# Specific Specifi



# **Record of Revision**

Version	Date	Page Description		Remark
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# **Order Information**

Part Number	Description
SPC-5000-8665U	SPC-5000, onboard Intel <sup>®</sup> Core™ i7-8665UE, 2 GigE LAN, 1 SSD, 4 USB 3.0 Gen2, 2 COM, 1 SIM
SPC-5000-8365U	SPC-5000, onboard Intel <sup>®</sup> Core™ i5-8365UE, 2 GigE LAN, 1 SSD, 4 USB 3.0 Gen2, 2 COM, 1 SIM
SPC-5000-8145U	SPC-5000, onboard Intel <sup>®</sup> Core™ i3-8145UE, 2 GigE LAN, 1 SSD, 4 USB 3.0 Gen2, 2 COM, 1 SIM
SPC-5000-4305U	SPC-5000, onboard Intel <sup>®</sup> Celeron <sup>®</sup> 4305UE, 4 GigE LAN, 1 SSD, 4 USB 3.0 Gen2, 2 COM, 1 SIM
SPC-5100-8665U	SPC-5100, onboard Intel <sup>®</sup> Core™ i7-8665UE, 2 GigE LAN, 1 SSD, 4 USB 3.0 Gen2, 2 COM, 1 SIM
SPC-5100-8365U	SPC-5100, onboard Intel <sup>®</sup> Core™ i5-8365UE, 2 GigE LAN, 1 SSD, 4 USB 3.0 Gen2, 2 COM, 1 SIM
SPC-5100-8145U	SPC-5100, onboard Intel <sup>®</sup> Core™ i3-8145UE, 2 GigE LAN, 1 SSD, 4 USB 3.0 Gen2, 2 COM, 1 SIM
SPC-5100-4305U	SPC-5100, onboard Intel <sup>®</sup> Celeron <sup>®</sup> 4305UE, 4 GigE LAN, 1 SSD, 4 USB 3.0 Gen2, 2 COM, 1 SIM
SPC-5200-8665U	SPC-5200, onboard Intel <sup>®</sup> Core™ i7-8665UE, 4 GigE LAN, 1 SSD, 4 USB 3.0 Gen2, 4 COM, 1 SIM, 2 PoE LAN, 16 Isolated DIO
SPC-5200-8365U	SPC-5200, onboard Intel <sup>®</sup> Core™ i5-8365UE, 4 GigE LAN, 1 SSD, 4 USB 3.0 Gen2, 4 COM, 1 SIM, 2 PoE LAN, 16 Isolated DIO
SPC-5200-8145U	SPC-5200, onboard Intel <sup>®</sup> Core™ i3-8145UE, 4 GigE LAN, 1 SSD, 4 USB 3.0 Gen2, 4 COM, 1 SIM, 2 PoE LAN, 16 Isolated DIO
SPC-5200-4305U	SPC-5200, onboard Intel <sup>®</sup> Celeron <sup>®</sup> 4305UE, 4 GigE LAN, 1 SSD, 4 USB 3.0 Gen2, 4 COM, 1 SIM, 2 PoE LAN, 16 Isolated DIO

# **Optional Accessories**

Part Number	Description			
DDR4 32G	Certified DDR4 32GB 2666MHz RAM			
DDR4 16G	Certified DDR4 16GB 2666/2400/2133 MHz RAM			
DDR4 8G	Certified DDR4 8GB 2666/2400/2133 MHz RAM			
DDR4 4G	Certified DDR4 4GB 2666/2400/2133 MHz RAM			
PWA-120W	120W, 24V, 90V AC to 264V AC Power Adapter with 3-pin Terminal Block			
PWA-160W-WT	160W, 24V, 85V AC to 264V AC Power Adaptor with 3-pin Terminal Block, Wide Temperature -30°C to +70°C			
TMK2-20P-100	Terminal Block 20-pin to Terminal Block 20-pin Cable, 100cm			
TMK2-20P-500	Terminal Block 20-pin to Terminal Block 20-pin Cable, 500cm			
TMB-TMBK-20P Terminal Board with One 20-pin Terminal Block Connector ar DIN-Rail Mounting				
VESA Mount	VESA Mounting Kit for SPC-5200			
DIN-RAIL	DIN Rail and VESA Mounting Kit for SPC-5200			
DIN-RAIL	DIN Rail Kit for SPC-5000/5100			
4G Module	Mini PCIe 4G/GPS Module with Antenna			
WiFi & Bluetooth Module	Intel <sup>®</sup> Mini PCIe WiFi & Bluetooth Module with Antenna			

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# **GENERAL INTRODUCTION**

## **1.1 Overview**

SPC-5000 is a series of rugged Ultra-compact Fanless Embedded Box PC. Powered by Quad-core 8th generation Intel<sup>®</sup> Core<sup>™</sup> i7/i5/i3 U-series processor (Whiskey Lake), dual channel DDR4 2133MHz up to 32GB memory; Advanced Intel<sup>®</sup> HD Graphics 620 graphics engine supports DirectX 12 and OpenGL 4.5 API, DVI-D and DisplayPort dual display serving up to ultra HD 4K resolution; Multiple USB 3.1 Gen 2 (10G), Gen 3 PCIe (8GT/s), SATA III (6Gbps), USB 3.0 (5Gbps), GigE (1Gbps) LAN and flexible 5G/WiFi/4G/3G/LTE/GPRS/UMTS wireless connections make high-speed data conveying possible. Vecow SPC-5000 Series Ultra-compact Fanless Embedded System delivers you more than 40% power productivity greater than former 7th Generation Intel<sup>®</sup> Kaby Lake U-series SoC processor with only 15W CPU power consumption.

Featuring 4 Independent GigE LAN with 2 PoE (Power over Ethernet), iAMT 12.0 supported, 2 COM RS-232/422/485, 4 external USB 3.1 Gen 2 support up to 10Gbps data transfer, 2 Mini PCIe sockets for PCIe/USB/SIM socket/ Optional mSATA expansion, 1 SIM card socket for WiFi/4G/3G/LTE/GPRS/ UMTS, 1 SATA III, 9V to 48V wide range power input, ignition power control, fanless -40°C to 85°C operating temperature, smart manageability features, SPC-5000 is your smart and compact embedded engine. Optional SUMIT A, B connection supports flexible expansion feature enabling 10GigE LAN/10G SFP+/5G networks/SIM socket/PoE LAN/GigE LAN/1G Fiber/Video capture functions possible. Vecow SPC-5000 Series Ultra-compact Fanless Embedded System integrates outstanding power productivity, smart manageability, mobile availability, leading power protection, versatile expandability, industrial-grade reliability and all-in-one compact solution for low-profile performance driven embedded applications.

Vecow SPC-5000 Series Ultra-compact Fanless Embedded System delivers outstanding performance, compact integrated functions, smart manageability, mobile availability, trusted reliability and flexible expansion features for your Machine Vision, In-Vehicle Computing, Factory Automation, Intelligent Control and any performance driven compact Industry 4.0 and AloT applications.

## **1.2 Features**

- 8th Generation Intel<sup>®</sup> Core<sup>™</sup> i7/i5/i3 U-series processor (Whiskey Lake)
- DDR4 2133MHz memory, up to 32GB
- Fanless, -40°C to 85°C Operating Temperature
- · Compact size, matches 1U one rack unit of height
- DisplayPort and DVI-D dual display supports up to 4K display
- 2 Independent GigE LAN, iAMT 12.0 supported (SPC-5000/5100)
- 4 Independent GigE LAN with 2 PoE (Power over Ethernet), iAMT 12.0 supported (SPC-5200)
- 4-port USB 3.1 Gen 2 supports up to 10Gbps data transfer
- SIM Socket for WiFi/4G/3G/LTE/GPRS/UMTS
- 2 COM RS-232/422/485 (SPC-5000/5100)
- 4 COM RS-232/422/485, 16 Isolated DIO (SPC-5200)
- 9V to 48V wide range DC Power Input
- Ignition Power Control, TPM 2.0
- Expansion : SATA III, mSATA and Mini PCIe
- Optional supports Full function SUMIT A, B expansion for multiple 10GigE LAN, 10GigE SFP+, 5G Network, SIM Socket, PoE LAN, Serial Port, GigE LAN, GigE Fiber LAN, or Video Capture (SPC-5000/5100)
- · Easy to customize for low-profile system applications
- One-stop SUMIT Expansion Design and Manufacturing Services (SPC-5000/5100)

# **1.3 Product Specification**

## 1.3.1 Specifications of SPC-5000

System					
Processor	Quad Core Intel <sup>®</sup> Core™ i7/i5/i3 U-series Processor (Whiskey Lake)				
Chipset	Intel <sup>®</sup> SoC (Cannon Lake)				
BIOS	AMI				
SIO	IT8786E				
Memory	1 DDR4 2400MHz SO-DIMM, up to 32GB				
Graphics					
Graphics Processor	Intel <sup>®</sup> UHD Graphics 620				
Interface	<ul> <li>DVI-D : Up to 1920 x 1200 @60Hz</li> <li>DisplayPort : Up to 4096 x 2304 @60Hz</li> </ul>				
Ethernet					
LAN1	Intel <sup>®</sup> I219LM GigE LAN supports iAMT 12.0				
LAN2	Intel <sup>®</sup> I210 GigE LAN				
Audio					
Audio Codec	Realtek ALC888S-VD, 7.1 Channel HD Audio				
Audio Interface	1 Mic-in, 1 Line-out				
Storage					
SATA	1 SATA III (6Gbps)				
mSATA	1 SATA III (Mini PCIe Type, 6Gbps)				
Storage Device	1 2.5" SSD/HDD Bracket (Internal)				
I/O Interface					
Serial	2 COM RS-232/422/485 (ESD 8KV)				
USB	4 USB 3.1 Gen 2 (External)				
LED	Power, HDD				
SIM Card 1 SIM Card Socket (Internal)					
Expansion					
Mini PCle	<ul> <li>2 Mini PCIe Socket :</li> <li>1 Full-Size for PCIe/USB/Internal SIM Card</li> <li>1 Full-size for PCIe/USB/Optional mSATA</li> </ul>				
SUMIT A, B	<ul> <li>1 SUMIT Connector A (Internal, optional)</li> <li>1 SUMIT Connector B (Internal, optional)</li> </ul>				

Power					
Power Input	9V to 48V DC-in				
Power Interface	3-pin Terminal Block : V+, V-, Frame Ground				
Ignition Control	16 Mode (Internal)				
Remote Switch	3-pin Terminal Block : On, Off, IGN				
Others					
ТРМ	Optional Infineon SLB9665 supports TPM 2.0, LPC Interface				
Watchdog Timer	Reset : 1 to 255 sec./min. per step				
Smart Management	Wake on LAN, PXE supported				
HW Monitor Monitoring temperature, voltages. Auto throttling control CPU overheats.					
Software Support					
Microsoft	Windows 10				
Linux	Fedora 19, Ubuntu 10.04 LTS, or Linux Kernel 3.0 above				
Mechanical					
Dimension	150.4mm x 106.2mm x 44.0mm (5.92" x 4.18" x 1.73")				
Weight	0.9 kg (1.98 lb)				
Mounting	<ul><li>Wallmount by mounting bracket</li><li>DIN Rail Mount (Optional)</li></ul>				
Environment					
Operating Temperature	-40°C to 70°C (-40°F to 158°F)				
Storage Temperature	-40°C to 85°C (-40°F to 185°F)				
Humidity	5% to 95% Humidity, non-condensing				
Relative Humidity	95% at 70°C				
<ul> <li>Shock</li> <li>IEC 60068-2-27</li> <li>SSD : 50G @wallmount, Half-sine, 11ms</li> </ul>					
Vibration	<ul><li>IEC 60068-2-64</li><li>SSD : 5Grms, 5Hz to 500Hz, 3 Axis</li></ul>				
EMC	CE, FCC, EN50155, EN50121-3-2				

## 1.3.2 Specifications of SPC-5100

System					
Processor	Quad Core Intel <sup>®</sup> Core™ i7/i5/i3 U-series Processor (Whiskey Lake)				
Chipset	Intel <sup>®</sup> SoC (Cannon Lake)				
BIOS	AMI				
SIO	IT8786E				
Memory	1 DDR4 2400MHz SO-DIMM, up to 32GB				
Graphics					
Graphics Processor	Intel <sup>®</sup> UHD Graphics 620				
Interface	<ul> <li>DVI-D : Up to 1920 x 1200 @60Hz</li> <li>DisplayPort : Up to 4096 x 2304 @60Hz</li> </ul>				
Ethernet					
LAN1	Intel <sup>®</sup> I219LM GigE LAN supports iAMT 12.0				
LAN2	Intel <sup>®</sup> I210 GigE LAN				
Audio					
Audio Codec	Realtek ALC888S-VD, 7.1 Channel HD Audio				
Audio Interface	1 Mic-in, 1 Line-out				
Storage					
SATA	1 SATA III (6Gbps)				
mSATA	1 SATA III (Mini PCIe Type, 6Gbps)				
Storage Device 1 2.5" SSD/HDD Bracket (Internal)					
I/O Interface					
Serial	2 COM RS-232/422/485 (ESD 8KV)				
USB	4 USB 3.1 Gen 2 (External)				
LED Power, HDD					
SIM Card	IM Card Socket (Internal)				
Expansion					
Mini PCle	<ul><li>2 Mini PCIe Socket :</li><li>1 Full-Size for PCIe/USB/Internal SIM Card</li><li>1 Full-size for PCIe/USB/Optional mSATA</li></ul>				
SUMIT A, B	<ul> <li>1 SUMIT Connector A (Internal, optional)</li> <li>1 SUMIT Connector B (Internal, optional)</li> </ul>				
Power					
Power Input	9V to 48V DC-in				
Power Interface	3-pin Terminal Block : V+, V-, Frame Ground				
Ignition Control	16 Mode (Internal)				
Remote Switch 3-pin Terminal Block : On, Off, IGN					

Others					
ТРМ	PM Optional Infineon SLB9665 supports TPM 2.0, LPC Interfac				
Watchdog Timer Reset : 1 to 255 sec./min. per step					
Smart Management	Wake on LAN, PXE supported				
HW Monitor	Monitoring temperature, voltages. Auto throttling control when CPU overheats.				
Software Support					
Microsoft	Windows 10				
Linux	Fedora 19, Ubuntu 10.04 LTS, or Linux Kernel 3.0 above				
Mechanical					
Dimension	150.4mm x 106.2mm x 62.1mm (5.92" x 4.18" x 2.44")				
Weight	1.3 kg (2.87 lb)				
Mounting• Wallmount by mounting bracket• DIN Rail Mount (Optional)					
Environment					
Operating Temperature	-40°C to 85°C (-40°F to 185°F)				
Storage Temperature	-40°C to 85°C (-40°F to 185°F)				
Humidity 5% to 95% Humidity, non-condensing					
Relative Humidity	95% at 85°C				
Shock	<ul> <li>IEC 60068-2-27</li> <li>SSD : 50G @wallmount, Half-sine, 11ms</li> </ul>				
Vibration	<ul><li>IEC 60068-2-64</li><li>SSD : 5Grms, 5Hz to 500Hz, 3 Axis</li></ul>				
EMC	CE, FCC, EN50155, EN50121-3-2				

## 1.3.3 Specifications of SPC-5200

System					
Processor	Quad Core Intel <sup>®</sup> Core™ i7/i5/i3 U-series Processor (Whiskey Lake)				
Chipset	Intel <sup>®</sup> SoC (Cannon Lake)				
BIOS	AMI				
SIO	IT8786E				
Memory	1 DDR4 2400MHz SO-DIMM, up to 32GB				
Graphics					
Graphics Processor	Intel <sup>®</sup> UHD Graphics 620				
Interface	<ul> <li>DVI-D : Up to 1920 x 1200 @60Hz</li> <li>DisplayPort : Up to 4096 x 2304 @60Hz</li> </ul>				
Ethernet					
LAN1	Intel <sup>®</sup> I219LM GigE LAN supports iAMT 12.0				
LAN2	Intel <sup>®</sup> I210 GigE LAN				
PoE					
LAN3	GigE IEEE 802.3af Class 3 PoE by Intel <sup>®</sup> I210				
LAN4	GigE IEEE 802.3af Class 3 PoE by Intel <sup>®</sup> I210				
Audio					
Audio Codec	Realtek ALC888S-VD, 7.1 Channel HD Audio				
Audio Interface	1 Mic-in, 1 Line-out				
Storage					
SATA	1 SATA III (6Gbps)				
mSATA	1 SATA III (Mini PCle Type, 6Gbps)				
Storage Device	1 2.5" SSD/HDD Bracket (Internal)				
I/O Interface					
Serial	4 COM RS-232/422/485 (ESD 8KV)				
USB	4 USB 3.1 Gen 2 (External)				
Isolated DIO	16 Isolated DIO : 8 DI, 8 DO				
LED	Power, HDD, PoE				
SIM Card	1 SIM Card Socket (Internal)				
Expansion					
Mini PCle	<ul> <li>2 Mini PCIe Socket :</li> <li>1 Full-Size for PCIe/USB/Internal SIM Card</li> <li>1 Full-size for PCIe/USB/Optional mSATA</li> </ul>				

Power				
Power Input	9V to 48V DC-in			
Power Interface	3-pin Terminal Block : V+, V-, Frame Ground			
Ignition Control	16 Mode (Internal)			
Remote Switch	3-pin Terminal Block : On, Off, IGN			
Others				
ТРМ	Optional Infineon SLB9665 supports TPM 2.0, LPC Interface			
Watchdog Timer	Reset : 1 to 255 sec./min. per step			
Smart Management	Wake on LAN, PXE supported			
HW Monitor	Monitoring temperature, voltages. Auto throttling control when CPU overheats.			
Software Support				
Microsoft	Windows 10			
Linux	Fedora 19, Ubuntu 10.04 LTS, or Linux Kernel 3.0 above			
Mechanical				
Dimension	227.4mm x 106.2mm x 44.0mm (8.95" x 4.18" x 1.73")			
Weight	1 kg (2.18 lb)			
<ul> <li>Wallmount by mounting bracket</li> <li>DIN Rail and VESA Mount (Optional)</li> <li>VESA Mount (Optional)</li> </ul>				
Environment				
Operating Temperature	-40°C to 70°C (-40°F to 158°F)			
Storage Temperature	-40°C to 85°C (-40°F to 185°F)			
Humidity	5% to 95% Humidity, non-condensing			
Relative Humidity	95% at 70°C			
Shock	<ul><li>IEC 60068-2-27</li><li>SSD : 50G @wallmount, Half-sine, 11ms</li></ul>			
Vibration	<ul><li>IEC 60068-2-64</li><li>SSD : 5Grms, 5Hz to 500Hz, 3 Axis</li></ul>			
EMC	CE, FCC, EN50155, EN50121-3-2			

# **1.4 Supported CPU List**

Processor No.	Cores	TDP	Cache	Max. Frequency	ECC Memory
Intel <sup>®</sup> Core™ i7-8665UE	4	15W	8M	Up to 4.4GHz	Ν
Intel <sup>®</sup> Core™ i5-8365UE	4	15W	6M	Up to 4.1GHz	N
Intel <sup>®</sup> Core™ i3-8145UE	2	15W	4M	Up to 3.9GHz	N
Intel <sup>®</sup> Celeron 4305UE	2	15W	2M	Up to 2.0GHz	N

# **1.5 Mechanical Dimension**

#### 1.5.1 SPC-5000 Mechanical Drawing



#### 1.5.2 SPC-5100 Mechanical Drawing



#### 1.5.3 SPC-5200 Mechanical Drawing





# **GETTING TO KNOW YOUR SPC-5000**

# 2.1 Packing List

### 2.1.1 SPC-5000 & SPC-5100 Packing List

Item	Description	Qty
1	SPC-5000/5100/Embedded System	1
2	<ul> <li>Wall-mounting bracket (SET)</li> <li>Terminal block plug pitch 5.0mm 3-pin</li> <li>Foot Pad</li> </ul>	1 2 4

Item	Description	Outlook	Usage	P/N	Qty
1	PHILLPIS M4x16L with washer, Ni	Standing	Mount	53-24D6416-30B	4
2	PHILLPIS M2.5x6L, Ni	8ª	Mini PCle slot	53-2426906-30B	2
3	PHILLPIS M3*6L	State of the second sec	Mount	53-2426206-80B	4
4	M3x4L	<b>8</b> 7	SSD/HDD	53-2470000-218	4

#### 2.1.2 SPC-5200 Packing List

Item	Description	Qty
1	SPC-5200 Embedded System	1
2	<ul> <li>Wall-mounting bracket (SET)</li> <li>Terminal block plug pitch 5.0mm 3-pin</li> <li>Foot Pad</li> </ul>	1 2 4

Item	Description	Outlook	Usage	P/N	Qty
1	PHILLPIS M4x16L with washer, Ni	Statement	Mount	53-24D6416-30B	4
2	PHILLPIS M2.5x6L, Ni	S	Mini PCle slot	53-2426906-30B	2
3	PHILLPIS M3*6L	Star Star	Mount	53-2426206-80B	4
4	M3x4L	87	SSD/HDD	53-2470000-218	4

# 2.2 Front Panel I/O & Functions

#### 2.2.1 SPC-5000/5100 Front I/O & Functions

In Vecow's SPC-5000/5100 series family, all I/O connectors are located on the front panel. Most of the general connections to the computer device, such as audio, USB3.1, DVI-D, LAN Jack, and DisplayPort, are placed on the front panel.

#### 2.2.1.1 Reset Tact Switch



It is a hardware reset switch. Use this switch to reset the system without power off the system. Press the Reset Switch for a few seconds, then reset will be enabled.

#### 2.2.1.2 Power Button



The power button is a non-latched switch. In case of system halts, you can press and hold the power button for 4 seconds to compulsorily shut down the system. Please note that a 4 seconds interval is kept by the system between two on/off operations (i.e. once turning off the system, you shall wait for 4 seconds to initiate another power-on operation).

#### 2.2.1.3 PWR and HDD LED Indicator



Yellow-HDD LED : A hard disk LED. If the LED is on, it indicates that the system's storage is functional. If it is off, it indicates that the system's storage is not functional. If it is flashing, it indicates data access activities are in progress.

Green-Power LED : If the LED is solid green, it indicates that the system is powered on.

LED Color	Indication	System Status
Yellow	HDD	<ul><li>On/Off : Storage status, function or not.</li><li>Twinkling : Data transferring.</li></ul>
Green	Power	System power status (on/off)

#### 2.2.1.4 DVI Connector



The DVI output mode supports up to 1920 x 1080 resolution. The DVI is automatically selected according to the display device connected. You will need a DVI-D cable when connecting to a display device.

#### 2.2.1.5 DisplayPort



DisplayPort connection supports up to 4096 x 2304 resolution at 60Hz.

#### 2.2.1.6 USB 3.1



There are 4 USB 3.1 connections available supporting up to 10GB per second data rate in the front side of SPC-5000/5100. It also compliant with the requirements of Super Speed (SS), high speed (HS), full speed (FS) and low speed (LS).

#### 2.2.1.7 Audio Jack



There are 2 audio connectors, Mic-in and Line-out, in the front side of SPC-5000/5100. Onboard Realtek ALC888S-VD audio codec supports 7.1 channel HD audio and fully complies with Intel<sup>®</sup> High Definition Audio (Azalia) specifications. To utilize the audio function in Windows platform, you need to install corresponding drivers for Realtek ALC888S-VD codec.

#### 2.2.1.8 10/100/1000 Mbps Ethernet Port



There are dual 8-pin RJ-45 jacks supporting 10/100/1000 Mbps Ethernet connections in the front side. LAN at right side is powered by Intel<sup>®</sup> i219 Ethernet Phy; LAN at left side is powered by Intel<sup>®</sup> I210 Ethernet engine. When both of LANs work in normal status, iAMT function is enabled. Using suitable RJ-45 cable, you can connect the system to a computer, or to any other devices with Ethernet connection, for example, a hub or a switch. Moreover, both of LANs support Wake on LAN and Pre-boot functions.

#### 2.2.1.9 Remote Power On/Off Switch and Ignition Control



It is a 3-pin power-on/power-off switch through Phoenix Contact terminal block. You could turn on or off the system power by using this contact. This terminal block supports dual function on soft power-on/power-off (instant off or delay four seconds), and suspend mode. Another function is provided ignition power control feature for in-vehicle applications. The built-in MCU monitors the ignition signal and turns on/off the system according to pre-defined on/off delay period.



#### 2.2.2 SPC-5200 Front I/O & Functions

In Vecow's SPC-5200 series family, all I/O connectors are located on the front panel. Most of the general connections to the computer device, such as audio, USB3.1, DVI-D, LAN Jack, and DisplayPort, are placed on the front panel.

#### 2.2.2.1 Reset Tact Switch



It is a hardware reset switch. Use this switch to reset the system without power off the system. Press the Reset Switch for a few seconds, then reset will be enabled.

#### 2.2.2.2 Power Button



The power button is a non-latched switch. In case of system halts, you can press and hold the power button for 4 seconds to compulsorily shut down the system. Please note that a 4 seconds interval is kept by the system between two on/off operations (i.e. once turning off the system, you shall wait for 4 seconds to initiate another power-on operation).

#### 2.2.2.3 PWR and HDD LED Indicator



Yellow-HDD LED : A hard disk LED. If the LED is on, it indicates that the system's storage is functional. If it is off, it indicates that the system's storage is not functional. If it is flashing, it indicates data access activities are in progress.

Green-Power LED : If the LED is solid green, it indicates that the system is powered on.

LED Color	Indication	System Status
Yellow	HDD	<ul><li>On/Off : Storage status, function or not.</li><li>Twinkling : Data transferring.</li></ul>
Green	Power	System power status (on/off)

#### 2.2.2.4 DVI Connector



The DVI output mode supports up to 1920 x 1080 resolution. The DVI is automatically selected according to the display device connected. You will need a DVI-D cable when connecting to a display device.

#### 2.2.2.5 DisplayPort



DisplayPort connection supports up to 4096 x 2304 resolution at 60Hz.

#### 2.2.2.6 USB 3.1



There are 4 USB 3.1 connections available supporting up to 10GB per second data rate in the front side of SPC-5200. It also compliant with the requirements of Super Speed (SS), high speed (HS), full speed (FS) and low speed (LS).

#### 2.2.2.7 Audio Jack



There are 2 audio connectors, Mic-in and Line-out, in the front side of SPC-5200. Onboard Realtek ALC888S-VD audio codec supports 7.1 channel HD audio and fully complies with Intel<sup>®</sup> High Definition Audio (Azalia) specifications. To utilize the audio function in Windows platform, you need to install corresponding drivers for Realtek ALC888S-VD codec.

#### 2.2.2.8 10/100/1000 Mbps Ethernet Port



There are dual 8-pin RJ-45 jacks supporting 10/100/1000 Mbps Ethernet connections in the front side. LAN at right side is powered by Intel<sup>®</sup> i219 Ethernet Phy; LAN at left side is powered by Intel<sup>®</sup> I210 Ethernet engine. When both of LANs work in normal status, iAMT function is enabled. Using suitable RJ-45 cable, you can connect the system to a computer, or to any other devices with Ethernet connection, for example, a hub or a switch. Moreover, both of LANs support Wake on LAN and Pre-boot functions.

#### 2.2.2.9 Remote Power On/Off Switch and Ignition Control



It is a 3-pin power-on/power-off switch through Phoenix Contact terminal block. You could turn on or off the system power by using this contact. This terminal block supports dual function on soft power-on/power-off (instant off or delay four seconds), and suspend mode. Another function is provided ignition power control feature for in-vehicle applications. The built-in MCU monitors the ignition signal and turns on/off the system according to pre-defined on/off delay period.





There is a 16-bit DIO (8-bit DI, 8-bit DO) connector in the rear side. Each DIO channel is equipped with a photocoupler for isolated protection. A power buffer device, TPD2007F, is integrated in 8-DO circuit for motors, solenoids, and lamp driver applications.

DIO 20 Solated 11 0 Solated 10 0 Solated 10			
Pin No.	Definition	Pin No.	Definition
1	INPUT 0	11	OUTPUT 0
2	INPUT 1	12	OUTPUT 1
3	INPUT 2	13	OUTPUT 2
4	INPUT 3	14	OUTPUT 3
5	INPUT 4	15	OUTPUT 4
6	INPUT 5	16	OUTPUT 5
7	INPUT 6	17	OUTPUT 6
8	INPUT 7	18	OUTPUT 7
9	DI_COM	19	DIO_GND
10	DIO_GND	20	External 6V to 36V DC Input

#### **GPI SINK Mode**

Isolated GPI input circuit in SINK mode (NPN) is illustrated as follow :



#### **GPI SOURCE Mode**

Digital GPI input signal circuit in SOURCE mode (PNP) is illustrated as follow :



#### **GPI SOURCE Mode**

Digital GPI input signal circuit in SOURCE mode (PNP) is illustrated as follow :



#### 2.2.2.11 PoE (Power over Ethernet)



There are 2 RJ45 connectors in the rear side of SPC-5200. It supports IEEE 802.3af Power over Ethernet (PoE) connection delivering up to 15.4W/54V per port (Total : 25W) and 1000BASE-T gigabit data signals over standard Ethernet Cat 5/Cat 6 cable.

Each PoE connection is powered by Intel<sup>®</sup> I210 Gigabit Ethernet controller and independent PCI express interface to connect with multi-core processor for network and data transmit optimization. Only when PoE port starts to supply power to power devices, the dedicated LED will be lightened.

POE LED	LED Color	POE Status
POE_LED1/POE_LED2	Green	POE ON

# 2.3 Rear Panel I/O & Functions

#### 2.3.1 SPC-5000/5100 Rear I/O & Functions

#### 2.3.1.1 Power Terminal Block



SPC-5000/5100 supports 9V to 48V DC power input.

	Pin No.	Definition
	1	V+
	2	V-
	3	Earth GND

#### 2.3.1.2 Serial Port COM



Serial port can be configured for RS-232, RS-422, or RS-485 with auto flow control communication. The default definition is RS-232, but if you want to change to RS-422 or RS-485, you can find the settings in BIOS.

	<b>BIOS Setting</b>	Function
	COM 1 COM 2	RS-232
96		RS-422 (5-wire)
<u><u>5°°°°1</u></u>		COM 1 COM 2
	001112	RS-485
		RS-485 w/z auto-flow control

Serial Port	Pin No.	RS-232	RS-422 (5-wire)	RS-422 (9-wire)	RS-485 (3-wire)
	1	DCD	TXD-	TXD-	DATA-
	2	RXD	TXD+	TXD+	DATA+
	3	TXD	RXD+	RXD+	
	4	DTR	RXD-	RXD-	
COM1	5	GND	GND	GND	GND
	6	DSR		RTS-	
	7	RTS		RTS+	
	8	CTS		CTS+	
	9	RI		CTS-	

#### 2.3.2 SPC-5200 Rear I/O & Functions

#### 2.3.2.1 Power Terminal Block



#### SPC-5200 supports 9V to 48V DC power input.



#### 2.3.2.2 Serial Port COM



BIOS Setting	Function	
	RS-232	
COM 1 COM 2 COM 3 COM 4	RS-422 (5-wire)	
	RS-422 (9-wire)	
	RS-485	
	RS-485 w/z auto-flow control	

# 2.4 Connector/Jumper Locations

#### 2.4.1 SPC-5000/5100/5200 Main Board Pin Header



#### 2.4.1.1 JPWBTN, JRESET, JSTATUS, JHDD : Miscellaneous Pin Header

These pin headers can be used as a backup for the following functions : hard drive, LED indicator, reset button, power LED indicator, and power on/off buttons, which already can be accessed by front panel and top panel. The pinouts of Miscellaneous port are listed in following table :



	Group	Pin No.	Description		
	JPWBTN	1	GND		
		2	FP_PWR_BTN_IN		
		1	GND		
	JRESEI	2	FP_RST_BTN_N		
		1	PWR_LED_N		
	JSTATUS	2 PWR_LED_P			
	JHDD	1	HDD_LED_N		
		2	HDD_LED_P		

#### 2.4.1.2 BAT : Battery

The EMBC-3000's real-time clock is powered by a lithium battery. It is equipped with Panasonic BR2032 190mAh lithium battery. It is recommended that you not replace the lithium battery on your own, but if the battery needs to be changed, please contact the Vecow RMA service team.



#### 2.4.1.3 CN9: Audio Connector



There are three audio connectors, mic-in, line-in, and line-out, in the top side of EMBC-3000. Onboard Realtek ALC888S-VD audio codec supports 7.1 channel HD audio and fully complies with Intel<sup>®</sup> High Definition Audio (Azalia) specifications.

To utilize the audio function in Windows platform, you need to install corresponding drivers for both Intel<sup>®</sup> Whiskey Lake-U chipset and Realtek ALC888S-VD codec. Please refer to Chapter 4 for more details of driver installation.

	Pin No.	Definition	Pin No.	Definition
10 5	1	A_z_MIC1-L	2	GND_A
	3	A_z_MIC1-R	4	GND_EARTH
	5	A_z_LINEO-R	6	A_z_LINEI-R
2⊲ 1	7	F_IO_SENSE	8	GND_EARTH
	9	A_z_LINEO-L	10	A_z_LINEI-L

The pinouts of Audio port are listed in the following table :



#### 2.4.1.4 JUSB1, JUSB2 : Internal USB 2.0 Connector

The EMBC-3000 main board provides maxima eight expansion USB ports. The USB interface supports 480Mbps transfer rate which comply with high speed USB specification Rev. 2.0.

The USB interface is accessed through one 10-pin JST 1.0mm connector. You will need an adapter cable if you use a standard USB connector. The adapter cable has a 10-pin connector on one end and a USB connector on the other.

JUSB1	Pin No.	Definition	Pin No.	Definition
	1	USB_VCC	2	USB_VCC
	3	USB_VCC	4	USB_D_4N
	5	USB_D_4P	6	USB_D_5N
	7	USB_D_5P	8	GND
	9	GND	10	GND

The pin assignments of JUSB1 and JUSB2 are listed in the following table :

JUSB2   10 1	Pin No.	Definition	Pin No.	Definition
	1	USB_VCC	2	USB_VCC
	3	USB_VCC	4	USB_D_6N
	5	USB_D_6P	6	USB_D_7N
	7	USB_D_7P	8	GND
	9	GND	10	GND

#### 2.4.1.5 CN4 : Mini PCIe, mSATA



Both mSATA and Mini PCIe share the same form factor and similar electrical pinout assignments on their connectors. There was no clear mechanism to distinguish if a mSATA drive or a Mini PCIe device is plugged into the socket until recently that SATA I/O issued an ECN change (ECN #045) to redefine pin43 on mSATA connector as "no connect" instead of "return current path" (or GND).

When an mSATA drive is inserted, its pin-43 is "no connect", and the respective pin on the socket is being pulled-up to logic 1. When a Mini PCIe device is inserted, its pin-43 forces the respective pin on the socket to ground, or logic 0.

FILLINO.	Signal Name	Pin No.	Signal Name
51	Reserved	52	+3.3Vaux
49	Reserved	50	GND
47	Reserved	48	+1.5V
45	Reserved	46	Reserved
43	SATA_PCIE_SEL	44	Reserved
41	+3.3Vaux	42	Reserved
39	+3.3Vaux	40	GND
37	GND	38	USB_D+
35	GND	36	USB_D-
33	PETp0	34	GND
31	PETn0	32	SMB_DATA
29	GND	30	SMB_CLK
27	GND	28	+1.5V
25	PERp0	26	GND
23	PERn0	24	+3.3Vaux
21	GND	22	PERST#
19	Reserved	20	reserved
17	Reserved	18	GND
	Mechan	ical Key	
15	GND	16	Reserved
13	REFCLK+	14	Reserved
11	REFCLK-	12	Reserved
9	GND	10	Reserved
7	CLKREQ#	8	Reserved
5	Reserved	6	1.5V
3	Reserved	4	GND
1	WAKE#	2	3.3Vaux

The pin assignments of CN4 are listed in the following table :

#### 2.4.1.6 CN3 : Mini PCIe, Micro-SIM



Note : The SIM card socket (CN2) do not support hot-plug. Please make sure to unplug the system power before inserting the SIM card.

The pin assignments of CN3 are listed in the following table :

Pin No.	Signal Name	Pin No.	Signal Name
51	Reserved	52	+3.3Vaux
49	Reserved	50	GND
47	Reserved	48	+1.5V
45	Reserved	46	Reserved
43	GND	44	Reserved
41	+3.3Vaux	42	Reserved
39	+3.3Vaux	40	GND
37	GND	38	USB_D+
35	GND	36	USB_D-
33	PETp0	34	GND
31	PETn0	32	SMB_DATA
29	GND	30	SMB_CLK
27	GND	28	+1.5V
25	PERp0	26	GND
23	PERn0	24	+3.3Vaux
21	GND	22	PERST#
19	Reserved	20	reserved
17	Reserved	18	GND
	Mechan	ical Key	
15	GND	16	UIM_VPP
13	REFCLK+	14	UIM_RESET
11	REFCLK-	12	UIM_CLK
9	GND	10	UIM_DATA
7	CLKREQ#	8	UIM_PWR
5	Reserved	6	1.5V
3	Reserved	4	GND
1	WAKE#	2	3.3Vaux
2.4.1.7 JCOM1, JCOM2, JCOM3, JCOM4 : Serial Port



Serial port 1 to 4 (JCOM 1 to 4) can be configured for RS-232, RS-422, or RS-485 with auto flow control communication. The default definition of COM 1 to 4 is RS-232, if you want to change to RS-422 or RS-485, you can find the setting in BIOS.

<b>-<sup>10</sup>000000001 </b>	BIOS Setting	Function
		RS-232
	COM 1 (JCOM1) COM 2 (JCOM2) COM 3 (JCOM3) COM 4 (JCOM4)	RS-422 (5-wire)
		RS-422 (9-wire)
		RS-485
		RS-485 w/z auto-flow control

The pin assignments are listed in the following table :

Serial Port	Pin No.	RS-232	RS-232 RS-422 (5-wire)		RS-485 (3-wire)	
	1	GND_EARTH	GND_EARTH	GND_EARTH	GND_EARTH	
	2	GND	GND	GND	GND	
	3	RI		CTS-	RI	
	4	DTR	RXD-	RXD-		
1, 2	5	CTS		CTS+		
3, 4	6	TXD	RXD+	RXD+		
	7	RTS		RTS+		
	8	RXD	TXD+	TXD+	DATA+	
	9	DSR		RTS-		
	10	DCD	TXD-	TXD-	DATA-	

#### 2.4.1.8 CN16: DVI-D Connector



The DVI-D connector on the front panel supports DVI display modes. The DVI output mode supports up to 1920 x 1080 resolutions.

## 2.4.1.9 CN14, CN15 : External USB 3.1 Connector



There are 4 USB 3.1 Gen2 connections available supporting up to 10GB per second data rate in the top side of EMBC-3000. They are also compliant with the requirements of SuperSpeed (SS), high speed (HS), full speed (FS) and low speed (LS).

## 2.4.1.10 CN13 : LAN1 + LAN2

There are two 8-pin RJ-45 jacks supporting 10/100/1000 Mbps Ethernet connections in the front side of EMBC-3000. LAN1 is powered by Intel<sup>®</sup> I219-LM Ethernet engine; LAN2 is powered by Intel<sup>®</sup> I210-IT Ethernet engine. When both LAN1 and LAN2 work in normal status, basic iAMT function is enabled.

Using suitable RJ-45 cable, you can connect EMBC-3000 system to a computer or to any other devices with Ethernet connection, for example, a hub or a switch. Moreover, both LAN1 and LAN2 supports Wake on LAN and Pre-boot functions. The pinouts of LAN1 and LAN2 are listed as follow :



Pin No.	10/100 Mbps	1000Mbps		
1	E_TX+	MDI0_P		
2	E_TX-	MDI0_N		
3	E_RX+	MDI1_P		
4		MDI2_P		
5		MDI2_N		
6	E_RX-	E_RX- MDI1_N		
7		MDI3_P		
8		MDI3_N		

Each LAN port is supported by standard RJ-45 connector with LED indicators to present Active/Link/Speed status of the connection.

The LED indicator on the right bottom corner lightens in solid green when the cable is properly connected to a 100Mbps Ethernet network; The LED indicator on the right bottom corner lightens in solid orange when the cable is properly connected to a 1000Mbps Ethernet network; The left LED will keep twinkling/off when Ethernet data packets are being transmitted/received.

LED Location	LED Color	10Mbps	100Mbps	1000Mbps
Right	Green/ Orange	Off	Solid Green	Solid Orange
Left	Green	Twinkling Green	Twinkling Green	Twinkling Green



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JUUUUU

## 2.4.1.11 CON1, J3 : LVDS



EMBC-3000 supports dual-channel 24-bit LVDS display and up to 4096 x 2304 pixels resolution.

The pin assignments of LVDS are listed in the following table :

40 00000000000000000000000000000000000					
Pin No.	Definition	Pin No.	Definition		
1	PANEL_VDD	2	TXO0-		
3	PANEL_VDD	4	TXO0+		
5	PANEL_VDD	6	TXO1-		
7	GND	8	TXO1+		
9	GND	10	TXO2-		
11	GND	12	TXO2+		
13	GND	14	TXOC-		
15	GND	16	TXOC+		
17	GND	18	TXO3-		
19	GND	20	TXO3+		
21	GND	22	TXE0-		
23	GND	24	TXE0+		
25	GND	26	TXE1-		
27	GND	28	TXE1+		
29	GND	30	TXE2-		
31	GND	32	TXE2+		
33	GND	34	TXEC-		
35	GND	36	TXEC+		
37	GND	38	TXE3-		
39	LVDS_DET#	40	TXE3+		

The LCD inverter is connected to J3 via a JST 7-pin, 2.5mm connector providing +5V/+12V power to LCD display. The pin assignments are listed in the following table :

	Pin No.	Definition	Pin No.	Definition
	1	+5V	2	+12V
ПОООООО	3	+12V	4	LBKLT_CTL
	5	GND	6	GND
	7	LBKLT_EN		

## 2.4.1.12 CN11: DP Connector

EMBC-3000 supports single Display Port and up to 4096 x 2304 pixels resolution.



## 2.4.1.13 CN1 : DC Power input



EMBC-3000 supports 9V to 48V DC power input by wire-to-board connector in the top side.

Pin No.	Definition	Pin No.	Definition
1	V-	2	V-
3	V+	4	V+

## 2.4.1.14 CN5, CN8 : SATA III Connector



There are two high performance Serial ATA III (SATA III) on the EMBC-3000. They support higher storage capacity with less cabling effort and smaller required space. The pin assignments of CN5 and CN8 are listed in the following table :

	Pin No.	Definition	Pin No.	Definition
7 0	1	GND	2	TXP
°	3	TXN	4	GND
	5	RXN	6	RXP
	7	GND		

## 2.4.1.15 J1: SATA Power Connector



The EMBC-3000 is also equipped with one SATA power connector. It supports 5V (Up to 2A) and 12V (Up to 2A) currents to the hard drive or SSD. The pinassignments of J1 is listed in the following table :

4 1		Pin No.	Definition	Pin No.	Definition
0000	)	1	+12V	2	GND
		3	GND	4	+5V

## 2.4.1.16 CN6 : SUMIT A+B Connector



## SUMIT-A Connector Pin Out

Pin No.	Definition	Pin No.	Definition
1	+5V_AUX	2	+12V
3	+3.3V	4	SMB_DATA
5	+3.3V	6	SMB_CLK
7	Reserved	8	Reserved
9	Reserved	10	Reserved
11	USB_OC#	12	Reserved
13	Reserved	14	Reserved
15	+5V	16	Reserved
17	USB_3+	18	Reserved
19	USB_3-	20	Reserved
21	+5V	22	Reserved
23	USB_2+	24	LPC_AD0
25	USB_2-	26	LPC_AD1
27	+5V	28	LPC_AD2
29	USB_1+	30	LPC_AD3
31	USB_1-	32	LPC_FRAME#
33	+5V	34	SERIRQ#
35	USB_0+	36	Reserved
37	USB_0-	38	CLK_33MHz
39	GND	40	GND
41	A_PET_P0	42	A_PER_P0
43	A_PET_N0	44	A_PER_N0
45	GND	46	GND
47	PERST#	48	A_CLKP
49	WAKE#	50	A_CLKN
51	+5V	52	GND

## SUMIT-B Connector Pin Out

Pin No.	Definition	Pin No.	Definition
1	GND	2	GND
3	B_PET_P0	4	B_PER_P0
5	B_PET_N0	6	B_PER_N0
7	GND	8	GND
9	C_CLKP	10	B_CLKP
11	C_CLKN	12	B_CLKN
13	CPRSNT#/C_PE_CLKREQ#	14	GND
15	C_PET_P0	16	C_PER_P0
17	C_PET_N0	18	C_PER_N0
19	GND	20	GND
21	C_PET_P1	22	C_PER_P1
23	C_PET_N1	24	C_PER_N1
25	GND	26	GND
27	C_PET_P2	28	C_PER_P2
29	C_PET_N2	30	C_PER_N2
31	GND	32	GND
33	C_PET_P3	34	C_PER_P3
35	C_PET_N3	36	C_PER_N3
37	GND	38	GND
39	PERST#	40	WAKE#
41	Reserves	42	Reserves
43	+5V	44	Reserves
45	+5V	46	+3.3V
47	+5V	48	+3.3V
49	+5V	50	+3.3V
51	+5V	52	+5V_AUX

2.4.1.17 SYS\_FAN1



Fan power connector supports higher thermal requirements

	Pin No.	Definition	Pin No.	Definition
1 0 0 0 4	1	GND	2	+12V (1.5A max)
	3	Fan speed sensor	4	Fan PWM

## 2.4.1.18 JPS2: PS/2 Keyboard and Mouse



JPS2 Keyboard and mouse pin assignment as the following table :

Pin No.	Definition	Pin No.	Definition
1	SIO_MCLK	2	SIO_MDAT
3	GND	4	SIO_KCLK
5	SIO_KDAT	6	VCC5_KBMS

## 2.4.1.19 JDIO1, JDIO2 : GPIO from Super I/O



There is a 16-bit GPIO connector in the Top side. Each GPIO channel can be configuration GPI or GPO.

JSEL\_DIO header is for SINK/SOURCE mode selection on ISO\_DIO board (DMX-100-E)

JDIO1 and JDIO2 pins are defined in the following table :

Pin No.	JDIO1 Definition	JDIO2 Definition
1	SIO_GPI80	SIO_GPO70
2	SIO_GPI81	SIO_GPO71
3	SIO_GPI82	SIO_GPO72
4	SIO_GPI83	SIO_GPO73
5	SIO_GPI84	SIO_GPO74
6	SIO_GPI85	SIO_GPO75
7	SIO_GPI86	SIO_GPO76
8	SIO_GPI87	SIO_GPO77
9	+3.3V	+3.3V
10	GND	GND

## 2.4.1.20 JP11: IGNITION Control and Remote Power on switch



Pin assignment as the following table :

	Pin No.	Definition	Pin No.	Definition
4 0000 1	1	FP_PWR_BTN_P	2	GND
	3	IGNITION	4	GND



# 2.4.2 SPC-5000/5100/5200 PCB Bottom Side

Green-PWR\_LED : If the LED is solid green, it indicates that the system is powered on.

Yellow-HDD\_LED : A hard disk LED. If the LED is on, it indicates that the system's storage is functional. If it is off, it indicates that the system's storage is not functional. If it is flashing, it indicates data access activities.

# 2.5 Main Board Jumper Settings

## 2.5.1 Front View of EMBC-3000 Main Board With Jumper Location

The figure below is the top view of the EMBC-3000 main board. It shows the location of the jumpers.



You may configure your card to match the needs of your application by setting jumpers. A jumper is a metal bridge used to close an electric circuit. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To "close" a jumper, you connect the pins with the clip. To "open" a jumper, you remove the clip. Sometimes a jumper will have three pins, labeled 1, 2, and 3. In this case you would connect either pins 1 and 2, or 2 and 3.



# 2.5.2 JP4 : Power Selection for LVDS Module



JP4 provides LVDS voltage selection function, Closing Pin 1 and Pin 2 is for 3.3V LVDS power input; closing Pin 2 and Pin 3 is for 5V LVDS power input.

	Pin No.	Definition
1 🗆 00 3	1-2	+3.3V (Default)
	2-3	+5V

# 2.5.3 JP2 : Clear CMOS, JP10 : Clear ME



2.5.4 JP5 : Power Selection for EXT and INT USB 3.1 Gen2/USB 2.0 Ports



	Pin No.	Power
1 🗆 00 3	1-2	+5V Standby Power
	2-3	+5V System Power

2.5.5 JP9 : Backlight Control Level Selection



# 2.6 Ignition Control

EMBC-3000 series provides ignition power control feature for in-vehicle applications. The built-in MCU monitors the ignition signal and turns on/off the system according to pre-defined on/off delay period.

# 2.6.1 Adjust Ignition Control Modes

EMBC-3000 series provides 16 modes of different power on/off delay periods adjustable via SW3 switch. The default rotary switch is set to 0 in ATX/AT power mode.



The modes are listed in the following table :

Deep Switch Position	Power on delay	Power off delay	Switch Position
0	ATX/AT mo	de (Default)	ON 1 2 3 4
1	No delay	No delay	
2	No delay	5 seconds	
3	No delay	10 seconds	
4	No delay	20 seconds	ON 1 2 3 4
5	5 seconds	30 seconds	
6	5 seconds	60 seconds	
7	5 seconds	90 seconds	
8	5 seconds	30 minutes	
9	5 seconds	1 hour	
A	10 seconds	2 hours	ON 1 2 3 4
В	10 seconds	4 hours	
С	10 seconds	6 hours	
D	10 seconds	8 hours	ON 1 2 3 4
E	10 seconds	12 hours	
F	10 seconds	24 hours	

## 2.6.2 Ignition Control Wiring

To activate ignition control, you need to provide IGN signal via the 3-pin pluggable terminal block locates in the back panel. Please find below the general wiring configuration

	GN DN OFF
Pin No.	Definition
1	Ignition (IGN)
2	SW+
3	SW-



For testing purpose, you can refer to the picture blow to simulate ignition signal input controlled by a latching switch.

Note :

- 1. DC power source and IGN share the same ground.
- 2. EMBC-3000 supports 9V to 48V wide range DC power input in ATX/AT mode. In Ignition mode, the input voltage is fixed to 12V/24V for car battery scenario.
- 3. For proper ignition control, the power button setting should be "Power Down" mode.



In Windows for example, you need to set "When I press the power button" to Shut down.



# **SYSTEM SETUP**

# 3.1 How to Open Your SPC-5000

3.1.1 SPC-5000 or SPC-5100

**Step 1** Remove one F-M3x4 screw.



Step 2 Remove two F-M3x4 screw.



**Step 3** Remove one F-M3x4 screw.



Step 4 Remove one F-M3x4 screw.



Step 5 Open bottom Cover.



## 3.1.2 SPC-5200





## Step 2 Open bottom Cover.



# 3.2 Installing DDR4 SO-DIMM Module



Step 1 Install DDR4 RAM module into SO-DIMM slot.



Step 2 Install DDR4 RAM module into SO-DIMM slot.



# 3.3 Installing Mini PCIe Card



**Step 1** Install Mini PCIe card into the Mini PCIe slot.







# 3.4 Installing Antenna Cable

Step 1 Check antenna cable and washers.



**Step 2** Install antenna cable and then fasten washer and nut.



# 3.5 Installing SIM Card



**Step 1** Open the SIM card cover.

Step 2 Install SIM card into to the SIM card slot and then close the SIM card cover.





# 3.6 Installing SSD/HDD

3.6.1 Installing SPC-5000 or SPC-5100 SSD/HDD



Step 1 Fasten 4 M3 screw.



# 3.6.2 Installing SPC-5200 SSD/HDD



Step 1 Fasten 4 M3 screw.



# 3.7 Mounting Your SPC-5000

# 3.8.1 SPC-5000

Fasten four M3 screws. (53-2426206-80B)



## 3.8.2 SPC-5100

Fasten four M3 screws. (53-2426206-80B)



## 3.8.3 SPC-5200

Fasten four M3 screws. (53-2426206-80B)





# **BIOS SETUP**

# 4.1 BIOS Setting

Aptio Setup Utility - Main Advanced Chipset Security	Copyright (C) 2019 America Boot Save & Exit	an Megatrends, Inc.
BIOS Information BIOS Vendor Core Version Compliancy Project Version Build Date and Time Access Level	American Megatrends 5.13 UEFI 2.7; PI 1.6 E3000XXPUF00003 09/05/2019 14:41:20 Administrator	
Processor Information Name Type Speed ID Stepping Package Number of Processors Microcode Revision	WhiskeyLake ULT Intel(R) Core(TM) 17-8665UE CPU @ 1.70GHz 2000 MHz 0x806EC V0 BGA1528 4Core(s) / 8Thread(s) B8 ST2 (0r2520)	: Select Screen 11: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Derrie Velece
GI INFO IGFX VBIOS Version IGFX GOP Version Memory RC Version Total Memory Memory Frequency	GI2 (UX3EAU) 1026 N/A 0.7.1.108 8192 MB 2400 MHz	F2: Frevious values F3: Optimized Defaults F4: Save & Exit ESC: Exit

Figure 4-1 : Entering Setup Screen

BIOS provide an interface for user to check and change system configuration. The BIOS setup program is accessed by pressing the <Del> key when POST display output then main BIOS Setup menu screen is displayed.

# 4.2 Main Manu

Aptio Setup Utility - Main Advanced Chipset Security	Copyright (C) 2019 American Boot Save & Exit	Megatrends, Inc.
Microcode Revision GT Info	B8 GT2 (0x3EA0)	Choose the system default language
IGFX VBIOS Version	1026	
IGFX GOP Version	N/A	
Memory RC Version	0.7.1.108	
Total Memory	8192 MB	
Memory Frequency	2400 MHz	
PCH Information	300 300 300	
Name	CNL PCH-LP	
PCH SKU	(U) Premium SKU	
Stepping	DO	
ChipsetInit Base Revision	20	: Select Screen
ChipsetInit OEM Revision	0	<pre> ti: Select Item </pre>
TXT Capability of Platform/PCH	Supported	Enter: Select
Production Type	Production	+/-: Change Opt.
ME FW Version	12.0.35.1427	F1: General Help F2: Previous Values
ME Firmware SKU	Corporate SKU	F3: Optimized Defaults
	[English]	F4: Save & Exit ESC: Exit
System Date	[Fri 09/06/2019]	
System Time	[15:48:50]	

Figure 4-2 : BIOS Main Menu

The Main menu display BIOS version and system information. There are two options on Main menu.

## System Date

Set the Date. Use Tab to switch between Date elements.

## **System Time**

Set the Time. Use Tab to switch between Time elements.

# 4.3 Advanced Functions

Aptio Setup Utility - Copyright (C) 2019 American Main Advanced Chipset Security Boot Save & Exit	Megatrends, Inc.
<ul> <li>CPU Configuration</li> <li>Power &amp; Performance</li> <li>PCH-FW Configuration</li> <li>Trusted Computing</li> <li>ACPI Settings</li> <li>SMART Settings</li> <li>IT8786 Super IO Configuration</li> </ul>	CPU Configuration Parameters
<ul> <li>Hardware Monitor</li> <li>Serial Port Console Redirection</li> <li>Intel TXT Information</li> <li>Acoustic Management Configuration</li> <li>PCI Subsystem Settings</li> <li>USB Configuration</li> <li>CSM Configuration</li> <li>NVMe Configuration</li> <li>Network Stack Configuration</li> </ul>	: Select Screen 11: Select Item Enter: Select

Figure 4-3 : BIOS Advanced Menu

Select Advanced tab to enter advanced BIOS Setup options such as CPU Configuration, SATA Configuration and USB Configuration.

# 4.3.1 CPU Configuration

CPU Configuration		To turn on/off the MLC streamer prefetcher.
Гуре	Intel(R) Core(TM)	
	17-8665UE CPU @ 1.70GHz	
ID	0x806EC	
Speed	2000 MHz	
ll Data Cache	32 KB x 4	
Ll Instruction Cache	32 KB x 4	
L2 Cache	256 KB x 4	
L3 Cache	8 MB	
L4 Cache	N/A	
7MX	Supported	
5MX/TXT	Supported	
		: Select Screen
		11: Select Item
Adjacent Cache Line Prefetch	[Enabled]	Enter: Select
Intel (VMX) Virtualization	[Enabled]	+/-: Change Opt.
Technology		Fl: General Help
Active Processor Cores	[A11]	F2: Previous Values
Hyper-Threading	[Enabled]	F3: Optimized Defaults
AES	[Enabled]	F4: Save & Exit
Intel Trusted Execution Technology	[Disabled]	ESC: Exit

Figure 4-3-1 : CPU Configuration

Display CPU related information and features supported.

## **Hardware Prefetcher**

To turn on/off the MLC streamer prefetcher.

## Adjacent Cache Line Prefetch

To turn on/off prefetching of adjacent cache lines.

## Intel (VMX) Virtualization Technology

When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.

#### **Active Processor Cores**

Number of cores to enable in each processor package.

#### Hyper-threading

Enabled or Disabled Hyper-Threading Technology.

## AES

Enable/Disable AES (Advanced Encryption Standard).

#### Intel Trusted Execution Technology

Enables utilization of additional hardware capabilities provided by Intel Trusted Execution Technology.

Changed require a full power cycle to take effect.

# 4.3.2 Power & Performance



Figure 4-3-2 : Power & Performance

# 4.3.2.1 CPU - Power Management Control

CPU - Power Management Control		Select the performance state
		that the BIOS will set
		starting from reset vector.
Intel(R) SpeedStep(tm)	[Enabled]	
Intel(R) Speed Shift Technology	[Enabled]	
Turbo Mode	[Disabled]	
C states	[Enabled]	
Enhanced C-states	[Enabled]	
Configurable TDP Boot Mode	[Nominal]	

Figure 4-3-2-1 : CPU - Power Management Control

## Boot performance mode

Select the performance state that the BIOS will set starting from reset vector.

## Intel<sup>®</sup> SpeedStep™

Allow more than two frequency ranges to be supported.

## Intel<sup>®</sup> Speed shift Technology

Enable/Disable Intel<sup>®</sup> Speed shift Technology support. Enabling will expose the CPPCv2 interface to allow for hardware controlled P-states.

## **Turbo Mode**

Enable/Disable processor Turbo Mode (requires Intel Speed Step or Intel Speed Shift to be available and enabled).

## C states

Enable or disable CPU Power management. Allows CPU to go to C states when it's no 100% utilized.

## **Enhanced C-states**

Enable/disable C1E. When enabled, CPU will switch to minimum speed when all cores enter C-State.

## **Configurable TDP Boot Mode**

Configurable TDP Mode as Nominal/Up/Down/Deactivate TDP selection. Deactivate option will set MSR to Nominal and MMIO to Zero. Configurable TDP allows operation in situation where extra cooling is available or situations where a cooler and quieter mode of operation is desired.

# 4.3.2.2 GT - Power Management Control



Figure 4-3-2-2 : GT - Power Management Control

## **RC6 (Render Standby)**

Check to enable render standby support.

#### **Maximum GT frequency**

Maximum GT frequency limited by the user. Choose between 300MHz (RPN) and 1150 MHz (RP0). Value beyond the range will be clipped to min/max supported by SKU.

## **Disable Turbo GT frequency**

Enabled : Disables Turbo GT frequency. Disabled : GT frequency is not limited.

## 4.3.3 PCH-FW Configuration



Figure 4-3-3 : PCH-FW Settings

## ME State

When Disabled ME will be put into ME Temporarily Disabled Mode.

## **AMT BIOS Features**

When disabled AMT BIOS Features are no longer supported and user is no longer able to access MEBx Setup. Note : This option does not disable Manageability Features in FW.

## AMT Configuration

Configure Intel Active Management Technology Parameters.

## **ME Unconfig on RTC Clear**

Disabling this option will cause ME not be unconfigured on RTC clear.

# 4.3.4 Trusted Computing

Aptio Setup Utili Advanced	ty - Copyright (C) 2019 An	merican Megatrends, Inc.
TPM20 Device Found		Enables or Disables BIOS
Firmware Version:	5.62	support for security device.
Vendor:	IFX	0.S. will not show Security Device. TCG EFI protocol and
Security Device Support	[Enable]	INTIA interface will not be

Figure 4-3-4 : Trusted Computing

Control the TPM device status and display related information if TPM chip is present.

## 4.3.5 ACPI Settings



igure 4-3-5 : ACPI Settings

## **Enable Hibernation :**

Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS.

## **ACPI Sleep State**

Select the highest ACPI sleep state the system will enter when the SUSPEND button is pressed.

## S3 Video Repost

Enable or Disable S3 Video Repost.

## 4.3.6 SMART Settings

	Aptio Advanced	Setup Utility - Copyright	(C) 2019 American	Megatrends, Inc.
SMART	Settings			Run SMART Self Test on all HDDs during POST.
SMART				

Figure 4-3-6 : SMART Settings

## SMART Self Test

Run SMART Self-test on all HDDs during POST.

## 4.3.7 IT8786 Super IO Configuration

Aptio Setup Utility - Advanced	- Copyright (C) 2019 American	n Megatrends, Inc.
IT8786 Super IO Configuration		Set Parameters of Serial Port
<pre>Super IO Chip Serial Port 1 Configuration Serial Port 2 Configuration Serial Port 3 Configuration Serial Port 4 Configuration</pre>	IT8786	
		: Select Screen 11: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit
Version 2.20.1271. Copyright (C) 2019 American Megatrends, Inc.		

Figure 4-3-7 : Super IO Settings

## **Serial Port 1 Configuration**

Set Parameters of Serial Port 1 (COM1).

## **Serial Port 2 Configuration**

Set Parameters of Serial Port 2 (COM2).

## **Serial Port 3 Configuration**

Set Parameters of Serial Port 3 (COM3).

#### **Serial Port 4 Configuration**

Set Parameters of Serial Port 4 (COM4).

## 4.3.8 Hardware Monitor

Pc Health StatusSmart Fan Support. Work with Full Speed if "Smart Fan Support" is Disabled.System temperature2: +45 □ System temperature2Support" is Disabled.CPU temperature: +36 □ System Fan SpeedSupport" is Disabled.VCORE: +0.768 V DDR: +1.212 V +122V+12V: +12.168 V +5V: +3.344 VSmart Fan Support[Enable] Smart Fan Mode: Select Screen 11: Select Item Enter: SelectSmart Fan Support[90: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit	Aptio Setup Utilit Advanced	y - Copyright (C) 2019 Amer:	ican Megatrends, Inc.
System temperature1: +45 DSupport" is Disabled.System temperature2: +45 DSupport" is Disabled.CPU temperature: +36 DSystem Fanl Speed: 3835 RPMVCORE: +0.768 VDDR: +1.212 V+12V: +12.168 V+5V: +3.344 VSmart Fan Support[Enable]Smart Fan Mode[User]Start Temperature45PWM Start Value(%)15Full Speed Temperature90+/-: Change Opt.F1: General HelpF2: Previous ValuesF3: Optimized DefaultsF4: Save & ExitESC: Exit	Pc Health Status		Smart Fan Support. Work with Full Speed if "Smart Fan
System temperature2 : +45 C CPU temperature : +36 C System Fanl Speed : 3835 RPM VCORE : +0.768 V DDR : +1.212 V +12V : +12.168 V +5V : +5.040 V +3.3V : +3.344 V Smart Fan Support [Enable] Smart Fan Mode [User] : Select Screen Start Temperature : 45 Full Speed Temperature : 90 :: Select Item Full Speed Temperature : 90 :: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit	System temperaturel	: +45 🗆	Support" is Disabled.
CPU temperature : +36 D System Fanl Speed : 3835 RPM VCORE : +0.768 V DDR : +1.212 V +12V : +12.168 V +5V : +5.040 V +3.3V : +3.344 V Smart Fan Mode [User]: Select Screen Start Temperature 45 11: Select Item FWM Start Value(%) 15 Enter: Select Full Speed Temperature 90 +/-: Change Opt. Fi: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit	System temperature2	: +45 🗆	
System Fanl Speed : 3835 RPM VCORE : +0.768 V DDR : +1.212 V +12V : +12.168 V +5V : +5.040 V +3.3V : +3.344 V Smart Fan Support [Enable] Smart Fan Mode [User] :: Select Screen 11: Select Item F FWM Start Value(%) 15 Enter: Select Full Speed Temperature 90 +/-: Change Opt. Full Speed Temperature 90 +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit	CPU temperature	: +36 🗆	
VCORE: +0.768 VDDR: +1.212 V+12V: +12.168 V+5V: +12.168 V+5V: +5.040 V+3.3V: +3.344 VSmart Fan Support[Enable]Smart Fan Mode[User]Start Temperature45FWM Start Value(%)15Full Speed Temperature90Full Speed Temperature90F1: General HelpF2: Previous ValuesF3: Optimized DefaultsF4: Save & ExitESC: Exit	System Fanl Speed	: 3835 RPM	
DDR : +1.212 V +12V : +12.168 V +5V : +5.040 V +3.3V : +3.344 V Smart Fan Support [Enable] Smart Tam Mode [User]: Select Screen Start Temperature 45 ; PWM Start Value(%) 15 Enter: Select Item Full Speed Temperature 90 +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit	VCORE	: +0.768 V	
+12V : +12.168 V +5V : +5.040 V +3.3V : +3.344 V Smart Fan Mode [User]: Select Screen Start Temperature 45 11: Select Item PWM Start Value(%) 15 Enter: Select Full Speed Temperature 90 +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit	DDR	: +1.212 V	
+5V : +5.040 V +3.3V : +3.344 V Smart Fan Support [Enable] Smart Fan Mode [User]: Select Screen Start Temperature 45 11: Select Item PWM Start Value(%) 15 Enter: Select Full Speed Temperature 90 +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit	+12V	: +12.168 V	
+3.3V : +3.344 V Smart Fan Support [Enable] Smart Fan Mode [User] Start Temperature 45 FWM Start Value(%) 15 Full Speed Temperature 90 Full Speed Temperature 90 F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit	+5V	: +5.040 V	
Smart Fan Support       [Enable]         Smart Fan Mode       [User]         Start Temperature       45         PWM Start Value(%)       15         Full Speed Temperature       90         +/-: Change Opt.         F1: General Help         F2: Previous Values         F3: Optimized Defaults         F4: Save & Exit         ESC: Exit	+3.3V	: +3.344 V	
Smart Fan Mode       [User]      : Select Screen         Start Temperature       45       11: Select Item         PWM Start Value(%)       15       Enter: Select         Full Speed Temperature       90       +/-: Change Opt.         F1: General Help       F2: Previous Values         F3: Optimized Defaults       F4: Save & Exit         ESC: Exit       ESC: Exit	Smart Fan Support		<u></u>
Start Temperature4511: Select ItemPWM Start Value(%)15Enter: SelectFull Speed Temperature90+/-: Change Opt.F1: General HelpF2: Previous ValuesF3: Optimized DefaultsF4: Save & ExitESC: Exit	Smart Fan Mode	[User]	: Select Screen
PWM Start Value(%)       15       Enter: Select         Full Speed Temperature       90       +/-: Change Opt.         F1: General Help       F2: Previous Values         F3: Optimized Defaults       F4: Save & Exit         ESC: Exit       ESC: Exit	Start Temperature	45	†↓: Select Item
Full Speed Temperature 90 +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit	PWM Start Value(%)	15	Enter: Select
Fl: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit	Full Speed Temperature	90	+/-: Change Opt.
F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit			Fl: General Help
F3: Optimized Defaults F4: Save & Exit ESC: Exit			F2: Previous Values
F4: Save & Exit ESC: Exit			F3: Optimized Defaults
ESC: Exit			F4: Save & Exit
			ESC: Exit
Version 2.20.1271. Copyright (C) 2019 American Megatrends. Inc.	Version 2.20.1271	. Copyright (C) 2019 America	an Megatrends, Inc.

Figure 4-3-8 : Hardware Monitor Settings

The IT8786 SIO features an enhanced hardware monitor providing thermal, fan speed and system voltages status monitoring.

## **Smart Fan Support**

Smart Fan Support. Work with full Speed if "Smart Fan Support" is Disabled.

#### Smart Fan Mode

Default : Using the default smart fan table. User : Setting parameters by user.

#### **Start Temperature**

Temperature Limit value of Fan Start (Degree C). (Range : 10-80)

## **PWM Start Value (%)**

Default PWM Value of Fan. (Range : 15%-100%)

## **Full Speed Temperature**

Temperature Limit value of Fan Full Speed (Degree C). (Range : 50-90)
#### 4.3.9 Serial Port Console Redirection

Aptio Setup Utility - Copyright (C) 2019 Advanced	American Megatrends, Inc.
COMO Console Redirection [Disabled] Console Redirection Settings	Console Redirection Enable or Disable.
Legacy Console Redirection Legacy Console Redirection Settings	
Serial Port for Out-of-Band Management/ Windows Emergency Management Services (EMS) Console Redirection [Disabled] Console Redirection Settings	
	: Select Screen fi: Select Item Enter: Select

Figure 4-3-9 : Serial Port Console Redirection Settings

#### **Console Redirection**

Console Redirection Enable or Disable.

#### **Console Redirection Settings**

The settings specify how the host computer and the remote computer (which the user is using) will exchange data. Both computers should have the same or compatible settings.

#### Legacy Console Redirection Settings

Legacy Console Redirection Settings

## Serial Port for Out-of-Band management/Windows Emergency Management Services (EMS)

Console Redirection Enable or Disable.

#### 4.3.10 Intel TXT Information

Intel TVT Information		
Incel IXI Information		
Chipset	Production Fused	
BiosAcm	Production Fused	
Cpu Txt	Supported	
Error Code	None	
Class Code	None	
Major Code	None	
Minor Code	None	

Figure 4-3-10 : Intel TXT Information

Display Intel TXT information.

#### 4.3.11 Acoustic Management Configuration



Figure 4-3-11 : Acoustic Management Settings

#### **Acoustic Management Configuration**

Option to Enable or Disable Automatic Acoustic Management.

#### 4.3.12 PCI Subsystem Settings



Figure 4-3-12 : PCI Subsystem Settings

#### Above 4G Decoding

Globally Enables or Disables 64bit capable Devices to be Decoded in Above 4G Address Space (Only if System Supports 64 bit PCI Decoding).

#### 4.3.13 USB Configuration

Aptio Setup Utility - Advanced	Copyright (C) 2019 American	Megatrends, Inc.
USB Configuration		Enables Legacy USB support.
USB Module Version	23	support if no USB devices are connected. DISABLE option will
USB Controllers:		keep USB devices available
USB Devices:		only for hir approactions.
l Keyboard, l Mouse		
Legacy USB Support		
XHCI Hand-off	[Enabled]	
USB Mass Storage Driver Support	[Enabled]	
Port 60/64 Emulation	[Disabled]	
AND ATTRACTOR ACCOUNTS OF A AND ADDRESS AND		: Select Screen
USB hardware delays and time-outs:		†↓: Select Item
USB transfer time-out	[20 sec]	Enter: Select
Device reset time-out	[20 sec]	+/-: Change Opt.
Device power-up delay	[Auto]	Fl: General Help
		F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
		LDC: LXIC

Figure 4-3-13 : USB Settings

#### Legacy USB Support

Enables Legacy USB support.

AUTO option disables legacy support if no USB devices are connected. ISABLE option will keep USB devices available only for EFI applications.

#### **XHCI Hand-off**

This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.

#### **USB Mass Storage Driver Support**

Enable/Disable USB Mass Storage Driver Support.

#### Port 60/64 Emulation

Enables I/O port 60h/64h emulation support. This should be enabled for the complete USB keyboard legacy support for non-USB aware OSes.

#### **USB transfer time-out**

The time-out value for Control, Bulk, and Interrupt transfers.

#### **Device reset time-out**

USB mass storage device Start Unit command time-out.

#### **Device power-up delay**

Maximum time the device will take before it properly reports itself to the Host Controller. 'Auto' uses default value : for a Root port it is 100 ms, for a Hub port the delay is taken from Hub descriptor.

#### 4.3.14 CSM Configuration

Compatibility Support Module	Configuration	Enable/Disable CSM Support.
CSM16 Module Version	07.82	
GateA20 Active	[Upon Request]	
Option ROM Messages	[Force BIOS]	
INT19 Trap Response	[Immediate]	
HDD Connection Order	[Adjust]	
Boot option filter	[UEFI and Legacy]	
Option ROM execution		: Select Screen
		↑↓: Select Item
Network	[Do not launch]	Enter: Select
Storage	[Legacy]	+/-: Change Opt.
Video	[Legacy]	Fl: General Help
Other PCI devices	[Legacy]	F2: Previous Values
		F3: Optimized Defaults

Figure 4-3-14 : CSM Settings

#### **CSM Support**

Enable/Disable CSM Support.

#### GateA20 Active

UPON REQUEST - GA20 can be disabled using BIOS services. ALWAYS - do not allow disabling GA20; this option is useful when any RT code is executed above 1MB.

#### **Option ROM Messages**

Set display mode for Option ROM.

#### **INT19 Trap Response**

BIOS reaction on INT19 trapping by Option ROM : IMMEDIATE - execute the trap right away; POSTPONED - execute the trap during legacy boot.

#### **HDD Connection Order**

Some OS require HDD handles to be adjusted, i.e. OS is installed on drive 80h.

#### **Boot option filter**

This option controls Legacy/UEFI ROMs priority.

#### Network

Controls the execution of UEFI and Legacy PXE OpROM.

#### Storage

Controls the execution of UEFI and Legacy Storage OpROM.

#### Video

Controls the execution of UEFI and Legacy Video OpROM.

#### **Other PCI devices**

Determines OpROM execution policy for devices other than Network, Storage, or Video.

#### 4.3.15 NVMe Configuration

Aptio Se Advanced	etup Utility - Copyright	(C) 2019 American	Megatrends, Inc.	
NVMe Configuration				
No NVME Device Found				

Figure 4-3-15 : NVMe Configuration

Display NVMe Controller and drive information.

#### 4.3.16 Network Stack Configuration

Aptio Setup Advanced	Utility - Copyright (C) 2019 Ameri	can Megatrends, Inc.
Network Stack Ipv4 PXE Support Ipv4 HTTP Support Ipv6 PXE Support Ipv6 HTTP Support IPSEC Certificate PXE boot wait time Media detect count	[Enabled] [Disabled] [Disabled] [Disabled] [Enabled] 0 1	Enable/Disable UEFI Network Stack

Figure 4-3-16 : Network Stack Settings

#### **Network Stack**

Enable/Disable UEFI Network Stack.

#### **Ipv4 PXE Support**

Enable/disable IPv4 PXE boot support.

#### **Ipv4 HTTP Support**

Enable/disable IPv4 HTTP boot support.

#### Ipv6 PXE Support

Enable/disable IPv6 PXE boot support.

#### **Ipv6 HTTP Support**

Enable/disable IPv6 HTTP boot support.

#### **IPSEC Certificate**

Support to Enable/disable IPSEC certificate for Ikev.

**PXE boot wait time** Wait time to press ESC key to abort the PXE boot.

#### Media detect count

Number of times presence of media will be checked.

## 4.4 Chipset Functions

Aptio Setup Utility - Copyright (C) 2019 Americ Main Advanced Chipset Security Boot Save & Exit	.can Megatrends, Inc.
<ul> <li>System Agent (SA) Configuration</li> <li>PCH-IO Configuration</li> <li>LVDS Configuration</li> </ul>	System Agent (SA) Parameters

Figure 4-4 : BIOS Chipset Menu

#### System Agent (SA) Configuration System Agent (SA) Parameters.

PCH-IO Configuration PCH Parameters.

LVDS Configuration LVDS Configuration.

#### 4.4.1 System Agent (SA) Configuration



Figure 4-4-1 : System Agent Settings

#### VT-d

VT-d capability.

#### Above 4GB MMIO BIOS assignment

Enable/Disable above 4GB MemoryMappedIO BIOS assignment. This is disabled automatically when Aperture Size is set to 2048MB.

#### 4.4.1.1 Memory Configuration

Aptio Setup Utility - Chipset	Copyright (C) 2019 American	Megatrends, Inc.
Memory Configuration		
Memory RC Version Memory Frequency Memory Timings (tCL-tRCD-tRP-tRAS)	0.7.1.108 2400 MHz 17-17-17-39	
Channel 0 Slot 0 Size Number of Ranks Manufacturer	Populated & Enabled 8192 MB (DDR4) 1 Kingston	

Figure 4-4-1-1 : Memory Information

Display memory information.

#### 4.4.1.2 Graphics Configuration

Aptio Setup Uti Chipset	lity - Copyright (C) 2019 A	merican Megatrends, Inc.
Graphics Configuration		Keep IGFX enabled based on the setup options.
GTT Size	[8MB]	
Aperture Size	[256MB]	
DVMT Pre-Allocated	[32M]	
DVMT Total Gfx Mem	[MAX]	

Figure 4-4-1-2 : Graphics Settings

#### **Internal Graphics**

Keep IGFX enabled based on the setup options.

#### **GTT Size**

Select the GTT size.

#### **Aperture Size**

Select the aperture size. Note : Above 4GB MMIO BIOS assignment is automatically enabled when selecting 2048MB aperture. To use this feature, please disable CSM support.

#### **DVMT Pre-Allocated**

Select DVMT 5.0 pre-allocated (fixed) graphics memory size used by the internal graphics device.

#### **DVMT Total Gfx Mem**

Select DVMT 5.0 total graphic memory size used by the internal graphics device.

#### 4.4.2 PCH-IO Configuration

Chipset		
PCH-IO Configuration		PCI Express Configuration settings
SATA And RST Configuration		
Security Configuration		
PCH LAN Controller	[Enabled]	
Wake on LAN Enable	[Enabled]	
Serial IRQ Mode	[Continuous]	
State After C3	ISS Statel	

Figure 4-4-2 : PCH-IO Settings

#### PCH LAN Controller

Enable or disable onboard NIC.

#### Wake on LAN

Enable or disable integrated LAN to wake the system. (The Wake On LAN cannot be disabled if ME is on at Sx state.).

#### Serial IRQ Mode

Configure Serial IRQ Mode.

#### State After G3

Specify what state to go to when power is re-applied after a power failure (G3 state).

#### 4.4.2.1 PCI Express Configuration of PCH-IO

Aptio Setup Utility Chipset	- Copyright (C) 2019 American	n Megatrends, Inc.
PCI Express Configuration		The control of Active State Power Management of the DMI
DMI Link ASPM Control		Link.
Native PCIE Enable PCIE Port assigned to LAN	[Enabled] 13	
<pre>&gt; SUMIT B (PCIe x4) &gt; SUMIT B (PCIe x1) &gt; SUMIT A (PCIe x1)</pre>		
Intel (R) Ethernet Controller 1219 LAN	Reserved for ethernet	
<ul> <li>Intel (R) Ethernet Controller I210</li> <li>mPCIe slot with SIM</li> </ul>	LAN	
mPCIe/mSATA slot	Lane configured as USB/SATA	: Select Screen <pre> i: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save &amp; Exit ESC: Exit</pre>

Figure 4-4-2-1 : PCI Express Configuration

#### **DMI Link ASPM Control**

The control of Active State Power Management of the DMI Link.

#### **Native PCIE Enable**

PCI Express Native Support Enable/Disable. This feature is available in vista and beyond Windows OS.

#### **PCI Express device settings**

BIOS options for PCI Express device setting.

#### 4.4.2.2 SATA And RST Configuration

Aptio Setup Utility - Chipset	Copyright (C) 2019 America	n Megatrends, Inc.
SATA And RST Configuration		Enable/Disable SATA Device.
SATA Controller(s) SATA Mode Selection	[Enabled] [AHCI]	
<ul> <li>Software Feature Mask Configuration Aggressive LPM Support</li> </ul>	[Enabled]	
Serial ATA Port 0 Software Preserve Port 0 Hot Plug Spin Up Device SATA Device Tupe	Phison SSB064G (64.0GB) SUPPORTED [Enabled] [Enabled] [Enabled] [Hard Disk Drive]	
Serial ATA Port 1 Software Preserve Port 1 Hot Plug Spin Up Device SaTA Device Tume	Empty Unknown [Enabled] [Disabled] [Enabled] [Hard Disk Drive]	: Select Screen 11: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values
SATA Device Type Serial ATA Port 2 Software Preserve Port 2 Hot Plug Spin Up Device SATA Device Type	[hard Disk Drive] Empty Unknown [Enabled] [Enabled] [Hard Disk Drive]	F2: Frevious values F3: Optimized Defaults F4: Save & Exit ESC: Exit

Figure 4-4-2-2 : SATA Devices Settings

#### SATA Controller(s)

Enable or disable SATA Device.

#### **SATA Mode Selection**

Determines how SATA controllers operate.

#### Software Feature Mask Configuration

RST Legacy OPROM/RST UEFI driver will refer to the SWFW configuration to enable/disable the storage features.

#### Aggressive LPM Support

Enable PCH to aggressively enter link power state.

#### Options for each SATA port.

Port n

Enable or disable SATA port.

#### **Hot Plug**

Designates this port as Hot Pluggable.

#### **Spin Up Device**

On an edge detect from 0 to 1, the PCH starts a COMRESET initialization sequence to the device.

#### SATA Device Type

Identify the SATA port is connected to Solid State Drive or Hard Disk Drive.

#### 4.4.2.3 BIOS Security Configuration of PCH-IO



Figure 4-4-2-3 : BIOS Security Settings

#### **BIOS Lock**

Enable/Disable the PCH BIOS Lock Enable (BLE bit) feature.

#### 4.4.3 LVDS Configuration

Aptio Setup Utility - Chipset	Copyright (C) 2019 American	Megatrends, Inc.
LCD Resolution Control LCD Panel Type	[1024x768 LVDS]	Select LCD Panel Resolution
	LCD Panel Type 800x600 LVDS 1024x600 LVDS 1024x768 LVDS 1280x800 LVDS 1280x1024 LVDS 1366x768 LVDS 1600x1200 LVDS 1920x1080 LVDS	: Select Screen 11: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

Figure 4-4-3 : LVDS Panel Settings

The LVDS Configuration option will be present if LVDS panel is connected on system.

#### **LCD Panel Type**

Select LCD Panel Resolution.

## 4.5 Security

Aptio Setup U Main Advanced Chipset <mark>S</mark>	tility - Copyright (C) 2019 curity Boot Save & Exit	American Megatrends, Inc.
Password Description		Set Administrator Password
If ONLY the Administrator's then this only limits access only asked for when entering If ONLY the User's password is a power on password and p boot or enter Setup. In Setu have Administrator rights. The password length must be in the following range: Minimum length	password is set, s to Setup and is g Setup. is set, then this must be entered to up the User will	
Maximum length	20	
Administrator Password User Password		→→: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values
HDD Security Configuration:		F3: Optimized Defaults
P0:Phison SSB064GPTC0-S91		F4: Save & Exit
▶ Secure Boot		LOC: LXIT

Figure 4-5 : BIOS Security Menu

#### Administrator Password

Set administrator password.

#### **User Password**

Set user password.

#### **Secure Boot**

Secure Boot coonfiguration.

#### 4.5.1 HDD Security Configuration

Aptio Setup Util Secu	ity - Copyright (C) 2019 Am rity	erican Megatrends, Inc.
HDD Password Description :		Set HDD User Password. *** Advisable to Power Cycle
Allows Access to Set, Modify a	nd Clear	System after Setting Hard Disk
Hard Disk User Password		Passwords ***.
and Master Password.		Discard or Save changes option
User Password is mandatory to	Enable HDD Security.	in setup does not have any
If Master password is installe	d (optional),	impact on HDD when password is
it can also be used to unlock	the HDD.	set or removed. If the 'Set
If the 'Set User Password' opt	ion is hidden,	HDD User Password' option is
do power cycle to enable the o	ption again.	hidden, do power cycle to
		enable the option again
HDD PASSWORD CONFIGURATION:		
Security Supported :	Yes	: Select Screen
Security Enabled :	No	11: Select Item
Security Locked :	No	Enter: Select
Security Frozen :	No	+/-: Change Opt.
HDD User Pwd Status:	NOT INSTALLED	Fl: General Help
HDD Master Pwd Status :	INSTALLED	F2: Previous Values
		F3: Optimized Defaults
		F4: Save & Exit
Set Master Password		ESC: Exit

Figure 4-5-1 : HDD Security Settings

#### Set User Password

Set HDD user password.

\*\*\* Advisable to power cycle system after setting hard disk passwords\*\*\*.

Discard or save changes option in setup does not have any impact on HDD when password is set or removed. If the 'Set HDD user Password' option is gray, do power cycle to enable the option again.

#### 4.5.2 Security Boot

Aptio Setup Ut Se	ility - Copyright (C) 2019 A curity	American Megatrends, Inc.
System Mode	Setup	Secure Boot mode options:
Secure Boot	[Disabled] Not Active	In Custom mode, Secure Boot Policy variables can be configured by a physically
Secure Boot Mode • Restore Factory Keys • Reset To Setup Mode		present user without full authentication

Figure 4-5-2 : Security Boot Settings

#### Secure Boot

Secure Boot feature is Active if Secure Boot is Enabled, Platform Key (PK) is enrolled and the System is in User mode. The mode change requires platform reset.

#### Secure Boot Mode

Secure Boot mode options : Standard or Custom.

In Custom mode, Secure Boot Policy variables can be configured by a physically present user without full authentication.

#### **Key Management**

Enables expert users to modify Secure Boot Policy variables without full authentication.

### 4.6 Boot Functions

Boot Configuration Setup Prompt Timeout Bootup NumLock State Quiet Boot	[Off] [Disabled]	Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.
Boot Option Priorities Boot Option #1	[Windows Boot Manager (PO: Phison SSB0640PTC0-S91)1	
Boot Option #2 Boot Option #3	[P0: Phison SSB064GPTC0-S91] [UEFI: Built-in EFI Shell1	
Hard Drive BBS Priorities		: Select Screen 11: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

Figure 4-6 : BIOS Boot Menu

#### **Setup Prompt Timeout**

Number of seconds to wait for setup activation key. 65535 (0xFFF) means indefinite waiting.

#### **Bootup NumLock State**

Select the keyboard NumLock state.

#### **Quiet Boot**

Enables or disables Quiet Boot option.

#### **Boot Option #x**

Sets the system boot order.

#### Hard Drive BBS Priorities

Set the order of the legacy devices in this group.

### 4.7 Save & Exit

Aptio Setup Utility - Copyright (C) 2019 American Main Advanced Chipset Security Boot <mark>Save &amp; Exit</mark>	Megatrends, Inc.
Save Options Save Changes and Exit Discard Changes and Exit Save Changes and Reset Discard Changes and Reset Save Changes Discard Changes Default Options Restore Defaults	Exit system setup after saving the changes.
Save as User Defaults Restore User Defaults Boot Override UEFI: Built-in EFI Shell Windows Boot Manager (PO: Phison SSB064GPTC0-S91) PO: Phison SSB064GPTC0-S91	: Select Screen 11: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F4: Save & Exit ESC: Exit

Figure 4-7 : BIOS Save and Exit Menu

#### Save Changes and Exit

Exit system setup after saving the changes.

#### **Discard Changes and Exit**

Exit system setup without saving any changes.

#### **Save Changes and Reset**

Reset the system after saving the changes.

#### **Discard Changes and Reset**

Reset system setup without saving any changes.

#### Save Changes

Save Changes done so far to any of the setup options.

#### **Discard Changes**

Discard Changes done so far to any of the setup options.

#### **Default Options :**

#### **Restore Defaults**

Restore/Load Default values for all the setup options.

#### Save as User Defaults

Save the changes done so far as User Defaults.

#### **Restore User Defaults**

Restore the User Defaults to all the setup options.



## **APPENDIX A : Isolated DIO Guide**

## **A.1 Function Description**

The SPC-5000 offers a 16-bit DIO (Isolated/Non-Isolated) 20-pin terminal block connector, and a watchdog timer.

DIO definition is shown below :



Pin No.	DIO Definition	Non-Isolated DIO Definition	Pin No.	JDIO2	Non-Isolated DIO Definition
1	DI0	DIO0	1	DO0	DIO8
2	DI1	DIO1	2	DO1	DIO9
3	DI2	DIO2	3	DO2	DIO10
4	DI3	DIO3	4	DO3	DIO11
5	DI4	DIO4	5	DO4	DIO12
6	DI5	DIO5	6	DO5	DIO13
7	DI6	DIO6	7	DO6	DIO14
8	DI7	DIO7	8	DO7	DIO15
9	DI COM	NC	9	DIO_GND	DIO_GND
10	DIO_GND	DIO_GND	10	External VDC	NC

## A.2 Isolated DIO Signal Circuit

DI reference circuit :



#### DO reference circuit :

Sink Mode (NPN, Default) Source Mode (PNP)	Device			DIO Connector
	6-48V DC	V+		DIO_VDC (Pin 20)
		10	$\rightarrow$ $\rightarrow$	DO (Pin 11-18)
		V-		DIO_GND (Pin 10, 19)
Source Mode	Device			DIO Connector
(PNP)	6-48V DC	V+		DIO_VDC (Pin 20)
Sink Mode (NPN, Default) G-48V DC V- Source Mode (PNP) Device 6-48V DC V+ 6-48V DC V-		DO (Pin 11-18)		
		V-		DIO_GND (Pin 10, 19)

## A.3 Software Package contain

Distribution folder include x32 and x64 versions, use batch file for installation. There are included as fallowed :

Win7_32.bat :	
Installation for 32-bit driver	Distribution
Win7_64.bat :	Runtime
Windows update package which driver required	Sample
(need to restart), and Installation for 64-bit driver	Source
Win8_32.bat, Win8_64.bat :	💿 Uninstall 32
Installation for driver, and guideline to Framework 3.5	Uninstall 64
distribution for sample	Win7 32
Win10_32.bat, and Win10_64.bat :	○ Win7_52
Installation for driver, and installation to Framework 3.5	1 VVin/_64
distribution for sample	Win8_32
Uninstall_32.bat, and Uninstall_64.bat :	💿 Win8_64
Uninstallation for driver	💿 Win10_32
Run batch file as Administrator.	💿 Win10_64
Support Windows 7 above.	
Make auro Windows version before installation	

Make sure Windows version before installation.

Runtime folder include head file for software developer or System Integration.

Sample folder include sample program, driver library, and API library.

Source folder include sample program source code that compile on Visual Studio 2008.

### A.4 Sample

Sample folder include x32 and x64 versions, as shown below :

drv.dll
 SPC5K.dll
 SPC5K.exe

Sample SPC5K.exe, as shown below :



#### DIO1 group :

Isolate check button :

DIO type of DIO configuration, isolated/non-isolated, defined in SPC-5000 series user manual.

Read button :

Set DIO configuration to get DI/DIO input state.

DO type check button :

User setting, DO type of DIO configuration to setup 8 pins - Source/Sink. Use for Write (DO) button activate.

Write button :

Set DIO configuration to set DO/DIO output state.

DI preference text :

User setting, DI type of DIO configuration by hexadecimal bitmask - Source/Sink. Use for Read (DI) button activate.

DO/DIO output text :

User setting, DO/DIO output state by hexadecimal bitmask - on/off.

Use for Write button activate.

DO/DIO writable text :

User setting, DO/DIO writable of DIO configuration by hexadecimal bitmask - yes/no.

Use for Read (DIO)/Write button activate.

DI/DIO input text (read only):

DI/DIO input state by hexadecimal bitmask – on/off.

Use for Read button activate.

DO/DIO text (read only):

DO/DIO output state with input state (DIO) and configuration.

Use for Write button activate.

DO/DIO output text (read only):

DO/DIO output state with configuration.

Use for Write button activate.

DI type pin check button (pin  $8 \sim pin 1$ ):

User setting, DI pin type of DIO configuration - Source/Sink.

DI/DIO input pin texts (read only, pin 8 ~ pin 1/pin 18 ~ pin 11, pin 8 ~ pin 1): DI/DIO input pin state

Use for Read button activate.

DO/DIO output pin check button (pin 18 ~ pin 11/pin 18 ~ pin 11, pin 8 ~ pin 1): User setting, DO/DIO output pin state

Use for Write button activate.

DO/DIO pin writable check button (pin 18 ~ pin 11/pin 18 ~ pin 11, pin 8 ~ pin 1): User setting, DO/DIO pin writable of DIO configuration.

Use for Read (DIO)/Write button activate.

#### WDT group :

Write button : Set WDT when WDT setup text is valid.
Stop button : Cancel WDT and counting. Use after Write button action.
WDT setup text : User setting, WDT value, unit : second. Use for Write button activate.
WDT counting text (read only) : WDT counting by program timer after set WDT. Shown after Write button action.
WDT setup day format texts (user setting) : User setting, WDT value, format : day'hour'minute'second.
WDT counting day format text (read only) : WDT counting day format text (read only) : WDT counting day format text (read only) :



## **APPENDIX B : Software Functions**

### **B.1 Driver API Guide**

In Runtime folder, on SPC5K.h :

\_DLL\_IMPORT\_ definition is used on LoadLibrary API for SPC5K.dll. SPC5K\_EXPORTS definition is used on SPC5K.dll building.

#### BOOL Initial (BYTE Isolate\_Type, BYTE DIO\_NPN)

Initial machine for DIO, watchdog timer, and POE

Isolate\_Type : DIO type

1 : Isolated DIO;

0 : Non-Isolated DIO

DIO\_NPN : DI/DO type

1 : PNP (Source) mode for European rule;

0 : NPN (Sink) mode for Japanese rule

Return :

TRUE (1) : Success;

FALSE (0) : Fail (Driver not exists, or initial error (version is too old, or machine not match))

#### BOOL GetDIO1Config (BYTE \*lsolate\_Type, BYTE \*DI\_NPN, BYTE \*DO\_ NPN, WORD \*Mask)

Get DIO configuration (by variable)

Isolate\_Type : DIO type

1 : Isolated DIO;

0 : Non-Isolated DIO

DI\_NPN ([7:0]) : DI type, pin setting by hexadecimal bitmask

1 : PNP (Source) mode for European rule;

0 : NPN (Sink) mode for Japanese rule

DO\_NPN : DO type

1 : PNP (Source) mode for European rule;

0 : NPN (Sink) mode for Japanese rule

Mask ([15:0]) : In/Out, pin setting by hexadecimal bitmask

1 : Output;

0 : Input

Return :

TRUE (1) : Success;

FALSE (0) : Fail (Initial error, or call by pointer error, or hardware problem)

#### BOOL SetDIO1Config (BYTE \*Isolate\_Type, BYTE \*DI\_NPN, BYTE \*DO\_ NPN, WORD \*Mask)

Set DIO configuration

Isolate\_Type : DIO type

1 : Isolated DIO;

0 : Non-Isolated DIO

DI\_NPN ([7:0]): DI type, pin setting by hexadecimal bitmask

1 : PNP (Source) mode for European rule;

0 : NPN (Sink) mode for Japanese rule

DO\_NPN : DO type

1 : PNP (Source) mode for European rule;

0 : NPN (Sink) mode for Japanese rule

Mask ([15:0]): In/Out, pin setting by hexadecimal bitmask

1 : Output;

0 : Input

Return :

TRUE (1) : Success;

FALSE (0) : Fail (Initial error, or hardware problem)

#### BOOL GetDI1 (BYTE \*DI)

Get isolated DIO input (DI)

DI ([7:0]) : Input state, pin setting by hexadecimal bitmask

1 : High;

0 : Low

Return :

TRUE (1) : Success;

FALSE (0) : Fail (Initial error, or call by pointer error, or hardware problem)

#### BOOL GetDO1 (BYTE \*DO)

Get isolated DIO output (DO)

DO ([7:0]) : Output state, pin setting by hexadecimal bitmask

1 : High;

0 : Low

Return :

TRUE (1) : Success;

FALSE (0) : Fail (Initial error, or call by pointer error, or hardware problem)

#### BOOL SetDO1 (BYTE DO)

Set isolated DIO output (DO)

DO ([7:0]) : Output state, pin setting by hexadecimal bitmask

1 : High;

0 : Low

Return :

TRUE (1) : Success;

FALSE (0) : Fail (Initial error, or hardware problem)

#### BOOL GetDIO1 (WORD \*DI)

Get non-isolated DIO input (DIO input)

DI ([15:0]): Input state, pin setting by hexadecimal bitmask

1 : High;

0 : Low

Return :

TRUE (1): Success;

FALSE (0): Fail (Initial error, or call by pointer error, or hardware problem)

#### BOOL SetDIO1 (WORD DO)

Set non-isolated DIO output (DIO output) DO ([15:0]): output state, pin setting by hexadecimal bitmask 1 : High; 0 : Low Return : TRUE (1) : Success; FALSE (0) : Fail (Initial error, or hardware problem)

#### BOOL GetWDT (DWORD \*WDT)

Get watchdog timer setup

WDT : watchdog timer setup

Unit : second. (Range : 0 ~ 65535 sec, 1093 ~ 65535 min (=65580 ~ 3932100 sec))

#### Return :

TRUE (1) : Success; FALSE (0) : Fail (Initial error, or call by pointer error, or hardware problem)

#### BOOL SetWDT (DWORD WDT)

Set watchdog timer setup

WDT : watchdog timer setup Unit : second. (Range : 1 ~ 65535 sec, 1093 ~ 65535 min (=65580 ~ 3932100 sec))

Return :

TRUE (1) : Success; FALSE (0) : Fail (Initial error, or setup 0 error, or hardware problem)

#### BOOL CancelWDT ()

Cancel watchdog timer Return : TRUE (1) : Success; FALSE (0) : Fail (Initial error, or hardware problem)



## **APPENDIX C : RAID Functions**

### C.1 SATA Mode for RAID

Please select SATA Device to RAID mode on BIOS menu.

Advanced  $\rightarrow$  SATA Configuration  $\rightarrow$  SATA Mode Selection

Main	Advanced	Chipset	Boot	Security	Save &	Exit
					Item	Specific Help
SATA (	Controller	(s)	[Ena	abled]		
SATA I	Model Sele	ction	[AH0	[[]		

## **C.2 OS Installation**

The system is featured with three SATA, include two internal SATA, 1 mSATA You can select one of SATA ports for OS installation

We used internal SATA for Windows 10 OS installation as an example.

## C.3 To Install All Device Drivers of the System

The instructions are as follows :

- 1. To install Chipset driver
- 2. To install VGA driver
- 3. To install ME driver (if available)
- 4. To install Network driver
- 5. To install Audio driver

## C.4 To Install "Intel Rapid Storage Technology" Software

You can get the latest information and the software directly from Intel website.

http://www.intel.com/p/en\_US/support/highlights/chpsts/imsm

The RAID environment has been done if you completed the steps above.

## C.5 To Insert SATA HDD for RAID 1

Please notice, you can use three SATA ports for SATA storage devices.

## C.6 To Create RAID Volume on "Rapid Storage Technology" Software

The system is featured with three SATA HDD's for RAID volume, so there are two options to choose on this page. Let's take RAID 1 as an example, select "RAID 1".

2 Intel® Rapid Storage Technology		
Status	Brage Preferences	intel
1. Select 2. Configure 1. Confirm	Select Volume Type  Performent data protection (Recovery)  Real-time data protection (RAID 1)  Optimized disk performance (RAID 0)  Efficient data hosting and protection (RAID 5)  Baranced performance and data protection (RAID 10)	Protection Performance Capacity Combine two disks to create a volume where each disk stores an exact copy of the data and provides real-time redundancy.
	Next	More help on Ibis page

## C.7 Disk Management : Partition the Disk

After RAID 1 volume created, you can see the figure of SATA device allocation.



To start Disk Management tool and select "Initialize Disk".

Then add "Logical Device" for Windows access.

E Computer Management					*
File Action View Help					
	· 😼				-
Computer Management (Local)	Volume	Layout Type File	System Status	Actions	
System Tools     Task Scheduler	C:) Sim	Simple Basic NI Simple Basic FA	FS Healthy (Boot, Page File, Crash Dun F32 Healthy (Primary Partition)	np, Primary Pa Disk Management	
P P Task Scheduler     Function of the scheduler     Scheduler	System Reserved	artition) More Actions	•		
Storage Disk Management	•	m		₽.	
▷ Services and Applications	Disk 0 Basic 6.88 GB Online	<b>RASC (D:)</b> 6.88 GB FAT32 Healthy (Primary Par	tition)		
	Basic 29.82 GB Online	System Reserved 100 MB NTFS Healthy (System, Act	(C:) 29.72 GB NTFS n Healthy (Boot, Page File, Crash Dump, Pri	imary Partitic	
	Unallocated P	rimary partition			

## C.8 If One SATA HDD on RAID Volume is Out-of-use

After RAID 1 volume created, you can see the figure of SATA device allocation.



## C.9 Recovery and Auto Re-build When Use the SAME RAID HDD

C Intel® Rapid Storage Technology	
Status Manage Preferences	intel
Vour system is functioning normally.	Storage System View
Click on any element in the storage system view to manage its properties. Array_0000 Volume_0000: Rebuilding 16% complete	7 GB 7 GB 7 GB 7 GB 7 GB 7 GB 7 GB
	External system disk 30 G8 External empty port 3 External empty port 4

## C.10 Recovery and Auto Re-build When Use DIFFERENT RAID HDD

There is a warning will pop-up to ask you if the disk is not a member of original RAID volume.

If you press "Rebuild", it will replace the broken SATA HDD to the last one SATA HDD of RAID volume.

Current Status		Storage Syste	m View	
our system is reporting one or more e efer to the details below for more infi	wents, and data may be at risk. simation.	Array_0000		RA
Create	Rebuild Volume	6	17.58	Volume_0000 Type: RAID 1
reate a volume by combining availab	An array disk has failed and you need to rebuild the volume to maintain r	redundancy and keep your data protected.		7 GB
Create a custom volume	Select the disk you want to rebuild the volume to:		0 GB	_
Manage	O Disk on port 2 (233 GB)		ernal system disk	an a
lick on any element in the storage sy	A WARNING: Completing this action will permanently delete existing da continuing.	ata on the selected disk. Back up data before	GS	
Array_0000 🦻	You can continue using other applications during this time.		ernal disk 3 GB	
Volume_0000: Degraded Rebu			emai emoty port	3
Details: Fix any problems reporte	More help	Rebuild Cancel		59.



## **APPENDIX D : Power Consumption**

## D.1 SPC-5000/SPC-5100

Testing Board	SPC-5000/SPC-5100		
RAM	8GB * 1		
USB-1 : (USB 3.0)	USB 3.0 Loopback Plug		
USB-2 : (USB 3.0)	USB 3.0 Loopback Plug		
USB-3 : (USB 3.0)	USB 3.0 Loopback Plug		
USB-4 : (USB 3.0)	USB 3.0 Loopback Plug		
USB-5 : (USB 2.0)	USB Mouse HP G1K28AA		
USB-6 : (USB 2.0)	USB Keyboard AOPEN CMS-730		
USB-7 : (USB 2.0)	Transcend JetFlash V60 USB 2.0 4GB		
USB-8 : (USB 2.0)	Kingston DataTraveler SE9 USB 2.0 8GB		
SATA 0	Innodisk 3MG2-P DGS25-64GD81BC1QC 64GB		
SATA 1	Transcend SSD370 TS64GSSD370 64GB		
mPCle 1	UMX-100		
mPCle 2	UMX-100		
FAN	SUNON PF40281B1-Q000-S99		
LAN1 (i219)	1.0Gbps		
LAN2 (i210)	1.0Gbps		
Graphics Output	DVI		
Power Plan	Balance (Windows10 Power plan)		
Power Source	Chroma 62006P-100-25		

# D.1.1 Intel<sup>®</sup> Core<sup>™</sup> i7-8665UE 1.70GHz (8M Cache, up to 4.40GHz)

		Standby Mode		Power on and boot to Win 10 (64-bit)			
CPU	Power Input			Sleep Mode		idle status CPU usage less 3%	
		Max Current	Max Consumption	Max Current	Max Consumption	Max Current	Max Consumption
Core™ i7- 8665UE	9V	0.425A	03.83W	0.497A	04.47W	1.382A	12.43W
	12V	0.325A	03.90W	0.378A	04.53W	1.155A	13.86W
	24V	0.189A	04.53W	0.215A	05.16W	0.522A	12.52W
	48V	0.122A	05.85W	0.132A	06.33W	0.324A	15.53W

CPU	Power Input	Power on and boot to Win10 (64-bit)						
		Run 100 usage v	0% CPU with 2D	Run 100% CPU usage with 3D				
		Max Current	Max Consumption	Max Current	Max Consumption			
	9V	2.240A	20.16W	4.270A	38.43W			
Core™ i7-	12V	1.678A	20.13W	3.300A	39.60W			
8665UE	24V	0.836A	20.07W	1.645A	39.48W			
	48V	0.455A	21.85W	0.847A	40.64W			

# D.1.2 Intel<sup>®</sup> Core<sup>™</sup> i5-8365UE 1.60GHz (6M Cache, up to 4.10GHz)

		Standby Mode		Power on and boot to Win 10 (64-bit)			
CPU	Power Input			Sleep Mode		idle status CPU usage less 3%	
		Max Current	Max Consumption	Max Current	Max Consumption	Max Current	Max Consumption
Core™ i5- 8365UE	9V	0.415A	03.73W	0.485A	04.37W	1.465A	13.19W
	12V	0.318A	03.81W	0.370A	04.44W	1.082A	12.98W
	24V	0.188A	04.51W	0.214A	05.14W	0.577A	13.84W
	48V	0.121A	05.82W	0.134A	06.45W	0.306A	14.70W

CPU	Power Input	Power on and boot to Win10 (64-bit)						
		Run 100 usage v	0% CPU with 2D	Run 100% CPU usage with 3D				
		Max Current	Max Consumption	Max Current	Max Consumption			
	9V	2.137A	19.23W	3.744A	33.70W			
Core™ i5-	12V	1.646A	19.76W	2.832A	33.99W			
8365UE	24V	0.802A	19.24W	1.395A	33.49W			
	48V	0.436A	20.93W	0.725A	34.81W			

# D.1.3 Intel<sup>®</sup> Core<sup>™</sup> i3-8145UE 2.20GHz (4M Cache, up to 3.90GHz)

		Standby Mode		Power on and boot to Win 10 (64-bit)			
CPU	Power Input			Sleep Mode		idle status CPU usage less 3%	
		Max Current	Max Consumption	Max Current	Max Consumption	Max Current	Max Consumption
Core™ i3- 8145UE	9V	0.416A	03.74W	0.485A	04.37W	1.429A	12.86W
	12V	0.317A	03.80W	0.368A	04.42W	1.054A	12.65W
	24V	0.185A	04.44W	0.211A	05.05W	0.543A	13.03W
	48V	0.120A	05.76W	0.133A	06.37W	0.334A	16.05W

CPU	Power Input	Power on and boot to Win10 (64-bit)						
		Run 100 usage v	0% CPU with 2D	Run 100% CPU usage with 3D				
		Max Current	Max Consumption	Max Current	Max Consumption			
	9V	2.040A	18.36W	3.601A	32.41W			
Core™ i3-	12V	1.578A	18.93W	2.666A	31.99W			
8145UE	24V	0.787A	18.88W	1.348A	32.35W			
	48V	0.414A	19.86W	0.698A	33.49W			

## D.2 SPC-5200

Testing Board	SPC-5200
RAM	8GB * 1
USB-1 : (USB 3.0)	USB 3.0 Loopback Plug
USB-2 : (USB 3.0)	USB 3.0 Loopback Plug
USB-3 : (USB 3.0)	USB 3.0 Loopback Plug
USB-4 : (USB 3.0)	USB 3.0 Loopback Plug
USB-5 : (USB 2.0)	USB Mouse HP G1K28AA
USB-6 : (USB 2.0)	USB Keyboard AOPEN CMS-730
USB-7 : (USB 2.0)	Transcend JetFlash V60 USB 2.0 4GB
USB-8 : (USB 2.0)	Kingston DataTraveler SE9 USB 2.0 8GB
SATA 0	Innodisk 3MG2-P DGS25-64GD81BC1QC 64GB
SATA 1	Transcend SSD370 TS64GSSD370 64GB
mPCle 1	PMX-100
mPCle 2	UMX-100
DIO	DMX-100-E
FAN	SUNON PF40281B1-Q000-S99
LAN1 (i219)	1.0Gbps
LAN2 (i210)	1.0Gbps
Graphics Output	DVI
Power Plan	Balance (Windows10 Power plan)
Power Source	Chroma 62006P-100-25

# D.2.1 Intel<sup>®</sup> Core<sup>™</sup> i7-8665UE 1.70GHz (8M Cache, up to 4.40GHz)

		Standby Mode		Power on and boot to Win 10 (64-bit)			
CPU	Power Input			Sleep Mode		idle status CPU usage less 3%	
		Max Current	Max Consumption	Max Current	Max Consumption	Max Current	Max Consumption
	9V	0.425A	03.83W	0.497A	04.47W	1.582A	14.24W
Core™ i7-	12V	0.325A	03.90W	0.378A	04.53W	1.316A	15.79W
8665UE	24V	0.189A	04.53W	0.215A	05.16W	0.597A	14.32W
	48V	0.122A	05.85W	0.132A	06.33W	0.380A	18.22W

CPU	Power Input	Power on and boot to Win10 (64-bit)						
		Run 100 usage v	0% CPU with 2D	Run 100% CPU usage with 3D				
		Max Current	Max Consumption	Max Current	Max Consumption			
	9V	2.440A	21.96W	4.471A	40.24W			
Core™ i7-	12V	1.838A	22.06W	3.461A	41.53W			
8665UE	24V	0.911A	21.87W	1.720A	41.28W			
	48V	0.511A	24.54W	0.903A	43.33W			

# D.2.2 Intel<sup>®</sup> Core<sup>™</sup> i5-8365UE 1.60GHz (6M Cache, up to 4.10GHz)

		Standby Mode		Power on and boot to Win 10 (64-bit)				
CPU	Power Input			Slee	ep Mode	idle status CPU usage less 3%		
		Max Current	Max Consumption	Max Current	Max Consumption	Max Current	Max Consumption	
Core™ i5- 8365UE	9V	0.415A	03.73W	0.485A	04.37W	1.866A	16.79W	
	12V	0.318A	03.81W	0.370A	04.44W	1.403A	16.83W	
	24V	0.188A	04.51W	0.214A	05.14W	0.727A	17.44W	
	48V	0.121A	05.82W	0.134A	06.45W	0.418A	20.08W	

CPU		Power on and boot to Win10 (64-bit)					
	Power Input	Run 100 usage v	0% CPU with 2D	Run 100% CPU usage with 3D			
		Max Current	Max Consumption	Max Current	Max Consumption		
Core™ i5- 8365UE	9V	2.338A	21.04W	3.945A	35.50W		
	12V	1.807A	21.68W	2.993A	35.91W		
	24V	0.877A	21.04W	1.470A	35.28W		
	48V	0.492A	23.62W	0.781A	37.50W		

# D.2.3 Intel<sup>®</sup> Core<sup>™</sup> i3-8145UE 2.20GHz (4M Cache, up to 3.90GHz)

		Standby Mode		Power on and boot to Win 10 (64-bit)				
CPU	Power Input			Slee	ep Mode	idle status CPU usage less 3%		
		Max Current	Max Consumption	Max Current	Max Consumption	Max Current	Max Consumption	
Core™ i3- 8145UE	9V	0.416A	03.74W	0.485A	04.37W	1.629A	14.66W	
	12V	0.317A	03.80W	0.368A	04.42W	1.214A	14.57W	
	24V	0.185A	04.44W	0.211A	05.05W	0.618A	14.83W	
	48V	0.120A	05.76W	0.133A	06.37W	0.390A	18.73W	

CPU		Power on and boot to Win10 (64-bit)					
	Power Input	Run 100 usage v	0% CPU with 2D	Run 100% CPU usage with 3D			
		Max Current	Max Consumption	Max Current	Max Consumption		
Core™ i3- 8145UE	9V	2.240A	20.16W	3.802A	34.22W		
	12V	1.738A	20.86W	2.826A	33.92W		
	24V	0.862A	20.68W	1.423A	34.15W		
	48V	0.470A	22.55W	0.754A	36.18W		



## APPENDIX E : Supported Memory & Storage List

### E.1 Test Item

\*1 (DIMM 1) PASS

Testing		SPC-5000/SPC-5100/SPC-5200						
Memor		MemTest86 V8.2						
BurnIr		BurnInTest Pro V8.1 (build 1025)						
Channel	Memory Test	Burn-in Test	Flash BIOS	Remove Batterv	Sleep	Hibernate	Reset	CPU-Z

PASS

PASS

PASS

## E.2 Supported Non-ECC Memory List

PASS

PASS

Brand	Info	Test Temp.(Celsius)
innodisk 4GB DDR4-2400 SODIMM	M4S0-4GSSN5SJ-H03	25°C
innodisk 16GB DDR4-2400 SODIMM	M4S0-AGS1OCSJ-H03	25°C
innodisk 4GB DDR4-2666 SODIMM	M4S0-4GSSNCIK-H03	25°C
innodisk 4GB DDR4-2666 SODIMM	M4S0-4GSSN5IK-H03	25°C
innodisk 8GB DDR4-2666 SODIMM	M4S0-8GS1N5IK-H03	25°C
innodisk 8GB DDR4-2666 SODIMM	M4S0-8GS1NCIK-H03	25°C
innodisk 8GB DDR4-2666 SODIMM	M4S0-8GSSOCIK-H03	25°C
innodisk 16GB DDR4-2666 SODIMM	M4S0-AGS1OCIK-H03	25°C
innodisk 16GB DDR4-2666 SODIMM	M4S0-AGS1O5IK-H03	25°C
SL-Link 16GB DDR4-2666 SODIMM	J4AGSH1G8QHFC	25°C
SL-Link 32GB DDR4-2666 SODIMM	J4BGSS2G8QHXI	25°C

PASS

PASS

## E.3 Supported Storage List

Туре	Brand	Model	Capacity
meata	Intel	Intel-310 SSDMAEMC080G2	80GB
IIISAIA	Kingston	SUV500MS	120GB
	Transcend	SSD370 TS64GSSD370	64GB
	innodisk	3MG2-P DGS25-64GD81BC1QC	64GB
	Kingston	SA400S371120G	120GB
	Intel	SSD E 5400s SSDSC2KR120H6	120GB
SATA SSD	MEMXPRO	M3A MI3MA1212802WN	128GB
	FORESEE	S903S128G	128GB
	FORESEE	S903S256G	256GB
	LITE-ON	K8-L1256	256GB
	LITE-ON	K8-L1512	512GB
## APPENDIX F: Install Win11 (BIOS TPM Setting)

## Step 1 Click on "Advanced", then click on "PCH-FW Configuration"

Aptio Setup Utility – Copyright (C) 2022 American Megatrends, Inc. Main <mark>Advanced</mark> Chipset Security Boot Save & Exit		
<ul> <li>▶ CPU Configuration</li> <li>▶ Power &amp; Performance</li> <li>▶ PCH-FW Configuration</li> </ul>	Configure Management Engine Technology Parameters	
<ul> <li>ACPI Settings</li> <li>SMART Settings</li> <li>IT8786 Super IO Configuration</li> <li>Hardware Monitor</li> <li>Serial Port Console Redirection</li> <li>Intel TXT Information</li> <li>Acoustic Management Configuration</li> <li>PCI Subsystem Settings</li> <li>Network Stack Configuration</li> <li>CSM Configuration</li> <li>USB Configuration</li> </ul>	≁: Select Screen †↓: Select Item	

## Step 2 Click on "PTT Configuration"

Aptio Setup Utility Advanced	∣ – Copyright (C) 2022 Ame	erican Megatrends, Inc.
ME Firmware Version ME Firmware Mode ME Firmware SKU ME File System Integrity Value ME Firmware Status 1 ME Firmware Status 2 NFC Support	11.8.77.3664 Normal Mode Corporate SKU 2 Ox90000255 Ox80108306 Disabled	Configure PTT
ME State AMT BIOS Features ► AMT Configuration ME Upconfig on BTC Clear	[Enabled] [Enabled]	
▶ PTT Configuration	[Endored]	→++: Select Screen ↑↓: Select Item Enter: Select

F



## **Step 3** Click on "dTPM" (TPM Device Selection)



**Step 4** Please save the BIOS settings by pressing F4. Please press Enter when the pop-up window which asks "Save configuration and exit?" appears. The computer will then restart.

Aptio Setup Uti Advanced	ility – Copyright (C) 2022 American	n Megatrends, Inc.
PTT Capability / State	1 / 0	Selects TPM device: PTT or dTPM, PTT – Enables PTT in
TPM Device Selection PTP aware OS	[dTPM] [PTP Aware]	SkuMgr dTPM 1.2 – Disables PTT in SkuMgr Warning ! PTT/dTPM will be disabled and all data saved on it will be lost.
	Save & Exit Setup ——— Save configuration and exit?	
	Yes No	←: Select Screen ↓: Select Item nter: Select
		F1: General Help F2: Previous Values F3: Optimized Defaults

Step 5 Click on "Trusted Computing"

Aptio Setup Utility – Copyright (C) 2022 Ameri Main <mark>Advanced</mark> Chipset Security Boot Save & Exit	ican Megatrends, Inc.
<ul> <li>CPU Configuration</li> <li>Power &amp; Performance</li> <li>PCH-EW Configuration</li> </ul>	Trusted Computing Settings
▶ Trusted Computing	
<ul> <li>HCF1 Settings</li> <li>SMART Settings</li> <li>IT8786 Super IO Configuration</li> <li>Hardware Monitor</li> <li>Serial Port Console Redirection</li> <li>Intel TXT Information</li> <li>Acoustic Management Configuration</li> <li>AMI Graphic Output Protocol Policy</li> <li>PPI Subsustem Settings</li> </ul>	
<ul> <li>Network Stack Configuration</li> </ul>	↔+: Select Screen
▶ CSM Configuration	t↓: Select Item
▶ USB Configuration	Enter: Select

**Step 6** If the window shows "TPM2.0 Device Found Firmware Version:5.62", then the setting is completed.



\*\* If more help is needed, please contact Vecow technical support \*\*



For further support information, please visit www.vecow.com

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