Alderamin Mk5

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1 Copyright

2 Regulatory Compliances

2.1 CE and UKCA Notice

This device complies with the requirements of the CE directive and UKCA regulations.

Low Voltage Directive 2014/35/EU + Electrical Equipment Safety Regulations 2016 (SI 2016 No 1101)

- IEC 62368-1:2018
- EN IEC 62368-1:2020+A11:2020
- BS EN IEC 62368-1:2020+A11:2020

EMC Directive 2014/30/EU + Electromagnetic Compatibility Regulations 2016

- EN 55032:2015/A1:2020; CISPR 32:2015/AMD1:2019; BS EN 55032:2015+A1:2020
- EN 55035:2015/A1:2020; CISPR 35:2015/AMD1:2019; BS EN 55035:2015+A1:2020
- IEC 61000-3-2:2018/AMD1:2020/ISH1:2021; EN IEC 61000-3-2:2019+A1:2021; BS EN IEC 61000-3-2:2019+A1:2021
- IEC 61000-3-3:2013/AMD1:2017+A2:2021+COR1:2022; EN 61000-3-3:2013+A1:2019+A2:2021+AC:2022-01; BS EN 61000-3-3:2013+A1:2019+A2:2021
- EN 55035:2017+A11:2020; CISPR 35:2016; BS EN 55035:2017+A11:2020
- IEC 61000-4-2:2008; EN 61000-4-2:2009; BS EN 61000-4-2:2009
- IEC 61000-4-3:2020; EN IEC 61000-4-3:2020; BS EN IEC 61000-4-3-TC:2020
- IEC 61000-4-4:2012; EN 61000-4-4:2012; BS EN 61000-4-4:2012
- IEC 61000-4-5:2014/AMD1:2017; EN 61000-4-5:2014+A1:2017; BS EN 61000-4-5:2014+A1:2017
- IEC 61000-4-6:2023; EN IEC 61000-4-6:2023; BS EN IEC 61000-4-6-TC:2023
- IEC 61000-4-8:2009; EN 61000-4-8:2010; BS EN 61000-4-8:2010
- IEC 61000-4-11:2020/COR1:2020/COR2:2022; EN IEC 61000-4-11:2020/AC:2020-10; BS EN IEC 61000-4-11:2020

RoHS 2 Directive 2011/65/EU & 2015/863/EU + RoHS 2 Directive 2020 No. 1647

- Exemption(s) used:
- 6c,7a,7c,9a

2.2 FCC PART 15 VERIFICATION STATEMENT

WARNING

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Notice: The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

2.3 ICED-003 ISSUE 7 VERIFICATION STATEMENT

CAN ICES3(A)/NMB3(A)

This device complies with CAN ICES-003 Issue 7 Class A. Operation is subject to the following two conditions: (1) This devicemay not cause harmful interference, and (2) this devicemust accept any interference received, including interference that may cause undesired operation.

3 Safety Instructions

Please read these instructions carefully and retain them for future reference.

1. Disconnect this equipment from the power outlet before cleaning. Do not use liquid or sprayed detergent for cleaning. Use a moist cloth or sheet.
2. Keep this equipment away from humidity.
3. Ensure the power cord is positioned to prevent tripping hazards and do not place anything on top of it.
4. Pay attention to all cautions and warnings on the equipment.
5. If the equipment is not used for an extended period, disconnect it from the main power to avoid damage from transient over-voltage.
6. **Prolonged usage with less than 12V may damage the PSU or destroy the mainboard.**
7. Never pour any liquid into openings as this could cause fire or electrical shock.
8. Have the equipment checked by service personnel if:
    - The power cord or plug is damaged.
    - Liquid has penetrated the equipment.
    - The equipment has been exposed to moisture in a condensation environment.
    - The equipment does not function properly, or you cannot get it to work by following the user manual.
    - The equipment has been dropped and damaged.
9. Do not leave this equipment in an unconditioned environment, with storage temperatures below -20 degrees or above 60 degrees Celsius for extended periods, as this may damage the equipment.
10. Unplug the power cord when performing any service or adding optional kits.
11. Lithium Battery Caution:
    - Risk of explosion if the battery is replaced incorrectly. Replace only with the original or an equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.
    - Do not remove the cover, and ensure no user-serviceable components are inside. Take the unit to a service center for service and repair.

⚠ Warning!
Always completely disconnect the power cord from your chassis whenever you work with the hardware. Do not make connections while the power is on. Sensitive electronic components can be damaged by sudden power surges. Only experienced electronics personnel should open the PC chassis.

⚠ Caution!
Always ground yourself to remove any static charge before touching the CPU card. Modern electronic devices are very sensitive to static electric charges. As a safety precaution, use a grounding wrist strap at all times. Place all electronic components in a static-dissipative surface or static-shielded bag when they are not in the chassis.

4 Product Specifications

4.1 Features

The **Alderamin MK5 Embedded System** delivers high performance and versatility with the following key features:

- **Powerful Processing**: Supports **14th Generation Intel® Core™ i9 / i7 / i5 / i3** processors.
- **Triple Display Support**: Connect via **HDMI, DisplayPort, and VGA** for enhanced multi-screen capabilities.
- **Fan-less & Expandable Design**: Ensures silent operation with modular expansion options.
- **Versatile Connectivity**: Expand via **COM, DIO, LAN, and PoE modules** for diverse applications.
- **Vehicle-Ready Power Ignition**: Supports **Xpansion Module** for in-vehicle applications.
- **Wide Power Range**: Operates on a **9-48V power supply** for industrial adaptability.
- **Extreme Temperature Tolerance**:
  - **-40°C to 70°C** with a **35W CPU**
  - **-40°C to 50°C** with a **51-65W CPU**
  - **-40°C to 40°C** with a **71-80W CPU**

4.2 Alderamin MK5 & Alderamin MK5-D CPU Options

Processor Name	Cores	Threads	TDP
Intel® Raptor Lake Refresh 14th Generation			
Intel® Core™ i9-14900T – 36M Cache, up to 5.50 GHz	24	32	35W
Intel® Core™ i7-14700T – 33M Cache, up to 5.20 GHz	20	28	35W
Intel® Core™ i5-14500T – 20M Cache, up to 4.50 GHz	10	16	35W
Intel® Core™ i3-14100T – 20M Cache, up to 4.50 GHz	4	8	35W

4.3 Technical Details

Feature	Specification	Details
Processor	CPU	14th Gen Intel® Raptor Lake Refresh Core-i FC-LGA16A Socket Processor, TDP Max. 65W
Chipset	Chipset	Intel® R680E
Memory	System Memory	DDR5 4800MHz, 2 x 262-pin SO-DIMM, Max. 96GB (i7 / i9: ECC; i3 / i5: Non-ECC)
Graphics	GPU	Intel® UHD Graphics 730 (i3 / i5), 770 (i7 / i9)
Storage	Storage Slots	2 x 2.5” HDD / SSD (1 w/ Removable HDD Bay; 2 w/ Internal HDD Bracket) 1 x mSATA
Networking	Ethernet	4x Intel® I226-LM 2.5 Gigabit LAN
Audio	Audio	Realtek® ALC888
Security	I/O Chipset	Nuvoton NCT6126D
	TPM	Nuvoton NPCT760AABYX
I/O Ports	Front I/O	1 x HDMI 1.4 2 x USB 3.2 Gen2 2 x SIM Card Slot w/ Cover 1 x 2.5” SATAIII HDD / SSD Bay
	Rear I/O	4 x RJ-45 6 x USB 3.2 Gen 2 (10 Gbps) 3 x RS232 / 422 / 485 (Support Power 5V / 12V) 6 x SMA Antenna (Optional for WiFi/LTE function) 1 x 8-bit GPIO (in DB9 Connector) 1 x DisplayPort 1.2 1 x VGA 1 x Mic-in 1 x Line-out 1 x PCIe x16 slot 1 x 2-pin Terminal Block Remote Power Reset 1 x 3-pin Terminal Block Power Input 1 x 2-pin Terminal Block Remote Power On/Off
Power	Power Input	9~48V Wide Range DC Input w/ Terminal Block Connectivity
Cooling	Thermal Design	Fanless (MK5) / Optional Internal System Fans (MK5-D)
Mechanical	Mounting	Wall mount
	Dimensions	MK5: 10.6” x 9.7” x 4.3” (268 mm x 246 mm x 108 mm) MK5-D: 10.6” x 9.7” x 5” (268 mm x 246 mm x 128 mm)
	Material	Top cover: Aluminum Alloy Bezel and chassis: Steel
Environmental	Operating Temperature	**Fanless Design (MK5 & MK5-D):** 35W TDP: -40°C to 70°C 51~65W TDP: -40°C to 50°C 71~80W TDP: -40°C to 40°C **MK5-D with Internal Fans:** 35W TDP: -20°C to 50°C 51~65W TDP: -20°C to 45°C 71~80W TDP: -20°C to 40°C
	Operating	10%~90% R/H (Non-condensing)

4.4 ⊠ Important Notes

Restricted Access Location (RAL) A Restricted Access Location is an area with extreme temperatures where only authorized personnel can enter for specific purposes.

1. Access is limited to trained personnel aware of location restrictions and necessary precautions.
2. Entry requires security measures such as tools, lock-and-key, or controlled access by the responsible authority.

Power Consumption Considerations Ensure power consumption is within the power supply's specifications.

- Recommended AC Adapters:
  - **AC/DC 24V/12.5A, 300W** (3PIN Terminal Block Power Adaptor)
  - **AC/DC 24V/9.16A, 220W** (3PIN Terminal Block Power Adaptor)

Ambient Temperature Precaution

- The maximum safe operating temperature is **40°C** if the external AC adapter model **EA12501J** or **EA13001N** is placed in the same high-temperature area as the embedded system.

PXE Application Requirement

- Before OS installation via PXE server, pre-install the **i219-LM driver** in the OS image.

Lithium Battery Safety Warning

- **Caution:** This system contains a **Lithium battery**.
- Do **NOT** puncture, mutilate, or dispose of it in fire.
- Risk of **explosion** if replaced incorrectly—use only manufacturer-recommended replacements.
- Dispose of batteries as per manufacturer instructions and local regulations.

System Shutdown Risks The following configurations may cause unexpected shutdowns:

- **12 x LANs** or **10 x PoE LANs** with certain **NVMe SSD models** (Check compatibility with sales support).
- **12 x LANs** or **10 x PoE LANs** with **mPCIe or M.2 Wi-Fi Cards** (Excludes CNVi Wi-Fi Cards; check compatibility with sales support).

BIOS Flashing Precautions

- **Read BIOS release notes before re-flashing BIOS.**
- If BIOS resets to default settings post-flash, verify configuration before booting.
- **Incorrect RAID settings** may cause system boot failure.

PCIe GFX Card Installation Considerations

- With a **PCIe GFX card** installed in **Alderamin MK5-D**, BIOS setup will only support display output via the **external graphics card**.

Storage Limitations for Dual-Layer PCIe GFX Cards

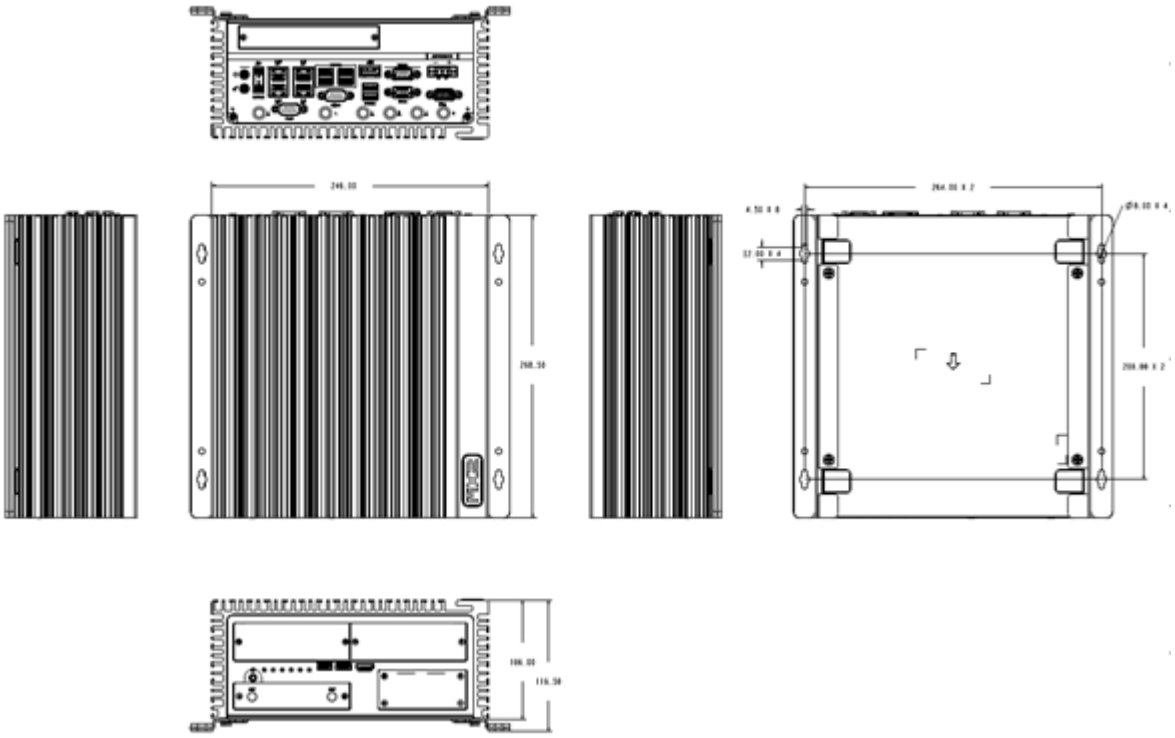
- Installing a **dual-layer PCIe GFX card** allows only **one** internal HDD/SSD (excluding removable HDD/SSD) instead of **two** due to mechanical constraints.
- **SATA cable connector** must be inserted into the **SATA port next to the 2 × 40x40x20mm internal system fan**.
- **Cable clip removal may be required** for clearance with the graphics card.

Storage Limitations for NVIDIA T4/P4 AI Card

- Installing an **NVIDIA T4 or P4 AI card** with **2 × 40x40x28mm internal fans and a fan duct** allows only **one** internal HDD/SSD (excluding removable HDD/SSD) instead of **two** to prevent interference.
- **SATA cable connector** must be inserted into the **internal SATA connector**.

4.5 Alderamin MK5

- **Mechanical Dimensions:** 268 mm x 246 mm x 108 mm
- **PCI Express x16 Slot Maximum Card Dimensions:**
  - **111.15 x 200 x 18.7 mm** (with mPCIe PoE Module)
  - **111.15 x 230 x 18.7 mm** (without mPCIe PoE Module)



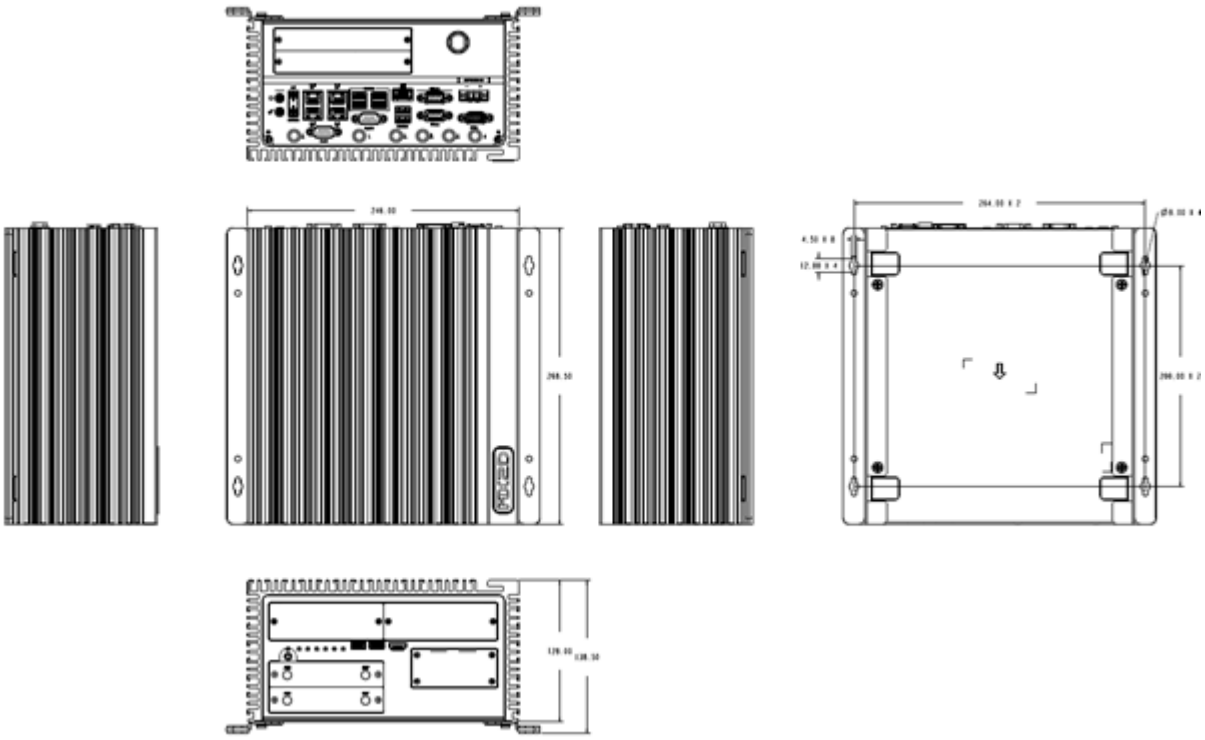
4.6 Alderamin MK5-D

- **Mechanical Dimensions:** 268 mm x 246 mm x 128 mm
- **PCI Express x16 Slot Maximum Card Dimensions:**
  - **145 x 221 x 43 mm** (without mPCIe PoE Module)
- **PCI Express Slot Configurations:**
  - **PCI Express X16 + X1 Dual Slot** (Default)
  - **PCI Express X8 + X8 Dual Slot** (Optional)

4.6.1 AI & Graphics Card Support List:

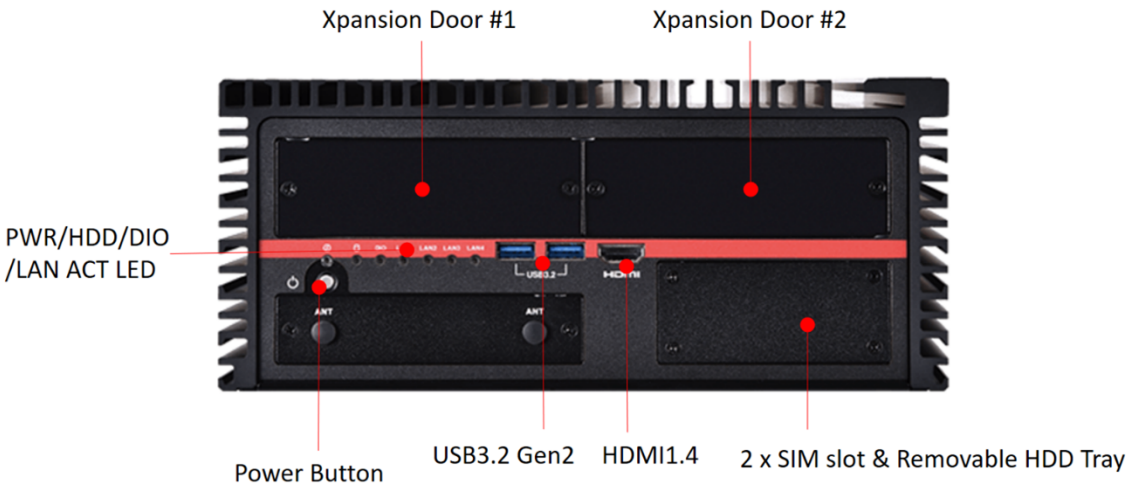
- **NVIDIA Quadro P400** (30W)
- **NVIDIA Quadro P620** (40W)
- **NVIDIA Quadro P2000** (75W)
- **NVIDIA Tesla T4 / P4** (75W)
- **Aetina GTX1050 N1050-J9FX** (2GB, 75W)
- **Leadtek WinFast GTX1650** (4GB, 75W)

- **Leadtek WinFast GTX1660 HURRICANE** (6GB, 120W) *Requires secondary 12V, 180W AC Adapter*
- **Leadtek WinFast GTX1660 Ti HURRICANE** (6GB, 120W) *Requires secondary 12V, 180W AC Adapter*



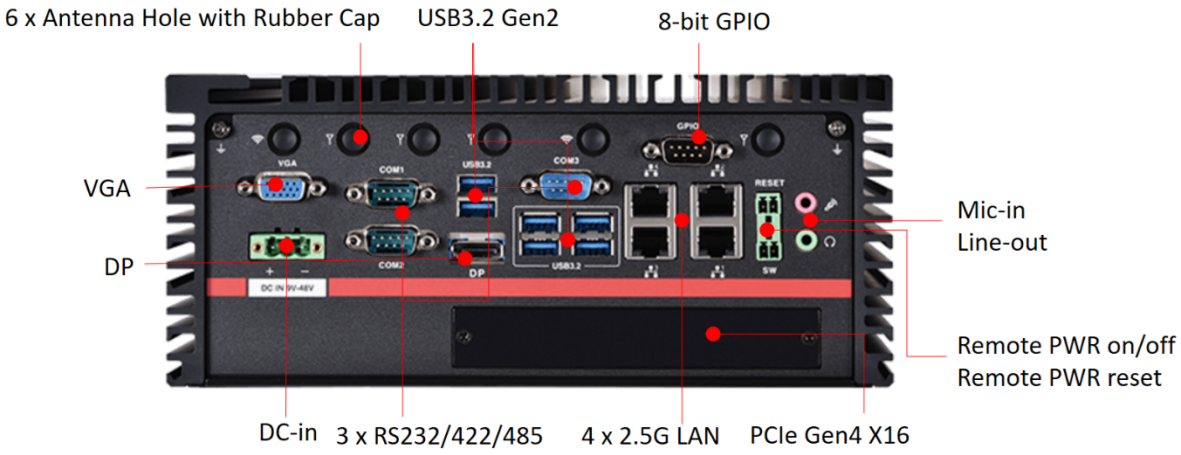
5 Interfaces and Connections

5.1 Front I/O

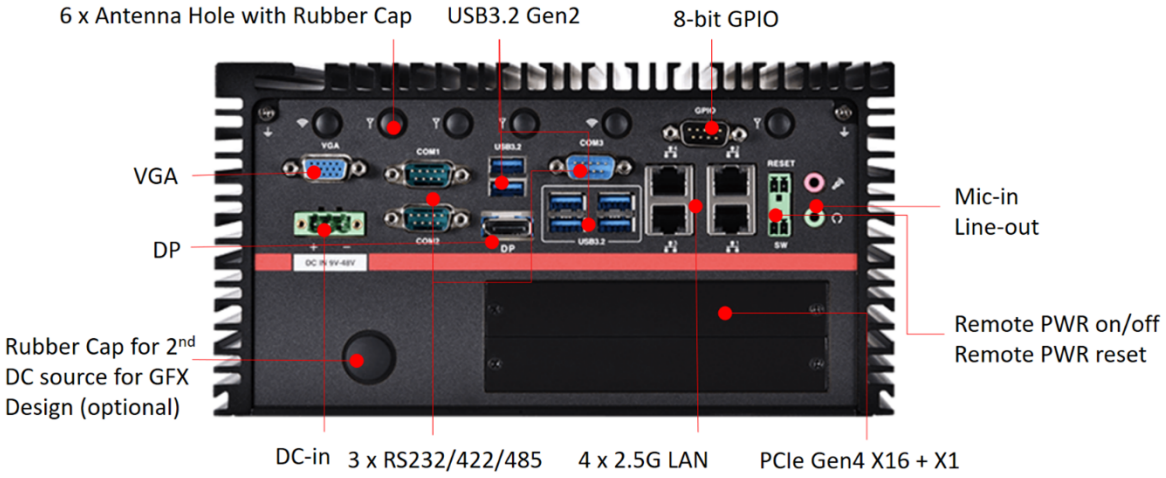


5.2 Rear I/O

5.2.1 Alderamin MK5



5.2.2 Alderamin MK5-D



Note: The recommended dimensions for a USB cable connector or device for USB 2.0 ports are **9mm height x 19mm width** when all other I/O ports are occupied. However, compatibility also depends on the dimensions of the DisplayPort connector and other devices to avoid interference.

5.3 Expansion Module (Optional) Configuration Table

Expansion	Function	1	2	3
COM/DIO	4x COM, 8x DIO	X	X	
PoE RJ45	4x Gigabit PoE RJ45	X	X	
PoE M12	4x Gigabit PoE M12	X	X	
DualLAN	2x Gigabit LAN RJ45			X

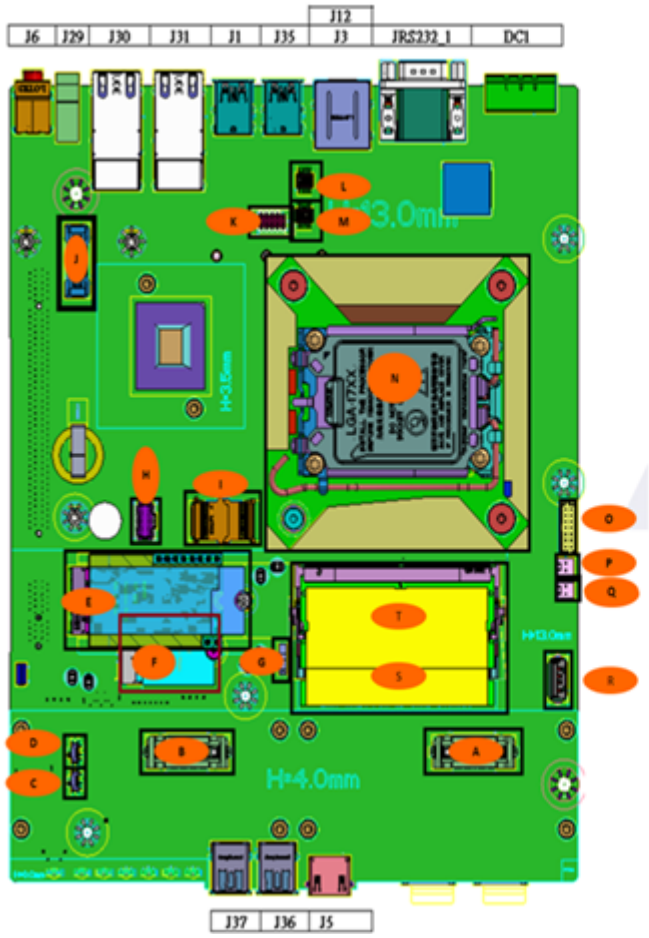
5.4 Recommended PoE Configuration and Environmental Spec Matrix

CPU TDP	PoE Configuration	Max. Ambient (°C)	CPU Utility	Memory Loading	HDD/SSD Loading	PoE Power %
35W	None	70	100%	40%	10%	-
35W	x2 PoE ports (Max. 30W)	65	70%	40%	10%	70%
35W	x4 PoE ports (Max. 50W)	60	70%	40%	10%	70%
35W	x6 PoE ports (Max. 80W)	55	70%	40%	10%	70%
35W	x8 PoE ports (Max. 100W)	50	70%	40%	10%	70%
35W	x12 PoE ports (Max. 130W)	40	70%	40%	10%	70%

6 DIP Switch Settings and Pin Definitions

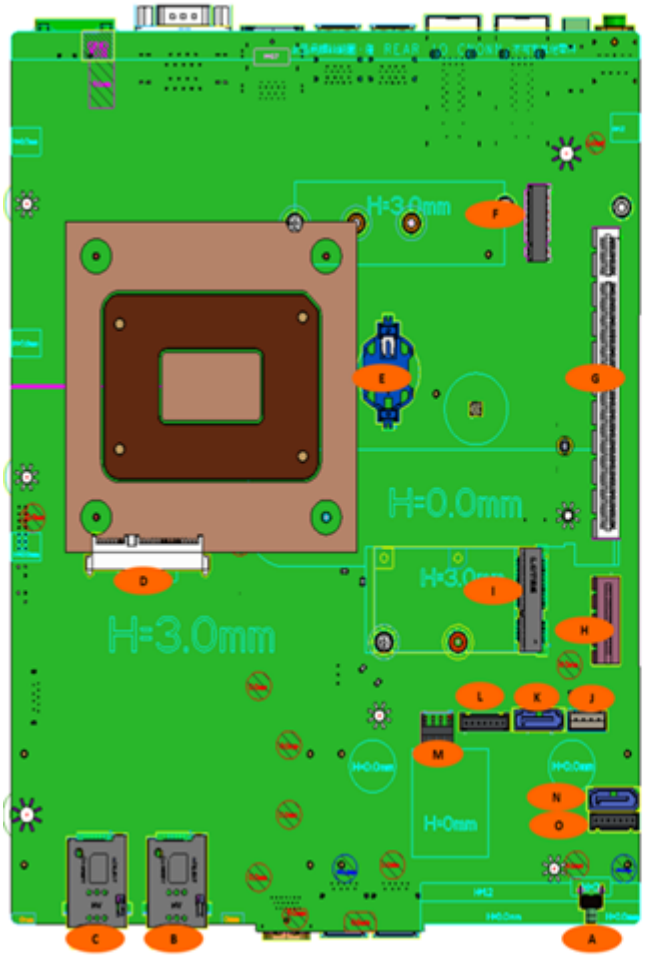
6.1 Jumper and Internal Connector Placement

6.1.1 Overall Layout



Side IO	
J6	AUDIO: MIC/ LINE OUT
J29	Power ON/OFF(Low)/ Reset(High)
J30	DUAL LAN CONN
J31	DUAL LAN CONN
J1	DUAL USB3.2 CONN
J35	DUAL USB3.2 CONN
J12	DUAL USB3.2 (stack-high)
J3	Display port ((stack-low)
JRS232_1	JRS232 CONN
DC1	DC Power CONN
J5	HDMI port
J36	USB3.2 CONN
J37	USB3.2 CONN

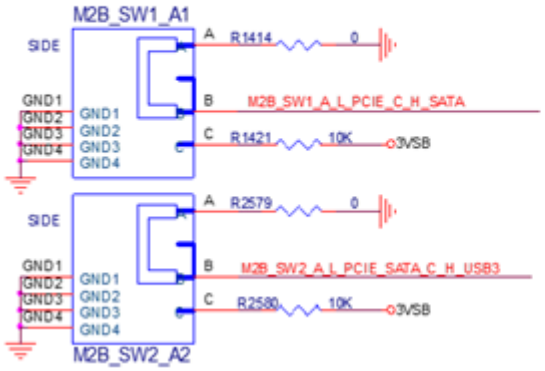
TOP side internal		
A	J16	Board to board 1
B	J17	Board to board 2
C	M2B_SW2_A1	M2B-PCIe/sata/USB3 switch
D	M2B_SW1_A1	M2B-PCIe/sata/USB3 switch
E	M2B1	M.2 key B
F	M2E1	M.2 key E
G	SW1	AT/ATX mode
H	J24	DIO header
I	E1	BIOS socket
J	J11	POE module header
K	J_RS232_P1	RS232 header
L	SW2	COM port RI power selector
M	SW3	COM port RI power selector
N	CPU SOCKET	CPU socket
O	J2	VGA header
P	J27	VCC output header
Q	J28	VCC output header
R	J15	USB3.1 header
S	DIMM2	DIMM2-DDR5
T	DIMM1	DIMM1-DDR5



BTN side internal		
A	PWR_BTN1	Power ON/OFF Button
B	SIM2_J1	SIM card header
C	SIM2_J2	SIM card header
D	J18	SATA header
E	XBT1	RTC battery header
F	M2M1	M.2 -m key Slot
G	PCIE_X16_SLOT1	PCIe X16 slot
H	PCIE_X1_SLOT1	PCIe X1 slot
I	MPCIE1	Mini PCIe slot
J	J26	Power Header(12V-5A)
K	J22	SATA header
L	J19	SATA Power header (12V/ 5V /3V)
M	J25	System FAN header
N	J21	SATA header
O	J20	SATA Power header (12V/ 5V /3V)

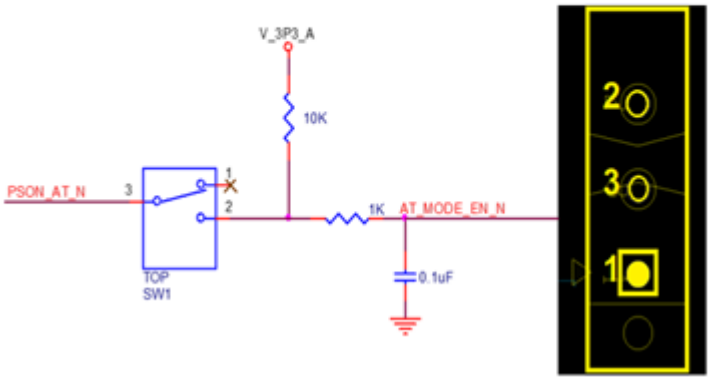
6.2 DIP Switch Settings

D	M2B_SW1_A1	M2B-PCIe/SATA/USB3 switch-1
C	M2B_SW2_A1	M2B-PCIe/SATA/USB3 switch-2

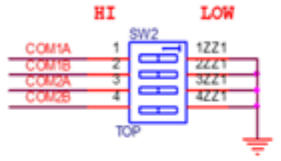


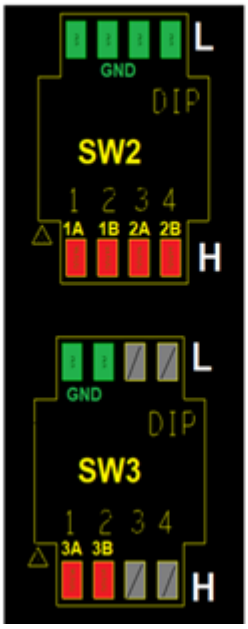
Function	M2B_SW1	M2B_SW2
PCIe	A	A
SATA	C	A
USB3.0	X (A or C)	C

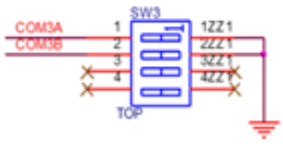
G	SW1	AT/ATX mode
	Pin1- Pin3	Normal mode
	Pin2- Pin3	AT mode



L	SW2	COM port RI power selector
M	SW3	COM port RI power selector







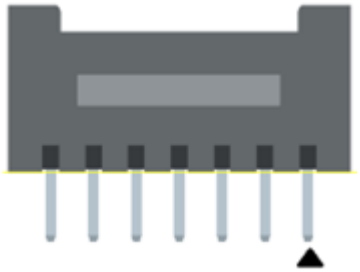
	COM1A	COM1B	COM1 MULTI_NRI1
SW2	Low	Low	Ring
	Low	High	5V
	High	Low	12V
	COM2A	COM2B	COM2 MULTI_NRI2
	Low	Low	Ring
	Low	High	5V
	High	Low	12V
SW3	COM3A	COM3B	COM3 J_RS232_P1
	Low	Low	Ring
	Low	High	5V
	High	Low	12V

6.3 Internal Connector Pin Definition

6.3.1 1st SATA Connector (Location J18)

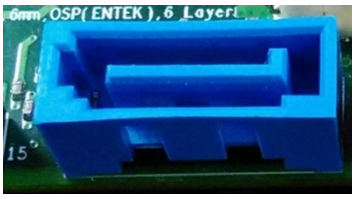
Pin	Signal Name
P1-P3	VCC3
P4-P6	GND
P7-P9	VCC
P10	GND
P11	RES
P12	GND
P13-P15	+12V
S1	GND
S2	SATAHDR_TXP0_C
S3	SATAHDR_TXN0_C
S4	GND
S5	SATAHDR_RXN0_C
S6	SATAHDR_RXP0_C
S7	GND

6.3.2 SATA Power Headers (Location J19/J20 - 2nd & 3rd SATA Power Headers)



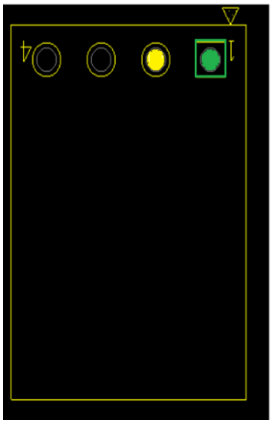
Pin	Signal Name
1	VCC3
2	GND
3-4	VCC
5	GND
6-7	+12V

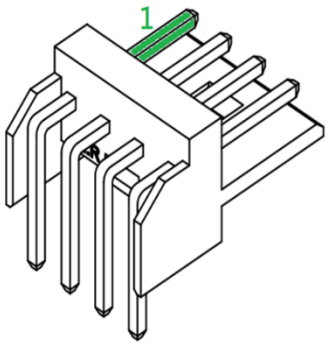
6.3.3 SATA Signal Headers (Location J19/J20 - 2nd & 3rd SATA Signal Headers)



Pin	Signal Name	Description
1	GND	Ground
2	SATAHDR_TXP_C	SATA Data Transmit (Positive)
3	SATAHDR_TXN_C	SATA Data Transmit (Negative)
4	GND	Ground
5	SATAHDR_RXN_C	SATA Data Receive (Negative)
6	SATAHDR_RXP_C	SATA Data Receive (Positive)
7	GND	Ground
8	G1	GND
9	G2	GND

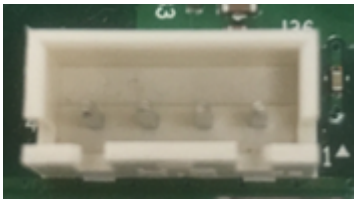
6.3.4 Fan Header (Location J25)





Pin	Signal
1	Ground
2	+12V
3	CPU_FAN_TACH
4	CPU_FAN_CTRL

6.3.5 12V/5A Power Headers for PoE Expansion (Location J26)



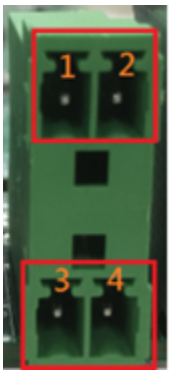
Pin	Signal
1	Ground
2-3	+12V
4	GND

6.4 External Connector Pin Definitions

6.4.1 3-Pin Terminal Block for DC Input

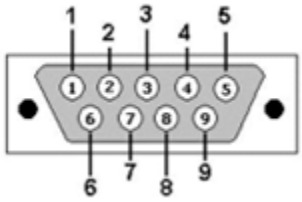
Pin	Signal
1	DC IN +9~48VIN
2	N/A
3	GND

6.4.2 2-Pin Terminal Block for Remote Power ON/OFF and Reset



Pin	Signal
1	Ground
2	EXT Reset
3	Ground
4	EXT_PWRBT_ON/OFF

6.4.3 COM#1 / COM#2 / COM#3



Pin No	RS-232	RS-422	RS-485
1	DCD	TX-	DATA-
2	RX	TX+	DATA+
3	RTX	RX+	NC
4	DTR	RX-	NC
5	GND	GND	GND
6	DSR	NC	NC
7	RTS	NC	NC
8	CTS	NC	NC
9	RI	NC	NC

6.5 Expansion Module DIO/COM

The DIO/COM module consists of two parts: **Serial COM** and **Digital IO** functions.
Please refer to the guideline for instructions on how to correctly set up this module.

6.5.1 COM Port Setting

Location

The **DIO/COM** module has a total of **4 COM ports**. These ports can be configured as:

- RS232
- RS422
- RS485
- Powered RS232

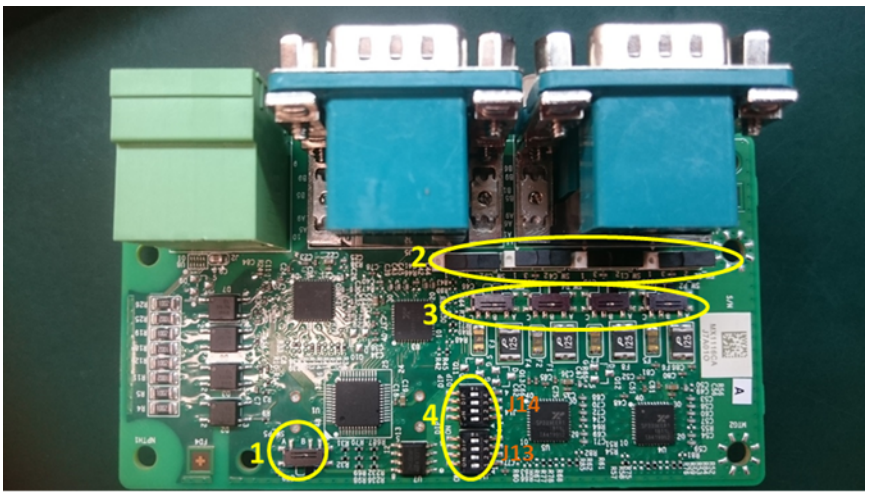
There are two types of **Expansion COM drivers**:

1. **Standard non-fixed COM port order driver**
2. **Fixed COM order driver**

If the **fixed COM port order driver** is installed, the positions will be as follows:

- 1st DIO/COM (Left Expansion Door)
- 2nd DIO/COM (Right Expansion Door)

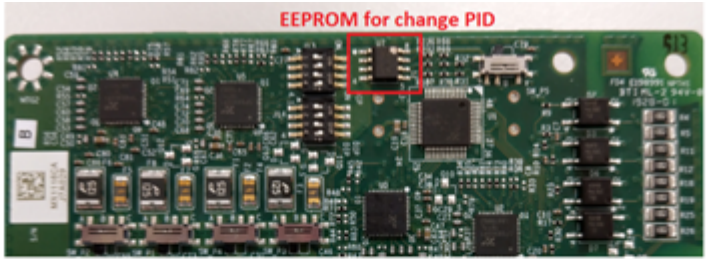
6.5.2 DIP Switch Function



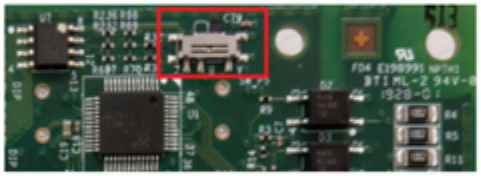
COM PID Selection Switch

- **Set A-B**: COM PID 0x1414 is determined by the UART controller (default).
- **Set B-C**: COM PID 0x1415 is determined by EEPROM (for 2nd MS-48CDN-DT10).

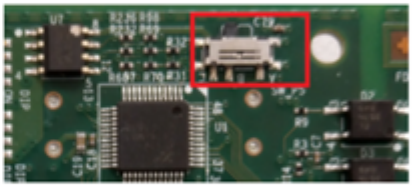
PID and Driver Version Matrix Table



PID 0x1414 from COM chip



PID 0x1415 from EERPOM



Fix COM driver (2.5.0.5) "SW Control table V0.21"	PID 0x1414	PID 0x1415
COM sequence	COM 12 ~ COM 15	COM 16 ~ 19

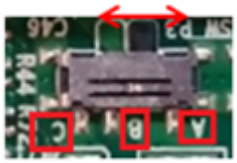
Standard driver (2.5.0.3) "SW Control table V0.21"	PID 0x1414	PID 0x1415
COM sequence	OS detect	OS detect

Powered COM Enable Switch

Set to the right(default)
Normal COM port (Pin9 = signal)

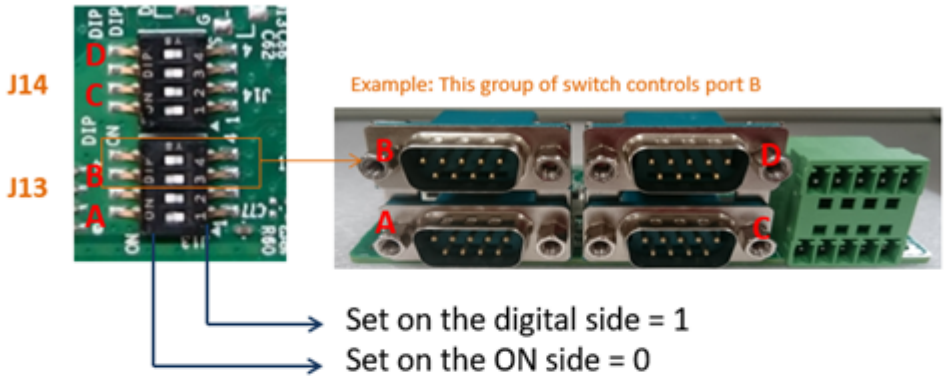
Set to the left
Powered COM port (Pin9 = VDD)

Powered COM Power Source Selection Switch



Set A-B; VDD = 12V (Default)
Set B-C; VDD = 5V

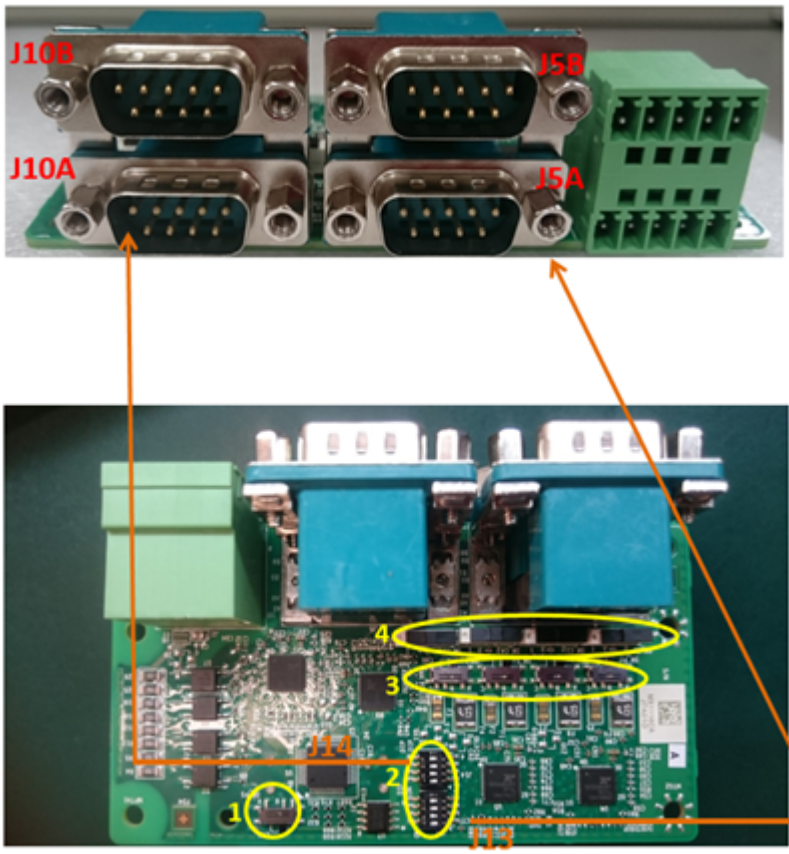
COM Mode Setting Switch

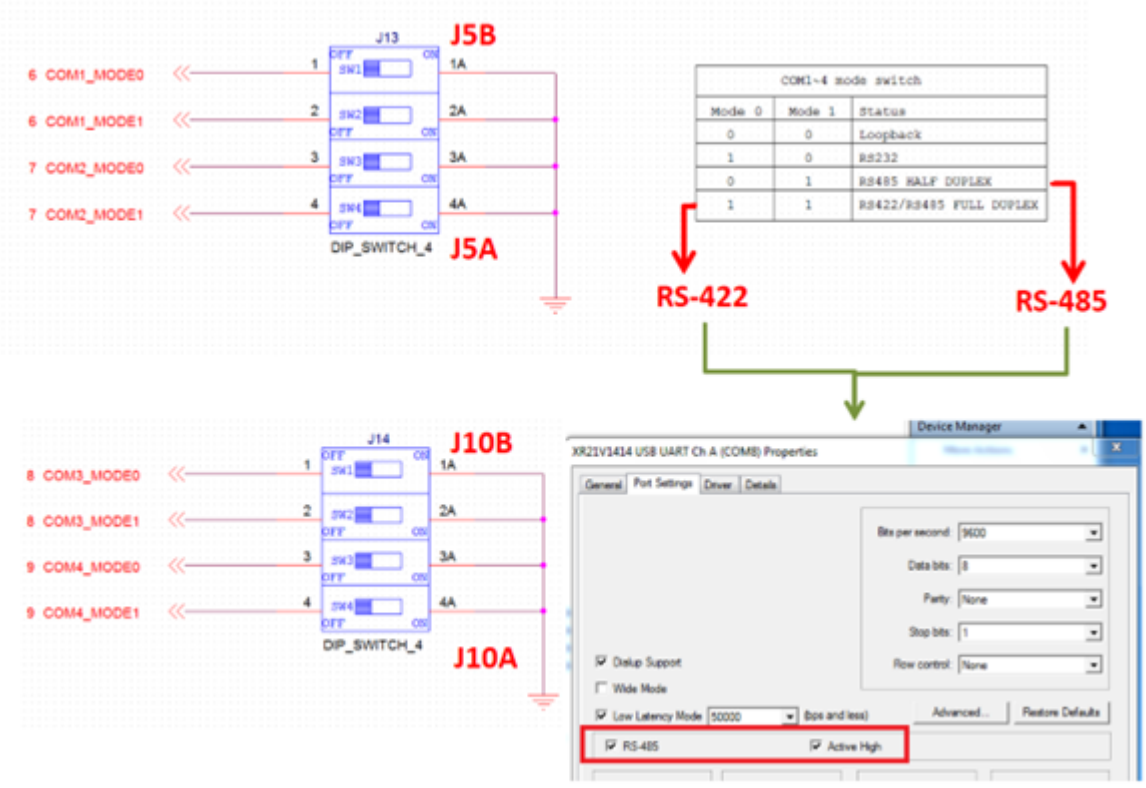


Switch	Bit	COM Port	Test Mode	RS485	RS232 (Default)	RS422
J14	4	Port D	0	1	0	1
	3		0	0	1	1
	2	Port C	0	1	0	1
	1		0	0	1	1

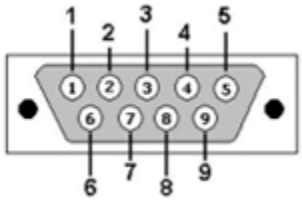
Switch	Bit	COM Port	Test Mode	RS485	RS232 (Default)	RS422
J13	4	Port B	0	1	0	1
	3		0	0	1	1
	2	Port A	0	1	0	1
	1		0	0	1	1

Driver Configuration Setting for RS485





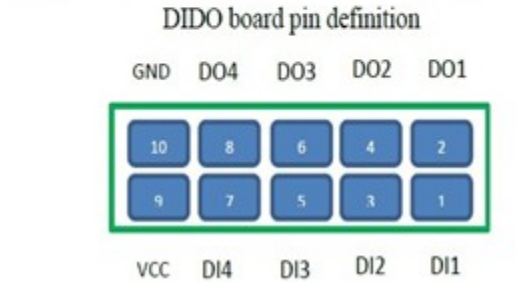
COM Port Pinout



Pin No	RS-232	RS-422	RS-485
1	DCD	TX-	DATA-
2	RX	TX+	DATA+
3	RTX	RX+	NC
4	DTR	RX-	NC
5	GND	GND	GND
6	DSR	NC	NC
7	RTS	NC	NC
8	CTS	NC	NC
9	RI	NC	NC

6.5.3 Digital IO Port

The **DIO/COM module** has a total **8-bit GPIO**, with the following positions:



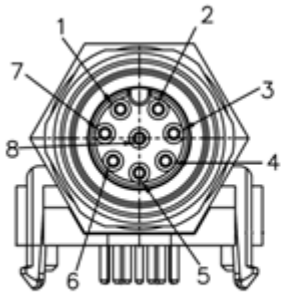
Left DIO Expansion / Right DIO Expansion

PIN	HW	Left DIO Order	Right DIO Order	Description
1	DI_1	21	11	Digital Input 1
2	DO_1	22	12	Digital Output 1
3	DI_2	23	13	Digital Input 2
4	DO_2	24	14	Digital Output 2
5	DI_3	25	15	Digital Input 3
6	DO_3	26	16	Digital Output 3
7	DI_4	27	17	Digital Input 4
8	DO_4	28	18	Digital Output 4
9	VCC	-	-	VCC
10	GND	-	-	Ground

6.5.4 Expansion Module PoE-LAN M12

This module is a Giga LAN module supporting **four M12-type interfaces**.
Combined with a power module, it supports **PoE (Type A)**.

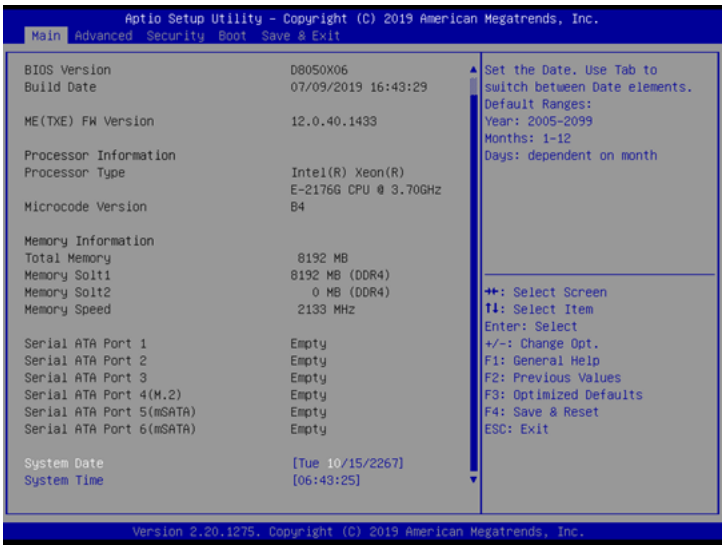
M12 Code A LAN Module Pin Definitions



PIN	Signal	POE typeA
1	LAN_MDI1+	DC+
2	LAN_MDI1-	DC+
3	LAN_MD20+	DC-
4	LAN_MDI2-	
5	LAN_MDI3+	
6	LAN_MDI3-	DC-
7	LAN_MDI4+	
8	LAN_MDI4-	

7 BIOS

7.1 Main Page



7.1.1 System Information

The **Main Page** displays essential system information, including BIOS version, build date, and hardware details. None of these fields are user-configurable.

- **BIOS Vendor:** AMI Megatrends
- **BIOS Version:** Displays the current BIOS version.
- **Build Date:** Shows the BIOS build date.
- **ME (TXE) Firmware Version:** Displays the Management Engine firmware version.
- **Processor Information:** Provides details about the installed CPU.
- **Total Memory:** Displays the installed RAM size.
- **Memory Frequency:** Shows the memory clock speed.
- **SATA Devices:** Lists installed storage devices connected via SATA, M.2, or mSATA.

7.1.2 System Date & Time Settings

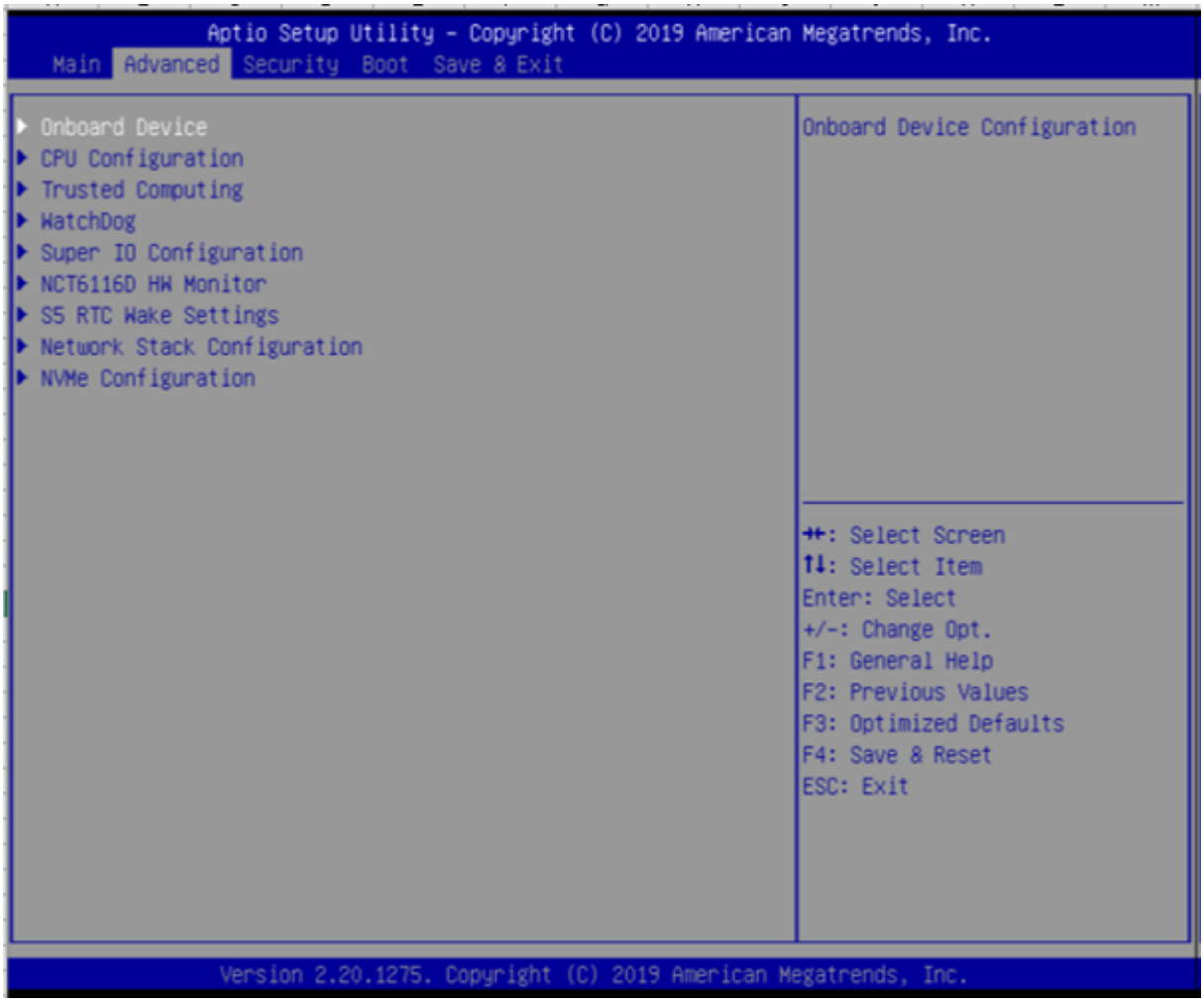
The **System Date & Time** settings allow you to configure the system's real-time clock.

- **System Date:** Set using the format `[Www mm/dd/yyyy]` where:
  - `Www`: Day of the week (Mon-Sun)
  - `mm`: Month (1-12)
  - `dd`: Day (1-31)
  - `yyyy`: Year (1998-9999)
- **System Time:** Set using the format `[hh:mm:ss]`, where:

- `hh`: Hours (0-23)
- `mm`: Minutes (0-59)
- `ss`: Seconds (0-59)

Use the **Tab** key to switch between date and time fields.

7.2 Advanced Page



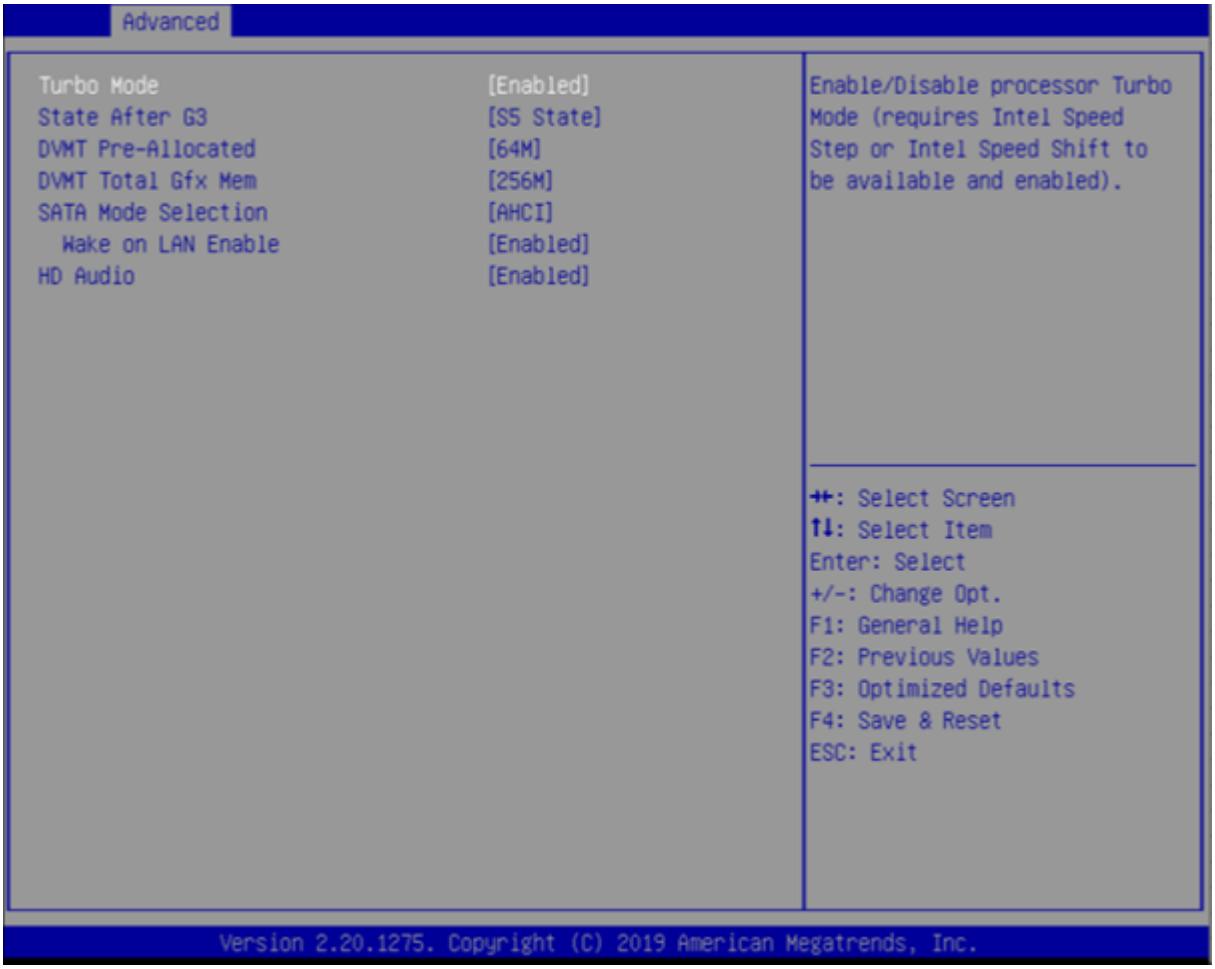
The **Advanced Page** contains various configuration options that allow users to fine-tune system behavior.

7.2.1 Advanced Configuration Options

- **Onboard Devices:** Configure integrated device settings.
- **CPU Configuration:** View and adjust processor settings.
- **Trusted Computing:** Manage TPM and security features.
- **WatchDog:** Enable or disable the WatchDog timer.
- **Super IO Configuration:** Configure settings for system I/O controllers.
- **NCT6116D HW Monitor:** Monitor system temperature, voltage, and fan speeds.
- **S5 RTC Wake Setting:** Enable system wake-up from S5 using an RTC alarm.

- **Network Stack Configuration:** Enable or disable UEFI network boot.
- **NVMe Configuration:** Configure settings for NVMe storage devices.

7.2.2 Onboard Devices Configuration



- **Turbo Mode:** Enable or disable the processor's Turbo Boost feature. Requires Intel Speed Step or Intel Speed Shift.
- **State After G3:** Determines system behavior after power loss (options include S0 and S5 states).
- **DVMT Pre-Allocated:** Set the amount of pre-allocated graphics memory for internal graphics.
- **DVMT Total Graphics Memory:** Choose the total memory allocation for integrated graphics.
- **SATA Mode Selection:** Defines how the SATA controller operates (AHCI or Intel RST Premium).
- **Wake on LAN:** Enable or disable system wake-up on network activity.
- **HD Audio:** Enable or disable high-definition audio detection.

7.3 CPU Configuration

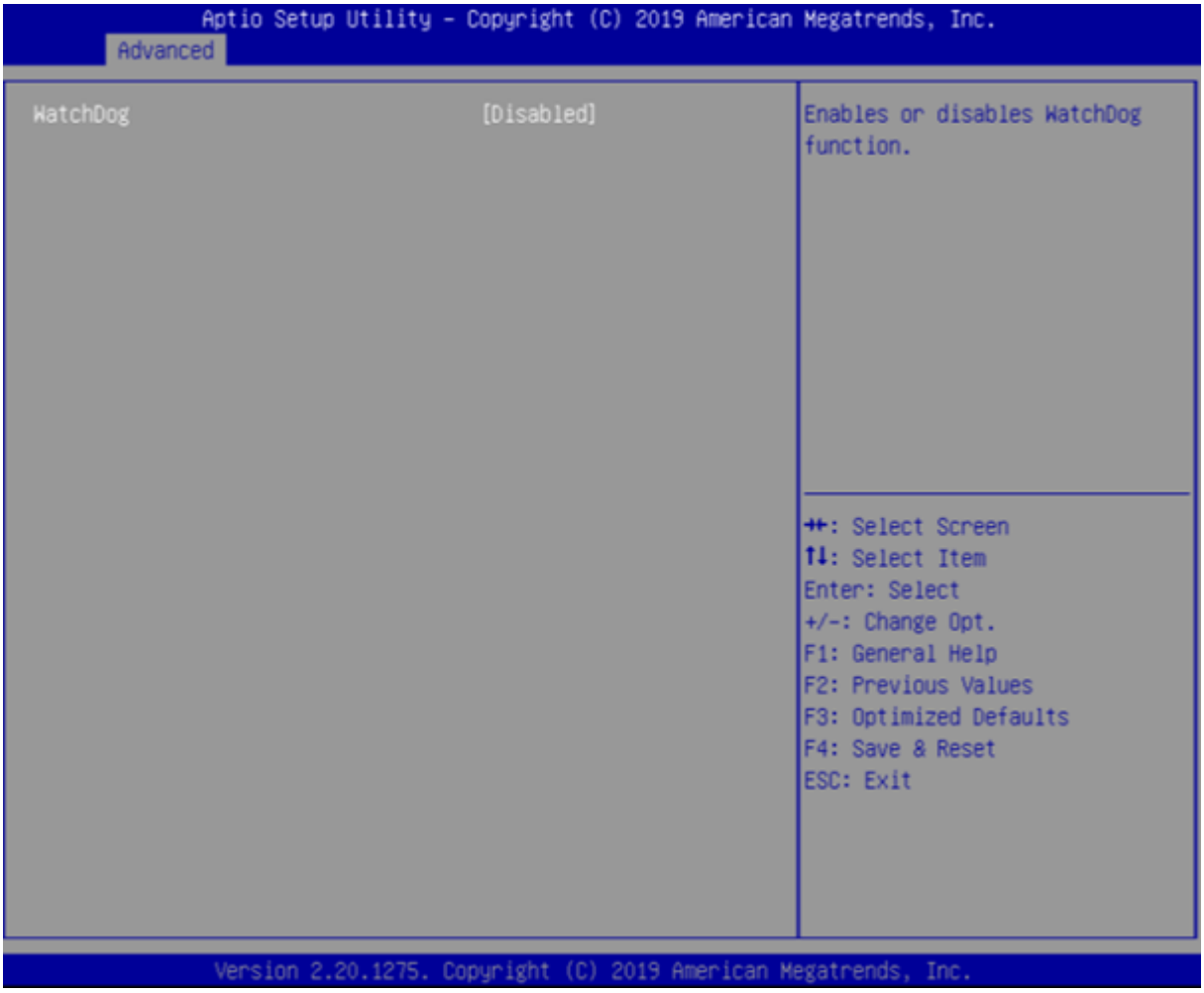
This section displays processor details and allows certain configurations:

- **Processor Type:** Displays the installed CPU model.
- **Processor ID:** Shows the CPU identification number.
- **Clock Speed:** Indicates the processor's base frequency.
- **Cache Levels:** Displays information about L1, L2, and L3 caches.
- **VMX Support:** Indicates whether Virtual Machine Extensions (VMX) are supported.
- **Intel Trusted Execution Technology:** Allows enabling or disabling of Intel's security extensions.

7.4 Trusted Computing

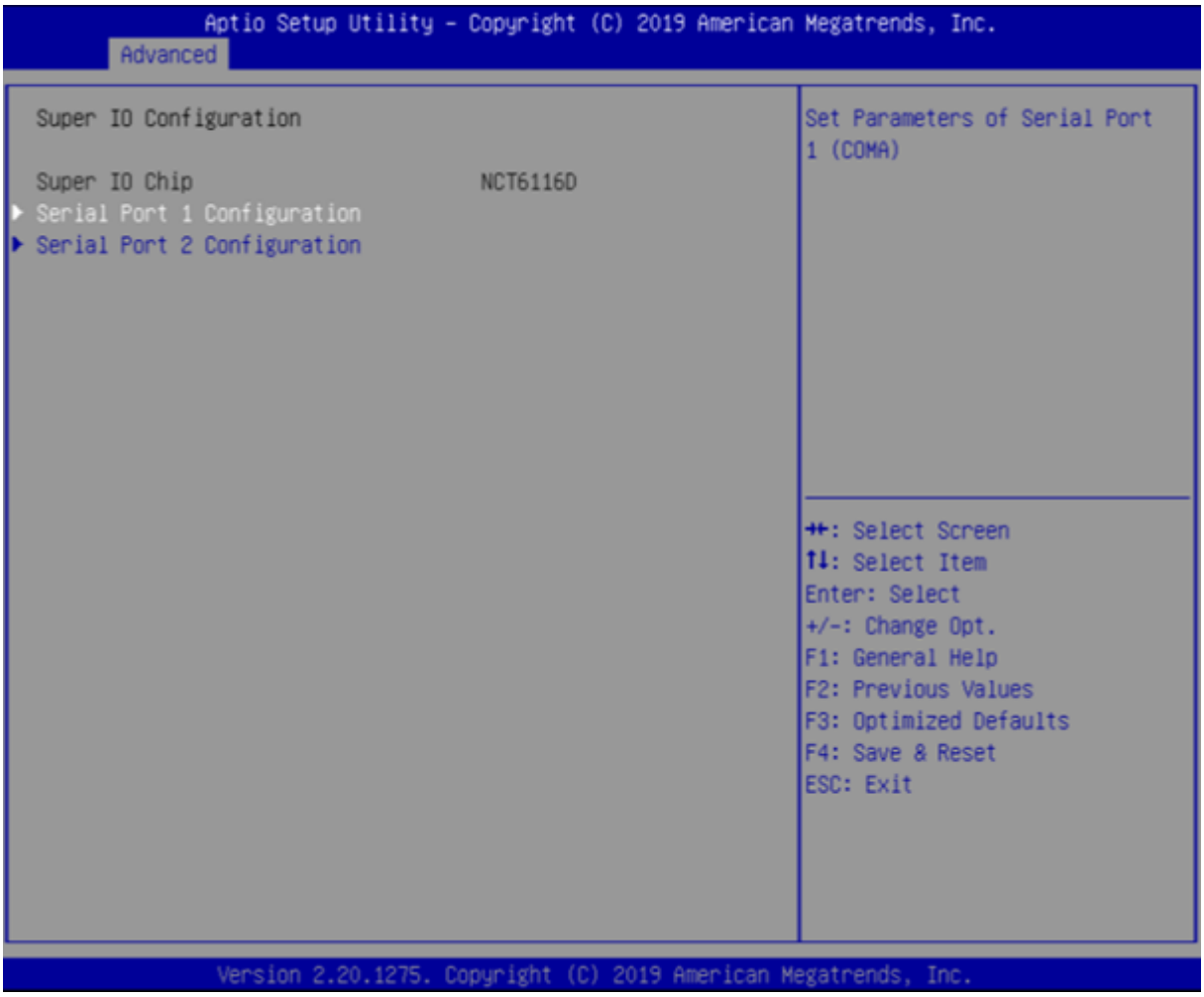
- **TPM 2.0 Device:** Displays the presence of a TPM security module.
- **Firmware Version:** Shows the TPM firmware version.
- **Vendor Information:** Displays the TPM manufacturer.
- **Security Device Support:** Enable or disable TPM functionality within the BIOS.

7.5 WatchDog Configuration



- **WatchDog Timer:** Enable or disable the WatchDog timer to automatically reset the system if it becomes unresponsive.

7.6 Super IO Configuration



- **Serial Port Configuration:** Configure RS232, RS485, and RS422 settings.
- **GPIO Settings:** Manage digital I/O configurations.

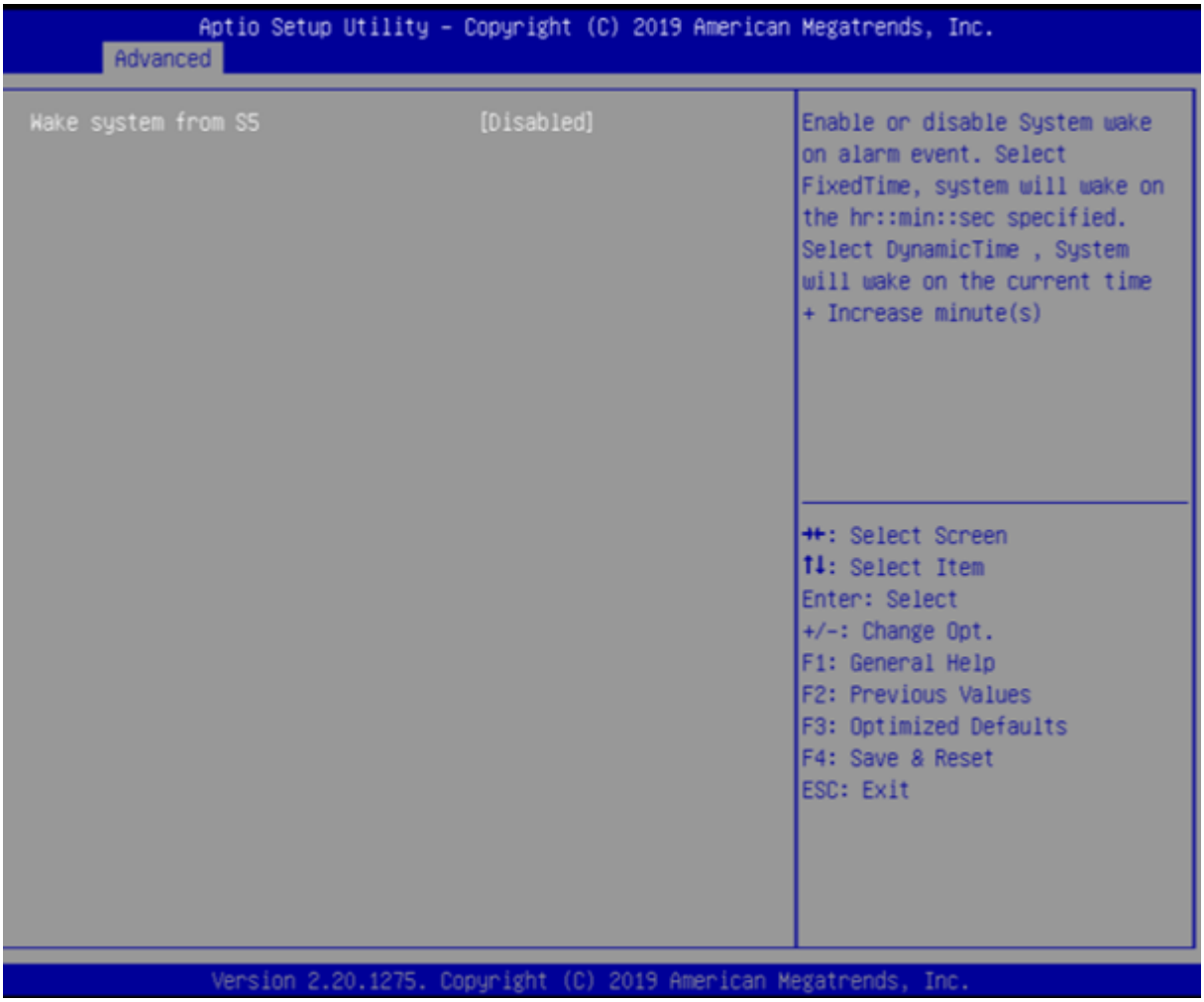
7.7 Hardware Monitoring

- **CPU Temperature:** Displays the current CPU temperature.
- **System Fan Speeds:** Monitors internal and external fan RPMs.
- **Voltage Readings:** Shows system voltage levels for various components.

7.8 RTC Wake Setting

- **Enable System Wake-Up from S5 Using RTC Alarm:** Allows setting a scheduled power-on time.

7.9 Network Stack Configuration

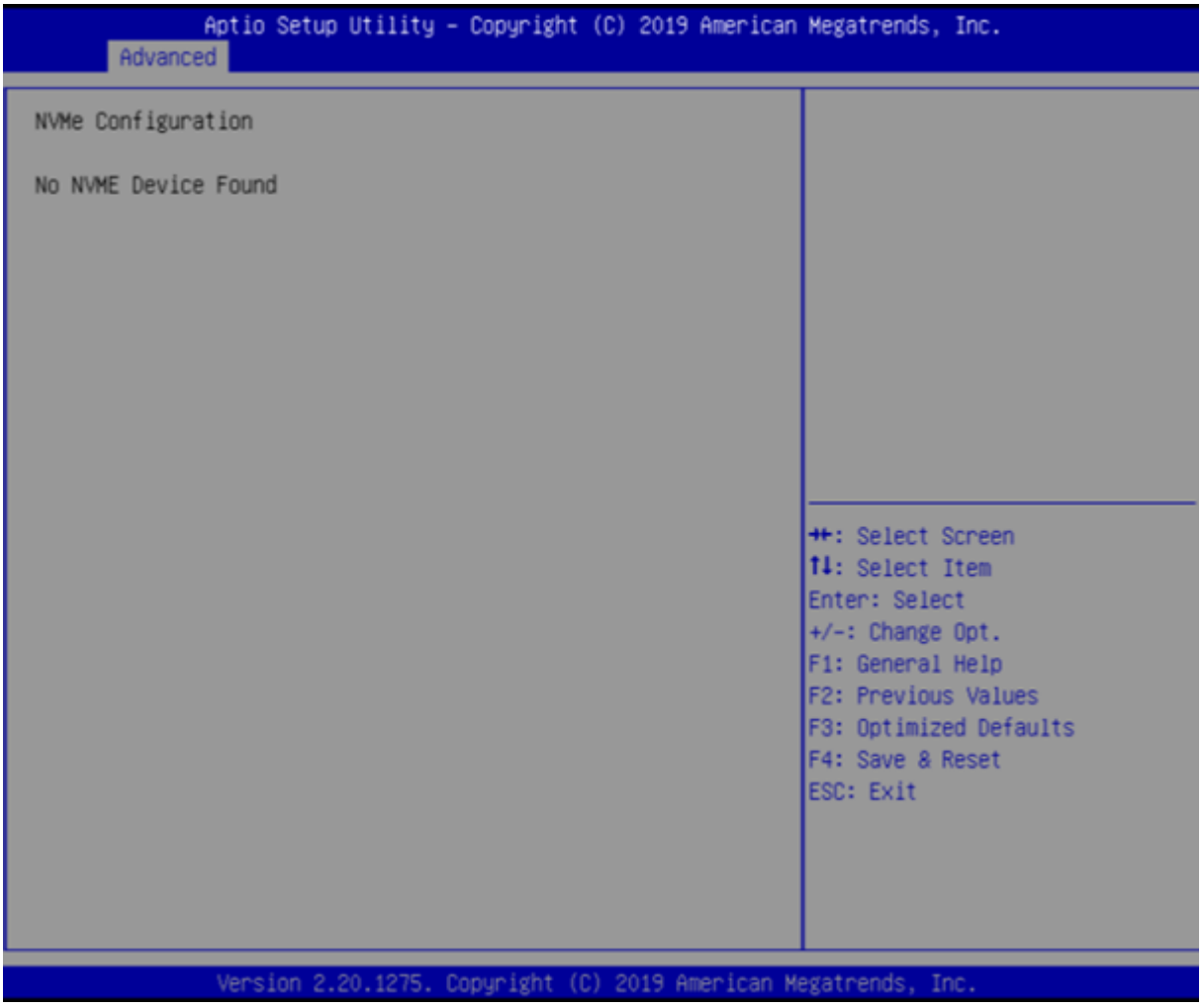


- **Enable UEFI Network Boot:** Toggle network boot functionality.

7.10 NVMe Configuration

- **Configure NVMe Storage Devices:** View and manage NVMe drives.

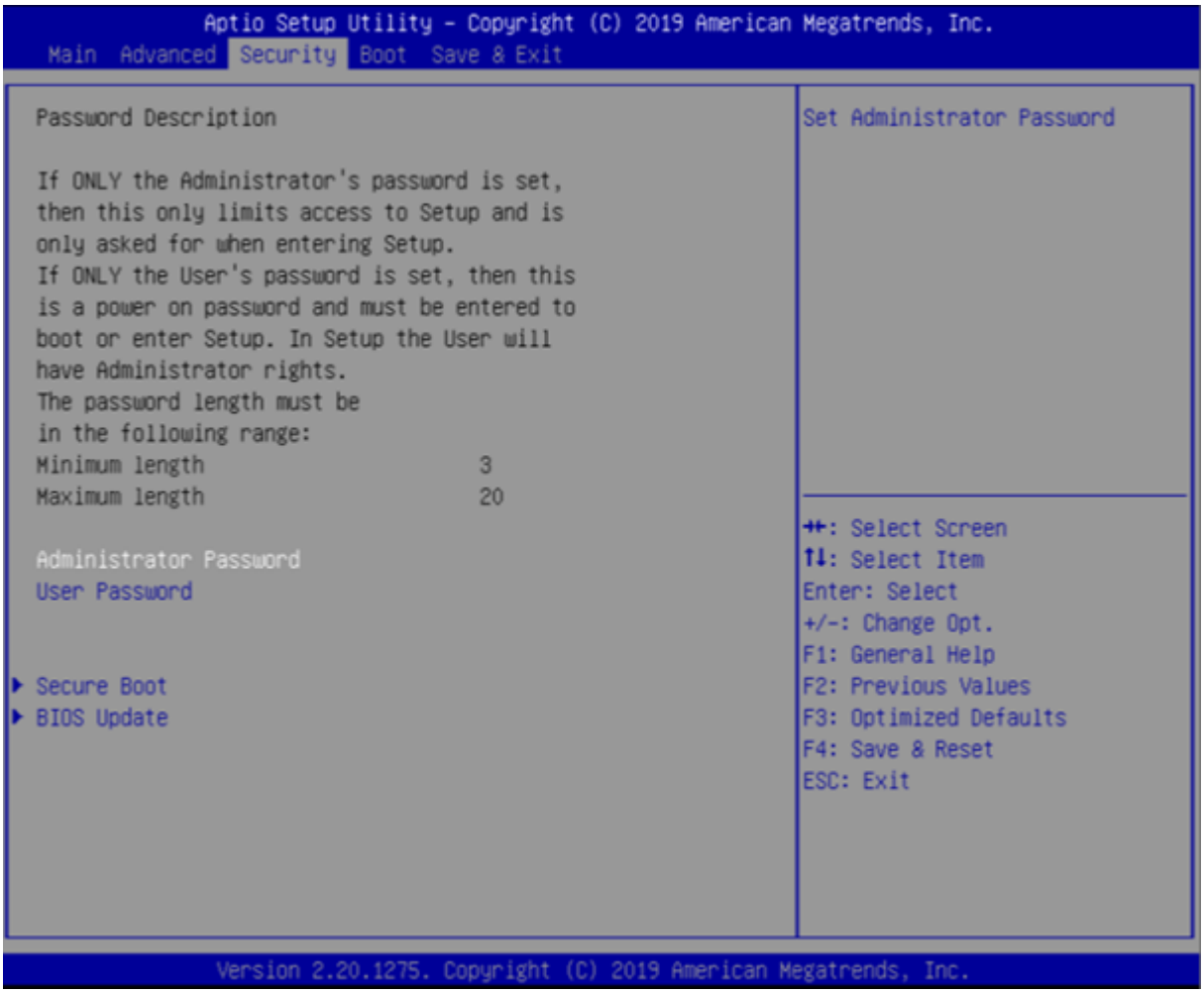
7.11 Security Page



The **Security Page** allows configuration of password protection and security features:

- **Administrator Password:** Set or modify the administrator password.
- **User Password:** Set or modify the user password.
- **Secure Boot:** Enable or disable Secure Boot to enforce signed OS loaders.

7.11.1 Secure Boot Configuration

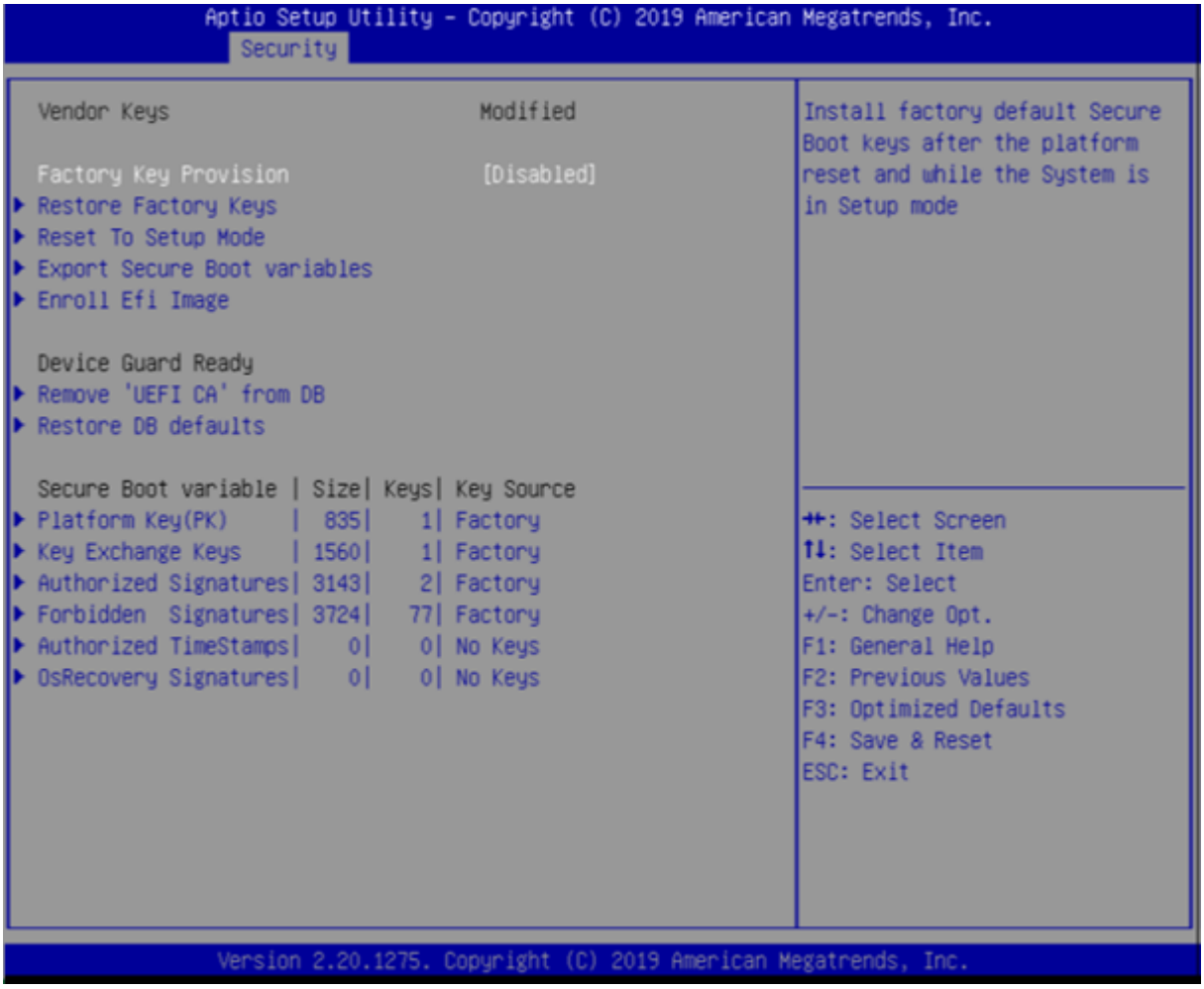


- **Secure Boot Mode:** Choose between Standard and Custom configurations.
- **Restore Factory Keys:** Reset Secure Boot keys to default factory settings.

7.12 Boot Page

- **Setup Prompt Timeout:** Set the time (in seconds) for the BIOS prompt to appear before boot.
- **Boot Order Configuration:** Define the sequence of boot devices.

7.13 Save & Exit



- **Save Changes and Reset:** Apply changes and restart the system.
- **Discard Changes and Reset:** Restart without saving any modifications.
- **Load Optimized Defaults:** Restore factory default settings for all BIOS configurations.

8 System Setup

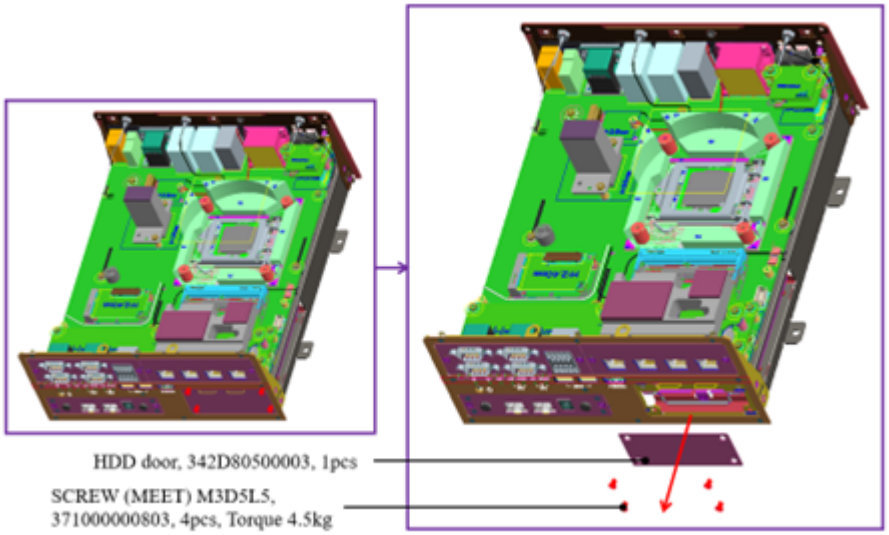
This chapter provides guidance on setting up the **Alderamin MK5 Embedded System** hardware.

Warning: The edges of the ALDERAMIN MK5 aluminum extrusion fins are sharp. Handle the unit carefully during installation, movement, and operation.

8.1 1st 2.5” SATA HDD/SSD Installation

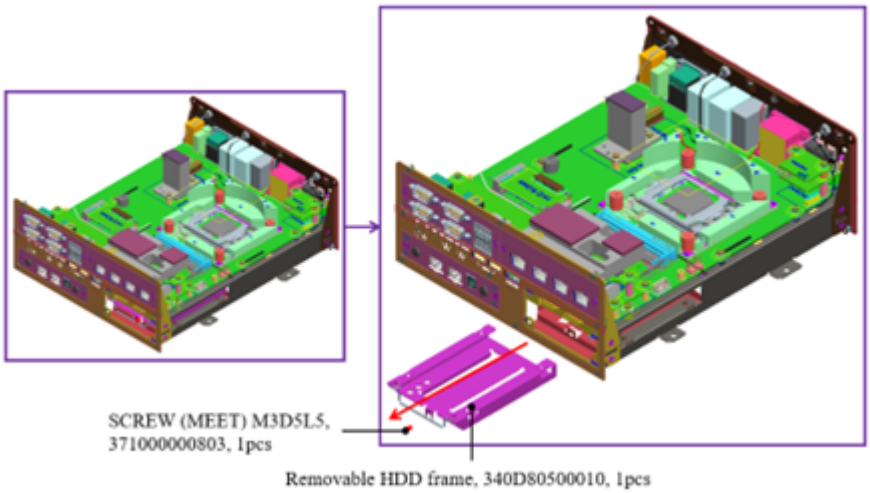
Follow these steps to install a SATA HDD:

- Remove the door from the front bezel.

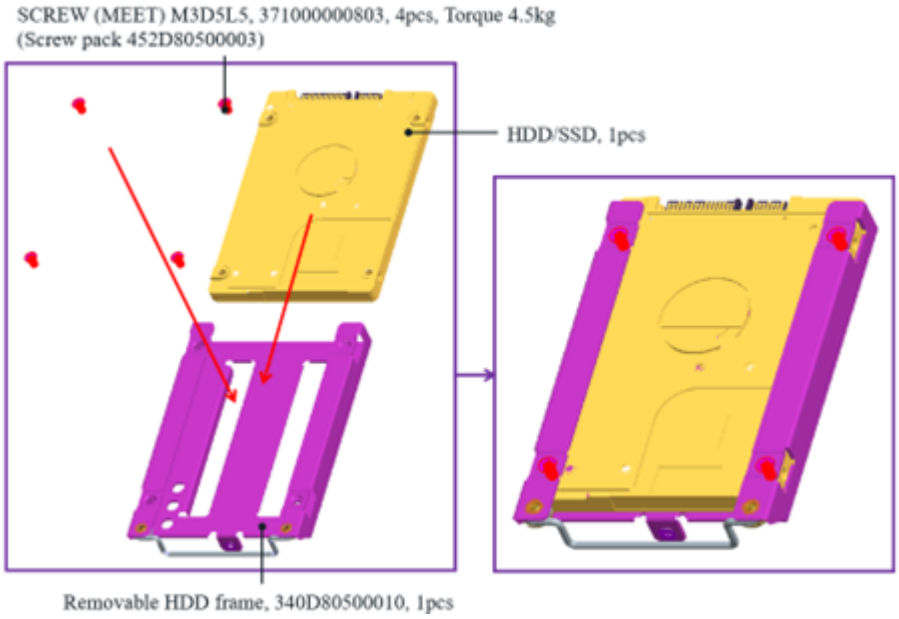


Note: Loosen the four screws from the expansion door, then gently lift the cover with your fingernail to carefully remove it.

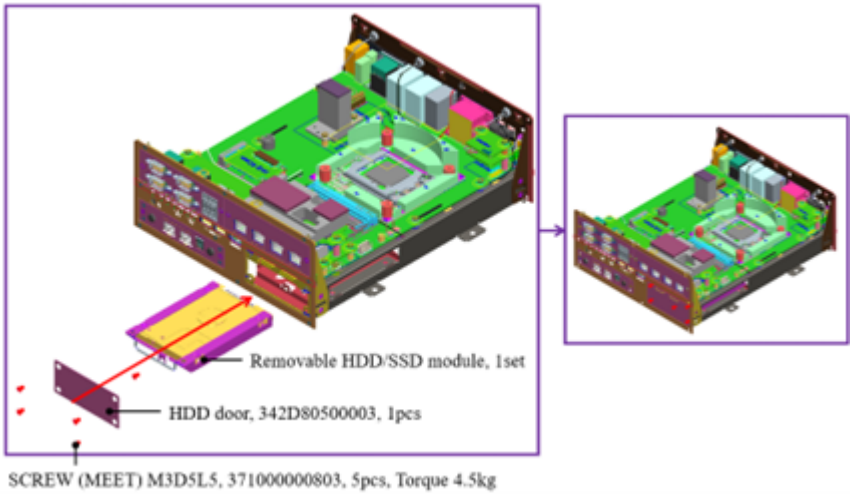
- Pull the HDD tray out from the main chassis.



- Secure the HDD/SSD to the bracket using screws.



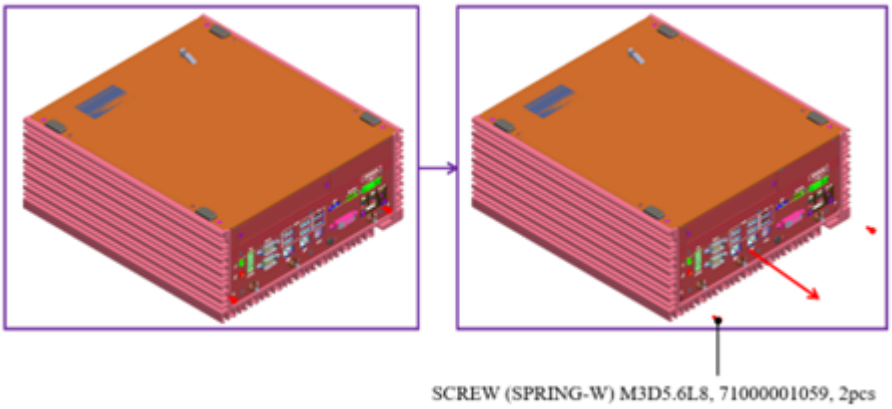
- Insert the HDD/SSD tray back into the main chassis and fasten the screws on the door.



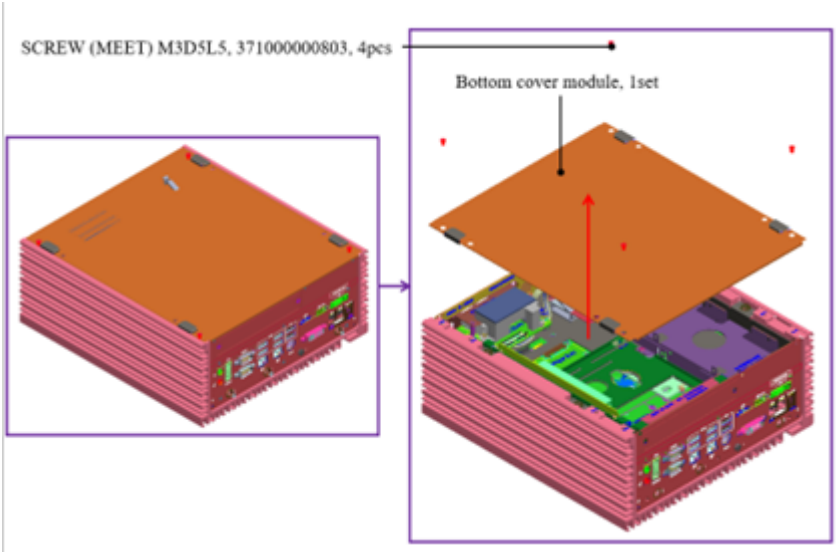
Note: Keep the unit horizontal to facilitate smooth reinsertion of the HDD tray.

8.2 2nd and 3rd 2.5” SATA HDD/SSD Installation

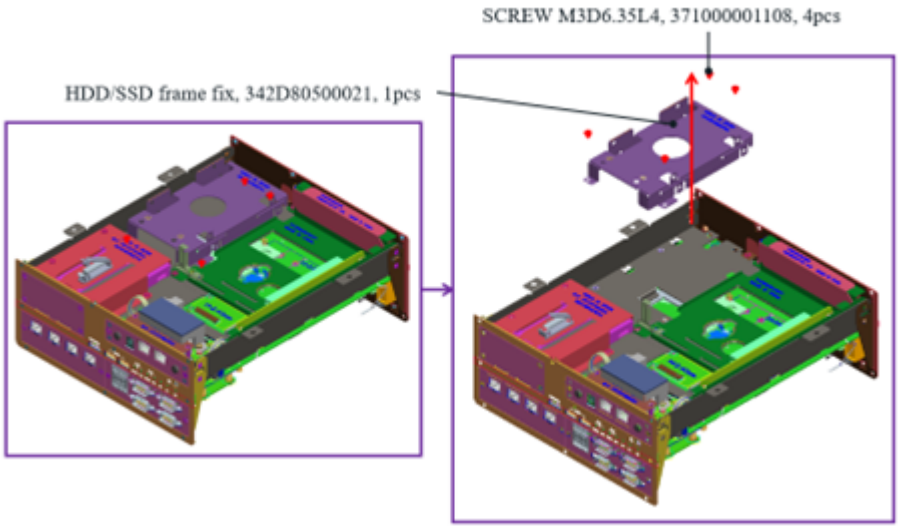
- Remove the **GND screws** from the rear bezel.



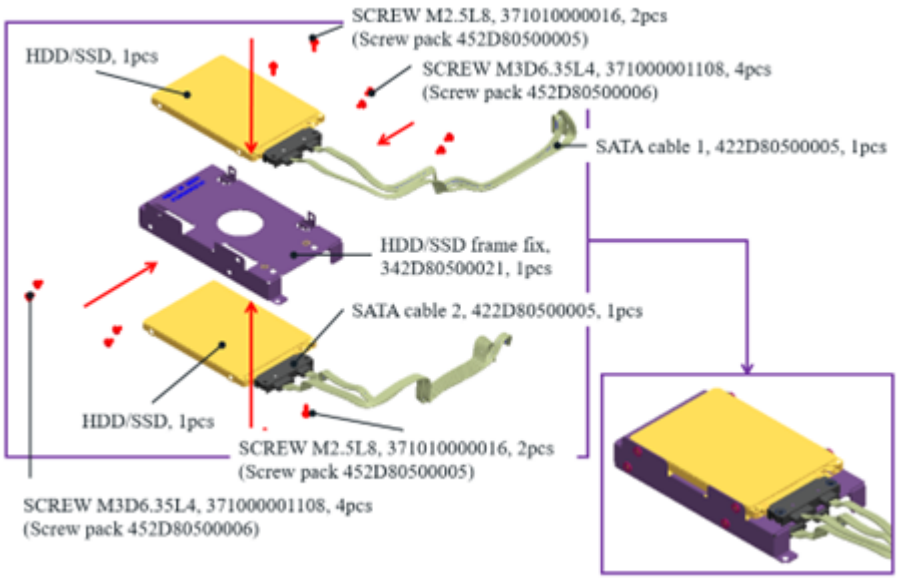
- Remove the **bottom cover**.



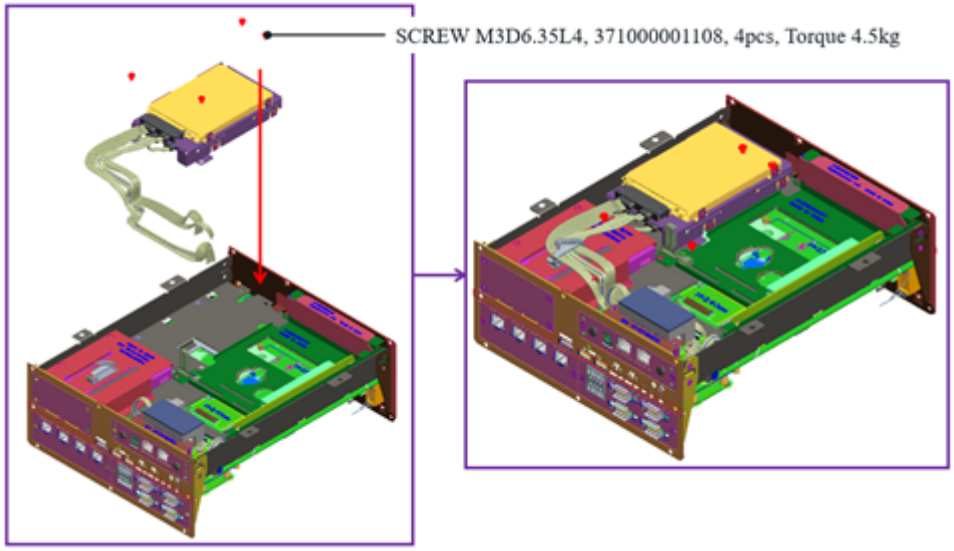
- Loosen the four **HDD bracket screws** and pull the bracket out of the unit.



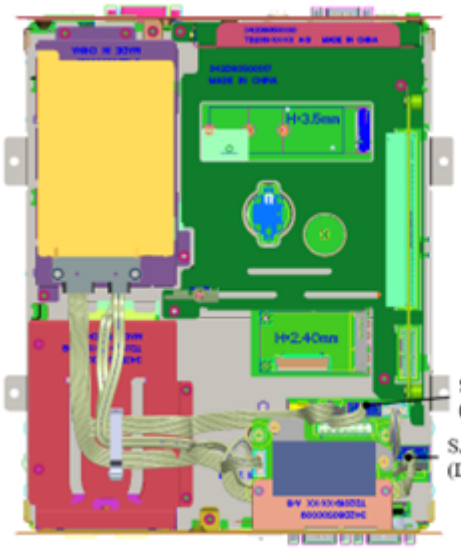
- Secure the **2nd and 3rd HDD/SSD** to the bracket as illustrated in the concept drawing.



- Fasten the **four bracket screws** to the main unit.

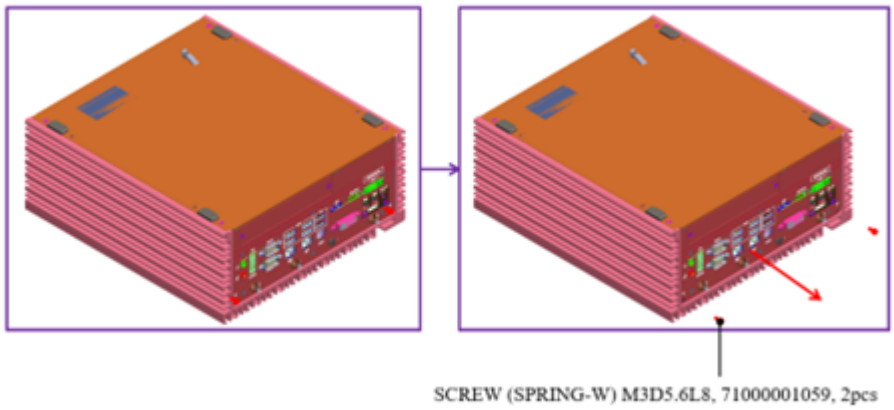


- Follow the guide for proper **SATA cable routing**.

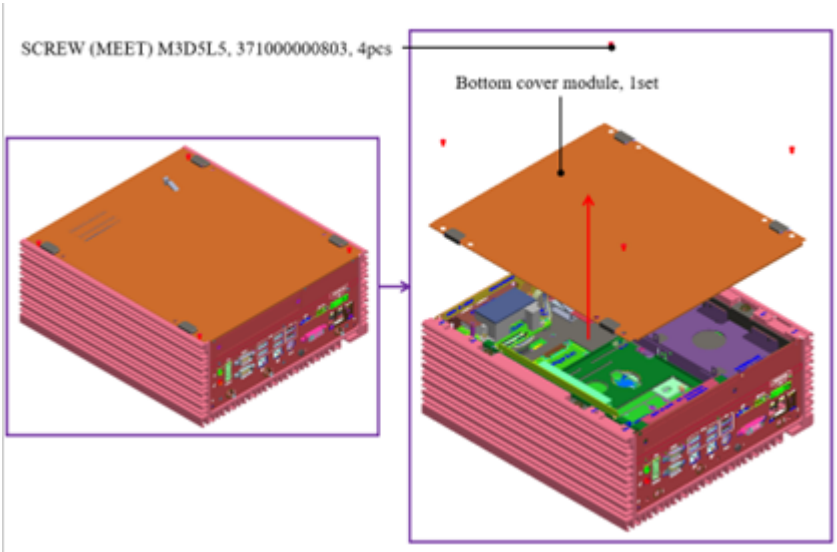


8.3 CPU, CPU Heatsink, and DRAM Installation

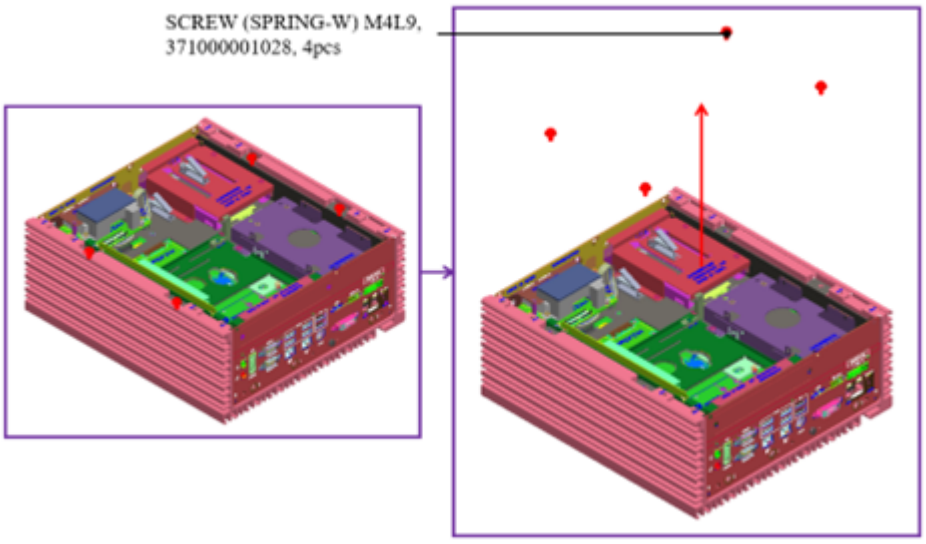
- Remove the **GND screws** from the rear bezel.



- Remove the **bottom cover**.

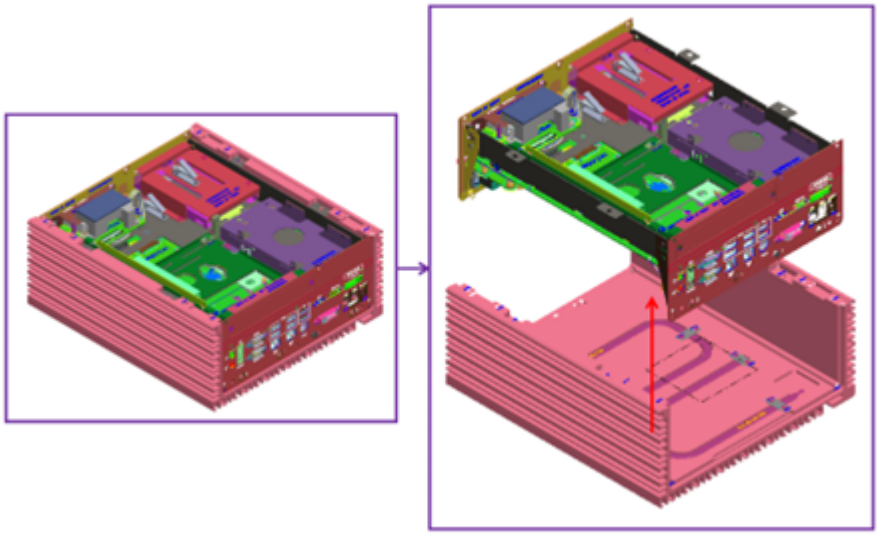


- Loosen the **four M4 screws** from the main chassis.

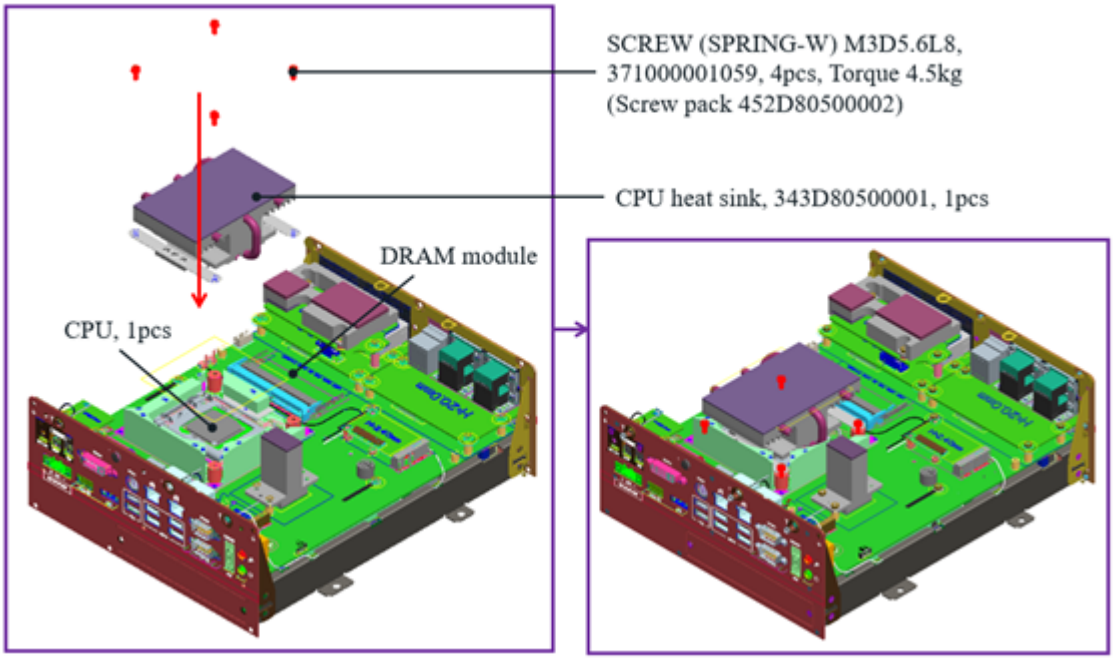


- Ensure the **two GND screws** are loosened, then carefully pull the **main chassis** from the aluminum extrusion.
  - The aluminum extrusion has **chipset thermal pads (L6)** and **two guide pins**, so some force may be required.

  Warning: The aluminum and metal edges are sharp—handle with extreme caution when pulling the main chassis out.

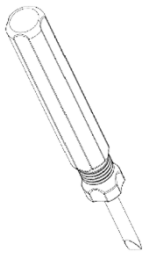


- Take the **CPU passive cooler** from the accessories and install the **CPU, CPU heatsink, and DRAM modules** as shown.



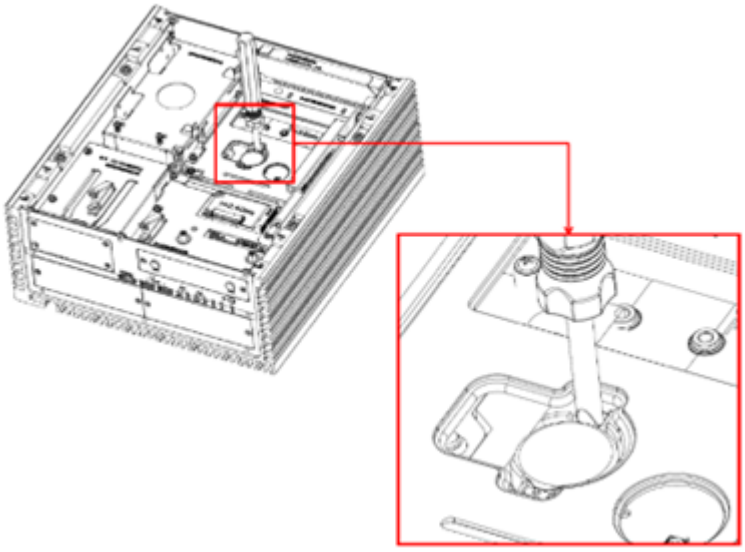
8.4 RTC Battery Maintenance

8.4.1 Preparation for Disassembly



Flathead Screwdriver *(Required for battery removal due to high vibration resistance design)*

- Insert the **flathead screwdriver** into the gap on one side of the **RTC battery** vertically.



- Rotate the screwdriver about **45 degrees** to loosen and remove the coin battery.