

Toshiba Personal Computer
TECRA A3/S2
Maintenance Manual

TOSHIBA CORPORATION

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Toshiba Personal Computer Tecra A3/S2 Maintenance Manual

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Preface

This maintenance manual describes how to perform hardware service maintenance for the Toshiba Personal Computer Tecra A3/S2, referred to as the Tecra A3/S2 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 Tecra A3/S2 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

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1.1 Features

The TECRA A3/S2 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 Celeron M CPU up to 1.5GHZ 0.09u, 1M L2, FSB 400MHz
- Intel Pentium M CPU up to 2.13GHz 0.09u, 2M L2, FSB 533MHz
- Micro FC-PGA package CPU

❑ Chipset

Intel:

- Mobile Intel® 915GM Express Chipset
- Mobile Intel® 910GML Express Chipset up to 128MB
- Mobile Intel® 915PM Express Chipset

ATI:

- MOBILITY™ RADEON® X600 with 64MB or 128MB
- MOBILITY™ RADEON® X300 with 32MB, 64MB, or 128MB.

NVIDIA:

- GeForce™ Go 6600 GPU with 64MB or 128MB
- GeForce™ Go 6200 GPU with Turbo Cache with 32MB or 64MB for local cache
- Video RAM Depending on the model you purchased:
- Intel Graphic model,
- Video RAM up to 128MB integrated solution and share with main memory for Intel 915GM/ 910GML.
- NVIDIA and ATI Graphic model, external 32/64/128MB VGA DDR RAM for VGA chip.

❑ Memory

- On board with two 200-pin +2.5V SO-DIMM connector, supporting, DDR memories card. Maximum up gradable to 2GB by two 1GB SO-DIMM module.
- 1MB/2MB L2 Cache on CPU
- Support 8MB UMA VGA Memory
- Support Maximum 128MB UMA VGA Memory allocation for more than 256MB System Memory
- Support Maximum 64MB UMA VGA Memory allocation for 128MB System Memory

BIOS

- 1MB Flash ROM for system BIOS.
 - a) Suspend to RAM/Disk.
 - b) Password protection (System).
 - c) Various hot key for system control.
 - d) Refreshable
 - e) ACPI compliant BIOS

 Power

- 12-cell Li-Ion smart battery pack with 10.8V*8600mAh capacity or 6-cell Li-Ion smart battery pack with 10.8V*4300mAh capacity (depending on the models).
- Approximately 12 hours or longer charge time to 100% battery capacity with the system on.
- Approximately 4 hours or longer charge time to 100% battery capacity with the system off.
- Approximately 2 days discharge time in standby mode for 12-cell battery and 1 day for 6-cell battery.
- Discharge time in shutdown mode is approximately 1 month.

 HDD

- One 2.5", 9.5mm hard disk with capacity 30GB/40GB/60GB/80/100GB/120GB
- Bus Master IDE
- 9.5mm, 2.5" HDD Support
- Support Ultra 100 synchronous DMA

 ODD Devices

One of the following:

- 5.25" 12.7mm height COMBO device
- 5.25" 12.7mm height DVD Dual device
- 5.25" 12.7mm height DVD Super Multi device
- 5.25" 12.7mm height DVD-ROM device
- 5.25" 12.7mm height CD-ROM device

 Optional Devices

- 256MB/512MB/1GB SO-DIMM modules
- MINI PCI module (802.11a+b+g Wireless LAN module/802.11b+g Wireless LAN module)
- MDC Modem
- Bluetooth modem
- Dual-Band build in Antenna for Wireless LAN Communication.

❑ 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.

Two buttons below the TouchPad are used like the buttons on a mouse pointer. Press the left button to select a menu item or to manipulate text or graphics designated by the pointer. Press the right button to display a menu or other function depending on the software you are using.

❑ Display

- 15.0" TFT screen with a resolution of 1600 horizontal x1200 vertical pixels UXGA
- 15.0" TFT screen with a resolution of 1400 horizontal x1050 vertical pixels SXGA+
- 15.0" TFT screen with a resolution of 1024 horizontal x768 vertical pixels XGA
- 15.0" TFT screen with a resolution of 1024 horizontal x768 vertical pixels XGA (CSV)
- 15.0" TFT screen with a resolution of 1024 horizontal x768 vertical pixels XGA (HCSV)
- 14.1" TFT screen with a resolution of 1024 horizontal x768 vertical pixels XGA
- 14.1" TFT screen with a resolution of 1400 horizontal x1050 vertical pixels SXGA+

❑ I/O Ports

- One optional 25-pins parallel port(BTO)
- One 15-pins CRT port, supports DDC 2B
- One 9-pins serial port(BTO)
- One S-video connector
- One MIC-In port
- One Headphone-Out
- One 2-pins AC adapter jack
- One type II PCMCIA card bus slot
- Three 4-pins USB 2.0 ports
- One 4-pins USB 2.0 port(BTO)
- One RJ11/RJ45 Port
- VR for volume control
- One optional IEEE 1394 port
- FIR
- One optional 6-in-1 port, support SD/MMC/SM/MS/MS Pro/xD

❑ PCMCIA Card Organization

- Accommodate one type II device for TECRA A3 or two type II devices/one type III device for TECRA S2.
- SRAM, OTPROM, FLASH ROM, mask ROM memory card up to 64MB
- MODEM/LAN card
- Card bus card
- ACPI 1.0 Compliant
- Full ACPI 1.0B supported
- LCD Auto-DIM mode by time out

❑ Multiple Digital Media Card

- Supports SD/MMC/SM/MS/MS Pro/xD card
- SD memory capacity support from 8MB to 512MB
- MMC memory capacity support from 8MB to 256MB
- SM memory capacity support from 4MB to 128MB
- MS memory capacity support from 8MB to 256MB
- MS Pro memory capacity support from 256MB to 1GB
- xD memory capacity support from 4MB to 512MB

❑ Universal Serial Bus (USB)

The computer comes with three 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-pins 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-pins 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.

❑ Sound system

A Realtek ALC250VD 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
Plug a 4-pins S-video cable into this connector for output of NTSC or PAL TV standard, supporting Macrovision copy protection.

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

- ❑ Switch buttons
 - Power button
 - TOSHIBA Assist Button
You can associate an application to this button for automatic launch.
 - TOSHIBA Presentation Button
This button allows the user to switch between the LCD and LCD/CRT (or projector).

1.2 System Unit

The system unit is composed of the following major components:

- ❑ Processor
 - Intel Celeron M CPU up to 1.5GHz 0.09u, 1M L2, FSB 400MHz
 - Intel Pentium M CPU up to 2.13GHz 0.09u, 2M L2, FSB 533MHz
 - Micro FC-PGA package CPU
- ❑ System Logic
 - Intel 915PM (Alviso-PM)/ Intel 915GM (Alviso-GM) (400/533 MHz FSB supported)
 - ICH6-M
 - ENE KB910 for Keyboard Controller, Battery management Unit, and RTC.
 - TI PCI7411 for Card Bus PCMCIA, 1394, 5 in 1 controller.
 - Integrated VGA solution for 915GM/ External VGA card for 915PM
 - ALC250DV for AC97 Codec
 - Marvell 88SA8040 for SATA to PATA HDD support
 - Marvell 88E8053 for GIGA LAN/ Marvell 88E8036 for 10/100M LAN
- ❑ Memory
 - On board with two 200-pin +2.5V SO-DIMM connector, supporting, DDR memories card. Maximum up gradable to 2GB by two 1GB SO-DIMM module.
 - 1MB/2MB L2 Cache on CPU
 - Support 64MB/128MB VGA memory for NV43M/M24P/M22P.
 - Adjustable 128MB UMA VGA memory share from North Bridge.
- ❑ Fixed Disk Interface
 - Marvell 88SA8040 supports PATA HDD.
- ❑ Video Subsystem
 - UMA VGA Memory up to 128MB
 - Display Core Frequency of 200/250/266/333MHZ
 - 3D Graphics Engine
 - Analog Display support
 - Digital Video out port (DVOB and DVOC) support
 - DVOB With 165-MHZ dot clock support for 12 bit interface.
 - Dedicated 2FP (local flat panel) interface
 - Single or dual channel LVDS panel support up to SXGA+ panel, resolution with frequency range from 25MHZ to 112MHZ per channel.
- ❑ SMC LPC 47N217 Super I/O with LPC Interface
 - PC99a, PC2001
 - ACPI 2.0 Compliant
 - Serial Ports
 - One Full Function Serial Port

- High Speed 16C550A Compatible UARTs with Send/Receive 16-Byte FIFO
- Supports 230k and 460k Baud
- Programmable Baud Rate Generator
- Modem Control Circuitry

Infrared Communications Controller

- IrDA v1.2 (4Mbps), HPSIR, ASKIR, Consumer IR Support
- 1 IR Ports
- 96 Base I/O Address, 15 IRQ Options and 3 DMA Options

Multi-Mode Parallel Port with ChiProtect

- Standard Mode IBM PC/XT, PC/AT,
- PS/2 Compatible Bidirectional Parallel Port
- Enhanced Parallel Port (EPP)
Compatible – EPP 1.7 and EPP 1.9 (IEEE 1284 Compliant)
- IEEE 1284 Compliant Enhanced Capabilities Port (ECP)
- ChiProtect Circuitry for Protection Against Damage Due to Printer Power-On
- 192 Base I/O Address, 15 IRQ and 3 DMA Options

LPC Bus Host Interface

- Multiplexed Command, Address and Data Bus
- 8-Bit I/O Transfers
- 8-Bit DMA Transfers
- 16-Bit Address Qualification
- Serial IRQ Interface Compatible with Serialized Serial IRQ Interface Compatible with Serialized IRQ Support for PCI Systems
- PCI CLKRUN# Support
- Power Management Event(IO_PME#)Interface Pin

Keyboard controller

- KB910L is use as keyboard controller and battery management unit

Audio subsystem

Realtek ALC250VD for AC97 codec

- Support of S'PDIF out is fully compliant with AC97 rev2.3 specification.
- 20-bit Stereo Digital-to-Analog Converters.
- 18-bit Stereo Analog-to-Digital Converters.
- Built-in 7 Bands of Digital Hardware Equalizer for Optimizing Speaker Response.
- Supports double sampling (96KHz) of DVD audio playback.
- Two Analog Line-level Stereo Inputs with LIN_IN, CD, and AUX.
- Two Analog Line-level Mono Inputs : PCBEEP, PHONE-IN.
- Two software selectable Microphone Inputs.
- High quality differential CD Input.
- Power Management and enhanced power saving features.
- Meets Microsoft® WHQL/WLP2.0 audio Requirements.

- HRTF 3D positional audio.
- 3D Stereo Enhancement.

TI PCI7411 Card Bus Host Adapter

- 3.3V operation with 5V Tolerance
- The PCI7411 controller is available in the 288-terminal MicroStar BGA package(GHK).
- Compliant with
 - PCI Local Bus Specification, Revision 2.3.
 - PCI Bus Power Management Interface Specification Revision 1.1
 - Windows Logo Program 2.0 compliant.
 - Intel Mobile Power Guideline 2000.
 - Advanced Configuration and Power Interface(ACPI) Specification, Revision 2.0.
 - PC 98/99 and PC2001.
 - PC Card Standard 8.1.
 - 1394 Open Host Controller Interface Specification 1.1.
 - Provisions of IEEE Std 1394-1995 for a high-performance serial bus and IEEE Std 1394a-2000.
- Interrupt configuration
 - Many interrupt modes supported.
 - Supports serialized IRQ with PCI interrupts.
- Supports PC Card or CardBus with hot insertion and removal.
- Supports 132-MBps burst transfers to maximize data throughput on both the PCI bus and the CardBus.
- Supports ring indicate , SUSPEND#, and PCI CLKRUN# protocols and PCI bus Lock(Lock#).
- Fully interoperable with FireWire and i.LINK implementations of IEEE Std 1394.
- Two IEEE Std 1394a-2000 fully compliant cable ports at 100M bits/s, 200M bits/s, and 400M bits/s.
- Universal PCI interfaces compatible with 3.3V and 5V PCI signaling environments.
- 1.5V core logic and 3.3V I/O cells with internal voltage regulator to generate 1.5V core Vcc.
- PCI power-management D0, D1, D2, and D3 power states.
- Advanced submicron, low-power CMOS technology.
- Isochronous receive dual-buffer mode.
- Node power class information signaling for system power management.
- PCI burst transfers and deep FIFOs to tolerate large host latency.
- Separate cable bias(TPBIAS) for each port.
- Register access fail interrupt when the PHY SCLK is not active.

Marvell 88E8053 for Giga LAN

- PCI Express base specification 1.0a compliant
- x1 PCI Express interface with 2.5 GHz signaling
- Advanced error reporting
- Message signaled interrupts
- Configurable 48 KB deep buffer
- On-chip VLAN insertion and removal
- TCP, IP, UDP Checksum offload
- Compliant to 802.3x flow control support
- 10/100/1000 IEEE 802.3 compliant
- Automatic MDI/MDIX crossover at all speeds
- Wake On LAN(WOL) power management support
- Compliant to ACPI 2.0 specification
- Smart power down when link is not detected
- Marvell Virtual Cable Tester(VCT) for advanced cable diagnostics

Marvell 88E8036 for 10/100M LAN

- PCI Express base specification 1.0a compliant
- x1 PCI Express interface with 2.5GHz signaling
- Active state power management (L0s) support
- Advanced error reporting
- Configurable 4KB deep buffer
- Message signaled interrupts
- Compliant to 802.3x flow control support
- 10/100 IEEE 802.3 compliant
- Wake On LAN(WOL) power management support
- Compliant to ACPI 2.0 specification
- Smart power down when link is not detected
- Power regulator outputs for 2.5V and 1.2V supplies

Marvell 88SA8040 for Serial ATA Bridge

- ATA/ATAPI PIO mode data transfer
- ATA/ATAPI Ultra DMA(UDMA) data transfer rates of 16.7, 25, 33, 44, 66, 100, 133 and 150MB/s
- Serial ATA power save modes
- Serial ATA hot-plug
- Enhanced receiving FIFO flow control for Serial ATA link
- DMA Command Queuing(maximum 32 entries)
- Supports 20, 25, 30, or 40MHz reference clock.
- Serial ATA Interface of 1.5Gbps
- Full scan for high production test coverage

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/ 80/ 100/ 120GB HDD.

1.4 Optical Devices module

The module compartments can accommodate the following removable modules:

- DVD-ROM drive
- CD-RW/DVD-ROM drive
- DVD±R/±RW drive
- DVD Super Multi drive
- CD-ROM driver

1.4.1 DVD-ROM Drive

The DVD-ROM drive (Toshiba SD-C2712) accommodates either 12cm (4.72-inch) or 8cm (3.15-inch) CDs or DVDs.

Transfer rates

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

Buffer capacity 256 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+(E)G	CD-MIDI	CD-R
DVD:	DVD-5	DVD-9	DVD-10
	DVD-18	DVD-RAM (Ver:2.1)	DVD-R (Ver:1.0/2.1)
	DVD-RW (Ver1.0/1.1)		

1.4.2 CD-ROM Drive

The CD-ROM drive (TEAC CD-224E) accommodates either 12cm (4.72-inch) or 8cm (3.15-inch) CDs.

Transfer rates

CD-ROM	Maximum 24 times faster rotational speed
--------	--

Buffer capacity 128 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-R		

1.4.3 CD-RW/DVD-ROM Drive

The CD-RW/DVD-ROM combo drive (Toshiba TS-L462A, Matsushita UJDA760 or TEAC DW-224E) 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
CD-ROM	Maximum 24 times faster rotational speed
DVD-RAM	Standard rotational speed

Write speeds

CD-R	Maximum 24 times faster rotational speed
CD-RW	Maximum 24 times(Ultra Speed) faster rotational speed

Buffer capacity 2 Mbytes (Max)

Supported formats

Applicable	CD	CD-R
Write Formats:		CD-RW
Applicable	CD	CD-R
Write Disc:		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	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
Read Disc:	DVD	DVD-ROM [DVD-5, DVD-9, DVD-10, DVD-18] DVD-R DVD-RW DVD+R DVD+RW DVD-RAM

1.4.4 DVD±R/±RW Drive

The DVD±R/±RW drive (Pioneer DVR-K15) 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
CD-ROM	Maximum 24 times faster rotational speed

Write speeds

CD-R	Maximum 24 times faster rotational speed
CD-RW	Maximum 24 times(Ultra Speed) faster rotational speed
DVD-R	Maximum 8 times faster rotational speed
DVD-RW	Maximum 4 times faster rotational speed
DVD+R	Maximum 8 times faster rotational speed
DVD+RW	Maximum 4 times faster rotational speed
DVD+R DL	Maximum 2.4 times faster rotational speed

Buffer capacity 2 Mbytes (Max)

Supported formats

Applicable	CD	CD-R
Write Formats:		CD-RW
	DVD	DVD-R
		DVD-RW
		DVD+R
		DVD+RW
DVD+R DL		
Applicable	CD	CD-R
Write Disc:		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	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
Read Disc:	DVD	DVD-ROM [DVD-5, DVD-9, DVD-10, DVD-18]
		DVD-R
		DVD-RW
		DVD+R
		DVD+RW

1.4.5 DVD Super Multi Drive

The DVD Super Multi Drive (Toshiba TS-L632A, Matsushita UJ-830B, UJ-831B or TEAC DV-W28E) 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
CD-ROM	Maximum 24 times faster rotational speed

DVD-RAM Standard rotational speed

Write speeds

CD-R	Maximum 24 times faster rotational speed
CD-RW	Maximum 10 times(High/Ultra Speed) faster rotational speed
DVD-R	Maximum 8 times faster rotational speed
DVD-RW	Maximum 4 times faster rotational speed
DVD+R	Maximum 8 times faster rotational speed
DVD+RW	Maximum 4 times faster rotational speed
DVD-RAM	Maximum 3 times faster rotational speed
DVD+R DL	Maximum 2.4 times faster rotational speed(UJ-831B & DV-W28E)

Buffer capacity 2 Mbytes (Max)

Supported formats

Applicable	CD	CD-R
Write Formats:		CD-RW
	DVD	DVD-R DVD-RW DVD+R DVD+RW DVD-RAM DVD+R DL(UJ-831B & DV-W28E)
Applicable	CD	CD-R
Write Disc:		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)]
	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
Applicable	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
Read Disc:	DVD	DVD-ROM [DVD-5, DVD-9, DVD-10, DVD-18]
		DVD-R
		DVD-RW
		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 8-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

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: Blue or Green(by sku))

- Green = indicates AC adaptor is connected

Battery LED (two colors: Green & Orange → Blue & Orange)

- Blue or 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 E²PROM 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/ 4300mAH
RTC battery	Lithium	3 V	14 mAH/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 24 hours
Data preservation period (full charge)	1 month

Chapter 2

Troubleshooting Procedures

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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 | 6. Printer (parallel) port | 11. PCMCIA unit |
| 2. USB Floppy Drive | 7. TouchPad | 12. IEEE 1394 port |
| 3. Keyboard | 8. Speaker | 13. Wireless LAN system |
| 4. USB ports | 9. Optical drive | |
| 5. TV-out port | 10. Modem | |

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

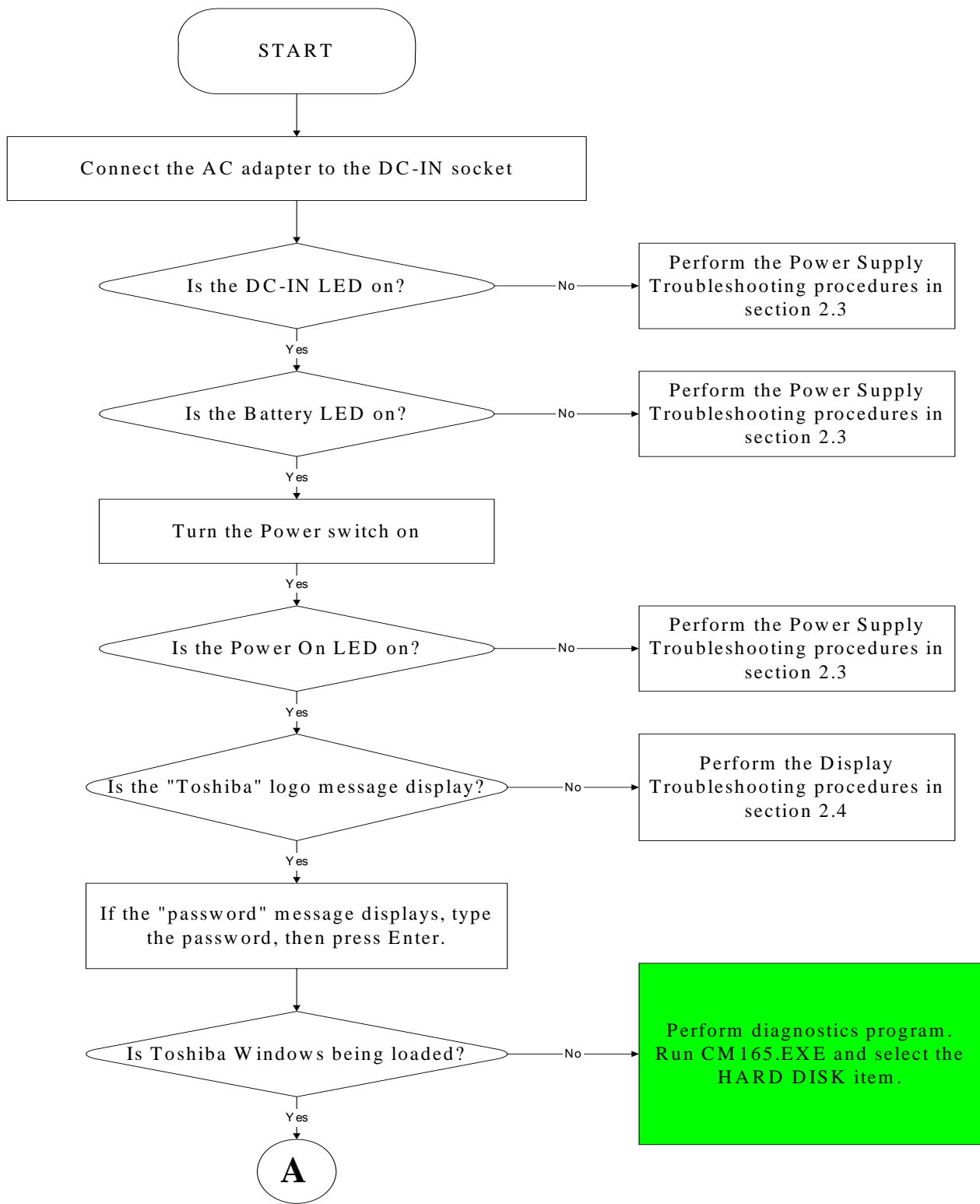


Figure 2-1 Troubleshooting flowchart (1/2)

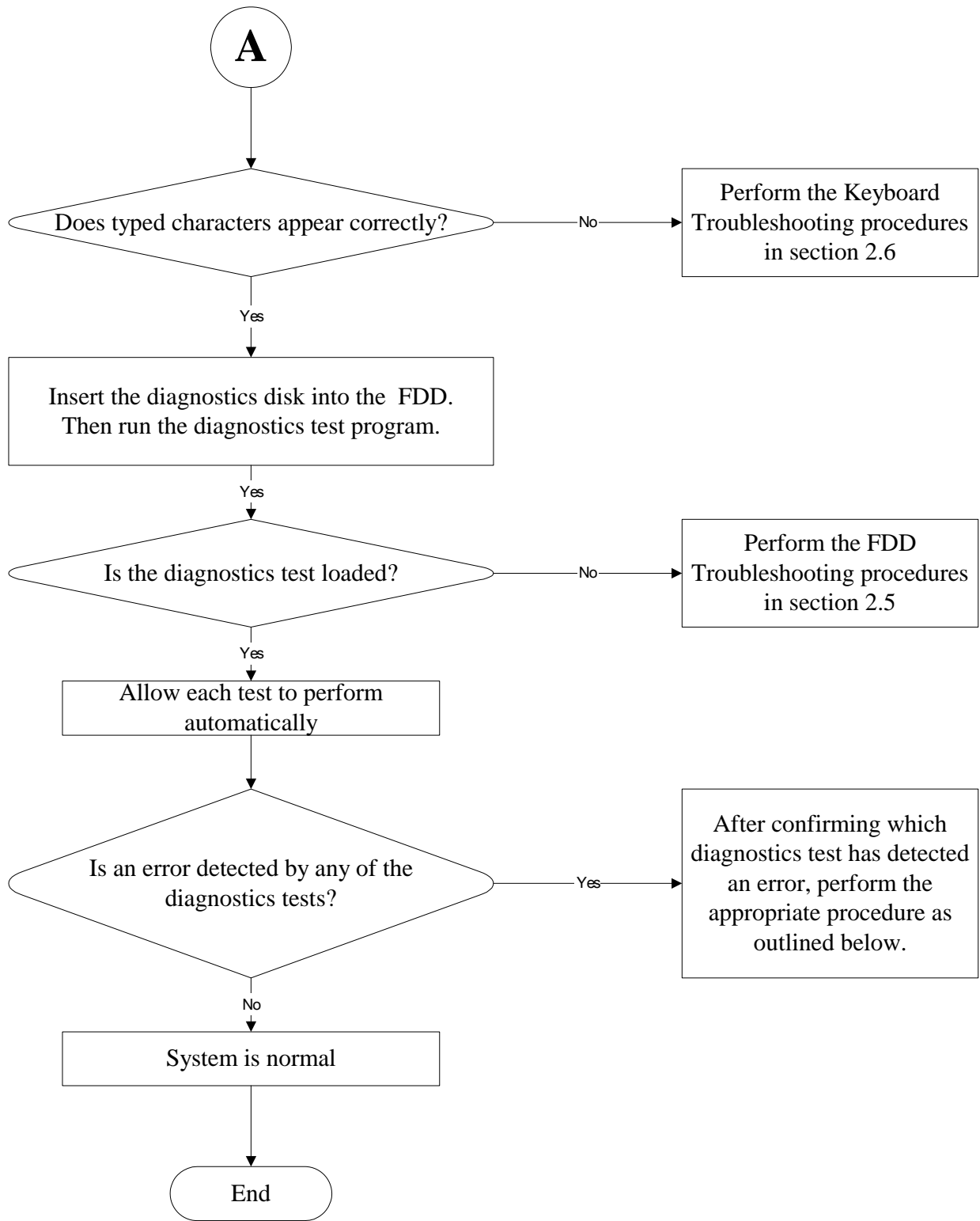


Figure 2-1 Troubleshooting flowchart (2/2)

If the diagnostics program cannot detect an error, the problem may be intermittent. The test program should be executed several times to isolate the problem. 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 keyboard test, perform the Keyboard Troubleshooting procedures in Section 2.5.
4. If an error is detected by the printer (parallel) port test, perform the Printer Port Troubleshooting procedures in Section 2.8.
5. If an error is detected by the TouchPad test, perform the TouchPad Troubleshooting procedures in Section 2.9.
6. If an error is detected by the audio test, perform the Speaker Troubleshooting procedures in Section 2.10 and the Optical Drive Troubleshooting Procedures in Section 2.12.
7. If an error is detected by the modem test, perform the Modem Troubleshooting Procedures in Section 2.12.

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 2.6.
2. If an error is detected when using the TV-out connection, perform the TV-Out Failure Troubleshooting procedures in Section 2.7.
3. If an error is detected when using the speakers, perform the Speaker Troubleshooting procedures in Section 2.10.
4. If an error is detected when using the modem, perform the Modem Troubleshooting procedures in Section 2.12.
5. If an error is detected when using the PCMCIA unit, perform the PCMCIA Troubleshooting procedures in Section 2.13.
6. If an error is detected when using the IEEE1394 device, perform the IEEE1394 device Troubleshooting procedures in Section 2.14.
7. If an error is detected when using the Wireless LAN, perform the Wireless LAN Troubleshooting procedures in Section 2.15.

2.3 Power Supply Troubleshooting

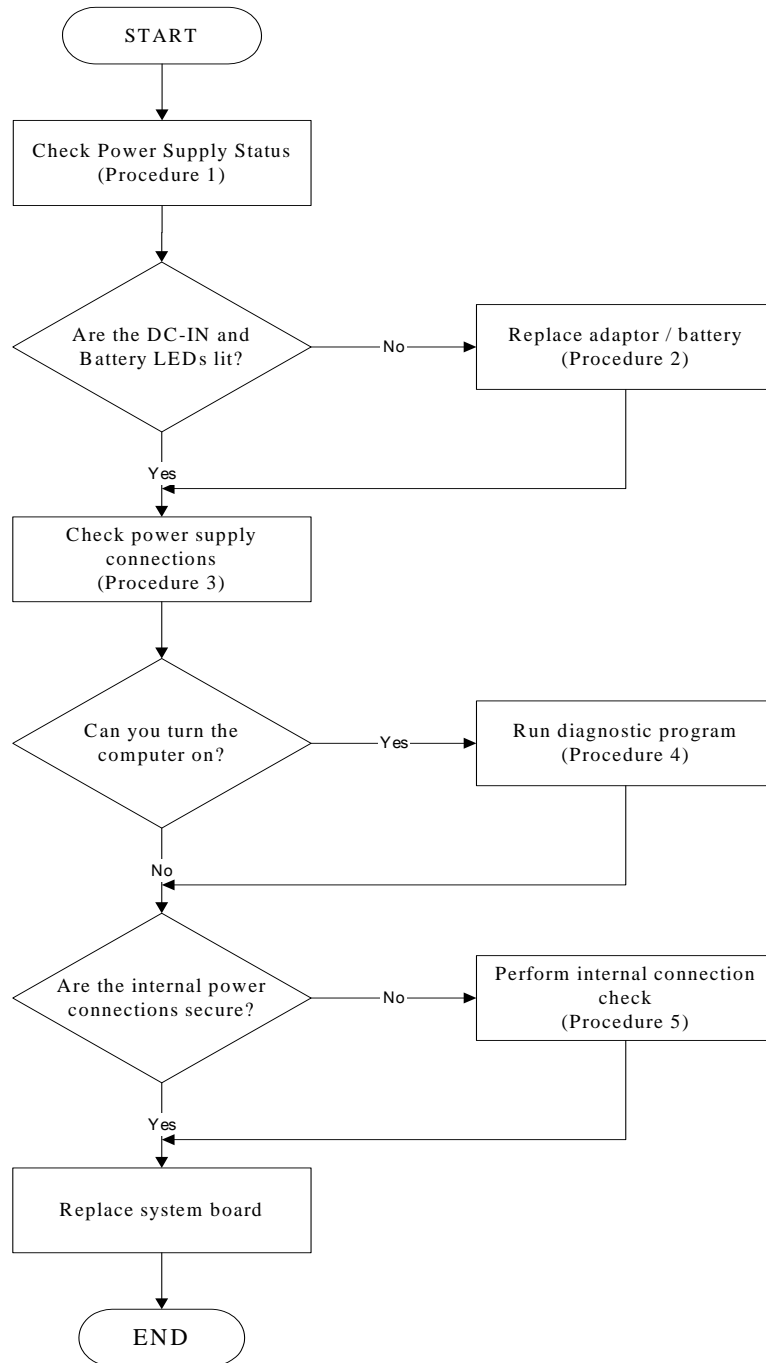


Figure 2-2 Power Supply Troubleshooting Process

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

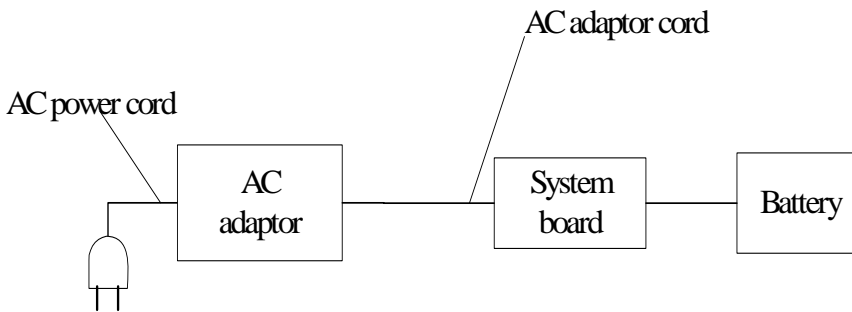
A faulty adaptor may not supply power or may not charge the battery. Perform Check 1.

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:



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 15V. If the output is several percent lower than 15V, go to Check 5. If the output is close to 15 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

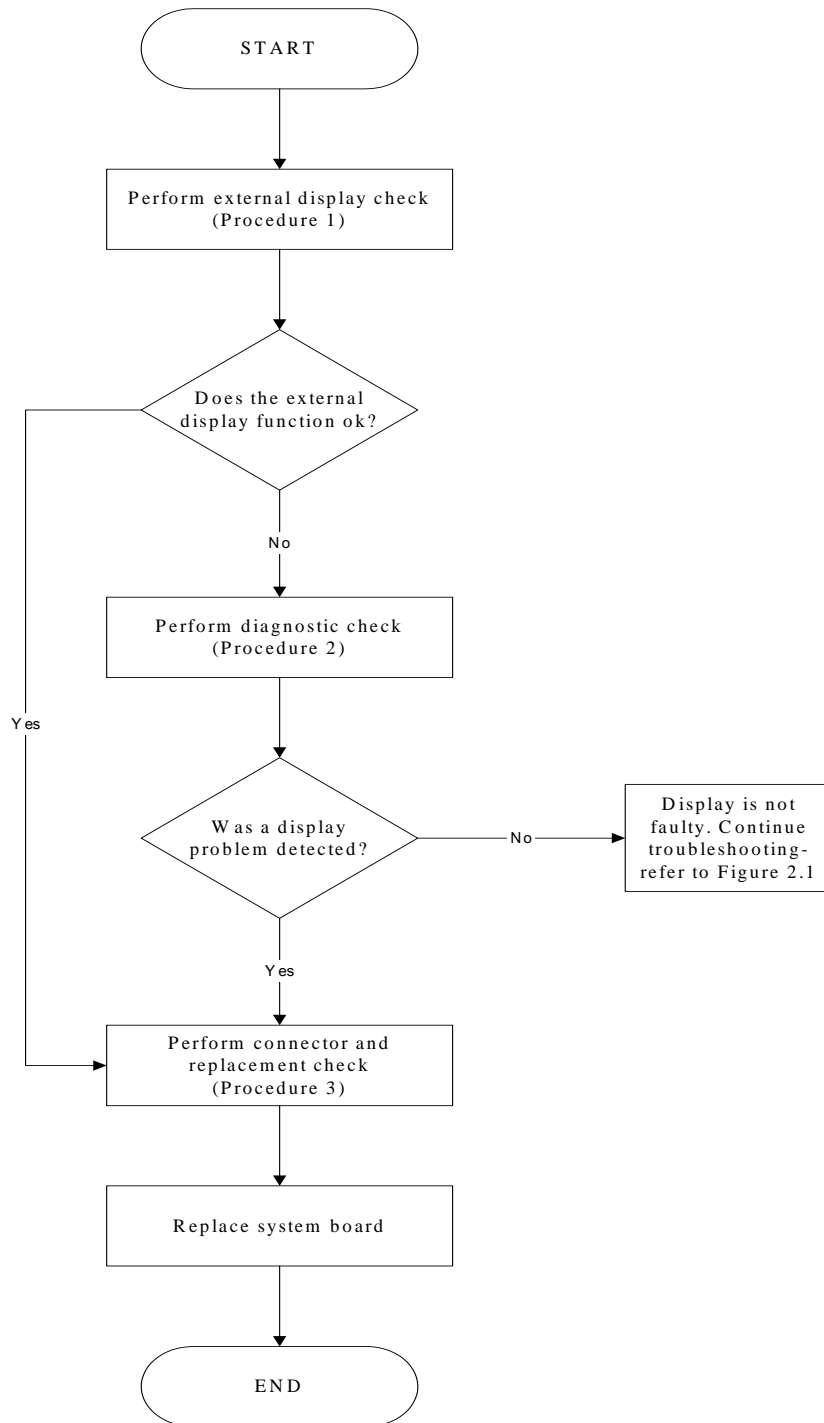


Figure 2-3 Display troubleshooting process

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 exists, 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 Keyboard Troubleshooting

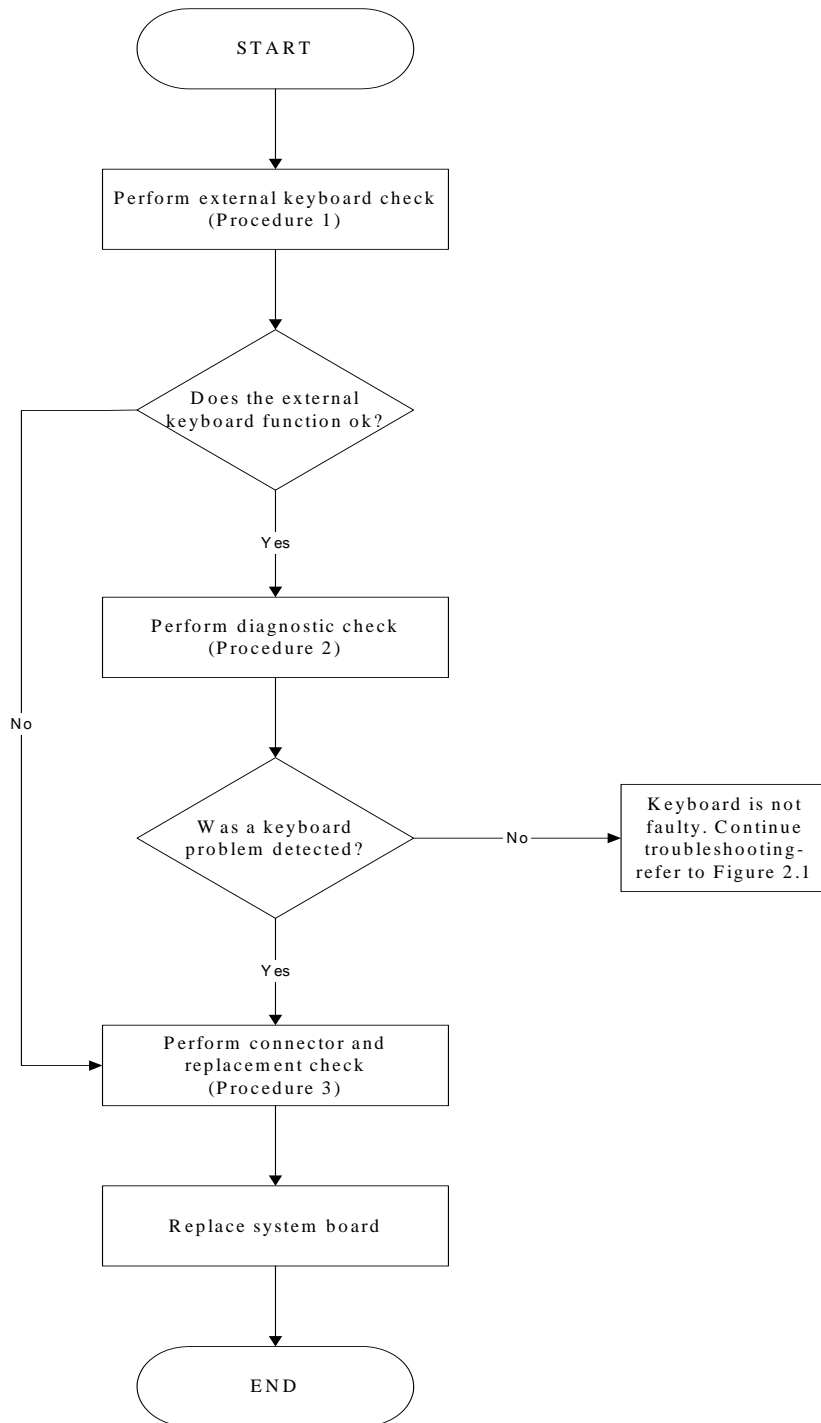


Figure 2-4 Keyboard troubleshooting process

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.

2.6 External USB Devices Troubleshooting

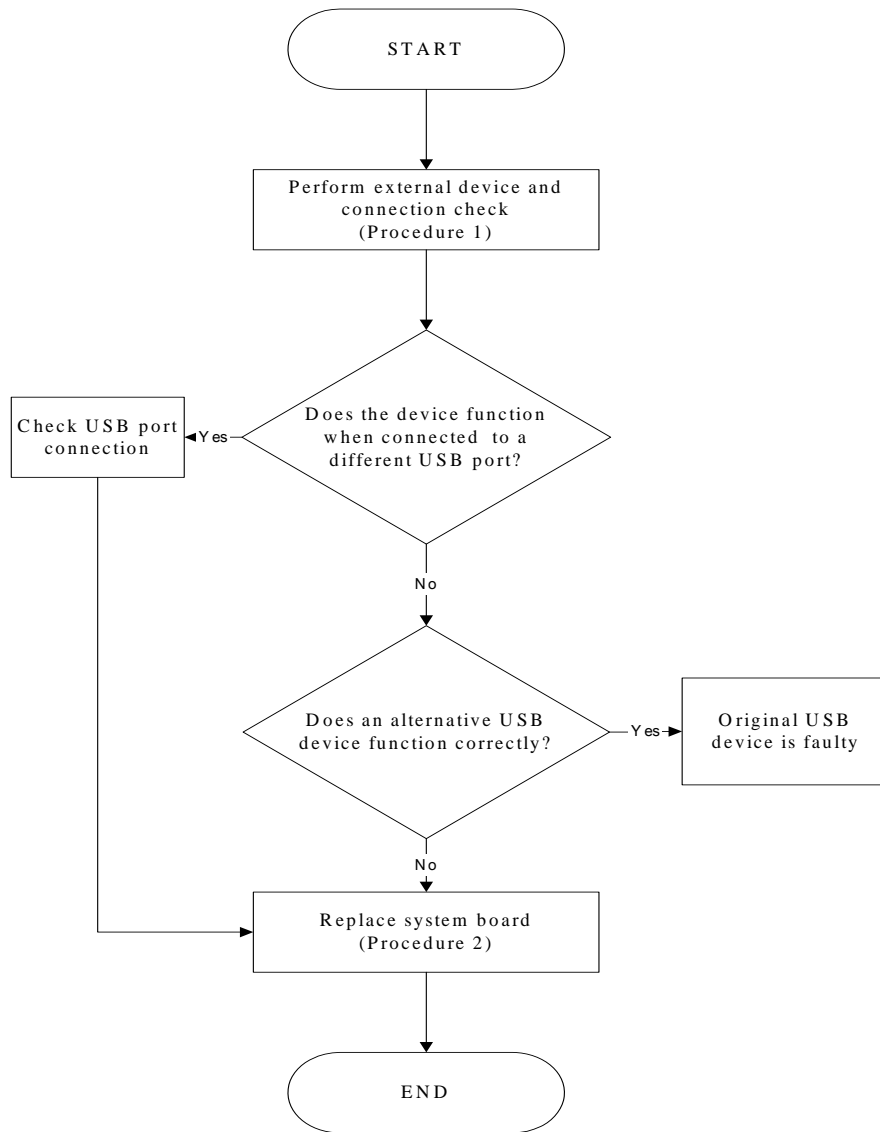


Figure 2-5 External USB device troubleshooting process

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.

2.7 TV-Out Failure Troubleshooting

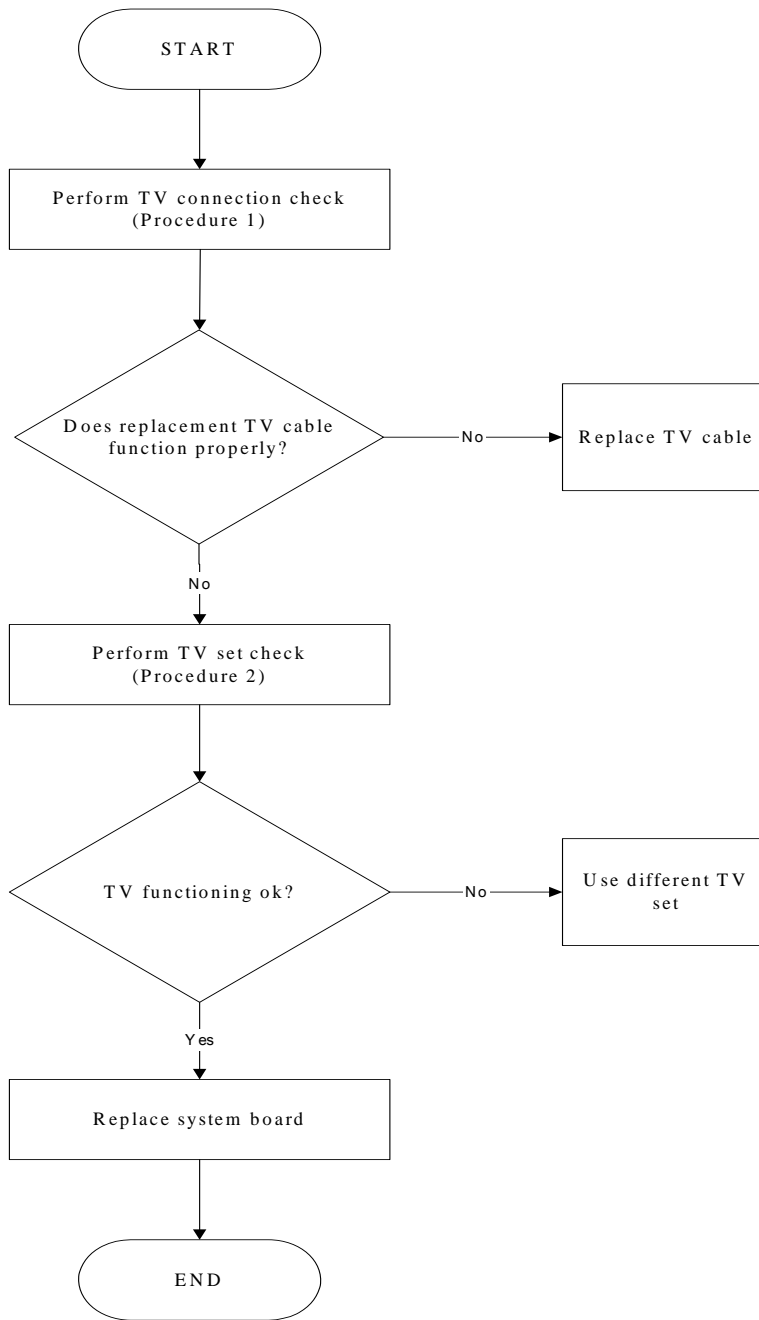


Figure 2-6 TV-out troubleshooting process

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.

2.8 Printer Port Troubleshooting

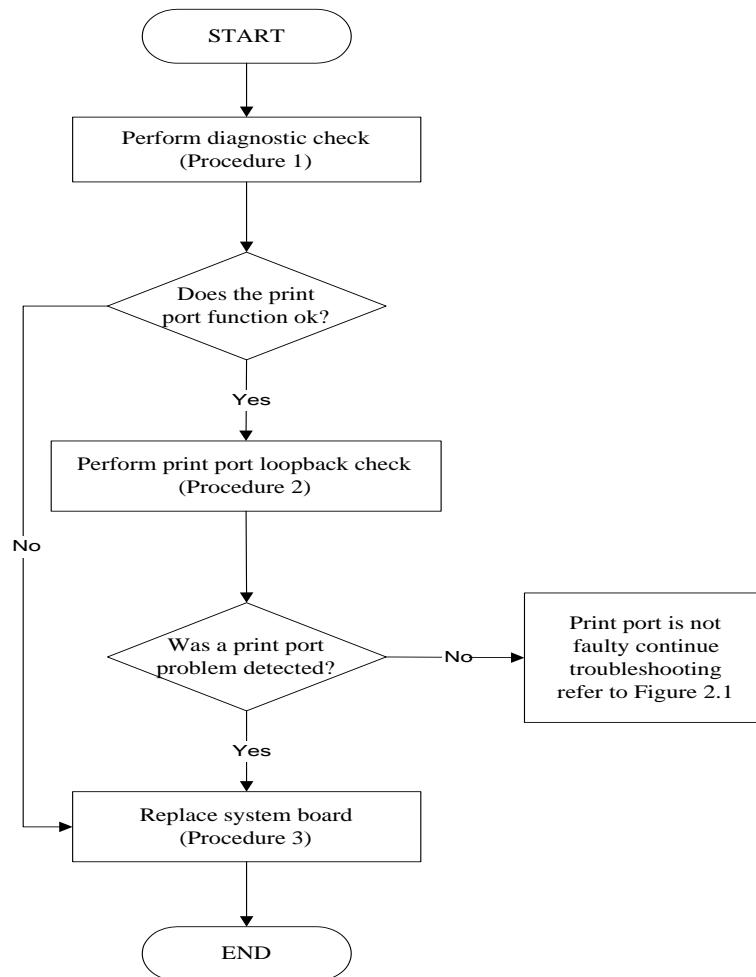


Figure 2-7 Printer port troubleshooting process

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.

2.9 TouchPad Troubleshooting

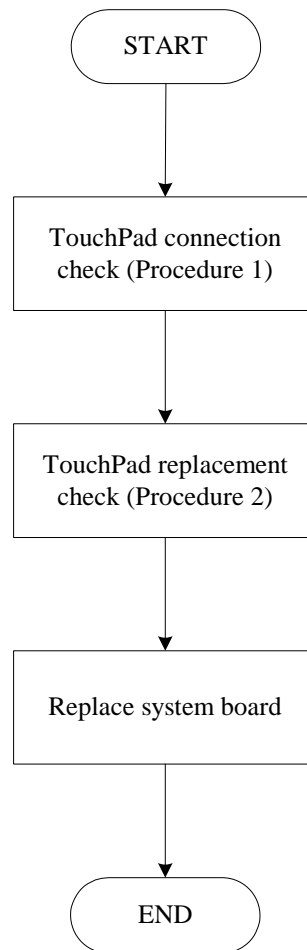


Figure 2-8 TouchPad troubleshooting process

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.

2.10 Speaker Troubleshooting

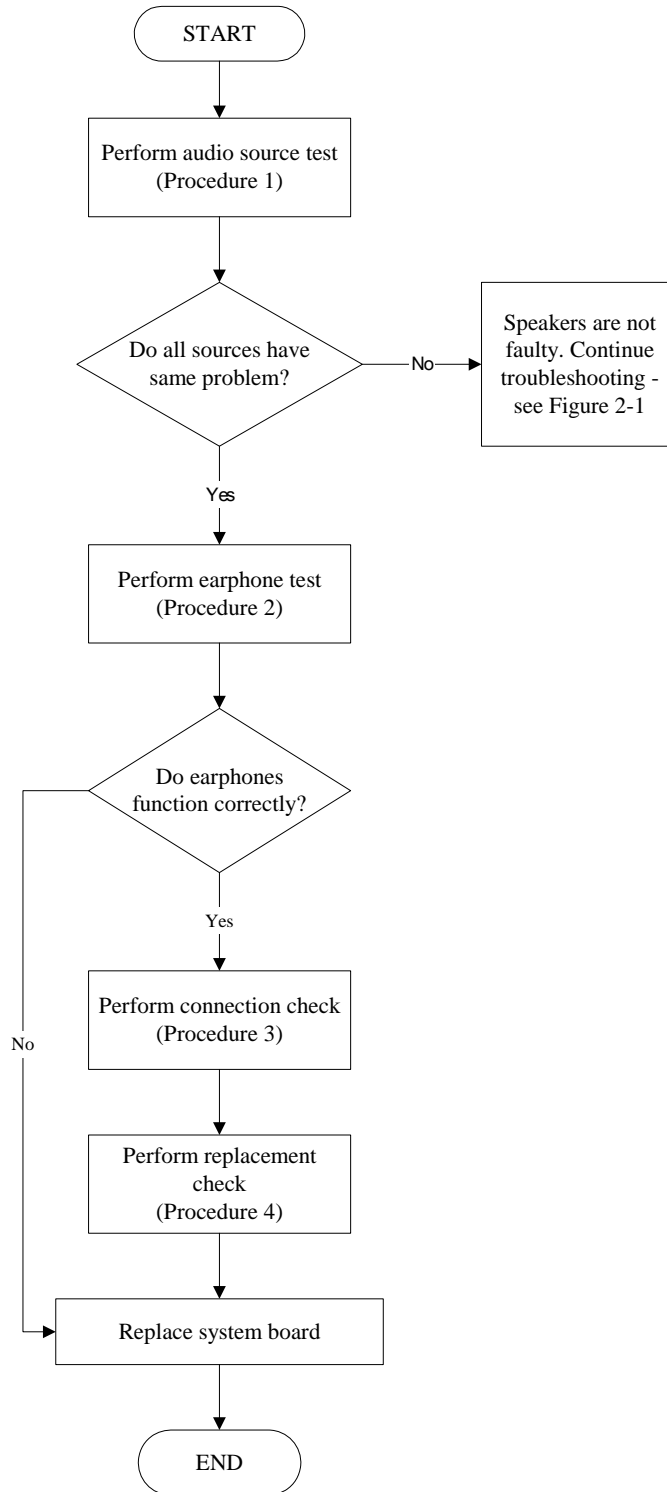


Figure 2-9 Speaker troubleshooting process

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 of 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.

2.11 Modem Troubleshooting

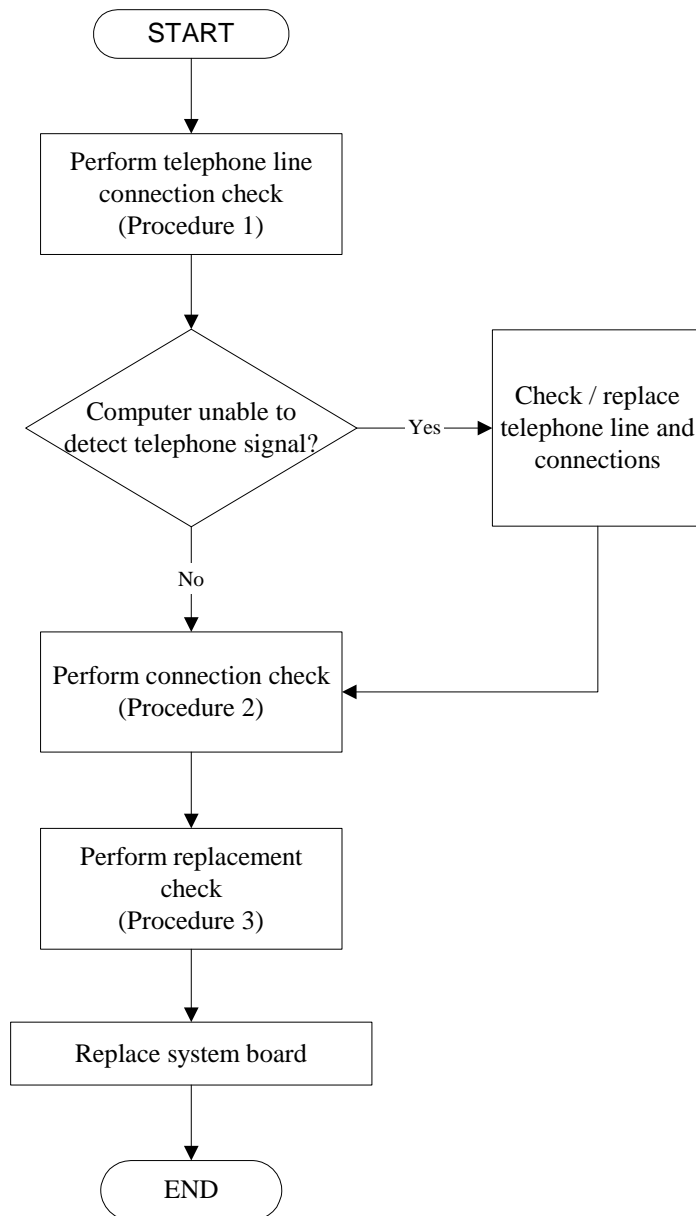


Figure 2-11 Modem troubleshooting process

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*.

2.12 PCMCIA Troubleshooting

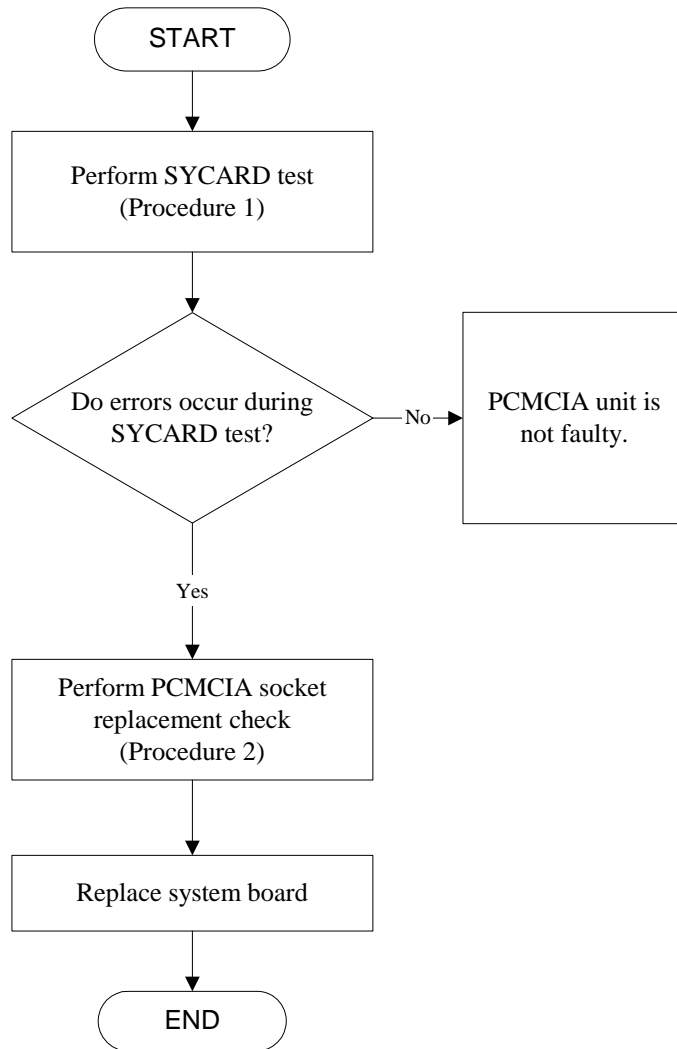


Figure 2-12 PCMCIA troubleshooting process

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 is 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.

2.13 IEEE 1394 Troubleshooting

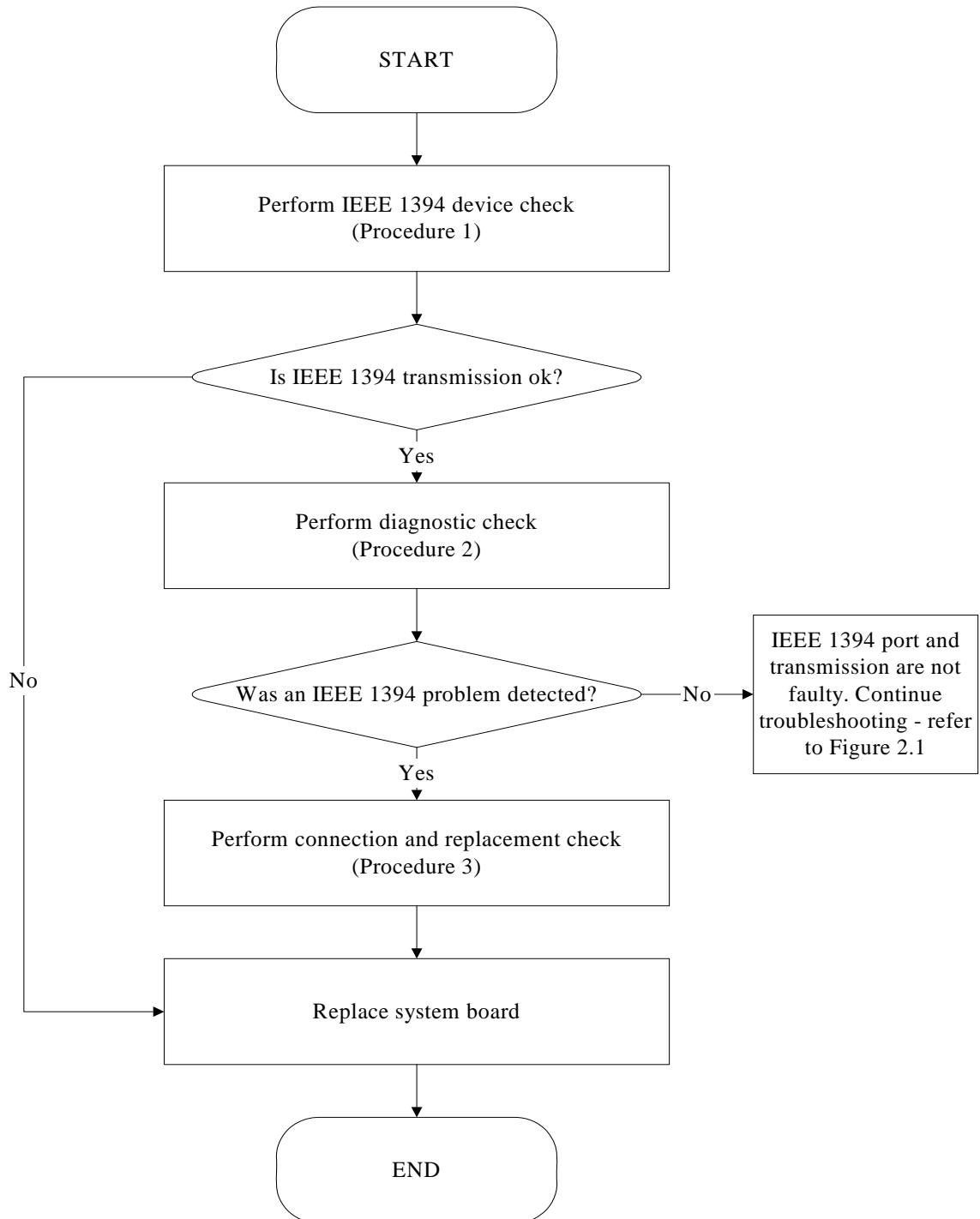


Figure 2-13 IEEE 1394 troubleshooting process

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.

2.14 Wireless LAN Troubleshooting

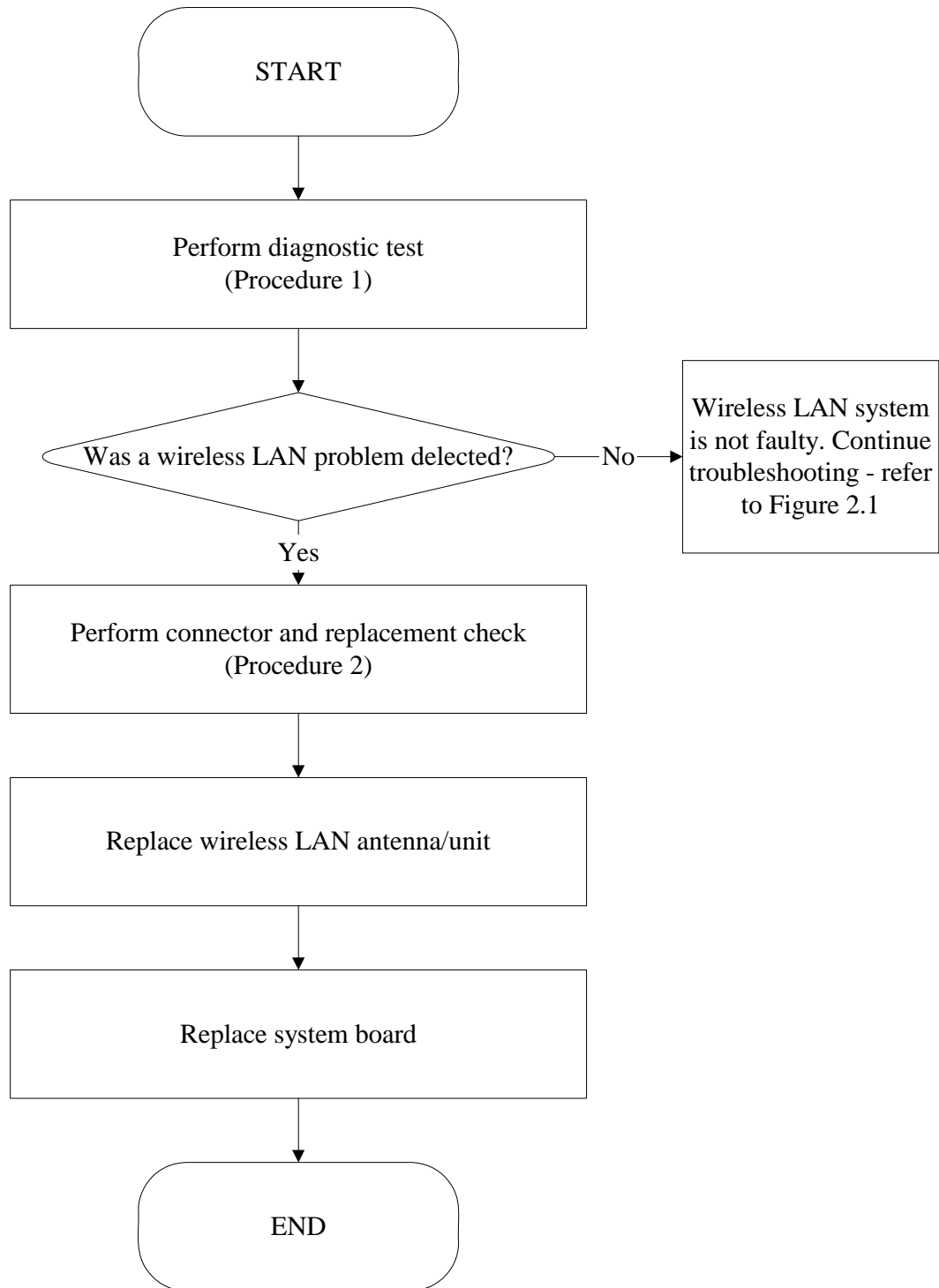


Figure 2-14 Wireless LAN troubleshooting process

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.

Chapter 3

Tests and Diagnostics

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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.

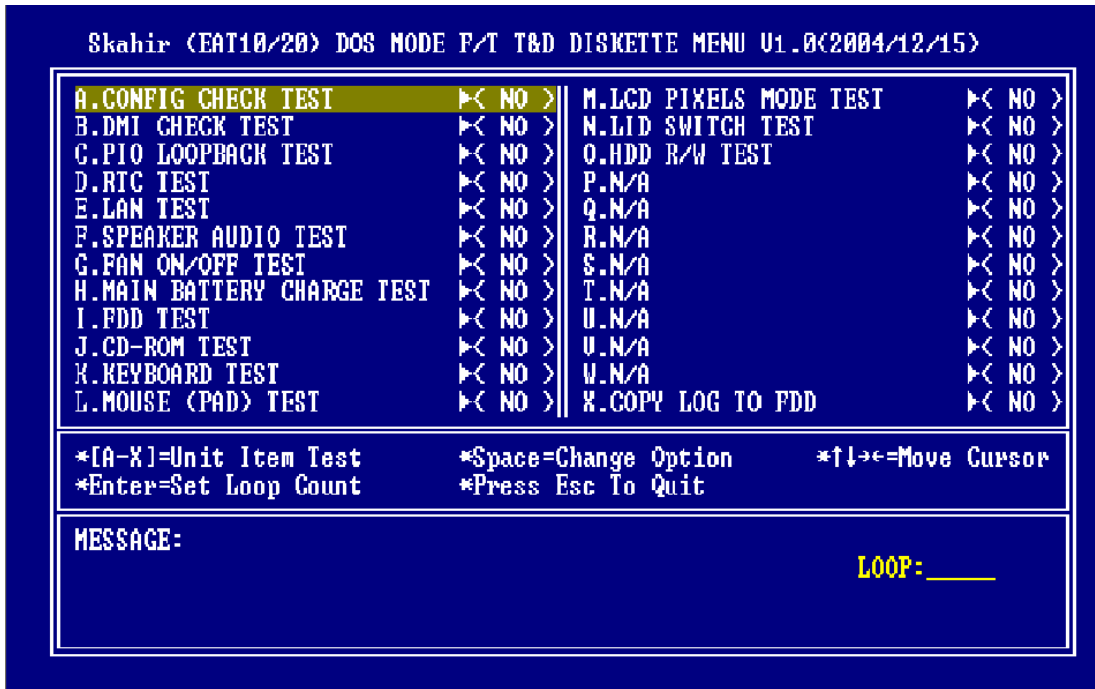
NOTE: To execute the CD test, make sure the CD is installed in the CD/DVD-ROM drive.

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. RTC TEST
- E. LAN TEST
- F. SPEAKER AUDIO TEST
- G. FAN ON/OFF TEST
- H. MAIN BATTERY CHARGE TEST
- I. FDD TEST
- J. CD-ROM TEST
- K. KEYBOARD TEST
- L. MOUSE (PAD) TEST
- M. LCD PIXELS MODE TEST
- N. LID SWITCH TEST
- O. HDD R/W TEST
- P. D1 STEPPING TEST

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



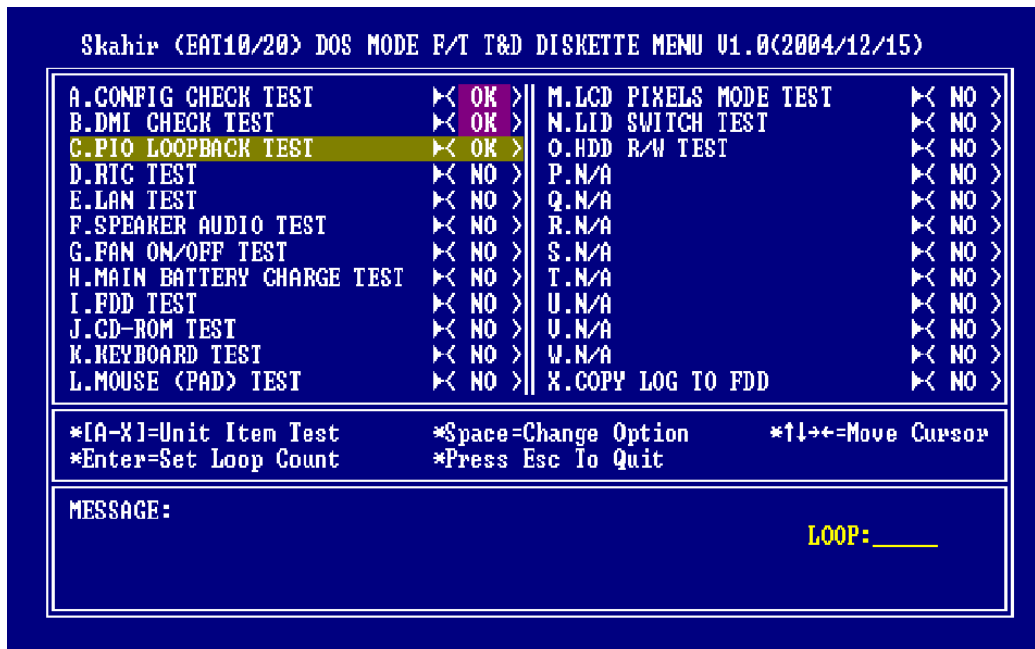
If the test result passes, the following display will show up:



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

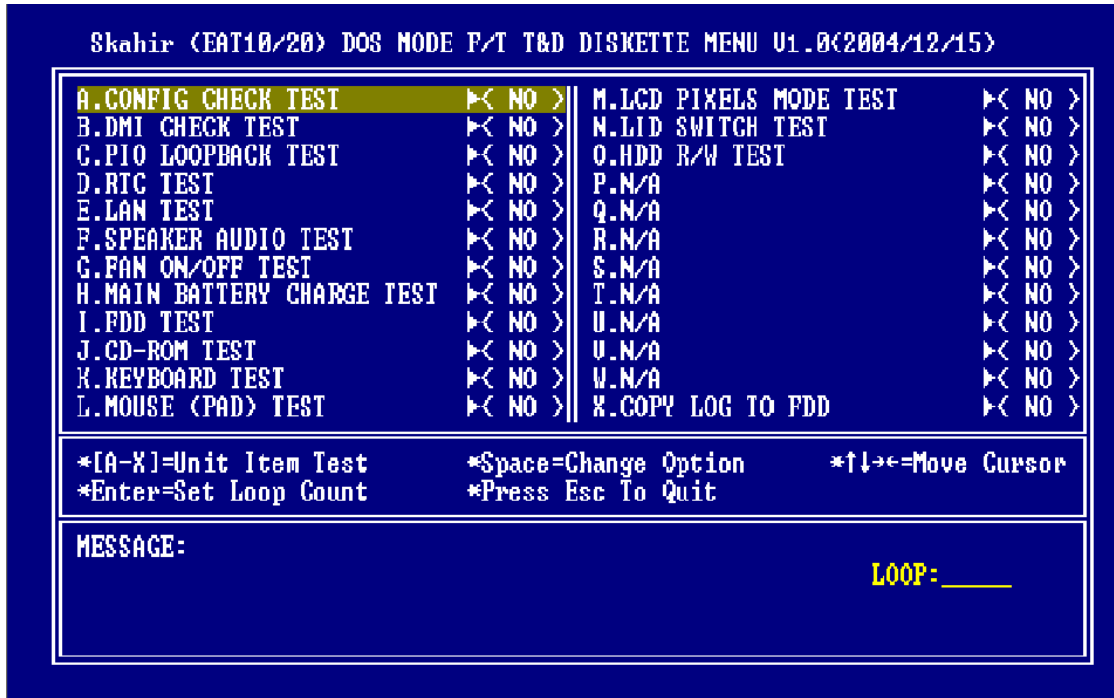


Then press any key for next actions – the below display presented if copying test log file onto diskette is necessary. This action will be executed when “Y” key pressed.



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.



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 DUDR/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.



```

      PASS

■ 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 !! *** U1.0 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 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]?
```

3.7 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]?
```

3.8 Main Battery Charge Test

NOTE: The AC adaptor (120W/90W, 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 . . .
```

3.9 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...
```


3.10 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 . . .
```

3.11 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.

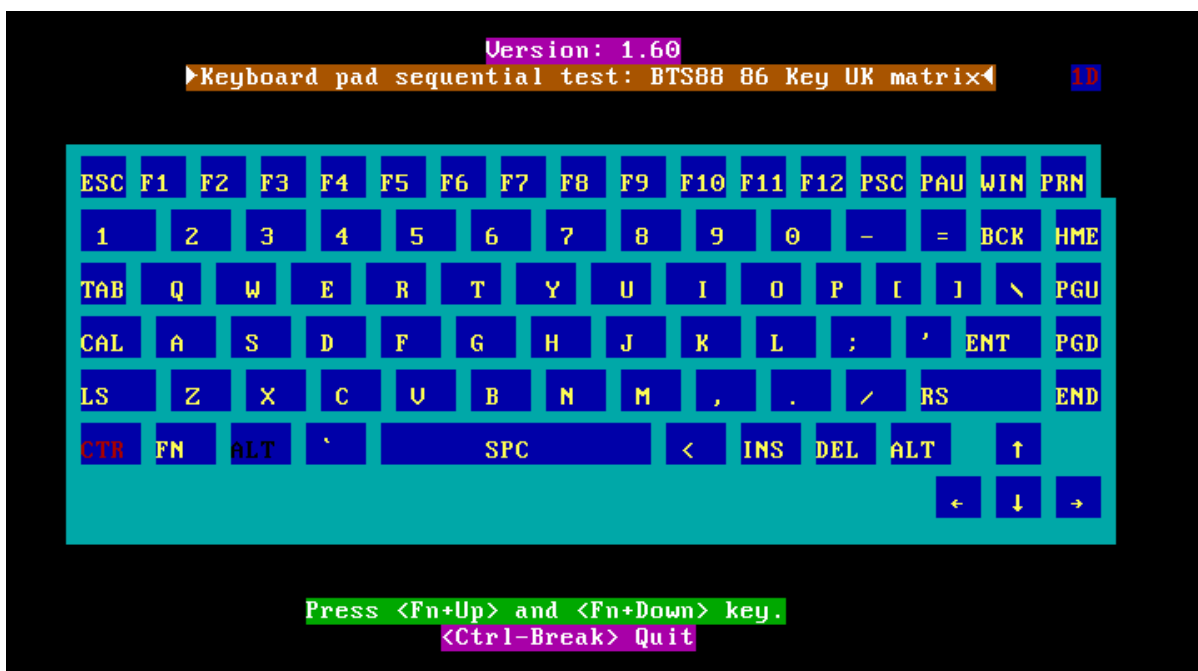
Before keyboard test starts, the keyboard matrix code should be chosen as below display:

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.



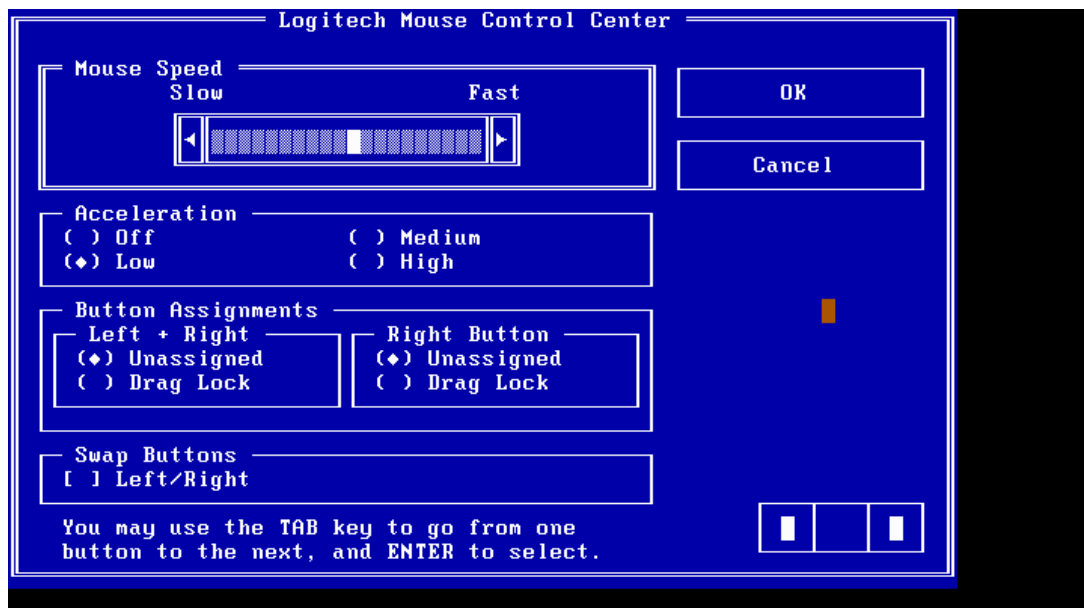
3.12 Mouse (Pad) Test

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.*

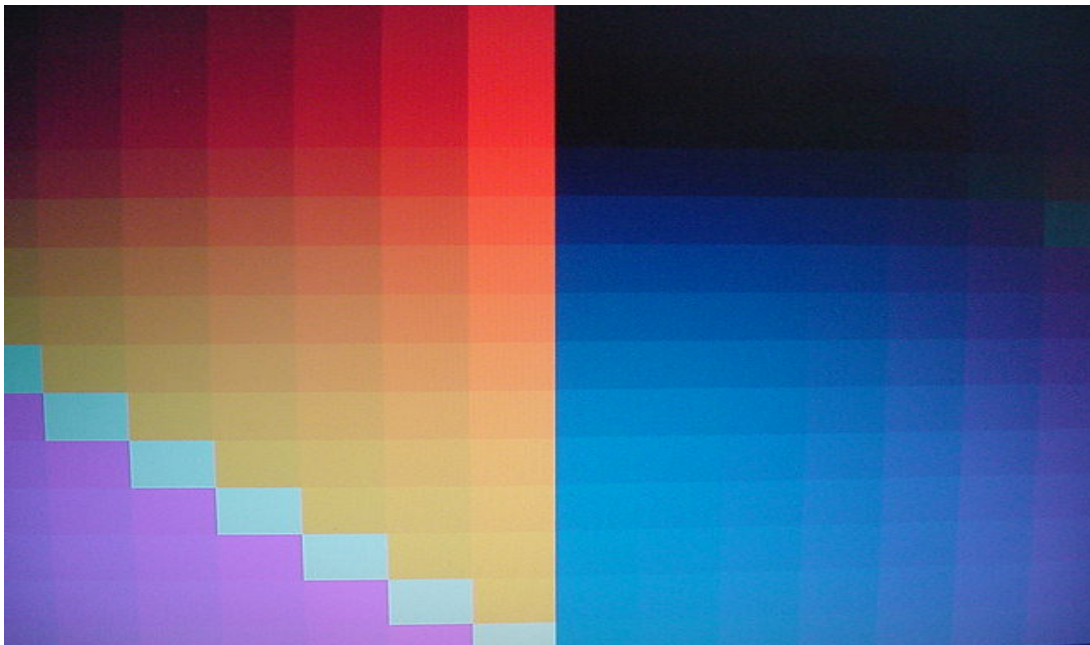
3.13 LCD Pixels Mode Test

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.



3.14 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 !!
```

3.15 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.

3.16 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:

- ◆ ASIC register Check:
- ◆ MAC register check:
- ◆ .PHY register check:
- ◆ .PHY IRQ(PCI) check:
- ◆ Check buffer RAM over register access:
- ◆ Test Rate Control .

The LAN test includes three subtests of the:

1. Speed1000
 - including ASIC Loopback (Speed=1000)
2. Speed100
 - including ASIC Loopback (speed=100)
3. Speed 10
 - including ASIC Loopback (Speed=10)

The subtests run automatically.

The screen should display as below, indicating pass will go on to next test

```
Diagnosics v6.23 (20040827) I           Free Mem. 105 kB   00:00:00
Marvell Yukon 88E8036 Fast Ethernet Controller
Output                               Script

>>n
ASIC register check: o.k.
MAC register check: o.k.
PHY register check: o.k.
PHY IRQ(PCI) check: o.k.
Check Buffer RAM over register access: o.k.
Test Rate Control ... skipped
Fragment Transfer Check: .. o.k.
Starting Loopback Tests ...
ASIC Loopback (Speed=10) Now start for 2 seconds
12693 packets looped by Port A
o.k.
MAC Loopback (Speed=10) Now start for 2 seconds
```

FAIL as below will keep this screen

```
Wrap plug is installed.  
>>y  
Starting Loopback Tests ...  
ASIC Loopback (Speed=10) Now start for 2 seconds  
12677 packets looped by Port A  
o.k.  
MAC Loopback (Speed=10) Now start for 2 seconds  
1649 packets looped by Port A  
o.k.  
Wrap Plug Loopback (Speed=10) Link Up Timeout  
Error occured during Wrap Plug Loopback  
  
Current time      : 00:00:00:54  
      ERROR      : E950 found on Adapter!  
Please check that a wrap plug is installed  
  
*** 1 ERROR(s) found ***  
>>
```

TOSHIBA

```
ackets looped by Port H  
Plug Loopback (Speed=10) Link Up Time  
occured during Wrap Plug Loopback  
  
t time      : 00:00:00:49  
  ERROR     : E950 found on Adapter!  
  check that a wrap plug is installed  
  
ERROR(s) found ***
```

3.17 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 . . .
```

Chapter 4

Replacement Procedures

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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					
Expansion Memory Module	HDD	ODD	MODEM	Keyboard	Wireless LAN
				Direct Play Button Board	Display Assembly
	Top Cover				Display Mask
System Board			Speakers	Touch Pad	LCD Module
Fan & Heat Sink					FL Inverter Board
CPU					

4 Replacement Procedures

The example below shows FRUs to be removed before the Direct Play button board can be removed and repaired or replaced. The Direct Play button board is overlapped by the top cover which must be removed before the Direct Play button board can be reached. The removable HDD, keyboard, wireless LAN, ODD, modem, and display assembly in turn overlap the top cover. Always starts the disassembly process by removing the battery pack.

Battery pack					
Expansion Memory Module	HDD	ODD	MODEM	Keyboard	Wireless LAN
				Direct Play Button Board	Display Assembly
	Top Cover				Display Mask
System Board			Speakers	Touch Pad	LCD Module
Fan & Heat Sink					FL Inverter Board
CPU					

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 contaminants
 - 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 battery bay, follow the steps below.

1. Turn the computer upside down.
2. Disengage the battery pack lock (1).
3. Release the battery pack release latch (2).
4. Remove the battery pack from the bay (3).

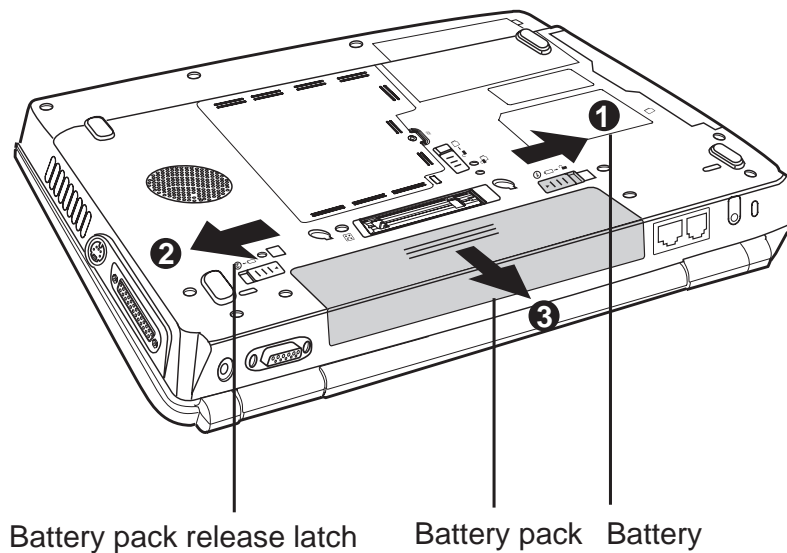


Figure 4-1 Removing the battery pack

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 battery 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 battery bay. The battery bay latch will click automatically.
2. Lock the battery pack lock and battery pack release latch to secure the installation.

4.3 PC Card

Removing a PC Card

To remove a PC Card, follow the steps below.

1. Push the PC Card's eject button. The button pops out when you release it.
2. Push the eject button once more to pop the PC Card out slightly.
3. Grasp the PC Card and remove it.
4. Push the eject button back into place, if necessary.

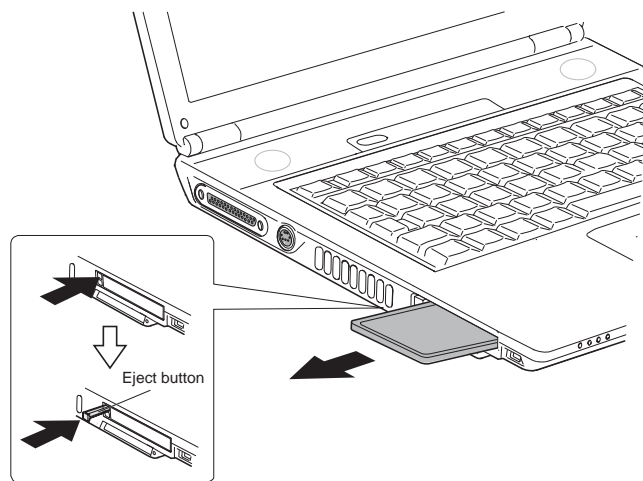


Figure 4-2 Removing a PC Card

Installing a PC Card

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

1. Make sure the eject button does not stick out.
2. Insert a PC Card and press gently to ensure a firm connection.

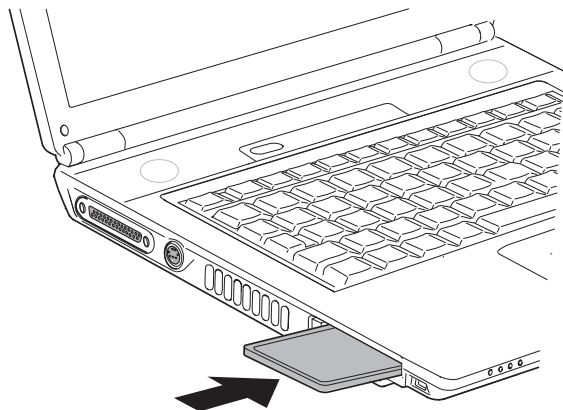


Figure 4-3 Installing a PC Card

4.4 HDD

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

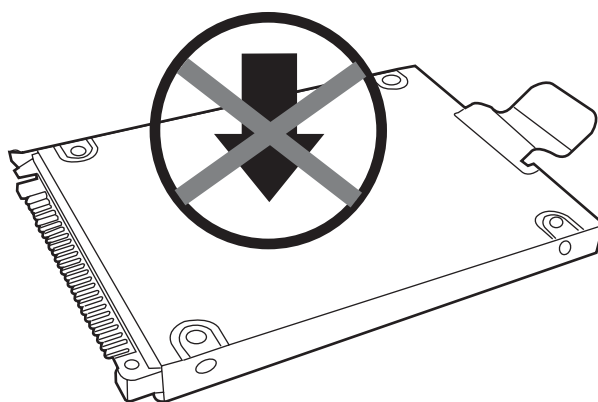


Figure 4-4 HDD

Removing the HDD Module

Follow the steps below to remove HDD module:

1. Turn the computer upside down
2. Remove two black M2.5x5 screws to release the HDD door.
3. Pull on the tab to remove the HDD module.
4. Remove the HDD module from the HDD case.

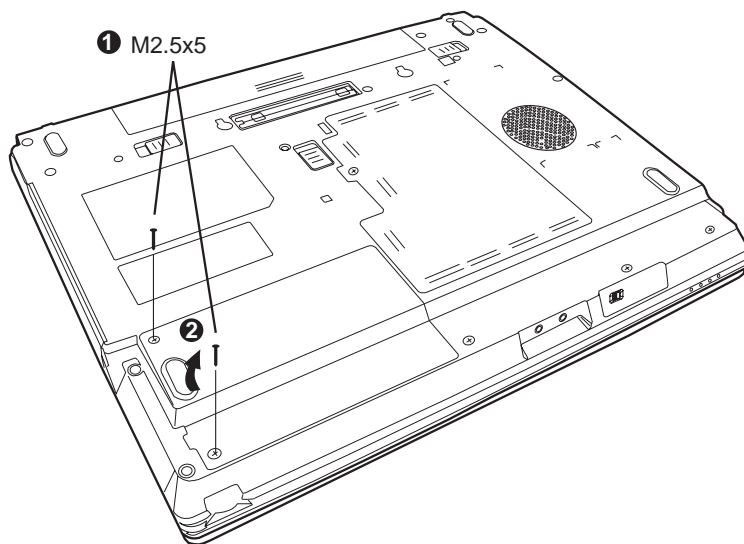


Figure 4-5 Removing the HDD door

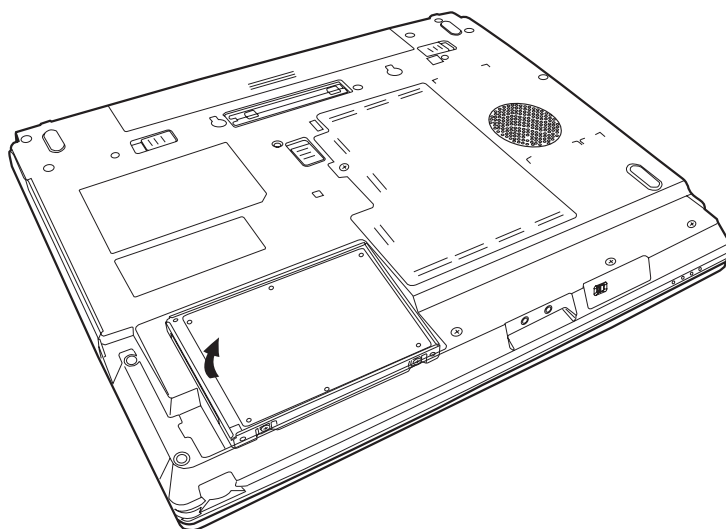


Figure 4-6 Removing the HDD module

Installing the HDD Module

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

1. Insert the HDD module into the HDD slot.
2. Secure the HDD door with two black M2.5x5 screws.

Disassembling the HDD Module

To take apart the HDD, first remove it from the computer as described earlier.

1. Remove four M3x3 screws securing the HDD mounting brackets to the HDD. There are two on each side.

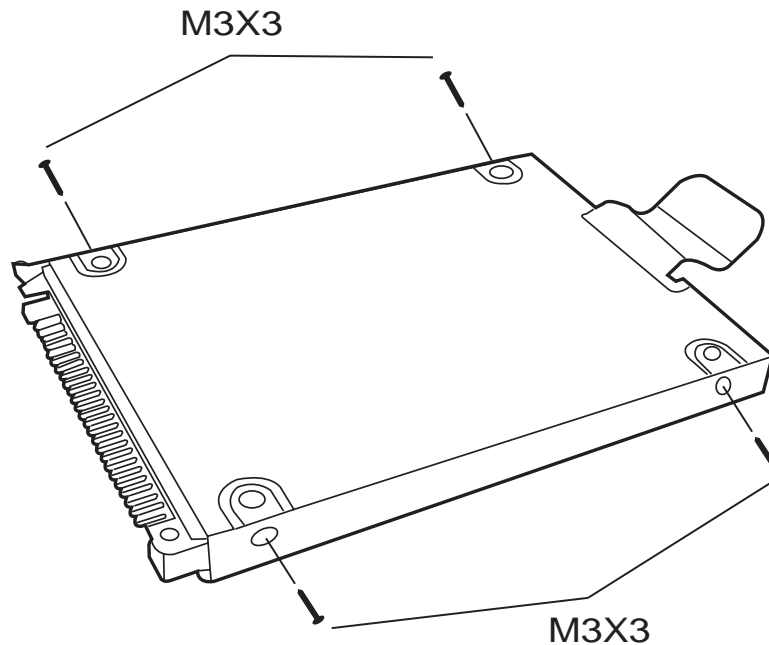


Figure 4-7 Removing the HDD bracket

4.5 Optical Drive Module

Removing the Optical Drive Module

To remove the optical drive module, you need to remove the HDD module first. Follow the steps below:

1. Turn the computer upside down.
2. Remove one M2.5x3 screw securing the optical drive module into place.
3. Slide the Slim Select Bay latch to unlock position.
4. Grasp the optical drive module and slide it out.

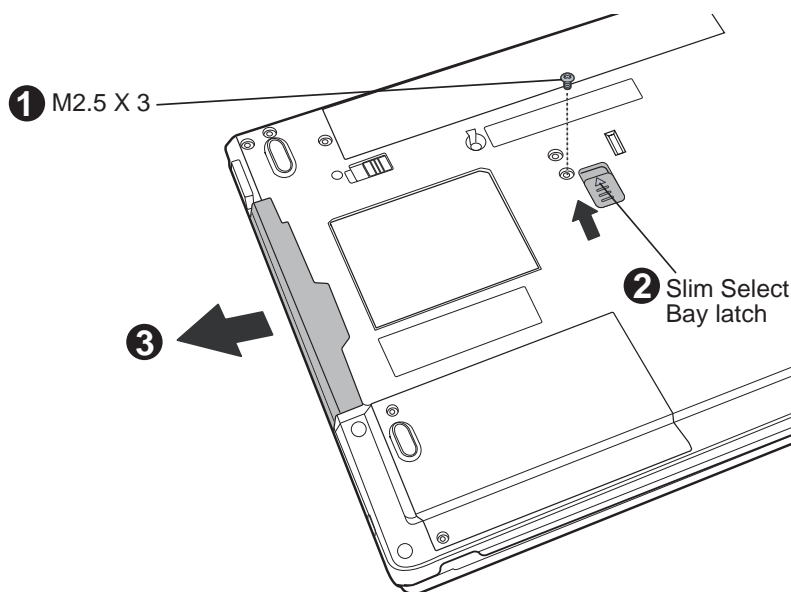


Figure 4-8 Removing the optical drive module

Installing the Optical Drive Module

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

1. Slide the device into the optical drive module bay.
2. Use one M2.5x3 screw to secure it in position.
3. Slide the Slim Select Bay latch to lock position.

4.6 Optical Drive

This computer may be fitted with a:

- CD-RW/DVD-ROM device
- DVD+-R/+-RW
- DVD Super Multi device

Disassembling the Optical Drive

To disassemble the optical drive, then follow the steps below.

1. Remove one M2.5x3 screw and slide the optical drive module from the bay.
2. Remove two M2.5x8 screws from bracket plate and five M2.5x3 screws from Base case.

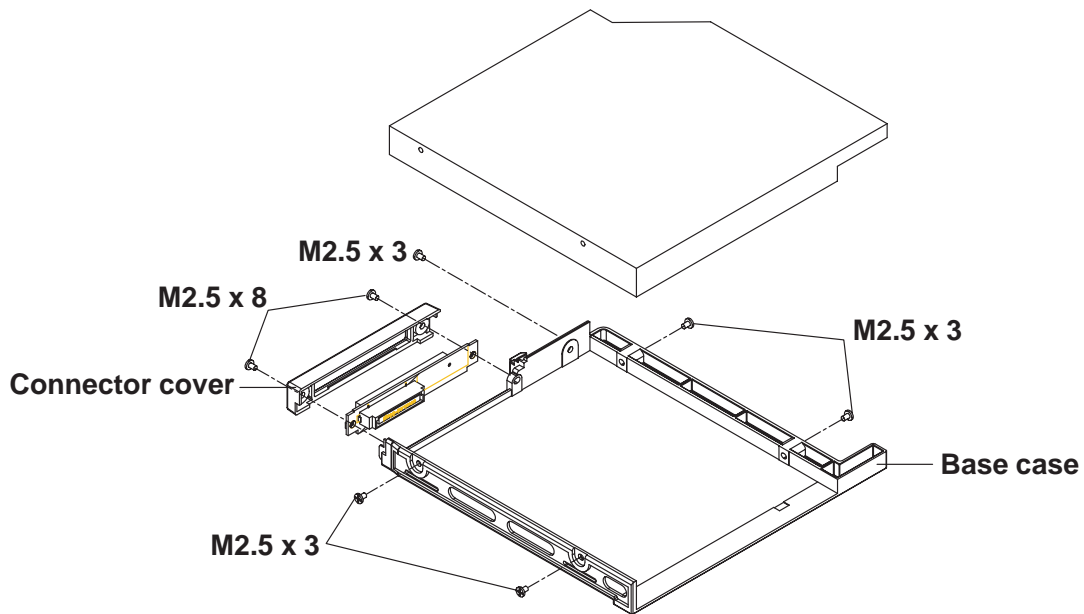


Figure 4-9 Removing the optical drive bracket

Reassembling the Optical Drive

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

1. Position the optical drive bracket plate to the rear panel of optical drive.
2. Secure the optical drive bracket plate with two black M2.5×8 screws.
3. Secure the Base case with five M2.5x3 screws.
4. Install the optical drive module into the bay and secure with one M2.5x3 screw.

4.7 Wireless LAN

Removing the Wireless LAN

1. Turn the computer upside down and loosen the embedded M2.5x5 screw securing the wireless LAN compartment cover.

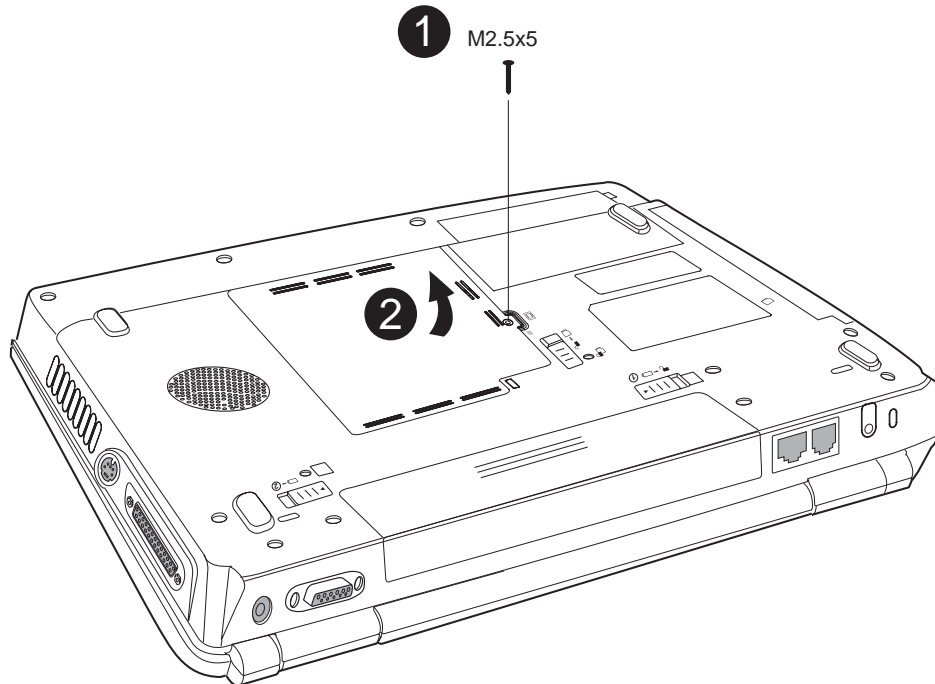


Figure 4-10 Removing the wireless LAN cover

2. Lift off the wireless LAN compartment cover.
3. Remove the embedded one M2.5x3.6 screw securing the Mini PCI bracket.
Note: If your wireless LAN unit is an 'A' type card, then the screw will be a safety screw.
4. Detach the two ends of the wireless LAN antenna.
5. Gently press out on the latches. One end of the wireless LAN unit will pop up.
6. Detach antenna cables from LAN card connector.
7. Grasp the wireless LAN unit and pull it out.

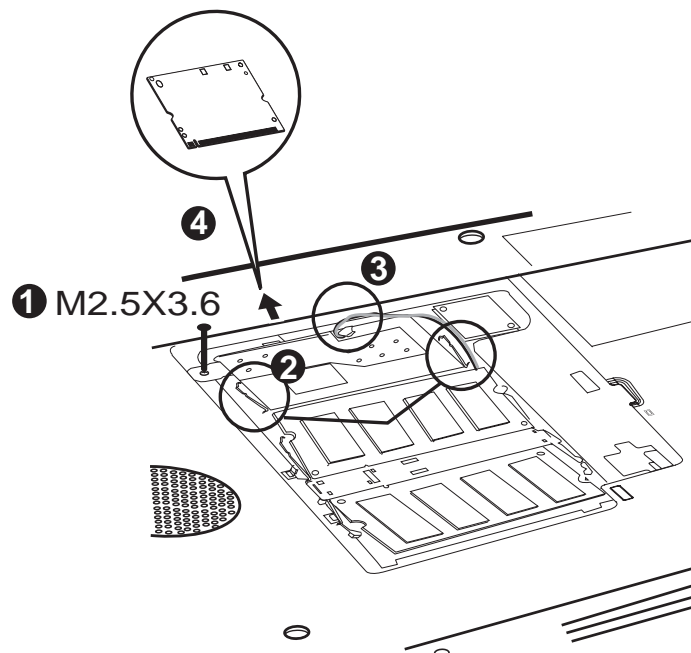


Figure 4-11 Removing the wireless LAN unit

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

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 the embedded M2.5x5 screw securing the wireless LAN compartment cover.
2. Lift off the wireless LAN compartment cover.
3. Fit the wireless LAN unit's connector to 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. Connect the antenna cables (a black one and a white one) to LAN card's connector.
6. Use one M2.5x3.6 screw to secure the Mini PCI bracket.

Note: If your wireless LAN unit is an 'A' type card, then the screw will be a safety screw.

7. Seat the wireless LAN compartment cover and secure it with the embedded security screw.

4.8 Expansion Memory Module

Removing an Expansion Memory

To remove an expansion memory module, make sure the computer is in boot mode then:

1. Be sure the power is off and all cables are disconnected from the computer.
2. Turn the computer upside down and remove the battery pack. Loosen the embedded M2.5x5 screw securing the memory module socket cover.

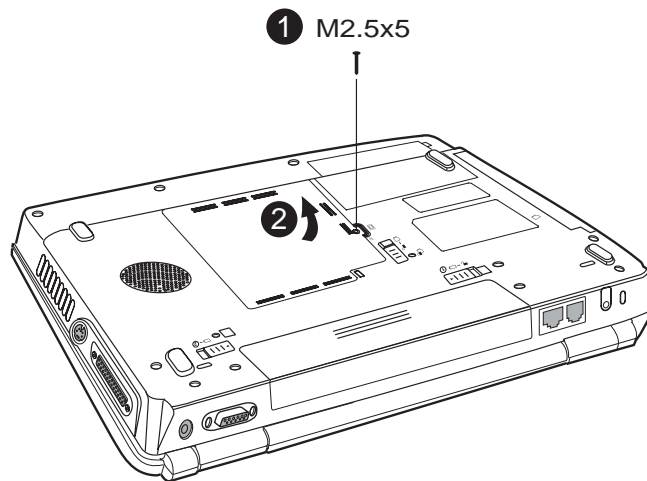


Figure 4-12 Removing the memory module cover

3. Slide your fingernail or a thin object under the cover and lift it off.
4. Push the latches to the outside to release a module. A spring will force one end of the module up.
5. Grasp the module and pull it out.
6. Seat the cover and secure its screw.

7. Replace the battery pack.

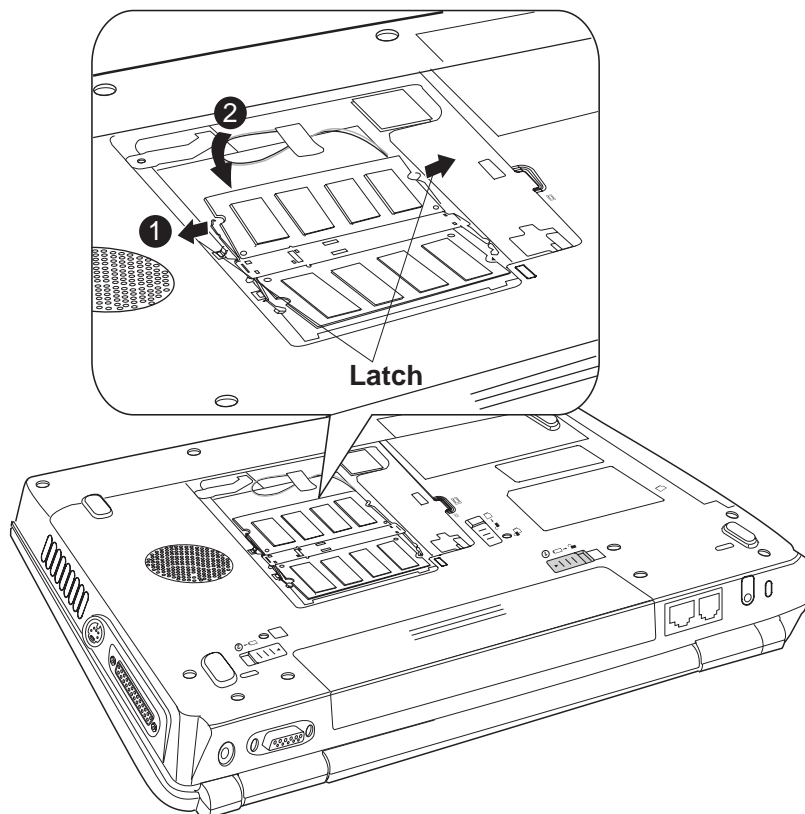


Figure 4-13 Removing a memory module

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

Installing an Expansion Memory Module

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

Follow these steps to install a memory module:

1. Set the computer to boot mode and turn off the power.
2. Remove all cables connected to the computer.
3. Turn the computer upside down and remove the battery. Loosen the embedded M2.5x5 screw securing the memory module socket cover.

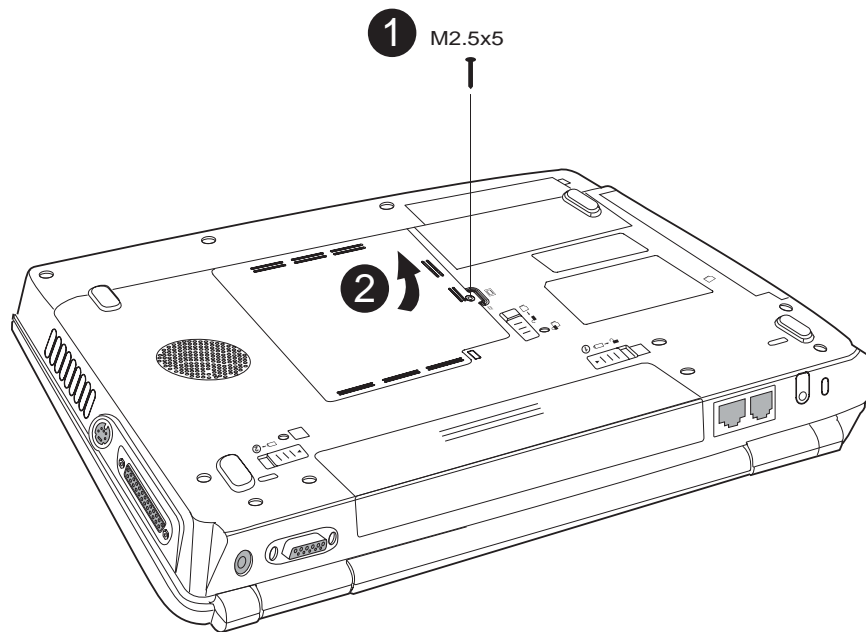


Figure 4-14 Removing an expansion memory cover

4. Slide your fingernail or a thin object under the cover and lift it off.
5. Fit the module's connectors into the computer's connectors at about a 45-degree angle and press the module carefully to ensure a firm connection.
6. Push the module down so it lies flat. Latches on either side will click into place to secure the module.

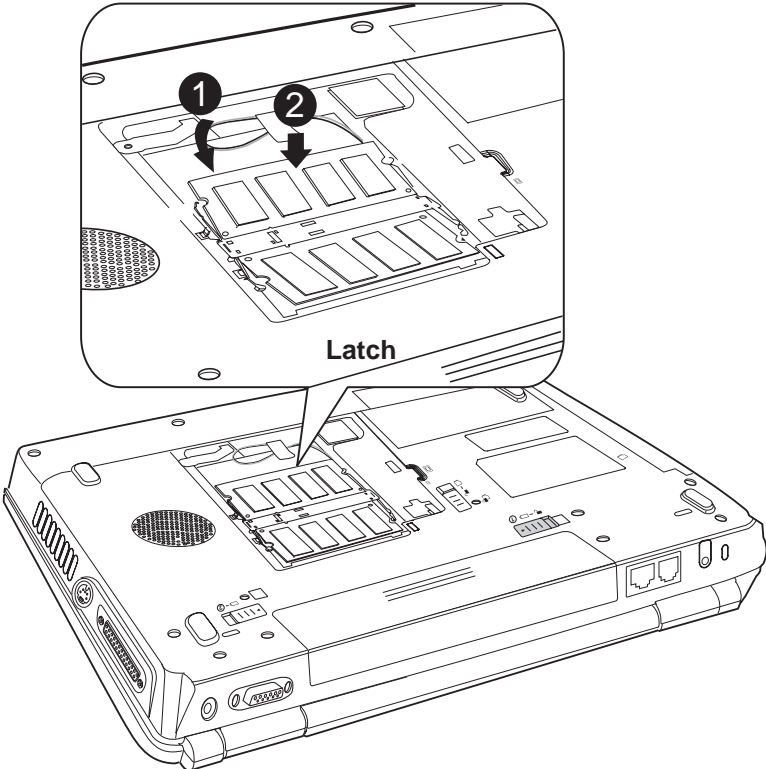


Figure 4-15 Installing an expansion memory

4.9 Keyboard

Removing the Keyboard

Follow the steps below to remove the keyboard:

1. Open the display panel.
2. Remove the strip cover by forcing one end of the strip cover up.

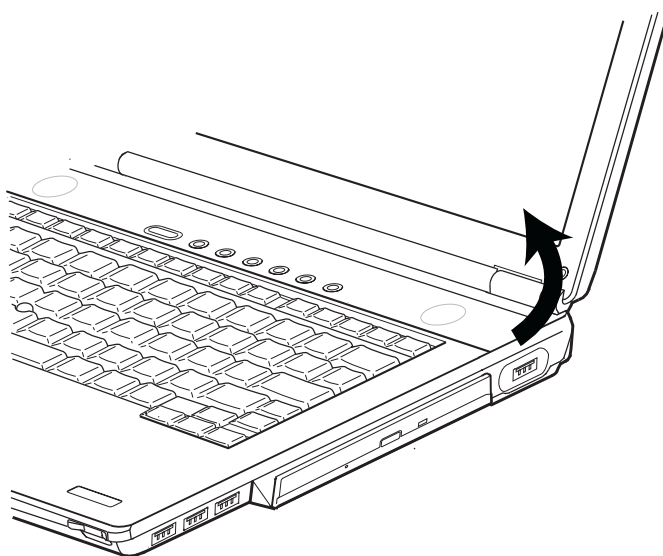


Figure 4-16 Removing the strip cover

3. Remove two black M2.5×3 screws securing the keyboard.

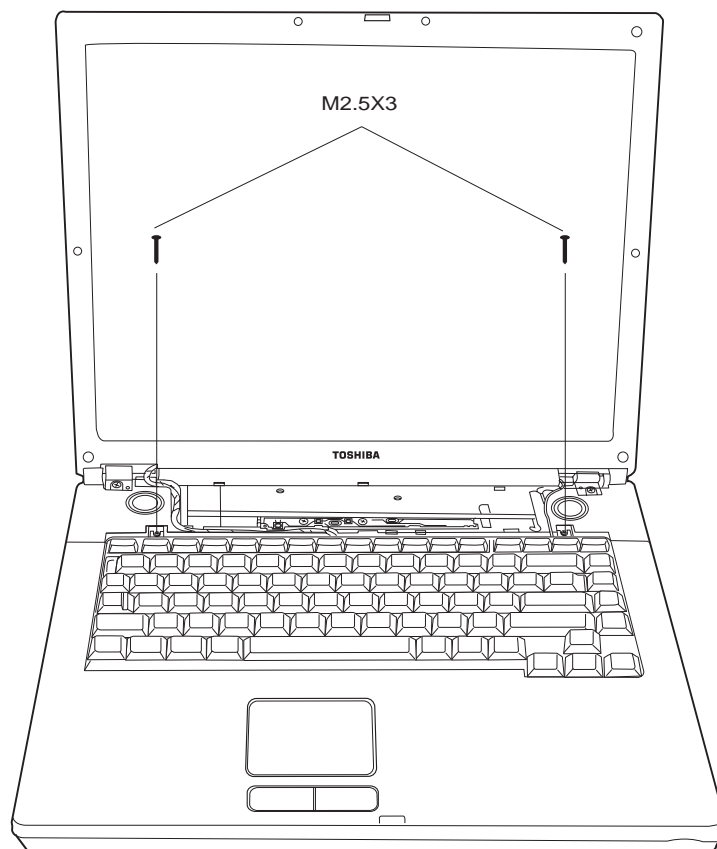


Figure 4-17 Removing the keyboard

4. After removing the screws, flip the keyboard latch with either a screwdriver or a fingernail.
5. Lift the keyboard out of its bay, revealing the keyboard cable.
6. Disconnect the keyboard cable and remove the keyboard from the computer entirely.

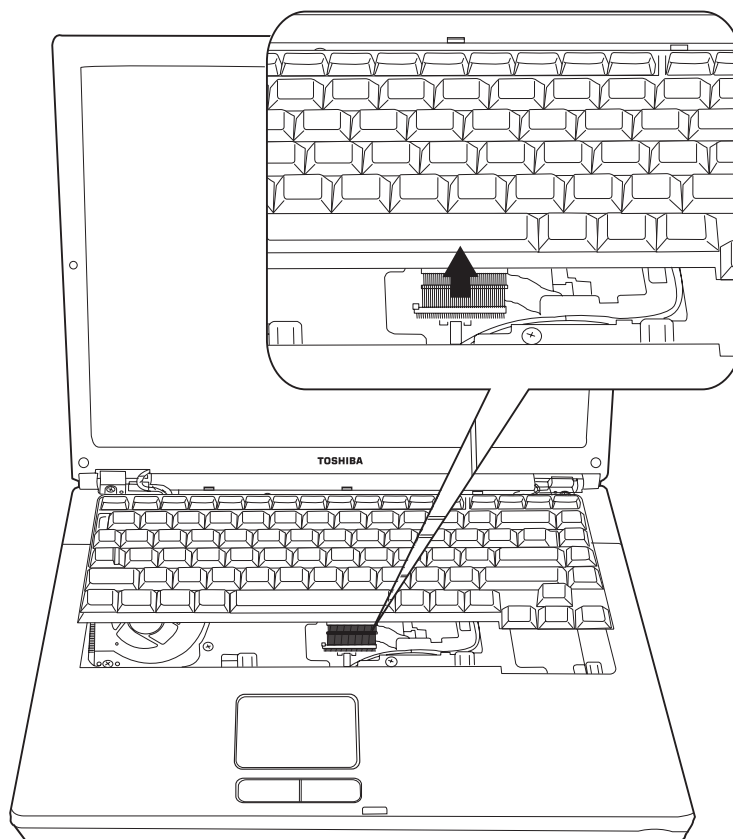


Figure 4-18 Disconnecting the keyboard cable

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 black M2.5x3 screws.
3. Engage the flip latch with either a screwdriver or a fingernail.
4. Set the strip cover and press down to secure the strip cover latches engage.

4.10 Bluetooth

Removing the Bluetooth

To remove a Bluetooth unit, follow the steps below.

1. Detach a FFC cable from motherboard.
2. Remove two black M2x3 screws.
3. Grasp the Bluetooth unit and remove it.

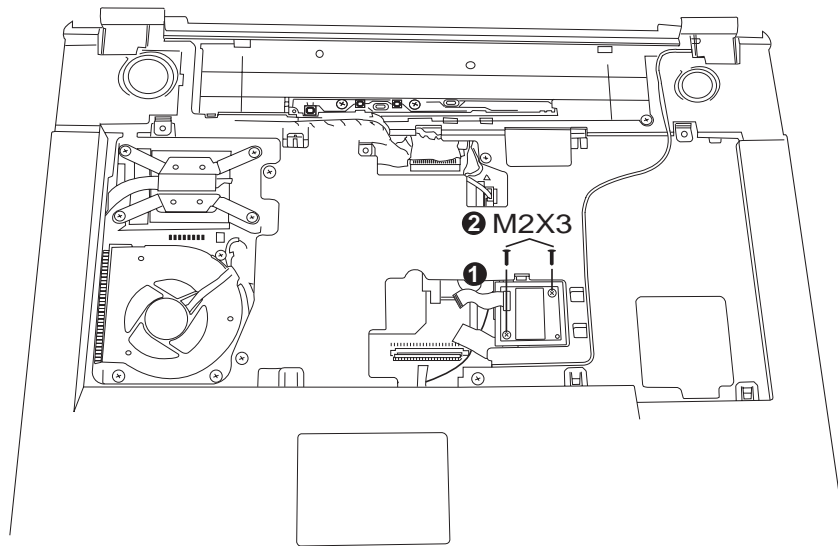


Figure 4-19 Removing the Bluetooth

Installing the Bluetooth

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

1. Seat the Bluetooth module securing with two black M2x3 screws.
2. Connect the FFC cable to motherboard.

4.11 Modem

Removing the Modem

To remove the installed modem, follow the steps below:

1. Remove the Modem cover.(Refer Figure 4-12)
2. Remove two black M2.5x3 screws securing the modem module.
3. Carefully lift the unit off its connector
4. Disconnect the modem cable from the modem module.

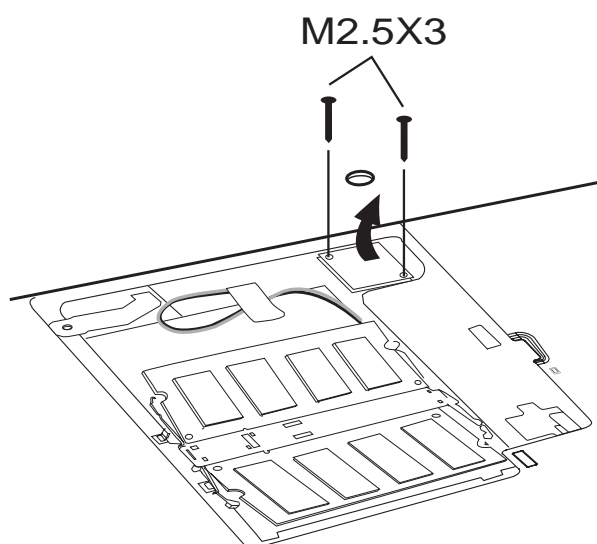


Figure 4-20 Removing the modem module

Installing the Modem

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

1. Connect the modem cable to the modem module.
2. Fit the modem into its connector and secure it with two black M2.5x3 screws.
3. Sheet the modem cover and secure with one M2.5x 5 screw.

4.12 Display Assembly

Removing the Display Assembly

To remove the display assembly, first remove the keyboard and wireless LAN, then follow the steps below:

1. Remove two black M2.5x8 screws from the back side of the computer.

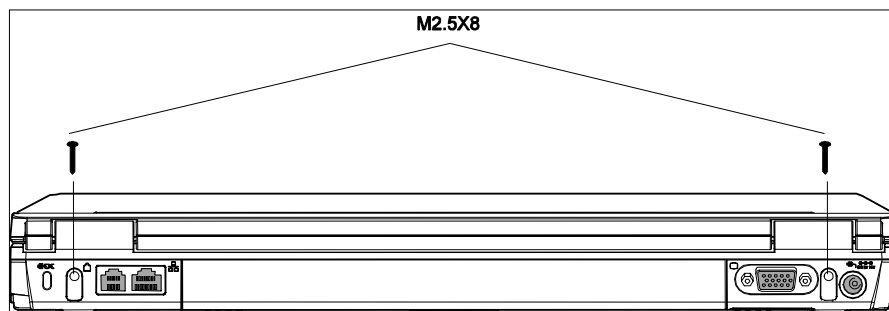


Figure 4-21 Removing the display assembly screws

2. Pull the strip cover.
3. Disconnect the wireless cable (1) from system.
4. Disconnect the LCD cable (2) from system.
5. Disconnect the Bluetooth cable.
6. Remove two M2.5x8 black screws securing LCD hinge.

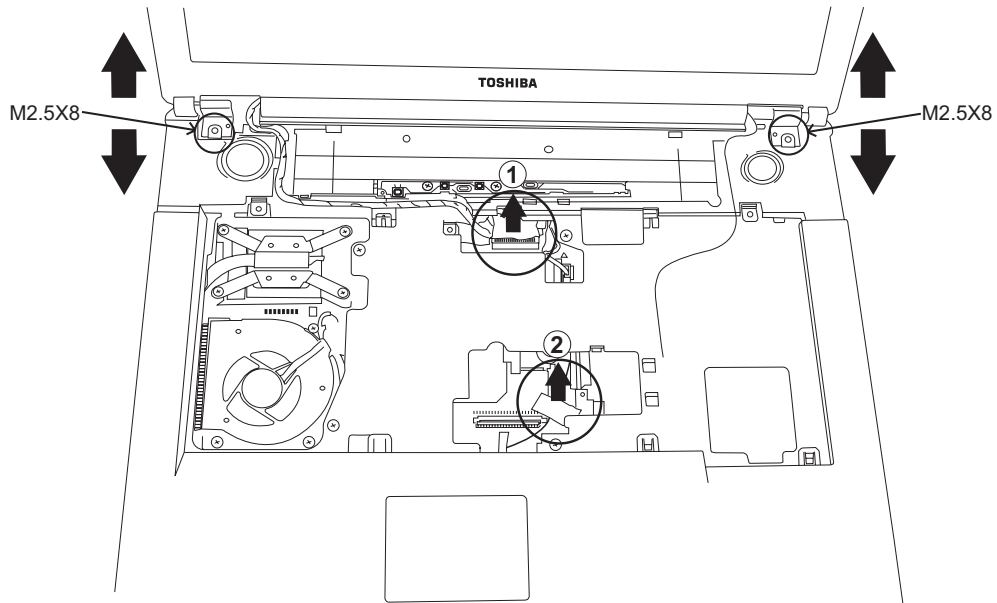


Figure 4-22 Removing the wireless and LCD cables

7. Lift the display assembly from the computer's 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 cable or wireless cable.
2. Secure two M2.5x8 black screws to LCD hinge.
3. Connect the LCD cable to the top chassis.
4. Connect the wireless cable to the wireless module.
5. Connect the Bluetooth cable to the Bluetooth module.
6. Reinstall the strip cover and the keyboard.
7. Secure two black M2.5x8 screws on the back of the computer.

4.13 Top Cover

Removing the Top Cover

To remove the top covers, first remove the battery pack, display assembly, optical drive module, HDD, memory module and wireless LAN as described in the preceding sections, then follow the steps below:

1. Remove seven black M2.5x8 and seven black M2.5x5 securing from bottom.

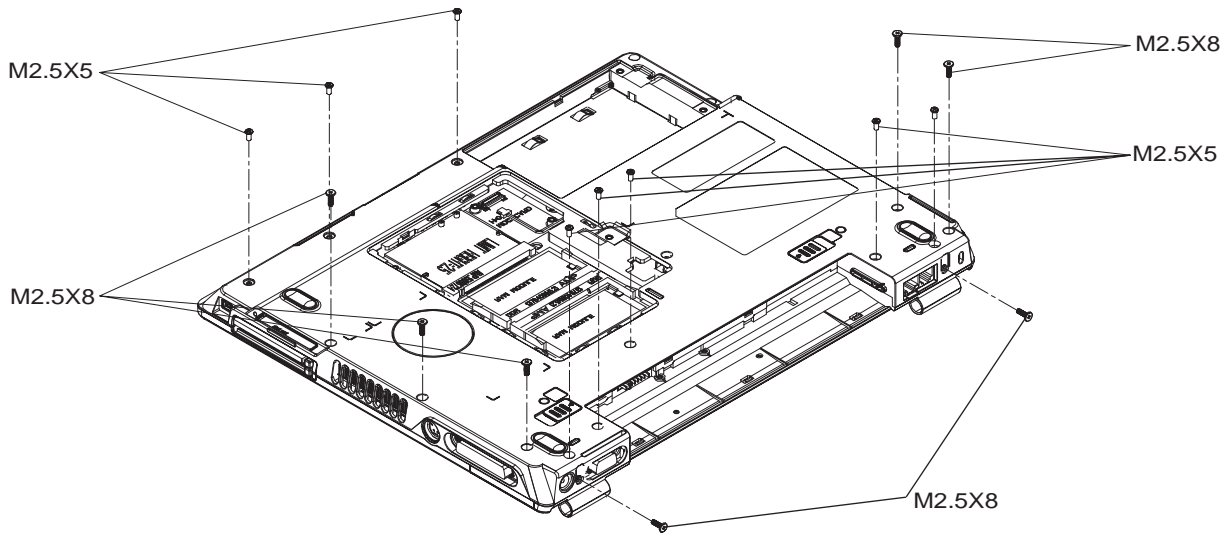


Figure 4-23 Removing screws of the bottom

2. Remove two black M2.5x5 and four black M2.5x14 screws securing the top half of the cover:

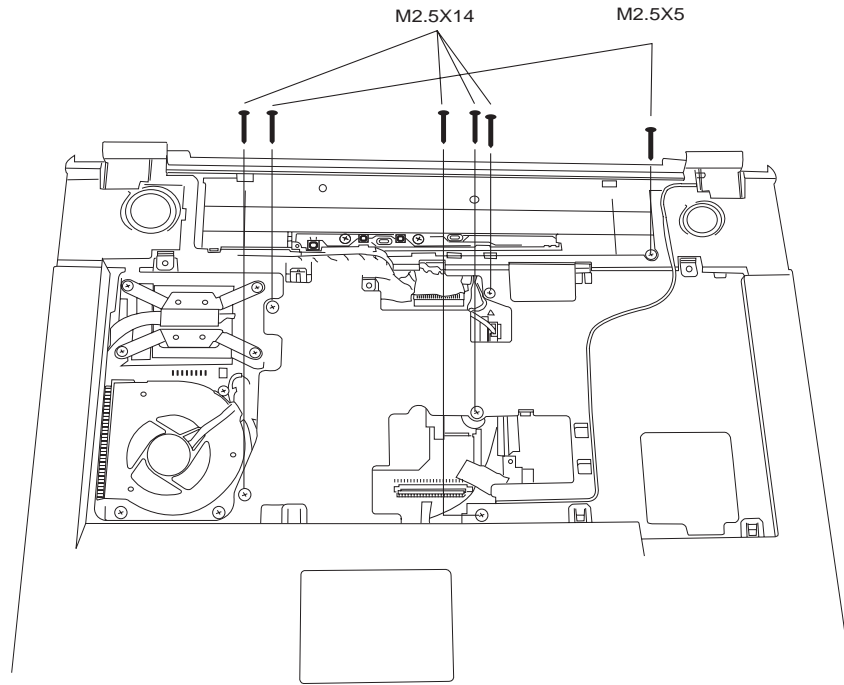


Figure 4-24 Removing the top cover

3. Detach the Switch board FFC, Bluetooth FFC and Touch Pad FFC cables.

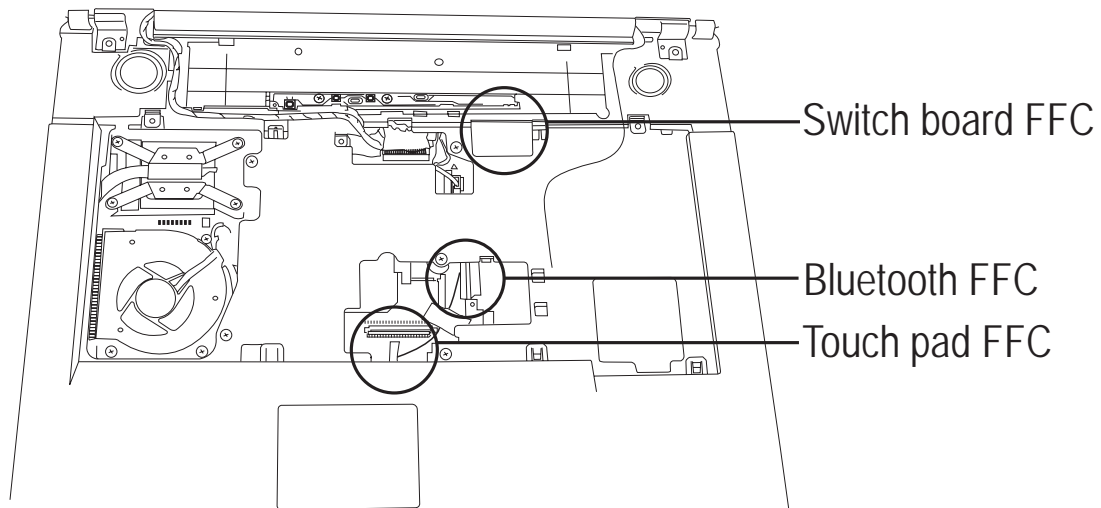


Figure 4-25 Removing FFC cables

4. Detach Speaker cable.

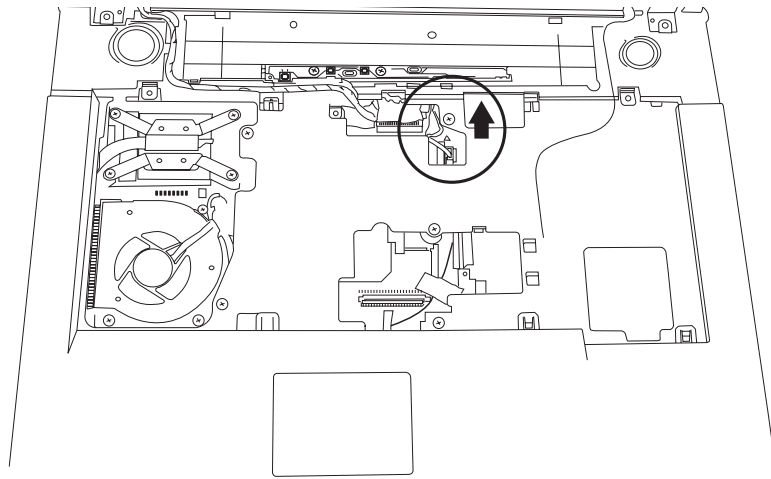


Figure 4-26 Removing Speaker cables

5. Remove 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 Switch board FFC, Bluetooth FFC and Touch Pad FFC cables.
2. Connect Speaker cable.
3. Secure the top cover with two black M2.5x5 and four black M2.5x14 screws.
4. Secure the seven black M2.5x8 and seven black M2.5x5 securing from bottom.

4.14 Touch Pad

Removing the Touch Pad

To remove the Touch Pad, first remove the top cover, then follow the steps below:

1. Remove two black M2.5x3 screws securing Touch Pad board FFC cable.
2. Remove FFC cable.
3. Remove one black M2.5x3 screw securing Touch Pad's frame.
4. Push the Touch Pad's frame forward and remove the Touch Pad bracket.

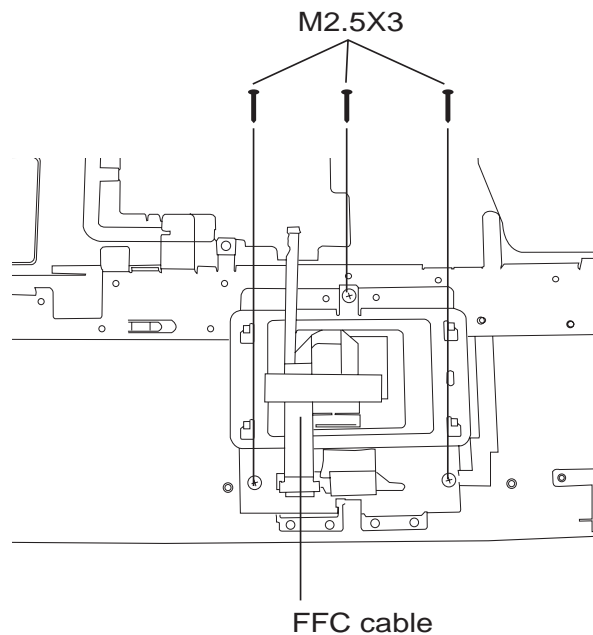


Figure 4-27 Removing the Touch Pad board

Installing the Touch Pad

To install the Touch Pad, follow the steps below and refer to the figures in the preceding section:

1. Secure Touch Pad Bracket with one black M2.5x3 screw.
2. Connect the Touch Pad board FFC cable to the Touch Pad, and then secure it with two black M2.5x3 screws.

4.15 Speakers

Removing the Speakers

To remove the speakers, first remove the top cover, then follow the steps below:

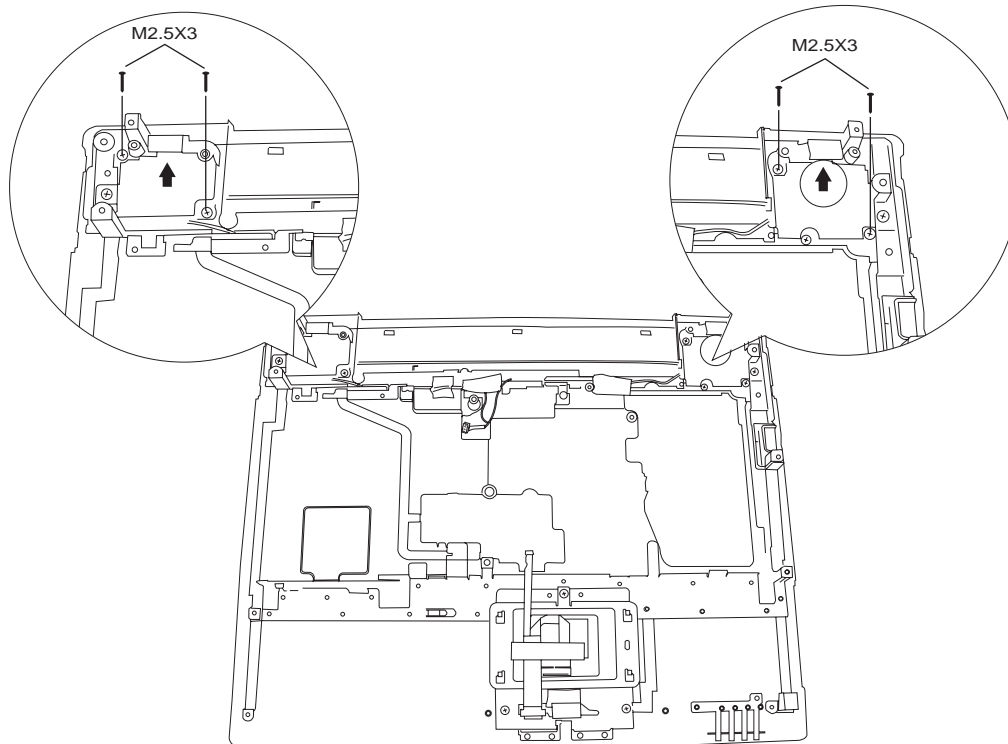


Figure 4-28 Removing the speakers

1. Remove two black M2.5x3 screws securing each speaker into place.
2. Lift out 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 black M2.5x3 screws.
3. Attached the left and right speaker cables to the system board.

4.16 System Board

Removing the LAN Board

Follow the steps below to remove the LAN board.

1. Detach the LAN cable from motherboard.
2. Remove one M2.5x3 screw securing the LAN board.
3. Remove Modem cable.
4. Remove the LAN board.

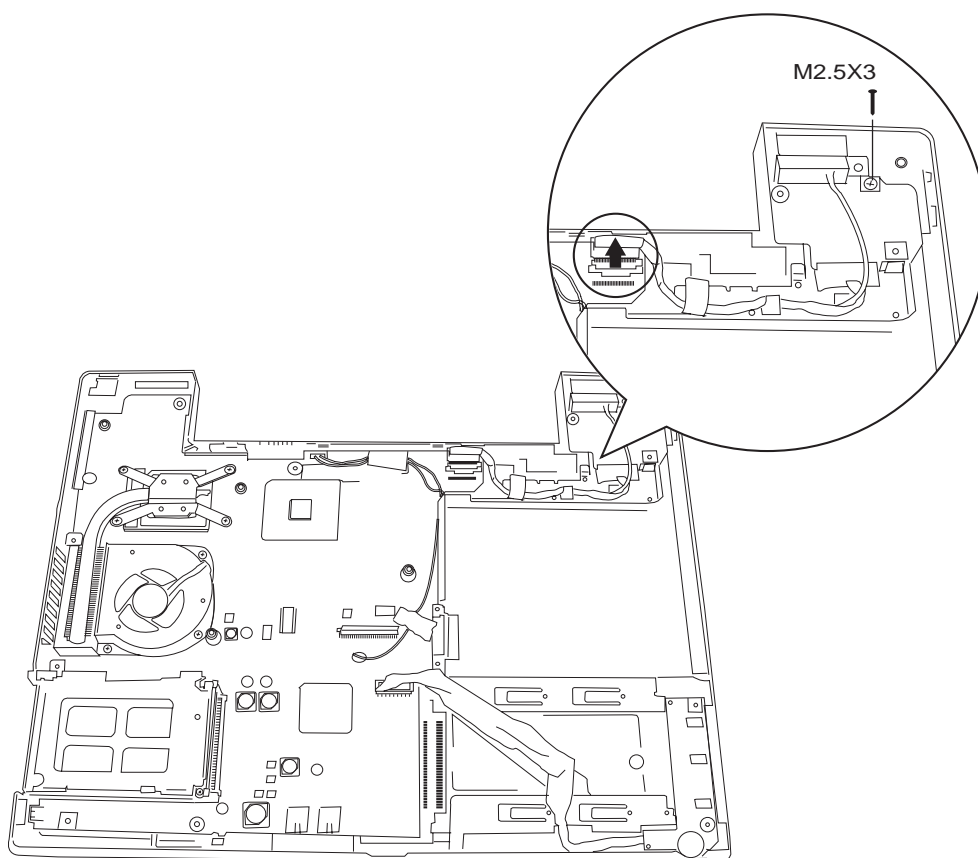


Figure 4-29 Removing LAN board

Installing the LAN Board

Follow the step below to install the LAN board.

1. Secure the LAN board with one M2.5x3 screw.
2. Attach LAN cable.
3. Attach Modem Cable

Removing the USB Board

Follow the steps below to remove the USB board.

1. Detach the USB cable from motherboard.
2. Remove the USB board.

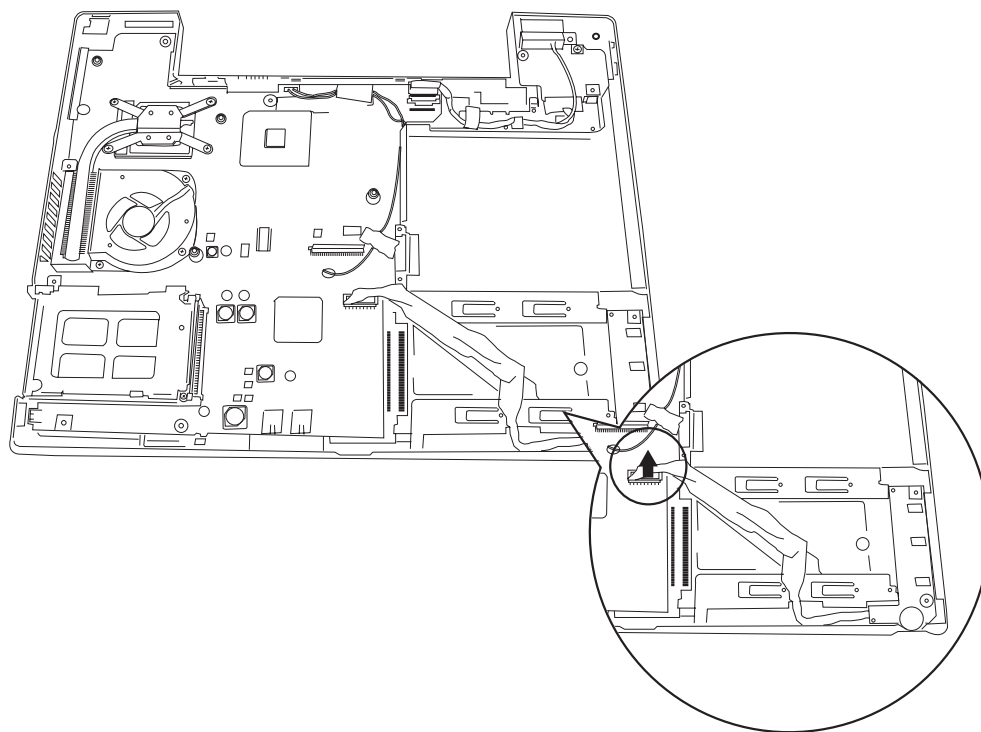


Figure 4-30 Removing USB board

Installing the USB Board

Follow the step below to install the USB board.

1. Connect the USB cable to the connector on motherboard.

Removing the System Board

To remove the system board, first remove the LCD display assembly and the top cover, then follow the steps below:

1. Remove two 4.75 x 9.6 NI hexagonal screws securing the system board to the printer port.

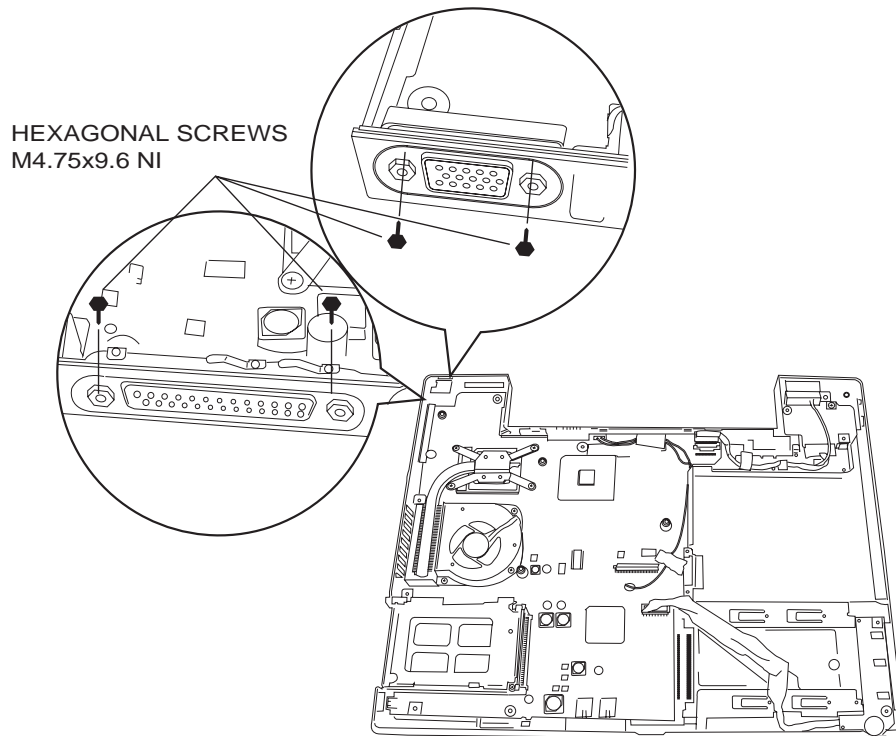


Figure 4-31 Removing the system board

2. Remove two 4.75 x 9.6 NI hexagonal screws securing the system board to the CRT port.
3. Remove three screws securing the Fan, and then detach the Fan from its connector.
4. Remove the system board.

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 in the chassis
2. Connect Fan to the Fan connector, and then secure it with three screws.
3. Secure the system board to the CRT port with two 4.75x 9.6 NI hexagonal screws.
4. Secure the system board to the printer port with two 4.75x 9.6 NI hexagonal screws.

4.17 Direct Play Button Board

Removing the Direct Play Button Board

To remove the Direct Play Button board, first remove the Keyboard, then follow the steps below:

1. Remove two M2.5x 3 screws and FFC from top cover.

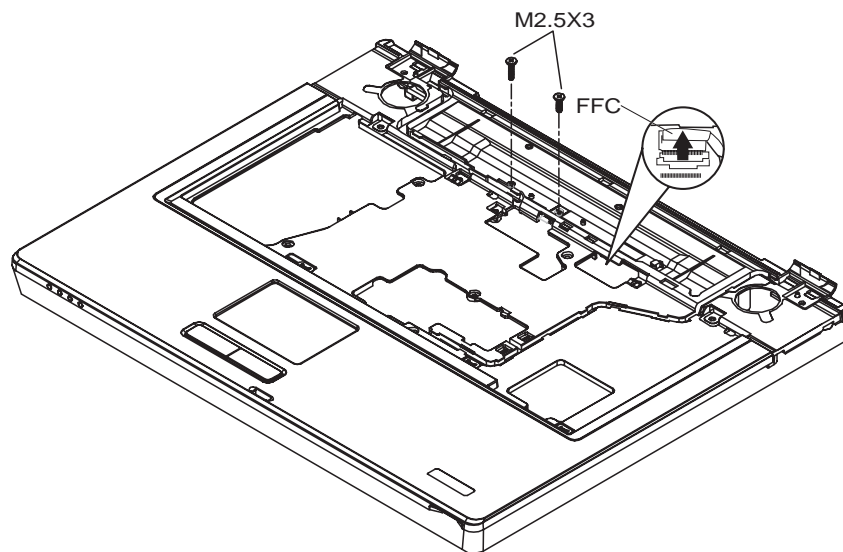


Figure 4-32 Removing the Direct Play Button board

Installing the Direct Play Button Board

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

1. Secure two M2.5x 3 screws and FFC from top cover.

4.18 Fan, Heat Sink, & CPU

Removing the Fan, Heat Sink & CPU

To remove the Fan, Heat Sink, and CPU, you must first remove the keyboard, top to reveal the system board, then follow the steps below:

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

1. On the topside of the system board, remove three M2.5x5 screws securing the fan module.
2. Remove the fan connectors from the system board.
3. Lift off the fan module.

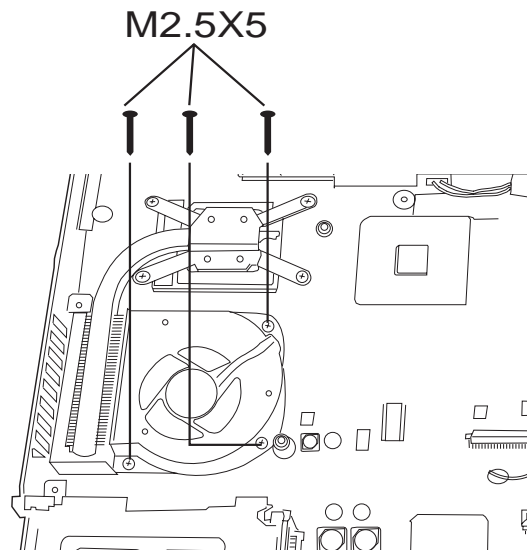


Figure 4-33 Removing the fan module

4. Remove the four embedded screws securing the heat sink in the order indicated on the heat sink. Lift out the heat sink while preventing stress to the CPU below.

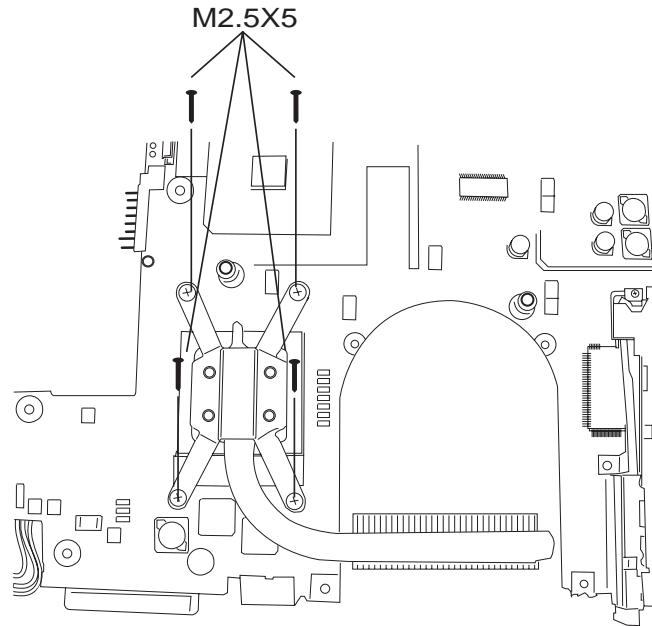


Figure 4-34 Removing the heat sink

5. 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.

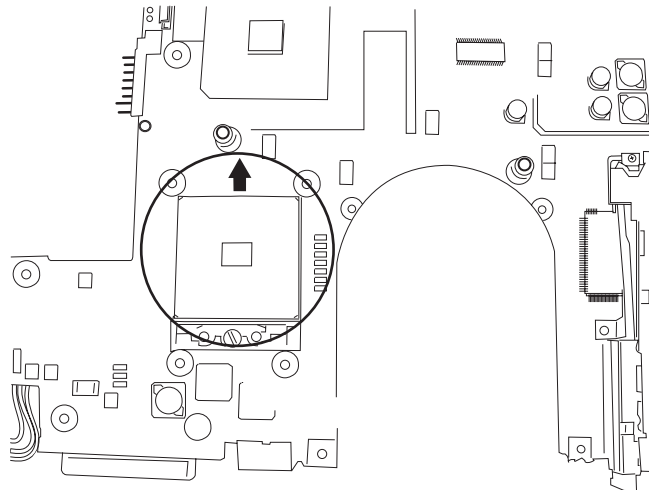


Figure 4-35 Removing the CPU

6. 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: *Reapply fresh grease with the grease tool before installing the heat sink.*

1. Make sure that the notch on the cam is aligned with the *open* position.
4. 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.
5. 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.
6. Seat the heat sink over the CPU and secure with the four embedded screws in the order indicated on the heat sink.
7. Seat the fan module.
8. Attach the fan connectors to the system board.
9. Secure the fan module to the topside of the system board with three M2.5x5 screws.

4.19 Display Mask

Removing the Display Mask

To remove the display mask, first remove the display assembly as described earlier, then follow the steps below:

1. Remove two black M2.5x5 screws on the upper corner.
2. Remove the mask seals by unsnapping the display mask along the two sides and the bottom edge to remove display.

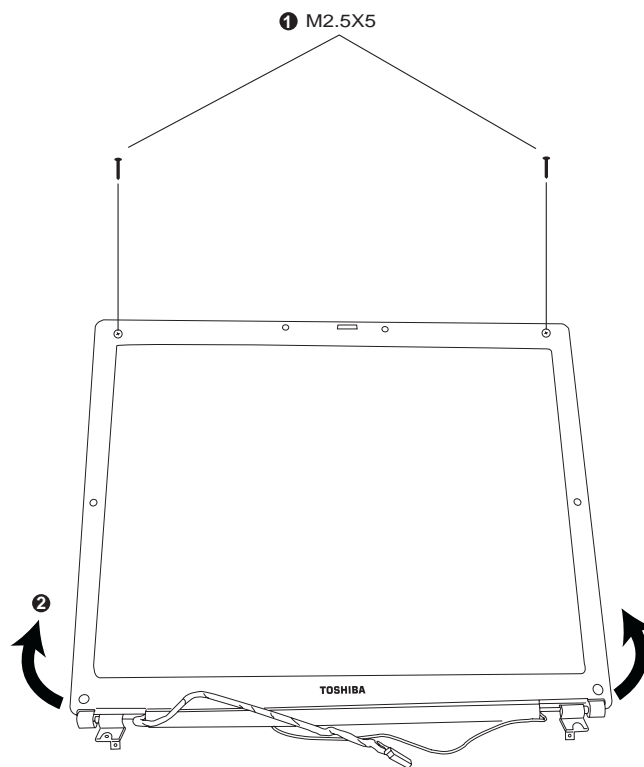


Figure 4-36 Removing the display mask

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 M2.5x5 screws.

4.20 LCD Module

Removing the LCD Module

To remove the LCD module, first remove the display assembly and display mask, then follow the steps below.

1. Remove two M2.5x5 black screws securing the LCD module bracket to LCD cover.
2. Disconnect the LCD cable from the FL inverter board.

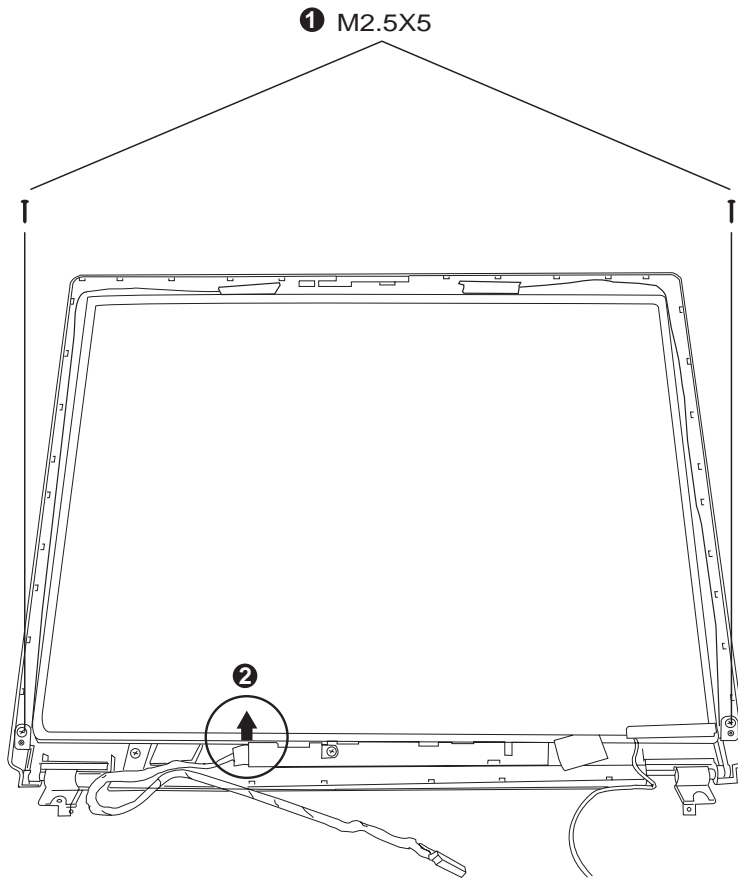


Figure 4-37 Removing the LCD module-1

3. Remove eight M2x3 screws securing LCD module bracket to the LCD module.

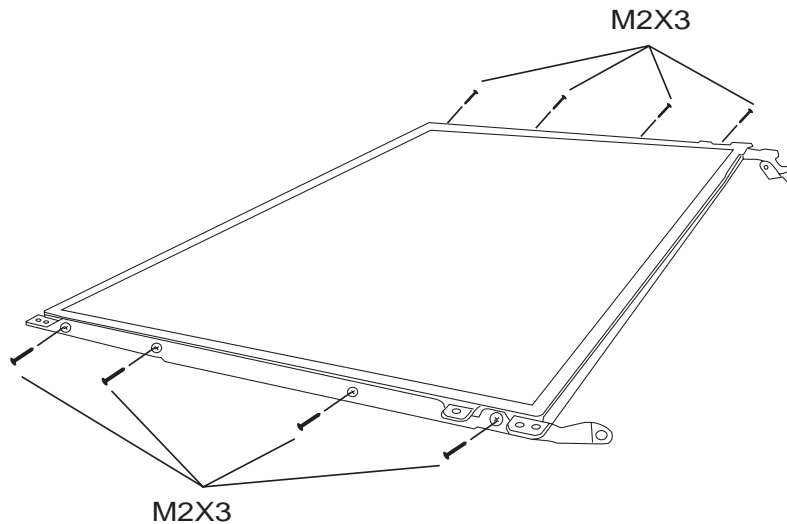


Figure 4-38 Removing the LCD module-2

1. Remove the LCD module.

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. Set the LCD module in the display assembly.
2. Secure the LCD module bracket to the LCD module with eight M2x3 screws.
3. Connect the LCD cable to the FL inverter board.
4. Secure the LCD module bracket to the LCD module with two M2.5x5 screws.

4.21 FL Inverter Board

Removing the FL Inverter Board

To remove the FL inverter board, first remove the battery pack, the display assembly, display mask, and LCD module, then follow the step below.

1. Remove one black M2x3 screw securing the FL invert board to the LCD display assembly.

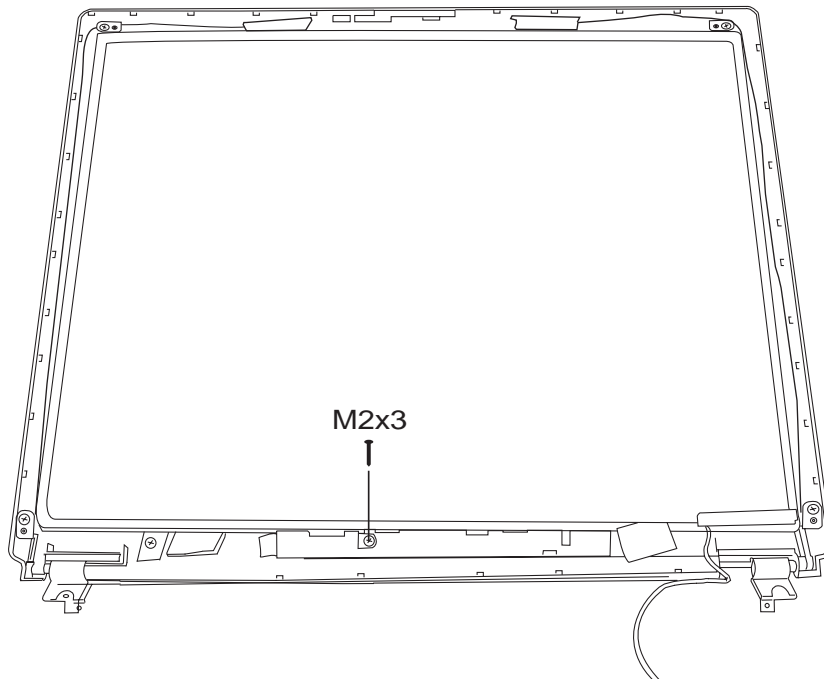


Figure 4-39 Removing the FL inverter board

Installing the FL Inverter Board

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

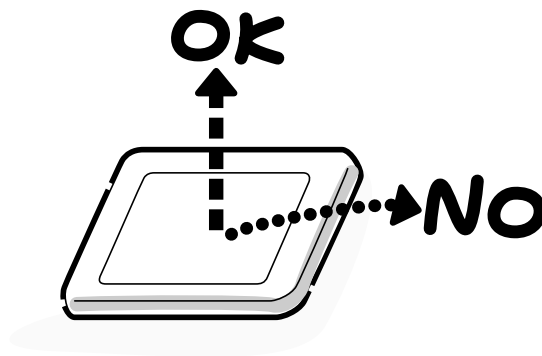
1. Secure one black M2x3 screw connecting the FL inverter board to the LCD display assembly.
2. Reassemble the computer.

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.



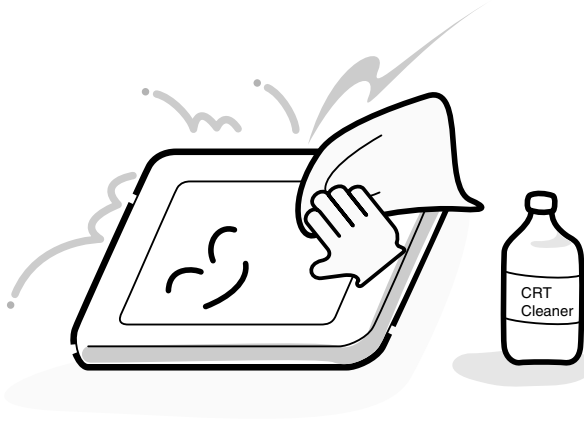
2. Be careful to align the holes at the four corners of the LCD module with the corresponding holes in the LCD cover before securing the module with screws. Do not force the module into place, because stress can affect its performance.

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.

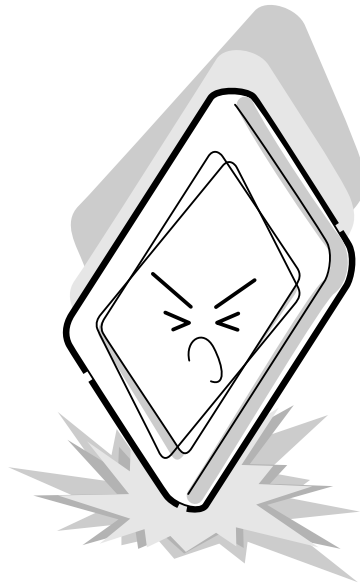
If the surface is very dirty, we recommend a CRT cleaning agent. Apply the agent to a cloth and then wipe the panel's surface. Do not apply cleanser directly to the panel.



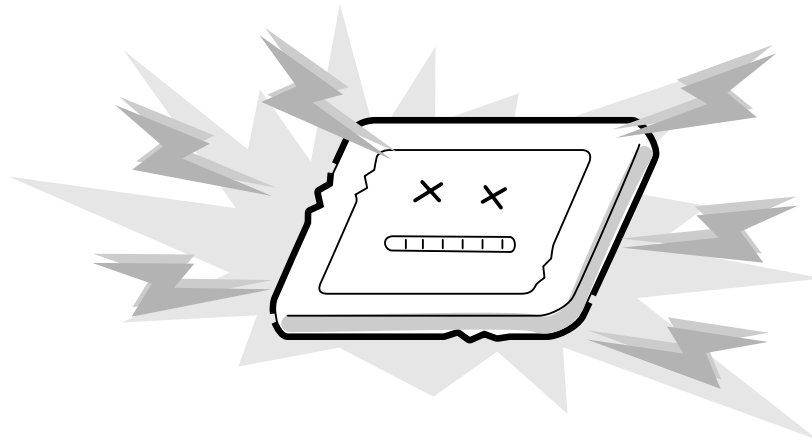
4. If water or other liquid is left on the panel's surface for a long period, it can change the screen's tint or stain it. Be sure to quickly wipe off any liquid.



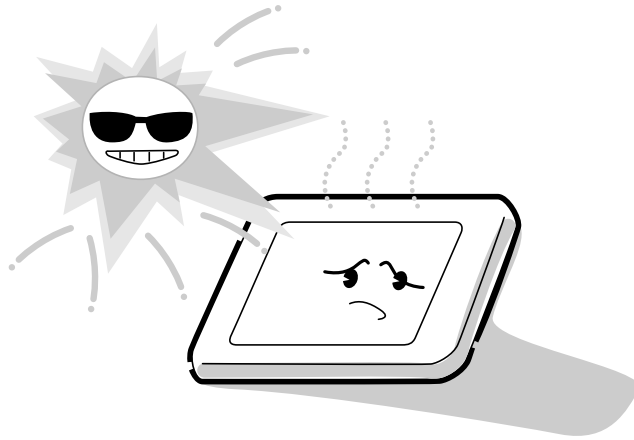
5. Glass is used in the panel, so be careful not to drop it or let it strike a hard object, which could cause breakage or cracks.



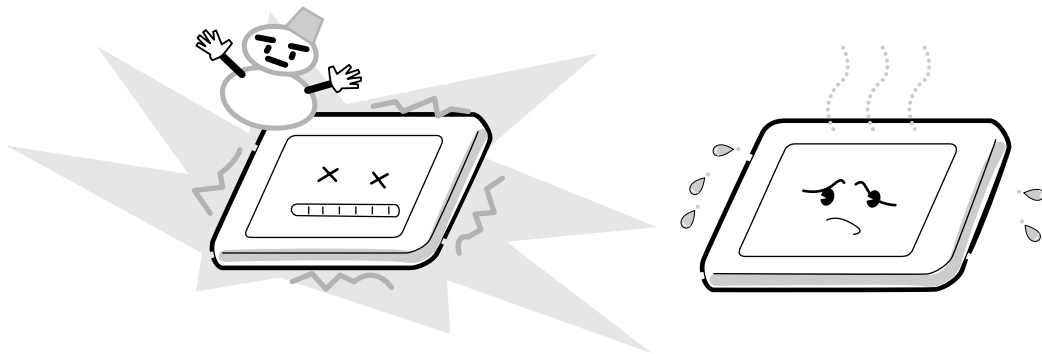
6. CMOS-LSI circuits are used in the module, so guard against damage from electrostatic discharge. Be sure to wear a wrist or ankle ground when handling the module.



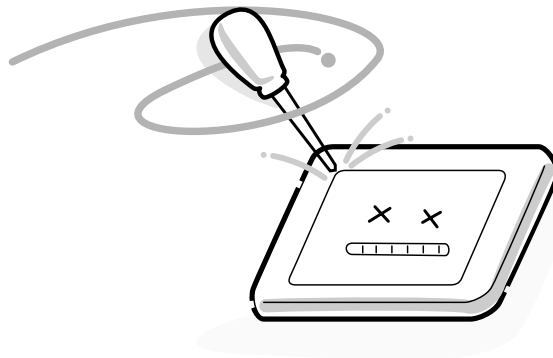
7. Do not expose the module to direct sunlight or strong ultraviolet rays for long periods.



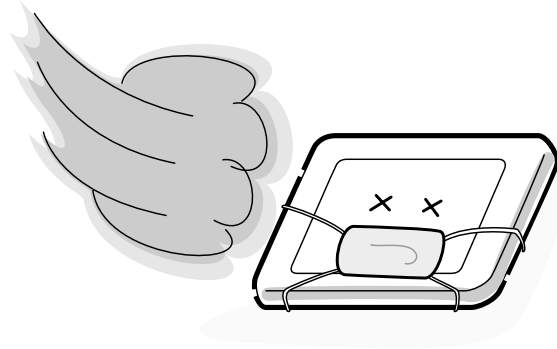
8. Do not store the module at temperatures below specifications. Cold can cause the liquid crystals to freeze, lose their elasticity or otherwise suffer damage.



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*) Top View

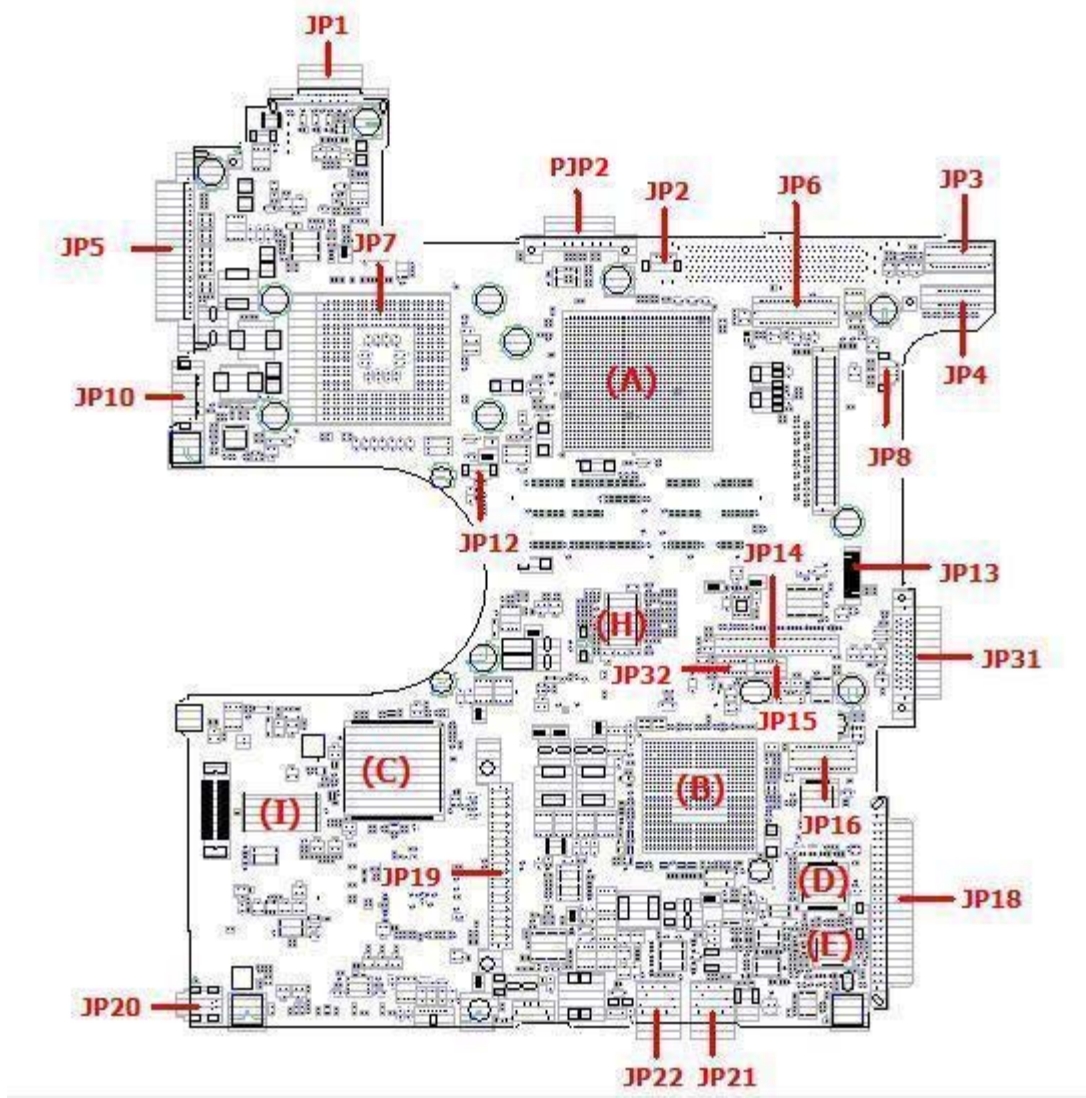


Figure B-1 System board (FRDSY*) layout (Top)

B.2 System Board (FRDSY*) Button View

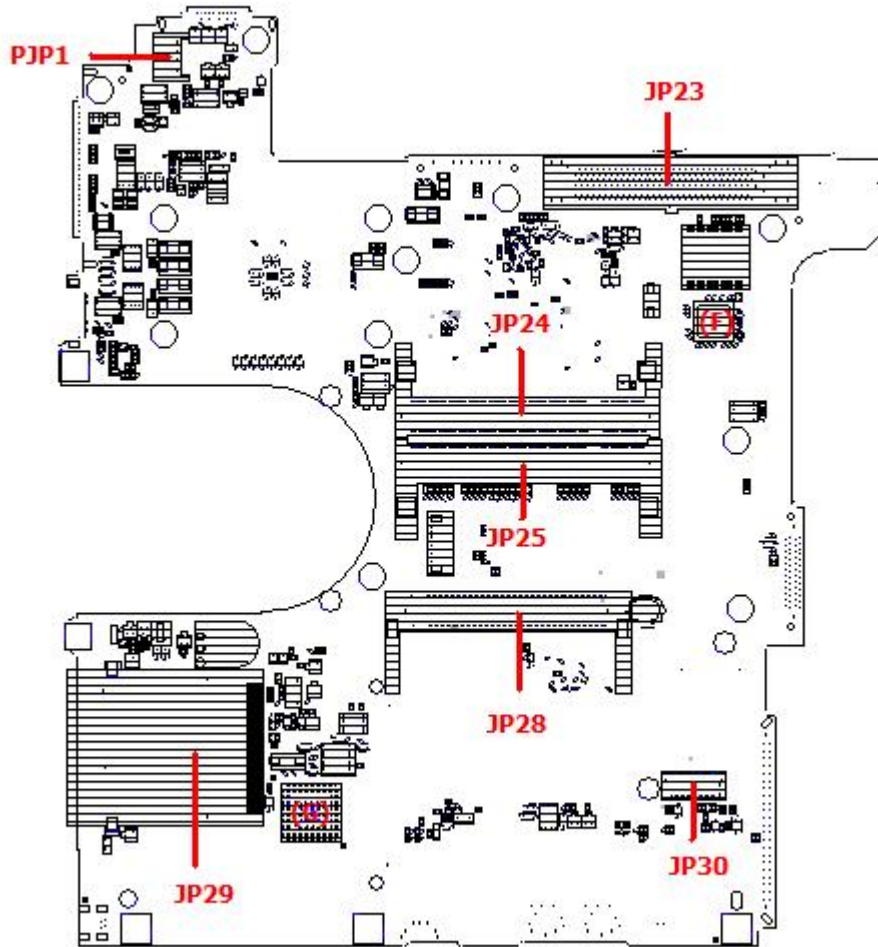


Figure B-2 System board (FRDSY*) layout (Button)

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

Mark	Number	Name
(A)	U5	Intel Alviso Chip
(B)	U17	ICH6-M
(C)	U15	ENE 910L
(D)	U22	Marvell 88SA8040
(E)	U27	RealTEK ALC250VD
(F)	U36	Marvell 8036
(G)	U41	TI PCI7411
(H)	U8	ICS954226AG
(I)	U16	BIOS ROM

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

Number	Name
JP1	CRT conn.
JP2	Docking modem conn.
JP3	LAN/B conn.
JP4	Power/B conn.
JP5	Printer conn.
JP6	LVDS conn
JP7	CPU Stocket
JP8	Spearker conn
JP10	TV-Out
JP12	Fan conn
JP13	Bluetooth conn
JP14	TP conn
JP15, JP32	TP conn for Hot bar
JP16	USB/B conn
JP18	HDD conn
JP19	PCMCIA Conn
JP20	1394 conn
JP21, JP22	Audio jack
JP23,	Docking conn
JP24, JP25	DDR conn
JP28	Mini-PCI conn
JP29	5 in 1 conn
JP30	MDC conn
JP31	ODD conn
PJP1	Power core conn
PJP2	Battery conn

Appendix C Pin Assignments

System Board

C.1 JP24,JP25

Table C-1 SODIMM I/F pin assignments (200-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 (200-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 (200-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 (200-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

Table C-2 RGB I/F pin assignments (15-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	CRT_R	O	2	CRT_G	O
3	CRT_B	O	4	NC	-
5	GND	-	6	GND	-
7	GND	-	8	GND	-
9	+CRT_VCC	-	10	GND	-
11	NC	-	12	DDC_DATA	I/O
13	DACA_HSYNC	O	14	DACA_VSYNC	O
15	DDC_CLK	I/O			

C.3 JP18

Table C-3 HDD I/F pin assignments (44-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
44	PIDE-RST#	O	43	GND	-
42	PDD7	I/O	41	PDD8	I/O
40	PDD6	I/O	39	PDD9	I/O
38	PDD5	I/O	37	PDD10	I/O
36	PDD4	I/O	35	PDD11	I/O
34	PDD3	I/O	33	PDD12	I/O
32	PDD2	I/O	31	PDD13	I/O
30	PDD1	I/O	29	PDD14	I/O
28	PDD0	I/O	27	PDD15	I/O
26	GND	-	25	NC	-
24	PDDREQ	I	23	NC	-
22	PDIOW#	O	21	GND	-
20	PDIOR#	O	19	GND	-
18	PDIORDY	I	17	PCSEL	O
16	PDDACK#	O	15	GND	-
14	IRQ14	I	13	NC	-
12	PDA1	O	11	NC	-
10	PDA0	O	9	PDA2	O
8	PDCS1#	O	7	PDCS3#	O
6	PHDD_LED#	I	5	GND	-
4	+5VS	-	3	+5VS	-
2	GND	-	1	NC	-

C.4 JP31

Table C-4 ODD I/F pin assignments (50-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	INT_CD_L	I	2	INT_CD_R	I
3	CD_AGND	-	4	GND	-
5	SIDE_RST#	O	6	SDD8	I/O
7	SDD7	I/O	8	SDD9	I/O
9	SDD6	I/O	10	SDD10	I/O
11	SDD5	I/O	12	SDD11	I/O
13	SDD4	I/O	14	SDD12	I/O
15	SDD3	I/O	16	SDD13	I/O
17	SDD2	I/O	18	SDD14	I/O
19	SDD1	I/O	20	SDD15	I/O
21	SDD0	I/O	22	SDDREQ	I
23	GND	-	24	SDIOR#	O
25	SDIOW#	O	26	GND	O
27	SIORDY	I	28	SDDACK#	O
29	IRQ15	I	30	NC	O
31	SDA1	O	32	+5VCD	I
33	SDA0	O	34	SDA2	I
35	SDCS1#	O	36	SDCS3#	-
37	SHDD_LED#	I	38	+5VCD	O
39	+5VCD	-	40	+5VCD	-
41	+5VCD	-	42	+5VCD	-
43	GND	-	44	GND	-
45	GND	-	46	GND	-
47	GND	-	48	GND	-
49	NC	-	50	NC	-

C.5 JP19

Table C-5 PC Card I/F pin assignments (84-pin) (1/2)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	GND	-	2	GND	-
3	S1_D3	I/O	4	S1_CD1#	O
5	S1_D4	I/O	6	S1_D11	I/O
7	S1_D5	I/O	8	S1_D12	I/O
9	S1_D6	I/O	10	S1_D13	I/O
11	S1_D7	I/O	12	S1_D14	I/O
13	S1_CE1#	I/O	14	S1_D15	I/O
15	S1_A10	I	16	S1_CE2#	I/O
17	S1_OE#	I/O	18	S1_VS1	I
19	S1_A11	I	20	S1_IORD#	I/O
21	S1_A9	I	22	S1_IOWR#	I
23	S1_A8	I	24	S1_A17	I
25	S1_A13	I	26	S1_A18	I
27	S1_A14	I	28	S1_A19	I
29	S1_WE#	I	30	S1_A20	I
31	S1_RDY#	O	32	S1_A21	I
33	+S1_VCC	-	34	+S1_VCC	-
35	+S1_VPP	-	36	+S1_VPP	-
37	S1_A16	I	38	S1_A22	I
39	S1_A15	I	40	S1_A23	I
41	S1_A12	I	42	S1_A24	I
43	S1_A7	I	44	S1_A25	I
45	S1_A6	I	46	S1_VS2	I
47	S1_A5	I	48	S1_RST	I
49	S1_A4	I	50	S1_WAIT#	I
51	S1_A3	I	52	S1_INPACK#	O
53	S1_A2	I	54	S1_REG#	I
55	S1_A1	I	56	S1_BVD2	O
57	S1_A0	I	58	S1_BVD1	I
59	S1_D0	I	60	S1_D8	I/O

Table C-5 PC Card I/F pin assignments (84-pin) (2/2)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
61	S1_D1	I/O	62	S1_D9	I/O
63	S1_D2	I/O	64	S1_D10	I/O
65	S1_WP	I/O	66	S1_CD2#	I
67	GND	-	68	GND	-
69	GND	-	70	GND	-
71	GND	-	72	GND	-
73	GND	-	74	GND	-
75	GND	-	76	GND	-
77	GND	-	78	GND	-
79	GND	-	80	GND	-
81	GND	-	82	GND	-
83	GND	-	84	GND	-

C.6 JP28

Table C-6 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	PIRQH#	I	18	+5VS_MINIPCI	-
19	+3.3V	O	20	PIRQG#	I
21	NC	-	22	NC	-
23	GND	-	24	+3.3V	O
25	PCICLK	O	26	PCIRST#	O
27	GND	-	28	+3.3V	O
29	REQ1#	I	30	GNT1#	O
31	+3.3V	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	+3.3V	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	MINI_IDSEL	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#	I/O	60	AD16	I/O

Table C-6 Mini PCI I/F pin assignments (124-pin)(2/2)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
61	IRDY#	I/O	62	GND	-
63	+3.3V	O	64	FRAME#	I/O
65	PM_CLKRUN#	I/O	66	TRDY#	I/O
67	PCI_SERR#	I/O	68	STOP#	I/O
69	GND	-	70	+3.3V	O
71	PCI_PERR#	O	72	DEVSEL#	I/O
73	C/BE1#	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	C/BE0#	I/O
87	AD07	I/O	88	+3.3V	O
89	+3.3V	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	+5VS_MINIPCI	O	98	NC	-
99	AD01	I/O	100	NC	-
101	GND	-	102	GND	-
103	NC	-	104	NC	-
105	NC	-	106	NC	-
107	NC	-	108	NC	-
109	NC	-	110	NC	-
111	NC	I	112	NC	-
113	GND	-	114	GND	-
115	NC	-	116	NC	-
117	GND	-	118	GND	-
119	GND	-	120	GND	-
121	NC	-	122	NC	-
123	+5VS_MINIPCI	-	124	+3.3V	-

C.7 JP6

Pin No.	Signal name	Function
1	B+	Power
2	DAC_BRIG	Inverter Control signal
3	B+	Power
4	INVT_PWM	Inverter Control signal
5	NC	Non-Connection
6	DISPOFF#	Inverter Control signal
7	+3VS	DDC 3.3V POWER SUPPLY : +3.3V
8	+LCDVDD	Power for Panel
9	GMCH_LCD_CLK	DDC Clock
10	+LCDVDD	Power for Panel
11	GMCH_LCD_DATA	DDC DATA
12	+LCDVDD	Power for Panel
13	Vss	GND
14	Vss	GND
15	GMCH_TZOUT0-	Panel Data Signals
16	GMCH_TXOUT0-	Panel Data Signals
17	GMCH_TZOUT0+	Panel Data Signals
18	GMCH_TXOUT0+	Panel Data Signals
19	Vss	GND
20	Vss	GND
21	GMCH_TZOUT1-	Panel Data Signals
22	GMCH_TXOUT1-	Panel Data Signals
23	GMCH_TZOUT1+	Panel Data Signals
24	GMCH_TXOUT1+	Panel Data Signals
25	GMCH_TZOUT2-	Panel Data Signals
26	GMCH_TXOUT2-	Panel Data Signals
27	GMCH_TZOUT2+	Panel Data Signals
28	GMCH_TXOUT2+	Panel Data Signals
29	Vss	GND
30	Vss	GND
31	GMCH_TZCLK-	Panel Clock Signals

32	GMCH_TXCLK-	Panel Clock Signals
33	GMCH_TZCLK+	Panel Clock Signals
34	GMCH_TXCLK+	Panel Clock Signals
35	NC	Non-Connection
36	NC	Non-Connection
37	NC	Non-Connection
38	NC	Non-Connection
39	LCD_ID	No EDID Panel Detect
40	VSS	GND

C.8 JP29

Pin No.	Signal name
1	5 in 1-GND
2	5M-CD-COM
3	5M-CD-SW
4	
5	SD-WP-SW
6	SD-DAT1
7	SD-DAT0
8	SD-CLK
9	SD-VCC
10	SD-CMD
11	SD-DAT3
12	SD-DAT2
13	M5-B5
14	MS-DATA1
15	MS-DATA0
16	MS-DATA2
17	MS-INS
18	MS-DATA3
19	MS-SCLK

Pin No.	Signal Name
23	S.M/xD-06
24	S.M/xD-07
25	S.M-LVD
26	#S.M/xD-R/B
27	#S.M/xD-RE
28	#S.M/xD-CE
29	S.M/xD-VCC
30	#S.M-CD
31	S.M/xD-03
32	S.M/xD-02
33	S.M/xD-01
34	S.M-D0
35	S.M/xD-WP-IN
36	#S.M/xD-WE
37	#S.M/xD-ALE
38	#S.M/xD-CLE
39	xD-CD
40	xD-VCC
41	SD-CD-COM

20	MS-VCC		42	SD-CD-SW
21	S.M/xD-04		43	SM-WP-SW
22	S.M/xD-05		44	5in1-GND

C.9 JP12

Table C-9-1 JP12 Fan I/F pin assignments (3-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	FAN1	I	2	FAN-SPEED1	O
3	GND	-			

C.10 PJP1

Table C-10 AC Adaptor Connector pin assignments (3-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	DC_IN_S2	I	2	DC_IN_S2	-
3	GND	-	4	GND	-

C.11 JP21

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.12 JP22

Table C-12 Headphone Connector pin assignments (6-pin)

Pin No.	Signal name	I/O	Pin No.	Signal Name	I/O
1	ANGND	-	2	INTSPK_L1	O
3	INTSPK_R1	O	4	NBA_PLUG	I
5	ANGND	-	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		Code set 2			Note
		Make	Break	Make	Break		
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				Code set 2				Note
		Make		Break		Make		Break		
122	F11	57		D7		78		F0 78		*3
123	F12	58		D8		07		F0 07		*3
124	PrintSc	*6		*6		*6		*6		*6
126	Pause	*7		*7		*7		*7		*7
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				Code set 2			
		Make		Break		Make		Break	
75	INS	E0 2A	E0 52	E0 D2	E0 AA	E0 12	E0 70	E0 F0	70 E0 F0 12
76	DEL	E0 2A	E0 53	E0 D3	E0 AA	E0 12	E0 71	E0 F0	71 E0 F0 12
79	←	E0 2A	E0 4B	E0 CB	E0 AA	E0 12	E0 6B	E0 F0	6B E0 F0 12
80	Home	E0 2A	E0 47	E0 C7	E0 AA	E0 12	E0 6C	E0 F0	6C E0 F0 12
81	End	E0 2A	E0 4F	E0 CF	E0 AA	E0 12	E0 69	E0 F0	69 E0 F0 12
83	↑	E0 2A	E0 48	E0 C8	E0 AA	E0 12	E0 75	E0 F0	75 E0 F0 12
84	↓	E0 2A	E0 50	E0 D0	E0 AA	E0 12	E0 72	E0 F0	72 E0 F0 12
85	PgUp	E0 2A	E0 49	E0 C9	E0 AA	E0 12	E0 7D	E0 F0	7D E0 F0 12
86	PgDn	E0 2A	E0 51	E0 D1	E0 AA	E0 12	E0 7A	E0 F0	7A E0 F0 12
89	→	E0 2A	E0 4D	E0 CD	E0 AA	E0 12	E0 74	E0 F0	74 E0 F0 12
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		Code set 2	
		Make	Break	Make	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	ScrI	46	C6	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

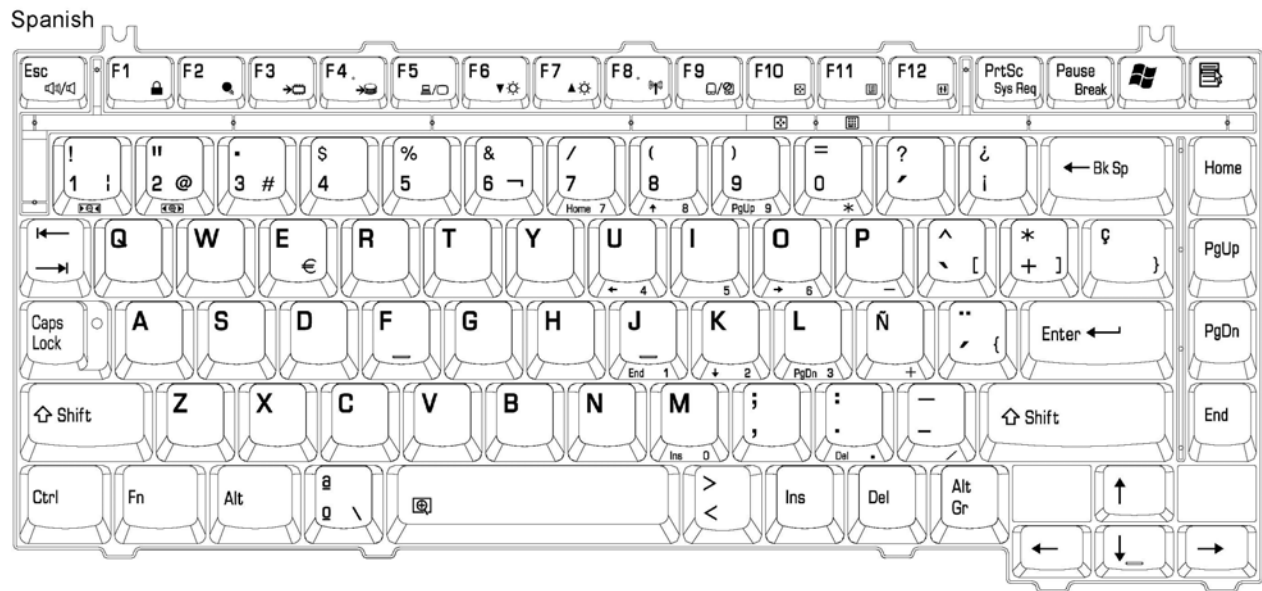


Figure E-3 SP keyboard

E.4 Japanese (JA) Keyboard

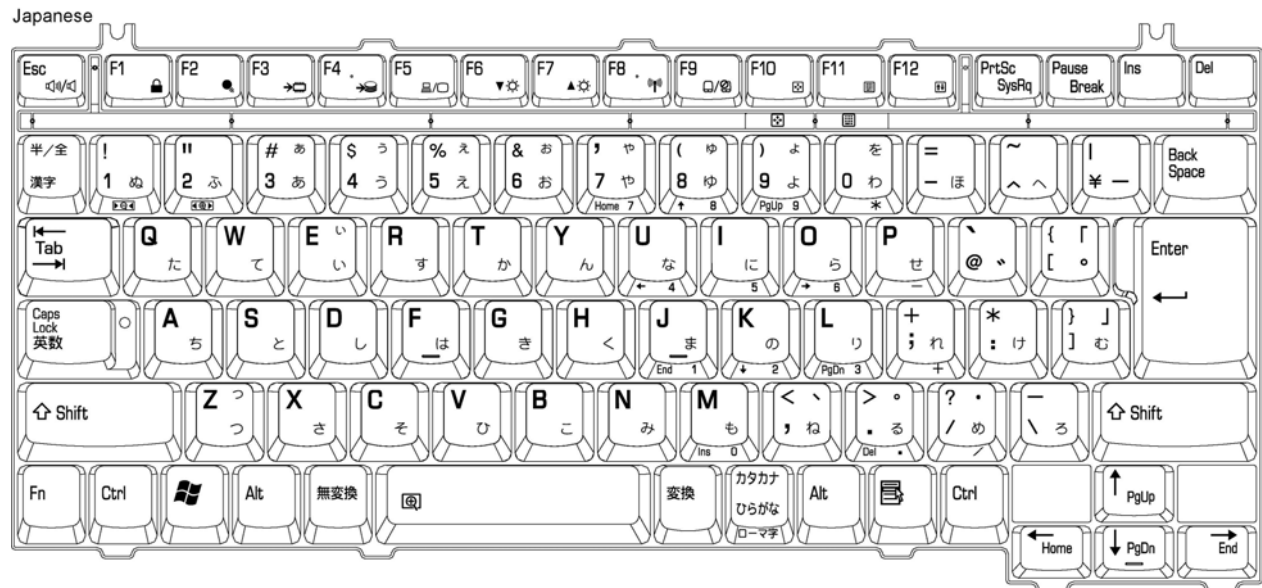


Figure E-4 JA keyboard

E.5 Korean (KO) Keyboard

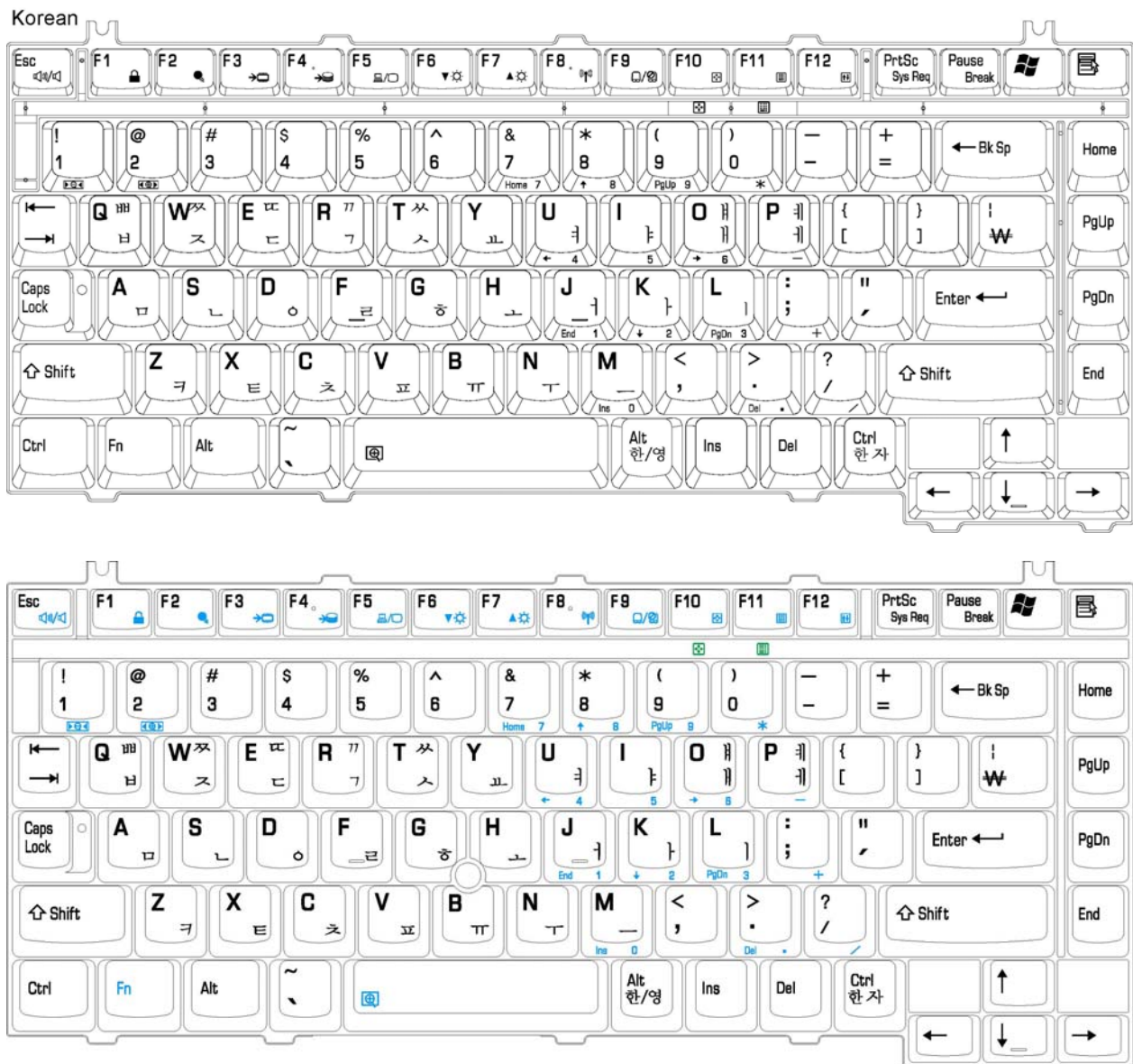


Figure E-5 KO keyboard

E.6 French (FR) Keyboard

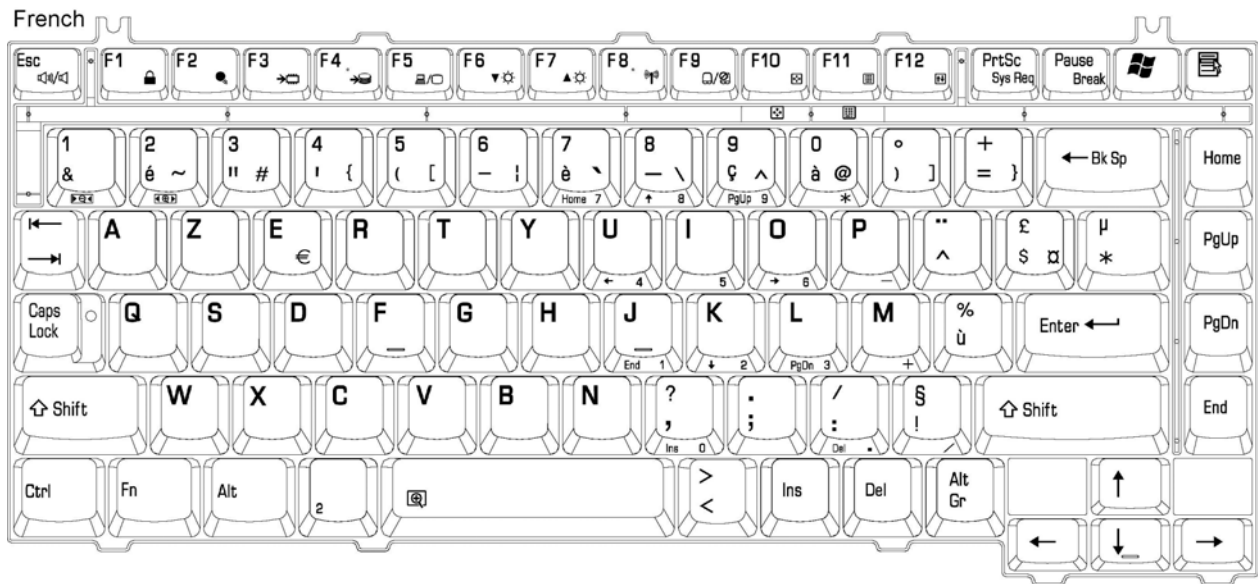


Figure E-6 FR keyboard

E.9 US-INTERNATIONAL Keyboard

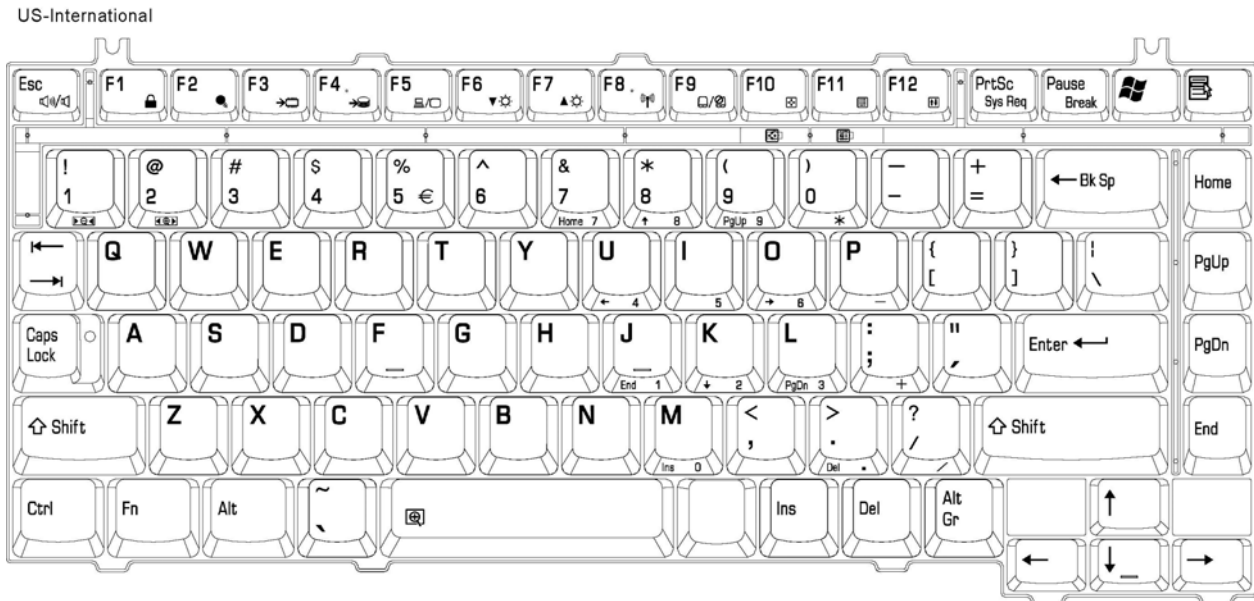


Figure E-9 US-INTE Keyboard

E.10 Greece(GR) Keyboard

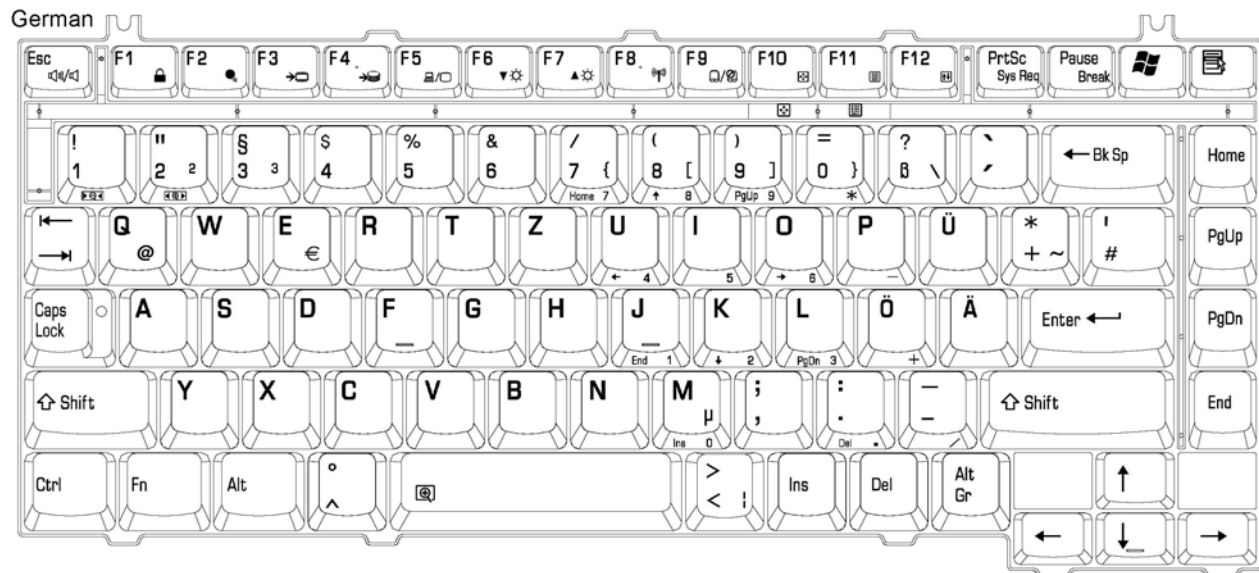


Figure E-10 GR keyboard

E.11 Chinese-T Keyboard

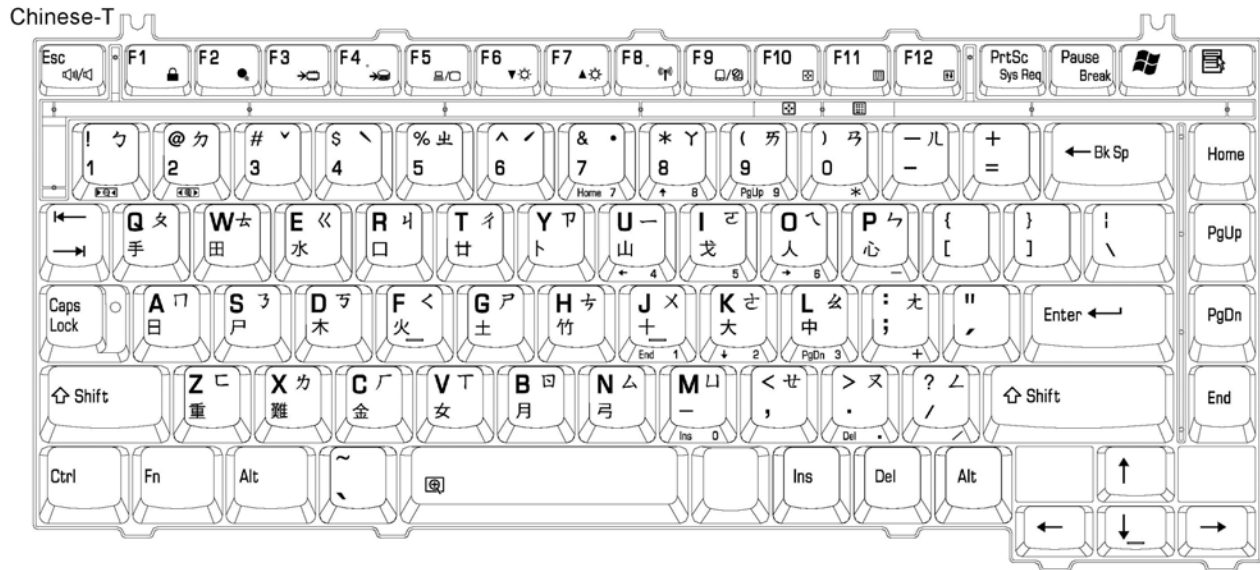


Figure E-11 CH-T keyboard

E.12 Swedish Keyboard

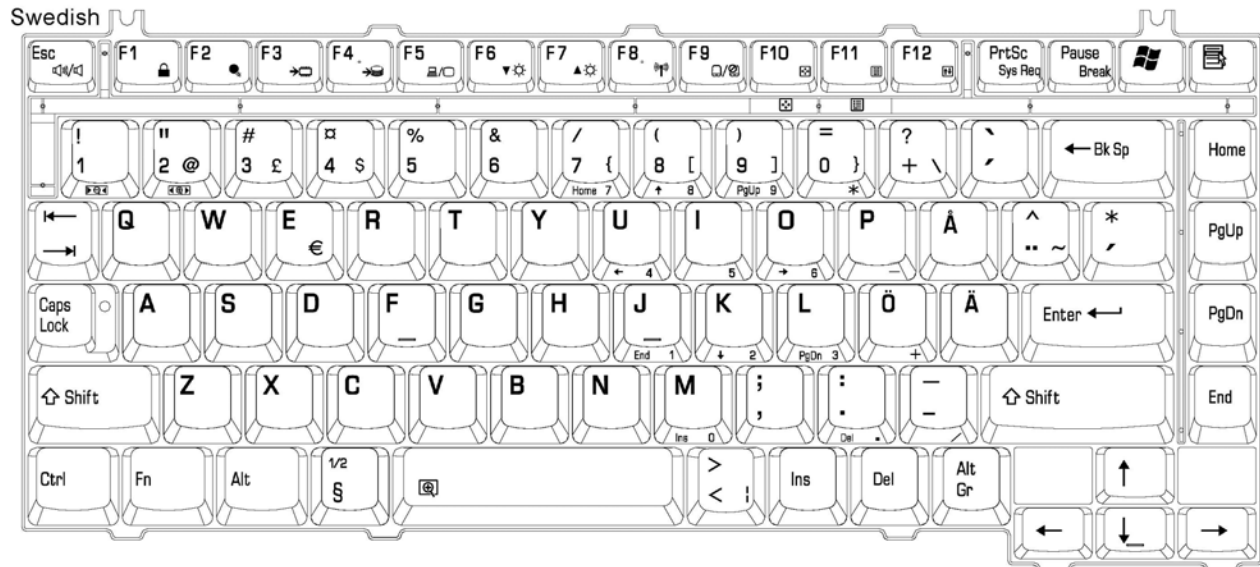


Figure E-12 Swedish keyboard

E.13 ITALIAN Keyboard

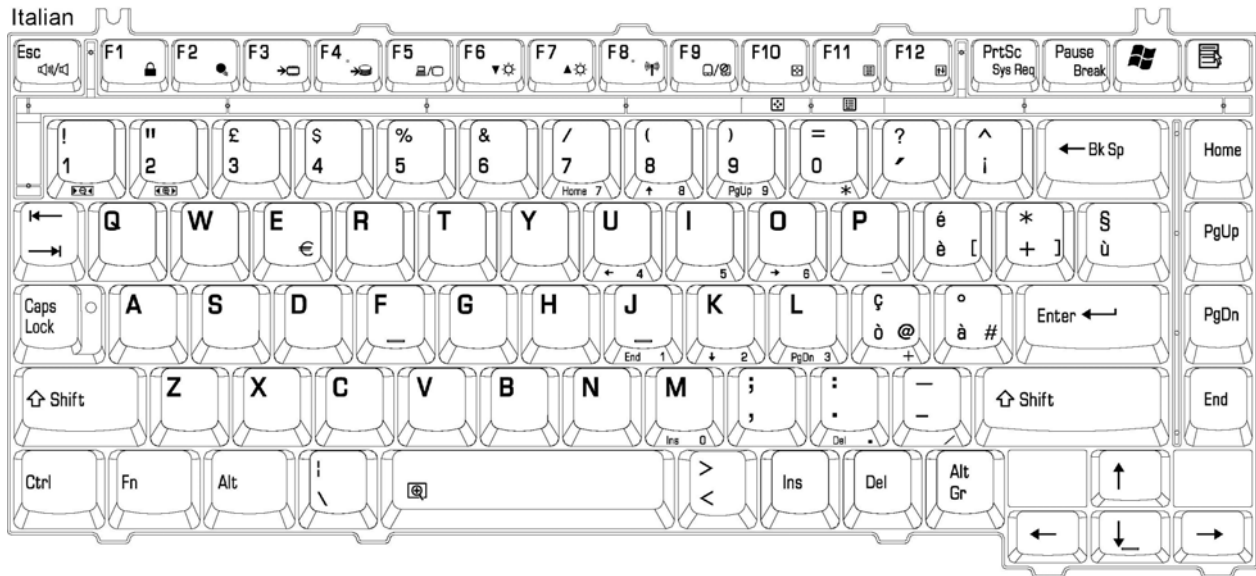


Figure E-13 IT keyboard

E.14 CZECH Keyboard

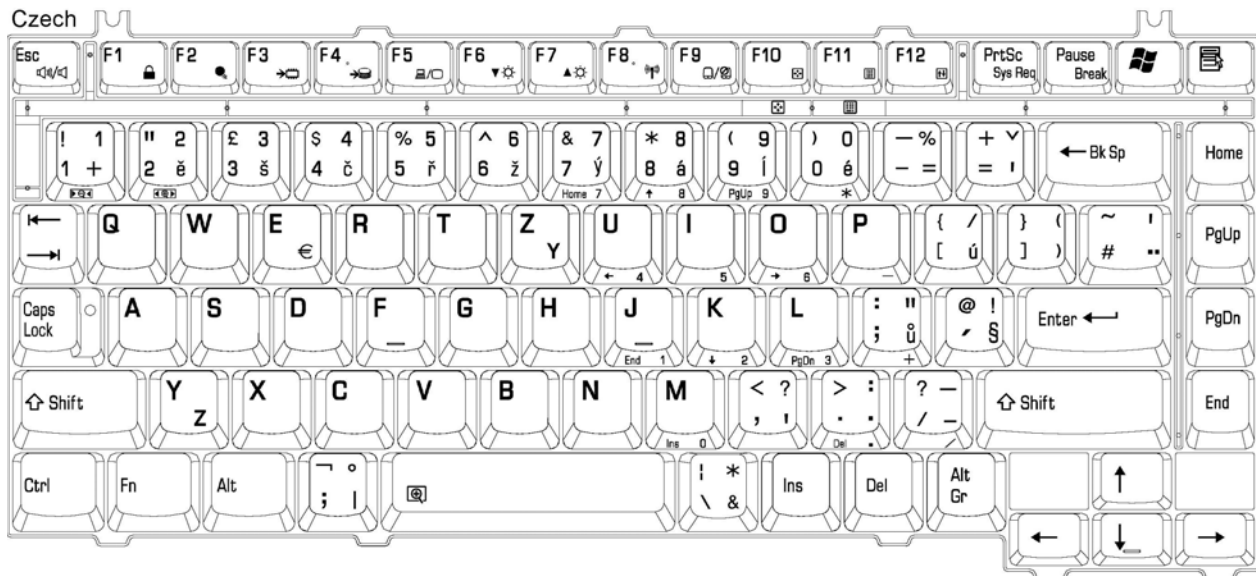


Figure E-14 Czech keyboard

Appendix F Series Screw Torque List

Table F-1 Series Screw Torque List

SCREW P/N	SCREW SPEC	Q'ty	LOCATION	SCREW TORQUE
LCD ASSY				
MMCK25050Z0	M2.5*5	4	LCD BRACKET ASSY (R/L) TO COVER SUB ASSY	2.5~3.0kg
MMCK20030Z0	M2.0*3	8	LCD BRK TO LCD PANEL (15")	2.0~2.5kg
MMCK20030Z0	M2.0*3	1	INVERTER TO COVER SUB ASSY	2.0~2.5kg
MMCK20030Z0	M2.0*3	1	LCD CABLE TO COVER	2.0~2.5kg
MB ASSY				
MM000000100	M2.0*4	4	PCMCIA TO MB	1.5~2.0kg
MM000000100	M2.0*4	2	BATT CONN TO MB	1.5~2.0kg
MM000000100	M2.0*4	2	MB TO CD ROM CONN.(FIX BAY)	1.5~2.0kg
HDD ASSY				
MM000000200	M2.5*3.6 (SPECIAL SCREW)	4	HDD BRACKET TO HDD	
LOG UPPER SUB ASSY				
MMCK25050Z0	M2.5*5	1	HINGE SADDLE(R) TO TOP SHIELD BATT TO LOG UP	2.5~3.0kg
LOG UPPER ASSY				
MMCK25030Z0	M2.5*3	1	TP BRK TO LOG UP	2.5~3.0kg
MMCK25030Z0	M2.5*3	1	SPEAKER R/L TO LOG UP	2.5~3.0kg
MMCK25030Z0	M2.5*3	1	TP PCB TO LOG UP	2.5~3.0kg
MMCK25030Z0	M2.5*3	1	POWER PCB TO LU	2.5~3.0kg

SCREW P/N	SCREW SPEC	Q'ty	LOCATION	SCREW TORQUE
LOGIC ASSY				
MACK25080Z0	M2.5*8	1	LOG LOW TO HINGE SADDLE R TO LOG UP	1.2~1.5kg
MACK25080Z0	M2.5*8	1	LL TO LL SHIELD TO MB TO LU	1.2~1.5kg
MACK25080Z0	M2.5*8	1	LL TO LL SHIELD MB STANDOFF TO HINGE SADDLE TO LU	1.2~1.5kg
MACK25080Z0	M2.5*8	1	LL TO LL SHIELD TO HINGE SADDLE TO LU	1.2~1.5kg
MACK25080Z0	M2.5*8	1	LL TO LL SHIELD HINGE SADDLE TO LU	1.2~1.5kg
MACK25080Z0	M2.5*8	2	LL TO LL HDD SHIELD TO VR_USB_BOARD TO LU	1.2~1.5kg
MACK25080Z0	M2.5*8	2	LL TO LCD SADDLE TO HINGE SADDLE	1.2~1.5kg
MACK25080Z0	M2.5*8	2	LCD SADDLE TO LU TO HINGE SADDLE	1.2~1.5kg
MMCK25140Z0	M2.5K 5.5*0.8	2	LOG UP TO VGA BOARD TO VGA BOARD STANDOFF TO MB LOG LOW	
MMCK25140Z0	M2.5K 5.5*0.8	2	LOG UP TO MB TO LOG LOW	
MMCK25050Z0	M2.5*5	3	VGA THERMAL SINK TO VGA BOARD	2.5~3.0kg
MMCK25050Z0	M2.5*5	1	LOG UP TO VGA BOARD TO VGA BOARD STANDOFF	2.5~3.0kg
MMCK25050Z0	M2.5*5	1	LOG LOW TO LOG LOW SHIELD TO HINGE SADDLE R	2.5~3.0kg
MMCK25050Z0	M2.5*5	1	LL TO FIX BAT BRK	2.5~3.0kg
MMCK25050Z0	M2.5*5	1	LL TO MB TO LU	2.5~3.0kg
MMCK25050Z0	M2.5*5	1	LOG LOW TO LOG LOW SHIELD TO HINGE SADDLE L	2.5~3.0kg
MMCK25050Z0	M2.5*5	1	LL TO LL SHIELD TO RJ11/45 PCB TO LU	2.5~3.0kg
MMCK25050Z0	M2.5*5	3	LL TO MB TO LU	2.5~3.0kg
MMCK25050Z0	M2.5*5	1	LL TO MB TO LU	2.5~3.0kg
MMCK25050Z0	M2.5*5	2	THERMAL FAN ASSY TO MB TO LL	2.5~3.0kg
MMCK25050Z0	M2.5*5	1	THERMAL FAN ASSY TO LL	2.5~3.0kg
MMCK25050Z0	M2.5*5	1	LU TO LL	2.5~3.0kg
MMCK25050Z0	M2.5*5	2	HDD DOOR TO LL	2.5~3.0kg
MMCK25050Z0	M2.5*5	4	CPU THERMAL SINK TO CPU STANDOFF	2.5~3.0kg

MMCK25030Z0	M2.5*3	2	KB TO TOP SHIELD BATT TO LU	2.5~3.0kg
MMCK25030Z0	M2.5*3	1	RJ11/45 PCB TO LL SHIELD TO LL	2.5~3.0kg
MMCK25030Z0	M2.5*3	2	MDC MODEN TO MDC MODEN STANDOFF	2.5~3.0kg
MMCK25030Z0	M2.5*3	1	LCD WIRE TO UP	2.5~3.0kg
MMCK20030Z0	M2.0*3	2	BLUETOOTH BOARD TO BLUETOOTH STANDOFF	2.0~2.5kg
MMCK20030Z0	M2.0*3	2	FIX BAY BRACKET WITH DRIVER	2.0~2.5kg
MM00000200	M2.5*3.6 (SPECIAL SCREW)	1	MINI PCI BRACKET TO LOG LOW	
MM00000300	M2.5*3.6 (SPECIAL SCREW)	1	MINI PCI BRACKET TO LOG LOW	
ECTQ0069000	(SPECIAL SCREW)	1	RAM DOOR TO LOG LOW	

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 adaptor	60,000

