

# **Notebook PC Service Manual**

**Model : PH6PG72**

## **Chapter 1** **General System Description**

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## 1. Hardware Specifications

Prepared by:		Approved by:	Date of Issue: Date of Revise:
Released to:			Version:1.0
CPU	Intel Raptor Lake-H	*DC/ QC ⊕ Intel® Turbo Boost Technology ⊕ CPU BGA package 50mmx25mmx1.185mm ⊕ TDP:45W ⊕ PCIe: Two PCIex4*Gen 4 ⊕ USB3.2*4Ports+ USB2.0*10ports&2 SATA ⊕ HDMI2.1&DP1.4 ⊕ DX12, Intel HD graphics	
GPU	NVIDIA GN21-X6	NVIDIA GN21-X6 4070 ⊕ Package, BGA, 40X40mm ⊕ Max TDP support 95W ⊕ 8GB(256Mx32x8pcs) GDDR6	
Memory	DDR5	Support for <b>DDR5</b> memories ⊕ Speed: 4800 MHz ⊕ TWO memory socket ⊕ System DDR5 up to 64GB total	
<b>Display Specification</b>			
LCD		⊕ 16" 16:10 ⊕ WUXGA 1920x1200,165H, sRGB100%, ⊕ WQXGA 2560x1600, 90Hz, sRGB100% ⊕ Panel thickness : 2.6 mm/3.0mm Max	
<b>BIOS Specification</b>			
KBC	IT5571E-128/BX	⊕ ESPI interface ⊕ KB, FAN control and Power management (APC control) ⊕ Non-Sharing System BIOS ROM for KB & EC Codes	
BIOS	AMI BIOS	⊕ *UEFI BIOS support (menu selection) ⊕ *ACPI 5.0 compliant ⊕ *Support external USB flash memory card boot up ⊕ RPMC ROM	
<b>Audio Specification</b>			

Audio Codec	Codec: Realtek ALC256	⊕ Azalia standard support ⊕ D3 mode support
Speaker/MIC		⊕ *Build-in two speakers ⊕ *Speaker: 2W/each ⊕ *Digital Microphone support
<b>Input Specification</b>		
Keyboard	Membrane KB	⊕ Membrane KB ⊕ 351.1*107*3.25mm ⊕ backlight = Single color/ White Lighting
Pointing Device	Follow AVL	⊕ Outline/PCB: 135x 86mm +/- 0.1mm (Glass) ⊕ Enable/Disable area :10mm x 10mm ⊕ Palm Rejection: Support
<b>Wireless Specification</b>		
WLAN + BT	Follow AVL	⊕ M.2 2230 w/ CNVI interface(Intel WIFI6 AX201) ⊕ IEEE802.11 a/b/g/n/ac/ax support
<b>Storage Specification</b>		
SSD	*2 Slots (NVMe) & *1 Slots (NVMe) for 99wh Battery *M.2 2280, Slot 1: NVMe/PCIEX4/(Gen4 support ) Slot 2: NVMe/PCIEX4/(Gen4 support ) *RAID 0/1 support	
Card reader	RTS5176E	⊕ USB Interface ⊕ UHS-I speed ⊕ Connector: Full SD size ⊕ Support SD/SDHC/SDXC card
<b>Webcam Specification</b>		
Webcam	HD webcam with D-MICx1 FHD+IR+TNR webcam with D-MICx2 (option) USB interface	
<b>Power Specification</b>		
Battery Pack	Li-polymer Battery, SW Gas Gauge IC, soft pack 4cells (4s1p 4100mAh) 62.32Wh 4cells (4s1p 5168 mAh)80wh	
AC-Adapter	⊕ Automatics Voltage adjustment between 100 and 240VAC 50/60Hz, ⊕ 20V 150W, 3 Pins (Slim Type) ⊕ 20V 180W, 3 Pins (Slim Type) (option)	

Type Adapter	<ul style="list-style-type: none"> <li>⊕ Automatics Voltage adjustment between 100 and 240VAC 50/60Hz</li> <li>⊕ 40Watts-100Watts /20V and 2A-5A</li> </ul>	
LED		
LED Indicator	Power indicator	<ul style="list-style-type: none"> <li>⊕ Power ON: White</li> <li>⊕ Suspend: White breath</li> <li>⊕ Power Off: OFF</li> </ul>
	Caps Lock	ON ( White )
	Charging & Battery indicator	<ul style="list-style-type: none"> <li>⊕ Charging (Power ON): Amber Breath</li> <li>⊕ Charging (Power Off): Amber Breath</li> <li>⊕ Battery Low (&lt;6%): Amber Blink</li> <li>⊕ Charging finish (w/AC ): OFF, (w/o AC): Off</li> </ul>
	TP indicator	<ul style="list-style-type: none"> <li>⊕ TP enable : OFF</li> <li>⊕ TP disable: White</li> </ul>
	KB backlight	<ul style="list-style-type: none"> <li>⊕ Default: White Lighting</li> <li>⊕ Power ON: ON (Welcome lighting, Optional by SW)</li> <li>⊕ Suspend: OFF</li> <li>⊕ Power off: OFF</li> </ul>
<b>Option Specification</b>		
SSD	*RAID 0/1 Support	
<b>OS Support</b>		
OS version	Support WIN11 Pro	

.....The content is subjected to change without notice.....

## 2. Software Specifications

### 2.1. Preface

The software engineering specification is a deployment from product marketing specification. It should outline major tasks to be implemented in a specific model. For any model which has been defined from product marketing division, there should have a product marketing specification comes out.

The purpose of this specification is to be an implementation guideline for engineers who are responsible for the model. It intends to avoid ambiguity about function definitions so as to allow engineers to shorten their implementation period.

The specification covers all the bundled software components which including UEFI BIOS, EC and applications. The target OS will be Windows 11 x64. The device drivers and applications are options based on per-customer's requirements.

The readers of this specification are assumed to have enough experiences and knowledge to understand whatever in the context. The specification will not intend to explain any detail of specific topic.

### 2.2. Power Management

#### 2.2.1 General Requirement

The purpose of the Power Management (PM) is trying to reduce the power consumption of the system and extent the battery life, increase the time without recharging the battery. The Advanced Configuration and Power Interface (ACPI) specification is the latest and better PM method and will replace the traditional APM and PNP functions. ACPI is a kind of Operating System Directed Power Management (OSPM), that is, the OS will control the system/devices to enter proper power -saving mode and determine when to do it.

The BIOS shall provide the ACPI table that is written by ASL language, to tell the OS how to setup and control the system/device configuration and the power-saving mode. So the system H/W, BIOS and drivers must be meet the ACPI specification:

- ✧ ACPI 6.0 compliant
- ✧ Supporting processor power state C0, C1, C1E, C3, C6, C7, C8, C9 and C10
- ✧ Supporting system state S0, S0i3, S4, S5
- ✧ Support Power Management Function

First of all, the next section will depict the power management state transition, then describe the definition for each system state.

## 2.2.2 Power Management Mode Definitions

Each system (or model) may have different PM model and state definition. For clear, see the following table:

PM Mode	Definitions
Full-On	The CPU runs in full speed and all the devices are power on. The system can respond to all applications with maximum performance. <ol style="list-style-type: none"> <li>1. The system is in the state S0.</li> <li>2. The CPU is in the state C0.</li> <li>3. All the devices are in the state D0.</li> </ol>
Idle	This mode is similar to Full-On. The CPU might change into C1 ~ C10 state depend on the OS, in order to save CPU power consumption. <ol style="list-style-type: none"> <li>1. The system is in the state S0.</li> <li>2. The CPU is in the state C1 ~ C10. (The state is switched by OS driver)</li> <li>3. Some devices may enter the low-power state (the Dx mode).</li> </ol>
Suspend	The state is more power saving than above, the CPU and most of parts power will be cut off except the DRAM. <ol style="list-style-type: none"> <li>1. The system is in the S0i3 state.</li> <li>2. The CPU is power off and all device stop clock except DRAM system.</li> </ol>
SOFF/STD	The state is the most power saving mode, all of the parts in the system will power off, except the Embedded Controller enter to idle mode continuously to control the battery charging and monitor power button. Note: Before enter to S4, the OS will save all of data or registers in disk. <ol style="list-style-type: none"> <li>1. The system is in the S4 or S5 state.</li> <li>2. The CPU and all of devices are power off.</li> </ol>
Silent	This modes has the lower CPU speed and lower fan noise.

## 2.2.3 System Overview

### 2.2.3.1 Memory

The System consists of DDR5 4800MHz memory and maximum size support up to 64GB total.

The BIOS will automatically detect the amount of memory during POST.

### 2.2.3.2 CPU

The Raptor Lake-P/Raptor Lake-H processor. Full support of ACPI C-states as implemented by the following processor C-states:C0,C1,C1E,C3,C6,C7,C8,C9 and C10.

### 2.2.3.3 Graphic Processing Unit

The System display on the internal panel through the IGD.

When the POST, system only display on the Local Flat Panel (LFP). The design principles is BIOS default use Panel EDID, and BIOS propose the panel EDID should not be modified. Once the EDID need to be changed

to solve some problem of display, HW and PT team must make sure the final solution can cover other LCDs. For the compatibility, UEFI BIOS has responsibility to package the VBIOS/UEFI GOP driver.

#### **2.2.3.4 Audio**

The audio controller is integrated in south bridge which through the Nahimic data line to connect to external CODEC. The BIOS take responsibilities for programing the Verb Table when Nahimic device get initializing, and the Stereo will be chosen as a default. The PCI legacy audio mode is not to be supported.

#### **2.2.3.5 Card Reader**

USB interface. Realtek RTS5176E. BIOS will program the ACPI \_PLD and \_UPC to match the USB port configuration and location of card reader.

#### **2.2.3.6 LAN Controller**

N/A.

#### **2.2.3.7 WLAN**

M.2 2230 w/CNVI interface.

#### **2.2.3.8 Storage**

The system contain the NVMe SSD, the storage capacity in BIOS Setup page shown is based on NVMe SSD reflected.

#### **2.2.3.9 Webcam**

USB interface. BIOS will program the ACPI \_PLD and \_UPC to match the USB port configuration and location of Webcam.

#### **2.2.3.10 Pointing Device**

The system use Click-pad, BIOS need to program the correct HID overI2C table in ACPI region to support Windows standard inbox driver.

### **2.2.4 Manage Power Function**

The purpose of Power Management is to save the power consumption during the system is not busy. This function not only save the power of Battery to extend the Notebook's battery working time, but also reduce the temperature of CPU / Chip and keep system working in a lower temperature to extend the CPU and whole system's life. Also reduce temperature will also keep Operation System work stable.

Once enable the system Silent mode, the status will keep in Silent mode when system resume from S3 and S4. The system will disable Silent mode automatically when system do the warm-boot or cold-boot.

### 2.2.5 CPU Fan Control

In the system use the fan as the active cooling device. It is not necessary always turn on full speed, so following will depict the method and specification of fan speed control. Before it we would like to define the fan speed.

Because fan will consume some power and make some noise, the system will try to keep the fan in low speed and keep the system in high performance as possible. Unfortunately, there are some trade-off among some factors: thermal, noise and CPU performance, so we increase the fan speed as active cooling method and decrease the CPU clock speed as passive cooling method. The CPU clock and fan speed is controlled depend on the CPU temperature from Power Management function architecture.

### 2.2.6 The backlight control of LCD

The LCD panel is another key parts that will consume more power of the notebook system, so there is a way to reduce the power consumption on battery only, i.e. reduce the brightness of backlight when end-user unplug the AC adaptor.

The backlight is controlled through the SOC, and it is divided into several levels from darkest to brightest. The VGA driver knows the status of power source and the current backlight's brightness any time. In addition, BIOS will take care about the system does not lost all backlight when backlight level is set to 0. When the AC adaptor plug/unplug, the VGA driver will base on the brightness settings which is defined in Windows Power Options to adjust the brightness level automatically.

There is another approach to control the backlight, it will be turn off when LCD cover is closed (LID switch), conversely, it will be turn on when LCD cover is opened and system does not in the S4/S5 mode.

## 2.3. BIOS Setup

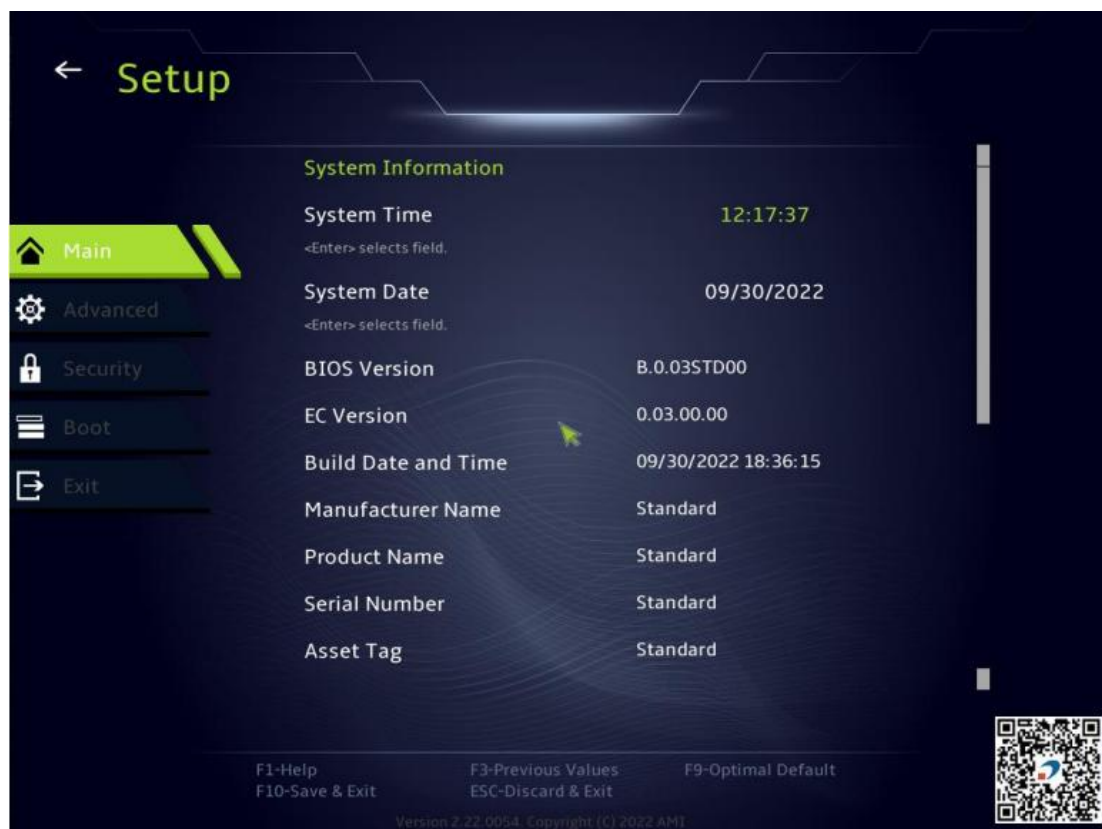
The BIOS Setup program is a GUI interface for users/customers to change features/options that control how the system functions. There are expandable/collapsible categories displayed on the left side of the screen. The currently selected option is displayed on the right-top of the screen with useful customer information. There are the operation key descriptions on the right-bottom of the screen.

BIOS Setup is entered by pressing F2/Del during boot or selected through the F7 Boot Menu. After a user/customer changes an option, when the "Save Changes and Reset" option have executed (or F9 function key pressed), the settings changed are immediately saved in NVRAM and system will do the reboot. Defaults can be set via the "Restore Defaults" option or via the F10 key sequence. If a user enter into BIOS Setup and escapes, the system will pop up the confirm message about save settings before exited.

### 2.3.1 Info Menu



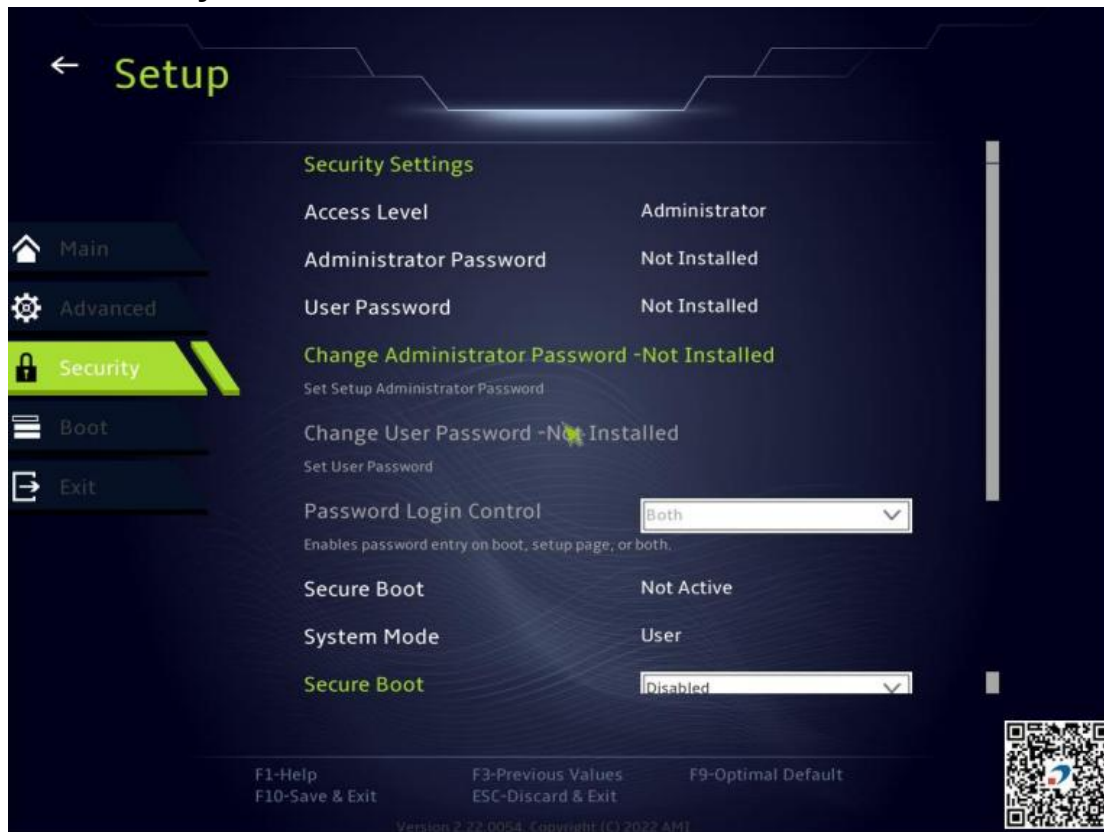
### 2.3.2 Main Menu



### 2.3.3 Advanced Menu



### 2.3.4 Security Menu



### 2.3.5 Boot Menu



### 2.3.6 EXIT & SAVE Changes

