AICOTEK

Empowering the world with AI solutions

BPC-511&BPC-513
User Manual



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Safety Precautions

1. Please read and follow the safety precautions before you are going to use it.
2. Pay attention to the labels on the product.
3. Make sure to use in an environment that meets the design specifications, otherwise, malfunction or partial damage caused by non-compliance with relevant regulations is not covered under the product quality guarantee.
4. Please unplug the power cord and do not use liquids to clean the PC.
5. Please keep the PC in a safe space to prevent it from falling and damaging its components.
6. Please keep the power cord in a safe location to avoid causing personal injury.
7. Please do not bundle control wires, communication cables and power wires together, it would be better to keep a distance of at least 100mm between them to avoid mutual interference.
8. It is recommended to use wires with isolation, especially in environments with severe electromagnetic interference.
9. Please disconnect it from the power socket if the PC is not used for a long time.
10. Please make sure that no liquids enter the device to avoid the risk of fire or short circuit.
11. Please disconnect the power cord before opening the computer case.
12. Please clean the dust regularly.
13. Please ask for technical support and return the PC to RMA:
    The power cord or plug is damaged;
    Liquid has entered the interior of the PC;
    PC doesn't work;
    PC is damaged;
    Physical damage on the PC.

Chapter 1

Genernal Introduction

This chapter gives background information on the BPC-511&BPC-513.

1.1 BPC-511 Introduction

The BPC-511 is a compact fanless Box PC featuring a wide range of I/O interfaces, including 4 × USB 3.2 Gen1, 2 x USB2.0 Type-A, 2 × Gigabit LAN, 1 × HDMI supporting 4K@60Hz, 1 × DP supporting 4K@60Hz, 1 × RS232, 1 × RS485, 1 × Audio Combo Jack, and 1 × SIM card slot. It supports DC 12–24V wide voltage input, as well as optional Wi-Fi, Bluetooth, and 4G/5G connectivity, providing flexible connectivity for industrial automation, data acquisition, and edge computing applications.

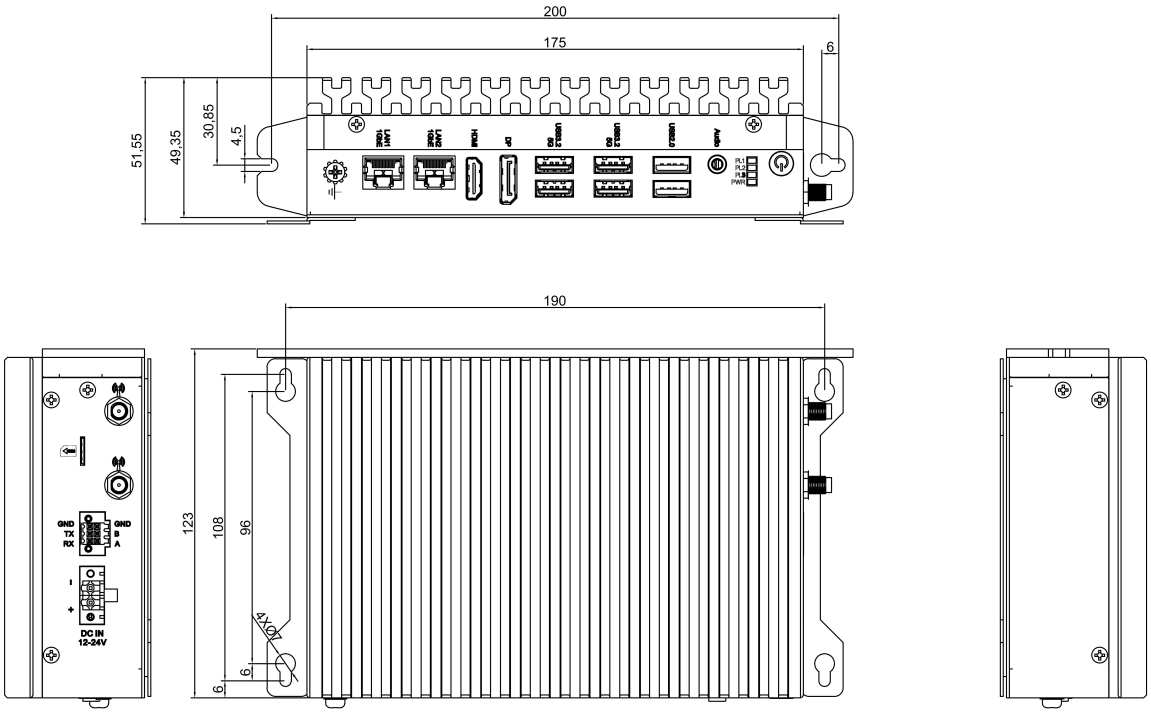
1.1.1 Product Specifications

Model Name		BPC-511
System	CPU	AMD Ryzen™ Embedded R2314 Processor
	Memory	1 x DDR4 SO-DIMM 3200MT/s, Max. 32 GB
	Storage	1 x M.2 M Key 2280 PCIe4.0 x4 NVMe SSD
	Display	1 x HDMI, support 4K@60Hz, 1 x DP, support 4K@60Hz
	USB	4 x USB3.2 Gen1 Type-A 2 x USB2.0 Type-A
	LAN	2 x RJ45, 10/100/1000Mbps
	Expansion	1 x M.2 E Key 2230 for WiFi & Bluetooth, 1 x M.2 B Key 3042/3052 for 4G/5G,
	Audio	1 x Audio Combo Jack(CTIA)
	COM	1 x RS232, 1 x RS485
	SIM Card	1 x Nano SIM Card slot
	TPM	fTPM2.0
OS	OS Support	Windows10/11, Linux
Power	Input Voltage	DC IN, 12-24V
Mechanical	Dimensions	175x123x49.4mm (6.9x4.8x1.9 in)
	Weight	1.3 kg

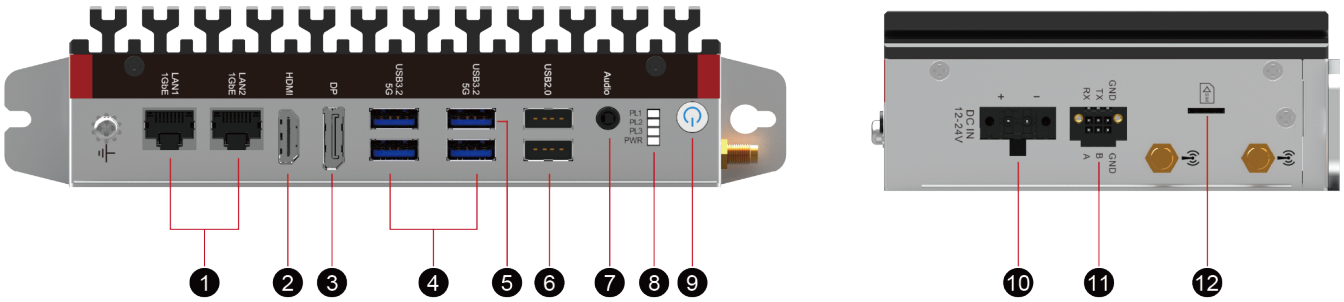
Model Name		BPC-511
Environment	Operating Temperature	0-60℃ (32-140°F)
	Storage Temperature	-20-75℃ (-4-167°F)
	Relative Humidity	10%-90% (non-condensing)
	Vibration	Operating random vibration test 5~500Hz, 1Grms @with SSD, follows IEC 60068-2-64
	Shock	Operating 10G peak acceleration (11ms duration), follows IEC 60068-2-27
	EMC	CE FCC

1.1.2 Dimensions

175 x 123 x 49.4mm



1.1.3 I/O Introduction

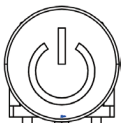


1	2 x RJ45, 1000Mbps	7	Audio Combo Jack
2	1 x HDMI, 4K@60Hz	8	PWR & PL1 & PL2 & PL3 LED
3	1 x DP, 4K@60Hz	9	Power Button
4	4 x USB3.2 Gen1	10	DC IN, 12V-24V
5*	1 x USB2.0 Type-A	11	1 x RS232, 1 x RS485
6	2 x USB2.0 Type-A	12	Nano SIM Card slot

5*:This port shares the USB 3.0 signals with the internal M.2 4G/5G module. Since the USB 3.0 signals are currently configured for the internal M.2 4G/5G module, this external port supports USB 2.0 functionality and data rates only

1.1.4 External I/O

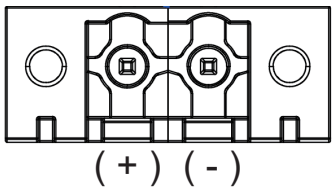
1. Power Button



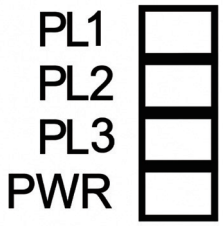
Operation	Function
Press One Times	Turn on or off
Long press for 4 seconds	Forced shutdown

2. Power Input Connector

BPC-511 is designed with the phoenix connector and 12-24V DC input. (-) stands for GND; (+) stands for +12-24V, supports Over-Voltage Protection, Under-Voltage Protection, Over-Current Protection, Reverse-Polarity Protection.



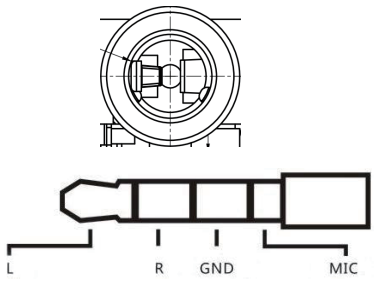
3. LED



PIN	LED	Status	Description
1	Power Led	off	The product is power off
		on(Yellow)	The product is power on
2	PL3	(Yellow)	User programmable led by setting the GPO
3	PL2	(Yellow)	User programmable led by setting the GPO
4	PL1	(Yellow)	User programmable led by setting the GPO

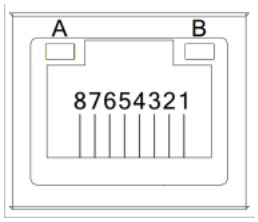
4 Audio

3.5mm audio combo jack, supporting left and right stereo audio output and microphone input.



5 LAN

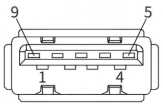
BPC-511 is equipped with two Ethernet controllers that are fully compliant with IEEE 802.3u 10/100/1000 Mbps CSMA/CD standards. The Ethernet port provides a standard RJ-45 jack connector with LED indicators on the front side to show its Active/Link status (Green LED) and Speed status (Yellow LED).



PIN	Definition		PIN	Definition	
1	MDI0+		5	MDI2-	
2	MDI0-		6	MDI1-	
3	MDI1+		7	MDI3+	
4	MDI2+		8	MDI3-	
A	Active LED	ACT:Twinkling Yellow	B	Speed LED	1000M: Turn Yellow
		Only LINK: Lights On			100M: Turn Green
		NO LINK: Lights Off			10M: Lights Off

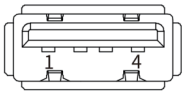
6 USB

BPC-511 supports three USB3.2 Gen2 interfaces.



PIN	Definition	PIN	Definition
1	VBUS	6	SSRX+
2	DATA-	7	GND-DRAIN
3	DATA+	8	SSTX-
4	GND	9	SSTX+
5	SSRX-		

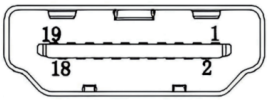
BPC-511 supports three USB2.0 interfaces.



PIN	Definition	PIN	Definition
1	VCC5	3	DATA+
2	DATA-	4	GND

7 HDMI

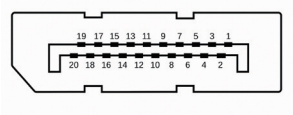
HDMI support 4K@60Hz.



PIN	Definition	PIN	Definition
1	TMDS DATA2+	11	TMDS Clock Shield
2	TMDS DATA2 Shield	12	TMDS Clock-
3	TMDS DATA2-	13	NC
4	TMDS DATA1+	14	NC
5	TMDS DATA1 Shield	15	SCL
6	TMDS DATA1-	16	SDA
7	TMDS DATA0+	17	GND
8	TMDS DATA0 Shield	18	+5V Power
9	TMDS DATA0-	19	Hot Plug Detect
10	TMDS Clock+		

8 DP

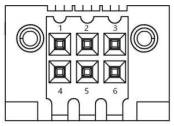
DP support 4K@60Hz.



PIN	Definition	PIN	Definition
1	ML_Lane 0+	11	GND
2	GND	12	ML_Lane 3-
3	ML_Lane 0-	13	NC
4	ML_Lane 1+	14	NC
5	GND	15	AUX_CH+
6	ML_Lane 1-	16	GND
7	ML_Lane 2+	17	AUX_CH-
8	GND	18	Hot Plug Detect
9	ML_Lane 2-	19	GND
10	ML_Lane 3+	20	DP_PWR(+3.3V)

9 COM

RX/TX are used for RS-232(COM4) communication; A/B are used for RS-485(COM6) communication.



PIN	Definition	PIN	Definition
1	RX	4	A
2	TX	5	B
3	GND	6	GND

10 M.2 E key 2230

M.2 E Key 2230 for WiFi & Bluetooth.



PIN	Definition	PIN	Definition
1	GND	2	3.3V
3	USB_D+	4	3.3V
5	USB_D-	6	/
7	GND	8	/
9	/	10	/
11	/	12	/
13	GND	14	/
15	/	16	/
17	/	18	GND
19	GND	20	/
21	/	22	/
23	/	24	/
25	/	26	/
27	/	28	/
29	/	30	/
31	/	32	/
33	GND	34	/
35	PETP0	36	/
37	PETN0	38	/
39	GND	40	/
41	PERP0	42	/
43	PERN0	44	/
45	GND	46	/
47	REFCLKP0	48	/
49	REFCLKN0	50	/
51	GND	52	PERST0*
53	CLKREQ0*	54	BT_RF_KILL_N
55	PEWAKE0*	56	WIFI_RF_KILL_N
57	GND	58	/
59	/	60	/
61	/	62	/
63	GND	64	/
65	/	66	/
67	/	68	/
69	GND	70	/
71	/	72	3.3V
73	/	74	3.3V
75	GND		

11 M.2 M key 2280

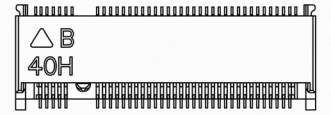
M.2 M Key 2280 PCIe4.0 x4 NVMe SSD.



PIN	Definition	PIN	Definition
1	GND	2	3.3V
3	GND	4	3.3V
5	PERN3	6	/
7	PERP3	8	/
9	GND	10	/
11	PETN3	12	3.3V
13	PETP3	14	3.3V
15	GND	16	3.3V
17	PERN2	18	3.3V
19	PERP2	20	/
21	GND	22	/
23	PETN2	24	/
25	PETP2	26	/
27	GND	28	/
29	PERN1	30	/
31	PERP1	32	/
33	GND	34	/
35	PETN0	36	/
37	PETP0	38	/
39	GND	40	/
41	PERN0	42	/
43	PERP0	44	/
45	GND	46	/
47	PETN0	48	/
49	PETP0	50	PERST#
51	GND	52	CLKREQ#
53	REFCLKN	54	PEWake#
55	REFCLKP	56	/
57	GND	58	/
59	/	60	/
61	/	62	/
63	/	64	/
65	/	66	/
67	/	68	/
69	/	70	3.3V
71	GND	72	3.3V
73	GND	74	3.3V
75	GND		

12 M.2 B key 3042/3052

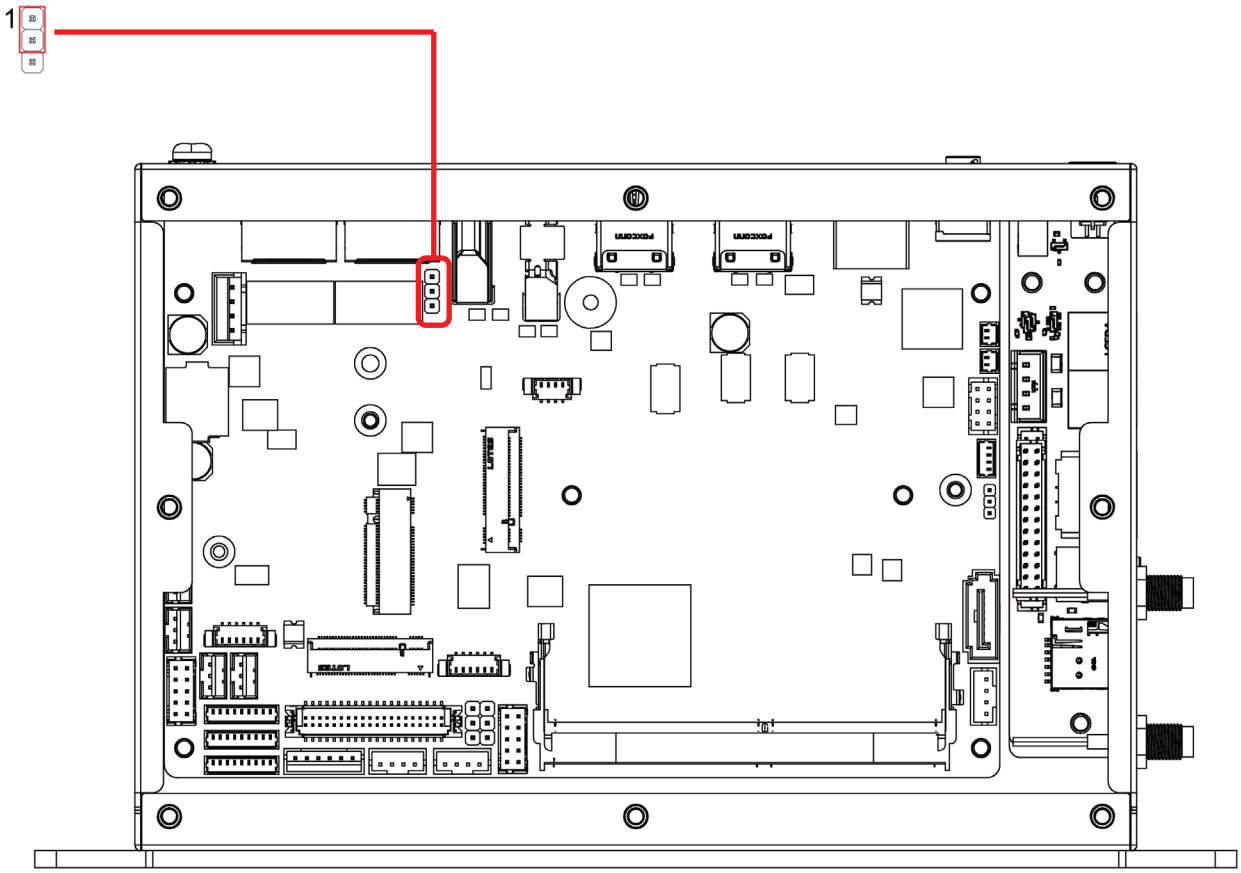
1 x M.2 B Key 3042/3052 for 4G/5G



PIN	Definition	PIN	Definition
1	GND	2	3.3V
3	GND	4	3.3V
5	GND	6	FULL CARD POWER OFF1#
7	USB_D+	8	AIRPLANE MODET1#
9	USB_D-	10	/
11	GND	12	/
13	/	14	/
15	/	16	/
17	/	18	/
19	/	20	/
21	/	22	/
23	PCH WAKE N	24	/
25	/	26	/
27	GND	28	UIM1_VPP
29	USB31_RXN0	30	UIM1_RST
31	USB31_RXP0	32	UIM1_CLK
33	GND	34	UIM1_DAT
35	USB31_TXN0	36	UIM1_PWR
37	USB31_TXP0	38	/
39	GND	40	/
41	PCIE_RXP0	42	/
43	PCIE_RXN0	44	/
45	GND	46	/
47	PCIE_TXN0	48	/
49	PCIE_TXP0	50	PERST#
51	GND	52	CLKREQ#
53	PCIECLKN	54	PEWake#
55	PCIECLKP	56	SMB_SDA
57	GND	58	SMB_SCL
59	/	60	/
61	/	62	/
63	/	64	/
65	/	66	/
67	RESET#	68	SUSCLK
69	KEYB_CFG	70	3.3V
71	GND	72	3.3V
73	GND	74	3.3V
75	/		

1.1.5 CMOS Clear Select

Setting	Function
1-2(Default)	Normal
2-3	Clear CMOS



1.2 BPC-513 Introduction

The BPC-513 is a compact fanless Box PC featuring a wide range of I/O interfaces, including 4 × USB 3.2 Gen1, 2 x USB2.0 Type-A, 4 × Gigabit LAN, 1 × HDMI supporting 4K@60Hz, 1 × DP supporting 4K@60Hz, 1 × RS232, 1 × RS485, 1 × Audio Combo Jack. It supports DC 12–24V wide voltage input, providing flexible connectivity for industrial automation, data acquisition, and edge computing applications.

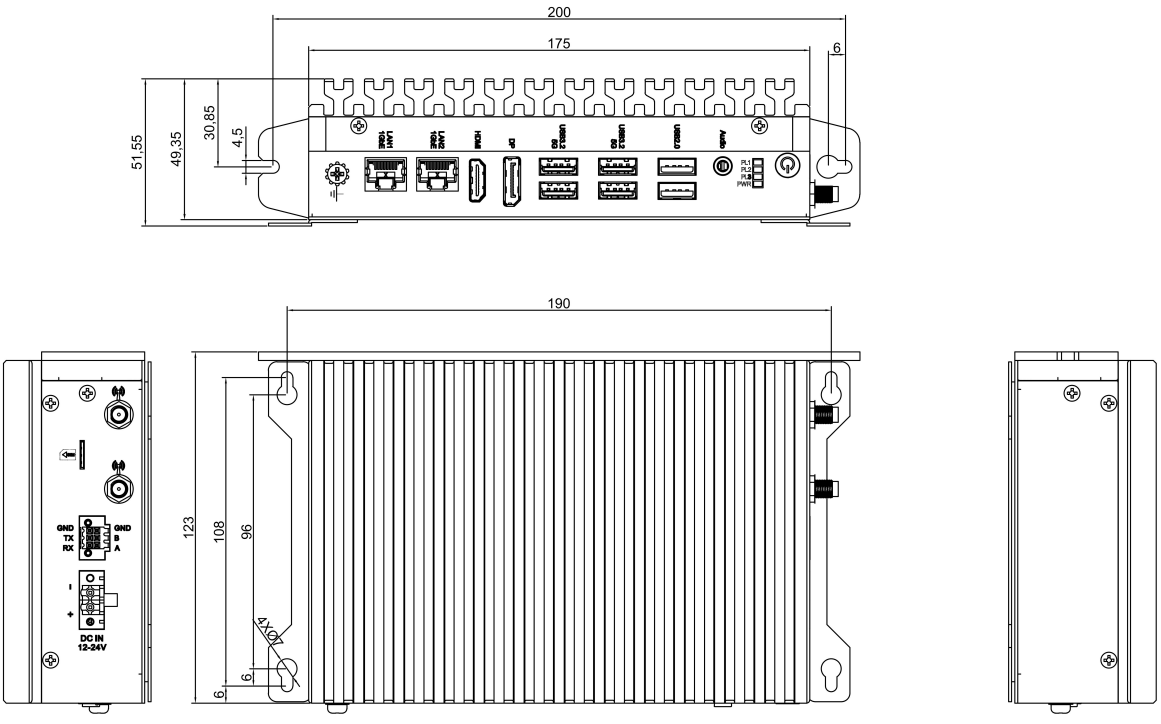
1.2.1 Product Specifications

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	Display	1 x HDMI, support 4K@60Hz, 1 x DP, support 4K@60Hz
	USB	4 x USB3.2 Gen1 Type-A 2 x USB2.0 Type-A
	LAN	4 x RJ45, 10/100/1000Mbps
	Expansion	1 x M.2 E Key 2230 for WiFi & Bluetooth
	Audio	1 x Audio Combo Jack(CTIA)
	COM	1 x RS232, 1 x RS485
	TPM	fTPM2.0
OS	OS Support	Windows10/11, Linux
Power	Input Voltage	DC IN, 12-24V
Mechanical	Dimensions	175x160x49.4mm (6.9x6.3x1.9 in)
	Weight	1.3 kg

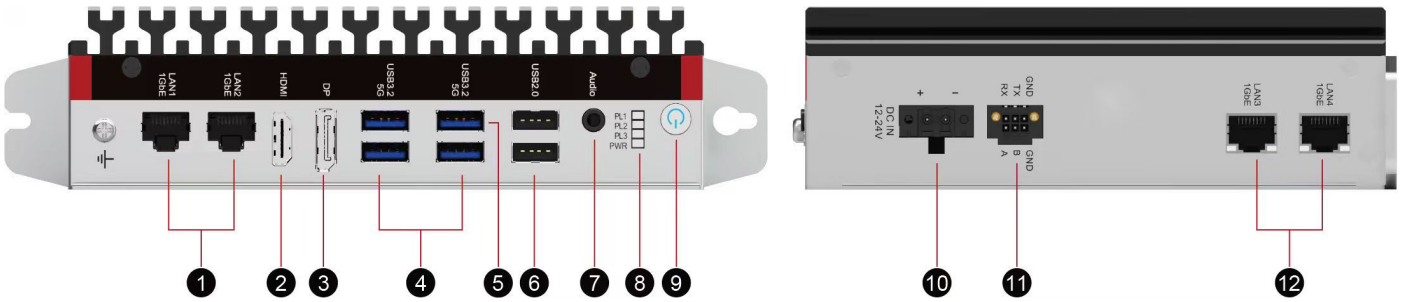
Model Name		BPC-513
Environment	Operating Temperature	0-60℃ (32-140°F)
	Storage Temperature	-20-75℃ (-4-167°F)
	Relative Humidity	10%-90% (non-condensing)
	Vibration	Operating random vibration test 5~500Hz, 1Grms @with SSD, follows IEC 60068-2-64
	Shock	Operating 10G peak acceleration (11ms duration), follows IEC 60068-2-27
	EMC	CE FCC

1.2.2 Dimensions

175 x 160 x 49.4mm



1.2.3 I/O Introduction

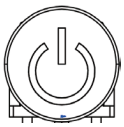


1	2 x RJ45, 1000Mbps	7	Audio Combo Jack
2	1 x HDMI, 4K@60Hz	8	PWR & PL1 & PL2 & PL3 LED
3	1 x DP, 4K@60Hz	9	Power Button
4	4 x USB3.2 Gen1	10	DC IN, 12V-24V
5*	1 x USB2.0 Type-A	11	1 x RS232, 1 x RS485
6	2 x USB2.0 Type-A	12	2 x RJ45, 1000Mbps

5*:This port shares the USB 3.0 signals with the internal M.2 4G/5G module. Since the USB 3.0 signals are currently configured for the internal M.2 4G/5G module, this external port supports USB 2.0 functionality and data rates only

1.2.4 External I/O

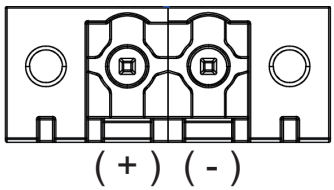
1. Power Button



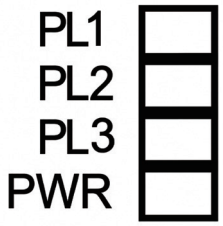
Operation	Function
Press One Times	Turn on or off
Long press for 4 seconds	Forced shutdown

2. Power Input Connector

BPC-513 is designed with the phoenix connector and 12-24V DC input. (-) stands for GND; (+) stands for +12-24V, supports Over-Voltage Protection, Under-Voltage Protection, Over-Current Protection, Reverse-Polarity Protection.



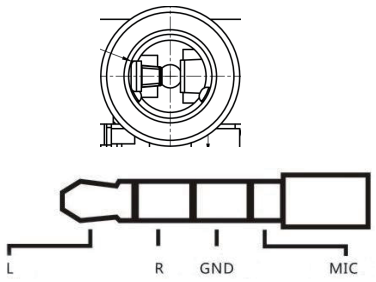
3. LED



PIN	LED	Status	Description
1	Power Led	off	The product is power off
		on(Yellow)	The product is power on
2	PL3	(Yellow)	User programmable led by setting the GPO
3	PL2	(Yellow)	User programmable led by setting the GPO
4	PL1	(Yellow)	User programmable led by setting the GPO

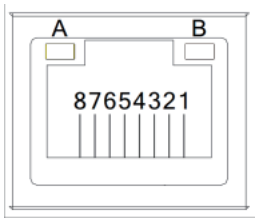
4. Audio

3.5mm audio combo jack, supporting left and right stereo audio output and microphone input.



5. LAN

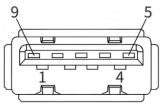
BPC-513 is equipped with four Ethernet controllers that are fully compliant with IEEE 802.3u 10/100/1000 Mbps CSMA/CD standards. The Ethernet port provides a standard RJ-45 jack connector with LED indicators on the front side to show its Active/Link status (Green LED) and Speed status (Yellow LED).



PIN	Definition		PIN	Definition	
1	MDI0+		5	MDI2-	
2	MDI0-		6	MDI1-	
3	MDI1+		7	MDI3+	
4	MDI2+		8	MDI3-	
A	Active LED	ACT:Twinkling Yellow	B	Speed LED	1000M: Turn Yellow
		Only LINK: Lights On			100M: Turn Green
		NO LINK: Lights Off			10M: Lights Off

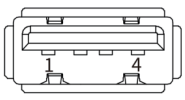
6. USB

BPC-513 supports three USB3.2 Gen2 interfaces.



PIN	Definition	PIN	Definition
1	VBUS	6	SSRX+
2	DATA-	7	GND-DRAIN
3	DATA+	8	SSTX-
4	GND	9	SSTX+
5	SSRX-		

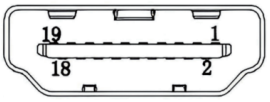
BPC-513 supports three USB2.0 interfaces.



PIN	Definition	PIN	Definition
1	VCC5	3	DATA+
2	DATA-	4	GND

7. HDMI

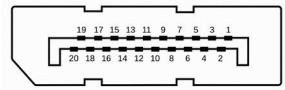
HDMI support 4K@60Hz.



PIN	Definition	PIN	Definition
1	TMDS DATA2+	11	TMDS Clock Shield
2	TMDS DATA2 Shield	12	TMDS Clock-
3	TMDS DATA2-	13	NC
4	TMDS DATA1+	14	NC
5	TMDS DATA1 Shield	15	SCL
6	TMDS DATA1-	16	SDA
7	TMDS DATA0+	17	GND
8	TMDS DATA0 Shield	18	+5V Power
9	TMDS DATA0-	19	Hot Plug Detect
10	TMDS Clock+		

8. DP

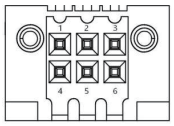
DP support 4K@60Hz.



PIN	Definition	PIN	Definition
1	ML_Lane 0+	11	GND
2	GND	12	ML_Lane 3-
3	ML_Lane 0-	13	NC
4	ML_Lane 1+	14	NC
5	GND	15	AUX_CH+
6	ML_Lane 1-	16	GND
7	ML_Lane 2+	17	AUX_CH-
8	GND	18	Hot Plug Detect
9	ML_Lane 2-	19	GND
10	ML_Lane 3+	20	DP_PWR(+3.3V)

9. COM

RX/TX are used for RS-232(COM4) communication; A/B are used for RS-485(COM6) communication.



PIN	Definition	PIN	Definition
1	RX	4	A
2	TX	5	B
3	GND	6	GND

10. M.2 E key 2230

M.2 E Key 2230 for WiFi & Bluetooth.



PIN	Definition	PIN	Definition
1	GND	2	3.3V
3	USB_D+	4	3.3V
5	USB_D-	6	/
7	GND	8	/
9	/	10	/
11	/	12	/
13	GND	14	/
15	/	16	/
17	/	18	GND
19	GND	20	/
21	/	22	/
23	/	24	/
25	/	26	/
27	/	28	/
29	/	30	/
31	/	32	/
33	GND	34	/
35	PETP0	36	/
37	PETN0	38	/
39	GND	40	/
41	PERP0	42	/
43	PERN0	44	/
45	GND	46	/
47	REFCLKP0	48	/
49	REFCLKN0	50	/
51	GND	52	PERST0*
53	CLKREQ0*	54	BT_RF_KILL_N
55	PEWAKE0*	56	WIFI_RF_KILL_N
57	GND	58	/
59	/	60	/
61	/	62	/
63	GND	64	/
65	/	66	/
67	/	68	/
69	GND	70	/
71	/	72	3.3V
73	/	74	3.3V
75	GND		

11. M.2 M key 2280

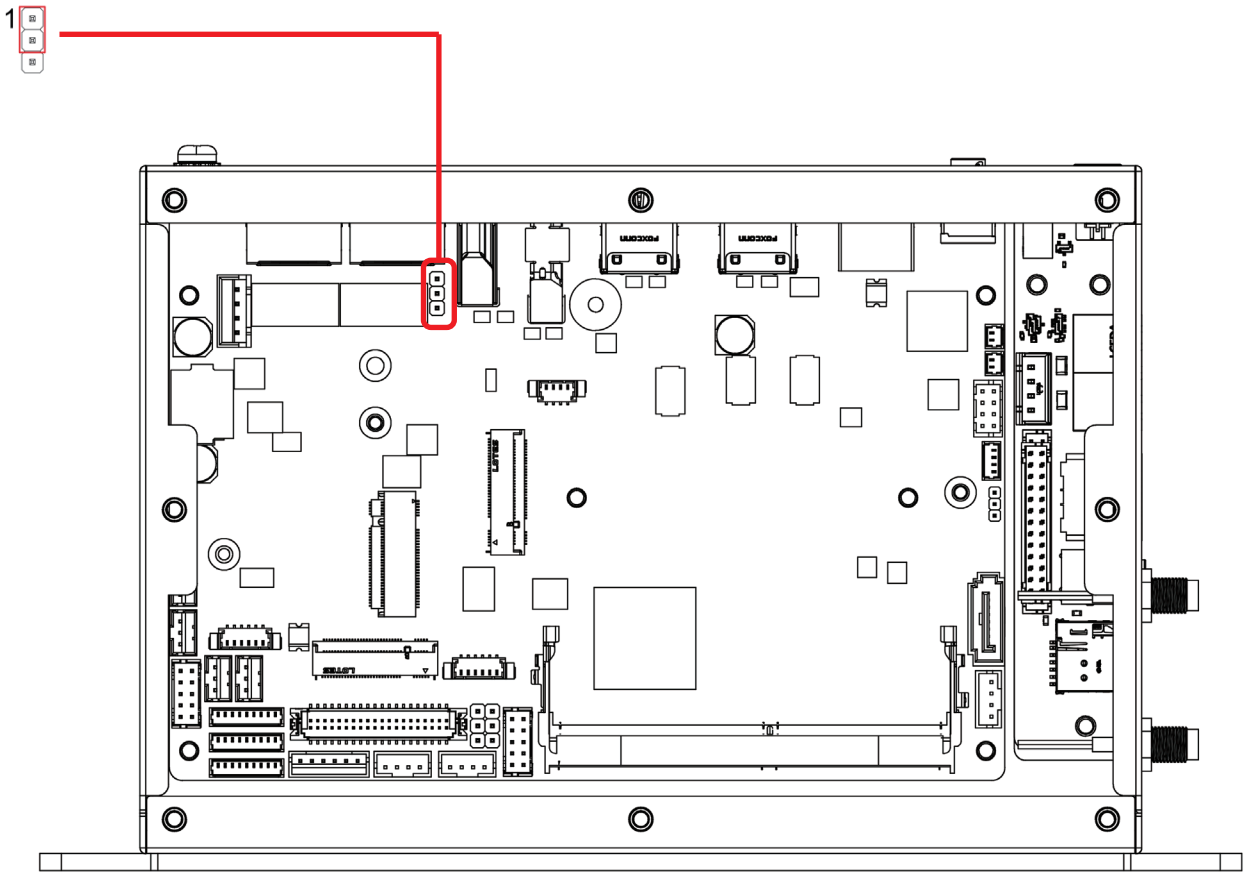
M.2 M Key 2280 PCIe4.0 x4 NVMe SSD.



PIN	Definition	PIN	Definition
1	GND	2	3.3V
3	GND	4	3.3V
5	PERN3	6	/
7	PERP3	8	/
9	GND	10	/
11	PETN3	12	3.3V
13	PETP3	14	3.3V
15	GND	16	3.3V
17	PERN2	18	3.3V
19	PERP2	20	/
21	GND	22	/
23	PETN2	24	/
25	PETP2	26	/
27	GND	28	/
29	PERN1	30	/
31	PERP1	32	/
33	GND	34	/
35	PETN0	36	/
37	PETP0	38	/
39	GND	40	/
41	PERN0	42	/
43	PERP0	44	/
45	GND	46	/
47	PETN0	48	/
49	PETP0	50	PERST#
51	GND	52	CLKREQ#
53	REFCLKN	54	PEWake#
55	REFCLKP	56	/
57	GND	58	/
59	/	60	/
61	/	62	/
63	/	64	/
65	/	66	/
67	/	68	/
69	/	70	3.3V
71	GND	72	3.3V
73	GND	74	3.3V
75	GND		

1.2.5 CMOS Clear Select

Setting	Function
1-2(Default)	Normal
2-3	Clear CMOS



Chapter 2

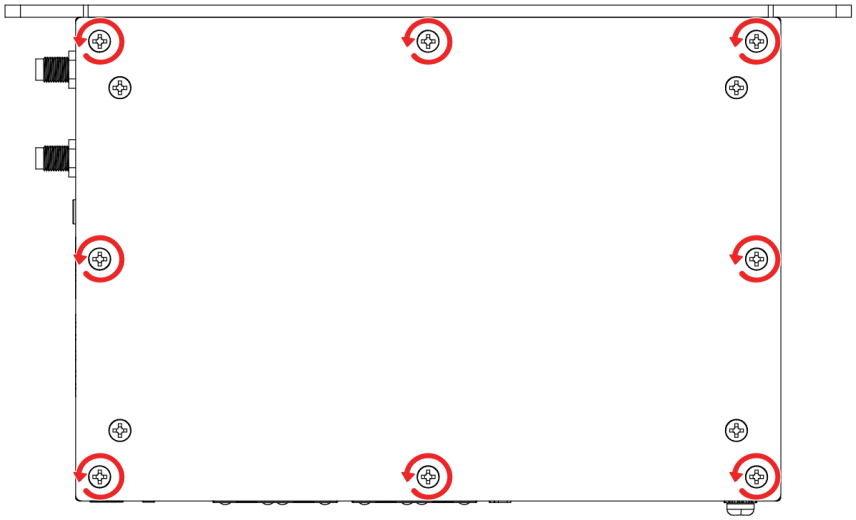
H/W Installation

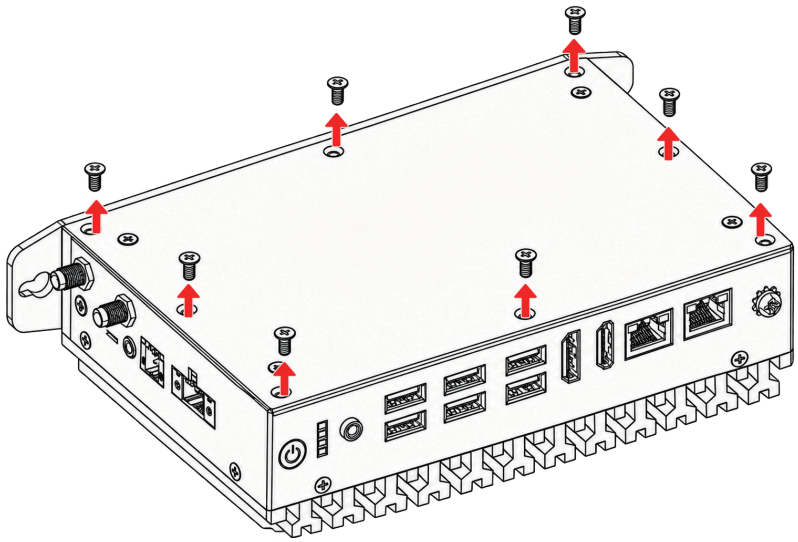
This chapter introduces the external I/O and the installation of BPC-511 & BPC-513 hardware.

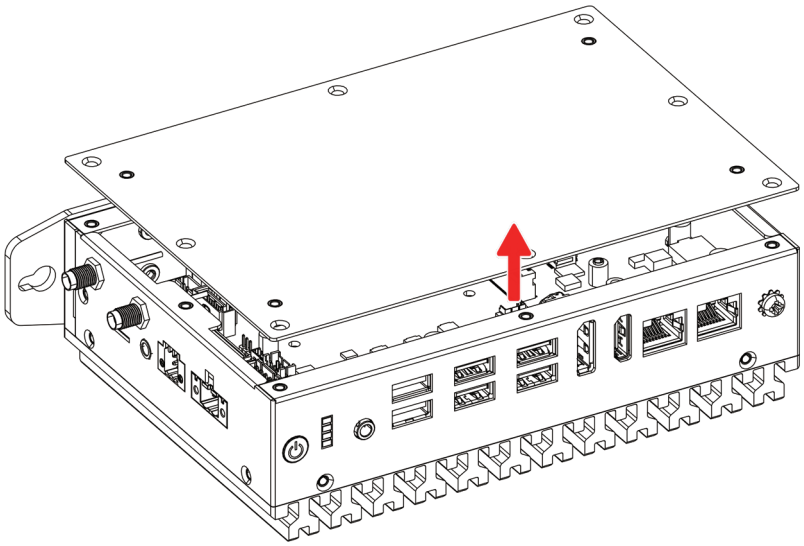
2.1 BPC-511 Installation

2.1.1 Memory Installation

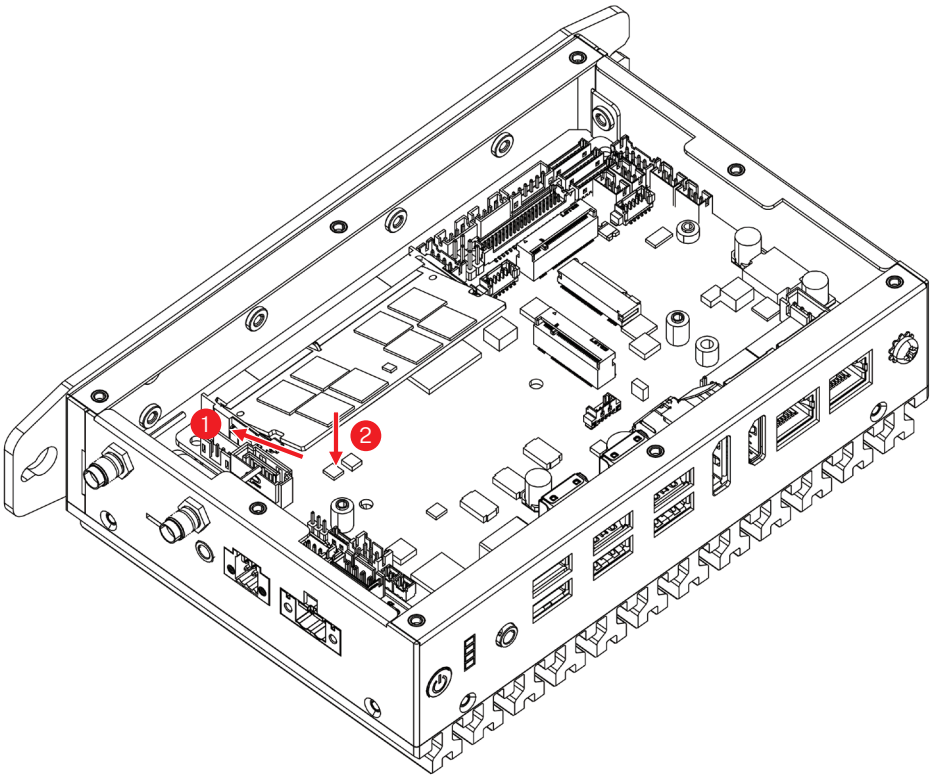
1. Loosen screws, open bottom case





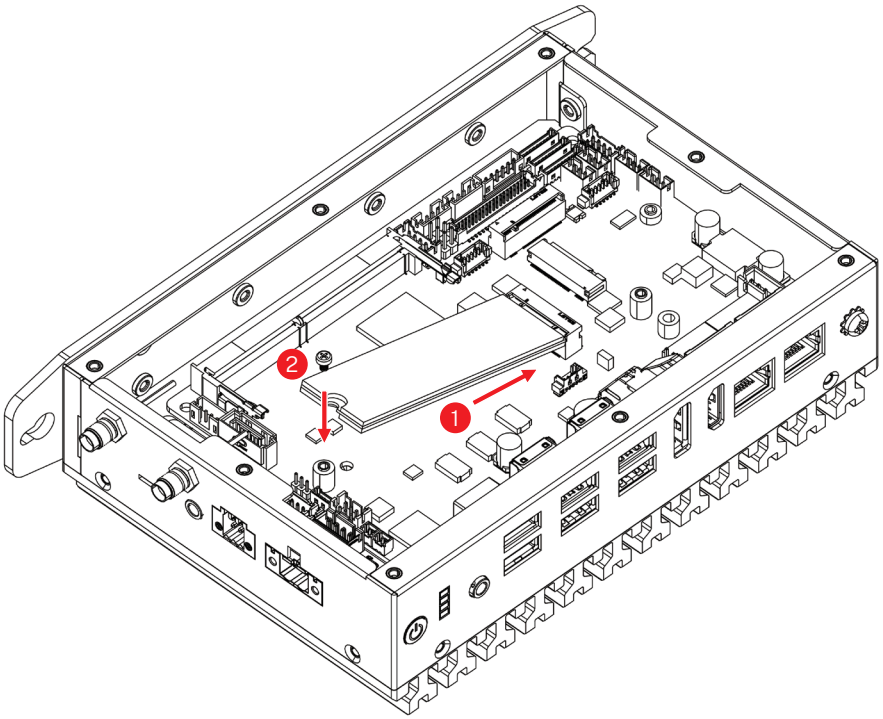


2. Install memory and tighten up the screws again.



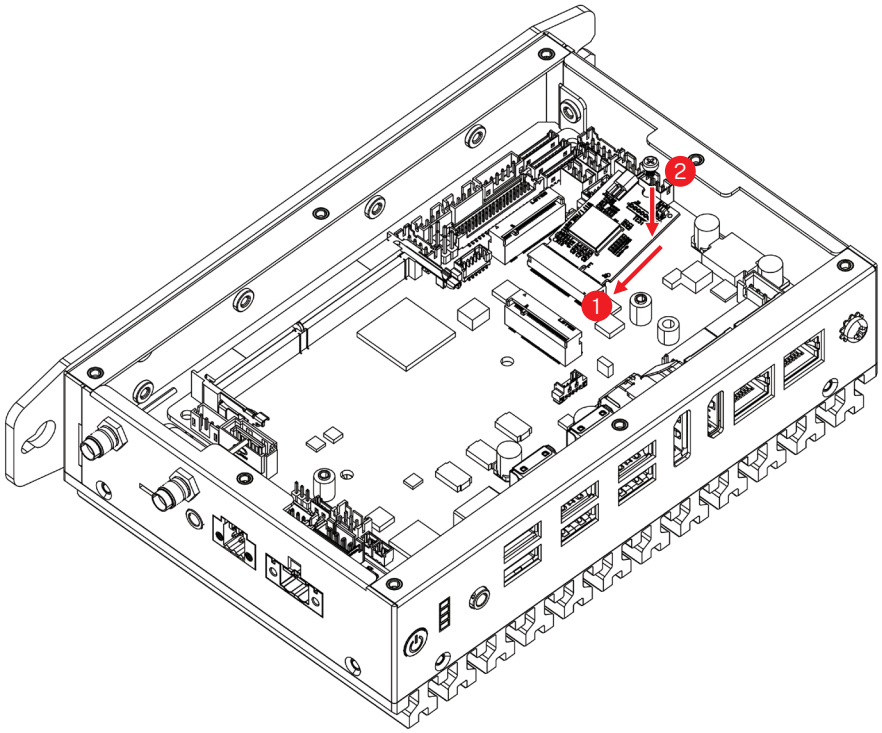
2.1.2 M.2 B Key 2280 SSD Installation

1. Repeat step 1 of Chapter 2.1.1 to open the back cover.Install M.2 Bkey 2280 SSD(NVME) and tighten up the screws again.



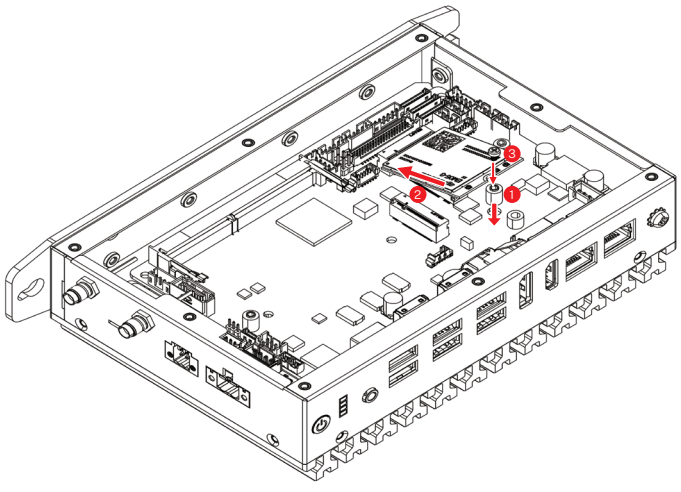
2.1.3 M.2 E Key 2230 Installation

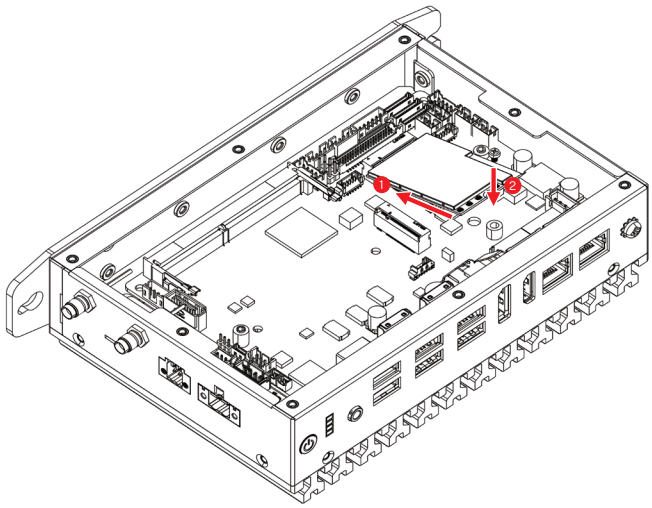
1. Repeat step 1 of Chapter 2.1.1 to open the back cover.Install M.2 Ekey 2230 card and tighten up the screws again.



2.1.4 M.2 B Key 3052/3042 Installation

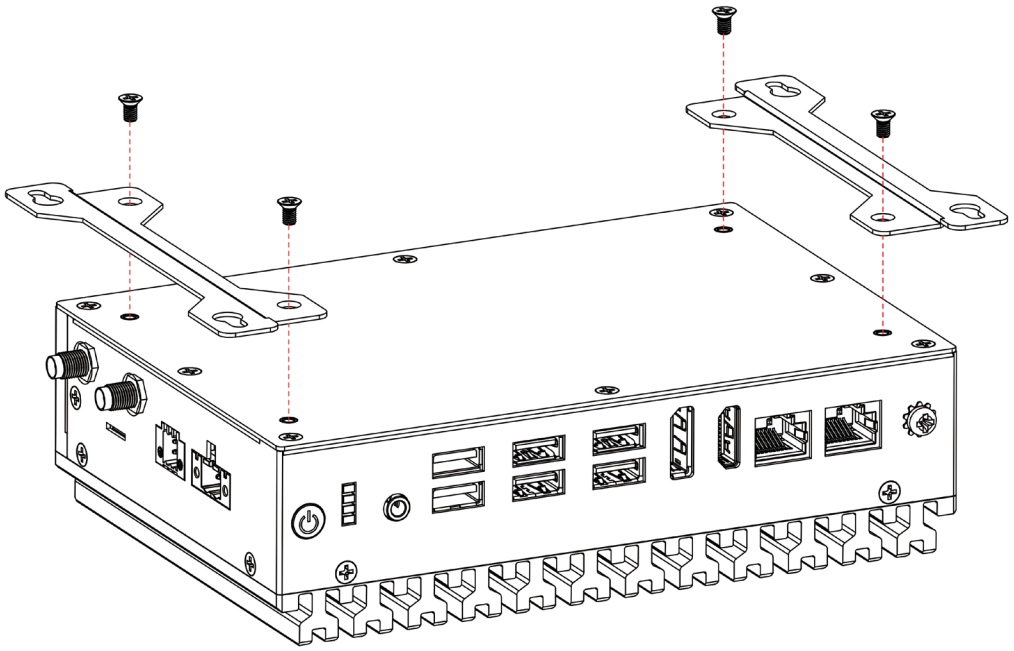
1. Repeat step 1 of Chapter 2.1.1 to open the back cover.Install M.2 B Key 3052 and tighten up the screws again.(Installation of the M.2 B Key 3042 requires the use of the included standoffs.)



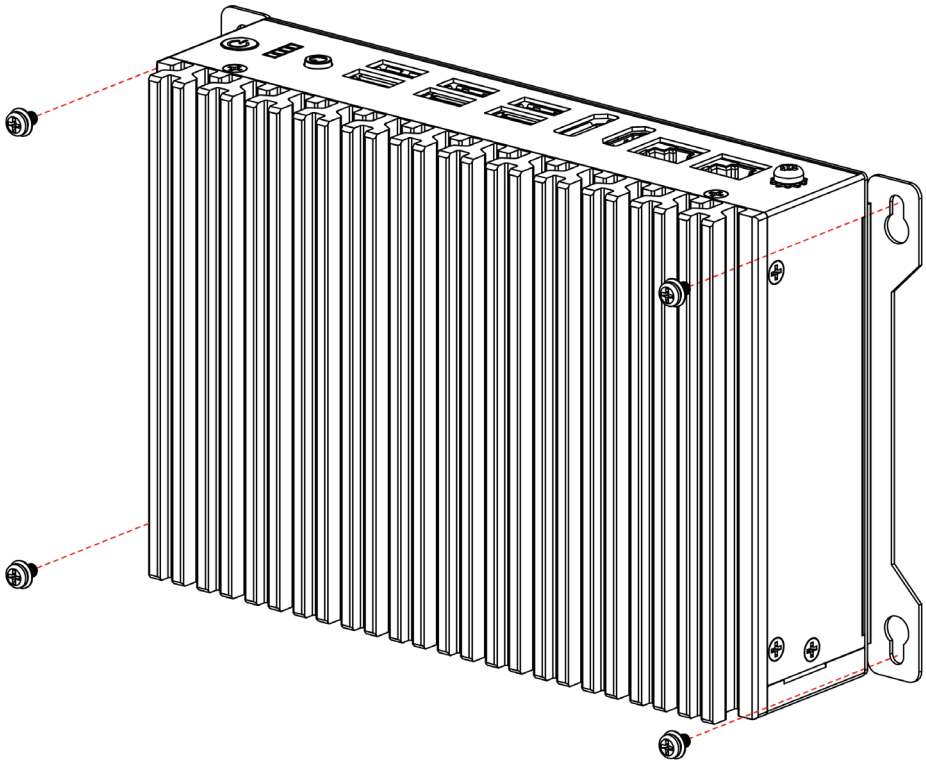


2.1.5 Wall Mount Installation (Optional A)

1. Loosen four side screws of the top case and screw back with the wall mount bracket.

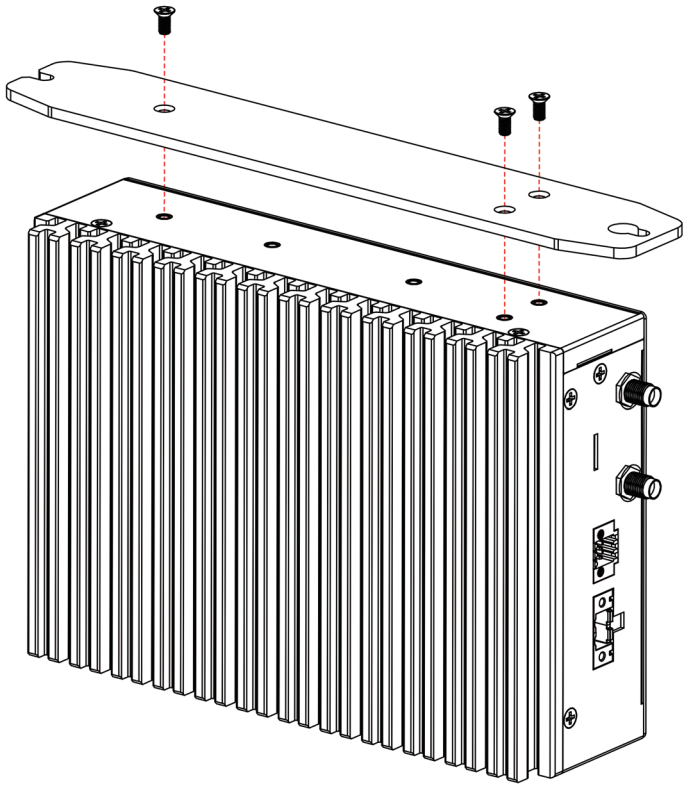


2. Screw down the four wall mount screws to the table.

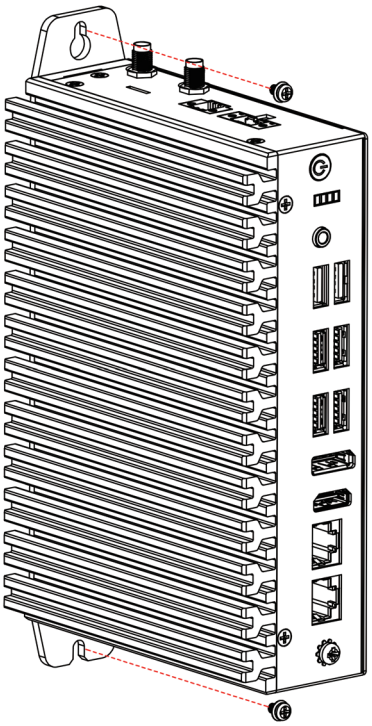


2.1.6 Wall Mount Installation (Optional B)

1. Loosen three side screws of the top case and screw back with the wall mount bracket.

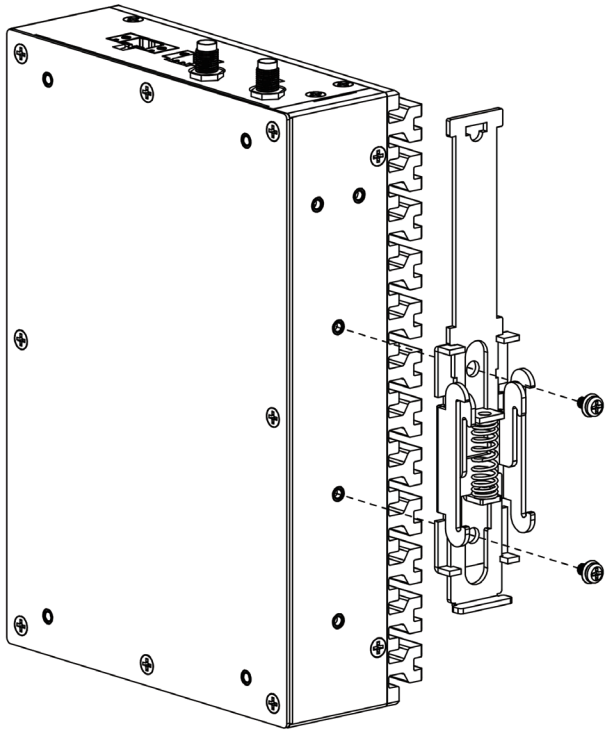


2. Screw down the two wall mount screws to the table.



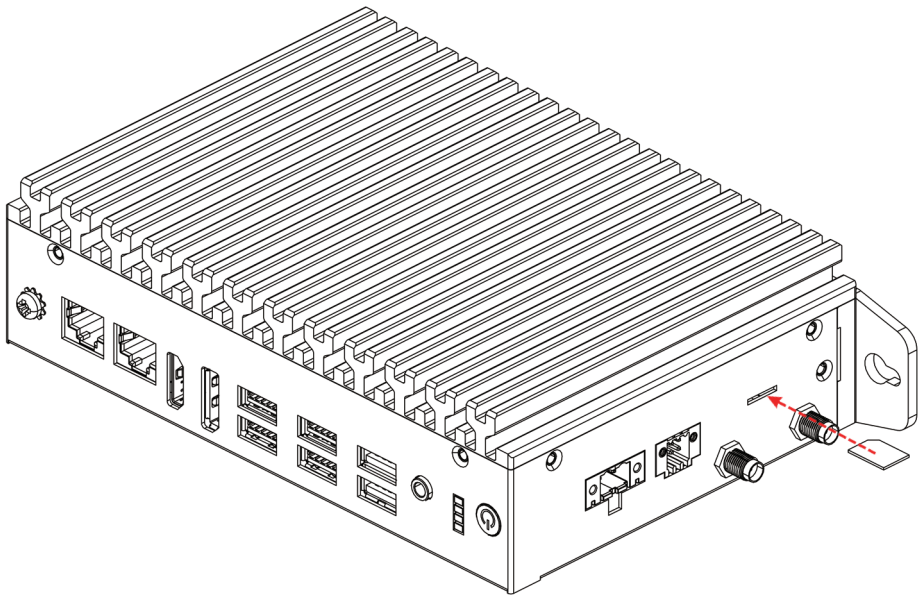
2.1.7 Din Rail Installation (Optional C)

1. Loosen two pcs Din rail screws on back cover.Use Din rail screws to mount Din rail.



2.1.8 Nano SIM card Installation

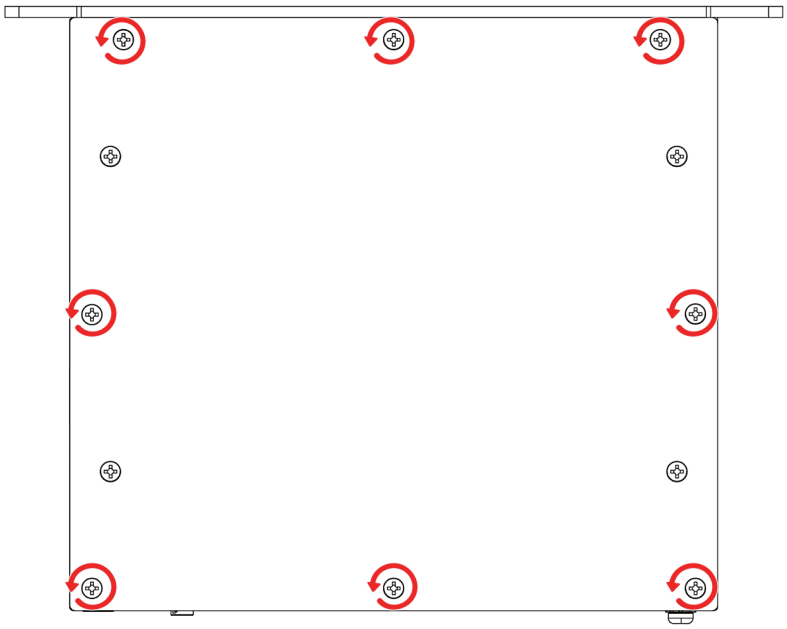
1. Insert the Nano SIM card in the direction shown in the illustration.

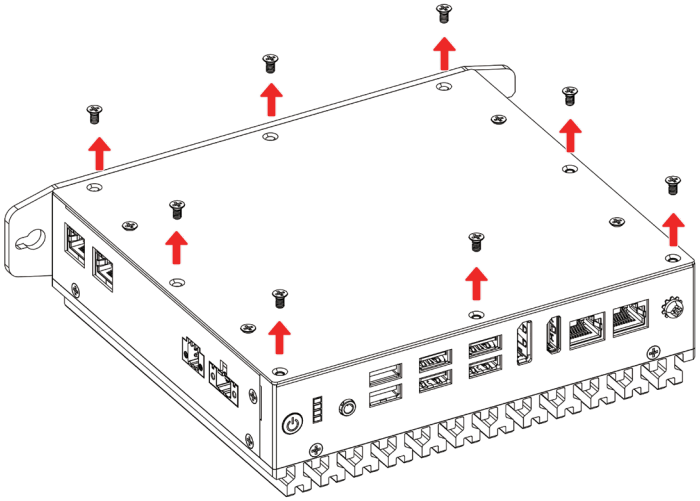


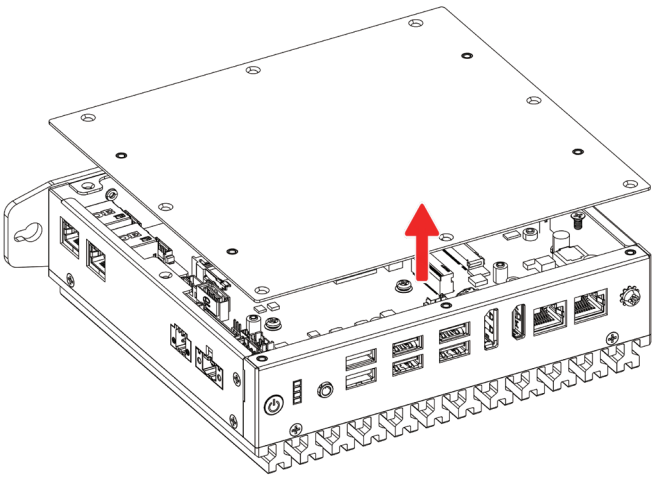
2.2 BPC-513 Installation

2.2.1 Memory Installation

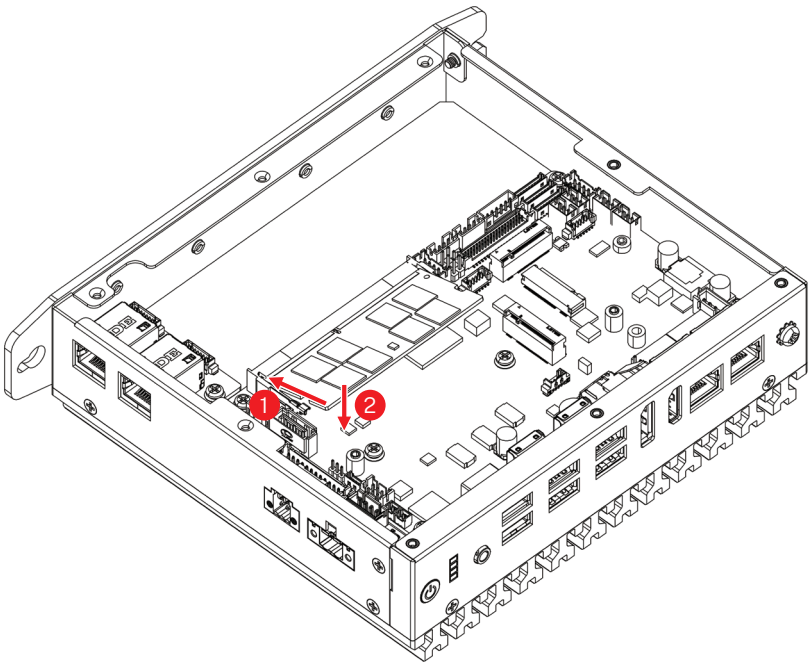
1. Loosen screws, open bottom case





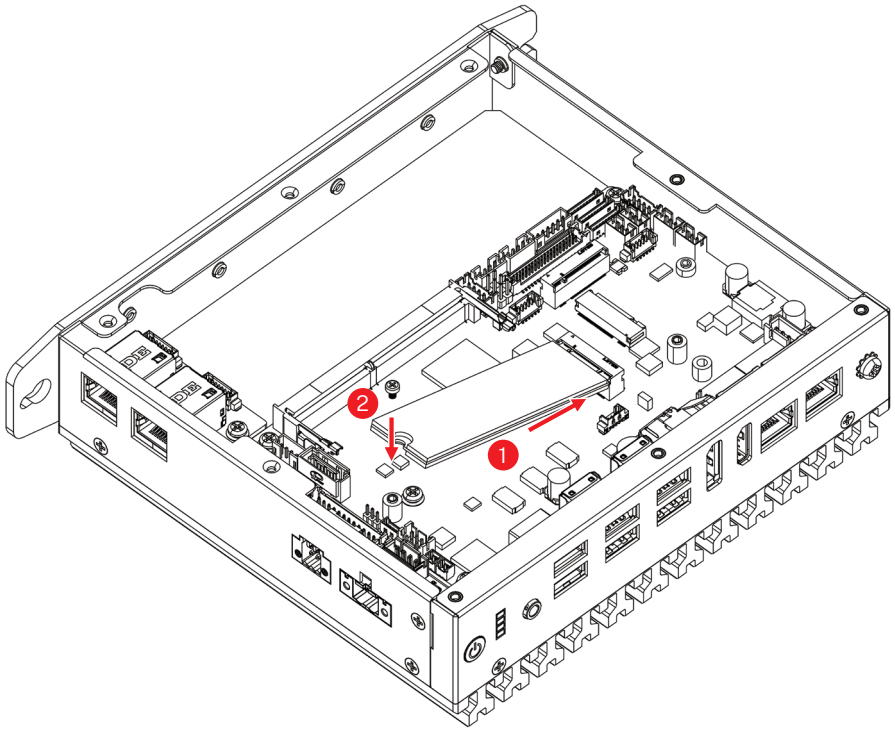


2. Install memory and tighten up the screws again.



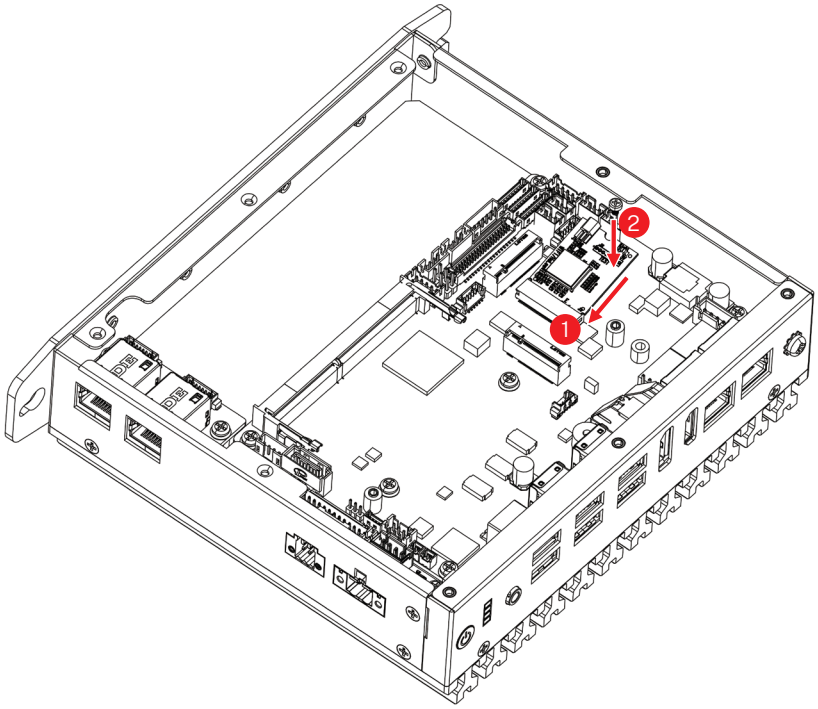
2.2.2 M.2 B Key 2280 SSD Installation

1. Repeat step 1 of Chapter 2.2.1 to open the back cover.Install M.2 Bkey 2280 SSD(NVME) and tighten up the screws again.



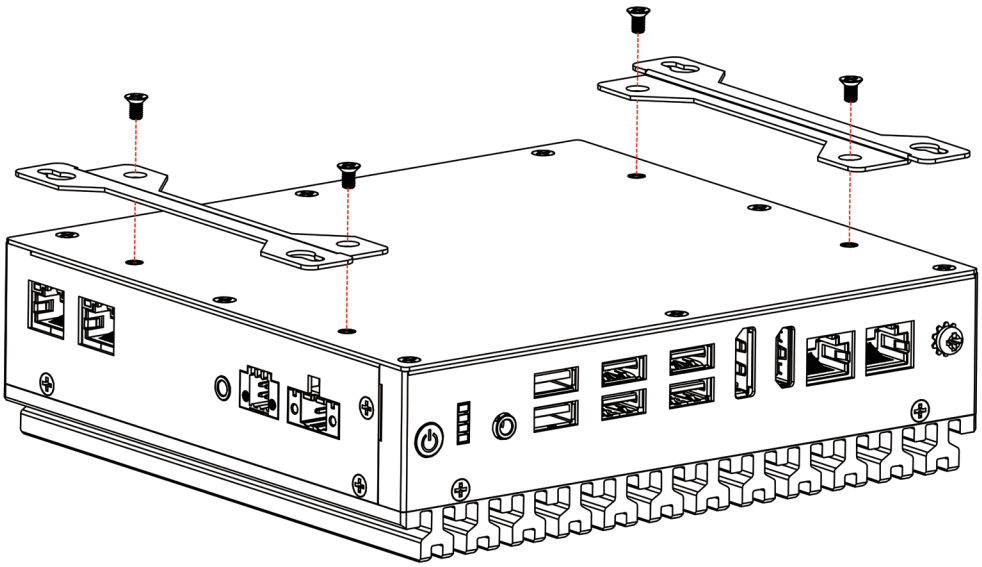
2.2.3 M.2 E Key 2230 Installation

1. Repeat step 1 of Chapter 2.2.1 to open the back cover.Install M.2 Ekey 2230 card and tighten up the screws again.

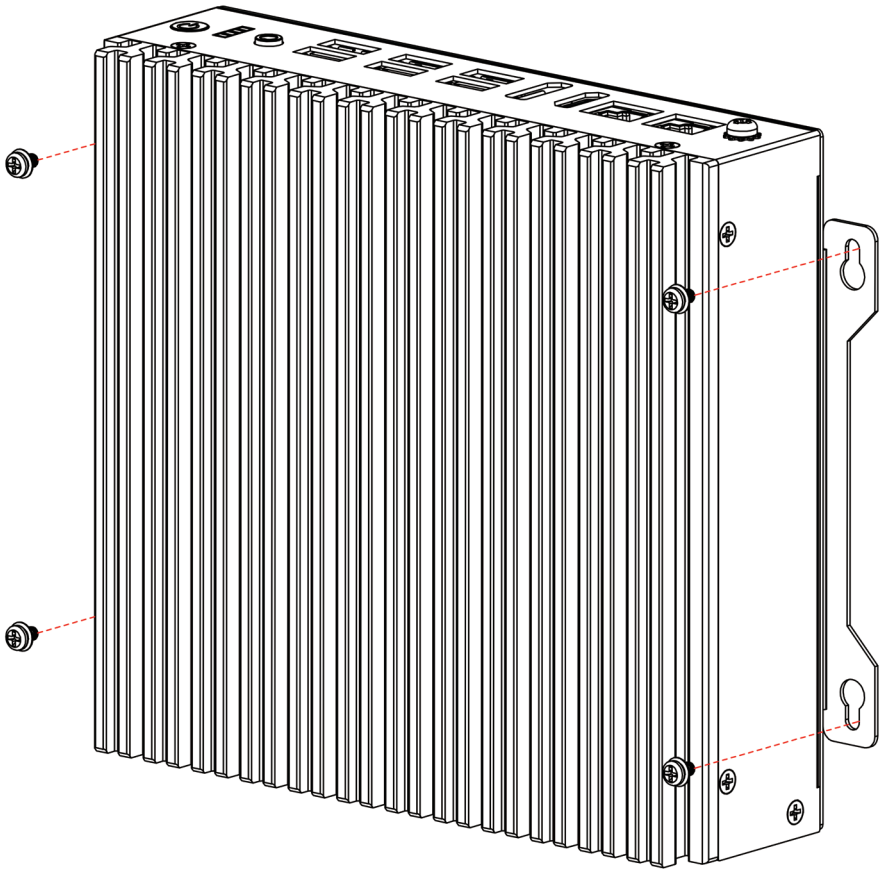


2.2.4 Wall Mount Installation (Optional A)

1. Loosen four side screws of the top case and screw back with the wall mount bracket.

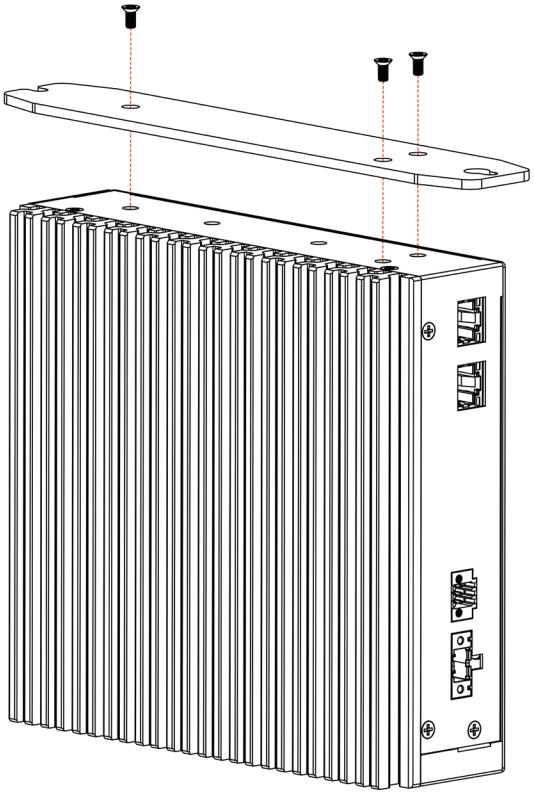


2. Screw down the four wall mount screws to the table.

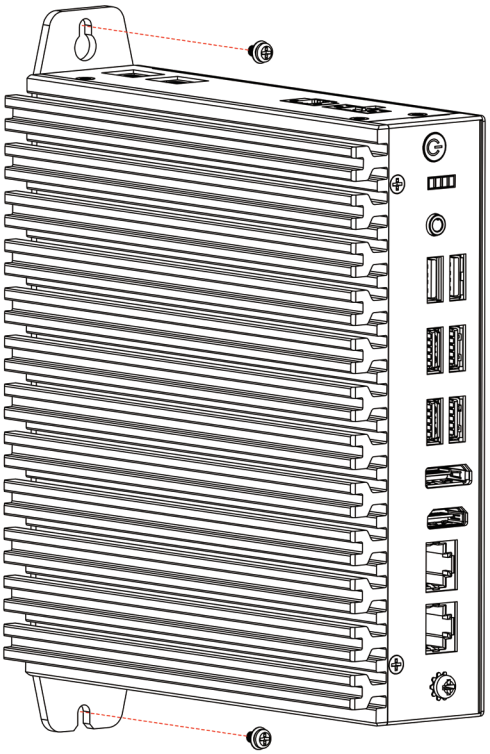


2.2.5 Wall Mount Installation (Optional B)

1. Loosen three side screws of the top case and screw back with the wall mount bracket.

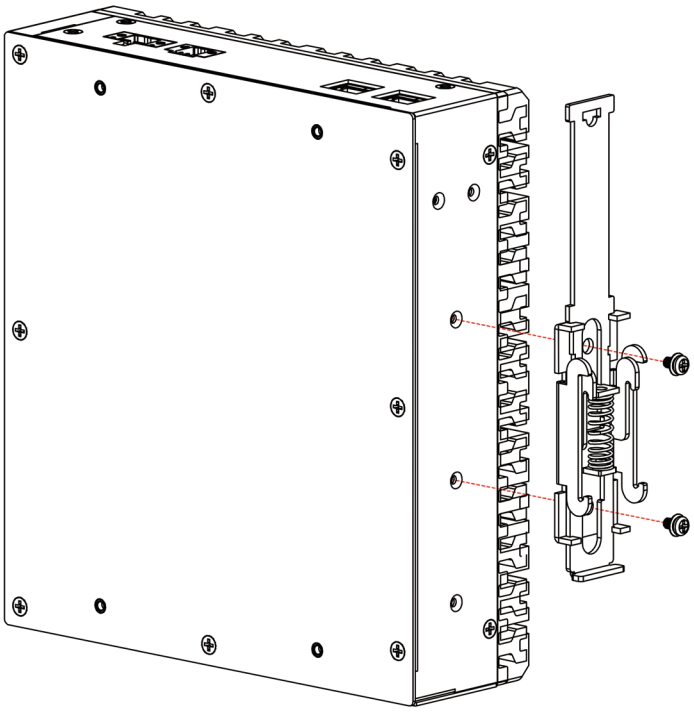


2. Screw down the two wall mount screws to the table.



2.2.6 Din Rail Installation (Optional C)

1. Loosen two pcs Din rail screws on back cover.Use Din rail screws to mount Din rail.



Chapter 3

BIOS Settings

3.1 Introduction

BIOS (Basic Input Output System) is the basic program responsible for motherboard POST (Power-On-Self-Test), initializing the central processing unit, memory and other hardware, detecting input/output devices and booting the system.

BIOS of this platform is developed based on AMI UEFI (Unified Extensible Firmware Interface) BIOS, which is safe, stable, reliable and provides rich functions.

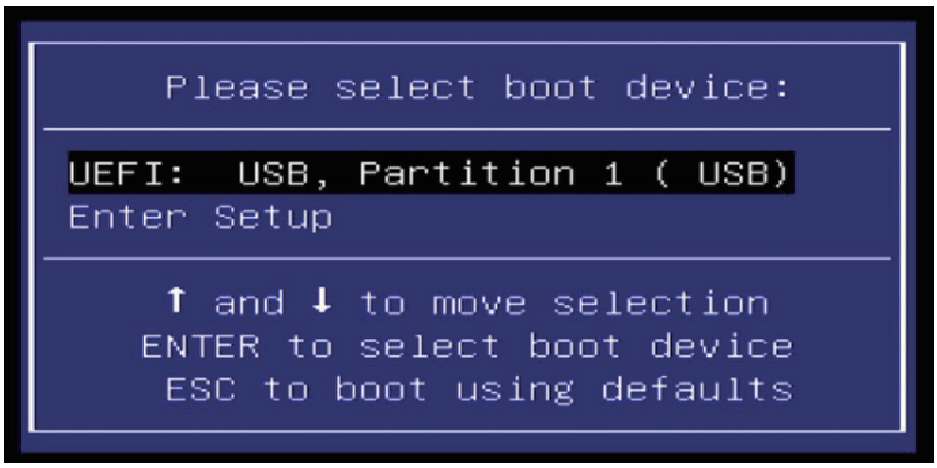
3.2 BIOS Update

It supports to update BIOS under UEFI Shell and Windows 10 environment.

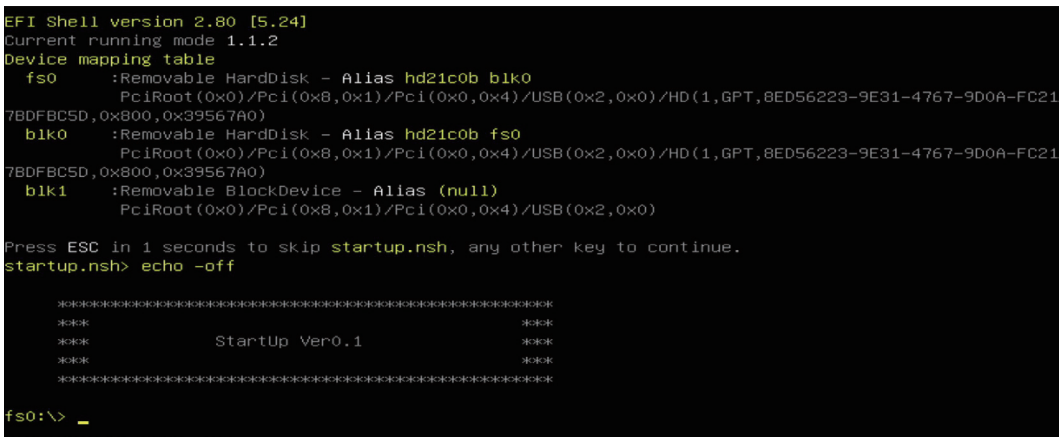
3.2.1 General BIOS Update

3.2.1.1 Updating BIOS under UEFI Shell Environment

1) Connect the U disk which stores BIOS update tool and BIOS file to the motherboard. Turn on the board, while screen displays POST interface, press “F7” key. After this, screen shows boot device selection menu, select “UEFI: Built-in EFI Shell” to boot.



2) After entering into UEFI Shell, Find USB disk number under Device mapping table as shown in the figure below. In the figure, USB is mapped to fs0:(while there are more than one storage devices, the mapping number may not be [0]), and then type “fs0:” and press “Enter” key. If startup.nsh exists, the system will automatically switch to the USB mapped disk.



3) Use the “cd [folder path]” command to enter the directory where the update tool and BIOS files are store. After this, type the command “AfuEfix64.efi [BIOS File Name] /x /p /b /n /k” to update BIOS.



4) After the step 3), it goes to update BIOS. Do not reboot, turn off and disconnect power until screen shows green strings” Process completed “.



5) Press power button and disconnect power source for several seconds, and restart the motherboard. The first-time power on, it will reboot for loading defaults and others normally. It is recommended that press “F3-Enter-F4-Enter” in BIOS Setup Utility to load defaults again.

⚠ Do not reboot, turn off, disconnect power or perform other actions while updating BIOS.

3.2.1.2 Updating BIOS under Windows Environment

1) Run Windows command prompt as administrator;

2) Type “driver letter:”, for example “C:”, enter to the partition where stores update tools and BIOS file. Use the “cd [folder path]” command to enter the directory.

3) Type the command “AFUWINx64.exe [BIOS File Name] /x /p /b /n /k” to update BIOS.

```
C:\Users\a>cd C:\Users\a\Desktop\S930A019-ZX_online_20251202

C:\Users\a\Desktop\S930A019-ZX_online_20251202>AFUWINx64.exe S930A019-ZX.BIN /x /p /b /n /k
```

4) After the step 3), it goes to update BIOS. Do not reboot, turn off and disconnect power until the pop-up window closes.

5) Shut down and disconnect power source for several seconds, and restart the motherboard. The first-time power on, it will reboot for loading defaults and others normally. It is recommended that press “F3-Enter-F4-Enter” in BIOS Setup Utility to load defaults again.

⚠ Do not reboot, turn off, disconnect power or perform other actions while updating BIOS.

3.2.1.3 Updating BIOS under Linux Environment

Please refer to the update method under Windows. Administrator under Windows means that Linux Root privilege, command prompt corresponds to Linux Shell.

3.2.2 Enter BIOS Setup Utility and Basic BIOS Operation

AMI UEFI BIOS supports Multiple function settings with its BIOS Setup Utility. Press “Delete” to enter BIOS Setup Utility while POST screen shows.

In the BIOS Setup Utility, the meaning of different font colors and signs is as follow:

Color/Sign	Meaning
Blue	Items allowed to be set or changed
Black	Items that cannot be set or changed
White	Items currently selected
►	There are submenu pages for this option

The operation keys are described as follows:

Control button	
→←	Select Screen
↑↓	Select Item
<Enter>	Select
+/-	Change Option
F1	General Help
F2	Previous Values
F3	Optimized Defaults
F4	Save & Exit
F12	Print Screen
<ESC>	Exit

3.2.3 Save Changes

Operation steps:

1) Press F4 to save the settings and exit the BIOS Setup Utility.

3.2.4 Setting Date & Time

Operation steps:

1) Enter BIOS, and in the main menu page. Select system date and system time by “↑↓” key.

2) On the selected item, change the selected date or time by entering a numeric value or pressing “+ / -”. Date format is “month / day / year”, time format is “hour / minute / second”.

3.2.5 Set BIOS password

When you set up an administrator password, it is recommended that you enter the administrator password when you enter the BIOS setup program to avoid some BIOS information or settings that are unavailable because user rights are insufficient (no password is entered as a user).

When you set a user password, you must use the user password to access the BIOS setup program, which means that you need to enter the user password when booting the operating system (using the BIOS boot feature).

Set/Change the Administrator Password Procedure:

1) Select “Security - Administrator Password”;

2) Enter the password you want to set in the “Create New Password” window and press enter. You will need to enter your current password to confirm when changing your administrator password before the “Create New Password” window;

3) Enter the password you want to set again to make sure it is entered correctly.

When you want to delete an administrator password, you should change the password by pressing carriage return directly in the Create New Password window to clear the password.

Set/Change the User Password Procedure:

1) Select “Security - User Password”;

2) Enter the password you want to set in the “Create New Password” window that appears and press enter. You will need to enter the current password to confirm when changing the user's password before the “Create New Password” window;

3) Enter the password you want to set again to make sure it is entered correctly.

When you want to delete a user password, you should change the password by pressing carriage return directly in the Create New Password window to clear the password.

3.2.6 Set Up Timed Power On Self & Timed Power On

Set Up Power-on Self:

1) Select “Advanced – AMD CBS - FCH Common Options–Ac Power Loss Options – Ac Loss Control”;

2) Change “Ac Loss Control” value: Always Off=Power Off, Always On=Power On, Previous=Last State.

Set Up Timed Power On:

1) Select “Advanced - S5 RTC Wake Settings - Wake system from S5”;

2) Change it from Disabled to Fixed Time;

3) Set the point in time to customize the boot settings in the “Wake up day, Wake up hour, Wake up minute, wake up second” that appears. Such as day: 2, hour: 13, minute:0, second:0 means 2nd of each month at 13 o'clock on the boot. When day is 0, it means that the point in time set every day is turned on.

3.2.7 Set Up Fan Control & Hardware Monitoring

Set Up Fan Control:

1) Select “Advanced – Hardware Monitor – Fan Function” item (This menu shows only this function is supported);

2) Select the fan to set up, such as “CPU_FAN1 Mode”. Select the operating mode for this fan: Full on Mode,Automatic Mode,Manual Mode;

3) After selecting manual Mode manual speed mode, the Manual PWM Setting input PWM (set range 0-255) value specifies the fan speed;

4) After selecting Automatic Mode, there will be Fan off temperature limit, Fan start temperature limit, Fan start PWM, PWM SLOPE SETTING options to set up.

Generally due to differences in fan performance, the actual performance of smart fans will differ from the set value, it is generally recommended to set THE PWM SLOPE SETTING to 8PWM to ensure that the fan speed with the temperature rise speed.

3.2.8 Setting Boot Order of Startup Disk

Set Boot Sequence:

1) Select “Boot” menu page;

2) Change “Boot Option #1” to the desired device;

3) If there are more than one similar device, such as more than one hard drive. Enter “Hard Disk Drive BBS Priorities” and change the boot order priority between multiple drives first.

When the Boot page has the Boot mode select option, it is recommended that the value of dual so that both Legacy and UEFI boot projects can be booted. UEFI boot items will be filtered when selected for Legacy, and legacy boot items will be filtered when selected as UEFI.

3.2.9 Setting PXE Boot

Open UEFI PXE:

1) Please select the “Advanced - Network Stack Configuration” item;

2) Set Network Stack or UEFI PXE to Enabled.

3.3 Description of the BIOS Options

Due to the differences in the specific model of the motherboard and the update of the BIOS version, there may be a few menus that do not match this manual, please take the actual basis.

3.3.1 Main



This menu contains the following information:

- **BIOS Version**

Display BIOS version information.

- **Build Date and Time**

Display BIOS date and time.

- **System Date**

Set the date. Use Tab to switch between Date elements. Default Ranges:

Year: 1998-9999

Months: 1-12

Days: Dependent on month

Range of Years may vary.

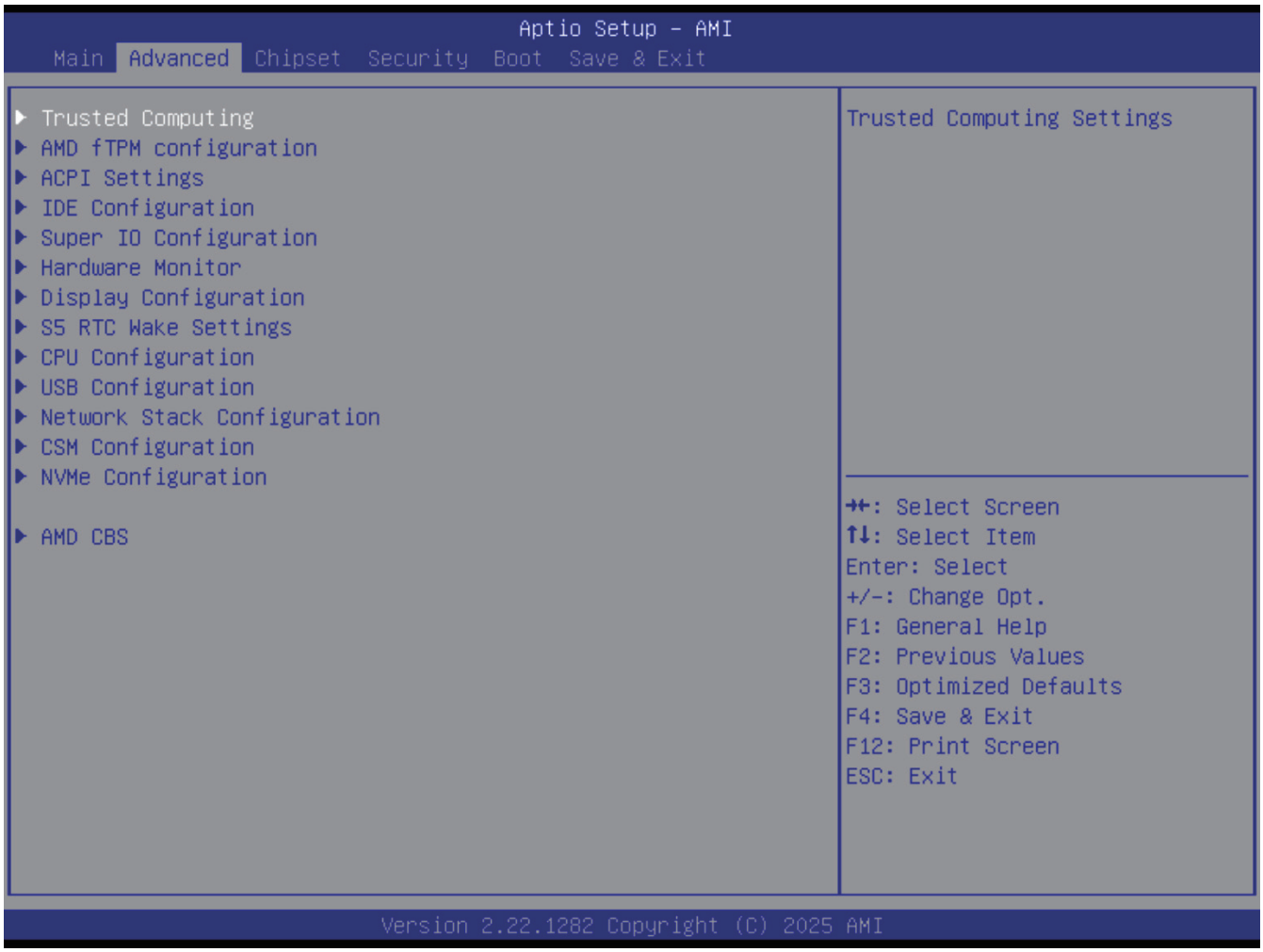
• **System Time**

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

• **Access Level**

Display the current access level to BIOS Setup Utility.

3.3.2 Advanced



This menu contains the following information:

• **Trusted Computing**

Trusted Computing Settings.

• **AMD fTPM configuration**

AMD fTPM Settings.

• **ACPI Settings**

System ACPI Parameters.

- **IDE Configuration**

IDE Devices Configuration.

- **Super IO Configuration**

System Super IO Chip Parameters.

- **Hardware Monitor**

Monitor hardware status.

- **Display Configuration**

Display Configuration Parameters.

- **S5 RTC Wake Settings**

Enable system to wake from S5 using RTC alarm.

- **CPU Configuration**

CPU Configuration Parameters.

- **USB Configuration**

USB Configuration Parameters.

- **Network Stack Configuration**

Network Stack Settings.

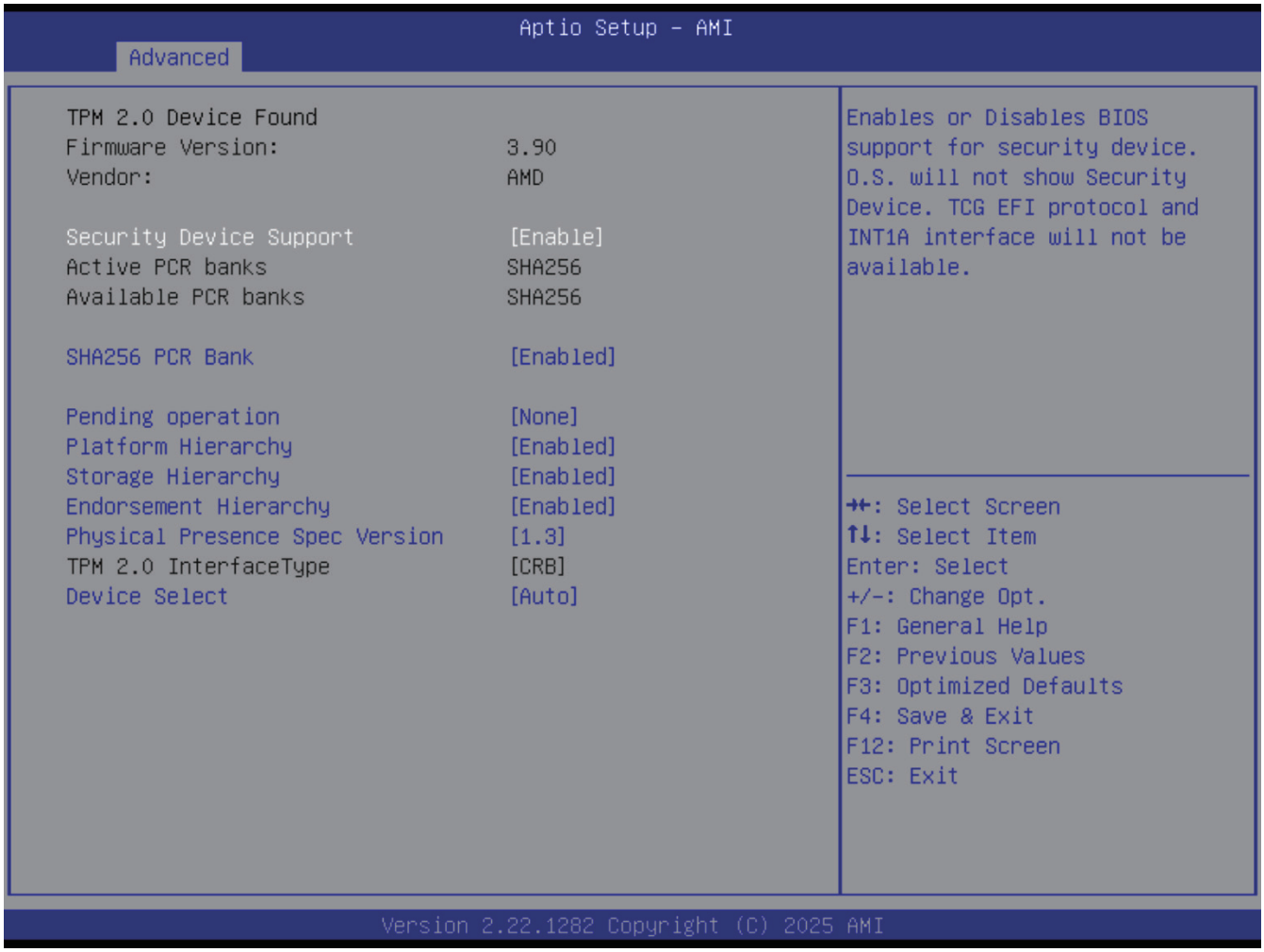
- **NVMe Configuration**

NVMe Device Options Settings.

- **AMD CBS**

AMD CBS Setup Page.

3.3.2.1 Trusted Computing



This menu contains the following information:

- **Display the TPM Device information: Firmware Version, vendor.**
- **Security Device Support**

Enable or Disable Security Device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.

- **SHA256 PCR Bank**

Enable or Disable SHA256 PCR Bank.

- **Pending operation**

Schedule an Operation for the Security Device. NOTE: Your Computer will reboot during restart in order to change State of Security Device.

- **Platform Hierarchy**

Enable or Disable Platform Hierarchy.

- **Storage Hierarchy**

Enable or Disable Storage Hierarchy.

- **Endorsement Hierarchy**

Enable or Disable Endorsement Hierarchy.

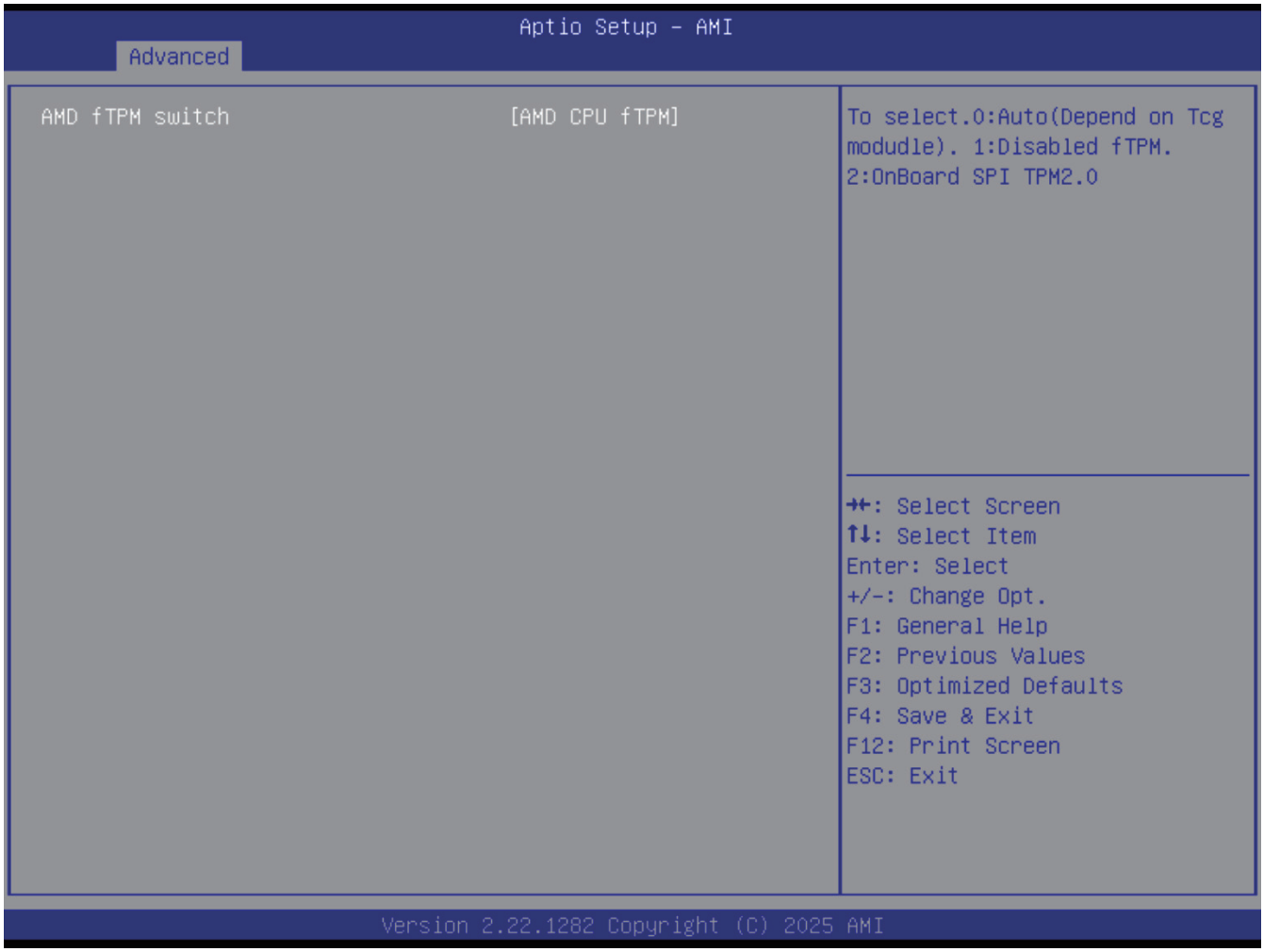
- **Physical Presence Spec Version**

Select to Tell O.S. to support PPI Spec Version 1.2 or 1.3. Note some HCK tests might not support 1.3.

- **Device Select**

TPM 1.2 will restrict support to TPM 1.2 devices, TPM 2.0 will restrict support to TPM 2.0 devices, Auto will support both with the default set to TPM 2.0 devices if not found, TPM 1.2 devices will be enumerated.

3.3.2.2 AMD fTPM configuration

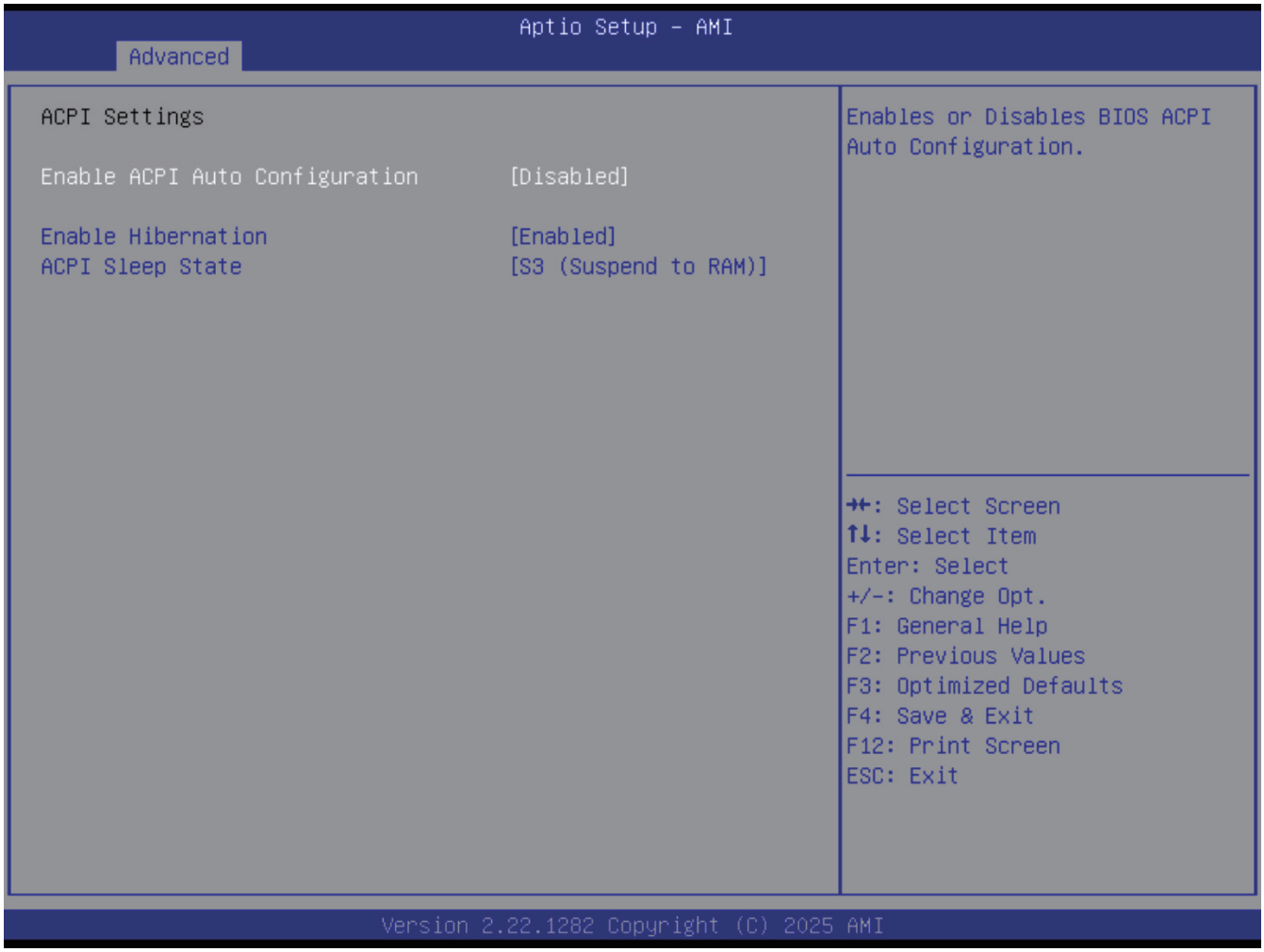


The menu contains the following information:

- **AMD fTPM switch**

To select.0: AMD CPU fTPM. 1: AMD CPU fTPM Disabled.

3.3.2.3 ACPI Settings



This menu contains the following information:

• Enable ACPI Auto Configuration

Enables or Disables BIOS ACPI Auto Configuration.

• Enable Hibernation

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

• ACPI Sleep State

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

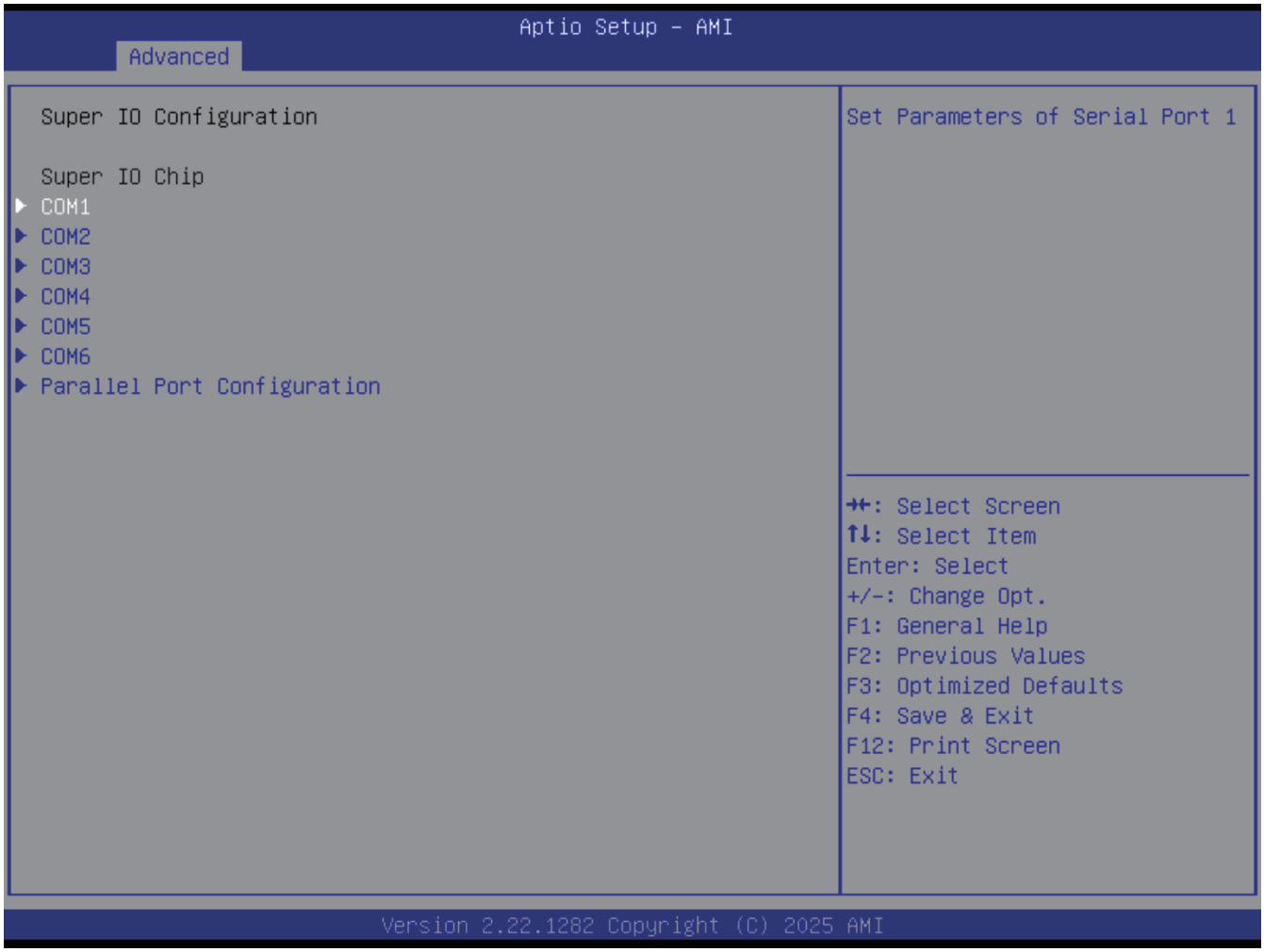
3.3.2.4 IDE Configuration



This menu contains the following information:

- **Display SATA Device information**

3.3.2.5 Super IO Configuration



This menu contains the following information:

• **COM x**

Set Parameters of Serial Port x:

The options after entering the interface settings above are as follows.

Serial Port: Enable or Disable Serial Port (COM).

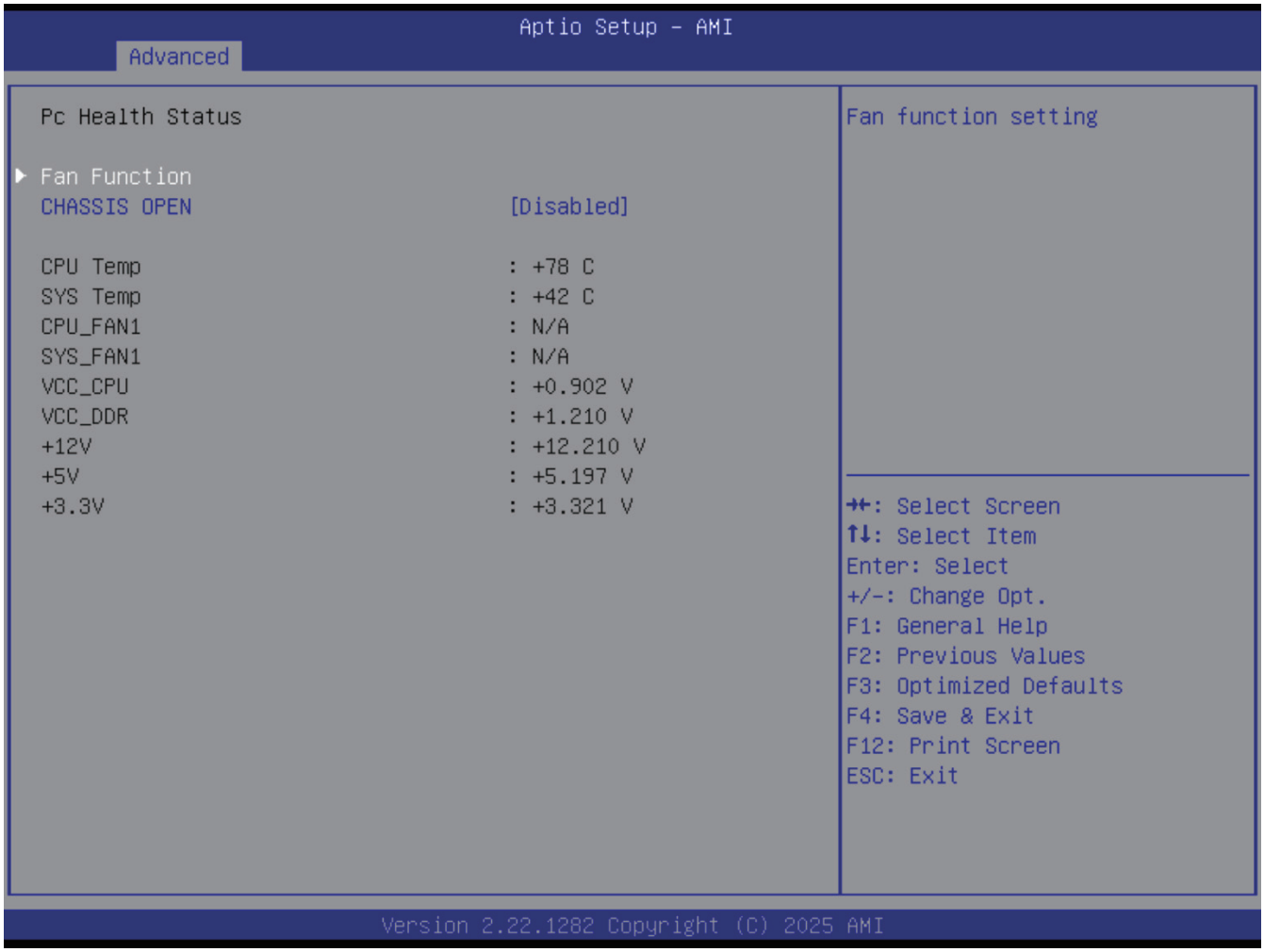
Device Settings: Display the Current Device Settings.

Change Settings: If the board supported, this menu shows. Select an optimal setting for Super IO Device.

• **Parallel Port Configuration**

Set Parameters of Parallel Port (LPT/LPTE).

3.3.2.6 Hardware Monitor



This menu contains the following information:

• Fan Function (If the board supported, this menu shows.)

Fan Function Setting.

CPU_FAN1 Mode: CPU_FAN1 Mode Select. Full on Mode; Automatic Mode; Manual Mode.

SYS_FAN1 Mode: SYS_FAN1 Mode Select. Full on Mode; Automatic Mode; Manual Mode. Refer to section 3.2.7 of this manual for setting up.

• CHASSIS OPEN

Sound the alarm if chassis opened; Stopped while closed.

• CPU Temp

Displays CPU Temperature.

- **SYS Temp**

Displays System Temperature.

- **CPU_FAN1**

Displays CPU_FAN1 Speed.

- **SYS_FAN1**

Displays SYS_FAN1 Speed.

- **VCC_CPU**

Displays CPU Core Voltage Value.

- **VCC_DDR**

Displays Memory Voltage Value.

- **+12V**

Displays +12 Voltage Value.

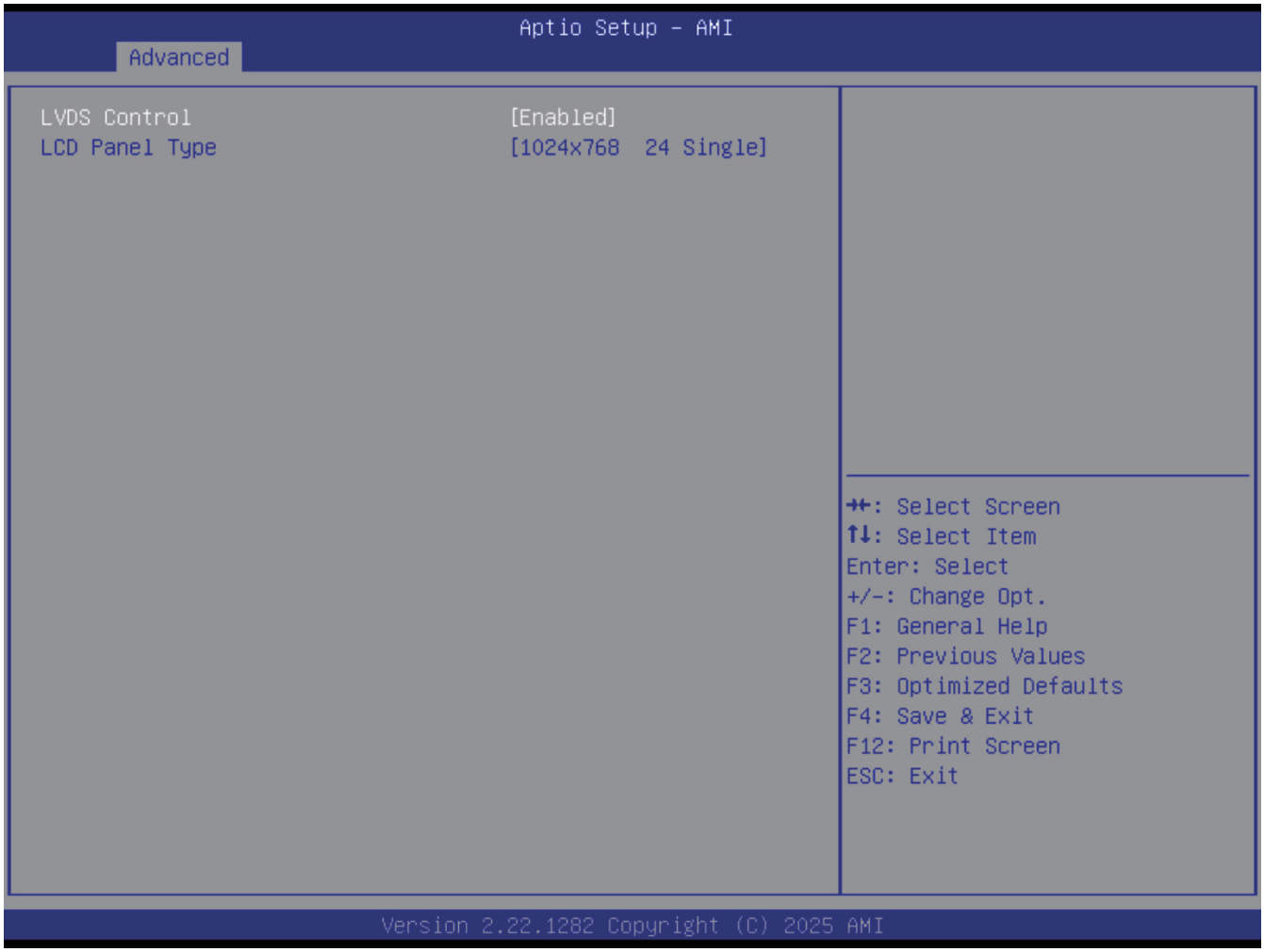
- **+5V**

Displays +5 Voltage Value.

- **+3.3V**

Displays +3.3 Voltage Value.

3.3.2.7 Display Configuration



This menu contains the following information:

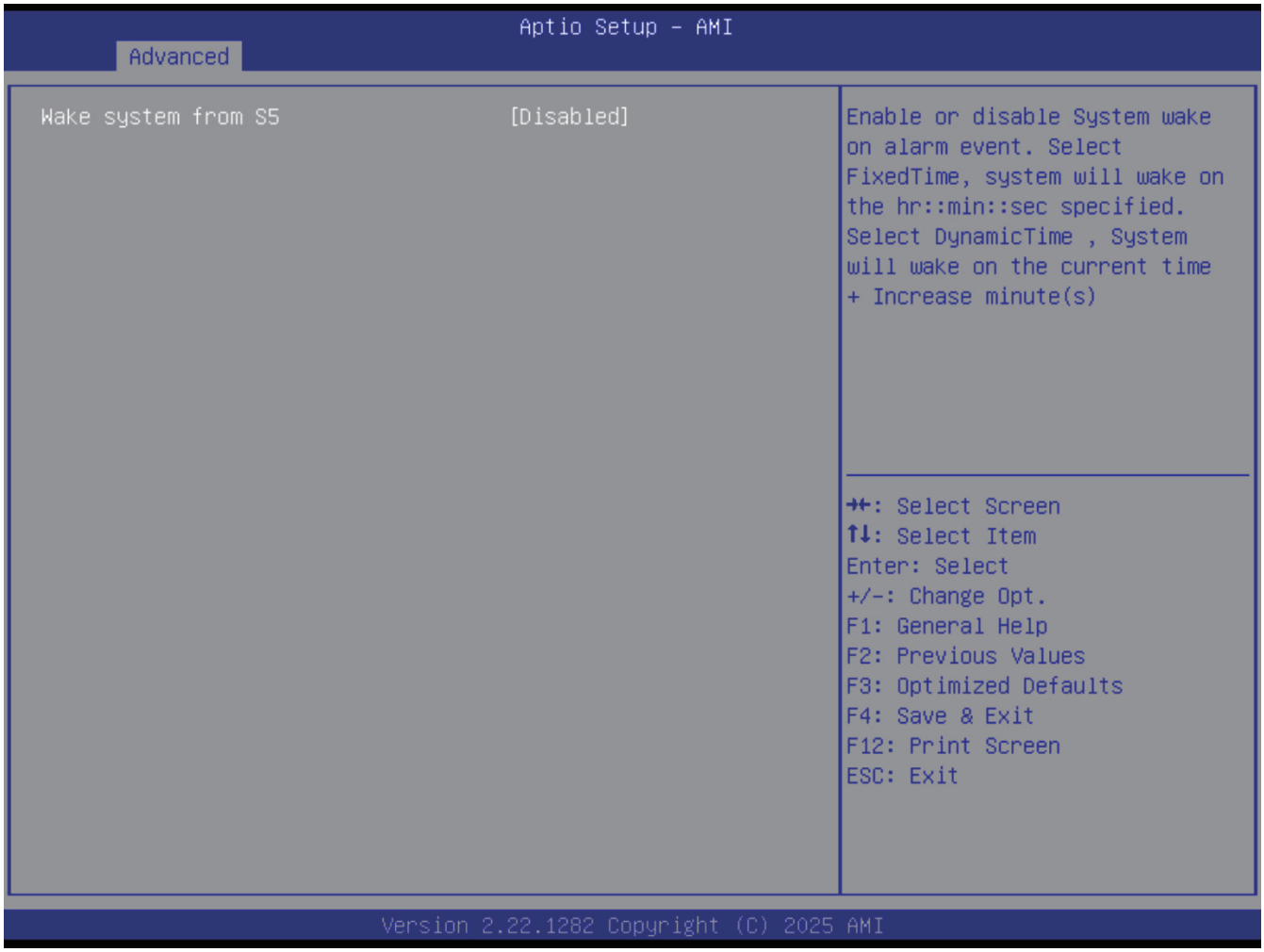
• LVDS Control

Enable or Disable onboard LVDS.

• LCD Panel Type

Select LCD Panel Type.

3.3.2.8 S5 RTC Wake Settings



This menu contains the following information:

- **Wake system from S5**

Enable or disable System wake on alarm event. Select Fixed Time, system will wake on the hr::min::sec specified. Select Dynamic Time, System will wake on the current time + Increase minute(s). Refer to section 3.2.6 of this manual for setting up.

3.3.2.9 CPU Configuration



This menu contains the following information:

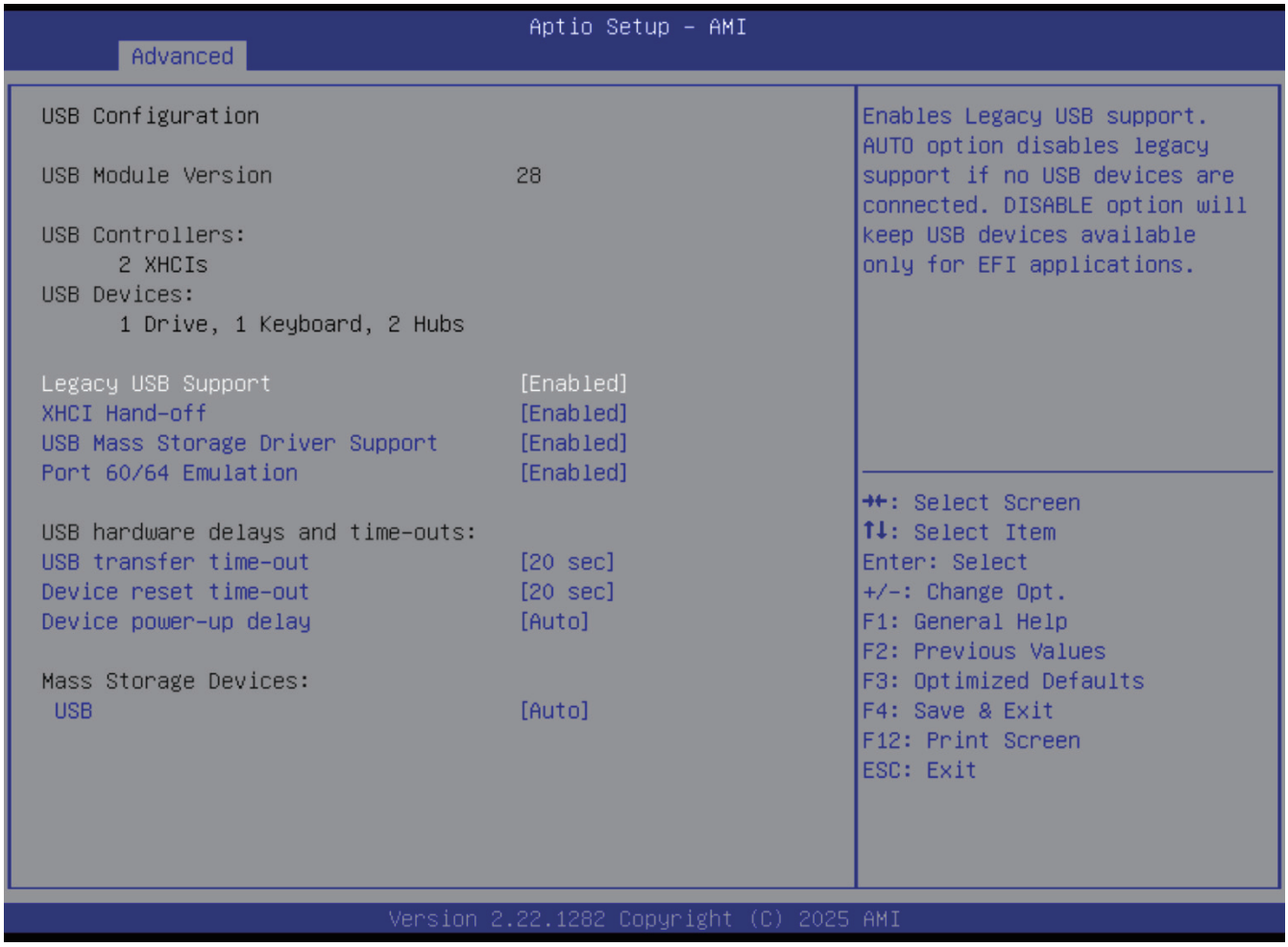
- **SVM Mode**

Enable or disable CPU Virtualization.

- **Node 0 Information**

View Memory Information related to Node 0.

3.3.2.10 USB Configuration



This menu contains the following information:

• USB Module Version

Display the USB Module Version.

• USB Controllers

Display the USB Controllers.

• USB Devices

Display the USB Devices.

• Legacy USB Support

Enables Legacy USB support. AUTO option disables legacy support if no USB devices are connected. DISABLE 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 or 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.

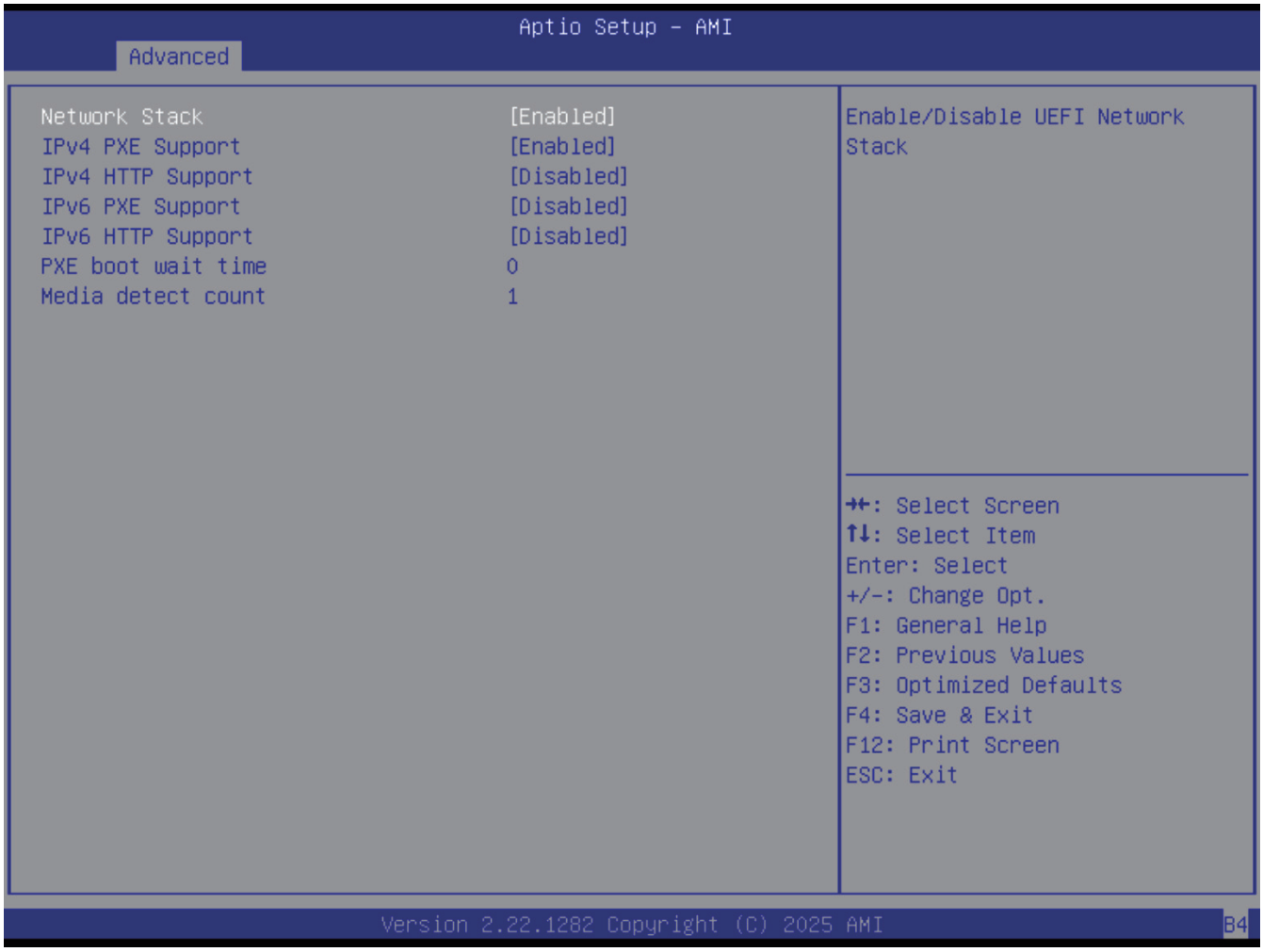
• USB hardware delays and time-outs:

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.

3.3.2.11 Network Stack Configuration



This menu contains the following information:

• Network Stack

Enable or Disable UEFI Network Stack.

• IPv4 PXE Support

Enable or Disable IPv4 PXE boot support. If disabled, IPv4 PXE boot support will not be available.

• IPv4 HTTP Support

Enable or Disable IPv4 HTTP boot support. If disabled, IPv4 HTTP boot support will not be available.

• IPv6 PXE Support

Enable or Disable IPv6 PXE boot support. If disabled, IPv6 PXE boot support will not be available.

• **IPv6 HTTP Support**

Enable or Disable IPv6 HTTP boot support. If disabled, IPv6 HTTP boot support will not be available.

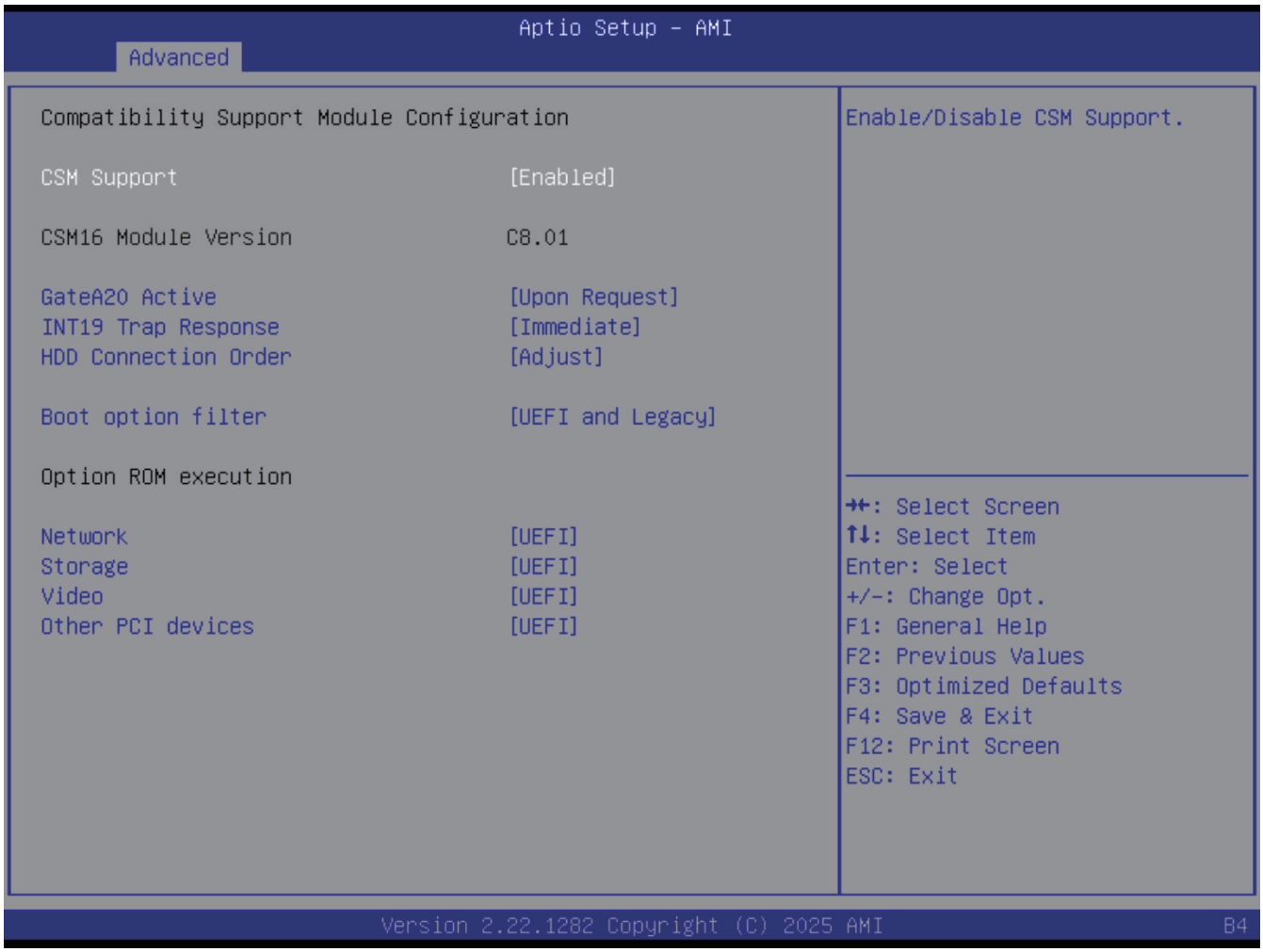
• **PXE boot wait time**

Wait time in seconds to press ESC key to abort the PXE boot. Use either +/- or numeric keys to set the value.

• **Media detect count**

Number of times the presence of media will be checked. Use either +/- or numeric keys to set the value.

3.3.2.12 CSM Configuration



This menu contains the following information:

• **CSM Support**

Enable or Disable CSM Support.

• CSM16 Module Version

Display the CSM16 Module Version.

• 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.

• 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.

• Option ROM execution

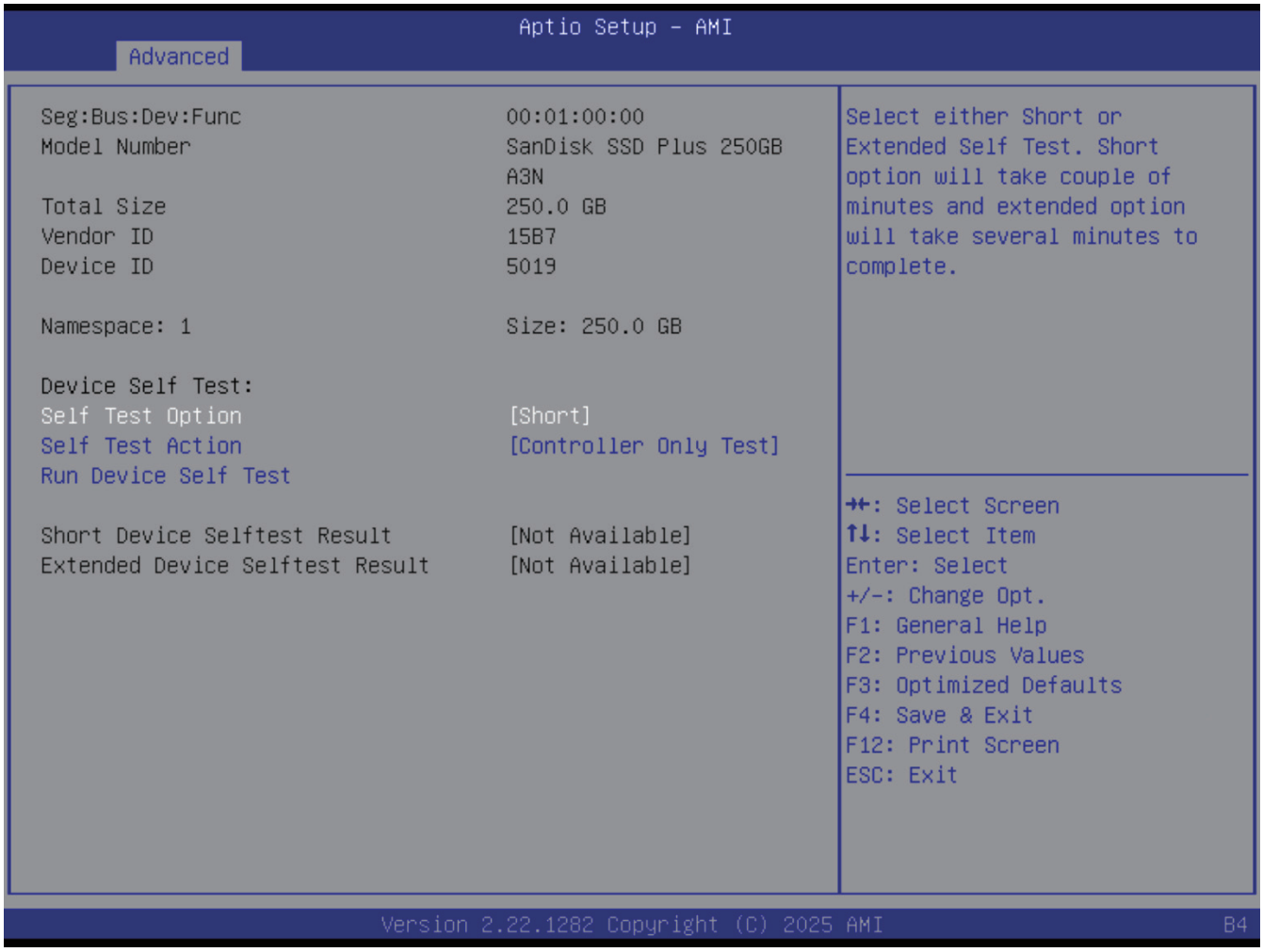
Network: Controls the execution of UEFI and Legacy Network OpROM.

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.

3.3.2.13 NVMe Configuration



This menu contains the following information:

- **Display NVMe device information**
- **Self Test Option**

Select either Short or Extended Self Test. Short option will take couple of minutes and extended option will take several minutes to complete.

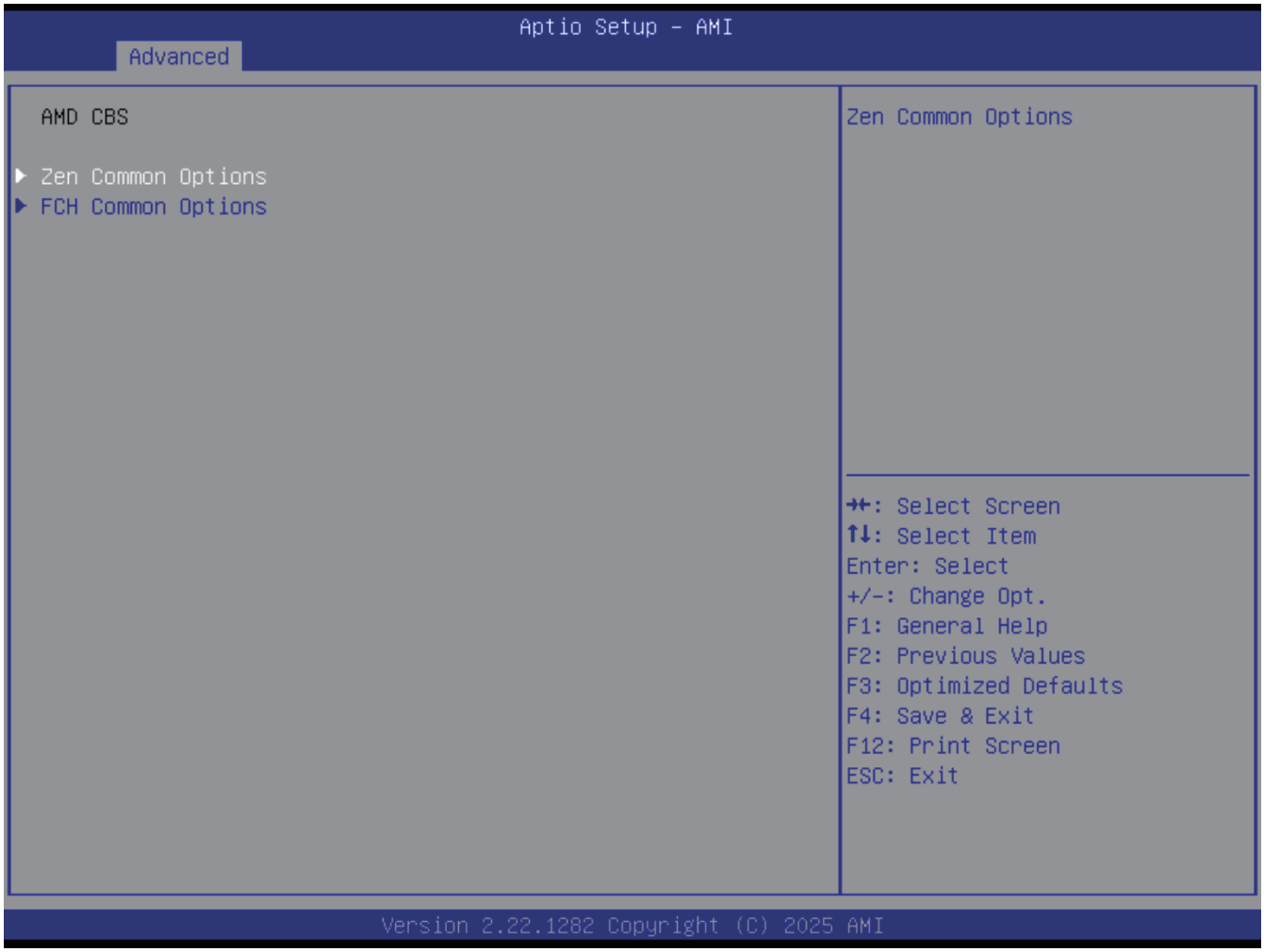
- **Self Test Action**

Select either to test Controller alone or Controller and NameSpace. Selecting Controller and Namespace option will take lot longer to complete the test.

- **Run Device Self Test**

Perform device self test for the corresponding Option and Action selected by user. Pressing 'Esc' key will abort the test. Result shown below is the recent result logged in the device.

3.3.2.14 AMD CBS



This menu contains the following information:

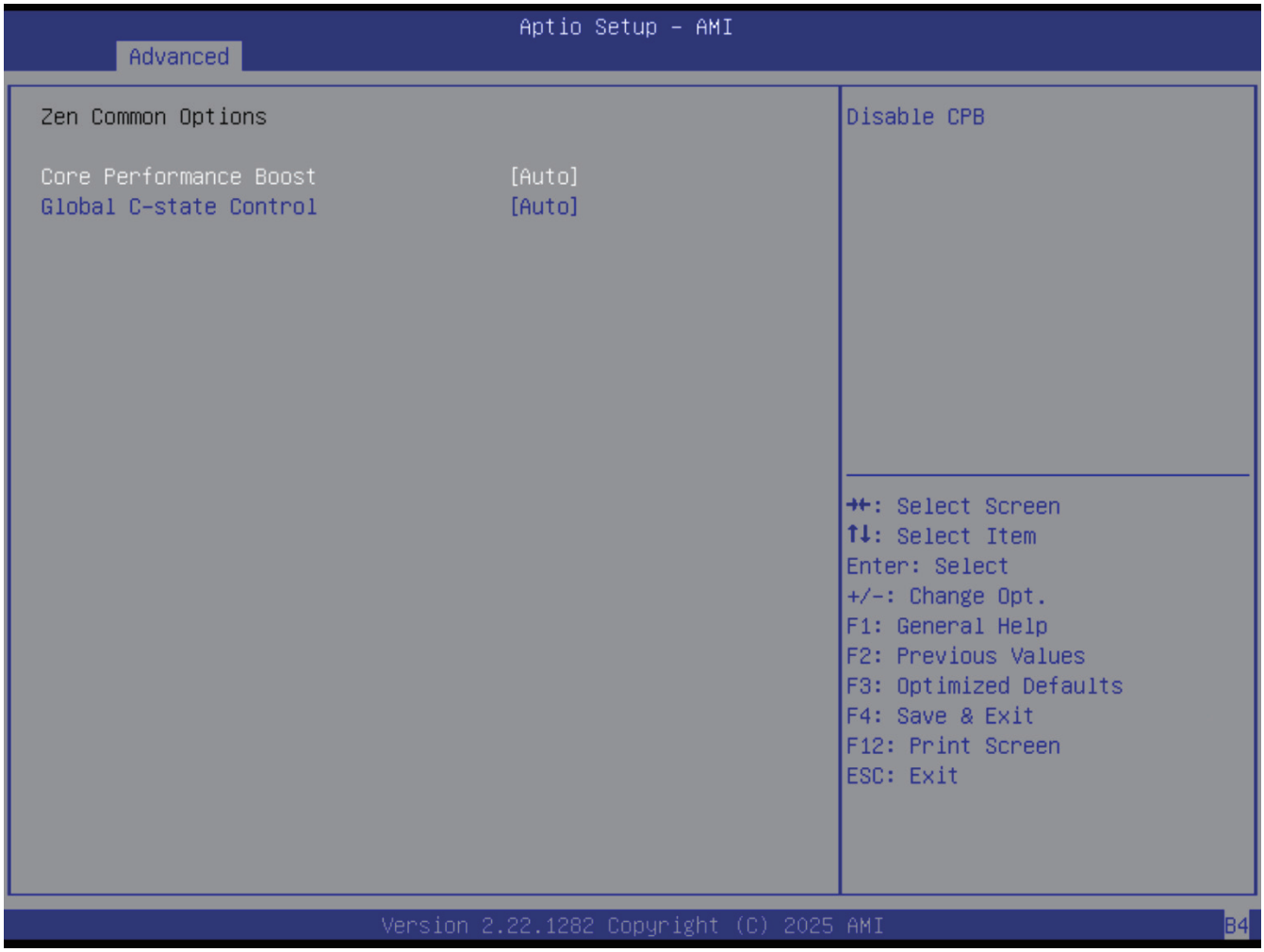
- **Zen Common Options**

Zen Common Options.

- **FCH Common Options**

FCH Common Options.

3.3.2.14.1 Zen Common Options



This menu contains the following information:

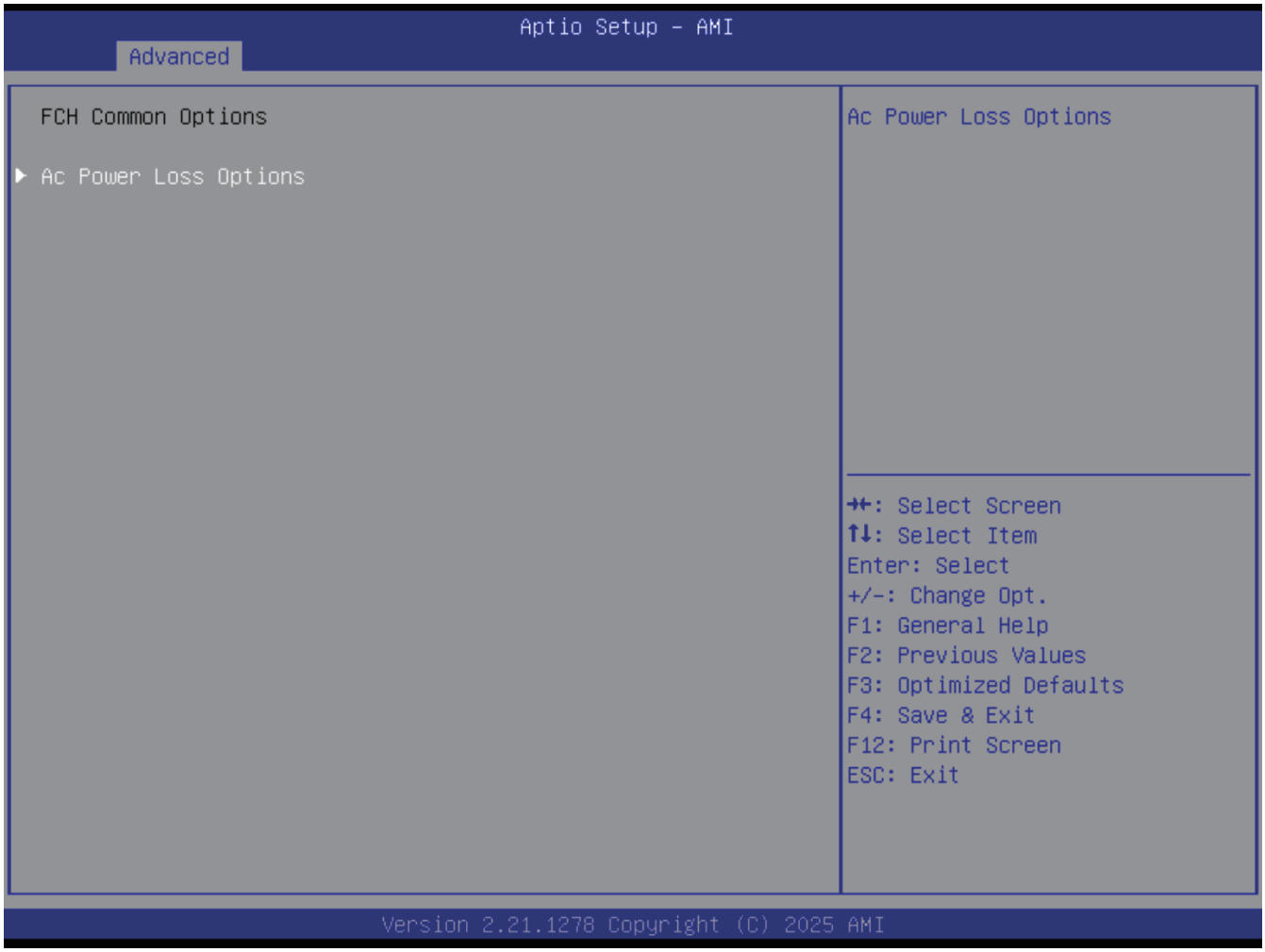
- **Core Performance Boost**

Enables or Disable CPB.

- **Global C-state Control**

Controls IO based C-state generation and DF C-states. There is another DF C-state option which will be synchronized with this option if DF C-state option is auto.

3.3.2.14.2 FCH Common Options

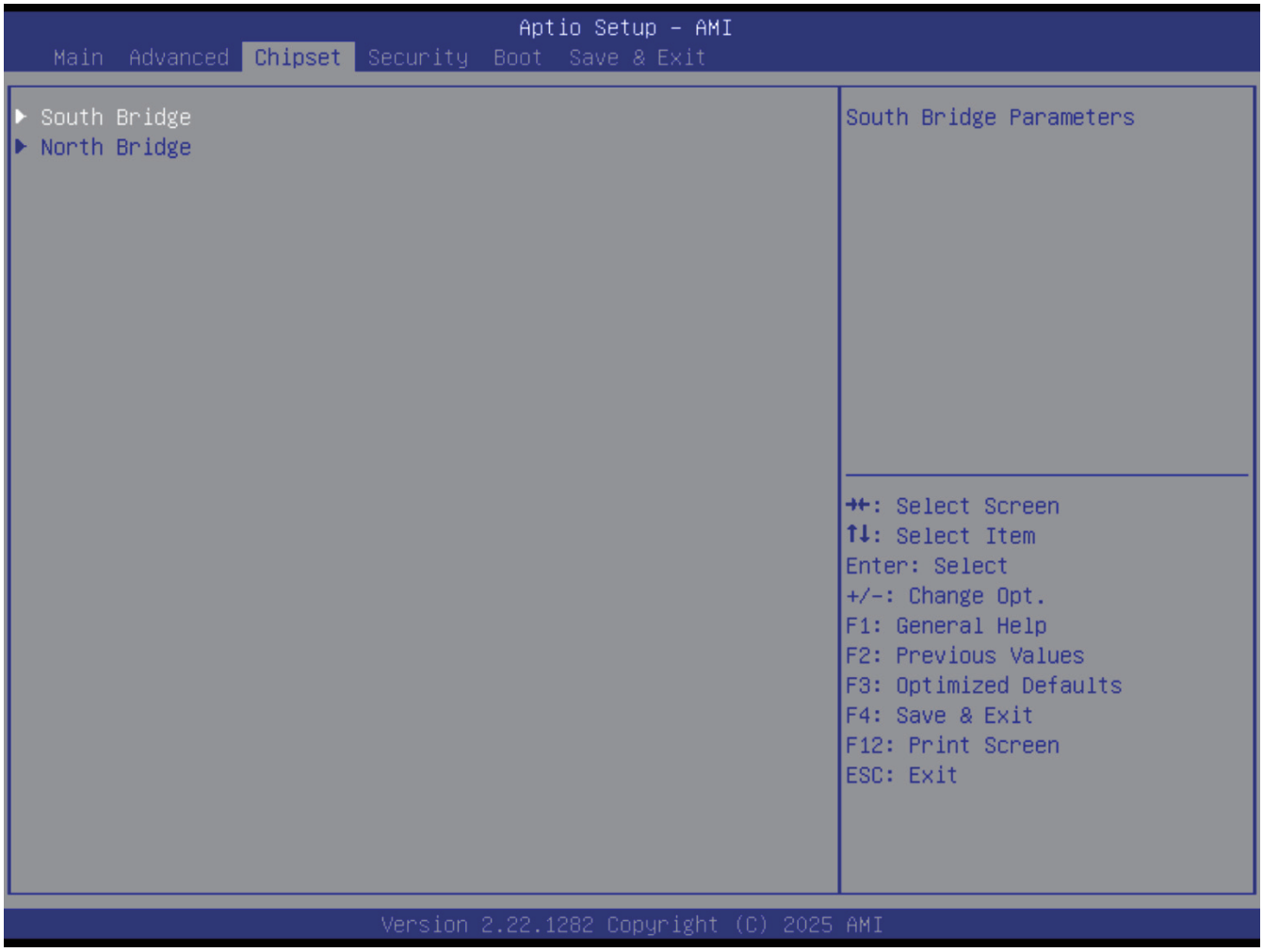


This menu contains the following information:

• Ac Power Loss Options

Ac Power Loss Options. Refer to section 3.2.6 of this manual for setting up.

3.3.3 Chipset



This menu contains the following information:

- **South Bridge**

South Bridge Parameters.

- **North Bridge**

North Bridge Parameters.

3.3.3.1 South Bridge

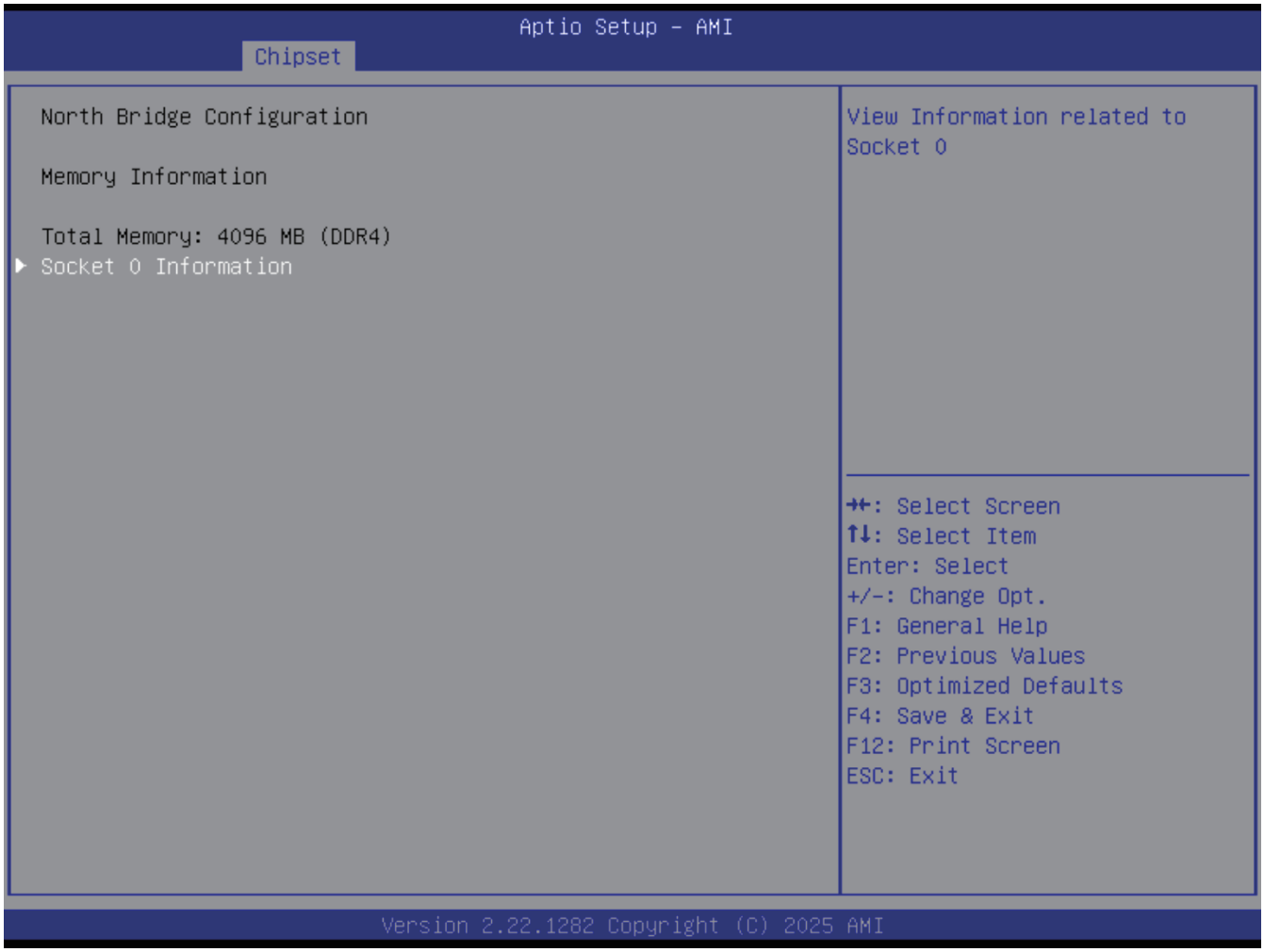


This menu contains the following information:

- **Display AMD Reference Code Version**
- **SB USB Configuration**

Options For SB USB Configuration.

3.3.3.2 North Bridge

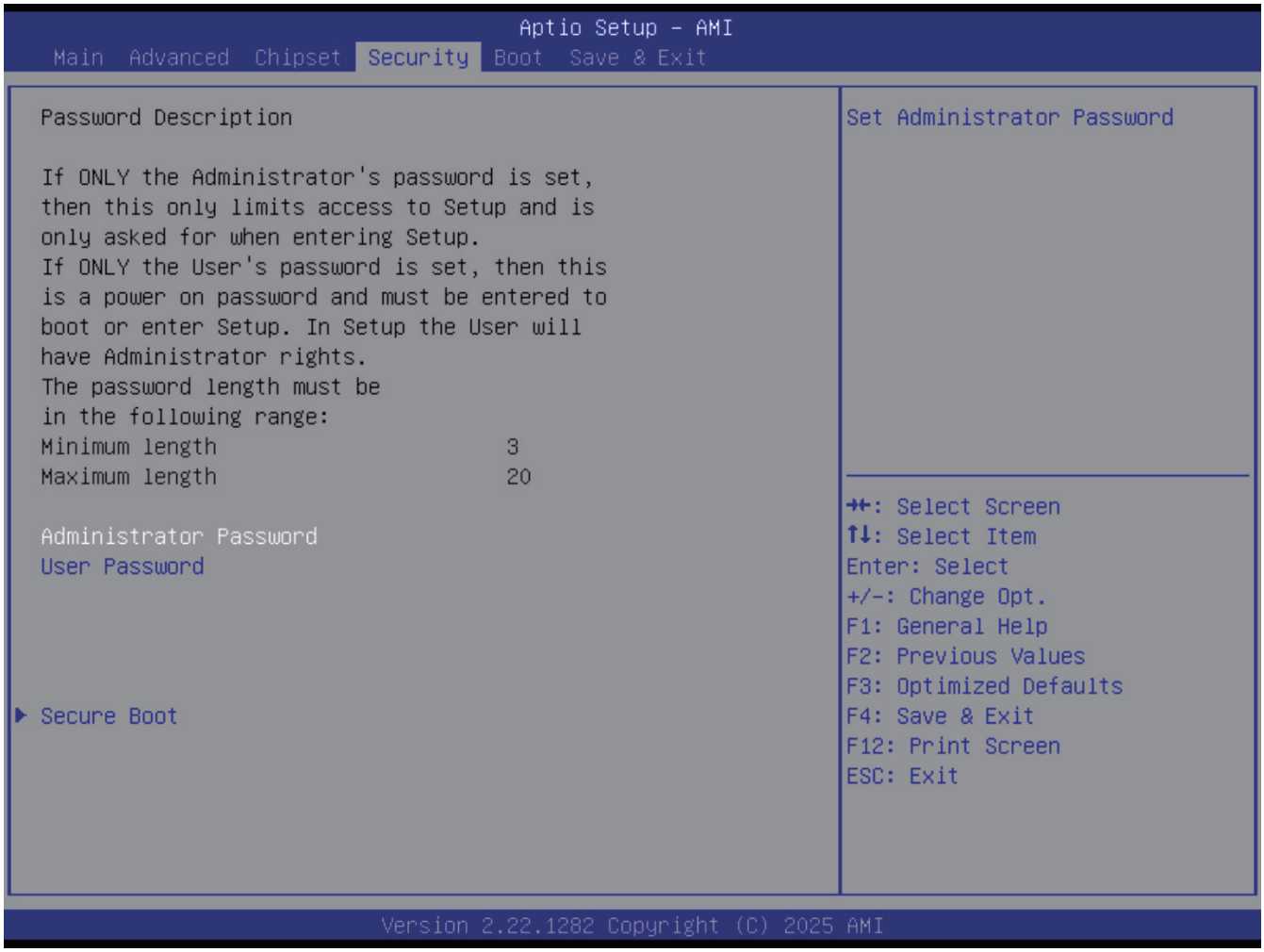


This menu contains the following information:

- **Socket 0 Information**

View Information related to Socket 0.

3.3.4 Security



This menu contains the following information:

- **Administrator Password**

Set Administrator Password.

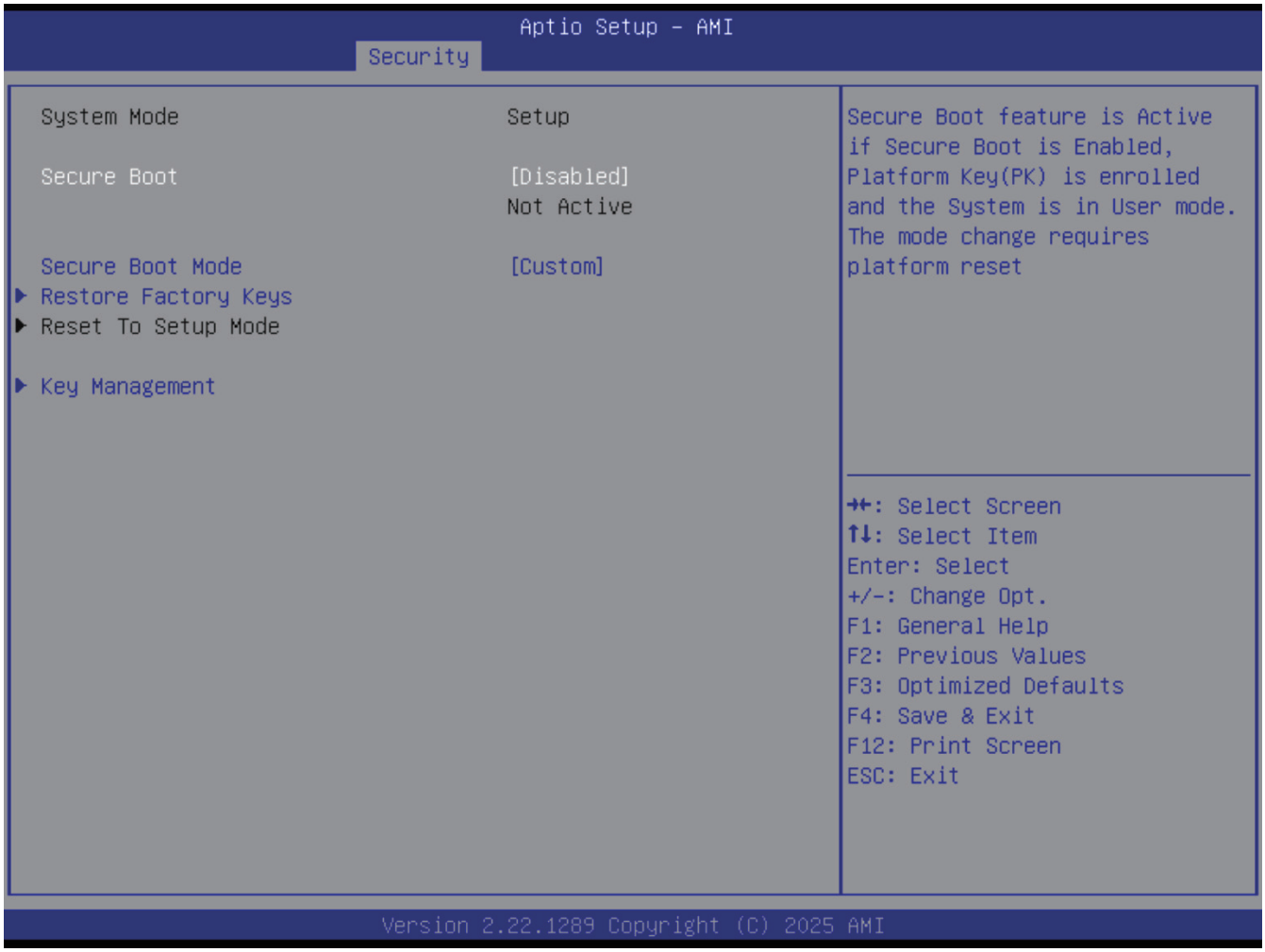
- **User Password**

Set User Password.

- **Secure Boot**

Secure Boot configuration.

3.3.4.1 Secure Boot



This menu contains the following information:

• System Mode

Display the System Mode.

• 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 Boor mode options: Standard or Custom. In Custom mode, Secure Boot Policy variables can be configured by a physically present user without full authentication.

• Restore Factory Keys

Force System to User Mode. Install factory default Secure Boot key databases.

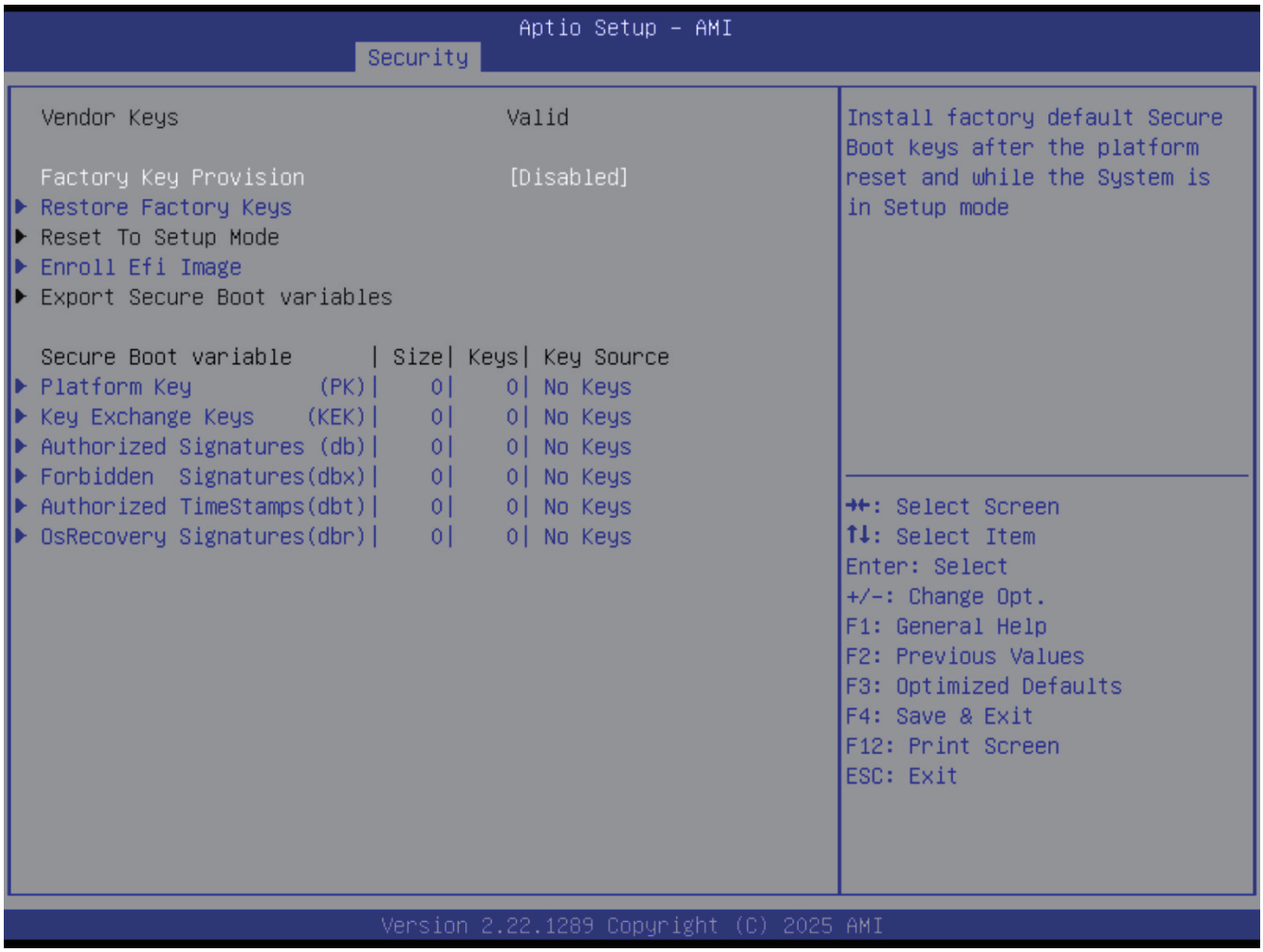
- **Reset To Setup Mode**

Delete all Secure Boot key databases from NVRAM.

- **Key Management**

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

3.3.4.1.1 Key Management



This menu contains the following information:

- **Vendor Keys**

Display the vendor key status.

- **Factory Key Provision**

Install factory default Secure Boot keys after the platform reset and while the System is in Setup mode.

• **Restore Factory Keys**

Force System to User Mode. Install factory default Secure Boot key databases.

• **Reset To Setup Mode**

Reset To Setup Mode.

• **Enroll Efi Image**

Allow Efi image to run in Secure Boot mode. Enroll SHA256 Hash certificate of a PE image into Authorized Signature Database (db).

• **Export Secure Boot variables**

Save NVRAM content of Secure Boot variable to a file.

• **Secure Boot variable | Size | Keys | Key Source:**

Platform Key(PK), Key Exchange Keys, Authorized Signatures, Forbidden Signatures, Authorized Time Stamps, OsRecovery Signatures: Enroll Factory Defaults or load certificates from a file:

1.Public Key Certificate:

a) EFI_SIGNATURE_LIST

b) EFI_CERT_X509 (DER)

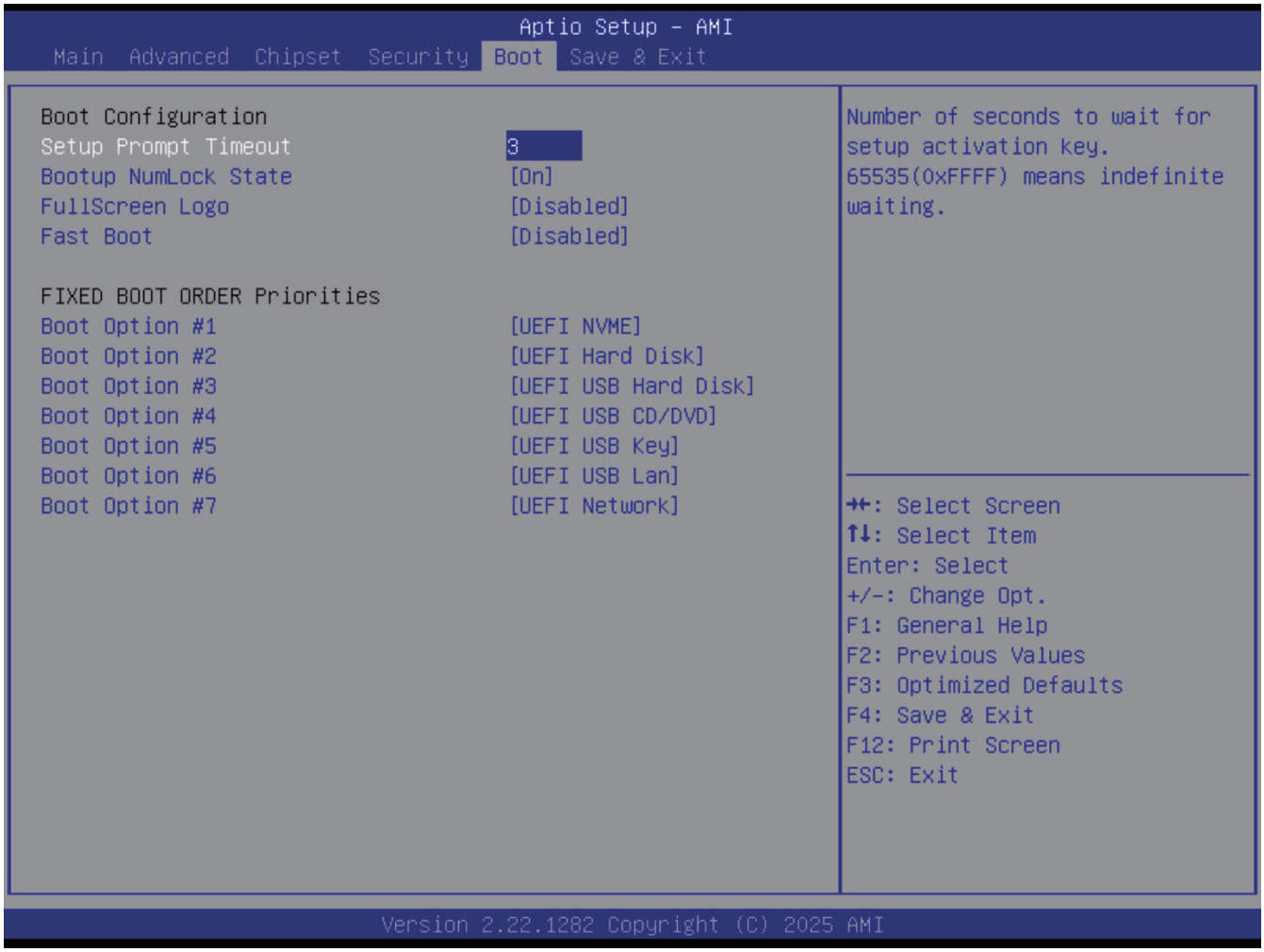
c) EFI_CERT_RAS2048 (bin)

d) EFI_CERT_SHAXXX

2.Authenticated UEFI Variable:

3.EFI PE/COFF Image (SHA256) Key Source: Factory, External, Mixed.

3.3.5 Boot



This menu contains the following information:

• Setup Prompt Timeout

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

• Bootup NumLock State

Select the keyboard NumLock state.

• FullScreen Logo

Enables or disables Full Screen Logo option.

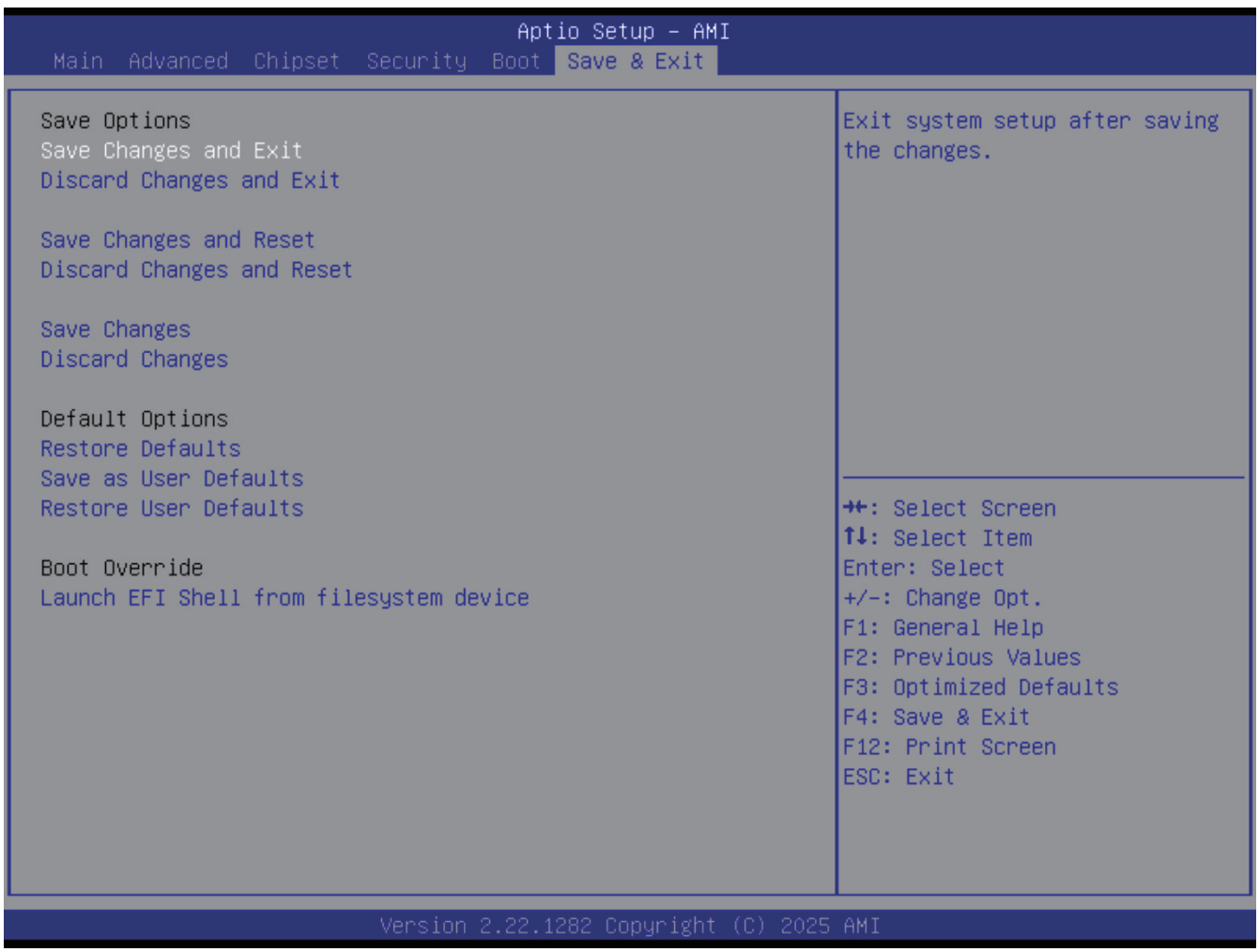
• Fast Boot

Enables or disables boot with initialization of a minimal set of devices required to launch active boot option. Has no effect for BBS boot options.

• **FIXED BOOT ORDER Priorities**

Display Boot order, and allow to set Hard Drive/USB/XXX boot order in this group.

3.3.6 Save & Exit



This menu contains the following information:

Save Options

• **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 or 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.

Boot Override

• Launch EFI Shell from filesystem device

Attempts to Launch EFI Shell applications (Shell.efi) from one of the available filesystem devices.

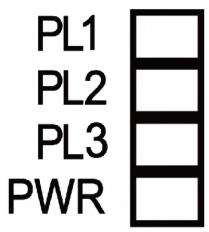
Chapter 4

PL1&PL2&PL3 Sample Code

4.1 Panel Light Control

The BPC-511/BPC-513 provides three software-controlled LEDs: PL1, PL2 and PL3. Each GPO drives one LED. Use SIO_GPIO_RW.exe to control or read its bit. Writing 1 turns the selected LED ON; writing 0 turns it OFF.

PL1, PL2 and PL3 each have a dedicated output bit in the same register. This guide covers these three LEDs only. PWR is not controlled by the commands in this chapter.



Control addresses

Panel light	Signal	I/O address	Bit	ON / OFF
PL1	SIO_GPO76	0xA06	6	1 / 0
PL2	SIO_GPO77	0xA06	7	1 / 0
PL3	SIO_GPO74	0xA06	4	1 / 0

All three lights share one 8-bit I/O register. The bit number selects the light; it is not the number printed on the panel. Use only bits 6, 7 and 4 for the operations described here.

Board reference: J_GPIO1 pin 8 = PL1; pin 7 = PL2; pin 6 = PL3.
The three GPO lines are connected to the LEDs; no external wiring is needed.

4.2 Switch the Panel Lights

Start the utility

Open Command Prompt with Run as administrator. Change to the folder containing the existing SIO_GPIO_RW.exe and its matching runtime files. Replace the example path with your installation folder.

```
cd /d "C:\BPC511_513_GPIO\Release\X64"
```

For the x64 executable, keep SvApiLibx64.dll and SvIoCtrlx64.sys in the deployment folder. For the x86 executable, retain SvApiLib.dll and the supplied SvIoCtrl driver files. Use the executable and DLL of the same architecture.

Turn one light on or off

Light	Turn ON	Turn OFF
PL1	SIO_GPIO_RW.exe -w 0xA06 6 1	SIO_GPIO_RW.exe -w 0xA06 6 0
PL2	SIO_GPIO_RW.exe -w 0xA06 7 1	SIO_GPIO_RW.exe -w 0xA06 7 0
PL3	SIO_GPIO_RW.exe -w 0xA06 4 1	SIO_GPIO_RW.exe -w 0xA06 4 0

Run each command on its own line. With valid arguments, the tool changes the selected bit and preserves the other bits in the value written. Do not run competing control programs at the same time.

Turn all three lights on

```
SIO_GPIO_RW.exe -w 0xA06 6 1
SIO_GPIO_RW.exe -w 0xA06 7 1
SIO_GPIO_RW.exe -w 0xA06 4 1
```

Turn all three lights off

```
SIO_GPIO_RW.exe -w 0xA06 6 0
SIO_GPIO_RW.exe -w 0xA06 7 0
SIO_GPIO_RW.exe -w 0xA06 4 0
```

These commands run sequentially; they do not switch all three lights at exactly the same instant. PWR is unaffected by these mapped operations.

4.3 Read and Confirm Light State

Light	Read control bit
PL1	SIO_GPIO_RW.exe -r 0xA06 6
PL2	SIO_GPIO_RW.exe -r 0xA06 7
PL3	SIO_GPIO_RW.exe -r 0xA06 4

A returned bit of 1 indicates the ON control state; 0 indicates the OFF control state. Reading the register reports the electrical control value. It does not detect a failed lamp or independently confirm visible light output.

Example for PL1

```
SIO_GPIO_RW.exe -w 0xA06 6 1
SIO_GPIO_RW.exe -r 0xA06 6
```

Example messages for the ON state are shown below. Spacing may vary.

```
Initialize Driver OK...
Writing Data at address,bit    a06,6 is 1
Initialize Driver OK...
Reading Data at address,bit    a06,6 is 1
```

Check that PL1 is visibly illuminated. To finish the test with PL1 off, run:

```
SIO_GPIO_RW.exe -w 0xA06 6 0
```

Process exit codes

The original read/write implementation returns the observed bit as its process exit code. A return of 1 is therefore the ON state, not a conventional failure code. A return of 0 can mean OFF, displayed help or an unrecognized option. Initialization and some parameter failures return -1. Check the printed messages as well as the exit code.

Command arguments

Use lowercase -w to write and -r to read. The address is hexadecimal, the bit number is decimal and the intended values are 0 or 1. Always provide every argument. The tool does not fully validate missing or out-of-range values.

```
SIO_GPIO_RW.exe -h
```

Help requires driver initialization. This source edition includes Aicotek LED help text; an older executable may show generic examples until rebuilt. Use the 0xA06 commands in this guide for BPC-511/BPC-513.

4.4 Functions Used for Light Control

Initialization and release

```
BOOL InitApiLib(HMODULE *hModule);
BOOL DeinitApiLib(HMODULE *hModule);
```

InitApiLib loads the architecture-matched DLL, resolves its required exports and initializes hardware access. hModule receives the loaded module handle. It returns FALSE on a load or export failure; otherwise it returns the initialization result. DeinitApiLib releases the initialized library, frees the DLL and clears the handle. The supplied main function does not call the release function before exit.

Read and write a byte

```
BYTE IoRead8(WORD port);
BOOL IoWrite8(WORD port, BYTE value);
```

IoRead8 reads an 8-bit value from the I/O address. For panel lights, port is 0xA06. The selected light state is (value >> bit) & 1. This wrapper ignores the underlying read status; a failed read is not reliably reported.

IoWrite8 writes an entire byte and returns the underlying BOOL status. Before calling it, main reads the old byte and replaces only the requested bit:

```
new_value = (old_value & ~(1 << bit)) | (value << bit);
```

For PL1 use bit 6; for PL2 use bit 7; for PL3 use bit 4. value is 1 for ON or 0 for OFF. main then reads the byte again and reports the selected bit. It does not check the write API status. The read–modify–write sequence is not atomic; serialize access when integrating multiple callers.

Command handling

```
void printfHelp(char *argv0);
int main(int argc, char **argv);
```

printfHelp prints the command syntax and panel-light examples. argv0 supplies the executable name. main initializes the API, processes -r, -w or -h, converts the arguments, performs the requested operation and prints the result. The complete application listing follows in Section 4.6.

Checked reads in an application

```
BYTE value = 0;
BOOL ok = ReadIoPortByte(0xA06, &value);
if (ok) {
    bool pl1_on = ((value >> 6) & 1) != 0;
    bool pl2_on = ((value >> 7) & 1) != 0;
    bool pl3_on = ((value >> 4) & 1) != 0;
}
```

Call this fragment only after successful InitApiLib. ReadIoPortByte is the loaded byte-read API pointer; checking its BOOL result avoids relying on the unchecked IoRead8 wrapper. Release the initialized library when finished.

4.5 Build and Troubleshooting

Build the Aicotek source edition

The companion Aicotek_BPC511_513_GPIO_Source.zip includes the application source, API headers, Visual Studio projects and EN/CN readmes. This source-only package excludes EXE, DLL and driver files. Use the matching runtime files supplied with the original GPIO tool.

1. Extract the package and open SIO_GPIO_RW\SIO_GPIO_RW.sln.
2. Use the project's Visual C++ v142 toolset and Windows SDK 10.0, or deliberately retarget to a compatible installed toolchain. Select Release and x86 (Win32) or x64.
3. Build the solution and deploy the resulting executable beside the existing matching DLL and driver files. Run as administrator.

The source comments and help text have been updated for Aicotek and the three panel lights. The underlying hardware read/write logic is unchanged. Include SvApiInit.h in one translation unit because it defines global function pointers and function bodies.

Troubleshooting

Symptom	Action
Can't load dynamic library	Check that the matching DLL is present and has the same architecture as the executable.
Can't find export function	Use the matching supplied runtime library. Initialization checks more exports than those used for panel lights.
Initialize Driver Error	Run as administrator and check the supplied driver files and target Windows compatibility.
Wrong light changes	Verify PL1 = bit 6, PL2 = bit 7 and PL3 = bit 4, all at address 0xA06.
Control reads 1 but lamp is dark	Check the visible lamp condition and the unit configuration. Register readback is not optical feedback.
Script reports failure on ON	An exit code of 1 is the ON bit value in this utility. Check printed messages before treating it as an error.

Integration notes

Validate all arguments and check low-level API status in production applications. The write path does not check that the value argument exists. The utility does not implement blinking, timing guarantees or saved power-on states. This source edition was build-checked for Win32 and x64; no hardware command was executed. Confirm LED operation on the target BPC-511/BPC-513.

4.6 Application Source

Complete SIO_GPIO_RW.cpp from the companion Aicotek source edition. The two API headers and project files are included in the ZIP.

```
//---------------------------------------------------------------------------
// Aicotek BPC-511/BPC-513 panel LED control
// Customer source edition; see THIRD_PARTY_NOTICES.txt
// License : The modified BSD license
//---------------------------------------------------------------------------
#include <stdio.h>
#include <windows.h>
#include <winioctl.h>
#include <string.h>
#include <cstdio>
#include <iostream>
#include "SvApiInit.h"
HMODULE module;
// Address 0xA06: PL1 = GPO76 / bit 6, PL2 = GPO77 / bit 7,
// PL3 = GPO74 / bit 4. Write 1 for ON and 0 for OFF.
// PWR is not controlled by these commands.
// Windows command line application
void printfHelp(char *argv0)
{
    printf("Aicotek BPC-511/BPC-513 panel LED control\n");
    printf("PL1: 0xA06 bit 6; PL2: bit 7; PL3: bit 4\n");
    printf("Write 1 = ON, 0 = OFF\n\n");
    printf("<%s> <-w/-r> <address> <bit> <0/1>\n", argv0);
    printf("For Example:\n");
    printf("%s -w 0xA06 6 1  \n", argv0);
    printf("%s -r 0xA06 6  \n", argv0);
    printf("\n%s -h:for help!\n", argv0);
}
int main(int argc, char** argv)
{
    WORD address;
    BYTE BYTEVal;
    BYTE Temp;
    UINT8 bit;  // Byte register bit index: 0-7
    UINT8 val;  // Panel light state: 0 = OFF, 1 = ON
    if (!InitApiLib(&module))
    {
        printf("Initialize Driver Error...\n\n");
        return  -1;
    }
    printf("Initialize Driver OK...\n\n");
    if (argv[1] == NULL || !strcmp(argv[1], "-h"))
    {
        printfHelp(argv[0]);
        return 0;
    }
```

```
    if (!strcmp(argv[1], "-r"))
    {
        if (argv[2] != NULL && argv[3] != NULL)
        {
            address = (WORD)strtoul(argv[2], NULL, 16);
            bit = (UINT8)strtoul(argv[3], NULL, 10);
        }
        else
        {
            printf("Wrong parameter!\n");
            return  -1;
        }
        BYTEVal = IoRead8(address);
        Temp = ((BYTEVal >> bit) & 0x1);
        printf("Reading Data at address,bit\t");
        printf("%lx,%d is %x\n", address, bit, Temp);
        return Temp;
    }
    else if (!strcmp(argv[1], "-w"))
    {
        if (argv[2] != NULL && argv[3] != NULL)
        {
            address = (WORD)strtoul(argv[2], NULL, 16);
            bit = (UINT8)strtoul(argv[3], NULL, 10);
            val = (UINT8)strtoul(argv[4], NULL, 16);
        }
        else
        {
            printf("Wrong parameter!\n");
            return  -1;
        }
        BYTEVal = IoRead8(address);
        Temp = ((BYTEVal&(~(1 << bit))) | (val << bit));
        IoWrite8(address, Temp);
        //printf("Finishing Data Write Process......\n");
        printf("Writing Data at address,bit\t\t");
        BYTEVal = IoRead8(address);
        printf("%lx,%d is %x\n", address, bit, ((BYTEVal >> bit) & 0x1));
        return ((BYTEVal >> bit) & 0x1);
    }
    else
    {
        printf("Wrong parameter!\n");
    }
    return 0;
}
```

Chapter 5

Watchdog Control Sample Code

5.1 Watchdog Control

This chapter covers the supplied ITE watchdog utility for BPC-511/BPC-513. Use WatchDogITE.exe to start, refresh or stop the watchdog. The following sections describe its functions, complete source and companion project.

A watchdog counts down independently of the feeding program. If software stops refreshing it, timeout is intended to reset the computer. Save your work before running a timeout test.

Prepare the utility

Extract the original Win_WatchDogITE(1).zip package. Open Command Prompt with Run as administrator and change to the appropriate Release folder. Keep the executable, DLL and driver together.

Folder	Required files
Release\X64	WatchDogITE.exe, SvApiLibx64.dll, SvIoCtrlx64.sys
Release\X86	WatchDogITE.exe, SvApiLib.dll, SvIoCtrl.sys

Choose matching executable and DLL architectures. A tested Windows version matrix is not supplied. The commands below assume that the current directory contains WatchDogITE.exe.

Commands at a glance

Command	Behavior
WatchDogITE.exe start 10	Starts a 10-second countdown and exits. It does not keep feeding.
WatchDogITE.exe enable	Starts a 6-second countdown and feeds every 3 seconds in a continuous loop.
WatchDogITE.exe stop	Calls the watchdog stop API and exits.
WatchDogITE.exe -h	Displays help after initializing the driver.

Based on the supplied ITE watchdog source for BPC-511/BPC-513. The Aicotek help retains version 20240924. The start, stop and enable behavior is unchanged; confirm reset operation on the target unit.

5.2 Operating the Watchdog

Run a deliberate timeout test

```
WatchDogITE.exe start 10
```

The utility calls WatchdogStart(10) and prints "watchdog is starting...". The original readme describes a restart after 10 seconds. The process then exits; the countdown remains armed. To cancel the test, run the following command before timeout:

```
WatchDogITE.exe stop
```

Run continuous monitoring

```
WatchDogITE.exe enable
```

Keep this process running. It starts the watchdog with a 6-second timeout, sleeps for 3000 milliseconds, then reloads the counter with 6. The loop repeats indefinitely. There is no configurable timeout argument for enable mode.

If the process or operating system stops feeding the timer, timeout is intended to cause a restart. The exact reset behavior and timing depend on the installed hardware and firmware. This example feeds unconditionally; it does not check the health of your application.

Stop continuous monitoring

Prepare a second administrator Command Prompt with the stop command ready. Terminate the enable process, then immediately run WatchDogITE.exe stop from that second prompt, within the remaining timeout. The sample provides no graceful loop shutdown and does not automatically disable the watchdog when terminated.

Do not rely on stop while enable is still running: the next loop iteration writes the timeout register again. For a production application, coordinate loop cancellation and WatchdogStop() in the same shutdown path.

Timeout input

start parses a decimal argument with strtoul and casts it to an 8-bit BYTE. The API parameter is named seconds. The sample does not validate numeric syntax or the hardware-supported range. Use the documented 10-second example for initial verification; values above 255 are truncated and zero has no documented meaning in the supplied materials.

5.3 Function Reference

Application entry points

main(int argc, char** argv) initializes the API library, selects start, stop or enable, and executes that branch. Initialization failure or a missing start argument returns -1. Help and other completed paths return 0; an unknown command also falls through with 0. A zero exit code is therefore not proof that the watchdog operation succeeded.

printfHelp(char* argv0) prints the utility version, command syntax and examples. argv0 supplies the executable name. main initializes the driver before handling help.

Library initialization and cleanup

BOOL InitApiLib(HMODULE* hModule) loads SvApiLibx64.dll for an x64 build or SvApiLib.dll otherwise, resolves the required exported functions and calls InitializeLib(). It returns FALSE if loading or symbol lookup fails, otherwise the initialization result. Its required export list includes other hardware services in addition to watchdog functions.

BOOL DeinitApiLib(HMODULE* hModule) calls DeinitializeLib(), frees the DLL and clears the handle. A null handle returns TRUE. This helper is defined in SvApiInit.h but is not called by the supplied main. Releasing the library is separate from disabling the watchdog.

Watchdog API functions

VOID WatchdogStart(BYTE seconds) is a function pointer bound to the DLL export SvWatchdogStart. It starts the watchdog with the requested seconds value. start passes the parsed byte; enable passes 6. The DLL implementation and supported hardware timeout range are not included in the source.

VOID WatchdogStop(VOID) is bound to SvWatchdogStop. It requests watchdog disable. Both watchdog functions return VOID, so the application cannot obtain a success code from these calls. Its printed messages report the selected path rather than verified hardware state.

Byte input and output helpers

BOOL IoWrite8(WORD port, BYTE value) calls WriteIoPortByte and returns its status. The feeding loop uses this helper but ignores the returned status. BYTE IoRead8(WORD port) reads a byte using ReadIoPortByte; its wrapper ignores the read status. It is available in the shared header but is not used by this application.

5.4 Feeding Sequence and Source Project

The enable loop writes the following sequence after each Sleep(3000). This table describes the supplied implementation; it is not a general register specification for other ITE devices.

Order	Port	Values written	Purpose in the sample
1	0x2E	0x87, 0x01, 0x55, 0x55	Enter the configuration sequence.
2	0x2E / 0x2F	0x22 / 0x80	Write configuration register 0x22.
3	0x2E / 0x2F	0x07 / 0x07	Select logical device 7.
4	0x2E / 0x2F	0x73 / 6	Reload the watchdog timeout.
5	0x2E / 0x2F	0x02 / 0x02	Exit the configuration sequence.

Build the companion source

Extract Aicotek_BPC511_513_Watchdog_Source.zip and open WatchDogITE\WatchDogITE.sln. Use v142 and Windows SDK 10.0, or retarget to a compatible toolchain. Select Release and x86 (Win32) or x64. The output is WatchDogITE.exe in Release\X86 or Release\X64 at the package root. Keep the matching runtime files beside the EXE.

Deploy the resulting executable with the original matching DLL and driver listed in Section 5.1. The companion archive contains source and project files only; it does not contain a rebuilt binary or the implementation of the DLL and kernel driver.

File	Purpose
WatchDog.cpp	Command handling, help and continuous feeding loop.
SvApiInit.h	Dynamic API loading, cleanup and hardware I/O wrappers.
SvApiInitDef.h	API function pointer type declarations.
WatchDogITE.sln and WatchDog.vcxproj	Solution and build configuration.

Integration and troubleshooting

For DLL load errors, check architecture and file placement. For missing export errors, use the matching supplied DLL. For initialization errors, check administrator rights and driver availability. The sample has limited argument validation and error reporting, no graceful loop cancellation and no automatic API cleanup. Address these when integrating it into an application.

Comments and help identify Aicotek BPC-511/BPC-513. Watchdog logic is unchanged; the output name is aligned with this guide. Both x86 and x64 builds passed. Hardware reset behavior has not been tested.

5.5 Application Source

Complete WatchDog.cpp from the companion Aicotek source package. Both supporting headers are included in full in the ZIP.

```
//---------------------------------------------------------------------------
//     Author : Aicotek customer source edition
//    Product : BPC-511 / BPC-513 ITE watchdog
//        SDK : Original runtime API names are retained.
//    License : The modified BSD license
//
// Original SDK attribution: see THIRD_PARTY_NOTICES.txt.
//---------------------------------------------------------------------------
#include <stdio.h>
#include <windows.h>
#include <winioctl.h>
#include <string.h>
#include <cstdio>
#include <iostream>
#include "SvApiInit.h"
HMODULE module;
//Ver 0.0.1
//Windows command line application
void printfHelp(char *argv0)
{
    printf("Aicotek BPC-511/BPC-513 Watchdog (20240924)\n\n");
    printf("<%s> <start/stop/enable> <time> \n", argv0);
    printf("For Example:\n");
    printf("%s start 10  \n", argv0);
    printf("%s enable \n", argv0);
    printf("%s stop  \n", argv0);
    printf("\n%s -h:for help!\n", argv0);
}
int main(int argc, char** argv)
{
    BYTE time;
    if (!InitApiLib(&module))
    {
        printf("Initialize Driver Error...\n\n");
        return  -1;
    }
    printf("Initialize Driver OK...\n\n");
    if (argv[1] == NULL || !strcmp(argv[1], "-h")) // Show help.
    {
        printfHelp(argv[0]);
        return 0;
    }
    if (!strcmp(argv[1], "start"))
    {
        if (argv[2] != NULL)
        {
            time = (UINT8)strtoul(argv[2], NULL, 10);
        }
        else
        {
            printf("Wrong parameter!\n");
            return  -1;
        }
```

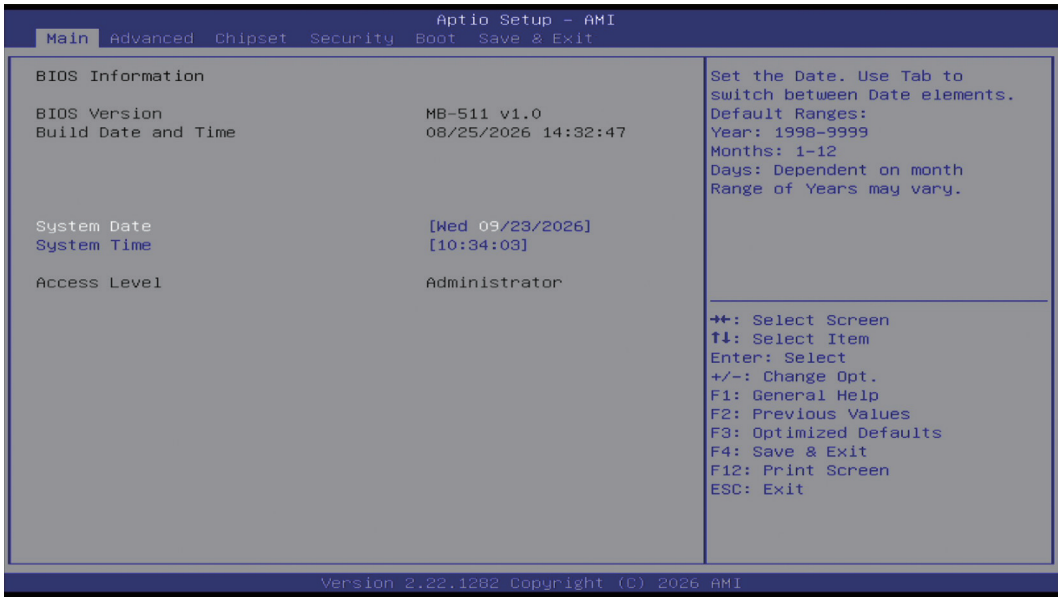
```
        WatchdogStart(time);
        printf("watchdog is starting...\n");
    }
    else if (!strcmp(argv[1], "stop"))
    {
        WatchdogStop();
        printf("watchdog is stopping...\n");
    }
    else if (!strcmp(argv[1], "enable"))
    {
        WatchdogStart(6);
        printf("watchdog is enable...\n");
        while (1)
        {
            Sleep(3000);
            IoWrite8(0x2E, 0x87);
            IoWrite8(0x2E, 0x01);
            IoWrite8(0x2E, 0x55);
            IoWrite8(0x2E, 0x55);
            IoWrite8(0x2E, 0x22);
            IoWrite8(0x2F, 0x80);
            IoWrite8(0x2E, 0x07);
            IoWrite8(0x2F, 0x07);
            IoWrite8(0x2E, 0x73);
            IoWrite8(0x2F, 6);
            IoWrite8(0x2E, 0x02);
            IoWrite8(0x2F, 0x02);
        }
    }
    else
    {
        //printf("Wrong parameter!\n");
    }
    return 0;
}
```

Appendix A

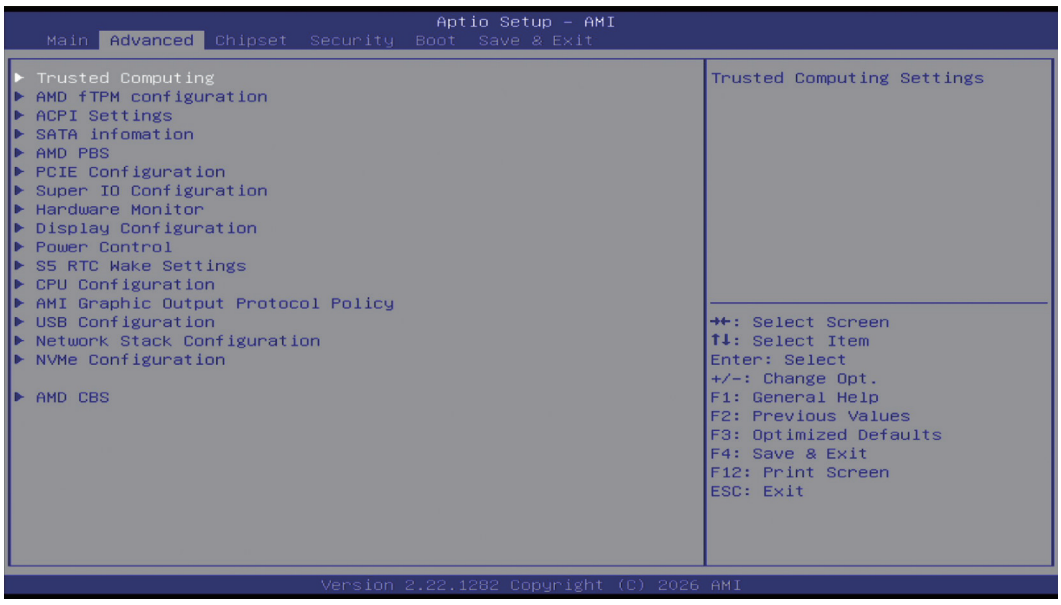
BIOS Hidden Menu Access Tutorial

A.1 Enter BIOS Setup

Step 1: Turn on the computer and repeatedly press the Delete key during startup to enter BIOS Setup.



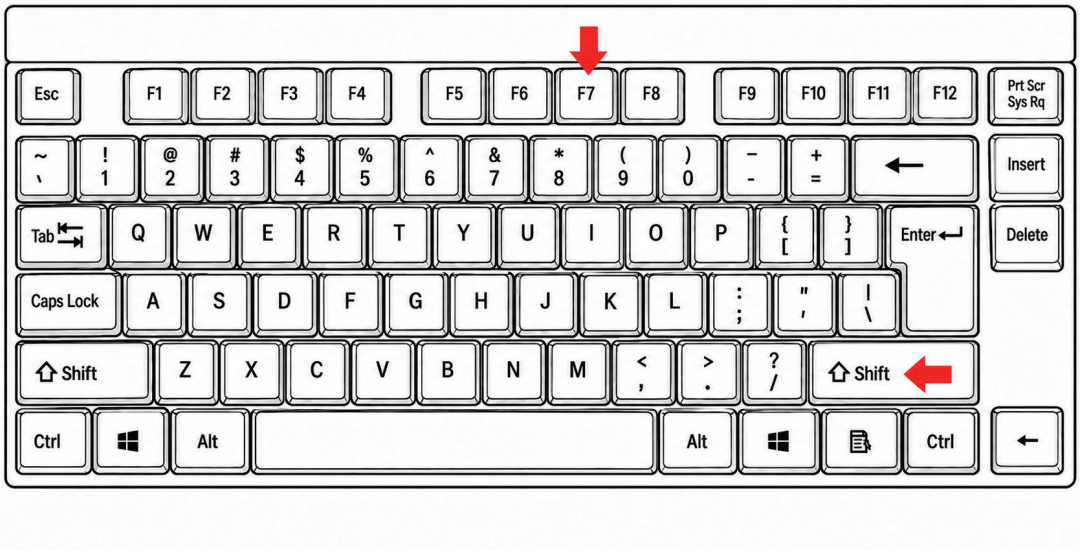
At this point, the Advanced tab does not show the hidden menus.



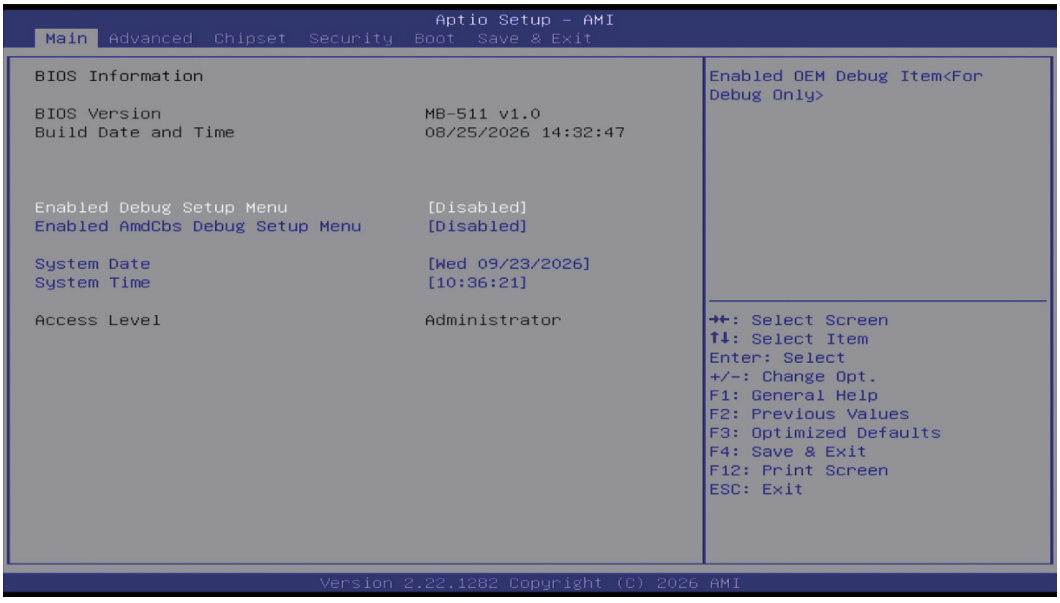
A.2 Reveal the Debug Setup Option

Step 2: Press Right Shift and F7 at the same time.

Important: Use the Shift key on the right side of the keyboard.

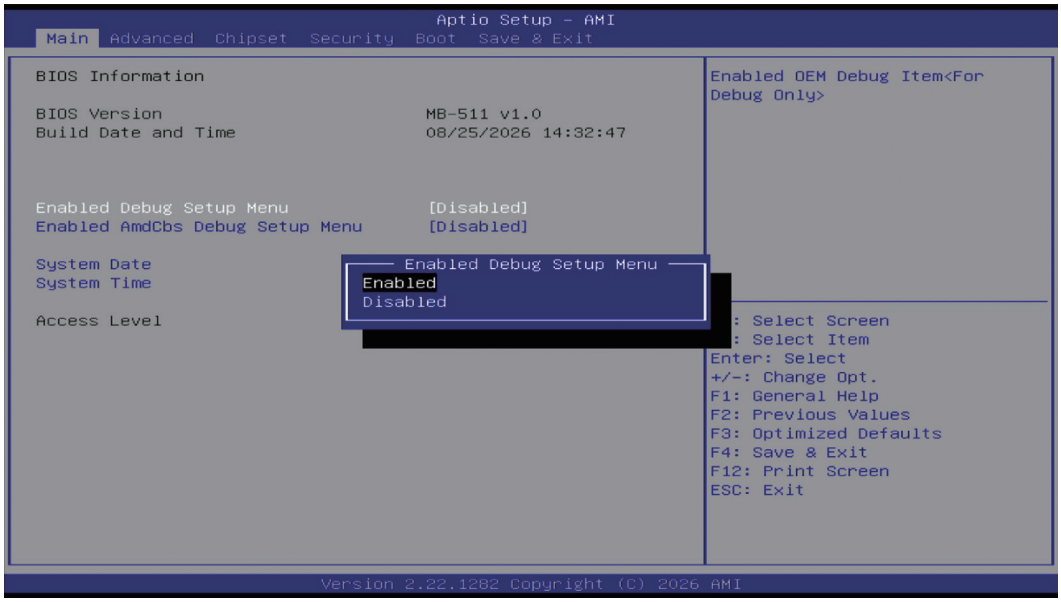


The "Enabled Debug Setup Menu" option appears on the Main tab.



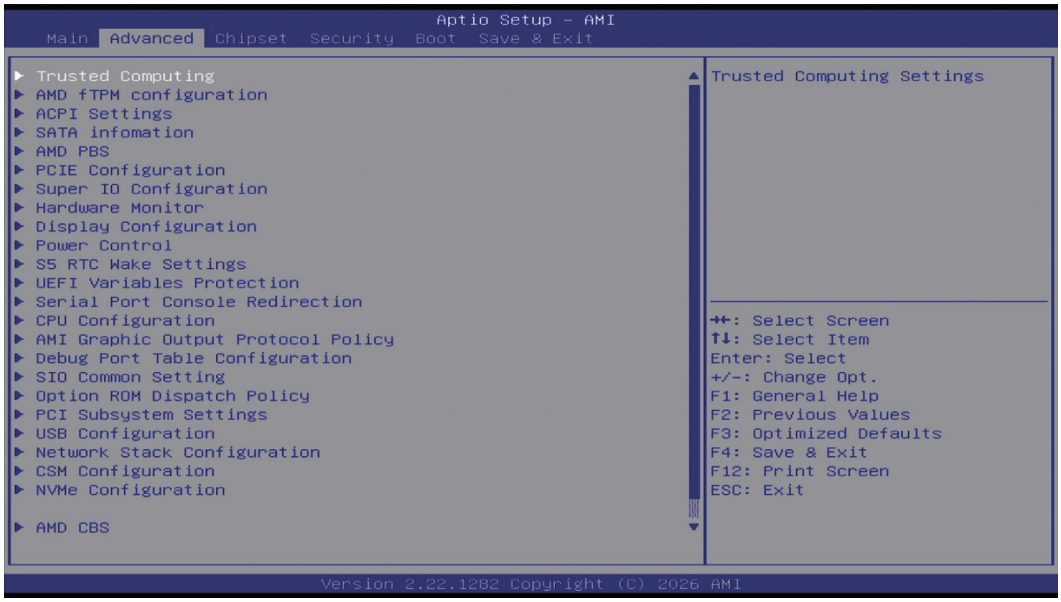
A.3 Enable Access to Hidden Menus

Step 3: Select "Enabled Debug Setup Menu" and press Enter.
Choose "Disabled" to make the hidden menus available.



A.4 Open the Advanced Tab

Step 4: Select the Advanced tab. The hidden menus are now displayed, as shown below.



Appendix B

Alarm and Protection Functions

B.1 Buzzer Alarm Indications

Buzzer Indication	Description
Continuous Beeping	Memory not detected
One Short Beep	Memory POST passed; system continues booting

B.2 Power Protection Specifications

Protection Function	Threshold / Description
Over-Voltage Protection	26V
Under-Voltage Protection	10V
Over-Current Protection	6A
Reverse-Polarity Protection	Supported

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