

## FIC MB05W Service Manual

### 1.1 Introduction

This chapter provides the outline features and operation of the MB05 including the BIOS Setup program and other system options.

The MB05 notebook offers the latest in advanced portable computing and multimedia technology that even outperforms most desktop computers. It incorporates the latest Intel Pentium - M processor and fully compatibles with an entire library of PC software based on operating systems such as Windows 2000 / XP. It also runs on future versions of Windows. It comes with a built-in keyboard, glide pad pointing device, sound system, PCMCIA slots, USB (Universal Serial Bus) port, IEEE 1394 port, advanced power management and more new multimedia features.

### 1.2 Feature Highlights

The MB05 includes a variety of innovative features:

Category	Specification	Stepping
CPU	Intel Pentium – M Processor : Banias 1.3/1.5 GHZ	
Core Logic	Intel Montara-GM (North Bridge) : CPU(Banias) I/F VGA Controller LVDS I/F DVOB&DVOC IF. RGB analog I/F 200/266 DDR MEMORY I/F Hub-Link I/F  Intel ICH4-M (South Bridge) : Integrated Hub-Link I/F to connect with PCI Bridge Dual IDE Master/Slave Controller ,Integrated DMA Controller 1.1/2.0 Universal Serial Bus Host Controller Integrated 10/100M Fast Ethernet MAC Controller Integrated Audio Controller with AC97 V2.2 Interface Advanced Power Management(ACPI) RTC Integrated PCI to LPC Bridge Integrated Audio Controller with AC97 Interface PCI Bus Interface (PCI 2.2 compliant) GPIO Advance PIC	

Cache Memory	<p>L1 Cache (Pentium Processor internal): 64KB 8-way cache associativity provides</p> <p>L2 Cache (Pentium Processor internal): 1024KB Advanced Transfer Cache, 8 way associativity 8-way set associative, 32-byte line size, 1 line per sector</p>	
System Memory	<p>Expansion Memory: 2 SO-DIMM Slot (1.25") Size: 128/256/512MB/1G Type: DDR DRAM, 3.3V Data Path: 64Bit Frequency : 266MHz</p> <p>Please refer to the MB05 Key component list in detail.</p>	
BIOS ROM	<p>Flash ROM 1<sup>st</sup> Vendor : SST 49LF040A PLCC Package 4Mbit LPC flash ROM</p>	
Super I/O	<p>SMSC LPC47N267 FDC, IEEE 1284 Printer Port Serial Port x 1 ports IR Port ASKIR, SIR, FIR, HPSIR, Consumer IR Plug and Play Support</p>	
RTC + NVRAM	<p>Integrated in South Bridge (Intel ICH4-M) Real Time Clock with 256 byte extended CMOS.</p>	
K/B Controller	<p>Mitsubishi M38859 LPC KBC Internal K/B, Touch Pad, External K/B or M/S Supported A20Gate, firmware version 2.14</p>	
PMU	<p>New PMU08 Mitsubishi M38859FFHP Embedded Controller</p>	TBD
VGA Controller	<p>Embedded in Intel Montara-GM High Performance and high quality 3D accelerator Integrated dual DVO bridge Integrated LVDS Interface Integrated RGB analog Interface High performance 2D accelerator Complete TV-OUT/Digital Flat Panel Solution</p>	
VRAM	<p>Share system memory, UMA (using DVMT configuration) 8/16/32 MB</p>	
TV out encoder	None	
CardBus Controller	<p>RICOH R5C554 (PCI Card Bus controller) PC/Card Bus Type II x1 Build in smart card (none)</p>	
Sound	<p>AC'97 CODEC Realtek ALC202 AC'97 Revision 2.2 Compliant</p>	

Modem	MDC modem support V.90, K56flex, ITU-T V.34, V.32, RJ11 Jack TIA/EIA 602, V.42 ITU-T V.17, V.29, V.27ter, V.21 Ch2 TIA/EIA 578 Class1 FAX Wake up on Ring	
On board LAN	Realtek 8100BL Support LAN boot( no used) Support for auto-negotiation (10BASE-T and 100BASE-TX) Wake up On LAN( S1~S5)	
3com Combo		
802.11b 802.11 a+b	Support by Intel Calexico Mini-PCI Wireless LAN Card <Design Ready Only>	
1394	RICOH R5C554 PCI-CARDBUS / 1394 OHCI-LINK / 1394 PHY	
USB Intel ICH4-M	Integrated in South Bridge Intel ICH4-M) Three Independent UHCI USB 1.1 Host Controllers and One EHCI USB 2.0 Host Controller, support up to six port. Legacy Keyboard/Mouse support. Supports only one Debug port at port 1(first port), it is at USB 2.0 transfer rate..	
IDE Interface (Intel ICH4-M)	Fast IDE: --Integrated multithreaded I/O link mastering with read pipelined streaming --Dual independent IDE channel each with 16 DW FIFO --Native and compatibility mode --PIO mode 0,1,2,3,4, and multiword DMA mode 0,1,2 --Ultra DMA 33/66/100	
Printer Interface	IEEE 1284-Compatible SPP mode (PS2 bi-directional mode) EPP mode (EPP 1.7 and EPP 1.9 IEEE 1284 Compliant) ECP mode (IEEE 1284 Compliant)	
Serial Interface	None	
External PS/2 Port (M38859)	External Keyboard or PS/2 Mouse Exclusively connected- Can use both device by using branch cable(option)	
Universal Serial Bus (Intel ICH4-M)	--INTEL ICH4-M Integrated --Three Independent OHCI USB 1.1 Host Controllers and One EHCI USB 2.0 Host Controller, support up to six port. --Support up to 6 USB ports --Support legacy devices --Over current detection equipped --Optional configured each port as a wake-up source	
Infrared	None	
Modem	56K Data/Fax Modem (v.90)	
LAN	10/100 Base TX LAN Lan boot support and WFM 2.0	
LCD Panel	14.1" XGA 15 XGA ; Please refer to the MB05 Key component list in detail.	

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HDD	2.5 inch HDD (Standard) 9.5mm Height ; Please refer to the MB05 Key component list in detail.	
CD-ROM (Option)	CD-ROM (9.5mm Height) ; Please refer to the MB05 Key component list in detail.	
FDD(None)	USB FDD 3 mode Support ; Please refer to the MB05 Key component list in detail.	
DVD (Option)	DVD 9.5mm Height ,8X ; Please refer to the MB05 Key component list in detail.	
CD-RW,Combo	9.5mm Height ,24X ; Please refer to the MB05 Key component list in detail.	
Pointing Device	Internal Touch Pad PS/2 mouse I/F Pad ALPS : KGDDDET 005A Please refer to the MB05T Key component list in detail.	
Keyboard	Internal Keyboard 6.5mm Height, 3.0mm Stroke, 19mm Pitch Please refer to the MB05 Key component list in detail.	
Speakers (audio)	Two built-in dynamic speakers 40 x 20mm, 1W 4Ω	
Microphone	None	
Buzzer	Not support	
Battery	Battery Pack Type: 8 cell Li-ION Battery with EEPROM Voltage: 14.4V Capacity: 4400mA(circle);3600mA(square) Vendor: SANYO Please refer to the MB05 Key component list in detail.	
RTC Battery	Ni-MH Battery Model: CR2032 Voltage: 2.9V Capacity: 225mAh Vendor: PANASONIC	
DC/DC Converter	Daughter Board 5.0 V Max 6.0 A 3.3 V Max 6.0 A 12V Max 120mA 2.5V Max 3.5A 1.8V Max 3.5A	
CPU Vcore	1.45V Max 22A	
AC Adapter	ADP75FB : Delta(Consign) PA-1600-05F : Liteon Input: AC100 – 240V, 50/60Hz Output: 19V, 60W Peak 80W(Liteon) 19V.75W(Delta) Size: 115mm x 50mm x 29mm (Delta) 110mm x 50mm x 29mm (Liteon) Vendor: Delta or Liteon Color : TBD ; Please refer to the MB05 Key component list in detail.	
Size	W=308mm, D=268mm, H=27.7~31mm.	

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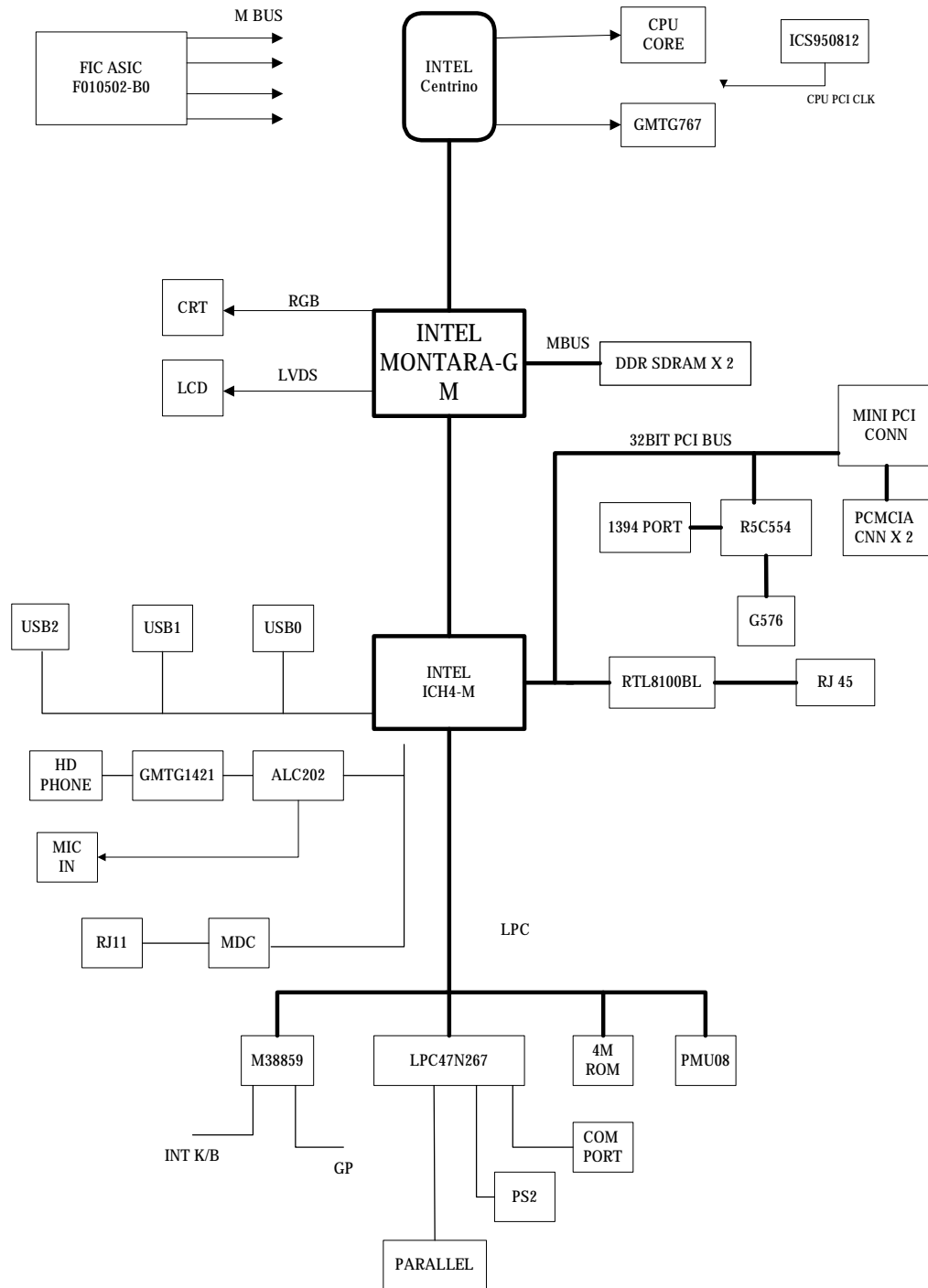
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Weight	Approx 4.9 lb = 2.2Kg	
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### Battery Handling

Category	Specification			Remark
Battery Charging	Power On	Li-ion	3.5 h	
Max Change Current: 1.7A-1.75A±150mA	Power Off	Li-ion	3.5 h	
Battery Life	1 <sup>st</sup> Li-ion		4 h	TBD
Save to RAM	1 <sup>st</sup> Li-ion		1 Days	TBD
CMOS Battery	Charge		24 h	System on
	Discharge		5 year	System off
Consumption power	Maximum		60W	
	Typical		30W	TBD

## 1.3 System Configuration



**Figure 1- 1 System Configuration Diagram**

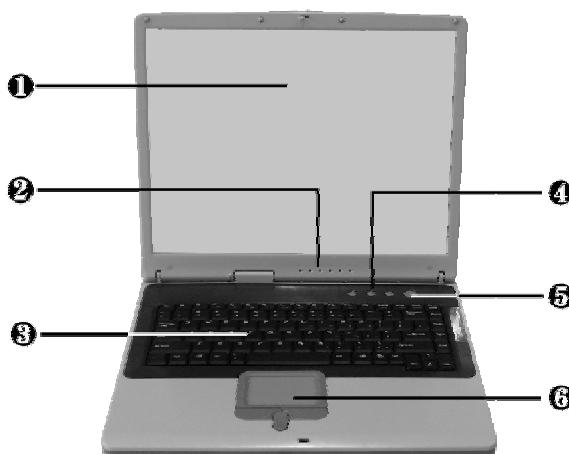
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## 1.4 Quick Tour of the Notebook

Please take a moment to become familiar with the location and purpose of every control, the LED status panel, connectors and ports, which are illustrated in this section. It is recommended to first go through the User Guide of the notebook, which is shipped together with the notebook for information on how to operate its features.

### 1.4.1 The Inside of the Notebook

To open the LCD cover of the notebook, find the cover latch located at the front center of the LCD cover. Push the latch to the right to release and tilt the LCD cover up. Inside, you will see the LCD display panel, keyboard, touch pad, status LED, and power switch.



❶	Color LCD Display	❷	Status LED Indicator	❸	Keyboard
❹	Easy Buttons	❺	Power On/Resume Button	❻	Touchpad Pointing Device

**Figure 1- 2 The Front side of the Notebook**

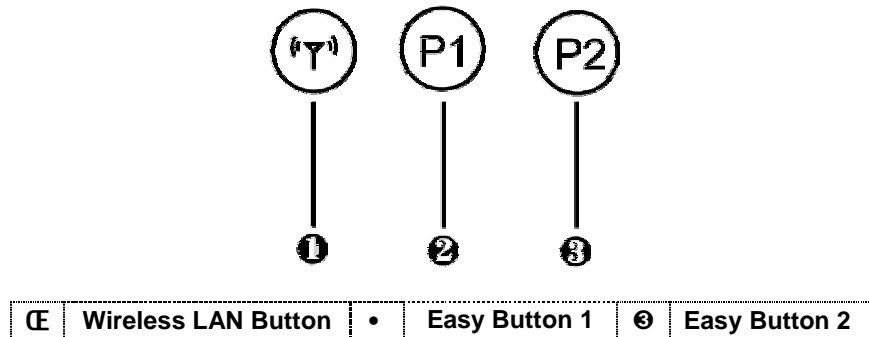
- Color LCD Display  
The notebook computer comes with a color LCD that you can adjust for a comfortable viewing position. The LCD can be 15" TFT color LVDS with 1024x768 XGA (Extended Graphics Array) or 1280x1024 SXGA+ resolution panels. The features of the Color LCD Display are summarized as follows:
  - ¥ TFT color LVDS with 14.1" 1024x768 XGA or 14.1" 1280x1024 SXGA+ resolution panels.
  - ¥ Capable of displaying 16M colors (32-bit true color) on either size panels.
  - ¥ LCD display control hot-keys allows you to adjust the brightness of the LCD.
  - ¥ Simultaneous display capability for LCD and external desktop computer monitor.

- **Easy Buttons**  
There are three easy buttons used for activating wireless function and accessing user-defined functions instantly and easily. Description of the easy buttons appears in the latter part of this section.
- **Status LED Indicator**  
Keeps you informed of your notebook computer's current power status and operating status. Description of the status icons appears in the latter part of this section.
- **Power On/Resume Button**  
Switches the computer power on and off, or resumes whenever it is in Suspend mode.
- **Keyboard**
  - Standard QWERTY-key layout and full-sized 82/84 keys keyboard with Windows system hot-keys, embedded numeric keypad, 7 hot keys, inverted "T" cursor arrow keys, and separate page screen control keys.
  - Wide extra space below the keyboard panel for your wrist or palm to sit-on comfortably during typing.
- **Touchpad Pointing Device**  
Microsoft and IBM PS/2 mouse compatible with three select buttons as one Scroll button and two Touchpad click buttons. These three buttons array below the Glide pad. The middle one is located with the Scroll button that lets you execute the scroll page function. The two click buttons located at each side support tapping selection and dragging functions. These buttons work like a standard computer mouse. Simply move your fingertip over the Glide Pad to control the position of the cursor. Use the selection buttons below the Glide Pad to select menu items.



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## Easy Buttons

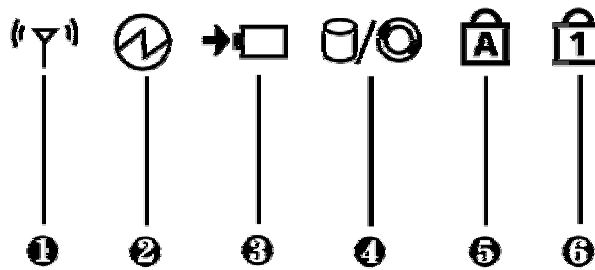


**Figure 1- 3 Easy Button**

- **Wireless LAN Button**  
Push this button to activate or inactivate the Wireless LAN. When you activate the wireless LAN function, it will search the wireless LAN signal automatically if you had installed the driver
- **Easy Button 1**  
You can define the specific function by yourself to active the program. For example, you can define it to access the outlook 98/2000/2002... utility just by pressing this button. You can simplify several procedures in entering into Outlook 98/2000/2002... environment. For more understanding and interesting, you can refer Section 2.5 to recognize the driver installation procedures in activating Easy Button 1.
- **Easy Button 2**  
You can define the specific function by yourself to active the program. For example, you can define it for providing a very convenient way in connecting Internet only by pressing this button. For more understanding and interesting, you can refer Section 2.5 to recognize the driver installation procedures in activating Easy Button 2.

## Status LED Indicator

Located just in front of the palmrest assembly, you will find three LEDs for the power and battery charge status. These LEDs are positioned to be visible even if the LCD cover is closed.



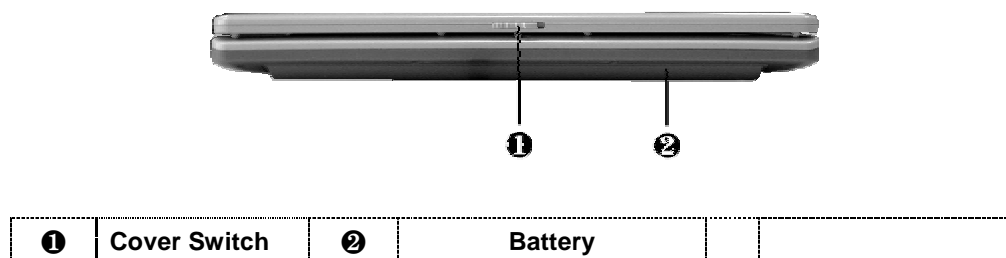
⌂	Wireless LAN Status	•	Power Indicator	⌂	Battery charging LED
•	HDD/CD Access	•	Caps Lock	'	Num Lock

**Figure 1- 4    Status LED Indicator**

- **Power Indicator**  
Lets you know that power to the system is turned on. This LED is positioned so that you can see the power state whether the LCD panel is opened or closed.
  - ⌂      Lights green when the system is powered on
  - ⌂      Lights green blinking when the system is in Suspend to RAM.
- **Battery Charging LED**  
Lights to indicate battery in charging status.
  - ⌂      Lights green to indicate that the battery is in charging.
  - ⌂      Lights off to indicate the battery is fully charged or no battery installed.
- **HDD/CD Access**  
When LED in green light indicates that the system is accessing either the Hard Disk or optical disk drive.
- **Caps Lock**  
When LED in green light indicates that the Caps Lock key on the keyboard is activated. When activated, all alphabet keys typed in will be in uppercase or capital letters.
- **Num Lock**  
When LED in yellow light indicates that the Num Lock key on the keyboard is activated. When activated, the embedded numeric keypad will be enabled.

- **Wireless LAN Status**  
When LED in green light indicates that the system is accessing data from or is retrieving data by wireless LAN.

### 1.4.2 Front Side of the Notebook

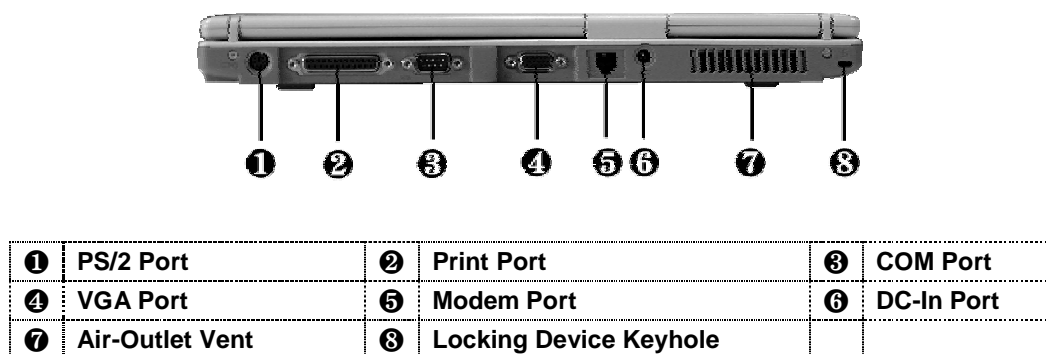


**Figure 1- 5 Front Side of the Notebook**

- **Cover Switch**  
The cover (LCD panel) is locked when it is closed. Slide the button right aside to release the latch for opening the cover of the computer.
- **Battery**  
The battery pack is inserted here.

### 1.4.3 The Rear Side of the Notebook

The right side of the notebook computer offers the features shown in the following figure.



**Figure 1- 6 Rear Side of the Notebook**

- **PS/2 Port**  
Lets you connect an external PS/2-style mouse, PS/2-style keyboard, or PS/2-style numeric keypad to the system. With an optional Y-cable adapter, you also can connect any combination on two of these devices simultaneously.

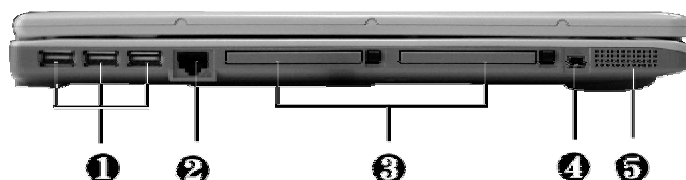
- **Print Port**  
Use this port to connect a parallel printer or other parallel device. The parallel port supports Enhanced Capabilities Port (ECP) standard. The standard provides you with a greater processing speed than the conventional parallel port. The port also supports bi-directional protocols.

+ ***The default setting for the parallel port on your notebook computer is set to Enhanced Capabilities Port (ECP). Some older parallel devices may not function with the ECP default setting. You may need to adjust the setting to accommodate your parallel device by changing the BIOS setting.***

- **COM Port**  
Lets you connect a 9-pin external serial device such as a PDA, mouse, or other serial devices.
- **VGA Port**  
Lets you attach an external CRT monitor for wider display. You can run the LCD display and the external CRT monitor simultaneously or switch it to CRT only using the display hot-key.
- **Modem Port**  
A 56K internal fax/data modem is installed. It keeps you connected to the outside world through networks.
- **DC-In Power Port**  
Lets you connect the AC power adapter in supplying continuous power to your notebook and recharging the battery.
- **Air-Outlet Vent**  
Emits the heat out of your computer and keeps it within operating temperature.
- **Locking Device Keyhole**  
Lets you attach a Kensington security system or a compatible lock to secure your notebook computer.

### 1.4.4 The Left Side of the Notebook

The left side of your notebook computer provides the features shown in the following figure. To see all the ports located on the left side, you can open the cover first.

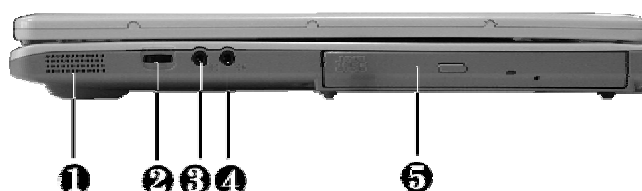


❶	USB Port	❷	LAN Port	❸	PC Card Slot
❹	IEEE 1394	❺	Built-in Stereo Speakers		

**Figure 1- 7 Left Side of the Notebook**

- LAN Port  
An internal 10Base-T/100Base-TX LAN module connects your computer to other computers/networks through a local area network (LAN).
- USB Port  
The Universal Serial Bus (USB) port allows you to connect up to 127 USB-equipped peripheral devices (for example, printers, scanners and so on) to your notebook computer
- IEEE 1394  
IEEE 1394 port is a high speed I/O port that can transfer high levels of data in real-time, such as external hard disk, Digital Video Camera.
- PC Card Slot
  - ↳ Lets you connect various PC cards such as memory card
  - ↳ Supports both 3V, 5V 32-bit CardBus and 16-bit PC cards.
- Built-in Stereo Speakers  
Integrated left and right mini stereo speakers located at the two sides of the N/B for sound and audio output for your multimedia presentations or listening pleasure.

## 1.4.5 The Right Side of the Notebook



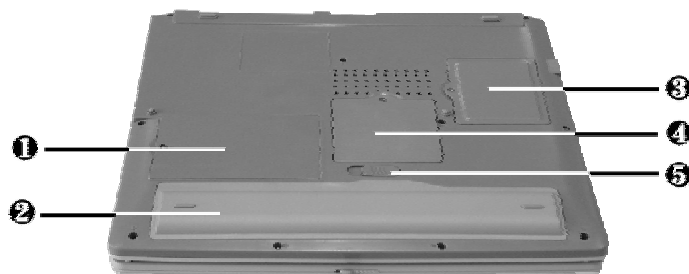
❶	Built-in Stereo Speakers	❷	Volume Control	❸	Microphone Jack
❹	Headphone Jack	❺	Optical Disk Drive		

**Figure 1- 8 Right Side of the Notebook**

- Built-in Stereo Speakers  
Integrated left and right mini stereo speakers located at the two side of the N/B for sound and audio output for your multimedia presentations or listening pleasure.
- Volume Control  
Allows you to control the speaker volume.

- **Headphone Jack**  
Lets you plug in a stereo headphone, powered speakers, or earphone set with 1/8 inch phono plug for personal listening.
- **Microphone Jack**  
Allows you to connect an external microphone for monophonic sound recording directly into your notebook computer.
- **Optical Disk Drive**  
Allows you to load and start programs from a compact disc (CD) or a digital video disc (DVD) and play conventional audio CDs. It also can make CD by using CD-R or CD-RW.

### 1.4.6 The Under Side of the Notebook



❶	Hard Disk Compartment	❷	Battery Bay	❸	Wireless LAN Compartment
❹	Memory Compartment	❺	Battery Release Latch		

**Figure 1- 9 Under Side of the Notebook**

- **Battery Release Latch**  
Push the latch to the left end to remove the battery pack.
- **Battery Bay**  
Equipped with a choice of Lithium-Ion (Li-Ion) battery pack.
- **Hard Disk Compartment**  
Open this cover of this compartment to replace with other Hard Disk Drive. Please refer to Chapter 7 for how to replace it.
- **Memory Compartment**  
Remove the screw to find two DIMM slots. One is inserted with DDR SDRAM memory board configured by the factory. The other is empty for upgrade use.
- **Wireless LAN Compartment**  
Provides optional wireless LAN card inserted into this compartment for executing relative functions.

### 1.5 Notebook Accessories and System Options

It is also important to understand the accessories that come along with the notebook and the options for fully utilizing the capabilities of the computer. This section describes briefly what these accessories and options are.

#### 1.5.1 AC Adapter and Power Cord

The AC Adapter supplies external power to your computer and at the same time charges the internal battery pack. The AC adapter has an auto-switching design that can connect to any 100VAC ~ 240VAC power outlets. Connect the adapter to the AC wall outlet using the power cord. You just change the power cord if you are going to use your notebook in other countries with different connector outlets. When you connect the AC adapter, it charges the battery whether or not the notebook computer is powered on. There is an LED on the AC adapter to indicate if DC power is already available.

#### 1.5.2 Battery Pack

Aside from the AC adapter, your computer can also be powered through the internal battery pack. The battery pack uses rechargeable Lithium-Ion (Li-Ion) battery cells that provide long computing hours when fully charged and power management enabled. You should always leave the battery inside your computer even when using the AC adapter as it also acts as a back-up power supply in case power from the AC adapter is cut off. It is also very important to have the battery pack always charged to prevent battery cell degradation.

#### 1.5.3 Internal Modem Module

The notebook allows you to insert a proprietary internal 56Kbps-modem card to the notebook found on the underside of the notebook. The internal modem card supports only fax and data communication and is V.90-compliant. You connect the telephone line to the RJ-11 jack found on the rear side of the notebook.

#### 1.5.4 Internal Ethernet LAN Module

This notebook comes with an optional 10Base-T/100Base-TX LAN module that supports data transfer rates at 10Mbps and can be up to 100Mbps.

#### 1.5.5 DVD-ROM Drive

Other than the internal CD-ROM drive, the notebook also provides optional factory built-in DVD-ROM drive. DVD-ROM drives are also backward compatible with CD-ROM, so you can also use any audio CDs, video CDs, photo CDs, and CD-R. Using a software MPEG-2/DVD program, the notebook can playback any commercial DVD movie titles.

### 1.6 System BIOS SETUP Program

Your computer is likely to have been properly setup and configured by your dealer prior to delivery. However, you may find it necessary to use the computer's BIOS (Basic Input-Output System) Setup program to change system configuration information, such as the current date and time, or your hard disk drive type. The Setup program can be accessed when you power on the system and pressing the <F2> function key.

The settings that you specify within the Setup program are recorded in a special area memory called the **CMOS RAM**. This memory is backed up by a battery so that it will not be erased when you turn off or reset the system. Whenever you turn on the computer, the system will read the settings stored in the CMOS RAM and compare them to the equipment check conducted during the Power On Self Test (POST). If an error occurs, an error message will be

displayed on the screen, and you will then be prompted to run the Setup Program. As the POST (Power-On Self Test) executes during the boot up process, the screen will display the following message:

Press <F2> to Enter SETUP

Press the <F2> key to run the BIOS Setup program. The BIOS Setup program is organized into five menus which you can select using the **↑** and **↓** keys. To move from one option to another, you use the up and down arrow keys while using the <F5> and <F6>, or <+> and <-> keys to change the settings. On the right hand side of the screen are some brief help descriptions of each item you want to change.

On the BIOS Setup program, you will find the following parts on the screen:

- Item Specific Help  
The right side of the screen. This area describes each parameter and its available settings.
- Menu Bar  
The top line of the screen. Each of the five selections displays its own screen.
- Parameters  
The left side of the screen. This area lists the parameters and their current settings.
- Key Status Bar  
The bottom part of the screen. These lines display the keys available to move the cursor, select a particular function and so forth.

To exit the BIOS Setup program, simply press the <Esc> key and select from the Exit menu whether you want to Save changes and exit; Discard Changes and exit.



## 1.6.1 Using the Main Menu Setup

Phoenix BIOS Setup Utility		
Main	Advanced	Security Boot Exit
System Time: [12 :00 :00] System Date: [02/19/2003] LAN MAC Address 00-40-CA-C3-9A-07  Boot Display Device: [Both]  4 Primary Master [30006MB] Secondary Master Installed CD/DVD  System Memory: 640 KB Extended Memory: 112640 KB CPU Type: Intel Pentium-M Processor CPU Speed: 1300 MHz BIOS Version: A.1A-2973-0812		Item Specific Help  <Tab>, <Shift-Tab>, or <Enter> selects field.
<b>F1 Help</b> <b>F2 Select Item</b> <b>F3 +/- Change Values</b> <b>F9 Setup Defaults</b> <b>Esc Exit</b> <b>F10 Select Menu</b> <b>Enter Select 4 Sub-Menu</b> <b>F10 Save and Exit</b>		

- **System Time**  
Allows you to change the system time using the hour:minute:second format of the computer.  
Enter the current time for each field and use the <Tab>, <Shift>+<Tab>, or <Enter> key to move from one field or back to another.  
You can also change the system time from your operating system.
- **System Date**  
Allows you to set the system date using the month/date/year format.  
Enter the current time for each field and use the <Tab>, <Shift>+<Tab>, or <Enter> key to move from one field or back to another.  
You can also change the system time from your operating system.
- **LAN MAC Address**  
This field reports the MAC address of the LAN module on your notebook.
- **Boot Display Device**  
Lets you select the display device.
- **Primary Master**  
This field displays various parameters for the hard disk drive. If type [Auto] is selected, the system automatically sets these parameters. If type [User] is selected, Cylinders, Heads and Sectors and other values can be edited.

- **Secondary Master**  
This field is for information only as the BIOS automatically detects the optical drive.
- **System Memory**  
This field reports the amount of base (or conventional) memory found by the BIOS during Power-On Self-Test (POST).
- **Extended Memory**  
This field reports the amount of extended memory found by the BIOS during Power-On Self-Test (POST).
- **CPU Type**  
This field reports the CPU type information detected by the BIOS during Power-On Self-Test (POST).
- **CPU Speed**  
This field reports the CPU speed information detected by the BIOS during Power-On Self-Test (POST).
- **BIOS Version**  
This field is for information only as the BIOS displays the BIOS version during the Power-On Self-Test (POST).

## 1.6.2 Internal HDD Sub-Menu

Phoenix BIOS Setup Utility				
Main	Advanced	Security	Boot	Exit
Primary Master: [30006MB]		Item Specific Help		
Type:	[Auto]	Select the drive type corresponding to the fixed disk installed in your system. If type USER is selected, Cylinders, Heads & Sectors are Edited directly.		
	LBA Format			
Total Sectors:	[58605120]			
Maximum Capacity:	30006MB			
Multi-Sector Transfers:	[16 Sectors]			
LBA Mode Control:	[Enabled]			
32 Bit I/O:	[Disabled]			
Transfer Mode:	[FPIO 4/DMA 2]			
Ultra DMA Mode:	[Mode 5]			
F1 Help	↶ ↷ Select Item	-/+ Change Values	F9 Setup Defaults	
Esc Exit	↵--> Select Menu	Enter Select 4 Sub-Menu	F10 Save and Exit	

Use the Type field to select the drive type installed. You can select different drive types as **CD-ROM**, **User**, **Auto**, or **None** by pressing <Space> bar. Set this option to Auto so your computer will automatically detect the drive type during power on. Set this option to None when your computer is not installed any devices. Press <Esc> to return to the Main Menu.

## 1.6.3 Using the Advanced CMOS Setup

Phoenix BIOS Setup Utility					
Main		Advanced	Security	Boot	Exit
				Item Specific Help	
NumLock		[LockOn]		Selects Power-on state for NumLock	
Embedded Share Memory		[16MB]			
Quiet Boot		[Enabled]			
Screen Expansion		[Disabled]			
Legacy USB Support		[Enabled]			
USB 2.0		[Enabled]			
PXE OPROM		[Disabled]			
Wake on LAN from S5:		[Enabled]			
4 I/O Device Configuration					
F1 Help	← →	Select Item	+/-	Change Values	F9 Setup Defaults
Esc Exit	↵-->	Select Menu	Enter	Select 4 Sub-Menu	F10 Save and Exit

- **Num-Lock**  
Lets you specify Enabled or Disabled for activating or inactivating Num-Lock function when system is booting.
- **Embedded Share Memory**  
Lets you specify the sharing memory size of the Video chip from DDR SDRAM. The Default sharing size is 32MB. You should carefully specify the value, since while the set value is too high, the memory size of your software application will be reduced.
- **Quiet Boot**  
Lets you specify the boot screen to Logo screen or POST screen by choosing Disabled or Enabled, respectively.
- **Screen Expansion**  
Lets you choose full-size screen or reduced size screen for viewing the display mode.
- **Legacy USB Support**  
Lets you specify Enabled or Disabled for activating or inactivating Legacy USB Device function when system is booting.
- **USB 2.0**  
Lets you specify Enabled or Disabled for activating or inactivating USB 2.0 Device function when system is booting.

- **PXE OPROM**  
Lets you specify Enabled or Disabled for activating or inactivating PXE OPROM Device function when system is booting. Please set it to default value
- **Wake on LAN from S5**  
Lets you activate or inactivate the LAN function when system is booting by specifying Enabled or Disabled option. Wake on LAN is a function that you can boot the system from LAN remotely.
- **I/O Device Configuration**  
Lets you configure input/output device such as Serial Port, Parallel Port, and Floppy disk controller.

## I/O Device Configuration Sub-Menu

PhoenixBIOS Setup Utility									
Main		Advanced		Security		Boot		Exit	
I/O Device Configuration						Item Specific Help			
Serial port A:		[Auto]		Configure serial port A using options:					
Parallel port:		[Auto]		[Disabled]					
Mode:		[Bi-directional]		[Enabled]					
				User configuration,					
				[Auto]					
				BIOS or OS chooses configuration,					
				(OS Controlled)					
				displayed when					
				controlled by OS					
F1 Help		← → Select Item		-/+ Change Values		F9 Setup Defaults			
Esc Exit		↑ ↓ Select Menu		Enter Select 4 Sub-Menu		F10 Save and Exit			

- **Serial port A**  
You can select the Enabled, Disabled, or Auto option for enabled or disabled the port, or automatically sensed by BIOS or OS.
- **Parallel port**  
Allows you to select the Enabled, Disabled, or Auto option for enabled or disabled this port, or automatically sensed by BIOS or OS.
- **Mode**  
Allows you to select a parallel mode as Bi-directional, EPP or ECP when the parallel port is configured. When you set the configured parallel port to

Enabled, you need to set the parameter of Base I/O address and IRQ for this port.

## 1.6.4 Security Menu Setup

Phoenix BIOS Setup Utility		
Main	Advanced	Security
		Item Specific Help
Supervisor Password Is	Clear	Supervisor Password controls access to the setup utility.
User Password Is	Clear	
Set Supervisor Password	[Enter]	
Set User Password	[Enter]	
Set Primary Hard Disk Password	[Enter]	
HDD Password Status	Clear	
Password on boot	[Disabled]	
I/O Security		
Modem:	[Enabled]	
LAN:	[Enabled]	
1394/CARDBUS:	[Enabled]	
USB:	[Enabled]	
Wireless LAN:	[Enabled]	
<b>F1 Help</b> <b>← →</b> Select Item <b>-/+</b> Change Values <b>F9</b> Setup Defaults <b>Esc Exit</b> <b>↑ ↓</b> Select Menu <b>Enter</b> Select 4 Sub-Menu <b>F10</b> Save and Exit		

- **Supervisor Password Is**  
This field will show Set or Clear that means whether this notebook is controlled by Supervisor Password or not.
- **User Password Is**  
This field will show Set or Clear that means whether this notebook is controlled by User Password or not.
- **Set Supervisor Password**  
Supervisor password gives you the authority in accessing the setup utility. You also need to enter this password in system booting and resuming from suspend mode. When you press **<Enter>** in this field, the Set Supervisor Password dialog box appears. Enter a new password with up to 8 alphanumeric characters, and then re-enter it for confirmation.

- **Set User Password**  
This field is only available when Supervisor Password has set. Enter the user password when boot the system or resume from suspend mode. But if the Write Protect is set in the Fixed disk boot sector field, you should enter a supervisor password to access the fixed disk when boot the system or resume from suspend mode.
- **Set Primary Hard Disk Password**  
This password gives you the authority in accessing the Hard Disk. When you press <Enter> in this field, the Set Supervisor Password dialog box appears. Enter a new password with up to 8 alpha-numeric characters, and then re-enter it for confirmation.
- **HDD Password Status**  
This field will show Set or Clear that means whether this notebook is controlled by HDD Password or not.
- **Password on Boot**  
If you set this field to Enabled, your computer will ask for the password each time you boot your computer.
- **Modem**  
Lets you specify Enabled or Disabled for activating or inactivating Modem Device function when system is booting.
- **LAN**  
Lets you specify Enabled or Disabled for activating or inactivating LAN Device function when system is booting.
- **1394/CARDBUS**  
Lets you specify Enabled or Disabled for activating or inactivating 1394/CARDBUS Device function when system is booting.
- **USB**  
Lets you specify Enabled or Disabled for activating or inactivating USB Device function when system is booting.
- **Wireless LAN**  
Lets you specify Enabled or Disabled for activating or inactivating Wireless LAN Device function when system is booting.

## 1.6.5 Using the Boot Setup

This item allows you to set the search drive sequence where the system will try to boot up first.

Phoenix BIOS Setup Utility				
Main	Advanced	Security	Boot	Exit
			Item Specific Help	
F12 Multi Boot Menu:			[Enabled]	
PXE Boot with WOL:			[Disabled]	
Boot Sequence:			+Hard Drive Removable Devices CD-ROM Drive	
<b>F1 Help</b> <b>↶ ↷</b> Select Item <b>-/+</b> Change Values <b>F9</b> Setup Defaults <b>Esc</b> Exit <b>↵</b> Select Menu <b>Enter</b> Select 4 Sub-Menu <b>F10</b> Save and Exit			Keys used to view or configure devices: <Enter> expands or collapses devices with a + or - <Ctrl+Enter> expands all <Shift + I> enables or disables a device. <+> and <-> moves the device up or down.	

- **F12 Multi Boot Menu**  
Lets you specify Enabled or Disabled for activating or inactivating the Multi Boot function by pressing F12 function key when system is booting.
- **PXE Boot with WOL**  
This field is for information only as whether the BIOS can automatically detect the PXE Boot with WOL status or not.
- **Boot Sequence**  
To select the boot device, you can use the up or down arrow key, then press <+> to move up the device in the list or press <-> to move down the device in the list.

## 1.6.6 How to Exit the Setup Program

There are two choices to escape from the Setup program.

Phoenix BIOS Setup Utility				
Main	Advanced	Security	Boot	Exit
Exit Saving Changes Exit Discarding Changes Load Setup Defaults Discard Changes Save Changes			Item Specific Help	
			Exit System Setup and save your changes to CMOS.	
F1 Help	← → Select Item	F5/F6 Change Values	F9 Setup Defaults	
Esc Exit	↵ Select Menu	Enter Execute Command	F10 Save and Exit	

- **Exit Saving Changes**  
Saves all changes to CMOS while running the BIOS setup program and exit from the system setup program.
- **Exit Discarding Changes**  
Allows you to discard all changes made while running the BIOS setup program and exit from the system setup program.
- **Load Setup Defaults**  
Lets you load the default values for all setup items.
- **Discard Changes**  
Reverts to previously selected settings.
- **Save Changes**  
Saves Setup data to CMOS.

## 1.6.7 How to Upgrade the BIOS

Your computer uses EPROM Flash BIOS chip that allows you to easily upgrade the BIOS program. When you update the BIOS, any customized settings you made are lost.  
To upgrade the BIOS:

1. Insert the BIOS Update diskette into the diskette drive.
2. Power on the system with the diskette in the diskette drive.



3. On the DOS prompt, type the following command.  
A:\>Phlash XXXXXX.ROM (*BIOS filename*) **or**  
A:\>XXXXXX.BAT (*Batch file for BIOS file*)
4. Press <Enter> to run this BIOS utility. After the system has been successfully run this program, a message similar to the following appears:  
  
Flash memory has been successfully programmed, press any key to restart the system. If the system does not restart, turn it off, then turn on again.
5. Press any key to restart this system.

Contact your dealer for the latest BIOS update file.

## 2.1 Overview

This chapter provides guidelines on installing the device drivers for the built-in features of the MB05. Most of the driver installation procedures mentioned here are only for Windows XP. This chapter also includes procedures on how to upgrade major internal system components like CPU, memory, hard disk, and feature card modules.

## 2.2 Notebook Drivers and Utilities

The notebook requires several device drivers that you need to install and setup before you can fully operate the notebook. These are:

- Intel 855GM VGA Driver – Windows XP
- ALC201A Audio Driver – Windows XP
- ALPS Touch Pad Driver – Windows XP
- Montara-GM Chipset Driver – Windows XP
- Easy Button PRO utility – Windows XP
- Askey MDC Modem – Windows XP
- Realtek 8100BL LAN driver – Windows XP
- Intel Wireless LAN driver – Windows XP

**i** Visit FIC Support website <ftp://ftp.pcg.fic.com.tw/NBTECH/MB05> for the latest driver updates.

### 2.2.1 Installing Windows XP from CD / DVD ROM

This section provides Windows XP installation guide from the CD-ROM or DVD-ROM device.

#### Installing Windows XP from CD-ROM / DVD-ROM

To install Windows XP directly from your CD-ROM, insert the Windows XP installation CD into CD-ROM drive with following the instructions on the screen to finish the installation. You could go to **Boot** menu of **BIOS** setup menu to confirm the priority of boot device. Use arrow key to select "ATAPI CD-ROM Drive", and then use "+" or "-" to move it to the top. Go to **Exit** menu and select "**Exit Saving Changes**".

### 2.2.2 Installing the VGA Device Driver

Your notebook computer uses the high-performance Intel 855GM VGA controller, which is an AGP 4x video local bus, 2D/3D Graphic Engine. Following is the procedure for installing the VGA Driver for Windows XP :

#### Installing VGA Driver for Windows XP

1. Click the **Start** button, then point to **Settings**, and click **Control Panel**.
2. Double-click on the **System** icon, **Hardware**, and then click on the **Device Manager** folder tab.
3. Under the **Other Devices** line, you will find the **Video Controller (VGA compatible)**, click **Uninstall**, **OK**, and then **Scan for Hardware Changes** buttons to appear the **New**

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### Hardware Found Message Box.

4. In the Found New Hardware Wizard message box which shows searching **Video Controller (VGA compatible)** driver. Click **Next** to proceed the further step.
5. Select "**Search for a suitable driver for my device**", and click **Next**.
6. Tick on "**Specify a location box**", then, click **Next** and **Browse** buttons, and then navigate to the VGA driver location as "**\\Drivers\\ WinXP\\VGA**".
7. Click **OK** and **Next** to begin searching the driver. Click **Next** to continue installing the driver.
8. Click **Finish** button to finish installing VGA driver and Click **Yes** to restart the computer.

### 2.2.3 Installing the Audio Device Driver

Your notebook computer uses Realtek Audio controller.

#### Installing Audio Driver for Windows XP

1. Click the **Start** button, then point to **Settings**, and click **Control Panel**.
2. Double-click on the **System** icon, **Hardware** and then click on the **Device Manager** folder tab.
3. Under the **Other Devices** line, you will find the **Multimedia Audio Controller**, click **Uninstall**, **OK**, and then **Scan for hardware changes** buttons to appear the **New Hardware Found** Message Box.
4. In the Found New Hardware Wizard message box which shows searching **Multimedia Audio Controller** driver. Click **Next** to proceed to the next step.
5. Select "**Search for a suitable driver for my device**", and click **Next**.
6. Tick on "**Specify a location box**", then click **Next** and **Browse** buttons, and navigate to the Audio driver location as "**\\Drivers\\ WinXP\\Audio**".
7. Click **OK** and **Next** to begin searching the driver. The Add New Hardware will found **Intel ALC201A Audio**.
8. Click **Yes** to continue installing the driver. Click **Finish** button to finish installing Audio driver.

### 2.2.4 Installing Touch Pad Driver

Following is the procedure for installing Synaptics touch pad driver.

#### Installing ALPS Touch Pad Driver for Windows XP

1. Boot Windows from your hard disk and insert the diskette containing touch pad driver.

2. Click the **Start** button, then click **Run**. In the Run dialog box, click **Browse** button and navigate to the directory as "**\\Driver\\WinXP\\Touch Pad\\setup.exe**", path according to your Operating System and run "**Setup.exe**".
3. Execute the setup program and then select the language for this installation. After that, a **Welcome** dialog box appears.
4. Click **Next** continuously three times when the screen appears the **Next** button.
5. Click **OK** to restart your system.

### 2.2.5 Installing Internal Modem Device Driver

Your notebook computer may come with an optional internal modem. The internal modem is a 56Kps V.90 Askey MDC modem.

#### Installing Internal Modem for Windows XP

1. Boot Windows from your hard disk and insert the disc containing the Modem driver for Windows.
2. Click the **Start** button and then click **Run**. In the Run dialog box, click **Browse** button and navigate to the directory as "**\\driver\\WinXP\\MODEM\\setup.exe**" where the modem driver is located.
3. Click **OK** to process the installation of modem driver. Follow the instruction to finish the installation.
4. With "**Yes, I want to restart my computer now**" selected, click **Finish** to complete the modem installation.

### 2.2.6 Installing Internal LAN Device Driver

Your notebook computer may come with an optional internal LAN, which uses the Intel 562EZ chip. Please follow the procedures below for installing the LAN driver:

#### Installing Internal LAN for Windows XP

1. Click the **Start** button, then point to **Settings**, and click **Control Panel**.
2. Double-click on the **System** icon, **Hardware** and then click on the **Device Manager** folder tab.
3. Under the **Other Devices** line, you will find the **Ethernet Controller**, click **Uninstall**, **OK**, then **Scan for hardware changes** buttons to appear the **New Hardware Found** Message Box.
4. In the Found New Hardware Wizard message box which shows searching **Ethernet Controller** driver. Click **Next** to proceed to the next step.
5. Select "**Search for a suitable driver for my device**", and click **Next**.
6. Tick on "**Specify a location box**". Then, click **Next** and **Browse** buttons and navigate to the LAN driver location as "**\\Drivers\\WinXP\\LAN**". Click **OK** and **Next** to begin searching

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the driver.

7. The Add New Hardware will found **Intel Fast Ethernet** . Click **Yes** to continue installing the driver.
8. Click **Finish** button to finish installing LAN driver.

### 2.2.7 Installing EzButton Driver

Following is the procedure for installing Easy Button driver.

#### Installing Easy Button driver for Windows XP

1. Boot Windows from your hard disk and insert the disc containing the Easy Button driver.
2. Click the **Start** button, then click **Run**. In the Run dialog box, click **Browse** button and navigate to the directory as "**\\Drivers\\WinXP\\Easy Button\\Ez Button.exe**".
3. Run the execution file for installing the Easy Button driver, and then click **Finish** after complete the installing procedure.

### 2.2.8 Installing the Chipset Driver

Your notebook computer uses the advanced chipset. Installing the driver to enhance the stability and performance.

#### Installing Chipset device driver for Windows XP

1. Click the **Start** button, then point to **Run**. The **Run** dialog box appears.
2. Click the **Browse** button and specify the directory as "**E:\\Drivers\\WinXP\\Chipset\\Setup.exe**".
3. Click "**OK**" to execute the setup program. The **Setup** box appears.
4. Click **Next** continuously to install this driver when screen displays this command.
5. Tick the option "**Yes, I want to restart my computer now.**", and press **Finish** to restart your system.

## 2.3 System Upgrades

This section provides an easy step in doing system upgrades for your notebook computer.

### 2.3.1 Jumper Settings

This section provides a jumper setting lists of configuring the notebook.

#### SW1

##### Keyboard Type Select

SW1	Pos #1	POS #2
JP KEYBOARD	OFF	OFF
US KEYBOARD	ON	OFF
UK KEYBOARD	OFF	ON

##### CD-ROM Cable select

SW1	Pos #7
Master	OFF
Slave	ON

##### Password Select

SW1	Pos#4
Normal	OFF
Clear Password	ON

##### CMOS Clear Select

SW1	Pos#8
Default	OFF

##### Auto POWER ON Select

SW1	Pos#6
Normal	OFF
Auto Power On	ON

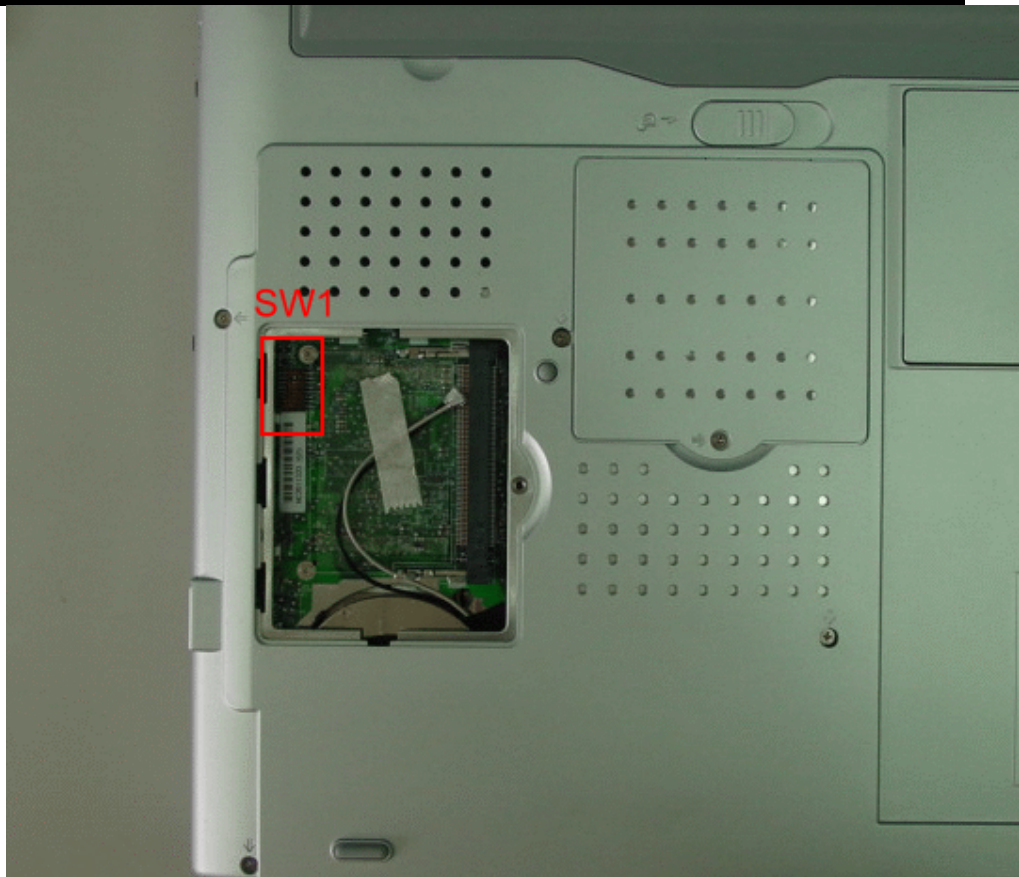
##### Logo Select

SW1	Pos#3
Default	OFF

##### MATHER BOARD ID Select

SW1	Pos#5
Default	OFF

The switch setting is on the bottom of Wireless LAN Compartment door. Please see the figure 2-1 for more clear location.



**Figure 2-1 Location of SW1**

### 2.3.2 CPU Upgrade Procedure

The MB05 features Mobile Intel Pentium-M FCPGA Processors.

#### **How to Access the CPU Socket**

To install or replace the CPU, follow the steps below:

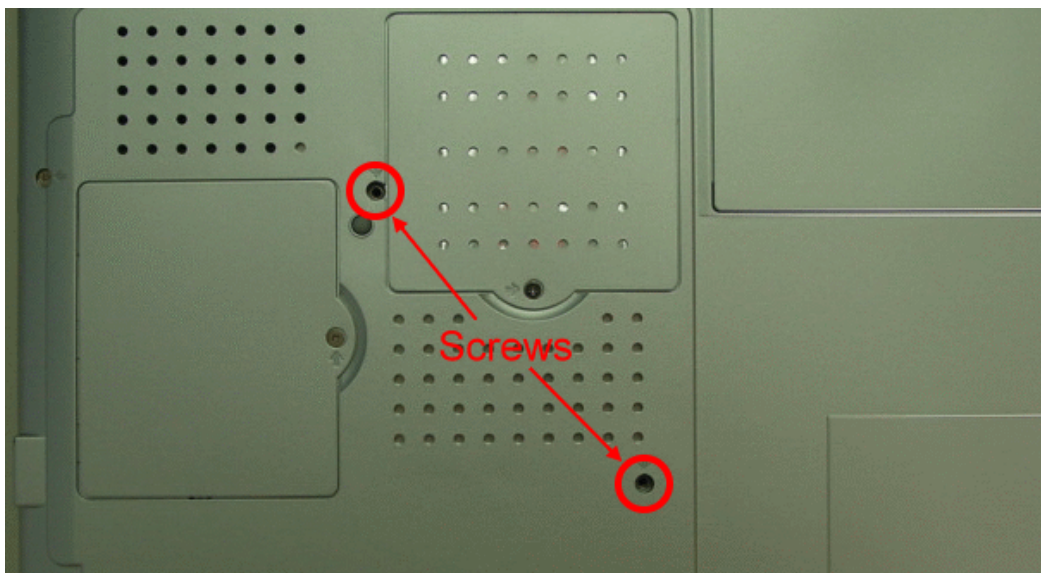
1. Turn off the system and remove both AC adapter and the battery pack from the notebook unit.
2. Remove keyboard cover by gently bending it and sliding it towards in front of you.





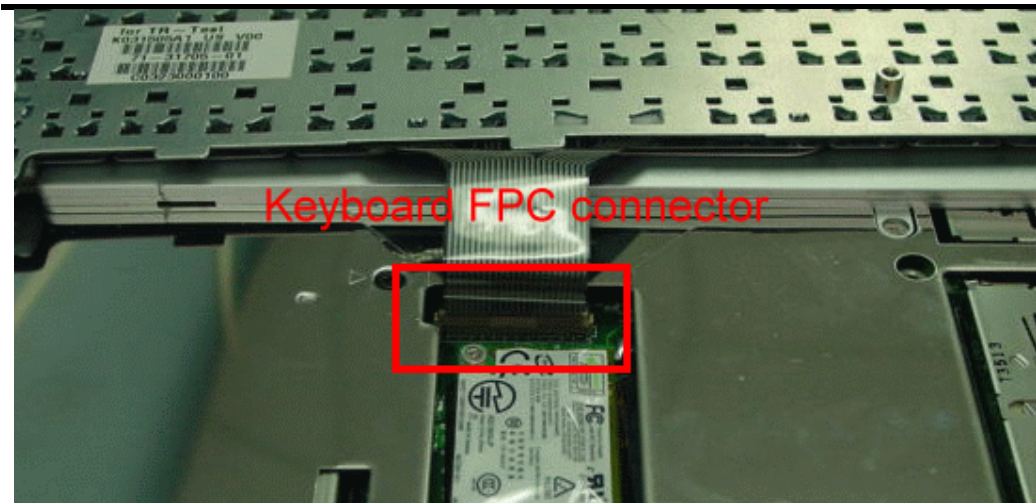
**Figure 2-2 Remove keyboard Cover**

3. There are two screws on the bottom case and that should be removing as the picture indicated.
4. Lift the keyboard and tilt it towards the LCD panel.
5. Release keyboard cable by sliding the ZIF connector towards up direction.



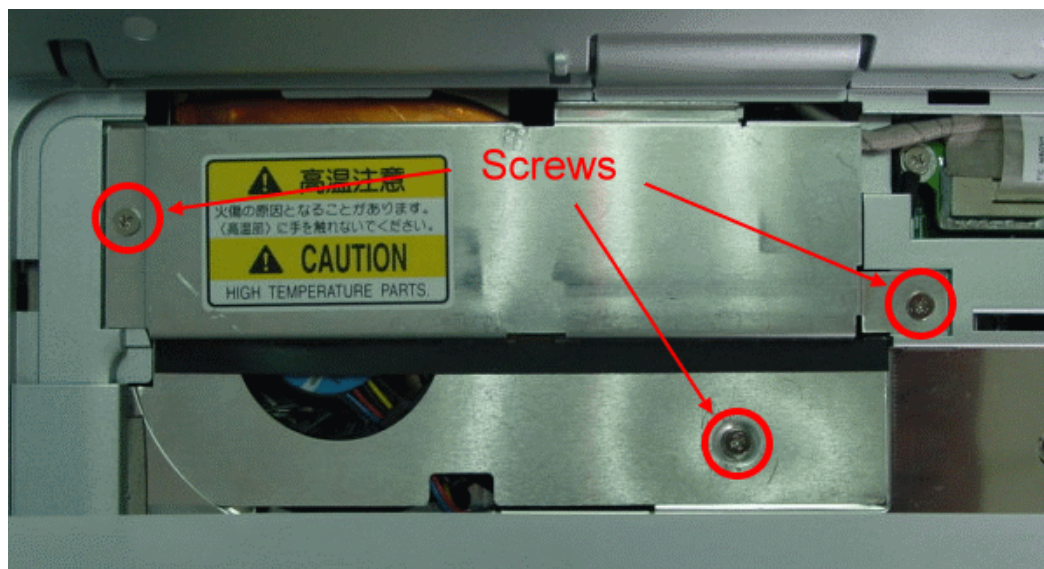
**Figure 2-3 Remove two screws**





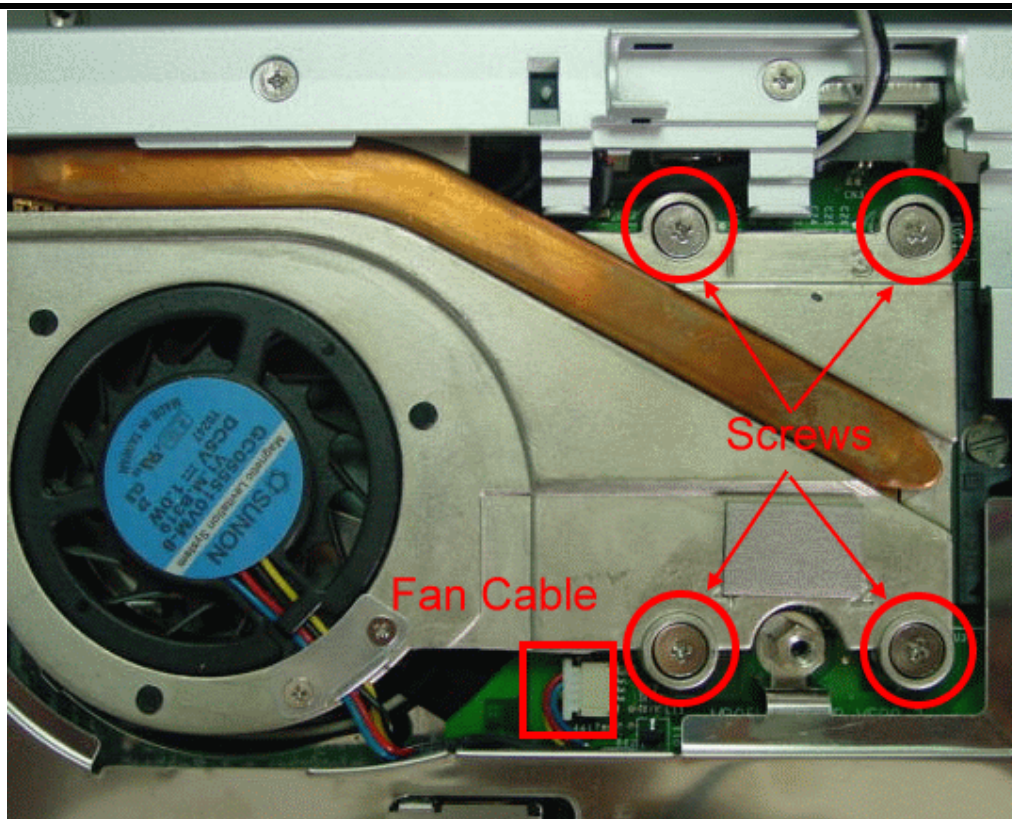
**Figure 2-4 Remove keyboard**

6. Release three screws as shown in the picture below, and then remove Frame Bracket.



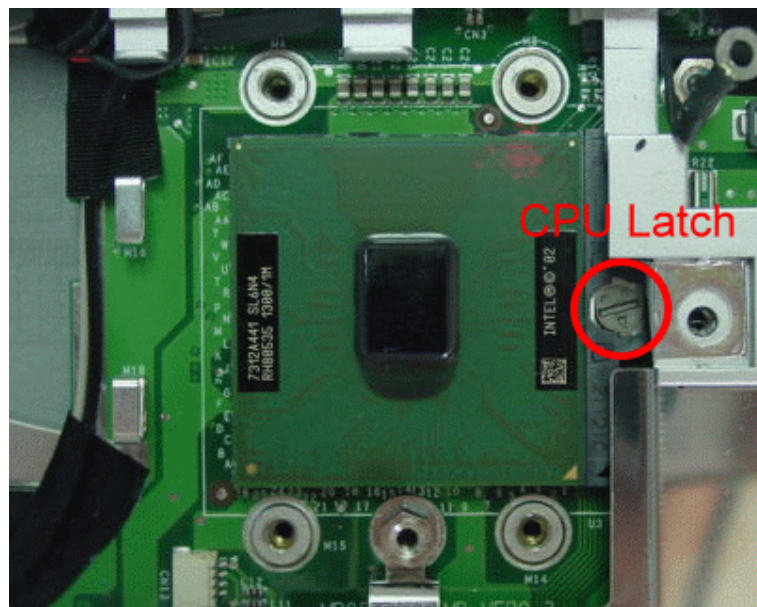
**Figure 2-5 Remove Frame Bracket**

7. Release four screws and one cable as shown in the picture below, and then remove heat sink plate and Fan.



**Figure 2-6** Remove heat sink plate and Fan

8. Use a flat screwdriver to unlock CPU.



**Figure 2-7** Remove CPU



9. Remove CPU and insert the preferred CPU.
10. Use a flat screwdriver to lock CPU.
11. Place back the heat plate and keyboard cover. Boot on the computer, and then BIOS will automatically detect the type of the CPU which just be installed.

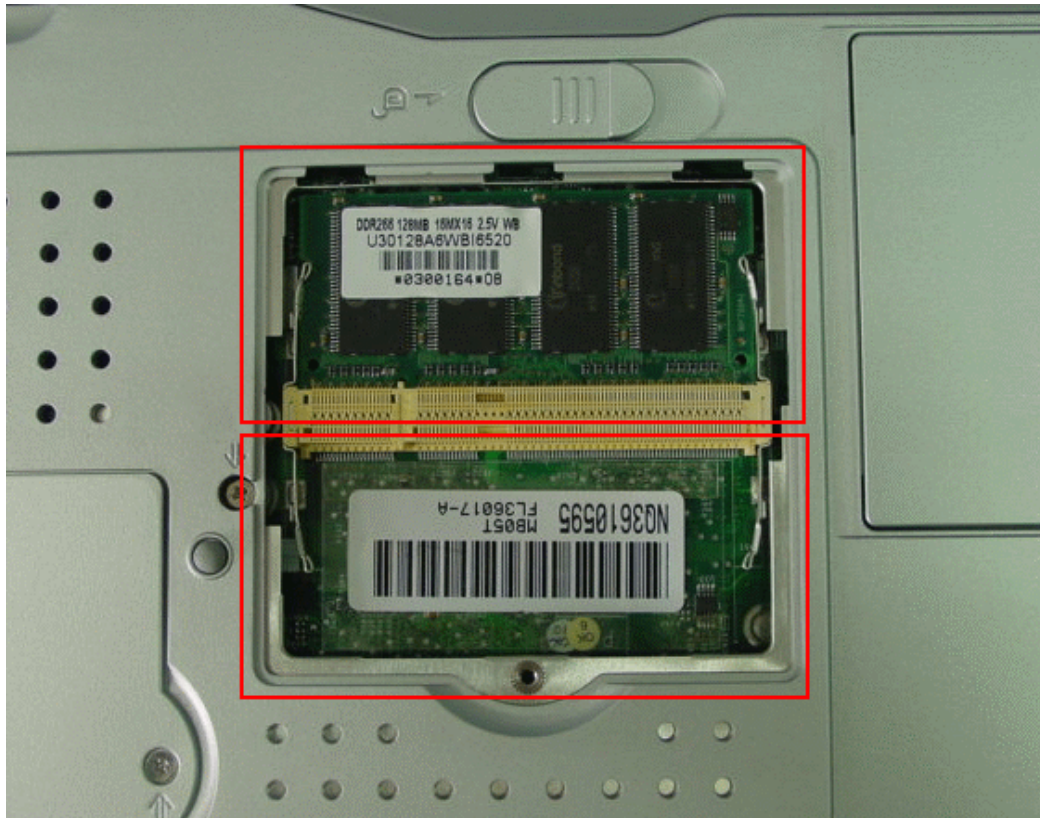
### 2.3.3 Memory Upgrade Procedure

The notebook computer offers two memory slot using DDR DIMM at 128MB, 256MB and 512MB DDR-RAM. Two memory slots are found inside the memory compartment. The memory compartment is located on the underside of your computer inside the memory compartment. With two memory slots, you can have several combinations up to 1024MB.

#### Using the Memory Slot inside the Memory Compartment

Follow the steps below on how to upgrade the memory modules:

1. Make sure the system is powered off and that no peripheral devices are attached.
2. Turn the system over and locate the screw on the memory compartment.



**Figure 2-8 Removing Memory module**

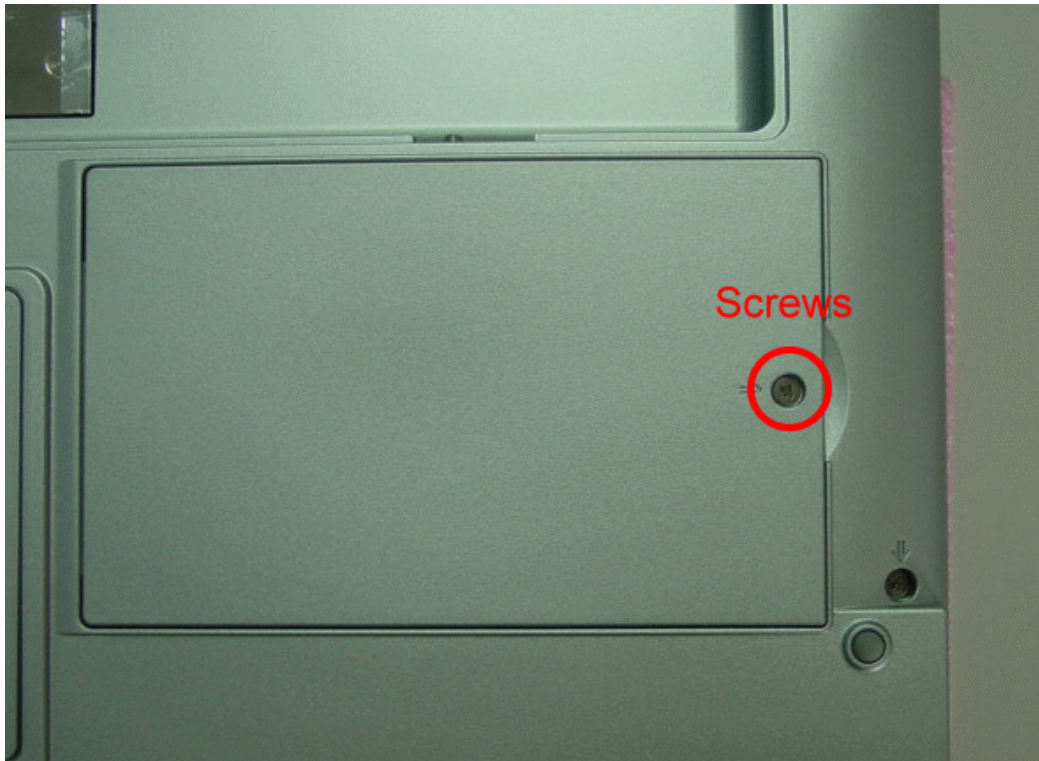
3. Locate the memory module socket. Align the notch with the notch in the socket connector and insert the module as follows:

- Hold the DIMM at a 60-degree angle and align the DIMM connector with the socket in the system. Push the connector into the socket.
  - Press down on the edge of the DIMM until the locking tabs on the sides snap into place, securing the module.
4. To remove a DIMM, press the locking tabs away from the sides of the module until the module pops up. Then, remove the DIMM.
5. Reassemble the notebook components as follows.
- Put the DIMM door back.
  - Replace the screw and turn the system over.

### 2.3.4 Hard Disk Upgrade Procedure

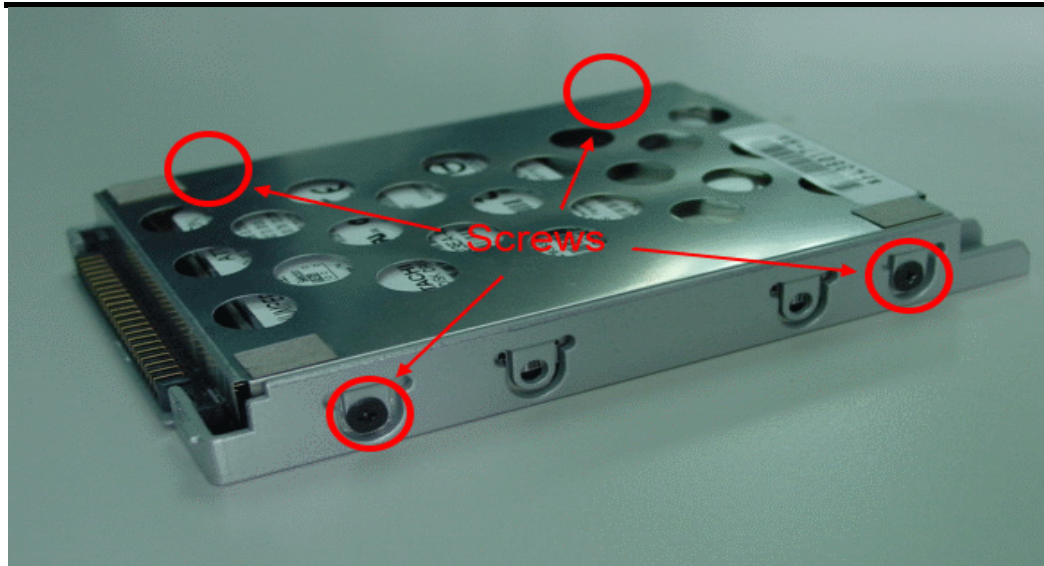
The notebook provides a built-in hard disk for the primary IDE controller. The HDD is an industry standard 2.5" IDE disk drive and can be upgraded with another standard 2.5" HDD.

1. Make sure the system is powered off and that no peripheral devices are attached.
2. Remove the one screw.



**Figure 2-9 Removing HDD module**

3. Remove the HDD module from the base unit.
4. Remove four screws of frame HDD bracket plate.



**Figure 2-10    Screws Locations of the frame HDD bracket plate**

### 2.3.5    System BIOS Upgrade Procedure

The notebook supports EPROM Flash BIOS that allows you to easily update the system BIOS using the Phoenix BIOS Flash utility program called "**PHLASH.COM**". This program runs under MS-DOS and requires the system not to load high memory like **HIMEM.SYS**. It also needs the "**PLATFORM.BIN**" file in order to activate.

Follow the steps below on how to update the system BIOS:

1. Prepare a clean bootable diskette without loading the HIMEM.SYS. Copy the files **PHLASH.COM** and **PLATFORM.BIN** into the diskette along with the BIOS ROM file.
2. Restart the computer and boot from the diskette. At the DOS prompt, type the command "**PHLASH <BIOSfile.ROM>**" to activate Flash BIOS programming utility. The computer will then start to update the system BIOS inside the notebook.
3. After programming is complete, the system will prompt you to press any key to shutdown the computer. The BIOS version is displayed inside the BIOS Setup Main menu. Press <F2> after power on to run CMOS Setup program.

**BIOS Version : 1.0A-0716-0724**

**i**

It is very important not to power off the system whenever the FLASH BIOS program is running. Otherwise, the system may not be able to power on and you need to replace the BIOS EPROM chip from another working notebook.

**i**

Always plug in the AC adapter when updating the BIOS.

### 3.1 Overview

The MB05 is an IBM PC/AT compatible Notebook PC which supports the Intel uFCPGA Socket. The following are the major features that MB05 supports.

- 2 Microsoft PC2001 logo and WinXP logo approval.
- 2 14.1",15" XGA and 15"SXGA+ panel support.
- 2 Support ACPI 1.0B (or above).
- 2 Support PCI 2.2 (or above).
- 2 Support USB 1.1/2.0.
- 2 Support SMBIOS 2.3.(or above)

### 3.2 Summary of the BIOS Specification

The summary of the BIOS specification is as the below description:



Controller Chip	Description
BIOS Feature	§ Microsoft PC99 logo and WinXP logo approval. § Support Boot Block / Crisis Rescue. § APM 1.2 Compliance § Support ACPI 1.0B (or above) Spec. § Support PCI 2.1 (or above) Spec. § Support SMBIOS 2.3 (or above) Spec. § Support Windows XP / Windows 2K. § Support flash function including both DOS and Windows interface for new BIOS update. § Support US keyboard . § Support boot from LAN , USB FDD/FLASH , HDD and CDROM Drive. § Support Phoenix First BIOS.
CPU	Auto detecting the CPU type and speed for Intel Banias based system. Support Intel Geyserville III Technology .
DRAM	Auto sizing and detection. Support PC-200/266 DDR SDRAM.
Cache	§ Level 2 SRAM auto sizing and detection. § Always enable CPU L1 and L2 cache.
Shadow	Always enable VGA and System BIOS shadow.
Display	§ System auto detects LCD or CRT or TV presence on boot . § Up to 32 MB of Dynamic Video Memory Allocation.
Hard Disk	§ Enhanced IDE spec. § Support auto IDE detection. § Support LBA mode for larger capacity HDD. § Support Ultra DMA 33/66/100. § Support Fast PIO mode 1-4 transfer. § Support 32 bit PIO transfer. § Support Multi-Sector transfer. § Support SMART monitoring.
Multi Boot	Allow the user to select boot from USB FDD/FLASH, HDD LAN and CD-ROM.
Plug and Play	Support PnP Run Time Service and conflict-free allocation of resource during POST
Smart Battery	Support BIOS interface to pass battery information to the application via SMBus.
Keyboard Controller	Support Fn hot keys, two Win95 hot keys, built-in Glide Pad.
PCMCIA	Compliant with PCMCIA 2.1 specification.
Power Management Support (ACPI Mode)	The power management is compliant with ACPI 1.0B specification and supports the following power state: § S0 (Full-On) Mode § S3 (STR) Mode § S4 (STD) Mode § S5 (Soft-Off) Mode

### 3.3 Subsystem Software Functions

This section provides introduction on the software functions of the notebook subsystems and BIOS related function.

#### 3.3.1 Key Chipset Summary

Following are the main chipsets used in the notebook:

Controller Chip	Vendor	Description
Processor	Intel	Mobile Banias
North Bridge	Intel	MontaraGM
South Bridge	Intel	ICH4
Video Controller	Intel	Embedded in MontaraGM
PCMCIA Controller	RICOH	R5C554
Supper I/O Controller	SMSC	LPC47N267
Audio Controller	Intel	South Bridge Integrated
Audio Codec	Realtek	ALC201
Keyboard Controller	Misubishi	M3885x
Power Management	NEC	PMU08
ROM BIOS	SST	49LF004A
Clock Generator	IMI	CY28346
Temperature Sensor	NS	MAX1617
IEEE 1394	RICOH	R5C554
LAN	Realtek	8100BL
Modem	ASKEY	MDC AC'97

#### 3.3.2 System Memory

The system memory consists of SDRAM memory on 64-bit bus and the module size options are 128/256/512/1GMB upward. The BIOS will automatically detect the amount of memory in the system and configure CMOS accordingly during the POST (Power-On Self Test) process. This must be done in a way that requires no user interaction.

Base SO-DIMM DRAM slot (Bank 0&1)	Expansion SO-DIMM DRAM slot (Bank 2&3)	Total Size
NIL	128MB	128MB
NIL	256MB	256MB
NIL	512MB	512MB
128MB	NIL	128MB
128MB	128MB	256MB
128MB	256MB	384MB
128MB	512MB	640MB
256MB	NIL	256MB
256MB	128MB	384MB
256MB	256MB	512MB
256MB	512MB	768MB
512MB	NIL	512MB
512MB	128MB	640MB
512MB	256MB	768MB



512MB	512MB	1024MB
-------	-------	--------

### 3.3.3 Video

#### Supported Video Mode

The following is the display modes supported by the INTEL Mobility Video control in LCD only, CRT only, and simultaneous mode. The VGA BIOS will allow mode sets of resolutions greater than the panel size but only show as much mode display as will fit on the panel.

#### Supported standard VGA modes:

The VGA BIOS supports the IBM VGA Standard 7-bit VGA modes numbers.

Mode	Pixel Resolution	Colors	Memory
00h/01h	40*25	16	Text
02h/03h	80*25	16	Text
04h/05h	320*200	4	2-bit Planar
06h	640*200	2	1-bit Planar
07h	80*25	Mono	Text
0Dh	320*200	16	4-bit Planar
0Eh	640*200	16	4-bit Planar
0Fh	640*350	Mono	1-bit Planar
10h	640*350	16	4-bit Planar
11h	640*480	2	2-bit Planar
12h	640*480	16	4-bit Planar
13h	320*200	256	8-bit Planar

Note: All Standard VGA Modes are limited to the standard VGA refresh rates.

#### Supported extended video modes:

CRT device will support all listed VESA mode; and other devices such as PANEL & TV may be limited to the mode support due to their characteristics.

VESA Mode	Pixel Resolution	Memory Model	Refresh Rates In (Hz)	Minimum Memory
100h	640 x 400	8-bit Packed	70	2MB
101h	640 x 480	8-bit Packed	60, 72, 75, 85	2MB
102h	800 x 600	4-bit Planar	60, 72, 75, 85, 100	2MB
103h	800 x 600	8-bit Packed	60, 72, 75, 85, 100	2MB
104h	1024 x 768	4-bit Planar	43(l), 60, 70, 75, 85, 100	2MB
105h	1024 x 768	8-bit Packed	43(l), 60, 70, 75, 85, 100	2MB
106h	1280 x 1024	4-bit Planar	43(l), 60, 75, 85	2MB
107h	1280 x 1024	8-bit Packed	43(l), 60, 75, 85	2MB
10Eh	320 x 200	16-bit Packed	70	2MB

10Fh	320 x 200	32-bit Unpacked	70	2MB
111h	640 x 480	16-bit Packed	60, 72, 75, 85	2MB
112h	640 x 480	32-bit Unpacked	60, 72, 75, 85	2MB
114h	800 x 600	16-bit Packed	60, 72, 75, 85, 100	2MB
115h	800 x 600	32-bit Unpacked	60, 72, 75, 85, 100	2MB
117h	1024 x 768	16-bit Packed	43(I), 60, 70, 75, 85, 100	2MB
118h	1028 x 768	32-bit Unpacked	43(I), 60, 70, 75, 85, 100	4MB
11Ah	1280 x 1024	16-bit Packed	43(I), 60, 75, 85	4MB
11Bh	1280 x 1024	32-bit Unpacked	43(I), 60, 75, 85	8MB
11Dh	640 x 400	16-bit Packed	70	2MB
11Eh	640 x 400	32-bit Packed	70	2MB
120h	1600 x 1200	8-bit Packed	48(I), 60, 75, 85	2MB
122h	1600 x 1200	16-bit Packed	48(I), 60, 75, 85	4MB
124h	1600 x 1200	32-bit Unpacked	48(I), 60, 75, 85	8MB
12Ah	640 x 480	24-bit Packed	60, 72, 75, 85	2MB
12Bh	800 x 600	24-bit Packed	60, 72, 75, 85, 100	2MB
12Ch	1024 x 768	24-bit Packed	43(I), 60, 70, 75, 85, 100	4MB
12Dh	1280 x 1024	24-bit Packed	43(I), 60, 75, 85	4MB
12Eh	320 x 200	8-bit Packed	70	2MB
131h	320 x 200	8-bit Packed	72	2MB
133h	320 x 200	16-bit Packed	72	2MB
134h	320 x 200	32-bit Packed	72	2MB
13Bh*	1400 x 1050	8-bit Packed	60, 75	2MB
13Ch*	1400 x 1050	16-bit Packed	60, 75	4MB
13Eh*	1400 x 1050	32-bitUnpacked	60, 75	8MB
141h	400 x 300	8-bit Packed	72	2MB
143h	400 x 300	16-bit Packed	72	2MB
144h	400 x 300	32-bitUnpacked	72	2MB
151h	512 x 384	8-bit Packed	70	2MB
153h	512 x 384	16-bit Packed	70	2MB
154h	512 x 384	32-bitUnpacked	70	2MB
171h	720 x 480	8-bit Packed	75	2MB
173h	720 x 480	16-bit Packed	75	2MB
174h	720 x 480	24-bit Packed	75	2MB
175h	720 x 480	32-bitUnpacked	75	2MB
176h	720 x 576	8-bit Packed	75	2MB
178h	720 x 576	16-bit Packed	75	2MB
179h	720 x 576	24-bit Packed	75	2MB
17Ah	720 x 576	32-bitUnpacked	75	2MB

Note: “\*” The modes may not be available. Their availability should be determined by VESA function calls.

---

### Panel Type Initialization

The VGA BIOS will issue INT 15h function call during POST. This function call allows the system BIOS to specify the panel type to the VGA BIOS. The system BIOS should get the panel type from GPIO pins before the VGA chip initialized, and pass this information to VGA BIOS through INT 15 Function 4E00h.

#### LCD Panel ID pin Definition:

ICH4 GPI Pins				Panel Type
GPI [23]	GPI [17]	GPI [11]	GPI [10]	
0	0	0	0	
0	0	0	1	
0	0	1	0	
0	0	1	1	
0	1	0	0	
0	1	0	1	
0	1	1	0	
0	1	1	1	
1	0	0	0	
1	0	0	1	
1	0	1	0	
1	0	1	1	
1	1	0	0	
1	1	0	1	
1	1	1	0	
1	1	1	1	

### 3.3.4 Enhanced IDE

The system BIOS must be ready to support 4 IDE devices on two controllers. The BIOS support Ultra DMA33/66/100 and also supports automatic configuration of drives using both the LBA and CHS large drive remapping method. In addition to supporting standard drives through an auto-configuration process that does NOT require user involvement or confirmation. The system should automatically do this at POST time in a way that is transparent to the user. If a drive is connected to the bus, the drive should be automatically recognized, configured and available for use under MS-DOS 6.2x.

### 3.3.5 Audio

The audio subsystem will support the requirements identified by the AC'97 specification. Both software and hardware will control the volume level for the internal audio subsystem. In addition to the volume control, the user will be able to mute the sound to completely cut off the volume using both software and hardware.

### 3.3.7 PCMCIA

The PCMCIA controller chip of the notebook provides the following features:

- Individually accessed, dual-buffer implementation
- Support for 2 separate CardBus slots (one type III or two type II stacked)

- Support for 3.3v, 5v and 12v (flash programming) cards

## 3.3.8 LED Indicator

The table below lists down the functions of the Status LED indicator:

Indicator	Function Description
HDD/CD accessing LED	This LED will turn on while accessing the IDE Device.
Battery Charging LED	Turn on (Green) – Battery is under charging mode Turn off – Battery full charged or no battery
CapsLock LED	This LED will turn on when the function of CapsLock is active.
Wireless LAN LED	When LED in green light indicates that the system is accessing data from or is retrieving data by wireless LAN.
NumLock LED	This LED will turn on when the function of NumLock is active.
Power Status LED	Green – System is powered on. Green Blinking- System is entered suspend mode.

## 3.3.9 Hot Keys Definition

All Hot keys must be active at all times under all operation systems.

Function	Function	Handler
Fn + F3	Mute (Speaker ON/OFF)	BIOS Handler
Fn + F4	Suspend	Control by OSPM
Fn + F7	Display toggle (CRT/LCD)	BIOS Handler
Fn + F8	Brightness Increase	Controlled by PMU08
Fn + F9	Brightness Decrease	Controlled by PMU08
Internet Button	Internet Function Key	Controlled by Driver
Mail Button	Mail Function Key	Controlled by Driver
Wireless Lan	Turn ON/OFF Wireless LAN	Control by Hardware

## 3.3.10 Plug & Play

The BIOS supports the Plug and Play Specification 1.0A. (Include ESCD)

This section describes the device management. The system board devices and its resources are as follows:

Device	Connect Type	Resources			
		I/O	IRQ	DMA	Memory
DMA Controller	Static	00~0F, 81~91, 93-9F, C0-DF	-	DMA4	-
Interrupt Controller	Static	20~21, A0~A1	IRQ2	-	-
System Timer	Static	40~43	IRQ0	-	-
RTC	Static	70~71	IRQ8	-	-
ISAPNP Read Data Port	Static	274-277, 279, A79,	-	-	-
System Speaker	Static	61	-	-	-
PCI Bus	Static	0-CF7, D00-FFFF	-	-	A0000-BFFFF, D0000-D7FFF,

					E0000-E3000, 10000000- FEBFFFFFFF,
MotherBoard Resource	Static	10-1F,24-25,28- 29,2C-31,34-35,38- 39,3C-3D,5053,72- 77,80,A4-A5,A8- A9,AC-AD,B0- B5,B8-B9,BC- BD,4D0-4D1,580- 587,1180- 11BF,1200,FE00	-	-	FEC10000- FEC1FFFF, FF000000- FF070000, FF800000- FF870000, FF880000- FF8FFFFFFF, FF900000- FFBFFFFFFF, FFF00000- FFFFFFFF
Keyboard Controller	Static	60, 64	IRQ1	-	-
PMU08 Controller	Static	68, 6C	-	-	-
Math Coprocessor	Static	F0~FE	IRQ13	-	-
Glide Pad	Static	-	IRQ12	-	-
Video Controller	Static	3B0~3BB, 3C0~3DF, 1800~1807,	IRQ11/IRQ 5/IRQ7	-	A0000~BFFFF , C0000~CFFFF , E0000000- E0FFFFFFF, E8000000- EFFFFFFF, F0000000- F7FFFFFFF,
Dual IDE Controller	Static	170~177, 1F0~1F7, 376,3F6	IRQ14, 15	-	-
CardBus Controller	Dynamic	3E0~3E1, FD00-FDFF, FF00-FFFF	Cardbus0: IRQ11/IRQ 5/IRQ7 Cardbus1: IRQ10/IRQ 3/IRQ4	-	D7000-D7FFF, FABFD000- FEBFCFFF, FEBFD000- FEBFDFFF, FEBFE000- FEBFEFFF,
Audio chip	Dynamic	1880-18BF, 1C00-1CFF	IRQ10/IRQ 3/IRQ4	-	E0100800- E01008FF, E0100C00- E0100DFF,
Modem	Dynamic	2000~207F, 2400-24FF	IRQ10/IRQ 3/IRQ4	-	-
LAN	Dynamic	3000~30FF	IRQ10/IRQ 3/IRQ4	-	E0201800- E02018FF
82801DB/DBM USB	Dynamic	1820~185F	IRQ11/IRQ 5/IRQ7	-	-
82801DB/DBM SMBUS	Dynamic	1100~111F	IRQ10/IRQ 3/IRQ4	-	-
82801DB/DBM Ultra ATA	Dynamic	1810~181F		-	FEBFFC00- FEBFFFFF,
ACPI-Compliant system	Dynamic	-	IRQ9	-	-

Wireless LAN	Dynamic	~	IRQ10/IRQ3/IRQ4	-	E0200000-E0200FFF-
FirmwareHub Devices	Static	-	-	-	FF800000-FFFFFFFF
IEEE 1394	Dynamic	-	IRQ10/IRQ3/IRQ4	-	E0200000-E02007FF

## 3.3.11 PCI Device

The table below summarizes the PCI IDSEL Pin Allocation:

IDSEL Pin	PCI	Device	
	Device Number	Function Number	Device Name
AD21	Device 05	Function 0	LAN
AD19	Device 03	Function 0,1	Card Bus/1394
AD17	Device 01	Function 0	MINI PCI

The table below summarizes the PCI bus master Allocation:

Arbiter	Signal	Agents (Master)	Function	Use
	REQ00/GNT00			
	REQ10/GNT10	RICOH	Card Bus Controller	
	REQ20/GNT20			
	REQ30/GNT30			
	REQ40/GNT40	RTL8100BL	N Controller	

## 3.3.12 SMBus Devices

The SMBus is a two-wire interface through which the system can communicate with power-related chips. The BIOS should initialize the SMBus devices during POST.

### ICH4 SMBus Connection Devices

SMBus Device	Host/Slave	Address	BIOS Need to Initialization
SO-DIMM	Slave	A0h/A2h	Memory Auto Sizing (SPD).
CY28346 CLK Generator	Slave	D2h	Program the desired clock frequency (Pin23 output 24MHz, Pin22 output 48MHz)

## PMU 08 SMBus Connection Devices

SMBus Device	Host/Slave	Address A7 ~ A1	BIOS Need to Initialization
PMU08	Master	10h	Enable Decode interface
MAX1617(Thermal sensor)	Slave	9Ch	Program the desired temperature range
Battery (1 <sup>st</sup> Battery)	Slave	A8h	No Need
ENE PIC (Fan Control)	Slave	24h	Program the desired Fan speed

## I/O Map

Hex Address	Device
000 - 01F	8237-1
020 - 021	8259-1
022	
040 - 05F	8254
060 - 064	Keyboard Controller
068 - 06C	PMU08 Controller
070 - 07F	RTC & NMI Mask
080 - 08F	DMA Page Registers
092	System Control Port
0A0 - 0A1	8259-2
0B2	Advanced Power Management Control Port
0B3	Advanced Power Management Status Port
0C0 - 0DF	8237-2
0F0 - 0FF	Math Coprocessor
170 - 177	IDE Secondary Command Block
1F0 - 1F7	IDE Primary Command Block
279	ISA PnP Address
330 - 333	MIDI
376	IDE Secondary Control Block
3B0 - 3DF	Video Controller
3E0 - 3E1	PCMCIA Controller
3E8 - 3EF	Fax/Modem
3F6	IDE Primary Control Block
778 - 77F	ECP port
A79	ISA PnP Address
CF8 - CFF	PCI BUS configuration Register

## ISA DMA Map

DMA Channel	Device
DMA 0	Unused
DMA 1	
DMA 2	
DMA 3	
DMA 4	[Cascade]
DMA 5	Unused
DMA 6	Unused
DMA 7	Unused

## Memory Map

Address Range	Length	Description
00000 - 9FFFFh	640 KB	System Memory
A0000 - BFFFFh	128 KB	Video Memory
C0000 - C9FFFh	40 KB	Video ROM
CA000 - DBFFFh	72 KB	Unused
DC000 - DFFFFh	16 KB	
E0000 - FFFFFh	128 KB	System ROM BIOS /DMI information

## IRQ Map

IRQ#	Description
IRQ 0	System Timer
IRQ 1	Keyboard
IRQ 2	Cascade
IRQ 3	Reserved for Card
IRQ 4	null
IRQ 5	Reserved for Card
IRQ 6	Reserved for Card
IRQ 7	null
IRQ 8	CMOS/RTC
IRQ 9	SCI IRQ used by ACPI bus
IRQ10	MiniPCI, LAN, Audio, Modem, IEEE1394, SMBus, cardbus1 Possible IRQ: 3, 4, 10
IRQ11	USB1.1, VGA, USB2.0, CardBus0 Possible IRQ: 5, 7, 11
IRQ12	null
IRQ13	Math Coprocessor
IRQ14	IDE primary channel
IRQ15	IDE secondary channel

### 3.3.13 GPIO Pin Assignment

The GPI and GPO pins connected to system devices. The BIOS can get device's status and control the device via the GPI and GPO pins.

#### ICH4 GPIO pin assignment

GPIO Number	Signal Name	Default	I/O	Notes
GPIO0	PanelID0		I	Panel ID setting
GPIO1	PanelID1		I	Panel ID setting
GPIO2	PanelID2		I	Panel ID setting
GPIO3	PanelID3		I	Panel ID setting
GPIO8	Q_SMI0		I	0:External K/B SMI0 1:Normal operation
GPIO11	LPC_QPME0	1	O	0:LPC_QPME0 Event Enable 1:Normal operation --
GPIO12	EC_SCI0		I	0:PMU SCI Detect 1:PMU SCI not Detect
GPIO13	PM_RI0		I	0:PMU GPIO detect 1:PMU GPIO not Detect



GPIO17	PMUFLASH0	1	O	0:Flash PMU08 Firmware --
GPIO25	CB_HWSUSP0	1	O	R5C551 Hardware suspend control pin
GPIO32	SPDMUX0	1	O	SMBus select 1
GPIO33	SPDMUX1	1	0	SMBus select 0

## 3.3.14 PMU08 GPIO pin assignment

GPIO number	Signal Name	Default	I/O	Notes	Remark
GPIO B6	PM_SLP_S10	1	I	Suspend Plane A control for ICH4 0: POS, STR and STD suspend state. 1: not suspend state.	
GPIO B5	N.C.	--	--	No used	
GPIO B4	N.C.	--	--	No used	
GPIO B1	N.C.	1	O	No used	
GPIO B0	N.C.	--	--	No use	
GPIO A7	RI10	1	I	RS Ring event 0: Ring 1: No Ring	
GPIO A6	PCMRI0	1	I	PC Card Ring event 0: Ring 1: No Ring	
GPIO A0	LID0	1	I	LCD Open/Close Status 0: LCD Close 1: LCD Open	
GPIO C1	NC	--	--	No Use	
GPIO B7	PM_RI0	1	O	Wake Up event request 0: Wake SMI(SCI) 1: There is no demand.	
GPIO B3	PDCOM0	1	O	SHUTDOWN MAX3243 1:NO SHUTDOWN 0: SHUTDOWN	
GPIO B2	N.C.	--	-	No Use	
GPIO B0	N.C.	--	--	No Use	
GPIO A5	PRSTMSK0	1	O	PCI Reset Mask 0: Reset Mask 1: Reset Enable	
GPIO A4	PCMUTE0	1	O	Mute PC Speaker	
GPIO A2	MAILED0	1	O	MAIL ARRIVAL INDICATE	
GPIO A1	N.C.	--	--	No use	
GPIO C2	CHGLED			Charge Battery indicator : 1 : charging Battery 0 : Stop charging Battery	
GPIO C3	N.C.	--	--	No Use	
GPIO C0	N.C.	--	--	No Use	

### 3.4 ACPI

#### General Requirements

The BIOS must meet the following general Power Management requirements:

Refers to the portion of the firmware that is compatible with the ACPI 1.0b specifications.

Support for Power ON(S0 state), Suspend-to-RAM (S3 state) , Suspend-to-Disk mode (S4 state) and Soft OFF(S5 state).

#### Global System State Definitions

Global system states (Gx states) apply to the entire system and are visible to the user.

Following is a list of the system states:

#### **G0/S0 - Working:**

A computer state where the system dispatches user mode (application) threads and they execute. In this state, devices (peripherals) are dynamically having their power state changed. The user will be able to select (through some user interface) various performance/power characteristics of the system to have the software optimize for performance or battery life. The system responds to external events in real time. It is not safe to disassemble the machine in this state.

#### **G1 - Sleeping:**

A computer state where the computer consumes a small amount of power, user mode threads are not being executed, and the system “appears” to be off (from an end user’s perspective, the display is off, etc.). Latency for returning to the Working state varies on the wakeup environment selected prior to entry of this state (for example, should the system answer phone calls, etc.). Work can be resumed without rebooting the OS because large elements of system context are saved by the hardware and the rest by system software. It is not safe to disassemble the machine in this state.

#### **G2/S5 - Soft Off:**

A computer state where the computer consumes a minimal amount of power. No user mode or system mode code is run. This state requires a large latency in order to return to the Working state. The system’s context will not be preserved by the hardware. The system must be restarted to return to the Working state. It is not safe to disassemble the machine.

#### **G3 – Mechanical Off:**

A computer state that is entered and left by a mechanical means. It is implied by the entry of this off state through a mechanical means that the no electrical current is running through the circuitry and it can be worked on without damaging the hardware or endangering the service personnel. The OS must be restarted to return to the Working state. No hardware context is retained. Except for the real time clock, power consumption is zero.

#### Sleeping State Definitions

Sleeping states (Sx states) are types of sleeping states within the global sleeping state, G1. The Sx states are briefly defined below. For a detailed definition of the system behavior within each Sx state, refer to ACPI specification section 7.5.2. For a detailed definition of the transitions between each of the Sx states, refer to ACPI specification section 9.1.

#### **S1 Sleeping State:**

The S1 sleeping state is a low wake-up latency sleeping state. In this state, no system context is lost (CPU or chip set) and hardware maintains all system context.

### S3 Sleeping State:

The S3 sleeping state is a low wake-up latency sleeping state where all system context is lost except system memory. CPU, cache, and chip set context are lost in this state. Hardware maintains memory context and restores some CPU and L2 configuration context. Control starts from the processor's reset vector after the wake-up event.

### S4 Sleeping State:

The S4 sleeping state is the lowest power, longest wake-up latency sleeping state supported by ACPI. In order to reduce power to a minimum, it is assumed that the hardware platform has powered off all devices. Platform context is saved in disk.

### S5 Soft Off State:

The S5 state is similar to the S4 state except the OS does not save any context nor enable any devices to wake the system. The system is in the "SOFT" off state and requires a complete boot when awakened. Software uses a different state value to distinguish between the S5 state and the S4 state to allow for initial boot operations within the BIOS to distinguish whether or not the boot is going to wake from a saved memory image.

## System Power Plane

The system components are grouped as the following parties to let the system to control the On/Off of power under different power management modes.

### 3.4.1 System Power Plane

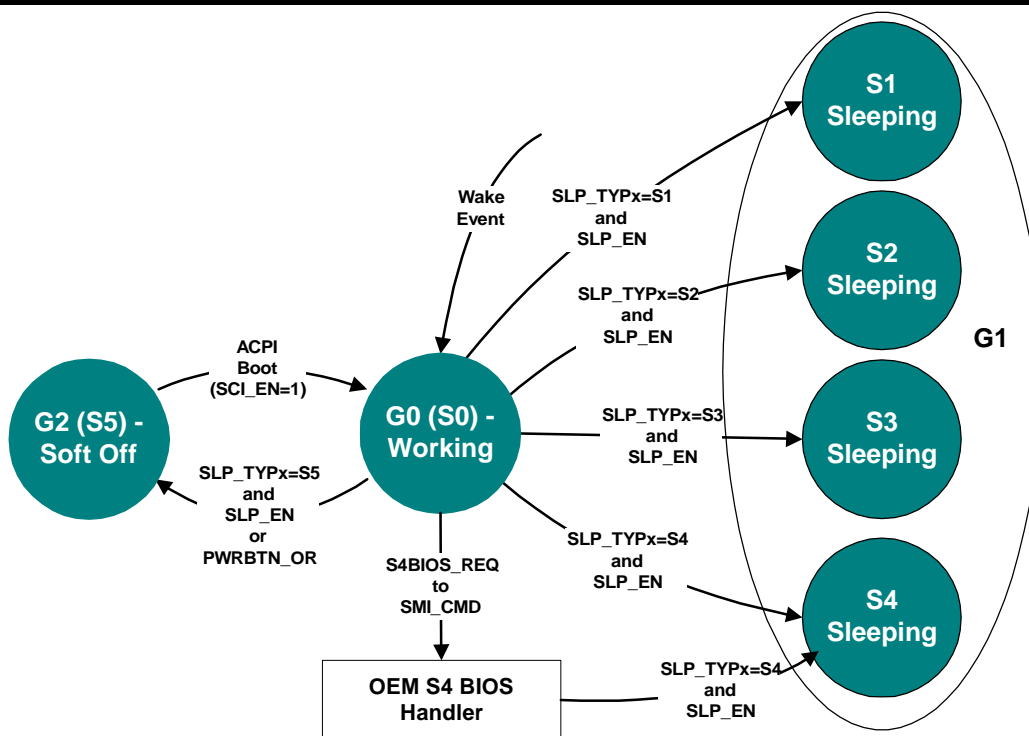
The system components are grouped as the following parties to let the system to control the On/Off of power under different power management modes.

The power plane is divided as following:

Power Group	Power Control Pin	Controlled Devices
+B	Nil	IMM, (9V~20V)
+3VA	Nil	RTC I/F, PMU08
+12V	PWRON	PCMCIA Card, AC97 Codec
+5V	PWRON	PCMCIA Slot 5V
+3V	PWRON	VGA, PCMCIA, PCMCIA Slot 3V, DRAM, Twister(DRAM I/F), M3885x, MAX3243
+5VS	SUSB#	FLASH ROM, HDD, CD-ROM, USB, Internal K/B, Glide Pad, Audio AMP, Fan
+3VS	SUSB#	ISA I/F Power, Clock Generator & Buffer (W137)
+RTCVCCS	Nil	RTC

### 3.4.2 Power Management Mode Transition Flow Chart

From a user-visible level, the system can be thought of as being one of the states in the following diagram:



### 3.4.3 Power States transition event

The following table summarizes the entry events and wake-up events of each power:

The following table summarize the entry events and wake-up events of each power state

Power State	Entry Event	Wake up Event
S3	OSPM control Lid Close Power Button Sleep Button Battery Low	Power Button Ring Wake up RTC Alarm LAN Wake Up Lid open
S4	OSPM control, Power button Sleep button Lid Close Battery Low	Power Button RTC Alarm
S5	Power Button Battery Low OSPM control	Power Button

x OSPM: OS-directed Power Management

## Device Power Control Methodology

### Power state of local devices table

This section illustrates the power control status of each key device/component of the system under each power management mode.

PowerState Component	Doze	Stand By	STR	STD/SOff
CPU	Stop Grant	Stop Clock	Power Off	Power Off
L2 CACHE	ON	Power Down	Power Off	Power Off
MontaraGM	ON	Stop Clock	Power Off (except Vcc)	Power Off
ICH4	ON	ON	Power Off (except SUSVcc, RTCVcc )	Power Off (except SUSVcc, RTCVcc)
DRAM	ON	Self Refresh	Self Refresh	Power Off
Clock Synthesizer	ON	Low Power	Power Off	Power Off
CDROM	ON	Power Down	Power Off	Power Off
HDD	ON	Power Down	Power Off	Power Off
FDD	ON	Power Down	Power Off	Power Off
KBC	ON	ON	Power Down	Power Off
PMU08	ON	ON	Power Down	Power Down
VGA/VRAM	ON	Power Down	Power Down	Power Off
PCMCIA	ON	Power Down	Power Down	Power Off
AUDIO	ON	Power Down	Power Off	Power Off
Audio AMP	ON	Power Down	Power Off	Power Off
LCD Backlight	ON	Power Off	Power Off	Power Off
LAN	ON	Power Down	Power Down	Power Down
Internal Modem	ON	Power Down	Power Down	Power Down

### Device Power control Methodology During S3 Mode

This section illustrates the control methodology of each device/component and its details under Stand by mode.

Device	Power Down Controlled by	Description
CPU	Hardware	Controlled by SUSB# pin
L2 CACHE	Hardware	Power off
ICH4	Hardware	Controlled by SUSB# pin
DRAM	Software	Self Refresh
Clock Synthesizer	Hardware	Controlled by SUSB# pin
CDROM	Hardware	Power off
HDD	Hardware	Power off
FDD	Hardware	Power off
KBC	Software	Controlled by M3885xM8 power down command
PMU08	Software	Controlled by PMU08 power down command
VGA/VRAM	Software	Controlled by MontaraGM
PCMCIA	Software	Controlled by SUSB# pin
AUDIO	Hardware	Controlled by ICH4
Audio AMP	Hardware	Controlled by BIOS
LCD Backlight	Hardware	Power off
IR Module	Hardware	Controlled by SUSB# pin
LAN	Hardware	Controlled by Driver enter Dx status
Internal Modem	Hardware	Controlled by Driver enter Dx status

## Power Button

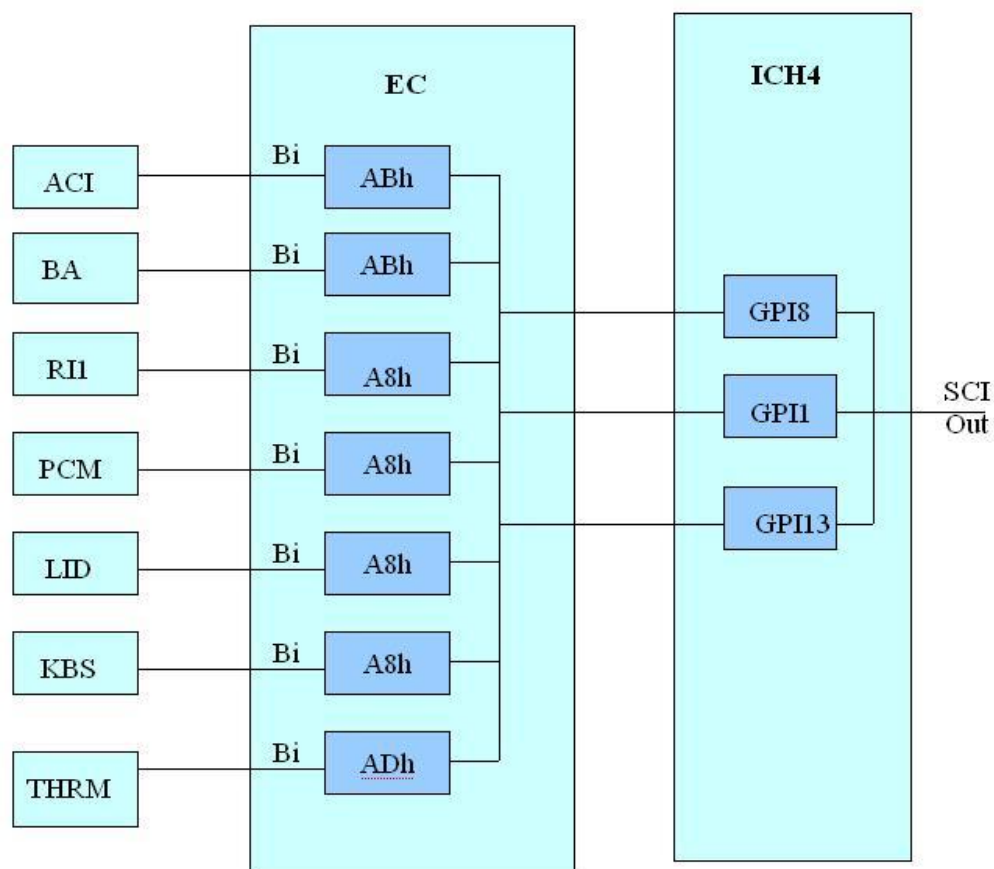
The function of Lid Switch is depends on the ACPI aware OS.

## Lid Switch (Cover Switch)

The function of Lid Switch is depends on the ACPI aware OS.

### 3.4.4 Expanding Event Through the Embedded Controller

The following figure shows the relationships between the devices that are wired to the embedded controller, the embedded controller queries, and ACPI general



**Figure 3-2 The Relationships between ACPI, Controller, and Device**

### SCI Source and GPE Event from PMU08

The system will issue a beep to inform user while the following SCI alerted:

PMU08	Input Event	GPE Event	Handler
ADPIN#	AC Plug In/Out	GPI12	AML Handler
BAT0#	Battery Plug In/Out	GPI12	AML Handler
GPIOA0	LID Event	GPI13	AML Handler
GPIOA3	Keyboard SMI	GPI8	AML Handler
GPIOA6	PCMCIA Ring In	GPI13	AML Handler
GPIOA7	COM Port Ring In	GPI13	AML Handler
THRM	Thermal Event	GPI12	AML Handler

### Control Method Battery Subsystem

EC should support all the battery information to ACPI-OS

- Designed Battery capacity
- Designed Voltage
- Designed Low battery capacity
- Designed Low – Low battery capacity
- Latest Full charged capacity
- Present Remaining capacity
- Present drain rate
- Present voltage
- Present Battery Status

ACPI BIOS should support an independent device object in the name space, and implement the following methods.

#### 3.4.5 Thermal Control

There are primary cooling policies that the OS use to control the thermal state of the hardware

Cooling Policy	Action	Temperature Setting
Active cooling	Fan Low On	Over 60°C
	Fan Low Off	Below 50°C
Active cooling	Fan High On	Over 75 °C
	Fan High Off	Below 65°C
Passive cooling	Throttling CPU On	Over 85 °C
	Throttling CPU Off	Below 80°C
Critical trip point	System Shutdown	Over 95 °C

## 3.5 Battery Management

### 3.5.1 Battery Sub-system

§ The charger will stop charge the battery when the following condition is detected.

- The temperature of the system is too high
- The remaining capacity is 95% and more.

Note that the battery life is depending on different configuration running. E.g. with CD-ROM battery life is shorter, document keyin only battery life is longer, PMU disable battery life is short, PMU enable battery life is longer.

- Battery reading methodology is through PMU08 SMBus.

### 3.5.2 Battery Low

When the battery voltage is approaching to the Low level, the PMU08 will generate a

battery low SMI. The system will do the following action.

- 1) The Power Indicator will become blinking.
- 2) The system will issue a Warning beep.

### 3.5.3 Battery Low - Low

When the battery voltage is approaching to the Low-Low level, the PMU08 will generate a battery low-low SMI. The system will do the following action.

- 1) The Power Indicator will keep on Blinking.
- 2) The system will enter Suspend To Disk mode even the power management is disabled. The function of power-on or Resume will be inhibited until the battery Low – Low condition is removed.

### 3.5.4 AC Adapter

When plug in the AC adapter, the system will do the following action:

- The charger will charge the Main Battery, if remaining capacity is not full.
- The Battery Charging Indicator will turn on if the battery is in charging mode.

## 3.6 PMU08

The Embedded controller PMU08 acts as a supplement for power management control. It supports a lot of functions via SMBus interface.

### 3.6.1 The System EC RAM with PMU08

Embedded Controller Command Set

The EC I/F command set allows the OS to communicate with the PMU08.

For detail information refer to ACPI 1.0B specification.

EC I/F Command	Command Byte Encoding	Byte	Register	R/W	Description	Interrupt
Read Embedded Controller (RD_EC)	0x80	#1	EC_SC	W	Command byte Header	Interrupt on IBF=0
		#2	EC_DATA	W	Address byte to read	No Interrupt
		#3	EC_DATA	R	Read data to host	Interrupt on OBF=1
Write Embedded Controller (WR_EC)	0x81	#1	EC_SC	W	Command byte Header	Interrupt on IBF=0
		#2	EC_DATA	W	Address byte to write	Interrupt on IBF=0
		#3	EC_DATA	W	Data to write	Interrupt on IBF=0



Burst Enable Embedded Controller (BE_EC)	0x82	#1	EC_SC	W	Command byte Header	No Interrupt
		#2	EC_DATA	R	Burst acknowledge byte	Interrupt on OBF=1
Burst Disable Embedded Controller (BD_EC)	0x83	#1	EC_SC	W	Command byte Header	Interrupt on IBF=0
Query Embedded Controller (QR_EC)	0x84	#1	EC_SC	W	Command byte Header	No Interrupt
		#2	EC_DATA	R	Query value to host	Interrupt on OBF=1

## 3.6.2 PMU08 EC RAM List

The micro controller PMU08 acts as a supplement for power management control. It supports the following functions via SMBus Command ( **0x80** , **0xC0** )

Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
1 <sup>st</sup> Battery [ _BIF ]	00h *3	Power unit	R/(W)	DATA[15:0] *1								-	0xffff	0x0000: mWh [Fixed value] 0xffff: Unknown
	02h *3	Design capacity	R/(W)	DATA[15:0] *1								-	0xffff	0x0000-0xffff(mWh) 0xffff: Unknown
	04h *3	Last Full Charge Capacity	R/(W)	DATA[15:0] *1								-	0xffff	0x0000-0xffff(mWh) 0xffff: Unknown
	06h *3	Battery Technology	R/(W)	DATA[15:0] *1								-	0xffff	0x0000 : Primary 0x0001: Secondary [Fixed value] 0xffff: Unknown.
	08h *3	Design Voltage	R/(W)	DATA[15:0] *1								-	0xffff	0x0000-0xffff(mV) 0xffff: Unknown

Function	Addresses	Register	R/W	Bit Number								Logic	Default	Description
		Name		7	6	5	4	3	2	1	0			
	0Ah *3	Design capacity of Warning	R(/W)	DATA[15:0] *1								-	0xffff	0x0000-0xfffe(mWh) 0xffff: Unknown
	0Ch *3	Design capacity of Low	R(/W)	DATA[15:0] *1								-	0xffff	0x0000-0xfffe(mWh) 0xffff: Unknown
	0Eh *3	Battery capacity Granularity 1	R(/W)	DATA[15:0] *1								-	0xffff	0x0000-0xfffe(mWh) 0xffff: Unknown
	10h *3	Battery capacity Granularity 2	R(/W)	DATA[15:0] *1								-	0xffff	0x0000-0xfffe(mWh) 0xffff: Unknown
	12h *3	Model number	R(/W)	DATA[15:0] *1								-	0xffff	0x0000 [Not support]
	14h *3	Serial Number	R(/W)	DATA[15:0] *1								-	0xffff	0x0000 [Not support]
	16h *3	<b>Battery type</b>	R(/W)	DATA[15:8] *1 All bits are 0				CELL_TYPE [7:0]				-	0xffff	CELL_TYPE [3:0] This code depends on battery data format. In the future, this code may be added. 0x00: NiMH 0x01: Li-ion <b>0x10: Non-rechargeable battery (Reserved)</b>

Function	Addresses	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
	18h *3	OEM Information	R/(W)	DATA [15:8] *1 All bits are 0				Vender [7:0]				-	0xffff	Vender [7:0] This code depends on battery data format. And the following name should be described in the ASL with the same character code. In the future, these codes will be added. 0: "MoliEnergy" 1: "Panasonic" 2: "" (SANYO does not agree the vender name display) 3: "TBCL" (Toshiba) 4: "Sony"
1 <sup>st</sup> Battery [ _BST ]	1Ah *3	Battery State	R/(W)	DATA[15:3] *1 All bits are 0				CRIT	CHG	DCHG		-	-	The battery is discharged DCHG=1: The battery is charged CHG =1: The battery is critical (Empty)
	1Ch *3	Battery Present rate	R/(W)	DATA[15:0] *1								-	0xffff	0x0000-0xfffe(mW) 0xffff: Unknown
	1Eh *3	Battery Remaining Capacity	R/(W)	DATA[15:0] *1								-	0xffff	0x0000-0xfffe(mWh) 0xffff: Unknown
	20h *3	Battery present Voltage	R/(W)	DATA[15:0] *1								-	0xffff	0x0000-0xfffe(mV) 0xffff: Unknown
1 <sup>st</sup> Battery [ _BTP ]	22h	Battery Trip Point	R/W	DATA[15:0] *1								-	0x0000	0x0000: Clear the trip point 0x0001-0xffff(mWh)
2 <sup>nd</sup> Battery [ _BIF ]	24h to 3Ch *3	*2	*2	*2								*2	*2	*2
2 <sup>nd</sup>	3Eh	*2	*2	*2								*2	*2	*2

Function	Addresses	Register	R/W	Bit Number								Logic	Default	Description
		Name		7	6	5	4	3	2	1	0			
Battery [ _BST ]	to 44h *3													
2 <sup>nd</sup> Battery [ _BTP ]	46h	*2	*2									*2	*2	*2
-	48h	Battery data Size	R (W)									-	-	0x01: DATA size is 3byte.(PMU06A) 0x00: DATA size is 2 byte. (PMU06) *8
1 <sup>st</sup> Battery [ _BIF ]	49h	Design capacity	R (W)									-	0xff	PMU06A use this data with 02/03h. *7 *8
	4Ah	Last Full Charge Capacity	R (W)									-	0xff	PMU06A use this data with 04/05h. *7 *8
1 <sup>st</sup> Battery [ _BST ]	4Bh	Battery Remaining Capacity	R (W)									-	0xff	PMU06A use this data with 1E/1Fh. *7 *8
1 <sup>st</sup> Battery [ _BTP ]	4Ch	Battery Trip Point	R (W)									-	0x00	PMU06A use this data with 22/23h. *7 *8
2 <sup>nd</sup> Battery [ _BIF ]	4Dh	Design capacity	R (W)									-	0xff	PMU06A use this data with 26/27h. *7 *8
	4Eh	Last Full Charge Capacity	R/(W)									-	0xff	PMU06A use this data with 28/29h. *7 *8
2 <sup>nd</sup> Battery [ _BST ]	4Fh	Battery Remaining Capacity	R (W)									-	0xff	PMU06A use this data with 42/43h. *7 *8
2 <sup>nd</sup> Battery [ _BTP ]	50h	Battery Trip Point	R (W)										0x00	PMU06A use this data with 46/47h. *7 *8
	51h to 6Bh	Reserved	R/W									-	-	

Function	Addresses	Register	R/W	Bit Number								Logic	Default	Description
		Name		7	6	5	4	3	2	1	0			
	*3													
PMU Access	6Ch	PMU_LOW_ADR	R/W	DATA [7:0]								-	-	These registers are available when PMU slave mode or charger mode is selected.  For detail information, refer to PMU slave communication section in this document
	6Dh	PMU_HIGH_ADR	R/W	DATA [15:8]								-	-	
	6Eh	CHECKSUM	R/W	DATA [7:0]								-	-	
	6Fh	PMU_DATA	R/W	DATA [7:0]								-	-	
SMBus	70h *7	SMB_PTCL	R/W	PROTOCOL [7:0]								-	-	For detail information, refer to ACPI 1.0 specification [13.9 SMBus Host controller Interface via Embedded controller]  These registers are not available when PMU slave mode or charger mode is selected.  <b>The PMU06 has access protect function for the EEPROM in the battery, to cancel the protection, set the access protect cancel bit. For detail, refer to SMBus section</b>
	71h *7	SMB_STS	R/W	D O N	A L E M	R E S	STATUS [4:0]					-	-	
	72h	SMB_ADDR	R/W	ADDRESS [6:0]						R E S	-	-		
	73h	SMB_CMD	R/W	COMMAND								-	-	
	74h to 93h	SMB_DATA [0-31]	R/W	DATA								-	-	
	94h	SMB_BCNT	R/W	RES [7:5]			BCNT [4:0]					-	-	
	95h	SMB_ALARM_ADDR	R (/W)	ADDRESS [6:0]						R E S	-	-		
	96h to 97h	AMB_ALARM_DATA [0-1]	R (/W)	DATA								-	-	
	98h	SMB_CNRL	R/W	RES [7:1]						P R T	0x00	PRT =1: TheSMBus address (A8-AE) protection is cancelled.		
Reserv	99h	Reserv	R/W	Don't care								-	-	

Function	Addresses	Register	R/W	Bit Number								Logic	Default	Description
		Name		7	6	5	4	3	2	1	0			
ed	to 9Fh	ed												
PMU Access	6Ch	PMU_LOW_ADR	R/W	DATA [7:0]								-	-	These registers are available when PMU slave mode or charger mode is selected.  For detail information, refer to PMU slave communication section in this document
	6Dh	PMU_HIGH_ADR	R/W	DATA [15:8]								-	-	
	6Eh	CHECK_SUM	R/W	DATA [7:0]								-	-	
	6Fh	PMU_DATA	R/W	DATA [7:0]								-	-	
SMBus	70h *7	SMB_PTCL	R/W	PROTOCOL [7:0]								-	-	For detail information, refer to ACPI 1.0 specification [13.9 SMBus Host controller Interface via Embedded controller]
	71h *7	SMB_STS	R/W	D O L E M	A L R E S	STATUS [4:0]						-	-	
	72h	SMB_ADDR	R/W	ADDRESS [6:0]						R E S	-	-		
	73h	SMB_CMD	R/W	COMMAND								-	-	These registers are not available when PMU slave mode or charger mode is selected.
	74h to 93h	SMB_DATA [0-31]	R/W	DATA								-	-	
	94h	SMB_BCNT	R/W	RES [7:5]		BCNT [4:0]						-	-	The PMU06 has access protect function for the EEPROM in the battery, to cancel the protection, set the access protect cancel bit.  For detail, refer to SMBus section
	95h	SMB_ALARM_ADDR	R (/W)	ADDRESS [6:0]						R E S	-	-		
	96h to 97h	AMB_ALARM_DATA [0-1]	R (/W)	DATA								-	-	
		98h	SMB_CNRL	R/W	RES [7:1]						P R T	0x00	PRT =1: TheSMBus address (A8-AE) protection is cancelled.	

Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
Reserved	99h to 9Fh	Reserved	R/W	Don't care								-	-	

R(W): This is the read only register, but the written data will be able to read back till PMU updates the data periodically, or PMU detects the status change.

\*7: When this register is checked by polling, the interval time is necessary more than 500usec.

Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
Status	A0h *3	ADP_STS	R(W)	RES [7:1]								C O N	-	CON = 1: AC adapter is connected
	A1h *3	BAT1_STS (1st Battery)	R(W)										-	Battery trip point is detected.
	A2h *3	BAT2_STS (2 <sup>nd</sup> Battery)	R(W)										-	BTP = 1: Battery is empty. EMP = 1: Battery is Low battery state. LOW = 1: Battery is Warning state. WAR = 1: Battery is Error state. ERR = 1: Battery is discharged. DCHG = 1: Battery is charged. CHG = 1: Battery is connected.
				B T P	E M P	L O W	O A R	W E R	R R G	D C H G	C H G	C O N	-	
	A3h *3	Reserved	R/W	Don't care								-	-	
	A4h *3	BAT1_CAP	R(W)	BCAP								-	-	0x00-0x64 = 0-100(%)
	A5h *3	BAT2_CAP	R(W)	BCAP								-	-	0x7F = Unknown 0x80 = Not installed
	A6h *3	Reserved	R/W	Don't care								-	-	

Function	Address	Register	R/W	Bit Number								Logic	Default	Description
		Name		7	6	5	4	3	2	1	0			
	A7h	SMB_Alert_ADDR	R/W	ADDRESS[6:0]							RES	-	0x00	SMBAlert output device address  The alert response function is available when this register is cleared (0x00) only.  When the several devices assert the alert signal at the same time, the least address is stored to this register. And when this register is cleared, next alert address is stored to this register.
	A8h *5	GPIO-A_EVT_STS	R/W	STS_A [7:0]							Read 0:No event 1:EVT detection Write 0:Clear event 1:Ignore	0x00	To clear the notified event flag without unexpected event loss, clear the corresponding bit flag only.  For this operation, this register has special writing manner as follows.  <b>STS_X AND (STS_X) AND (Written data)</b>	
	A9h *5	GPIO-B_EVT_STS	R/W	0	STS_B [6:0]							0x00		
	AAh *5	GPIO-C_EVT_STS	R/W	0	0	0	0	0	0	0		STS_C [1:0]		0x00
	ABh *5	RUN_EVT_STS	R/W	BTP	SMB	Alert	GPIO	GPIO	GPIO	GPIO	GPIO	Read 0:No event 1:EVT	0x00	BTP2 =1: BTP2 event is detected SMB =1 : SMBus



Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
	ACh*5	WAKE_EVT_STS	R/W	2		T	O		2	1		detection Write 0:Clear event 1:Ignore	0x00	ALRT=1 : event is detected. GPIO SMBAlert=1 : is detected. BATn=1 : GPIO event is detected. ADP=1 : Battery event is detected. TH=1 : event is detected. HIGH=1 : detected. LOW=1 : Battery event is detected. ERR=1 : Thermal event is detected. High alarm point is detected. Low alarm point is detected. Polling communication failure with retry.
	ADh*5	RUN_EVT_STS_2	R/W	Reserved [7:1]							TH	0x00		To clear the notified event flag without unexpected event loss, clear the corresponding bit flag only.
	A Eh*5	WAKE_EVT_STS_2	R/W	Reserved [7:1]							TH	0x00		For this operation, this register has special writing manner as follows.
	A Fh*5	THERMAL_EVT_STS	R/W	Reserved [7:3]					ERR	LOW	HIGH	0x00		STS_X (STS_X) AND (Written data)
Event/ GPIO Control	B0h	EC_RUN_ENB	R/W	BTP2	SMB	ALRT	RES[4:1]				ADP	0: Disable 1: Enable	0x00	BTP2 : SMBus event.
	B1h	EC_WAKE_ENB	R/W								ADP	0: Disable 1: Enable	0x00	ALRT : SMBAlert event. ADP: Adapter event.

Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
	B2h	BATT_RUN_ENB	R/W									0: Disable 1: Enable	0x00	Battery trip point BTP: Empty. EMP: Low battery LOW: Warning WAR: Error ERR: Capacity learning CAP: Charge/Disc C/D: harge CON: Battery presence
	B3h	BATT_WAKE_ENB	R/W	B T P	E M P	L O W	W A R	E R R	C A P	C /	C O N	0: Disable 1: Enable	0x00	
	B4h	GPIO-A_IO_CONF	R/W	CONF_A [7:0]								0: Input 1: Output	0x00	For detail information, refer to GPIO section in this document.
	B5h	GPIO-A_DATA	R/W	DATA_A [7:0]									-	
	B6h	GPIO-A_RUN_ENB	R/W	RUN_ENB_A [7:0]								0: Disable 1: Enable	0x00	
	B7h	GPIO-A_EVT_POL	R/W	POL_A [7:0]								0: Falling edge 1: Rising edge	0x00	
	B8h	GPIO-A_WAKE_ENB	R/W	WAKE_ENB_A [7:0]								0: Disable 1: Enable	0x00	
	B9h	GPIO-B_IO_CONF	R/W	1	CONF_B [6:0]							0: Input 1: Output	0x80	
	BAh	GPIO-B_DATA	R/W	0	DATA_B [6:0]								-	
	BBh	GPIO-B_RUN_ENB	R/W	0	RUN_ENB_B [6:0]							0: Disable 1: Enable	0x00	
	BCh	GPIO-B_EVT_POL	R/W	0	POL_B [6:0]							0: Falling edge 1: Rising edge	0x00	
	BDh	GPIO-B_WAKE_ENB	R/W	0	WAKE_ENB_B [6:0]							0: Disable 1: Enable	0x00	
	BEh	GPIO-C_DATA	R/W	RES [7:4] *4				DATA_C [3:0]					-	

Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
	BFh	GPIO-C_RUN_ENB	R/W	0	0	0	0	0	0	0	RUN_ENB_C [1:0]	0: Disable 1: Enable	0x00	
Event/ GPIO Control	C0h	GPIO-C_EVT_POL	R/W	0	0	0	0	0	0	0	POL_C [1:0]	0: Falling edge 1: Rising edge	0x00	
	C1h	GPIO-C_WAKE_ENB_C	R/W	0	0	0	0	0	0	0	WAKE_ENB_C [1:0]	0: Disable 1: Enable	0x00	

Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description	
				7	6	5	4	3	2	1	0				
	C2h	EVT_COUNT	R/W	RES [7:6]	WAKE	SCI	WAKE	SCI	WAKE	SCI	WAKE		0x00	Q_RUN	<p>=0: Wake# output is "Level".</p> <p>=1: Wake# output is "Pulse".</p> <p>=0: SCI is always output by event detection and SCI_EVT shows the query data is stored. And next SCI is not output until SCI_EVT is cleared.</p> <p>=1: SCI is output when the command set is not executed and OBF=0.</p> <p>SCI_EVT shows the output SCI is for event notification.</p> <p>=0: Runtime event status is reflected to RUN_EVT_STS register.</p> <p>=1: Runtime event status is</p>
1-68															<p>FIC MB05W Service Manual</p> <p>Query data.</p>

Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
	C3h	EC_RUN_ENB_2	R/W	Reserved [7:1]								0: Disable 1: Enable	0x00	TH: Thermal event
	C4h	EC_WAKE_ENB_2	R/W									0: Disable 1: Enable	0x00	
	C5h To C7h	Reserved	R/W	Don't care								-	-	
	C8h *6	GPI_AD0	R	AD0_DATA [7:0]								-	-	For detail information, refer to GPIO section in this document.
	C9h *6	GPI_AD1	R	AD1_DATA [7:0]								-	-	
	CAh *6	Reserved	R/W	Don't care								-	-	
	CBh	D/A_CONVERT	R/W	DATA [7:0]								-	0xff	0x00-0xfe: D/A converter output data 0xff : Battery capacity(%) output
Battery control	D0h	BAT_CHG_CONT	R/W	RES[7:5]				CHG_READY#	RES[3:2]	CHG2	CHG1	-	-	CHG_RDY# =0 : Charge ready CHGn =1 : The nth battery is charged
	D1h	BAT_DISCH_PRI	R/W	RES[7:3]				PAT [2:0]				-	0x00	Battery discharge priority 0 : 2 1 1 : 1 2 2 : 2 1 3 : 2 1 4 : 1 2 5 : 1 2 6 : Same as 0 7 : Simultaneously discharge (Read only : This data can be set using PMU register)

Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
	D2h	BAT_DC H_ CONT	R/W	RES[7:2]							D D C C H H G G 2 1	0: Not discharge 1: Discharge	-	The discharge battery can be selected one of the batteries can be discharged.
	D3h	BAT_WA R_ ABS	R/W	DATA[15:0] *1								-	0x00 00	Absolute capacity battery Warning detection point 0x0000-0xffff (mWh)
	D5h	BAT_LO W_ ABS	R/W	DATA[15:0] *1								-	0x00 00	Absolute capacity battery Low detection point 0x0000-0xffff (mWh)
	D7h	BAT_WA R_ REL	R/W	DATA [7:0]								-	0x10	Relative capacity battery Warning detection point 00-C8h (0-100% step 0.5%)
	D8h	BAT_LO W_ REL	R/W	DATA [7:0]								-	0x06	Relative capacity battery Low detection point 00-C8h (0-100% step 0.5%)
	D9h *3	FULL_D ATA	R/W	DATA [7:0]								-	0xbe	Full charge cancel point 00-C8h (0-100% step 0.5%)
	Dah	CC_CUR _ DATA	R	DATA [7:0]								-	0x00	Battery charging current setting 0x01-0xff (0.02- 5.10A step 0.02A) 0x00 Depends on the battery This register is “read only”, to change the value, use the register in PMU registers area.

Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
	DBh To DCh	BTP2	R/W	DATA [15:0]								-	0x0000	0x0000: Clear the trip point 0x0001-0xffff : (mWh) When all of the battery's capacities lesser than this setting value, the BTP2 is detected if event is enabled.
	DDh To DFh	Reserved	R/W	Don't care								-	-	
PMU control	E0h	PMU_CONTROL	R/W	RES[7:3]								-	0x00	PMU does not initialize EC register when system power is off. EC_REG = 1: PMU indicates the Battery discharge status to the LED_BAY#n, when the battery is installed. The Power LED blink
	E1h	ACPI_AC_C_ENB	R/W	RES [7:1]								-	0x00	OS_STS = 1: ACPI mode = 0: Legacy mode

Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
	E2h	OFF_TIME	R/W	DATA [7:0]								-	0x64	Power switch override function timer 01h-FFh (0.1-25.5sec step 0.1sec) 00h : Reserved
Thermal Sensor Polling	E3h	POLLING_ADDRESS	R/W	Slave Address [6:0]						RES			0x00	Address: 0x00-0x7F The polling slave address setting If this address is 00, the Polling is disabled.
	E4h	HIGH_ALARM	R/W	DATA [7:0]								Signed value	0x00	If the received data GE this value, the event will be detected.
	E5h	LOW_ALARM	R/W	DATA [7:0]								Signed value	0x00	If the received data LE this value, the event will be detected.
	E6h	POLLING_INTERVAL	R/W	DATA [7:0]									0x00	0x00 :Polling disable 0x01 – 0xFF [x 250ms] (250ms to 63.75sec)
	E7h	POLLING_DATA	R(W)	DATA [7:0]								Signed value	0x00	This register shows data at latest polling.
	E8h	HARDWARE_SHUT_DOWN	R/W	DATA [7:0]								Signed value	0x7D	If the thermal sensor read value GE this value, the PMU automatically off the power.
	E9h	POLLING_COMMAND	R/W	DATA [7:0]									0x00	Polling command (data register) address.
	EAh	RETRY_COUNT	R/W	DATA [7:0]									0x10	0x00 - 0xFF: Retry count value (0-255)
	EBh To EFh	Reserved	R/W	Don't care										
PMU control	F0h	BURST_FLG_CLR	R/W	DATA [7:0]								-	-	After writing to the register addressed A8h-AFh, Set the 00h to this register.



Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
	F1h To FFh	Reserved	R/W	Don't care										

### 3.6.3 Security

The user may enter up to 8 standard text characters for a password. The password includes two levels. The higher priority is the Supervisor Password. The lower priority is the User Password. The Supervisor Password can access all the system resource, while the User Password may not access the floppy disk when it is protected by Supervisor Password. When the security function is enabled, the system will request the user to enter password during the following situation.

- I. Power On: The system will prompt the user to enter the password before booting the OS. If the user key in the wrong password for 3 times, then the system will halt.
- II. Resume: The system will prompt the user to enter password while resuming from STR or STD mode. If the user keys in the wrong password for 3 times, the system will not resume and should return to Suspend mode again.
- III. Entering CMOS Setup: The system will prompt the user to enter the password before entering the CMOS Setup. If the user keys in the wrong password for 3 times, then the system will halt.

### 3.7 CMOS Setup Utility

The Setup utility is used to configure the system. The Setup contains the information regarding the hardware for boot purpose. The changed settings will take effect after the system rebooted. Refer to Chapter 1 on running BIOS Setup Program for more detailed information.

### 3.8 Definitions of Terms

**10Base-T (Ethernet)** - A networking standard that supports data transfer rates up to 10Mbps (10 megabits per second).

**100Base-T (Fast Ethernet)** - A relatively new networking standard that supports data transfer rates up to 100Mbps.

**ACPI** - Advanced Configuration and Power Management Interface, a power management specification developed by Intel, Microsoft, and Toshiba.

**CardBus** - The 32-bit version of the PCMCIA PC Card standard. In addition to supporting a wider bus (32 bits instead of 16 bits), CardBus also supports bus mastering and operation speeds up to 33MHz.

**Clock Throttling** – South bridge function that allows the CPU clock to be stopped and started at a known duty cycle using the STPCLK# pin to enter and exit Stop Grant mode. Clock throttling is used for power saving, thermal management, and reducing the processing speed.

**DIMM (SODIMM)** - Dual In-line Memory Module, a small circuit board that holds memory chips. A Single In-line Memory Module (SIMM) has a 32-bit path to the memory chips whereas a DIMM has 64-bit path. Because the Pentium processor requires a 64-bit path to memory, you need to install SIMMs two at a time. With DIMMs, you can install one DIMM at a time. SODIMM is Small Outline Dual In-line Memory Module used in notebook computers.

**DMI** - Desktop Management Interface, an API to enable software to collect information about a computer environment about a computer environment. For example, using DMI a program can determine what hardware and expansion boards are installed on a computer.

**GPI** - General Purpose Input.

**GPO** - General Purpose Output.

**Lid Switch** - A switch that indicates the notebook LCD Panel has been closed and it can be

turned off.

**MPEG-2** - Moving Picture Experts Group, a working group of ISO. The term also refers to the family of digital video compression standards developed by the group. There are two major MPEG standards : MPEG-1 and MPEG-2. The most common implementations of the MPEG-1 standard provide a video resolution 352x240 at 30 frames per second(fps). A newer standard, MPEG-2, offers resolution of 720x480 and 1280x720 at 60 fps, with full CD-quality audio.

**North Bridge** - The CPU to PCI interface, also contains the memory and cache controllers.

**South Bridge** - The PCI to ISA interface, also contains many legacy devices.

**SMM** - System Management Mode, Mode of operation while an SMI is active.

**SMI** - System Management Interrupt, non-maskable interrupt that causes the system to enter SMM. SMM functions include power management, USB legacy keyboard control, security, hot keys, and thermal monitoring.

**SMB** - System Management Bus, that is used for managing smart batteries, reading SDRAM configuration information, and other miscellaneous system function.

**TBD** -To Be Discussed. The mentioned specification is not final that should be discussed with related engineers.

**Ultra DMA-33** - A protocol developed by Quantum Corporation and Intel that supports burst mode data transfer rates of 33.3 MBps.

**USB** - A new external bus standard that supports data transfer rates of 12 MBps. A single USB port can be used to connect up to 127 peripheral devices, such as mice, modems, and keyboards. USB also supports Plug-and-Play installation and hot plugging.

### 4.1 Overview

The FIC MB05 notebook consists of several important functions and subsystems including:

Notebook size, 2 spindle, IBM PC/AT compatible personal computer with PCI-bus and Multimedia functions, provide full basic function with lowest price and easy of use.

The following is a summary of MB05 features:

<b>CPU</b>	
CPU Type	uFCPGA 478pin Intel Banias 1.3/1.5 GHZ
<b>Chip Set</b>	
TDP(Target)	25W
Core Logic	Intel Montara-GM (North) :CPU(Banias) I/F, LVDS I/F, RGB analog I/F 200/266 DDR MEMORY I/F, Hub-Link I/F, DVOB&DVOC IF....  Intel ICH4-M (South) : PCI I/F, LPC I/F, ATA100 IDE I/F, Hub-Link I/F ,AC97 V2.2 I/F, RTC, 2.0/1.1USB I/F, 10/100M LAN I/F, GPIO, ACPI, APIC....
<b>Memory</b>	
Support Memory	DDR266/200 SDRAM 128/256/512MB SO-DIMM
Memory Slots	2 Slots SO-DIMM (1.25")
Max Memory	1024MB (512MB DIMM X2 )
<b>Video</b>	
Controller	Embedded in Intel Montara-GM. UMA (using DVMT configuration) High performance & High quality 3D accelerator High performance 2D accelerator Complete TV-OUT/Digital flat panel solution MPEG-2/1 video decoder Video accelerator
<b>LCD Panel</b>	
	14.1" XGA Controlled by hot key (8 level) 15.0" XGA TFT/200nit support Controlled by hot key (8 level)
<b>PCMCIA</b>	
Controller	RICOH R5C554 Single Slot PCI-CARDBUS BRIDGE Built in Smart Card reader(None) ZV-Port Support (None) Ring wakeup support(None)
Power Switch	G576
<b>Sound</b>	
Controller	Integrated in Intel ICH4-M (PCI audio)
CODEC	Realtek ALC201A AC97 CODEC 2.2 S/PDIF
Function	Sound Blaster Compatible S/W Wave Table
Buzzer	Support (None)
Volume	SW control.

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<b>IEEE 1394(Optional)</b>	Support two port
Controller	RICOH R5C554 two IEEE1394 ports BRIDGE
Function	Compliant with Link Layer Services as defined in 1394 Open Host Controller Interface specification release 1.0 Compliant with Physical Layer Services as defined in P1394a draft 2.0(Data Rate 100/200/400 Mbps)
<b>Storage</b>	
USB FDD	3.5" 3 mode(option)
IDE bus	IDE bus Bus Mastering Ultra DMA 33/66/100 PIO mode 0,1,2,3,4
Internal HDD2.5"	9.5 mmH Pack
Internal Optical Drive	
DVD Combo	8x DVD , 8x CDR, CDRW write , 20x CD-ROM 9.5mm type (KME: UJDA745, Toshiba: SD-R9022)
<b>Communication</b>	
Internal Modem	Ambit (1456VQL19V) (MDC Modem AC97 Interface) (Option) V.90, K56flex RJ11 Jack Wake up on Ring support S1 or S3 Voice Function not support
Internal LAN	Realtec 8100BL 10Base-T/100Base-TX RJ-45 jack
<b>I/O</b>	
Parallel	EPP/ECP x1
CRT	D-sub 15pin x1
USB	4pin x3 port (Ver:2.0)
IEEE 1394	one port
H/P	Min Jack x1
Mic In	Min Jack x1
Modem	RJ11 x1
LAN	RJ45 x1
Ps2	Ps2 x1
<b>Keyboard</b>	
Pitch/Travel	19mm/3mm
Language	US, Japan, UK
Hot Key	Fn+F2: Wireless On/Off Fn+F3: Display Mode Fn+F4: Sleep Fn+F6: Speaker On/Off Fn+F7: PMU Level(No silk) Fn+F8: Brightness Up (8 leve) Fn+F9: Brightness Down (8 level)
<b>Point Device</b>	ALPS : KGDDT 005A Glide Pad
<b>AC Adapter</b>	LITEON PA-1600-05, DELTA ADP75FB
Input	AC 100-240V
Output	19V, 60W Peak80W(LITEON), 75W(DELTA)
Color	Black or White

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## FIC MB05W Service Manual

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### Battery

1<sup>st</sup> battery      Li-ion (8 cell)  
SANYO 4400mA(Circle);3600mA(Square)

Battery Life      4.5 hours

RTC battery      x1

### Switch

**Power SW**      Push button type (As asserted switch over 4s,system will be powered down by force )

**Short Cut Key**      3 Short Cut Key (Mail Key and Internet Key)

### LED

Power Status	Yes (Need see while LCD is closed)
Battery Charge	Yes (Need see while LCD is closed)
IDE Device Access	Yes (HDD & CD-ROM )
Caps Lock	Yes
Scr Lock	Yes
Num Lock	No
Mail arrival	No
RF Access	Yes

### Security

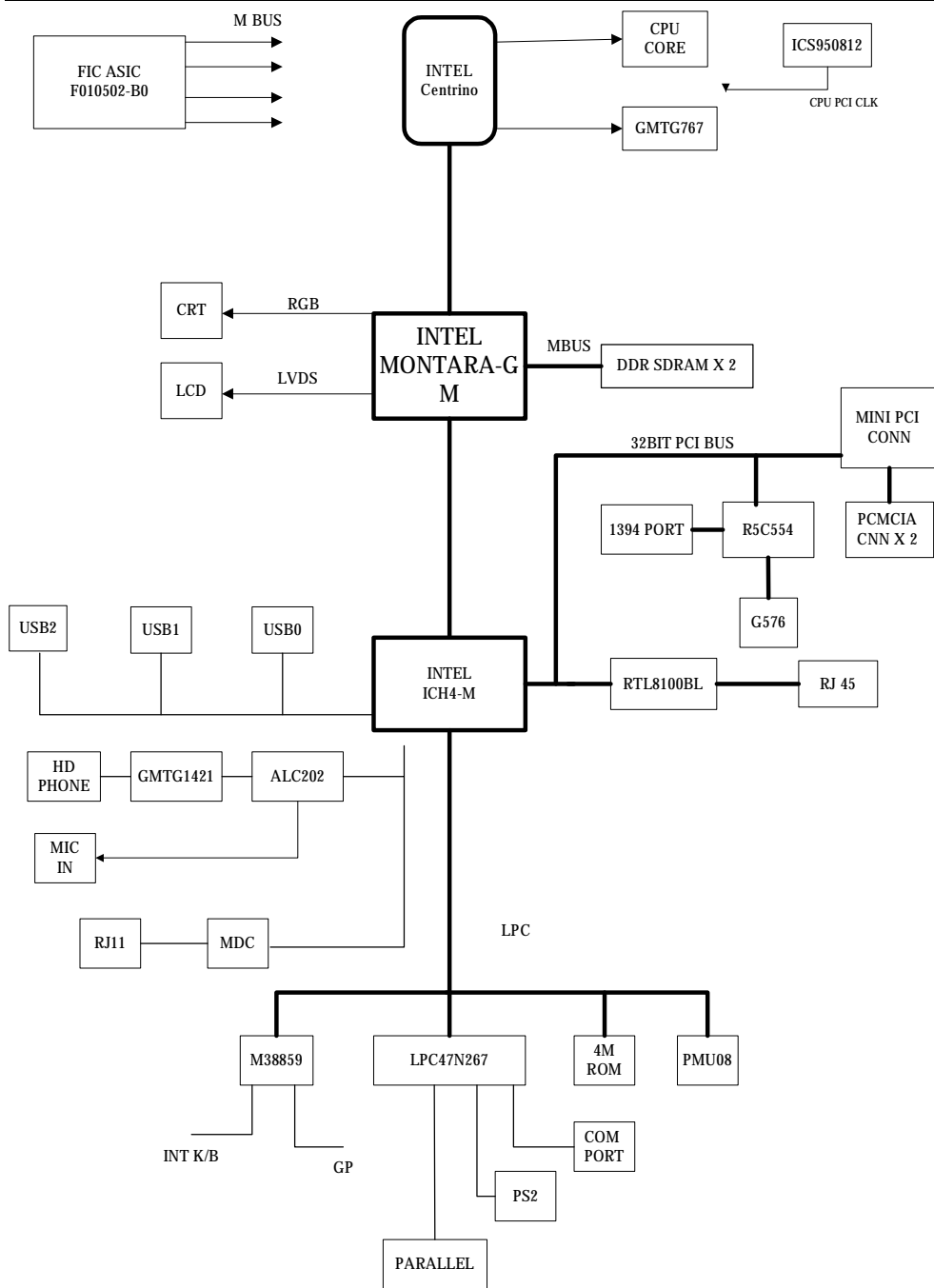
Kensington Lock Hole   x1

**PMU**      PMU08

### Compliance

PC2001 compliant  
ACPI compliant  
Plug and Play Support  
Auto Configuration  
16bit I/O Address Decoded  
Selectable I/O Address, IRQ and DMA  
VESA Support   DDC,DPMS

## 4.2 System Hardware Block Diagram



**Figure 1-1 MB05 Block Diagram**

## 4.3 Chipset Summary

The MB05 notebook consists of following major chipsets:

Controller Chip	Vendor	Description
Processor	Intel	Mobile Banias
North Bridge	Intel	MontaraGM
South Bridge	Intel	ICH4
Video Controller	Intel	Embedded in MontaraGM
PCMCIA Controller	RICOH	R5C554
Supper I/O Controller	SMSC	LPC47N267
Audio Controller	Intel	South Bridge Integrated
Audio Codec	Realtek	ALC201
Keyboard Controller	Misubishi	M3885x
Power Management	NEC	PMU08
ROM BIOS	SST	49LF004A
Clock Generator	IMI	CY28346
Temperature Sensor	NS	MAX1617
IEEE 1394	RICOH	R5C554
LAN	Realtek	8100BL
Modem	ASKEY	MDC AC'97

### 4.4 System Processor (CPU)

The FIC MB05 runs on Intel Banias based on uFCPGA packaging. It supports CPU with up to 1.3/1.5 GHZ clock speed rating. The processor operates in conjunction with the RAM and ROM memory and the system control logic to process software instructions (BIOS, Windows, and Applications).

#### Intel Pentium M Features

The Intel® Pentium® M processor is a high performance, low power mobile processor with several micro-architectural enhancements over existing Intel mobile processors.

The following list provides some of the key features on this processor:

- Supports Intel® Architecture with Dynamic Execution
- High performance, low-power core
- On-die, primary 32-kbyte instruction cache and 32-kbyte write-back data cache
- On-die, 1-MByte second level cache with Advanced Transfer Cache Architecture
- Advanced Branch Prediction and Data Prefetch Logic
- Streaming SIMD Extensions 2 (SSE2)
- 400-MHz, Source-Synchronous processor system bus
- Advanced Power Management features including Enhanced Intel® SpeedStep® technology
- Micro-FCPGA and Micro-FCBGA packaging technologies

The Intel Pentium M processor is manufactured on Intel's advanced 0.13 micron process technology with copper interconnect. The processor maintains support for MMX™ technology and Internet Streaming SIMD instructions and full compatibility with IA-32 software. The high performance core features architectural innovations like Micro-op Fusion and Advanced Stack Management that reduce the number of micro-ops handled by the processor. This results in more efficient scheduling and better performance at lower power. The on-die 32-kB Level 1 instruction and data caches and the 1-MB Level 2 cache with Advanced Transfer Cache Architecture enable significant performance improvement over existing mobile processors. The processor also features a very advanced branch prediction architecture that significantly reduces the number of mispredicted branches. The processor's Data Prefetch Logic speculatively fetches data to the L2 cache before an L1 cache requests occurs, resulting in reduced bus cycle penalties and improved performance.

The Streaming SIMD Extensions 2 (SSE2) enable break-through levels of performance in multimedia applications including 3-D graphics, video decoding/encoding, and speech recognition. The new packed double-precision floating-point instructions enhance performance

for applications that require greater range and precision, including scientific and engineering applications and advanced 3-D geometry techniques, such as ray tracing.

The Intel Pentium M processor's 400-MHz processor system bus utilizes a split-transaction, deferred reply protocol. The 400-MHz processor system bus uses Source-Synchronous Transfer (SST) of address and data to improve performance by transferring data four times per bus clock (4X data transfer rate, as in AGP 4X). Along with the 4X data bus, the address bus can deliver addresses two times per bus clock and is referred to as a "double-clocked" or 2X address bus. Working together, the 4X data bus and 2X address bus provide a data bus bandwidth of up to 3.2 Gbytes/second. The processor system bus uses Advanced Gunning Transceiver Logic (AGTL+) signal technology, a variant of GTL+ signalling technology with low power enhancements.

The processor features Enhanced Intel SpeedStep technology, which enables real-time dynamic switching between multiple voltage and frequency points instead of two points supported on previous versions of Intel SpeedStep technology. This results in optimal performance without compromising low power. The processor features the Auto Halt, Stop-Grant, Deep Sleep, and Deeper Sleep low power states.

The Intel Pentium M processor utilizes socketable Micro Flip-Chip Pin Grid Array (Micro-FCPGA) and surface mount Micro Flip-Chip Ball Grid Array (Micro-FCBGA) package technology. The Micro-FCPGA package plugs into a 479-hole, surface-mount, Zero Insertion Force (ZIF) socket, which is referred to as the mPGA479M socket.

This document includes specifications for the Intel Pentium M processor at Highest Frequency Mode (HFM) core frequencies of 1.30, 1.40, 1.50, and 1.60 GHz, the Low Voltage Intel Pentium M processor at HFM core frequency of 1.10 GHz and the Ultra Low Voltage Intel Pentium M processor at HFM core frequency of 900 MHz.

## 4.5 System Core Logic

### 4.5.1 Intel 855GM Chipset GMCH Features

#### Processor/Host Bus Support

- Ø . Intel® Pentium® M processor
- Ø . 2x address, 4x data
- Ø . Supports system bus at 400 MHz
- Ø . Supports Host bus dynamic bus inversion (DBI)
- Ø . Supports 64-bit host bus addressing
- Ø . 12-deep in-order queue
- Ø . AGTL+ bus driver technology with integrated AGTL+ termination resistors and low voltage operation ( $V_{tt} = 1.05\text{ V}$ )
- Ø . Supports Enhanced Intel® SpeedStep® technology
- Ø . Support for DPWR# signal to Intel Pentium M processor for PSB power anagement

#### Memory System

- Ø . Directly supports one DDR SDRAM channel, 64-bits wide (72-bits with ECC)
- Ø . Supports 200/266-MHz DDR SDRAM devices with max of two, double-sided SO-DIMMs (four rows populated) with unbuffered PC1600/PC2100 DDR SDRAM.
- Ø . Supports 128-Mbit, 256-Mbit, and 512-Mbit technologies providing maximum capacity of 1 GB with x16 devices and up to 2-GB with high density 512-Mbit technology
- Ø . All supported devices have four banks
- Ø . Supports up to 16 simultaneous open pages
- Ø . Supports page sizes of 2-kB, 4-kB, 8-kB, and 16-kB. Page size is individually selected for every row
- Ø . UMA support only



### System Interrupts

- Ø . Supports Intel 8259 and processor system bus interrupt delivery mechanism
- Ø . Supports interrupts signaled as upstream memory writes from PCI and Hub interface
- Ø . MSI sent to the CPU through the system bus
- Ø . IOxAPIC in ICH4-M provides redirection for upstream interrupts to the system bus

### Video Stream Decoder

- Ø . Improved hardware motion compensation for MPEG2
- Ø . All format decoder (18 ATSC formats) supported
- Ø . Dynamic Bob and Weave support for video streams
- Ø . Software DVD at 60 Fields/second and 30 frames/second full screen
- Ø . Support for standard definition DVD (i.e. NTSC pixel resolution of 720x480, etc.) quality encoding at low CPU utilization

### Video Overlay

- Ø . Single high quality scalable overlay and second Sprite to support second overlay
- Ø . Multiple overlay functionality provided via arithmetic stretch BLT(Block Transfer)
- Ø . 5-tap horizontal, 3-tap vertical filtered scaling
- Ø . Multiple overlay formats
- Ø . Direct YUV from overlay to TV-out
- Ø . Independent gamma correction
- Ø . Independent brightness / contrast/ saturation
- Ø . Independent tint/hue support
- Ø . Destination colorkeying
- Ø . Source chromakeying

### Multiple hardware color cursor support (32-bit with alpha and legacy 2-bpp mode)

### Accompanying I2C and DDC channels provided through multiplexed interface

### Display

- Ø . Analog display support
  - 350-MHz integrated 24-bit RAMDAC that can drive a standard progressive scan analog monitor with pixel resolution up to 1600x1200 at 85 Hz and up to 2048x1536 at 75 Hz
- Ø . Dual independent pipe support
  - Concurrent: Different images and native display timings on each display device
  - Simultaneous: Same images and native display timings on each display device
- Ø . DVO (DVOB and DVOC) support
  - Digital video out ports DVOB and DVOC with 165-MHz dot clock on each 12-bit interface; two 12-bit channels can be combined to form one dual channel 24-bit interface with an effective dot clock of 330-MHz
  - The combined DVO B/C ports as well as individual DVO B/C ports can drive a variety of DVO devices (TV-Out Encoders, TMDS and LVDS transmitters, etc.) with pixel resolution up to 1600x1200 at 85 Hz and up to 2048x1536 at 72 Hz.
  - Compliant with DVI Specification 1.0
- Ø . Dedicated LFP (local flat panel) LVDS interface
  - Single- or dual-channel LVDS panel support up to UXGA panel resolution with frequency range from 25 MHz to 112 MHz (single channel/dual channel)
  - Supports data format of 18 bpp
  - SSC support of 0.5%, 1.0%, and 2.5% center and down spread with external SSC clock
  - LCD panel power sequencing compliant with SPWG timing specification

- Compliant with ANSI/TIA/EIA –644-1995 spec
- Integrated PWM interface for LCD backlight inverter control
- Bi-linear panel fitting
- . Tri-view support through LFP interface, DVO B/C port, and CRT

### Internal Graphics Features

- Ø . Up to 64 MB of dynamic video memory allocation
- Ø . Display image rotation
- Ø . Graphics core frequency
- Ø . Display core frequency at 133 MHz or 200 MHz
- Ø . Render core frequency at 100 MHz, 133 MHz, 200 MHz
- Ø . 2D graphics engine
  - n Optimized 128-bit BLT engine
  - n Ten programmable and predefined monochrome patterns
  - n Alpha Stretch BLT (via 3D pipeline)
  - n Anti-aliased lines
  - n Hardware-based BLT Clipping and Scissoring
  - n 32-bit Alpha Blended cursor
  - n Programmable 64 x 64 3-color Transparent cursor
  - n Color Space Conversion
  - n Three Operand Raster BLTs
  - n 8-bit, 16-bit, and 32-bit color
  - n ROP support
  - n DIB translation and Linear/Tile addressing
- Ø . 3D graphics engine
  - n 3D setup and render engine
  - n Zone rendering
  - n High quality performance texture engine
  - n Viewpoint transform and perspective divide
  - n Triangle lists, strips and fans support
  - n Indexed vertex and flexible vertex formats
  - n Pixel accurate fast scissoring and clipping operation
  - n Backface culling support
  - n DirectX\* and OpenGL\* pixelization rules
  - n Anti-Aliased lines support
  - n Sprite points support
  - n Provides the highest sustained fill rate performance in 32-bit color and 24-bit W mode
  - n High quality performance texture engine
  - n 266-MegaTexel/s peak performance
  - n Per pixel perspective corrected texture mapping
  - n Single pass texture compositing (multi-textures)
  - n Enhanced texture blending functions
  - n Twelve level of detail MIP map sizes from 1x1 to 2k x 2k
  - n Numerous texture formats including 32-bit RGBA
  - n Alpha and Luminance maps
  - n Texture chromakeying
  - n Bilinear, trilinear, and anisotropic MIP map filtering
  - n Cubic environment reflection mapping
  - n Dot product bump-mapping
  - n Embossed bump-mapping
  - n DXTn texture decompression
  - n FX1 texture compression
  - n 3D graphics rasterization enhancements
  - n One Pixel per clock
  - n Flat and Gouraud shading

- n Color alpha blending for transparency
- n Vertex and programmable pixel fog and atmospheric effects
- n Color specular lighting
- n Z Bias support
- n Dithering
- n Line and full-scene anti-aliasing
- n 16 and 24-bit Z buffering
- n 16 and 24-bit W buffering
- n 8-bit Stencil buffering
- n Double and triple render buffer support
- n 16 and 32-bit color
- n Destination alpha
- n Vertex cache
- n Optimal 3D resolution supported
- n Fast Clear support
- n ROP support

### Hub Interface to ICH4-M

- . 266 -MB/s point-to-point Hub Interface to ICH4-M
- . 66-MHz base clock

### Power Management

- Ø . SMRAM space remapping to A0000h (128-kB)
- Ø . Supports extended SMRAM space above 256-MB, additional 1-MB TSEG from top of memory, cacheable (cacheability controlled by CPU)
- Ø . APM Rev 1.2 compliant power management
- Ø . Supports Suspend to System Memory (S3), Suspend to Disk (S4) and Soft Off (S5)
- Ø . ACPI 1.0b, 2.0 support
- Ø . Enhanced Intel SpeedStep technology support

### Package

- . 732-pin Micro-FCBGA (37.5 x 37.5 mm)

## 4.5.2 Intel ICH4 Features

The ICH4 provides extensive I/O support. Functions and capabilities include:

- PCI Local Bus Specification, Revision 2.2-compliant with support for 33-MHz PCI operations.
- PCI slots (supports up to 6 Req/Gnt pairs)
- ACPI Power Management Logic Support
- Enhanced DMA Controller, Interrupt Controller, and Timer Functions
- Integrated IDE controller supports Ultra ATA100/66/33
- USB host interface with support for 6 USB ports; 3 UHCI host controllers; 1 EHCI high-speed USB 2.0 Host Controller
- Integrated LAN Controller
- System Management Bus (SMBus) Specification, Version 2.0 with additional support for I2C devices
- Supports Audio Codec '97, Revision 2.3 specification (a.k.a., AC '97 Component)

Specification, Revision 2.3). Link for Audio and Telephony codecs (up to 7 channels)

- Low Pin Count (LPC) interface
- Firmware Hub (FWH) interface support
- Alert On LAN\* (AOL) and Alert On LAN 2\* (AOL2)

### Hub Architecture

As I/O speeds increase, the demand placed on the PCI bus by the I/O bridge has become significant. With AC '97, USB 2.0, and Ultra ATA/100, coupled with the existing USB, I/O requirements could impact PCI bus performance. The chipset's *hub interface architecture* ensures that the I/O subsystem; both PCI and the integrated I/O features (IDE, AC '97, USB, etc.), receive adequate bandwidth. By placing the I/O bridge on the hub interface (instead of PCI), the hub architecture ensures that both the I/O functions integrated into the ICH4 and the PCI peripherals obtain the bandwidth necessary for peak performance.

### PCI Interface

The ICH4 PCI interface provides a 33-MHz, Rev. 2.2 compliant implementation. All PCI signals are 5-V tolerant, except PME#. The ICH4 integrates a PCI arbiter that supports up to six external PCI bus masters in addition to the internal ICH4 requests.

### IDE Interface (Bus Master Capability and Synchronous DMA Mode)

The fast IDE interface supports up to four IDE devices providing an interface for IDE hard disks and ATAPI devices. Each IDE device can have independent timings. The IDE interface supports PIO IDE transfers up to 16 Mbytes/sec and Ultra ATA transfers up to 100 Mbytes/sec. It does not consume any ISA DMA resources. The IDE interface integrates 16x32-bit buffers for optimal transfers.

The ICH4's IDE system contains two independent IDE signal channels. They can be electrically isolated independently. They can be configured to the standard primary and secondary channels (four devices). There are integrated series resistors on the data and control lines (see Section 5.15, "IDE Controller (D31:F1)" on page 5-175 for details).

### Low Pin Count (LPC) Interface

The ICH4 implements an LPC Interface as described in the LPC 1.0 specification. The Low Pin Count (LPC) Bridge function of the ICH4 resides in PCI Device 31:Function 0. In addition to the LPC bridge interface function, D31:F0 contains other functional units including DMA, Interrupt Controllers, Timers, Power Management, System Management, GPIO, and RTC.

Note that in the current chipset platform, the Super I/O (SIO) component has migrated to the Low Pin Count (LPC) interface. Migration to the LPC interface allows for lower cost Super I/O designs.

### Compatibility Modules (DMA Controller, Timer/Counters, Interrupt Controller)

The DMA controller incorporates the logic of two 82C37 DMA controllers, with seven independently programmable channels. Channels 0–3 are hardwired to 8-bit, count-by-byte

transfers, and channels 5–7 are hardwired to 16-bit, count-by-word transfers. Any two of the seven DMA channels can be programmed to support fast Type-F transfers.

The ICH4 supports two types of DMA (LPC and PC/PCI). DMA via LPC is similar to ISA DMA. LPC DMA and PC/PCI DMA use the ICH4's DMA controller. The PC/PCI protocol allows PCI-based peripherals to initiate DMA cycles by encoding requests and grants via two PC/PCI REQ#/GNT# pairs.

LPC DMA is handled through the use of the LDRQ# lines from peripherals and special encodings on LAD[3:0] from the host. Single, Demand, Verify, and Increment modes are supported on the LPC interface. Channels 0–3 are 8 bit channels. Channels 5–7 are 16 bit channels. Channel 4 is reserved as a generic bus master request.

The timer/counter block contains three counters that are equivalent in function to those found in one 82C54 programmable interval timer. These three counters are combined to provide the system timer function, and speaker tone. The 14.31818-MHz oscillator input provides the clock source for these three counters.

The ICH4 provides an ISA-Compatible Programmable Interrupt Controller (PIC) that incorporates the functionality of two 82C59 interrupt controllers. The two interrupt controllers are cascaded so that 14 external and two internal interrupts are possible. In addition, the ICH4 supports a serial interrupt scheme.

All of the registers in these modules can be read and restored. This is required to save and restore system state after power has been removed and restored to the platform.

### **Advanced Programmable Interrupt Controller (APIC)**

In addition to the standard ISA compatible Programmable Interrupt Controller (PIC) described in the previous section, the ICH4 incorporates the Advanced Programmable Interrupt Controller

### **Universal Serial Bus (USB) Controller**

The ICH4 contains an Enhanced Host Controller Interface (EHCI) compliant host controller that supports USB high-speed signaling. High-speed USB 2.0 allows data transfers up to 480 Mb/s which is 40 times faster than full-speed USB. The ICH4 also contains three Universal Host Controller Interface (UHCI) controllers that support USB full-speed and low-speed signaling.

The ICH4 supports 6 USB 2.0 ports. All six ports are high-speed, full-speed, and low-speed capable. ICH4's port-routing logic determines whether a USB port is controlled by one of the UHCI controllers or by the EHCI controller. See Section 5.16, "USB UHCI Controllers (D29:F0, F1 and F2)" and Section 5.17, "USB EHCI Controller (D29:F7)" for details.

### **LAN Controller**

The ICH4's integrated LAN Controller includes a 32-bit PCI controller that provides enhanced scatter-gather bus mastering capabilities and enables the LAN Controller to perform high speed data transfers over the PCI bus. Its bus master capabilities enable the component to process high-level commands and perform multiple operations; this lowers processor utilization by off-loading communication tasks from the processor. Two large transmit and

receive FIFOs of 3 kB each help prevent data underruns and overruns while waiting for bus accesses. This enables the integrated LAN Controller to transmit data with minimum interframe spacing (IFS).

The LAN Controller can operate in either full duplex or half duplex mode. In full duplex mode the LAN Controller adheres with the IEEE 802.3x Flow Control specification. Half duplex performance is enhanced by a proprietary collision reduction mechanism. See Section 5.2, "LAN Controller (B1:D8:F0)" on page 5-78 for details.

### RTC

The ICH4 contains a Motorola\* MC146818A-compatible real-time clock with 256 bytes of battery-backed RAM. The real-time clock performs two key functions: keeping track of the time of day and storing system data, even when the system is powered down. The RTC operates on a 32.768 KHz crystal and a separate 3-V lithium battery that provides up to seven years of protection.

The RTC also supports two lockable memory ranges. By setting bits in the configuration space, two 8-byte ranges can be locked to read and write accesses. This prevents unauthorized reading of passwords or other system security information.

The RTC also supports a date alarm that allows for scheduling a wake up event up to 30 days in advance, rather than just 24 hours in advance.

### 4.6 Clock Frequency Generator

The notebook utilizes the IMI CY28346 chip to supply the system clock needed to run the computer. The following are the available clock frequencies:

System clock:

Clock generator IMI CY28346 support:

- 66/100 MHz for Pentium III Mobile CPU
- 30/33 MHz for PCI device bus clock use
- 48 MHz for PIIX4M
- 14.318 MHz for PIIX4M refresh use
- 14.318 MHz XTAL for Clock Generator use
- 32.768 KHz XTAL for RTC real time clock
- 8.0 MHz XTAL for K/B controller use
- 14.318 MHz OSC for sound blaster use

### 4.7 Cache Memory

The primary (L1) and secondary (L2) level cache are integrated on the CPU. By incorporating the cache on-die (meaning it is combined with the CPU into one component), Intel eliminates the need for separate components. The 512KB on-die L2 cache provides three (3X) times faster processor access, resulting in significant improvements in performance. Likewise, an integrated cache means a reduction of connections resulting in increased reliability.

### 4.8 System Memory

The memory subsystem, implemented on the motherboard, includes System and Video memory. The Intel 855GM System Controller chip provides primary control for the system memory.

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### 4.8.1 System Memory

The notebook offers two 64-bit SODIMM (Small Outline Dual Inline Memory Module) sockets for main memory configuration. The memory sockets accept any standard 144-pin SODIMM modules at 128MB, 256MB, 512MB and 1GB sizes. Memory modules are DDR 200/266 SDRAM type.

### 4.8.2 Video Memory

The video memory of the notebook is using share system memory with 8/16/32MB UMA video memory that can support display resolutions of up to 1024 x 768 at 32-bit 16M color (TFT LCD).

## 4.9 System BIOS

The notebook utilizes the Phoenix BIOS 4.0 Release 6.0 (Basic I/O System) that contains both the main system BIOS and the VGA BIOS with Shadow BIOS capability. It utilizes Flash EPROM BIOS that allows instant erasing and programming without replacing the EPROM chip.

The BIOS is stored in a 32-pin PLCC package FLASH ROM SST 49LF040A with 4Mbit size and is mounted into the motherboard. While posting the system, the Shadow RAM will be enabled and the ROM will be disabled.

## 4.10 Video Subsystem

The video subsystem, embedded inside the North Bridge chip and the LCD panel, controls the display output to both the LCD Panel screen and to the external VGA port.

### 4.10.1 Video Chip Controller

Features summary of the Intel 852GM Video Chip Controller:

#### Video Stream Decoder

- . Improved HW Motion Compensation for MPEG2
- . All format decoder (18 ATSC formats) supported
- . Dynamic Bob and Weave support for Video Streams
- . Software DVD at 60 fields/second and 30 frames/second full screen
- . Support for standard definition DVD (i.e. NTSC pixel resolution of 720x480, etc.) quality encoding at low CPU utilization

#### Video Overlay

- . Single high quality scalable Overlay and second Sprite to support second Overlay
- . Multiple Overlay functionality provided via Arithmetic Stretch Blt
- . 5-tap horizontal, 3-tap vertical filtered scaling
- . Multiple Overlay formats
- . Direct YUV from Overlay to TV-out
- . Independent Gamma Correction
- . Independent Brightness / Contrast/ Saturation
- . Independent Tint/Hue support
- . Destination Colorkeying
- . Source Chromakeying

Multiple hardware color cursor support (32-bit with alpha and legacy 2-bpp mode)

Accompanying I2C and DDC channels provided through multiplexed interface Display

- . Analog Display Support
- . 350-MHz integrated 24-bit RAMDAC that can drive a standard progressive scan analog



- monitor with pixel resolution up to 1600x1200 at 85-Hz and up to 1920x1440 at 60 Hz
- . Dual independent pipe support
  - Concurrent: Different images and native display timings on each display device
  - Simultaneous: Same images and native display timings on each display device
- . DVO (DVOC) support
  - Digital video out port DVOC with 165-MHz dot clock on 12-bit double pumped interface
  - Variety of DVO devices supported
  - Compliant with DVI Specification 1.0, thereby providing support for a display resolution up to 1400x1050 @ 75-Hz, up to 1600x1200 at 60-Hz, or up to 1920x1200 @ 60 Hz
- . Dedicated LFP (local flat panel) LVDS interface
  - Single or dual channel LVDS panel support up to SXGA+(1400x1050 @ 60 Hz) panel resolution with frequency range from 25-MHz to 112-MHz (single channel/dual channel)
  - SSC support of 0.5%, 1.0%, and 2.5% center and down spread with external SSC clock
  - Supports data format of 18-bpp
  - LCD panel power sequencing compliant with SPWG timing specification
  - Compliant with ANSI/TIA/EIA –644-1995 spec
  - Integrated PWM interface for LCD backlight inverter control
  - Bi-linear Panel fitting
- . Tri-view support through LFP interface, DVO C port, and CRT
- . Up to 64 MB of Dynamic Video Memory Allocation
- . Display Image Rotation
- . Core Frequency
  - Display Core frequency of 133-MHz
  - Render Core frequency of 133-MHz
- .
- 2D Graphics Engine
  - Optimized 128-bit BLT engine
  - Ten programmable and predefined monochrome patterns
  - Alpha Stretch Blt (via 3D pipeline)
  - Anti-aliased lines
  - Hardware-based BLT Clipping and Scissoring
  - 32-bit Alpha Blended cursor
  - Programmable 64 x 64 3-color Transparent cursor
  - Color Space Conversion
  - 3 Operand Raster BLTs
  - 8-bit, 16-bit, and 32-bit color
  - ROP support
  - DIB translation and Linear/Tile addressing
- .
- 3D Graphics Engine
  - 3D Setup and Render Engine
  - Viewpoint Transform and Perspective Divide
  - Triangle Lists, Strips and Fans support
  - Indexed Vertex and Flexible Vertex formats
  - Pixel accurate Fast Scissoring and Clipping operation
  - Backface Culling support
  - DirectX\* and OGL Pixelization rules
  - Anti-Aliased Lines support
  - Sprite Points support
  - Provides the highest sustained fill rate performance in 32-bit color and 24-bit W mode
  - High quality performance Texture Engine
  - 266-MegaTexel/s peak performance



- Per Pixel Perspective Corrected Texture Mapping
- Single Pass Texture Compositing (Multi-Textures) at rate
- Enhanced Texture Blending functions
- Twelve Level of Detail MIP Map Sizes from 1x1 to 2Kx2K
- Numerous Texture formats including 32-bit RGBA
- Alpha and Luminance Maps
- Texture Chromakeying
- Bilinear, Trilinear, and Anisotropic MIP - Mapped Filtering
- Cubic Environment Reflection Mapping
- Embossed Bump-Mapping
- DXTn Texture Decompression
- FX1 Texture Compression
- 3D Graphics Rasterization enhancements
- One Pixel per clock
  - Flat and Gouraud Shading
- Color Alpha Blending for Transparency
- Vertex and Programmable Pixel Fog and Atmospheric effects
- Color Specular Lighting
- Z Bias support
- Dithering
- Line and Full-Scene Anti-Aliasing
- 16 and 24-bit Z Buffering
- 16 and 24-bit W Buffering
- 8-bit Stencil Buffering
- Double and Triple Render Buffer support
- 16 and 32-bit color
- Destination Alpha
- Vertex Cache
- Maximum 3D resolution of 1600x1200 at 85- Hz (contact your Intel Field Representative for detailed display information, i.e. pixel depths, etc.)
- Optimal 3D resolution supported
- Fast Clear support
- ROP support

### 4.10.2 Video Clock

Intel 852GM North Bridge provides input to generate VGA internal slate machine, MCLK, and DCLK. Also provides 32.768 KHz O/P for video RAM refresh.

### 4.11 PCMCIA Controller

The PCMCIA controller of the notebook is implemented on the motherboard using the RICOH R5C554 CardBus Controller. The MB05 notebook only supports single PCMCIA slot for PCI-Cardbus Bridge.

### CARDBUS CONTROLLERS

The R5C554 is an ACPI and PC98/99 logo certified high performance, single slot PC Card controller with a synchronous 32-bit bus master/target PCI interface. This PC Card to PCI bridge host controller is compliant with the 2000 PC Card Standard. This standard incorporates the new 32-bit CardBus while retaining the 16-bit PC Card specification as defined by PCMCIA release 2.1. CardBus is intended to support "temporal" add-in functions on PC Cards, such as Memory cards, Network interfaces, FAX/Modems and other wireless

communication cards, etc. The high performance and capability of the CardBus interface will enable the new development of many new functions and applications.

The R5C554 CardBus controller is compliant with the latest ACPI-PCI Bus Power Management interface Specification. It supports all four power states and the PME# function for maximum power savings and ACPI compliance. Additional compliance to On Now Power Management includes D3 cold state support, paving the way for low sleep state power consumption and minimized resume times. To allow host software to reduce power consumption further, the R5C554 provides a power-down mode in which internal clock distribution and the PC Card socket clocks are stopped. An advanced CMOS process is also used to minimize system power consumption.

The R5C554 single PCMCIA socket supports the 3.3V/5V 8/16-bit PC Card R2 cards or 32-bit CardBus R3 cards. The R2 card support is compatible with the Intel 82365SL PCIC controller, and the R3 card support is fully compliant with the 2000 PC Card Standard CardBus specification. The R5C554 is an additional buffer chip for the PC Card socket interface. In addition, the R5C554 supports dynamic PC Card hot insertion and removal, with auto configuration capabilities.

The R5C554 is fully compliant with the 33Mhz PCI Bus specification, v2.2. It supports a master device with internal CardBus direct data transfer. The R5C554 implements FIFO data buffer architecture between the PCI bus and CardBus socket interface to enhance data transfers to CardBus Devices. The bi-directional FIFO buffer permits the R5C554 to accept data from a target bus (PCI or CardBus interface) while simultaneously transferring data. This architecture not only speeds up data transfers but also prevents system deadlocks.

The R5C554 is a PCMCIA R2/CardBus controller, providing the most advanced design flexibility for PC Cards that interface with advanced notebook designs.

### **R5C554 FEATURES – Slot Solution**

- Supports only one PCMCIA 2.1 and JEIDA 4.2 R2 cards or 2 CardBus cards
- ACPI-PCI Bus Power Management Interface Specification Rev 1.1 Compliant
- Supports OnNow LAN wakeup, OnNow Ring Indicate, PCI CLKRUN#, PME#, and CardBus CCLKRUN#
- Compliant with the 33Mhz PCI Specification V2.2, 2000 PC Card Standard 7.1 for R5C554
- Yenta™ PCI to PCMCIA CardBus Bridge register compatible
- ExCA (Exchangeable Card Architecture) compatible registers map-able in memory and I/O space
- Intel™ 82365SL PCIC Register Compatible
- Supports PCMCIA\_ATA Specification
- Supports 5V/3.3V PC and 3.3V Cardbus cards
- Supports two PC Card or CardBus slots with hot insertion and removal
- Supports multiple FIFOs for PCI/CardBus data transfer
- Supports Direct Memory Access for PC/PCI and PCI/Way on PC Card socket

- Programmable interrupt protocol: PCI, PCI+ISA, PCI/Way, or PC/PCI interrupt signaling modes
- Win'98 IRQ and PC-98/99 compliant
- Parallel or Serial interface for socket power control devices including Micrel and TI
- Integrated PC 98/99 -Subsystem Vendor ID support, with auto lock bit
- LED Activity Pins
- R5C554 supports D3cold state PME# wakeup; 3.3Vaux Power; and Zoomed video buffer enable pins
- R5C554: "Built-in" live video, high throughput, multimedia ZV ports support without additional buffers; 3V card protection during host system suspend with Auto Card VS# resensing; dedicated ZV output port to LCD controller

SmartCardBus™ combines a Smart Card reader and CardBus controller in a single IC. In addition to meeting PC Card standards, SmartCardBus is compliant to Microsoft PC/SC, ISO 7816-1, -2, -3 electrical specifications, standard protocols including T = 0, T = 1, and synchronous and asynchronous formats. SmartCardBus lowers the cost of ownership of e-commerce and corporate security Smart Card applications.

### 4.12 Audio Subsystem

The audio subsystem is integrated inside the South Bridge chip on the motherboard. Refer to the System Core Logic section of this chapter.

An internal two-way mini speaker and microphone provide the notebook with mobile sound generation and recording capabilities. In addition, a set of 3.5mm bayonet socket (1/8" minijack) connectors allow for external microphone, line inputs, and headphone outputs.

### 4.13 Keyboard and Pointing Device

The Keyboard Subsystem of the notebook is implemented on the Motherboard and Keyboard Assembly using the Mitsubishi M38859 keyboard controller chip and the Mitsubishi M38859 keyboard controller firmware. This chip controls the internal built-in keyboard, the built-in touchpad pointing device, as well as the external PS/2 keyboard and mouse port. The keyboard controller allows simultaneous use of both the internal and external keyboard and PS/2 mouse.

The MB05 membrane keyboard is an 86-key IBM 101-key enhanced compatible keyboard with standard characters and 12 function keys including an embedded numeric keypad. See Chapter 1 for more information.

The pointing device subsystem consists of the built-in Synaptics touch pad pointing device module on the system top cover assembly and a pre-programmed Mitsubishi M38859 micro-controller that interfaces the mouse device to the Motherboard. The touch pad module is connected to battery board through a 6-pin FPC cable. An external PS/2 port also supports the use of an external PS/2 compatible mouse where the system automatically detects on system power up and runs both internal and external mouse simultaneously.

The Synaptic touch pad, a pointing device for personal computers, detects the position of a finger over a touch-sensitive area. To move the cursor, the user lightly slides a finger over the smooth sensor area. To 'click', the user gently taps on the surface.

The ultra-thin module is the thinnest PCB based touchpad available today. It is a capacitive sensor - the finger is detected by measuring its effect on an array of capacitive lines integrated into the PC board. The pad senses both the finger's position and its contact area (X, Y, and Z). The area of contact is a measure of applied pressure. One side of the module PC board is the sensor surface; electronic components are mounted on the other side. The sensitive area is protected by a layer of smooth and durable mylar.

The Synaptic touch pad communicates with the host via a standard PS/2 mouse or trackball interface. It is fully compatible with the standard Microsoft mouse driver. The module connector includes the PS/2 signal pins, power supply pins and two connections for external button switches.

The Synaptic touch pad includes a special "edge-motion" feature that allows the user to extend a drag operation when the finger reaches the edge of the sensor pad. The cursor continues to coast in the indicated direction when the finger is held against the edge.

### 4.14 IDE Drives Subsystem

The disk drives subsystem, implemented on the Motherboard and on the associated internal hard disk drive assembly and device bay, provides disk storage for all system software and user files.

The notebook is equipped with high capacity hard disk drive using Enhanced IDE controller with LBA (Logical Block Addressing) and Ultra DMA mode support.

The ICH4 controller chip provides the Primary IDE controller for the internal hard disk, and the Secondary Master for the CD-ROM.

The notebook uses the 24X-speed IDE CD-ROM Drive and 8X-speed DVD-ROM. The CD-ROM drive supports CD-DA transfer over ATAPI function that the host system can read CD audio data. The drive also supports Photo-CD Multi-session disc compatibility and Multimedia PC-3 specification compatibility. The notebook also could use the 8X+ speed IDE DVD-ROM Drive that reads DVD digital data stored on DVD-ROM at 8 times faster rotational speed.

### 4.15 Power Subsystem

The Power Subsystem consists of the following major sections:

#### 4.15.1 AC Power Adapter

The computer is equipped with a 60W Peak 80W universal AC power adapter that converts AC voltage (100 to 240VAC, 50 to 60Hz) into DC voltage used to operate the notebook and charge the batteries.

#### 4.15.2 Internal Battery Pack

The computer utilizes Lithium-Ion (Li-Ion) that provides DC power for the notebook and real time clock battery on the motherboard when the AC Adapter is not connected to the computer.

The normal charging time for the battery is around 3.5 hours when computer is turn off while it should take around 8 hours when the computer is running. Running time of battery is around 4.5 hours.

### 4.15.3 DC-DC Module of Motherboard

The DC-DC module receives approximately 12VDC from the battery pack and uses this input voltage to generate multiple regulated output voltages to provide power for all internal notebook board assemblies.

### 4.15.4 LCD Inverter Board Assembly

The LCD Inverter Board Assembly is located in the LCD Panel Assembly. It converts the +12VDC input directly from the Battery Pack into a high voltage AC output used to light the CCFT (Cold-Cathode Fluorescent Tube).

## 4.16 Micro-P Subsystem (PMU-08)

The micro controller NEC PMU08 acts as a supplement for the power management control. It supports many functions via the SMBus interface.

The system communicates with the PMU08 via the SMBus interface. The SMBus host should be first initialized before starting the transaction. The following is the procedure for system communication with PMU08:

1. Enable SMBus interface by writing 01h to SmbHstCfg register.
2. Get SMBus I/O port base address by reading from SmbBA register.
3. Clear SMBus status by writing 1Eh to SmbHstSts register.
4. Write the PMU07 slave address to SmbHstAdd register.
  - Send command to PMU08 -- Slave address is 04h.
  - Read data from PMU08 -- Slave address is 05h.
5. Write the desired command to SmbHstCmd register.
6. Write the desired parameters to SmbHstDat0 (High byte) and SmbHstDat1 (Low byte) registers if the system wants to send command to PMU08.
7. Wait for SMBus interrupt occurred by monitoring SmbHstSts register INTR bit.
8. Get the desired data by reading from SmbHstDat0 (High byte) and SmbHstDat1 (Low byte) registers if the system wants to read data from PMU08.

Features Summary of the Micro-P:

- 5 channels 8-bit analog to digital converter
- Timer0: 8-bit timer/counter with 8-bit prescaler
- Timer1: 16-bit timer/counter. TMR1 can be incremented during sleep via external crystal/clock
- Timer2: 8-bit timer/counter with 8-bit period register, prescaler and postscaler
- Capture, Compare, PWM module
- Synchronous Serial port (SSP) with SPI and I<sup>2</sup>C
- Universal Synchronous Asynchronous Receiver Transmitter (USART/SCI)
- Brown-out detection circuitry for Brown-out Reset (BOR)
- 2K bytes program memory
- 128 bytes data memory
- 22 I/O pin
- 8 interrupt sources

## 5.1 Introduction

This section contains preventive and corrective maintenance procedures for the MB05 notebook. The first part of the section describes the computer cleaning procedures and preferred handling procedures for sensitive components (e.g. disk drives, LCD, CPU, batteries).

The second part of the chapter identifies all field replaceable parts with the remainder explaining the removal and replacement procedures for the field replaceable parts.

## 5.2 Preventive Maintenance

Preventive maintenance is limited to cleaning the plastic case, the keyboard, and the display screen and cleaning the floppy drive heads as required.

### 5.2.1 Cleaning the Computer

When it is necessary to clean the plastic case and keyboard, use a soft lint-free cloth, slightly dampened with a mild detergent solution, or use the contents of any commercially available computer cleaning kit.

**i** Never use alcohol, petroleum-based solvents, or harsh detergents to clean the notebook. Also, do not spray any liquids directly on the computer case, keyboard, or screen. If the liquid-crystal display (LCD) screen has become smeared or dusty, clean the screen by first applying a mild glass cleaner to a soft, clean, lint-free cloth, and gently wipe the glass. Never apply liquids directly on the screen surface. Moreover, do not use paper towels to clean the display screen. Paper can scratch the display screen matte.

### 5.2.2 Maintaining the LCD Quality

When it comes to screen problems, heat plays a big part. After a good working session, the typical routine is to shut the machine and close the cover. But the display surface - no matter what type it is - and the components inside the computer radiates heat; when you close the cover, you trap the heat against the screen. Leave the computer's cover open for about ten minutes while the heat disperses. Make this a habit.

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### 5.2.3 Maintaining the Hard Disk Drive

The hard disk drive is one of the most common parts that always gets problem. Here is some preventive maintenance that you can do when handling the hard disk.

- Always back up the data files from the hard disk.
- Run a virus detecting program for possible virus infected area on the hard disk.
- Use **SCANDISK** to correct any errors found in the directory and File Allocation Table (FAT). This will also free up space from any unused sectors.
- Never turn the computer off when the hard disk is being accessed.
- Never move or raise the computer while the hard disk is being accessed, most especially don't jar the hard disk as this may cause a hard disk crash.
- Use hard disk system tools like **Disk Defragmenter** under Windows. This reorganizes your hard disk by eliminating fragmentation and improves the hard disk access time.

### 5.2.4 Handling the Computer Battery Packs

The battery packs furnished with the computer require reasonable care and handling to ensure efficient operation and maximum life. Periodically inspect the battery terminals and the batteries for evidence of corrosion and oxide build-up.

To ensure that the battery packs endure normal life cycle, always observe the following precautions when handling the battery packs:

- Do not drop the battery packs or subject them to excessive shock and vibration.
- Do not expose the battery packs to direct sunlight, moisture, or chemical compounds.
- Do not disassemble the battery packs.
- Do not use the battery packs to power other devices.
- Do not short the battery leads or connect the battery with reversed polarity.
- Never attempt to charge the battery packs in any way other than as described in this manual and the User's Manual.
- Always charge the battery packs as soon as possible after a low battery indication.

### 5.3 Required Tools and Equipment

To troubleshoot and repair PC systems properly, you need a few basic tools:

- Tweezers
- Small flat-blade screwdriver
- Small Cross screwdriver
- Regular size Cross screwdriver
- Small Hex-bolt screwdriver
- 

**i** All boards, options, and peripherals contain components that are sensitive to static electricity. When handling any of these items, use wrist or ankle grounding straps and grounded working mats. When moving or storing items, use the anti-static bags supplied with the items.

### 5.4 Notebook Field-Replaceable Parts and Assemblies

The notebook contains two major assemblies: The Cover Display LCD Assembly and the System Unit Assembly.

#### 5.4.1 Cover-Display LCD assembly

The Cover-Display LCD Assembly includes the following major Field Replaceable Units/parts (FRUs):

- **LCD Face and Back Panel Cover**  
These parts are used to cover the whole LCD Panel assembly, which includes the LCD Display Module, the LCD FPC cables, and inverter board.
- **LCD Display Module**  
“14” LCD (Liquid Crystal Display) screen is used for output display. This part is assembled together with LCD Power Inverter Board, and LCD cables contained inside the whole LCD Panel. Handle this part with care against static electricity and accidents that can break the LCD.
- **LCD Power Inverter Board**  
This part or PCB (Printed Circuit Board) is used to provide high voltage to the CCFT (Cold Cathode Fluorescent Tube) of the notebook’s LCD backlighting. It is connected to the right side of the LCD display screen and attached to the back panel by a screw. Exercise safety electrical precautions in handling and servicing this part. The circuit board also includes the function for displaying the power status and battery charge LED indicators.
- **LCD FPC Cable**  
The LCD FPC cable is used to convert output signals from the motherboard in driving the LCD display screen. The cable is connected to the back of the LCD Panel.

#### 5.4.2 System Unit Assembly

The System Unit Assembly comprise of several assemblies of which can be divided into two major sub-assemblies.

- The System Top Unit Assembly.
- The System Base Unit Assembly.



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The following System Top Unit Assembly includes the following major Field Replaceable Units/parts (FRUs):

- **Glidepad Touch Pad Module Assembly**  
The touch pad (glide pad) pointing device module is assembled at the underside of the top cover with the sensor pad exposed on the top. The assembly comprises of the glide pad board, the glide pad converter board, the select buttons bracket casing, the insulator sheet, the glide pad FPC cable, and the glidepad wire cable. The glide pad board is assembled just underneath the select button assembly. It provides a FPC cable connector for the mother board.
- **Keyboard Panel Assembly**  
The keyboard is assembled on top of the system unit and connected to the main board's keyboard FPC type connector. The keyboard is also secured on the system's top unit casing. There are no screws attached to the keyboard.
- **Heat Plate and Fan Exhaust Unit**  
The Fan Exhaust unit is assembled on the upper-right side of the system unit. It comprises of a heat plate and one fan. There are seven screws securing the heat plate to the CPU module inserted on the motherboard. The exhaust fan is secured beside the heat plate.
- **Keyboard Cover Assembly**  
The keyboard cover is a thin bracket for holding the keyboard as well as covering the base unit. It is also includes the power button, easy buttons, and status LED cover moldings.

The following System Base Unit Assembly includes the following major Field Replaceable Units/parts (FRUs):

- **Battery Pack**  
This is one of more easily replaceable parts. The battery pack is found on the right side on the base unit and can be easily removed by pressing the latch underneath the unit and pulling the battery on its handle. The battery pack is replaced as a whole and must not be opened for repair.
- **Hard Disk Drive Module**  
The Hard Disk Drive is attached on the lower-left side of the system base unit located just below the keyboard. The HDD is secured by only one screw. The HDD module is a 2.5-inch hard disk drive with a maximum height of 9.5mm. The hard drive module assembly is attached to the motherboard through the HDD connector.
- **CD-ROM / DVD-ROM Drive Assembly**  
The CD-ROM / DVD-ROM / Drive Assembly is attached on the right side of the base unit and is lock with one latch.
- **CPU**  
The Pentium socket is found on the top right part of the motherboard. You will need a flat screwdriver and CPU tooling for removing or installing the CPU. Refer to Chapter 2 on how to install and upgrade the CPU.
- **Speaker Assembly**  
The internal speakers of the notebook are assembled into front side of the system. They are secured into a slot and speaker cable connector is attached into the main board.

- **Motherboard Assembly**

The Motherboard assembly is the most important part of the notebook. It contains the entire major chipsets including the core logic, PCMCIA, memory, and BIOS to operate the whole computer. It also includes the sockets, connectors and ports completing the functionality.

- **Internal Modem / LAN / Combo Module Assembly**

If the computer includes an internal modem, LAN

- **System Base Unit Case**

The System Base Unit Case is where the Motherboard is placed. It includes openings for the battery, FDD, CD-ROM and PCMCIA equipment.

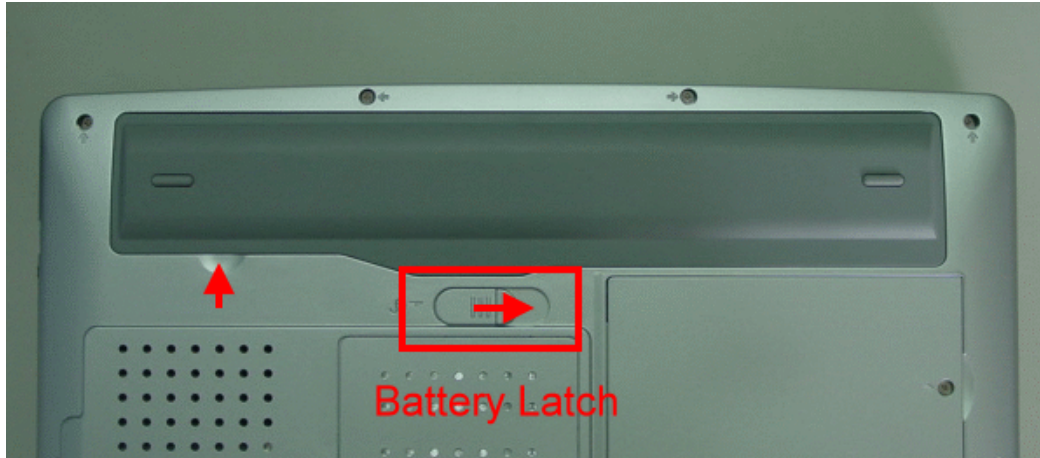
## 5.5 Parts Removal and Replacement Procedures

This section contains the field service-level removal/ replacement procedures for the notebook of MB05 model. The notebook is designed for optimum modularity in order to make field replacement and maintenance easy and efficient.

### 5.5.1 Removing the Battery Pack

The procedure for removing and replacing the battery pack is as follows:

To remove the battery pack, slide the latch to left side and hold it, then take out the battery pack with your finger.



**Figure 5-1 Remove the battery pack**

### 5.5.2 Removing the Keyboard

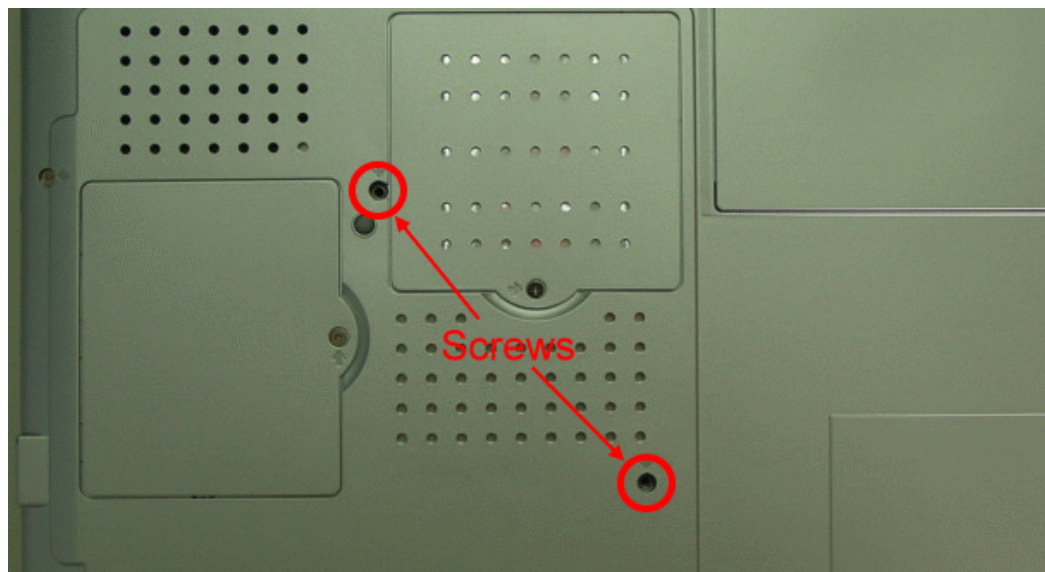
The internal keyboard is located above the system top unit and is fitted in without screws on the top unit case. Follow the steps below on how to remove the keyboard:

12. Turn off the system and remove both AC adapter and the battery pack from the notebook unit.
13. Remove keyboard cover by gently bending it and sliding it towards in front of you.



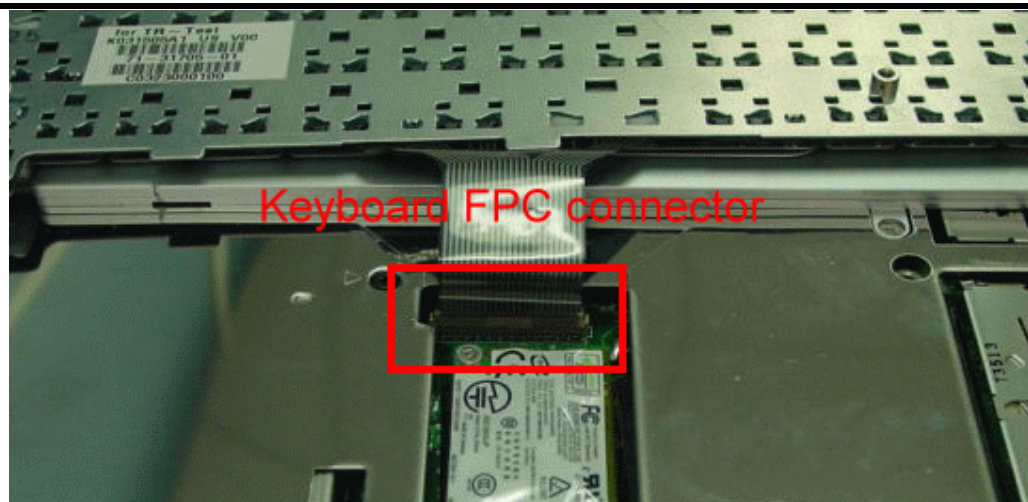
**Figure 5-2 Remove keyboard Cover**

14. There are two screws on the bottom case and that should be removing as the picture indicated.
15. Lift the keyboard and tilt it towards the LCD panel.
16. Release keyboard cable by sliding the ZIF connector towards up direction.



**Figure 5-3 Remove two screws**



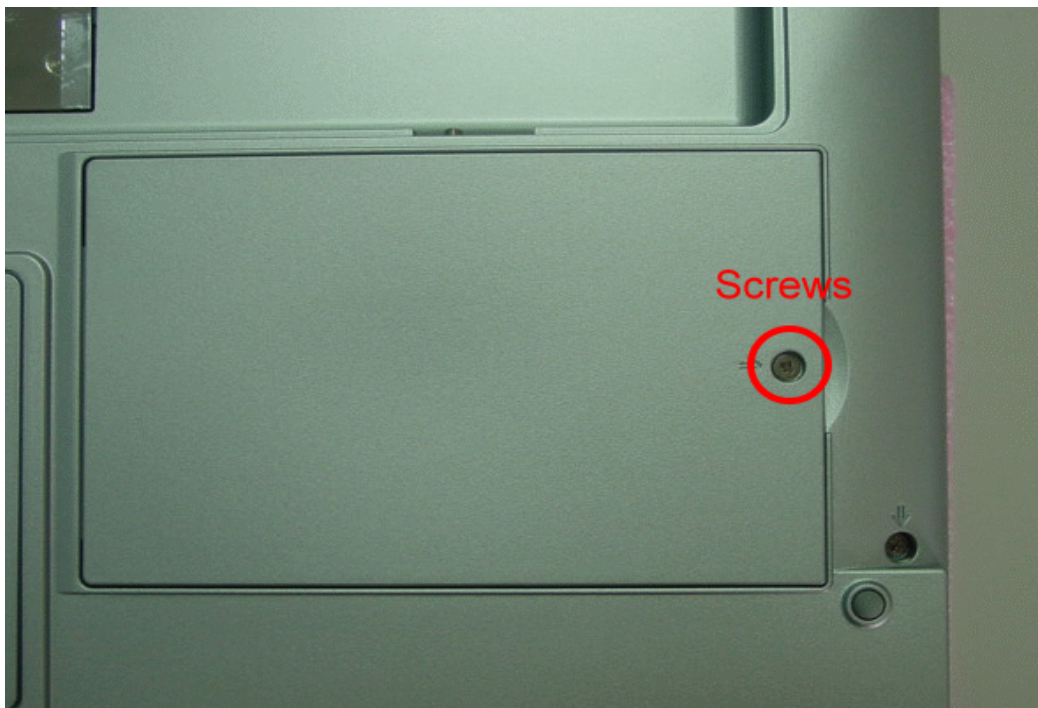


**Figure 5-4 Remove keyboard**

### 5.5.3 Removing the Internal Hard Disk Drive

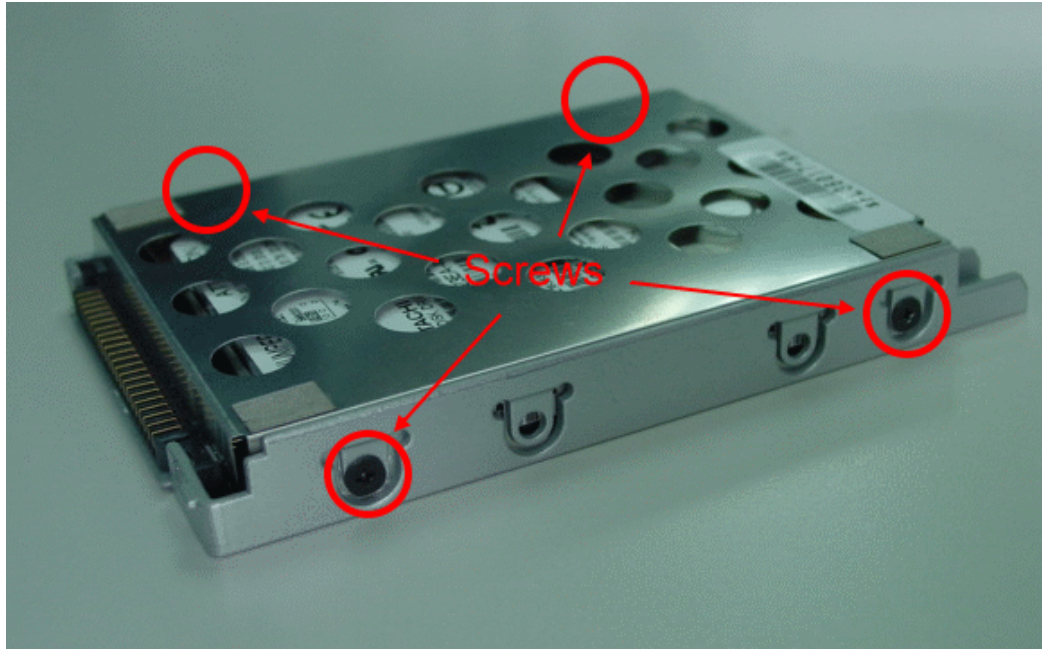
The notebook provides a built-in hard disk for the primary IDE controller. The HDD is an industry standard 2.5" IDE disk drive with a maximum height of 9.5mm.

1. Find out the built-in hard disk secured with one screw at the upper of the bottom case. Remove this screw and take out the hard disk door then pull the hard disk module from the connector.



**Figure 5-5 The disassembly of Hard Disk Drive**

2. Remove four screws of frame HDD bracket plate.

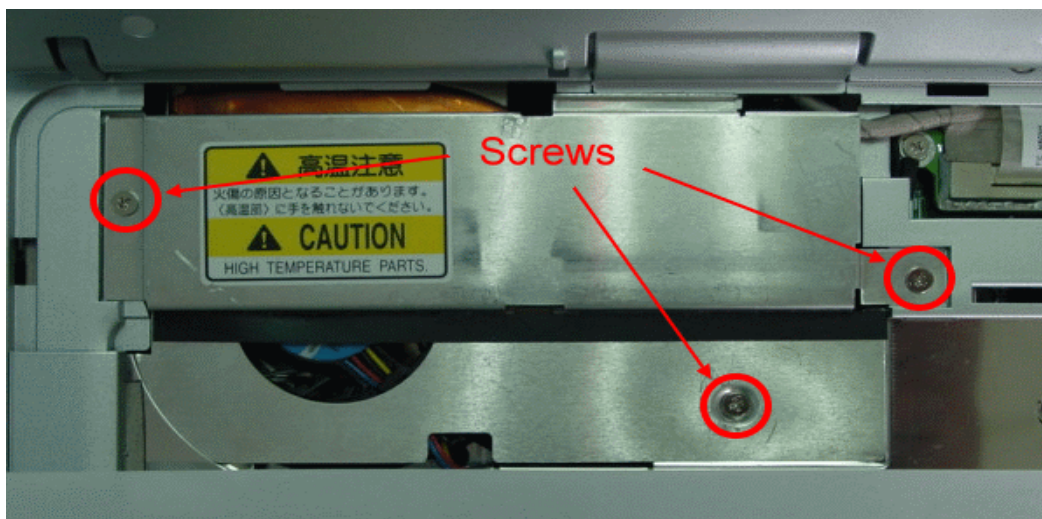


**Figure 5-6** Screws Locations of the frame HDD bracket plate

### 5.5.4 Removing the heat sink plate

The procedure for removing the heat sink plate is as follows:

1. Removing the plate, there are three screws as the picture shown.



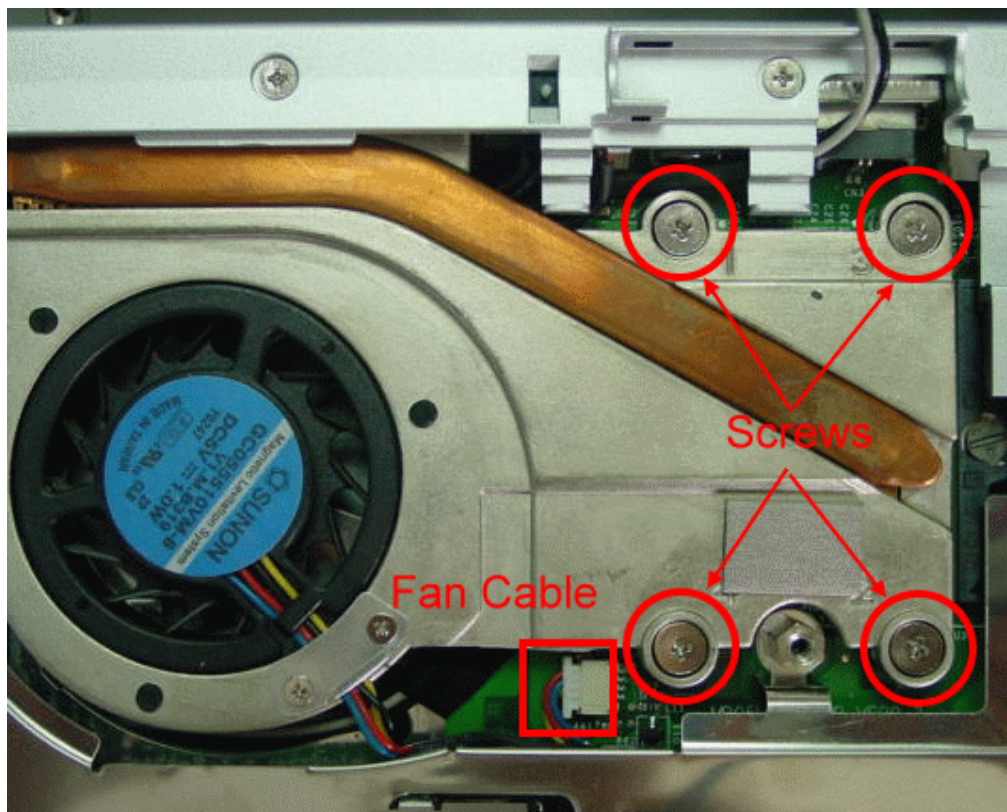
**Figure 5-7** Removing the heat sink plate



### 5.5.5 Removing the Heat Sink

The procedure for removing the heat sink is as follows:

1. Removing the heat sink, there are four screws and one FAN cables as the picture shown.

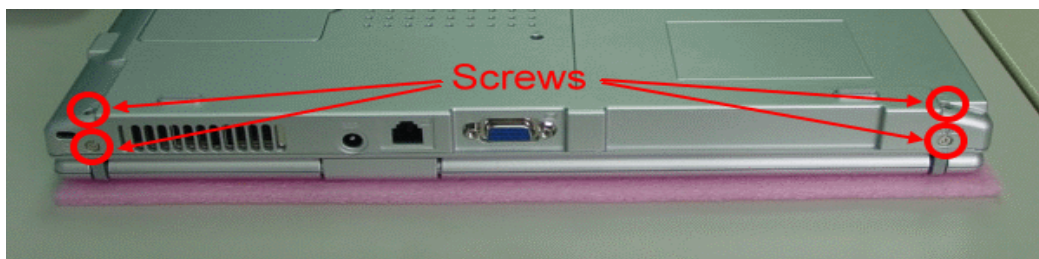


**Figure 5-8 Removing the Heat Sink Module**

### 5.5.6 Removing the LCD Panel

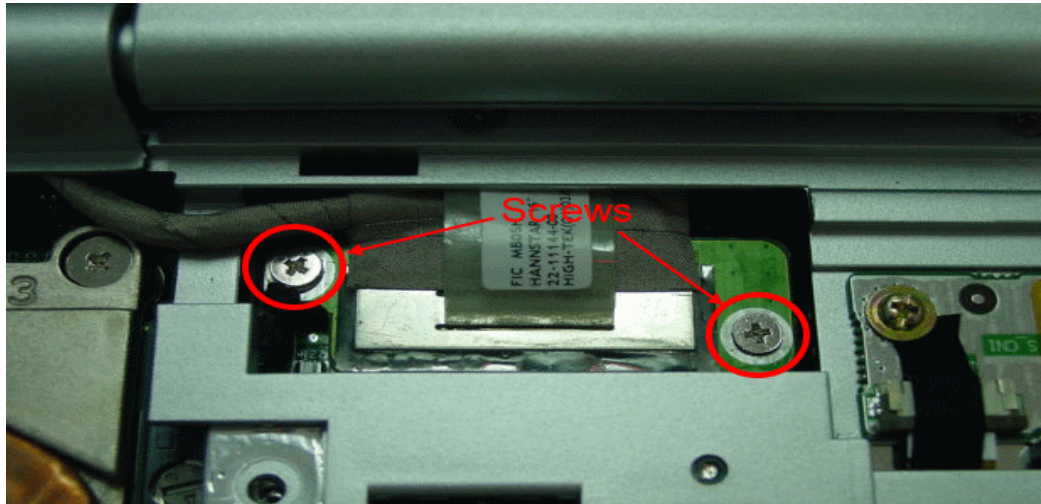
The procedure for removing the LCD Panel is as follows:

1. To remove the four screws of rear side for the system unit.



**Figure 5-9 Four Screws**

2. Removing the two screws for LCD cable.



**Figure 5-10 Two screws for LCD cable**

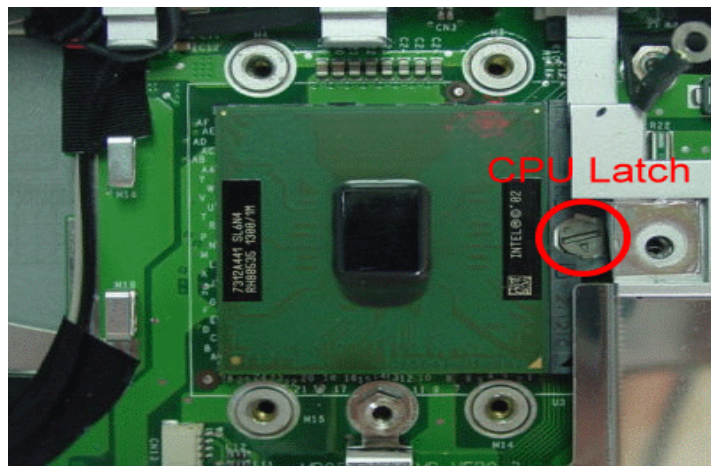
3. Slowly pullout the LCD panel from the system unit.

### 5.5.7 Removing the Intel CPU

The MB05 features Intel Pentium M uFC-PGA Processors. It is located on the upper left side of the system motherboard.

To install or replace the CPU, follow the steps below:

1. Before removing the CPU module, you need first to disassemble keyboard and heat sink plate.
2. Using a flat screwdriver, turn the socket lock counter-clockwise direction to unlock CPU from the socket.



**Figure 5-11 CPU Assembly**

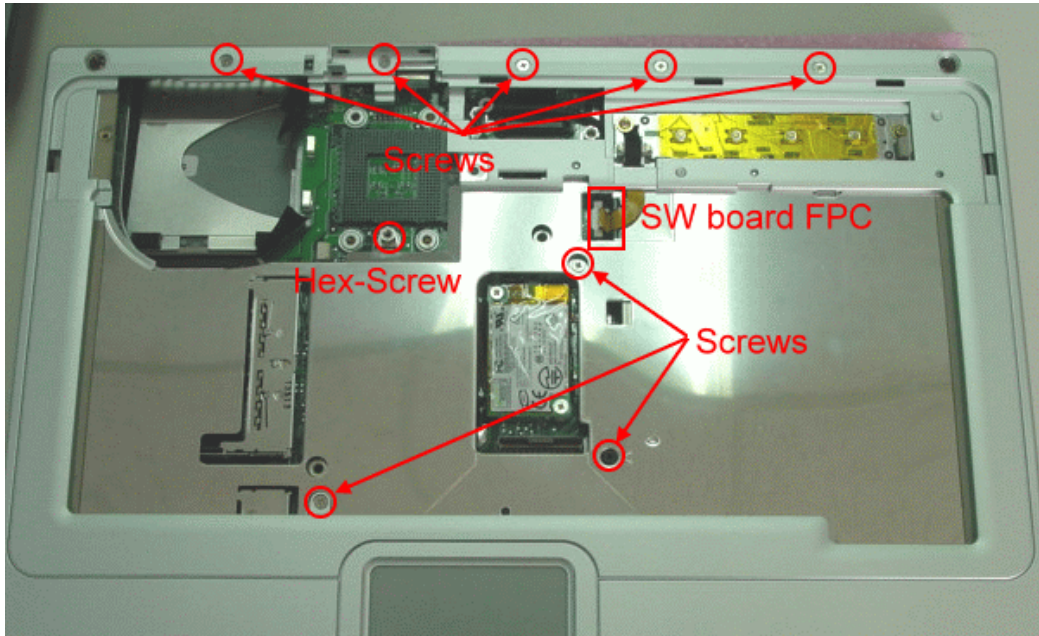


### 5.5.8 Removing the Top Cover

The procedure for removing the top cover is as follow:

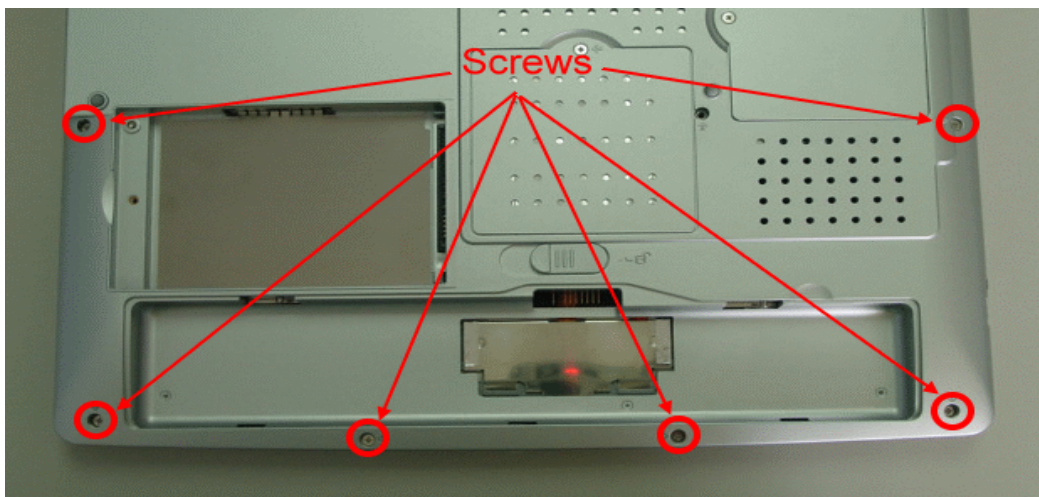
Please see the location of top cover as the below picture shown.

1. To remove the top cover, you also need to remove the seven screws and one Hex-screw and one FPC on top cover.



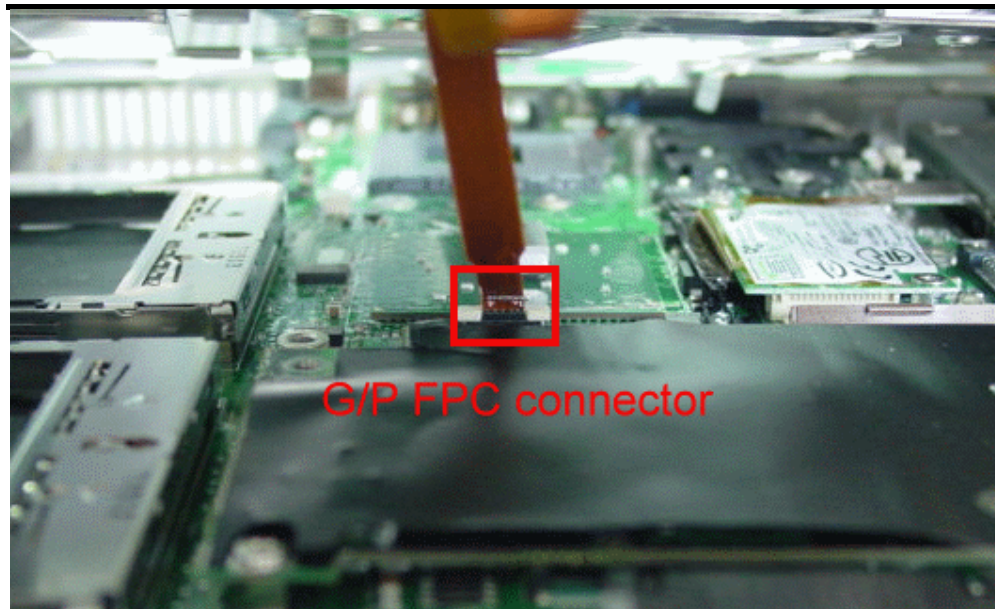
**Figure 5-12 Location of Top Cover**

2. There are six screws on the bottom case



**Figure 5-13 Removing the six screws of bottom case**



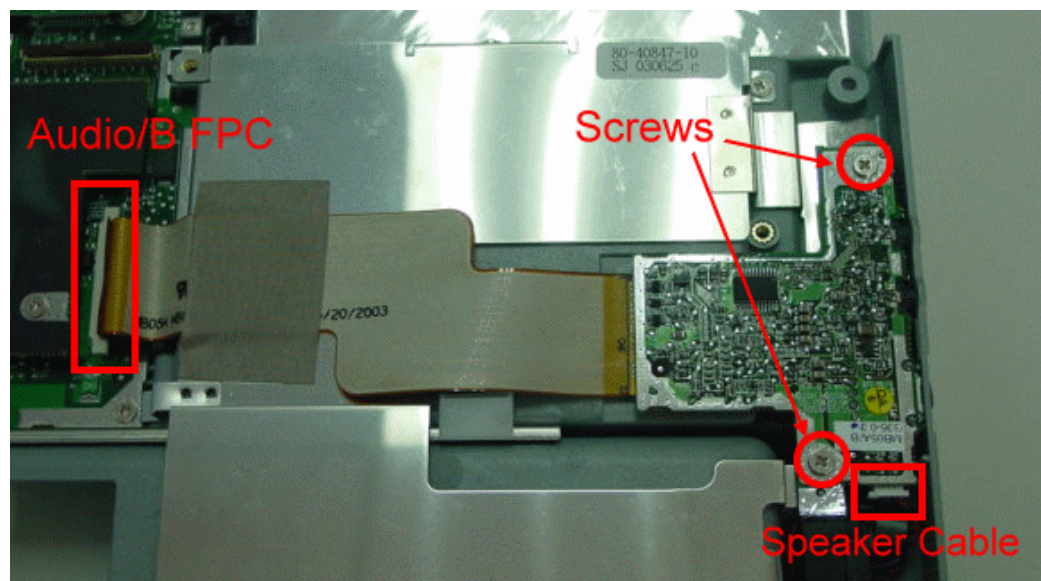


**Figure 5-14 Removing the G/P FPC of top case**

#### 5.5.9 Removing the Audio board

The procedure for removing the audio board is as follows:

1. There are two screws and one cable for speaker and audio FPC to remove the audio board.



**Figure 5-15 Removing the Audio board**

### 5.5.10 Removing the DC board

The procedure for removing the DC board is as follows:

1. There are two screws for this DC board as the pictures shown.

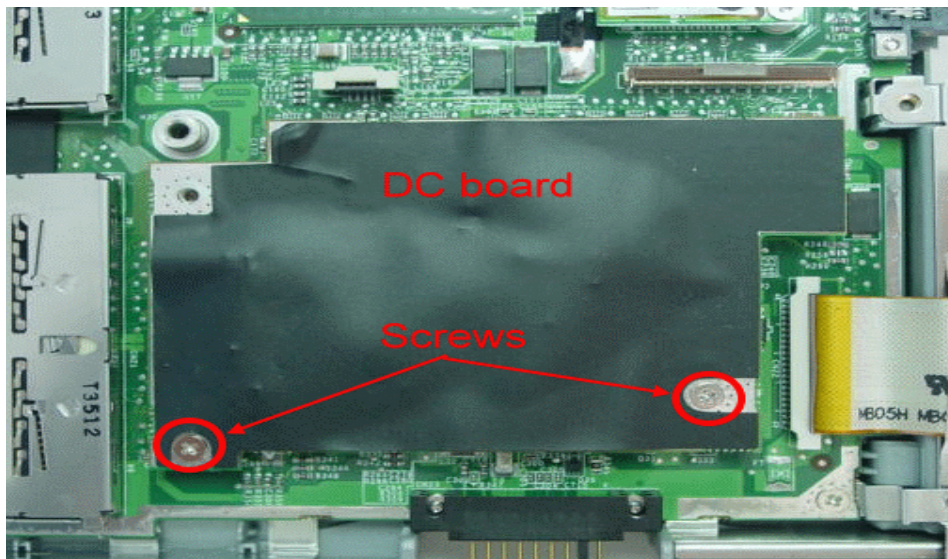
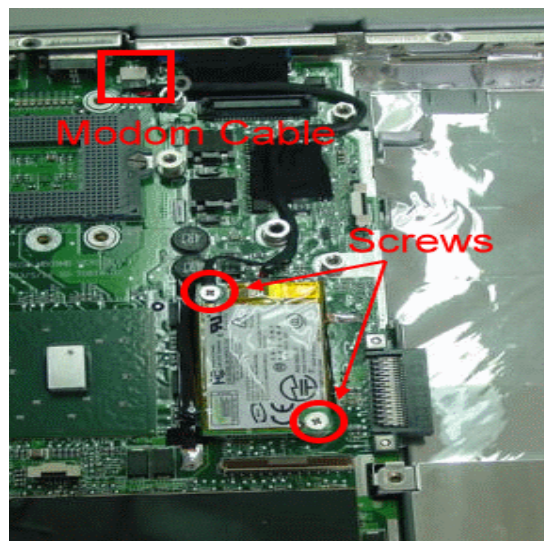


Figure 5-16 Removing the DC/DC board

### 5.5.11 Removing the MDC Modem board

The procedure for removing the MDC Modem board is as follows:

1. There is only two screws for this MDC Modem board and one cable as the pictures shown.



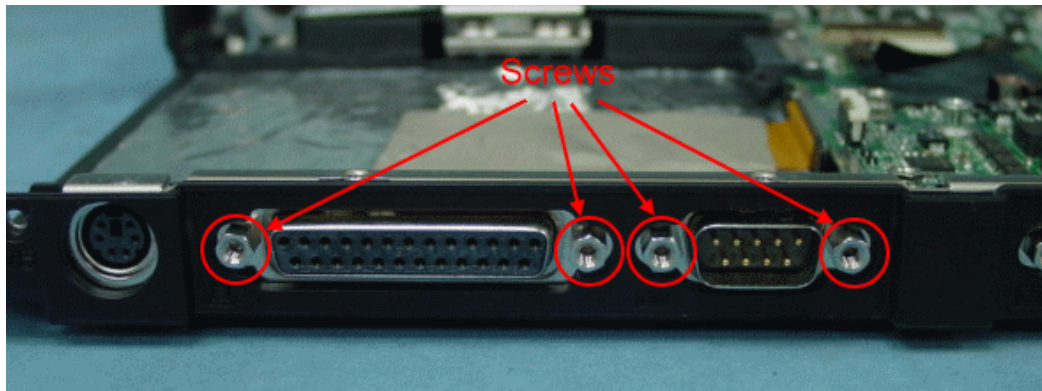


**Figure 5-17 Removing the DC/DC board**

### 5.5.12 Removing the IO board

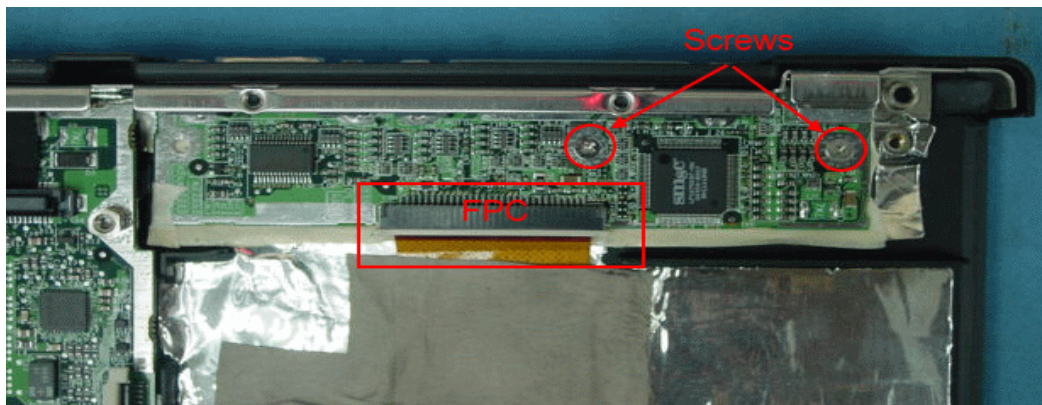
The procedure for removing the IO board with serial/parallel/PS2 ports are as follows:

1. There are four screws on the rear side as the pictures shown.



**Figure 5-18 Removing the IO Hex-Screws**

2. There are two screws and one FPC for this IO board as the pictures shown.

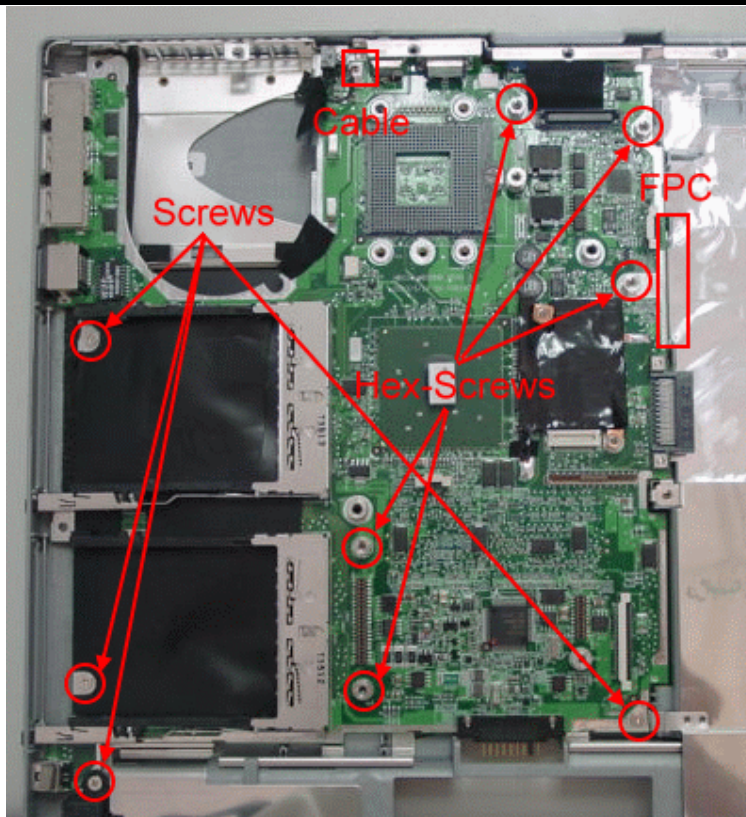


**Figure 5-19 Removing the IO board**

### 5.5.13 Removing / Replacing the Motherboard

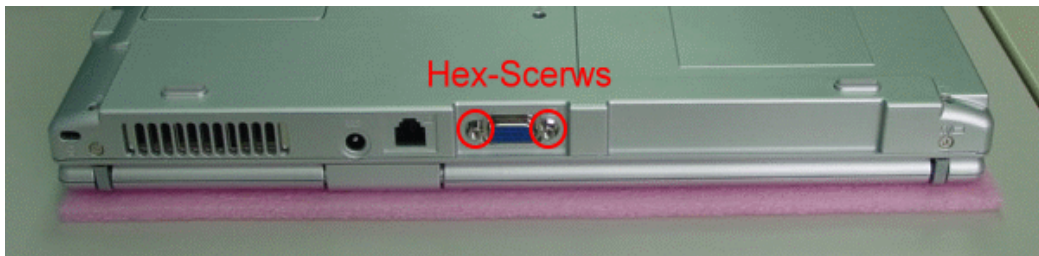
The motherboard contains the major chipset and components needed to run the MB05 notebook. Follow the steps below on how to remove and replace the motherboard:

1. Before removing the motherboard, you need first to disassemble the all basis unit modules mentioned in the previous sections.
2. On the motherboard, please make sure to remove the five hex bolts and 4 screws and one cable on the rear side of the system.



**Figure 5-20 Motherboard Screws Location**

3. You will see two Hex-screws as the picture shown.



**Figure 5-21 Removing Hex-Screws**

4. When all screws and bolts are removing, the mother board and FPC should lift up together gently from the casing of base unit..

This appendix provides the technical specification of the MB05 notebook:

### A.1 System Specification

Category	Specification	Stepping
CPU	Intel Mobile Centrino Processor FSB Speed 400MHz	
Core Logic	MONTARA-GM (North Bridge) CPU Interface Integrated 3D/2D Graphic Engine. AGP Bus Controller DDR DRAM Controller HUB Interface ICH4-M (South Bridge ) Hub Interface Technology interconnecting INTEL NB and SB. Dual IDE Master/Slave Controller ,Integrated DMA Controller Universal Serial Bus Host Controller Integrated LAN Controller(Not use) Integrated Audio Controller with AC97 Interface Advanced Programmable Interrupt Controller Integrated PCI to LPC Bridge Integrated RTC compatible MC146818A with 256bytes of battery backed RAM Integrated Audio Controller with AC97 Interface PCI Bus Interface (PCI 2.2 compliant) Note: See INTEL spec for Detail.	
Cache Memory	L1 Cache (Centrino Processor internal): 64KB 8-way cache association provides	
	L2 Cache (Centrino Processor internal): 1024KB Advanced Transfer Cache,8 way association 8-way set associative, 32-byte line size, 1 line per sector	
System Memory	Base Memory: 1 SO-DIMM Slot (1.25") Size: 128/256/512MB Type: DDR SDRAM, 2.5V Data Path: 64Bit Frequency: 266MHz Refresh: CBR Refresh Expansion Memory: 1 SO-DIMM Slot (1.25") Size: 128/256/512MB Type: DDR SDRAM, 2.5V Data Path: 64Bit Frequency : 266MHz Refresh: CBR Refresh	

BIOS ROM	Flash ROM 1 <sup>st</sup> Vendor : SST 49LF040A PLCC Package 4Mbit LPC flash ROM	
Super I/O	SMSC LPC47N267 FDC, IEEE 1284 Printer Port Serial Port x 1 ports IR Port ASKIR, SIR, FIR, HPSIR, Consumer IR Plug and Play Support	
RTC + CMOS SRAM	Integrated in South Bridge (INTEL ICH4-M) Real Time Clock with 256 byte of CMOS SRAM. Supports keeping track of the time of day and storing system data.	
K/B Controller	Mitsubishi M38859 Internal K/B, Touch Pad, External K/B or M/S	
PMU	New PMU08 Mitsubishi M38859FFHP Embedded Controller	
VGA Controller	MONTARA-GM Integrated 3D/2D Graphic Engine. High Performance and high quality 3D accelerator AGP 1X/2X/4X BUS High performance 2D accelerator Complete TV-OUT/Digital Flat Panel Solution(DVO Interface)	
VRAM	Shared Main Memory 8/16/32 MB.	
LVDS Transmitter	ICH4-M Integrated.	
CardBus Controller	RICOH R5C554 PCI-CARDBUS / 1394 OHCI-LINK / 1394 PHY PC/Card Bus Type II x 2	

Sound	AC'97 CODEC Realtek ALC202 AC'97 Revision 2.2 Compliant	
Modem	MDC modem support V.90, K56flex, ITU-T V.34, V.32, RJ11 Jack TIA/EIA 602, V.42 ITU-T V.17, V.29, V.27ter, V.21 Ch2 TIA/EIA 578 Class1 FAX Wake up on Ring	
On board LAN	Realtek 8100BL Support LAN boot( no used) Support for auto-negotiation (10BASE-T and 100BASE-TX) Wake up On LAN( S1~S5).	
802.11a+b 802.11 b	Support by Mini-pci.	
1394	RICOH R5C554 PCI-CARDBUS / 1394 OHCI-LINK / 1394 PHY	
USB (ICH4-M)	Integrated in South Bridge (INTEL ICH4-M) Three Independent UHCI USB 1.1 Host Controllers and One EHCI USB 2.0 Host Controller, support up to six port. Legacy Keyboard/Mouse support. Supports only one Debug port at port 1(first port), it is at USB 2.0 transfer rate..	

## A.2 Display Specification

15" TFT LCD (HANNSTAR)	
LCD Model	HSD150PX16-A
LCD Type	15" TFT
Display Pixels	H1024 x V768 pixels
Pixel Arrangement	RGB vertical stripe
Display colors	262K Colors
Module Size	298.5(W) x 227.5(H) x 5.8(D) [mm]
Weight	Approx. 500g
Contrast Ratio	200:1 (typ.)
Power Supply	3.3V
Response Time	30ms (max)
Operating Temperature	0 to 50 degrees Celsius



<b>Storage Temperature</b>	-20 to 60 degrees Celsius
<b>15" TFT LCD (LG)</b>	
<b>LCD Model</b>	LP150X05-C2
<b>LCD Type</b>	15" TFT
<b>Display Pixels</b>	H1024 x V768 pixels
<b>Pixel Arrangement</b>	RGB vertical stripe
<b>Display colors</b>	262K Colors
<b>Module Size</b>	298.5(W) x 227.5(H) x 5.8(D) [mm]
<b>Weight</b>	Approx. 500g
<b>Contrast Ratio</b>	200:1 (typ.)
<b>Power Supply</b>	3.3V
<b>Response Time</b>	30ms (max)
<b>Operating Temperature</b>	0 to 50 degrees Celsius
<b>Storage Temperature</b>	-20 to 60 degrees Celsius
<b>15" TFT LCD (AU)</b>	
<b>LCD Model</b>	B150XG01-2
<b>LCD Type</b>	15" TFT
<b>Display Pixels</b>	H1024 x V768 pixels
<b>Pixel Arrangement</b>	RGB vertical stripe
<b>Display colors</b>	262K Colors
<b>Module Size</b>	298.5(W) x 227.5(H) x 5.8(D) [mm]
<b>Weight</b>	Approx. 500g
<b>Contrast Ratio</b>	200:1 (typ.)
<b>Power Supply</b>	3.3V
<b>Response Time</b>	30ms (max)
<b>Operating Temperature</b>	0 to 50 degrees Celsius
<b>Storage Temperature</b>	-20 to 60 degrees Celsius
<b>14.1" TFT LCD (SAMSUNG)</b>	
<b>LCD Model</b>	LTN141XB-L02
<b>LCD Type</b>	14.1" TFT
<b>Display Pixels</b>	H1024 x V768 pixels
<b>Pixel Arrangement</b>	RGB vertical stripe
<b>Display colors</b>	262K Colors
<b>Module Size</b>	298.5(W) x 227.5(H) x 5.8(D) [mm]
<b>Weight</b>	Approx. 500g
<b>Contrast Ratio</b>	200:1 (typ.)
<b>Power Supply</b>	3.3V
<b>Response Time</b>	30ms (max)
<b>Operating Temperature</b>	0 to 50 degrees Celsius



<b>Storage Temperature</b>	-20 to 60 degrees Celsius
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## A.5 DVD/RW Combo Drive Specification

<b>Drive Manufacturer</b>	QSI SBW242
<b>Physical Dimension</b>	128.0 x 12.7 x 129 [mm] ( W * H * D )
<b>Weight</b>	250g +/- 10g
<b>Loading</b>	Manual tray loading
<b>Ejection</b>	Manual eject using the eject button Auto eject using the eject command on software
<b>Host Interface</b>	Enhanced IDE (ATAPI)
<b>Average Access Time</b>	150ms Typ.
<b>Data Transfer Rate (burst)</b>	16.7 MByte/s (PIO Mode 4) 16.7 MByte/s (Multi word DMA transfer mode-2) 33.3 MByte/s (Ultra DMA transfer mode-2)
<b>Data Transfer Rate (sustained)</b>	Max. 2,100Kbyte/s (CD-RW) ; Max.3,600Kbyte/s(CD)
<b>Data Write Rate</b>	Max. 1,200Kbyte/s (CD-R) ; Max.600Kbyte/s(CD-RW)
<b>Starting Time</b>	Max. 10 sec (from stand by to ready)
<b>Data Buffer Capacity</b>	2MB
<b>Supply Voltage</b>	+5VDC +/- 15%
<b>MTBF</b>	50,000POH or more
<b>Drive Manufacturer</b>	TEAC DW224EA
<b>Physical Dimension</b>	128.0 x 12.7 x 129 [mm] ( W * H * D )
<b>Weight</b>	250g +/- 10g
<b>Loading</b>	Manual tray loading
<b>Ejection</b>	Manual eject using the eject button Auto eject using the eject command on software
<b>Host Interface</b>	Enhanced IDE (ATAPI)
<b>Average Access Time</b>	150ms Typ.
<b>Data Transfer Rate (burst)</b>	16.7 MByte/s (PIO Mode 4) 16.7 MByte/s (Multi word DMA transfer mode-2) 33.3 MByte/s (Ultra DMA transfer mode-2)
<b>Data Transfer Rate (sustained)</b>	Max. 2,100Kbyte/s (CD-RW) ; Max.3,600Kbyte/s(CD)
<b>Data Write Rate</b>	Max. 1,200Kbyte/s (CD-R) ; Max.600Kbyte/s(CD-RW)
<b>Starting Time</b>	Max. 10 sec (from stand by to ready)
<b>Data Buffer Capacity</b>	2MB
<b>Supply Voltage</b>	+5VDC +/- 15%
<b>MTBF</b>	50,000POH or more

## A.6 Keyboard Specification

<b>Keyboard Type</b>	SUNREX KB
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<b>Type of key switch</b>	Membrane (PE) Switch
<b>Number of keys</b>	87 keys with embedded numeric keypad
<b>Compatibility</b>	Enhanced 101/102 emulation
<b>Travel</b>	3.0 mm $\pm$ 0.3 mm
<b>Keyboard Height</b>	6.5 $\pm$ 0.3 mm 7.0 $\pm$ 0.3 mm (SPACE Key)
<b>Keycap Pull Off Force</b>	$\geq$ 500g
<b>Supply Voltage</b>	6V
<b>Operating Temperature</b>	-10 to 60 degrees Celsius

## A.7 Touch Pad Specification

<b>Interface</b>	PS/2 (compatible with Microsoft Mouse Driver)
<b>Supply Voltage</b>	5V
<b>Supply Current</b>	4.0mA (Max) Operating
<b>Dimension</b>	W65 x H49 x D2.82 (D1.07 PCB ) mm
<b>Weight</b>	8g.
<b>Operating Temperature</b>	0 to 60 degrees Celsius
<b>Storage Temperature</b>	-40 to 65 degrees Celsius

## A.8 On board MDC Modem Specification

<b>Modem Type</b>	Ambit
<b>Wake Up Function</b>	Supports Ring-in Resume Wake Up function
<b>Connection Mode</b>	V.90 Kbps
<b>Speakerphone</b>	Full duplex speakerphone (FDSP)
<b>Fax Transmission Way</b>	Half Duplex
<b>Modem Speed</b>	56 Kbps
<b>Modulation Format</b>	V.90 PCM

## A.9 On board LAN Specification

<b>LAN Type</b>	Realtek 8100BL
<b>Speed</b>	10/100 Mbps
<b>Wake Up Function</b>	Supports Wake-on-LAN (WOL) function

## A.10 Power Supply

AC POWER ADAPTER (DELTA)	
<b>Input Voltage</b>	100 to 240VAC
<b>Input Frequency</b>	50 to 60 Hz
<b>Input Current</b>	1.32A Max at 110VAC 0.66A Max at 220VAC
<b>Efficiency</b>	83% Min
<b>In-Rush Current (Cold Start)</b>	50A Max at 100 VAC 100A Max at 240 VAC
<b>Output Power</b>	75W

<b>Output Voltage</b>	+19Vdc (main)
<b>Output Current</b>	3.16A (Max)
<b>Over Voltage Protection</b>	24V Max
<b>Over Current Protection</b>	19V / 5A (max)
<b>Dimension</b>	L115 x W50 x H29 [mm]
<b>Weight</b>	250g
<b>AC POWER ADAPTER (LITEON)</b>	
<b>Input Voltage</b>	100 to 240VAC
<b>Input Frequency</b>	50 to 60 Hz
<b>Input Current</b>	1.32A Max at 110VAC 0.66A Max at 220VAC
<b>Efficiency</b>	83% Min
<b>In-Rush Current (Cold Start)</b>	50A Max at 100 VAC 100A Max at 240 VAC
<b>Output Power</b>	80W
<b>Output Voltage</b>	+19Vdc (main)
<b>Output Current</b>	3.16A (Max)
<b>Over Voltage Protection</b>	24V Max
<b>Over Current Protection</b>	19V / 5A (max)
<b>Dimension</b>	L115 x W50 x H29 [mm]
<b>Weight</b>	250g
<b>BATTERY PACK</b>	
<b>Model</b>	Sanyo Li-Ion Rechargeable Smart Battery
<b>Cell Number</b>	8
<b>Rating (Nominal) Voltage</b>	14.4V
<b>Typical Capacity</b>	4400 mAH
<b>Watts</b>	52 W
<b>Charging Voltage</b>	16.8V
<b>Charging Efficiency</b>	100%
<b>EVD1</b>	14.0V
<b>EVDF</b>	12.0V

## A.11 Inverter Specification

<b>Input Voltage</b>	5.0V
<b>Start Voltage</b>	1200Vrms (min)
<b>Output Current</b>	6mA (max)
<b>Frequency</b>	30~70KHz
<b>Efficiency</b>	75% (min)
<b>Brightness Control Voltage</b>	0.94~1.86V

### A.12 DC/DC Specification

<b>Controller</b>	PMU 08
<b>Input Voltage</b>	8 ~ 20V
<b>Output Current</b>	4A (5V) / 4A (3.3V) / 100mA (12V)
<b>Frequency</b>	200KHz
<b>Support Mode</b>	OVP / OCP

### A.13 Charger Specification

<b>Controller</b>	PMU 08
<b>Input Voltage</b>	18.5 ~ 20V

### A.14 Mechanical Specification

Category	Specification	Remark
Size	W=308mm, D=268mm, H=27.7~31mm.	
Weight	Approx 4.9 lb = 2.2Kg	

### A.15 Environmental Requirements

<b>Temperature</b> Operating Temperature Storage Temperature	5°C to 35°C -20°C to 60°C
<b>Humidity</b> Operating Storage	10% to 80% RH without condensation 5% to 90% RH without condensation
<b>Shock (Non-operating)</b> Unpacked	Acceleration: 30G/50G Duration Time: 11ms No. of Times: 3 Times Direction: 6 face
<b>Drop</b> Package	Drop Height: 91cm (under 10Kg) 76cm (over 10Kg) Drop Phase: 1 corner, 3 line, 6 face
<b>Electro-Static Discharge (ESD)</b>	Contact: +/- 6KV Air: +/-10KV

# FIC MB05W Service Manual

This appendix provides you with the field replaceable unit (FRU) parts listing of the MB05 Series. Refer to this appendix whenever ordering for spare parts or requesting for RMA (Returned Merchandise Authorization) number.

ITEM	FRU	Q'ty	FRU Level			FIC Part Number	Lead Time (Days)	Warranty Period	Return to FIC/Customer for Repair
			A	B	C				
1	CPU Centrino 1.3GHZ	1	x			01-10966-01	40	N/A	N/A
2	CPU Centrino 1.5GHZ	1	x			01-10968-01	40	N/A	N/A
3	CPU Centrino 1.3GHZ Trigem Consign	1	x			01-10966N01	40	N/A	N/A
4	CPU Centrino 1.3GHZ Trigem Assign	1	x			01-10966D02	40	N/A	N/A
5	DDR-UNI 128M	1	x			02-33036-01	40	N/A	N/A
6	DDR-A-data 128M	1	x			02-33095-00	40	N/A	N/A
7	DDR-UNI 256M	1	x			02-33037-01	40	N/A	N/A
8	DDR-Adata 256M	1	x			02-33096-00	40	N/A	N/A
9	COMBO DW-224E-A97	1	x			25-03434-10	N/A	N/A	N/A
10	CD-RW+DVD COMBO DW-224EA97 TEAC	1			x	23-40558-01	60	12 Mth	FIC
11	FRAME M05H ODD Support PLATE	1			x	24-52423-00	30	N/A	N/A
12	PLASTIC-M CDROM DW TEAC	1			x	80-40844-10	30	N/A	N/A
13	COMBO SBW-242 QSI	1	x			25-03435-00	N/A	N/A	N/A
14	DVD-ROM COMBO SBW-242 QSI	1			x	23-40489-00	60	12 Mth	FIC
15	FRAME M05H ODD Support PLATE	1			x	24-52423-00	30	N/A	N/A
16	PLASTIC-M COMBO QSI PANEL	1			x	80-40855-10	30	N/A	N/A
17	CD-ROM CD-224E-C97	1	x			25-03436-10	N/A	N/A	N/A
18	CD-ROM 24X CD-224E-C97 650MB TEAC	1			x	23-40139-14	60	12 Mth	FIC
19	FRAME M05H ODD Support PLATE	1			x	24-52423-00	30	N/A	N/A
20	PLASTIC-M CDROM TEAC PANEL	1			x	80-40843-10	30	N/A	N/A
21	Module HDD _30GB _HIT	1	x			25-03541-00	N/A	N/A	N/A
22	HDD 30GB HIT	1			x	23-20813-06	45	12 Mth	FIC
23	CON SOCKET FOR HDD S-TECH	1			x	20-21749-00	30	N/A	N/A
24	FRAME HDD	1			x	24-52404-00	30	N/A	N/A
25	PLASIIIC-M HDD	1			x	80-40845-10	30	N/A	N/A
26	Module HDD _60GB _HIT	1	x			25-03542-00	N/A	N/A	N/A
27	HDD 60GB HIT	1			x	23-20900-00	45	12 Mth	FIC
28	CON SOCKET FOR HDD S-TECH	1			x	20-21749-00	30	N/A	N/A
29	FRAME HDD	1			x	24-52404-00	30	N/A	N/A
30	PLASIIIC-M HDD	1			x	80-40845-10	30	N/A	N/A

31	Module HDD_40GB_HIT	1	x			25-03553-00	N/A	N/A	N/A
32	HDD 40GB HIT	1			x	23-20862-03	45	12 Mth	FIC
33	CON SOCKET FOR HDD S-TECH	1			x	20-21749-00	30	N/A	N/A
34	FRAME HDD	1			x	24-52404-00	30	N/A	N/A
35	PLASIC-M HDD	1			x	80-40854-10	30	N/A	N/A
36	Module HDD 60 GB_HIT	1	x			25-03571-00	N/A	N/A	N/A
37	HDD 60 GB HIT	1			x	23-21021N00	45	12 Mth	FIC
38	CON SOCKET FOR HDD S-TECH	1			x	20-21749-00	30	N/A	N/A
39	FRAME HDD	1			x	24-52404-00	30	N/A	N/A
40	PLASIIC-M HDD	1			x	80-40845-10	30	N/A	N/A
41	Module HDD_40GB_HIT	1	x			25-03570-00	N/A	N/A	N/A
42	HDD 40GB HIT	1			x	23-21020N00	45	12 Mth	FIC
43	CON SOCKET FOR HDD S-TECH	1			x	20-21749-00	30	N/A	N/A
44	FRAME HDD	1			x	24-52404-00	30	N/A	N/A
45	PLASIIC-M HDD	1			x	80-40845-10	30	N/A	N/A
46	Module HDD_40GB_FUJ	1	x			25-03554-00	N/A	N/A	N/A
47	HDD 40GB FUJ	1			x	23-21016-01	45	12 Mth	FIC
48	CON SOCKET FOR HDD S-TECH	1			x	20-21749-00	30	N/A	N/A
49	FRAME HDD	1			x	24-52404-00	30	N/A	N/A
50	PLASIC-M HDD	1			x	80-40854-10	30	N/A	N/A
51	Module HDD_40GB_HIT	1	x			25-03570-01	N/A	N/A	N/A
52	HDD 40GB HIT	1			x	23-21020D00	45	12 Mth	FIC
53	CON SOCKET FOR HDD S-TECH	1			x	20-21749-00	30	N/A	N/A
54	FRAME HDD	1			x	24-52404-00	30	N/A	N/A
55	PLASIIC-M HDD	1			x	80-40845-10	30	N/A	N/A
56	Module HDD 60 GB_HIT	1	x			25-03571-01	N/A	N/A	N/A
57	HDD 60 GB HIT	1			x	23-21021D00	45	12 Mth	FIC
58	CON SOCKET FOR HDD S-TECH	1			x	20-21749-00	30	N/A	N/A
59	FRAME HDD	1			x	24-52404-00	30	N/A	N/A
60	PLASIIC-M HDD	1			x	80-40845-10	30	N/A	N/A
61	USB FDD MPF82Z-U3 SONY	1			x	25-03487-00	45	12 Mth	FIC
62	BATT LI 4400(Sanyo)	1			x	21-92190-02	90	3 Mth	FIC
63	Wireless LAN unit	1			x	71-40231-01	45	12 Mth	FIC
64	Wireless LAN unit (consign)	1			x	71-40231N04	45	N/A	N/A
65	Wireless LAN unit (Assign)	1			x	71-40231D02	45	N/A	N/A
66	MDC moden	1			x	71-40245-03	45	12 Mth	FIC
67	Phone cable	1			x	71-90124-01	45	N/A	N/A
68	Main Module	1	x			56-20810-00	N/A	N/A	N/A
69	Main Board	1			x	51-71577-03	30	12 Mth	FIC
70	Audio Board	1			x	51-71578-03	30	12 Mth	FIC
71	DC Board	1			x	51-71579-02	30	12 Mth	FIC
72	K/B Cover	1			x	80-40842-10	30	N/A	N/A
73	DRAM COVER	1			x	80-40845-10	30	N/A	N/A
74	DIMM MINIPCI Cover	1			x	80-40846-10	30	N/A	N/A
75	BATTERY RTC 3V	1			x	21-92197-01	30	N/A	N/A

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76	SPEAKER +CABLE	1			x	21-20779-00	30	N/A	N/A
77	HEAT SINK FOR CPU	1			x	24-20705-00	30	N/A	N/A
78	HEAT SINK MB02 NORTH BRIDGE	1			x	24-20687-00	30	N/A	N/A
79	Module Bottom cover	1	x			80-40847-10	N/A	N/A	N/A
80	CASE BOTTOM	1			x	24-45816-10	35	N/A	N/A
81	CASE PCMCIA DOOR	1			x	24-45817-10	35	N/A	N/A
82	FRAME SLIDE PLT FOR BATTERY	1			x	24-52412-00	35	N/A	N/A
83	FRAME HDD BRACKET(BOTTEN SIDE)	1			x	24-52403-00	35	N/A	N/A
84	RUBBER FOOT	1			x	24-84611-00	35	N/A	N/A
85	RUBBER CIRCLE	1			x	24-84569-00	35	N/A	N/A
86	Metal-M Topcover Plat Thermal	1			x	80-50238-00	35	N/A	N/A
87	MUDULE PALM-REST	1	x			25-03559-00	N/A	N/A	N/A
8	F-CABLE MB05H SWITCH FPC	1			x	22-21321-00	35	N/A	N/A
89	SW/ Board	1			x	51-71581-03	35	N/A	N/A
90	GLIDE PAD KGDDFT014A	1			x	71-23017-00	35	N/A	N/A
91	PLASTIC-M TOP COVER	1			x	80-40841-10	35	N/A	N/A
92	METAL-M MB05H G/P	1			x	80-50233-00	35	N/A	N/A
93	Module LCD TFT 15" HAN	1	x			56-10684-10	N/A	N/A	N/A
94	LCD 15" MONITOR 15.0INCH TFT XGA HAN	1			x	71-10681-00	60	12 Mth	FIC
95	INVT /B	1			x	12-01614-01	60	12 Mth	FIC
96	WIRE MB05H COAXIAL CABLE15" HAN	1			x	22-11144-00	60	N/A	N/A
97	CASE HINGE COVER	1			x	24-45798-10	30	N/A	N/A
98	RUBBER LCD UPPER	1			x	24-84515-00	30	N/A	N/A
99	LCD BEZEL 15"	1			x	80-40839-10	30	N/A	N/A
100	LCD 15"Back Cover	1			x	80-40840-10	30	N/A	N/A
101	Module LCD TFT 15" LG	1	x			56-10703-10	N/A	N/A	N/A
102	LCD 15" TFT XGA LP150X05-C2 LG	1			x	71-10676-10	60	12 Mth	FIC
103	INVT/B	1			x	12-01614-01	60	12 Mth	FIC
104	WIRE MB05H COAXIAL CABLE15" HAN	1			x	22-11144-00	60	N/A	N/A
105	CASE HINGE COVER	1			x	24-45798-10	30	N/A	N/A
106	RUBBER LCD UPPER	1			x	24-84515-00	30	N/A	N/A
107	LCD BEZEL 15"	1			x	80-40839-10	30	N/A	N/A
108	LCD 15"Back Cover	1			x	80-40840-10	30	N/A	N/A
109	HINGE_L_15"	1			x	24-84519-00	30	N/A	N/A
110	HINGE_R_15"	1			x	24-84517-00	30	N/A	N/A
111	Module LCD TFT 15" AU	1	x			56-10707-00	N/A	N/A	N/A
112	LCD 15INCH TFT XGA B150XG01-2 AU	1			x	71-10726-00	60	12 Mth	FIC
113	INVT TBD141N TDK FOR MB05H	1			x	12-01614-01	60	12 Mth	FIC
114	WIRE MB05H COAXIAL CABLE15" HAN	1			x	22-11144-00	60	N/A	N/A
115	RUBBER LCD UPPER	1			x	24-84515-00	30	N/A	N/A
116	LCD BEZEL 15"	1			x	80-40839-10	30	N/A	N/A
117	LCD 15"Back Cover	1			x	80-40840-10	30	N/A	N/A
118	HINGE_L_15"	1			x	24-84519-00	30	N/A	N/A
119	HINGE_R_15"	1			x	24-84517-00	30	N/A	N/A

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120	POWER CORD (JAP)	1	x			22-30135-06	30	N/A	N/A
121	POWER CORD (US)	1	x			22-30135-15	30	N/A	N/A
122	POWER CORD (UK)	1	x			22-30135-16	30	N/A	N/A
123	POWER CORD(EUR)	1	x			22-30135-17	30	N/A	N/A
124	POWER CORD(Korea)	1	x			22-301135-18	30	N/A	N/A
125	ADAPTOR 60W FIC DELAT ADP-60NH	1	x			12-01618-02	35	12 Mth	FIC
126	Keyboard(JAP)	1	x			71-31705-00	35	12 Mth	FIC
127	Keyboard(US)	1	x			71-31705-01	35	12 Mth	FIC
128	Keyboard(Canada)	1	x			71-31705-04	35	12 Mth	FIC
129	Keyboard(UK)	1	x			71-31705-05	35	12 Mth	FIC
130	Keyboard(Taiwan)	1	x			71-31705-06	35	12 Mth	FIC
131	Keyboard(Korea)	1	x			71-31705-07	35	12 Mth	FIC
132	Keyboard(France)	1	x			71-31705-09	35	12 Mth	FIC
133	Keyboard(GR)	1	x			71-31705-11	35	12 Mth	FIC