

Software Functional Overview

3.1 Overview

The MD02 is an IBM PC/AT compatible Notebook PC, which supports the Intel Micro-PGA Pentium M CPU processors family. The following are the major features that MD02 supports.

- § Microsoft PC99 logo and Win XP logo approval.
- § Offer 1024x768 XGA display with 13.3 XGA LCD panel.
- § Support ACPI 1.0B (or above).
- § Support PCI 2.1 (or above).
- § Support AGP 2.0.
- § Support SMBIOS 2.3.
- § Support DDR266/200 SDRAM.
- § Support 100/133 Mhz CPU front side bus.

3.2 Summary of the BIOS Specification

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

Controller Chip	Description
BIOS Feature	<ul style="list-style-type: none"> § Microsoft PC99 logo and WinXP logo approval. § Support Boot Block / Crisis Rescue. § APM 1.2 Compliance § Support ACPI 1.0B (or above) Spec. § Support PCI 2.1 (or above) Spec. § Support SMBIOS 2.3 (or above) Spec § Support Windows XP. § Support flash function including both DOS and Windows interface for new BIOS update. § Support US keyboard . § Support boot from LAN , USB FDD/FLASH , HDD and CDROM Drive. § Support Phoenix First BIOS.
CPU	Auto detecting the CPU type and speed for Intel Dothan based system. Support Intel Geyserville III Technology .
DRAM	Auto sizing and detection. Support PC-200/266/333 DDR SDRAM.
Cache	<ul style="list-style-type: none"> § Level 2 SRAM auto sizing and detection. § Always enable CPU L1 and L2 cache.
Shadow	Always enable VGA and System BIOS shadow
Display	<ul style="list-style-type: none"> § 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. § Support AGP 4x BUS.

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Hard Disk	<ul style="list-style-type: none"> § Enhanced IDE spec. § Support auto IDE detection. § Support LBA mode for larger capacity HDD. § Support Ultra DMA 33/66/100. § Support Fast PIO mode 1-4 transfer. § Support 32 bit PIO transfer. § Support Multi-Sector transfer. § Support SMART monitoring.
Multi Boot	Allow the user to select boot from FDD, 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.
PCMCIA	Compliant with PCMCIA 2.1 specification
Power Management Support (ACPI Mode)	<p>The power management is compliant with ACPI 1.0B specification and supports the following power state:</p> <ul style="list-style-type: none"> § S0 (Full-On) Mode § S3 (STR) Mode § S4 (STD) Mode § S5 (Soft-Off) Mode

3.3 Subsystem Software Functions

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

3.3.1 Key Chipset Summary

Following are the main chipsets used in the notebook:

Controller Chip	Vendor	Description
Processor	Intel	Mobile Dothan
North Bridge	Intel	MontaraGM+
South Bridge	Intel	ICH4
Video Controller	Intel	Embedded in MontaraGM+
PCMCIA Controller	TI	PCI4510
Audio Chip	Intel	South Bridge Integrated
Audio Codec	Intel	ICH4
Keyboard Controller	Misubishi	M38857M8
PMU Controller	NEC	PMU08
ROM BIOS	SST	49LF004A
Clock Generator	IMI	CY28346
Temperature Sensor	NS	MAX6690
IEE 1394	TI	PCI4510
LAN	Intel	ICH4-M+BroadCom BCM4401
Modem	Intel	MDC AC'97

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3.3.2 System Memory

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

Base SO-DIMM DRAM slot (Bank 0&1)	Expansion SO-DIMM DRAM slot (Bank 2&3)	Total Size
128MB	NIL	128MB
128MB	128MB	256MB
128MB	256MB	384MB
128MB	512MB	640MB
128MB	1GB	1128MB
256MB	NIL	256MB
256MB	128MB	384MB
256MB	256MB	512MB
256MB	512MB	768MB
256MB	1GB	1256MB
512MB	NIL	512MB
512MB	128MB	640MB
512MB	256MB	768MB
512MB	512MB	1GB
1GB	1GB	2GB

3.3.3 Video

The Video subsystem used External DDR memory of Video memory. The system will support the true ZV port, the Microsoft Direct 3D assist, simultaneous display, monitor sense for auto display on boot and VESA Super VGA function call.

Supported Video Mode

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

Supported standard VGA modes:

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

Mode	Pixel Resolution	Colors	Memory
00h/01h	40*25	16	Text
02h/03h	80*25	16	Text
04h/05h	320*200	4	2-bit Planar
06h	640*200	2	1-bit Planar
07h	80*25	Mono	Text
0Dh	320*200	16	4-bit Planar

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0Eh	640*200	16	4-bit Planar
0Fh	640*350	Mono	1-bit Planar
10h	640*350	16	4-bit Planar
11h	640*480	2	2-bit Planar
12h	640*480	16	4-bit Planar
13h	320*200	256	8-bit Planar

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

Supported extended video modes:

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

VESA Mode	Pixel Resolution	Memory Model	Refresh Rates In (Hz)	Minimum Memory
100h	640 x 400	8-bit Packed	70	2MB
101h	640 x 480	8-bit Packed	60, 72, 75, 85	2MB
102h	800 x 600	4-bit Planar	60, 72, 75, 85, 100	2MB
103h	800 x 600	8-bit Packed	60, 72, 75, 85, 100	2MB
104h	1024 x 768	4-bit Planar	43(I), 60, 70, 75, 85, 100	2MB
105h	1024 x 768	8-bit Packed	43(I), 60, 70, 75, 85, 100	2MB
106h	1280 x 1024	4-bit Planar	43(I), 60, 75, 85	2MB
107h	1280 x 1024	8-bit Packed	43(I), 60, 75, 85	2MB
10Eh	320 x 200	16-bit Packed	70	2MB
10Fh	320 x 200	32-bit Unpacked	70	2MB
111h	640 x 480	16-bit Packed	60, 72, 75, 85	2MB
112h	640 x 480	32-bit Unpacked	60, 72, 75, 85	2MB
114h	800 x 600	16-bit Packed	60, 72, 75, 85, 100	2MB
115h	800 x 600	32-bit Unpacked	60, 72, 75, 85, 100	2MB
117h	1024 x 768	16-bit Packed	43(I), 60, 70, 75, 85, 100	2MB
118h	1028 x 768	32-bit Unpacked	43(I), 60, 70, 75, 85, 100	4MB
11Ah	1280 x 1024	16-bit Packed	43(I), 60, 75, 85	4MB
11Bh	1280 x 1024	32-bit Unpacked	43(I), 60, 75, 85	8MB
11Dh	640 x 400	16-bit Packed	70	2MB
11Eh	640 x 400	32-bit Packed	70	2MB
120h	1600 x 1200	8-bit Packed	48(I), 60, 75, 85	2MB
122h	1600 x 1200	16-bit Packed	48(I), 60, 75, 85	4MB
124h	1600 x 1200	32-bit Unpacked	48(I), 60, 75, 85	8MB
12Ah	640 x 480	24-bit Packed	60, 72, 75, 85	2MB
12Bh	800 x 600	24-bit Packed	60, 72, 75, 85, 100	2MB
12Ch	1024 x 768	24-bit Packed	43(I), 60, 70, 75, 85, 100	4MB
12Dh	1280 x 1024	24-bit Packed	43(I), 60, 75, 85	4MB
12Eh	320 x 200	8-bit Packed	70	2MB
131h	320 x 200	8-bit Packed	72	2MB
133h	320 x 200	16-bit Packed	72	2MB

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134h	320 x 200	32-bit Packed	72	2MB
13Bh*	1400 x 1050	8-bit Packed	60, 75	2MB
13Ch*	1400 x 1050	16-bit Packed	60, 75	4MB
13Eh*	1400 x 1050	32-bit Unpacked	60, 75	8MB
141h	400 x 300	8-bit Packed	72	2MB
143h	400 x 300	16-bit Packed	72	2MB
144h	400 x 300	32-bit Unpacked	72	2MB
151h	512 x 384	8-bit Packed	70	2MB
153h	512 x 384	16-bit Packed	70	2MB
154h	512 x 384	32-bit Unpacked	70	2MB
171h	720 x 480	8-bit Packed	75	2MB
173h	720 x 480	16-bit Packed	75	2MB
174h	720 x 480	24-bit Packed	75	2MB
175h	720 x 480	32-bit Unpacked	75	2MB
176h	720 x 576	8-bit Packed	75	2MB
178h	720 x 576	16-bit Packed	75	2MB
179h	720 x 576	24-bit Packed	75	2MB
17Ah	720 x 576	32-bit Unpacked	75	2MB

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

Panel Type Initialization

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

LCD Panel ID pin Definition:

VT82C686B GPI Pins				Panel Type
GPI [23]	GPI [17]	GPI [11]	GPI [10]	
0	0	0	0	
0	0	0	1	ID0
0	0	1	0	ID1
0	0	1	1	
0	1	0	0	ID2
0	1	0	1	
0	1	1	0	
0	1	1	1	
1	0	0	0	ID3
1	0	0	1	
1	0	1	0	
1	0	1	1	
1	1	0	0	

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1	1	0	1	
1	1	1	0	
1	1	1	1	

3.3.4 Enhanced IDE

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

3.3.5 Audio

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

3.3.7 PCMCIA

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

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

3.3.8 LED Indicator

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

Indicator	Function Description
IDE accessing LED	This LED will turn on while accessing the IDE Device.
Battery Charging LED	Turn on (Blue) – Battery is under charging mode Turn off – Battery full charged or no battery
CapsLock LED	This LED will turn on when the function of CapsLock is active.
ScrollLock LED	This LED will turn on when the function of ScrollLock is active.
NumLock LED	This LED will turn on when the function of NumLock is active.
Power Status LED	Yellow – System is powered on. Yellow Blinking- System is entered suspend mode. Turn off – Battery Low.
Mail LED	This LED will turn on while Mail was arrived.

i - These LEDs 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.

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Function	Function	Handler
Fn + F3	Toggle Display (LCD/CRT/TV/LCD&CRT)	BIOS Handler
Fn + F2	RF ON/OFF	BIOS Handler
Fn + F6	System Speaker On/Off	BIOS Handler
Fn + F8	Brightness Increase	Controlled by PMU08
Fn + F9	Brightness Decrease	Controlled by PMU08
ScrLock	Scroll Lock	
Internet Button	Internet Function Key	Controlled by Driver
Mail Button	Mail Function Key	Controlled by Driver

3.3.10 Plug & Play

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

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

Device	Connect Type	Resources			
		I/O	IRQ	DMA	Memory
DMA Controller	Static	00~0F, 81~8F	-	DMA5	-
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~FFFFFF
PnP Mother Board	Static	80	-	-	-
Keyboard Controller	Static	60, 64	IRQ1	-	-
PMU08 Controller	Static	68, 6C	-	-	-
Math Coprocessor	Static	F0~FF	IRQ13	-	-
Glide Pad	Static	-	IRQ12	-	-
Video Controller	Static	3B0~3BB, 3C0~3DF	IRQ5	-	A0000~BFFFF , C0000~CFFFF
Dual IDE Controller	Static	170~177, 1F0~1F7, 3F6	IRQ14, 15	-	-
CardBus Controller	Dynamic	3E0~3E1	IRQ10	-	-
Audio chip	Dynamic	220~22F, 300~301, 388~38B	IRQ5	DMA3	-
IEEE1394	Dynamic		IRQ10		
Modem	Dynamic	3E8~3EF	IRQ10	-	-
LAN	Dynamic	1080~10FF	IRQ10	-	-
USB Host Controller	Dynamic	EF80~EF9F	IRQ5	-	-

3.3.11 PCI Device

The table below summarizes the PCI IDSEL Pin Allocation:

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IDSEL Pin	PCI Device		
	Device Number	Function Number	Device Name
AD23	Device 07	Function 0	RICOH Card Bus
		Function 1	RICOH IEEE1394
AD17	Device 01	Function 0	MINI PCI

The table below summarizes the INT Pin Allocation:

INT Pin	PCI Device
INTA	CardBus/MiniPCI/LAN
INTB	Cardbus/MiniPCI
INTC	
INTD	

The table below summarizes the PCI bus master Allocation:

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

3.3.12 SMBus Devices

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

ICH4 SMBus Connection Devices

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

PMU 08 SMBus Connection Devices

SMBus Device	Host/Slave	Addresses	BIOS Need to Initialization
		A7 ~ A1	
PMU08	Master	10h	Enable PS01 decode interface
MAX6690 (Thermal sensor)	Slave	9Ch	Program the desired temperature range
Battery (1 st Battery)	Slave	A8h	No Need

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I/O Map

Hex Address	Device
000 - 01F	8237-1
020 - 021	8259-1
022	
040 - 05F	8254
060 - 064	Keyboard Controller
068 - 06C	PMU08 Controller
070 - 07F	RTC & NMI Mask
080 - 08F	DMA Page Registers
092	System Control Port
0A0 - 0A1	8259-2
0B2	Advanced Power Management Control Port
0B3	Advanced Power Management Status Port
0C0 - 0DF	8237-2
0F0 - 0FF	Math Coprocessor
170 - 177	IDE Secondary Command Block
1F0 - 1F7	IDE Primary Command Block
220 - 22F	Sound Blaster
279	ISA PnP Address
330 - 333	MIDI
376	IDE Secondary Control Block
388 - 38B	FM Synthesizer
3B0 - 3DF	Video Controller
3E0 - 3E1	PCMCIA Controller
3F0 - 3F5, 3F7	Floppy Disk Controller
3F6	IDE Primary Control Block
A79	ISA PnP Address
CF8 - CFF	PCI BUS configuration Register

ISADMA Map

DMA Channel	Device
DMA 0	Unused
DMA 1	Unused
DMA 2	Floppy Disk
DMA 3	Audio
DMA 4	Unused
DMA 5	Unused
DMA 6	Unused
DMA 7	Unused

Memory Map

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

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IRQ Map

IRQ#	Description
IRQ 0	System Timer
IRQ 1	Keyboard
IRQ 2	
IRQ 3	
IRQ 4	
IRQ 5	Audio/VGA/USB
IRQ 6	Floppy Disk Drive
IRQ 7	
IRQ 8	RTC Alarm
IRQ 9	ACPI
IRQ10	LAN / Modem or Combo, (Card Bus), IEEE 1394
IRQ11	Reserved for PCMCIA card
IRQ12	Glide Pad
IRQ13	FPU (FERR)
IRQ14	Hard Disk Drive
IRQ15	CD-ROM or DVD-ROM

3.3.13 GPIO Pin Assignment

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

ICH4 GPI pin assignment

GPIO Number	Signal Name	Default	I/O	Notes
GPIO0	PanelID0		I	Panel ID setting
GPIO1	PanelID1		I	Panel ID setting
GPIO2	PanelID2		I	Panel ID setting
GPIO3	PanelID3		I	Panel ID setting
GPIO8	Q_SMI0		I	0:External K/B SMI0 1:Normal operation
GPIO11	LPC_QPME0	1	O	0:LPC_QPME0 Event Enable 1:Normal operation --
GPIO12	EC_SCI0		I	0:PMU SCI Detect 1:PMU SCI not Detect
GPIO13	PM_RI0		I	0:PMU GPIO detect 1:PMU GPIO not Detect
GPIO25	CB_HWSUSP 0	1	O	R5C551 Hardware suspend control pin
GPIO32	SPDMUX0	1	O	SMBus select 1
GPIO33	SPDMUX1	1	0	SMBus select 0

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3.3.14 PMU08 GPIO pin assignment

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

3.4 ACPI

General Requirements

The BIOS must meet the following general Power Management requirements:
Refers to the portion of the firmware that is compatible with the ACPI 1.0b specifications.
Support for Power ON(S0 state), Suspend-to-RAM (S3 state) , Suspend-to-Disk mode (S4 state) and Soft OFF(S5 state).

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Global System State Definitions

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

Following is a list of the system states:

G0/S0 - Working:

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

G1 - Sleeping:

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

G2/S5 - Soft Off:

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

G3 – Mechanical Off:

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

Sleeping State Definitions

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

S1 Sleeping State:

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

S3 Sleeping State:

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

S4 Sleeping State:

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

S5 Soft Off State:

The S5 state is similar to the S4 state except the OS does not save any context nor enable any devices to wake the system. The system is in the “SOFT” off state and requires a

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complete boot when awakened. Software uses a different state value to distinguish between the S5 state and the S4 state to allow for initial boot operations within the BIOS to distinguish whether or not the boot is going to wake from a saved memory image.

System Power Plane

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

3.4.1 System Power Plane

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

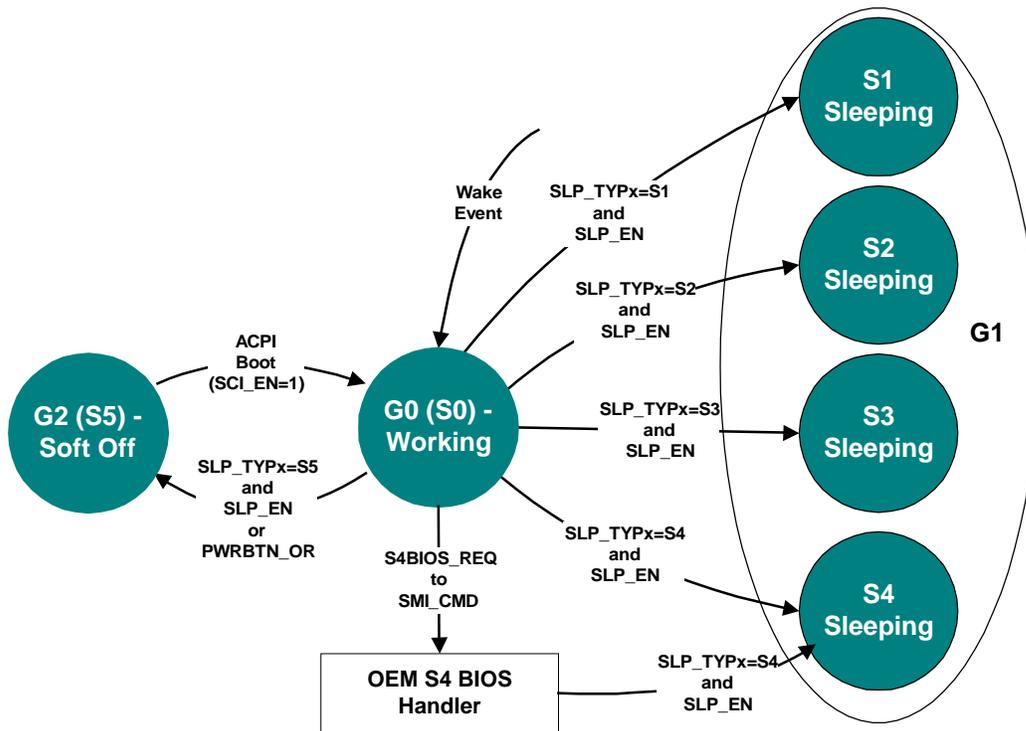
The power plane is divided as following:

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

3.4.2 Power Management Mode Transition Flow Chart

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

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3.4.3 Power States transition event

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

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

x OSPM: OS-directed Power Management

Device Power Control Methodology

Power state of local devices table

This section illustrates the power control status of each key device/component of the

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system under each power management mode.

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

Device Power control Methodology During S3 Mode

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

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

Power Button

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

Software Functional Overview

Lid Switch (Cover Switch)

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

3.4.4 Expanding Event Through the Embedded Controller

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

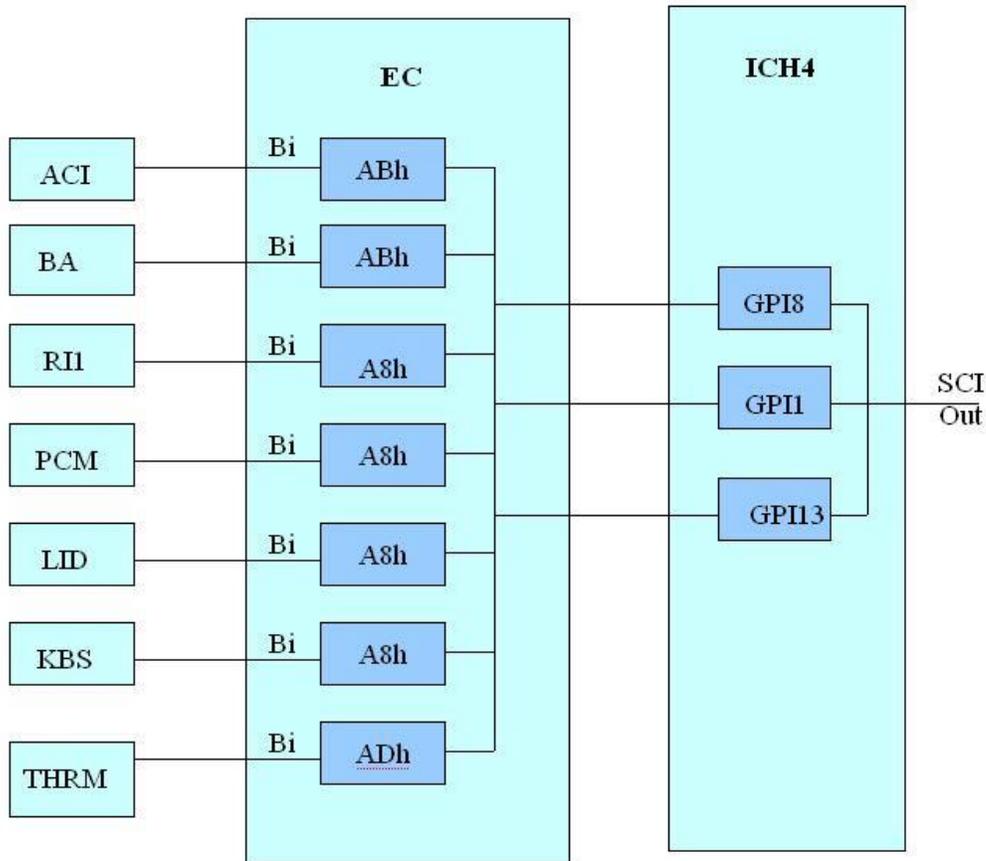


Figure 3-2 The Relationships between ACPI, Controller, and Device

SCI Source and GPE Event from PMU08

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

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

Software Functional Overview

Control Method Battery Subsystem

EC should support all the battery information to ACPI-OS

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

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

3.4.5 Thermal Control

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

Cooling Policy	Action	Temperature Setting
Action cooling	Fan On	Always On
Action cooling	Fan High On	Over 70 °C
	Fan High Off	Below 65°C
Passive cooling	Throttling CPU On	Over 90 °C
	Throttling CPU Off	Below 85°C
Critical trip point	System Shutdown	Over 110 °C

3.5 Battery Management

3.5.1 Battery Sub-system

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

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

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

- Battery reading methodology is through PMU08 SMBus.

3.5.2 Battery Low

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

- 1) The Power Indicator will become blinking.

Software Functional Overview

2) The system will issue a Warning beep.

3.5.3 Battery Low - Low

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

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

3.5.4 AC Adapter

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

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

3.6 PMU08

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

3.6.1 The System EC RAM with PMU08

Embedded Controller Command Set

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

For detail information refer to ACPI 1.0B specification.

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

Software Functional Overview

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

3.6.2 PMU08 EC RAM List

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

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

Software Functional Overview

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

Software Functional Overview

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

Software Functional Overview

Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
	*3													
2 nd Battery [_BST]	3Eh to 44h *3	*2	*2									*2	*2	*2
2 nd Battery [_BTP]	46h	*2	*2									*2	*2	*2
-	48h	Battery data Size	R (W)	DATA [7:0]								-	-	0x01: DATA size is 3byte.(PMU06A) 0x00: DATA size is 2 byte. (PMU06) *8
1 st Battery [_BIF]	49h	Design capacity	R (W)	DATA [23:16] *1 *7								-	0xff	PMU06A use this data with 02/03h. *7 *8
	4Ah	Last Full Charge Capacity	R (W)	DATA [23:16] *1 *7								-	0xff	PMU06A use this data with 04/05h. *7 *8
1 st Battery [_BST]	4Bh	Battery Remaining Capacity	R (W)	DATA [23:16] *1 *7								-	0xff	PMU06A use this data with 1E/1Fh. *7 *8
1 st Battery [_BTP]	4Ch	Battery Trip Point	R (W)	DATA [23:16] *1 *7								-	0x00	PMU06A use this data with 22/23h. *7 *8
2 nd Battery [_BIF]	4Dh	Design capacity	R (W)	DATA [23:16] *1 *7								-	0xff	PMU06A use this data with 26/27h. *7 *8
	4Eh	Last Full Charge Capacity	R(W)	DATA [23:16] *1 *7								-	0xff	PMU06A use this data with 28/29h. *7 *8
2 nd Battery [_BST]	4Fh	Battery Remaining Capacity	R (W)	DATA [23:16] *1 *7								-	0xff	PMU06A use this data with 42/43h. *7 *8
2 nd Battery [_BTP]	50h	Battery Trip Point	R (W)	DATA [23:16] *1 *7									0x00	PMU06A use this data with 46/47h. *7 *8

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Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
	51h to 6Bh *3	Reserved	R/W	Don't care								-	-	
Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
PMU Access	6Ch	PMU_LOW_ADR	R/W	DATA [7:0]								-	-	These registers are available when PMU slave mode or charger mode is selected. For detail information, refer to PMU slave communication section in this document
	6Dh	PMU_HIG_ADR	R/W	DATA [15:8]								-	-	
	6Eh	CHECK_SUM	R/W	DATA [7:0]								-	-	
	6Fh	PMU_DATA	R/W	DATA [7:0]								-	-	
SMBus	70h *7	SMB_PTCL	R/W	PROTOCOL [7:0]								-	-	For detail information, refer to ACPI 1.0 specification [13.9 SMBus Host controller Interface via Embedded controller] These registers are not available when PMU slave mode or charger mode is selected. The PMU06 has access protect function for the EEPROM in the battery, to cancel the protection, set the access protect cancel bit. For detail, refer to SMBus section
	71h *7	SMB_STS	R/W	D O L E M	A L E M	R E S	STATUS [4:0]					-	-	
	72h	SMB_ADDR	R/W	ADDRESS [6:0]							R E S	-	-	
	73h	SMB_CMD	R/W	COMMAND								-	-	
	74h to 93h	SMB_DATA [0-31]	R/W	DATA								-	-	
	94h	SMB_BCNT	R/W	RES [7:5]		BCNT [4:0]						-	-	
	95h	SMB_ALARM_ADDR	R (/W)	ADDRESS [6:0]							R E S	-	-	
	96h to 97h	AMB_ALARM_DATA [0-1]	R (/W)	DATA								-	-	

Software Functional Overview

Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
	98h	SMB_CNRL	R/W	RES [7:1]							PRT	0x00	PRT =1: The SMBus address (A8-AE) protection is cancelled.	
Reserved	99h to 9Fh	Reserved	R/W	Don't care								-	-	
Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
PMU Access	6Ch	PMU_LOW_ADR	R/W	DATA [7:0]								-	-	These registers are available when PMU slave mode or charger mode is selected. For detail information, refer to PMU slave communication section in this document
	6Dh	PMU_HIG_ADR	R/W	DATA [15:8]								-	-	
	6Eh	CHECK_SUM	R/W	DATA [7:0]								-	-	
	6Fh	PMU_DATA	R/W	DATA [7:0]								-	-	
SMBus	70h *7	SMB_PTCL	R/W	PROTOCOL [7:0]								-	-	For detail information, refer to ACPI 1.0 specification [13.9 SMBus Host controller Interface via Embedded controller]
	71h *7	SMB_STS	R/W	D O L E M	A R E S	STATUS [4:0]						-	-	
	72h	SMB_ADDR	R/W	ADDRESS [6:0]							R E S	-	-	These registers are not available when PMU slave mode or charger mode is selected.
	73h	SMB_CMD	R/W	COMMAND								-	-	
	74h to 93h	SMB_DATA [0-31]	R/W	DATA								-	-	The PMU06 has access protect function for the EEPROM in the battery, to cancel the protection, set the access protect cancel bit. For detail, refer to SMBus section
	94h	SMB_BCNT	R/W	RES [7:5]		BCNT [4:0]						-	-	
	95h	SMB_ALARM_ADDR	R (/W)	ADDRESS [6:0]							R E S	-	-	

Software Functional Overview

Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
	96h to 97h	AMB_ALARM_DATA [0-1]	R (/W)	DATA								-	-	
	98h	SMB_CNRL	R/W	RES [7:1]							PRT	0x00	PRT =1: The SMBus address (A8-AE) protection is cancelled.	
Reserved	99h to 9Fh	Reserved	R/W	Don't care								-	-	

Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
Status	A0h *3	ADP_STS	R(/W)	RES [7:1]							CON	-	-	CON = 1: AC adapter is connected
	A1h *3	BAT1_STS (1st Battery)	R(/W)										BTP =1: Battery trip point is detected.	
	A2h *3	BAT2_STS (2nd Battery)	R(/W)	BTP	EMP	LOW	WAR	ERR	DCHG	CHG	CON		EMP =1: Battery is empty. LOW =1: Low battery state. WAR =1: Battery is Warning state. ERR =1: Battery is Error state. DCHG =1: Battery is discharged. CHG =1: Battery is charged. CON =1: Battery is connected.	
	A3h *3	Reserved	R/W	Don't care								-	-	
	A4h *3	BAT1_CAP	R(/W)	BCAP								-	-	0x00-0x64 = 0-100(%)

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Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
	A5h *3	BAT2_CAP	R(W)	BCAP								-	-	0x7F = Unknown 0x80 = Not installed
	A6h *3	Reserved	R/W	Don't care								-	-	
	A7h	SMB_Alert_ADDR	R/W	ADDRESS[6:0]							R E S	-	0x00	SMBAlert output device address The alert response function is available when this register is cleared (0x00) only. When the several devices assert the alert signal at the same time, the least address is stored to this register. And when this register is cleared, next alert address is stored to this register.
	A8h *5	GPIO-A_EVT_STS	R/W	STS_A [7:0]								Read 0:No event 1:EVT detection Write 0:Clear event 1:Ignore	0x00	To clear the notified event flag without unexpected event loss, clear the corresponding bit flag only. For this operation, this register has special writing manner as follows. STS_X B (STS_X) AND (Written data)
	A9h *5	GPIO-B_EVT_STS	R/W	0	STS_B [6:0]								0x00	
	AAh *5	GPIO-C_EVT_STS	R/W	0	0	0	0	0	0	0	STS_C [1:0]		0x00	
	ABh *5	RUN_EVT_STS	R/W	B T P	S M B	A L R T	G R I S	R E S T	B A D	B A D	A D D		Read 0:No event 1:EVT detection	

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

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

Software Functional Overview

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

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Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
	C2h	EVT_CON	R/W	RES [7:6]	WAKE	SCI	RES	WAKE	Q	WAKE	WAKE	0x00	<p>=0: Wake# output is "Level".</p> <p>=1: Wake# output is "Pulse".</p> <p>=0: SCI is always output by event detection and SCI_EVT shows the query data is stored. And next SCI is not output until SCI_EVT is cleared.</p> <p>=1: SCI is output when the</p> <p>WAKE SCI command set is not executed and OBF=0.</p> <p>SCI_EVT shows the output SCI is for event notification.</p> <p>=0: Runtime event status is reflected to RUN_EVT_STS</p> <p>WAKE_OUT register.</p> <p>=1: Runtime event status is</p>	
3-30												FIC MD02 Service Manual	<p>reflected to SUS_X Query data.</p>	

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

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Function	Address	Register Name	R/W	Bit Number								Logic	Default	Description
				7	6	5	4	3	2	1	0			
	D2h	BAT_DC H_ CONT	R/W	RES[7:2]								DD CC: Not HH discharge GG1: Discharge 21	-	The discharge battery can be selected one of the batteries can be discharged.
	D3h	BAT_WA R_ ABS	R/W	DATA[15:0] *1								-	0x00 00	Absolute capacity battery Warning detection point 0x0000-0xffff (mWh)
	D5h	BAT_LO W_ ABS	R/W	DATA[15:0] *1								-	0x00 00	Absolute capacity battery Low detection point 0x0000-0xffff (mWh)
	D7h	BAT_WA R_ REL	R/W	DATA [7:0]								-	0x10	Relative capacity battery Warning detection point 00-C8h (0-100% step 0.5%)
	D8h	BAT_LO W_ REL	R/W	DATA [7:0]								-	0x06	Relative capacity battery Low detection point 00-C8h (0-100% step 0.5%)
	D9h *3	FULL_D ATA	R/W	DATA [7:0]								-	0xbe	Full charge cancel point 00-C8h (0-100% step 0.5%)
	Dah	CC_CUR _ DATA	R	DATA [7:0]								-	0x00	Battery charging current setting 0x01-0xff (0.02-5.10A step 0.02A) 0x00 Depends on the battery This register is "read only", to change the value, use the register in PMU registers area.

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

Software Functional Overview

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

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

3.6.3 Security

The user may enter up to 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, while the User Password may not access the floppy disk when it is protected by Supervisor Password. 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 for 3 times, then the system will halt..
- Entering CMOS Setup → The system will prompt the user to enter the password before entering the CMOS Setup. If the user keys in the wrong password for 3 times, then the system will halt.

3.7 CMOS Setup Utility

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

3.8 Definitions of Terms

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

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

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

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

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

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

DMI - Desktop Management Interface, an API to enable software to collect information

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about a computer environment about a computer environment. For example, using DMI a program can determine what hardware and expansion boards are installed on a computer.

GPI - General Purpose Input.

GPO - General Purpose Output.

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

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

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

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

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

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

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

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

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

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