



Compact box PC

User manual

UM EN VL3 UPC

User manual

Compact box PC

UM EN VL3 UPC, Revision F

2024-05-13

This user manual is valid for:

Designation	Item number
VL3 UPC	1459506
VL3 UPC 1110	1433148
VL3 UPC 1320	1433147
VL3 UPC 2430	1433152
VL3 UPC 2440	1697948

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1 For your safety

Read this user manual carefully and keep it for future reference.

1.1 Labeling of warning notes



This symbol indicates hazards that could lead to personal injury.

There are three signal words indicating the severity of a potential injury.

DANGER

Indicates a hazard with a high risk level. If this hazardous situation is not avoided, it will result in death or serious injury.

WARNING

Indicates a hazard with a medium risk level. If this hazardous situation is not avoided, it could result in death or serious injury.

CAUTION

Indicates a hazard with a low risk level. If this hazardous situation is not avoided, it could result in minor or moderate injury.



This symbol together with the **NOTE** signal word warns the reader of actions that might cause property damage or a malfunction.



Here you will find additional information or detailed sources of information.

1.2 Qualification of users

The use of products described in this manual is oriented exclusively to electrically skilled persons or persons instructed by them. The users must be familiar with the relevant safety concepts of automation technology as well as applicable standards and other regulations.

1.3 Field of application of the product

1.3.1 Intended use

The products described in this document are designed for use in manufacturing and industrial environments.

The products are built according to the latest safety requirements. However, dangerous situations or damage to the products or other property can arise from misuse of this device.

The products fulfill the requirements of the EMC directives and harmonized European standards. Any modifications to the systems can influence the EMC behavior.



The device contains valuable recyclable materials, which should be utilized. The electronic circuit board is fitted with a lithium battery. Dispose of the device separately from other waste, i.e., via an appropriate collection site.

Radio interference

These products are Class A items of equipment (EN 61000-6-4). When using the equipment in residential areas, it may cause radio interference. In this case, the operator is obligated to implement appropriate measures.

1.3.2 Product changes

Changes or modifications to hardware and software of the device are not permitted.

Incorrect operation or modifications to the device can endanger your safety or damage the device. Do not repair the device yourself. If the device is defective, please contact Phoenix Contact.

1.4 Security in the network



NOTE: Risk of unauthorized network access

Connecting devices to a network via Ethernet entails the danger of unauthorized access to the network.

To prevent unauthorized network access, please read the following notes:

- If possible, deactivate unused communication channels.
- Assign passwords such that third parties cannot access the device and make unauthorized changes.
- Due to its communication interfaces, the device should not be used in security-critical applications unless additional security appliances are used. Therefore, please take additional protective measures in accordance with the IT security requirements and the standards applicable to your application, e.g., virtual networks (VPN) for remote maintenance access, firewalls, etc., for protection against unauthorized network access.
- On first request, you shall release Phoenix Contact and the companies associated with Phoenix Contact GmbH & Co. KG, Flachsmarkstrasse 8, 32825 Blomberg, Germany in accordance with §§ 15 ff AktG (German Stock Corporation Act), hereinafter collectively referred to as “Phoenix Contact”, from all third-party claims made due to improper use.
- For the protection of networks for remote maintenance via VPN, Phoenix Contact offers the mGuard product series of security appliances; these are described in the latest Phoenix Contact catalog (phoenixcontact.net/products).
- Additional measures for protection against unauthorized network access are listed in the AH EN INDUSTRIAL SECURITY application note. The application note can be downloaded at phoenixcontact.net/products.

2 Overview and ordering data

2.1 Description

The VL3 UPC ... is a small footprint, configurable box PC (BPC). The small footprint allows it to be placed in applications where larger PCs do not fit or are not applicable.

Features

- Compact, IP30 housing
- Fanless design
- Intel® Atom® x6211E or x6413E processor
- DIN rail and wall-mount options
- Two integrated RJ45 Ethernet ports as standard, two additional optional RJ45 ports
- DisplayPort for visual applications
- Optional configurable COM ports
- Optional WLAN capabilities
- Optional 4G/LTE modem
- Optional Windows® 10 operating system

2.2 Ordering data

Products

Description	Type	Order No.	Pcs./Pkt.
Industrial box PC , configurable, fanless, IP30	VL3 UPC	1459506	1
Industrial box PC , Intel Atom® processor x6211E 1.30 GHz, fanless, IP30, 2 GB memory, 30 GB 3D TLC SSD data storage, DIN rail mount	VL3 UPC 1110	1433148	1
Industrial box PC , Intel Atom® processor x6211E 1.30 GHz, fanless, IP30, 8 GB memory, 60 GB 3D TLC SSD data storage, DIN rail mount	VL3 UPC 1320	1433147	1
Industrial box PC , Intel Atom® processor x6413E 1.50 GHz, fanless, IP30, 16 GB memory, 120 GB 3D TLC SSD data storage, DIN rail mount	VL3 UPC 2430	1433152	1
Industrial box PC , Intel Atom® processor x6413E 1.50 GHz, fanless, IP30, 16 GB memory, 240 GB 3D TLC SSD data storage, DIN rail mount	VL3 UPC 2440	1697948	1

Accessories

Description	Type	Order No.	Pcs./Pkt.
Mount , wall bracket	VL3 UPC WALL MOUNT KIT	1452685	1
Mount , DIN rail bracket	UTA 107/30	2320089	1
Service socket with USB (socket/plug), type A with 0.6 m cable	SI-SES-U1A/0,6	1404514	1
Adapter , DisplayPort to VGA video adapter	DP to VGA ADPTR	2400173	1
Adapter , DisplayPort to DVI-I video adapter	DP to DVI ADPTR	2400174	1
Cable , DisplayPort to DisplayPort, 2 m	VL 2.0M DP CABLE	2404774	1
Memory , 60 GB M.2 SSD kit	60 GB M.2 2280 SSD KIT	1536235	1
Memory , 120 GB M.2 SSD kit	120 GB M.2 2280 SSD KIT	1536236	1
Memory , 240 GB M.2 SSD kit	240 GB M.2 2280 SSD KIT	1536237	1
Memory , 480 GB M.2 SSD kit	480 GB M.2 2280 SSD KIT	1537275	1
Memory , 960 GB M.2 SSD kit	960 GB M.2 2280 SSD KIT	1537274	1
Port cover kit , includes port dust covers for DP, USB, Ethernet, and serial communication interfaces	VL3 UPC PORT COVER KIT	1452726	1
Power supply unit , Primary-switched with push-in connection for DIN rail mounting, 24 V DC/3A	TRIO-PS-2G/1AC/24DC/3/C2LPS	2903147	1
Visit phoenixcontact.net/products for available accessories			

Replacement parts

Description	Type	Order No.	Pcs./Pkt.
Connector , printed circuit board connector (standard)	FMC 1,5/ 3-STF-3,5 GY 7035	1561300	1
Connector , printed circuit board connector (standard)	FMC 1,5/ 3-STF-3,5	1966101	1
Connector , printed circuit board connector (optional)	MC 1,5/ 3-STF-3,5	1847068	1
Battery	TP/WP 6000 RTC BATTERY KIT	1289761	1
Antenna kit , replacement antennas for 4G/LTE wireless connectivity (EF31)	VL3 UPC/PPCS EF31 LTE ANT KIT	1698498	1
Antenna kit , replacement antennas for 802.11 A/B/G/N/AC wireless connectivity (EF16)	VL3 UPC/PPCS EF16 WLAN ANT KIT	1698499	1

2.3 Product key

A product key is appended to the order number that describes the exact product options configured for your product.

Figure 2-1 VL3 UPC ... product key

1459506/A21/I61/R39/M102/M93/OS74/S00/EF12/EF00/EF16/EF31/AP00

A B C D E F G H I J K L M

Table 2-1 Configuration codes reference

Category	Option code	Description
A) Base order number	1459506	VL3 UPC ...
B) Mounting	A21	Wall mount
	A22	DIN rail mount
C) Processor	I61	x6211E 1.30 GHz
	I62	x6413E 1.50 GHz
D) RAM	R39	2 GB DDR4
	R30	8 GB DDR4
	R31	16 GB DDR4
E) Onboard storage	M102	30 GB Onboard NVMe X1
	M103	60 GB Onboard NVMe X1
	M104	120 GB Onboard NVMe X1
	M105	240 GB Onboard NVMe X1
F) Additional storage	M00	None
	M93	60 GB M.2 SSD
	M94	120 GB M.2 SSD
	M95	240 GB M.2 SSD
	M96	480 GB M.2 SSD
G) Operating system	OS00	None
	OS74	WIN 10 IOT ENT LTSC 2021 X64
H) Software Option	S00	None
	S30	VISU+ HMI RT 1K
	S31	VISU+ HMI RT 2K
	S32	VISU+ HMI RT 4K
I) Expansion	EF00	None
	EF12	2x RS-232/422/485
J) Expansion	EF00	None
	EF15	TPM 2.0
K) Expansion	EF00	None
	EF16	802.11 A/B/G/N/AC

Table 2-1 Configuration codes reference [...]

Category	Option code	Description
L) Expansion	EF00	None
	EF30	Additional mass storage
	EF31	4G/LTE
	EF32	2x 10/100/1000 RJ45
M) Approvals	AP00	None
	AP01	UL Ordinary Locations
	AP02	UL Ordinary Locations and Class I, Div. 2

3 Installation

3.1 Mounting

The VL3 UPC ... can be mounted on a wall or NS35 DIN rail. Use the appropriate section below to mount the VL3 UPC

**NOTE:**

Install the VL3 UPC ... with adequate clearance around the heat sink to provide sufficient air flow such that ambient temperatures do not exceed the operating limits. Install cooling fan(s) in the enclosure, if necessary.

Connectors and switches must be accessible.

This equipment is an open-type device that must be installed in a locked cabinet, accessible only by authorized personnel trained in proper ESD procedures.

When installing the VL3 UPC ... in a cabinet, follow these general rules:

- Verify clearances within the cabinet. Typically, leave at least 5 cm (2 in.) on each side with 12.7 cm (5 in.) on the connector side.
- Drill all holes and make all cuts before beginning installation. Be sure to protect already installed components from shavings during this procedure.



The DIN rail mounting bracket is included as standard with each unit.

3.1.1 Wall mount

The VL3 UPC ... can be attached to a flat surface in a wall-mount orientation using the four key holes. The mounting surface must be flat and not subject to vibration.



The VL3 UPC WALL MOUNT KIT (Item No. 1452685) must be ordered separately unless specified in the configuration.

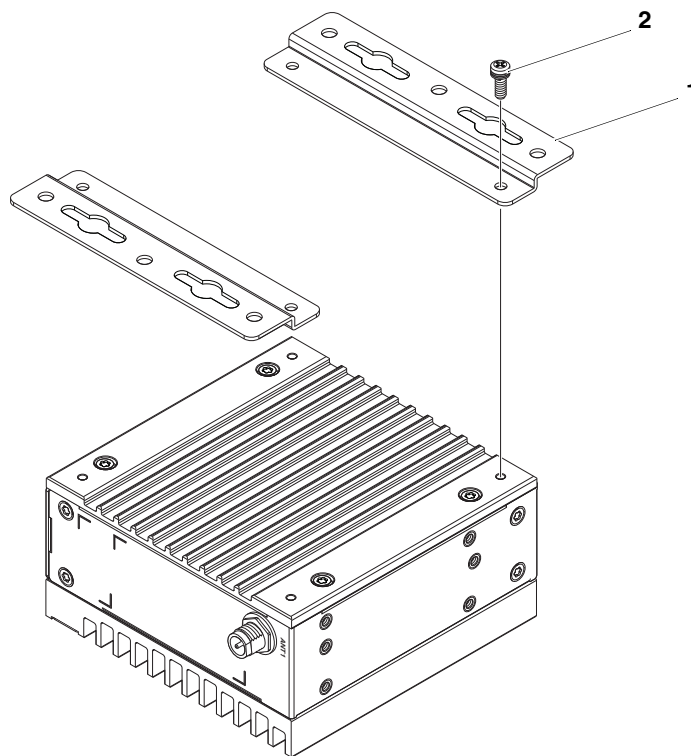
Installation

1. Attach the two brackets (1) to the VL3 UPC ... as shown in [Figure 3-1](#). Torque the provided M3 x 5 screws (2) to 0.59 Nm.



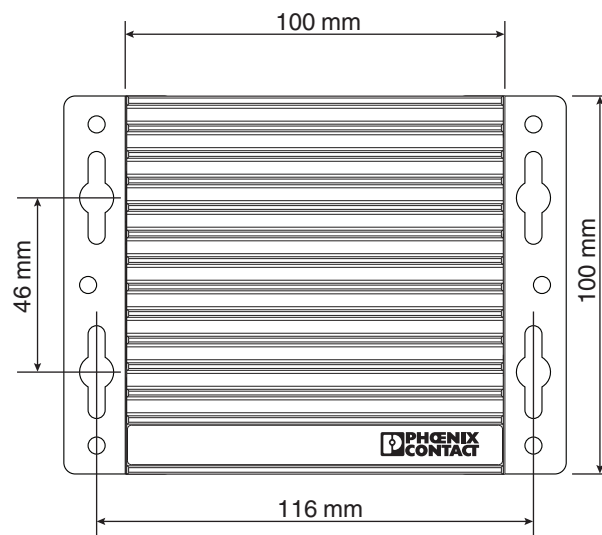
The DIN rail mounting bracket can be removed if the VL3 UPC WALL MOUNT KIT is installed. Remove the four screws that secure the DIN rail mounting bracket to the housing to remove the bracket.

Figure 3-1 Wall bracket installation



2. Use the VL3 UPC ... as a template (or refer to [Figure 3-2](#)) and mark the locations of the mounting holes on the mounting surface.

Figure 3-2 Wall-mount dimensions

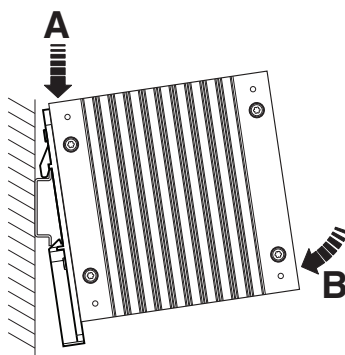


3. Use the correct anchor type for the mounting surface and securely attach the VL3 UPC ... to the wall. Ensure the attaching hardware is in the small section of the mounting holes.

3.1.2 DIN rail mount

1. Angle the VL3 UPC ... so the top edge of the mounting plate hangs on the top edge of the DIN rail (A).

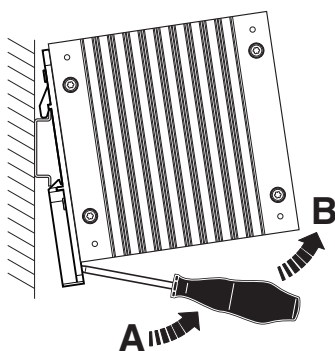
Figure 3-3 DIN rail mounting



2. Rotate the device down against the lower edge of the rail (B) until the latch snaps closed.
3. Secure the device on the rail with rail clamps.

If necessary to remove, release the latch using a screwdriver (A), rotate the bottom of the device away from the rail (B), and then lift it off of the DIN rail.

Figure 3-4 DIN rail removal



3.2 Interfaces



A number of configurations are available that present different port layouts. Be sure to refer to the correct image that matches your configuration.

Figure 3-5 Base unit connectors and ports

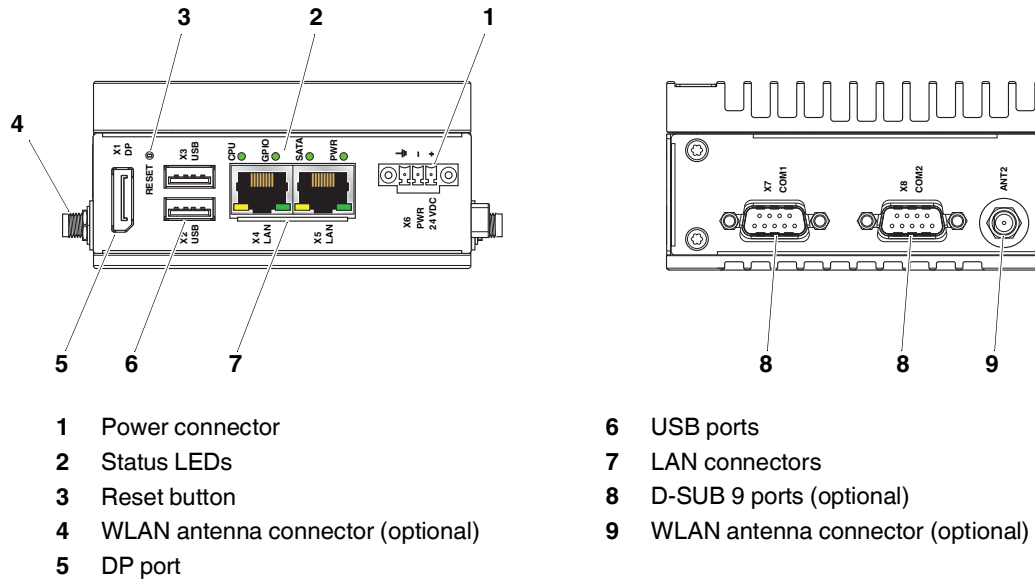


Figure 3-6 Optional (EF16 and EF30) connectors and ports

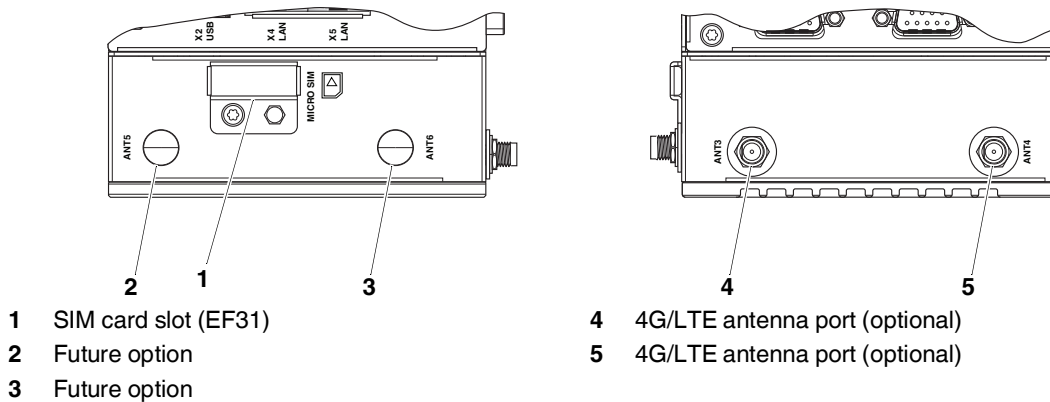
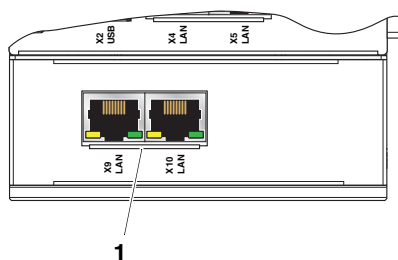


Figure 3-7 Optional (EF32) connectors and ports



1 LAN ports (EF32)

After mounting the VL3 UPC ..., make any necessary cable connections.

The available connectors are:

- Power connector (PWR 24 VDC): Supplies power to the VL3 UPC ... (see [“Power connection” on page 14](#)).
- USB (USB): USB devices connect using Type A connectors.



All USB ports are USB 3.1 Gen. 1 ports.

- DisplayPort (DP): Allows connection of up to three external digital displays with a corresponding DisplayPort connector. The VL3 UPC ... supports DisplayPort 1.2 and newer and Multi-Stream Transport (MST). MST allows multiple video signals through a single DP port and cable.
- Ethernet (LAN): Two RJ45 connectors allow the computer to communicate on a 10/100/1000 Base-T Ethernet network.
Two additional ports are provided when the device is configured with the EF32 option.
- Serial (COM): Two D-SUB 9 ports provide serial communication. Each port may be configured as either RS-422, RS-485, or 5-wire RS-232 (see [“Serial communication” on page 21](#) for configuration).
- SMA/RSMA (ANTx): Antenna connector for wireless communication. The locations and number of connectors will vary depending on how the VL3 UPC ... is configured.

Table 3-1 Antenna ports

Label	Function	Option code	Connection type
ANT1	WLAN a/b/g/n/AC	EF16	RSMA
ANT2	WLAN a/b/g/n/AC	EF16	RSMA
ANT3	4G LTE	EF31	SMA
ANT4	4G LTE	EF31	SMA
ANT5	Future option	–	
ANT6	Future option	–	

- SIM card slot: When EF31 (4G LTE) is selected, the VL3 UPC ... requires a valid mini SIM card in 2FF/ID-000 format which allows the device to assign and authenticate itself to a mobile network.

3.2.1 Power connection

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, and D, or non-hazardous locations only.

These devices are open-type devices that are to be installed in an enclosure suitable for the environment that is only accessible with the use of a tool.



WARNING:

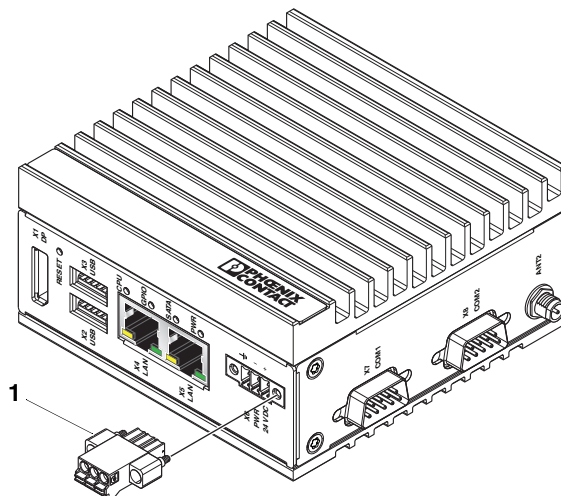
Explosion hazard

Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

Battery must only be changed in an area known to be non-hazardous.

A removable connector is provided for connecting power to the VL3 UPC

Figure 3-8 Power connection



Power connects through a three-position, removable connector (1) (Item No. 1561300) that utilizes push-in technology. The connector accepts wire sizes from 0.2 to 1.5 mm² (24 to 16 AWG). Torque the connector flange screws to 0.3 Nm.



NOTE:

To ensure safe operation, use safety extra-low voltage (SELV) according to DIN EN 61131 as a supply voltage.

This device is protection class III item of equipment.

Connect the VL3 UPC ... to a 24 V DC power source.

3.2.2 Wireless options

WLAN

A factory-installed wireless option (EF16) is available to allow the VL3 UPC ... to communicate on a wireless local area network (WLAN). Antennas should allow dual band operation at 2.4 GHz with less 3.5 dBi gain and 5 GHz with less than 4 dBi gain.

Table 3-2 WLAN antenna requirements

Antenna frequency	Gain
2.4 GHz	<3.5 dBi
5 GHz	<4 dBi

4G/LTE

A factory-installed 4G/LTE option (EF31) is available to allow the VL3 UPC ... to communicate on cellular networks. Antennas should allow multi-band operation.

Table 3-3 4G/LTE antenna requirements

Antenna frequency	Gain
698 - 960 MHz	<0.7 dB
1710 - 2170 MHz	<3.4 dB
2500 - 2690 MHz	<3.3 dB

Cellular connectivity

The VL3 UPC, when equipped with EF31, is 4G/LTE-capable and can be used globally (Europe, Asia, and North America).



The EF31 cellular modem option is pre-certified to operate on most global networks. The list of pre-certifications can be found in the Technical Appendix (see “4G LTE interface card (configurable option)” on page 66) or the modem manufacturer’s documentation.

Additional certification may be required to operate the system on Verizon and AT&T networks.

Visit www.frequencycheck.com/countries to determine what frequency bands are available in most countries.

- The VL3 UPC ... frequency bands for the “4G/LTE interface” are shown in the Technical Appendix (see page 66). Verify that these frequency bands are available at the installation location.
- Ensure that there is network coverage at the installation location.
- Verify that the device is approved for operation at the installation location.
- Additional country-specific approvals may be required for operation.

3.2.2.1 Antenna installation

The VL3 UPC ... has location options, either ordinary locations or hazardous locations. For hazardous locations:



WARNING:

Do not remove or replace antennas while circuit is live unless the area is known to be free of ignitable concentrations of flammable substances.

Only the antennas shipped with the unit may be used in a hazardous location.

Antennas are intended for installation inside the enclosure. Alternatively, the antennas may be mounted externally directly on the outside of the enclosure. All antenna wiring must be fully contained within the enclosure.

For external installation of the antennas, appropriate length antenna cables must be purchased separately. The warning label, provided in the accessory box, must be placed at the external antenna connectors on the enclosure.

The antenna (or antenna cable) threads into the VL3 UPC For external antenna mounting, route and secure the antenna cable appropriately within the enclosure.

- WLAN antennas connect to ANT1 and ANT2 (see [Figure 3-13](#))
- 4G LTE antennas connect to ANT3 and ANT4 (see [Figure 3-14](#)).

3.2.2.2 SIM card installation

A subscriber identity module (SIM) card must be inserted into the SIM card slot (see [Figure 3-6](#)).


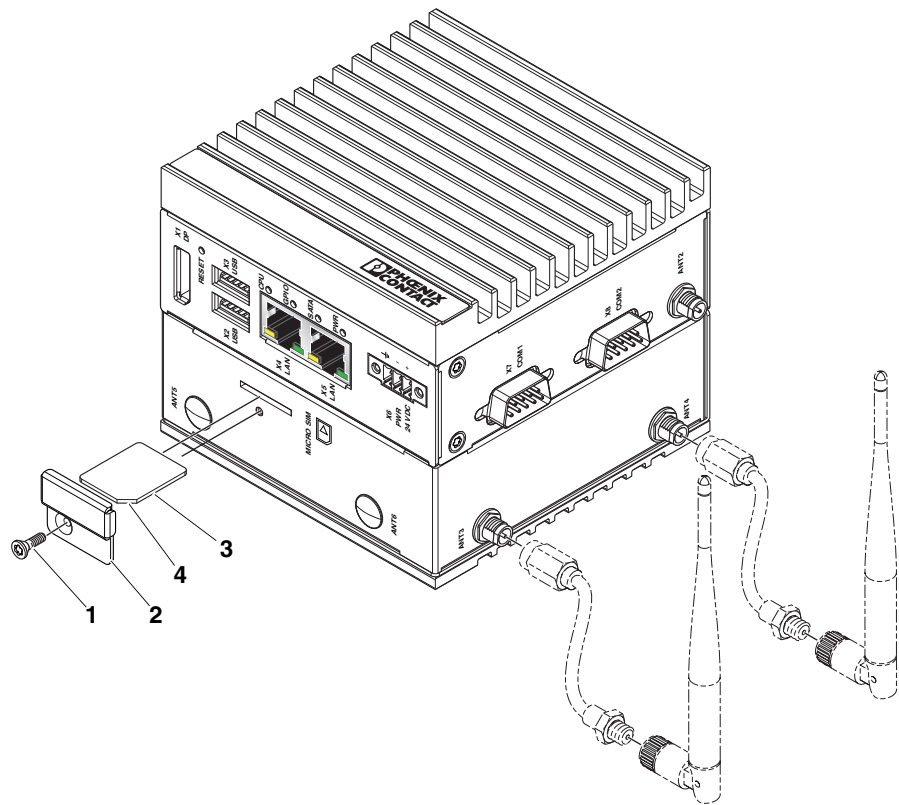

 The SIM card must be obtained locally. It must conform to the micro-3FF SIM form factor.

Figure 3-9 SIM card installation



To install a SIM card:


1. Remove the screw (1) securing the SIM card cover (2) using a screwdriver.
2. Insert the SIM card (3) with the notch in the card (4) facing outward.


 The card can be inserted incorrectly. However, the system will not recognize it and a message “No SIM card detected” will appear when attempting to connect via the 4G LTE network.

3. Reinstall the SIM card protective cover. Torque the screw securing the cover to 0.59 Nm.

3.2.2.3 Connection to a mobile network

Both Windows and Ubuntu operating systems have built-in interfaces to control cellular modems. No third-party applications are needed. Additional information can be found at www.microsoft.com.

 **NOTE:** Be aware that the standard configuration of the Windows operating system will terminate the LTE connection once an Ethernet port is connected. The network priority can be changed in the system registry. Phoenix Contact created the PxC LTE Priority Tool to simplify changing the network priorities in the Windows operating system.

 Both operating systems hide the cellular configuration menu until a cellular modem is detected.

PxC LTE Priority Tool

Standard Windows operating system behavior prioritizes an Ethernet connection over a cellular connection. The PxC LTE Priority Tool toggles the IgnoreNonRoutableEthernet registry setting for the cellular modem in VL3 UPC ... devices. Note that:

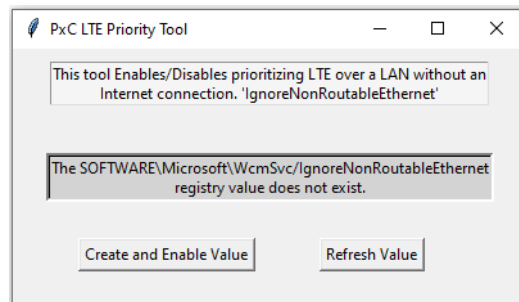
- this tool does require elevated (administrator) access.
- if the registry setting is already enabled, then “Disable” shows on the button.
- the tool logs usage.

Run the PxC LTE Priority Tool as administrator and confirm execution if a warning message appears.

The first time view of the PxC LTE Priority Tool indicates that the registry entry is unknown. Standard operating system behavior prioritizes any Ethernet connection over a cellular network connection. In other words, the modem cellular network connection gets terminated as soon as an Ethernet cable is connected.

Click the “Create and Enable Value” button to create the registry entry and prioritize the cellular network connection over the Ethernet connection.

Figure 3-10 First time view of PxC LTE Priority Tool



Click the “Disable LTE Priority” button to change the network priority back to Ethernet network.

Figure 3-11 Disable LTE priority

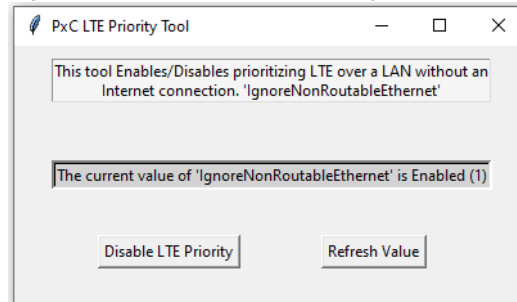
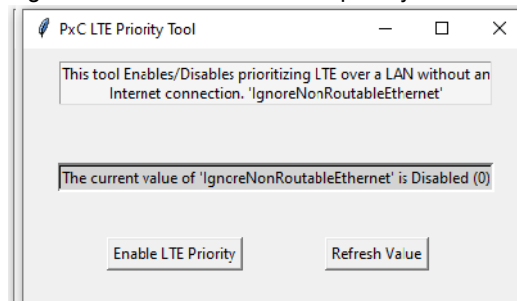


Figure 3-12 Re-enable LTE priority



To re-enable cellular network priority, click the “Enable LTE Priority” button.

3.2.2.4 APN configuration

Both operating systems require configuration of the Access Point Name (APN) for the service provider before the device will connect to the wireless WAN. Typically, the APN is automatically set once the SIM card is inserted. If not, the APN must be configured in the cellular configuration menu before it will connect to the wireless WAN.



Contact your mobile network provider if you need help configuring the APN.

3.2.2.5 Monitoring data usage

Windows operating system

The Windows operating system contains a built-in tool to measure data usage.

Built-in powershell reference:

```
netsh mbn show interfaces
```

Shows mobile interfaces and detailed information, including manufacturer, Device ID, model, firmware version, mobile network provider, IMEI, signal strength, and RSSI/RSCP.

Linux

Ubuntu also includes the mmcli application pre-installed. This can also provide detailed information about the cellular modem, including signal strength in dB:

```
mmcli --signal-setup=1 -m 0
watch -n 1 mmcli --signal-get -m 0
```

Figure 3-13 WLAN antenna (EF16) installation

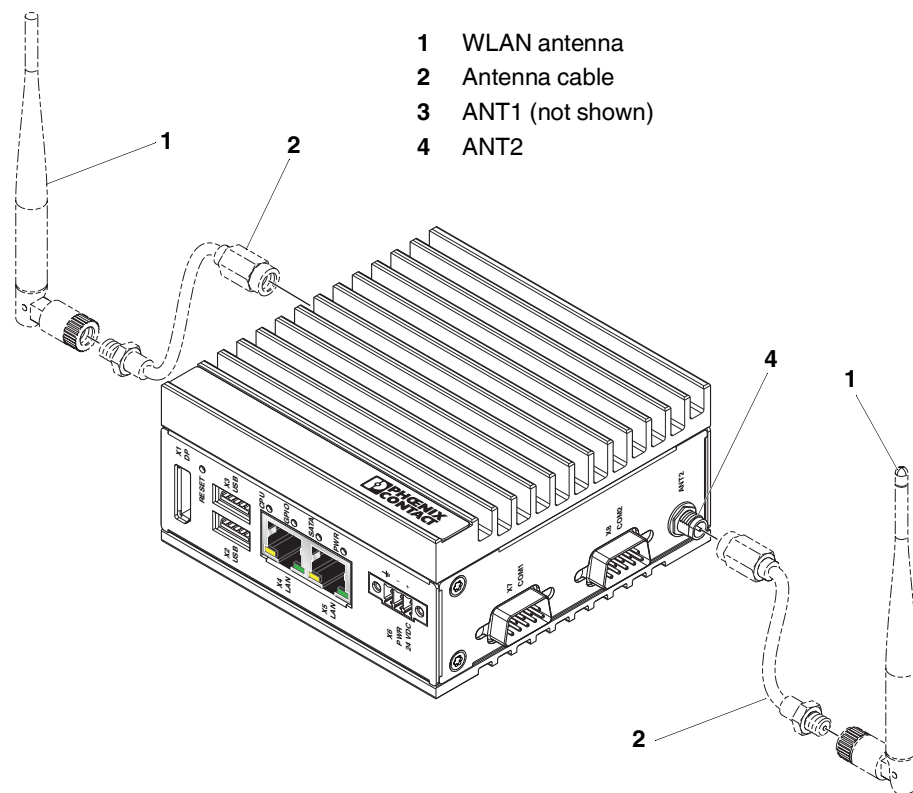
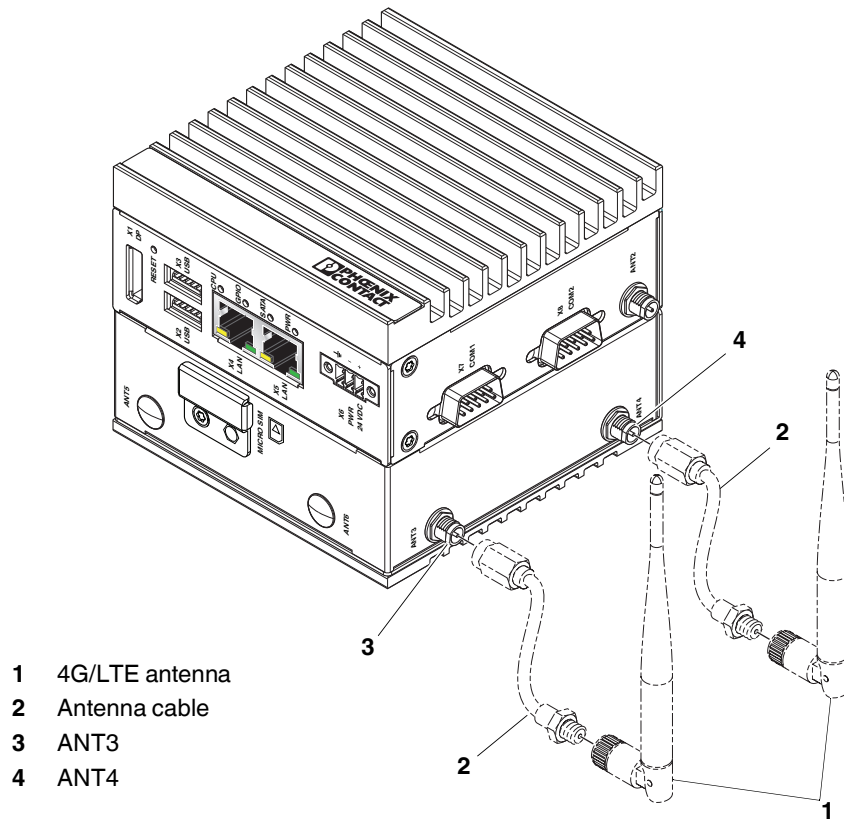


Figure 3-14 4G/LTE antenna (EF31) installation



3.2.3 Serial communication

The optional D-SUB 9 COM ports can be configured to support RS-232, RS-422, or RS-485 physical layer signal levels. RS-232 is the default setting. The physical layer is set using the BIOS setup accessed during the boot sequence (see [“Serial port configuration” on page 51](#)).



RS-485 support requires software to control the transmit direction via RTS.

The function of the pins in the D-SUB 9 connector varies with the different configuration settings.

Table 3-4 D-SUB 9 pinout

D-SUB 9 pin	RS-232	RS-422	RS-485
1	DCD	TXD-	TXD-/RXD-
2	RXD	TXD+	TXD+/RXD+
3	TXD	RXD+	–
4	DTR	RXD-	–
5	GND	GND	GND
6	DSR	–	–
7	RTS	–	–
8	CTS	–	–
9	Wake on ring	Wake on ring	Wake on ring

4 Operation

4.1 LED operation

Four LEDs on the VL3 UPC ... provide operating information (see [Figure 3-5](#)).

Figure 4-1 LED indications

LED	Indication	Description
PWR	Green	Input power > 19.2 V DC and < 28.8 V DC
SATA	Flashes green	Indicates data storage activity
GPIO	Green	Controllable via the PxCeAPI (see phoenixcontact.net/product/1459506)
CPU	Orange	Indicates processor is actively thermal throttling
	Red	Indicates processor has shut down due to overheating

Figure 4-2 Ethernet port LED indications


LED	Indication	Description
Activity link	Off	No link
	Solid orange	Linked
	Flashes orange	Active data transfer
Speed	Off	10 Mbps connection
	Orange	100 Mbps connection
	Green	1000 Mbps connection

4.2 Reset

Push the “RESET” button (see [Figure 3-5](#)) to perform a hardware reset. The device will reboot without a proper operating system shutdown.

4.3 PxCeAPI

The LED, USB reset, and watchdog timer is managed using the PxCeAPI.

 Integrating PxCeAPI into a software application requires a skilled software developer knowledgeable with the tools required to accomplish such a task. The PxCeAPI is compiled using Microsoft Visual Studio® 2019 compiler. Visual Studio 2019 can be used to open the solution and re-compile the sample code.

In order to use PxCeAPI, the PxCeAPI driver (PxCeAPI.sys) must be installed on the system. If the system was ordered with an operating system supplied by Phoenix Contact, this driver will already be installed. If installing your own operating system, this driver, API, libraries and sample code can be downloaded from [Phoenix Contact.net/products](https://phoenixcontact.net/products).

4.3.1 Installing the PxCeAPI driver

1. Go to phoenixcontact.net/products search for the product and download the file VL3_IPC_PxCeAPI.zip from the download section.
2. Unzip the file to the local system.
3. Run the Install_PxCeAPI_Driver.cmd file using administrator rights.



Administration rights is required to install or uninstall a driver.

4.3.2 Sample code

Contained within the VL3_IPC_PxCeAPI.zip file is sample code to demonstrate how to communicate and interact with the system hardware:

- LED_Demo
- WDT_Demo
- USB_Reset

Sample code is located in the Sample Code folder and provides base functionality for the specific feature. Using Visual Studio 2019, the sample code can be modified to meet the needs of most applications.

4.3.3 Demo applications

Contained within the BIN folder of the VL3_IPC_PxCeAPI.zip file are stand-alone demo applications for the following functions:

- LED_Demo
- WDT_Demo
- USB_Reset

Running these demo applications on the appropriate hardware while viewing the associated sample code, will provide the software programmer with a good understanding of how to interact with the various features of the hardware.

4.3.4 Programming details of the PxCeAPI

Programming details of the PxCeAPI can be found in the separate documentation.

Watchdog Timer (WDT)

The watchdog element represents the hardware watchdog on the Industrial PC. If the time-out value of the watchdog is not reset within a specified time period, the watchdog triggers the action specified in the settings.

The software reset interval is to be used in a similar fashion.

Instructions and sample code can be found in the PxCeAPI documentation.

5 Maintenance

**WARNING: Explosion hazard**

Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.

**NOTE: Electrostatic discharge**

The module contains components that can be damaged or destroyed by electrostatic discharge. When handling the module, observe the necessary safety precautions against electrostatic discharge (ESD), in accordance with EN 61340-5-1 and IEC 61340-5-1.

5.1 M.2 drive

VL3 UPC ... products equipped with hardware expansion options EF30, EF31, or EF32 accept M.2 SSD drives.

The VL3 UPC ... accepts 22 x 80 SATA III M.2 drives with B or M key.

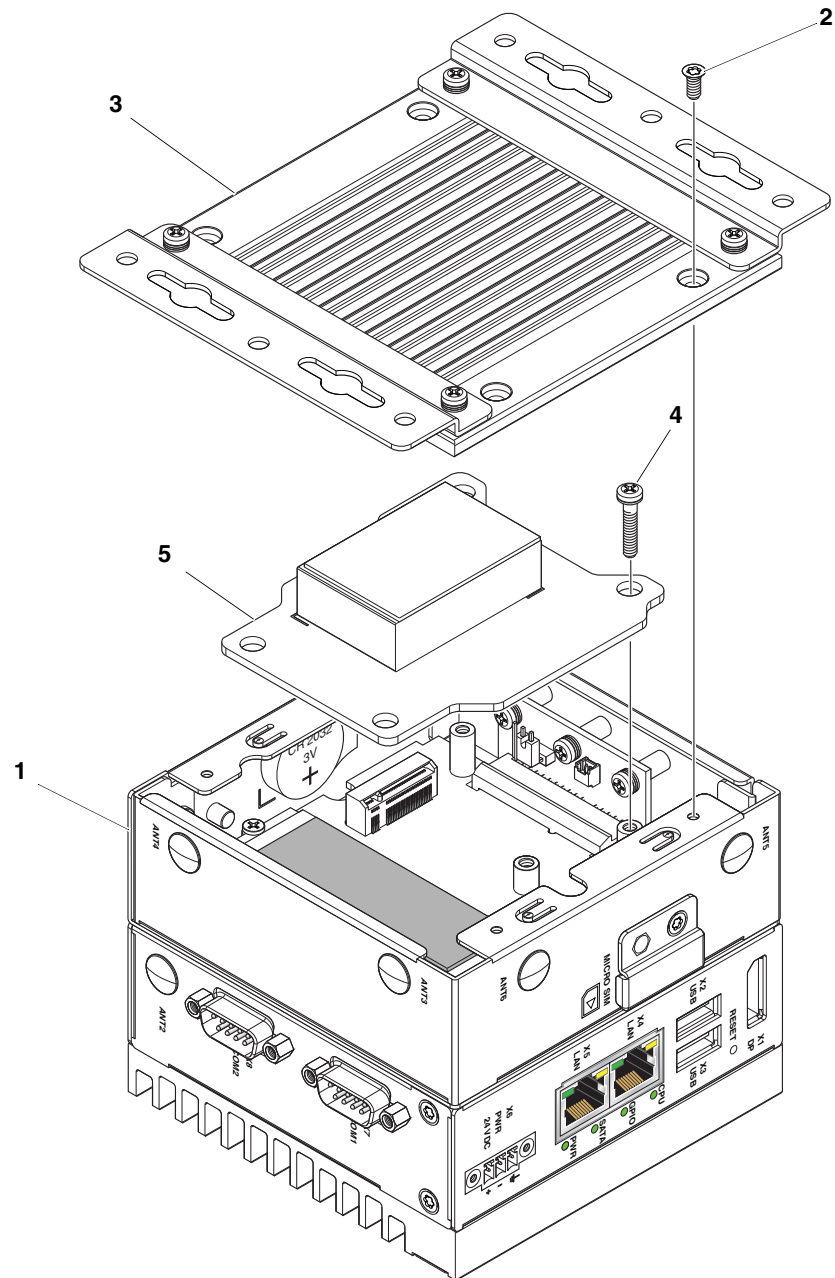


The VL3 UPC ... does not support the use of NVMe drives as additional storage.

5.1.1 Drive replacement

1. Remove the power connector from the VL3 UPC ... to disconnect the input power (see [“Power connection” on page 14](#)).
2. Remove any remaining connected cables.
3. Remove the VL3 UPC ... (1) from the wall or DIN rail (see [“DIN rail mount” on page 11](#)) and set it on a clean work bench.

Figure 5-1 Removing the access panel (wall mount brackets shown)



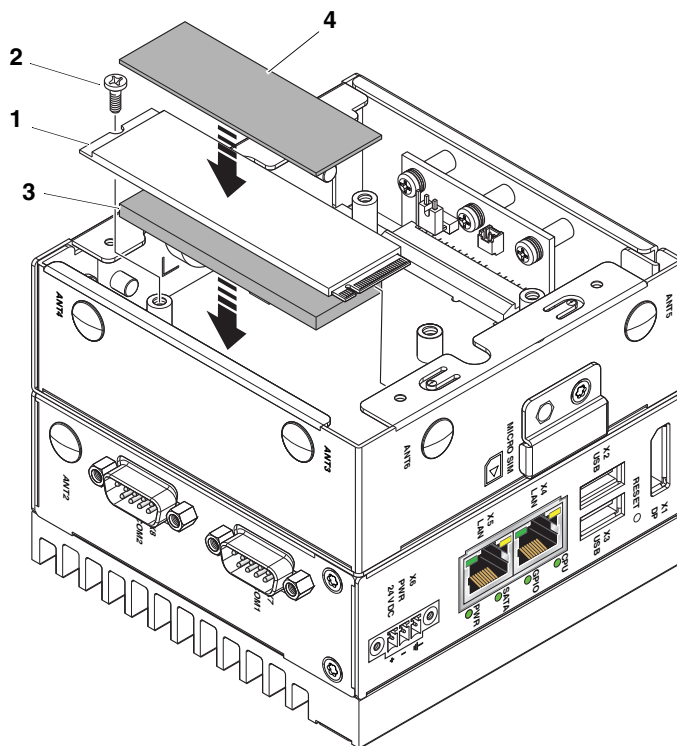
4. Remove the four screws (2) on the access panel (3) and remove the panel.



The wall mount brackets and access panel can be removed as an assembly.

5. Remove the four screws (4) securing the heat sink (5) into the chassis. Remove the heat sink assembly.

Figure 5-2 Removing the M.2 card



6. If removing an existing M.2 card (1), remove the screw (2) securing the card. The card will pop off the circuit board to allow it to slide out of the slot.
7. Remove the card and any thermal pads.

**NOTE:**

Do not damage the circuit board during thermal pad removal. The thermal pads use glue to hold them in place.



When removing an M.2 card, the thermal pads may stick fast to the card, the circuit board, or the heat sink.

The thermal pads can be reused if not damaged.

8. Remove the backer paper from the thick thermal pad (3) and put it in place on the circuit board.
9. Insert the new M.2 card straight into the slot. Ensure it is fully seated.

**NOTE:**

Be careful to orient pin 1 on the card to pin 1 on the slot.

10. Secure the card using the hardware provided with the VL3 UPC Torque the screw to 0.39 Nm.

**NOTE:**

Ensure that the thermal pad is not attached to the bottom of the heat sink before placing a new thermal pad on the M.2 card.

11. Remove the backer paper from the thin thermal pad (4) and attach it to the M.2 card.
12. Reinstall the heat sink into the unit using the previously removed hardware. Torque hardware to 0.59 Nm.

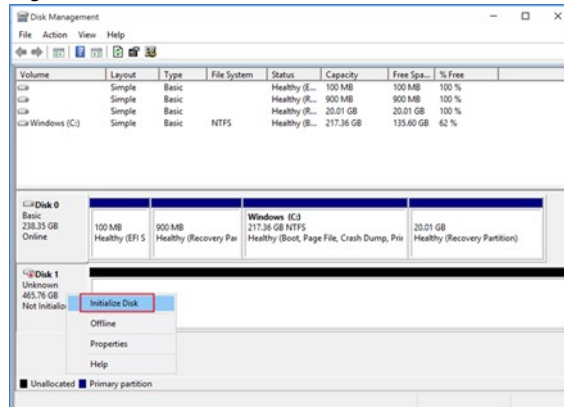
13. Place the access panel on the chassis and secure with the hardware previously removed. Torque the screws to 0.59 Nm.

5.1.2 Initializing a new drive

A new, customer-installed drive must be initialized with at least one partition for a drive to be recognized by the system. Factory-installed drives are initialized and formatted before shipment.

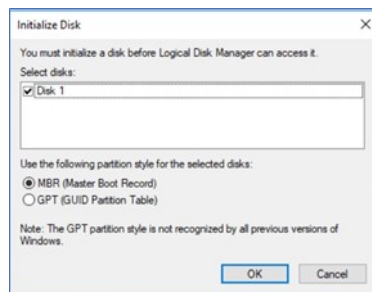
1. After completing the hardware installation, reconnect all cables and apply power to the device. Wait for the VL3 UPC ... to boot.
2. Right-click the “Start” button, and then click the “Disk Management” menu.
3. Right-click the drive marked “Unknown” and “Not Initialized” and then click the “Initialize Disk...” option.

Figure 5-3 Initialize disk screen



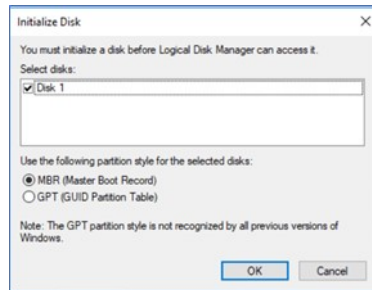
4. From the “Initialize Disk” dialog box, check the box to select the disk to initialize.

Figure 5-4 Select disk screen



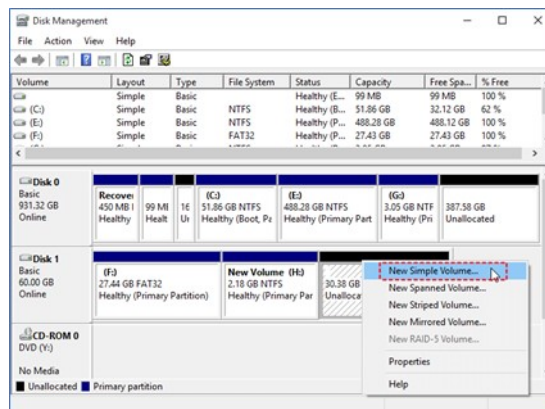
5. Select the partition style and confirm by clicking the “OK” button. Choose from:
 - MBR (Master Boot Record) for drives smaller than 2 TB.
 - GPT (GUID Partition Table) for drives larger than 2 TB.

Figure 5-5 Simple Volume



6. When the process is complete, the "Initialize Disk" dialog box closes.
7. From the "Disk Management" window, right-click the newly installed disk and click the "New Simple Volume..." option to create a new partition.

Figure 5-6 New Simple Volume



8. Follow the prompts to finalize drive initialization.

5.2 Battery replacement

**WARNING: Explosion hazard**

Battery must only be changed in an area known to be non-hazardous.

The battery supplies power to the real-time clock (RTC) and maintains the BIOS settings when the system is not connected to a 24 V DC power source. If power is removed while the battery is discharged or removed, any user-defined BIOS settings will be lost and a "CMOS checksum error" message appears once power is restored.

It is recommended that the user-defined BIOS settings be recorded through photos or a separate document before the battery is depleted or removed. Store the photos or documents on a different device so they are accessible in the event of a boot failure.

The VL3 UPC ... uses a coin-type battery sealed in plastic with a pluggable pigtail (Order No. 1289761).

The location of the battery (1) depends upon the configuration.

Figure 5-7 Battery location base unit

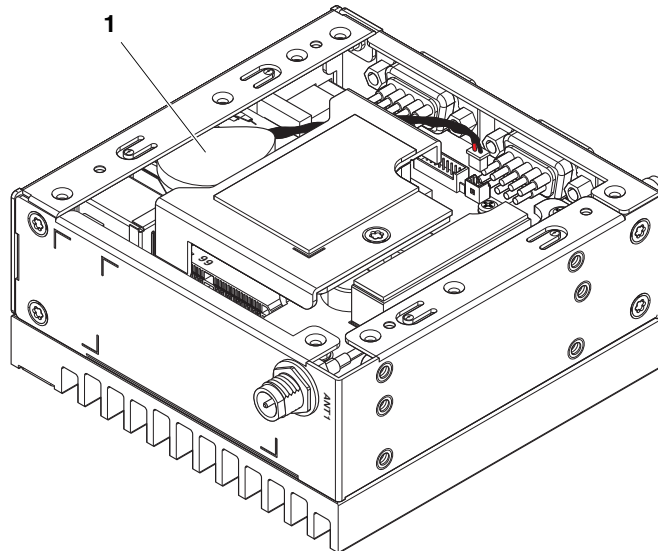
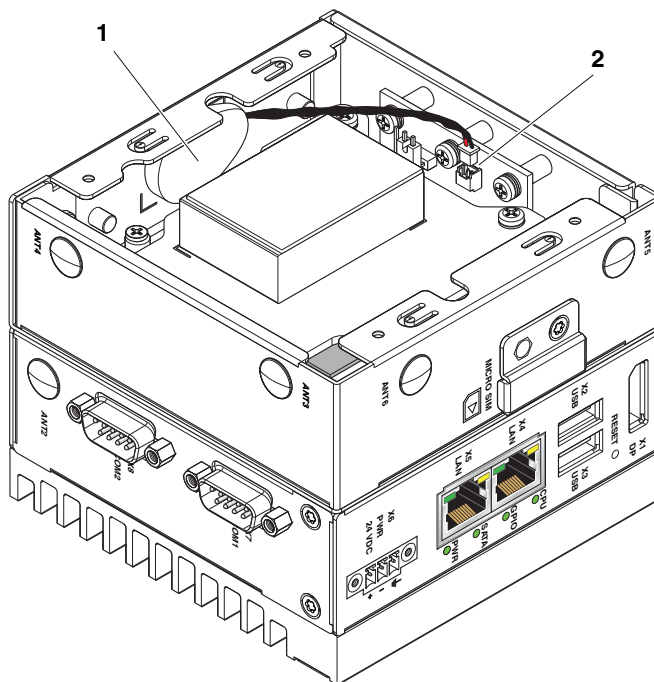


Figure 5-8 Battery location with expansion options (EF31 shown)



Replacement

1. Remove the power connector from the VL3 UPC ... to disconnect the input power (see [“Power connection” on page 14](#)).
2. Remove any remaining connected cables.
3. Remove the access panel (see step 4 of the M.2 drive replacement process).
4. Use a needle-nose pliers to pull the battery harness plug from the socket (2).
5. Use a screwdriver to loosen the battery (1) from the adhesive that secures it in place and remove the battery and cable. Note the cable routing for installation of the replacement battery.
6. Position the new battery in place of the old one and route the cable as previously noted.
7. Insert the battery cable plug into the socket.
8. Reinstall the access panel with the previously removed hardware.
9. Reinstall the VL3 UPC ... and attach previously removed connectors.
10. Apply power to the unit and note the BIOS status and any messages that may appear.

6 Configuration

6.1 BIOS

The BIOS configures the software to match the hardware contained within the industrial PC.

**NOTE:**

Changing BIOS settings can lead to system instability and data loss. Therefore, it is recommended that only advanced users modify the BIOS settings.

To access the BIOS setup utility, there must be an actual (physical) keyboard attached to one of the USB ports.

During the boot process, press the <Delete> or <F2> key continually before the operating system initiates to enter the BIOS setup utility. Once the main screen appears, follow the prompts. Use the arrow keys to navigate and highlight desired selections. Follow on-screen instructions and be sure to save any changes.

One-time change to the boot sequence

A device must be connected before applying power to appear as a selectable device.

A quick-boot menu allows changes to the boot sequence one time. This allows loading a new operating system from a USB drive.

1. Press the <F12> key during the boot process to access the quick-boot menu.
2. Highlight the device from which to boot.
3. Press the <Enter> key to initiate the boot process.

BIOS navigation

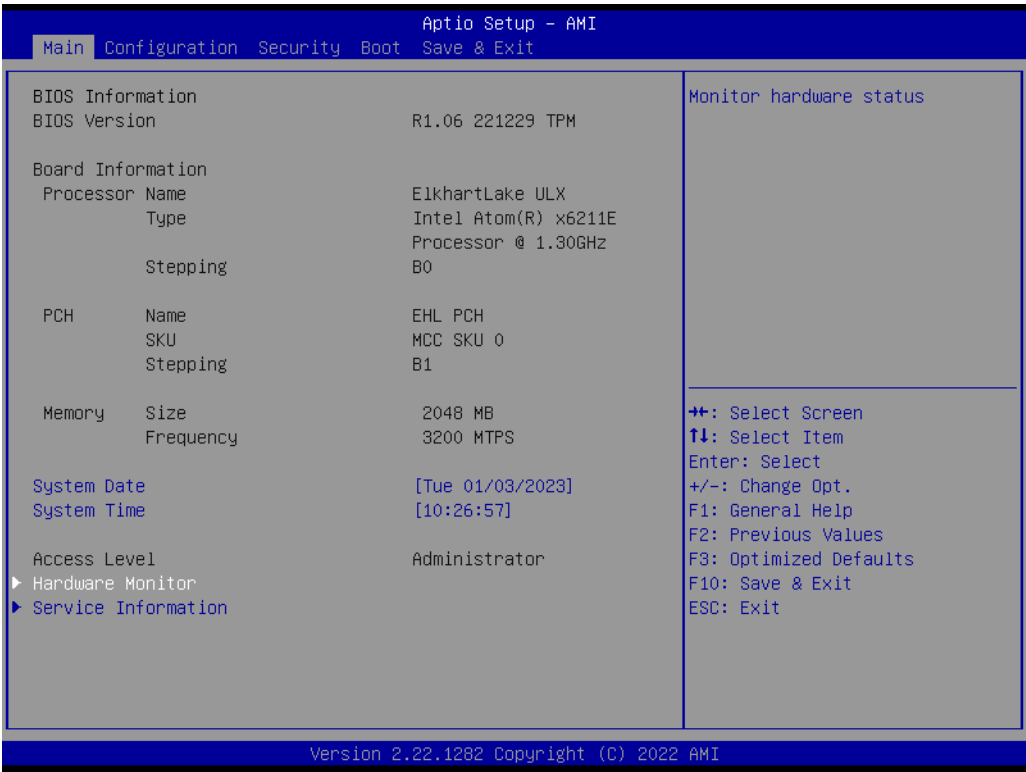
BIOS navigation keys are displayed in the lower right of the window. Use the various keys to navigate to the desired line which, when selected, displays in white letters. Press the <Enter> key to access the parameters for the selected line.

The upper right of each screen shows specific options for configuring the selected line.

6.1.1 Main menu

Once the BIOS is accessed, the “Main” screen appears.

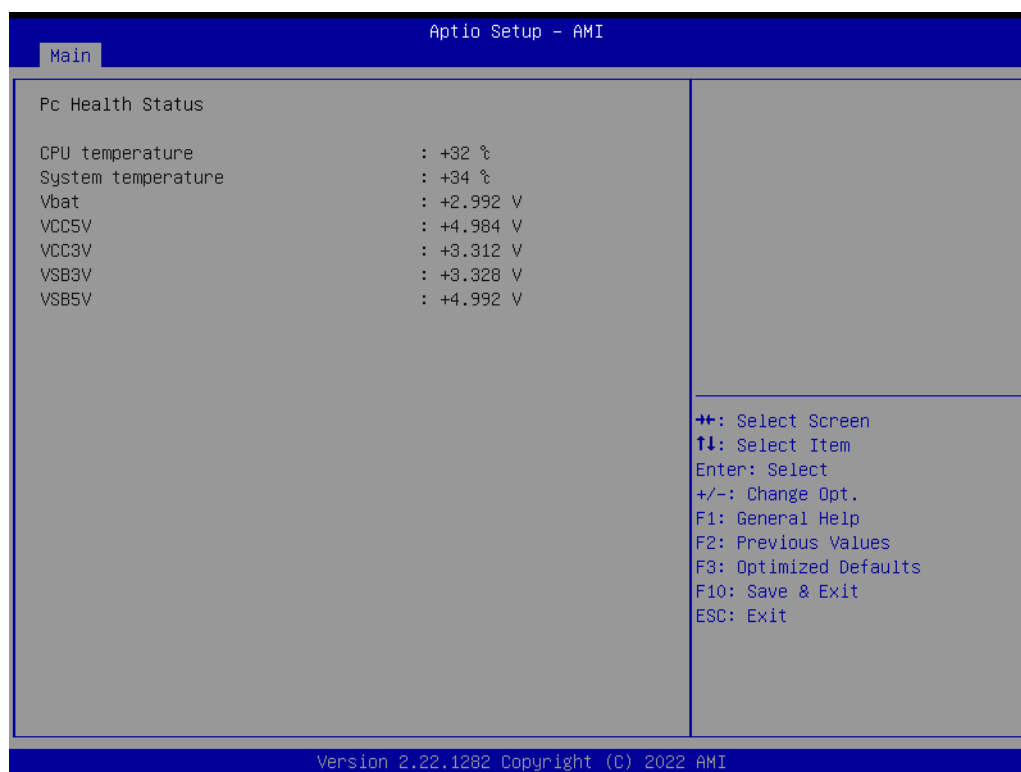
Figure 6-1 “Main” screen



The “Main” screen displays general information about the device and allows setting the date and time. The screen also provides access to the “Hardware Monitor” and “Service Information” screens for additional information.

Hardware monitor

Figure 6-2 Hardware monitor screen

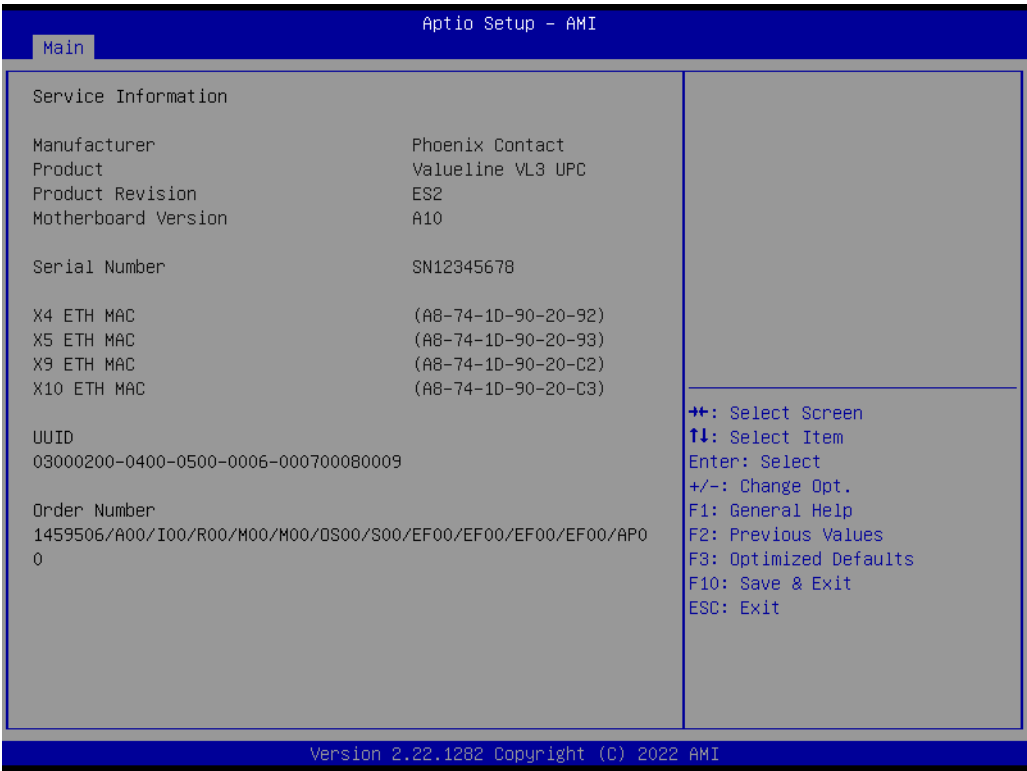


From the “Main” screen, click the “Hardware Monitor” line to display various data about the PC hardware, such as temperatures and voltages. This information can be used for troubleshooting, if problems arise.

There are no editable fields on this page.

Service information

Figure 6-3 “Service Information” menu



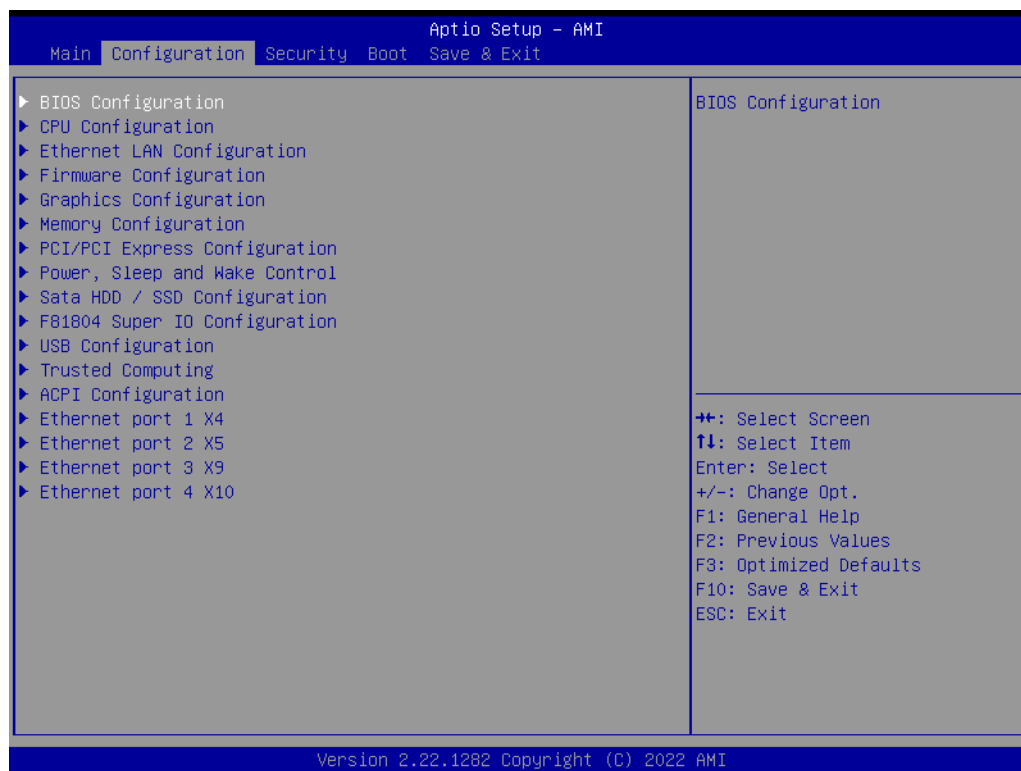
From the “Main” screen, click the “Service Information” line to view detailed data regarding the specific device, such as serial number, order number, configuration, etc.

There are no editable fields on this page.

6.1.2 Configuration menu

Click the “Configuration” menu to access the “System Configuration” screen.

Figure 6-4 “System Configuration” screen



Options may vary depending upon the configuration of the VL3 UPC



NOTE:

Modification of BIOS settings not described in this document could cause the VL3 UPC ... to stop functioning.

6.1.2.1 BIOS configuration

Highlight the “BIOS Configuration” line on the main “Configuration” screen (see [Figure 6-4](#)), and then press the <Enter> key.

Figure 6-5 “BIOS configuration” screen

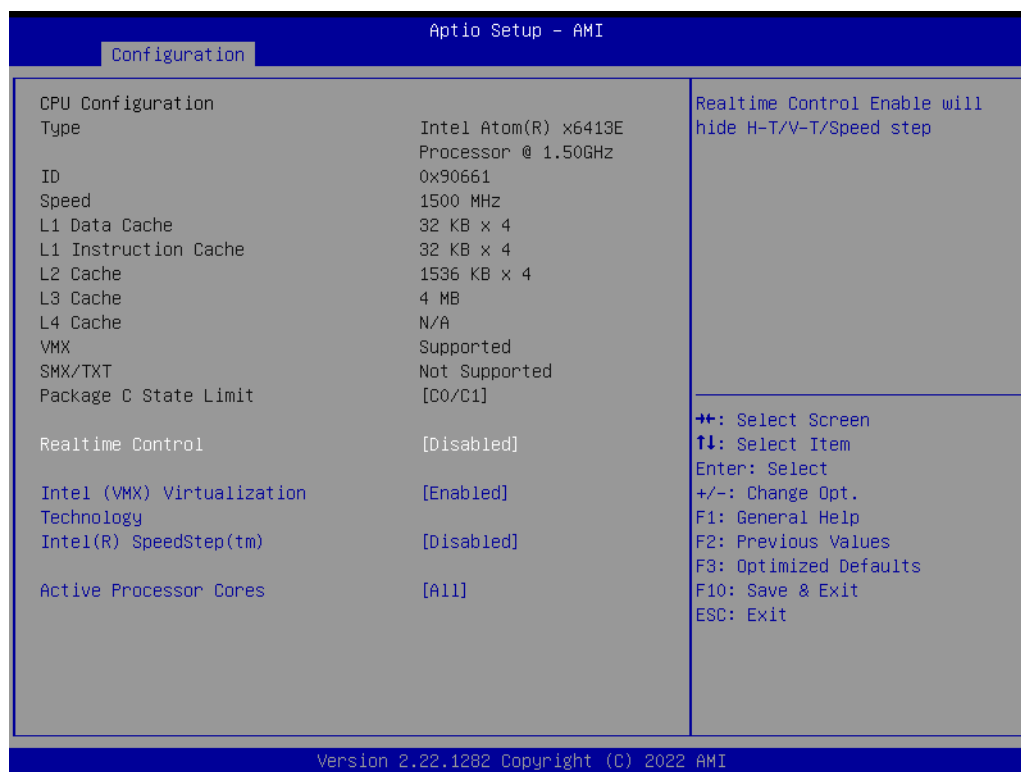


This screen enables changing the NUMLOCK status (default is **Enabled**) and the settings for the boot logo size.

6.1.2.2 CPU configuration

Highlight the “CPU Configuration” line on the “Configuration” screen (see [Figure 6-4](#)), and then press the <Enter> key.

Figure 6-6 “CPU Configuration” screen



Realtime control can be enabled if running a real-time operating system (RTOS). The default is **Disabled**.



Realtime control disables the settings that make the real-time clock inaccurate.

Configure the following options:

- Inter Virtualization VT-x and VT-d is enabled
- Intel Speedstep is enabled (default)
- Turbo Boost / Burst is enabled (default)
- Realtime control = Enable
- Inter Virtualization VT-x and VT-d is disabled, hidden
- Intel Speedstep is disabled, hidden
- Turbo Boost / Burst is disabled, hidden

6.1.2.3 Ethernet LAN configuration

Highlight the “Ethernet LAN Configuration” line on the “Configuration” screen (see [Figure 6-4](#)), and then press the <Enter> key.

Figure 6-7 “Ethernet LAN Configuration” screen

Configuration		Aptio Setup - AMI	
Ethernet LAN Configuration		LAN Port Enable and Disable	
X4: LAN1	[Enabled]		
MAC Address	(A8-74-1D-90-20-92)		
X5: LAN2	[Enabled]		
MAC Address	(A8-74-1D-90-20-93)		
X9 and X10:LAN	[Enabled]		
MAC Address	(A8-74-1D-90-20-C2)		
MAC Address	(A8-74-1D-90-20-C3)		
MAC Address	(A8-74-1D-90-20-C3)		
Network Stack	[Enabled]	++: Select Screen ↑↓: Select Item Enter: Select +/-: Change Opt. F1: General Help F2: Previous Values F3: Optimized Defaults F10: Save & Exit ESC: Exit	
IPv4 PXE Support	[Enabled]		
IPv6 PXE Support	[Disabled]		
X4 PXE Control	[Enabled]		
X5 PXE Control	[Enabled]		
X9 PXE Control	[Enabled]		
X10 PXE Control	[Enabled]		

Version 2.22.1282 Copyright (C) 2022 AMI

This screen enables and disables each of the Ethernet ports. PXE boot can also be enabled and disabled.



Ethernet ports X9 and X10 must be enabled/disabled together.

6.1.2.4 Ethernet port configuration

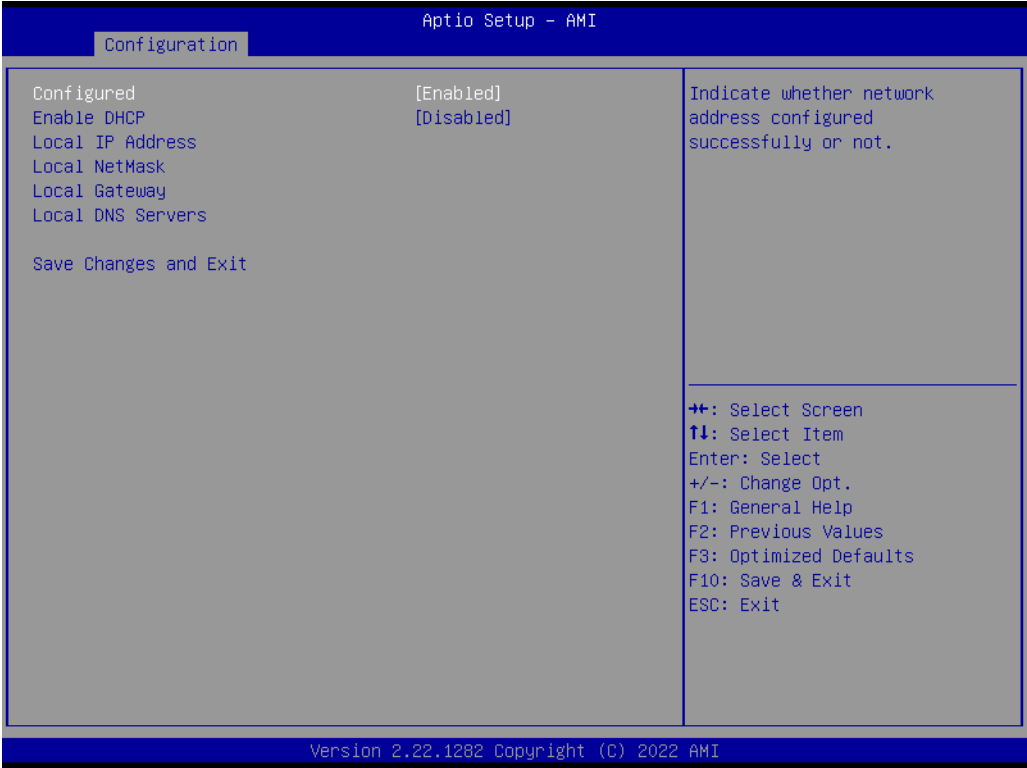
Highlight the desired “Ethernet port n X n ” line, where n indicates the port number, on the main “Configuration” screen (see [Figure 6-4](#)), and then press the <Enter> key.

Figure 6-8 “Ethernet port Configuration” screen showing Disabled options



Enable and disable the network configuration of an Ethernet port. By default, each port is set to **DHCP**.

Figure 6-9 “Ethernet port Configuration” screen showing Enabled options

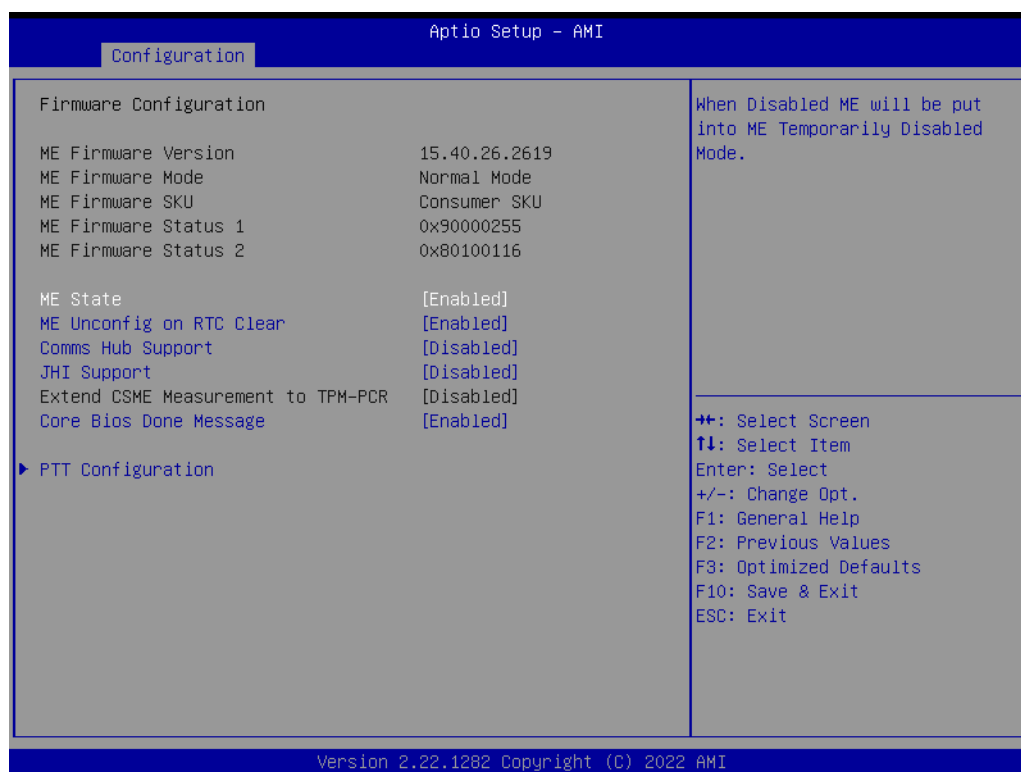


When configuring an Ethernet, disable DHCP, and then set the network settings manually.

6.1.2.5 Firmware configuration

Highlight the “Firmware Configuration” line on the main “Configuration” screen (see [Figure 6-5](#)), and then press the <Enter> key.

Figure 6-10 “Firmware Configuration” screen



The “Firmware Configuration” screen provides access to the “PTT Configuration” screen (see [Figure 6-11](#)) to change between dTPM and fTPM.

Figure 6-11 “PTT Capability / State screen”

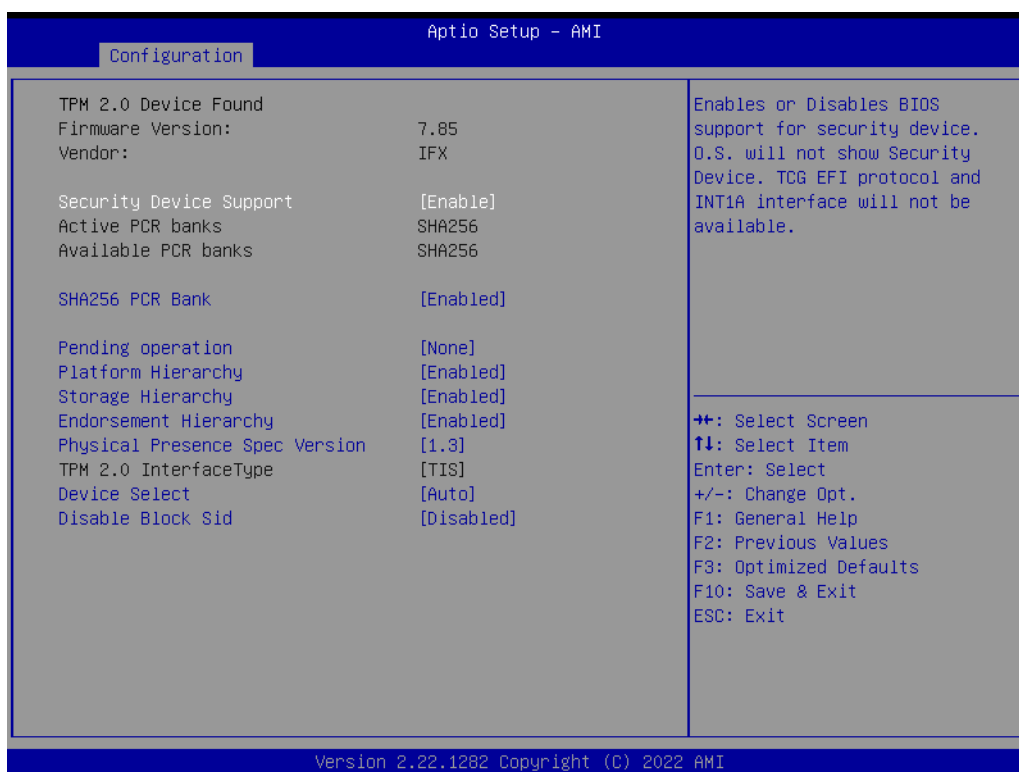


This screen allows changing from a discrete (HW) dTPM to a firmware-based TPM. The default settings is PTT (fTPM) and dTPM is not installed.

6.1.2.6 TPM configuration

Highlight the “Trusted Computing” line on the main “Configuration” screen (see [Figure 6-4](#)), and then press the <Enter> key.

Figure 6-12 “TPM configuration” screen

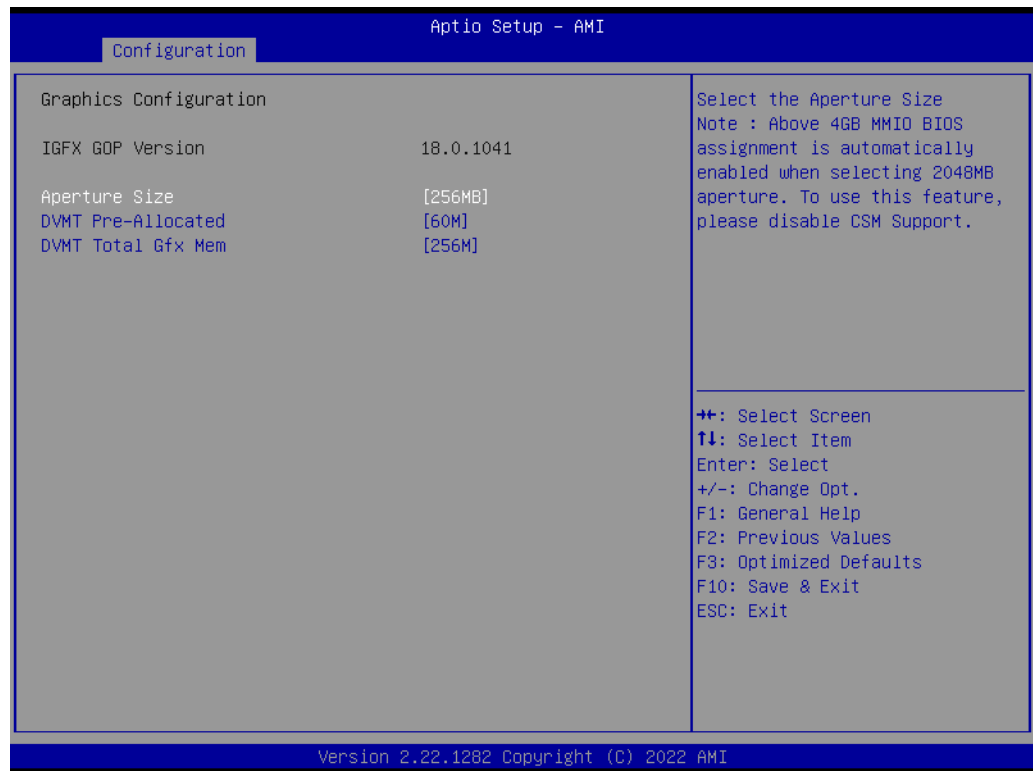


Trusted Platform Management (TPM) can be enabled and disabled from this screen. Settings also include setting the mode of the TPM.

6.1.2.7 Graphics configuration

Highlight the “Graphics Configuration” line on the main “Configuration” screen (see [Figure 6-4](#)), and then press the <Enter> key.

Figure 6-13 “Graphics Configuration” screen



The screen allows configuration of graphic settings.

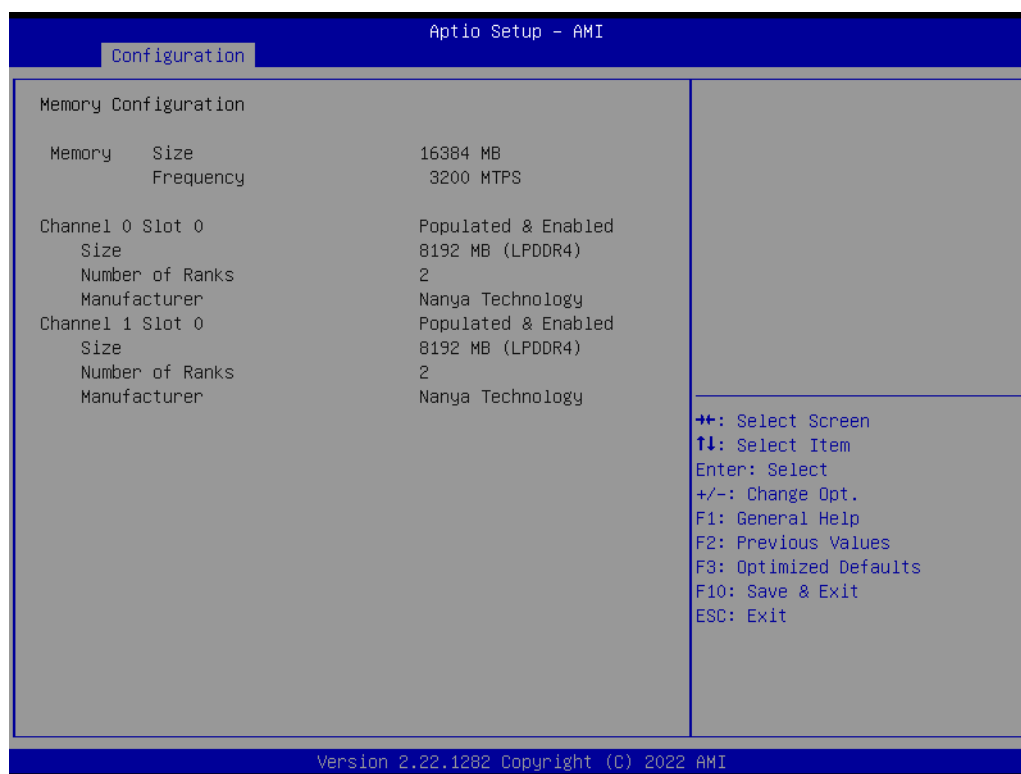


Changing settings on this screen is typically not necessary.

6.1.2.8 Memory configuration

Highlight the “Memory Configuration” line on the main “Configuration” screen (see [Figure 6-4](#)), and then press the <Enter> key.

Figure 6-14 “Memory Configuration” screen

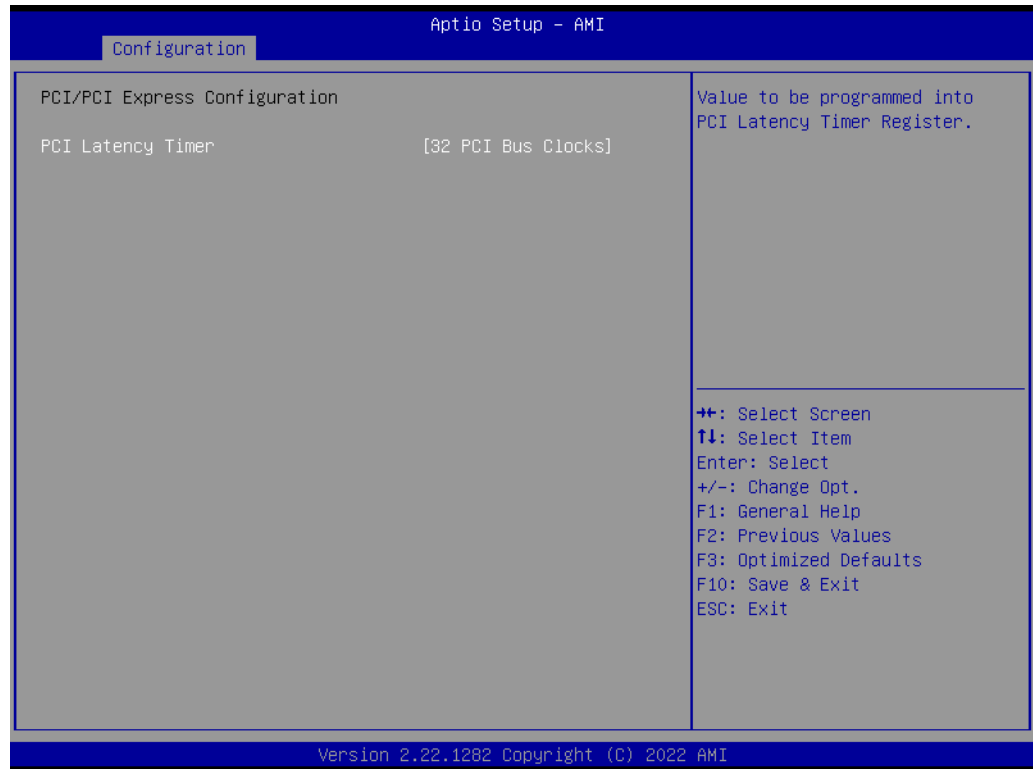


This screen provides information about the RAM memory. There are no editable fields.

6.1.2.9 PCI/PCIe configuration

Highlight the “PCI/PCI Express Configuration” line on the main “Configuration” screen (see [Figure 6-4](#)), and then press the <Enter> key.

Figure 6-15 “PCI/PCI Express Configuration” screen



This screen allows changing the latency of the PCI bus.

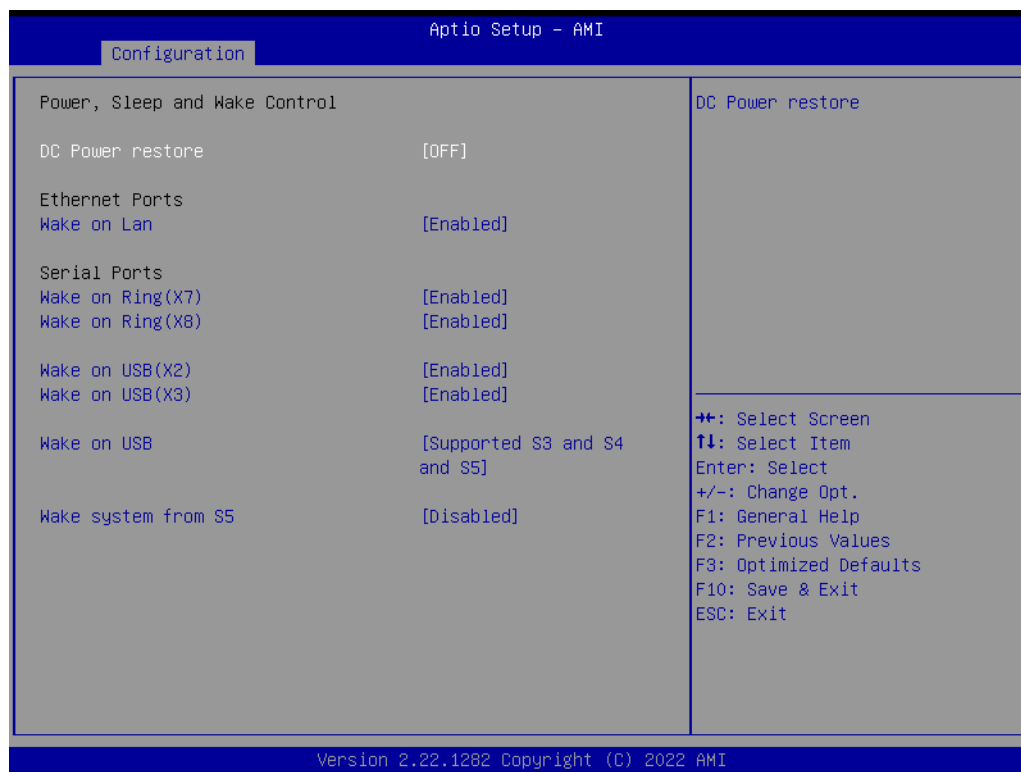


Changing settings on this screen is typically not necessary.

6.1.2.10 Power, sleep and wake control

Highlight the “Power, Sleep and Wake Control” line on the main “Configuration” screen (see [Figure 6-4](#)), and then press the <Enter> key.

Figure 6-16 “Power Sleep and Wake Control” screen

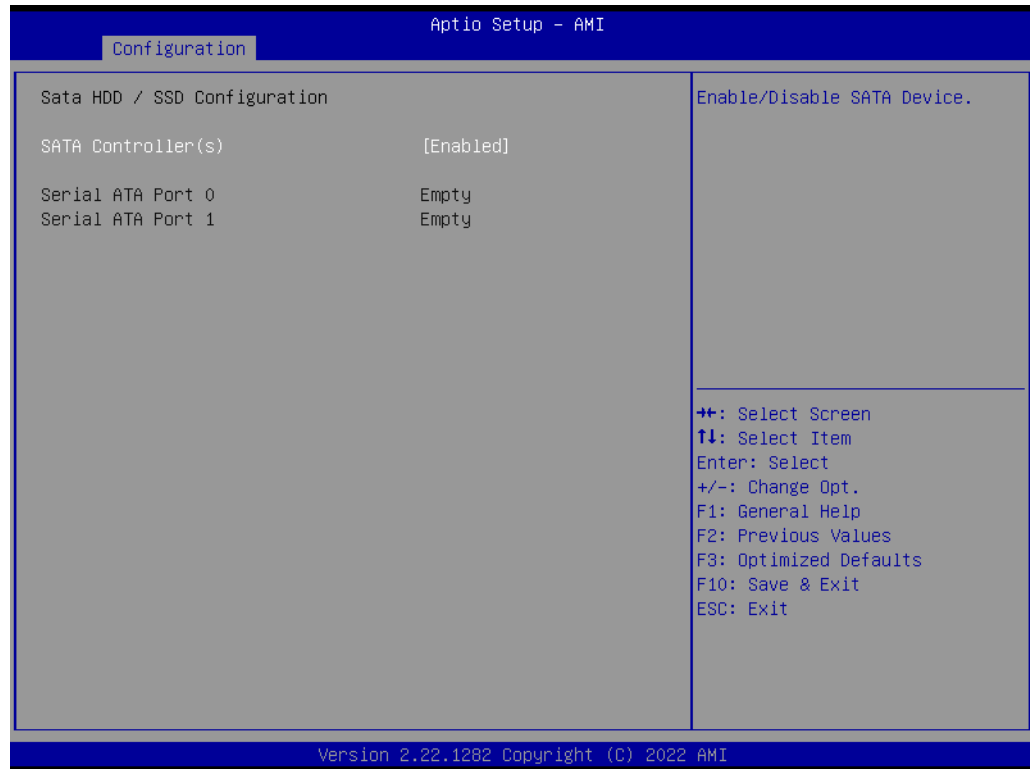


Configure the behavior of the VL3 UPC ... when power is applied and how the system responds to wake signals on Ethernet, USB, and COM ports.

6.1.2.11 SATA HDD/SSD configuration

Highlight the “SATA HDD / SSD Configuration” line on the main “Configuration” screen (see [Figure 6-4](#)), and then press the <Enter> key.

Figure 6-17 “SATA HDD / SSD Configuration” screen



This screen disables and enables the SATA controller.



When the SATA controller is disabled, it will not be able to communicate to the additional storage device on expanded systems.

The screen shows details about the additional storage device.

6.1.2.12 Serial port configuration

Highlight the “F81804 Super IO Configuration” line on the main “Configuration” screen (see [Figure 6-4](#)), and then press the <Enter> key.

Figure 6-18 “F81804 Super IO configuration” screen



Highlight the line describing the desired port and press the <Enter> key to access the configuration screen for that particular port.

Figure 6-19 Serial Port n Configuration showing RS485

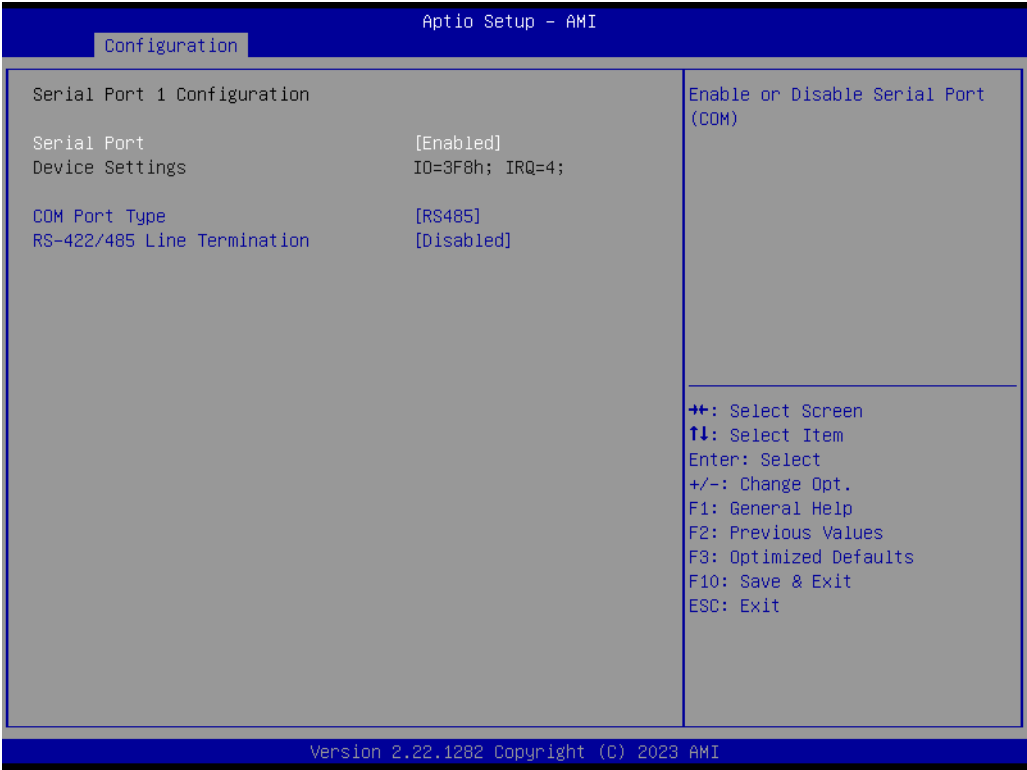
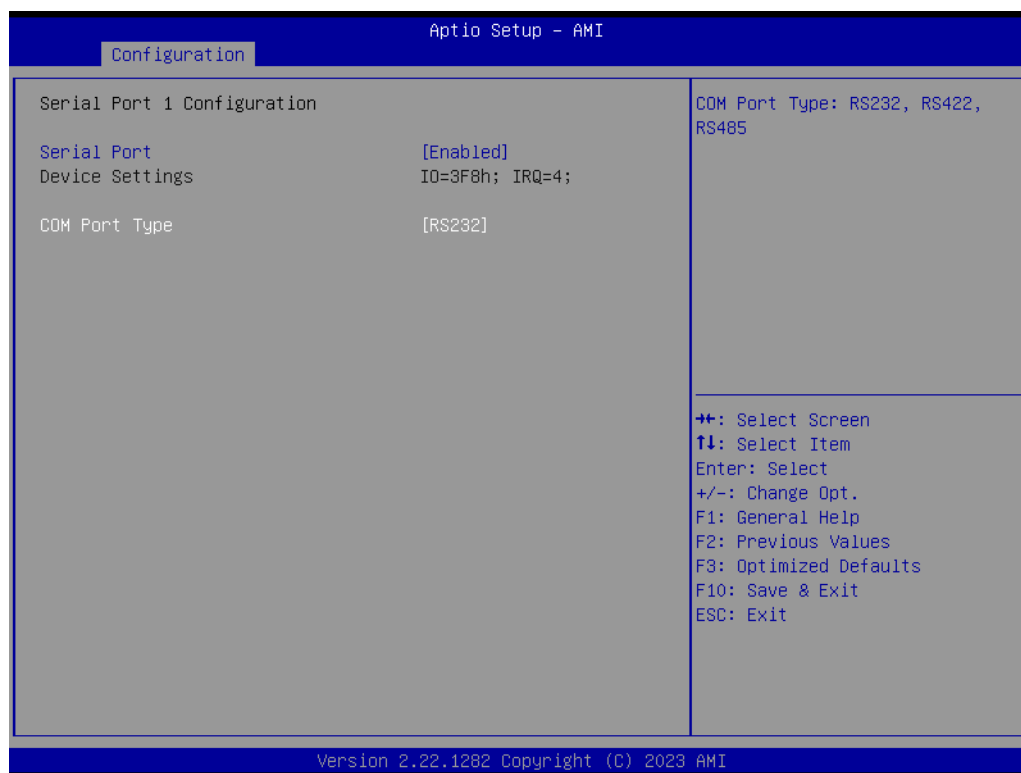


Figure 6-20 Serial Port *n* Configuration showing RS232

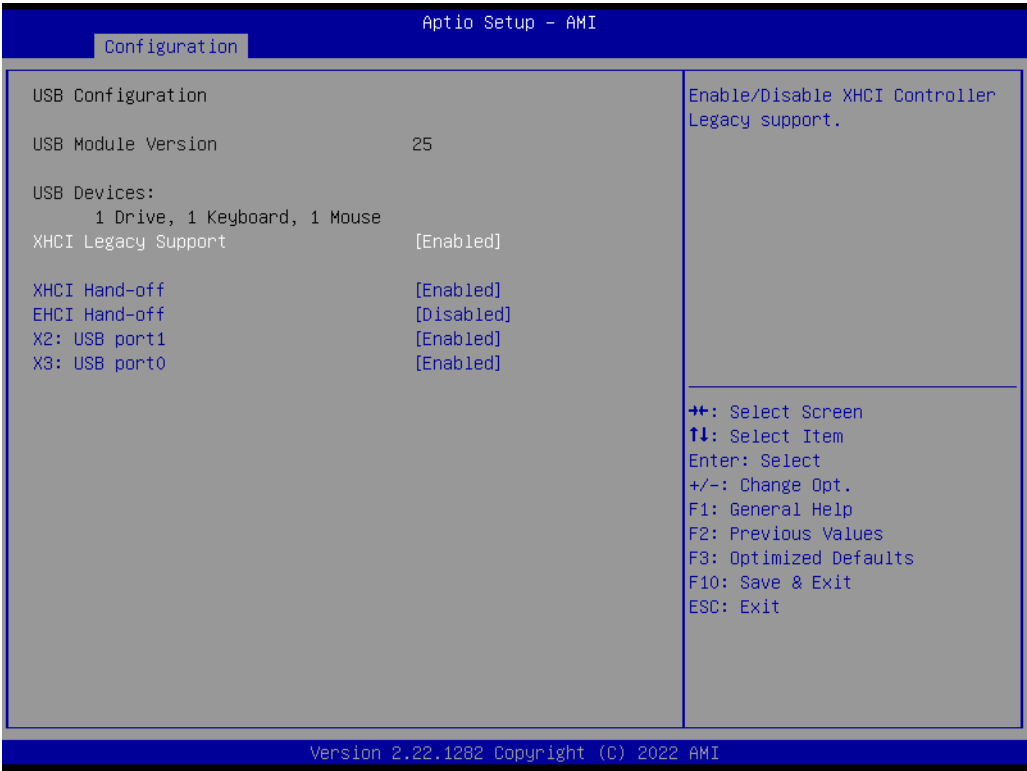
From the “Serial Port *n* Configuration” screen, set the following by highlighting the appropriate line:

- Enabled or disabled.
- Select the port type as RS-232, RS-422, or RS-485.

6.1.2.13 USB configuration

Highlight the “USB Configuration” line on the main “Configuration” screen (see [Figure 6-4](#)), and then press the <Enter> key.

Figure 6-21 “USB Configuration” screen



Enable and disable the various USB ports as desired.

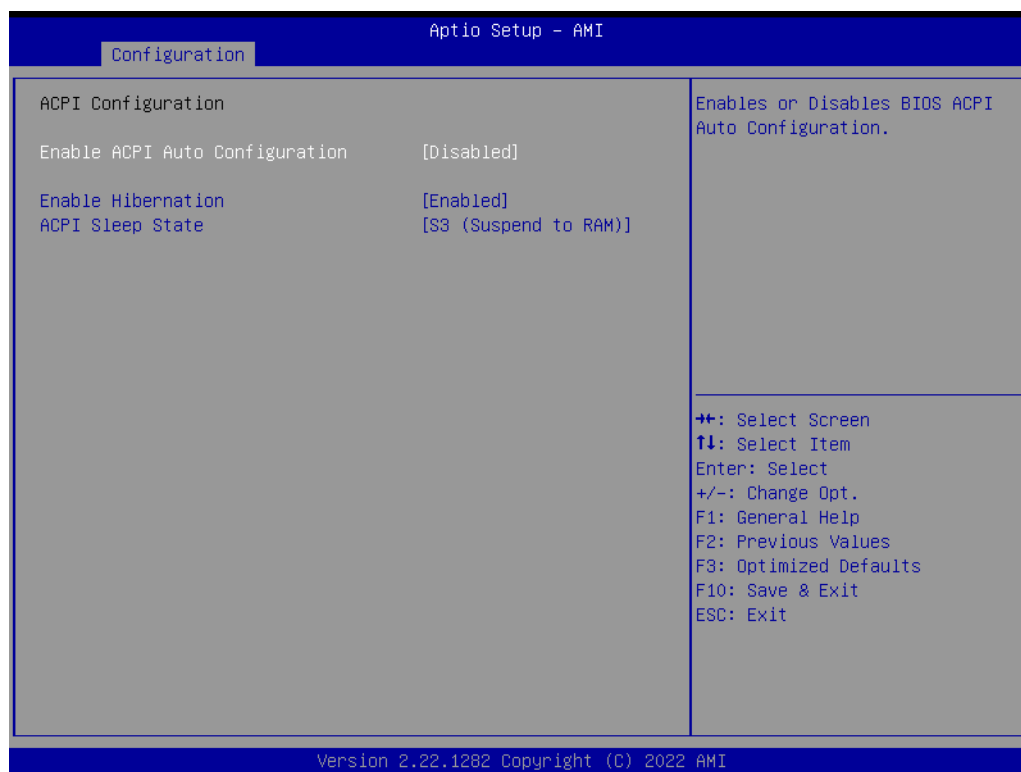


Changing settings on this screen is typically not necessary.

6.1.2.14 Advanced configuration and power interface configuration

Highlight the “ACPI Configuration” line on the main “Configuration” screen (see [Figure 6-4](#)), and then press the <Enter> key.

Figure 6-22 “ACPI Configuration” screen

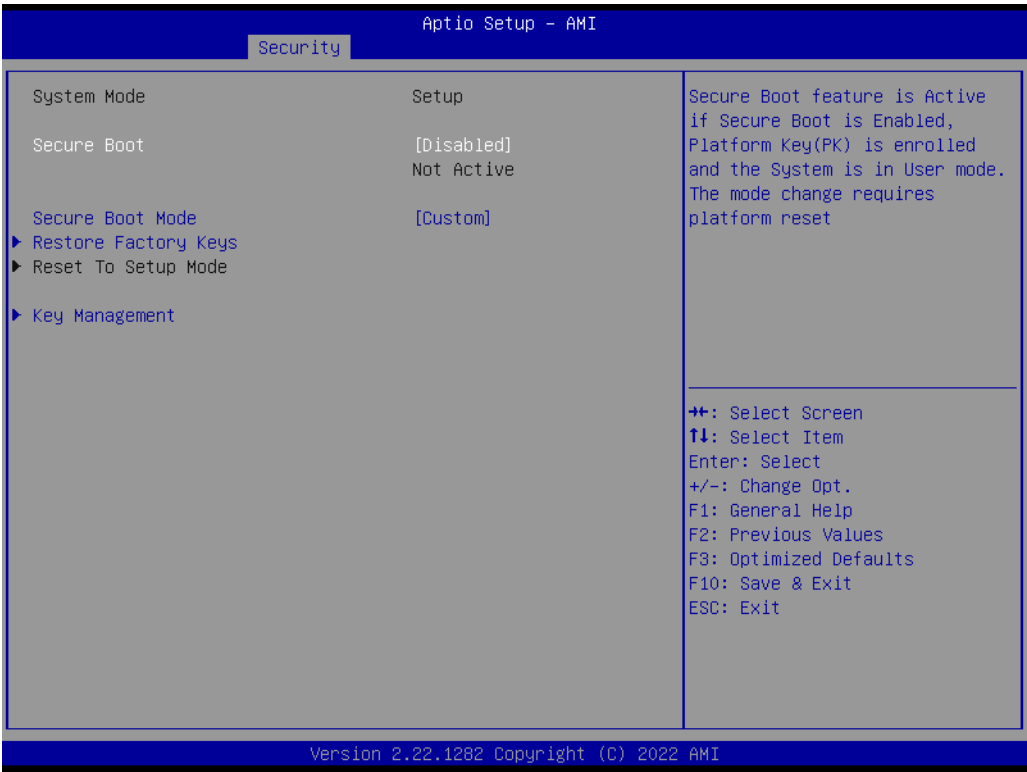


Configure the hibernation and system sleep settings as desired.

6.1.3 Security

From the “Main” screen (see [Figure 6-1](#)), navigate to the “Security” menu to access the “System security” screen.

Figure 6-23 Security screen

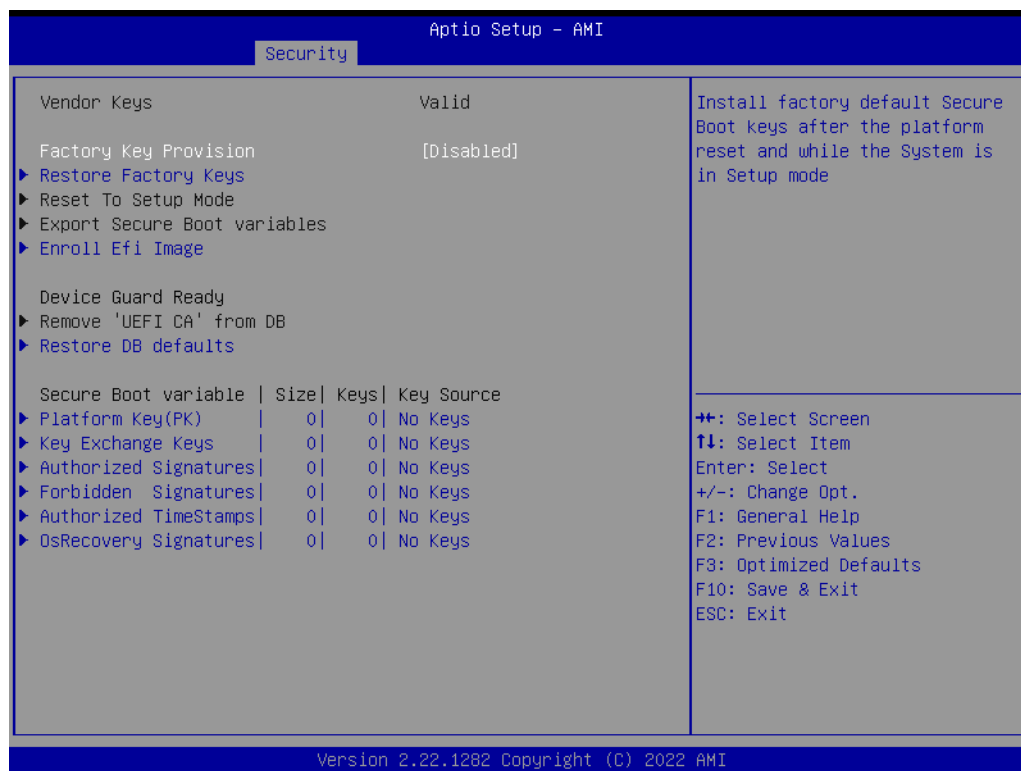


Highlight the desired line and press the <Enter> key.



Secure Boot must be enabled before it can be configured.

Figure 6-24 System key settings

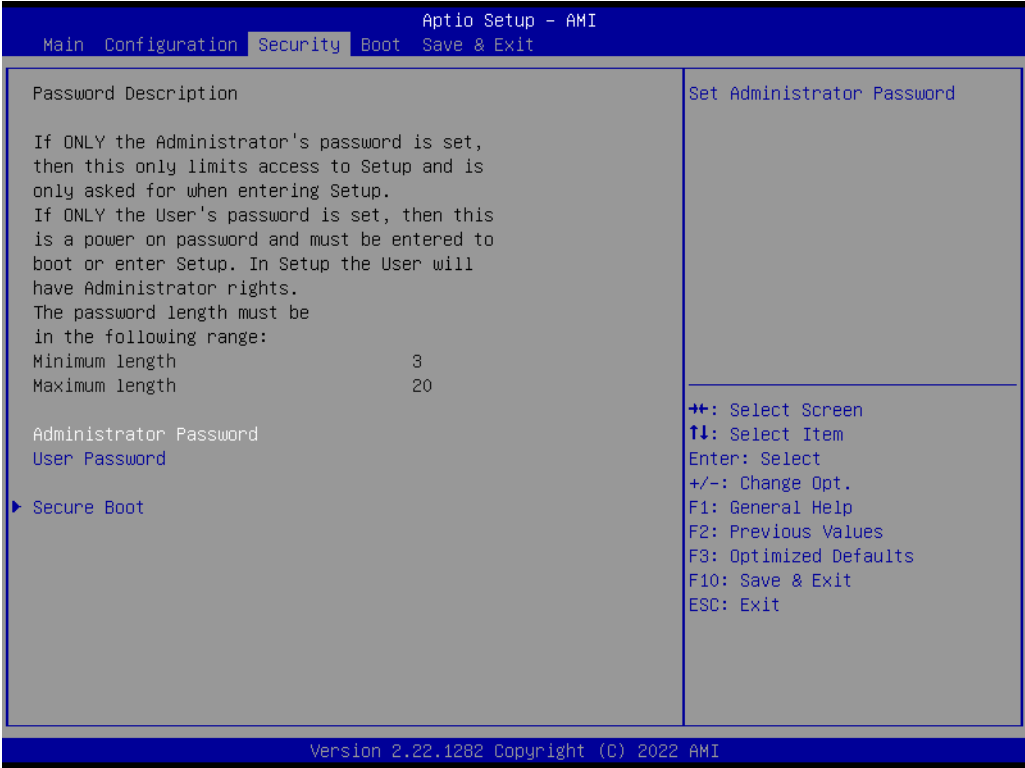


Manage the secure boot key settings on this screen.




Normally, managing secure boot is done in the operating system. Installation of platform keys is responsibility of the end customer. Additional information can be found at www.microsoft.com.

Figure 6-25 System security password



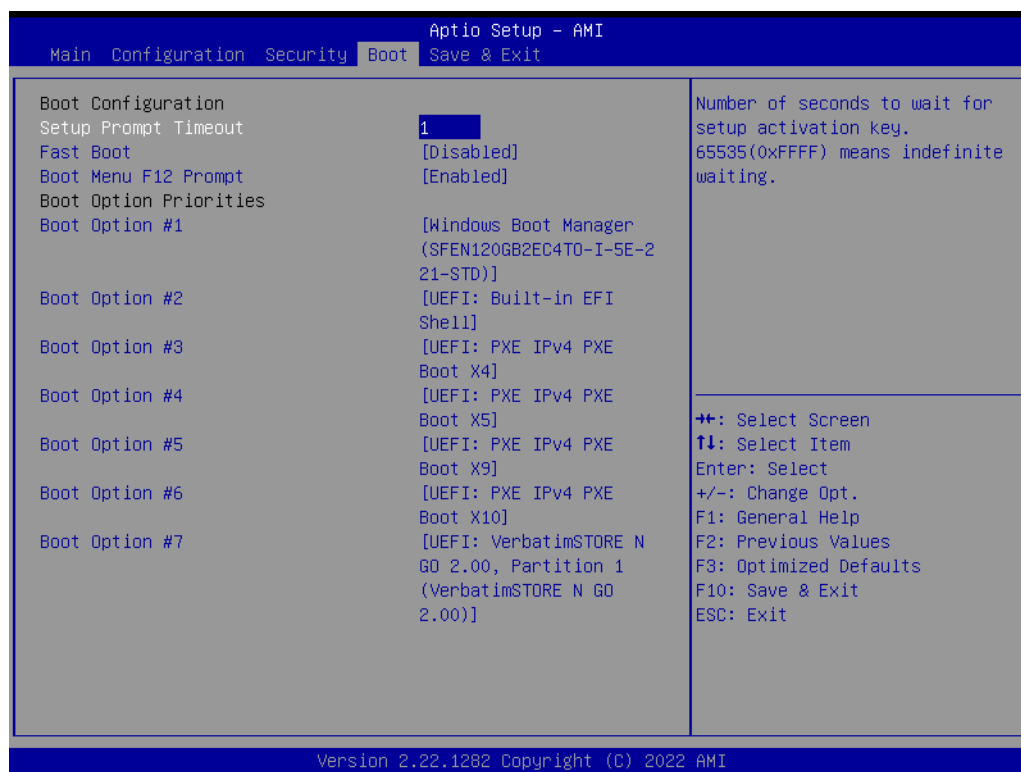
The “Password Description” screen allows setting or changing the system password for an administrator and user. Users can view BIOS settings while administrators will be able to make changes to the BIOS.

 Loss of the system password requires resetting the system to the factory defaults. All settings will be lost and, if Secure boot is enabled, all data on the device will be lost.

6.1.4 Boot menu

From the “Main” screen (see [Figure 6-1](#)), navigate to the “Boot” menu to access the “Boot Configuration” screen.

Figure 6-26 “Boot Configuration” screen

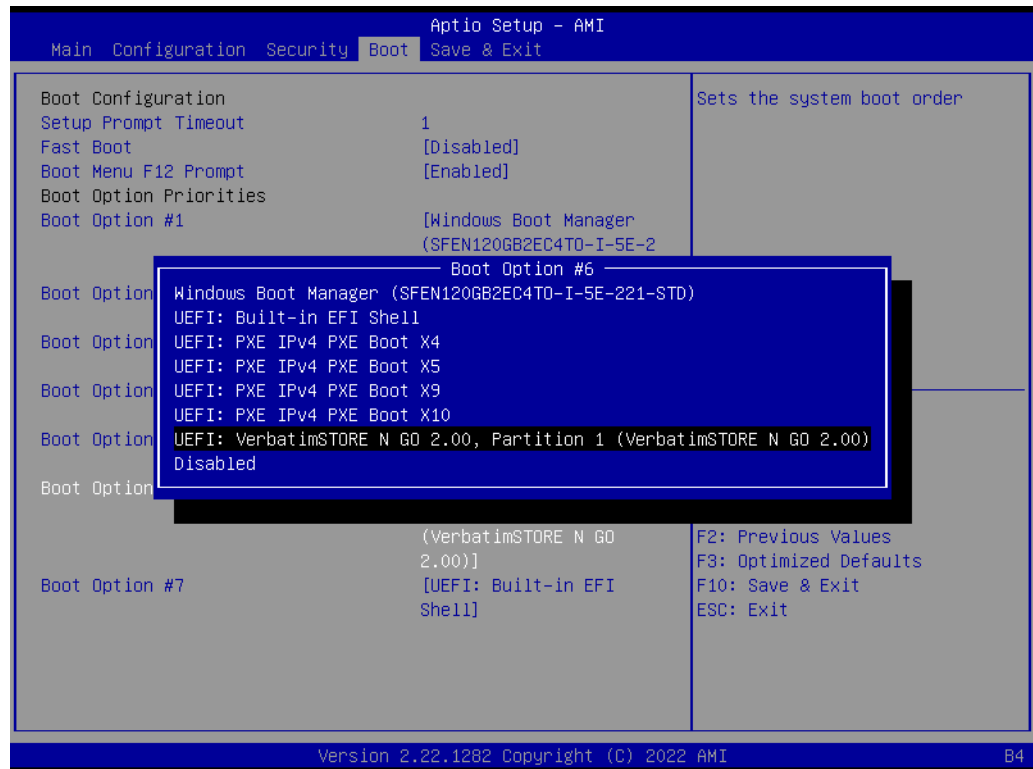


The Boot Options Priorities displays the boot source by priority with Option #1 showing the first boot priority. If that is not available, the system uses Boot Option #2, and so forth through all the options.

Set the boot priority order as desired. The default boot device is the internal storage device.

6.1.4.1 Boot option

Figure 6-27 “Boot options #n” screen



The source for each boot option is selected by highlighting the “Boot Option #n” line and pressing the <Enter> key. A sub menu appears showing the available boot options. Use the arrow keys to highlight the desired boot option and press the <Enter> key.

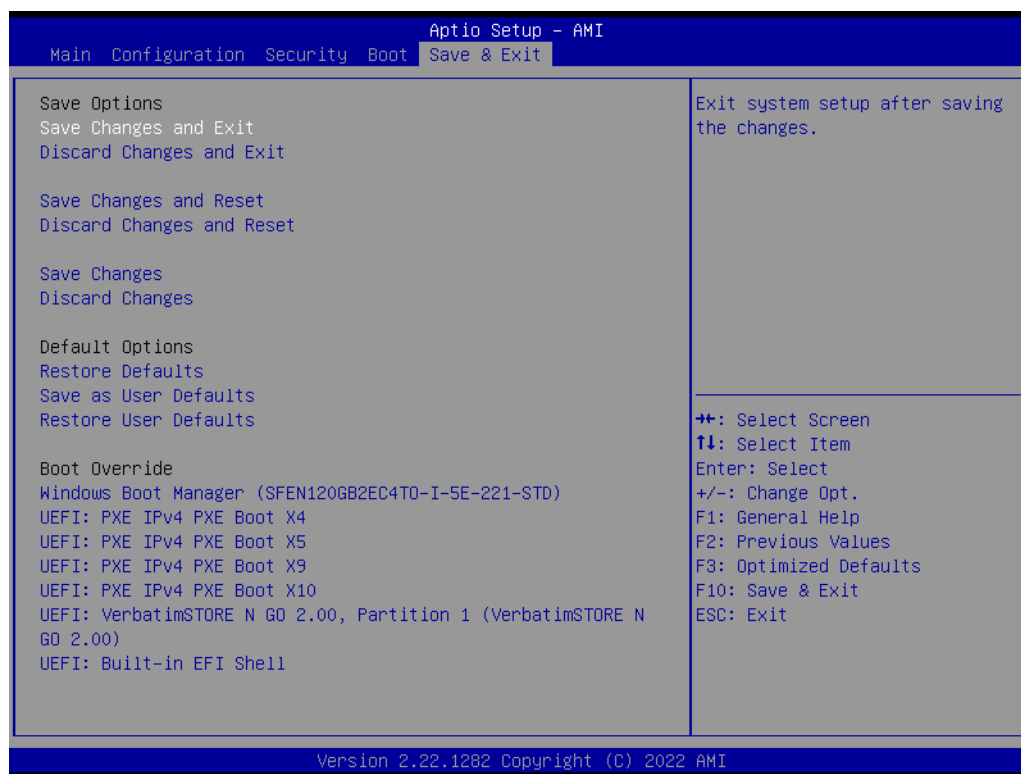
If a boot option is selected that was previously selected under a different priority, the two boot options will exchange priorities.

In addition to the various boot options, the priority level can be disabled.

6.1.5 Save and exit

When desired changes have been made, navigate to the “Main” screen (see [Figure 6-1](#)) and then to the “Save & Exit” menu.

Figure 6-28 “Save” screen



Highlight the desired command and press the <Enter> key.

A Technical appendix

A 1 Technical data

General data

Overall, dimensions (width x height x depth)*

VL3 UPC 100 x 100 x 50 mm

VL3 UPC with PCIe expansion 100 x 100 x 81 mm

Ambient temperature (operation)†

0 ... 2000 m altitude -20 ... 60°C

2001 ... 3000 m altitude -20 ... 54°C

Ambient temperature (storage/transport) -40 ... 70°C

Permissible humidity (relative) 10% ... 95%, non-condensing

Altitude, maximum 3000 m

Degree of protection IP30

Pollution degree 2

Overvoltage category II

Mounting Wall, DIN rail

Weight

VL3 UPC base without expansion 0.70 kg

VL3 UPC with expansion options 0.96 kg

Security (configurable option) TPM 2.0 (Infineon SLB96370)

LED indicators CPU, GPIO, SATA, Power

* Dimensions are overall but do not include mounting brackets

† Rated temperatures require a minimum of 0.5 m/s airflow.

Electrical data

Power supply, nominal 24 V DC ±20%

Type of connection Removable push-in wire clamping

Conductor size 0.2 ... 1.5 mm² (24 ... 16 AWG)

RTC battery life, typical 5 years

Current consumption @ 24 V DC

VL3 UPC base without expansion 1.72 A

VL3 UPC with expansion options 2.08 A

Power, maximum @ 24 V DC 49.0 W

Operating systems

Operating system (configurable option) Windows® 10 IoT Enterprise LTSC 2021 X64

No operating system

Data storage		
Type	1x NVMe x1 SSD	
Size		
VL3 UPC (configurable option)	30 GB, 60 GB, or 120 GB	
VL3 UPC 1110	30 GB	
VL3 UPC 1320	60 GB	
VL3 UPC 2430	120 GB	
VL3 UPC 2440	240 GB	
Type (configurable option)	M.2 with B or M Key SSD	
Number of bays	1	
Size	2280 (22 x 80 mm)	
RAID support	None	
Main memory		
RAM, maximum		
VL3 UPC (configurable option)	16 GB maximum	
VL3 UPC 1110	2 GB	
VL3 UPC 1320	8 GB	
VL3 UPC 2430, VL3 UPC 2440	16 GB	
Type	LPDDR4	
Processor data		
	Configuration code	
Processor (configurable option)	Intel Atom® x6211E	Intel Atom® x6413E
Clock speed		
Base	1.30 GHz	1.50 GHz
Burst*	3.00 GHz	3.00 GHz
Cache	1.5 MB	1.5 MB
Number of cores	2	4
Number of threads	2	4
Average TDP	6 W	9 W
Number of memory channels	4	4
Graphics processor	UHD Graphics	UHD Graphics
* Single core operation only		
Interfaces		
USB	2x Type A USB 3.1 Gen. 1	
Serial connection (configurable option)	2x D-SUB 9 (male), BIOS selectable for RS-232/422/485	
Super I/O chipset	Fintek F81804U	
Video out	1x DP++	
Number of Ethernet connectors	2	
Ethernet connections (configurable option)	Up to 4X 10/100/1000 Mbps	
LAN chipset (RJ45)	Intel Ethernet controller i225-IT	
Expansion slots	1x mini PCIe, 30.00 x 50.95 mm with SIM slot	
	1x M.2 2230 E key for wireless card	

WLAN interface card (configurable option)

Manufacturer	ENLI
Model	ENL-Q6174AH
Interface type	MiniPCle
Frequency band	IEEE 802.11 a/b/g/n/ac
Antenna impedance	50 Ω
Antenna interface	2x RSMA
Frequency range	
2.4 GHz	2.412 ... 2.484 GHz
5 GHz	5.15 ... 5.85 GHz
Data transfer rate	Up to 3 Mbps
Operation channel	
2.4 GHz	11: (Channel 1-11) - United States 13: (Channel 1-13) - Europe 14: (Channel 1-14) - Japan
5 GHz (a)	12: United States 19: Europe 8: Japan
Transmit output power, 2x2	802.11a: 17 dBm@54 Mbps 802.11b: 18 dBm@11 Mbps 802.11g: 17 dBm@54 Mbps 802.11n: 2.4 GHz 20 MHz: 16 dBm@MCS7 40 MHz: 16 dBm@MCS7 802.11n: 5 GHz 20 MHz: 16 dBm@MCS7 40 MHz: 16 dBm@MCS7 802.11ac: 80 MHz: 14 dBm@MCS9

WLAN interface card (configurable option) [...]

Bluetooth standard	V5.0, V4.2, V4.0LE, V3.0+HS, V2.1+EDR
Bluetooth frequency range	2.402 ... 2.480 GHz
Wireless radio conformity	FCC Part 15, Subpart B, Class B ANSI C63.4:2014 ICES-003 Issue 6 FCC Part 15 Subpart C (Section 15.247) FCC Part 15 Subpart C (Section 15.407) ID:PPD-QCNFA324 IC RSS-247 Issue 2 (2017-02) RSS-102 ID: 4104A-QCNFA324 ETSI R&TTE EN 300 328 V.2.2.2 ETSI R&TTE EN 301 893 V.1.7.1 EN 62368-1:2014+A11:2017 EN 62311:2008 EN 301489 V.2.1.1 EN 301489-17 V.3.1.1

4G LTE interface card (configurable option)

Manufacturer	Telit
Model	LN920A6-WW
Interface type	M.2 with B key
Card dimensions	30 x 42 mm
SIM card interface	1x micro-SIM 1.8 V/3 V
LTE bands	1, 2, 3, 4, 5, 7, 8, 12, 13, 14, 17, 18, 19, 20, 25, 26, 28, 29, 30, 38, 39, 40, 41, 42, 43, 48 (CBRSI), 66, 71
WCDMA bands	1, 2, 4, 5, 8, 9, 19
LTE Category	6
Maximum download throughput	300 Mbps (category 6)
Maximum upload throughput	50 Mbps (category 6)
Download CA	Up to 2xCA (category 6)
Antenna impedance	50 Ω
Antenna interface	2x SMA
Mobile network operator (MNO) approval	KDDI, NTT Docomo, Softbank, T-Mobile U.S., Telus, Telstra
Industry standards	GCF, PTCRB
Regulatory standards	CE/RED, FCC, IC, Jate/Telec

Mechanical tests

Shock test according to IEC 60068-2-27	15g @ half sine with 11 ms impulse
Vibration resistance according to EN 60068-2-6	1g

Conformance with EMC directives

EN/IEC 61000-6-2: 2019

IEC 61000-6-4: 2019

IEC 61000-4-4:2012 / IEC 61000-4-5:2014+A1:2017

IEC 61000-4-6:2013+COR1:2015 / EN 61000-4-8:2009

IEC 61000-4-11:2004+A1:2017

Approvals

CE compliant

2014/30/EU

2011/65/EU

2014/53/EU (EU Radio Equipment Directive)

UL

UL 61010-1

UL 61010-2-201 Class I, Division 2, Groups A, B, C, D T4

EN 300 328 V2.2.2; EN 301 4899-1 V2.1.1; EN 301 489-17 V3.1.1

RCM compliance

AS/NZS CISPR 32

Wireless radio country authorization

U.S., Canada, Japan, Europe (EMC certification of each country might be required)

UKCA

S.I 2012/3032

S.I 2016/1091

S.I 2017/1206

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