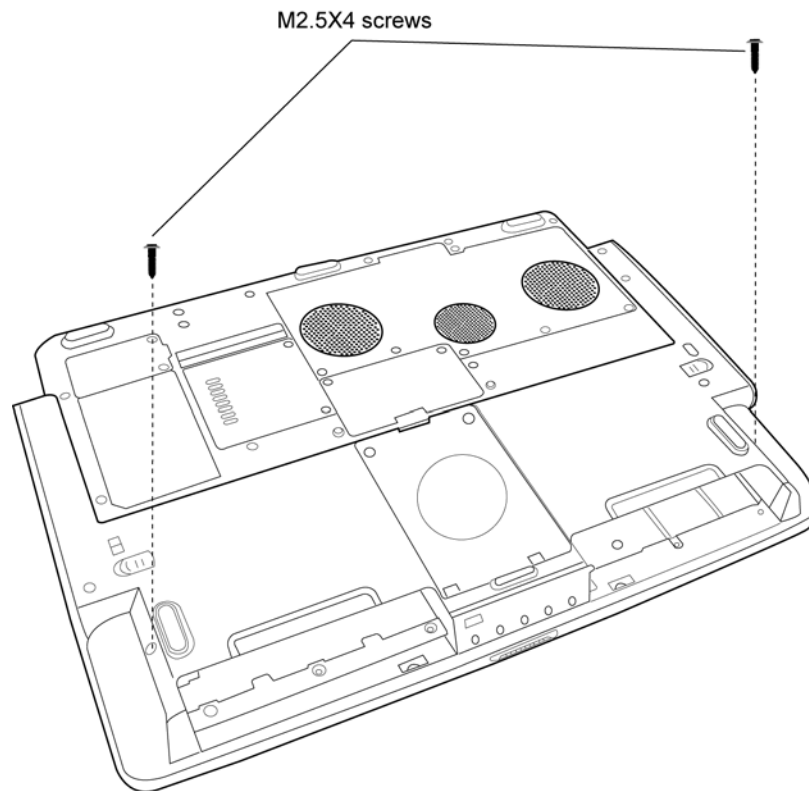
Fig 4-40: Removing the speaker screws

3. Place the chassis upright. Detach the left-side **speaker cable** from the **audio board**
    and the right-side **speaker cable** from the **system board**.

4. Remove **two M2.5×4 screws** securing each **speaker**.

5. Lift out each **speaker**.
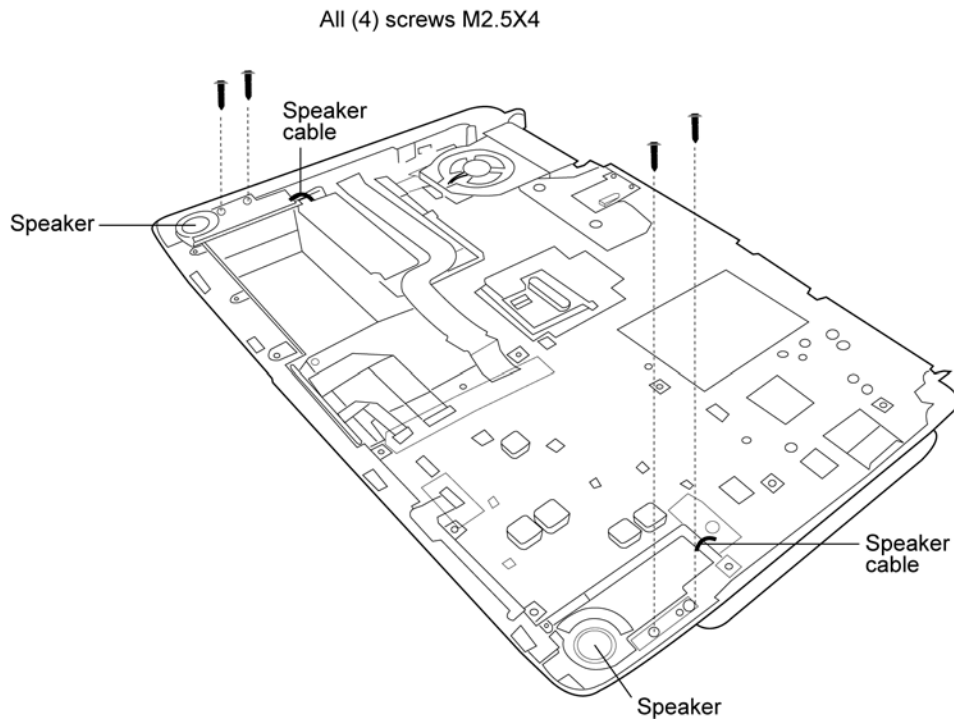
Fig 4-41: Removing the speakers

Installing the Speakers

To install the speakers, follow the steps below and refer to the figure in the preceding section.

1. Seat each **speaker**. The speaker cases are marked with **L** (left) and **R** (right).

2. Secure each speaker with **two M2.5×4 screws**.

3. Attach the left-side **speaker cable** to the **audio board** and the right-side **speaker cable** to the **system board**.

4. Turn the computer upside down and secure each **speaker** with **one M2.5×4 screw**.

4.26 Fan Set

Removing the Fan Set

To remove the fan set, first remove the battery pack, then follow the steps below.

1. Remove the **keyboard**, **HDD**, **main module, CPU, modem** or **Bluetooth unit**, **expansion memory cards**, **wireless LAN cards**, **PC card(s)**, **top cover** and **system board**.

2. Remove **five M2.5×4 screws** and **one M2.5×3 screw** securing the fan set from inside the chassis.
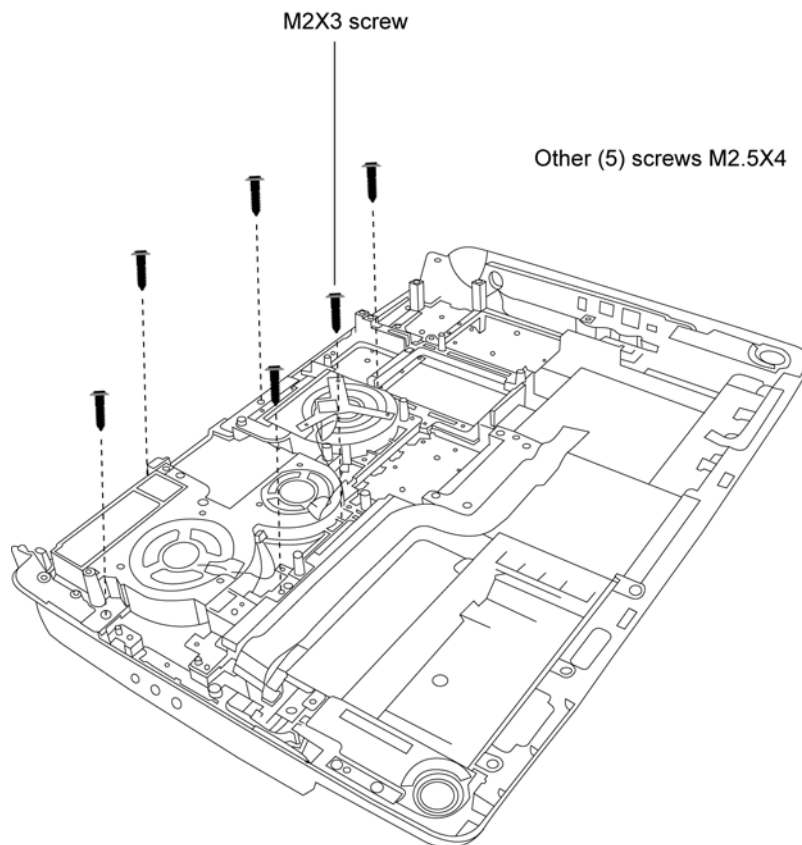
Fig 4-42: Removing the inner chassis fan screws

3. Turn the computer over and remove **seven M2.5×4 screws** securing the fan set from the base.
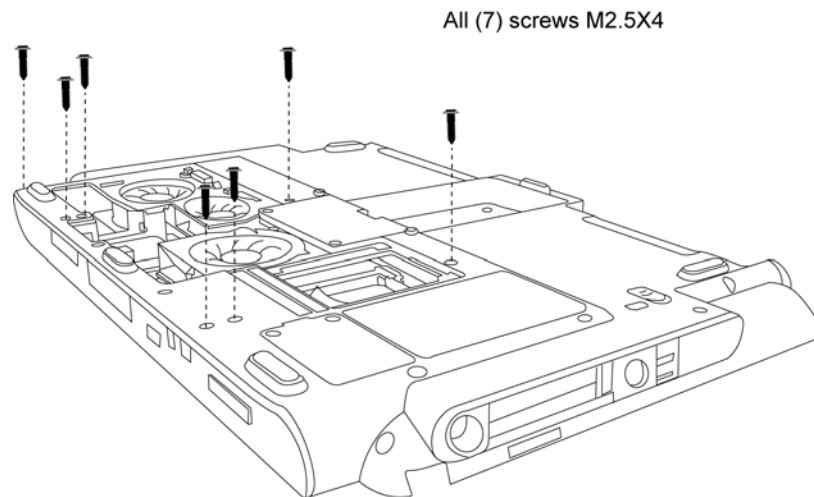
Fig 4-43: Removing the outer chassis fan screws

4. Lift out the **fan set**.

Installing the Fan Set

To install the fan set, follow the steps below and refer to the figure in the preceding section.

1. Seat the **fan set** and secure from inside the chassis with **five M2.5×4 screws** and **one M2.5×3 screw**.

2. Turn the computer over and secure the fan set with **seven M2.5×4 screws** from the base.

4.27 Display Mask

Removing the Display Mask

To remove the display mask, first remove the battery pack, then follow the steps below.

1. Remove the **main module**, **HDD**, **keyboard**, **top cover** and **display assembly**.

2. Remove **six mask seals** to expose **six screws** securing the **display mask**.

3. Remove **two M2×3 screws** from the top of display assembly and another **four M2.5×6 screws** that were covered by the **mask seals**.
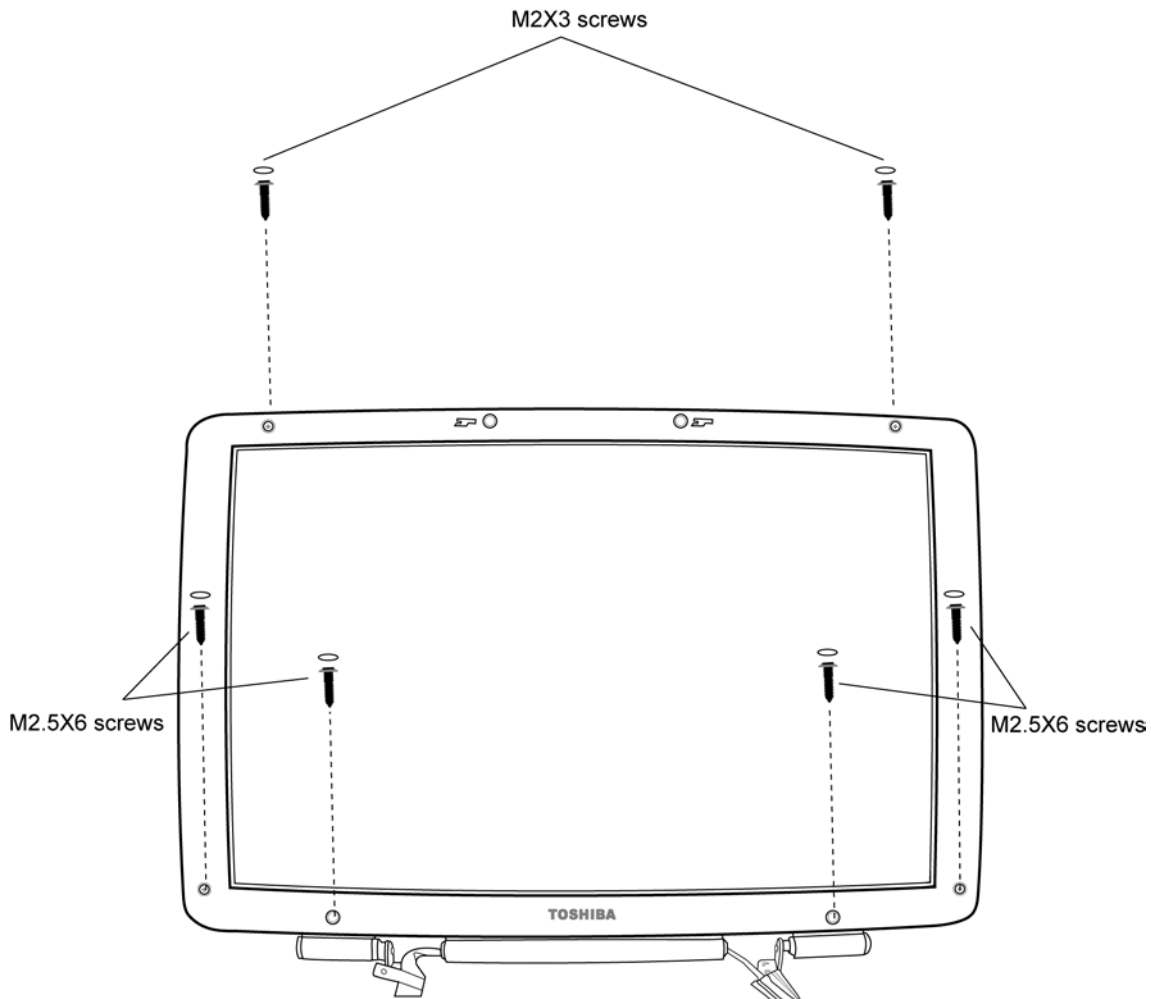
Fig 4-44: Removing the display mask screws

3. A total of 18 snaps secure the **display mask**. Carefully insert your fingers between the **mask** and the **LCD panel** and pry open the **snaps**. Start with the **four snaps** at the top of the **display mask**. Continue unsnapping the **display mask** along the two sides (**five snaps** on each side), and the bottom edge (**four snaps**).

Installing the Display Mask

To install the display mask, follow the steps below and refer to the figures in the preceding section.

1. Seat the **display mask** and secure the **snaps** on each side.

2. Secure the **display mask** with **two M2×3 screws** at the top of display assembly and another **four M2.5×6 screws** nearer the base.

3. Cover the six secured screws with **mask seals**.

4.28 FL Inverter Board

Removing the FL Inverter Board

To remove the FL inverter board, first remove the battery pack, then follow the steps below.

1. Remove the **main module**, **HDD**, **keyboard**, **top cover**, **display assembly** and **display mask**.

2. Remove **one M2x3 screw** securing the **LCD cable**.

3. Remove **one M2x3 screw** securing the **FL inverter board**.

4. Lift up the **FL inverter board** and detach the **FL cable** and **HV cable**. Remove the **FL inverter board**.
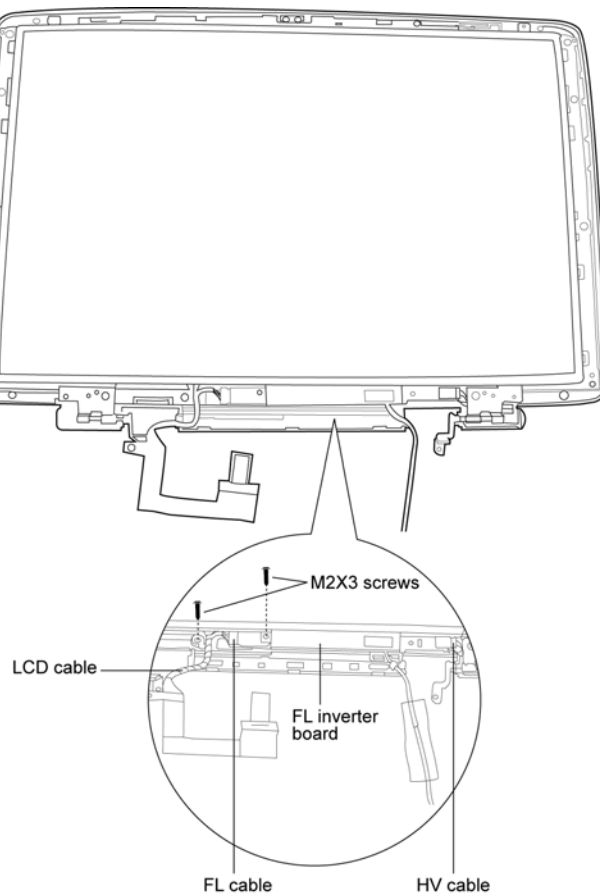
Fig 4-45: Removing the FL inverter board

Installing the FL Inverter Board

To install the FL inverter board, follow the steps below and refer to the figure in the preceding section..

1. Connect the **FL cable** and **HV cable** to the **FL inverter board**.

2. Seat the **FL inverter board** and secure it with **t one M2x3 screw**.

3. Secure the **LCD cable** with **one M2x3 screw**.

4. Install the **display mask**, **display assembly**, **top cover**, **keyboard**, **HDD**, **main module** and **battery pack**.

4.29 LCD Module

Removing the LCD Module

To remove the LCD module, first remove the battery pack, then follow the steps below.

1. Remove the **main module**, **HDD**, **keyboard**, **top cover**, **display assembly**, **display mask** and **FL inverter board**.

2. Remove **six M2.5×6 screws** securing the **LCD module**.

3. Lift the **LCD module** out of the **LCD cover**.

All (6) screws M2.5X6
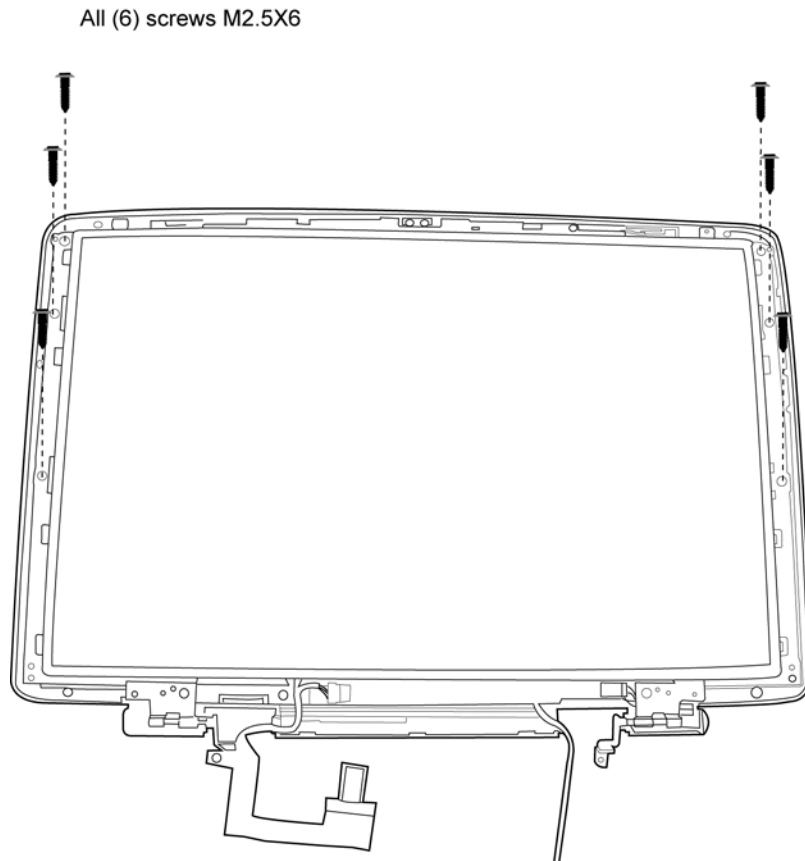
Fig 4-46: Removing the LCD module

4. Remove **eight M2×3 screws** securing the **LCD bracket** (the number of bracket
    screws may vary on different models).

5. Remove the **LCD bracket**.

6. Peel away the **Kapton film** securing the **LCD cable**.

7. Pull out **LCD cable** from **LCD connector**.
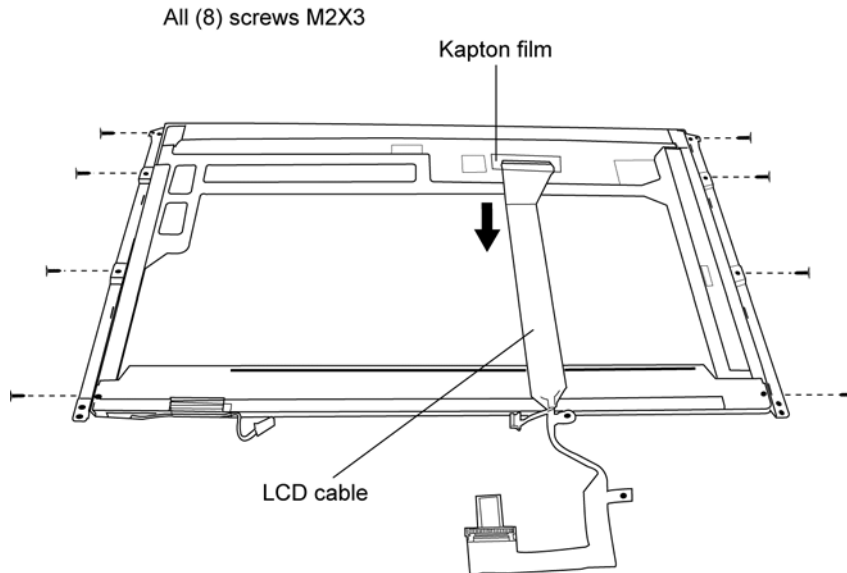
Fig 4-47: Removing the LCD cable

NOTE*: If the LCD module malfunctions, remove the LCD cable and LCD bracket. Then
replace the whole LCD module unit.*

Installing the LCD Module

To install the LCD module, follow the steps below and refer to the figures in the preceding section.

1. Connect the **LCD cable** to the **LCD connector** on the back of the **LCD module**.

2. Secure the **LCD cable** with **Kapton film**.

3. Secure the **LCD bracket** to the **LCD module** with **eight M2×3 screws** (the number of bracket screws may vary on different models).

4. Position the **LCD module** in place.

5. Secure the **LCD module** with **six M2.5×6 screws**. First secure the screws (one on each side) nearer the base of the module, then secure the screws nearer the top.

6. Secure **LCD cable** with **one M2.5×4 screw**.

Appendices

Appendix   Contents

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Appendix A   Handling the LCD Module

Precautions for handling the LCD module

The LCD module can be easily damaged during assembly or disassembly. Therefore, please observe the following precautions when handling it:

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.
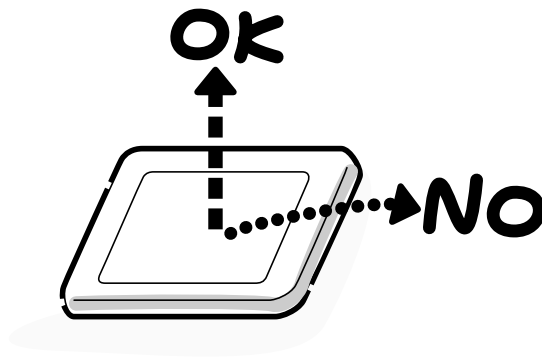
2. Be careful to align the holes at the four corners of the LCD module with the corresponding holes in the LCD cover before securing the module with screws. Do not force the module into place, because stress can affect its performance.

   Note: The panel's polarized surface is easily scarred, so handle it carefully.
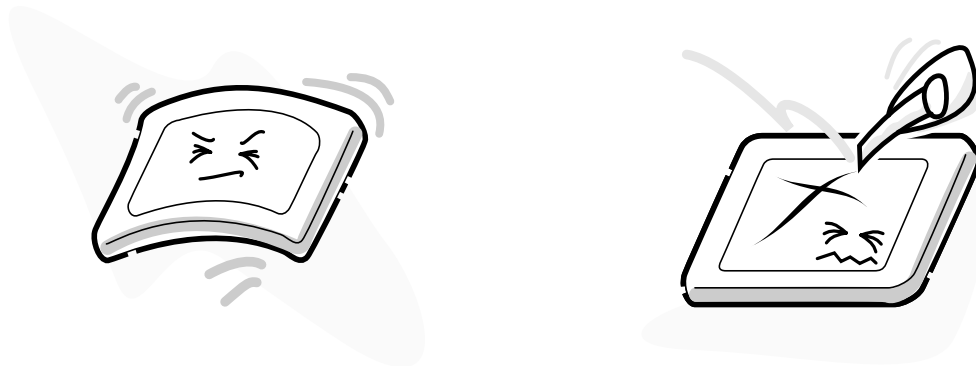
3. If the panel's surface gets dirty, wipe it with cotton or a soft cloth. If it is still dirty, try breathing on the surface to create a light condensate and wipe it again.

   If the surface is very dirty, 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.

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.

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.
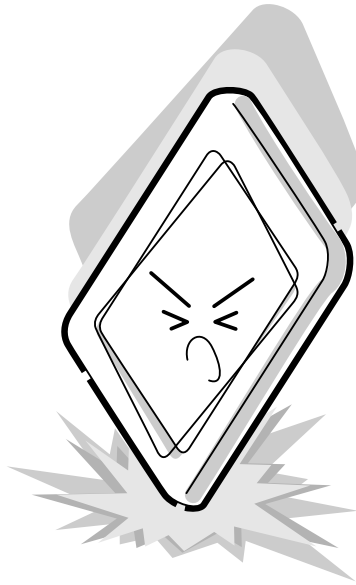
6. CMOS-LSI circuits are used in the module, so guard against damage from electrostatic discharge. Be sure to wear a wrist or ankle ground when handling the module.
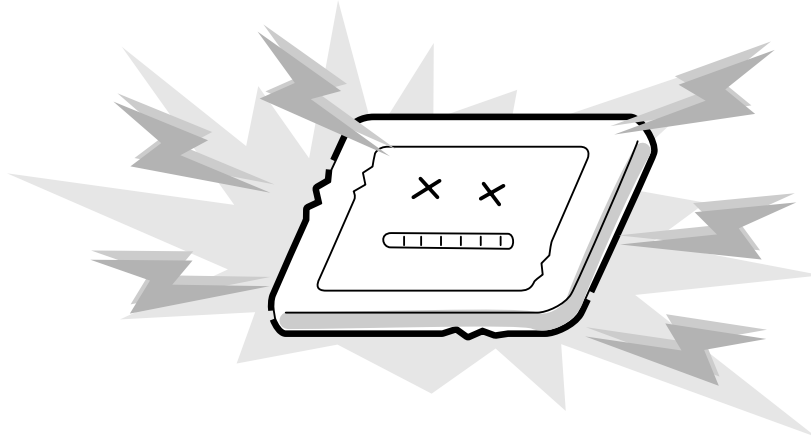
7. Do not expose the module to direct sunlight or strong ultraviolet rays for long periods.

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.
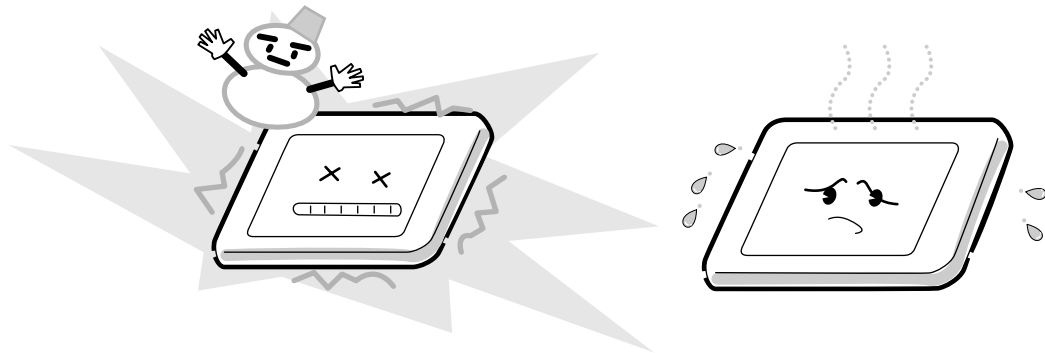
9. Do not disassemble the LCD module. Disassembly can cause malfunctions.
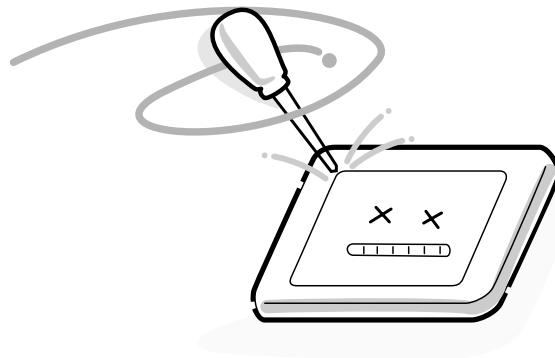
10. If you transport the module, do not use packing material that contains epoxy resin (amine) or silicon glue (alcohol or oxime). These materials can release gas that can damage the panel's polarization.
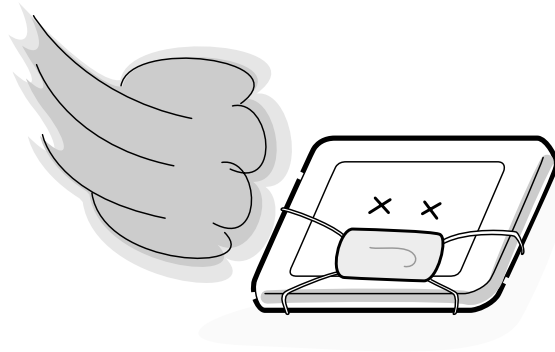
Appendix B   Board Layout

B.1   System Board (FRDSY*) Bottom View
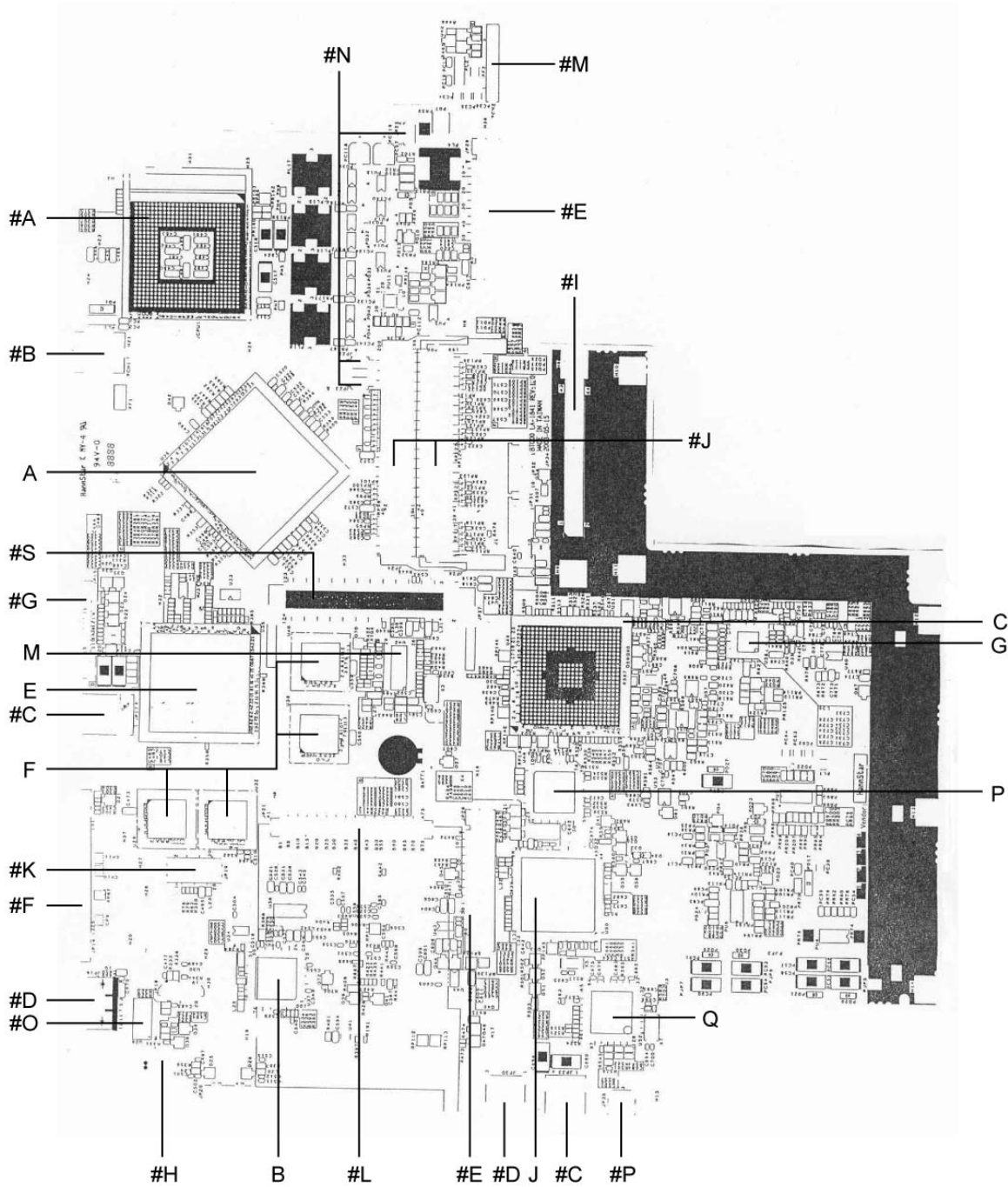
Figure B-1 System board (FRDSY*) layout (Bottom)

B.2 System Board (FRDSY*) Top View
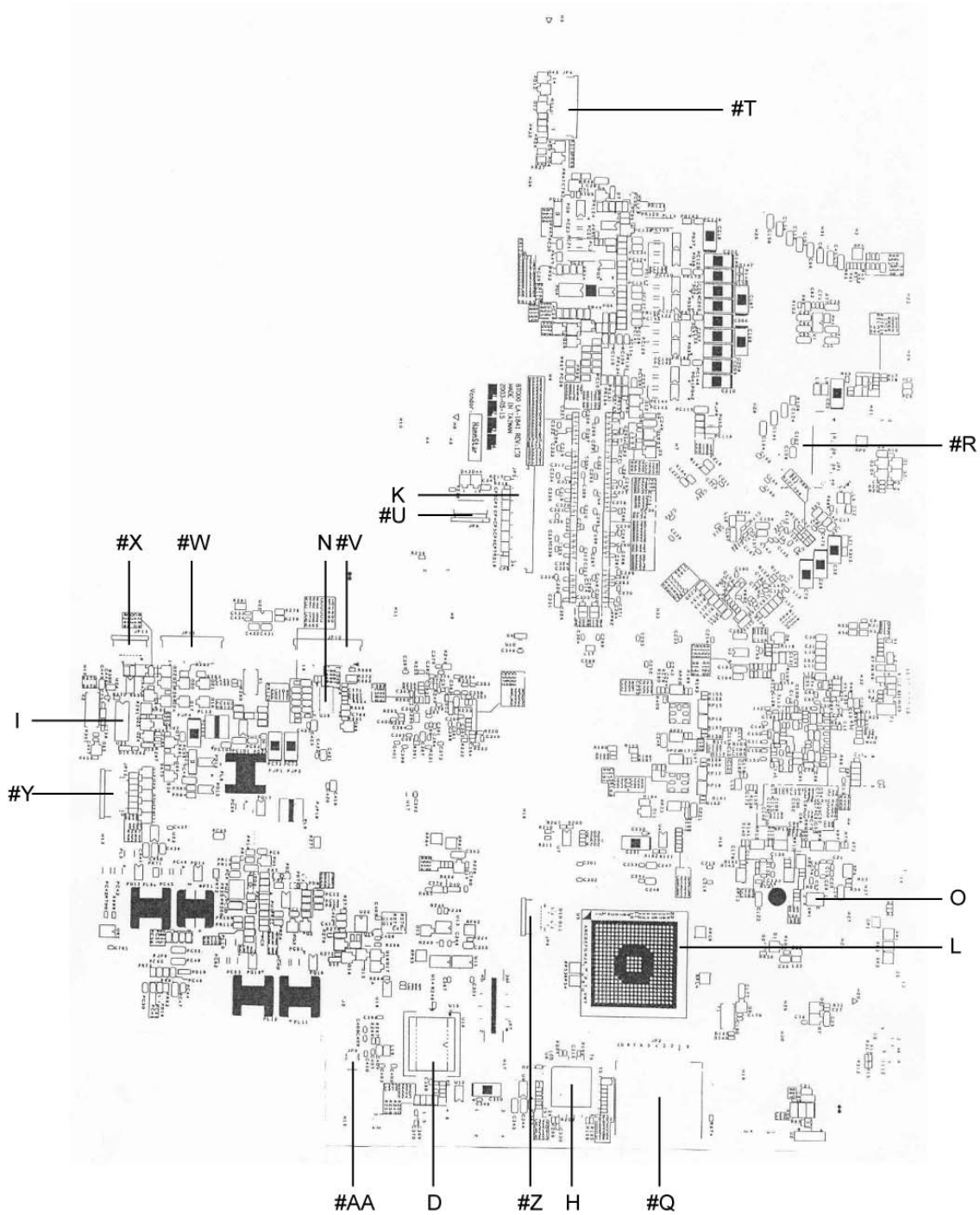
Figure B-2 System board (FRDSY) layout (Top)*

Table B-1 System board ICs and connectors (top and bottom)

Mark	Number	Name
(A)	U36	MCH 865PE
(B)	U37	LAN Controller RTL8101L
(C)	U49	ICH5 Intel 82801
(D)	U16	BIOS ROM 512K8-90
(E)	U35	VGA Chip GO5200
(F)	U29,U32, U39, U40	4M32 VRAM
(G)	U58	AC97 Codec ALC202
(H)	U8	SUPER I/O LPC47N227
(I)	U25	CIR Control
(J)	U50	KBC/EC PC87591L
(K)	JP5	Keyboard Connector
(L)	U5	CARDBUS & SD Controller T7L58XB-0101
(M)	U42	Clock Generator ICS-952623CG
(N)	U59	Audio Amplifier Chip TPA6011
(O)	SW1	Lid Switch
(P)	U46	OZ-168T
(Q)	U52	1394 Fire Wire Controller TSB43AB21A

Table B-2 System board ICs and connectors (top and bottom)

Mark	Number	Name
(#A)	JCPU1	CPU Socket
(#B)	PCN1	DC-In Connector
(#C)	JP17, JP33	USB Connector
(#D)	JP30, JP16	RJ11/RJ45 Connector
(#E)	JP28, JP29	ODD Connector
(#F)	JP14	Parallel Connector
(#G)	JP15	CRT Connector
(#H)	JP20	S-Video Connector
(#I)	JP34	HDD Connector
(#J)	JP24, JP26	SODIMM Socket
(#K)	JP19	MDC Module Connector
(#L)	JP21	PCMCIA Connector
(#M)	PCN2	Battery Connector
(#N)	JP22, JP23, JP25	Fan Connector
(#O)	U28	LAN Transformer
(#P)	JP35	1394 Connector
(#Q)	JP2	SD Socket
(#R)	JP1	LVDS Connector
(#S)	JP27	MINI PCI
(#T)	JP4	POWER FPC CONNECTOR
(#U)	JP8	TPA FPC CONNECTOR
(#V)	JP10	AUDIO FPC CONNECTOR
(#W)	JP27	DIRECT/B FFC CONNECTOR
(#X)	JP13	CIR/B FFC CONNECTOR
(#Y)	JP12	LED FPC CONNECTOR
(#Z)	JP6	USER KEY FPC CONNECTOR
(#AA)	JP9	AUDIO CONNECTOR

Appendix C   Pin Assignments

System Board

C.1   JP24/JP26 SODIMM I/F (144-pin)

Table C-1 SODIMM I/F pin assignments (144-pin) (1/4)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	VREF	O	2	VREF	O
3	VSS	-	4	VSS	-
5	DQ0	I/O	6	DQ4	I/O
7	DQ1	I/O	8	DQ5	I/O
9	25VDD	O	10	2.5VDD	O
11	DQS0	I/O	12	DM0	O
13	DQ2	I/O	14	DQ6	I/O
15	VSS	-	16	VSS	-
17	DQ3	I/O	18	DQ7	I/O
19	DQ8	I/O	20	DQ12	I/O
21	2.5VDD	O	22	2.5VDD	O
23	DQ9	I/O	24	DQ13	I/O
25	DQS1	I/O	26	DM1	O
27	VSS	-	28	VSS	-
29	DQ10	I/O	30	DQ14	I/O
31	DQ11	I/O	32	DQ15	I/O
33	2.5VDD	O	34	2.5VDD	O
35	CK0	O	36	2.5VDD	O
37	CK0#	O	38	VSS	-
39	VSS	-	40	VSS	-
41	DQ16	I/O	42	DQ20	I/O
43	DQ17	I/O	44	DQ21	I/O
45	2.5VDD	O	46	2.5VDD	O
47	DQS2	I/O	48	DM2	O
49	DQ18	I/O	50v	DQ22	I/O

Table C-1 SODIMM I/F pin assignments (144-pin) (2/4)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
51	VSS	-	52	VSS	-
53	DQ19	I/O	54	DQ23	I/O
55	DQ24	I/O	56	DQ28	I/O
57	2.5VDD	O	58	2.5VDD	O
59	DQ25	I/O	60	DQ29	I/O
61	DQS3	I/O	62	DM3	O
63	VSS	-	64	VSS	-
65	DQ26	I/O	66	DQ30	I/O
67	DQ27	I/O	68	DQ31	I/O
69	2.5VDD	O	70	2.5VDD	O
71	CB0	-	72	CB4	-
73	CB1	-	74	CB5	-
75	VSS	-	76	VSS	-
77	DQS8	-	78	DM8	-
79	CB2	-	80	CB6	-
81	2.5VDD	O	82	2.5VDD	O
83	CB3	-	84	CB7	-
85	DU	-	86	DU/RESET#	-
87	VSS	-	88	VSS	-
89	CK2	-	90	VSS	-
91	CK2#	-	92	2.5VDD	O
93	2.5VDD	O	94	2.5VDD	O
95	CKE1	-	96	CKE0	O
97	DU/A13	-	98	DU/BA2	-
99	A12	-	100	A11	O
101	A9	O	102	A8	O
103	VSS	-	104	VSS	-
105	A7	O	106	A6	O
107	A5	O	108	A4	O
109	A3	O	110	A2	O
111	A1	O	112	A0	O
113	2.5VDD	O	114	2.5VDD	O

Table C-1 SODIMM I/F pin assignments (144-pin) (3/4)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
115	A10/AP	O	116	BA1	O
117	BA0	O	118	RAS#	O
119	WE#	O	120	CAS#	O
121	SO#	O	122	S1#	-
123	DU	-	124	DU	-
125	VSS	-	126	VSS	-
127	DQ32	I/O	128	DQ36	I/O
129	DQ33	I/O	130	DQ37	I/O
131	2.5VDD	O	132	2.5VDD	O
133	DQS4	I/O	134	DM4	O
135	DQ34	I/O	136	DQ38	I/O
137	VSS	-	138	VSS	-
139	DQ35	I/O	140	DQ39	I/O
141	DQ40	I/O	142	DQ44	I/O
143	2.5VDD	O	144	2.5VDD	O
145	DQ41	I/O	146	DQ45	I/O
147	DQS5	I/O	148	DM5	O
149	VSS	-	150	VSS	-
151	DQ42	I/O	152	DQ46	I/O
153	DQ43	I/O	154	DQ47	I/O
155	2.5VDD	O	156	2.5VDD	O
157	2.5VDD	O	158	CK1#	O
159	VSS	-	160	CK1	O
161	VSS	-	162	VSS	-
163	DQ48	I/O	164	DQ52	I/O
165	DQ49	I/O	166	DQ53	I/O
167	2.5VDD	O	168	2.5VDD	O
169	DQS6	I/O	170	DM6	O
171	DQ50	I/O	172	DQ54	I/O
173	VSS	-	174	VSS	-
175	DQ51	I/O	176	DQ55	I/O
177	DQ56	I/O	178	DQ60	I/O
179	2.5VDD	O	180	2.5VDD	O

Table C-1 SODIMM I/F pin assignments (144-pin) (4/4)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
181	DQ57	I/O	182	DQ61	I/O
183	DQS7	I/O	184	DM7	O
185	VSS	-	186	VSS	-
187	DQ58	I/O	188	DQ62	I/O
189	DQ59	I/O	190	DQ63	I/O
191	2.5VDD	O	192	2.5VDD	O
193	SDA	I/O	194	SA0	O
195	SCL	O	196	SA1	O
197	3.3VDD_SPD	O	198	SA2	O
199	VDD_ID	O	200	DU	-

C.2 JP1 LCD I/F (40-pin)

Table C-2 LCD I/F pin assignments (40-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	PID3	I	2	PID2	I
3	PID1	I	4	PID0	I
5	GND	-	6	TZCLK-	O
7	TZCLK+	O	8	GND	-
9	TZOUT3-	O	10	TZOUT3+	O
11	TZOUT2-	O	12	TZOUT2+	O
13	GND	-	14	TZOUT1-	O
15	TZOUT1+	O	16	TZOUT0-	O
17	TZOUT0+	O	18	GND	-
19	TXCLK-	O	20	TXCLK+	O
21	GND	-	22	TXOUT3-	O
23	TXOUT3+	O	24	TXOUT2-	O
25	TXOUT2+	O	26	GND	-
27	TXOUT1-	O	28	TXOUT1+	O
29	TXOUT0-	O	30	TXOUT0+	O
31	GND	-	32	NC	-
33	+LCDVDD	O	34	+LCDVDD	O
35	DISPOFF#	O	36	B_INVT_PWM	O
37	DAC_BRIG	O	38	NC	-
39	B+	O	40	B+	O

C.3 JP15 RGB I/F (15-pin)

Table C-3 RGB I/F pin assignments (15-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	CRTRED; 100	O	2	CRTGREEN; 100	O
3	CRTBLUE; 100	O	4	NC	-
5	GND	-	6	GND (VGAGND)	-
7	GND (VGAGND)	-	8	GND (VGAGND)	-
9	VCC	-	10	GND	-
11	NC	-	12	DDCSDA; 100	I/O
13	CHSYNC; 100	O	14	CVSYNC; 100	O
15	DDCSCL; 100	I/O			

C.4   JP34 HDD I/F (44-pin)

Table C-4 HDD I/F pin assignments (44-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	PIDE-RST	O	2	GND	-
3	PDD07	I/O	4	PDD08	I/O
5	PDD06	I/O	6	PDD09	I/O
7	PDD05	I/O	8	PDD10	I/O
9	PDD04	I/O	10	PDD11	I/O
11	PDD03	I/O	12	PDD12	I/O
13	PDD02	I/O	14	PDD13	I/O
15	PDD01	I/O	16	PDD14	I/O
17	PDD00	I/O	18	PDD15	I/O
19	GND	-	20	NC	-
21	PDDREQ	I	22	NC	-
23	PDIOW	O	24	GND	-
25	PDIOR	O	26	GND	-
27	PIORDY	I	28	PCSEL	O
29	PDDACK	O	30	GND	-
31	RQ14	I	32	NC	-
33	PDA1	O	34	NC	-
35	PDA0	O	36	PDA2	O
37	PDCS1	O	38	PDCS3	O
39	PHDDLED	I	40	GND	-
41	+5VS	O	42	+5VS	O
43	GND	-	44	NC	-

C.5 JP28 Main Module I/F (60-pin)

Table C-5 CD-ROM I/F pin assignments (50-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	INT-CD-L	I	2	INTCD-R	I
3	CD_AGND	-	4	CD_AGND	-
5	CD_RSTDRV#	O	6	CDD08	I/O
7	CDD07	I/O	8	CDD09	I/O
9	CDD06	I/O	10	CDD10	I/O
11	CDD05	I/O	12	CDD11	I/O
13	CDD04	I/O	14	CDD12	I/O
15	CDD03	I/O	16	CDD13	I/O
17	CDD02	I/O	18	CDD14	I/O
19	CDD01	I/O	20	CDD15	I/O
21	CDD00	I/O	22	CD_DREQ	I
23	PDIAG	-	24	CD_SDIOR#	O
25	CD_SIOW#	O	26	CD_DACK#	O
27	CD_SIORDY	I	28	CD_SBA2	O
29	CD_IRQ	I	30	CD_SCS3#	O
31	CD_SBA1	O	32	EXTID0	I
33	CD_SBA0	O	34	EXTID1	I
35	CD_SCS1#	O	36	NC	-
37	SHDD_LED	I	38	HDSEL#	O
39	EXTCSEL1	I	40	WGATE#	O
41	GND	-	42	GND	-
43	GND	-	44	USBP7+	I/O
45	RDATA#	O	46	USBP7-	I/O
47	WP#	O	48	GND	-
49	TRACK0#	O	50	FDDIR#	I
51	WDATA#	I	52	3MODE#	I
53	STEP#	I	54	+5VCD	O
55	MTR0#	I	56	+5VCD	O
57	DSKCHG#	O	58	INDEX#	O
59	DRV0#	I	60	+5VCD	O

C.6 JP29 Second Module I/F (60-pin)

Table C-5 CD-ROM I/F pin assignments (50-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	NC	-	2	NC	-
3	NC	-	4	NC	-
5	SIDE_RST#	O	6	IDE_SD08	I/O
7	IDE_SD07	I/O	8	IDE_SD09	I/O
9	IDE_SD06	I/O	10	IDE_SD10	I/O
11	IDE_SD05	I/O	12	IDE_SD11	I/O
13	IDE_SD04	I/O	14	IDE_SD12	I/O
15	IDE_SD03	I/O	16	IDE_SD13	I/O
17	IDE_SD02	I/O	18	IDE_SD14	I/O
19	IDE_SD01	I/O	20	IDE_SD15	I/O
21	IDE_SD00	I/O	22	IDE_SDREQ	I
23	PDIAG	-	24	IDE_SDIOR#	O
25	IDE_SIOW#	O	26	IDE_SDACK#	O
27	IDE_SIORDY	I	28	IDE_SDA2	O
29	IDE_SIRQ15	I	30	IDE_SCS3#	O
31	IDE_SBA1	O	32	EXTID2	I
33	IDE_SBA0	O	34	EXTID3	I
35	IDE_SCS1#	O	36	NC	-
37	SHDD_LED	I	38	NC	-
39	EXTCSEL2	I	40	NC	-
41	GND	-	42	GND	-
43	GND	-	44	USBP3+	I/O
45	NC	-	46	USBP3-	I/O
47	NC	-	48	GND	-
49	NC	-	50	NC	-
51	NC	-	52	NC	-
53	NC	-	54	+5VS	O
55	NC	-	56	+5VS	O
57	NC	-	58	NC	-
59	NC	-	60	+5VS	O

C.7 JP14 Parallel I/F (25-pin)

Table C-6 Parallel I/F pin assignments (25-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	STROB; 000	O	2	PDB00; 100	I/O
3	PDB01; 100	I/O	4	PDB02; 100	I/O
5	PDB03; 100	I/O	6	PDB04; 100	I/O
7	PDB05; 100	I/O	8	PDB06; 100	I/O
9	PDB07; 100	I/O	10	ACK; 000	I
11	BUSY; 100	I	12	PE; 100	I
13	SELCT; 100	I	14	AUTFD; 000	O
15	ERROR; 000	I	16	PINIT; 000	O
17	SLIN; 000	O	18	GND	-
19	GND	-	20	GND	-
21	GND	-	22	GND	-
23	GND	-	24	GND	-
25	GND	-			

C.8 JP21 PC Card I/F (150-pin)

Table C-7 PC Card I/F pin assignments (154-pin) (1/3)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
A1	GND	-	B1	GND	-
A2	GND	-	B2	GND	-
A3	S1 WP	O	B3	S2 WP	O
A4	S1 CD2#	O	B4	S2 CD2#	O
A5	S1 D2	I/O	B5	S2 D2	I/O
A6	S1 D10	I/O	B6	S2 D10	I/O
A7	S1 D1	I/O	B7	S2 D1	I/O
A8	S1 D9	I/O	B8	S2 D9	I/O
A9	GND	-	B9	GND	-
A10	S1 D0	I/O	B10	S2 D0	I/O
A11	S1 D8	I/O	B11	S2 D8	I/O
A12	S1 A0	I	B12	S2 A0	I
A13	S1 BVD1	O	B13	S2 BVD1	O
A14	S1 A1	I	B14	S2 A1	I
A15	S1 BVD2	O	B15	S2 BVD2	O
A16	S1 A2	I	B16	S2 A2	I
A17	GND	-	B17	GND	-
A18	S1 REG#	I	B18	S2 REG#	I
A19	S1 A3	I	B19	S2 A3	I
A20	S1 INPACK#	I	B20	S2 INPACK#	I
A21	S1 A4	I	B21	S2 A4	I
A22	S1 WAIT#	O	B22	S2 WAIT#	O
A23	S1 A5	I	B23	S2 A5	I
A24	S1 RST	I	B24	S2 RST	I
A25	GND	-	B25	GND	-
A26	S1 A6	I	B26	S2 A6	I
A27	S1 VS2	O	B27	S2 VS2	O
A28	S1 A7	I	B28	S2 A7	I
A29	S1 A25	I	B29	S2 A25	I
A30	S1 A12	I	B30	S2 A12	I

Table C-7 PC Card I/F pin assignments (154-pin) (2/3)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
A31	S1 A24	I	B31	S2 A24	I
A32	S1 A15	I	B32	S2 A15	I
A33	GND	-	B33	GND	-
A34	S1 A23	I	B34	S1 A23	I
A35	S1 A16	I	B35	S1 A16	I
A36	S1 A22	I	B36	S1 A22	I
A37	+S1_VPP	I	B37	+S2_VPP	I
A38		-	B38		-
A39	+S1VCC	I	B39	+S2VCC	I
A40	S1 A21	I	B40	S2 A21	I
A41	S1 RDY#	O	B41	S2 RDY#	O
A42	S1 A20	I	B42	S2 A20	I
A43	GND	-	B43	GND	-
A44	S1 WE#	I	B44	S2 WE#	I
A45	S1 A19	I	B45	S2 A19	I
A46	S1 A14	I	B46	S2 A14	I
A47	S1 A18	I	B47	S2 A18	I
A48	S1 A13	I	B48	S2 A13	I
A49	S1 A17	I	B49	S2 A17	I
A50	S1 A8	I	B50	S2 A8	I
A51	GND	-	B51	GND	-
A52	S1 IOWR#	I	B52	S2 IOWR#	I
A53	S1 A9	I	B53	S2 A9	I
A54	S1 IORD#	I	B54	S2 IORD#	I
A55	S1 A11	I	B55	S2 A11	I
A56	S1 VS1	O	B56	S2 VS1	O
A57	S1 OE#	I	B57	S2 OE#	I
A58	S1 CE2#	I	B58	S2 CE2#	I
A59	GND	-	B59	GND	-
A60	S1 A10	I	B60	S2 A10	I
A61	S1 D15	I/O	B61	S2 D15	I/O
A62	S1 CE1#	I	B62	S2 CE1#	I

Table C-7 PC Card I/F pin assignments (154-pin) (3/3)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
A63	S1 D14	I/O	B63	S2 D14	I/O
A64	S1 D7	I/O	B64	S2 D7	I/O
A65	S1 D13	I/O	B65	S2 D13	I/O
A66	S1 D6	I/O	B66	S2 D6	I/O
A67	GND	-	B67	GND	-
A68	S1 D12	I/O	B68	S2 D12	I/O
A69	S1 D5	I/O	B69	S2 D5	I/O
A70	S1 D11	I/O	B70	S2 D11	I/O
A71	S1 D4	I/O	B71	S2 D4	I/O
A72	S1 CD1#	O	B72	S2 CD1#	O
A73	S1 D3	I/O	B73	S2 D3	I/O
A74	GND	-	B74	GND	-
A75	GND	-	B75	GND	-

C.9　JP27 Mini PCI I/F (124-pin)

Table C-8　Mini PCI I/F pin assignments (124-pin) (1/2)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	NC	-	2	NC	-
3	NC	-	4	NC	-
5	NC	-	6	NC	-
7	NC	-	8	NC	-
9	NC	-	10	NC	-
11	NC	-	12	NC	-
13	SWITCH	O	14	NC	-
15	NC	-	16	NC	-
17	IRQA	I	18	+5VS	O
19	3V	O	20	IRQD	I
21	NC	-	22	NC	-
23	GNGNDD	-	24	3.3V AVX	O
25	PCICLK	O	26	MINI-SRT	O
27	GND	-	28	3VS	O
29	REQ2	I	30	GNT	O
31	3V	O	32	GND	-
33	AD31	I/O	34	WLANME	I
35	AD29	I/O	36	NC	-
37	GND	-	38	AD30	I/O
39	AD27	I/O	40	3VS	O
41	AD25	I/O	42	AD28	I/O
43	NC	-	44	AD26	I/O
45	CBE3	I/O	46	AD24	I/O
47	AD23	I/O	48	AD19	I/O
49	GND	-	50	GND	-
51	AD21	I/O	52	AD22	I/O
53	AD19	I/O	54	AD20	I/O
55	GND	-	56	PAR	I/O
57	AD17	I/O	58	AD18	I/O
59	CBE2; 000	I/O	60	AD16	I/O

Table C-8 Mini PCI I/F pin assignments (124-pin)(1/2)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
61	IRDY	I/O	62	GND	-
63	P3V	O	64	FRAME	I/O
65	CLKRUN	I/O	66	TRDY	I/O
67	SERR	I/O	68	STOP	I/O
69	GND	-	70	3VS	O
71	P3V	O	72	DEVSEL	I/O
73	CBE1	I/O	74	GND	-
75	AD14	I/O	76	AD15	I/O
77	GND	-	78	AD13	I/O
79	AD12	I/O	80	AD11	I/O
81	AD10	I/O	82	GND	-
83	GND	-	84	AD09	I/O
85	AD08	I/O	86	CBE0	I/O
87	AD07	I/O	88	3VS	O
89	P3V	O	90	AD06	I/O
91	AD05	I/O	92	AD04	I/O
93	NC	-	94	AD02	I/O
95	AD03	I/O	96	AD00	I/O
97	VCC	O	98	NC	-
99	AD01	I/O	100	NC	-
101	GND	-	102	GND	-
103	NC	-	104	GND	-
105	NC	-	106	NC	-
107	NC	-	108	NC	-
109	NC	-	110	NC	-
111	SPK	I	112	NC	-
113	GND	-	114	GND	-
115	NC	-	116	NC	-
117	GND	-	118	GND	-
119	GND	-	120	GND	-
121	NC	-	122	MPCACT	I
123	VCC	-	124	3.3VAUX	-

C.10 JP22, JP23, JP25 Fan I/F (3-pin)

Table C-9-1 JP22 Fan I/F pin assignments (3-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	FAN2-1	O	2	FAN-DET_F	I
3	GND	-			

Table C-9-2 JP23 Fan I/F pin assignments (3-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	FAN2	O	2	FAN-SPEED2	I
3	GND	-			

Table C-9-3 JP25 Fan I/F pin assignments (4-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	GND	-	2	FAN-SPEED	I
3	NC	-	4	FAN1	O

C.11 AC Adaptor Connector (3-pin)---Find Power Team

Table C-10 AC Adaptor Connector pin assignments (3-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	DCIN	I	2	GND	-
3	GND	-			

C.12 Microphone (6-pin)

Table C-11 Microphone I/F pin assignments (6-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	ANGND	-	2	MIC	I
3	BIAS	I	4	NC	-
5	NC	-	6	ANGND	-

C.13 Headphone Connector (6-pin)

Table C-12 Headphone Connector pin assignments (6-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	ANGND	-	2	INTSPKL	O
3	INTSPKR	O	4	NBA PLUG	-
5	GND	I	6	NC	-

Appendix D   Keyboard Scan/Character Codes

Table D-1 Scan codes (set 1 and set 2) (1/4)

Cap No.	Keytop	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	18	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 Make		Code set 1 Break		Code set 2 Make		Code set 2 Break			Note
58	Ctrl(L)		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	
64	Ctrl(R)	E0	1D	E0	9D	E0	14	E0	F0	14	
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 Make		Code set 1 Break		Code set 2 Make		Code set 2 Break			Note
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
X	Fn	—		—		—		—			*4
X	Win	E0	5B	E0	DB	E0	1F	E0	F0	1F	
x	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. * Combination with the **Fn** key gives different codes.
4. * The **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
X	Win	E0	AA	E0	5B	E0	DB	E0	2A	E0	F0	12	E0	1F	E0	F0	1F	E0	12
X	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 Make				Code set 1 Break				Code set 2 Make				Code set 2 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
X	Win	E0	2A	E0	5B	E0	DB	E0	AA	E0	12	E0	1F	E0	F0	1F	E0	F0	12
X	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 Make		Code set 1 Break		Code set 2 Make		Code set 2 Break		
43	ENT	E0	1C	E0	9C	E0	5A	E0	F0	5A
58	L-CTRL	E0	1D	E0	9D	E0	14	E0	F0	14
60	L-ALT	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   Key Layout

E.1   United States (US) Keyboard

Figure E-1 US keyboard

E.2   United Kingdom (UK) Keyboard

Figure E-2 UK keyboard

E.3 Spanish (SP) Keyboard

Figure E-3 SP keyboard

E.4 Japanese (JA) Keyboard

Figure E-3 JA keyboard

E.5 Korean (KO) Keyboard

Figure E-3 KO keyboard

Appendix F   Series Screw Torque List

Table F-1 Series Screw Torque List

SCREW P/N	SCREW SPEC	Q'ty	LOCATION	SCREW TORQUE
MAC925006Z0	M2.5*6	2	HING ASSY/L&R TO COVER SUB ASSY	
MAC925006Z0	M2.5*6	6	170" LCD BKTs TO COVER SUB ASSY	
MAC925006Z0	M2.5*6	4	LCD BEZEL TO COVER	
MAC925006Z0	M2.5*6	2	AUDIO PCB TO LL	
MAC925006Z0	M2.5*6	1	CIR PCB TO LL	
MAC925006Z0	M2.5*6	2	DIRECT BKT THRU CIR PCB TO LL	
MAC925006Z0	M2.5*6	3	MB TO BODY FRAME ASSY	
MAC925006Z0	M2.5*6	2	LCD ASSY TO LOGIC TOP SIDE	
MAC925006Z0	M2.5*6	2	LCD ASSY TO LOGIC BACK SIDE	
MAC925006Z0	M2.5*6	7	LU TO LL TOP SIDE	
MAC925006Z0	M2.5*6	2	LL TO LU BOTTOM SIDE	
MACK25040Z0	M2.5*4	3	FPC SUPPORT TO LOGIC/LOW	
MACK25040Z0	M2.5*4	5	BADY FRAME TO LL TOP SIDE	
MACK25040Z0	M2.5*4	7	BADY FRAME TO LL BOTTOM SIDE	
MACK25040Z0	M2.5*4	4	SPEAKER L/R TO LL TOP SIDE	
MACK25040Z0	M2.5*4	2	SPEAKER L/R TO LL BOTTOM SIDE	
MACK25040Z0	M2.5*4	5	IO DOOR TO LOGIC TOP SIDE	
MACK25040Z0	M2.5*4	2	IO DOOR TO LL BACK SIDE	
MACK25040Z0	M2.5*4	2	IO DOOR TO LL BOTTOM SIDE	
MACK25040Z0	M2.5*4	5	LL TO LU BOTTOM SIDE	
MACK25040Z0	M2.5*4	2	HDD ASSY TO LL	
MACK25040Z0	M2.5*4	7	FDD NEC SUB-ASSY	
MACK25040Z0	M2.5*4	7	FDD TEAC SUB-ASSY	

SCREW P/N	SCREW SPEC	Q'ty	LOCATION	SCREW TORQUE
MACA0007204	M2.5*3	2	MDC TO MB	
MACA0007204	M2.5*3	2	USER KEY FPC SUPP TO LOGIC UP (R)	
MACA0007204	M2.5*3	4	PWR FPC SUPP PLATE TO LOGIC UP (L)	
MACA0007204	M2.5*3	2	TP PCB TO LOGIC UP	
MACA0007204	M2.5*3	5	TP BKT TO LOGIC UP	
MACA0007204	M2.5*3	2	MODULE LATCH TO LL (L/R SIDE)	
MACA0007204	M2.5*3	1	UP HINGE COVER TO LOGIC TOP SIDE	
MACA0007204	M2.5*3	3	LL TO LU BOTTOM SIDE	
MACA0007204	M2.5*3	2	K/B ASSY TO LOGIC	
MACA0007204	M2.5*3	2	HDD BKT TO HDD DOOR ASSY	
MAC925014Z0	M2.5*14	1	IO DOOR TO LOGIC TOP SIDE	
MAC925014Z0	M2.5*14	6	LL TO LU BOTTOM SIDE	
MAAA0015320	M2*3	2	COVER SUB ASSY/hook BKT to LCD cover	
MAAA0015320	M2*3	8	LCD BRK L&R TO LCD 17.0"	
MAAA0015320	M2*3	1	INVERTER TO COVER SUB ASSY	
MAAA0015320	M2*3	1	LCD CABLE TO COVER	
MAAA0015320	M2*3	2	LCD BEZEL TO COVER	
MAAA0015320	M2*3	4	CPU PLATE ASSY TO M/B STANDOFF	
MAAA0015320	M2*3	1	BADY FRAME TO LL TOP SIDE	
MAAA0015320	M2*3	2	DIRECT PCB TO DIRECT BKT	
MAAA0015320	M2*3	1	DIRECT PCB w/BKT TO DIRECT PLAY DOOR	
MAAA0015320	M2*3	7	TV TUNER/HOUSING	
MAAA0015320	M2*3	6	2ND HDD /HOUSING	
MACK20040N0	M2*4	4	PCMCIA TO MB	

SCREW P/N	SCREW SPEC	Q'ty	LOCATION	SCREW TORQUE
MACK20040N0	M2*4	2	BLUETOOTH TO MB	
MACK20040N0	M2*4	2	UP HINGE COVER TO IO DOOR BACK SIDE	
MACK20040N0	M2*4	5	DVD MODULE MKE / HOUSING/PANEL	
MACK20040N0	M2*4	5	COMBO MODULE KME /HOUSING/PANEL	
MACK20040N0	M2*4	5	DVD MODULE TOSHIBA / HOUSING	
MACK20040N0	M2*4	5	COMBO MODULE TOSHIBA / HOUSING	
MMCK20040N1	M2*4	4	MODULE CONN TO MB	
MMCK20040N1	M2*4	2	UP HINGE COVER TO IO DOOR BACK SIDE	
MACK25001Z0	M2.5*12	1	UP HINGE COVER TO LOGIC TOP SIDE	
MMCK20080Z0	M2*8	3	DVD MODULE MKE / HOUSING/PANEL	
MMCK20080Z0	M2*8	3	COMBO MODULE KME /HOUSING/PANEL	
MMCK20080Z0	M2*8	3	DVD MODULE TOSHIBA / HOUSING	
MMCK20080Z0	M2*8	3	COMBO MODULE TOSHIBA / HOUSING	
MAAA4303000	M3*3	4	2ND HDD /HOUSING	
MAFA94001N0	D-SUB NUT	4	IO DOOR TO LL BACK SIDE	
MAA00002800	D1.7*2.5	2	DVD MODULE MKE / HOUSING/PANEL	
MAAAA173500	M1.7*3.5	3	COMBO MODULE KME /HOUSING/PANEL	
FATQ00AD000	M2.5*6	1	BTQ00_BATTERY_ASSY_WEIGHT_SAVER	
FATQ00AD000	M2.5*4	1	BTQ00_BATTERY_ASSY_WEIGHT_SAVER	

Appendix G   Reliability

The following table shows MTBF (Mean Time Between Failures) for each component.

Table G-1 MTBF

Component	Time (hours)
LCD	50,000
Keyboard	40,000
HDD	300,000
Removable FDD	30,000
Optical (DVD/CD) drive	60,000
AC adapter	60,000

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