Chapter 1

Outline of the A440 Series

1.1 Introduction

This chapter provides the outline features and operation of the A440 Series including the BIOS Setup program and other system options.

The A440 series all-in-one notebook offers the latest in advanced portable computing and multimedia technology that even outperforms most desktop computers. It incorporates the latest Intel Pentium-III Mobile Processor or Intel Celeron Mobile processor running at 100MHz Front Side Bus. It comes with a built-in Windows 95/98 keyboard, glide pad pointing device, sound system, PCMCIA slots, and advanced power management. It also includes most of the I/O ports found in today's desktop PC including USB (Universal Serial Bus) port, Infrared (FIR), and a docking port.

1.2 Feature Highlights

The A440 Series includes a variety of innovative features:

Table 1-1 Feature Highlights

Features	Description
CPU	• Pentium-III Mobile Processors using Socket 370 FCPGA packaging at 650 / 700 / 750 / 800 / 850 MHz • Celeron Mobile processor using Socket 370 FCPGA packaging at 500 / 533 / 566 / 600 / 633 / 667 MHz
Cache Memory	• On-die secondary level cache (256-Kbyte) for Pentium-III Mobile • On-die secondary level cache (128-Kbyte) for Celeron Mobile
Bus Architecture	32-bit PCI/PCI-to-ISA Bus Architecture
Bus Speed	100 MHz Front Side Bus
System Memory	• Two memory slots for 144-pin SODIMM SDRAM (3.3V) • Uses PC-100 SDRAM (32 / 64 / 128 MB) • Upgradeable to 256MB
Display	• 12.1" SVGA DSTN or TFT Color LCD at 800x600 pixel resolution • 13.3" XGA TFT Color LCD at 1024x768 pixels resolution • 14.1" XGA TFT Color LCD at 1024x768 pixels resolution • Maximum 32-bit True Color display at 1024x768 pixel resolution • Brightness controls via hot-key function
VGA	• High Performance ProMedia CyberBladei1 2D / 3D Graphics Accelerator With AGP support (integrated in North Bridge chip) • 4 or 8 MB RAM using Shared Memory Architecture (SMA) • Up to 1024x768 resolution for external CRT monitor at 16M colors (24-bit True Color)

Features	Description
HDD	• Built-in (internal) 2.5-inch Enhanced IDE hard drive • 4.8 / 6.4 / 10 / 12 GB or above disk drive options • Supports Bus Mastering Ultra-DMA feature
FDD	Built-in 3.5-inch 1.44MB floppy disk drive (3-mode)
CD-ROM / DVD-ROM	• Built-in ATAPI IDE 24X Speed CD-ROM drive; or • Built-in ATAPI IDE 6X or 8X Speed DVD-ROM drive
Keyboard	• Built-in 87-key (90-keys for Japan) Windows 95/98 keyboard with 12 programmable function keys and 9 hot-key functions • Compatible with IBM enhanced 101/102-key keyboard
Pointing Device	• Integrated Touchpad (Glidepad) with 2 select click buttons • PS/2 mouse interface
PCMCIA Slot	• Double-deck PCMCIA 2.1 card slots that support two Type II or one Type III PC cards • 32-bit CardBus PCI local bus technology / Supports mixed voltage PC cards (5V and 3.3V) • Integrated ZV (Zoomed Video) Port function on top PC slot
I/O Port	• Includes the following standard I/O ports: ✓ 1 x 9-pin Serial Port (COM1) ✓ 1 x 25-pin Printer Port (LPT1) ✓ 1 x mini-DIN PS/2 Port (K/B or Mouse) ✓ 1 x 15-pin VGA Port (CRT) ✓ 1 x S-Video Port (TV-out) ✓ 2 x standard USB Port ✓ 1 x SIR Port (COM2) ✓ 1 x Docking Port (Port Replicator)
Audio System	• 16-bit full-duplex sound controller with software wavetable function and FM stereo synthesizer (integrated in South Bridge chip) • Compatible with Sound Blaster Pro • Integrated 2-way stereo speakers and mono microphone • Includes the following: ✓ Microphone-in jack (MIC-IN) ✓ Audio line-out jack ✓ Audio line-in jack ✓ Volume thumb-wheel knob control

Features	Description
Power System	• Universal Auto-switching 60W AC Adapter (100V – 240V) / Auto-charging capability • Rechargeable NiMH (3800mAh/9.6V) or Li-Ion (3200mAh/14.4V) Battery Pack • NiMH Battery Life: 1.5 hours (Power Management Off) • Li-Ion Battery Life: 2 hours (Power Management Off) • Charging Time: 2.5 ~ 3 hours quick charge (computer off)
Power Management	• Windows APM 1.2 Compliant • ACPI and DMI 2.0 BIOS Ready • Suspend-to-RAM and Suspend-to-Disk feature / Auto Suspend hot-key function / Battery Low Auto Suspend • Cover Switch (Suspend/CRT-only) function
LED Indicator	7 x LED Status Indicator for Power Source, Battery Charge, IDE, FDD, Caps Lock, Scroll Lock, Num Lock
Optional Module	• 56Kbps Fax/Voice/Data Internal Modem with V.90 support • 10/100Mbps Fast Ethernet Internal LAN module

1.3 System Configuration

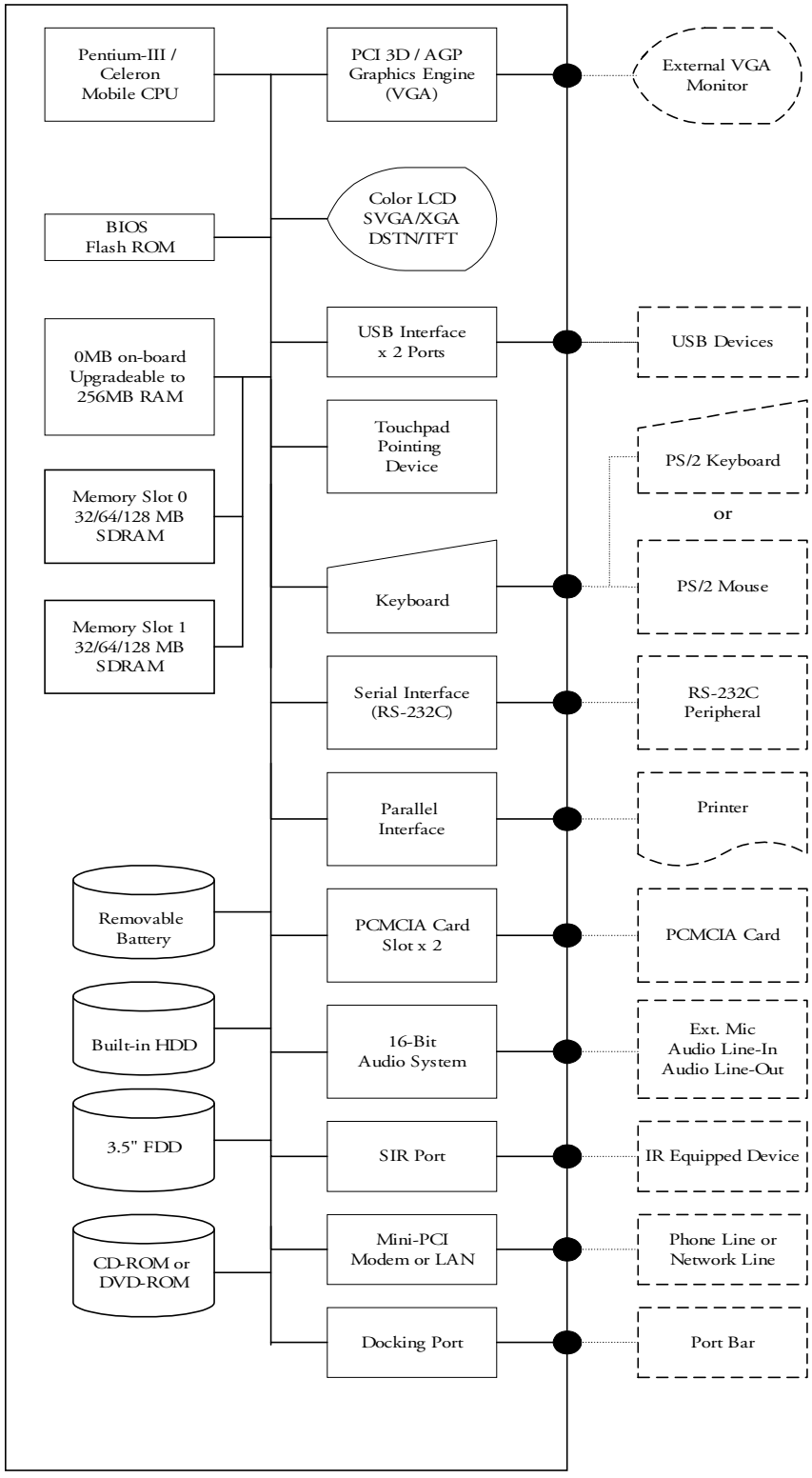


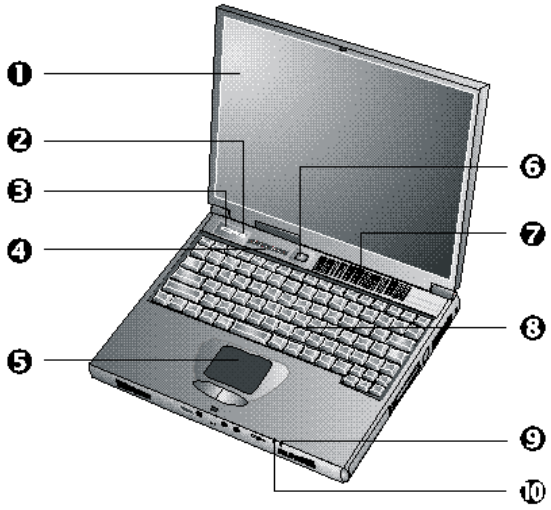
Figure 1-1 System Configuration Diagram

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 Inside 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, touchpad, status LED, and power switch.



❶	Color LCD Panel	❷/❸	Email / Browser Buttons	❹	Status LED Panel
❺	Glidepad	❻	Power Button	❼	Air Cooling Vent
❽	Keyboard	❾/❿	Power/Charge LEDs		

Figure 1-2 Inside the Notebook

Color LCD Display Panel

The notebook comes with several LCD option sizes at SVGA (800x600) or XGA (1024x768) active-matrix TFT color liquid crystal display (LCD). You can adjust and tilt (up to 180°) the LCD screen panel to your desired viewing position.

The notebook uses an integrated AGP VGA graphics controller and shares its video memory (4 or 8MB) from the system main memory using Shared Memory Architecture or SMA. All LCD models can support 16M colors or maximum 32-bit true color at 1024x768 resolution. The notebook also supports simultaneous display of the LCD with the external VGA monitor.

The LCD screen also uses CCFT (Cold Cathode Fluorescent Tube) backlighting which consumes much of the electrical power of the notebook. To save battery power, the system has an advanced power management feature that switches off the LCD when there is no system activity for a predetermined amount of time.

You adjust the brightness and contrast level of the LCD by pressing the display control hot-keys. You activate the hot-keys by pressing the **<Fn>** key along with another function key:

- <**Fn**> + <**F8**> Key = Increases the brightness of the LCD display
- <**Fn**> + <**F9**> Key = Decreases the brightness of the LCD display
- <**Fn**> + <**F10**> Key = Increases the contrast of the LCD display (for DSTN display only)
- <**Fn**> + <**F11**> Key = Decreases the contrast of the LCD display (for DSTN display only)

E-mail and Internet Browser Buttons

The notebook includes two special function buttons for activating the Internet e-mail and browser programs. These buttons are located on the left upper side, above the keyboard assembly. The default e-mail program always activated is Microsoft Outlook Express while the default browser program is Microsoft Internet Explorer. To enable these buttons, the EZ-Button Utility program should first be installed and activated during Windows startup.

Power and Charge Status LED

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

1. **Power / Suspend LED** – lets you know if power to the system is turned on and if system is in Suspend-to-RAM mode. This LED is positioned so that you can see it on both sides whether the LCD panel is opened or closed.

   - Turns color green when the system is powered on.
   - Turns color amber when the battery is low (8%).
   - Blinks when system is in Suspend-to-RAM (STR) mode. Press power button to resume operation.
   - Lights color amber when the battery is critical (below 6%) and system will not allow to power on during cold boot.

2. **Battery Charging LED** – turns on to indicate the battery charging status.

   - Turns color amber to indicate the battery is charging.
   - Turns off to indicate the battery is fully charged or not charging.

Power Button

Press the Power button either to power on or power off the system. The Power button is also a "Smart" switch, meaning that it recognizes when the system is in Suspend mode. If in Suspend mode, pressing the Power button will bring it out of Suspend mode and resume to the system's last state. You can also set the power button function under the CMOS Setup program to either On/Off or Suspend/Resume function. Always check the Power LED after pressing the power button to know the power status of the notebook.

If you are unable to power off the system, use the power override function. Press the power button and hold it in place for four seconds. The system will then power off.

Status LED Panel

The Status LED Panel keeps you informed of the notebook's current operating status. Each LED is marked with an icon to designate a system status.

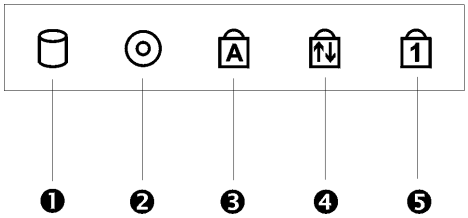


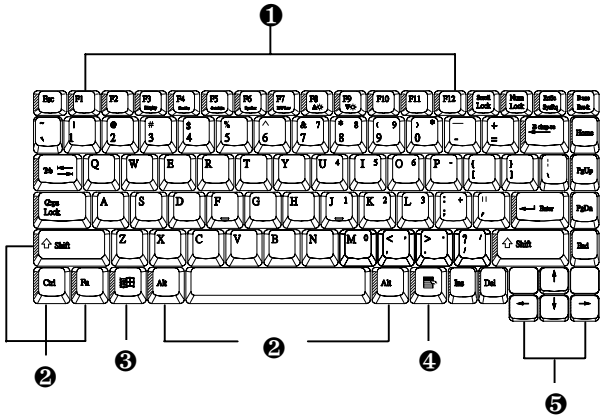
Figure 1-3 Status LED Panel Icons

Table 1-2 Status LED Panel

Icon	Represents	Indicates
❶	**IDE Drive Access**	This LED will turn on when the system is accessing the hard disk drive (HDD).
❷	**Diskette Drive Access**	This LED will turn on when the system is accessing the floppy disk drive (FDD).
❸	**Caps Lock**	This LED will turn on when the Caps Lock key is activated. When activated, all alphabet keys type in will be in upper case or in capital letters.
❹	**Scroll Lock**	This LED will turn on when the Scroll Lock key is activated.
❺	**Num Lock**	This LED will turn on when the Num Lock key is activated. When activated, the embedded numeric keypad (blue print numeric keys) will be enabled.

Keyboard Panel

The notebook keyboard has 87-keys that provides complete emulation of a full-sized enhanced desktop keyboard.



❶	Function Keys	❷	Control Keys	❸	Windows 95/98 Key
❹	Windows Short-cut Key	❺	Cursor Control Keys		

Figure 1-4 Keyboard Layout

The notebook keyboard is a little bit different from a standard desktop keyboard. Aside from the normal alphanumeric characters and the standard keyboard function keys, the notebook keyboard includes an embedded numeric keypad, and special function keys that activates by pressing the <Fn> key together with another key. These special function keys or "hot-keys" allows you to control and adjust some of the functions of the notebook like display controls, power saving features, and others.

(1) **Function Keys** — Six function keys, out of **<F1>** through **<F12>**, are available on the notebook keyboard. These keys also work together with the **<Fn>** key to activate special functions. The following function-key combinations are pre-programmed:

Table 1-3 <Fn> Function Key Combinations

Function Keys	Function Description
<Fn> + <F3>	Display toggles between three video modes, LCD, CRT, or simultaneous display on both.
<Fn> + <F4>	Activates Suspend-to-RAM (STR) mode. Press the power button to resume.
<Fn> + <F5>	Stretch the LCD display when running low-resolution modes on high-resolution LCD panel.
<Fn> + <F6>	Turn the system speaker to on or off.
<Fn> + <F8>	Increases the LCD's brightness.
<Fn> + <F9>	Reduces the LCD's brightness.

(2) **Control keys** – **<Ctrl>**, **<Alt>**, **<Fn>**, and **<Shift>** keys are controls used in conjunction with other keys to change their functions. To use control keys, press and hold the control key while pressing another key. For example, "Press **<Ctrl>+ <C>**" means to hold down the **<Ctrl>** key and type the letter **<C>**.

(3) **Windows 95/98 keys –** Use this key to activate the Start Menu of Windows 95/98.

(4) **Shortcut/Application key** – provides quick access to shortcut menus. (This key acts like a right mouse button.)

(5) **Cursor Control keys** – Cursor control keys let you position the cursor on the screen where you want. On the screen, the cursor is a blinking underline, block, or vertical bar depending on the application.

(6) **Typewriter keys** – Typewriter keys (also called *alphanumeric* keys) are used to enter text and characters. Keys with blue print on them behave differently when combined with control keys or the **<Fn>** key.

(7) **Numeric Keypad** – Pressing **<NumLock>** on the keyboard activates the embedded numeric keypad numbers and functions printed in blue on top of the keys. When you press **<NumLock>** again, the keys revert to their normal functions as typewriter keys.

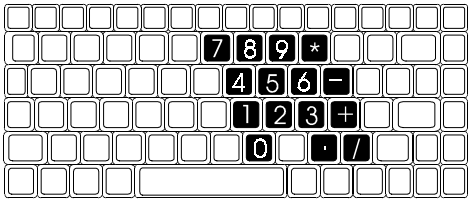


Figure 1-5 Embedded Numeric Keypad

Glidepad

Built in just below the keyboard panel is the Glidepad pointing device. The left and right select buttons of the glidepad is found below the glidepad surface. The left select button is configured (by default) as the left button you normally click on the mouse while the select key to the right is configured as the right button.

To move cursor, place your finger lightly on the sensor pad and move in the desired direction. If you reach the end of the pad, lift your finger and place it back down on the other side.

The Glidepad is compatible with the standard PS/2 mouse and can be activated using the normal DOS or Windows IBM or PS/2 mouse driver. You can also disable the glidepad in the BIOS Setup program.

ⓘ You can execute a left button click function by simply tapping on the Glidepad surface once. Refer to the User Guide of the notebook for more information.

Internal Hard Disk Drive

Found just underneath the left side of the palm-rest panel is the internal hard disk drive (HDD). The internal HDD is an approved industry standard 2.5-inch (12.7mm or 9.5mm) high-capacity IDE hard disk drive. The notebook likewise supports Ultra-DMA and LBA mode up to 12GB capacity or higher.

Cover Switch

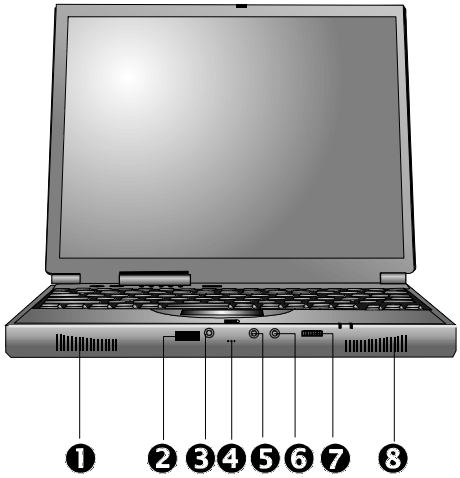
The Cover Switch is found inside the notebook assembly just underneath the latch opening where you insert the LCD cover hook. Whenever the LCD cover is closed, it activates the Suspend mode or switches the display to CRT if there is an external monitor connected.

ⓘ When Suspend-to-RAM mode is activated, make sure not to leave the system for a long period when running at battery mode. The battery will continue to drain some power even in Suspend mode. It is better to save all files and shutdown the power instead or run Suspend-to-Disk mode.

Air Cooling Vent

The air vent allows the CPU fan to draw air into the heat pipe unit found inside the notebook. The hot air, in turn, is emitted out of the notebook through another air vent found on the right side of the notebook.

1.4.2 Front Side of the Notebook



❶	Left Speaker	❷	Optional IR Port	❸	Microphone Port
❹	Internal Microphone	❺	Line-In Port	❻	Earphone Port
❼	Volume Knob	❽	Right Speaker		

Figure 1-6 Right Side of the Notebook

Left and Right Audio Speakers

At the front left and right sides of the base unit are two built-in stereo mini speakers. The speakers are controlled by the audio controller of the notebook and activated by installing the audio driver. For adjusting the volume of the speakers, you can use the volume control program under Windows 95/98 or by adjusting the thumb-wheel volume knob also found on the front side of the notebook.

Internal Microphone

Also in front of the notebook are three small holes where the integrated mono microphone is installed. This allows you to instantly record voice annotations (normally saved as WAV files) and later attached them to documents and presentation using the notebook integrated audio system and application software. Since the notebook also supports full-duplex audio capabilities, you can talk to the microphone and at the same time listen to others talk when connected to a speakerphone modem, Internet live chat, or video conferencing.

External Microphone Jack

The microphone jack (1/8-inch mini-jack) allows you to connect an external microphone with 600-ohm dynamic in place of the built-in microphone of the notebook. The external microphone provides lesser recording noise compared to the built-in microphone of the notebook.

ⓘ Plugging in an external microphone disables the internal microphone.

Audio Line-In Jack

This jack (1/8-inch mini-jack) allows you to feed in audio signals from compact disc player, radio cassette and tape recorder.

Earphone/Headphone Jack

This jack (1/8-inch mini-jack) allows you to connect an external headphone, earphone, or amplified speakers for personal listening.

- Turn the volume level down first before placing the earphone or headphone set into your ear. Then adjust the volume according to your listening level.
- If you get noise feedback on the external speaker, try to lower down the volume knob on the speaker and adjust the volume using the notebook's volume control buttons or the software.

Thumb-Wheel Volume Knob Control

The notebook includes a thumb-wheel volume knob to easily adjust the volume level of the built-in speakers or the external earphone/headphone set.

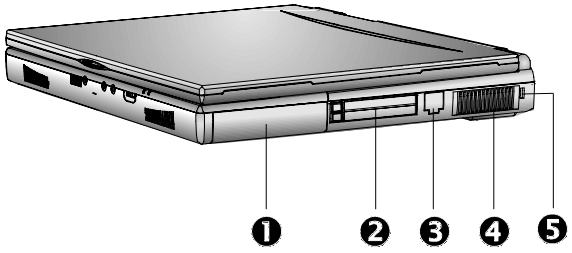
- The volume knob does not work for the Line-Out jack. You need to adjust the volume from the external speakers itself or from Windows program.

IR Port (Optional)

The IR port (COM2 port) provides wireless file transfer between your notebook computer and an IR-equipped computer or device. You can also print to an IR-equipped printer without connecting the printer cable. Refer to Chapter 2 on how to setup and configure the IR port driver. This feature is not available on all models.

- When not using the IR port, it is recommended to disable the COM2 port under BIOS Setup program to free up IRQ resource. The IR port is disabled by default.
- When using the IR port, make sure that there is nothing blocking the transmission.
- When IR is enabled, you must set the PCMCIA fax/modem to COM3 or COM4 instead since COM2 has already been used.

1.4.3 The Right Side of the Notebook



❶	Battery Pack	❷	PCMCIA Slots
❸	Internal Modem or LAN	❹	Air Vent Exhaust
❺	Kensington Lock		

Figure 1-7 Right Side of the Notebook

Battery Compartment

The battery compartment stores the Nickel Metal-Hydride (NiMH) or Lithium-Ion (Li-Ion) battery pack for off-the-cord operation. The battery pack is instantly charge whenever you connect the AC adapter to the notebook. It is very important to always have the battery installed on the notebook to have it always charged and conditioned by the AC adapter. Normal operating time using NiMH battery pack is close to 2 hours while Li-Ion battery pack can take more than 2.5 hours.

ⓘ For new battery packs or for battery packs that are not used for a certain time, you may need to fully discharge and recharge the battery for several times.

PCMCIA Slot Compartment

The PCMCIA slot compartment houses two card slots that support two PCMCIA Type II cards at the same time or one Type III card. The notebook uses a CardBus PCMCIA controller that supports 5V and 3V 32-bit CardBus and 16-bit PC cards including cards with Zoomed Video (ZV) function like MPEG PC cards. The PCMCIA slot compartment comes with vertical sliding doors so you can directly insert the PC card. If you are using a Type III card, insert the Type III card into the top slot.

To remove the inserted PC card, slightly push the button found on the left side of the PC slot to release the eject button. Then push it again to release the PC card. The upper left button releases the card on the top slot while the lower left button releases the card on the bottom slot. When the PC card has moved out a space out of the slot, hold the edges of the card and slowly slide it out.

ⓘ For ZV function PC cards, insert it only into the upper slot. The bottom slot does not support it.

ⓘ For full functionality of PC cards, always ask for the latest driver from your PCMCIA card dealer or download it from their Internet website.

ⓘ For network PC cards, you need first to stop the device under the PC Card properties of Windows 95/98 Control Panel. Otherwise, this may cause system hang or system fatal error.

Modem /LAN Port

The modem/LAN port provides a reserve jack for installing an internal modem with RJ-11 jack or internal LAN module with RJ-45 jack. The internal modem is a 56Kbps-fax/data PCI modem and supports the latest V.90 standard. The internal LAN module is a 10/100Mbps Fast Ethernet PCI module. Only one module can be fitted in and is not user-upgradable. The internal module uses mini-PCI technology. It is sort of a PCI add-in card reduced into a smaller compact form. The internal module is inserted into the mini-PCI socket found on the underside of the notebook.

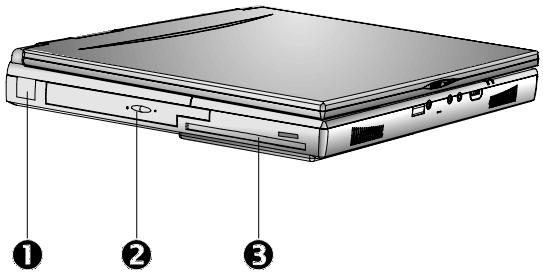
CPU Fan Exhaust

The exhaust vent allows the CPU fan inside to emit the heat out of the notebook and keep it within operating temperature.

Security Lock Latch

This latch allows you to attach a Kensington security lock or other compatible lock for securing the notebook from theft. It is found on the corner near the rear side of the notebook.

1.4.4 The Left Side of the Notebook



❶	USB Ports	❷	CD-ROM or DVD-ROM Drive	❸	FDD Drive

Figure 1-8 Left Side of the Notebook

USB (Universal Serial Bus) Ports

The USB (Universal Serial Bus) Port is a new generation port and has the symbol ⇐. This 4-pin slim port allows you to connect multiple USB devices through daisy chaining or through a USB hub and use them all simultaneously. The USB specification states it can support up to 127 USB devices running at up to 12Mbps. This notebook provides two USB ports.

> When you resume the system from suspend mode, the USB port may not initialize properly. If in case the USB device does not work, unplug and plug the USB device again. This is a known bug released by Intel and Microsoft Windows.

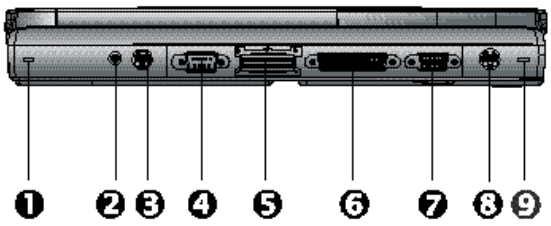
Built-in CD-ROM or DVD-ROM Drive

The notebook comes with a standard 24X-speed ATAPI IDE CD-ROM drive that supports all major CD formats like CD-R, Photo CD, and Video CD. The drive utilizes a pop-out tray loading mechanism and supports bootable CD by setting the BIOS Setup program. Refer to Chapter 2 on how to install the CD-ROM driver. The notebook also comes with a 6X or 8X-speed DVD-ROM drive option.

Built-in Floppy Disk Drive (FDD)

The built-in FDD allows you to use any standard double-sided high-density (DSHD) diskette for copying and transferring data files. The notebook also comes with a 3-mode driver for 1.2MB diskette normally used in Japan. In the BIOS Setup program of the notebook, you also have the option to disable the FDD or set a password option when accessing the drive.

1.4.5 The Rear Side of the Notebook



❶	PortBar Notch	❷	AC Power Port	❸	PS/2 Port
❹	Serial Port	❺	Docking Port	❻	Printer Port
❼	VGA Port	❽	TV Port	❾	PortBar Notch

Figure 1-9 Upper Rear Side of the Notebook

PortBar Notches

Use this notch to secure the PortBar to the back of the system. There are two PortBar notches located at the both ends of the rear side of the system.

AC Power Port

Lets you attach the notebook to the AC power source using the AC adapter that comes with your system. Keep the system connected to AC power whenever possible to keep the battery pack and internal CMOS battery charged. The Battery Charge LED will activate whenever the battery is being recharged.

PS/2 Port

Use the standard PS/2 port to 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 can connect any combination of two of these devices at the same time. For non-PS/2 keyboard, you need to use a keyboard adapter that converts the DIN-type connector to PS/2 connector.

Serial Port (COM 1)

The 9-pin serial port provides a serial interface to which you can connect an RS-232C device such as external serial mouse or modem. This port is commonly referred to as COM1.

ⓘ When connecting an external serial mouse, you must first power off the system before connecting the external mouse. You can auto-detect the serial mouse hardware and run both glidepad and serial mouse simultaneously.

ⓘ Whenever using an external mouse in place of the built-in glidepad, it is recommended to switch the mouse driver to the default standard Microsoft mouse driver.

Expansion Port (Optional)

Use this port to connect the PortBar. The PortBar is an accessory that duplicates the ports found on the back of the notebook. Keep the PortBar in your office connected to peripherals while you take the notebook on the road.

Printer Port (LPT1)

The printer port lets you connect a 25-pin parallel device such as printer, pocket LAN adapter, ZIP drive, or remote data transfer cable. Many operating systems and software applications refer to this port as LPT1. You can run the BIOS setup program to change the configuration of the parallel port to Bi-directional or ECP (Extended Capabilities Port) mode.

> Some older parallel devices may not function with the ECP default setting. You need to run the BIOS Setup program to adjust the settings.

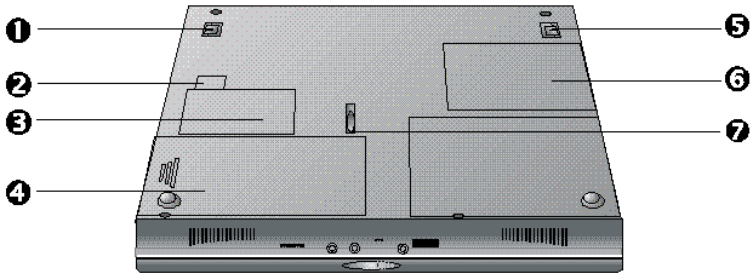
VGA Port (CRT)

The VGA port lets you connect an external VGA (CRT) monitor to the notebook. You can also run the LCD and the external CRT monitor display simultaneously; or switch it to CRT only using the function hot-key (Fn+F3). When switch to CRT only, you can set the display resolution up to 1024x768 at 16M colors (24-bit true color).

TV Port (Optional)

The TV port allows you to connect the notebook to the S-Video connector of your TV and output display for presentation or video playback. This port is not available on all models.

1.4.6 The Under Side of the Notebook



❶/❺	Tilt Foot	❷/❸	Internal Module Compartment
❹/❼	Battery Compartment / Latch	❻	Memory Compartment

Figure 1-10 The Under Side of the Notebook

Tilt Foot (Left and Right)

Allow you to tilt the rear of the notebook upward for more comfortable typing.

Modem/LAN Module (Mini-PCI Socket Compartment)

This compartment houses the mini-PCI socket for inserting the internal modem or LAN module. When upgrading the internal module to either LAN or modem, it is also required to change the cable. Refer to Chapter 2 for installing the Modem/LAN module.

Battery Bay

Also found on the underside of the notebook is the battery bay where the battery pack is attached.

Battery Bay Latch

Also found on the underside of the notebook is the battery bay latch. To remove the battery pack, you need to push this latch and at the same time pull the battery pack.

Memory Compartment

Found on the underside of the notebook is the memory compartment. Underneath the cover are two 144-pin SODIMM memory slots for inserting and upgrading the system memory using 32MB, 64MB, and 128MB SODIMM. The notebook uses PC-100 SDRAM modules for faster memory access. You can upgrade the total memory up to 256MB. One is inserted with a SDRAM configured by the factory. The other is empty for upgrade use. Refer to Chapter 2 on how to upgrade the system memory.

1.5 System BIOS SETUP Program

The notebook uses the Phoenix BIOS Setup program that allows you to set several system configurations in changing the way the system performs. This includes your system time and date, disk drive configuration, I/O device controls, boot drive sequence, and power management settings. The information is then stored in the CMOS RAM chip and will remain permanent unless you change it again. The notebook also uses EPROM Flash BIOS that allows you to update the system BIOS by simply overwriting it using the Phoenix Flash programming utility.

Before boot-up, the system will read the BIOS settings and compare them to the equipment check conducted during the POST (Power-On Self-Test). If an error occurs, an error message will be displayed on the screen, and you will then be prompted to run the BIOS Setup Program. Press the <**F2**> key to run the BIOS Setup program. The BIOS Setup program is organized into six menus which you can select using the <←> and <→> keys. To move from one option to another, you use the up and down arrow keys.

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

- **Menu Bar** - found on the top line of the screen. Each of the six items has a separate menu screen.
- **Parameters** - found on the left side of the screen. This area lists the parameters and their current settings.
- **Item Specific Help** - found on the right side of the screen. This area describes each parameter and its available settings.
- **Key Legend** - the bottom part of the screen. These lines display the keys available to move the cursor, select a particular function and so forth.

The following table lists the keys on how to edit and move around the setup menus inside.

Table 1-4 BIOS Setup Control Keys

KEY	WHAT IT DOES
<F1>	Shows on-line help on key functions.
↑ ↓	Moves the cursor between the displayed parameters.
<+> / <->	Modifies the current parameter settings.
<F9>	Load default configuration.
Tab, Shift-Tab or Enter	For some parameter settings, moves the cursor between the subfields. Also moves the cursor to the next line or selection.
Esc	Exits the current menu and returns to the main menu or go directly to the Exit menu.
←→	Changes between displayed menus.
<F10>	Save changes and exit.

ⓘ Some information here may not be available or different from other date code versions of the notebook BIOS. Always check for the latest BIOS update from the FIC Internet homepage.

1.5.1 Using the Main Menu

The BIOS Setup Main Menu contains the settings for system time and date, and disk drives as well as CPU and system memory information.

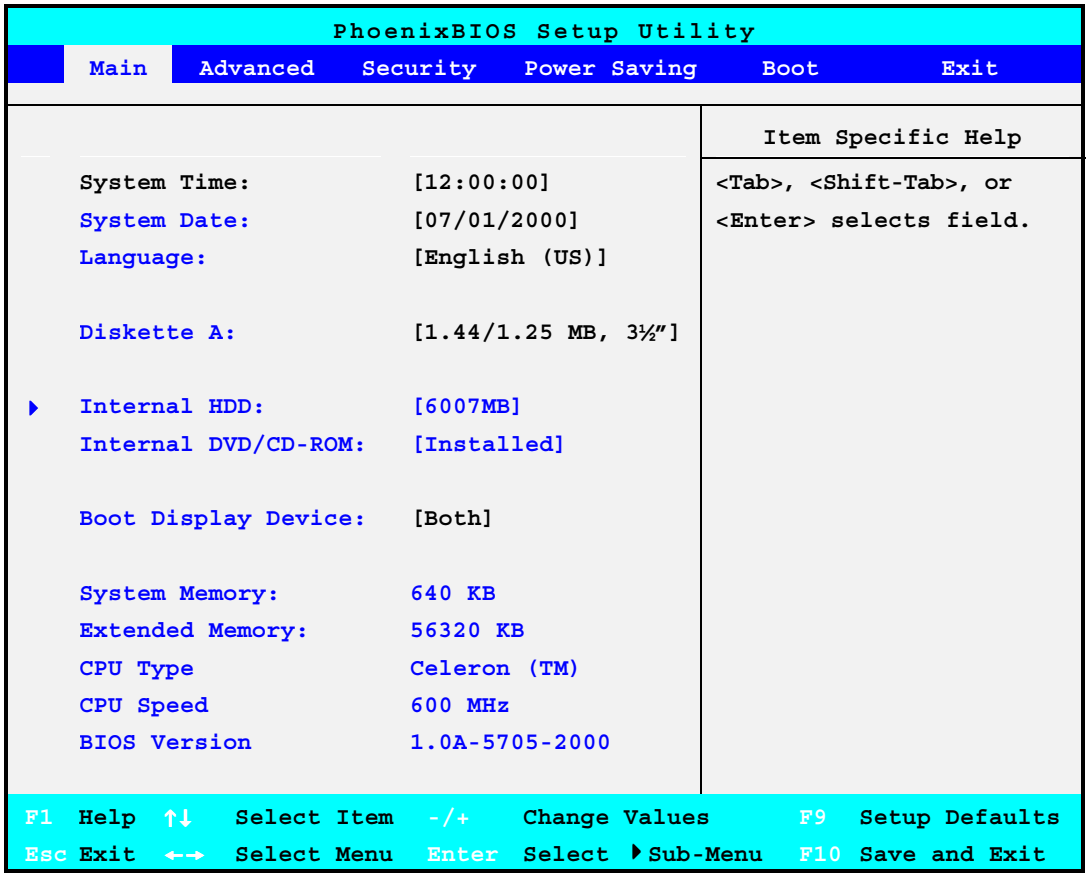


Figure 1-11 BIOS Setup Main Menu

Table 1-5 BIOS Setup Parameters, Default and Alternate Settings

System Time:	[12:00:00]	<Tab>, <Shift-Tab>, or <Enter> selects field.
System Date:	[07/01/2000]	<Tab>, <Shift-Tab>, or <Enter> selects field.
Language:	[English (US)]	Select the display language for the BIOS.
Diskette A:	[Disabled] / [1.44/1.25 MB, 3½"]	Select floppy type. Note that 1.25 MB references a 1024-byte/sector Japanese media format. The 1.25 MB, 3½" diskette requires a 3-Mode floppy-disk drive.
▶ Internal HDD	[6007MB]	
Internal DVD / CD-ROM	Installed	(BIOS auto detect, for information only)
Boot Display Device:	[Both] / [CRT] / [LCD]	Choose the display device.
System Memory	640 KB	(BIOS auto detect, for information only)
Extended Memory	56320 KB	(BIOS auto detect, for information only)
CPU Type	Celeron (TM)	(BIOS auto detect, for information only)
CPU Speed	600MHz	(BIOS auto detect, for information only)
BIOS Version	1.0A-5705-2000	(BIOS auto detect, for information only)

- **System Time** – To set the time, enter the current hour, minute, and second on hr/min/sec, 24-hour format.
- **System Date** – This field lets you set the calendar month, day, and year. The calendar clock is year 2000-compliant and remains in memory even after you turn off the system.
- **Language** – This field lets you set the type of language for the BIOS display.
- **Diskette Drive A** – This field allows you to enable or disable the built-in 1.44/1.25MB 3½" Diskette.
- **Internal HDD** – 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 can be edited.
- **Internal DVD/CD-ROM** – This field displays various parameters for the internal CD-ROM or a DVD-ROM Drive.
- **Boot Display Device** – This field allows you to set the output boot display to the LCD, CRT, or Both.
- **System Memory, Extended Memory, CPU Type, CPU Speed and BIOS Version** – These fields are for information only as the BIOS automatically detects related values.

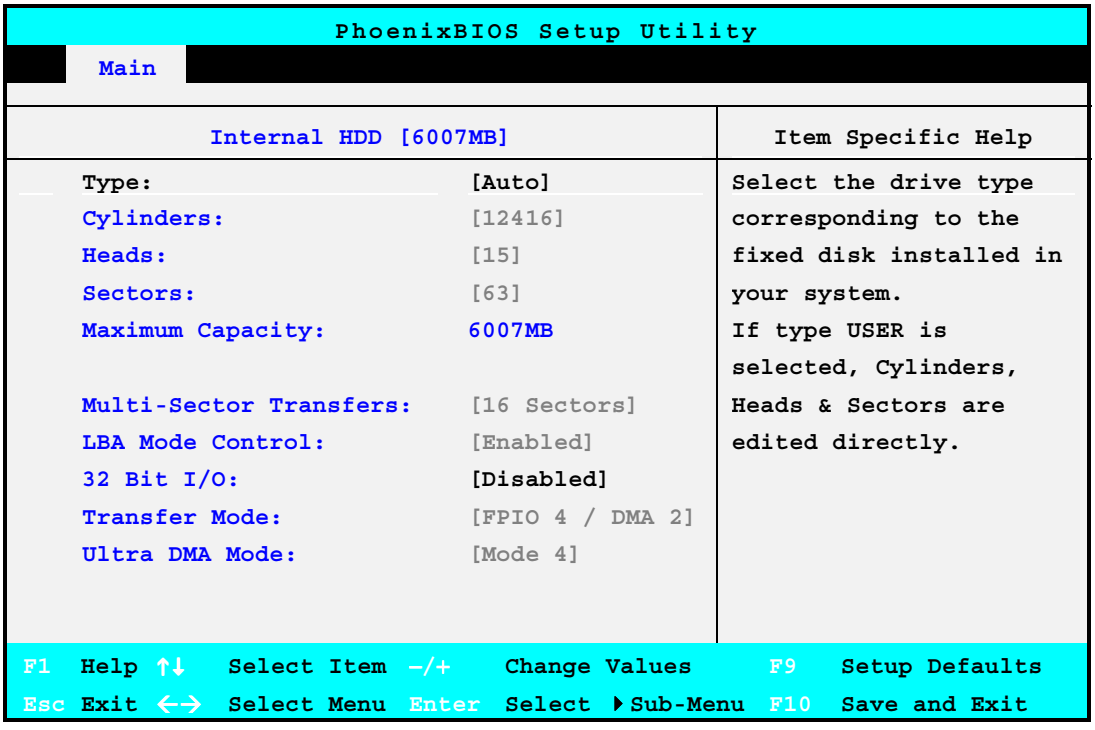


Figure 1-12 Internal HDD/CD-ROM Sub-Menu

Table 1-6 Internal HDD / Internal CD-ROM Sub-Menu Options

Type:	[None] / [CD-ROM] / [User] / [Auto]	Select the drive type corresponding to the fixed disk installed in your system. If type USER is selected, Cylinders, Heads & Sectors edited directly.
Cylinders:	[10068]	(BIOS auto detect, for information only)
Heads:	[15]	(BIOS auto detect, for information only)
Sectors:	[63]	(BIOS auto detect, for information only)
Maximum Capacity:	4871MB	(BIOS auto detect, for information only)
Multi-Sector Transfers:	[Disabled] / [2 Sectors] / [4 Sectors] / [8 Sectors] / [16 Sectors]	Determine the number of sectors per block for multiple sector transfers.
LBA Mode Control:	[Disabled] / [Enabled]	Enabling LBA causes Logical Block Addressing to be used in place of Cylinders, Heads & Sectors
32 Bit I/O:	[Disabled] / [Enabled]	This setting enables or disables 32 bit IDE data transfers
Transfer Mode:	[Standard] / [Fast PIO 1] / [Fast PIO 2] / [Fast PIO 3] / [Fast PIO 4] / [FPIO 3 / DMA1] / [FPIO 4 / DMA2]	Select the method for moving data to/from the drive. Autotype the drive to select the optimum transfer mode
Ultra DMA Mode:	[Mode 2]	(BIOS auto detect, for information only)

1.5.2 Using the Advanced Menu

The Advanced Menu allows you to configure the OS and I/O device settings.

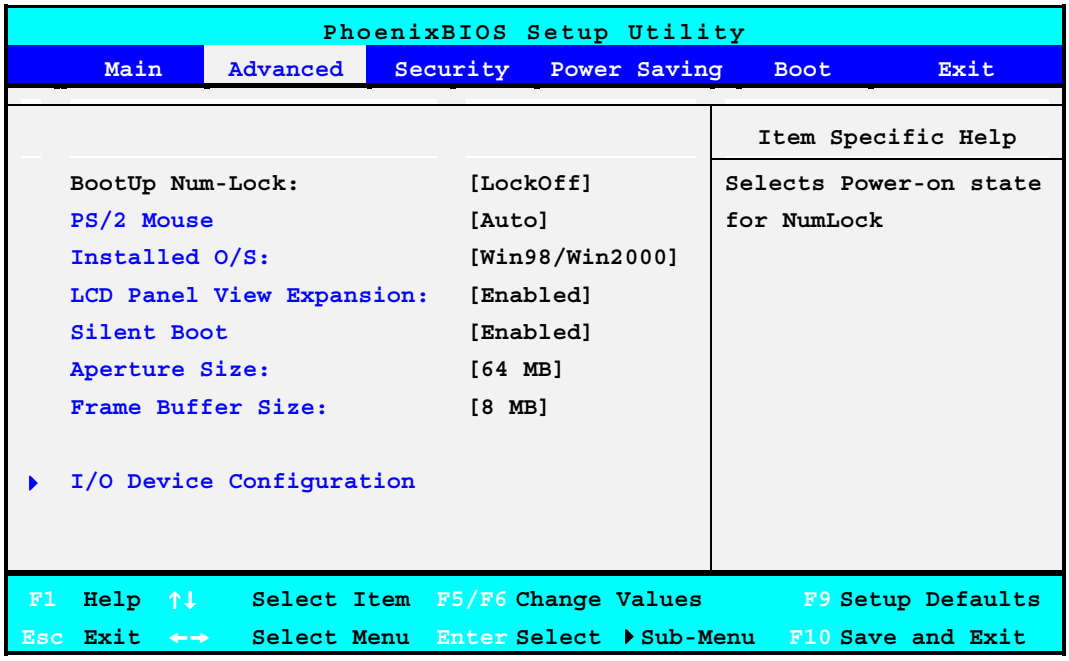


Figure 1-13 BIOS Setup Advanced Menu

Table 1-8 BIOS Setup Advanced Menu Options

BootUp Num-Lock:	[LockOn] / **[LockOff]**	Selects Power-on state for NumLock
PS/2 Mouse:	[Disabled] / [Both] / **[Auto]**	[Disabled] prevents any installed PS/2 mouse from functioning, but frees up IRQ12. [Both] allows both internal and external PS/2 mouse to be active. [Auto] will only allow the external PS/2 mouse to be active if it is detected.
Installed O/S:	[Other] / **[Win98/Win2000]**	Select the operating system installed on your system which you will use most commonly. Note: An incorrect setting can cause some operating systems to display unexpected behavior.
LCD Panel View Expansion:	[Disabled] / **[Enabled]**	[Disabled] – Reduces the panel view in some video mode [Enabled] – Expands the panel view, but it may adversely affect the graphic/text quality
Silent Boot:	**[Enabled]** / [Disabled] / [Black]	Select boot screen using options: [Enabled] – Logo screen on boot [Disabled] – POST screen on boot [Black] – Black screen on boot
Aperture Size:	[4MB] / [8MB] / [16MB] / [32MB] / **[64MB]** / [128MB]	Virtual address use for VGA
Frame Buffer Size:	[4MB] / **[8MB]**	Video memory size.

▸I/O Device Configuration	Submenu	Peripheral Configuration

- **BootUp Num-Lock** – Allows you to set the power-on state for the <NumLock> key. Set this to [LockOn] if you want to enable <NumLock> during power on.
- **PS/2 Mouse** – [Disabled] prevents any installed PS/2 mouse from functioning, but frees up IRQ12. [Both] allows both internal and external PS/2 mouse to be active. [Auto] will only allow the external PS/2 mouse to be active if it is detected.
- **Installed O/S** – Set this option to [Win98/Win2000] if you are installing a Windows operating system. Otherwise, set this option to [Other].
- **LCD Panel View Expansion** – Allows you to expand the display according to the panel resolution of the LCD.
- **Silent Boot** – Select boot screen during POST.
- **Aperture Size** – Allows you to set the aperture size of the VGA.
- **Frame Buffer Size** – You can set to either 4MB or 8MB. Uses Shared Memory Architecture (SMA) so this video memory will be taken from the system main memory.
- **I/O Device Configuration** – Lets you configure input/output device such as Serial Port, Parallel Port, and Floppy disk controller.

```
                    PhoenixBIOS Setup Utility
                       Advanced
 I/O Device Configuration                  Item Specific Help
 Serial port:                [Enabled]     Configure serial port
   Base I/O address:         [3F8 IRQ4]    using options:

 Parallel port:              [Enabled]     [Disabled]
   Mode:                     [Uni-irectional]   No configuration
   Base I/O address:         [378]

                                           [Enabled]
 Floppy disk controller:     [Enabled]       User configuration

                                           [Auto]
                                             BIOS or OS chooses
                                             configuration
 F1  Help ↑↓   Select Item  -/+   Change Values     F9   Setup Defaults
 Esc Exit ←→   Select Menu  Enter Select ▸Sub-Menu  F10  Save and Exit
```

Figure 1-14 I/O Device Configuration Sub-Menu

Table 1-9 I/O Device Configuration Sub-Menu Options

Serial port A	[Disabled] / [Auto] / **[Enabled]**	Configure serial port A using options: Disabled - No configuration, Enabled - User configuration, Auto - BIOS or OS configuration.
Base I/O address	**[3F8 IRQ4]** / [2F8 IRQ3] / [3E8 IRQ4] / [2E8 IRQ3]	Set the base I/O address for serial port A.
Parallel port	[Disabled] / [Auto] / **[Enabled]**	Configure parallel port using options: Disabled - No configuration, Enabled - User configuration, Auto - BIOS or OS configuration.
Mode	**[Uni-directional]** / [ECP] / [Bi-directional]	Set the mode for the parallel port using options.
Base I/O address	**[378]** / [278] / [3BC]	Select the base I/O address for the parallel port when port is Enabled.
DMA channel	[DMA 0] / **[DMA 1]**	Set the DMA channel for the ECP mode.
Floppy disk controller	[Disabled] / **[Enabled]**	Configure the floppy disk controller using options: Disabled - No configuration, Enabled - User configuration

If you disable a device in Setup, you cannot enable or assign it using the Windows (95 or 98) Device Manager. The device is not listed in the Windows device list. You need to select any setting other than “Disable” in Setup.

1.5.3 Using the Security Menu

The Security menu allows you to set the system password as well as disk-protection security.

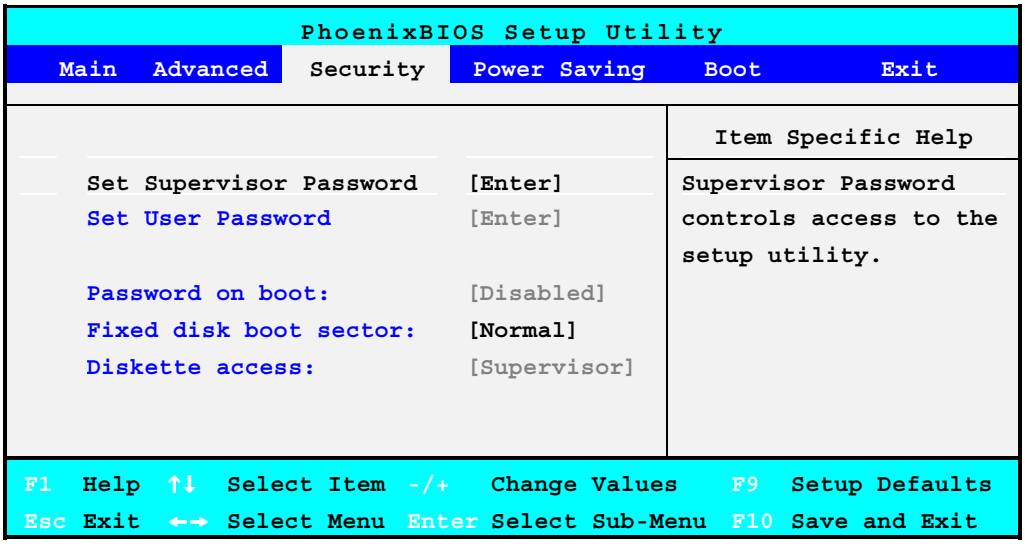


Figure 1-15 BIOS Setup Security Menu

Table 1-11 BIOS Setup Security Menu Options

Set Supervisor Password	Press Enter	Supervisor Password controls access to the setup utility.
Set User Password	Press Enter	User Password controls access to the system.
Password on boot	[Disabled] / [Enabled]	Enabled password entry on boot
Fixed disk boot sector	[Normal] / [Write protect]	Write protects boot sector on hard disk, to protect against viruses.
Diskette access	[User] / [Supervisor]	Control access to diskette drives.

- **Set User Password** – Specifies if the system prompts you to enter a password when accessing the system. The Set User Password function will be enabled once a Supervisor password is set. Enter a new password with up to eight alphanumeric characters, and then enter this same new password again for confirmation.

- **Set Supervisor Password** – Specifies if the system prompts you to enter a password when entering Setup.

- **Password on boot** – Enables password check when booting.

- **Fixed disk boot sector** – [Write Protect] enables write protect boot sector on hard disk to prevent against viruses. [Normal] disables this write protect function.

- **Diskette access** – Controls access to diskette drive.

1.5.4 Using the Power Menu

The Power setup menu lets you balance high performance and energy conservation using parameters including the following.

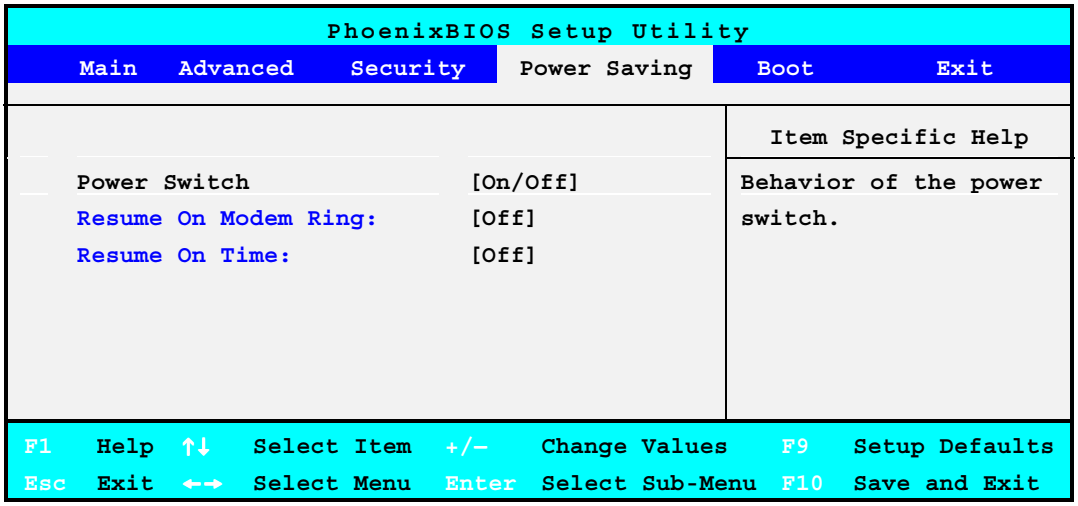


Figure 1-16 BIOS Setup Power Menu

Table 1-11 BIOS Setup Power Menu Options

Power Switch	**[On/Off]** / [Suspend/Resume]	Behavior of the power switch.
Resume On Modem Ring	**[Off]** / [On]	Enabled wakes the system up when an incoming call is detected on your modem.
Resume On Time	**[Off]** / [On]	Enabled wakes the system up at a specific time.
Resume Time	[Hour:Minute:Second]	Specify the time when system is to wake up. <Tab., <Shift-Tab>, or <Enter> selects field.

- **`Power Switch`** – Select the behavior of the power switch.
- **`Resume On Modem Ring`** – **`[On]`** will wake the system up when an incoming call is detected on your modem.
- **`Resume On Time`** – **`[On]`** will wake the system up at a specific time.
- **`Resume Time`** – Specifies the time when system is to wake up. This option is only available when the **`Resume On Time`** is set to **`[On]`**.

Some operating systems, like Windows 98 or Windows 2000, have their own power management software that overrides the CMOS settings. In this case, use the power management settings provided by Windows 98 or Windows 2000.

1.5.5 Using the Boot Menu

The Boot menu lets you decide the boot order of booting devices including:

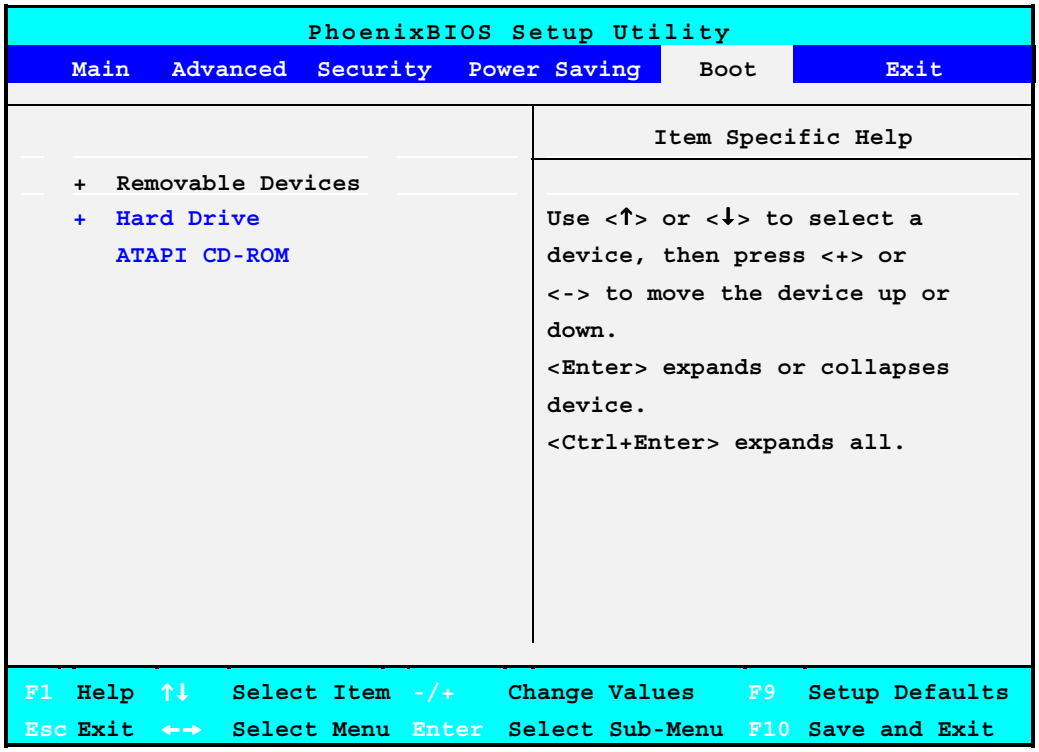


Figure 1-17 BIOS Setup Boot Menu

- **Removable Devices** – put this option on top if you want to boot from a bootable floppy diskette (Drive A:\).
- **Hard Drive** – put this option on top if you want to boot from a bootable hard disk drive (Drive C:\)
- **ATAPI CD-ROM Drive** – put this option on top if you want to boot from a bootable CD-ROM like Windows NT (Drive D:\).

1.5.6 How to Exit the Setup Program

There are three choices to escape from the Setup program.

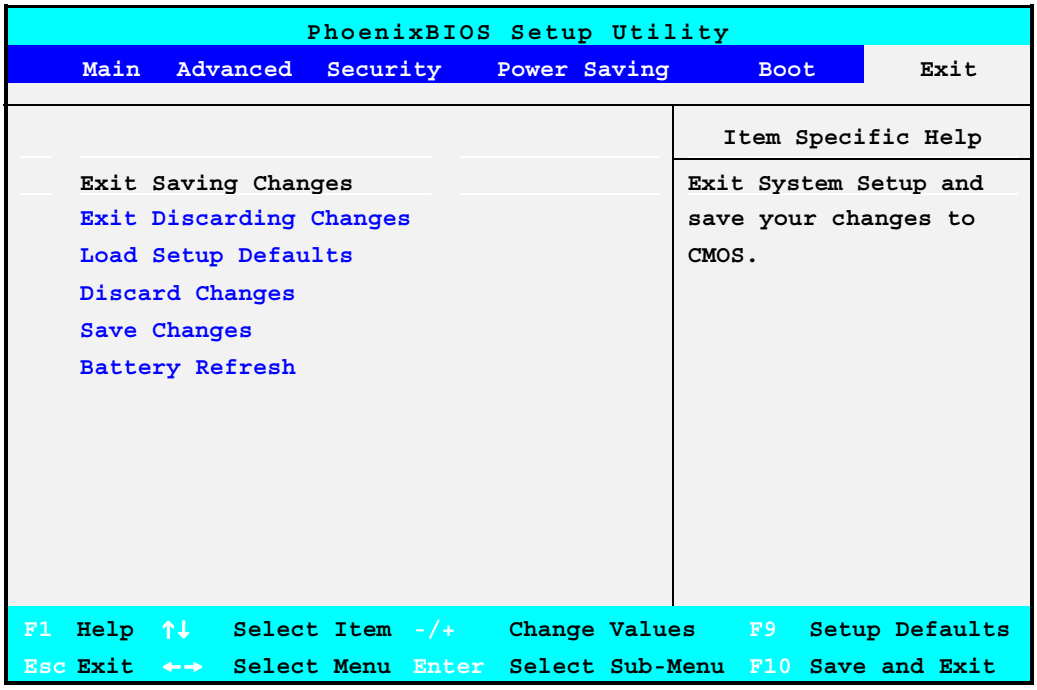


Figure 1-18 BIOS Setup Exit Menu

- **Exit Saving Changes** – Exits System Setup and saves your changes to CMOS.
- **Exit Discard Changes** – Exits Setup utility without saving Setup data to CMOS.
- **Load Setup Defaults** – Loads the default settings for all items in Setup.
- **Discard Changes** – Reverts to previously selected settings and exits Setup.
- **Save Changes** – Saves Setup data to CMOS.
- **Battery Refresh** – Drains and refreshes the battery. This option is only for NiMH battery.

1.6 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.

1.6.1 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. There is an LED on the AC adapter to indicate if DC power is already available.

1.6.2 Battery Pack

Aside from the AC adapter, your computer can also be powered through the removable battery pack. The battery pack uses rechargeable Nickel-Metal Hydride (NiMH) or Lithium-Ion (Li-Ion) battery cells that can run for 2.5 to 3 hours when fully charged and power management enabled. Recharging the battery takes around 2.5 to 3 hours when the computer is off.

You should always leave the battery inside your computer even when using the AC adapter as it also acts as 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. If the AC adapter is not connected or not available, and the notebook is not going to be used for some period, it is advisable to remove the battery pack from the notebook to prevent any current leak.

1.6.3 Internal Modem Module Card

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 right side of the notebook.

1.6.4 Internal LAN Module Card

The notebook also provides an internal 10/100Base-T Ethernet LAN module card in place of the internal modem. The reserve LAN/Modem port can fit either a RJ-11 or RJ-45 jack.

1.6.5 DVD-ROM Drive

Other than the internal CD-ROM drive, the notebook also provides an optional DVD-ROM drive that plugs into the same Secondary Master IDE interface of the CD-ROM drive. The DVD-ROM drive is backward compatible with the CD-ROM drive aside from being capable of reading and playing DVD disc. Using a software MPEG-2/DVD program, the notebook can playback any commercial DVD movie titles. There are some patent restrictions, however, when you want to playback the DVD into your TV set.

1.6.6 PortBar

The PortBar is an accessory that duplicates the ports found on the back of the notebook. Keep the PortBar in your office connected to peripherals while you take the notebook on the road.

Chapter 2

Installation and Upgrade

2.1 Overview

This chapter provides guidelines on installing the device drivers for the built-in features of the A440 Series. Most of the driver installation procedures mentioned here are only for Windows 98/2000 and Windows NT 4.0. 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:

- Phoenix PHDISK Suspend-to-Disk Utility – DOS
- TEAC CD-ROM or MKE DVD-ROM Driver – DOS
- Trident CyberBLADEi1 AGP VGA Driver – Windows 98/2000 and NT 4.0
- AC 97 Software Codec Audio controller Driver – Windows 98/2000 and NT 4.0
- EasyButton (Internet/E-mail button) Driver – Windows 98/2000 and NT 4.0

The notebook also comes with other option devices that requires driver installation:

- MC-97 S/W Modem – Windows 98/2000 and NT4.0
- Intel 82559 LAN Driver – Windows 98/2000 and NT 4.0

Go to the FIC Support website for the latest driver updates.

2.2.1 Running the PHDISK STD Utility

The PHDISK utility of the notebook allows you to create a suspend-to-disk (STD) partition or file that is used to save the opened files when you activate STD mode and power off the computer. If you want to make use of the STD feature, you need first to run the PHDISK utility. There are two options for executing this utility:

1. **PHDISK /Create /Partition** - you can choose to run Suspend-to-Disk and save your work into an allocated fixed disk partition. This option should be done before partitioning and formatting your hard disk. The advantage of this option is that it is more secure since the files are saved in a separate partition and has no risk of being deleted. The disadvantage of this is that you need to allocate enough disk partition for future memory upgrade. The STD partition should always be larger than the system memory RAM.

2. **PHDISK /Create /File** - you can also choose to run Suspend-to-Disk and save your work into a STD file. You do not need to allocate an extra disk partition when running this option. The advantage of this is that you do not need to allocate or waste extra disk partition. The disadvantage of this option is that it is less secure since there is risk of deleting the STD file although the file is hidden.

Running the PHDISK /Create /Partition Option

Before you run this option, you should carefully consider how much disk size you need to allocate for the STD partition. The STD partition should be larger than the installed system memory RAM. If you are planning to install more memory in the future, it is recommended to allocate more disk space. Run FDISK under DOS and leave around 5% of disk space or more for Non-DOS partition. This will later be used by the PHDISK for creating the STD partition. If you already run FDISK before, you need to delete the original partition of the hard disk. Load the notebook driver CD and look for the PHDISK program file. Run "**PHDISK /Create /Partition**" or "**PHDISK /C /P**". The PHDISK utility program will automatically assign a disk size in reference to the installed system RAM to be allocated for the STD partition. After PHDISK has completed the STD partition, you will be prompted to reboot the system.

Running the PHDISK /Create /File

Creating a STD file is much simpler since you do not need to allocate an extra disk partition. Load the notebook driver CD and look for the PHDISK program file. Run "**PHDISK /Create /File**" or "**PHDISK /C /F**". PHDISK will create the **SAVE2DSK.BIN** file on Drive C. The size of this file will depend on the installed RAM memory of your computer. This file also is hidden and has read-only attributes. You must not delete this file.

ⓘ During power on or restart, the system will detect if STD partition or file is present. If not, it will show a red colored dialog box informing you that "Save to Disk Partition Not Present" and "Save to Disk Feature Disabled".

ⓘ Whenever you upgrade the memory, you need to delete the existing STD partition or file and create a new one according to the new memory size. Run PHDISK /Delete /Partition or PHDISK /Delete /File to delete existing STD partition or file.

ⓘ Use PHDISK v4.3 or later.

2.2.2 Installing the DVD-ROM or CD-ROM Driver (For DOS)

This section provides installation guide for the DVD-ROM or CD-ROM device driver under MS-DOS and other operating systems.

> For DOS installation, you must have a pre-installed MS-DOS v6.0 or higher operating system on your hard disk with the “MSCDEX.EXE“ (Microsoft CD Extension) driver file. For DOS, this is located under the DOS directory. For Windows 95/98, this is located under the \WINDOWS\COMMAND subdirectory.

Installing the CD-ROM driver under DOS prompt

1. Boot up the system of your computer and insert the Teac CD-ROM driver diskette into the floppy drive.

2. Change the directory of the DOS prompt to Drive A and run the CD-ROM installation program by typing the command **A:\>INSTALL**.

3. The CD-ROM Setup program will appear and ask you for directory name where the driver will be installed. Press <Enter> to install into the default directory.

4. With "Auto Select" selected, press <Enter> to continue with the installation.

5. With "Modify the file now" selected, press <Enter> to modify AUTOEXEC.BAT file.

6. With "Modify the file now" selected, press <Enter> once again to modify CONFIG.SYS file.

7. Finally, press <Enter> to complete installation. Then, restart the computer after installation is complete. Your computer will then detect the CD-ROM drive and will display the designated drive letter. The CD-ROM drive should be assigned to Drive D. If you have two disk partition, the CD-ROM drive will be assigned to Drive E.

Installing the DVD-ROM driver under DOS prompt

1. Boot up the system of your computer and insert the Toshiba DVD-ROM driver diskette into the floppy drive.

2. Change the directory of the DOS prompt to Drive A and run the DVD-ROM installation program by typing the command **A:\>INSTALL**.

3. The DVD-ROM Setup program will appear and ask you to press <Enter> to start installation or press <ESC> key to exit installation program.

4. A connection diagram appears with a message shown "Confirm the connection environment of the computer, Are you sure?" Press <Y> to confirm.

5. The installation program will ask you to specify the directory where you want to place the DVD-ROM driver. Press <Enter> to install into the default directory.

6. Press <Enter> to continue with the next step.

7. The installation program will automatically copy the DVD-ROM driver to your hard disk and modify the AUTOEXEC.BAT and CONFIG.SYS files in activating the DVD-ROM drive every time you boot the system up.

Installing the MKE DVD-ROM driver under DOS prompt

1. Boot up the system of your computer and insert the MKE DVD-ROM driver diskette into the floppy drive.

2. Change the directory of the DOS prompt to Drive A and run the DVD-ROM installation program by typing the command **A:\>INSTALL**.

3. The Easy Installation menu will appear and ask you to select type of installation. Input <2> and press <Enter> to select Express Installation.

4. Press <Y> to confirm that Autoexec.bat is updated with Mscdex.exe.

5. The installation program will automatically copy the DVD-ROM driver to your hard disk and modify the AUTOEXEC.BAT and CONFIG.SYS files in activating the DVD-ROM drive every time you boot the system up.

ⓘ You may also install Windows 98 by first installing the DVD-ROM / CD-ROM driver under a pre-formatted hard disk with MS-DOS operating system. Then go to Drive D (where the DVD-ROM / CD-ROM drive is assigned), and run "**SETUP.EXE**" to install Windows 98.

ⓘ It is important that you use the DVD-ROM / CD-ROM driver provided together with the notebook. Using other DVD-ROM / CD-ROM driver may not allow Windows 98 to shutdown properly.

Installing Windows 98 from DVD-ROM / CD-ROM

After installing DVD-ROM / CD-ROM driver, you may insert Windows 98 disc into your DVD-ROM / CD-ROM drive and run **"Setup.exe"**.

Installing Windows 2000 / NT from DVD-ROM / CD-ROM

If you are installing Windows 2000 or NT 4.0, you only need to set the boot sequence under the Boot menu of the BIOS SETUP program to "**ATAPI CD-ROM Drive**". Insert the Windows NT compact disc into the CD-ROM or drive and boot directly from the disc for immediate installation.

2.2.3 Installing the VGA Device Driver

Your notebook computer uses the high-performance Trident CyberBLADEi1 VGA controller, which is an AGP 2x video local bus, 2D/3D Graphic Engine and includes Zoomed Video (ZV) Port Technology for supporting ZV PCMCIA cards. Following is the procedure for installing the VGA Driver for Windows 98 and NT 4.0:

Installing VGA Device Driver for Windows 98

1. Insert the CD containing the VGA driver for Windows 98 into CD-ROM drive.

2. Click the **Start** button, and then click **Control Panel.**

3. Click on the **Display** Icon, then go to the S**ettings** folder, click on **Advanced.**

4. Choose the **Adapter** folder, and then click **Change.**

5. The Update Device Driver Wizard message box appears. Click **Next** to continue with the next step.

6. Choose "**Search for a better driver than the one your device is using now. [Recommended]", then** click **Next.**

7. Click on the "**Specify a location"**, then enter the correct path of the Windows 98 VGA driver or click the **Browse** button and navigate into the directory where the VGA driver is.. Then click **Next.**

8. Select "**The updated driver [recommended], Trident Cyberbladei1 AGP [8520-83]**", then click **next.**

9. Windows will display the current Location of the VGA driver, click **Next.**

10. An Insert Disk window will appear, click **OK.**

11. Enter the path of the Windows 98 VGA driver or click the **Browse** button and navigate into the directory where the VGA driver is, then click **OK.**

12. Click **Finish** and choose **Yes** to restart.

13. After restarting the system, you may want to set screen resolution and color depth to have optimum viewing. Go back to the **Display** icon, and then go to the **Settings** folder. Then, adjust resolution and color depth in accordance with your preference.

Installing VGA Device Driver for Windows NT 4.0

1. Insert the CD containing the VGA driver for Windows 2000 into CD-ROM drive.

2. Click the **Start** button, and then click **Control Panel.**

3. Click on the **Display** Icon, then go to the S**ettings** folder, click on **Display Type.**

4. Click **Change.**

5. Click **Have Disk.**

6. Enter the correct path of the Windows 98 VGA driver or click the **Browse** button and navigate into the directory where the VGA driver is.

7. Click **open** and **ok.**

8. Select "**Trident Video Accelerator 3D Adapter V4.83040.83"**, then click **ok.**

9. Windows will display "**Third party Drivers**" window, click **yes** to proceed.

10. Click **ok** and restart.

After restarting the system, you may want to set screen resolution and color depth to have optimum viewing. Go back to the **Display** icon, and then go to the **Settings** folder. Then, adjust resolution and color depth in accordance with your preference

ⓘ The VGA driver for **Trident Cyberbladei1** is already pre-installed in Windows 2000. Therefore, you don't need to install VGA driver.

2.2.4 Installing the Audio Device Driver

Your notebook computer uses the AC97 software CODEC Audio.

Installing Audio Driver for Windows 98/2000

1. Boot Windows from your hard disk and insert the disc containing the Audio driver.
2. Click the **Start** button, and then click **Run**. In the Run dialog box, click the **Browse** button and navigate into the directory where the Audio driver is. Then, run **"Setup.exe".**
3. Click **OK** button to run the setup program.
4. The Welcome message box appears. Click **Next** to continue with the next step.
5. With **"Install"** selected, click **Next** to begin installing the audio driver.
6. With **"Yes, I want to restart my computer now"** selected, click **Finish** to complete the audio installation.

Installing Audio Driver for Windows NT4.0

1. Boot Windows from your hard disk and insert the disc containing the Audio driver.
2. Click the **Start** button, then click **Run**. In the Run dialog box, click the **Browse** button and navigate into the directory where the Audio driver is. Then, run **"Setup.exe".**
3. Click **OK** button to run the setup program.
4. The Welcome message box appears. Click **Next** to continue with the next step.
5. With **"Install"** selected, click **Next** to begin installing the audio driver.
6. An information window will appear, click **ok.**
7. Click **Add.** Select "**VIA MIDI External Port Device**" and then click **ok.**
8. Click **Add.** Select "**VIA PCI Audio Controller**" and then click **ok.**
9. Windows will prompt you if you want to install the joystick driver for Microsoft Sidewinder 3D Pro Joystick. If you have the joystick, click **Yes** and then click **ok.**
10. Click **Add** and then choose the Microsoft Sidewinder 3D Pro Joystick driver.

11. Click **ok.**

12. With **"Yes, I want to restart my computer now"** selected, click **Finish** to complete the audio installation.

2.2.5 Installing the PCMCIA Device Driver

Your notebook computer incorporates a true 32-bit PCMCIA CardBus controller. The PCMCIA controller is pre-configured during Windows 98 / 2000 installation. Inside the System Device Manager, you will find two identical **Texas Instruments PCI-1225 CardBus Controller** device line.

2.2.6 Installing the Infrared (Optional)

Your notebook PC incorporates an IR port that provides wireless data communication with other infrared device.

To use the IR feature, you need to enter BIOS setup and go to the Advanced menu. Select I/O Device Configuration and enable Infrared port.

Windows 98 / 2000 will automatically detect and install the IR port.

2.2.7 Installing the USB Driver

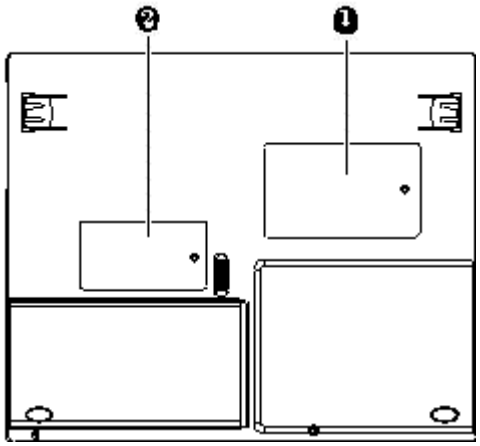
Windows 98 / 2000 will automatically detect and install the USB driver. Check the Universal serial bus controller on the System Device Manager Properties, it should show as follows:

- **Intel 82371AB/EB PCI to USB Universal Host Controller**
- **USB Root Hub**

2.2.8 Installing the Internal Modem

Your notebook computer may come with an optional internal modem. The internal modem is a 56Kps V.90 MC-97 software modem.

Installing Internal Modem for Win98

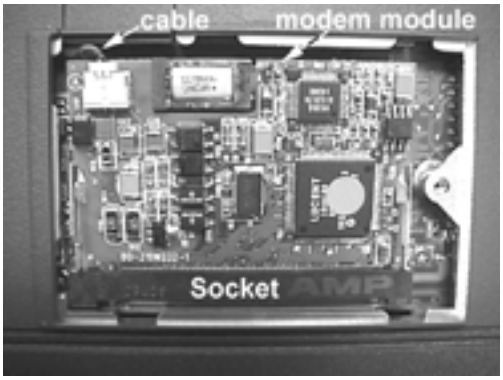


❶	DIMM door	❷	Int. modem / LAN door

1. Make sure the system is powered off and that no peripheral devices are attached. Turn the system over and locate the screw on the internal modem / LAN door.

2. Remove the screw and open the internal modem / LAN door. Locate the alignment notch on the modem module.

3. Locate the modem module socket. Align the notch with the notch in the socket connector and insert the module as follows:
   - Insert the cable into the modem module.
   - Hold the modem module at an angle and align the modem module connector with the socket in the system. Push the connector into the socket.
   - Press down on the edge of the modem module until the locking tabs on the sides snap into place, securing the module.



4. To remove the modem module, press the locking tabs away from the sides of the module until the module pops up. Then, remove the modem module.

5. Reassemble the notebook components as follows:
   - Put the internal modem / LAN door back.
   - Replace the screw.
   - Turn the system over.

6. Boot Windows 98 from your hard disk and insert the driver CD containing the modem driver.

7. Click the **Start** button, and then click **Run.** In the Run dialog box, click **Browse** button and navigate into the directory where the modem driver is. Then, run **"Setup.exe"**.

8. The Welcome message box appears. Click **Next** to begin installing modem driver.

9. With **"Yes, I want to restart my computer now"** selected, click **Finish** to complete the modem installation.

Installing Internal Modem for Windows 2000

1. After the internal modem module is carefully inserted into the socket, boot to Windows 2000 and insert driver CD containing internal modem driver for Windows 2000.

2. Click the **Start** button, and then click **Run**. In the Run dialog box, click **Browse** button and navigate into the directory where the modem driver is. Then, run **"Setup.exe"**.

3. Click **OK** to begin installing modem driver. A message box will appear asking you if you want to continue installation. Click **Yes**.

Installing Internal Modem for Windows NT4.0

1. After the internal modem module is carefully inserted into the socket, boot to Windows NT4.0 and insert the driver CD containing internal modem driver for Windows NT4.0

2. Click the **Start** button, and then click **Run**. In the Run dialog box, click **Browse** button and navigate into the directory where the modem driver is. Then, run **"Setup.exe"**.

3. You will see the Modem installation window, click **Next**. Select "Install New Modem Driver and Components", click **Next**.

4. With **"Yes, I want to restart my computer now"** selected, click **Finish** to complete the modem installation.

2.2.11 Installing Internal LAN

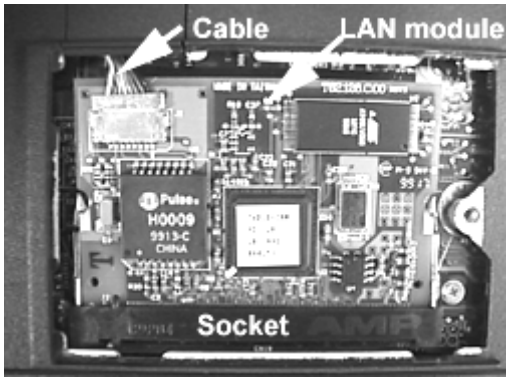
Your notebook computer may come with an optional internal LAN, which uses the Intel 82559 chip.

Installing Internal LAN for Win98 RTM

1. Make sure the system is powered off and that no peripheral devices are attached. Turn the system over and locate the screw on the internal modem / LAN door.

2. Remove the screw and open the internal modem / LAN door. Locate the alignment notch on the LAN module.

3. Locate the LAN module socket. Align the notch with the notch in the socket connector and insert the module as follows:
   - Insert the cable into the LAN module.
   - Hold the LAN module at an angle and align the LAN module connector with the socket in the system. Push the connector into the socket.
   - Press down on the edge of the LAN module until the locking tabs on the sides snap into place, securing the module.



4. To remove the LAN module, press the locking tabs away from the sides of the module until the module pops up. Then, remove the LAN module.

5. Reassemble the notebook components as follows:
   - Put the internal modem / LAN door back.
   - Replace the screw.
   - Turn the system over.

6. Boot Windows 98 from your hard disk and insert the driver CD containing the LAN driver for Windows 98.

7. Click the **Start** button, then click **Settings**, and **Control Panel**. Double click **System** and click **Device Manager** tab. Under **Other devices,** you'll see **PCI Ethernet Controller**. Select it and click **Remove** button.

8. Click **Refresh** button. The **Add New Hardware Wizard** will detect PCI Ethernet Controller. Click **Next** to search for the driver.

9. Click **Next** to continue.

10. Tick **Specify a location** and click **Browse** button. Then, navigate into the directory where the LAN driver is and click **OK**.

11. Click **Next** to continue with the next step.

12. Click **Next** to accept the updated driver for Intel 82559 Fast Ethernet LAN driver.

13. Click **Next** to continue with LAN driver installation.

14. When Windows prompt you for **Intel PRO Adapter CD-ROM**, navigate into the directory where the LAN driver is and click **OK**.

15. Click **Finish** to complete installation.

16. Restart Computer to finish setting up LAN.

ⓘ If you're using Windows 98 Second Edition or Windows 2000, you don't need to install the driver for internal LAN (Intel 82559 PCI Ethernet Adapter) since it is already pre-installed in Windows 98SE and Windows 2000. The above LAN driver installation is only applicable on Windows 98 RTM version.

Installing Internal LAN for Windows NT4.0

1. After the internal LAN module is carefully inserted into the socket, boot to Windows NT4.0 and insert the disc containing internal LAN driver for Windows NT4.0

2. Click the **Start** button, then click **Settings**, and **Control Panel**. Double click **Network** and click **Yes** to install network.

3. With Wired to Network box ticked on, click **Next.**

4. Click **Select from list** button and click **Have disk** button. Type the directory where the driver is and click **OK.**

5. Click **OK** and click **Next** to proceed with next step.

6. Select **Network Protocols** you need and click **Next** to proceed to next step.

7. Select **Network Services** and click **Next** to proceed to next step.

8. Click **Next** to continue installation.

9. When Windows prompts you that Setup needs to copy some Windows files, insert Windows NT disc and type **"E:\i386"**. Then, click **Continue.**

10. Select **"Intel PRO PCI Adapter"** and click **Continue.**

11. Windows will ask you if you have DHCP server on your network. Ask your system administrator and click either **Yes** or **No.**

12. After enabling or disabling network bindings, click **Next** to continue with the next procedure.

13. Click **Next** to start network.

14. Windows might ask you for your computer name, workgroup or domain. Input your data and click **Next.**

15. Finally, click **Finish** and click **Yes** to restart computer.

2.2.12 Installing EZButton Driver

Following is the procedure for installing the Internet and e-mail button driver.

Installing EZButton driver for Windows

1. Boot Windows from your hard disk and insert the diskette containing the Internet/e-mail button driver.

2. Click the **Start** button, then click **Run**. In the Run dialog box, click **Browse** button and navigate into the directory where the EZButton driver is. Then, run **"Setup.exe"**.

3. The **Welcome** dialog will appear. Click **Next** to continue with the installation.

4. If you wish to install the driver in a different directory, click **Browse**. Otherwise, click **Next** to continue with the next step.

5. The **Select Program Folder** dialog box will appear. To setup icon on a different folder, you may type a new folder name or select one from the existing Folder list. Click **Next** to continue.

6. Click **Finish** to complete installation.

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.

S4 – CPU/PCI BUS CLOCK (S4 switch is located above the CPU socket)

Pos #4	Pos #3	Pos #2	Pos #1	CPU	PCI
OFF	OFF	OFF	OFF	91.5	30.5
OFF	OFF	OFF	ON	66.82	33.41
OFF	OFF	ON	OFF	96.22	32.07
OFF	OFF	ON	ON	90	33
OFF	ON	OFF	OFF	133.33	33.33
OFF	ON	OFF	ON	83.1	27.77
OFF	ON	ON	OFF	95	31.67
OFF	ON	ON	ON	100	33.3
ON	OFF	OFF	OFF	75	37.5
ON	OFF	OFF	ON	137	34.25
ON	OFF	ON	OFF	83.31	41.65
ON	OFF	ON	ON	105	35
ON	ON	OFF	OFF	109.99	36.66
ON	ON	OFF	ON	114.99	38.33
ON	ON	ON	OFF	120	40
ON	ON	ON	ON	124	41.33

S3 – K/B ID (S3 is located beside the memory socket)

K/B type	Pos #2	POS #3
US KEYBOARD	OFF	OFF
JP KEYBOARD	OFF	ON
GR KEYBOARD	ON	OFF
RESERVE	ON	ON

Password Override (CMOS/RTC Data) Jumper Setting (SW4)

SW3	Pos#4
RTC Battery Normal	Off
Clear (RTC) DATA	On

Before doing password override, take off AC adapter and battery first.

2.3.2 CPU Upgrade Procedure

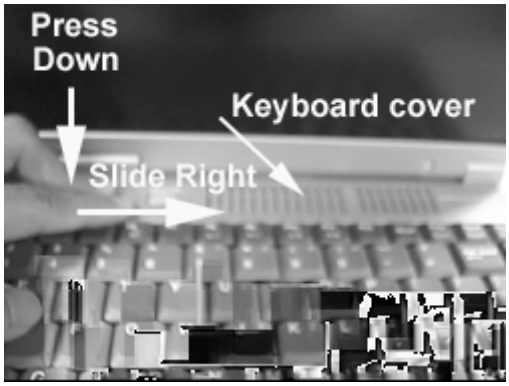
The A440 series features a Socket 370 FCPGA connector for Intel Celeron and Pentium III Processors. The socket is located on the center of the system motherboard. You need to set the CPU speed jumper settings before or after you replace another CPU. Refer to the previous section on jumper settings.

How to Access the CPU Socket

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

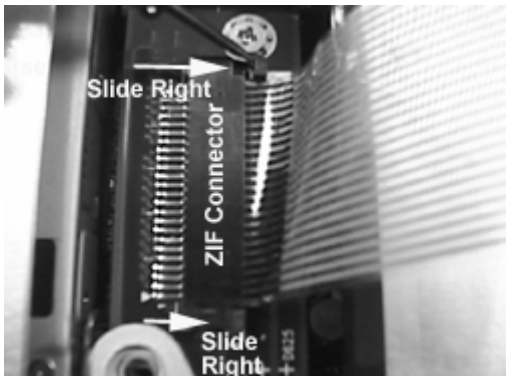
1. Turn off the system and remove both AC adapter and the battery pack from the notebook unit.

2. Remove "keyboard cover" by gently pressing on it and sliding it towards right direction.

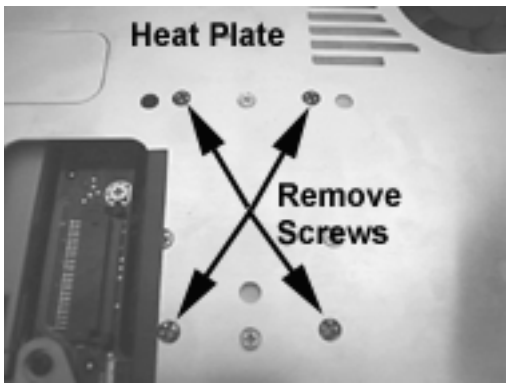


3. Lift the keyboard and tilt it towards the LCD panel.

4. Release keyboard cable by sliding the ZIF connector towards right direction.

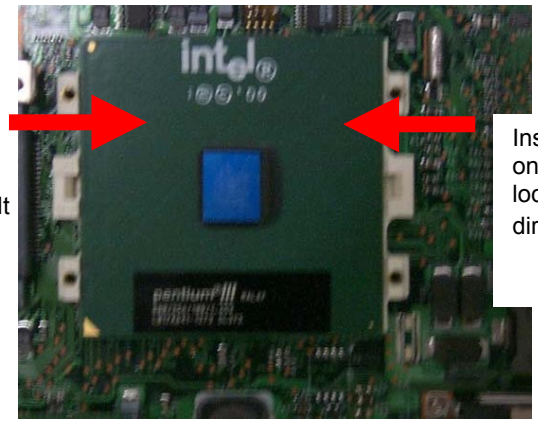


5. Remove four screws as shown in the picture below. Then, remove heat-sink by slightly lifting it up and sliding it towards left direction. Be careful with the CPU fan cable that is still connected on the motherboard. Unplug the CPU fan cable.



6. Using a flat screwdriver, insert it onto the CPU socket and tilt it towards to left direction to unlock CPU from the socket.

Insert flat screwdriver onto the CPU socket. To unlock CPU, Tilt it to the right direction.



Insert flat screwdriver onto the CPU socket. To lock CPU, Tilt it to the left direction.

7. Remove CPU and insert the preferred CPU.

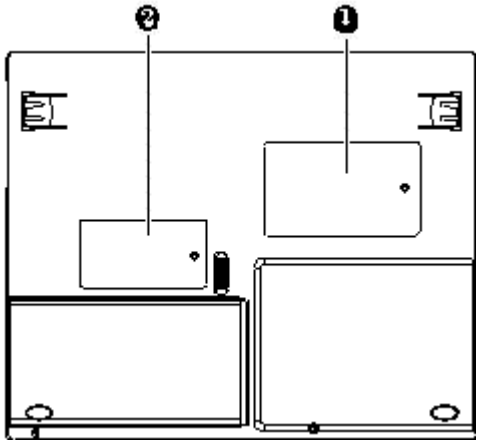
8. Insert a flat screwdriver onto the CPU socket and tilt it towards left direction to lock CPU onto the socket.

9. Set jumper settings in accordance with the tables in section 2.3.1 and place back the heat plate, keyboard and keyboard cable.

2.3.3 Memory Upgrade Procedure

The notebook computer offers two 64-bit memory slot using 144-pin SODIMM (Small Outline Dual Inline Memory Module) at 32MB, 64MB, and 128MB PC-100 SDRAM. Two memory slots are found inside the memory compartment. The memory compartment is located on the underside of your computer inside the memory compartment. The notebook has no memory on-board so you should have at least one SODIMM module inserted.

With two memory slots, you can have several combinations up to 256MB.



❶	DIMM door	❷	Int. modem / LAN door

Memory Compartment

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.

3. Remove the screw and open the memory compartment. Locate the alignment notch on the module.

4. Locate the memory module socket. Align the notch with the notch in the socket connector and insert the module as follows:
   - Hold the SODIMM at a 60-degree angle and align the SODIMM connector with the socket in the system. Push the connector into the socket.
   - Press down on the edge of the SODIMM until the locking tabs on the sides snap into place, securing the module.

5. To remove a SODIMM, press the locking tabs away from the sides of the module until the module pops up. Then, remove the SODIMM.

6. 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.

To remove the built-in hard disk:

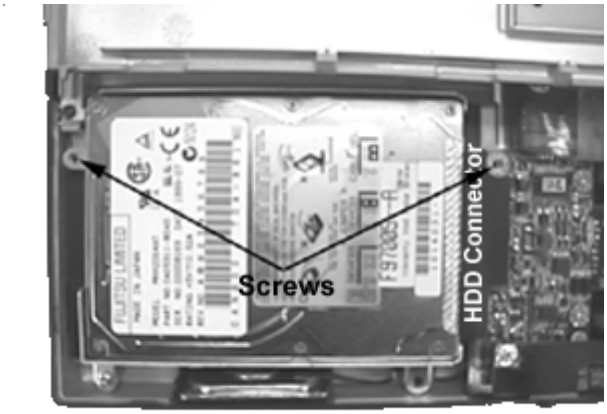
1. Remove the two screws securing the palm-rest cover underneath the system base unit.

2. Remove the palm-rest cover by slowly unsnapping each section of the palm-rest cover from the base unit.

3. When you have remove the entire palm-rest cover, simply flip over the touchpad panel to the keyboard. You will find the built-in hard disk secured with one screw at the upper left corner of the hard disk and another screw at the upper right corner of the hard disk. Remove the screw and carefully pull the hard disk module from the connector on the daughterboard.

4. Remove the four screws securing the hard disk to the bracket connector and replace with another one.

5. Plug in the hard disk module to the connector on the daughterboard and secure the screw on the upper left corner of the hard disk.



Hard Disk Drive Location

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 : 0.3B-0216-6211

ⓘ 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.

ⓘ Always plug in the AC adapter when updating the BIOS.

Chapter 3

Software Functional Overview

3.1 Overview

The A440 is an IBM PC/AT compatible Notebook PC that supports the Socket 370 Intel Mobile Pentium III or Celeron processor family. The following are the major features that A440 supports:

- Microsoft PC99 and ACPI logo approval
- Offer 800x600 SVGA display with 12.1" LCD panel
- Offer 1024x768 XGA display with 13.3"/14.1" LCD panel
- Support ACPI 1.0 (or above)
- Support PCI 2.1 (or above)
- Support AGP 2.0
- Support SMBIOS 2.1 (or above)
- Support 100MHz CPU front side bus
- Support a proprietary Port Replicator

3.2 Summary of the BIOS Specification

Below is the summary of the BIOS software specification:

Controller Chip	Description
BIOS Feature	▪ Boot Block / Crisis Rescue ▪ APM 1.2 Compliance ▪ Support PCI 2.1 (or above) Spec ▪ Support Windows 95, Windows NT4.0, Windows 98, and Windows 2000 ▪ Support Flash function for new BIOS update ▪ Support 3-Mode FDD ▪ Support ACPI 1.0 (or above) Spec ▪ Support SMBIOS 2.1 (or above) Spec ▪ Support AGP 2.0 ▪ Support boot from FDD, HDD and CDROM Drive ▪ Support maximum 4 different keyboards on same BIOS
CPU	Auto detect the CPU type and speed for the Socket 370 or Slot 1 based system
DRAM	▪ Auto sizing and detection ▪ Support PC-100 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 presence on boot and lid closed ▪ Support Panning while LCD in a display resolution greater than supported ▪ Support Microsoft Direct 3D

Controller Chip	Description
Hard Disk	▪ Enhanced IDE spec ▪ Support auto IDE detection ▪ Support LBA mode for larger capacity HDD ▪ Support Ultra DMA 33 ▪ Support Fast PIO mode 1-4 transfer ▪ Support 32-bit PIO transfer ▪ Support Multi-Sector transfer
Multi Boot	Allow the user to select boot from FDD, LS120, HDD 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, one Win95 hot keys, built-in Glide Pad and external PS/2 mouse/keyboard
PCMCIA	Compliant with PCMCIA 2.1 specification
Port Replicator	I/O port replicator duplicates the following ports ▪ Video port ▪ Printer port ▪ COM1 port ▪ PS/2 Mouse & Standard Keyboard port ▪ USB Port ▪ DC In Jack
Power Management Support (APM Mode)	The power management is compliant with APM 1.2 specification and supports the following power state: ▪ Full-On Mode ▪ Doze Mode (This mode is transparent to user) ▪ Stand-By (POS) Mode ▪ Suspend to RAM (STR) Mode ▪ Suspend to Disk (STD) Mode ▪ Soft-Off Mode (SOff)
Power Management Support (ACPI Mode)	The power management is compliant with ACPI 1.0 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	Socket 370 Pentium III at 650 – 850MHz Socket 370 Celeron at 500 – 667MHz
Core Logic	VIA	ProMedia VT8601 (North Bridge) ProMedia VT82C686A (South Bridge)
Video Controller	Trident	Trident 8400 (Integrated in North Bridge)
PCMCIA Controller	TI	TI-1225 CardBus
Supper I/O Controller	VIA	(Integrated in South Bridge)
Audio Codec	WM	WM9701A (AC97 1.03) / WM9703 (AC97 2.1)
Audio Amplifier	TI	TDA0102
Keyboard Controller	Mitsubishi	M38867
PMU Controller	MicroChip	PIC16C62B (SSOP)
ROM BIOS	Winbond	W29C040P, Boot Block Structure
Clock Generator	IC Work	W156
Temperature Sensor	VIA	(embedded in South Bridge chip)
LVDS		THC63LVDM63A
LAN	Intel	82559 (10/100Mbs Fast Ethernet)
Modem	Lucent	Mars3 (PCI Bus S/W Modem)

3.3.2 System Memory

The system memory consists of PC100 SDRAM memory on 64-bit bus and the module size options are 16/32/64/128MB. PC100 SDRAM synchronizes itself with the CPU bus speed so if the CPU is set at 100MHz-bus speed, the memory speed is also running at 100MHz. 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 is done in a way that requires no user interaction.

DRAM Combination Configuration:

Slot #1	Slot #2	Total Size
32MB	NIL	32MB
32MB	32MB	64MB
32MB	64MB	96MB
32MB	128MB	160MB
64MB	NIL	64MB
64MB	32MB	96MB
64MB	64MB	128MB
64MB	128MB	192MB
128MB	NIL	128MB

Slot #1	Slot #2	Total Size
128MB	32MB	160MB
128MB	64MB	192MB
128MB	128MB	256MB
NIL	32MB	32MB
NIL	64MB	64MB
NIL	128MB	128MB

3.3.3 Video

The Video subsystem uses 4 or 8MB of "Shared Memory" from the System Main Memory. The system supports true ZV port, Microsoft Direct 3D, simultaneous display, monitor sense for auto display on boot and VESA Super VGA function call.

Supported Video Mode

The following is all the display modes supported by the Trident 8400 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:

Mode	Pixel Resolution	Colors	Dot Clock	Horizontal Freq.	Vertical Freq.
0, 1	320*400	16	27.175 MHz	31.5 KHz	70 Hz
0*, 1*	320*350	16	25.175 MHz	21.85 KHz	60 Hz
0+, 1+	360*400	16	28.322 MHz	31.5 KHz	70 Hz
2, 3	640*200	16	25.175 MHz	31.5 KHz	70 Hz
2*, 3*	640*350	16	25.175 MHz	21.85 KHz	60 Hz
2+, 3+	720*400	16	28.322 MHz	31.5 KHz	70 Hz
4, 5	320*200	4	25.175 MHz	31.5 KHz	70 Hz
6	640*200	2	25.175 MHz	31.5 KHz	70 Hz
7	720*400	Mono	28.322 MHz	31.5 KHz	70 Hz
D	320*200	16	25.175 MHz	31.5 KHz	70 Hz
E	640*200	16	25.175 MHz	31.5 KHz	70 Hz
F	640*350	Mono	25.175 MHz	31.5 KHz	70 Hz
10	640*350	16	25.175 MHz	31.5 KHz	70 Hz
11	640*480	2	25.175 MHz	31.5 KHz	60 Hz
12	640*480	16	25.175 MHz	31.5 KHz	60 Hz
13	320*200	256	25.175 MHz	31.5 KHz	70 Hz

"*" - Needs to be assign numbers of scan line before setting VGA mode.

"+" - Means default mode.

Supported extended video modes:

VESA Mode	Pixel Resolution	Colors	Dot Clock	Horizontal Freq.	Vertical Freq.
100	640*400	256	25.175 MHz	31.5 KHz	70 Hz
101	640*480	256	25.175 MHz	31.5 KHz	60 Hz
			31.5 MHz	37.5 KHz	75 Hz
			36.0 MHz	43.3 KHz	85 Hz
103	800*600	256	40.0 MHz	37.8 KHz	60 Hz
			49.5 MHz	46.9 KHz	75 Hz
			56.25 MHz	53.7 KHz	85 Hz
105	1024*768	256	65.0 MHz	48.3 KHz	60 Hz
			75.359 MHz	56.746 KHz	75 Hz
			78.75 MHz	60.0 KHz	85 Hz
10D	320*200	32K	25.175 MHz	31.5 KHz	70 Hz
10E	320*200	64K	25.175 MHz	31.5 KHz	70 Hz
110	640*480	32K	25.175 MHz	31.5 KHz	60 Hz
			31.5 MHz	37.5 KHz	75 Hz
			36.0 MHz	43.3 KHz	85 Hz
111	640*480	64K	25.175 MHz	31.5 KHz	60 Hz
			31.5 MHz	37.5 KHz	75 Hz
			36.0 MHz	43.3 KHz	85 Hz
112	640*480	16M	25.175 MHz	31.5 KHz	60 Hz
			31.5 MHz	37.5 KHz	75 Hz
			36.0 MHz	43.3 KHz	85 Hz
113	800*600	32K	40.0 MHz	37.8 KHz	60 Hz
			49.5 MHz	46.9 KHz	75 Hz
			56.25 MHz	53.7 KHz	85 Hz
114	800*600	64K	40.0 MHz	37.8 KHz	60 Hz
			49.5 MHz	46.9 KHz	75 Hz
			56.25 MHz	53.7 KHz	85 Hz
115	800*600	16M	40.0 MHz	37.8 KHz	60 Hz
			49.5 MHz	46.9 KHz	75 Hz
			56.25 MHz	53.7 KHz	85 Hz
116	1024*768	32K	65.0 MHz	48.3 KHz	60 Hz
			75.359 MHz	56.746 KHz	75 Hz
			78.75 MHz	60.0 KHz	85 Hz
117	1024*768	64K	65.0 MHz	48.3 KHz	60 Hz
			75.359 MHz	56.746 KHz	75 Hz
			78.75 MHz	60.0 KHz	85 Hz
120	320*240	256	25.212 MHz	31.5 KHz	60 Hz
121	320*240	64K	25.212 MHz	31.5 KHz	60 Hz
122	400*300	256	40.091 MHz	37.965 KHz	60 Hz
123	400*300	64K	40.091 MHz	37.965 KHz	60 Hz
124	512*384	256	65.028 MHz	48.384 KHz	60 Hz
125	512*384	64K	65.028 MHz	48.384 KHz	60 Hz

Panel Type Initialization

The VGA BIOS will issue an 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 GPI pins before the VGA chip initializes, and pass this information to VGA BIOS through INT 15 Function 5F00h.

LCD Panel ID pin Definition:

GPI Pins			Panel Type
GPI [18]	GPI [10]	GPI [9]	
0	0	0	Reserved
0	0	1	Type 5
0	1	0	Reserved
0	1	1	Type 2
1	0	0	Type 3
1	0	1	Type 4
1	1	0	Type 1
1	1	1	Type 0

Supported LCD panel: Panel Type	Display Size	Panel Description
Type 0	1024*768	14.1” TFT LG
Type 1	1024*768	14.1” TFT Hitachi
Type 2	1024*768	13.1” TFT Acer
Type 3	800*600	12.1” TFT Sanyo
Type 4	1024*768	14.1” TFT CPT
Type 5	800*600	12.1” DSTN Panasonic

3.3.4 Enhanced IDE

The system BIOS can support 4 IDE devices on two controllers up to 12GB in capacity. The BIOS supports Ultra DMA 33 and automatic configuration of drives using both the LBA and CHS large drive re-mapping 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.

Ultra DMA

Ultra DMA/33 is a new physical protocol used to transfer data between an Ultra DMA/33 capable IDE controller and one or more Ultra DMA/33 capable IDE devices. It utilizes the standard Bus Master IDE functionality and interface to initiate and control the transfer. Ultra DMA/33 utilizes a “source-synchronous” signaling protocol to transfer data at rates up to 33 Mbytes/sec.

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.

3.3.6 Super I/O

The Super I/O controller is embedded inside the VIA VT82C686A South Bridge chip. This controller contains 16550A or FIFO Enabled UART, ECP/Standard/Bi-directional Parallel Port meeting the 1284 specification.

3.3.7 PCMCIA

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

- PCI Power Management Compliant
- ACPI 1.0 Compliant
- Supports Two PC Card or CardBus Slots with Hot Insertion and Removal
- Supports Serialized IRQ with PCI Interrupts
- System Interrupts can be Programmed as PCI-style or ISA IRQ-style
- Supports Zoom Video with internal Dual-Buffering (Top Slot)
- 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
IDE accessing LED❶	This LED will turn on while accessing the IDE Device.
FDD accessing LED❶	This LED will turn on while accessing the FDD Device.
Battery Charging LED	Turn on (Green) – Battery is under charging mode Turn off – Battery full charged or no battery
Caps Lock LED❶	This LED will turn on when the function of Caps Lock is active.
Scroll Lock LED❶	This LED will turn on when the function of Scroll Lock is active.
Num Lock LED❶	This LED will turn on when the function of Num Lock is active.
Power Status LED	Green – System is powered on. Green Blinking- System is entered suspend mode. Amber – Battery Low.

❶ - LED will be turned off during Suspend mode.

3.3.9 Hot Keys Definition

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

Hot Keys by Internal Keyboard

Hot Key	Function	Handler
Fn + F3	Toggle Display (LCD/CRT/Simul)	BIOS Handler
Fn + F4	Standby (STR)	BIOS Handler
Fn + F5	Display Stretch	BIOS Handler
Fn + F6	System Speaker On/Off	BIOS Handler
Fn + F8	Brightness Increase	Controlled by M38867
Fn + F9	Brightness Decrease	Controlled by M38867
Fn + F10	Contrast Increase	Controlled by M38867
Fn + F11	Contrast Decrease	Controlled by M38867
Fn + Power Button	Save to Disk	BIOS Handler
Internet Button	Internet Explorer Browser function	Controlled by Driver
Email Button	Internet email function	Controlled by Driver

ⓘ The system will issue a beep to inform user when Fn + F4 and Fn + Power Button hot-keys are pressed.

ⓘ The scale parameters of the brightness and contrast will be saved in CMOS before SoftOff.

Hot Keys by External Keyboard

The following hot keys should be accessible via an external keyboard:

External Keyboard	Function	Handler
Ctrl + Alt + F3	Toggle Display (LCD/CRT/Simul)	BIOS Handler
Ctrl + Alt + F4	Standby (STR)	BIOS Handler
Ctrl + Alt + F5	Display Stretch	BIOS Handler
Ctrl + Alt + F6	System Speaker On/Off	BIOS Handler

3.3.10 Port Replicator (Docking Station)

The Port Bar duplicates the following ports from the notebook:

- VGA port
- Serial port
- Printer port
- PS/2 port For Keyboard
- PS/2 port For Mouse
- USB Port
- DC In Jack

3.3.11 Plug & Play

The BIOS supports the Plug and Play Specification 1.0A. 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, 81~8F	-	4	-
Interrupt Controller	Static	20~21, A0~A1	2	-	-
System Timer	Static	40~43	0	-	-
RTC	Static	70~71	8	-	-
ISA Bus	Static	-	-	-	-
System Speaker	Static	61	-	-	-
System Board	Static	-	-	-	E0000~FFFFF
PnP Mother Board	Static	80	-	-	-
Keyboard Controller	Static	60, 64	1	-	-
Math Coprocessor	Static	F0~FF	13	-	-
PS/2 Mouse	Enable / Disable	-	12	-	-
Video Controller	Static	3B0~3BB, 3C0~3DF	5	-	A0000~BFFFF, C0000~C9FFF, FE800000~FEBFFFFF
Serial Port	Static	3F8~3FF	4	-	-
ECP, Parallel port	Static	378~37F, 778~77F	7	1	-
FDC	Static	3F0~3F5, 3F7	6	2	-
Dual IDE Controller	Static	170~177, 1F0~1F7, 3F6	14, 15	-	-
CardBus Controller	Static	3E0~3E1	10	-	08000000~08001FFF
FAX/Modem	Static	1050~1057, 1400~14FF	5	-	64000000~640000FF
LAN	Static	1080~10FF	5	-	08003000~080033FF
SIR	Static	2F8-2FF, 108~10F	3	0	-
USB Host Controller	Static	EF80~EF9F	5	-	-
Audio Controller	Static		5		

3.3.12 PCI Device

The table below summarizes the IDSEL Pin Allocation:

IDSEL Pin	PCI Device		
	Device Number	Function Number	Device Name
AD11	Device 00	Function 0	VT8601 Host to PCI bridge.
AD12	Device 01	Function 0	VT8601 PCI to PCI bridge.
AD17	Device 06	Function 0	MODEM / LAN
		Function 0	VT82C686A – PCI to ISA bridge
		Function 1	VT82C686A – IDE interface
		Function 2	VT82C686A – USB Port 0-1 Interface
AD18	Device 07	Function 3	VT82C686A – USB Port 2-3 Interface.
		Function 4	VT82C686A – PMU and SMBus interface
		Function 5	VT82C686A – AC97 Audio Interface.
		Function 6	VT82C686A – AC97 Modem Interface.
AD21	Device 0A	Function 0	Card Bus Socket A
		Function 1	Card Bus Socket B

The table below summarizes the INT Pin Allocation:

INT Pin	PCI Device
INTA	CardBus
INTB	LAN/Modem
INTC	VGA/Audio
INTD	USB

The table below summarizes the PCI bus master Allocation:

REQ# Pin	PCI Device
REQ 0	CardBus
REQ 1	VGA
REQ 2	Audio
REQ 3	LAN/Modem

3.3.13 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.

SMBus Device	Host/Slave	Address	BIOS Need to Initialize
VIA VT82C686A	Both Host and Slave	10h	Enable SMBus interface and SMBus interrupt
PIC16C62 – Micro P	Both Host and Slave	04h	No need
IMISC671 – Clock Synthesizer	Slave	D2h	Program the desired clock frequency (Pin23 output 24MHz, Pin22 output 48MHz)
BQ 2040 – Smart Battery	Both Host and Slave	16h	No need

3.3.14 Resource Allocation

This section summarizes the resource allocation of the notebook computer.

I/O Map

Hex Address	Device
000 – 01F	8237-1
020 – 021	8259-1
022	VIA VT82C686A
040 – 05F	8254
060 – 06F	Keyboard Controller
070 – 07F	RTC & NMI Mask
080 – 08F	DMA Page Registers
092	System Control Port
0A0 – 0A1	8259-2
0C0 – 0DF	8237-2
0F0 – 0FF	Math Coprocessor
170 – 177	Secondary IDE Controller
1F0 – 1F7	Primary IDE Controller
200 – 20F	Game Port
220 – 22F	Sound Blaster
279	PnP configuration – Address port
2F8 – 2FF	FIR
330 – 333	MIDI
370 – 371	Sound chip control port
378 – 37A	Parallel Port
388 – 38B	FM Synthesizer
398 – 399	Super I/O Chip
3B0 – 3DF	Video Controller
3E0 – 3E1	PCMCIA Controller
3E8 – 3EF	Fax/Modem

Hex Address	Device
3F0 – 3F7	Floppy Disk Controller
3F8 – 3FF	Serial Port 1
530 – 537	Windows Sound System
778 – 77B	ECP port
A79	PnP configuration – Write data port
CF8 – CFC	PCI BUS configuration register

ISA DMA Map

DMA Channel	Device
DMA 0	Unused
DMA 1	ECP
DMA 2	Floppy Disk
DMA 3	Audio
DMA 4	[Cascade]
DMA 5	Unused
DMA 6	Unused
DMA 7	Unused

Memory Map

Address Range	Length	Description
00000 ~ 9F7FFh	638KB	Base Memory
9F800 ~ 9FFFFh	2 KB	Extended BIOS Data Area
A0000 ~ BFFFFh	128 KB	Video Memory
C0000 ~ C9FFFh	40 KB	Video ROM
CA000 ~ DFFFFh	88 KB	Unused
E0000 ~ FFFFFh	128 KB	System ROM BIOS

IRQ Map

IRQ#	Description
IRQ 0	System Timer
IRQ 1	Keyboard
IRQ 2	[Cascade]
IRQ 3	SIR
IRQ 4	Serial Port
IRQ 5	Audio / VGA / USB / (LAN/MODEM)
IRQ 6	Floppy Disk Drive
IRQ 7	Parallel Port
IRQ 8	RTC Alarm
IRQ 9	Reserved for PCMCIA card
IRQ10	Cardbus
IRQ11	Reserved for PCMCIA card
IRQ12	PS/2 Mouse

IRQ#	Description
IRQ13	FPU
IRQ14	Hard Disk Drive
IRQ15	CDROM or DVD

3.3.15 GPIO Pin Assignment

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

PMU and GPIO Signal Description

Pin Name	Signal Name	Description	Components
GPI [0]	LS120IN#	LS120 module inside.	VT82C686A
GPI [1]	PSCI#	System control interrupt for ACPI events	VT82C686A ← M38867
GPI [2]	PWRBTN#	Power button release check	VT82C686A
GPI [3]	PWSCI#	System control interrupt for wake-up events	VT82C686A ← M38867
GPI [4]	IRQ 6	Assign to IRQ 6.	VT82C686A
GPI [5]	PME#	PME#	VT82C686A
GPI [6]	CLRTC#	Clear RTC	VT82C686A
GPI [7]	RING#	Ring indicate	VT82C686A
GPI [8]	NC		
GPI [9]	LCDID0	LCD Panel ID Pin 0	VT82C686A
GPI [10]	LCDID1	LCD Panel ID Pin 1	VT82C686A
GPI [11]	NC		
GPI [12]	NC		
GPI [13]	NC		
GPI [14]	NC		
GPI [15]	NC		
GPI [16]	KBID0	Keyboard type data 0	VT82C686A
GPI [17]	KBID1	Keyboard type data 1	VT82C686A
GPI [18]	LCDID 2	LCD Panel ID Pin 2	VT82C686A
GPI [19]	BATT_CHG	Battery Charge LED Indicator	VT82C686A
GPI [20]	CDIN#	CDROM module inside	VT82C686A
GPI [21]	DVDIN#	DVD module inside	VT82C686A
GPI [22]	NC		
GPI [23]	NC		

Pin Name	Signal Name	Description	Components
GPO [0]	NC		
GPO [1]	NC		
GPO [2]	STR#	Suspend to ram.	VT82C686A → PIC
GPO [3]	SUSSTAT1#	Suspend status 1	VT82C686A
GPO [4]	CPUSTP#	CPU stop clock	VT82C686A
GPO [5]	PCISTP#	PCI stop clock	VT82C686A
GPO [6]	NC		
GPO [7]	NC		
GPO [8]	DRAMEN#	Select SO0DIMM Dram socket I2C Bus A or B.	VT82C686A
GPO [9]	NC		
GPO [10]	NC		
GPO [11]	L2ZZNC	Power down L2 Cache	VT82C686A
GPO [12]	PORT80CS#	Read/Write Port 80H	VT82C686A
GPO [13]	MCCS#	ACPI chip select	VT82C686A
GPO [14]	IRTX#	SIR	VT82C686A
GPO [15]	IRRX#	SIR	VT82C686A
GPO [16]	HDDREST#	HDD reset.	VT82C686A
GPO [17]	CDROMReset#	CDROM reset.	VT82C686A
GPO [18]	NC		
GPO [19]	SERIRQ	Serial interrupt request	VT82C686A
GPO [20]	FANON#	Power on FAN.	VT82C686A
GPO [21]	PDCOM#	Power down COM	VT82C686A
GPO [22]	PDAMP#	Power down audio amplifier	VT82C686A
GPO [23]	STANDBY#	Inform to PIC the system is in Standby mode	VT82C686A → PIC
EXTSMI#	EXTSMI#	External SMI signal	VT82C686A ← M38867
RSMRST#	RSMRST#	Reset internal suspend logic(resume reset)	VT82C686A ← PIC
PWRBTN#	PWRBTN#	Power button for VT82C686A	VT82C686A ← PIC

Pin Name	Signal Name	Description	Components
SDA	SMBCLK	SM bus clock	M 38867 → PIC
SCL	SMBDATA	SM bus data	M 38867 → PIC
P40	KBCEXTSMI#	Keyboard SMI#	M38867
P54	BATLOW#	Battery low signal	M38867 ← PIC
P55	LID#	LCD lid closing	M38867
P56	CONADJ#	Panel contrast vary	M38867
P57	BACKADJ#	Panel backlight brightness vary	M38867
P60	IDA#	Battery Inside.	M38867
P62	WAKEUP#	SM bus Alert	M38867,PIC
P64	ACIN#	Adapter plug-in detect	M38867, PIC
P66	PME#		M38867
MCLR	PICRESET#	Reset PIC16C62	PIC
RA5	PWRON	Enable system power	PIC
RA1	LEDBATL#	Battery low led indicate	PIC
RB0	PWRSW#	Power switch for PIC	PIC
RA4	RSTGATE	Reset gate for wakeup inhibit reset	PIC
RB2	VEEENA	Enable panel form PIC	PIC
RB3	LEDSUSP#	Suspend led indicate	PIC

3.4 Power Management

This section provides the Power Management software function of the notebook.

3.4.1 General Requirements

The BIOS meet the following general Power Management requirements:

- Compliant with APM 1.2 Specification
- Full APM Support for Windows 95 Fuel Gauge and Power Management functionality
- Support for Suspend-to-RAM and Suspend-to-Disk mode
- Support for Resume on Modem Ring while in STR Mode. This is controlled by a CMOS Setup option
- Power Management must be OS independent
- Power Management must support Resume-on-Time

3.4.2 Power Management Mode Definitions

A particular implementation of system power management may use some or all of the depicted states. A brief description of the state's characteristics is:

Full-On Mode

The system state where no devices are power managed and the system can respond to applications with maximum performance.

Doze Mode

The CPU clock is slow down and all other devices are still full on. (Similar to IDLE mode – Transparent to user)

Stand By (POS) Mode

A suspend state where all motherboard components are still powered-on except for the system clock generator device. The PCI and CPU buses are driven to the inactive idle state. The system memory is powered and refreshed by the memory bridge, and the graphics frame buffer is powered and refreshed by the graphic chip. The system provides a 32KHz clock (SUSCLK) in this suspend mode to support refresh of these memory subsystems. Only an enabled "resume event" can bring the system out of the powered-on suspend (POS) state. The Banister also provides a resume timer that allows the system to resume after a programmed time has elapsed.

Suspend to RAM (STR) Mode

A suspend state where all motherboard components are powered-off. The CPU and PCI busses are powered off. All devices connected to the CPU and PCI busses must either be powered-off or isolate their bus interfaces. The system memory is powered and refreshed by the memory bridge, and the graphics frame buffer is powered and refreshed by the graphics chip. The system provides a 32 KHz clock (SUSCLK) in this suspend mode to support refresh of these memory subsystems. Only an enabled "resume event" can bring the platform out of the Suspend-to-RAM (STR) state.

Suspend to Disk (STD) Mode:

A suspend state where the context of the entire system is saved to disk, all motherboard components are powered-off, and all clocks are stopped. Any enabled "resume event", such as

Power Button or RTC, can bring the platform out of the Suspend-to-disk (STD) state.

Soft Off (SOFF) Mode

This is the same as suspend to disk except the context of memory is not saved. The system will resume from Soft Off as if a hard reset had occurred.

Mechanical Off (MOFF) Mode

All power except the RTC has been removed from the system.

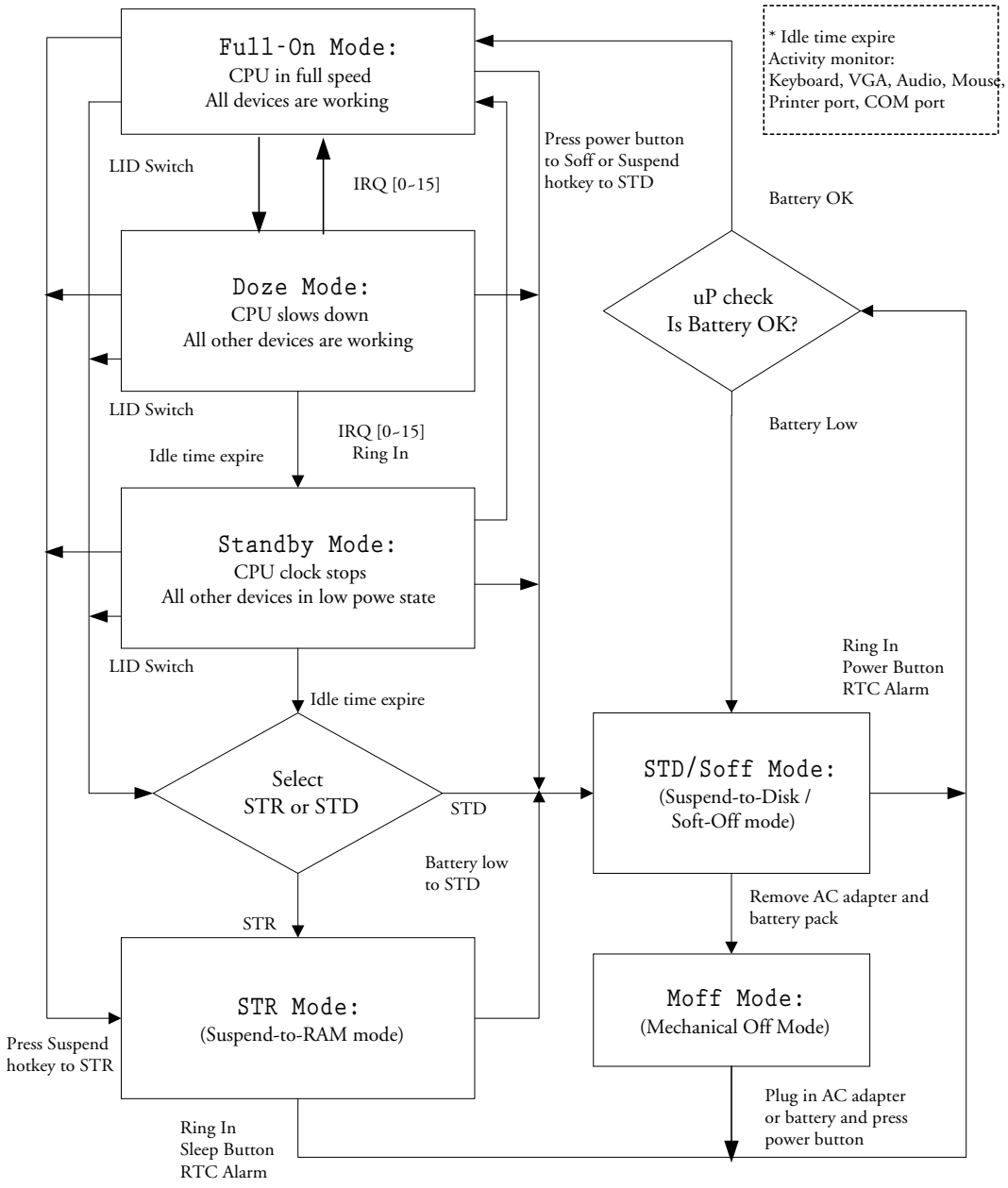
3.4.3 System Power Plane

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)
5VALWAYS	Nil	PIC 16C62A
3VALWAYS	Nil	RTC I/F, Internal modem ring
RTCVCC	Nil	RTC
+12V	PWRON	PCMACIA card
+5V	PWRON	M38867, MAX 3243, PCMCIA Slot (5V VCC)
+3V	PWRON	VGA, Video RAM, PCMCIA chip, PCMCIA Slot (3V), DRAM
+3VS	SUSB#	Audio, Clock Generator, FIR (IMI651 SCLK), TAG RAM, PCI interface, Super-IO
+5VS	SUSB#	HDD, CD-ROM, USB, Internal K/B, Glide Pad, External P/S2 Mouse, FDD, Audio AMP, BIOS ROM

3.4.4 Power Management Mode Transition Flow Chart



3.4.5 PMU Mode Transition Event

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

Power State	Entry Event	Wake up Event
Doze	Doze Time out	Predefined Memory I/O range access Ring Indicator Keystroke (Internal, external or USB keyboard) Mouse movement IRQ 1-15
STR	Suspend Time out Lid close Sleep button STR hotkey pressed.	Sleep Button Ring Indicator Schedule Alarm Battery Low Lid Open
STD	Suspend Time out Battery Low Fn + Sleep Button	Sleep Button Schedule Alarm
Soft Off	Sleep button Execute Win95 shutdown command	Sleep Button Schedule Alarm

3.4.6 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.

State / Component	Doze	Stand By	STR	STD/SOff
CPU	Stop Grant	Stop Clock	Power Off	Power Off
VT8601	ON	Stop Clock	Power Off (except Vcc)	Power Off
VT82C686A	ON	ON	Power Off (except SUSVcc, RTCVcc)	Power Off (except SUSVcc, RTCVcc)
DRAM	ON	Self Refresh	Self Refresh	Power Off
L2 CACHE	ON	Power down	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
PIC 16C62A	ON	ON	Power down	Power down
VGA	ON	Power down	Power down	Power Off
PCMCIA	ON	Power down	Power down	Power Off
Sound	ON	Power down	Power Off	Power Off

State / Component	Doze	Stand By	STR	STD/Soff
LCD Backlight	ON	Power down	Power Off	Power Off
Serial (UART1)	ON	Power down	Power down	Power Off
LAN	ON	Power down	Power down	Power Off
Modem	ON	Power down	Power down	Power down
Parallel	ON	Power down	Power Off	Power Off

Device Power Control Methodology During Stand by 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 SUS_STAT1# pin
VT8601	Hardware	Controlled by SUS_STAT1# pin
VGA Chip	Software	Enter PCI PM D3 state
PCMCIA Controller	Software	Enter PCI PM D3 state
KBC	Working	
FDD	Software	FDD support power down command
HDD	Software	HDD support power down command
CD-ROM	Software	CD-ROM support power down command
Audio AMP	Software	Controlled by GPO[22] pin
Modem	Software	Enter PCI PM D3hot state
LAN	Software	Enter PCI PM D3hot state
LCD Backlight	Hardware	Controlled by VGA chip (FPBACK pin)
Clock Synthesizer	Hardware	Controlled by CPUSTP# and PCISTP# pin
PIC 16C62A	Working	
MAX3243 (RS232 Transceiver)	Software	Controlled by GPO[21] pin
L2 CACHE	Software	Controlled by GPO[3] pin

Device Power Control Methodology During Suspend to RAM Mode

This section illustrates the control methodology of each device/component and its details under Suspend to RAM mode.

Device	Power Down Controlled by	Description
VT8601	Hardware	Controlled by SUS_STAT1# pin
Super I/O	Hardware	Power off
VGA Chip	Software	Controlled by VT8501
HDD	Hardware	Power off
CD-ROM	Hardware	Power off.
PCMCIA Controller	Hardware	Controlled by PCI Bus.
Modem	Software	Power off

Device	Power Down Controlled by	Description
LAN	Hardware	See H/W Spec
FDD	Hardware	Power off
Audio AMP	Hardware	Power off
LCD Backlight	Hardware	Power off
Clock Synthesizer	Hardware	Power off
KBC	Software	Controlled by M38867 power down command
MAX3243 (RS232 transceiver)	Hardware	Controlled by GPO [21] Pin
L2 CACHE	Hardware	Power off
PIC 16C62A	Software	Controlled by PIC 16C62A power down command

Device Power Control Methodology During Suspend to Disk Mode

This section illustrates the control methodology of each device/component and its details under Suspend to Disk mode.

Device	Power Down Controlled by	Description
VT8501	Hardware	Power off
Super I/O	Hardware	Power off
VGA Chip	Hardware	Power off
HDD	Hardware	Power off
CD-ROM	Hardware	Power off
PCMCIA Controller	Hardware	Power off
Modem	Hardware	Supply ring power
LAN	Hardware	Power off
FDD	Hardware	Power off
Audio AMP	Hardware	Power off
LCD Backlight	Hardware	Power off
Clock Synthesizer	Hardware	Power off
KBC	Hardware	Power off
MAX3243 (RS232 transceiver)	Hardware	Power off
L2 CACHE	Hardware	Power off
PIC 16C62A	Software	Controlled by PIC 16C62A power down command

3.4.7 Power / Sleep Button

The Power / Sleep Button can work as Power Button or Suspend Button where the working mode is selected by CMOS setup menu.

Working Mode	Power State					
	OFF	Full on	Doze	Stand by	STR	STD
Power on/off	Power on	Power off	Power off	Power off	Full on	Full on
Sleep	Power on	STR/STD*	STR/STD	STR/STD	Full on	Full on

If you cannot resume properly from Suspend by pressing the Sleep button, try to press it and hold for over 4 seconds, the system will force to power off.

The mode of STR/STD can be selected via CMOS setup.

3.4.8 Lid Switch (Cover Switch)

The Lid Switch will be recognized only when Lid Switch continuously closed for more than 1 second. The system may have different action upon the LCD panel is closed or opened.

Display Mode	Power State	Lid Close	Lid Open
LCD	Full on	STR	Resume
	STR	No active	Resume
	STD	No active	No active
CRT	Full on	No active	No active
	STR	No active	Resume
	STD	No active	No active
Both	Full on	CRT	Both
	STR	No active	Resume
	STD	No active	No active

3.4.9 Power Management Mode Transition

To / From	Full-On	Stand by	Suspend to RAM	Suspend to disk	Off
Full-On	-	Yes	Yes	Yes	Yes
Stand by	Yes	-	Yes	Yes	Yes
Suspend to RAM	Yes	No	-	Yes	-
Suspend to Disk	Yes	No	No	-	-
Soft Off	Yes	No	No	No	-

Transition to Suspend to RAM

- Timer expires
- Lid Switch pressed down (LCD only)

Transition to Suspend to Disk

- Timer expires
- Critical Battery (always Suspend to Disk)

Transition to Soft Off

- Power Switch (When system is not in STR or STD mode)

Resume from Suspend to RAM

- Power Switch
- Modem Ring (SETUP “Resume From Modem Ring: [Enabled]”)
- RTC alarm

Resume from Suspend to Disk

- Power Switch
- Modem Ring (SETUP ”Resume From Modem Ring: [Enabled]“)
- RTC alarm

Resume from Off

- Power Switch

3.5 ACPI

This section provides the ACPI software function of the notebook.

3.5.1 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 specifications.
- Support for Suspend-to-RAM (S3 state) and Suspend-to-Disk mode (S4 state).
- Support the Wake up event from Modem Ring in S3~S4 state. This is enabled by a CMOS Setup option.
- Support the Wake up event from RTC Time/Date alarm in S3~S4 state. This is enabled by a CMOS Setup option.
- Power Management must not substantially affect or degrade system performance.
- Power Management must be OS independent

3.5.2 System Power Plane

Power Group	Power Control Pin	Controlled Devices
B+	Nil	IMM, (9V~12V)
+12V	PWRON	Inverter, AC97 codec, PCMCIA card
+3V	PWRON	VGA, PCMCIA, PCMCIA Slot 3V, DRAM, North Cluster (DRAM I/F), MAX32443
+3VS	SUSB#	Flash ROM, Audio, Clock Generator, TAG RAM
+5V	PWRON	PCMCIA Slot 5V VCC, M38867
+5VS	SUSB#	Super I/O, HDD, CD-ROM, USB, LPT Port, K/B, Glide Pad, Ext. PS/2 Mouse, IR, FDD, Audio AMP
+3V Always	Nil	UP (PIC16C62), Internal modem ring

3.5.3 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

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 state where the computer consumes a small amount of power, user mode threads are not being executed, and the system appear 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, while the rest by the system software. It is not safe to disassemble the machine in this state.

G2/S5 - Soft Off

This is a state where the computer consumes a minimal amount of power. No user mode or system mode code is running. 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:

This state 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.

3.5.4 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 and transition, refer to the ACPI specification.

S1 Sleeping State (Doze mode)

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 contexts.

S2 Sleeping State (Standby mode)

The S2 sleeping state is a low wake-up latency sleeping state. This state is similar to the S1 sleeping state except the CPU and system cache context is lost (the OS is responsible for maintaining the caches and CPU context). Control starts from the processor's reset vector after the wake-up event.

S3 Sleeping State (STR mode)

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 (STD mode)

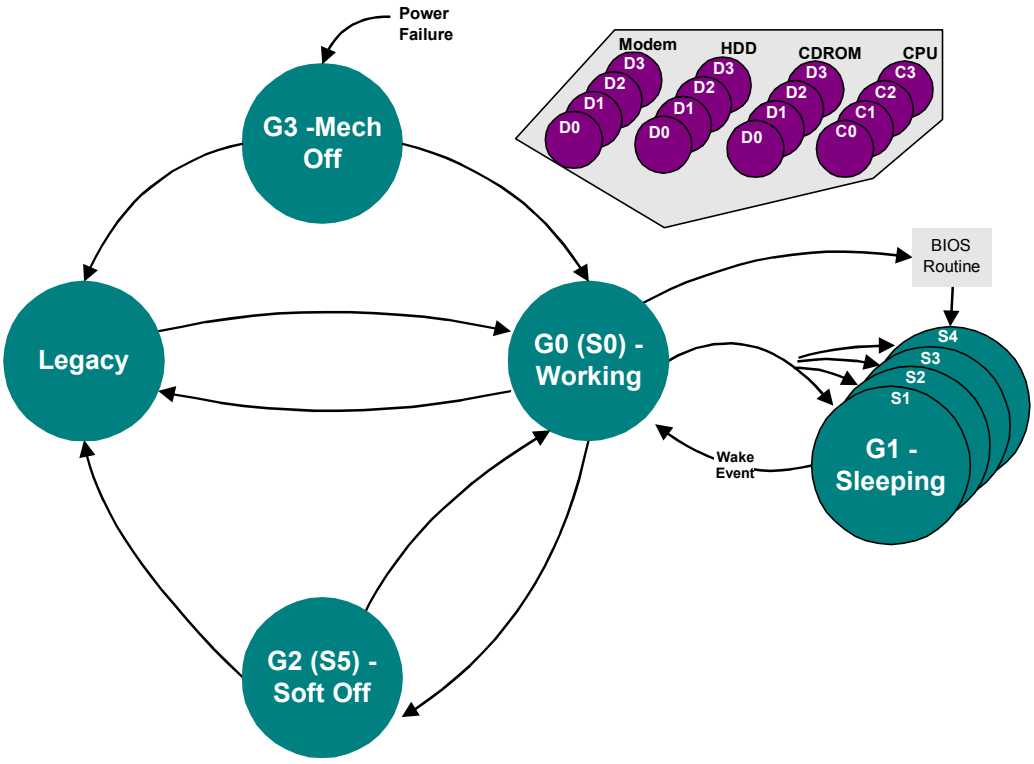
The S4 sleeping state is the lowest power, longest wake-up latency sleeping state supported by ACPI. In order to reduce power to a minimum, it is assumed that the hardware platform has powered off all devices. Platform context is saved in disk.

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 "SOFF" 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. This is 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.

3.5.5 Power States

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



3.5.6 Power States transition event

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

Power State	Entry Event	Wake up Event
S1	OSPM* control	Predefined Mem/IO range access Ring Indicator Keystroke IRQ1-15 SMI# / ACPI SCI# / USB
S2	OSPM control	Predefined Mem/IO range access Battery Warning Battery Low Ring Indicator Keystroke (Int., Ex. And USB keyboard) Mouse movement Schedule Alarm SMI# / ACPI SCI# / USB

Power State	Entry Event	Wake up Event
S3	OSPM control, Sleep Button, Lid Close	Sleep button Ring Indicator Schedule Alarm Lid Open PME# Battery Low
S4	OSPM control,	Sleep Button Ring Indicator Schedule Alarm
S5	OSPM control, Power Button	

ⓘ OSPM: OS-directed Power Management

3.5.7 Lid Switch

ⓘ The function of the Lid Switch (Lid Cover) follows the ACPI Power Management Control Settings under Windows.

3.5.8 Power/Sleep Button

ⓘ The function of the Power/Sleep Button follows the ACPI Power Management Control Settings under Windows.

3.5.9 Device Power Management

ⓘ Please refer to the 3.4.8 Device Power Management for APM mode.

3.6 Battery Management

The A440 supports both Li-Ion and Ni-MH Battery Pack. There is only one battery pack activating at one time.

3.6.1 Battery-Powered Mode

This mode assumes that the mobile system is powered only from the battery. The purpose of this is to maximize battery life.

3.6.2 AC-Powered Mode

In this mode it is assumed that the mobile system is powered from an external AC/DC source. The purpose of this state is to maximize performance subject to thermal constraints.

3.6.3 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 battery voltage is too high
- Battery Life → average 2.5 Hours.
- Battery reading methodology is through M38867 SMBus.

ⓘ Note that the battery life is dependent 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.

3.6.4 Battery Low

When the battery voltage is approaching to the Low level (8%), the M38867 will generate a battery low SMI. The system will do the following action.

- The Power Indicator will become amber.
- The system will issue Warning beep.

ⓘ Under Windows 98, the battery low level is set at 10%.

3.6.5 Battery Low-Low

When the battery voltage is approaching to the Low-Low level (3%), the M38867 will generate a battery low-low SMI. The system will do the following action.

- The Power Indicator will keep amber.
- 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.

ⓘ Under Windows 98, the battery critical level is set at 3%.

3.6.6 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 changing mode.
- The power management function will be disabled, if the Setup item of “Power Management” is set to “Battery Only”.
- The “Battery Warning” and “Battery Low” condition will be removed.

3.7 PIC16C62A – uP

The micro controller PIC16C62A acts as a supplement for power management control. It supports many functions via SMBus interface.

3.7.1 System Communication with PIC16C62A

The system communicates with PIC16C62A via SMBus interface. The SMBus host (M38867) should be firstly initialized before starting the transaction. The following is the procedure for system communication with PIC16C62A:

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 PIC16C62 slave address to SmbHstAdd register.
   - Send command to PIC16C62A -- Slave address is 04h.
   - Read data from PIC16C62A -- 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 PIC16C62A.

7. Wait for SMBus interrupt to occur, 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 PIC16C62A.

3.7.2 PIC16C62 Command List

The micro controller PIC16C62 (called micro-P or uP) acts as a supplement for power management control. It supports the following functions via SMBus command:

Command/Data	Access	Unit	Function Description
0x00			Reserved
0x01	read	word	Read PIC software version
0x02	read	byte	Read LCD contrast level (DAC)
0x03	read	byte	Read LCD brightness level (DAC)
0x04	read	word byte0 byte1	Read primary battery DQ_NAC NACH NACL
0x05	read	word byte0 byte1	Read 1st battery DQ_LMD&NACH DQ_LMD DQ_NACH
0x06	read	byte	Read primary battery DQ_FLGS1
0x07	read	byte	Read primary battery DQ_TMPGG
0x08	read	byte	Read primary battery DQ_FLGS2

Command/Data	Access	Unit	Function Description
0x09	read	byte	Read primary battery DQ_PPD
0x0A	read	byte	Read primary battery DQ_PPU
0x0B	read	byte	Read primary battery DQ_VSB 2014
0x0C	read	byte	Read primary battery DQ_VTS 2014
0x0D	read	word byte0 byte1	Read secondary battery DQ_NAC NACH NACL
0x0E	read	byte byte0 byte1	Read 2nd battery DQ_LMD&NACH DQ_LMD DQ_NACH
0x0F	read	byte	Read secondary battery DQ_FLGS1
0x10	read	byte	Read secondary battery DQ_TMPGG
0x11	read	byte	Read secondary battery DQ_FLGS2
0x12	read	byte	Read secondary battery DQ_PPD
0x13	read	byte	Read secondary battery DQ_PPU
0x14	read	byte	Read secondary battery DQ_VSB
0x15	read	byte	Read secondary battery DQ_VTS
0x16	read	word byte0 byte1	Read battery chemistry characteristic Primary battery 0x00:non-battery 0x02:Li-ION 0x03:Ni-MH Secondary battery 0x00:non-battery 0x02:Li-ION 0x03:Ni-MH
0x17	read	word byte0 byte1	Read primary battery NACL1, NACL2 at interval of 20s NACL2 NACL1
0x18	read	word byte0 byte1	Read secondary battery NACL1, NACL2 at interval of 20s NACL2 NACL1
0x19	read	word byte0 byte1	Read LCD contrast/brightness Brightness Contrast
0x1A	reserved		
0x1B	reserved		
0x1C	reserved		
0x1D	reserved		
0x1E	reserved		
0x1F	reserved		
0x20	write	byte	System command

Command/Data	Access	Unit	Function Description
0x20/00			NOP
0x20/01			System suspend request
0x20/02			System resume from suspend
0x20/03			Mask PICSMI, BAT_L, BAT_LL
0x20/04			Enable PICSMI, BAT_L, BAT_LL
0x20/05			Blinking battery low LED
0x20/06			Un-blinking battery low LED
0x20/07			AC adapter plugged in
0x20/08			AC adapter plugged out
0x20/09			System power off
0x20/0A			Used in SMB system
0x20/0B			Used in DQ battery system
0x20/0C			Sound single set alarm beep
0x20/0D			Un-sound alarm beep
0x20/0E			Blinking battery low LED & Sound single alarm beep
0x20/0F			Un-blinking battery low LED & Un-sound single alarm beep
0x20/10			Sound alarm beep twice per minute
0x20/11			Un-sound alarm beep twice per minute
0x20/12			Blinking battery low LED & Sound alarm beep twice per minute
0x20/13			Un-blinking battery low LED & Un-sound alarm beep twice per minute
0x20/14			Enable LCM VEENA
0x20/15			Disable LCM VEENA
0x20/16			System resume from suspend & Issue a low pulse 100mS
0x20/17			Set suspend LED ON
0x20/18			Set suspend LED OFF
0x20/19			Stop PWM1 & PWM2 function
0x20/1A			Resume PWM1 & PWM2 function
0x20/1B			Mask modem ring-in resume
0x20/1C			Enable modem ring-in resume
0x21	write	byte	Set LCD contrast level
0x22	write	byte	Set LCD contrast maximum value
0x23	write	byte	Set LCD contrast minimum value
0x24	write	word byte0 byte1	Set LCD adjust scale Contrast scale Brightness scale
0x25	write	byte	Set LCD brightness level
0x26	write	byte	Set LCD brightness maximum value
0x27	write	byte	Set LCD brightness minimum value

Command/Data	Access	Unit	Function Description
0x28	write	word byte0 byte1	First power on set LCD contrast, brightness level & for POST reset BAT_L, BAT_LL signal & LED Contrast Brightness
0x29	reserved		
0x2A	write	word byte0 byte1	Write data to primary battery BQ2010 command | 0x80 (set bit7) i.e. 83H:write NACH 84H:write BATID 85H:write LMD 8CH:write VTS 2014 only Data
0x2B	write	word byte0 byte1	Write data to secondary battery BQ2010 command | 0x80 (set bit7) i.e. 83H:write NACH 84H:write BATID 85H:write LMD 8CH:write VTS 2014 only Data

3.8 Miscellaneous

3.8.1 Security

The user may enter up to eight 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. Also, the User Password may not access the floppy disk when the Supervisor Password protects it.

When the security function is enabled, the system will request the user to enter password during the following situation:

- Power On → The system will prompt the user to enter the password before booting the OS. If the user key in the wrong password three times, then the system will halt.

- 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 three times, the system will not resume and should return to Suspend mode.

- 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 three times, then the system will halt.

3.9 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.

Chapter 4

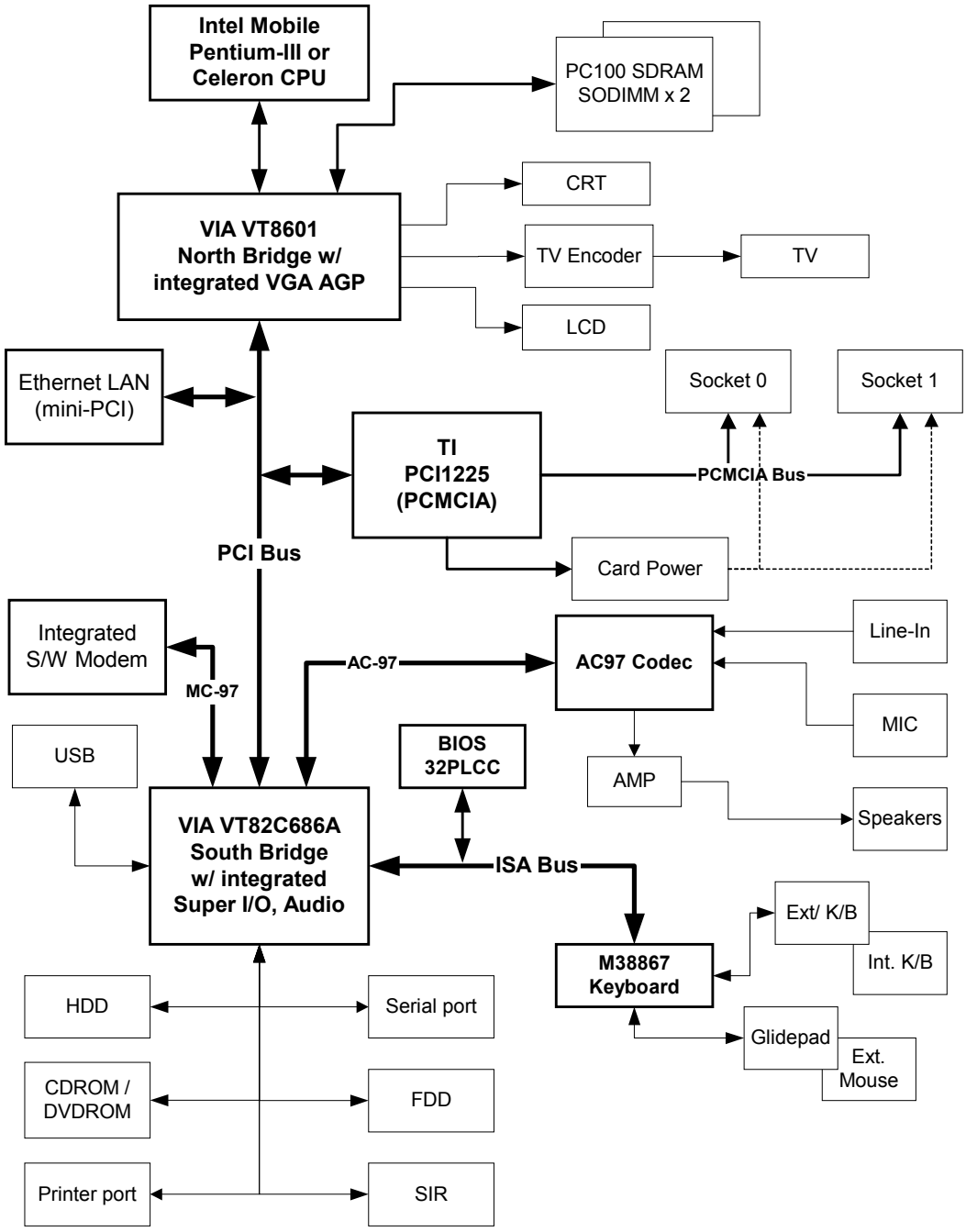
Hardware Functional Overview

4.1 Overview

The FIC A440 Series consist of several major functions and subsystems (see Figure 4-1) including:

- System Processor – implemented on the motherboard using Intel Pentium-III or Mobile Celeron with Socket 370 FC-PGA packaging at 100MHz system bus speed.
- System North Bridge Core Logic – implemented on the motherboard using the VIA ProMedia VT8601 chipset which integrates the following:
  - Trident CyberBladei1 AGP 3D Graphics Accelerator
  - Advanced System Memory Controller
- System South Bridge Core Logic – implemented on the motherboard using the VIA VT82686A PCI-to-ISA chipset which integrates the following:
  - Enhanced IDE Interface for HDD, CD-ROM, and IDE Device Bay
  - SoundBlaster/DirectSound AC97 Digital Audio Controller
  - USB Interface for the external USB port
  - Super I/O
- Clock Frequency Generator – implemented on the motherboard using the ICWork W156 clock generator chip.
- Cache Memory Subsystem – implemented on-die on the Intel Mobile CPU.
- Video Subsystem – integrated on the VIA VT8601 North Bridge chip using Trident CyberBladei1 and on the LCD Panel for supporting the LCD and CRT.
- PCMCIA Subsystem – implemented on the motherboard using the Texas Instrument (TI) 1225 PCMCIA controller chip.
- Audio Subsystem – integrated on the VIA South Bridge chip.
- Keyboard and Pointing Device Subsystem – implemented on the AIO board, the Keyboard assembly, and the Glidepad assembly.
- I/O Subsystem – integrated on the VIA South Bridge chip.
- LAN and Modem Feature Card – implemented on the motherboard via the mini-PCI bus module socket.
- Port Bar – implemented on the motherboard and the Port Bar assembly.
- Power Subsystem – implemented on the DC-DC board, LCD Inverter Board, Battery Pack, and AC adapter.
- Micro-P Subsystem – implemented on the motherboard using PIC 16C62A.

4.2 System Hardware Block Diagram



4.3 Chipset Summary

The notebook consists of following major chipsets:

Controller Chip	Vendor	Description
Processor	Intel	Socket 370 Pentium III at 650 – 850MHz Socket 370 Celeron at 500 – 667MHz
Core Logic	VIA	ProMedia VT8601 (North Bridge) ProMedia VT82C686A (South Bridge)
Video Controller	Trident	CyberBladei1 (Integrated in North Bridge)
PCMCIA Controller	TI	TI-1225 CardBus
Supper I/O Controller	VIA	(Integrated in South Bridge)
Audio Codec	WM	WM9701A (AC97 1.03) / WM9703 (AC97 2.1)
Audio Amplifier	TI	TDA0102
Keyboard Controller	Mitsubishi	M38867
PMU Controller	MicroChip	PIC16C62B (SSOP)
ROM BIOS	Winbond	W29C040P, Boot Block Structure
Clock Generator	IC Work	W156
Temperature Sensor	VIA	(embedded in South Bridge chip)
LVDS		THC63LVDM63A
LAN	Intel	82559 (10/100Mbs Fast Ethernet)
Modem	PCTEL	MC-97 S/W Modem (integrated in South Bridge)

4.4 System Processor (CPU)

The FIC A440 runs on Intel Mobile Pentium-III based on Socket 370 FCPGA packaging. It supports CPU with up to 850 MHz clock speed rating. The processor operates in conjunction with the RAM and ROM memory and the system control logic (e.g. VIA VT8601) to process software instructions (BIOS, Windows, and Applications).

4.4.1 Intel Mobile Pentium-III Features

Using Intel's advanced 0.18 micron process technology, the Intel mobile Pentium III processor is offered at speeds of 400MHz, 450MHz, and 500MHz while still offering lower power for long battery life. Other performance advancements include the addition of new Internet Streaming SIMD instructions, an advanced transfer cache architecture, and a processor system bus speed of 100MHz.

Intel Mobile Pentium III processor featuring Intel SpeedStep technology is the next dramatic step towards achieving near desktop performance. This exciting new processor has two performance modes and allows real-time dynamic switching of the voltage and frequency between the modes. This occurs by switching the bus ratios, core operating voltage, and core processor speeds without resetting the system.

There are two performance modes offered, Maximum Performance and Battery Optimized Performance. Maximum Performance mode provides near desktop performance and runs at 600 or 650MHz. Battery Optimized Performance mode provides the best balance between performance and battery life and operates at a lower frequency of 500MHz.

The integrated L2 cache is designed to help improve performance, and it complements the system bus by providing critical data faster and reducing total system power consumption. The mobile Pentium III processor's 64-bit wide Gunning Transceiver Logic (GTL+) system bus provides a glue-less, point-to-point interface for an I/O bridge/memory controller, and is compatible with the 440BX AGPset, 440ZX-M AGPset, and the 440MX Chipset.

Features summary of the Mobile Pentium-III CPU:

- Processor core/bus speeds
  - Single frequency at 1.60V: 450/100 MHz and 500/100 MHz
  - Single frequency at 1.35V: 400/100 MHz and 500/100 MHz
  - Featuring Intel SpeedStep technology: 600/100 MHz and 650/100 MHz (Maximum Performance Mode at 1.60V) and 500/100 MHz (Battery Optimized Performance Mode at 1.35V)
- Supports the Intel Architecture with Dynamic Execution
- On-die primary (L1) 16-Kbyte instruction cache and 16-Kbyte write-back data cache
- On-die second level L2 cache (256-Kbyte)
- Integrated GTL+ termination
  6-bit data bus, 100-MHz operation
- Integrated math co-processor
- Intel Processor Serial Number
- Fully compatible with previous Intel microprocessors
  - Binary compatible with all applications
  - Support for MMX technology
  - Support for Streaming SIMD Extensions enhances floating point, video, sound, and 3-D application performance
- Power Management Features
  - Quick Start for low power, low exit latency clock "throttling"
  - Deep Sleep mode provide low power dissipation
- On-die thermal diode

4.4.2 Intel Mobile Celeron Features

The Intel Celeron processor is designed for uni-processor based Value PC and is binary compatible with previous generation Intel architecture processors. The Intel Celeron processor provides good performance for applications running on advanced operating systems such as Windows 95/98, Windows NT, and UNIX. This is achieved by integrating the best attributes of Intel processors – the dynamic execution performance of the P6 micro-architecture plus the capabilities of MMX technology – bringing a balanced level of performance to the Value PC market segment.

Features summary of the Mobile Celeron CPU:

- Available up to 700 MHz core frequencies with 128 KB level-two cache (on die)
- Intel's latest Celeron processors in the FC-PGA package are manufactured using the advanced 0.18 micron technology.
- Binary compatible with applications running on previous members of the Intel microprocessor line.
- Dynamic execution microarchitecture.
- Operates on a 66 MHz, transaction-oriented system bus.
- Specifically designed for uni-processor based Value PC systems, with the capabilities of MMX technology.

- Power Management Capabilities
- Optimized for 32-bit applications running on advanced 32-bit operating systems.
- Uses Flip-Chip Pin Grid Array (FC-PGA) Package. The FC-PGA uses the same 370-pin zero insertion force socket (PGA370) as the PPGA. Thermal solutions are attached directly to the back of the processor core package without the use of a thermal plate or heat speader.
- Integrated high performance 32 KB instruction and data, nonblocking, level-one cache: separate 16 KB instruction and 16 KB data caches.
- Integrated thermal diode.

4.5 System Core Logic

The system core logic function of the notebook is implemented on the CPU module and motherboard using the VIA Apollo ProMedia VT8601 North Bridge chip and the VIA VT82C686A South Bridge chip.

4.5.1 Apollo ProMedia Features

The VIA VT8601 Apollo ProMedia – System Media Accelerated North Bridge (SMA) – is a high performance, cost-effective and energy efficient solution for the implementation of Integrated 2D / 3D Graphics – PCI – ISA desktop and notebook personal computer systems from 66MHz to 133MHz based on 64-bit Intel Pentium II, Pentium III, and Celeron processors.

Summary Features of the VT8601:

- Supports Intel Celeron, Pentium III and VIA Cyrix III processors
- 66 / 100 / 133 MHz Front Side Bus (FSB) settings
- Integrated Trident Blade3D AGP 2X graphics core
- Support for PC133 SDRAM as well as PC66/100 SDRAM and Virtual Channel memory
- Integrated AC-97, MC-97 Audio/Modem
- Integrated 10/100 Base-T Ethernet controller
- Integrated Super I/O and IOAPIC
- Support for ATA 33/66/100
- Support for CRT, LCD or TV display
- 4 USB ports, UHCI compliant
- Integrated hardware monitoring
- Advanced mobile power management features
- 510 BGA VT8601 North Bridge

The VT8601 functions and capabilities include:

- General
  - 510 BGA Package
  - 2.5V core with 3.3V CMOS I/O
  - Supports GTL+ I/O buffer Host interface
  - Supports separately powered 5.0V tolerant interface to PCI bus and Video interface
  - 2.5V, 0.25um, high speed / low power CMOS process
  - PC98/99 compatible using VIA VT82C686A (352-pin BGA) south bridge chip for Desktop and Mobile applications

  - 66 / 100 / 133MHz CPU Front Side Bus (FSB) Operation
- High Integration
  - Single chip implementation for 64-bit Slot-1 and Socket-370 CPUs, 64-bit system memory, 32-bit PCI with integrated 2D / 3D GUI accelerator
  - Apollo ProMedia Chipset: VT8601 system controller and VT82C686A PCI to ISA bridge
  - Chipset includes dual UltraDMA-33/66 EIDE, AC-97 link, 4 USB ports, integrated Super-I/O, hardware monitoring, keyboard/mouse interfaces, and RTC/CMOS
- High Performance CPU Interface
  - Supports Slot-1 Intel Pentium II / Pentium III and Socket 370 Celeron processors
  - 66 / 100 / 133 MHz CPU Front Side Bus (FSB)
  - Built-in PLL (Phase Lock Loop) circuitry for optimal skew control within and between clocking regions
  - Five outstanding transactions (four In-Order Queue (IOQ) plus one input latch)
  - Supports WC (Write Combining) cycles
  - Dynamic deferred transaction support
  - Sleep mode support
  - System management interrupt, memory remap and STPCLK mechanism
- Internal Accelerated Graphics Port (AGP) Controller
  - AGP v1.0 compliant
  - Pipelined split-transaction long-burst transfers up to 533 MB/sec
  - Eight level posted-write request queue
  - Thirty-two level (quadwords) read data FIFO (128 bytes)
  - Sixteen level (quadwords) write data FIFO (64 bytes)
  - Intelligent request reordering for maximum AGP bus utilization
  - Supports Flush/Fence commands
  - Graphics Address Relocation Table (GART)
  - Independent GART lookup control for host / AGP / PCI master accesses
  - Windows 95 OSR-2 VXD and integrated Windows 98 / NT5 miniport driver support
- Concurrent PCI Bus Controller
  - PCI Bus is synchronous / pseudo-synchronous to host CPU bus
  - 33 MHz operation on the primary PCI bus
  - Supports up to five PCI masters
  - Concurrent multiple PCI master transactions
  - Zero wait state PCI master and slave burst transfer rate
  - PCI to system memory data streaming up to 132MB/sec
  - Six levels (double-words) of CPU to PCI posted write buffers
  - Enhanced PCI command optimization
  - Delay transaction from PCI master reading DRAM
  - Complete steerable PCI interrupts
  - PCI-2.2 compliant, 32 bit 3.3V PCI interface with 5V tolerant inputs
- Advanced High Performance DRAM Controller
  - DRAM interface synchronous or pseudo-synchronous with CPU FSB speed of 66 / 100 / 133 MHz
  - Concurrent CPU, AGP, and PCI access
  - Supports FP, EDO, SDRAM and VCM-SDRAM memory types
  - 64-bit data width only
  - 3.3V DRAM interface with 5V-tolerant inputs
- General Graphics Capabilities
  - 64-bit Single Cycle 2D/3D Graphics Engine

- Supports 2 to 8 MB of Frame Buffer
- Real Time DVD MPEG-2 and AC-3 Playback
- Video Processor
- I^2C Serial Interface
- Integrated 24-bit 230MHz True Color DAC
- Extended Screen Resolutions up to 1600x1200
- Extended Text Modes 80 or 132 columns by 25/30/43/60 rows
- DirectX 6 and OpenGL ICD API

- Graphics Performance
  - Sustained 1M polygon/second and 100M pixel/second
  - 30fps DVD playback of 9.8Mbps MPEG-2 video with 30% headroom
  - Host Based AC-3 decode at only 8% utilization
- High Performance rCAD3D Accelerator
  - 32-entry command queue, 32 entry data queue
  - 4Kbyte texture cache with over 90% hit rates
  - Pipelined Single Cycle Setup/Texturing/Rendering Engines
  - DirectDraw acceleration
  - Multiple buffering and page flipping
- DVD
  - Hardware Assisted MPEG-2 Architecture for DVD with AC-3
  - Simultaneous motion compensation and front-end processing
  - Supports full DVD 1.0, VCD 2.0 and CD-Karaoke
  - Microsoft DirectShow 3.0 native support, backward compatible with MCI
  - No additional frame buffer requirements
- Video Processor
  - On-chip Color Space Converter (CSC)
  - Dual frame buffer apertures for independent memory access for graphics and video
  - Horizontal/vertical interpolation with edge recovery
  - Video Module Interface (VMI) to MPEG and video decoder
  - Overlay differing video and graphic color depths
  - Display two simultaneous video streams from both internal AGP and VMI
- Flat Panel Interfaces
  - 85MHz Flat Panel interface supports 1024x768 panels
  - Support TFT, STN & DSTN panel technologies
  - Allows external LVDS or TMDS transmitter for advanced panel interfaces
- Power Management Support
  - Dynamic power down of SDRAM (CKE)
  - Independent clock stop controls for CPU / SDRAM, AGP, and PCI bus
  - PCI and AGP bus clock run and clock generator control
  - Suspend-to-DRAM and Self-Refresh operation
  - EDO self-refresh and SDRAM self-refresh power down
  - 8 bytes of BIOS scratch registers
  - Low-leakage I/O pads
- Testability
  - Build-in NAND-tree pin scan test capability

4.5.2 VT82C686A Features

The VT82C686A PSIPC (PCI Super-I/O Integrated Peripheral Controller) is a high-integration, high performance, power-efficient, and high compatibility device that supports Intel and non-Intel based processor to PCI bus bridge functionality to make a complete Microsoft PC99-compliant PCI/ISA system.

The VT82C686A functions and capabilities include:

- Inter-operable with VIA and other Host-to-PCI Bridges
  - Combine with VT8601 for a complete 66 / 100 / 133 MHz Socket 370 or Slot-1 system with integrated 2D / 3D graphics (Apollo ProMedia)
  - Inter-operable with Intel or other Host-to-PCI bridges for a complete PC99 compliant PCI / AGP / ISA system
- PCI to ISA Bridge
  - Integrated ISA Bus Controller with integrated DMA, timer, and interrupt controller
  - Integrated Keyboard Controller with PS2 mouse support
  - Integrated DS12885-style Real Time Clock with extended 256 byte CMOS RAM and Day/Month Alarm for ACPI
  - Integrated USB Controller with root hub and four function ports
  - Integrated UltraDMA-33/66 master mode EIDE controller with enhanced PCI bus commands
  - PCI-2.2 compliant with delay transaction and remote power management
  - Distributed DMA support for ISA legacy DMA across the PCI bus
  - Fast reset and Gate A20 operation
  - Flash EPROM, 4Mb EPROM and combined BIOS support
  - Supports positive and subtractive decoding
- UltraDMA-33 / 66 Master Mode PCI EIDE Controller
  - Dual channel master mode PCI supporting four Enhanced IDE devices
  - Transfer rate up to 33MB/sec to cover PIO mode 4, multi-word DMA mode 2 drives, and UltraDMA-33 interface
  - Support ATAPI compliant devices including DVD devices
  - Support PC native and ATA compatibility modes
  - Complete software driver support
- Integrated Super IO Controller
  - Supports 2 serial ports, IR port, parallel port, and floppy disk controller functions
  - Two UARTs for Complete Serial Ports
  - Infrared-IrDA (HPSIR) and ASK (Amplitude Shift Keyed) IR port multiplexed on COM2
  - Multi-mode parallel port
  - Floppy Disk Controller
- SoundBlaster Pro Hardware and Direct Sound Ready AC97 Digital Audio Controller
  - Dual full-duplex Direct Sound channels between system memory and AC97 link
  - PCI master interface with scatter / gather and bursting capability
  - 32 byte FIFO of each direct sound channel
  - Standard v1.0 or v2.0 AC97 Codec interface for single or cascaded AC97 Codec's from multiple vendors
  - Loopback capability for re-directing mixed audio streams into USB and 1394 speakers
  - Hardware SoundBlaster Pro for Windows DOS box and real-mode DOS legacy compatibility

  - Hardware assisted FM synthesis for legacy compatibility
  - Direct two game ports and one MIDI port interface
  - Complete software driver support for Windows-95/98/2000 and Windows NT
- Voltage, Temperature, Fan Speed Monitor and Controller
  - Five positive voltage (one internal), three temperature (one internal) and two fan-speed monitoring
  - Programmable control, status, monitor and alarm for flexible desktop management
  - Automatic clock throttling with integrated temperature sensing
  - Internal core VCC voltage sensing
  - Flexible external voltage sensing arrangement (any positive supply and battery)
- Universal Serial Bus Controller
  - USB v1.1 and Intel Universal HCI v1.1 compatible
  - Eighteen level (doublewords) data FIFO with full scatter and gather capability
  - Root hub and four function ports
  - Integrated physical layer transceivers with optional over-current detection status on USB inputs
  - Legacy keyboard and PS/2 mouse support
- System Management Bus Interface
  - Host interface for processor communications
  - Slave interface for external SMBus masters
- Sophisticated PC99-Compatible Mobile Power Management
  - Supports both ACPI and legacy APM power management
  - ACPI v1.0 Compliant
  - APM v1.2 Compliant
  - CPU clock throttling and clock stop control for complete ACPI C0 to C3 state support
  - PCI bus clock run, Power Management Enabled (PME) control, and PCI/CPU clock generator stop control
  - Supports multiple system suspend types
  - Multiple suspend power plane controls and suspend status indicators
  - Normal, doze, sleep, suspend and conserve modes
  - Global and local device power control
  - System event monitoring with two event classes
  - Dedicated input pins for power and sleep buttons, external modem ring indicator, and notebook lid open/close for system wake-up
  - Up to 12 general purpose input ports and 23 output ports
  - One programmable chip select and one microcontroller chip select
  - Enhanced integrated real time clock (RTC) with date alarm, month alarm, and century field
  - Thermal alarm on either external or any combination of three internal temperature sensing circuits
  - Hot docking support
  - I/O pad leakage control
- Plug and Play Controller
  - PCI interrupts steerable to any interrupt channel
  - Steerable interrupts for integrated peripheral controllers: USB, floppy, serial, parallel, audio, soundblaster, MIDI
  - Steerable DMA channels for integrated floppy, parallel, and soundblaster pro controllers
  - One additional steerable interrupt channel for on-board plug and play devices

  - Microsoft Windows 98, Windows NT, Windows 95 and plug and play BIOS compliant
- Integrated I/O APIC (Advanced Peripheral Interrupt Controller) (CG Silicon)
- Built-in NAND-tree pin scan test capability
- 0.35um, 3.3V, low power CMOS process
- Single chip 27x27 mm, 352 pin BGA

4.6 Clock Frequency Generator

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

- System clock:
  - Clock generator support:
    - 66/100 MHz for Pentium IIII Mobile CPU
  - 30/33 MHz for PCI device bus clock use
  - 48 MHz for VT82C686A
  - 14.318 MHz for VT82C686A refresh use
- 14.318 MHz XTAL for ICWORK 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 256KB 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 VIA VT8601 System Controller chip provides primary control for the system memory.

4.8.1 System Memory

The notebook offers two (2) 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 16MB, 32MB, 64MB, and 128MB sizes. Memory modules are 3.3V SDRAM type.

4.8.2 Video Memory

The video memory (frame buffer) of the notebook is shared from the system main memory using Shared Memory Architecture (SMA) design of the integrated VGA controller. The frame buffer size can be set to either 4MB or 8MB from the CMOS Setup program. With 4MB, the notebook can support display resolutions of up to 1024x768 at 16M color (TFT LCD). The default frame buffer size is 8MB.

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 29EE020 120ns 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, integrated 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

The video subsystem utilizes the Trident CyberBladei1 VGA controller integrated inside the North Bridge chip. CyberBladei1's notebook graphics controller core incorporates high performance 2D and 3D graphics engine, video accelerator, DVD playback, video capture and TV output capabilities. It also eliminates the need for an external frame buffer by taking advantage of the Shared Memory Architecture (SMA). For more information of the VGA function, refer to the System Core Logic section of this chapter.

4.10.2 Video Clock

ICWORK provides 14.318 MHz input to generate VGA internal slate machine, MCLK, and DCLK. The VT82C686A chip also provides 32.768 KHz O/P for video RAM refresh.

4.11 I/O Subsystem

The I/O (Input/Output) Subsystem of the notebook is integrated inside the South Bridge chip VT82C686A on the motherboard. Refer to the System Core Logic section of this chapter.

4.12 PCMCIA Controller

The PCMCIA controller of the notebook is implemented on the motherboard using the TI PCI1225 PC Card Controller. The TI PCI1225 is a high-performance PCI-to-PC Card controller that supports two independent card sockets compliant with the 1997 PC Card Standard. The PCI1225 provides a rich features set that makes it the best choice for bridging between PCI and PC Cards in both notebook and desktop computers. The 1997 PC Card Standard retains the 16-bit PC Card specification defined in PCMCIA Release 2.2 and defines the new 32-bit PC Card (CardBus), capable of full 32-bit data transfers at 33MHz. The PCI-1225 supports any combination of 16-bit and CardBus PC Cards in the two sockets, powered at 5V or 3.3V, as required.

Feature Summary of the PCI1225:

- PCI Bus Power Management Interface Specification 1.0 Compliant
- ACPI 1.0 Compliant
- Packaged in 208-pin low-profile QFP (PDV) or GHK High Density BGA
- PCI Local Bus Specification Revision 2.2 Compliant

- 1997 PC Card Standard Compliant
- PC99 Compliant
- 3.3V Core Logic with Universal PCI Interfaces Compatible with 3.3V and 5V PCI Signaling Environments
- Mix and Match 5V/3.3V 16-bit PC Cards and 3.3V CardBus Cards
- Supports Two PC Card or CardBus Slots with hot insertion and removal
- Uses serial interface to TI TPS2202/2206 Dual-Slot PC Card Power Switch
- Supports Burst Transfers to Maximize Data Throughput on the PCI Bus and CardBus Bus
- Supports Parallel PCI Interrupts, Parallel ISA IRQ and Parallel PCI Interrupts, Serial ISA IRQ with Parallel PCI Interrupts, and Serial ISA IRQ and PCI Interrupts
- Serial EEPROM Interface for Loading Subsystem ID and Subsystem Vendor ID
- Pipelined Architecture allows greater than 130-MBps throughput from CardBus-to-PCI and from PCI-to-CardBus
- Supports up to Five General-Purpose I/Os
- Programmable Output Select for CLKRUN
- Multifunction PCI Device with separate configuration space for each socket
- Five PCI Memory Windows and Two I/O Windows available for each R2 socket
- Two I/O Windows and Two Memory Windows available to each CardBus socket
- Exchange Card Architecture (ExCA) Compatible Registers are mapped in memory and I/O Space
- Intel 82365Sl-DF Register Compatible
- Supports Distributed DMA (DDMA) and PC/PCI DMA
- Supports 16-bit DMA on both PC Card sockets
- Supports Ring Indicate, SUSPEND, PCI CLKRUN, and CardBus CCLKRUN
- LED Activity Pins
- Supports PCI Bus Lock (LOCK)
- Advanced Submicron, Low-Power CMOS Technology

4.13 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.

4.14 Keyboard and Pointing Device

The Keyboard Subsystem of the notebook is implemented on the Motherboard and Keyboard Assembly using the Mitsubishi 38867M8 keyboard controller chip and the Phoenix MultiKey/M3886L 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 A440 Series 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 ALPS Touchpad pointing device

module on the system top cover assembly and a pre-programmed Mitsubishi 38867M8 micro-controller that interfaces the mouse device to the Motherboard. The touchpad module is connected to audio 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 ALPS Touchpad, 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 ALPS touchpad 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 ALPS Touchpad 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.

4.15 Disk 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 ranging from 6.0GB to 18GB using Enhanced IDE controller with LBA (Logical Block Addressing) and Ultra DMA mode support.

The VT82C686A controller chip provides the Primary IDE controller for the internal hard disk, and the Secondary Master for the CD-ROM.

The floppy disk drive supports standard 3.5-inch 720KB and 1.44MB mini-diskettes while adding support for 1.2MB (Mode 3) mini-diskettes for Japanese market.

The notebook uses the TEAC 24X-speed IDE CD-ROM Drive that reads digital data stored on CD-ROM at 24 times faster rotational speed. 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.

4.16 Power Subsystem

The Power Subsystem consists of the following major sections:

4.16.1 AC Power Adapter

The computer is equipped with a 50W universal AC power adapter that converts AC voltage (100 to 240VAC, 47 to 63Hz) into DC voltage used to operate the notebook and charge the batteries.

4.16.2 Internal Battery Pack

The computer utilizes Nickel Metal Hydride (NiMH) or 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 Li-Ion battery is around 2.5 hours when computer is turn off while it should take around 8 hours when the computer is running. Running time of battery is around 2 to 2.5 hours.

4.16.3 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.

4.16.4 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).

4.17 Micro-P Subsystem (PIC-16C62A)

The micro controller PIC16C62A acts as a supplement for the power management control. It supports many functions via the SMBus interface.

The system communicates with the PIC16C62A via the SMBus interface. The SMBus host (M38867) should be first initialized before starting the transaction. The following is the procedure for system communication with PIC16C62A:

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 PIC16C62A slave address to SmbHstAdd register.
   - Send command to PIC16C62A -- Slave address is 04h.
   - Read data from PIC16C62A -- 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 PIC16C62A.
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 PIC16C62A.

Features Summary of the Micro-P:

- 5 channels 8-bit analog to digital converter
- Timer0: 8-bit tuner/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^2C
- 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

Chapter 4

Hardware Functional Overview

4.1 Overview

The A440 is an IBM PC/AT compatible notebook PC which supports the Socket 370 processor family. The following are the major features that A440 supports.

Microsoft PC99 and ACPI logo approves.

Offers 1024x768 high resolution LCD display with 12.1“ ,13.3”&14.1’’ panel.

Supports the powerful & flexible Power Management modes.

Support PCI 2.1

Support AGP 2.0

Support ACPI 1.0.

Support SMBios 2.3

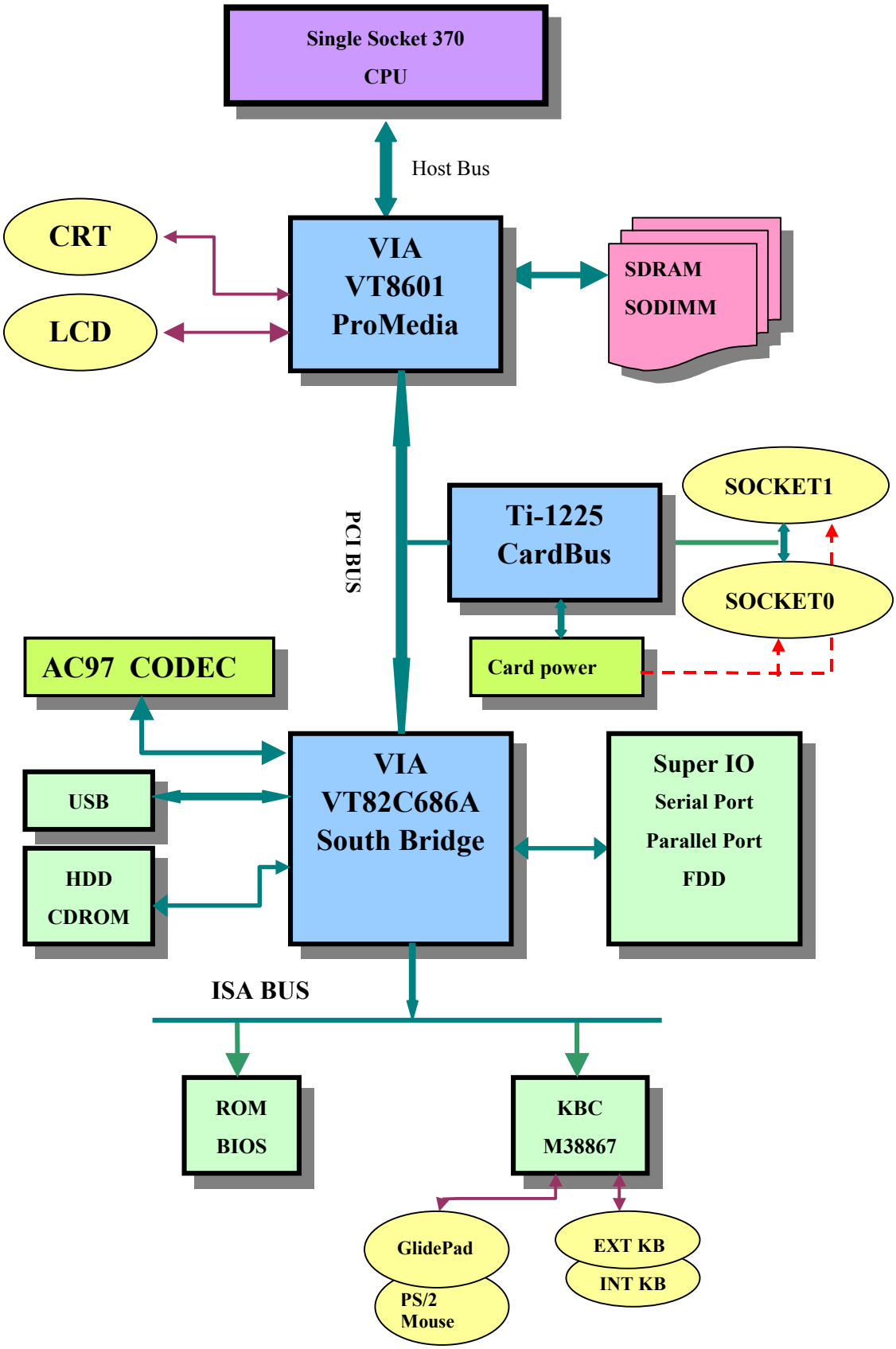
Support 66/100 MHz CPU Front Side Bus.

Support a proprietary Port Replicator.

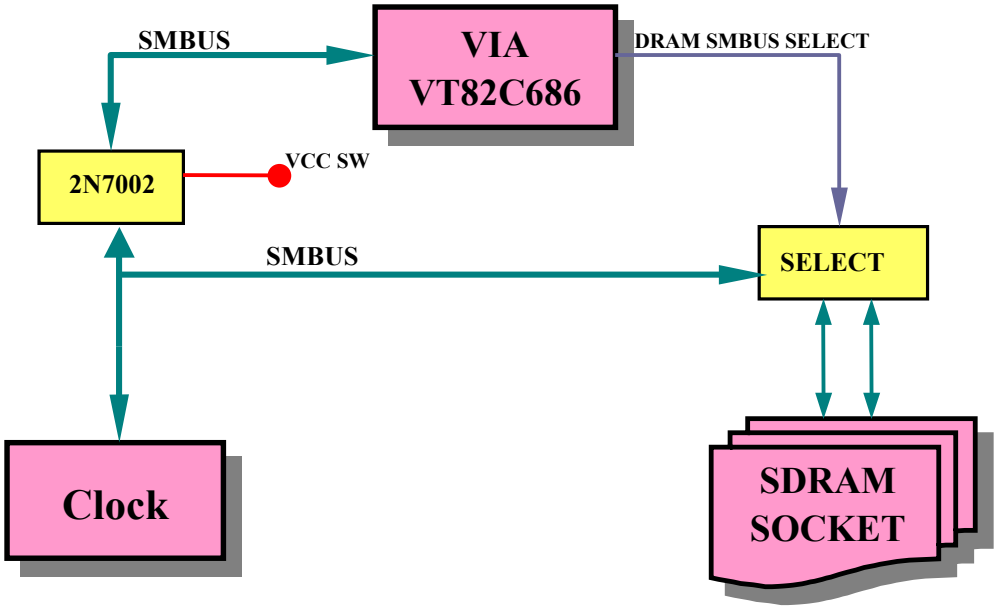
4.2 Summary of H/W Related Spec.

This section describes about the key component list that using on A440 machine and it's related marketing specification.

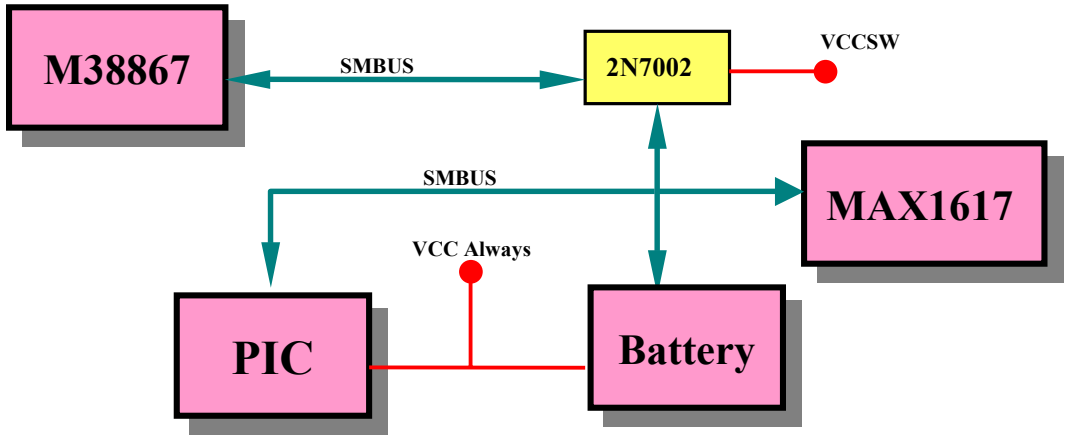
Main components block diagram:



System SMBUS block diagram:



Battery SMBUS block diagram:



4.2.1 H/W Key ChipSet List

Controller Chip	Vender	Description
Processor	Intel	Pentium III 650- 850 Mhz Celeron 500 – 667 Mhz
North Bridge	VIA	ProMedia VT8601
South Bridge	VIA	ProMedia VT82C686A
VGA Controller	Trident	Trident 8400 North Bridge Integrated
PCMCIA Controller	Ti	Ti –1225
Supper I/O Controller	VIA	South Bridge Integrated
Audio Codec	WM	WM9701A(AC97 1.03) /WM9703(AC97 2.1)
Audio Amplifier	TI	TPA0102
Keyboard Controller	Mitsubishi	M38867
PMU Controller	MicroChip	PIC-16C62 B (SSOP)
ROM BIOS	Winbond	W29C040P
Clock Generator	IC Work	W156
Temperature Sensor	VIA	South Bridge embeded
LVDS		THC63LVDM63A
MODEM	Lucent	PCI bus S/W Modem Lucent Mars3
LAN	INTEL	Intel 82559

4.3 Summary Of BIOS Spec.

Controller Chip	Description
BIOS Feature	▪ Boot Block / Crisis Rescue ▪ APM 1.2 Compliance ▪ Support PCI 2.1 Spec ▪ Support Win98,Win2000. ▪ Support flash function for new BIOS update ▪ Support 3 Mode FDD ▪ Support DMI 2.0 spec. (SMBIOS 2.3) ▪ Support ACPI 1.0 spec. ▪ Support AGP 2.0. ▪ Support maximal 4 different keyboards on same bios.
CPU	Auto detect the CPU type and speed for the Socket 370 or Slot 1based system
DRAM	Auto sizing and detection. Support PC-100 SDRAM.
Cache	▪ Level 2 Sync/Async PBSRAM auto sizing and detection ▪ Always enable CPU L1 and external L2 cache.
Shadow	Always enable VGA and System BIOS shadow
Display	▪ System auto detects LCD or CRT presence on boot and lid closed. ▪ Support Panning while LCD in a display resolution greater than supported ▪ Support Microsoft Direct 3D
Hard Disk	▪ Enhanced IDE spec. ▪ Support auto IDE detection. ▪ Support LBA mode for larger capacity HDD. ▪ Support 32-bit PIO transfer. ▪ Support Multi-sector transfer. ▪ Support Fast PIO mode 1-4 transfer. ▪ Support Ultra DMA 33.
Multi Boot	Allow the user to select boot from FDD, HDD, 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 Windows hot keys, built-in Glide Pad and external PS/2 mouse/keyboard
PCMCIA	Compliant with PCMCIA 2.1 specification.
Port Replicator	I/O port replicator duplicates the following ports ▪ Video port ▪ Printer port ▪ COM1 port ▪ PS/2 Mouse & Standard Keyboard port ▪ USB Port ▪ DC In Jack
Pointing stick	The pointing stick device is the small red knob (it looks lie a pencil eraser) that sits just below the [G] and [H] keys of your keyboard. This pressure-sensitive device translates the pressure of your fingertip on the knob into movement of the cursor. Shift the pressure of your fingertip slightly in the direction in which you want to move the

	cursor. The two switches below the touchpad serve as the left and right mouse buttons and can be used with either the pointing stick or the touchpad.
Power Management Support	The power management is compliant with APM 1.2 specification and supports the following power state: ▪ On Mode ▪ Doze Mode (This mode is transparent to user) ▪ Suspend to RAM (STR) Mode ▪ Suspend to Disk (STD) Mode ▪ Off Mode (Also support Soft-Off Mode, SOff)

4.4 System

4.4.1 System Memory

The system main memory consists of SDRAM on 64-bit bus. The memory size options range from 32/64/128 MB 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.

DRAM Combination Configuration

Base SO-DIMM DRAM slot (Bank 0&1)	Expansion SO-DIMM DRAM slot (Bank 2&3)	Total Size
32MB	NIL	32MB
32MB	32MB	64MB
32MB	64MB	96MB
32MB	128MB	160MB
64MB	NIL	64MB
64MB	32MB	96MB
64MB	64MB	128MB
64MB	128MB	192MB
128MB	NIL	128MB
128MB	32MB	160MB
128MB	64MB	192MB
128MB	128MB	256MB
NIL	32MB	32MB
NIL	64MB	64MB
NIL	128MB	128MB

4.4.2 Video

The Video subsystem used share memory of Video memory. The system will support the ZV port, simultaneous display, monitor sense for auto display on boot and VESA Super VGA function call.

Supported Video Mode

The following is all the display modes supported by the Trident 8400 in CRT only, panel 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:

Mode	Pixel Resolution	Colors	Dot Clock	Horiz.Freq.	Vert. Freq.
0, 1	320*400	16	27.175 Mhz	31.5 Khz	70 Hz
0*, 1*	320*350	16	25.175 Mhz	21.85 Khz	60 Hz
0+, 1+	360*400	16	28.322 Mhz	31.5 Khz	70 Hz
2, 3	640*200	16	25.175 Mhz	31.5 Khz	70 Hz
2*, 3*	640*350	16	25.175 Mhz	21.85 Khz	60 Hz
2+, 3+	720*400	16	28.322 Mhz	31.5 Khz	70 Hz
4, 5	320*200	4	25.175 Mhz	31.5 Khz	70 Hz
6	640*200	2	25.175 Mhz	31.5 Khz	70 Hz
7	720*400	Mono	28.322 Mhz	31.5 Khz	70 Hz
D	320*200	16	25.175 Mhz	31.5 Khz	70 Hz
E	640*200	16	25.175 Mhz	31.5 Khz	70 Hz
F	640*350	Mono	25.175 Mhz	31.5 Khz	70 Hz
10	640*350	16	25.175 Mhz	31.5 Khz	70 Hz
11	640*480	2	25.175 Mhz	31.5 Khz	60 Hz
12	640*480	16	25.175 Mhz	31.5 Khz	60 Hz
13	320*200	256	25.175 Mhz	31.5 Khz	70 Hz

Supported extended video modes:

VESA Mode	Pixel Resolution	Colors	Dot Clock	Horiz.Freq.	Vert. Freq.
100	640*400	256	25.175 Mhz	31.5 Khz	70 Hz
101	640*480	256	25.175 Mhz 31.5 Mhz 36.0 Mhz	31.5 Khz 37.5 Khz 43.3 Khz	60 Hz 75 Hz 85 Hz
103	800*600	256	40.0 Mhz 49.5 Mhz 56.25 Mhz	37.8 Khz 46.9 Khz 53.7 Khz	60 Hz 75 Hz 85 Hz
105	1024*768	256	65.0 Mhz 75.359 Mhz 78.75 Mhz	48.3 Khz 56.746 Khz 60.0 Khz	60 Hz 75 Hz 85 Hz
10D	320*200	32K	25.175 Mhz	31.5 Khz	70 Hz
10E	320*200	64K	25.175 Mhz	31.5 Khz	70 Hz
110	640*480	32K	25.175 Mhz 31.5 Mhz 36.0 Mhz	31.5 Khz 37.5 Khz 43.3 Khz	60 Hz 75 Hz 85 Hz
111	640*480	64K	25.175 Mhz 31.5 Mhz 36.0 Mhz	31.5 Khz 37.5 Khz 43.3 Khz	60 Hz 75 Hz 85 Hz
112	640*480	16M	25.175 Mhz 31.5 Mhz 36.0 Mhz	31.5 Khz 37.5 Khz 43.3 Khz	60 Hz 75 Hz 85 Hz
113	800*600	32K	40.0 Mhz 49.5 Mhz 56.25 Mhz	37.8 Khz 46.9 Khz 53.7 Khz	60 Hz 75 Hz 85 Hz
114	800*600	64K	40.0 Mhz 49.5 Mhz 56.25 Mhz	37.8 Khz 46.9 Khz 53.7 Khz	60 Hz 75 Hz 85 Hz
115	800*600	16M	40.0 Mhz 49.5 Mhz 56.25 Mhz	37.8 Khz 46.9 Khz 53.7 Khz	60 Hz 75 Hz 85 Hz
116	1024*768	32K	65.0 Mhz	48.3 Khz	60 Hz

			75.359 Mhz 78.75 Mhz	56.746 Khz 60.0 Khz	75 Hz 85 Hz
117	1024*768	64K	65.0 Mhz 75.359 Mhz 78.75 Mhz	48.3 Khz 56.746 Khz 60.0 Khz	60 Hz 75 Hz 85 Hz
120	320*240	256	25.212 Mhz	31.5 Khz	60 Hz
121	320*240	64K	25.212 Mhz	31.5 Khz	60 Hz
122	400*300	256	40.091 Mhz	37.965 Khz	60 Hz
123	400*300	64K	40.091 Mhz	37.965 Khz	60 Hz
124	512*384	256	65.028 Mhz	48.384 Khz	60 Hz
125	512*384	64K	65.028 Mhz	48.384 Khz	60 Hz

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 GPI pins before the VGA chip initialized, and passes this information to VGA BIOS through INT 15 Function 5F00h.

LCD Panel ID pin Definition:

GPI Pins			Panel Type
GPI [18]	**GPI [10]**	**GPI [9]**	
0	0	0	Reserved
0	0	1	Type 5
0	1	0	Reserved
0	1	1	Type 2
1	0	0	Type 3
1	0	1	Type 4
1	1	0	Type 1
1	1	1	Type 0

Supported LCD panel type: Panel Type	Display Size	Panel Description
Type 0	1024*768	14.1” TFT LG
Type 1	1024*768	14.1” TFT Hitachi
Type 2	1024*768	13.1” TFT Acer
Type 3	800*600	12.1” TFT Sanyo
Type 4	1024*768	14.1” TFT CPT
Type 5	800*600	12.1” DSTN Panasonic

4.4.3 Enhanced IDE

The system BIOS supports 4 IDE devices on two controllers up to 8 GB capacity. The BIOS support Ultra DMA 33 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.

4.4.4 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 volume control, the user will be able to mute the sound to completely cut off the volume using both software and hardware.

4.4.5 Super I/O

This controller contains 16550A or FIFO Enabled UART, ECP/Standard/Bi-directional Parallel Port meeting the 1284 specification.

4.4.6 PCMCIA

- Support for 2 separate CardBus slots (one type III or two type II stacked).
- Individually accessed, dual-buffer implemented.
- Support for 3.3v, 5v and 12v (flash programming) cards.

4.4.7 LED Indicator

System Status LED (LCD panel side)

Indicator	Function Description
Power LED	Green – System is powered on. Yellow – Battery warning. (When plug-in AC the power LED will turn Green) Amber – Battery low. (When plug-in AC the power LED will turn Green) This LED will blink during the system is in Suspend to RAM mode.
Battery Charging LED	Amber – Battery is under charging mode Turn off – Battery full charged or no battery

System Status LED (Main system side)

Indicator	Function Description
IDE accessing LED	This LED will turn on while accessing the HDD.
Device Bay accessing LED	This LED will turn on while accessing the FDD
Caps Lock LED	This LED will turn on when the function of CapsLock is active.
Scroll Lock LED	This LED will turn on when the function of Scroll Lock is active.
Num Lock LED	This LED will turn on when the function of NumLock is active.

4.4.8 Hot Keys Definition

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

Hot Keys by Internal Keyboard

Hot Key	Function
Fn + F1	Places the LCD display into a standby mode.
Fn + F2	If an external monitor is present, pressing this hot key combination toggles the display between the built-in LCD screen, the external monitor and simultaneous display on both screens.
Fn + F5	Toggles between expanded and non-expanded views when the computer is set to the 640x480 resolution.
Fn + F6	Decreases screen brightness.
Fn + F7	Increase screen brightness.
Fn + F8	Decrease screen contrast.
Fn + F9	Increase screen contrast.
Fn + F10	Mutes system audio.

4.4.9 Port Replicator

The Port Bar duplicates the following ports from the Notebook:

- CRT port
- Printer port
- COM1 port
- PS/2 Mouse port
- Standard Keyboard port
- USB Port
- DC in Jack

4.4.10 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, 81~8F	-	DMA4	-
Interrupt Controller	Static	20~21, A0~A1	IRQ2	-	-
System Timer	Static	40~43	IRQ0	-	-
RTC	Static	70~71	IRQ8	-	-
ISA Bus	Static	-	-	-	-
System Speaker	Static	61	-	-	-
System Board	Static	-	-	-	E0000~FFFFF
PnP Mother Board	Static	80	-	-	-
Keyboard Controller	Static	60, 64	IRQ1	-	-

Math Coprocessor	Static	F0~FF	IRQ13	-	-
PS/2 Mouse	Enable/Disable	-	IRQ12	-	-
Video Controller	Static	3B0~3BB, 3C0~3DF	IRQ 5	-	A0000~BFFFF, C0000~C9FFF, FE800000~FEBFFFFF
Serial Port	Static	3F8~3FF	IRQ4	-	-
ECP, Parallel port	Static	378~37F, 778~77F	IRQ7	DMA1	-
FDC	Static	3F0~3F5, 3F7	IRQ6	DMA2	-
Dual IDE Controller	Static	170~177, 1F0~1F7, 3F6	IRQ14, 15	-	-
CardBus Controller	Static	3E0~3E1	IRQ 10	-	08000000~08001FFF
FAX/Modem	Static	1050~1057, 1400~14FF	IRQ 5	-	64000000~640000FF
LAN	Static	1080~10FF	IRQ 5	-	08003000~080033FF
SIR	Static	2F8-2FF, 108~10F	IRQ 3	DMA0	-
USB Host Controller	Static	EF80~EF9F	IRQ5	-	-
Audio Controller	Static		IRQ 5		

PCI Device

IDSEL Pin Allocation:

IDSEL Pin	PCI Device		
	Device Number	Function Number	Device Name
AD11	Device 00	Function 0	VT8601 Host to PCI bridge.
AD12	Device 01	Function 0	VT8601 PCI to PCI bridge.
AD17	Device 06	Function 0	MODEM / LAN
AD18	Device 07	Function 0	VT82C686A – PCI to ISA bridge
		Function 1	VT82C686A – IDE interface
		Function 2	VT82C686A – USB Port 0-1 Interface
		Function 3	VT82C686A – USB Port 2-3 Interface.
		Function 4	VT82C686A – PMU and SMBus interface
		Function 5	VT82C686A – AC97 Audio Interface.
		Function 6	VT82C686A – AC97 Modem Interface.
AD21	Device 0A	Function 0	Card Bus Socket A
		Function 1	Card Bus Socket B

INT Pin Allocation:

INT Pin	PCI Device
INTA	CardBus
INTB	Modem / LAN
INTC	VGA/Audio
INTD	USB

PCI bus master Allocation:

REQ# Pin	PCI Device
REQ 0	CardBus
REQ 1	VGA
REQ 2	Audio
REQ 3	Modem / LAN

4.4.11 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.

SMBus Device	Host/Slave	Address	BIOS Need to Initialize
VIA VT82C686A	Both Host and Slave	10h	Enable SMBus interface and SMBus interrupt
PIC16C62 – Micro P	Both Host and Slave	04h	No need
IMISC671 – Clock Synthesizer	Slave	D2h	Program the desired clock frequency (Pin23 output 24MHz, Pin22 output 48MHz)
BQ 2040 – Smart Battery	Both Host and Slave	16h	No need

4.4.12 Resource Allocation

I/O Map

Hex Address	Device
000 – 01F	8237-1
020 – 021	8259-1
022	VIA VT82C686A
040 – 05F	8254
060 – 06F	Keyboard Controller
070 – 07F	RTC & NMI Mask
080 – 08F	DMA Page Registers
092	System Control Port
0A0 – 0A1	8259-2
0C0 – 0DF	8237-2
0F0 – 0FF	Math Coprocessor
170 – 177	Secondary IDE Controller
1F0 – 1F7	Primary IDE Controller
200 – 20F	Game Port
220 – 22F	Sound Blaster
279	PnP configuration – Address port
2F8 – 2FF	FIR

330 – 333	MIDI
370 – 371	Sound chip control port
378 – 37A	Parallel Port
388 – 38B	FM Synthesizer
398 – 399	Super I/O Chip
3B0 – 3DF	Video Controller
3E0 – 3E1	PCMCIA Controller
3E8 – 3EF	Fax/Modem
3F0 – 3F7	Floppy Disk Controller
3F8 – 3FF	Serial Port 1
530 – 537	Windows Sound System
778 – 77B	ECP port
A79	PnP configuration – Write data port
CF8 – CFC	PCI BUS configuration register

ISA DMA Map

DMA Channel	Device
DMA 0	Unused
DMA 1	ECP
DMA 2	Floppy Disk
DMA 3	Audio
DMA 4	[Cascade]
DMA 5	Unused
DMA 6	Unused
DMA 7	Unused

Memory Map

Address Range	Length	Description
00000 ~ 9F7FFh	638KB	Base Memory
9F800 ~ 9FFFFh	2 KB	Extended BIOS Data Area
A0000 ~ BFFFFh	128 KB	Video Memory
C0000 ~ C9FFFh	40 KB	Video ROM
CA000 ~ DFFFFh	88 KB	Unused
E0000 ~ FFFFFh	128 KB	System ROM BIOS

IRQ Map

IRQ#	Description
IRQ 0	System Timer
IRQ 1	Keyboard
IRQ 2	[Cascade]
IRQ 3	SIR

IRQ 4	Serial Port
IRQ 5	Audio / VGA / USB / (LAN/MODEM)
IRQ 6	Floppy Disk Drive
IRQ 7	Parallel Port
IRQ 8	RTC Alarm
IRQ 9	Reserved for PCMCIA card
IRQ10	Cardbus
IRQ11	Reserved for PCMCIA card
IRQ12	PS/2 Mouse
IRQ13	FPU
IRQ14	Hard Disk Drive
IRQ15	CDROM or DVD

4.4.13 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.

PMU and GPIO Signal description

Pin Name	Signal Name	Description	Components
GPI [0]	LS120IN#	LS120 module inside.	VT82C686A
GPI [1]	PSCI#	System control interrupt for ACPI events	VT82C686A ← M38867
GPI [2]	PWRBTN#	Power button release check	VT82C686A
GPI [3]	PWSCI#	System control interrupt for wake-up events	VT82C686A ← M38867
GPI [4]	IRQ 6	Assign to IRQ 6.	VT82C686A
GPI [5]	PME#	PME#	VT82C686A
GPI [6]	CLRTC#	Clear RTC	VT82C686A
GPI [7]	RING#	Ring indicate	VT82C686A
GPI [8]	NC		
GPI [9]	LCDID0	LCD Panel ID Pin 0	VT82C686A
GPI [10]	LCDID1	LCD Panel ID Pin 1	VT82C686A
GPI [11]	NC		
GPI [12]	NC		
GPI [13]	NC		
GPI [14]	NC		
GPI [15]	NC		
GPI [16]	KBID0	Keyboard type data 0	VT82C686A
GPI [17]	KBID1	Keyboard type data 1	VT82C686A
GPI [18]	LCDID 2	LCD Panel ID Pin 2	VT82C686A
GPI [19]	BATT_CHG	Battery Charge LED Indicator	VT82C686A
GPI [20]	CDIN#	CDROM module inside	VT82C686A
GPI [21]	DVDIN#	DVD module inside	VT82C686A
GPI [22]	NC		
GPI [23]	NC		

GPO [0]	NC		
GPO [1]	NC		
GPO [2]	STR#	Suspend to ram.	VT82C686A → PIC
GPO [3]	SUSSTAT1#	Susoend status 1	VT82C686A
GPO [4]	CPUSTP#	CPU stop clock	VT82C686A
GPO [5]	PCISTP#	PCI stop clock	VT82C686A
GPO [6]	NC		
GPO [7]	NC		
GPO [8]	DRAMEN#	Select SO0DIMM Dram socket I2C Bus A or B.	VT82C686A
GPO [9]	NC		
GPO [10]	NC		
GPO [11]	L2ZZNC	Power down L2 Cache	VT82C686A
GPO [12]	PORT80CS#	Read/Write Port 80H	VT82C686A
GPO [13]	MCCS#	ACPI chip select	VT82C686A
GPO [14]	IRTX#	SIR	VT82C686A
GPO [15]	IRRX#	SIR	VT82C686A
GPO [16]	HDDREST#	HDD reset.	VT82C686A
GPO [17]	CdromReset#	CDROM reset.	VT82C686A
GPO [18]	NC		
GPO [19]	SERIRQ	Serial interrupt request	VT82C686A
GPO [20]	FANON#	Power on FAN.	VT82C686A
GPO [21]	PDCOM#	Power down COM	VT82C686A
GPO [22]	PDAMP#	Power down audio amplifier	VT82C686A
GPO [23]	STANDBY#	Inform to PIC the system is in Standby mode	VT82C686A → PIC
EXTSMI#	EXTSMI#	External SMI signal	VT82C686A ← M38867
RSMRST#	RSMRST#	Reset internal suspend logic(resume reset)	VT82C686A ← PIC
PWRBTN#	PWRBTN#	Power button for VT82C686A	VT82C686A ← PIC
SDA	SMBCLK	SM bus clock	M 38867 → PIC
SCL	SMBDATA	SM bus data	M 38867 → PIC
P40	KBCEXTSMI#	Keyboard SMI#	M38867
P54	BATLOW#	Battery low signal	M38867 ← PIC
P55	LID#	LCD lid closing	M38867
P56	CONADJ#	Panel contrast vary	M38867
P57	BACKADJ#	Panel backlight brightness vary	M38867
P60	IDA#	Battery Inside.	M38867
P62	WAKEUP#	SM bus Alert	M38867,PIC
P64	ACIN#	Adapter plug-in detect	M38867, PIC
P66	PME#		M38867
MCLR	PICRESET#	Reset PIC16C62	PIC
RA5	PWRON	Enable system power	PIC
RA1	LEDBATL#	Battery low led indicate	PIC
RB0	PWRSW#	Power switch for PIC	PIC
RA4	RSTGATE	Reset gate for wakeup inhibit reset	PIC
RB2	VEEENA	Enable panel form PIC	PIC

RB3	LEDSUSP#	Suspend led indicate	PIC

VT82C686A GPI pins signal

See H/W Function Specification for detail.

VT82C686A GPO pins signal

See H/W Function Specification for detail.

M38867 I/O port signal

See H/W Function Specification for detail.

PIC I/O port signal

4.5 Power Management

See H/W Function Specification for detail.

4.5.1 General Requirements

The BIOS must meet the following general Power Management requirements:

- Comply with APM 1.2 Spec.
- Full APM Support for Windows 95 Fuel Gauge and Power Management functionality.
- Support for Suspend-to-RAM and Suspend-to-Disk mode.
- Support for Resume on Modem Ring while in STR Mode. This is enabled by a CMOS setup option.
- Support resume on Time.

4.5.2 System Power Plane

Power Group	Power Control Pin	Controlled Devices
B+	Nil	IMM, (9V~20V)
$5V_{ALWAYS}$	Nil	PIC 16C62A
$3V_{ALWAYS}$	Nil	RTC I/F, Internal modem ring
RTCVCC	Nil	RTC
+12V	PWRON	PCMACIA card
+5V	PWRON	M38867, MAX 3243, PCMCIA Slot(5V VCC)
+3V	PWRON	VGA, Video RAM, PCMCIA chip, PCMCIA Slot(3V), DRAM
+3VS	SUSB#	Audio, Clock Generator, FIR(IMI651 SCLK), TAG RAM, PCI interface, Super-IO

+5VS	SUSB#	HDD, CD-ROM, USB, Internal K/B, Glide Pad, External P/S2 Mouse, FDD, Audio AMP, BIOS ROM

4.5.3 Power management mode

Full-On mode

The System State where no devices are power managed and the system can respond to applications with maximum performance.

Doze mode

The CPU clock is slow down and all other devices are full on.

Suspend to RAM (STR) mode

A suspend state where all motherboard components are powered-off. The CPU/L2 and PCI busses are powered off. All devices connected to the CPU/L2 and PCI busses must either be powered-off or isolate their bus interfaces. The system memory(include graphics frame buffer) is powered and refreshed by the Memory Bridge. The system provides a 32kHz clock (SUSCLK) in this suspend mode to support refresh of these memory subsystems. Only an enabled “resume event” can bring the platform out of the Suspend to RAM (STR) state.

Suspend to disk (STD) mode

A suspend state where the context of the entire system is saved to disk, all motherboard components are powered-off, and all clocks are stopped. Any enabled “resume event”, such as PowerBTN or RTC, can bring the platform out of the Suspend to disk (STD) state.

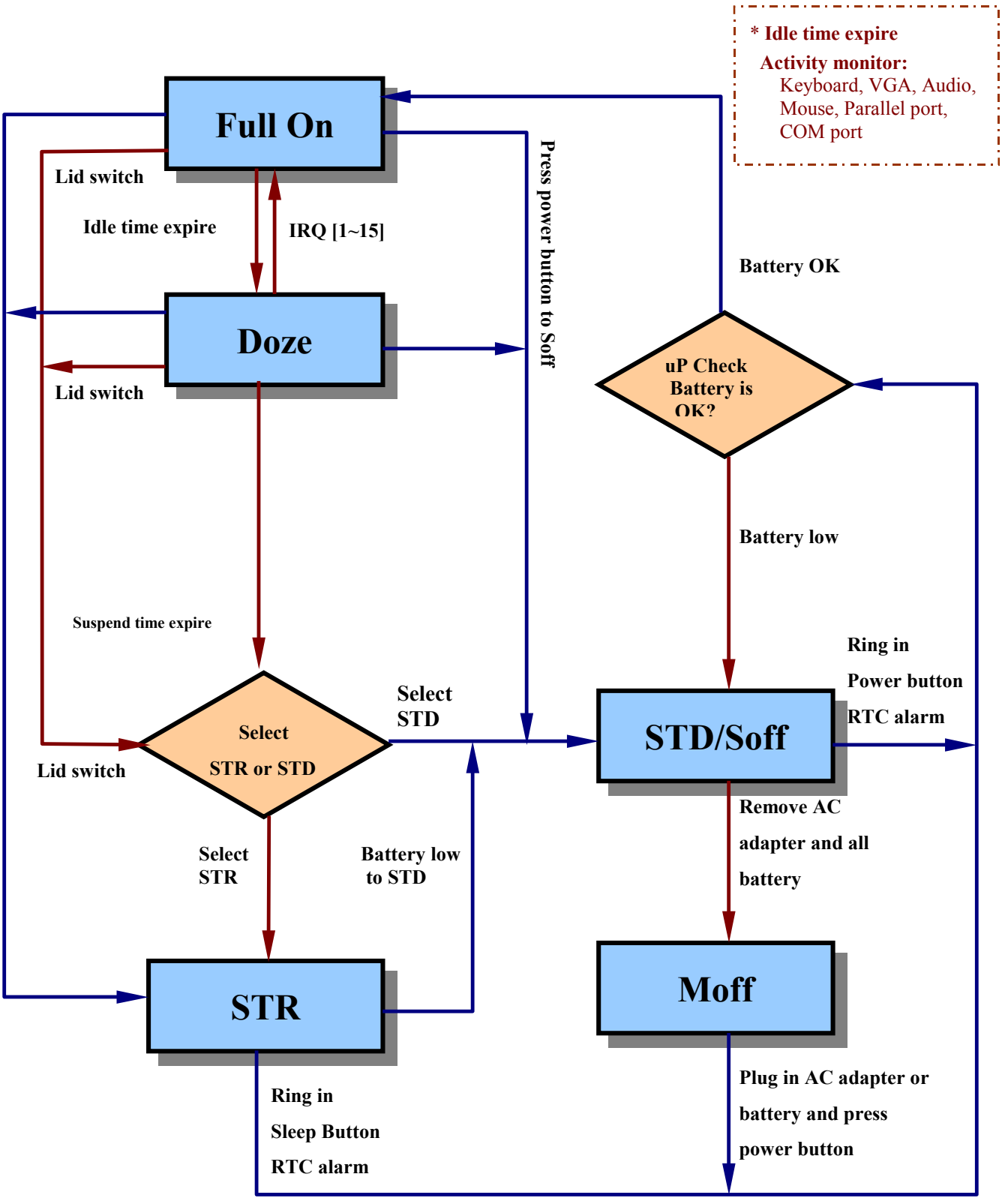
Soft off (SOFF) mode

This is the same as suspend to disk except the context of memory is not saved.

Mechanical off (MOFF) mode

All power except the RTC has been removed from the system.

4.5.4 PMU mode transition flow



4.5.5 PMU mode transition event

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

Power State	Entry Event	Wake up Event
Doze	Doze Time out	Predefined Mem/IO range access Ring Indicator Keystroke(Int., Ex. and USB keyboard) Mouse movement IRQ 1-15
STR	Suspend Time out Lid close Sleep button STR hotkey pressed.	Sleep Button Ring Indicator Schedule Alarm Battery Low Lid Open
STD	Suspend Time out Battery Low Fn + Sleep Button	Sleep Button Schedule Alarm
Soft Off	Sleep button Execute Windows shutdown command	Sleep Button Schedule Alarm

4.5.6 Lid Switch

Warning!!When operating your notebook with an external video device(CRT or TV), you should not close the LCD panel of the Notebok.

Closing the LCD panel will block the ventilation system and can cause overheating and system.

Display Mode	Power State	Lid Close	Lid Open
LCD	Full on	STR	Resume
	STR	No active	Resume
	STD	No active	No active
CRT	Full on	No active	No active
	STR	No active	Resume
	STD	No active	No active
Both	Full on	CRT	Both
	STR	No active	Resume
	STD	No active	No active

4.5.7 Power/Sleep Button

The Power/Sleep Button can work as Power Button or Sleep Button, the working mode is selected by CMOS setup menu.

Working Mode	Power State					
	OFF	Full on	Doze	Stand by	STR	STD

Power on/off	Power on	Power off	Power off	Power off	Full on	Full on
Suspend	Power on	STR/STD*	STR/STD	STR/STD	Full on	Full on

Note: As pressed Sleep button over 4 sec, the system will force to power off.

*The mode of STR/STD can be selected via CMOS setup.

4.5.8 Device Power management

Power state of local devices table

PowerState / Component	Doze	Stand By	STR	STD/SOff
CPU	Stop Grant	Stop Clock	Power Off	Power Off
VT8601	ON	Stop Clock	Power Off (except Vcc)	Power Off
VT82C686A	ON	ON	Power Off (except SUSVcc, RTCVcc)	Power Off (except SUSVcc, RTCVcc)
DRAM	ON	Self Refresh	Self Refresh	Power Off
L2 CACHE	ON	Power down	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
PIC 16C62A	ON	ON	Power down	Power down
VGA	ON	Power down	Power down	Power Off
O2 6833 (PCMCIA)	ON	Power down	Power down	Power Off
Sound	ON	Power down	Power Off	Power Off
LCD Backlight	ON	Power down	Power Off	Power Off
Serial (UART1)	ON	Power down	Power down	Power Off
LAN	ON	Power down	Power down	Power Off
Modem	ON	Power down	Power down	Power down
Parallel	ON	Power down	Power Off	Power Off

Device PM control during Stand by mode

Device	Power Down Controlled by	Description
CPU	Hardware	Controlled by SUS_STAT1# pin
VT8601	Hardware	Controlled by SUS_STAT1# pin
VGA Chip	Software	Enter PCI PM D3 state
PCMCIA Controller	Software	Enter PCI PM D3 state
KBC	Working	
FDD	Software	FDD support power down command
HDD	Software	HDD support power down command
CD-ROM	Software	CD-ROM support power down command
Audio AMP	Software	Controlled by GPO[22] pin
Modem	Software	Enter PCI PM D3hot state
LAN	Software	Enter PCI PM D3hot state

LCD Backlight	Hardware	Controlled by VGA chip(FPBACK pin)
Clock Synthesizer	Hardware	Controlled by CPUSTP# and PCISTP# pin
PIC 16C62A	Working	
MAX3243(RS232 Transceiver)	Software	Controlled by GPO[21] pin
L2 CACHE	Software	Controlled by GPO[3] pin

Device PM control during STR mode

Device	Power Down Controlled by	Description
VT8601	Hardware	Controlled by SUS_STAT1# pin
Super I/O	Hardware	Power off
VGA Chip	Software	Controlled by VT8501
HDD	Hardware	Power off
CD-ROM	Hardware	Power off.
PCMCIA Controller	Hardware	Controlled by PCI Bus.
Modem	Software	Power off
LAN	Hardware	See H/W Spec Chapter 18.
FDD	Hardware	Power off
Audio AMP	Hardware	Power off
LCD Backlight	Hardware	Power off
Clock Synthesizer	Hardware	Power off
KBC	Software	Controlled by M38867 power down command
MAX3243(RS232 transceiver)	Hardware	Controlled by GPO [21] Pin
L2 CACHE	Hardware	Power off
PIC 16C62A	Software	Controlled by PIC 16C62A power down command

Device PM control during STD mode

Device	Power Down Controlled by	Description
VT8601	Hardware	Power off
Super I/O	Hardware	Power off
VGA Chip	Hardware	Power off
HDD	Hardware	Power off
CD-ROM	Hardware	Power off
PCMCIA Controller	Hardware	Power off
Modem	Hardware	Supply ring power
LAN	Hardware	Power off
FDD	Hardware	Power off
Audio AMP	Hardware	Power off
LCD Backlight	Hardware	Power off
Clock Synthesizer	Hardware	Power off
KBC	Hardware	Power off
MAX3243(RS232 transceiver)	Hardware	Power off
L2 CACHE	Hardware	Power off
PIC 16C62A	Software	Controlled by PIC 16C62A power down command

4.6 ACPI

4.6.1 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 specifications.
- ✍ Support for Suspend-to-RAM (S3 state) and Suspend-to-Disk mode (S4 state).
- ✍ Support the Wake up event from Modem Ring in S2~S5 state. This is enabled by a ACPI driver or application.
- ✍ Support the Wake up event from RTC Time/Date alarm in S2~S5 state. This is enabled by a CMOS Setup option.
- ✍ Power Management must not substantially affect or degrade system performance.

4.6.2 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:

G2/S5 - Soft Off:

Power is removed from most of system components except Suspend wakeup logic in PIC and RTC.

Wake up event refer to section 6.5

G1 - Sleeping:

CPU in stop clock mode (core logic in stop clock mode also)

Clock chip in Power down Mode

VGA chip enter suspend mode, LCD power is removed,

PCMCIA chip enter sleep mode,

Hard disk enter sleep mode,

CD-ROM enter sleep mode,

Modem in power down mode,

LAN is in power down mode

G0 - 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.

4.6.3 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.

S2 Sleeping State:

The S2 sleeping state is a low wake-up latency sleeping state. This state is similar to the S1 sleeping state except the CPU and system cache context is lost (the OS is responsible for maintaining the caches and CPU context). Control starts from the processor's reset vector after the wake-up event.

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 "SOFF" 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.

4.6.4 Power States

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

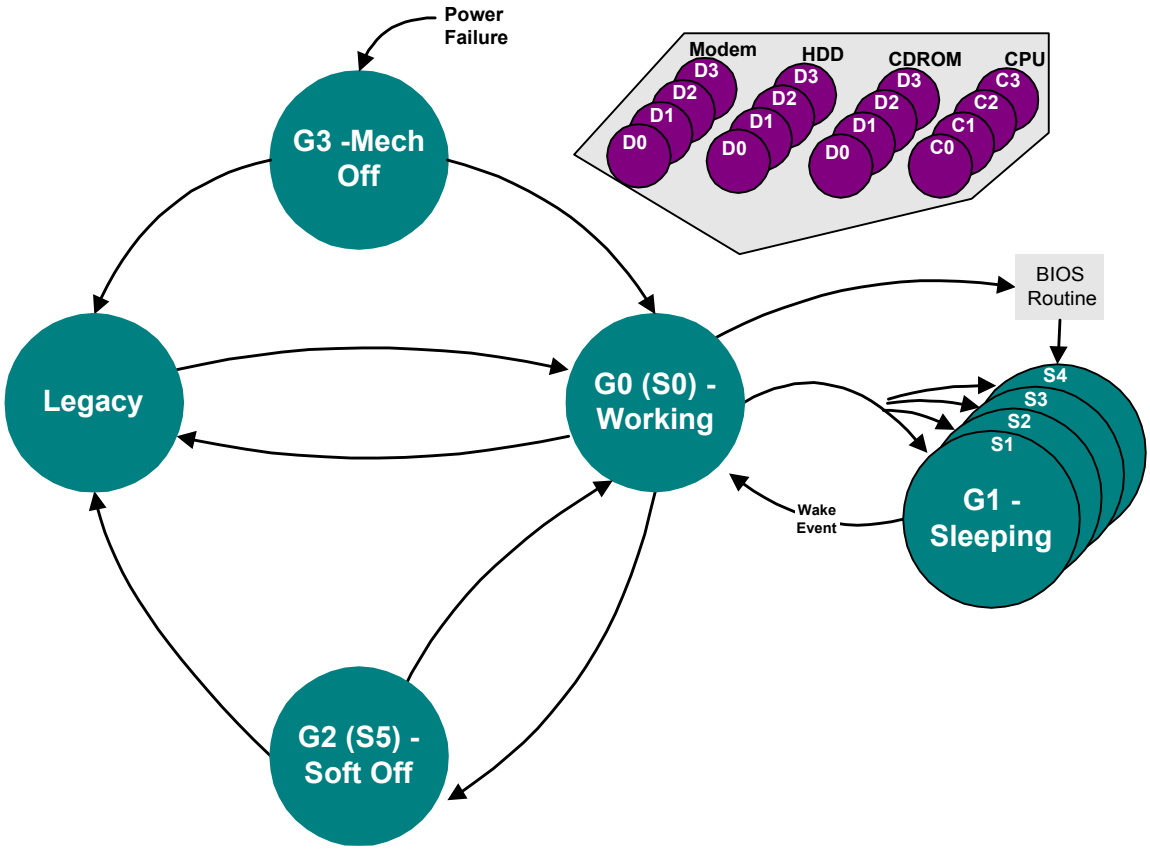


Figure: Global System Power States and Transitions

4.6.5 Power States transition event

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

Power State	Entry Event	Wake up Event
S1	OSPM* control	Predefined Mem/IO range access Ring Indicator Keystroke IRQ1-15 SMI# / ACPI SCI# / USB
S2	OSPM control	Predefined Mem/IO range access Battery Warning Battery Low Ring Indicator Keystroke (Int., Ex. And USB keyboard) Mouse movement Schedule Alarm SMI# / ACPI SCI# / USB
S3	OSPM control, Sleep Button, Lid Close	Sleep button Ring Indicator Schedule Alarm Lid Open PME# Battery Low
S4	OSPM control,	Sleep Button Ring Indicator Schedule Alarm
S5	OSPM control, Power Button	

*OSPM: OS-directed Power Management

4.6.6 Lid Switch

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

4.6.7 Power/Sleep Button

The function of Power/Sleep Button is depends on the ACPI aware OS.

4.6.8 Device Power management

Power state of local devices table

See section 5.8.1 “Power state of local devices table” for detail.

Device PM control during Stand by mode

See section 5.8.2 “Device PM control during Stand by mode” for detail.

Device PM control during STR mode

See section 5.8.3 “Device PM control during STR mode” for detail.

Device PM control during STD mode

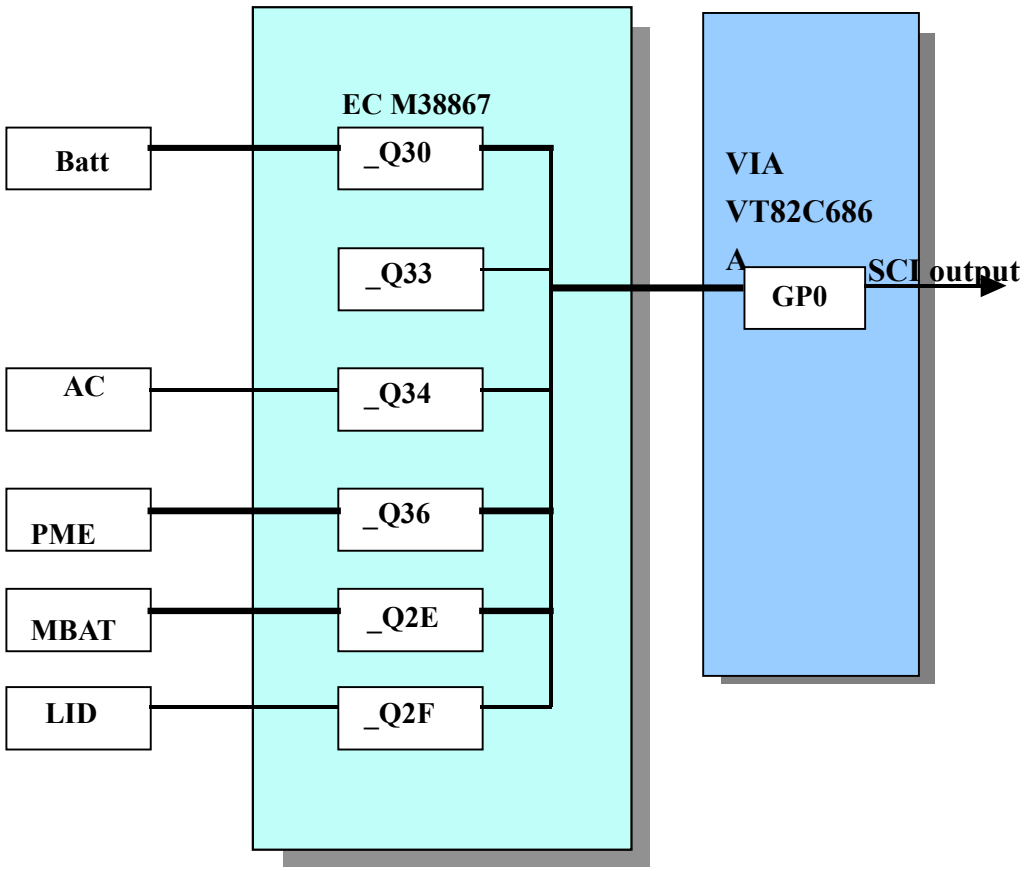
See section 5.8.4 “Device PM control during STD mode” for detail.

The power plane is divided as following:

See section 5.2 “System Power Plane” for detail.

4.6.9 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 the ACPI specified General



SCI Source and Query Event from M38867

M38867 GPI	Input Event	Query Event	Handler
Port 6.0	Battery	_Q30	AML Handler
Port 6.4	AC in	_Q34	AML Handler
Port 6.6	PME	_Q36	AML Handler
Port 5.4	Main battery low	_Q2E	AML Handler
Port 5.5	LID switch	_Q2F	AML Handler

Control Method Battery Subsystem

EC should support all the battery information to ACPI-OS

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

4.6.10 Thermal Control T.B.D

There are three primary cooling policies that the OS uses to control the thermal state of the hardware.

Cooling Policy	Action	Temperature
Passive cooling	Throttle CPU Off	T_A
Active cooling	Throttle CPU On	T_B
Critical cooling	System shut down	T_C

Note: The temperature is $T_A < T_B < T_C$

Mobile CUP ($T_A = 62$□, $T_B = 65$□, $T_C = 80$□)

Desktop CPU ($T_A = 52$□, $T_B = 54$□, $T_C = 70$□)

4.7 Battery Management

The A440 supports both Li-Ion and Ni-MH Battery Pack. There is only one battery pack activating at one time.

4.7.1 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 battery voltage is too high.
- ✍ Battery Life is around 2.5 Hours.
  Note that the battery life depends on different configuration running. (E.g. the battery life is shorter with CDROM running, the battery life is longer with document keyin only; battery life is short while PMU disabled, battery life is longer while PMU enabled.)
- ✍ Battery reading methodology is through M38867 SMBus.

4.7.2 Battery Warning

When the battery capacity remains 8%*, the M38867 will generate a battery warning SMI. The system will do the following action.

- The system issues a warning beep (3 beeps at once).

Note: *Under Win 98: It will depend on the setting of O/S. (Default is 10%)

4.7.3 Battery Low

When the battery capacity remains 3%*, the system will generate a battery low SMI. The system will do the following action.

- The Power LED will become amber.
- 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 condition is removed.

Note: *Under Win 98: It will depend on the setting of O/S. (Default is 3%)

4.7.4 AC Adapter

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

- The charger will charge the Battery.
- The Battery Charging Indicator will turn on if the battery is in changing mode.
- The power management function will be disabled, if the Setup item of "Power Management Mode" is set to "Battery Only".
- The "Battery Warning" and "Battery Low" condition will be removed.

4.8 PIC16C62A - uP

The micro controller PIC16C62 acts as a supplement for power management control. It supports a lot of functions via SMBus interface.

4.8.1 The System Communication with PIC16C62

The system communicates with PIC16C62A via SMBus interface. The SMBus host (M38867) should be firstly initialized before starting the transaction. The following is the procedure for system communication with PIC16C62:

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 PIC16C62A slave address to SmbHstAdd register.
   i.) Send command to PIC16C62A -- Slave address is 04h.
   ii.) Read data from PIC16C62A -- 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 PIC16C62A.
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 PIC16C62A.

4.8.2 PIC16C62A Command List

Command/Data	Access	Unit	Function Description
0x00			Reserved
0x01	read	Word	Read PIC software version
0x02	read	Byte	Read LCD contrast level (DAC)
0x03	read	byte	Read LCD brightness level (DAC)
0x04	read	word byte0 byte1	Read primary battery DQ_NAC NACH NACL
0x05	read	word byte0 byte1	Read 1st battery DQ_LMD&NACH DQ_LMD DQ_NACH
0x06	read	byte	Read primary battery DQ_FLGS1
0x07	read	byte	Read primary battery DQ_TMPGG
0x08	read	byte	Read primary battery DQ_FLGS2
0x09	read	byte	Read primary battery DQ_PPD
0x0A	read	byte	Read primary battery DQ_PPU
0x0B	read	byte	Read primary battery DQ_VSB 2014
0x0C	read	byte	Read primary battery DQ_VTS 2014
0x0D	read	word byte0 byte1	Read secondary battery DQ_NAC NACH NACL

0x0E	read	byte byte0 byte1	Read 2nd battery DQ_LMD&NACH DQ_LMD DQ_NACH
0x0F	read	byte	Read secondary battery DQ_FLGS1
0x10	read	byte	Read secondary battery DQ_TMPGG
0x11	read	byte	Read secondary battery DQ_FLGS2
0x12	read	byte	Read secondary battery DQ_PPD
0x13	read	byte	Read secondary battery DQ_PPU
0x14	read	byte	Read secondary battery DQ_VSB
0x15	read	byte	Read secondary battery DQ_VTS
0x16	read	word byte0 byte1	Read battery chemistry characteristic primary battery 0x00:non-battery 0x02:Li-ION 0x03:Ni-MH secondary battery 0x00:non-battery 0x02:Li-ION 0x03:Ni-MH
0x17	read	word byte0 byte1	Read primary battery NACL1,NACL2 at interval of 20s NACL2 NACL1
0x18	read	word byte0 byte1	Read secondary battery NACL1,NACL2 at interval of 20s NACL2 NACL1
0x19	read	word byte0 byte1	Read LCD contrast/brightness brightness contrast
0x1A	reserved		
0x1B	reserved		
0x1C	reserved		
0x1D	reserved		
0x1E	reserved		
0x1F	reserved		
0x20	write	byte	System command
0x20/00			NOP
0x20/01			System suspend request
0x20/02			System resume from suspend
0x20/03			Mask PICSMI ,BAT_L,BAT_LL
0x20/04			Enable PICSMI,BAT_L,BAT_LL
0x20/05			Blinking battery low LED
0x20/06			Un-blinking battery low LED
0x20/07			AC adapter plugged in
0x20/08			AC adapter plugged out
0x20/09			System power off
0x20/0A			Used in SMB system
0x20/0B			Used in DQ battery system
0x20/0C			Sound single set alarm beep
0x20/0D			Un-sound alarm beep

0x20/0E			Blinking battery low LED & Sound single alarm beep
0x20/0F			Un-blinking battery low LED & Un-sound single alarm beep
0x20/10			Sound alarm beep twice per minute
0x20/11			Un-sound alarm beep twice per minute
0x20/12			Blinking battery low LED & Sound alarm beep twice per minute
0x20/13			Un-blinking battery low LED & Un-sound alarm beep twice per minute
0x20/14			Enable LCM VEENA
0x20/15			Disable LCM VEENA
0x20/16			System resume from suspend & Issue a low pulse 100mS
0x20/17			Set suspend LED ON
0x20/18			Set suspend LED OFF
0x20/19			Stop PWM1 & PWM2 function
0x20/1A			Resume PWM1 & PWM2 function
0x20/1B			Mask modem ring in resume
0x20/1C			Enable modem ring in resume
0x21	write	byte	Set LCD contrast level
0x22	write	byte	Set LCD contrast max. value
0x23	write	byte	Set LCD contrast min. value
0x24	write	word byte0 byte1	Set LCD adjust scale contrast scale brightness scale
0x25	write	byte	Set LCD brightness level
0x26	write	byte	Set LCD brightness max. value
0x27	write	byte	Set LCD brightness min. value
0x28	write	word byte0 byte1	First power on set LCD contrast, brightness level & for POST reset BAT_L, BAT_LL signal & LED contrast brightness
0x29	reserved		
0x2A	write	word byte0 byte1	Write data to primary battery BQ2010 command | 0x80 (set bit7) i.e. 83H:write NACH 84H:write BATID 85H:write LMD 8CH:write VTS 2014 only Data
0x2B	write	word byte0 byte1	Write data to secondary battery BQ2010 command | 0x80 (set bit7) i.e. 83H:write NACH 84H:write BATID 85H:write LMD 8CH:write VTS 2014 only Data

4.9 Miscellaneous

4.9.1 Security

The user may enter up to 8 standard text characters to be 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, 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, the system will halt.

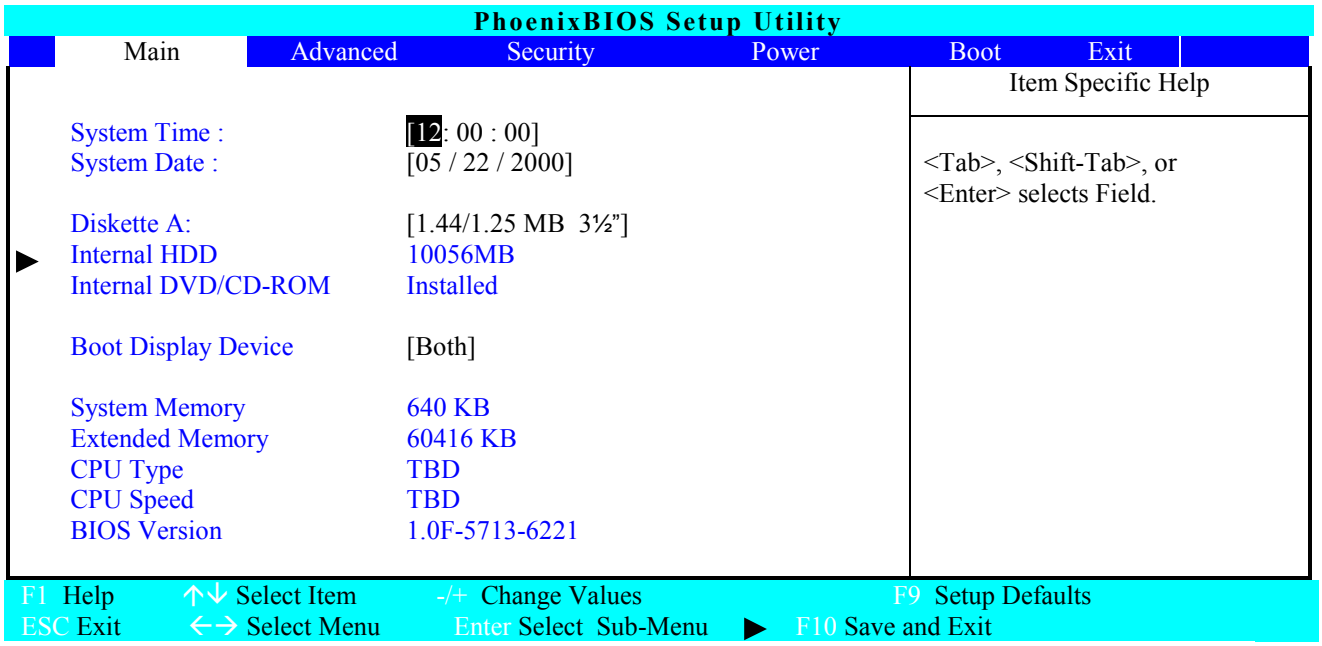
4.9.2 SMBIOS Support

System Management BIOS 2.1 support DMI 2.0 interface.

4.10 CMOS Setup Utility

The Setup utility is used to configure the system. The Setup contains the information related to the hardware for boot & power management purpose. All the changed settings will take effect after the system rebooted.

4.10.1 Main Menu Default & Options



\System Time:	[12:00:00]	<Tab>, <Shift-Tab>, or <Enter> selects Field.
System Date:	[07/01/1998]	<Tab>, <Shift-Tab>, or <Enter> selects field.
Diskette A:	[1.44/1.25 MB 3½"] / [Disabled]	Selects floppy type. Not that 1.25 MB 3½" references a 1024 byte/sector Japanese media format. The 1.25 MB, 3½" diskette requires a 3-Mode floppy-disk drive.
Language:	[English (US)]	
▶ Internal HDD	[10056MB]	□10.1.1
Internal DVD/CD-ROM	Installed	(BIOS auto detect, display for information only)
Boot Display Device	[Both / LCD / CRT]	Choice the display device.
System Memory	640 KB	(BIOS auto detect, display for information only)
Extended Memory	60416 KB	(BIOS auto detect, display for information only)
CPU Type	Pentium® III	(BIOS auto detect, display for information only)
CPU Speed	800MHz	(BIOS auto detect, display for information only)
BIOS Version	1.0F-5713-6221	(BIOS-VGA-□P version)

4.10.1.1 Internal HDD Sub-Menu Default & Options

PhoenixBIOS Setup Utility

Main

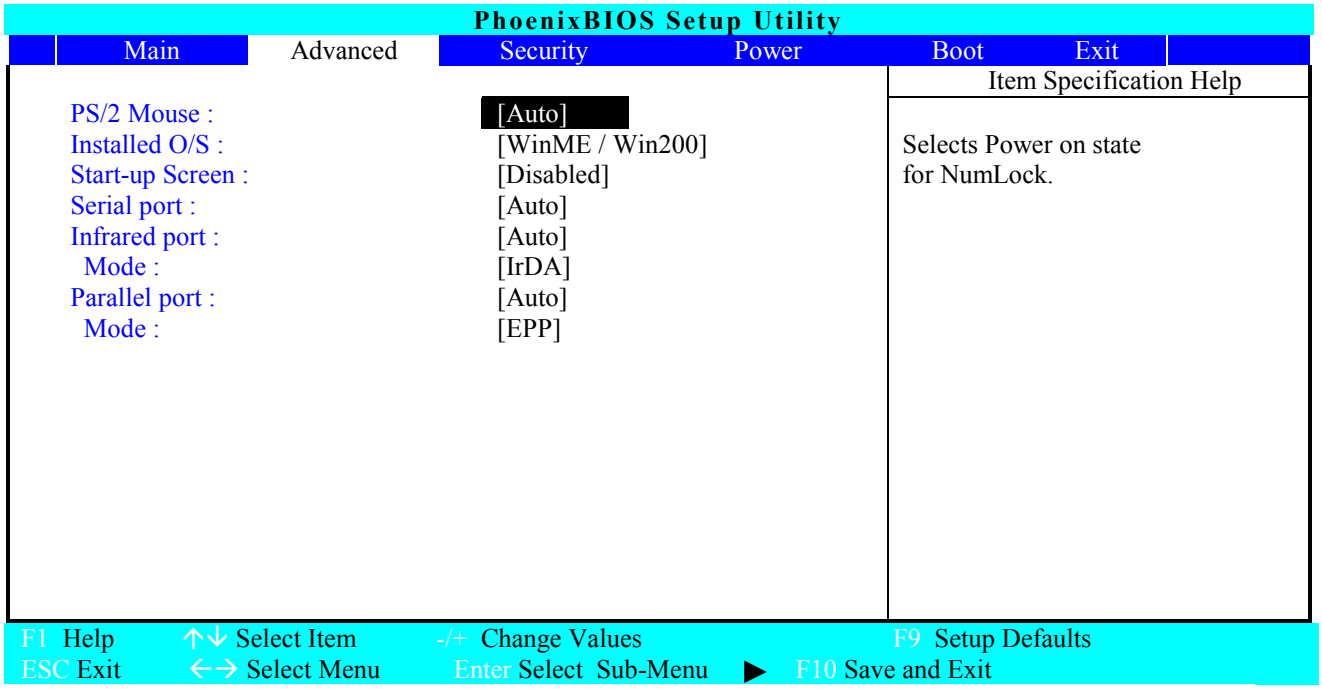
Internal HDD: [10056MB]		Item Specific Help
Type:	[redacted]	Select the drive type correspond to the fixed disk installled in your System .If type USER is select, Cylinders ,Heads & Sectors are edited directly.
Cylinders:	16383	
Heads:	16	
Sectors:	63	
Maximum Capacity:	10056MB	
Multi-Sector Transfers:	16 Sectors	
LBA Mode Control:	Enabled	
32 Bit I/O:	[Disabled]	
Transfer Mode:	[FPIO 4 / DMA 2]	
Ultra DMA Mode:	[Mode 2]	
SMART Monitoring	Enabled	

F1 Help ↑↓ Select Item -/+ Change Values F9 Setup Defaults
ESC Exit ←→ Select Menu Enter Select Sub-Menu ▶ F10 Save and Exit

Type: Cylinders: Heads: Sectors:	[Auto] 16383 16 63	Select the drive type corresponding to the fixed disk installed in your system. If type USER is selected, Cylinders, Heads & Sectors edited directly.
Maximum Capacity:	10056MB	(BIOS auto detect, display for information only)
Multi-Sector Transfers:	[16 Sectors] / [Disabled] / [2 Sectors] / [4 Sectors] / [8 Sectors]	Specify the number of sectors per block for multiple sector transfers. 'MAX' refers to the size the disk returns when queried.
LBA Mode Control:	[Enabled] / [Disabled]	Enabling LBA causes Logical Block Addressing to be used in place of Cylinders, Heads & Sectors
32 Bit I/O :	[Disabled] / [Enabled]	This setting enables or disables 32 bit IDE data transfers
Transfer Mode:	[Standard] / [Fast PIO 1] /	Select the method for moving data to/from the drive.

	[Fast PIO 2] / [Fast PIO 3] / [Fast PIO 4] / [FPIO 3 / DMA 1] / [FPIO 4 / DMA 2]	Autotype the drive to select the optimum transfer mode
Ultra DMA Mode:	[Disabled] / [Mode 0] / [Mode1] / [Mode 2] / [Mode3] / [Mode 4]	Selects the Ultra DMA mode used for moving data to / form the drive.
SMART Monitoring	Disabled / Enabled	

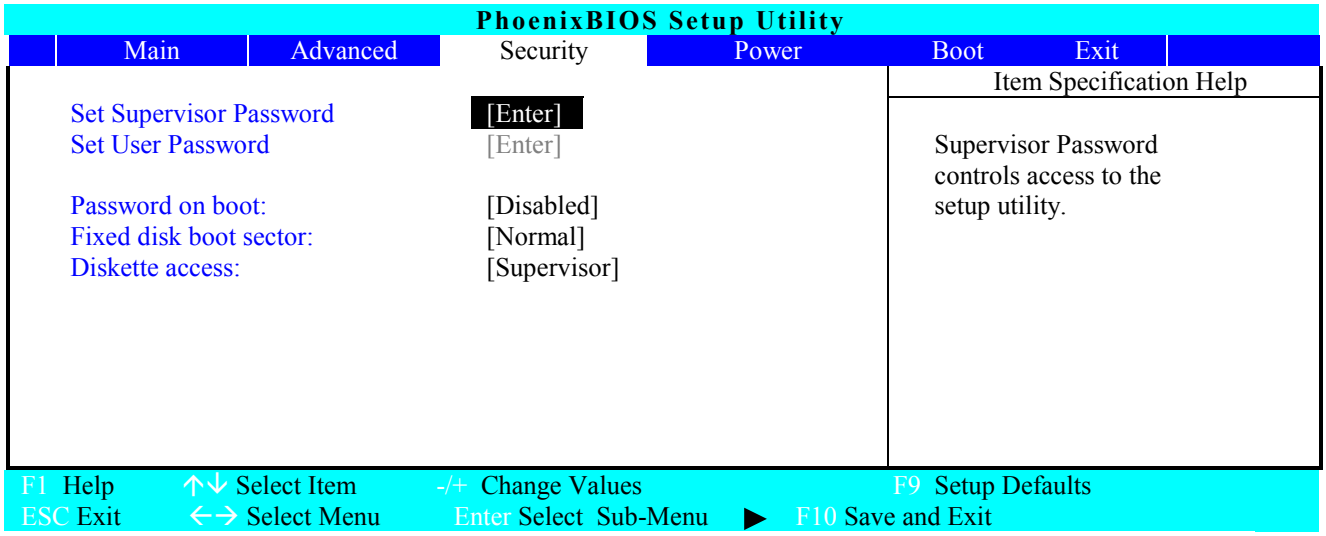
4.10.2 Advanced Menu Default & Options



PS/2 Mouse	[Auto] / [Both]/ [Disabled]	'Disabled' prevents any installed PS/2 mouse from functioning, but frees up IRQ12. [Both] allows both internal and external PS/2 mouse to be active.[Auto] will only allow the external PS/2 mouse to be active if it is detected.
Installed O/S	[WinME / Win2000] / [Other]	Select the operating system installed on your system which you will use most commonly. Note: An incorrect setting can cause some operating systems to display unexpected behavior.
Start-up Screen	[Enabled] / [Disabled]	Select boot screen using options: [Enabled] – Boot with POST screen. [Disabled] – Boot with black screen.

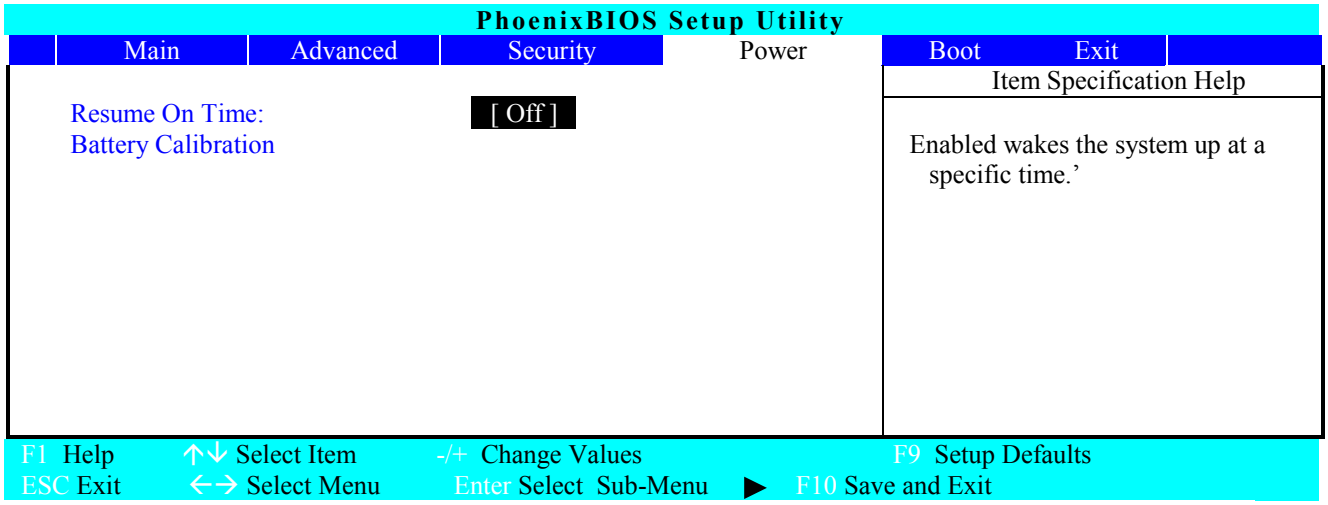
Serial port	[Auto] / [Disabled]	Configure serial port A using options: Disabled - No configuration, Auto - BIOS or OS chooses configuration.
Infrared port	[Auto] / [Disabled]	Configure Infrared port using options: Disabled - No configuration, Auto - BIOS or OS chooses configuration..
Parallel port	[Auto] / [Disabled]	Configure parallel port using options: Disabled - No configuration, Auto - BIOS or OS chooses configuration,
Mode	[Uni-directional] /[ECP] / [EPP]	Set the mode for the parallel port using options: Uni-directional,.ECP, EPP.

4.10.3 Security Menu Default & Security Menu Options



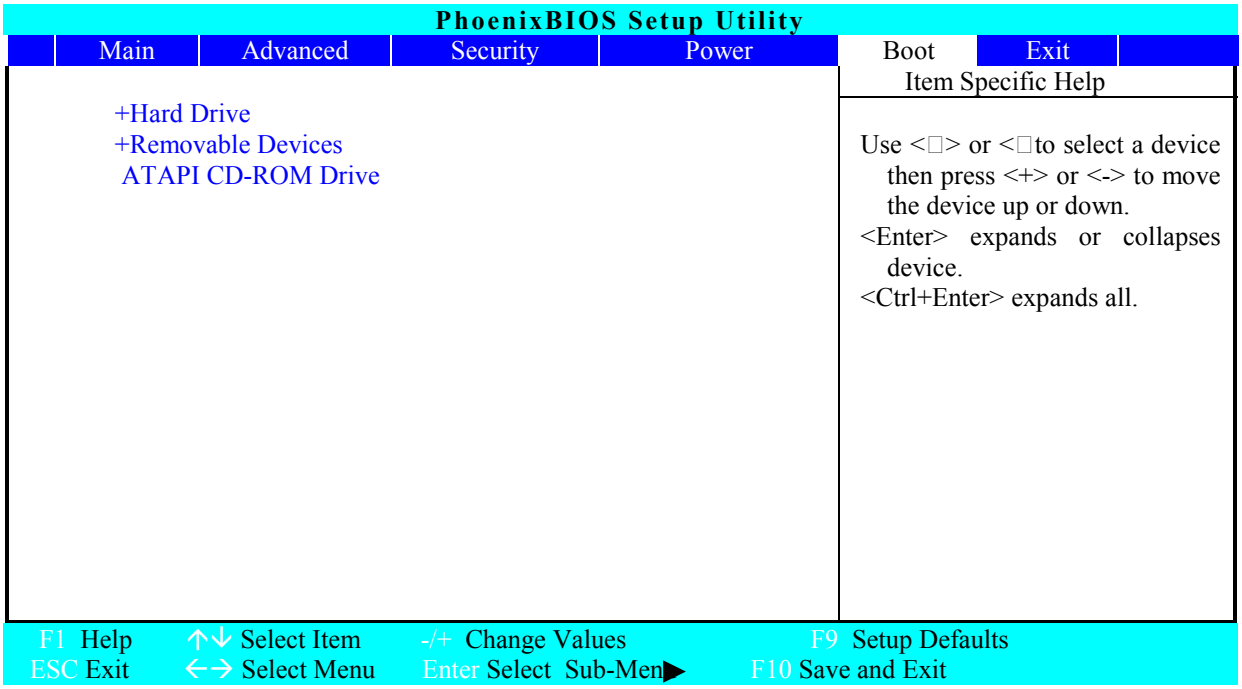
Set Supervisor Password	Press Enter	Supervisor Password controls access to the setup utility.
Set User Password	Press Enter	User Password controls access to the system at boot.
Password on boot	[Disabled] / [Enabled]	Enabled password entry on boot
Fixed disk boot sector	[Normal] / [Write protect]	Write protects boot sector on hard disk, to protect against viruses.
Diskette access	[Supervisor] / [User]	Control access to diskette drives.

4.10.4 Power Saving Menu Default & Power Options

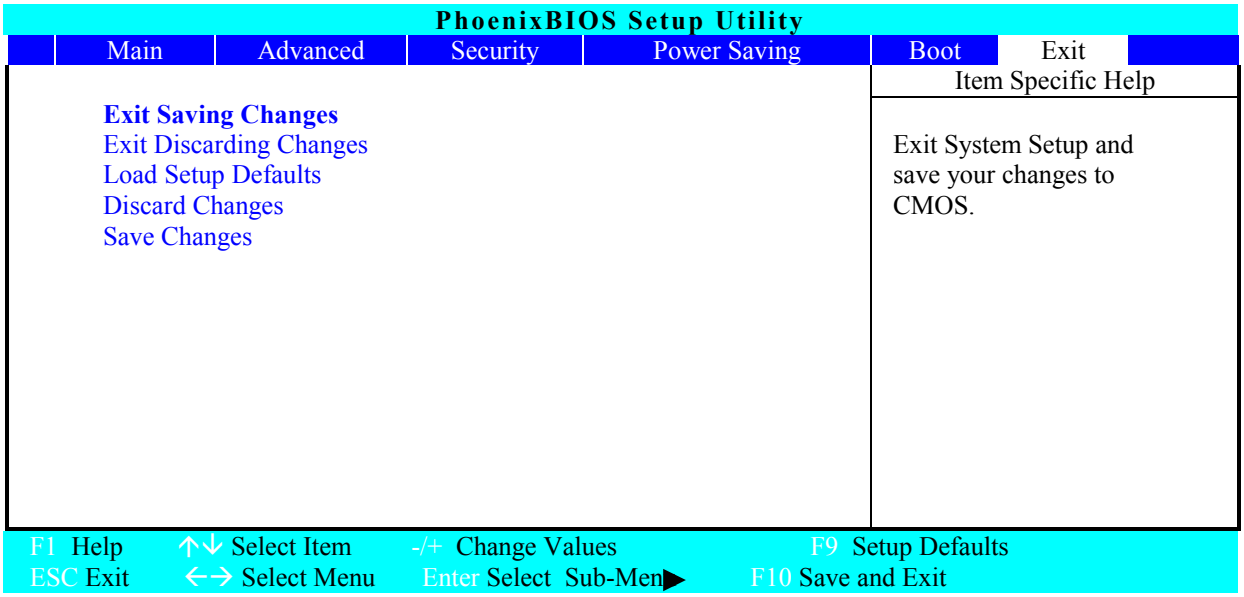


Resume On Time	[On] / [Off]	Enabled wakes the system up at a specific time.
Battery Calibration		Reactivate the battery.

4.10.5 Boot Menu Default & Boot Menu Options



4.10.6 Exit Menu & Exit Options



Exit Saving Changes	Exit System Setup and save your changes to CMOS.
Exit Discarding Changes	Exit utility without saving Setup data to CMOS.
Load Setup Defaults	Load default values for all SETUP items.
Discard Changes	Load previous values from CMOS for all SETUP items.
Save Changes	Save Setup Data to CMOS.

4.11 Definitions of Terms

ACPI - Advanced Configuration and Power Management Interface.

Clock Throttling - VT82C686A 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 savings, thermal management, and reducing the processing speed.

GPI - General Purpose Input.

GPO - General Purpose Output.

Lid Switch - A switch that indicates the notebook LCD Panel has been closed or not.

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 includes power management, USB legacy keyboard control, security, hot keys, and thermal monitoring.

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

TBD -To Be Discussed. It means that the specification is not final yet and should be discussed with related groups.

Chapter 5

Maintenance & Disassembly

5.1 Introduction

This section contains preventive and corrective maintenance procedures for the A440 Series 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.

> ⓘ 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 Protecting the Disk Drives

To protect the disk drives and data, back up the system disk periodically on floppy diskettes. Periodically use a head-cleaning diskette in the floppy diskette drive to prolong the life of the drive and to help maintain data integrity.

5.2.3 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.

5.2.4 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.

5.2.5 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 Phillips screwdriver
- Regular size Phillips screwdriver
- Small Hex-bolt screwdriver

> 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.

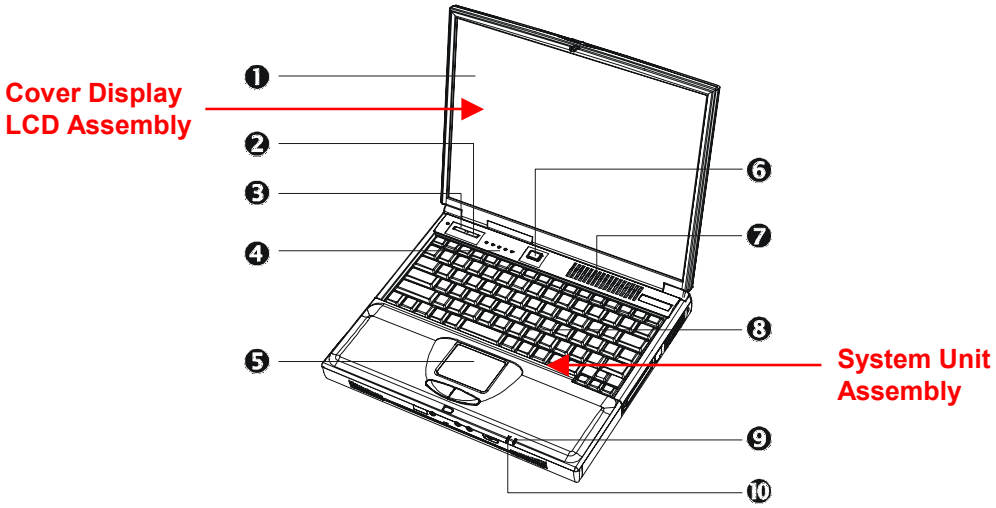


Figure 5-1 Cover Display and System Unit Assembly

❶	Color LCD Panel	❷/❸	Email / Browser Buttons	❹	Status LED Panel
❺	Glidepad	❻	Power Button	❼	Air Cooling Vent
❽	Keyboard	❾/❿	Power/Charge LEDs		

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**
  12.1”/13.3”/14.1” LCD (Liquid Crystal Display) screen 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.

The following System Top Unit Assembly includes the following major field replaceable units/parts (FRUs):

- **Glidepad Touchpad Module Assembly**
  The touchpad (glidepad) pointing device module is assembled at the underside of the Palm-rest case with the sensor pad exposed on the top. The assembly comprises of the glidepad board, the glidepad converter board, the select buttons bracket casing, the insulator sheet, the glidepad FPC cable, and the glidepad wire cable. The glidepad board is assembled just underneath the select button assembly. It provides a FPC cable connector for the glidepad converter board. The converter board on the other hand provides the wire cable connector to the audio board of the system unit.

- **Keyboard Panel Assembly**
  The keyboard is assembled on top of the system unit and connected to the I/O 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 right side of the system unit. It comprises of a heat plate and one fan. There are four screws securing the heat plate to the CPU module inserted on the motherboard. The exhaust fan is secured underneath the heat plate using two small screws.

- **System Upper Unit Case Assembly**
  The system upper unit case assembly is a thin bracket for holding the keyboard and heat plate as well as covering the base unit. It is also where you attached the LCD panel through the hinge sections and includes the power button 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 the 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 front left side of the system base unit located just above the floppy disk drive assembly. The HDD is secured by a steel bracket and one screw. The HDD module is a 2.5-inch hard disk drive with a maximum height of 12.7mm. The hard drive module assembly is attached to the motherboard through the HDD board connector that plugs into the I/O board.

- **I/O Board + Charger Board**
  The I/O board is a daughter board attached to the system main board or motherboard. This I/O board also has the charger board attached to it underneath. The I/O board provides connections for the hard drive, floppy drive, and keyboard. The I/O board also includes the cover switch for activating STR mode when the LCD cover is closed.
  The charger board, on the other hand, provides the circuitry for charging the battery. It is attached on the underneath the I/O board and can be separated from it. You need to remove the I/O board first before you can see the charger board.

- **Audio Board**
  The audio board is a daughter board that is attached to the system main board or motherboard through a connector near the PCMCIA connector. The audio board sits on top of the battery pack compartment and is just on the right side of the I/O board. This board provides connections for the internal microphone, speakers, CMOS battery, and glidepad. It also includes the external audio ports for connecting external audio devices.

- **CD-ROM / DVD-ROM Drive Assembly**
  The CD-ROM / DVD-ROM Drive Assembly is attached on the left end side of the base unit and is only secured with one screw. The drive module includes a metal bracket (left and right) with two screws securing each bracket.

- **Floppy Disk Drive Assembly**
  The Floppy Drive assembly is located at the front left side of the base unit just underneath the hard disk drive assembly. It is assembled to the unit with one screw secured on the lower left corner. The module consists of the metal bracket with four screws, insulation sheet, FDD FPC cable, and the floppy drive.

- **CPU**
  The Pentium-III/Celeron FC-PGA socket is found on the top part of the motherboard. You will need a flat screwdriver for removing or installing the CPU. Refer to Chapter 2 on how to install and upgrade the CPU.

- **Speaker Assembly**
  The two internal speakers of the notebook are assembled into front left and right side corner of the System. The Speakers are secured into a slot and speaker cable connector is attached into the audio 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 Module Assembly**
  If the computer includes an internal modem or an internal LAN module, it is located underneath the motherboard using a mini-PCI slot. The output jack is inserted into the port just beside the exhaust vent.

- **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. 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:

1. The battery pack is located on the right side of the system unit.
2. To release the battery pack, locate the battery latch found underneath the unit.
3. Push the latch to release the lock and at the same time pull the battery pack out.
4. To replace the battery pack, simply slide in the battery pack until the latch snaps in.

5.5.2 Removing the Glidepad

The glidepad module is assembled underneath the palm-rest cover case. Follow the procedure below on how to remove the module:

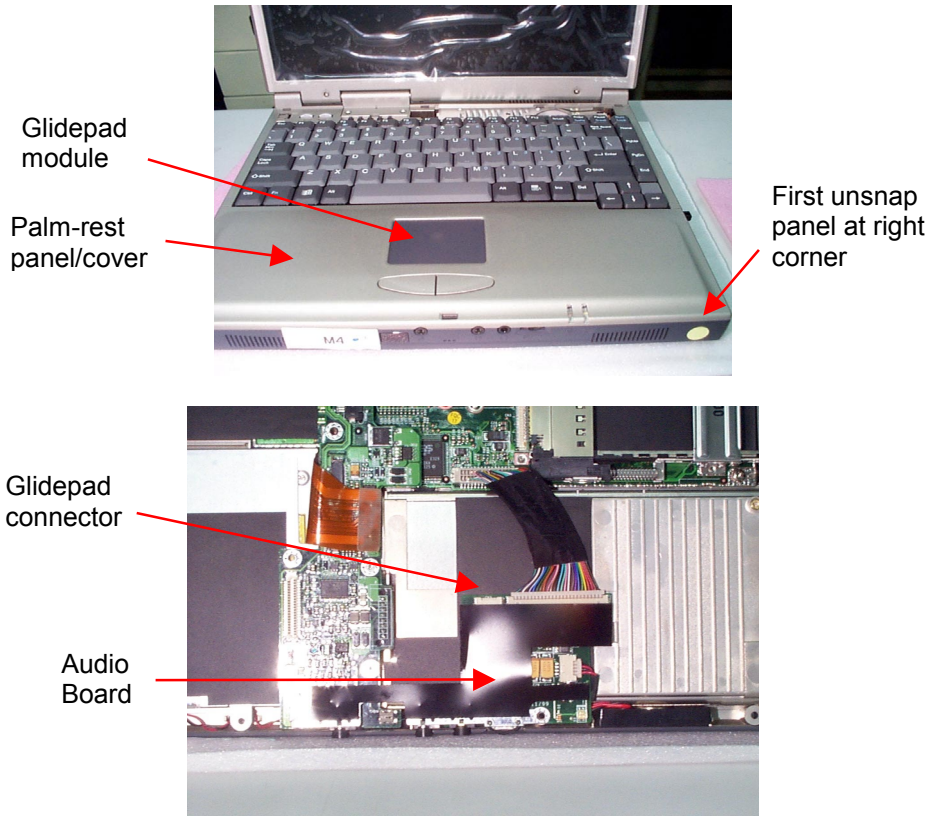


Figure 5-2(a) Removing the Glidepad / Palmrest Cover

1. Remove the three screws mounted on the palm-rest assembly found underneath the unit.
2. Slowly remove the palm-rest cover by unsnapping the sides from the system base unit, starting at the right corner panel.
3. Slowly lift the cover case, and you will find a cable connected from the glidepad to the

audio board. Pull the glidepad cable from the audio board to separate the palm-rest cover from the system unit.

4. Underneath the palm-rest cover, you will see the glidepad module assembly. Remove first the three screws on the glidepad converter board where the glidepad wire cable is connected. Remove the FPC cable connected to it as well.

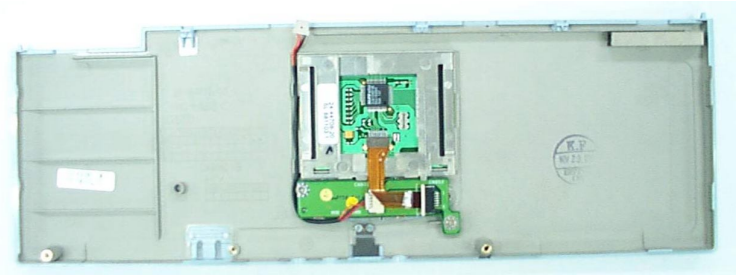


Figure 5-2(b) Glidepad Assembly

5. When the converted board is removed, you can remove the select-button bracket casing covering the glidepad board.
6. Replace a new glidepad module and reverse the procedure to reassemble.

5.5.3 Removing the Keyboard and Heat Plate

The internal keyboard is located just 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 and heat plate:

1. Follow the steps on removing the Glidepad assembly (palm-rest cover). There are no screws attached to the keyboard.
2. Remove the keyboard cover by gently pressing on it and sliding it towards right direction.

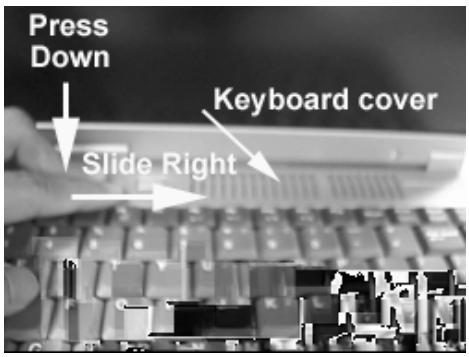


Figure 5-3 Removing the Keyboard Cover

3. Lift the keyboard and tilt it towards the LCD panel. You will find the keyboard cable connected to the I/O board inside the unit. Release keyboard cable by sliding the ZIF connector towards right direction.

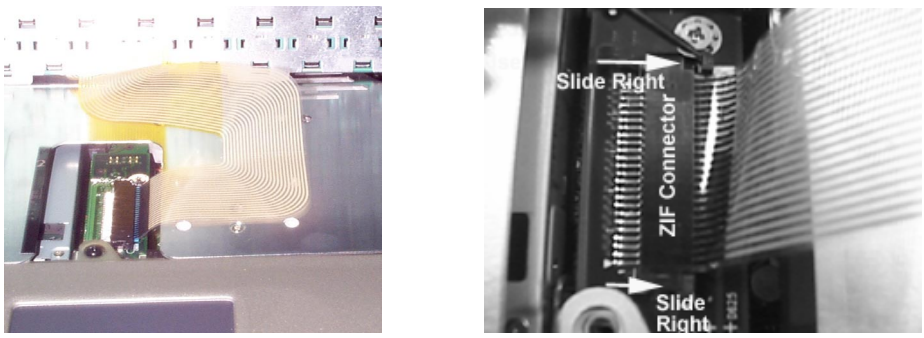


Figure 5-4 Removing the Keyboard Cable

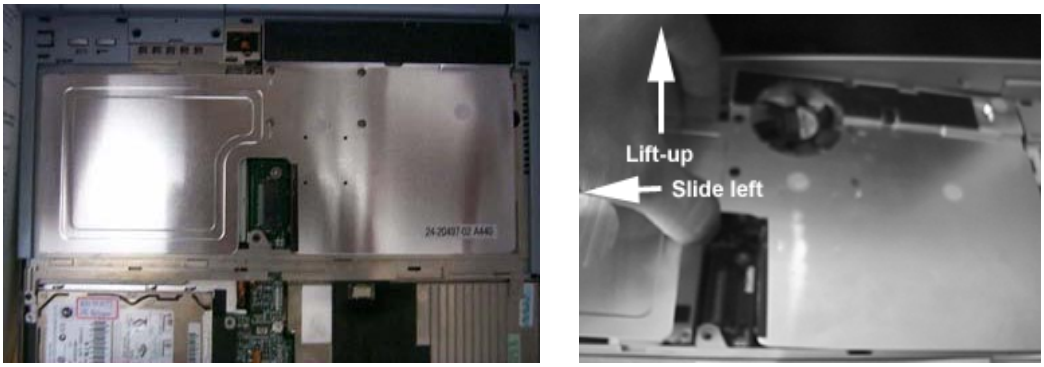


Figure 5-5 Removing the Heat Plate

4. Release the three screws securing the heat plate found on the top center. Remove the heat sink by slightly lifting it up and sliding it towards left direction. Be careful with the CPU fan cable that is still connected on the motherboard. Unplug the CPU fan cable. The heat sink may be a bit difficult to pull out at first time.

5.5.4 Removing the LCD Panel

The procedure for removing the LCD Panel is as follows:

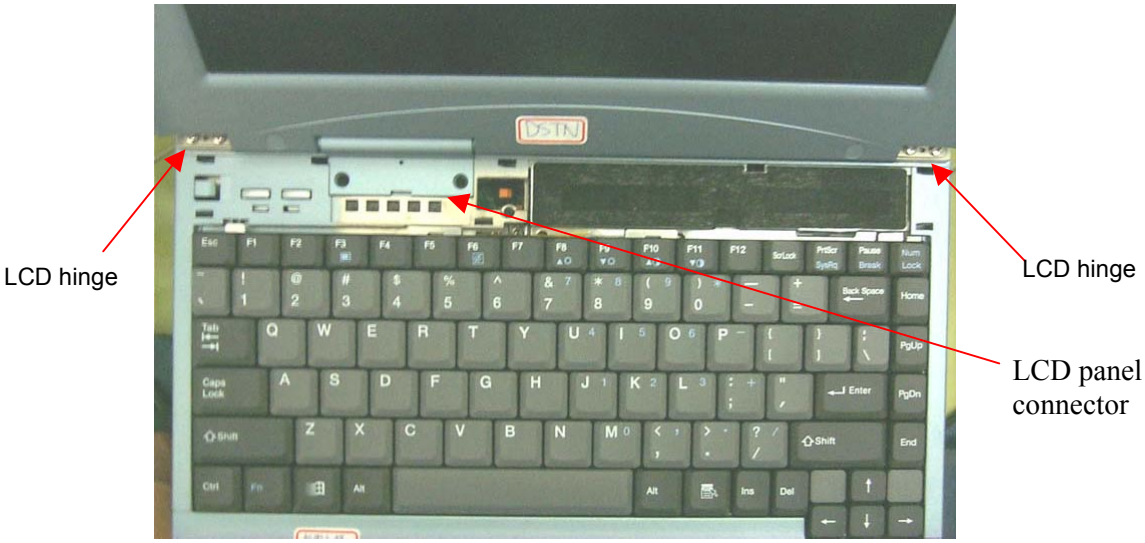


Figure 5-6 LCD Hinge and LCD Panel Connector

1. Follow the steps above in removing the keyboard cover.

2. You will find the LCD panel connector attached to the system unit using two screws. Remove the screws of the LCD panel connector.

3. At the back of the LCD panel connector where the I/O ports are located, you will find another two small screws. The screws are just located on top of the printer port and VGA port. Remove the two screws as well.

4. You now need to pull out the LCD hinge cover found at both rear corners of the system unit where the LCD panel is attached. Use a small flat screwdriver first to unsnap the hinge cover before pulling them.

5. There are two screws securing both LCD hinge to the system unit. Remove the screws to separate the LCD panel from the system unit.

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

7. To remove the LCD screen itself, you need to disassemble the LCD front panel casing. Remove the screws on the front panel as shown in the figure below. Then, carefully separate the front panel cover from the LCD assembly.

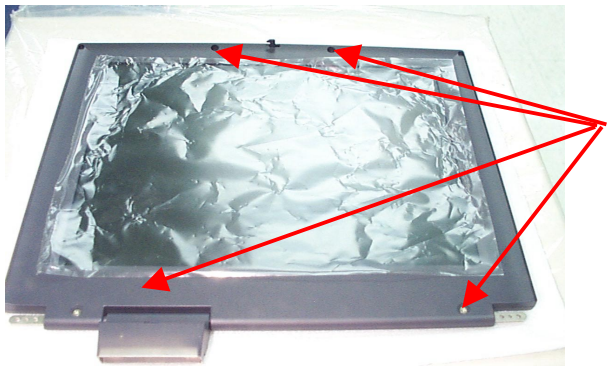


Figure 5-7 LCD Face Cover Screw Locations

5.5.5 Removing the System Upper Case

The procedure for removing the system upper case is as follows:

1. For doing this disassembly, you need first to do the disassembly for the glidepad, keyboard, heat plate, and LCD panel.

2. To remove the system top case, you need to remove several screws. There are nine screws found on the top case - four small ones on the rear end and another five screws as indicated on the figure below. Remove them all.

3. At the rear corners of the system unit on the I/O port, you will find four round screws secured at both ends. Remove them.

4. Slowly unsnap the top case bracket from the bottom case. Pull out the top case.

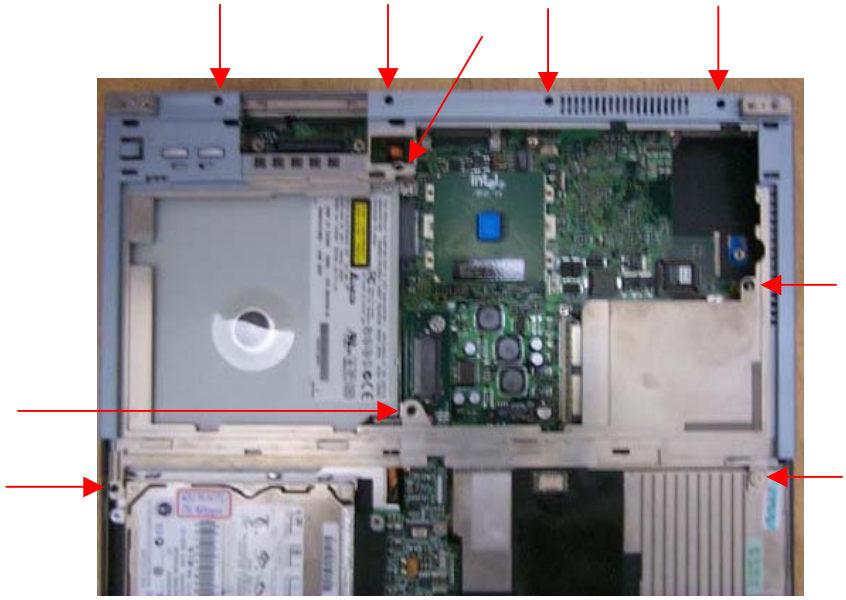


Figure 5-8 Removing the Screws of the System Upper Case

5.5.6 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 and can be upgraded with another standard 2.5" HDD.

1. Remove the two screws securing the palm-rest cover underneath the system base unit. Remove the palm-rest cover by slowly unsnapping each section of the palm-rest cover from the base unit.

2. When you have remove the entire palm-rest cover, simply flip over the touchpad panel to the keyboard. You will find the built-in hard disk secured with one screw at the upper left corner of the hard disk and another screw at the upper right corner of the hard disk. Remove the screw and carefully pull the hard disk module from the connector on the daughter board.

3. Remove the four screws securing the hard disk to the bracket connector and replace with another one. Plug in the hard disk module to the connector on the daughter board and secure the screw on the upper left corner of the hard disk.

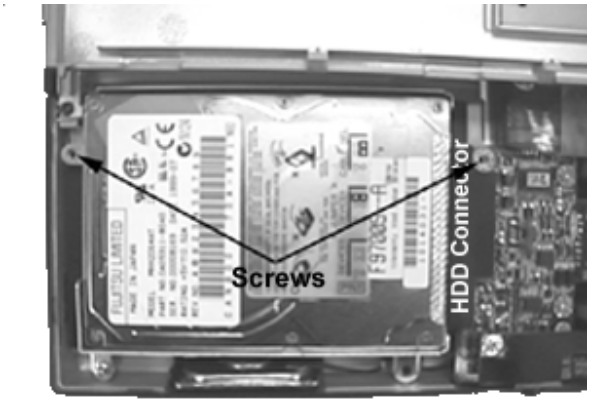


Figure 5-9 Hard Disk Drive Assemblies

5.5.7 Removing the Audio Board

The procedures for removing and replacing the audio board is as follows:

1. Before removing the audio board, you need first to disassemble the glidepad, keyboard, heat plate, LCD panel, and upper casing.
2. The audio board is plugged onto the connector found on the motherboard just behind the PCMCIA connector. The board sits on top of the battery pack compartment. The audio board is where the speaker cable, glidepad cable, internal microphone, and RTC battery are attached.

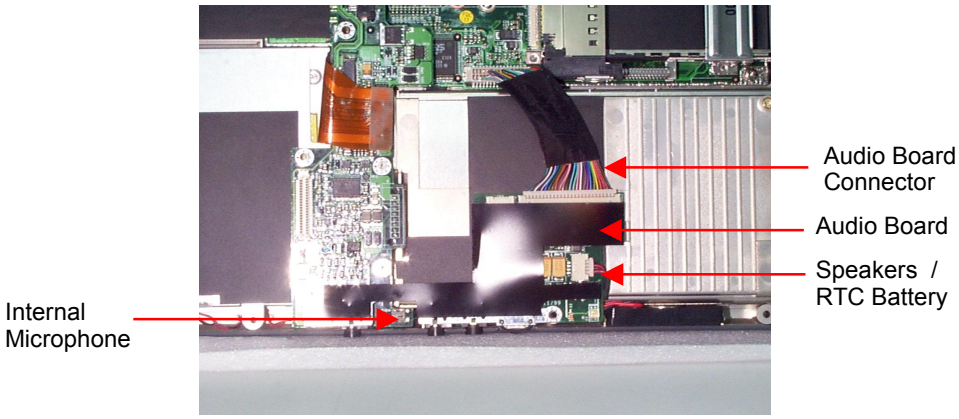


Figure 5-10 Audio Board Screws and Connectors Locations

3. There are three screws securing the audio board (see Figure 5-10). The screw on the right corner is secured on top of the audio board, while the other screw on the left is secured underneath the bottom case and beside the microphone jack. To replace the audio board, remove the two screws, and plug out all cables connected to it.

5.5.8 Removing the Charger Board

The procedures for removing and replacing the I/O + Charger board and DC/DC board are as follows:

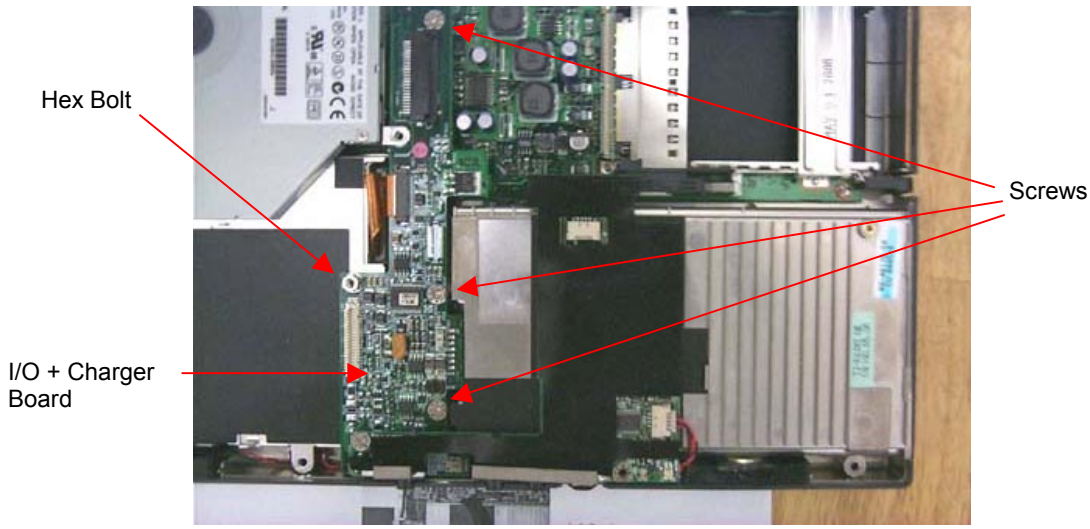


Figure 5-11 I/O Board Assembly

1. Before removing the I/O + charger board, you need first to disassemble the glidepad, keyboard, heat plate, hard disk, LCD panel, upper casing, and audio board.
2. The I/O board is plugged into the middle of the motherboard. The I/O board is also where the FDD cable, hard disk, and audio board are attached. Remove all cables connected to it.
3. There are three screws and one hex bolt securing the I/O board (see Figure 5-11). Remove the screws and slowly pull out the I/O board.

5.5.9 Removing the CD-ROM Module

The procedures for removing and replacing the CD-ROM module is as follows:

1. Before removing the CD-ROM module, you need first to disassemble the glidepad, keyboard, heat plate, hard disk, LCD panel, and upper casing. The CD-ROM module is found at the upper left side of the base unit.
2. To remove the CD-ROM module, remove the screws securing the CD-ROM bracket and pull out the drive from the connector.
3. Slowly slide the CD-ROM module out of the base unit.
4. To replace the CD-ROM, remove the metal bracket around it.

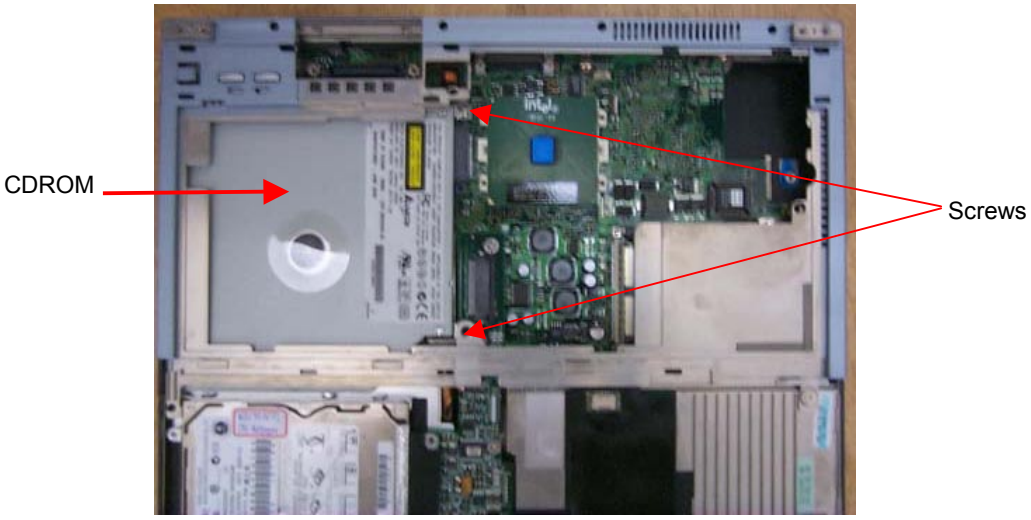


Figure 5-12 CD-ROM Screw Location

5.5.10 Removing the Internal Speaker

The internal speakers are connected on the front left and right side of the base unit assembly. Both speakers are connected to the audio board using wire cable. Follow the procedure below and illustration on how to remove the internal speaker:

1. The internal speakers are located on the front left and right side of the base unit. There are no screws attached to the speakers, just unhook the speakers from the speaker compartment case.

2. The speaker cables are directly connected to the audio board. Pull the wire cable of the internal speakers and take out them out.

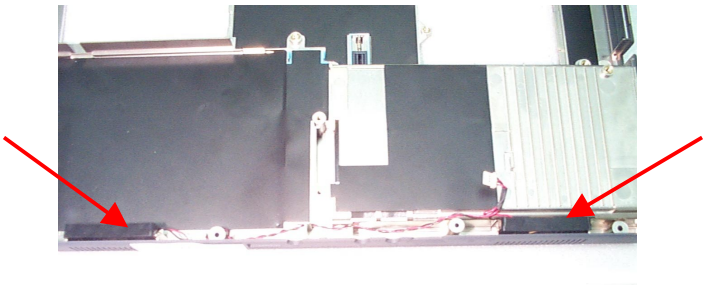


Figure 5-13 Internal Speaker Assembly

5.5.11 Removing the FDD Module

The procedures for removing and replacing the FDD module is as follows:

1. Before removing the FDD module, you need first to disassemble the glidepad, keyboard, heat plate, hard disk, LCD panel, upper casing, CD-ROM module, audio board and I/O board. The FDD cable is also connected to the I/O board. Detach the FDD cable also.
2. The FDD module is assembled to the lower left side of the base unit, just on top of the hard disk drive.
3. Remove the screw securing the lower left side of the FDD metal bracket.

4. Slowly lift the entire FDD module and remove from the base unit.
5. To replace the FDD, remove first the metal bracket and mylar sheet.

5.5.12 Removing the CPU

For removing and installing the Socket 370 FC-PGA CPU, please refer to Chapter 2 on CPU upgrade procedures.

Figure 5-14 Socket 370 FC-PGA

5.5.13 Removing / Replacing the Motherboard

The motherboard contains the major chipset and components needed to run the 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 base unit modules mentioned in the previous sections.
2. On the motherboard, there are six hex bolts and six screws (see figures below). Remove these hex bolts and screws.

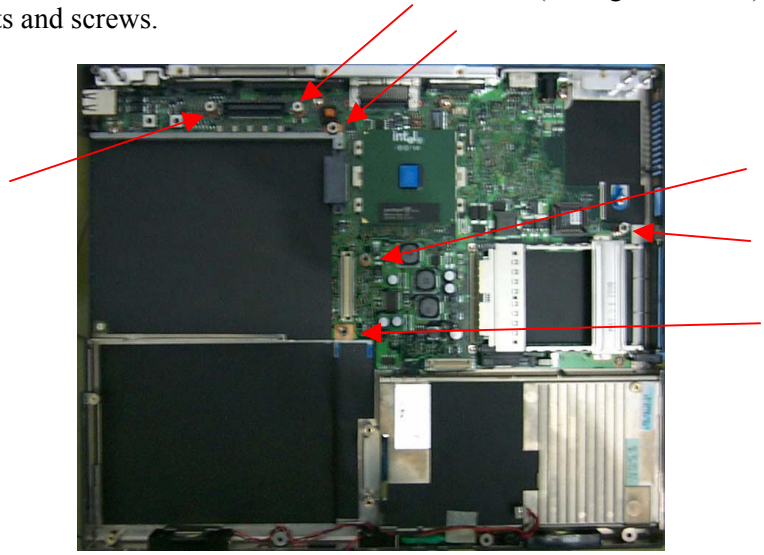


Figure 5-15(a) Motherboard Hex Bolts Location

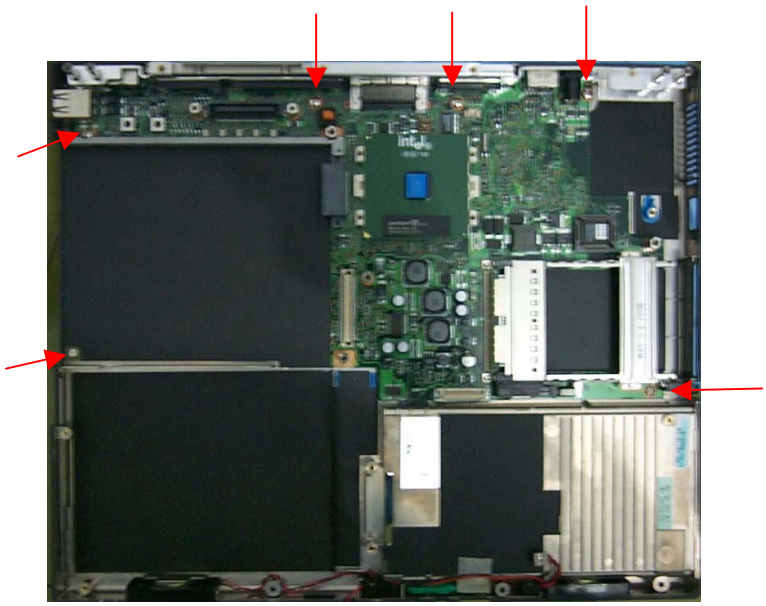


Figure 5-15(b) Motherboard Screws Location

3. Underneath the unit, there are two screws found on the rear corners near the tilt foot. Remove them as well. When all screws and bolts are removed, slowly detached the motherboard from the base unit casing.
4. After removing the motherboard, you can also pull out the I/O port bracket.
5. To remove the I/O port bracket, use a hex bolt screwdriver to remove the hex bolts.

Chapter 6

Troubleshooting and Repair

6.1 Introduction

This chapter provides the most common problem encountered with the A440 notebook computer and some troubleshooting means. Some of the common problems are:

- System BIOS Related Problems
- LCD Display Problems
- System Power and Boot-Up Problems
- External Interface Problems (Serial, Printer, CRT, IR, USB, PS/2)
- Audio Problems
- PCMCIA Problems
- Power Management Problems
- Input Device Problems (Keyboard and Glidepad)

6.1.1 Helpful Starters

Here are a few helpful starters to begin with before troubleshooting the notebook:

- Is there any external power source connected to the computer?
- Does the battery installed been fully charged?
- Is the computer turn on and the POWER LED activated?
- Are all cables connected properly and securely?
- Are all needed device drivers been installed properly?
- Have you checked your AUTOEXEC.BAT and CONFIG.SYS files for errors?
- Is the Power Management function enabled under BIOS Setup? Press any key to wake system up again.

6.2 System BIOS Related Problems

This section provides you with information on how the BIOS handles errors encountered during POST (Power On Self Test) and translate them to beep codes and error messages. Refer to this whenever you encounter error messages or beep codes generated by the computer during startup.

6.2.1 POST Messages

The following is a summary of the Phoenix BIOS startup error messages that is displayed on the notebook's screen. These messages help you in understanding some of the notebook's problems that may be corrected by entering the BIOS SETUP program and checking the original values.

Table 6-1(a) POST Error Messages

Message	Possible Cause	Action
Diskette drive A failure	The drive failed or is missing. Floppy Disk Controller is disabled.	Check the drive to determine the problem. Enabled the FDD Controller.
Diskette read failure - press F1 to retry boot, F2 for SETUP utility	The diskette is either not formatted or is defective.	Replace the diskette with a bootable diskette and retry.
Display adapter failed, using alternate	The primary video adapter failed.	Check the primary video adapter.
Gate A20 failure	The keyboard controller is not accepting command, specifically, the enable and disable A20 command.	Check the keyboard controller and system board. Turn the power off, then back on again. If the problem persists contact qualified service personnel.
Fixed disk configuration error	The specified configuration is not supported or doesn't match the actual hardware installed.	Correct the fixed disk configuration.
Fixed disk controller failure	The fixed disk may be defective.	Try rebooting. If that doesn't work, replace the fixed disk.
Fixed disk read failure-press F1 to retry boot, F2 for SETUP utility	The fixed disk may be configured incorrectly or is defective.	Check the drive type selected in SETUP. Try rebooting. If that does not work, replace the fixed disk.
Pointer device failure	The PS/2-style mouse failed.	Try rebooting. If problem persists, check the mouse, it's cable and connector.
No boot device available - press F1 to retry boot, F2 for SETUP utility	Either diskette drive A:, the fixed disk, or both the diskette and fixed disk are defective.	Try rebooting. If problem persists, replace the diskette or the fixed disk.
No boot sector on fixed disk – press F1 to retry boot, F2 for SETUP utility	The C: drive is not formatted or is not bootable.	Format the C: drive and make it bootable.
Not a boot diskette - press F1 to retry boot, F2 for SETUP utility	The diskette in drive A: is not formatted as a bootable diskette.	Replace the diskette with a bootable diskette and try rebooting.
No timer tick interrupt	The timer chip has failed.	Check the system board, Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
Shutdown failure	Either the keyboard controller is not accepting the reset command or the associated reset logic has failed.	Check the keyboard controller and system board. Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
Time of day not set - run SETUP program	Real Time Clock not set.	Run SETUP utility.

Table 6-1(b) POST Error Messages

Message	Possible Cause	Action
Timer 2 failure	The timer chip has failed.	Check the system board. Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
F2 to enter ROM-based SETUP	Invalid configuration information must be changed.	You must run SETUP utility and correct configuration information.
Invalid configuration information - please run SETUP	Display adapter is configured incorrectly. Memory size is incorrect. Wrong number of diskette drives. Other configuration errors.	Run the SETUP utility.
Keyboard clock line failure	The keyboard, the keyboard cable connection, or the keyboard controller is defective.	Make sure the keyboard cable and keyboard are connected properly. Check the keyboard controller and the system board. Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
Keyboard data line failure	The keyboard controller firmware has failed.	Check the keyboard controller and system board. Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
Keyboard stuck key failure	A key is jammed.	Locate the jammed key and fix it. Make sure the keyboard cable and keyboard are connected properly. Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
Memory failure at *hex-value*, read *hex-value*, expecting *hex-value*	Circuitry associated with the memory chips has failed.	Turn the power off, then back on again. If the problem persists, contact qualified service personnel.
Unexpected interrupt in protected mode	Hardware interrupt or NMI occurred while in protected mode.	Check the timer chip or the interrupt controller on the system board.
Real time clock failure	The RTC or battery failed.	Run SETUP and turn the power off and on. If the problem persists, replace the RTC battery. If the problem remains, contact qualified service personnel.

6.2.2 Informational Messages

This section lists the messages that provide information to the user but require no action.

Table 6-2 BIOS Informational Messages

Message	Meaning
***nnn*K Base Memory**	The amount of base memory that tested successfully.
***nnn*K Extended**	The amount of extended memory that tested successfully.
Memory tests terminated by keystroke	The message indicates that a user pressed the spacebar while memory tests were running and stopped the memory tests.
Press the F1 key to continue	This message indicates that an error was found during POST. Pressing the F1 key allows the system to attempt to reboot.
Beginning memory test Press the SPACEBAR to terminate the memory test	A user can stop the memory tests by pressing the spacebar.
Press the F1 key to continue, F2 to run the Setup utility	This message indicates that an error was found during POST. Pressing the F1 key allows the system to attempt to boot. Press F2 allows users to run the ROM-based SETUP utility to correct configuration information.

6.2.3 Beep Codes

Beep codes are used to identify a POST error that occurs when the screen is not available. Once the screen is operating, diagnostic messages are reported to the screen. There are beep codes for both fatal and non-fatal system board errors.

ⓘ No beep code is generated if a test is aborted while in progress. However, diagnostic cards can be installed in order to display the contents of the diagnostic port 80h and identify the area of failure.

Explanation of test terms for beep code table

The following terms are used in the Test Performed column of the beep code table:

1. **Pattern test** - One or more particular patterns are written to a location then read back from the same location. Examples of patterns used are 55h and AAh. If the value read does not match the value written, the test is considered a failure.

2. **Rolling ones test** - Several patterns are constructed. These patterns represent a one rolling through the given location. For example, to roll a one through three bits, the following patterns would be constructed: 001, 010, 011, 100, 101, 110, and 111. The patterns are written to the location and then read back, one by one. If the value read does not match the value written, the test is considered a failure.

3. **Rolling zeros test** - Several patterns are constructed. These patterns represent a zero rolling through the given location. For example, to roll a zero through three bits, the following patterns would be constructed: 011, 001, and 000. The patterns are written to the location and then read back, one by one. If the value read does not match the value written, the test is considered a failure.

4. **Checksum test** - All of the values in a given range of locations are added together. The

range includes a location which when added to sum of the ranges, will produce a known result, such as zero.

Beep codes for system board errors

Table 6-3 (a) BIOS Beep Codes

Beep Code	Diagnostic Code	Description	Test Performed
none	01h	CPU registers test in progress or failure	Pattern test of most of the 16-bit CPU registers. Failure will result in a system halt.
1-1-3	02h	CMOS write/read test in progress or failure.	Rolling ones test in the shutdown byte (offset 0Eh) of the CMOS RAM. Failure will result in a system halt.
1-1-4	03h	ROM BIOS checksum test in progress or failure.	The range of ROM that includes the BIOS is checksummed. Failure will result in a system halt.
1-2-1	04h	Programmable interval timer 0 test in progress or failure.	Over a period of time, the current count values in timer 0 are read and accumulated by ORing them into the values read so far. It is expected that during the time period, all bits will be set. Failure will result in a system halt.
1-2-2	05h	DMA channel 0 address and count register test in progress or failure.	Rolling ones and rolling zeros test of the address and count registers of DMA channel 0. Failure will result in a system halt.
1-2-3	06h	DMA page register write/read test in progress of failure.	Pattern test of DMA page registers. Failure will result in a system halt.
1-3-1	08h	RAM refresh verification test in progress or failure.	Over a period of time, the refresh bit (bit 4) in port 60h is read and tested. The refresh bit should toggle from 0 to 1, then 1 to 0 within the time period. Failure will result in system halt.
none	09h	First 64K RAM test in progress.	No specific test is performed - just indicates that the test is beginning.
1-3-3	0Ah	First 64K RAM chip or data line failure, multi-bit.	The first 64K of RAM is tested with a rolling ones test and a pattern test. If any of the pattern tests fail, then the BIOS reports that multiple data bits failure. Failure results in a system halt.

Table 6-3 (b) BIOS Beep Codes

Beep Code	Diagnostic Code	Description	Test Performed
1-4-2	0Dh	Parity failure first 64K RAM	At the completion of the rolling ones and pattern tests of the first 64K, the BIOS checks the parity error bits (bits 7 and 6) of port 60h. Failure results in a system halt.
2-1-1 2-1-2 2-1-3 2-1-4 2-2-1 2-2-2 2-2-3 2-2-4 2-3-1 2-3-2 2-3-3 2-3-4 2-4-1 2-4-2 2-4-3 2-4-4	10h-1Fh	First 64K RAM chip or data line failure on bit x	The first 64K of RAM is tested with a rolling ones test and a pattern test. If any of the rolling ones tests fail, then the BIOS reports the specific bit that failed. To determine the bit number from the diagnostic code, subtract 10h. For example, if 12h is displayed at the diagnostic port, bit 2 failed. Failure results in a system halt.
3-3-1	20h	Slave DMA register test in progress or failure.	Pattern test of channels 1 through 3 of the slave controller (starting port address = 02h). Failure results in a system halt.
3-1-2	21h	Master DMA register test in progress or failure.	Pattern test of channels 1 through 3 of the master DMA controller (starting port address = C4h). Failure results in a system halt.
3-1-3	22h	Master interrupt mask register test in progress or failure.	Rolling ones and zeros tests of the mask register of the master programmable interrupt controller (port 21h). Failure results in a system halt.
3-1-4	23h	Slave interrupt mask register test in progress or failure.	Rolling ones and zeros tests of the mask register of the master programmable interrupt controller (port A1h). Failure results in a system halt.
none	25h	Interrupt vector loading in progress.	No specific test is performed - just indicates that the Interrupt Vector table is being initialized.
3-2-4	27h	Keyboard controller test in progress or failure.	The self-test command (AAh) is issued to the 8042 (keyboard controller) and the results are monitored. Failure results in a system halt.

Table 6-3 (c) BIOS Beep Codes

Beep Code	Diagnostic Code	Description	Test Performed
None	28h	CMOS RAM power failure and checksum calculation test in progress.	The power-fail bit in CMOS RAM is tested and the lower CMOS RAM area is being checksummed. A failure does not result in system halt.
None	29h	CMOS RAM configuration validation for video in progress.	No specific test is performed - just indicates that the configuration specified in CMOS for video is being matched against the actual installation. A failure does not result in a system halt.
3-3-4	2Bh	Screen memory test in progress or failure.	The video buffers (B0000h and B8000h) are tested with a pattern test and a rolling ones test. Failure will result in a beep code but not a system halt.
3-4-1	2Ch	Screen initialization in progress.	Until the video installation is confirmed, any calls to INT 10h Function 0 (set mode) will be prefaced with the diagnostic code. There is no expected failure from this.
3-4-2	2Dh	Screen retrace test in progress or failure.	Over a period of time, the retrace bit (bit0) in the appropriate CRT controller status register (either port 3BAh or 3DAh) is read and tested. The retrace bit should toggle from 0 to 1, then 1 to 0 within the time period.
None	2Eh	Search for video ROM in progress.	No specific test is performed by the system BIOS - just indicates that the BIOS is about to jump to the initialization code in the video option ROM.
none	30h	Screen running with video ROM.	No specific test is performed - just indicates that a video option ROM was found and believed to be operating.
none	31h	Monochrome monitor operable.	No specific test is performed - just indicates that the BIOS believes a monochrome monitor is installed and is operating.
none	32h	Color monitor (40-column) operable.	No specific test is performed - just indicates that the BIOS believes a color monitor is installed and is operating. The mode has been set to 40-column as selected by the user in CMOS RAM.
none	33h	Color monitor (80-column) operable.	No specific test is performed - just indicates that the BIOS believes a color monitor is installed and is operating. The mode has been set to 80-column as selected by the user in CMOS RAM.

Table 6-3 (d) BIOS Beep Codes

Beep Code	Diagnostic Code	Description	Test Performed
4-2-1	34h	Timer-tick interrupt test in progress or failure.	All interrupts expect the timer-tick interrupt are masked off at the interrupt controllers. If a timer-tick interrupt does not occur during a specific time period, an error message is displayed on the screen. The system does not halt.
4-2-2	35h	Shutdown test in progress or failure.	A return address is stored in 40:67h and the processor is reset via the keyboard controller. If a timer tick occurs during this time period, an error message is displayed on the screen. Other failures are hard to detect. If possible, the BIOS will continue with POST, skipping the memory tests.
4-2-3	36h	Gate A20 failure.	To test extended memory, the processor must be placed in protected mode and the A20 line must be enabled. For the memory tests, the BIOS generally uses the keyboard controller to enable A20. If the A20 line is not properly set during the memory test, an error message is displayed on the screen and the memory test are suspended. The system does not halt.
4-2-4	37h	Unexpected interrupt in protected mode.	During the memory tests, the processor is placed in protected mode. All interrupts in the interrupt descriptor table are initialized to point to special handler that displays a message on the screen. All hardware interrupt are disabled. The system does not halt when an unexpected interrupt occurs.
4-3-1	38h	RAM test of memory above 64K in progress or failure.	The memory above the first 64K is tested with a rolling ones test and a pattern test. All success and failure messages are displayed on the screen and POST will continue.
4-3-2	3Ah	Programmable interval timer channel 2 test in progress or failure.	Over a period of time, the current count values in timer 2 are read and accumulated by ORing them into the values read so far. It is expected that during the time period, all bits will be set. If an error is detected, an error message will be displayed on the screen and POST will continue.
4-3-4	3Bh	Real-time clock test in progress or failure.	Over a period of time, the Update-In-Progress bit of Status Register A of the real-time clock is read and tested. The bit should toggle from 0 to 1 within the time period.

Table 6-3 (e) BIOS Beep Codes

Beep Code	Diagnostic Code	Description	Test Performed
4-4-1	3Ch	Serial port test in progress or failure.	Pattern test of one or more of the installed serial ports. If a failure is detected, an error message will be displayed and POST will continue.
4-4-2	3Dh	Parallel port test in progress or failure.	Rolling ones test is done to one or more of the installed parallel ports. If a failure is detected, an error message will be displayed and POST will continue.
4-4-3	3Eh	Math coprocessor test in progress or failure.	An integer load and store is performed with the math coprocessor. If the values do not match, an error message will be displayed and POST will continue.

6.2.4 Run-time Error Messages

Table 6-4 BIOS Run-time Error Messages

Message	Cause	Action
I/O card parity interrupt at *address*. Type (S)hut off NMI, (R)eboot, other keys to continue	Memory on a peripheral card has failed.	Check the memory cards installed in the system.
Memory parity interrupt at *address*. Type (S)hut off NMI, (R)eboot, other keys to continue	A memory chip(s) has failed.	Check the memory on the system board.
Unexpected HW interrupt *interrupt at address*. Type (R)eboot, other keys to continue	Hardware problem. Not displayed if the expected interrupt handler is not enabled.	Check all hardware in the system.
Unexpected SW interrupt *interrupt at address*. Type (R)eboot, other keys to continue	Error(s) in the software program. Not displayed if the extended interrupt handler is not enabled.	Turn the machine off and then on again. If doesn't work, check the program.
Unexpected type 02 interrupt at *xxxxh*. Type (S)hut off NMI, (R)eboot, other keys to continue	A parity error occurred, but the source can not be determined.	Turn the power off and then on again.

6.3 Quick Troubleshooting

This section summarizes problems that may develop during system operation and lists suggested corrective actions to isolate problem properly.

Table 6-5 (a) Quick Troubleshooting

Problem or Symptoms	Corrective Actions
No power (Power LED not on)	1. Check that the AC adapter is plugged into the DC-IN connector of the notebook. Also, that the AC adapter is plugged into a properly grounded AC power outlet. 2. If using the battery as main power source, check if the battery pack is of the right type, charged and is inserted correctly. 3. Check the internal DC-DC board of the notebook if it is inserted into the motherboard connector properly. Otherwise, replace the DC-DC board.
Power LED is on but no display and system does not turn on	1. Press power button for 4 seconds to reset hardware settings. Check if Power LED turns off. 2. Check memory module if it is inserted properly. Try to check also the module on the internal slot. 3. Reset CMOS RTC. 4. Replace memory module, CPU module, or DC-DC board.
Display on the LCD is unreadable	1. Adjust the brightness display controls. 2. Check if installed VGA driver is correct and resolution is set according to LCD size and type. 3. Check if the LCD cables are inserted properly. Check also connections inside the LCD panel. 4. Check LCD inverter board inside LCD panel if faulty. 5. Check the North Bridge chip on the motherboard if there is any cold or loosed soldering. 6. Replace the motherboard.
LCD screen does not show display	1. Check the LED Status Bar if Power Saving mode is activated. Press any key or press the power button to resume operation and display. 2. Check if the display output is switched to the external monitor. 3. Check if there is power. 4. Check if LCD cables are disconnected or loosed. 5. Replace LCD Inverter board found inside the LCD Panel.
Battery Power does not last or does not read properly under Win95/Win98	1. Make sure that the power management options under BIOS Setup are enabled and set properly. 2. Recharge the battery pack for at 3 least hours before using again. 3. Discharge and recharge the battery twice (Battery Low-Low Suspend Off) to allow more accurate reading of battery meter under Windows 95 or Windows 98. 4. Replace the battery pack.

Table 6-5 (b) Quick Troubleshooting

Problem or Symptoms	Corrective Actions
System halts during boot sequence	1. Check condition of selected bootload device (diskette or hard disk) for bad boot track or incorrect OS files. 2. Try booting from a new bootable diskette and recopy or repartition hard disk. 3. Check for any BIOS error messages on the display. 4. Replace motherboard.
I/O processing malfunctions	1. Check the connections of all internal devices. 2. Replace motherboard.
Diskette drive does not work	1. Check if FDD option is DISABLED under BIOS Setup program. 2. Check if floppy drive cable is connected properly. 3. Check diskette type if correct and not faulty. 4. Replace diskette drive. 5. Replace motherboard.
Hard disk drive malfunction	1. Check if hard disk drive is set properly on BIOS SETUP. 2. Check cables and connections. 3. Check if disk drive is good. Replace the drive. 4. Replace the motherboard.
CD-ROM drive malfunction	1. Check if drive is set properly on BIOS Setup. 2. Check if device driver is installed properly. Do not use other CD-ROM driver. 3. Check cables and connections. 4. Replace drive or motherboard.
Memory malfunction	1. Check if the memory module is inserted properly. Try to insert it also to the other slot. 2. Replace the memory module. 3. Replace the motherboard.
External keyboard or PS/2 mouse doesn't work	1. Check if keyboard or mouse is connected properly. Check PS/2 Y-cable if it is being used. Power off system first before plugging in the device. 2. Check PS/2 mouse driver if it is installed properly. 3. Replace the keyboard or mouse. 4. Replace the motherboard.
PCMCIA card does not work	1. Check if the PCMCIA card is inserted properly and all cables and connections are set. 2. Check the PCMCIA card driver installation for any IRQ or IO address conflict. Try to disable the COM2 port (SIR) inside the BIOS Setup menu to free up unused IRQ. 3. If PC card is not detected, insert it to the other PCMCIA slot. Otherwise, replace PC card. 4. Contact the PC card manufacturer for support. 5. Replace the motherboard.

Table 6-5 (c) Quick Troubleshooting

Problem or Symptoms	Corrective Actions
Glidepad does not work	1. Check if PS/2 mouse driver is properly installed. Remove any external PS/2 mouse. 2. Check the glidepad cable inside the system if it is inserted properly. 3. Replace the glidepad module. 4. Check the keyboard controller chip for any cold or loosed soldering. 5. Replace the motherboard.
Serial device does not work	1. Check if Serial Port is set to ENABLED under BIOS Setup program (Advanced menu). 2. Check if serial device is connected properly. 3. If using serial mouse, check if Internal Touchpad is disabled under BIOS Setup. On Windows 95 or 98, check if it detects the serial mouse in System Device Manager under the Control Panel. 4. Check if mouse driver is installed properly. 5. Replace serial device. 6. Check the South Bridge chip on the motherboard for any cold or loosed soldering. 7. Replace the motherboard.
Parallel device does not work	1. Check if Printer is set to ENABLED under BIOS Setup program (Advanced menu). 2. Check if all connections are properly set. 3. Check if external device is turned on. 4. Check if Printer Mode is set properly. 5. Check the South Bridge chip on the motherboard for any cold or loosed soldering. 6. Replace the motherboard.
IR Port does not work.	1. Check if IR port (COM2) is enabled under BIOS Setup (Advanced Menu). 2. Check if IR driver is properly installed under Win95. Refer to Chapter 2. 3. Check if File Sharing and Computer name is set properly on both sides. 4. Check if Infrared Monitor is activated. 5. Check if IR ports on both ends are not blocked or obstructed. 6. Check the IR module. 7. Check the I/O controller chip on the motherboard for any cold or loosed soldering. 8. Replace the motherboard.

Table 6-5 (d) Quick Troubleshooting

Problem or Symptoms	Corrective Actions
USB Port does not work	1. Check if USB port option under BIOS Setup is ENABLED. 2. Check if USB device connection is OK. Unplug and re-plug the device. 3. Check if the USB port driver and the USB device driver are installed. 4. Replace USB device or contact USB device manufacturer for support. 5. Replace motherboard.
Audio components does not work	1. Check external connections if OK and volume mixer is set properly. 2. Check audio source (CD, tape, etc.) if faulty. 3. Check if audio driver is installed. 4. Check internal connections for speaker and microphone if not working. 5. Check audio board, cables and connections. 6. Replace motherboard.

6.4 Component-Level Troubleshooting

This section provides an easy to follow flowcharts for performing component-level troubleshooting on the A440 notebook.

6.4.1 General Overview

The component-level troubleshooting is broken down as follows:

Troubleshooting Item	Figure
Starting Check	Figure 6-1
Memory Interface Check	Figure 6-2
CRT Interface Check	Figure 6-3
FDD Interface Check	Figure 6-4
HDD Interface Check	Figure 6-5
Internal Keyboard Interface Check	Figure 6-6
Glidepad Interface Check	Figure 6-7
CD-ROM Interface Check	Figure 6-8
Charger Board Interface Check	Figure 6-9
Serial Port Interface Check	Figure 6-10
Ext. Keyboard Interface Check	Figure 6-11
PS/2 Mouse Interface Check	Figure 6-12
Printer Port Interface Check	Figure 6-13
Audio Port Interface Check	Figure 6-14
PCMCIA Interface Check	Figure 6-15
USB Port Interface Check	Figure 6-16
IR Port Interface Check	Figure 6-17
LCD Panel Interface Check	Figure 6-18
Suspend Function Check	Figure 6-19
LED Indicator Function Check	Figure 6-20
Cover Switch Function Check	Figure 6-21
Internal Modem / LAN Interface Check	Figure 6-22
DC-DC Check	Figure 6-23
TV Out Check	Figure 6-24

6.4.2 Starting Check

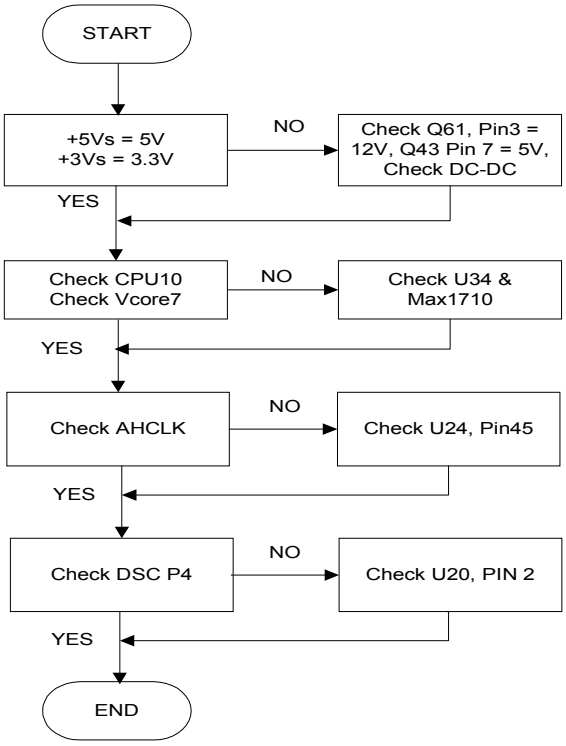


Figure 6-1 Starting Check

6.4.3 Memory Interface Check

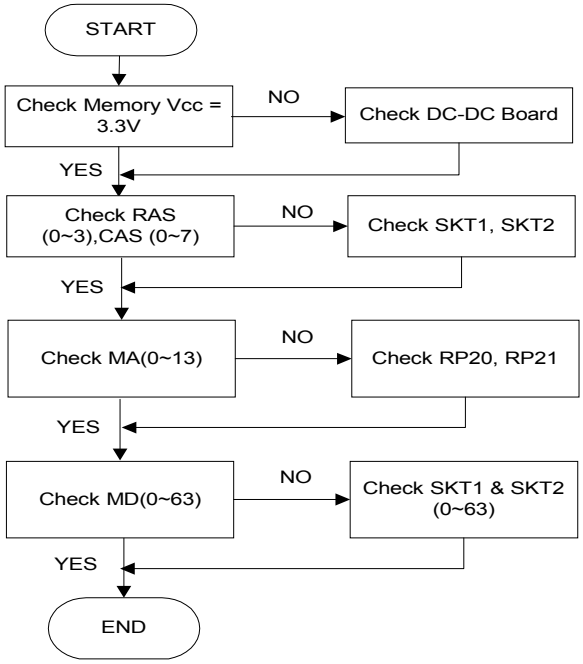


Figure 6-2 Memory Interface Check

6.4.4 CRT Interface Check

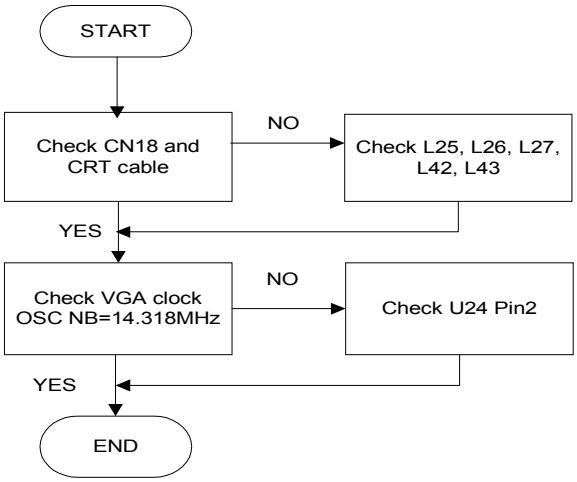


Figure 6-3 CRT Interface Check

6.4.5 FDD Interface Check

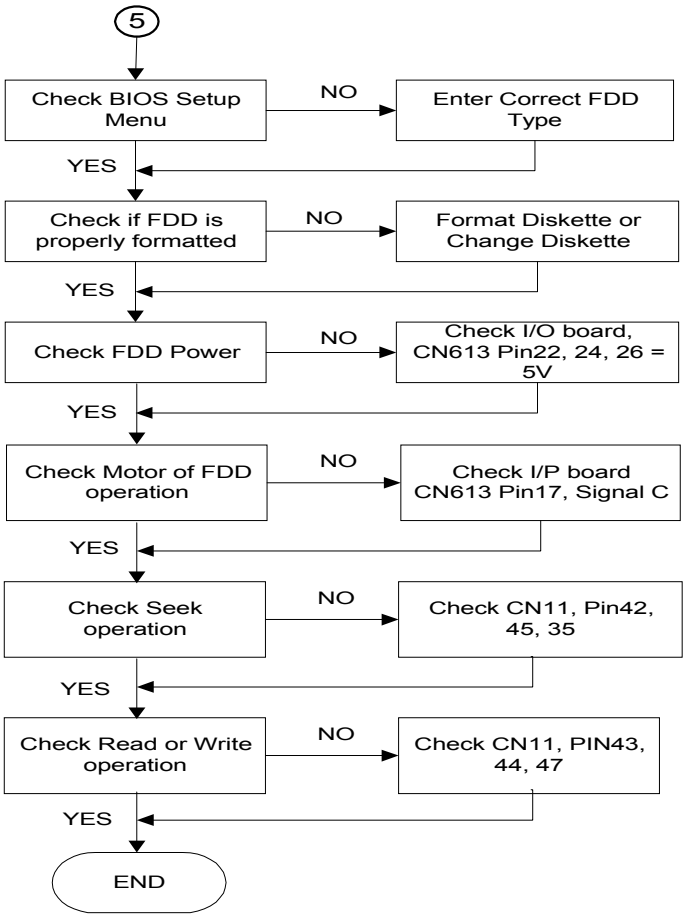


Figure 6-4 FDD Interface Check

6.4.6 HDD Interface Check

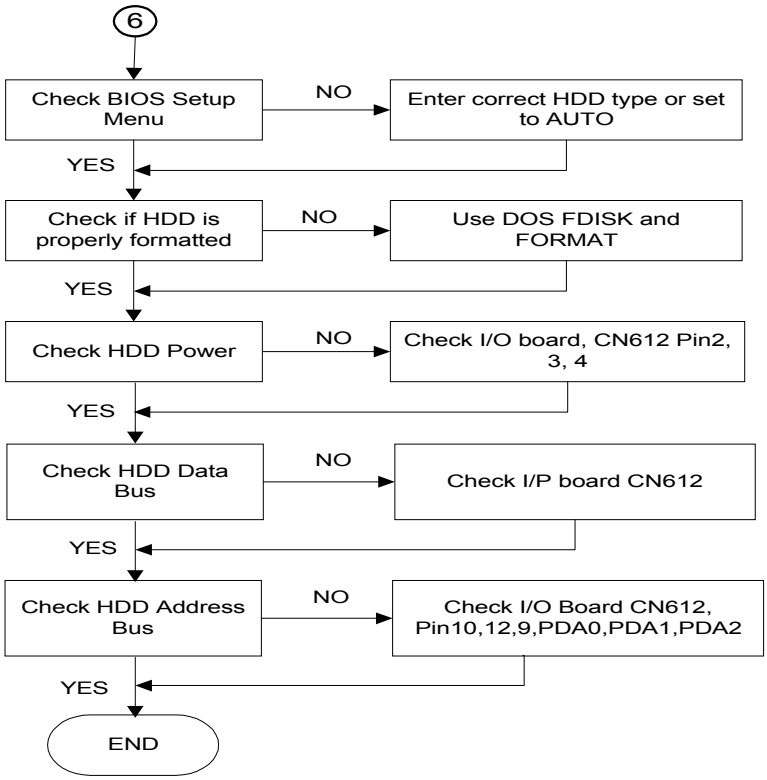


Figure 6-5 HDD Interface Check

6.4.7 Internal Keyboard Check

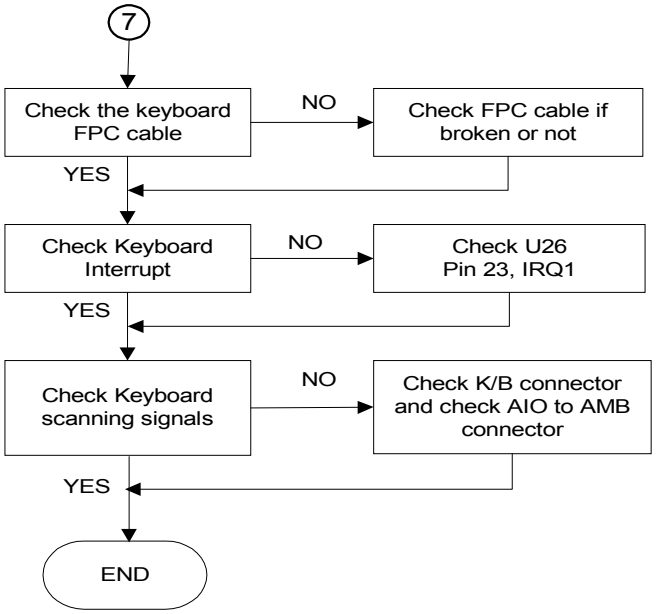


Figure 6-6 Internal Keyboard Check

6.4.8 Glidepad Interface Check

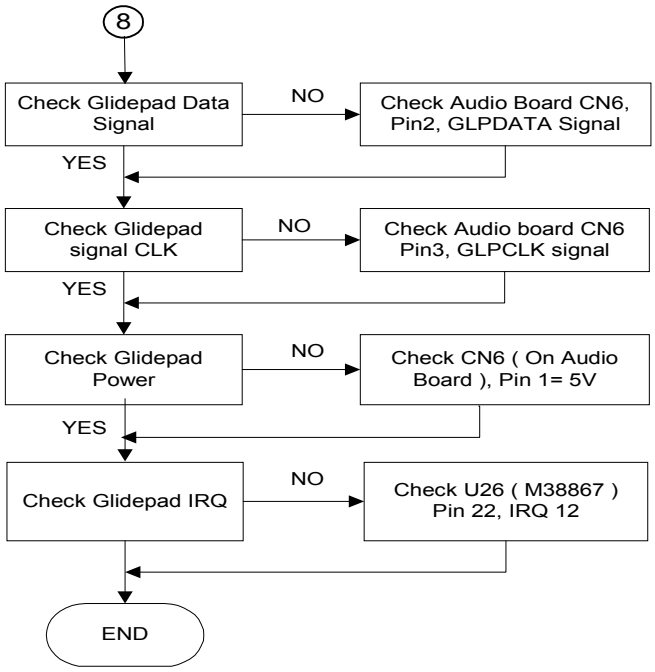


Figure 6-7 Glidepad Interface Check

6.4.9 CD-ROM Interface Check

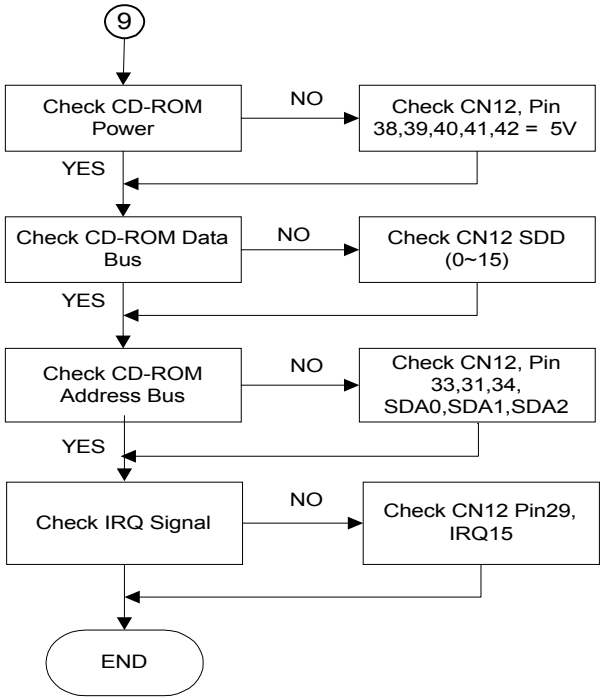


Figure 6-8 CD-ROM Interface Check

6.4.10 Charger Board Interface Check

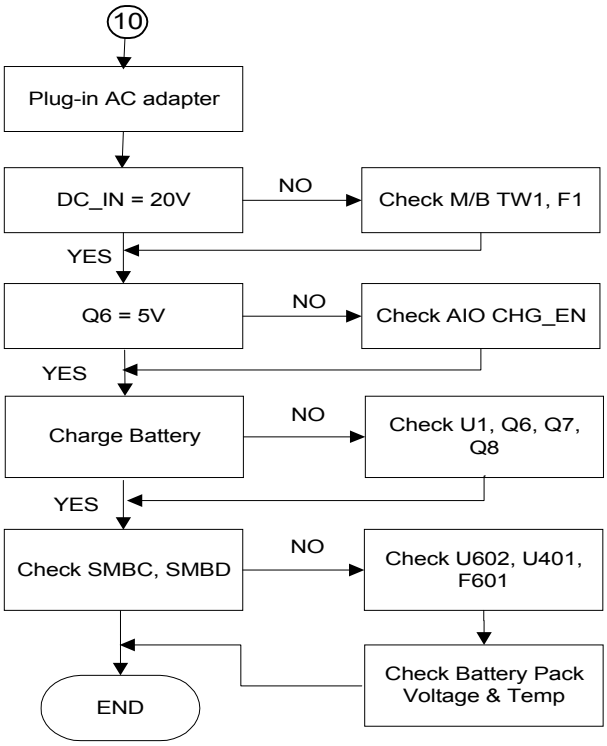


Figure 6-9 Charger Board Interface Check

6.4.11 Serial Port Interface Check

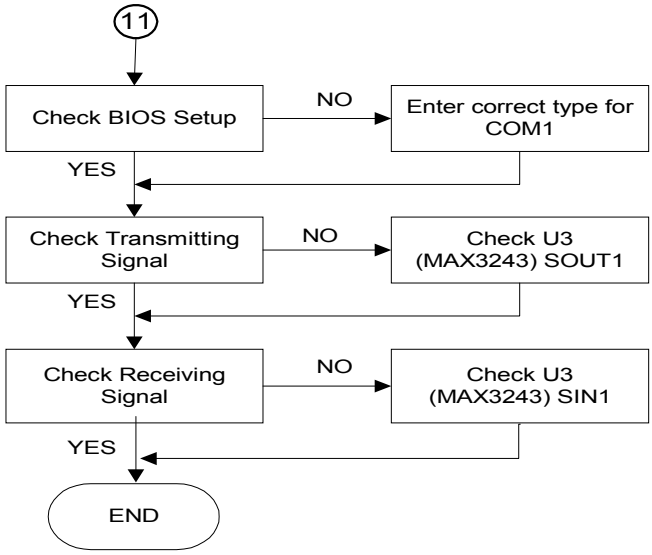


Figure 6-10 Serial Port Interface Check

6.4.12 External Keyboard Check

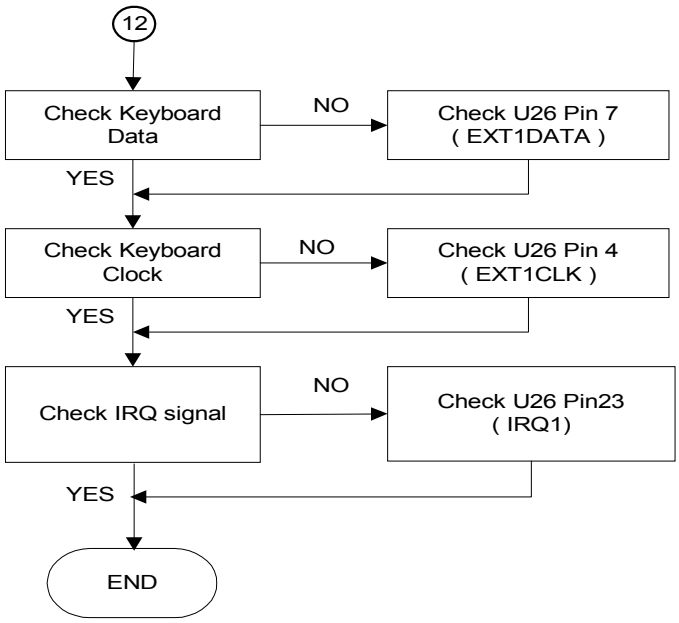


Figure 6-11 Internal Keyboard Check

6.4.13 PS/2 Mouse Interface Check

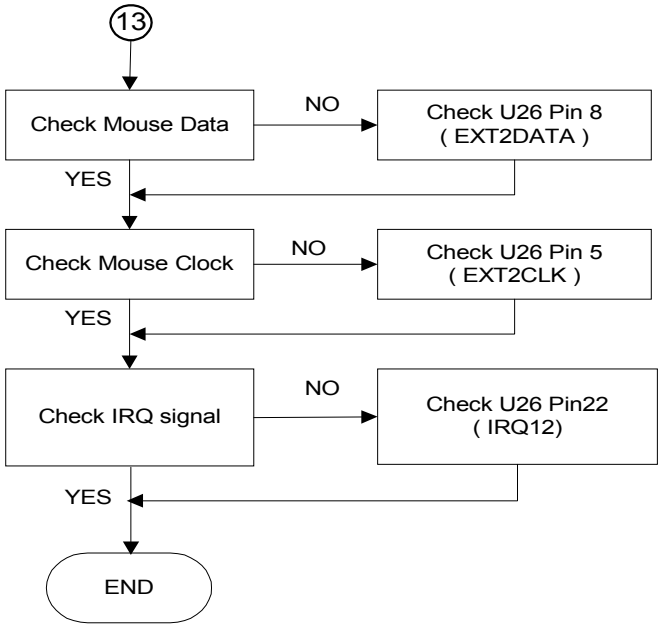


Figure 6-12 Internal Keyboard Check

6.4.14 Printer Port Interface Check

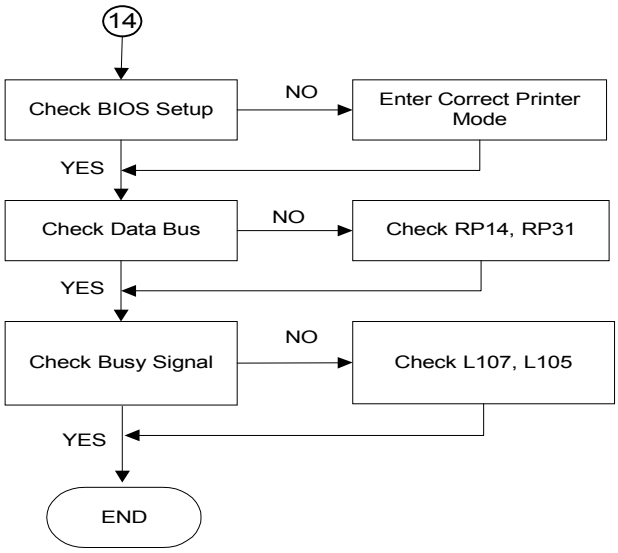


Figure 6-13 Printer Port Interface Check

6.4.15 Audio Port Interface Check

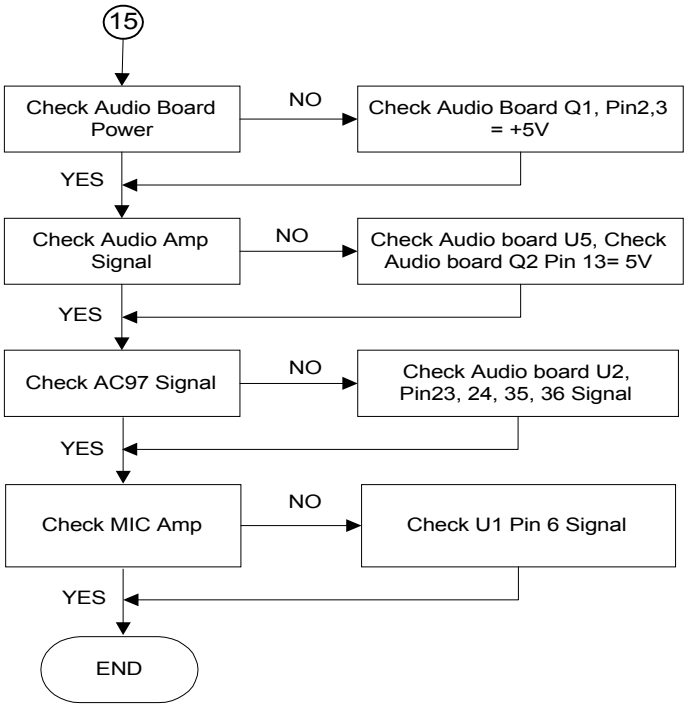


Figure 6-14 Audio Port Interface Check

6.4.16 PCMCIA Interface Check

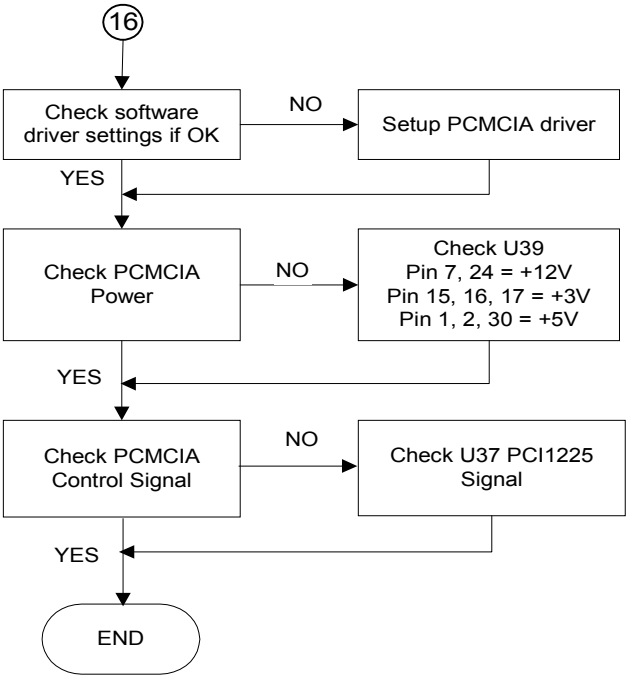


Figure 6-15 PCMCIA Interface Check

6.4.17 USB Port Interface Check

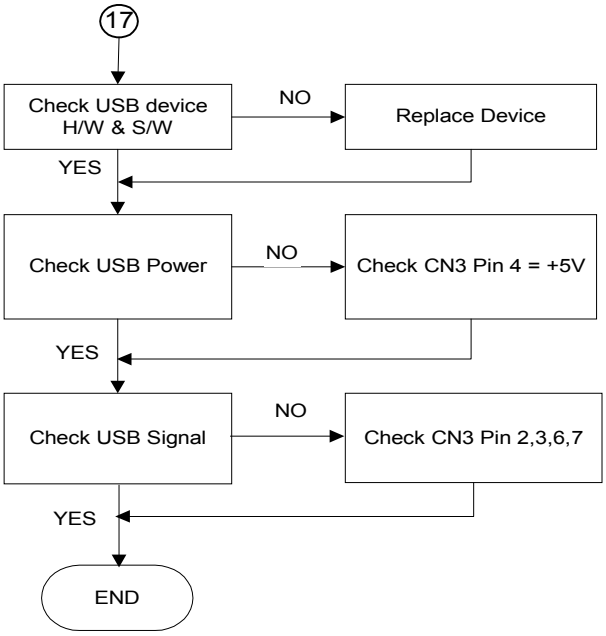


Figure 6-16 USB Port Interface Check

6.4.18 IR Interface Check

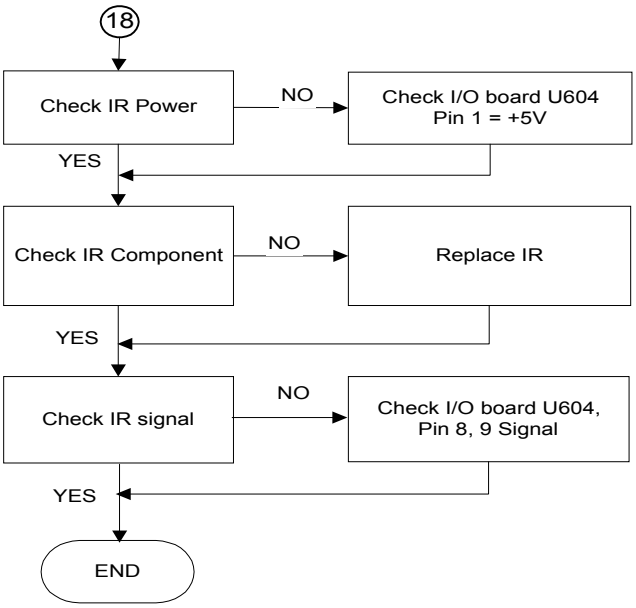


Figure 6-17 IR Port Interface Check

6.4.19 LCD Panel Interface Check

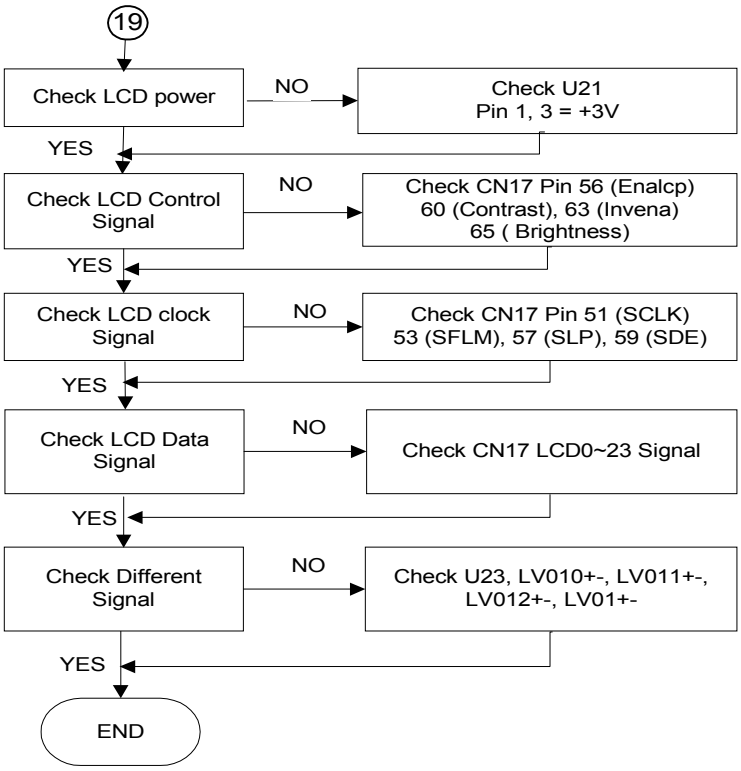


Figure 6-18 LCD Panel Interface Check

6.4.20 Suspend Function Check

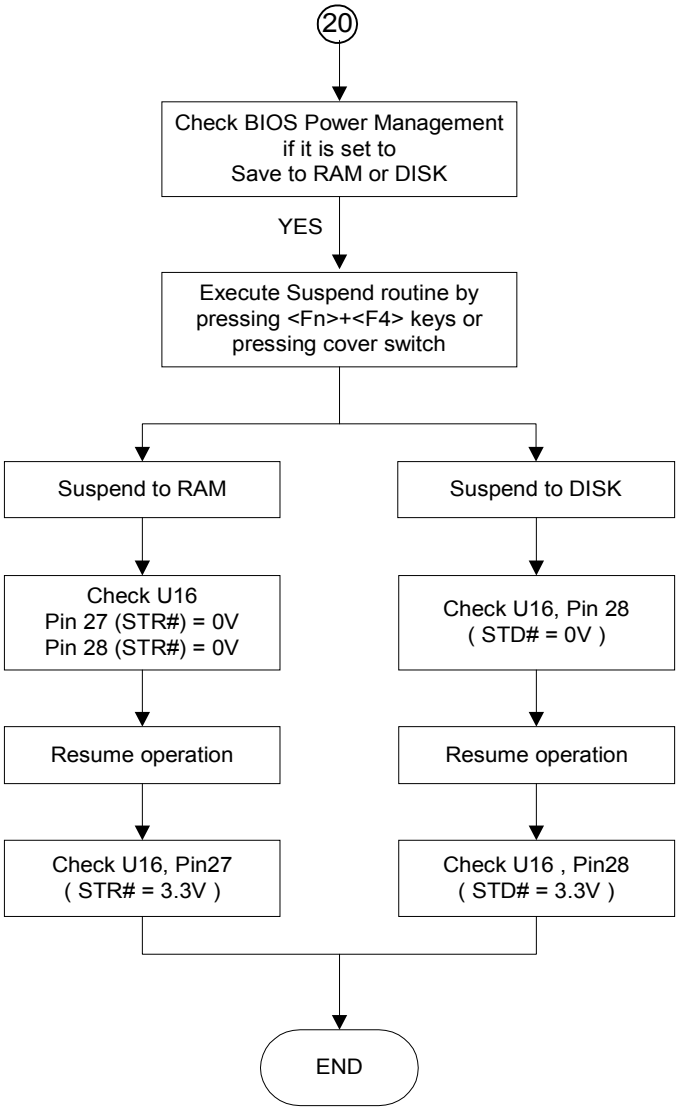


Figure 6-19 Suspend Function Check

6.4.21 LED Indicator Function Check

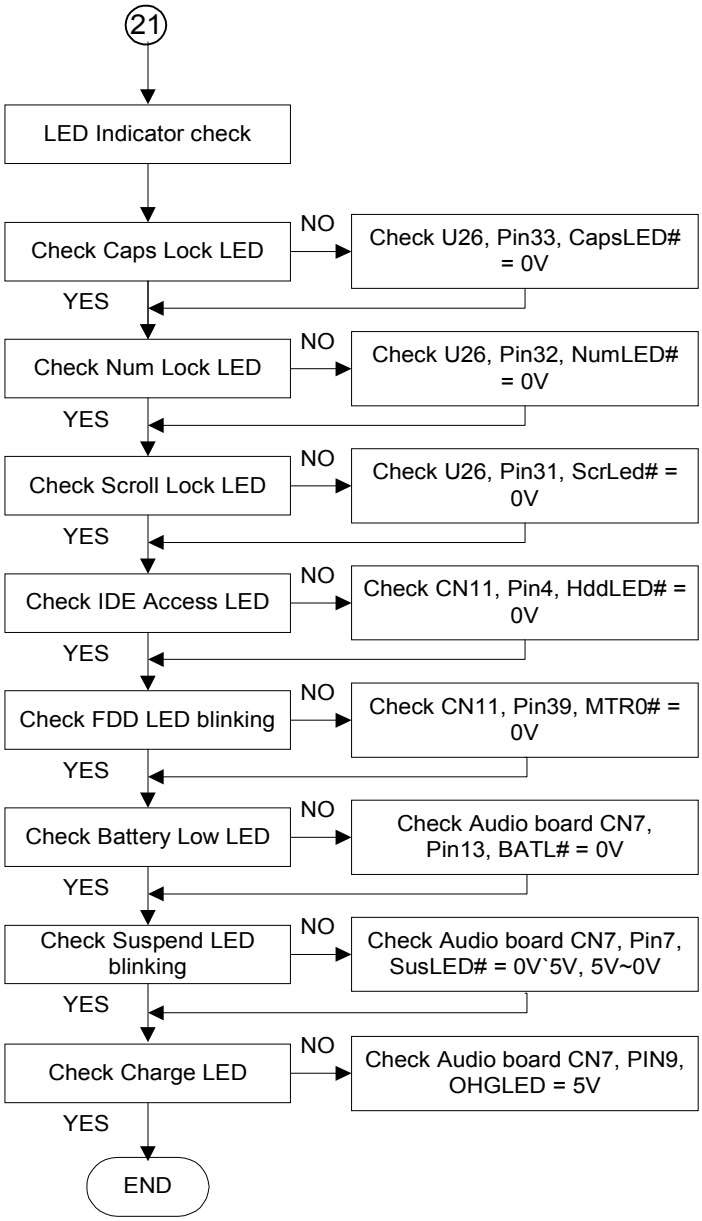


Figure 6-20 Suspend Function Check

6.4.22 Cover Switch Function Check

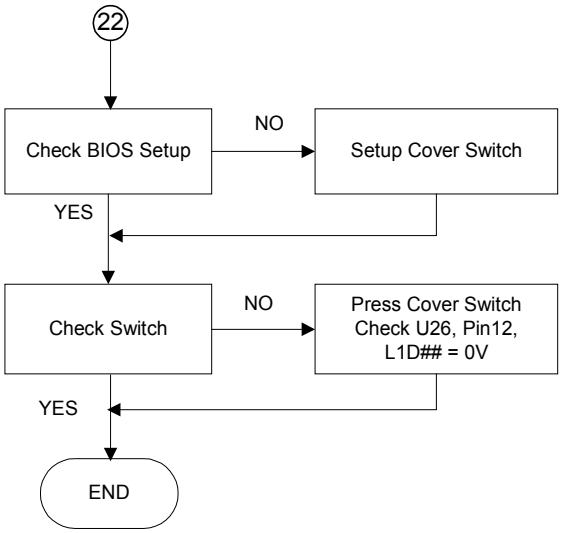


Figure 6-21 Cover Switch Function Check

6.4.23 Internal Modem or LAN Port Check

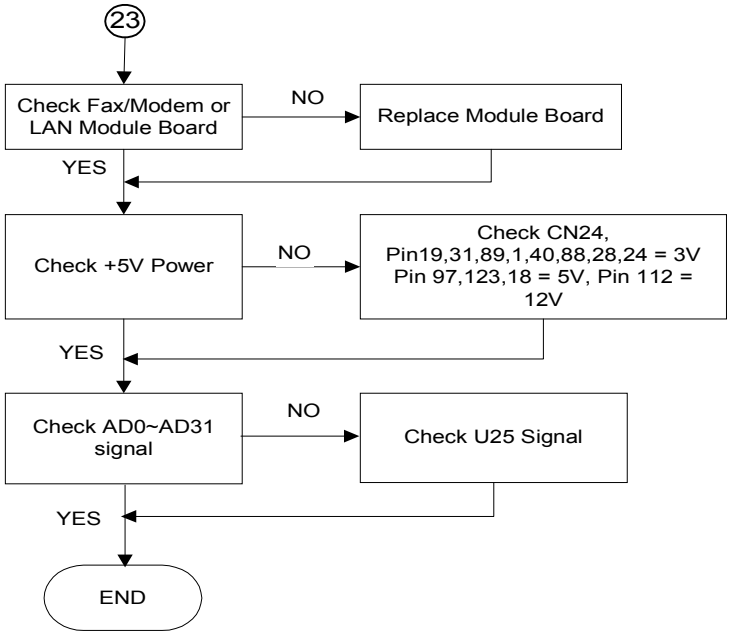


Figure 6-22 Internal Fax/Modem Port Check

6.4.24 DC-DC Power Check

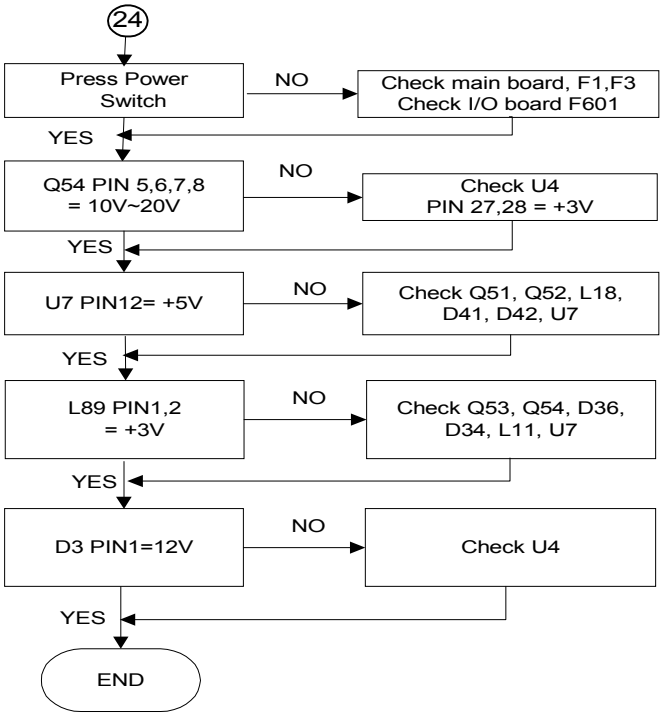


Figure 6-23 DC-DC Power Check

6.4.25 TV Out Check

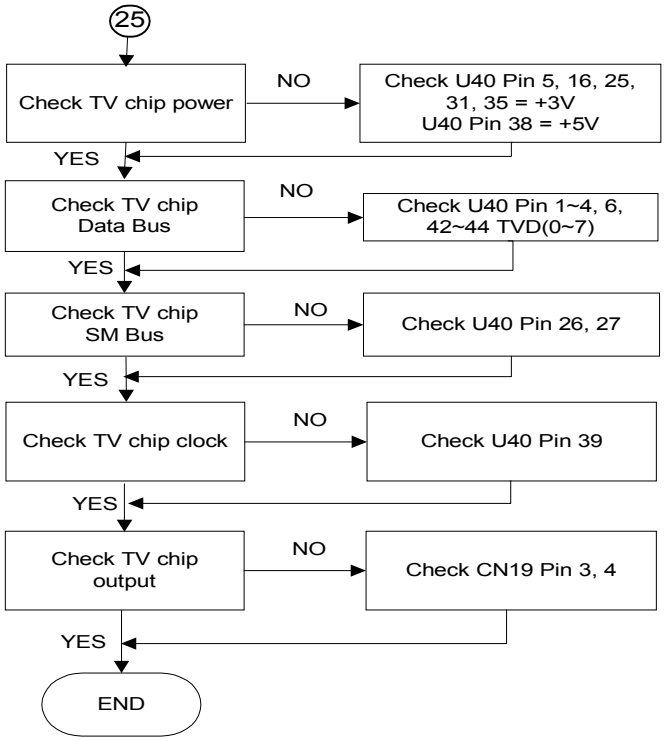


Figure 6-24 TV Out Check

Appendix

A

Notebook Specification

This appendix provides the technical specification of the A440 Series notebook:

A.1 System Specification

MICROPROCESSOR	
CPU Type	Pentium-III / Celeron
Clock Speed and Voltage	• Pentium-III CPU at 650 / 700 / 750 / 800 / 850 MHz • Celeron CPU at 500 / 533 / 566 / 600 / 633 / 667 MHz
External L2 Cache	256 KB (Pentium-III) / 128KB (Celeron)
CPU Package	FC-PGA
SYSTEM LOGIC CHIPSET	
Chipset Type	• VIA VT8601 - North Bridge • VIA VT82C686A - South Bridge
Thermal controller	Integrated in South Bridge chip
SYSTEM CLOCK	
System Clock	ICWork W156
Package	SSOP
Clock Summary	• CPUCLK = 66/100 MHz • PCICLK = 30/33 MHz • South Bridge / VGA = 14.318 MHz • North Bridge = 48 MHz
Supply Current	Icc Max = 90mA (CPU = 66.6 MHz, PCI = 33 MHz)
MEMORY MODULE	
Memory DRAM Module	PQI / Pan RAM / Kingmax
Package	PC100 SODIMM 144-pin
Operation Mode	Synchronous Dynamic Mode
Refresh	Auto and Self Refresh
Slow Refresh	4096 refresh cycle / 64ms
Supply Voltage	3.3V
Configuration	• Standard SODIMM DRAM Module – 2 pieces • 640KB Conventional RAM • 128KB BIOS Shadow • 256KB reserved for Power Management usage • 7168KB Extended RAM • Upgradable to max. 256MB using 16, 32, 64, 128 MB SODIMM
Parity Support	No parity bit for all memory

BIOS ROM	
ROM Type	256K x 8 CMOS Flash Memory – 28SF040-15 (SST)
ROM Size	4M-bit
Boot Code Sector	Top Sector
Package	PLCC 32-lead
Erase / Program	• 8 second typical chip erase • 3.6 second chip program • 100,000 erase/program cycles minimum
Program Voltage	5V
Supply Current	• Icc Max = 30mA (operating) • Iccsb Max = 1uA (standby)
VIDEO SUBSYSTEM	
Video Chipset	Trident CyberBladei1 (Integrated in North Bridge chip)
Video RAM	4MB or 8MB using Shared Memory Architecture (SMA)
Bus Interface	32-bit PCI Local Bus
Addressing	Linear Addressing
Simul Scan	Yes
Maximum Resolution at CRT	1204 x 1024 at 24-bit color (16 million colors)
Maximum Color at CRT	24-bit color (16 million colors)
External CRT connector	15-pin D-Sub female
I/O SUBSYSTEM	
I/O Controller Chip	Integrated in South Bridge chip
Parallel / Printer Port (LPT1)	25-pin D-sub female connector (with EPP/ECP support)
Serial / COM Port (COM1)	• Type: 9-pin D-sub male RS-232 connector • Baud Rate: 300 – 38400 bps (UART 16C550) • Drivers / Receiver: Maxim MAX3243 (SSOP, 28-pin)
SIR Port (COM2)	• Type: IrDA • Communication: Full-Duplex • Operating Distance: 1 meter • Data Rate: 2.4 to 115.2Kbps (SIR)
KEYBOARD SUBSYSTEM	
Keyboard Controller	Mitsubishi M38867
Package	QFP 80-Pin
Host Interface	8042-style host interface
Keyboard Scan	Local 16 x 8 keyboard switch matrix
External PS/2 Keyboard	Mini-DIN PS/2 connector

SOUND SUBSYSTEM	
Audio Chip	Integrated in South Bridge (AC-97)
Bus Interface	32-bit PCI Bus
Compatibility	Sound Blaster (Pro) & 3D Surround Sound
Wavetable Function	Software
Connection	Full-Duplex
Built-in Speaker	2-way (left and right) mini speakers
Built-in Microphone	Mono
Line-In Jack	1 x line-in jack
Line-Out Jack	1 x line-out jack
Microphone Jack	1 x 3.5p microphone jack
POINTING DEVICE SUBSYSTEM	
Chipset Controller	Mitsubishi M38867
Package	QFP 80-Pin
Touchpad Type	ALPS Glide Point
Interface	PS/2
External PS/2 Mouse	Mini-DIN PS/2 connector (share with PS/2 keyboard)
PCMCIA SUBSYSTEM	
Chipset Controller	Texas Instrument (TI) PCI1225
PCMCIA Slot Configuration	2 Type I or Type II at the same time, or 1 Type III
Bus Type	32-bit PCI CardBus
Compatibility	Register Compatible with Intel 82365SL
ZV Port Support Slots	Support Zoomed Video (ZV) port on top slot
POWER MANAGEMENT UNIT (PMU)	
PMU Modes	Doze mode, Video Timeout, Hard Disk Timeout, Suspend to RAM (STR) mode, Suspend to Disk (STD) mode
Others	LCD Cover-Switch STR, ACPI, DMI 2.0, Thermal Control
STATUS LED INDICATORS	
Number of LEDs	7 LEDs
Power Status LED	Green color for system power on Green color and blinking when system enters STR mode Amber color when battery low warning
Battery Charge LED	Amber color when charging Off when fully charged or not charging
HDD LED	Green color when accessing the HDD
FDD LED	Green color when accessing the FDD
Num Lock LED	Green color for Num Lock activate on keyboard
Caps Lock LED	Green color for Caps Lock activate on keyboard
Scroll Lock LED	Green color for Scroll Lock activate on keyboard

HOT-KEY DEFINITION	
Number of hot-keys	11 <Fn> key combinations
LCD/CRT Simul	Fn + F3 (toggle)
Suspend mode	Fn + F4
Display Stretch / Normal	Fn + F5 (toggle)
PC Speaker On / Off (Mute)	Fn + F6 (toggle)
Brightness Up	Fn + F8
Brightness Down	Fn + F9
Contrast Up	Fn + F10 (DSTN only)
Contrast Down	Fn + F11 (DSTN only)
Scroll Lock	Fn + F12 (US / Canada is supported by direct key)
Save to Disk	Fn + Power Button

A.2 Display Specification

12.1" SVGA TFT LCD (SANYO)	
LCD Model	Sanyo TM121SV-02L03A
LCD Type	12.1" SVGA TFT
Display Area	H246 x V184.5 [mm]
Display Pixels	H800 x V600 pixels
Pixel Pitch	H 0.3075 x V 0.3075
Pixel Arrangement	RGB vertical stripe
Display colors	262K Colors
Module Size	H275 x V199 x t6.9 MAX [mm]
Weight	Approx. 440g
Contrast Ratio	150:1 (typ.)
Power Supply	3.3V
Power Consumption	3.3W
Response Time	30ms (max)
Operating Temperature	0 to 50 degrees Celsius
Storage Temperature	-20 to 60 degrees Celsius
12.1" SVGA TFT LCD (LG)	
LCD Model	LG LP121S3-A LCD
LCD Type	12.1" SVGA TFT
Display Area	H246 x V184.5 [mm]
Display Pixels	H800 x V600 pixels
Pixel Pitch	H 0.3075mm x V 0.3075mm
Pixel Arrangement	RGB stripe arrangement
Display colors	262K Colors
Module Size	H275 x V199 x T6.5 MAX [mm]
Weight	Approx. 450g
Contrast Ratio	150:1 (Typ.)

Power Supply	3.3 V
Power Consumption	1.4 W
Response Time	30ms (max)
Operating Temperature	0 to 50 degrees Celsius
Storage Temperature	-20 to 60 degrees Celsius
13.3" XGA TFT LCD (ADT)	
LCD Model	ADT L133X 1-3
LCD Type	13.3.1" XGA TFT
Display Area	H270.336 x V202.752 [mm]
Display Pixels	H1024 x V768 pixels
Pixel Pitch	0.264(per one triad) X 0.264 [mm]
Pixel Arrangement	RGB vertical stripe
Display colors	262K Colors
Module Size	292(W) x 215(H) x 6.5(D) typ., 6.8(D) max
Weight	Approx. 515g
Contrast Ratio	150:1 (typ.)
Power Supply	3.3V
Power Consumption	4.0 W (w/o Inverter, All Black Pattern)
Response Time	30ms (max)
Operating Temperature	0 to 50 degrees Celsius
Storage Temperature	-20 to 60 degrees Celsius
14.1" XGA TFT LCD	
LCD Model	LG LP141X5-B1NC
LCD Type	14.1" XGA TFT
Display Area	H285.7 x V214.3 [mm]
Display Pixels	H1024 x V768 pixels
Pixel Pitch	H 0.279 x V 0.279
Pixel Arrangement	RGB vertical stripe
Display colors	262K Colors
Module Size	H298.5 x V227.5 x t6.9 MAX [mm]
Weight	Approx. 610g
Contrast Ratio	200:1 (typ.)
Power Supply	3.30V
Power Consumption	3.3W
Response Time	30ms (max)
Operating Temperature	0 to 50 degrees Celsius
Storage Temperature	-20 to 60 degrees Celsius
14.1" XGA TFT LCD (CPT)	
LCD Model	CPT CLAA141XB01
LCD Type	14.1" XGA TFT
Display Area	H285.696 x V214.272 [mm]
Display Pixels	H1024 x V768 pixels

Pixel Pitch	H0.279 x H0.279 [mm]
Pixel Arrangement	RGB vertical stripe
Display colors	262K Colors
Module Size	298.5(W) x 227.0(H) x 6.5(D) [mm]
Weight	Approx. 575g
Contrast Ratio	200:1 (typ.)
Power Supply	3.3V
Power Consumption	4.7(W)
Response Time	30ms (max)
Operating Temperature	0 to 50 degrees Celsius
Storage Temperature	-20 to 60 degrees Celsius

A.3 Floppy Disk Drive Specification

Drive Manufacturer	Mitsubishi MF355H-347MN
Floppy Diskette Type	3.5" Double Sided, High Density
Physical Dimension	126 x 96 x 12.7 [mm]
Weight	160g
Capacity	1.44MB / 1.2MB / 720KB High Density (Formatted) 2MB / 1MB (Unformatted)
Transfer Rate	500 / 250 Kbits/sec
Recording Method	MFM / FM
Track to Track Seek Time	3 ms
Seek Settling Time	15 ms
Average Access Time	94 ms
Disk Revolution	300 rpm
FDD Indicator	LED on drive and Media Access LED on LED Indicator
MTBF	30,000
Operating Temperature	4 to 46 degrees Celsius

A.4 CD-ROM Drive Specification

Drive Manufacturer	TEAC CD-224E-A92
Physical Dimension	128.0 x 129.0 x 12.7 [mm]
Weight	280g or less
Loading	Manual tray loading
Ejection	Manual eject using the eject button Auto eject using the eject command on software
Host Interface	IDE (ATAPI)
Average Access Time	130msec. average (x24-speed)
Full Stroke Access Time	300msec (x24-speed)
Disc Speed	5,136rpm typ.
Data Transfer Rate (burst)	16.7 Mbytes/sec. Max.
Data Transfer Rate (sustained)	1,545 ~ 3,600KB/sec

Starting Time	12 sec. Max.
Data Buffer Capacity	128 KB
Supply Voltage	+5VDC
MTBF	60,000POH or more

A.5 DVD-ROM Drive Specification

TOSHIBA SD-C2302	
Drive Manufacturer	TOSHIBA SD-C2302
Physical Dimension	128.0 x 12.7 x 126.1 [mm] (W * H * D)
Weight	265g (Net)
Loading	Manual tray loading
Ejection	Manual eject using the eject button Auto eject using the eject command on software
Host Interface	IDE (ATAPI)
Average Access Time	120ms(DVD)/95 ms(CD)
Full Stroke Access Time	300msec (x24-speed)
Disc Speed	3,400 rpm(DVD); 5,100 rpm(CD)
Data Transfer Rate (burst)	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)
Data Transfer Rate (sustained)	Max. 8,112Kbyte/s (DVD) ; Max.3,600Kbyte/s(CD)
Starting Time	Typical 9 sec / Max 18 sec (from stand by to ready)
Data Buffer Capacity	128 KB
Supply Voltage	+5VDC
MTBF	60,000POH or more
MKE SR-8174-CPK	
Drive Manufacturer	MKE SR-8174-CPK
Physical Dimension	128.0 x 12.7 x 129 [mm] (W * H * D)
Weight	290g (Net)
Loading	Manual tray loading
Ejection	Manual eject using the eject button Auto eject using the eject command on software
Host Interface	IDE (ATAPI)
Average Access Time	120ms (Typical) 180ms (Average) (CD) 170ms (Typical) 270ms (Average) (DVD)
Full Stroke Access Time	210ms (Typical) 270ms (Average) (CD) 320ms (Typical) 480ms (Average) (DVD)
Disc Speed	N/A
Data Transfer Rate (burst)	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)
Data Transfer Rate (sustained)	Max. 8,115Kbyte/s (DVD) ; Max.3,600Kbyte/s(CD)
Starting Time	Typical 4 sec / Max 10 sec (from stand by to ready)

Data Buffer Capacity	512 KB
Supply Voltage	+5VDC
MTBF	60,000POH or more

A.6 Keyboard Specification

Keyboard Type	JME K9801
Type of key switch	Membrane (PE) Switch
Number of keys	87 keys with embedded numeric keypad
Compatibility	Enhanced 101/102 emulation
Travel	2.5 mm
Keyboard Height	6.5 ± 0.3 mm 7.0 ± 0.3 mm (SPACE Key)
Keycap Pull Off Force	≥ 800g
Supply Voltage	6V
Operating Temperature	-10 to 60 degrees Celsius

A.7 Touchpad Specification

Touchpad Type	ALPS GlidePoint KGDDBA941A-2
Interface	PS/2 (compatible with Microsoft Mouse Driver)
Supply Voltage	5V
Supply Current	4.0mA (Max) Operating
Dimension	W56 x H40 x D0.69 (2.5 w/ PCB) mm
Weight	20g max.
Operating Temperature	0 to 50 degrees Celsius
Storage Temperature	-20 to 60 degrees Celsius

A.8 Internal Modem Specification

Modem Type	Software Modem (Integrated in South Bridge)
Wake Up Function	Supports Ring-in Resume Wake Up function
Connection Mode	V.90 Kbps
Speakerphone	Full duplex speakerphone (FDSP)
Fax Transmission Way	Half Duplex
Modem Speed	56 Kbps
Modulation Format	V.90 PCM

A.9 Internal LAN Specification

LAN Type	Intel 82559
LAN Chip Interface	Mini-PCI Bus
Speed	10/100 Mbps
Wake Up Function	Supports Wake-on-LAN (WOL) function

A.10 Power Supply

AC POWER ADAPTER	
Adapter Type	Delta ADP-50MB
Input Voltage	100 to 240VAC
Input Frequency	50 to 60 Hz
Input Current	1.5A Max at 90VAC 0.75A Max at 180VAC
Efficiency	80% Min
In-Rush Current (Cold Start)	60A Max at 115 VAC 100A Max at 230 VAC
Output Power	60W
Output Voltage	+19Vdc (main)
Output Current	3.16A (Max)
Over Voltage Protection	28V Max
Over Current Protection	19V / 4A (max)
LED Display	Green LED (On / Off)
Dimension	L107 x W60.5 x H30 [mm]
Weight	250g
LITHIUM ION (LI-ION) BATTERY PACK	
Model	Panasonic Li-Ion Rechargeable Smart Battery
Cell Type	CGR18650
Cell Number	8
Rating (Nominal) Voltage	14.4V
Typical Capacity	3000 mAH
Watts	43.2 W
Charging Voltage	17V
Charging Efficiency	100%
EVD1	13.9V
EVDF	12.0V
NICKEL-METAL HYDRIDE (NIMH) BATTERY PACK	
Model	Panasonic NiMH Rechargeable Smart Battery
Cell Type	HHR380A
Cell Number	8
Rating (Nominal) Voltage	9.6V
Typical Capacity	4500 mAH
Watts	43.2 W
Charging Voltage	14V
Charging Efficiency	95%
EVD1	8.8V
EVDF	8.0V

A.11 Charger Specification

Controller	TMP47C440M (GR11)
Input Voltage	18.5 ~ 20V
NICKEL-METAL HYDRIDE (NIMH) BATTERY PACK	
Full Charger Sense	3 degree / 4 minute
Max. Temperature	60 degrees
Max. Charger Voltage	1.8V / cell
Charger Entry Temperature	0 – 50 degrees
Max. Timer	512 minutes
Trickle Charger Detect	0 < V < 1V / cell
Recharge Spec	Battery gauge capacity < 95%
Output Current (system off)	1.3A (Min) / 1.4A (Typ) / 1.5A (Max)
Output Current (system on)	1.3A (Min) / 1.4A (Typ) / 1.5A (Max)
Trickle Charger Current	1/16 Hz 1.4A 100 min.
Ripple & Noise	500mV
Efficiency	90%
LITHIUM ION (LI-ION) BATTERY PACK	
Full Charger Sense	1 min : 150mA
Max. Temperature	60 degrees
Max. Charger Voltage	4.4V / cell
Charger Entry Temperature	0 – 50 degrees
Max. Timer	512 minutes
Trickle Charger Detect	0 < V < 3V / cell
Recharge Spec	Battery gauge capacity < 95%
Output Current (system off)	1.3A (Min) / 1.4A (Typ) / 1.5A (Max)
Output Current (system on)	1.3A (Min) / 1.4A (Typ) / 1.5A (Max)
Trickle Charger Current	1/16 Hz 1.4A 100 min.
Ripple & Noise	500mV
Efficiency	90%

A.12 Mechanical Specification

Unit Dimensions (W x D x H) in millimeters	350 x 250 x 39 mm
Unit Weight	Under 6.6 lbs

A.13 Environmental Requirements

Temperature	
Operating Temperature	5^{O}C to 35^{O}C
Storage Temperature	-20^{O}C to 60^{O}C

Humidity	
Operating	10% to 80% RH without condensation
Storage	5% to 90% RH without condensation
Altitude	
Operating / Non-operating	10,000 feet / 40,000 feet
Shock (Non-operating)	
Unpacked	240 G, 1/2 sine wave, 2p3 ms
Packed	40 G, 1/3 sine wave, 10p3 ms
Drop	
Packed	10 drops (6 faces, 3 edges, 1 corner) at 42 inches height, after 6 hours at -10.5^{O}C and 50.5^{O}C
Loose Cargo	11800 impact at 1/16"
Electro-Static Discharge (ESD)	
Under 8KV	No soft error is allowed for 10 discharges
8.5KV to 15KV	No component damaged for 5 discharges

Appendix

B

Pin Assignments

B.1 CRT (VGA) Connector

The pin assignment of the VGA connector is as follows:

No	PIN ASSIGEMENT(by: sort)	DESCRIPTION
1	RED Video_5 :O (analog)	Red this DAC analog output drives the CRT interface.
2	GREEN Video_5 :O (analog)	Green this DAC analog output drives the CRT interface.
3	BLUE Video_5 :O (analog)	Blue this DAC analog output drives the CRT interface.
4	Monitor ID Bit 2	Option
5	GROUND	Ground
6	RED Return (ground)	Ground
7	GREEN Return (ground)	Ground
8	BLUE Return (ground)	Ground
9	KEY (no connector)	VCC
10	SYNC Return (ground)	Ground
11	MONITOR ID Bit 0_5	Monitor Sense Indicator
12	MONITOR ID Bit 1_5 :I	DDC monitor data
13	HORIZONTAL SYNC_5 :O (t/s)	CRT Horizontal Sync this output is The Horizontal sync pulse for the CRT Monitor.
14	VERTICAL SYNC_5 :O (t/s)	CRT Vertical Sync this output is the Vertical sync pulse for the CRT Monitor.
15	MONITOR ID Bit 3_5 :I/O	DDC monitor clock

Absolute Maximum Conditions

The following parameters are maximum ratings for VGA. Permanent device damage may occur if these rating are exceeded. Extended exposure to these ratings may also cause device failure.

PARAMETER	MIN	MAX	UNIT
I/O VOLTAGE	-0.5	6.25V	V
OUTPUT CURRENT		50	m A

B.2 Serial Port Connector

The pin assignment of the serial (COM1) port connector is as follows:

No	PIN ASSIGMENT (by: sort)	DESCRIPTION
1	DCDA#_T:I	Active low Data Carrier Detect inputs For the serial port.
2	SINA_T:I	Receiver serial data input for port 1.
3	SOUTA_12:O	Transmit serial data output for port 1.
4	DTRA#_6:O	Active low Data Terminal Ready Outputs for the serial port.
5	GND	Ground
6	DSRA#_T:I	Active low Data Set Ready inputs For the serial port.
7	RTSA#_6:O	Active low Request to Send Outputs For the serial port.
8	CTSA#_T:I	Active low Clear to Send inputs For the serial port.
9	RI#_T:I	Active low Ring Indicator inputs For the serial port.

B.3 Parallel Port Connector

The pin assignment of the parallel/printer (LPT1) port connector is as follows:

No	PIN ASSIGMENT(by: sort)	DESCRIPTION
1	STB#/DS0#_D14/_P14/_D12:O	An active low pulse on this output is used to strobe the printer data into the printer. The STROBE output is the complement of bit 0 of the printer control register. Refer to parallel port description for use of this pin in ECP and EPP mode. Active low outputs select driver 0.
2	PD0/INDEX3#_P14/_S:IO/I	Port data 0. This active low Schmidt trigger input senses from the disk drive that the head is positioned over the beginning of a track as marked by an index hole.
3	PD1/TRK0#_P14/_S:IO/I	Port data 1 This active low Schmidt trigger input senses from the disk drive that the head is positioned over the outermost track.
4	PD2/WRTPRT#_P14/_S:IO/I	Port data 2 This active low Schmidt trigger input senses from the disk drive that a disk is write protected. Any write command is ignored.
5	PD3/RDATA#_P14/_S:IO/I	Port data 3 Raw serial bit stream from the disk drive, low active. Each falling edge represents a flux transition of the encoded data.
6	PD4/DSKCHG_P14/_S:IO/I	Port data 4 This input senses that the driver door is open or that the diskette has possibly been changed since the last drive selection.
7	PD5_P14:IO	Port data 5

No	PIN ASSIGMENT(by: sort)	DESCRIPTION
8	PD6/MTR0#_P14/_D12:IO/O	Port data 6 This active low outputs select motor Drives 0.
9	PD7_P14:IO	Port data 7
10	ACK#/DS1#_T_D12:I/O	A low active output from the printer indicating that it has received the data and is ready to accept new data. Bit 6 of the printer status register reads the ACK# input. Refer to parallel port description for use of this pin in ECP and EPP mode.
11	BUSY/MRT1#_T/_D12:_I/O	This is a status output from the printer, a high indicating that the printer is not ready to receive new data. Bit 7 of the printer status register is the complement of the BUSY input. Refer to parallel port Description for use of this pin in ECP and EPP mode. This active low outputs select motor Drives 1.
12	PE/WDATA#_T/_D12:I/O	Another status output from the printer, a high indicating that printer is out of paper. Bit 5 of the printer status register reads the PE input. Refer to parallel port description for use of this pin in ECP and EPP mode. This active low high current driver Provide the encoded data to the disk drive. Each falling edge cause a flux transfer on the media.
13	SLCT/WGATE#_T/_D12:I/O	This high active output from the printer indicates that it has power on. Bit 4 of the printer status register read the SLCT input. Refer to parallel port description For use of this pin in ECP and EPP mode. This active low high current driver allows current to flow through the write head. It becomes active just prior to writing to the diskette.
14	AFD#/DSB#_D14,_P14/_D12:O,O/O	This output goes low to cause the printer to automatically feed one line after each line is printed. The AFD# output is the complement of bit 1 of the printer control register. Refer to parallel pot description for use of this pin in ECP and EPP mode.
15	ERR#/HDSEL_T/D12:I/O	A low on this input from the printer indicates that there is a error condition at the printer. Bit 3 of the printer status register reads the ERR# input. Refer to Parallel port description for use of this pin in ECP and EPP mode. This high current output selects the floppy Disk side for reading or writing. A logic “1” on this pin means side 0 will be accessed while a logic “0” means side 1 will be accessed.
16	INIT#/DIR#_D14,_P14/D12:O,O/O	This output is bit 2 of the printer control register. This is used to initiate the printer when low. Refer to parallel port description for use of this pin in ECP and EPP mode. This high current low active output determines the direction of the head movement. A logic “1” on this pin means outward motion, while a logic “0” means inward motion.
17	SLIN#/STEP#_D14,_P14/_D12:O,O/O	This active low output selects the printer. This is the complement of bit 3 of the printer control register. Refer to parallel port description for use of this pin in ECP and EPP mode. This active low high current driver issues a low pulse for each track to track movement of the head.

No	PIN ASSIGMENT(by: sort)	DESCRIPTION
18	GND:	Ground
19	GND:	Ground
20	GND:	Ground
21	GND:	Ground
22	GND:	Ground
23	GND:	Ground
24	GND:	Ground
25	GND:	Ground

B.4 Docking Port Replicator

The pin assignment of the port replicator connector is as follows:

Number	Function	Pin name
51	**Printer Port**	LPT_PD0
49		LPT_PD1
47		LPT_PD2
45		LPT_PD3
43		LPT_PD4
41		LPT_PD5
39		LPT_PD6
37		LPT_PD7
30		LPT_SLIN#
32		LPT_INIT#
34		LPT_ERR#
36		LPT_AFD#
40		LPT_PE
42		LPT_SLCT
44		LPT_ACK#
46		LPT_BUSY#
48		LPT_STB#
17	**COM Port**	COM_PSOUTA
16		COM_PSINA
15		COM_PDTRA#
18		COM_PDSRA#
21		COM_PRTSA#
23		COM_PCTSA#
19		COM_PRIS/D#
20		COM_PDCDA#
57	**Ext K/B & PS2 Mouse**	EKB_DATA
59		EKB_CLK
58		MOUSE_DATA
60		MOUSE_CLK
3	**CRT**	CRT_RED
7		CRT_GREEN
5		CRT_BULE
4		CRT_HSYNC
8		CRT_VSYNC

Number	Function	Pin name
9	**CRT**	CRT_SENSE
6		DDDA
10		DDCK
29	**USB Port**	D-USBP0+
33		D-USBP0-
31		OC0#
71,73,75,77,79	**POWER**	+5VS
68,70,72,74,76,78, 80		+ADAPV
13,14,26,27,35,38, 52,55,63,64,		GND
61	**CONTROL**	ON MOSFET
67	**POWER**	+12VS
1,2	**PLUG IN Identified**	DOCKING POWER ENABLE

B.5 PS/2 Mouse / Ext. Keyboard Mini-DIN Connector

Following is the pin assignment of the PS/2 connector:

No	Signal	Description	Type
1	EKB_DATA	External data for mouse or keyboard	I/O
2	MOUSE_DATA	External data for mouse or keyboard	I/O
3	Gnd	Ground	I
4	+5vs	5v power supply	O
5	EKB_CLK	External clock for mouse or keyboard	I/O
6	MOUSE_CLK	External clock for mouse or keyboard	I/O

B.6 USB Connector

The pin assignment of the USB port connector is as follows:

No	Signal	Description	Type
1, 5, 9, 10, 11, 12	GND	Ground	O
2	USBP0+	USB port0 bus signal	O
3	USBP0-	USB port0 bus signal	O
4	+5VS	USB port0 power	
6	USBP1+	USB port1 bus signal	
7	USBP1-	USB port1 bus signal	
8	+5VS	USB port1 power	

B.7 CD-ROM IDE Connector

The following is the pin assignment for the CD-ROM IDE connector:

NO.	Signal	Description	Type
5	CDROMRESET#	Reset secondary disk	O
33	RSDA0	Secondary disk address 0	O
31	RSDA1	Secondary disk address 1	O
34	RSDA2	Secondary disk address 2	O
21	RSDD0	Secondary disk data 0	I/O
19	RSDD1	Secondary disk data 1	I/O
17	RSDD2	Secondary disk data 2	I/O
15	RSDD3	Secondary disk data 3	I/O
13	RSDD4	Secondary disk data 4	I/O
11	RSDD5	Secondary disk data 5	I/O
9	RSDD6	Secondary disk data 6	I/O
7	RSDD7	Secondary disk data 7	I/O
6	RSDD8	Secondary disk data 8	I/O
8	RSDD9	Secondary disk data 9	I/O
10	RSDD10	Secondary disk data 10	I/O
12	RSDD11	Secondary disk data 11	I/O
14	RSDD12	Secondary disk data 12	I/O
16	RSDD13	Secondary disk data 13	I/O
18	RSDD14	Secondary disk data 14	I/O
20	RSDD15	Secondary disk data 15	I/O
35	RSDCS1#	Secondary disk chip select for 100 range	O
36	RSDCS3#	Secondary disk chip select for 300 range	O
28	RSDDACK#	Secondary DMA acknowledge	O
22	RSDDREQ	Secondary DMA request	I
24	RSDIOR#	Secondary disk IO read	O
25	RSDIOW#	Secondary disk IO write	O
27	RSIORDY	Secondary disk IO channel ready	I
29	IRQ15	Secondary disk interrupt	I
50	DVDIN#	DVD Insert	I
49	CDIN#	CDROM insert	I
37	CDROMLED#	CDROM access indicator	O
2	CD_R	CDROM sound right signal	O
4	CD_LGND	Right Ground	I
1	CD_L	CDROM sound left signal	O
3	CD_RGND	Left Ground	I
39,41,38,40, 42	+5Vs	+5V power supply	I
23,43,44,45, 46,48	Gnd	Ground	O

B.8 DC-IN Jack Pin Assignment

The pin assignment of the DC-IN connector is as follows:

No	Signal	Description	Type
1	ADAPV+	Adapter input voltage	I
2	Gnd	Ground	O

B.9 LCD Connector Pin Assignment

The pin assignment of the LCD connector is as follows:

Pin	Name	Remark	Pin	Name	Remark
1	GND		2	GND	
3	LCD_P7D	For DSTN LCD	4	GND	
5	LCD_P7	For LVDS panel	6	LCD_L_P8	
7	LCD_P6	For LVDS panel	8	LCD_L_P9	
9	LCD_P6D	For DSTN LCD	10	LCD_L_P10	
11	GND		12	LCD_L_P11	
13	LCD_P5D	For DSTN LCD	14	GND	
15	LCD_P5	For LVDS panel	16	LCD_L_P12	
17	LCD_P4	For LVDS panel	18	LCD_L_P13	
19	LCD_P4D	For DSTN LCD	20	LCD_L_P14	
21	GND		22	LCD_L_P15	
23	LCD_P3D	For DSTN LCD	24	GND	
25	LCD_P3	For LVDS panel	26	LCD_L_P16	
27	LCD_P2	For LVDS panel	28	LCD_L_P17	
29	LCD_P2D	For DSTN LCD	30	LCD_L_P18	
31	GND		32	LCD_L_P19	
33	LCD_P1D	For DSTN LCD	34	GND	
35	LCD_P1	For LVDS panel	36	LCD_L_P20	
37	LCD_P0	For LVDS panel	38	LCD_L_P21	
39	LCD_P0D	For DSTN LCD	40	LCD_L_P22	
41	GND		42	LCD_L_P23	
43	GND		44	GND	
45	+VLCD		46	+VLCD	
47	+VLCD		48	+VLCD	
49	GND		50	GPI5_PIIX4_LCDID0#	
51	LCD_LCDSCLK		52	GPI19_PIIX4_LCDID1#	
53	LCD_SFLM		54	GPI21_PIIX4_LCDID2#	
55	GND		56	DIGON	
57	LCD_SLP		58	LCD_BIASON	
59	LCD_SDE		60	LCD_CONTRAST	
61	GND		62	GND	
63	LCD_INTVNA		64	GND	
65	LCD_BRIGHTNESS		66	GND	
67	+5VS_INVERT		68	+5VS_INVERT	
69	+5VS_INVERT		70	+5VS_INVERT	

B.10 Fan Pin Assignment

The pin assignment of the internal fan is as follows:

No	Signal	No	Signal
1	+5VS	2	GND

B.11 AIO Board Pin Assignment

The pin assignment of the AIO board is as follows:

No	Signal		No	Signal
1, 2, 23, 24, 33, 36, 49, 50, 55, 60, 86, 87	GND		100, 99, 98, 97, 92, 94, 96, 95, 93	+5VS
3	PIDE_RPDCS3#		46	FDD_WP#
4	HDDLED#		47	FDD_RDATA#
5	PIDE_RPDA2		48	FDD_HDSEL#
6	PIDE_RPDCS1#		51	IR_TXD
7	PIDE_RPDD15		52	IR_RX1
8	PIDE_RPDA0		53	IR_RX2
9	PIDE_RPDD14		54	GPI13_PIIX4_FDDIN#
10	PIDE_RPDA1		56	SMDATA_KB
11	PIDE_RPDD13		57	PWRON
12	IRQ14		58	SMCLK_KB
13	PIDE_RPDD12		59	LED_CHARGE
14	PIDE_RPDDACK#		61	LS120IN#
15	PIDE_RPDD11		62	KB_X15
16	PIDE_RPIORDY		63	KB_X14
17	PIDE_RPDD10		64	KB_X13
18	PIDE_RPDIOR#		65	KB_X12
19	PIDE_RPDD9		66	KB_X11
20	PIDE_RPDIOW#		67	KB_X10
21	PIDE_RPDD8		68	KB_X9
22	PIDE_RPDDRQ		69	KB_X8
25	PIDE_RPDD0		70	KB_X7
26	PIDE_RPDD4		71	KB_X6
27	PIDE_RPDD1		72	KB_X5
28	PIDE_RPDD5		73	KB_X4
29	PIDE_RPDD2		74	KB_X3
30	PIDE_RPDD6		75	KB_X2
31	PIDE_RPDD3		76	KB_X1
32	PIDE_RPDD7		77	KB_X0
34	GPO6_PIIX4_HDDRESET#		78	KB_XY7
35	FDD_INDEX#		79	KB_XY6
37	FDD_DSKCHG#		80	KB_XY5
38	FDD_DR0#		81	KB_XY4
39	FDD_MTR0#		82	KB_XY3
40	FDD_DIR#		83	KB_XY2
41	FDD_3MODE		84	KB_XY1
42	FDD_STEP#		85	KB_XY0

43	FDD_WDATA#		88	ACIN
44	FDD_WGATE#		89	IDA#
45	FDD_TRK0#		90	TERR
92,94	+3VS		91	LID_SW#

B.12 Internal FDD Connector

The pin assignment for the FDD connector is as follows:

NO.	Signal	Description	Type
3	RDATA#	Read disk data. Raw serial bit stream form the disk drive, low active. Each falling edge represents a flux transition of the encoded data.	I
9	WGATE#	Write gate. This active low high current driver allows current to flow through the write head. It becomes active just prior to writing to the diskette.	O
11	WDATA#	Write data. This active low high current driver provides the encoded data to the disk drive. Each falling edge causes a flux transition on the media.	O
1	HDSEL#	Head select. The high current select the floppy disk side for reading or writing. A logic “1” on the pin means side 0 will be accessed, while a logic “0” means side 1 will be accessed.	O
15	DIR#	Direction control. This high current low active output determines the direction of the head movement. A logic “1” on this pin means outward motion, while a logic “0” means inward motion.	O
13	STEP#	Step pulse. The active low high current driver issues a low pulse for each track-to-track movement of the head.	O
21	DSKCHG#	Disk change. This input senses that the drive door is open or that the diskette has possibly been changed since the last drive selection. This input is inverted and read via bit 7 of I/O address 3F7H. The DSKCHG# bit also depends upon the state of the Force Disk Change bits in the Force FDD Status Change configuration register.	I
23	DS0#	Drive select 0. Active low outputs select drives 0.	O
17	MOTR0	Motor on. These active low output motor on.	O
14	3MODE	3 Mode FDD select.	O
5	WRTPRT#	Write protected. This active low Schmitt trigger input senses from the disk drive that a disk is write protected.	I
7	TRK0#	Track 00. This active low Schmitt trigger input senses from the disk drive that the head is positioned over the outermost track.	I
25	INDEX#	This active low Schmitt Trigger input senses from the disk drive that head is positioned over the beginning of a track , as marked by an index hole.	I
16	READY	FDD ready	I
20	FDDIN#	FDD insert	I
2,4,6,8,10,12	Gnd	Ground	I
22,24,26	+5Vs	+5V power supply	O
18,19	NC	No connection	

B.13 HDD Pin Assignment

The pin assignment of the internal HDD is as follows:

PIN NUMBER	PIN NAME	PIN NUMBER	PIN NAME
1	HD1RST#	2	GND
3	PDD7	4	PDD8
5	PDD6	6	PDD9
7	PDD5	8	PDD10
9	PDD4	10	PDD11
11	PDD3	12	PDD12
13	PDD2	14	PDD13
15	PDD1	16	PDD14
17	PDD0	18	PDD15
19	GND	20	NC
21	PDDREQ	22	GND
23	PDIOW#	24	GND
25	PDIOR#	26	GND
27	PIORDY	28	CSEL
29	PDDACK#	30	GND
31	IRQ14	32	NC
33	PDA1	34	PDIAG#
35	PDA0	36	PDA2
37	PDCS1#	38	PDCS3#
39	HDDLED#	40	GND
41	+5VHDS1	42	+5VHDS1
43	GND	44	NC

B.14 B+ of 12 Pin Assignment

The pin assignment of the B+ 12V is as follows:

No	Signal	Description	Type
1,2,3,4,5,6	B+	Power	O
8	NU	Key	NC
7,9,10, 11,12	GND	Ground	O

B.15 Internal Keyboard FPC Connector

The pin assignment of the internal keyboard connector is as follows:

No	Signal	Description	Type
1	X15	Keyboard matrix column 15	I
2	X14	Keyboard matrix column 14	I
3	X13	Keyboard matrix column 13	I
4	X12	Keyboard matrix column 12	I
5	X11	Keyboard matrix column 11	I
6	X10	Keyboard matrix column 10	I
7	X9	Keyboard matrix column 9	I
8	X8	Keyboard matrix column 8	I
9	X7	Keyboard matrix column 7	I

10	X6	Keyboard matrix column 6	I
11	X5	Keyboard matrix column 5	I
12	XY7	Keyboard matrix row 7	O
13	XY6	Keyboard matrix row 6	O
14	XY5	Keyboard matrix row 5	O
15	XY4	Keyboard matrix row 4	O
16	X4	Keyboard matrix column 4	I
17	X3	Keyboard matrix column 3	I
18	XY3	Keyboard matrix row 3	O
19	XY2	Keyboard matrix row 2	O
20	XY1	Keyboard matrix row 1	O
21	XY0	Keyboard matrix row 0	O
22	X2	Keyboard matrix column 2	I
23	X1	Keyboard matrix column 1	I
24	X0	Keyboard matrix column 0	I

B.16 Battery Connector

The pin assignment for the battery connector is as follows:

No	Signal	Description	Type
8	Gnd	Ground	I
7	TH	Thermal sensor	I
6	DTA	SMBus data signal	I/O
5	CLK	SMBus clock signal	I/O
4	SEL	Not used	-
3	ID2	Battery insert detection	O
2	ID1	Not Used	-
1	BAT+	Battery output/input voltage	I/O

B.17 Audio Board Pin Assignment

No	Signal	No	Signal
1	GND	2	+5VS
3	+3VS	4	+5VS
5	PDAMP#	6	CD_GND
7	SUSLED#	8,	CD_L
9	CHGLED	10	CD_R
11	MBATW#	12	CD_GND
13	BATL#	14	ZV_SDATA
15	GND	16	ZV_SCLK
17	NC	18	ZV_RCLK
19	NC	20	ZV_MCLK
21	+5V	22	+5VS
23	GLIDPAD_CLK	24	NC
25	GLIDPAD_DATA	26	C24
27	GND	28	GND
29	INTAC97RST#	30	SDFSO
31	AUDSCLK	32	PCIRST#
33	NC	34	SDATA_IN

35	BEEP	36	SDATA_OUT
37	GND	38	GND
39	+RTCBAT	40	+12VS

B.18 Audio Jack

The audio jack comprises of the headphone jack, line-out jack, and microphone jack:

Headphone Jack

The pin assignment of the headphone jack is as follows:

No	Signal	Description	Type
1	GND	Ground	I
2	HP_L	Headphone left sound	O
3	HP_R	Headphone right sound	O
4	AMPCTRL	Amplifier control signal	I
5	GNDP	Pull-down signal	O
6	NC	Not used	-

Line-In Jack

The pin assignment of the line-in jack is as follows:

No	Signal	Description	Type
1	GND	Ground	I
2	LINEINL	Line in left sound	O
3	GND	Ground	I
4	GND	Ground	I
5	LINEINR	Line in right sound	O

Microphone Jack

The pin assignment of the microphone jack is as follows:

No	Signal	Description	Type
1	GND	Ground	I
2	MICIN	External Microphone input signal	I
3	INTMIC	Internal microphone signal	O
4	NC	Not used	-
5	NC	Not used	-

B.19 Internal Microphone Connector

The pin assignment of the internal microphone is as follows:

No	Signal	Description	Type
1	MICIN	External Microphone input signal	
2	GND	Ground	

B.20 Internal Left Speaker Connector

The pin assignment of the internal left speaker is as follows:

No	Signal	Description	Type
1	L_OUT+	Speaker signal	
2	L_OUT-	Speaker signal	
3	R_OUT+	Speaker signal	
4	R_OUT-	Speaker signal	

B.21 RTC Battery

The pin assignment of the RTC battery is as follows:

No	Signal	Description	Type
1	+RTCBAT	RTC Battery Power	
2	GND	Ground	

B.22 Glidepad Connector

The pin assignment of the glidepad is as follows:

No	Signal	Description	Type
1	+5VS	+5V POWER	
2	DATA	Data Signal	
3	CLK	Clock Signal	
4	SW-R	Switch Right	
5	SW-L	Switch Left	
6	GND	Gound	

B.23 S-Video Connector

The pin assignment of the S-Video connector is as follows:

No	Signal	Description	Type
1	GND	Ground	
2	GND	Ground	
3	Y	Luminance O/P	
4	C	Chrominance O/P	

Appendix C

FRU Parts Listing

This appendix provides you with the field replaceable unit (FRU) parts listing of the A440 Series. Refer to this appendix whenever ordering for spare parts or requesting for RMA (Returned Merchandise Authorization) number.

FRU	FIC Part Number
Module CD-ROM_24X_TEAC	25-02099-00
CD-ROM 24X - Teac (CD224E)	23-40139-10
CD-ROM BRACKET(L)	24-50749-00
CD-ROM BRACKET(R)	24-50750-00
PLASTIC-M CD-ROM PANEL	80-40173-20
Module - CD-ROM _24X_MKE	25-02069-00
CD-ROM 24X MKE	23-40165-05
CD-ROM BRACKET(L)	24-50749-00
CD-ROM BRACKET(R)	24-50750-00
PLASTIC-M CD-ROM PANEL	80-40308-01
Module - CD-ROM _24X_DELTA	25-02070-00
CD-ROM 24X DELTA	23-40240-00
CD-ROM BRACKET(L)	24-50749-00
CD-ROM BRACKET(R)	24-50750-00
PLASTIC-M CD-ROM PANEL	80-40311-01
Module - DVD-ROM 6X MKE	25-01616-10
DVD-ROM 6X MKE	23-40208-00
CD-ROM BRACKET(L)	24-50990-00
CD-ROM BRACKET(R)	24-50750-00
CD-ROM CYBERLINK POWER DVD SW	24-70110-10
PLASTIC-M DVD-ROM PANEL	80-40181-20
Module - DVD-ROM 6X MKE (W/O POWER)	25-02075-20
DVD-ROM 6X MKE	23-40208-00
CD-ROM BRACKET(L)	24-50990-00
CD-ROM BRACKET(R)	24-50750-00
PLASTIC-M DVD-ROM PANEL	80-40181-20

FRU Parts Listing

Module - DVD-ROM 8X SANYO	25-02072-10
DVD-ROM 8X SANYO	23-40285-00
CD-ROM BRACKET(L)	24-50990-00
CD-ROM BRACKET(R)	24-50750-00
CD-ROM CYBERLINK POWER DVD SW	24-70110-10
PLASTIC-M DVD-ROM PANEL	80-40295-20
Module - DVD-ROM 8X SANYO (W/O POWER)	25-02076-30
DVD-ROM 8X SANYO	23-40285-00
CD-ROM BRACKET(L)	24-50990-00
CD-ROM BRACKET(R)	24-50750-00
PLASTIC-M DVD-ROM PANEL	80-40295-20
Module - DVD-ROM 8X QSI	25-02073-10
DVD-ROM 8X QSI	23-40293-00
CD-ROM BRACKET(L)	24-50990-00
CD-ROM BRACKET(R)	24-50750-00
CD-ROM CYBERLINK POWER DVD SW	24-70110-10
PLASTIC-M DVD-ROM PANEL	80-40312-00
Module - DVD-ROM 8X QSI (W/O POWER)	25-02077-30
DVD-ROM 8X QSI	23-40293-00
CD-ROM BRACKET(L)	24-50990-00
CD-ROM BRACKET(R)	24-50750-00
PLASTIC-M DVD-ROM PANEL	80-40312-00
Module - CD-RW KME	25-02074-10
CD-RW KME	23-40133-01
CD-ROM BRACKET(L)	24-50990-00
CD-ROM BRACKET(R)	24-50750-00
PLASTIC-M DVD-ROM PANEL	80-40291-20
Module HDD _10 GB _HIT	25-02080-10
HDD 10GB HIT	23-20723-00
HDD BRACKET(R)	24-50752-10
HDD BRACKET(L)	24-50753-00
HDD Board	51-71069-XX
Module HDD _10 GB _FUJ	25-02080-00
HDD 10GB FUJ	23-20725-00
HDD BRACKET(R)	24-50752-10
HDD BRACKET(L)	24-50753-00
HDD Board	51-71069-XX

FRU	FIC Part Number
Module HDD _10 GB _IBM	25-02020-20
HDD 10 GB IBM	23-20725-00
HDD BRACKET(L)	24-50752-10
HDD BRACKET(L)	24-50753-00
HDD Board	51-71069-XX
Module HDD _12 GB _HIT	25-02078-10
HDD 12GB HIT	23-20609-02
HDD BRACKET(R)	24-50752-10
HDD BRACKET(L)	24-50753-00
HDD Board	51-71069-XX
Module HDD _12 GB _FUJ	25-02078-00
HDD 12GB FUJ	23-20614-00
HDD BRACKET(R)	24-50752-10
HDD BRACKET(L)	24-50753-00
HDD Board	51-71069-XX
Module HDD _12 GB _IBM	25-02078-20
HDD 12 GB IBM	23-20620-00
HDD BRACKET(L)	24-50752-10
HDD BRACKET(L)	24-50753-00
HDD Board	51-71069-XX
Module HDD _18 GB _HIT	25-02079-10
HDD 18GB HIT	23-20621-00
HDD BRACKET(R)	24-50752-10
HDD BRACKET(L)	24-50753-00
HDD Board	51-71069-XX
Module HDD _18 GB _FUJ	25-02079-00
HDD 18GB FUJ	23-20649-00
HDD BRACKET(R)	24-50752-10
HDD BRACKET(L)	24-50753-00
HDD Board	51-71069-XX
Module HDD _18 GB _IBM	25-02079-20
HDD 18 GB IBM	23-20622-00
HDD BRACKET(L)	24-50752-10
HDD BRACKET(L)	24-50753-00
HDD Board	51-71069-XX

FRU Parts Listing

FRU	FIC Part Number
Module HDD _20 GB _HIT	25-02081-10
HDD 20GB HIT	23-20726-00
HDD BRACKET(R)	24-50752-10
HDD BRACKET(L)	24-50753-00
HDD Board	51-71069-XX
Module HDD _20 GB _FUJ	25-02081-00
HDD 20GB FUJ	23-20728-00
HDD BRACKET(R)	24-50752-10
HDD BRACKET(L)	24-50753-00
HDD Board	51-71069-XX
Module HDD _20 GB _IBM	25-02081-20
HDD 20 GB IBM	23-20741-00
HDD BRACKET(L)	24-50752-10
HDD BRACKET(L)	24-50753-00
HDD Board	51-71069-XX
Battery Pack - NiMH_Panasonic_4500mA:	21-90493-50
Battery Pack LI-ION (PAN) 3200MA	21-91026-50
Dummy Fax Modem	25-02152-00
CASE MODEM JACK COVER	24-44726-00
FAX/MODEM MODULE	71-40156-00
Dummy LAN Module	25-02151-00
CASE MODEM JACK COVER	24-51157-00
LAN/MODEM MODULE	71-40161-00
Main Module	N/A
Charger Board+IO/Bd	51-70588-XX
Charger Board	51-71068-XX
AUDIO Board	51-71088-XX
Main Board	51-71071-XX
BOTTOM CASE Module	80-40320-20
Module TOP Case	80-40167-21
K/B Cover	80-40178-02
MODEM-Cover	80-40163-22
DRAM COVER	80-40254-24

FRU	FIC Part Number
Module FDD_Mitsubishi	25-01613-00
FDD 3.5" MITSUBISHI	23-10080-04
F-CABLE FDD FPC	22-20364-21
FDD PLATE	80-50021-20
Module FDD_NEC	25-02012-00
FDD 3.5" NEC	23-10086-05
F-CABLE FDD FPC	22-20364-21
FDD PLATE	80-50021-20
Module Palm Rest	25-02083-00
F-CABLE GLIDE PAD CABLE	22-10406-01
F-CABLE GLIDE PAD FPC	22-21042-00
CASE GLIDE PAD BUTTON	24-44708-20
GLIDE PAD/B	51-71080-21
GLIDE PAD	71-20145-00
PLASTIC-M PALM-REST MODULE	80-40168-22
Module LCD TFT 12.1" LG	56-10231-21
LCD 12.1" TFT LG	71-10532-00
INVERTER/B	12-01295-01
CABLE-M LCD FPC/CABLE 12.1" LG	80-30050-21
LCD BEZEL FOR 12.1"	24-44697-21
LCD COVER FOR 12.1"	80-40214-21
FRAME HINGE-R	24-81923-00
FRAME HINGE-L	24-81924-00
Module LCD TFT 12.1" Sanyo	56-10364-21
LCD 12.1" TFT SANYO	71-10539-01
INVERTER/B	12-01295-01
CABLE-M LCD FPC/CABLE 12.1" SANYO	80-30051-00
LCD BEZEL FOR 12.1"	24-44697-21
LCD COVER FOR 12.1"	80-40214-21
FRAME HINGE-R	24-81923-00
FRAME HINGE-L	24-81924-00
Module LCD DSTN 12.1" PAN	56-10262-21
LCD 12.1" TFT PAN	71-10519-00
INVETER/B	12-01295-01
CABLE-M LCD FPC/CABLE 12.1" PAN	80-30073-10
LCD BEZEL FOR 12.1"	24-44697-21
LCD COVER BACK FOR 12.1"	80-40214-21
FRAME HINGE-R	24-81923-00
FRAME HINGE-L	24-81924-00

FRU Parts Listing

FRU	FIC Part Number
Module LCD TFT 13.3" ADT	56-10236-21
LCD 13.3" TFT ADT	71-10546-00
INVERTER/B	12-01294-01
CABLE-M LCD FPC/CABLE 13.3" ADT	80-30129-00
LCD BEZEL FOR 13.3"	24-44717-21
LCD COVER FOR 13.3"	80-40213-21
FRAME HINGE-R	24-81923-00
FRAME HINGE-L	24-81924-00
Module LCD TFT 14.1" CPT:	56-10367-21
LCD 14.1" TFT CPT	71-10547-00
INVERTER/B	12-01294-01
CABLE-M LCD FPC/CABLE 14.1"CPT	80-30118-00
LCD BEZEL FOR 14.1"	24-44692-21
LCD COVER FOR 14.1"	80-40164-21
FRAME HINGE-R	24-81925-00
FRAME HINGE-L	24-81926-00
AC Adaptor (3 PIN)	12-01322-50
Keyboard (US)	71-30411-00
Keyboard (GER)	71-30411-01
Keyboard (UK)	71-30411-02
Keyboard (JAP)	71-30411-03
Keyboard (SD)	71-30411-04
Keyboard (SPI)	71-30411-05
Keyboard (ITA)	71-30411-06
Keyboard (FRA)	71-30411-07
Keyboard (CHI)	71-30411-08
Keyboard (KOR)	71-30411-09
Keyboard (CZ)	71-30411-10
Keyboard (TURKEY)	71-30411-13
Keyboard (JAP-M)	71-30411-14
Keyboard (PROTUGAL)	71-30411-15
Keyboard (BEL)	71-30411-16
Keyboard (SW/GER)	71-30411-17
Keyboard (SW/FR)	71-30411-18
Keyboard (TURKEY)	71-30411-19
Keyboard (HB)	71-30411-20