Alderamin Femto Mk5 Series

Version:
v1.1.0

Date:
25.11.2025

Contents

1 Copyright

2 Regulatory Compliances

2.1 Complies with the following EU directives

No	Short Name
2014/35/EU	Low Voltage Directive (LVD)
2014/30/EU	Electromagnetic Compatibility (EMC)
2011/65/EU	Restriction of the use of certain hazardous substances in electrical and electronic equipment Directive (RoHS2)
2015/863/EU	Amendment to Annex II in Directive 2011/65/EU regards the list of restricted substances (RoHS3)

2.2 References of standards applied

Standard	Reference	Issue
EN IEC 62368-1	Safety requirements: Audio/video, information and communication technology	2018 2020+A11:2020
IEC 61000-4-2	Electromagnetic compatibility (EMC) - Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test	2008
IEC 61000-4-4	Electromagnetic compatibility (EMC) - Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test	2012
IEC 61000-4-3	Electromagnetic compatibility (EMC) - Part 4-3 : Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test	2020
IEC 61000-4-6	Electromagnetic compatibility (EMC) - Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields	2023 2008
IEC 61000-4-8	Electromagnetic compatibility (EMC) - Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test	2009
EN 55032	Electromagnetic compatibility (EMC) of multimedia equipment: Emission Requirements	2015+A1:2020
EN 55035	Electromagnetic compatibility (EMC) of multimedia equipment: Immunity requirements	2017 2017+A11:2020
IEC 61000-4-5	Electromagnetic compatibility (EMC) - Part 4-5: Testing and measurement techniques - Surge immunity test	2014 + AMD1:2017
IEC 61000-4-11	Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests	2020
EN 61000-3-2	Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions	2019+A1:2021 Class A
EN 61000-3-3	Electromagnetic compatibility (EMC) - Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems	2013+A1:2019

3 Intended Use and IT Security Instructions

This section provides crucial safety and security information and recommendations to help you configure your Welotec Industrial Computer (IPC) for optimal security in your deployment.

3.1 Intended Use

This section specifies the intended use and essential operating conditions for your Welotec Industrial Computer (hereinafter referred to as “IPC”).

The IPC is designed for use as a dedicated control, monitoring, and data acquisition unit within the enclosed control cabinet of a machine. Its primary function is to execute specific machine-control software, process operational data, provide human-machine interface (HMI) functionalities, and/or facilitate communication within the industrial automation environment. The IPC is exclusively intended for continuous operation within a controlled industrial setting.

The intended use of the IPC is strictly defined by the following conditions and requirements:

3.1.1 Physical Security and Installation Environment

- Enclosure: The IPC must be permanently installed within a secure, locked control cabinet (e.g., meeting IP54 or higher protection class) that provides adequate protection against dust, moisture, mechanical impact and unauthorized access.
- Controlled Access: Access to the control cabinet and its wiring must be restricted to authorized personnel only. Physical security measures (e.g., key locks, access control systems) are mandatory.
- Environmental Conditions:
  - Temperature: The IPC must operate within the specified ambient temperature and humidity range as outlined in the technical specifications. Adequate ventilation or active cooling within the cabinet must ensure these limits are not exceeded. This includes accounting for the unit’s own thermal dissipation and that of all other components in the cabinet.
  - Vibration and Shock: The IPC must be mounted securely within the cabinet to minimize exposure to excessive vibrations and mechanical shock, adhering to the manufacturer’s specifications.
  - Cleanliness: The inside of the cabinet must be kept free of dust, debris, and contaminants that could impair cooling or lead to electrical shorts.

3.1.2 EMC compliant electrical Installation and Power Supply

This product is designed to meet EMC standards when installed according to the following instructions. Failure to adhere to these instructions may result in the equipment failing to meet compliance standards and can cause interference with other devices. The installer is responsible for ensuring the EMC conformity of the final system.

- Power Supply: The IPC must be connected to a dedicated stable and filtered power supply within the specified voltage range. To ensure operational reliability and meet EMC requirements, the power source must provide adequate filtering against surges, transients, electrical fast transients (EFTs), and conducted RF noise common in industrial environments. An Uninterruptible Power Supply (UPS) is highly recommended to protect further against power fluctuations and outages.

- Wiring: All wiring connecting to the IPC must comply with applicable industrial wiring standards, be properly insulated, strain-relieved, and protected against mechanical damage.
- Grounding: The unit must be properly grounded according to the installation manual, typically via a low-impedance connection to the control cabinet's central grounding point.

3.1.3 Functional Safety

This unit is not certified as a standalone component for functional safety applications (e.g., SIL, PL).

Intended Use: The unit is intended for standard control and monitoring. It must not be used as the sole or primary controller for safety-critical functions (e.g., emergency stops, safety interlocks, light curtains, burner controls).

System Integration: Safety-related control logic must be executed by dedicated, certified safety controllers (e.g., Safety PLC, safety relays). This unit may be used to supervise or monitor a safety system (e.g., for HMI visualization or data logging) via a non-safety-rated communication channel, but it must not be part of the safety-critical control loop. The failure of this unit must not lead to a loss of the primary safety function.

3.1.4 Qualified and Trained Personnel

- Installation, Configuration, and Maintenance: All installation, configuration, maintenance, troubleshooting, and repair activities on the IPC and its connections within the control cabinet must be performed exclusively by qualified, trained, and authorized technical personnel. This personnel must possess proven expertise in electrical systems, IT hardware, and cybersecurity best practices.
- Security Awareness: All personnel interacting with the IPC or the network it is connected to must receive regular training on IT security awareness including password policies and reporting suspicious activities.

3.1.5 Software and Configuration

- Operating System: Only the pre-installed or manufacturer-approved operating system (OS) version may be used. The OS must be regularly updated with security patches provided by the manufacturer or OS vendor, after thorough testing in a non-production environment.
- Secure Configuration: The IPC's operating system, firmware, and installed applications must be configured according to secure hardening guidelines, including disabling unused services, ports, and protocols, and enforcing strong password policies.
- Secure Boot: Where supported Secure Boot must be enabled to prevent the loading of unsigned or malicious bootloaders.

Please refer to the section "Cyber Security" for further details.

3.1.6 Network Segmentation and "Defense in Depth" IT Security Principles

- Network Segmentation: The unit and its control network must be isolated from all other networks (e.g., corporate, guest, public internet) using industrial firewalls and network segmentation. Direct connection to the internet is considered misuse unless done via a secure, managed gateway.
- Defense in Depth: A multi-layered security approach ("Defense in Depth") must be implemented for the entire machine. This includes:
  - Network Security: Industrial Firewalls (e.g., Next-Generation Firewalls) at network boundaries, strict firewall rules (whitelist approach – only allow explicitly required traffic), VLANs for segmentation.
  - System Security: Operating system hardening (minimum services, disabled unnecessary ports), regular security updates, robust antivirus/anti-malware solutions specifically designed for industrial environments, and strong password policies.

  - Application Security: Secure configuration of all industrial applications, disabling default credentials, and ensuring application-level security features are enabled.
  - Data Integrity: Measures to ensure data integrity and availability (e.g., backups, redundant systems where appropriate).
  - Physical Security: see above

- Access Control: Remote access to the IPC (if required) must be strictly controlled, using secure connections, multi-factor authentication, and granular user permissions. Unnecessary remote access functionalities must be disabled.
- Logging and Monitoring: The IPC and connected network devices should implement logging of security-relevant events. Centralized monitoring and alerting systems are recommended for timely detection of anomalies.

3.2 Non-Intended Use

Any use of the IPC that deviates from the conditions described including but not limited to:

- Operation outside the specified environmental limits.
- Operation without a secure, enclosed control cabinet.
- Operation in hazardous locations (e.g., explosive atmospheres) for which the unit is not explicitly certified.
- Installation or maintenance by unqualified personnel.
- Connection to an unfiltered, unstable, or non-grounded power source.
- Direct connection to unsecured corporate networks or the internet without adequate protective measures.
- Installation of unauthorized software or operating systems.
- Bypassing or disabling of security features (e.g., firewall, antivirus, Secure Boot).
- Failure to implement a cyber security management plan (patching, hardening, access control).

is considered non-intended use and may result in:

- Damage to the IPC or the machine.
- Compromised data security and integrity.
- Serious personal injury or death.
- Failure to comply with regulatory requirements.

3.3 Exposed Interfaces and Services

The following interfaces are exposed:

Interface	Comment
LAN 1 and 2	
COM 1 and 2	
USB 1 … 6	
HDMI	
DP	
Line-out	
SW	Power Switch

Available services highly depend on Operating System type and version.

3.4 Cyber Security

The flexibility to run common operating systems like Windows and Linux places the full responsibility of cyber security implementation on the system integrator and end-user. The unit is a component that must be integrated into a comprehensive, defense-in-depth security architecture.

The intended use requires the integrator/user to implement, at a minimum, the following:

3.4.1 Use Secure Boot

Secure Boot is a crucial security feature that helps protect your system from malware and unauthorized operating systems during the boot process. It's a component of the Unified Extensible Firmware Interface (UEFI) that ensures only trustworthy software, signed with a digital certificate, loads when your system starts. Without Secure Boot, malicious programs or unsigned operating systems could load unnoticed before the actual operating system, compromising your system's integrity and security.

We highly recommend enabling Secure Boot - please refer to "BIOS" section for further details

3.4.2 Enable Storage Encryption

Storage encryption is a critical security measure that protects your sensitive data by rendering it unreadable to unauthorized parties, even if they gain physical access to your storage device. In today's interconnected world, where devices can be lost, stolen, or compromised, ensuring the confidentiality of your information is paramount.

Windows (using BitLocker with TPM)

Windows' built-in BitLocker encryption leverages the TPM to securely store the encryption key, making the process largely automatic and secure.

- Check TPM Status: Ensure that the TPM chip is enabled in the UEFI/BIOS settings
- Open BitLocker Drive Encryption: Search for "BitLocker" in the Windows search bar and select "Manage BitLocker."
- Turn on BitLocker: Select the drive you wish to encrypt (typically your C: drive) and click "Turn on BitLocker."

- Follow the Wizard: Windows will guide you through the process. Since a TPM is present, it will typically automatically use the TPM to store the encryption key. You will be prompted to save a recovery key (e.g., to a Microsoft account, a USB drive, or print it) – this is crucial in case you ever need to access your data if the TPM is reset or unavailable.
- Start Encryption: The encryption process will begin in the background. You can continue using your computer during this time.

Linux (using LUKS with TPM consideration):

Linux uses LUKS (Linux Unified Key Setup) for full disk encryption. Integrating it with a TPM for automatic unlocking at boot can be more involved than BitLocker but offers similar benefits. This typically involves tools like clevis or systemd-cryptenroll.

- Install Necessary Tools: You'll need cryptsetup for LUKS and potentially tpm2-tools and clevis (or similar TPM integration tools) if you want to bind your LUKS key to the TPM for automatic decryption.
- Encrypt the Drive (during OS Installation or manually):
  - During Installation: Most Linux distributions (e.g., Ubuntu, Fedora) offer an option to "Encrypt the disk" during the installation process. This is the simplest way to set up LUKS.
  - Manually (Post-Installation): If encrypting an existing drive or a secondary drive, you would use cryptsetup luksFormat /dev/sdXy to format the partition for LUKS, followed by cryptsetup luksOpen /dev/sdXy my_encrypted_drive and then creating a filesystem on the opened device.
- Bind LUKS Key to TPM (Optional, for automatic unlock):
  - This is the step that utilizes the TPM. Tools like clevis can be used to "bind" a LUKS passphrase (or a key slot) to the TPM. This allows the system to automatically unlock the encrypted volume at boot if the TPM verifies the system's integrity.
  - The exact commands vary, but it generally involves generating a new LUKS key slot and then using a TPM-binding tool to store the key in the TPM and configure the system to use it for unlocking.
- Update Boot Configuration: Ensure your bootloader (e.g., GRUB) is configured correctly to handle the encrypted root partition and, if used, to leverage the TPM for unlocking.

For both operating systems, it's essential to:

- Backup your recovery keys/passphrases: Without them, your data can be permanently lost if there's a hardware failure or you forget your primary password.
- Understand the implications: While encryption provides strong security, proper handling of keys and adherence to security best practices are still crucial.

3.4.3 Use Strong Passwords

Strong passwords are the first line of defense against unauthorized access. If you want to use password based access it is recommended to:

- Change the factory default password on first login
- Use passwords with a minimum length of 12 characters or more
- Use a combination of uppercase and lowercase letters, numbers, and special characters (e.g., !@#$%^&*)
- Do not use easily guessable patterns, such as sequences (e.g., "123456", "abcdef"), repeated characters (e.g., "aaaaaa"), or dictionary words

3.4.4 System Hardening:

The operating system (Windows or Linux) must be hardened. This includes:

- Disabling all unused services, applications, and network ports.
- Enforcing strong, unique passwords for all accounts.
- Implementing a least-privilege access model for users and applications.
- Configuring OS-level firewalls (e.g., ufw, Windows Defender Firewall).

3.4.5 Patch Management

A robust process must be in place for testing and deploying security patches for the operating system and all installed third-party applications. This process must be compatible with the operational constraints of the industrial environment.

3.4.6 Endpoint Protection

Where appropriate for the application, industrial-compatible endpoint protection (e.g., anti-malware, application whitelisting, host-based intrusion detection) must be installed, maintained, and kept up-to-date.

3.4.7 Physical Security

Use of the locked control cabinet (see Section 3) to prevent unauthorized physical access and tampering (e.g., via USB ports) is a critical part of the security model.

3.5 Vulnerability Handling

Welotec has implemented a Coordinated Vulnerability Disclosure Policy - please visit the following site for further details: https://welotec.com/pages/coordinated-vulnerability-disclosure-policy

4 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 8V 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.

5 Product Specifications

Alderamin Femto Mk5 Embedded System offers the following features:

- Intel® Alder Lake-N N97 (4C) / i3-N305 (8C8T) Processor
- 1 x DDR5 SO-DIMM and support up to 16GB
- Support Triple display for LVDS (optional eDP), HDMI, and DisplayPort
- 2 x Intel® i226 2.5Gigabit Ethernet
- 1 x M.2 B Key, 1 x M.2 M Key, 1 x M.2 E Key slot
- 2 x USB 2.0, 3 x USB 3.2 Gen2, and 1 x USB Type C
- 8V~26V wide voltage power input
- Support Hailo-8™ AI Accelerator

5.1 Technical Details

Feature	Specification	Details
Processor	CPU	Intel® Alder Lake-N N97 (4C) / i3-N305 (8C8T), 10nm
Memory	System Memory	DDR5 4800 MHz, 1 x 262-pin SO-DIMM, Max. 16GB (Non-ECC)
Graphics	GPU	Intel® UHD Graphics
Storage	Storage Slots	- 2 x SATA III* - 1 x SATA power header - 1 x M.2 2242/3042/3052 B Key (USB2.0 / PCIe x1 / SATA III) - 1 x M.2 2280 M Key (PCIe x1 / SATA III) *Note: 1 SATA port multiplexed with M.2 B Key
Networking	Ethernet	2 x Intel® I226-V 2.5 Gigabit LAN
Audio	Audio	Realtek® ALC256
Security	I/O Chipset	Nuvoton NCT6126D
	TPM	Nuvoton NPCT760AABYX, TPM 2.0
I/O Ports	Internal I/O	1 x AT/ATX Mode Select Jumper 1 x CMOS Jumper 1 x Buzzer
	Front I/O	i3-N305 SKU: 3 x RS232 + 1 x RS232/422/485 N97 SKU: 1 x RS232 + 1 x RS232/422/485 2 x USB 2.0 1 x Line-out
	Side I/O	8-bit GPIO via 10-pin Terminal Block (i3-N305 SKU only) 2 x SMA Antenna hole with rubber caps
	Rear I/O	1 x DisplayPort 1.4 1 x HDMI 1.4 2 x RJ-45 3 x USB 3.2 Gen 2 (10Gbps) 1 x USB Type-C (PD15W, 5V/3A, DP Alt Mode, USB 3.2 Gen1) 1 x 2-pin Terminal Block (Remote Power On/Off) 1 x 2-pin Terminal Block (Power Input) 2 x SMA Antenna hole with rubber caps
Power	Power Input	8~26V Wide Range DC Input with Terminal Block Connectivity
Cooling	Thermal Design	Fanless
Mechanical	Dimensions	6.7” x 5.2” x 2.2” (171 mm x 133 mm x 57 mm)
Environmental	Operating Temperature	-25°C to 60°C (with 0.7 m/s airflow and extended-temp SSD/mSATA/RAM)
	Storage Temperature	-40°C to 85°C
	Operating Humidity	10%~95% R/H (Non-condensing)
	Vibration	5Hz~500Hz, 2Grms, 3 Axes (w/ SSD, IEC60068-2-64)

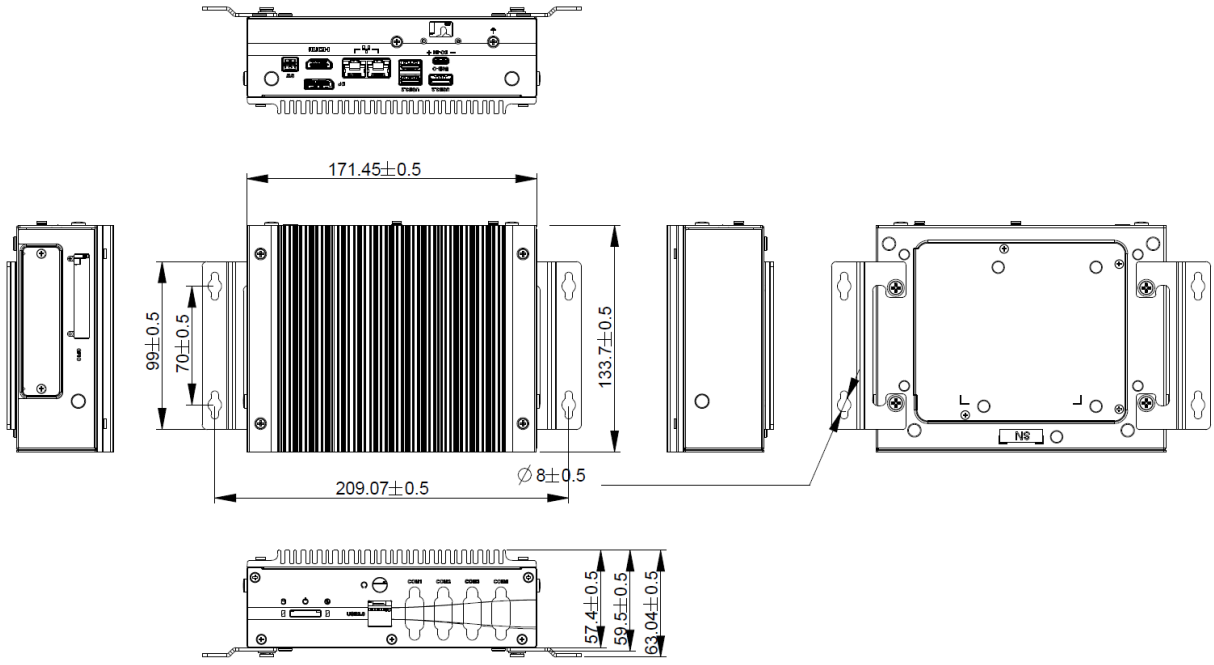
Note

This embedded system includes a lithium battery. Do not puncture, mutilate, or dispose of the battery in fire. There is a risk of explosion if the battery is replaced incorrectly. Replace only with the same or an equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions and local regulations.

The audio jack supports OMTP TRS & TRRS, and CTIA TRS. For CTIA TRRS, the jack may need to be pulled out slightly to ensure proper connection.

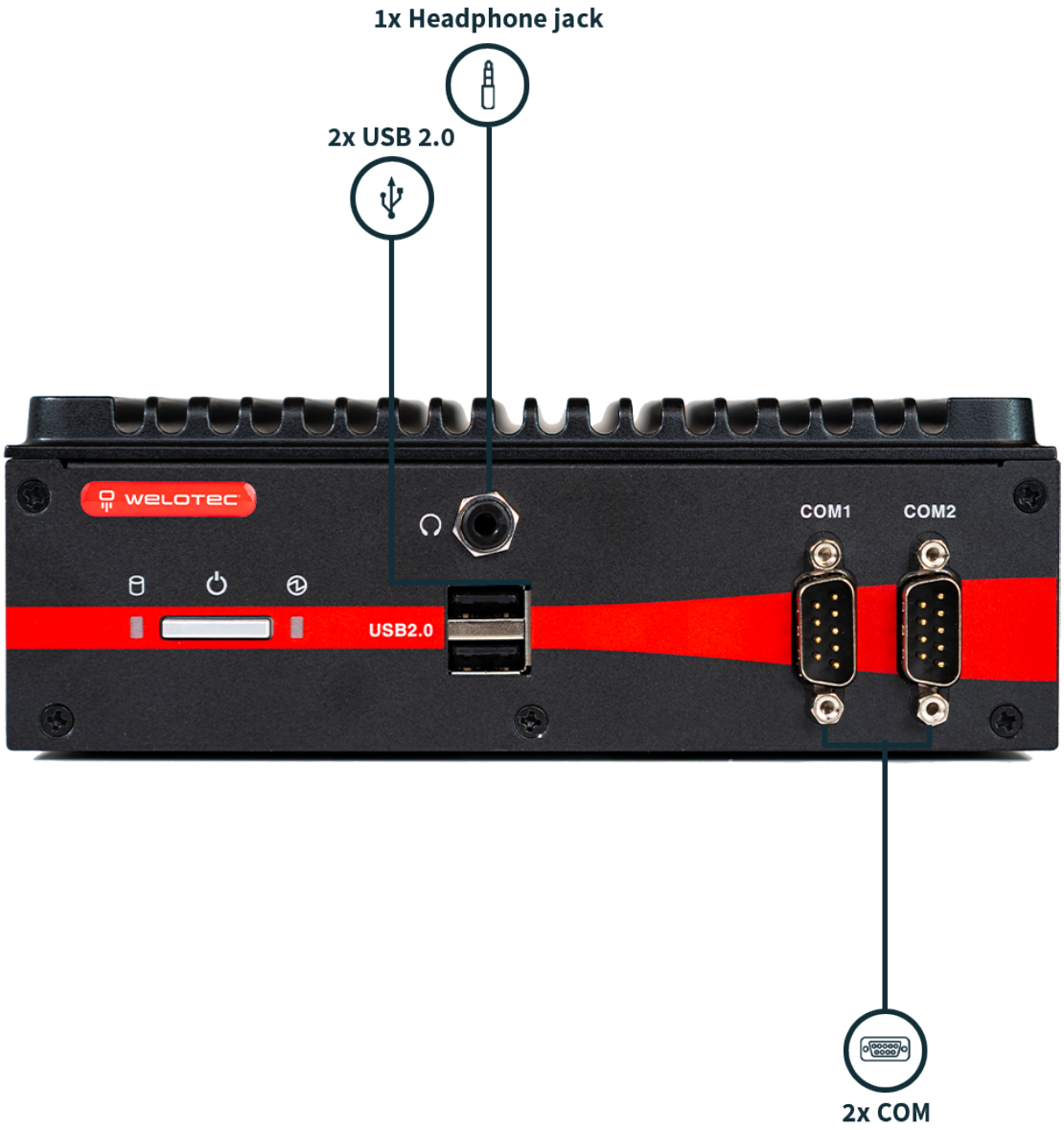
5.2 Mechanical Dimensions

Dimensions: 171 mm x 133 mm x 57 mm

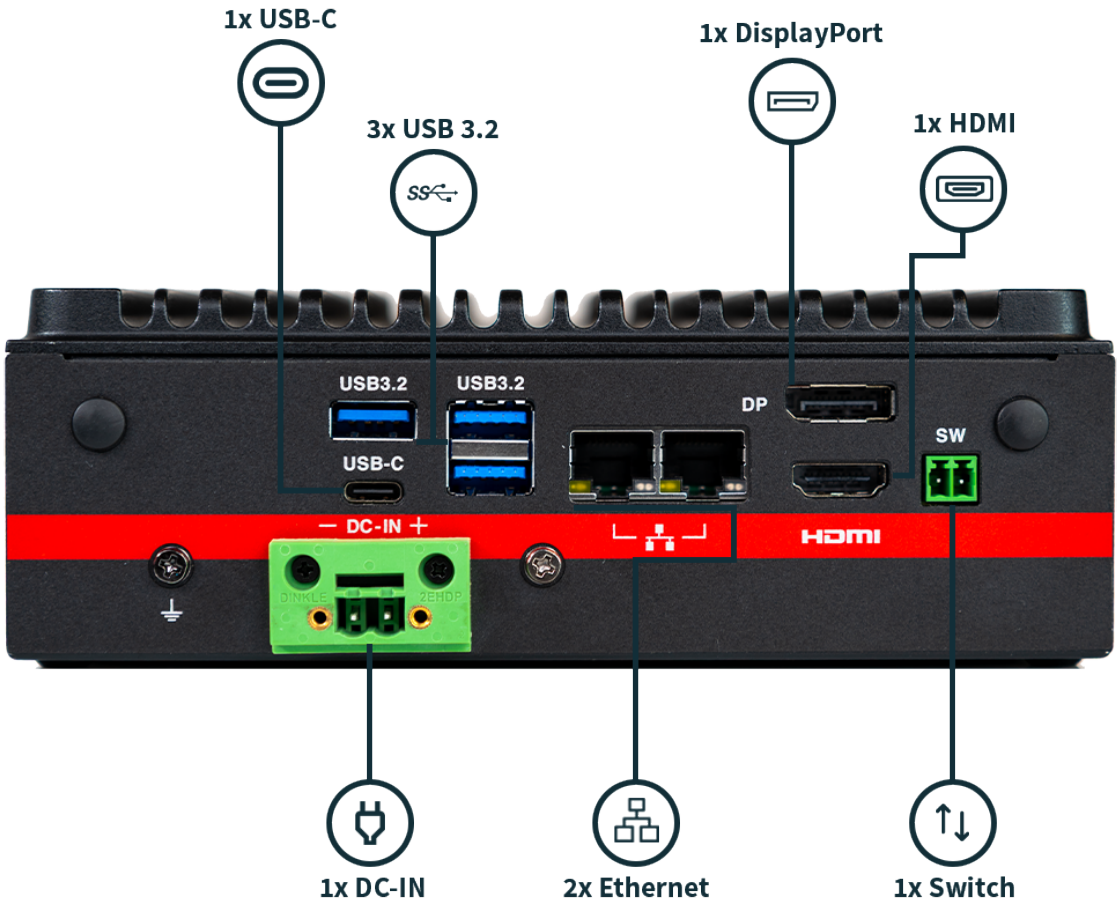


6 Interfaces and Connections

6.1 Front I/O

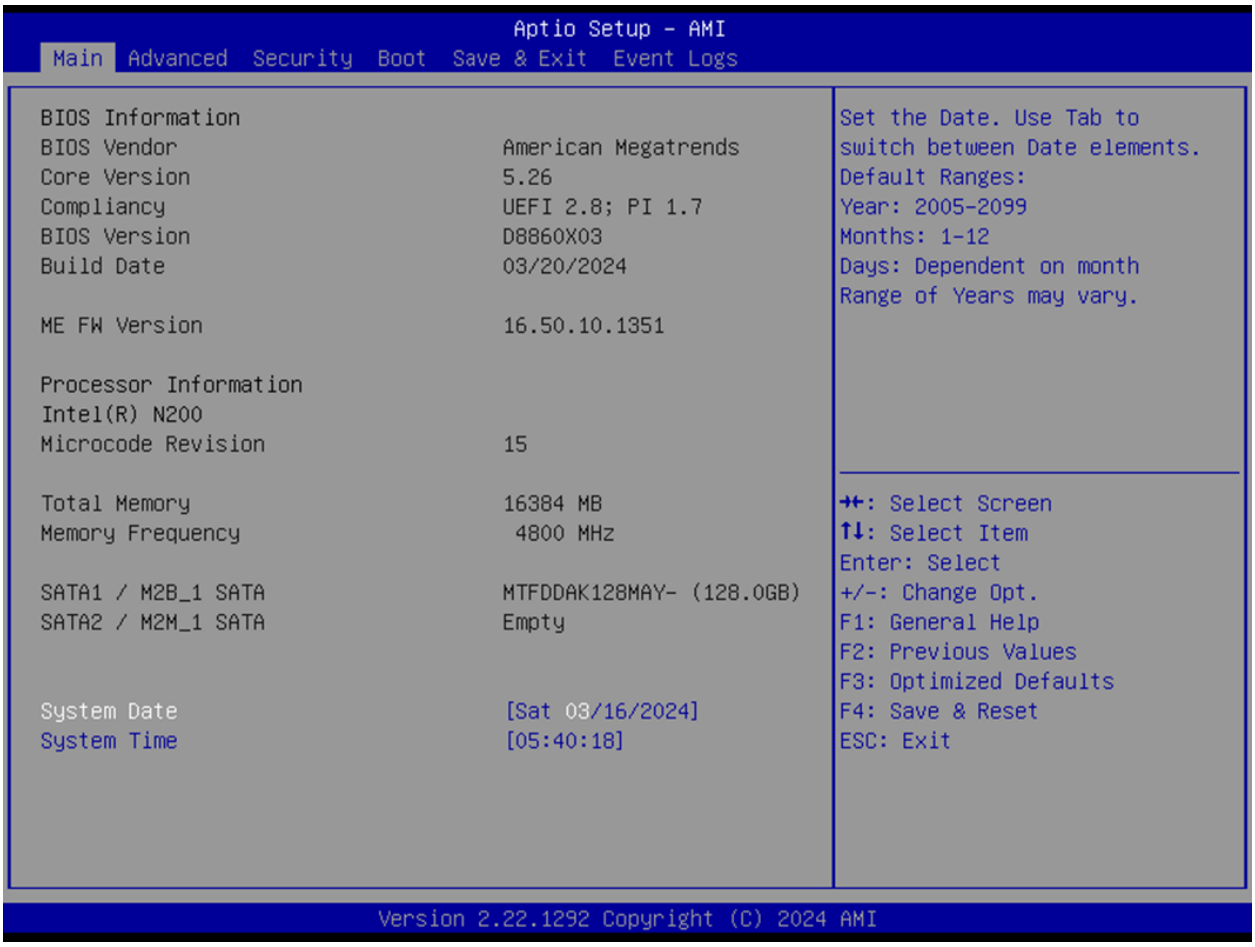


6.2 Rear I/O


1x USB-C
3x USB 3.2
1x DisplayPort
1x HDMI
USB3.2
USB3.2
USB-C
DP
SW
– DC-IN +
HDMI
1x DC-IN
2x Ethernet
1x Switch

7 BIOS

7.1 Main Page



The **Main Page** provides an overview of system-level information. All fields are display-only and cannot be modified:

- **BIOS Vendor:** American Megatrends
- **Core Version:** 5.26
- **Compliancy:** UEFI 2.8 ; PI 1.7
- **BIOS Version:** Displays the version of the BIOS
- **Build Date:** Shows the BIOS build date
- **ME FW Version:** Displays the Management Engine firmware version
- **Processor Information:** Displays the installed CPU brand
- **Microcode Revision:** Displays the CPU microcode revision
- **Total Memory:** Shows the installed memory size
- **Memory Frequency:** Displays the memory frequency

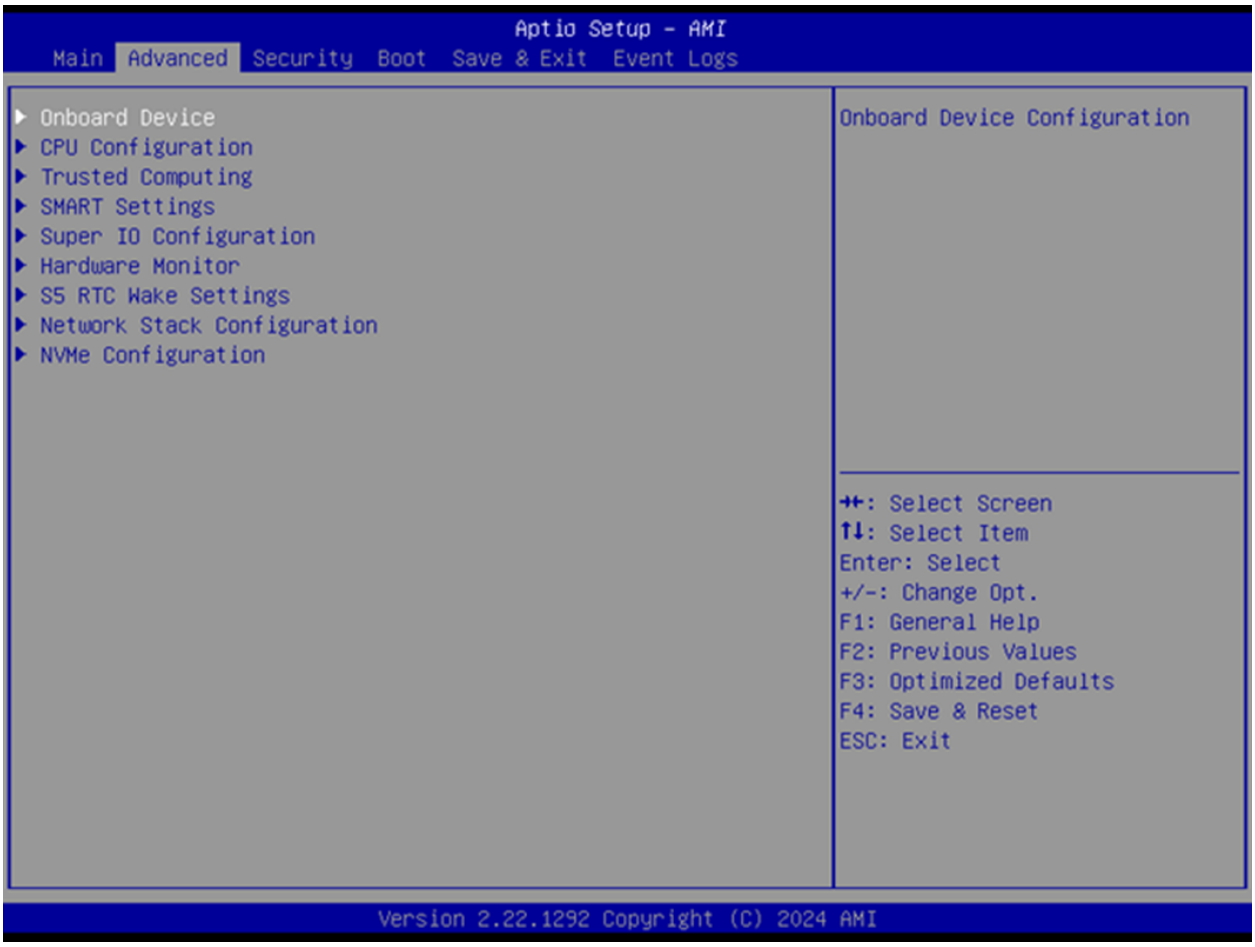
- **SATA1 / M2B_1 SATA:** Lists the installed SATA device model and size
- **SATA2 / M2M_1 SATA:** Lists the installed SATA device model and size

7.1.1 System Date & Time

The **System Date & Time** fields allow configuring the system's real-time clock:

- **System Date**
  - Format: `[Www mm/dd/yyyy]`
  - `Www`: Day of the week (Mon–Sun)
  - `mm`: Month (1–12)
  - `dd`: Day (1–31)
  - `yyyy`: Year (2005–2099)
  - Use Tab to switch between elements
- **System Time**
  - Format: `[hh:mm:ss]`
  - `hh`: Hours (0–23)
  - `mm`: Minutes (0–59)
  - `ss`: Seconds (0–59)
  - Use Tab to switch between elements

7.2 Advanced Page

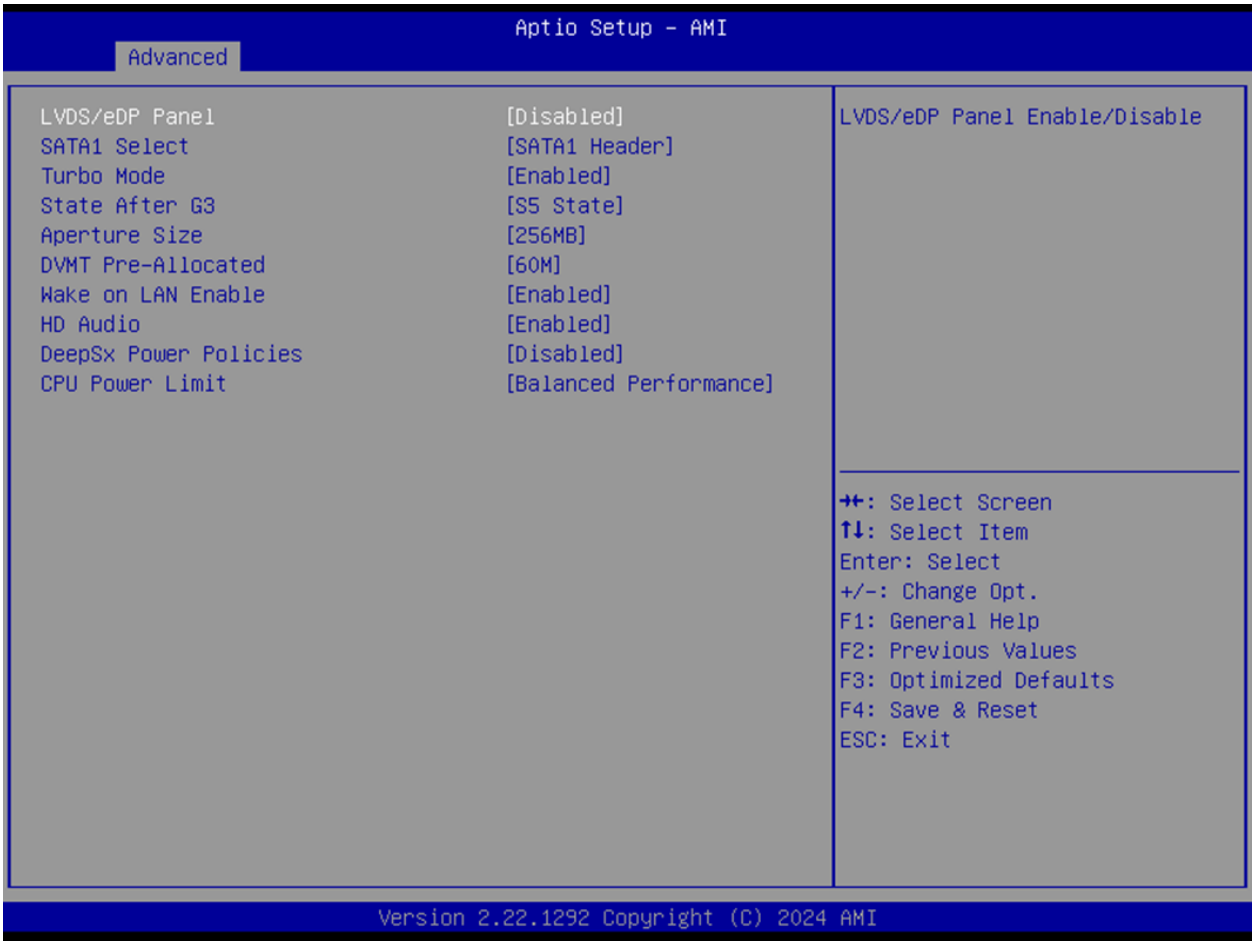


The **Advanced Page** gives you access to configuration menus for detailed system tuning and hardware settings.

7.2.1 Advanced Configuration Options

- **Onboard Device Configuration** – Press Enter to access onboard device settings
- **CPU Configuration** – Press Enter to configure CPU-related features
- **Trusted Computing** – Press Enter to access TPM settings
- **SMART Settings** – Press Enter to configure system SMART behavior
- **Super IO Configuration** – Press Enter to configure Super IO chip parameters
- **Hardware Monitor** – Press Enter to view hardware monitoring status
- **S5 RTC Wake Settings** – Press Enter to enable or disable RTC wake from S5 state
- **Network Stack Configuration** – Press Enter to manage network stack settings
- **NVMe Configuration** – Press Enter to view NVMe device options

7.3 Onboard Device Configuration



The **Onboard Device Configuration** menu allows you to enable or disable onboard components and adjust device-specific behavior.

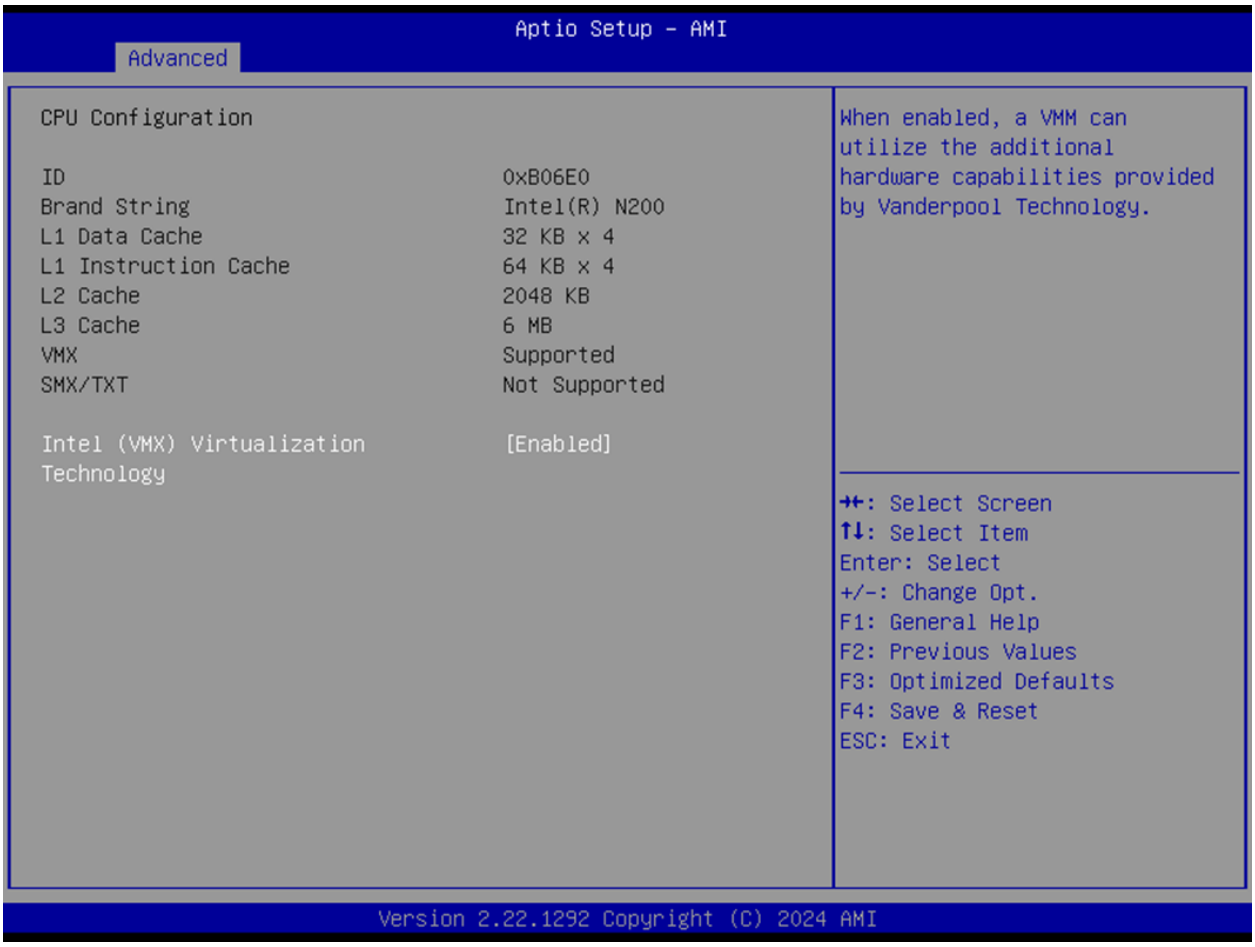
7.3.1 Device Settings

- **LVDS/eDP Panel**
  - Default: `Disabled`
  - Options: `Enabled`, `Disabled`
  - Enables or disables the LVDS/eDP panel output.
- **SATA1 Select**
  - Default: `SATA1 Header`
  - Options: `M2B SATA_PCIE Slot`, `SATA1 Header`
  - Selects the SATA1 device source.
- **Turbo Mode**
  - Default: `Enabled`
  - Options: `Enabled`, `Disabled`
  - Enables or disables the CPU's Turbo Boost feature.
- **State After G3**

  - Default: `S5 State`
  - Options: `S0 State`, `S5 State`
  - Determines the system power state after power is restored following a G3 (mechanical off) state.
- **Aperture Size**
  - Default: `256MB`
  - Options: `128MB`, `256MB`, `512MB`, `1024MB`
  - Sets the graphics aperture size.

    Note: Selecting aperture sizes above 2048MB enables automatic MMIO BIOS assignment. To use this feature, disable CSM Support.
- **DVMT Pre-Allocated**
  - Default: `60M`
  - Options: `32M`, `36M`, `40M`, `44M`, `48M`, `52M`, `56M`, `60M`, `64M`, `96M`, `128M`, `160M`, `32M/F7`
  - Sets fixed graphics memory size (DVMT 5.0) used by the internal graphics device.
- **Wake on LAN Enable**
  - Default: `Enabled`
  - Options: `Enabled`, `Disabled`
  - Allows the system to be powered on remotely via the LAN.
- **HD Audio**
  - Default: `Enabled`
  - Options: `Enabled`, `Disabled`
  - Controls detection of the HD-Audio device.
    Enabled: HDA always on
    Disabled: HDA always off
- **DeepSx Power Policies**
  - Default: `Disabled`
  - Options: `Disabled`, `Enabled in S4-S5`
  - Configures DeepSx low-power mode behavior in specific sleep states.
- **CPU Power Limit**
  - Default: `Balanced Performance`
  - Options: `Maximum Performance`, `Balanced Performance`, `Power Saver`
  - Sets CPU TDP configuration:
    * *Maximum Performance*: Uses max CPU TDP based on SKU
    * *Balanced Performance*: Limits TDP to 10W
    * *Power Saver*: Limits TDP to 6W (N97 only)

7.4 CPU Configuration



The **CPU Configuration** page displays processor-related information and supports virtualization settings. Most fields are read-only and cannot be modified.

7.4.1 CPU Details

- **ID**
  - Displays the CPU signature
  - *Not selectable*
- **Brand String**
  - Displays the CPU brand/model
  - *Not selectable*
- **L1 Data Cache**
  - Shows L1 data cache information
  - *Not selectable*
- **L1 Instruction Cache**
  - Shows L1 instruction cache information
  - *Not selectable*
- **L2 Cache**

  - Shows L2 cache information
  - *Not selectable*
- **L3 Cache**
  - Shows L3 cache information
  - *Not selectable*
- **VMX**
  - Displays whether Virtual Machine Extensions are supported
  - *Not selectable*
- **SMX/TXT**
  - Displays whether Safer Mode Extensions / Trusted Execution Technology is supported
  - *Not selectable*

7.4.2 Virtualization Setting

- **Intel® Virtualization Technology (VMX)**
  - Default: `Enabled`
  - Options: `Enabled`, `Disabled`
  - When enabled, virtualization-based software (VMM) can utilize additional hardware features provided by Intel® VT-x (Vanderpool Technology).

7.5 Trusted Computing

The **Trusted Computing** menu manages settings related to TPM (Trusted Platform Module) and BIOS-level hardware security.

7.5.1 TPM Information

- **Firmware Version**
  - Displays the installed TPM module firmware version
  - *Not selectable*
- **Vendor**
  - Shows the TPM vendor name
  - *Not selectable*

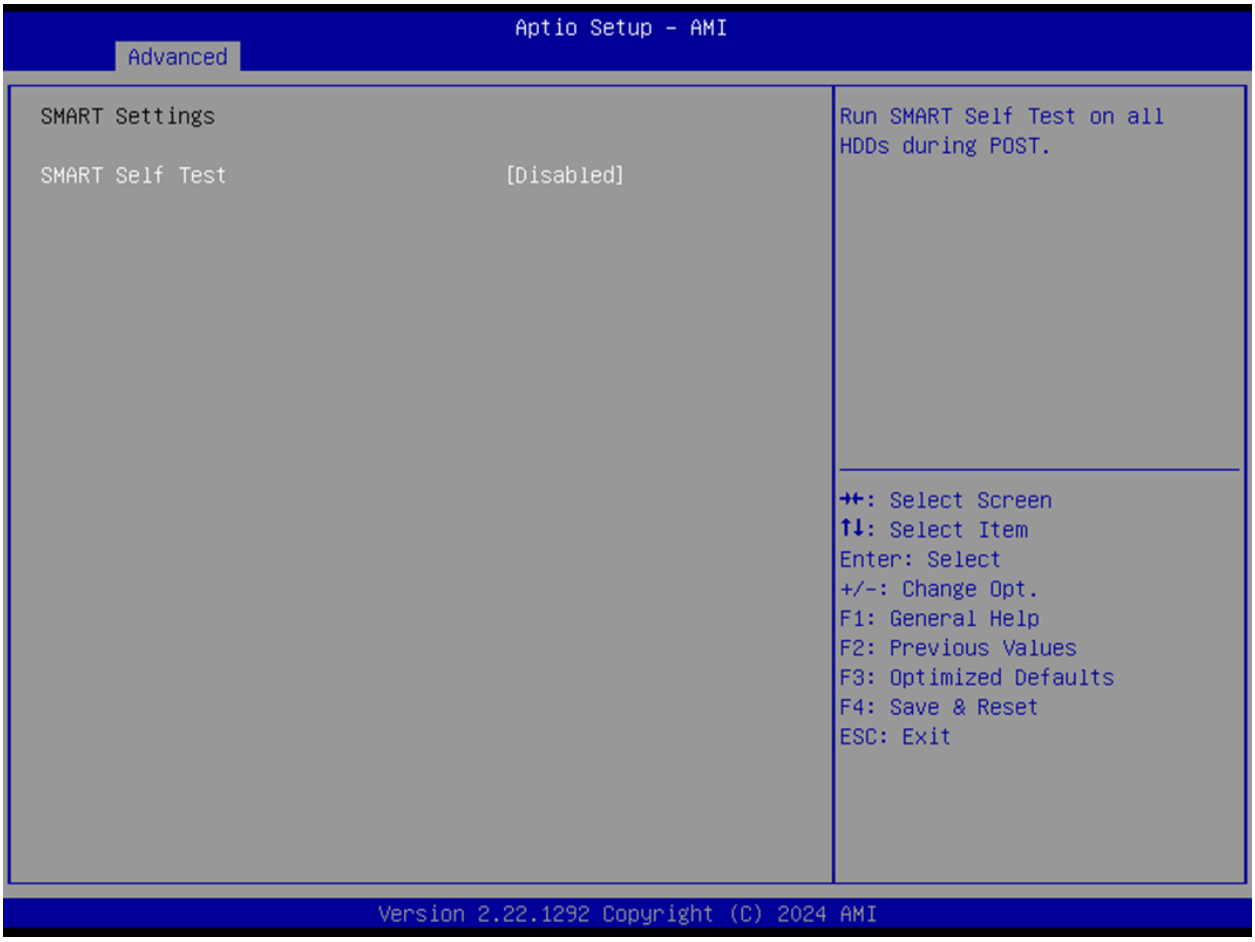
7.5.2 TPM Configuration

- **Security Device Support**
  - Default: `Enabled`
  - Options: `Enabled`, `Disabled`
  - Enables or disables BIOS-level support for the TPM device.

    Note: If disabled, TCG EFI protocol and INT1A interface will not be available, and the OS will not detect the security device.
- **Pending Operation**
  - Default: `None`
  - Options: `None`, `TPM Clear`
  - Schedules a TPM operation.

    Note: The system will reboot during restart to apply the change.

7.6 SMART Settings

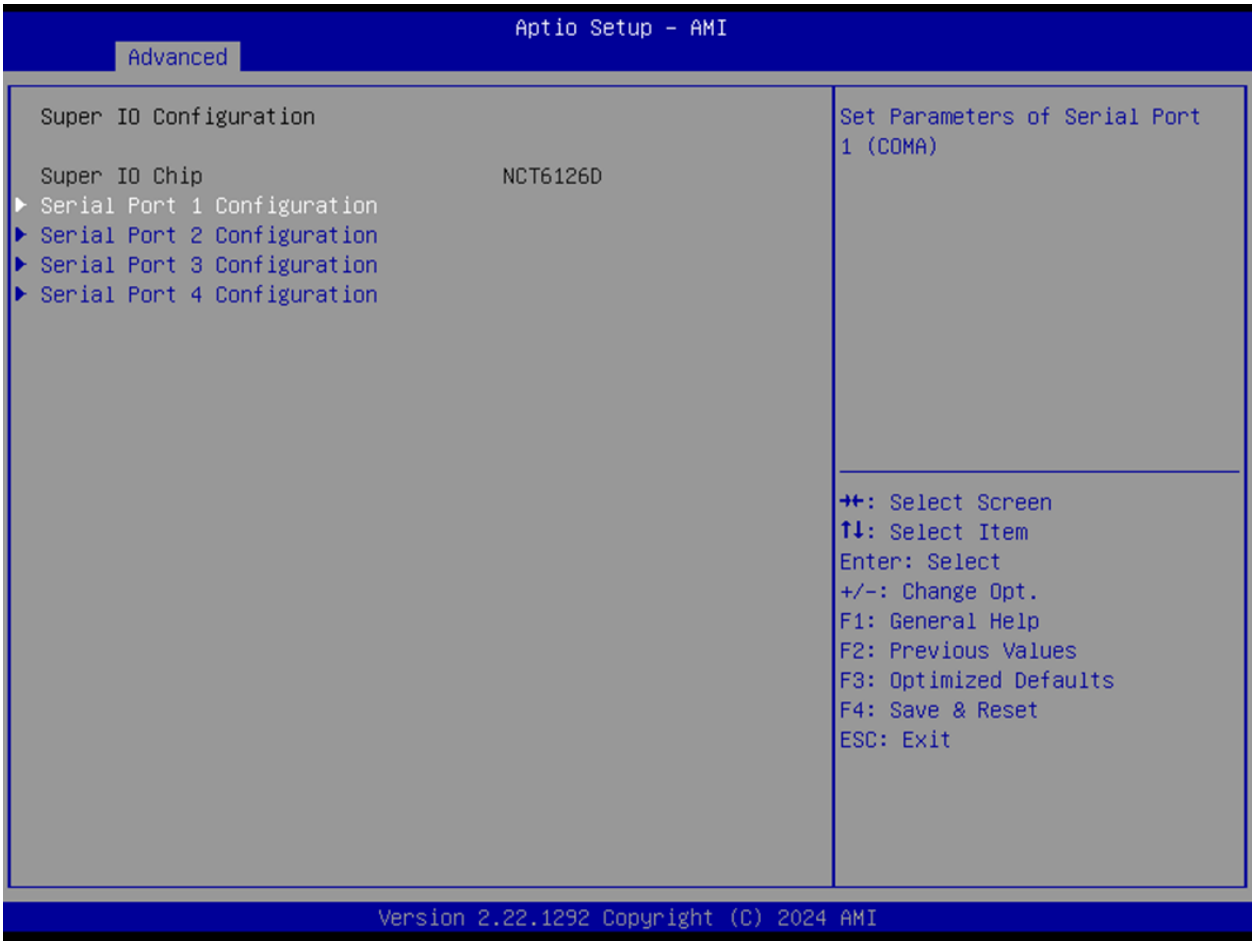


The **SMART Settings** menu allows configuration of SMART (Self-Monitoring, Analysis, and Reporting Technology) for storage health monitoring.

- **SMART Self Test**
  - Default: `Disabled`

- Options: `Enabled`, `Disabled`
- Enables SMART self-tests on all connected hard disk drives (HDDs) during POST (Power-On Self-Test).

7.7 Super IO Configuration



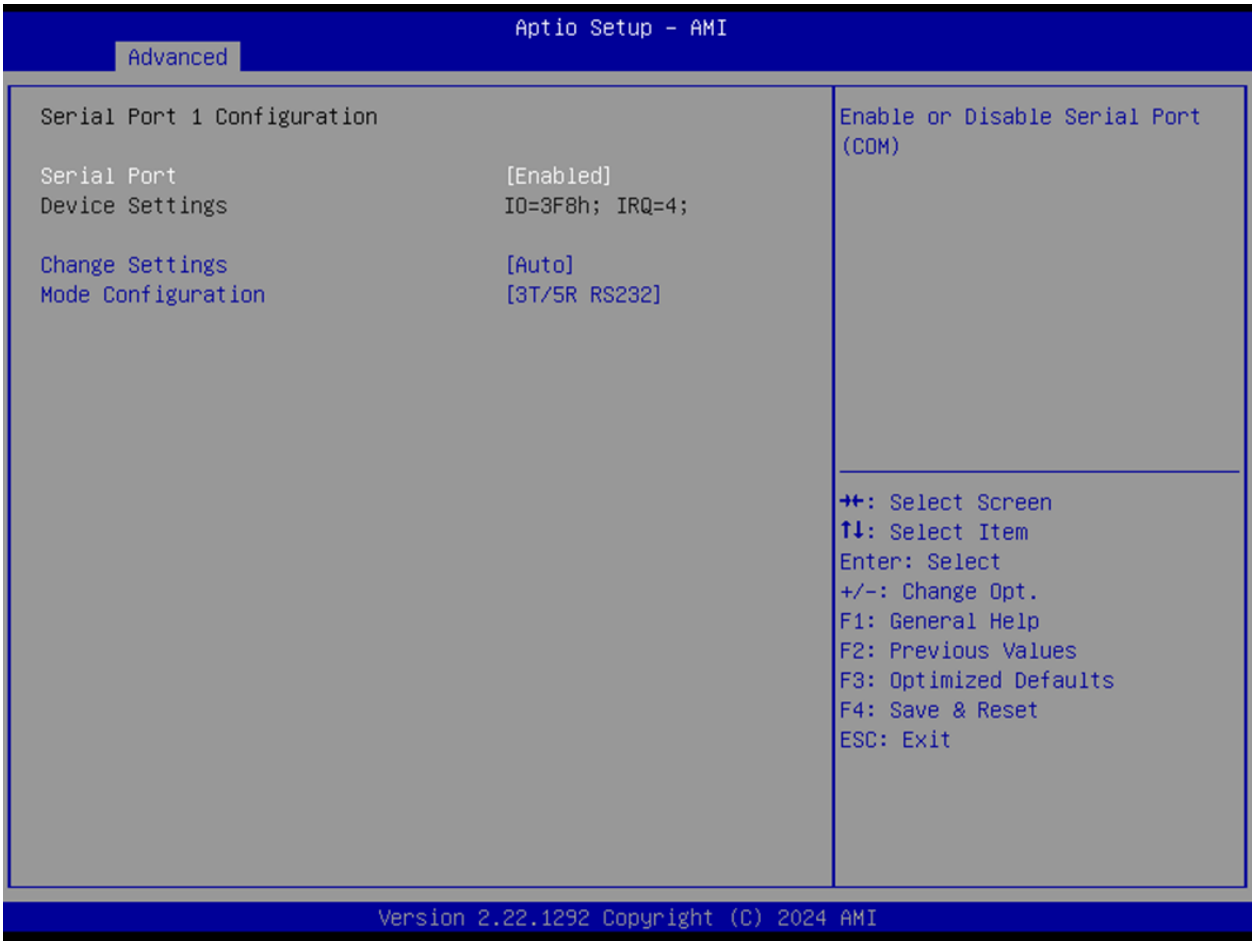
The **Super IO Configuration** menu provides access to settings for the system's serial ports.

7.7.1 Serial Port Configuration

- **Serial Port 1 Configuration**
  - Interface: COMA
  - Press Enter to access configuration submenu for Serial Port 1
- **Serial Port 2 Configuration**
  - Interface: COMB
  - Press Enter to access configuration submenu for Serial Port 2
- **Serial Port 3 Configuration**
  - Interface: COMC
  - Press Enter to access configuration submenu for Serial Port 3
- **Serial Port 4 Configuration**
  - Interface: COMD

- Press Enter to access configuration submenu for Serial Port 4

7.7.2 Serial Port 1 Configuration

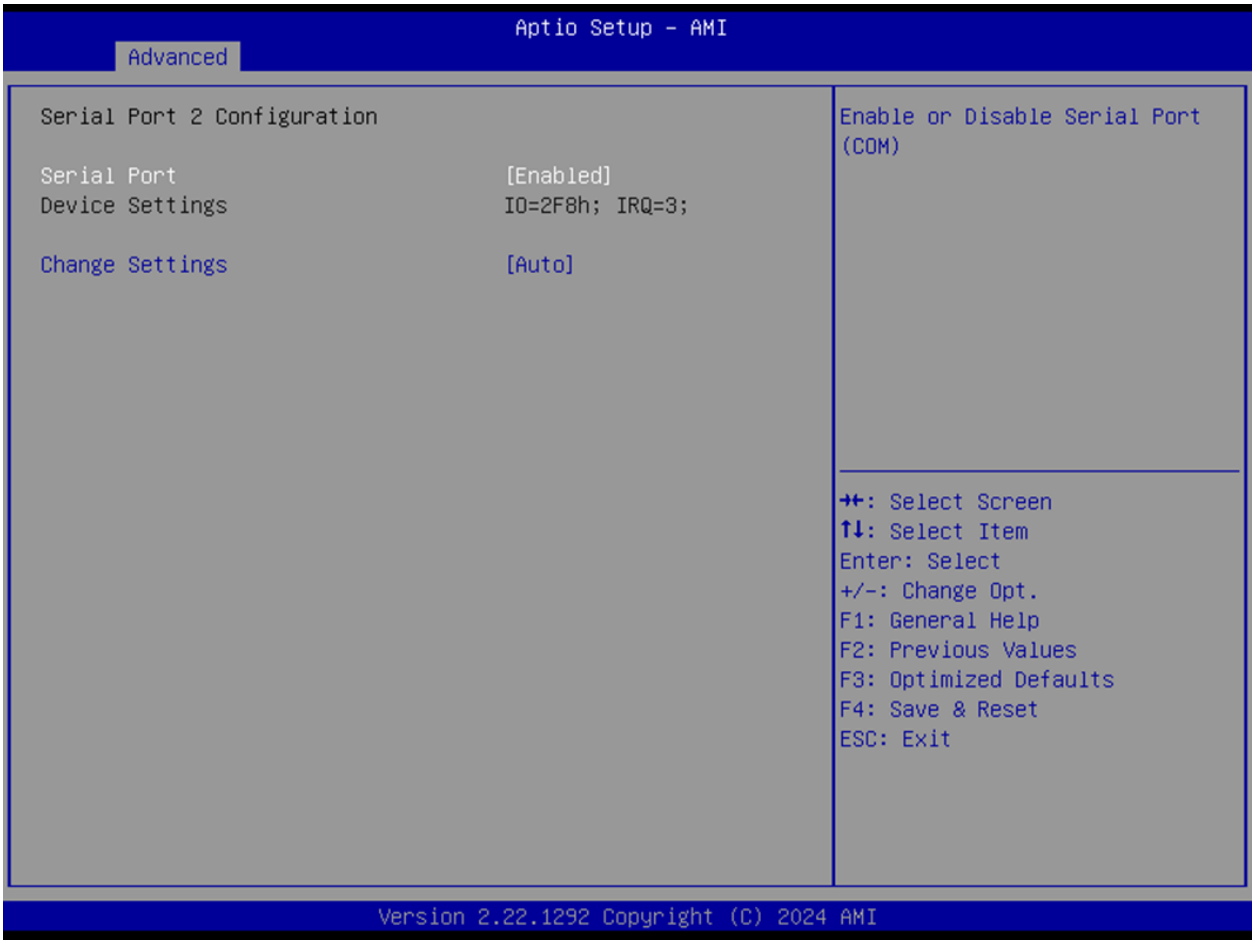


This section configures **Serial Port 1 (COMA)**, including enabling/disabling the port, assigning address/IRQ, and setting the operating mode.

- **Serial Port**
  - Default: `Enabled`
  - Options: `Enabled`, `Disabled`
  - Enables or disables the serial port (COMA).
- **Device Settings**
  - Displays Super IO COM1 address and IRQ
  - *Not selectable*
- **Change Settings**
  - Default: `Auto`
  - Options:
    * `Auto`
    * `IO=3F8h; IRQ=4`
    * `IO=3F8h; IRQ=3,4,5,6,7,9,10,11,12`

    * IO=2F8h; IRQ=3,4,5,6,7,9,10,11,12
    * IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12
    * IO=2E8h; IRQ=3,4,5,6,7,9,10,11,12
  - Allows selecting optimal COM1 settings manually or automatically.
- **Mode Configuration**
  - Default: 3T/5R RS232
  - Options:
    * 1T/1R RS422
    * 3T/5R RS232
    * 1T/1R RS485 TX ENABLE Low Active
    * 1T/1R RS422 with termination resistor
    * 1T/1R RS485 with termination resistor TX ENABLE Low Active
  - Configures the serial port communication mode (RS232/RS422/RS485).

7.7.3 Serial Port 2 Configuration

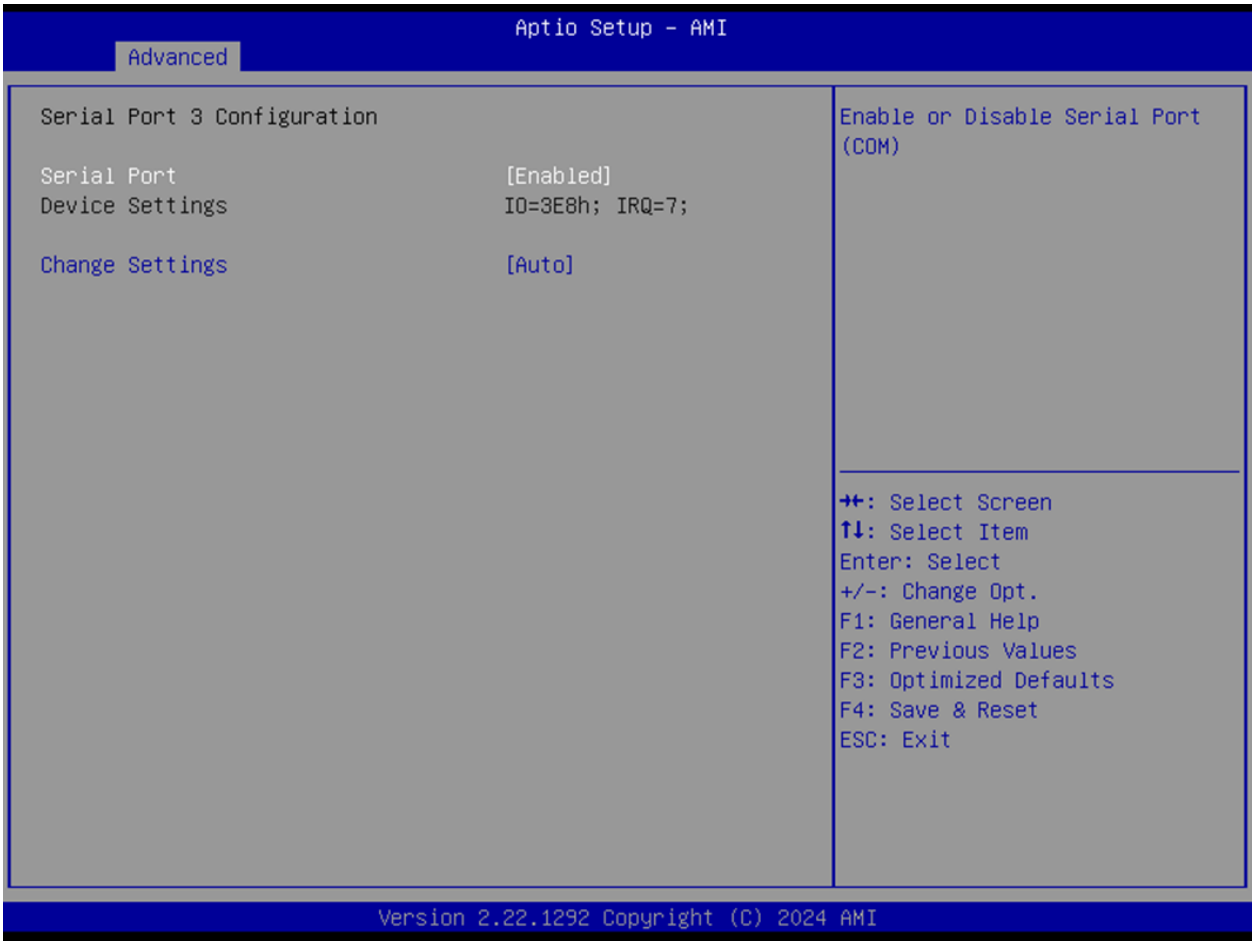


This section configures **Serial Port 2 (COMB)**.

- **Serial Port**
  - Default: Enabled

  - Options: `Enabled`, `Disabled`
  - Enables or disables the serial port (COMB).
- **Device Settings**
  - Displays Super IO COM2 address and IRQ
  - *Not selectable*
- **Change Settings**
  - Default: `Auto`
  - Options:
    * `Auto`
    * `IO=2F8h; IRQ=3`
    * `IO=3F8h; IRQ=3,4,5,6,7,9,10,11,12`
    * `IO=2F8h; IRQ=3,4,5,6,7,9,10,11,12`
    * `IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12`
    * `IO=2E8h; IRQ=3,4,5,6,7,9,10,11,12`
  - Allows selecting optimal COM2 settings manually or automatically.

7.7.4 Serial Port 3 Configuration



This section configures **Serial Port 3 (COMC)**.

- **Serial Port**
  - Default: `Enabled`
  - Options: `Enabled`, `Disabled`
  - Enables or disables the serial port (COMC).
- **Device Settings**
  - Displays Super IO COM3 address and IRQ
  - *Not selectable*
- **Change Settings**
  - Default: `Auto`
  - Options:
    * `Auto`
    * `IO=3E8h; IRQ=7`
    * `IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12`
    * `IO=2E8h; IRQ=3,4,5,6,7,9,10,11,12`
    * `IO=220h; IRQ=3,4,5,6,7,9,10,11,12`
    * `IO=228h; IRQ=3,4,5,6,7,9,10,11,12`
  - Allows selecting optimal COM3 settings manually or automatically.

7.7.5 Serial Port 4 Configuration

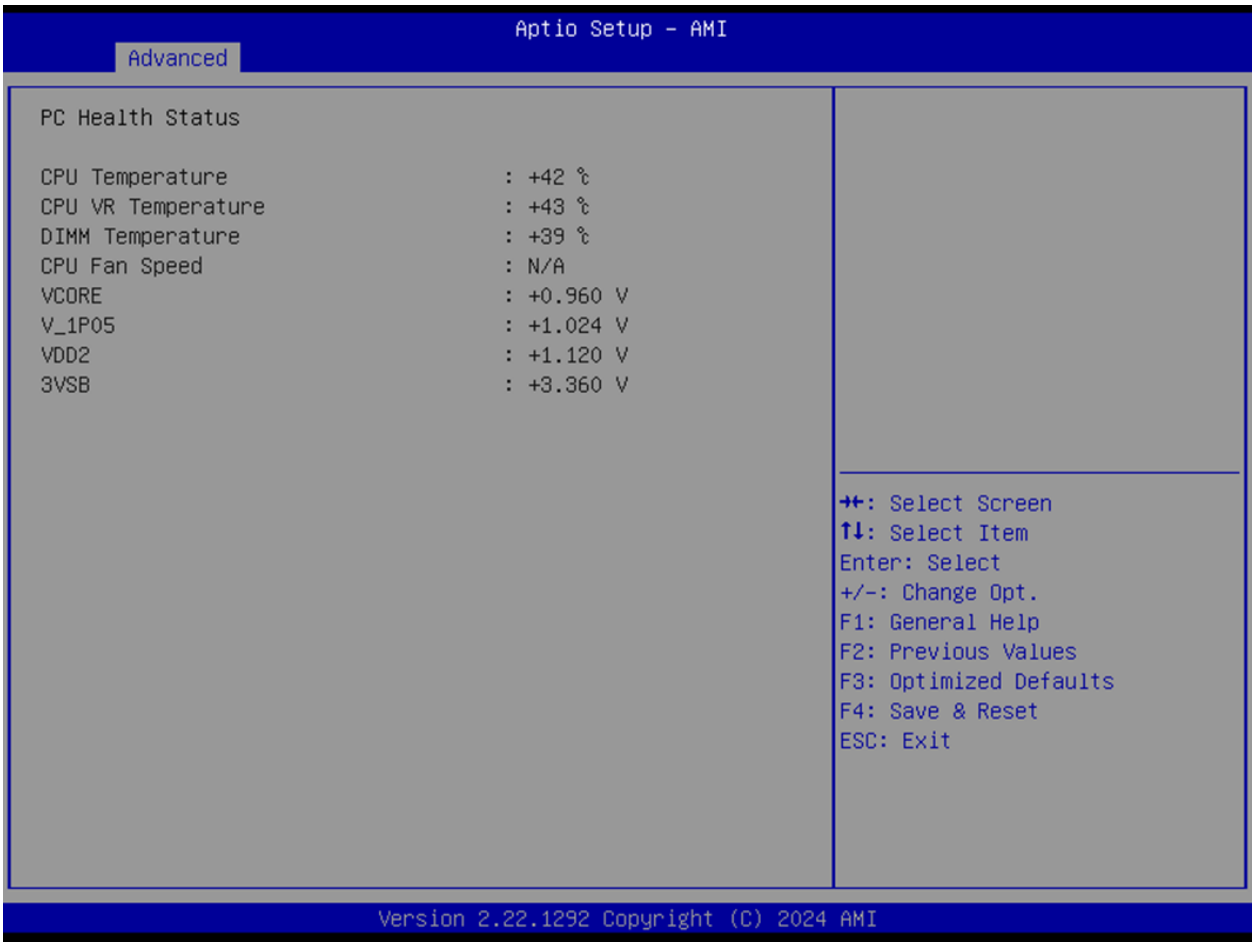
This section configures **Serial Port 4 (COMD)**.

- **Serial Port**
  - Default: `Enabled`
  - Options: `Enabled`, `Disabled`
  - Enables or disables the serial port (COMD).
- **Device Settings**
  - Displays Super IO COM4 address and IRQ
  - *Not selectable*
- **Change Settings**
  - Default: `Auto`
  - Options:
    - `Auto`
    - `IO=2E8h; IRQ=7`
    - `IO=3E8h; IRQ=3,4,5,6,7,9,10,11,12`
    - `IO=2E8h; IRQ=3,4,5,6,7,9,10,11,12`
    - `IO=220h; IRQ=3,4,5,6,7,9,10,11,12`

* IO=228h; IRQ=3,4,5,6,7,9,10,11,12

– Allows selecting optimal COM4 settings manually or automatically.

7.8 Hardware Monitor



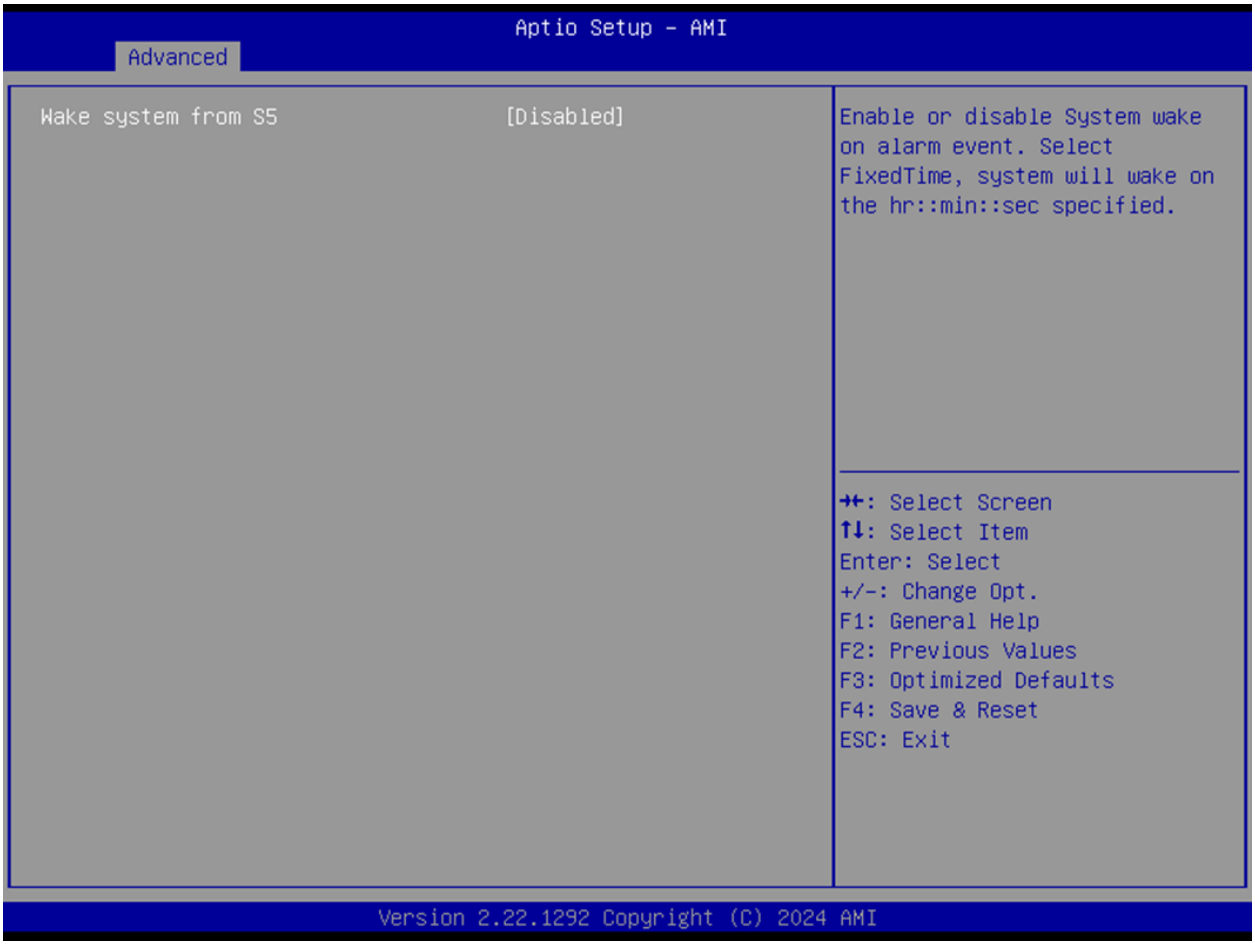
The **Hardware Monitor** page displays real-time system temperature, fan, and voltage information. All fields are read-only and intended for system diagnostics.

7.8.1 Sensor Readings

Type	Range
CPU Temperature	-20°C to Processor TjMax
CPU VR Temperature	-20°C to 120°C
DIMM Temperature	-20°C to 120°C
CPU Fan Speed	0 RPM (minimum failure threshold) – No upper RPM limit
VCORE	0 V to 1.72 V
V_1P05	0.9975 V to 1.1025 V
VDD2	1.045 V to 1.155 V
3VSB	3.135 V to 3.465 V

Note: Fan speed and voltage thresholds are system- and sensor-dependent. RPM reading of 0 indicates a fan failure condition.

7.9 S5 RTC Wake Settings

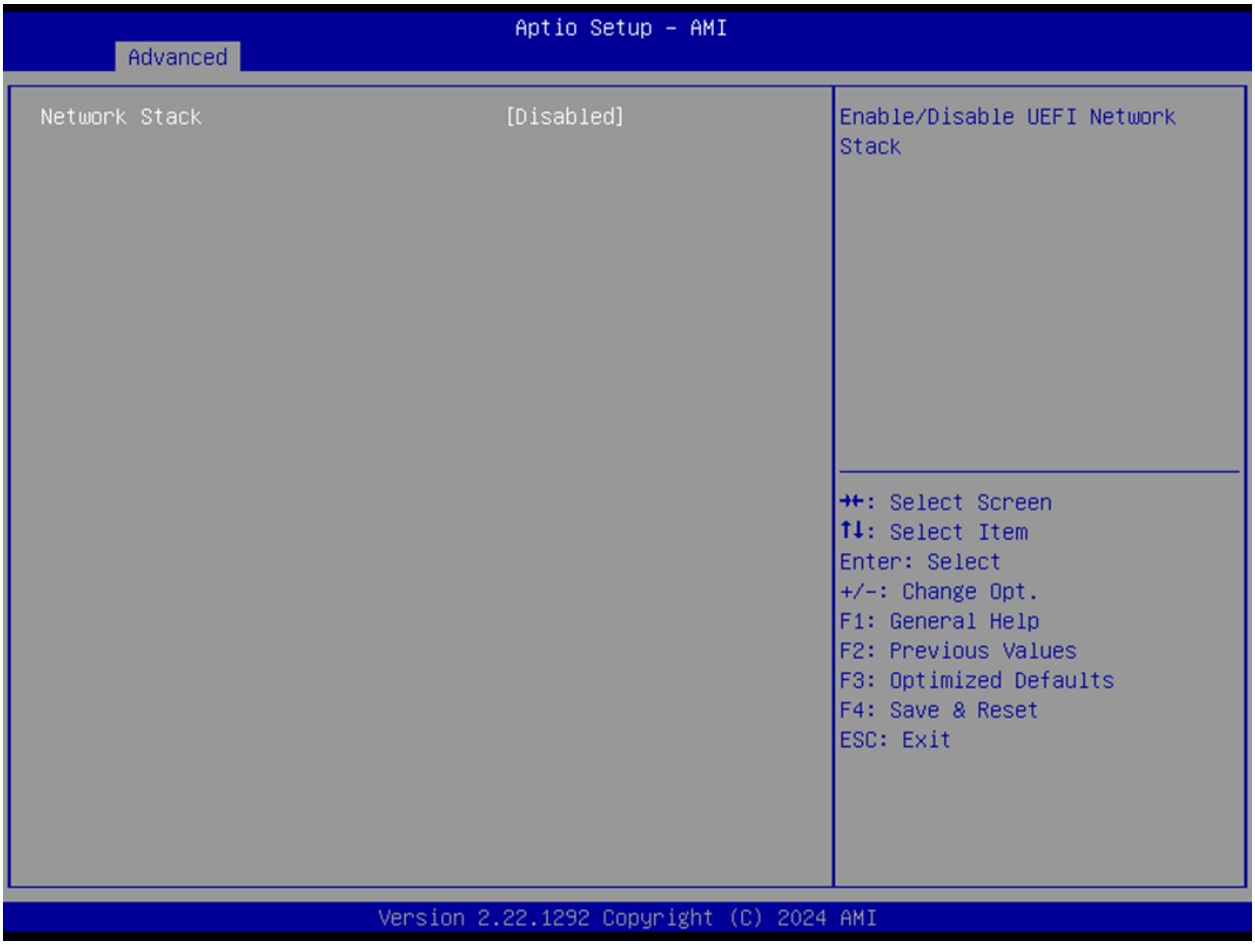


The **S5 RTC Wake Settings** menu configures automatic system wake-up behavior from the S5 (Soft Off) state.

- **Wake System from S5**
  - Default: `Disabled`
  - Options: `Disabled`, `Fixed Time`
  - Enables the system to wake at a defined time from S5 state.
- **Wake Up Hour** *(Visible when Fixed Time is selected)*
  - Default: `0`
  - Range: `0`–`23`
  - Sets the hour of wake-up. (e.g., 3 = 3 AM, 15 = 3 PM)
- **Wake Up Minute** *(Visible when Fixed Time is selected)*
  - Default: `0`
  - Range: `0`–`59`
  - Sets the minute of wake-up.
- **Wake Up Second** *(Visible when Fixed Time is selected)*

- Default: 0
- Range: 0–59
- Sets the second of wake-up.

7.10 Network Stack Configuration

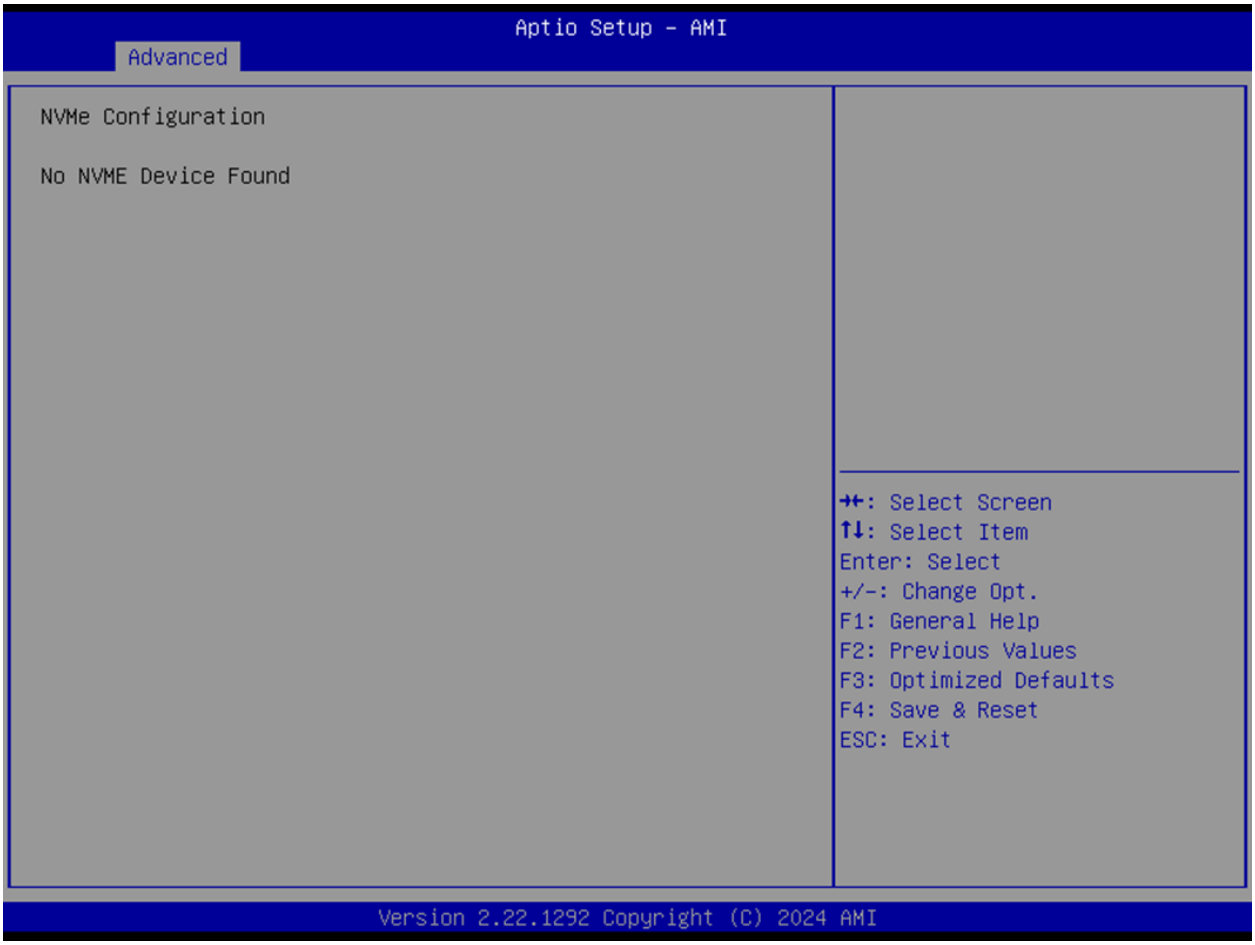


This section allows configuring the UEFI network stack and related PXE boot options.

- **Network Stack**
  - Default: `Disabled`
  - Options: `Enabled`, `Disabled`
  - Enables or disables the UEFI network stack.
- **IPv4 PXE Support** *(Available when Network Stack is Enabled)*
  - Default: `Disabled`
  - Options: `Enabled`, `Disabled`
  - Enables IPv4 PXE boot support.
- **IPv6 PXE Support** *(Available when Network Stack is Enabled)*
  - Default: `Disabled`
  - Options: `Enabled`, `Disabled`

- Enables IPv6 PXE boot support.

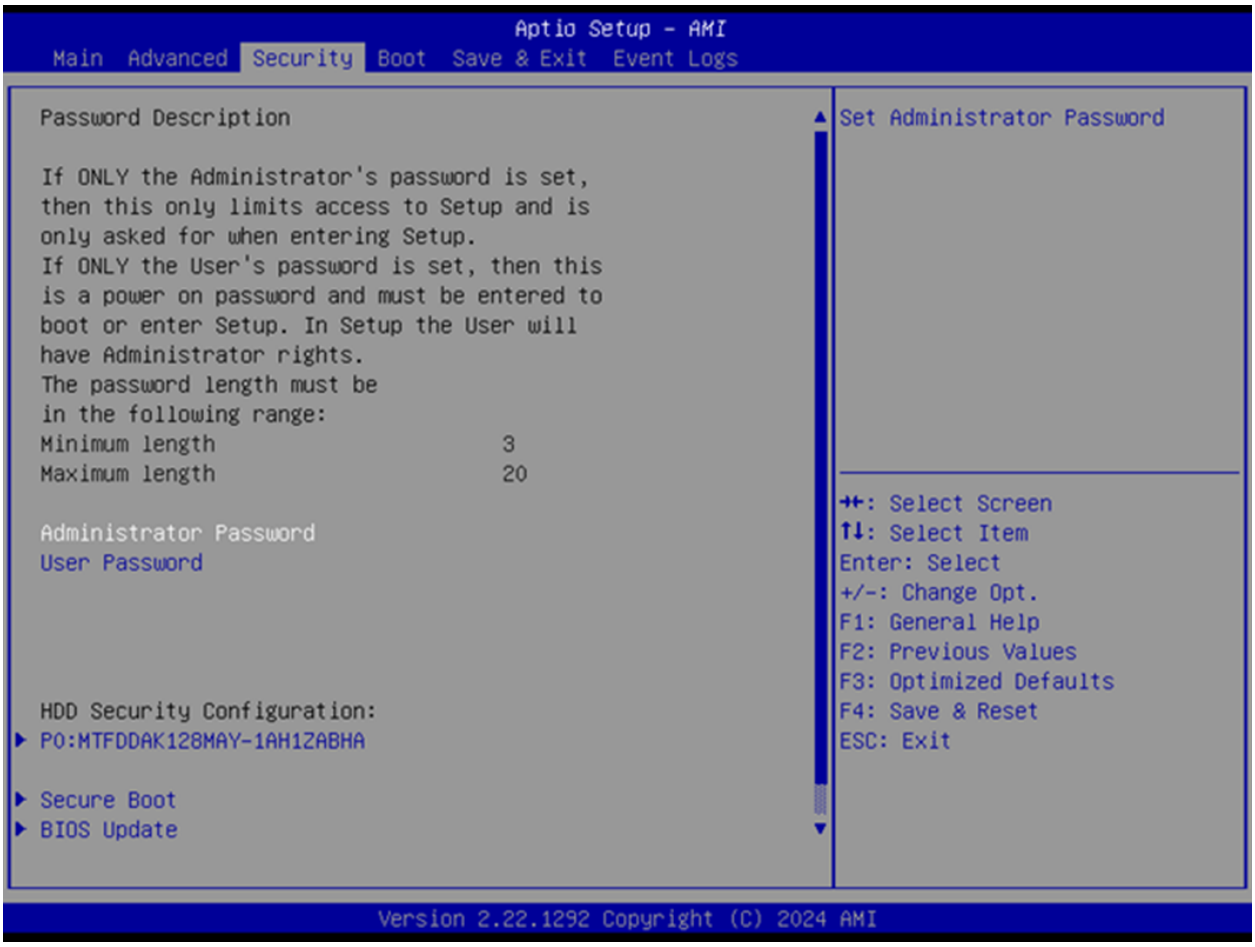
7.11 NVMe Configuration



The **NVMe Configuration** page provides access to settings and information related to connected NVMe devices.

- **(Device)**
  - Press Enter to view device details and configuration sub-menu.

7.12 Security Page

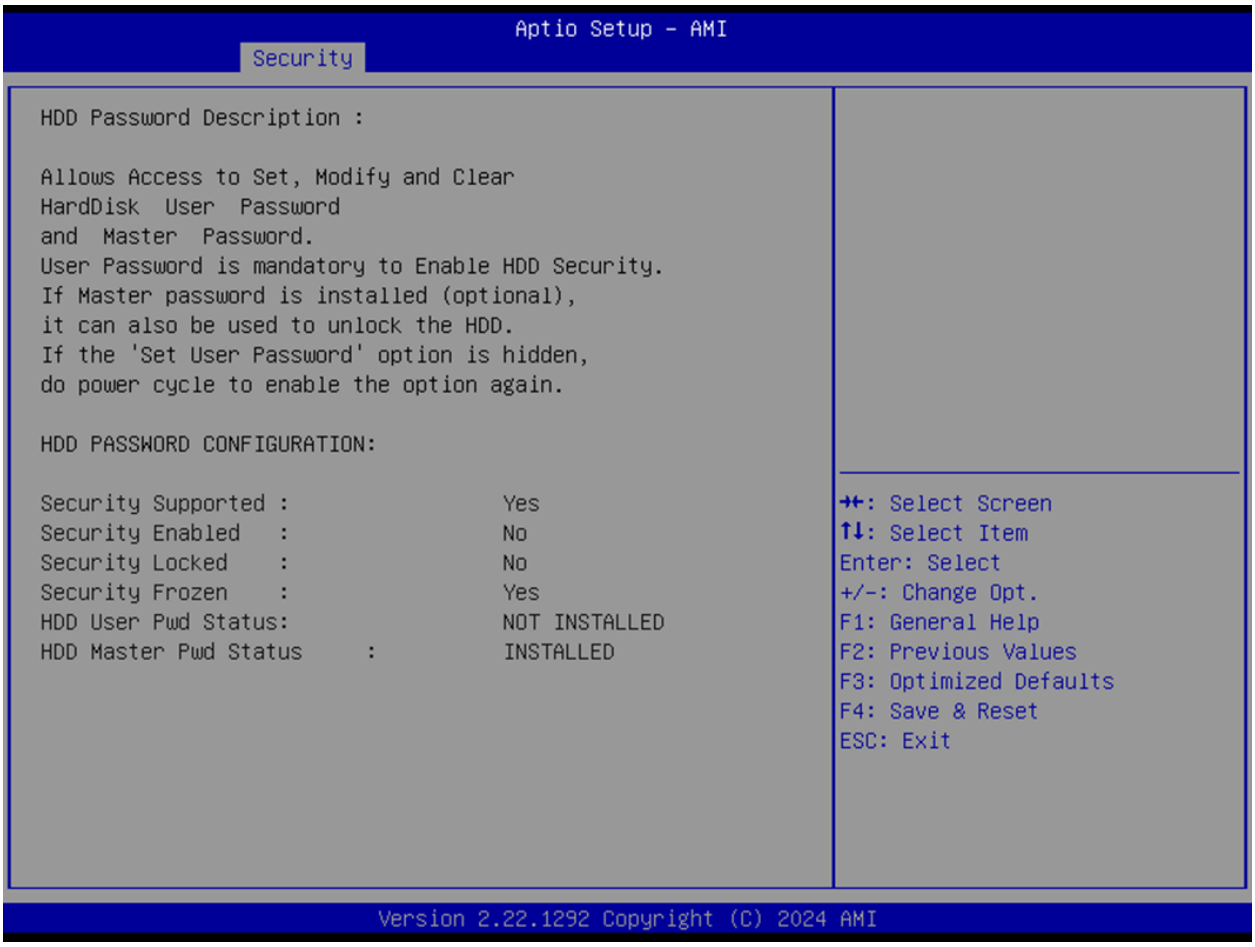


The **Security Page** allows users to configure BIOS access protection, disk security, secure boot, and firmware update options.

7.12.1 Security Options

- **Administrator Password**
  - Set or modify the administrator password to control access to BIOS settings.
- **User Password**
  - Set or modify a user-level password for limited access.
- **HDD Security Drive**
  - Opens the HDD security configuration menu for password protection on specific drives.
  - *Press Enter to access submenu.*
- **Secure Boot**
  - Opens the Secure Boot configuration menu for key and policy management.
  - *Press Enter to access submenu.*
- **BIOS Update**
  - Launches the BIOS update utility.
  - *Press Enter to access submenu.*

7.13 HDD Security

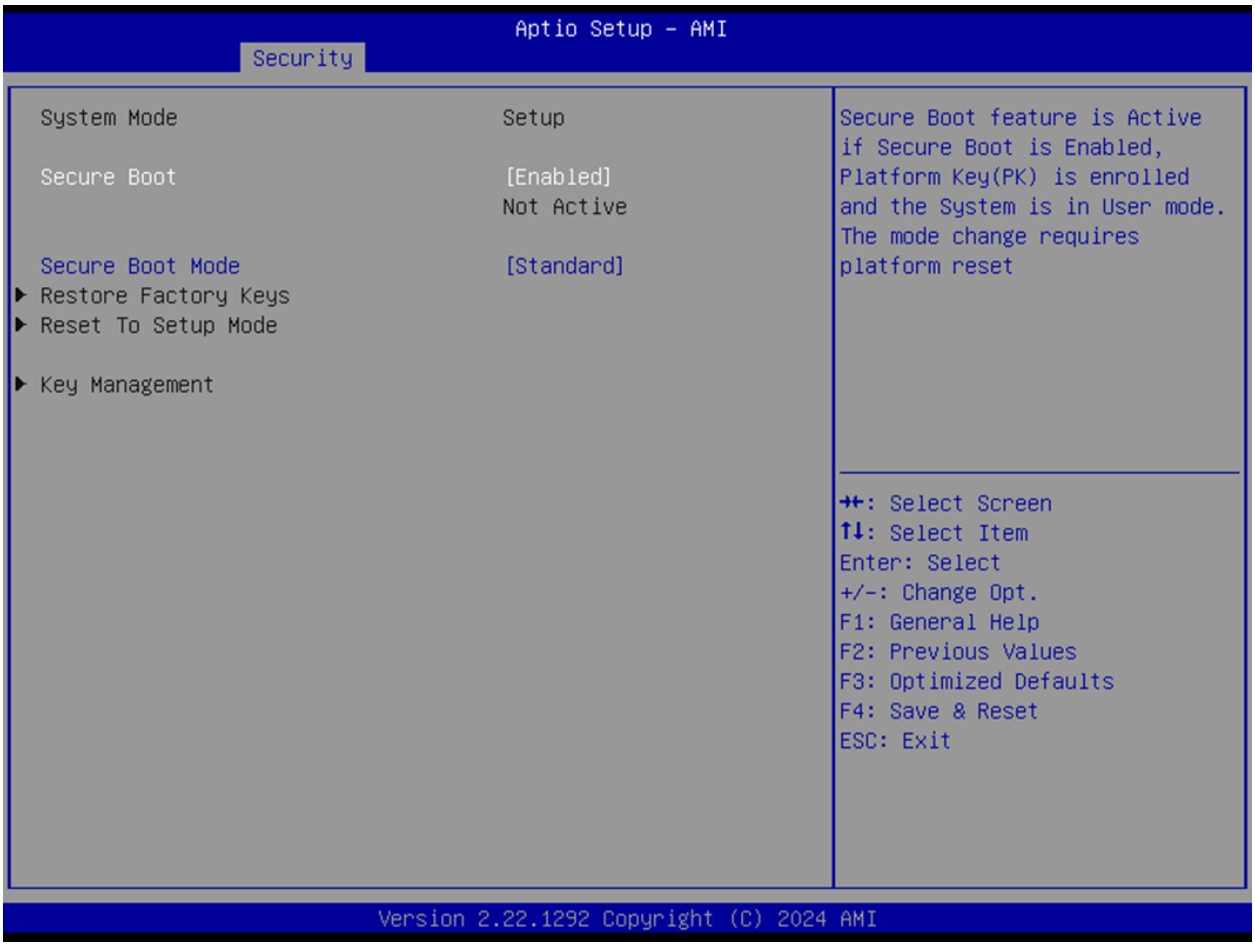


This submenu configures password protection for hard disk drives.

- **Set User Password**
  - Sets a user password for the selected HDD.

    After setting or removing HDD passwords, a full power cycle is recommended. Changes made here are independent of BIOS save/discard actions. If this field becomes hidden, perform a power cycle to restore visibility.

7.14 Secure Boot



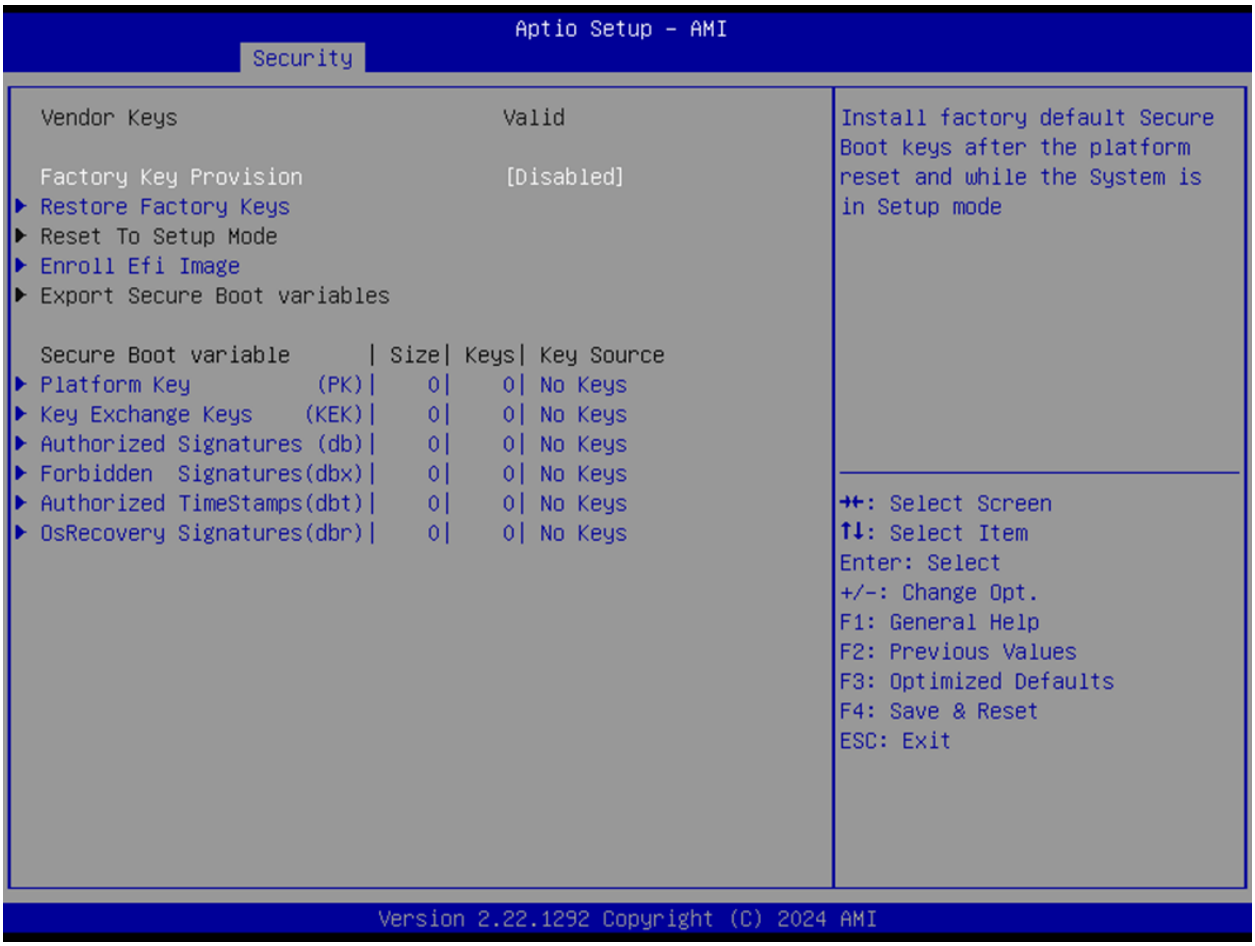
The **Secure Boot** feature ensures that only trusted operating systems and software are loaded during startup.

- **Secure Boot**
  - Default: `Enabled`
  - Options: `Enabled`, `Disabled`
  - When enabled, Secure Boot is active if a Platform Key (PK) is enrolled and the system is in User Mode.

    Mode changes require a platform reset.
- **Secure Boot Mode**
  - Default: `Standard`
  - Options: `Standard`, `Custom`
  - In **Standard** mode, keys and policies follow default specifications.
    In **Custom** mode, policy variables can be modified by a physically present user without full authentication.
- **Restore Factory Keys**
  - Restores factory default Secure Boot key databases and forces system into User Mode.
- **Reset to Setup Mode**
  - Deletes all Secure Boot key databases from NVRAM.
- **Key Management**

- Opens advanced Secure Boot key management options.
- *Press Enter to access submenu.*

7.15 Key Management



The **Key Management** submenu provides expert-level control over Secure Boot certificates and key databases.

- **Factory Key Provision**
  - Default: `Disabled`
  - Options: `Enabled`, `Disabled`
  - Installs factory default Secure Boot keys after platform reset when in Setup Mode.
- **Restore Factory Keys**
  - Reinstalls all factory Secure Boot keys and switches system to User Mode.
- **Reset to Setup Mode**
  - Clears all Secure Boot key databases from NVRAM.
- **Enroll EFI Image**
  - Allows SHA256 hash of a PE image to be enrolled into the authorized signature database (db) to permit its execution under Secure Boot.
- **Export Secure Boot Variables**
  - Saves the content of current Secure Boot variables from NVRAM to a file.

7.15.1 Key Databases

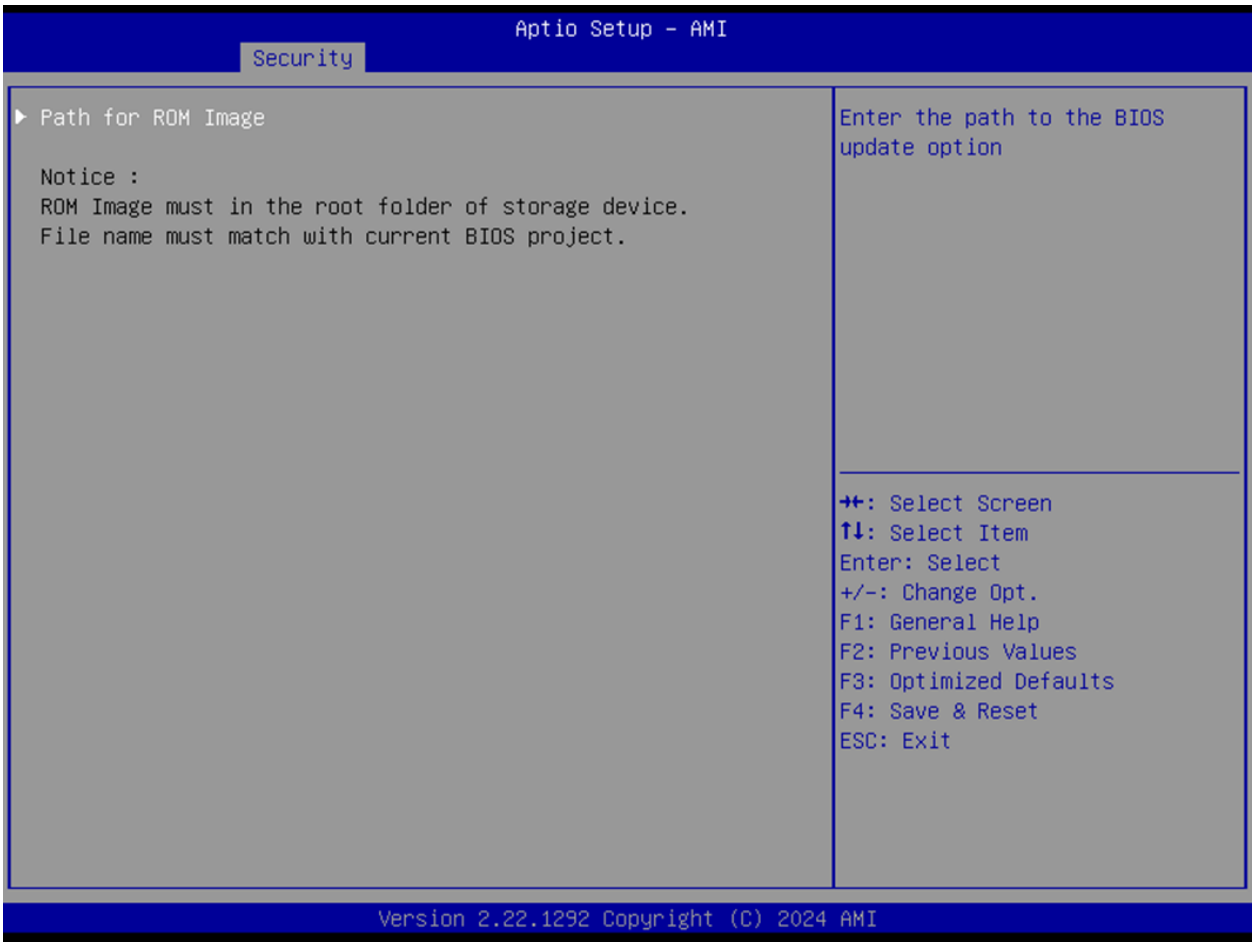
Each item below shows key size, count, and source. All support Factory, Modified, or Mixed key sources. Press Enter to manage entries in their respective sub-menus.

- **Platform Key (PK)**
  - Default: `Size: 0, Keys: 0, Key Source: No Keys`
- **Key Exchange Keys (KEK)**
  - Default: `Size: 0, Keys: 0, Key Source: No Keys`
- **Authorized Signatures (db)**
  - Default: `Size: 0, Keys: 0, Key Source: No Keys`
- **Forbidden Signatures (dbx)**
  - Default: `Size: 0, Keys: 0, Key Source: No Keys`
- **Authorized TimeStamps (dbt)**
  - Default: `Size: 0, Keys: 0, Key Source: No Keys`
- **OS Recovery Signatures (dbr)**
  - Default: `Size: 0, Keys: 0, Key Source: No Keys`

  Each key field accepts:

  1. Public Key Certificates:
     - `EFI_SIGNATURE_LIST`
     - `EFI_CERT_X509 (DER)`
     - `EFI_CERT_RSA2048 (bin)`
     - `EFI_CERT_SHAXXX`
  2. Authenticated UEFI Variable
  3. EFI PE/COFF Image (SHA256)

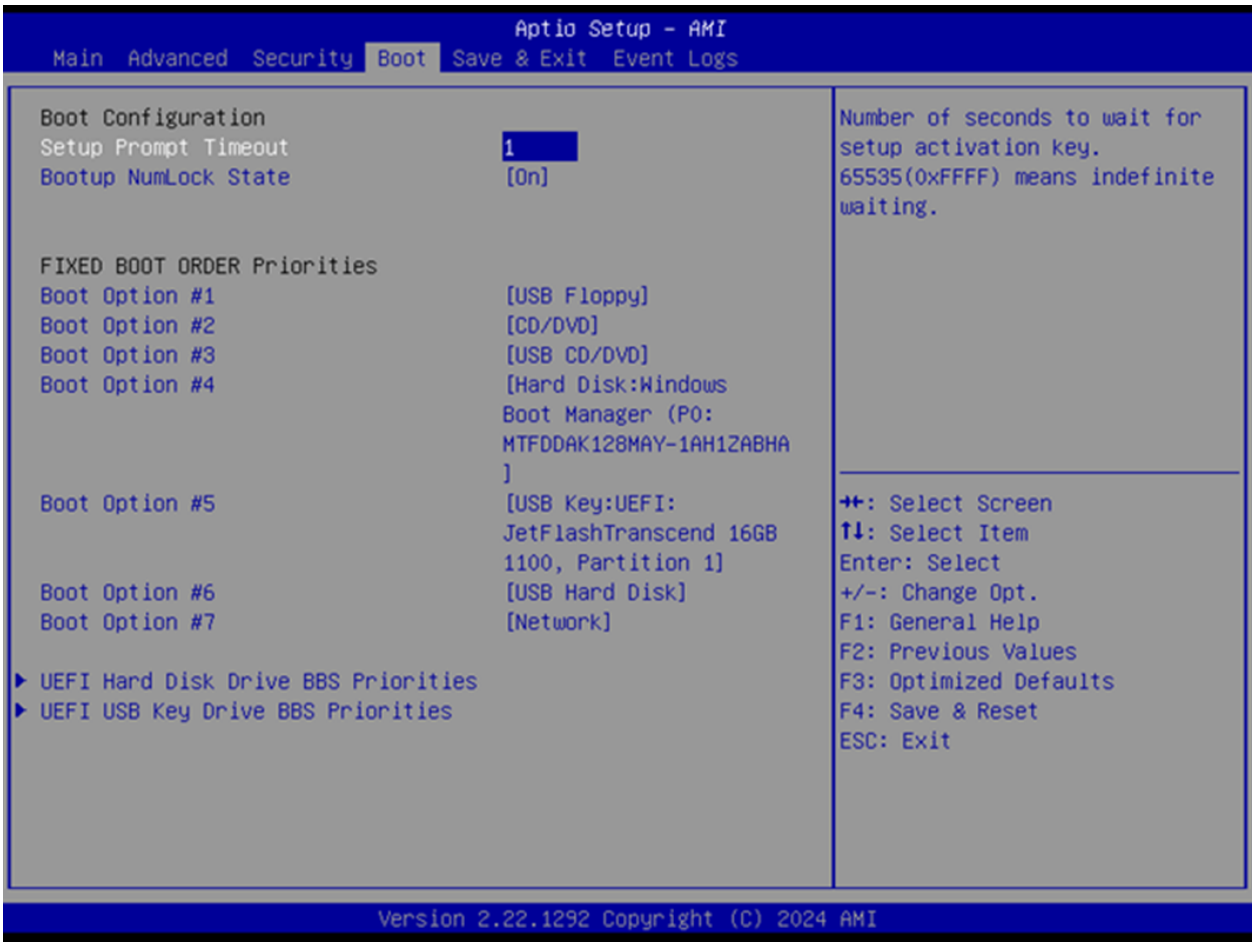
7.16 BIOS Update



The **BIOS Update** submenu allows users to specify the file path to a BIOS ROM image for updating firmware.

- **Path for ROM Image**
  - Enter the location or path of the BIOS update file to initiate the update process.

7.17 Boot Page



The **Boot Page** allows configuring boot behavior, NumLock state, and boot priority order.

7.17.1 Boot Settings

- **Setup Prompt Timeout**
  - Default: `1`
  - Range: `1`–`65535`
  - Sets the number of seconds to wait for setup activation key.

    `65535` (0xFFFF) means indefinite wait.
- **Bootup NumLock State**
  - Default: `On`
  - Options: `On`, `Off`
  - Sets the keyboard NumLock state at boot.

7.17.2 Boot Options

- **Boot Option #1 – #7**
  - Default Values:
    - #1: `USB Floppy`
    - #2: `CD/DVD`
    - #3: `USB CD/DVD`
    - #4: `Hard Disk`
    - #5: `USB Key`
    - #6: `USB Hard Disk`
    - #7: `Network`
  - Options: `USB Floppy`, `CD/DVD`, `USB CD/DVD`, `Hard Disk`, `USB Key`, `USB Hard Disk`, `Network`, `Disabled`
  - Defines the system boot sequence. Lower numbers indicate higher priority.

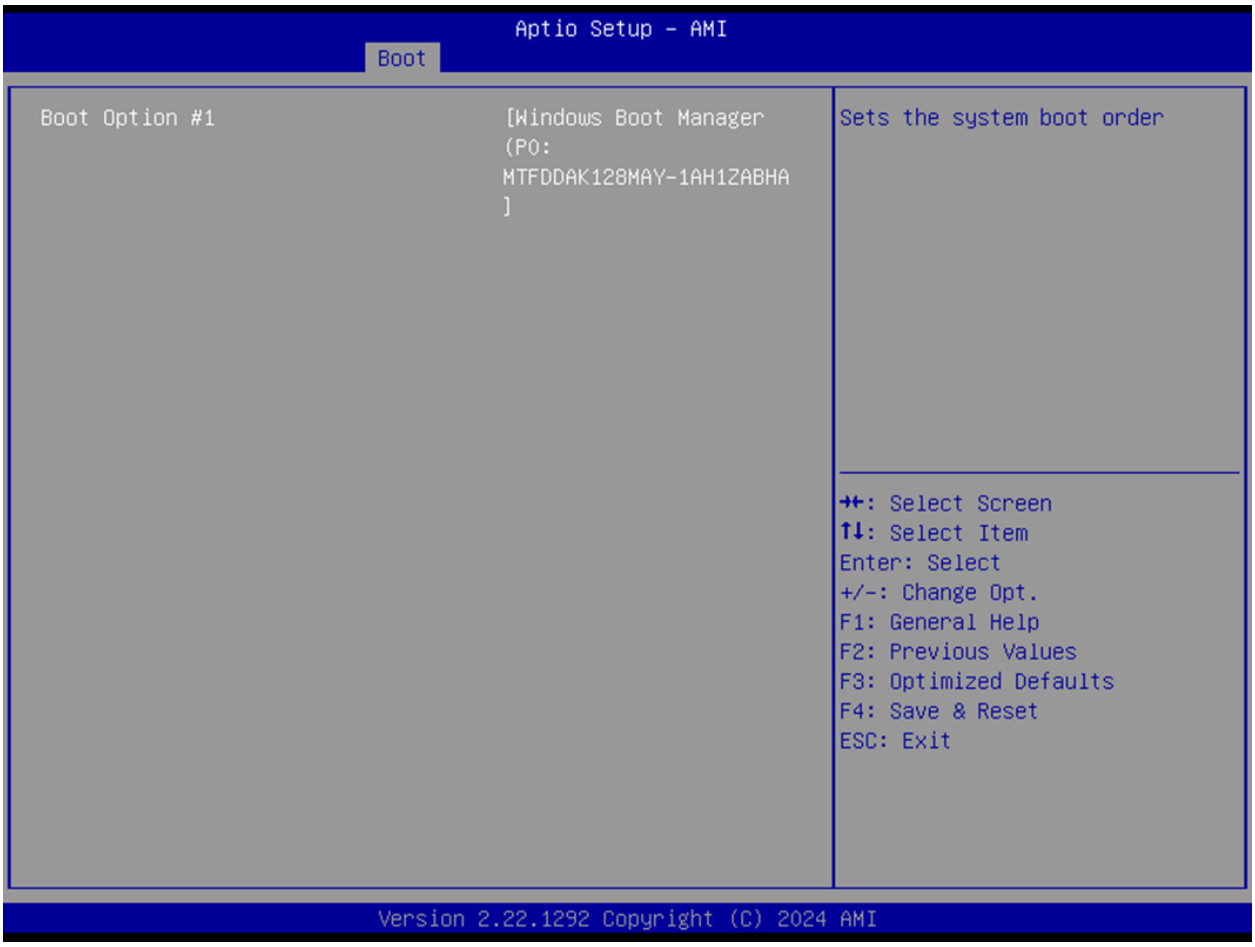
7.17.3 UEFI BBS Priorities

The following submenus allow ordering of UEFI-compatible boot devices within their respective types:

- **(UEFI) USB Floppy Drive BBS Priorities**
- **(UEFI) CDROM/DVD Drive BBS Priorities**
- **(UEFI) USB CDROM/DVD ROM Drive BBS Priorities**
- **(UEFI) Hard Disk Drive BBS Priorities**
- **(UEFI) USB Key Drive BBS Priorities**
- **(UEFI) USB Hard Disk Drive BBS Priorities**
- **(UEFI) Network Drive BBS Priorities**

  Press Enter to access each submenu and define device-specific boot priorities.

7.18 Drive BBS Priorities



This submenu appears per device type (USB, CD/DVD, HDD, etc.) and allows granular boot ordering for matching devices.

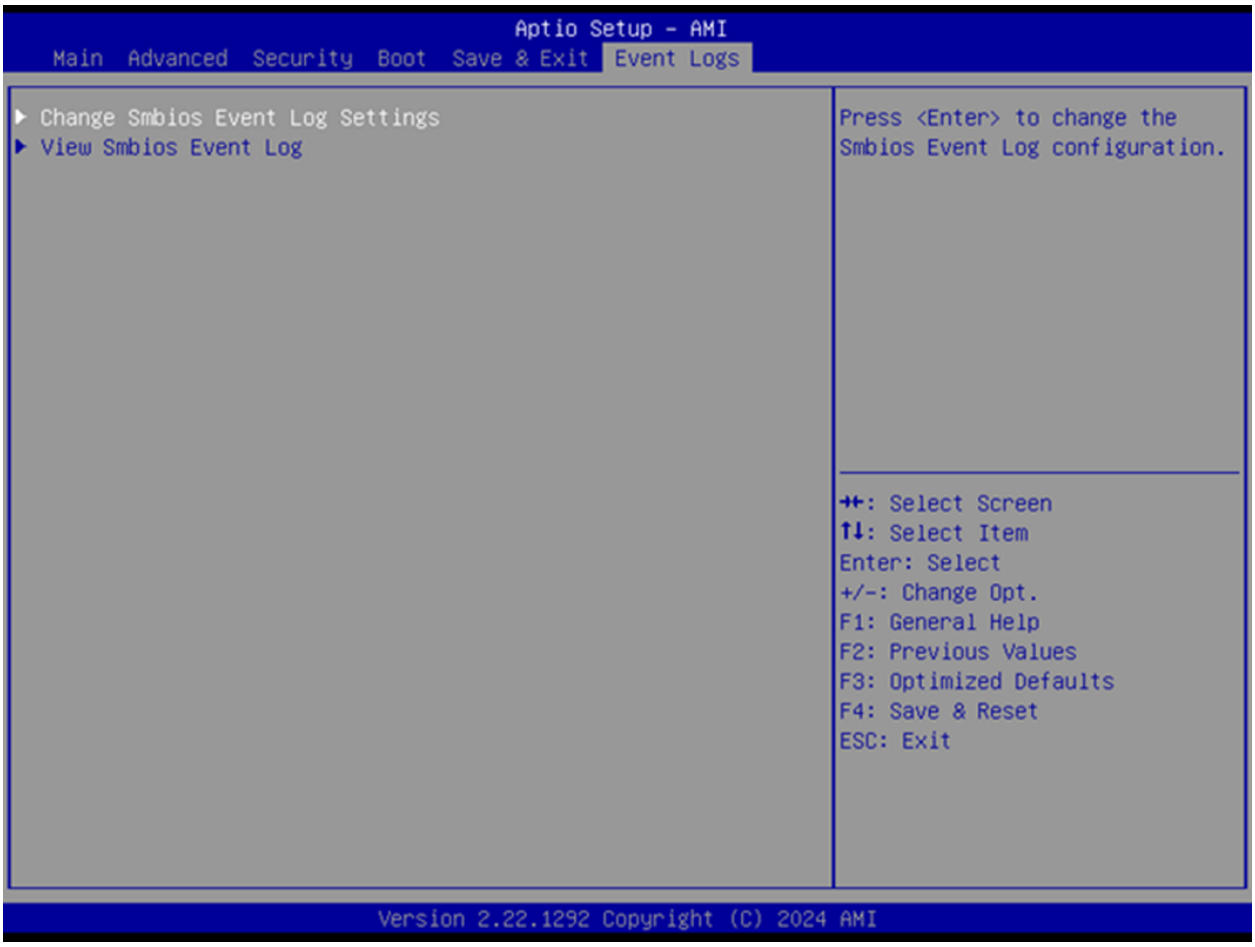
- **Boot Option #1**
  - Options: `<Device Name>` or `Disabled`
  - Sets boot priority for available devices of the selected type.

7.19 Save & Exit Page

The **Save & Exit Page** provides options for applying or discarding changes and restoring factory defaults.

- **Save Changes and Reset**
  - Saves BIOS configuration changes and restarts the system.
- **Discard Changes and Reset**
  - Restarts the system without saving any changes.
- **Restore Defaults**
  - Restores all BIOS settings to their factory default values.

7.20 Event Logs

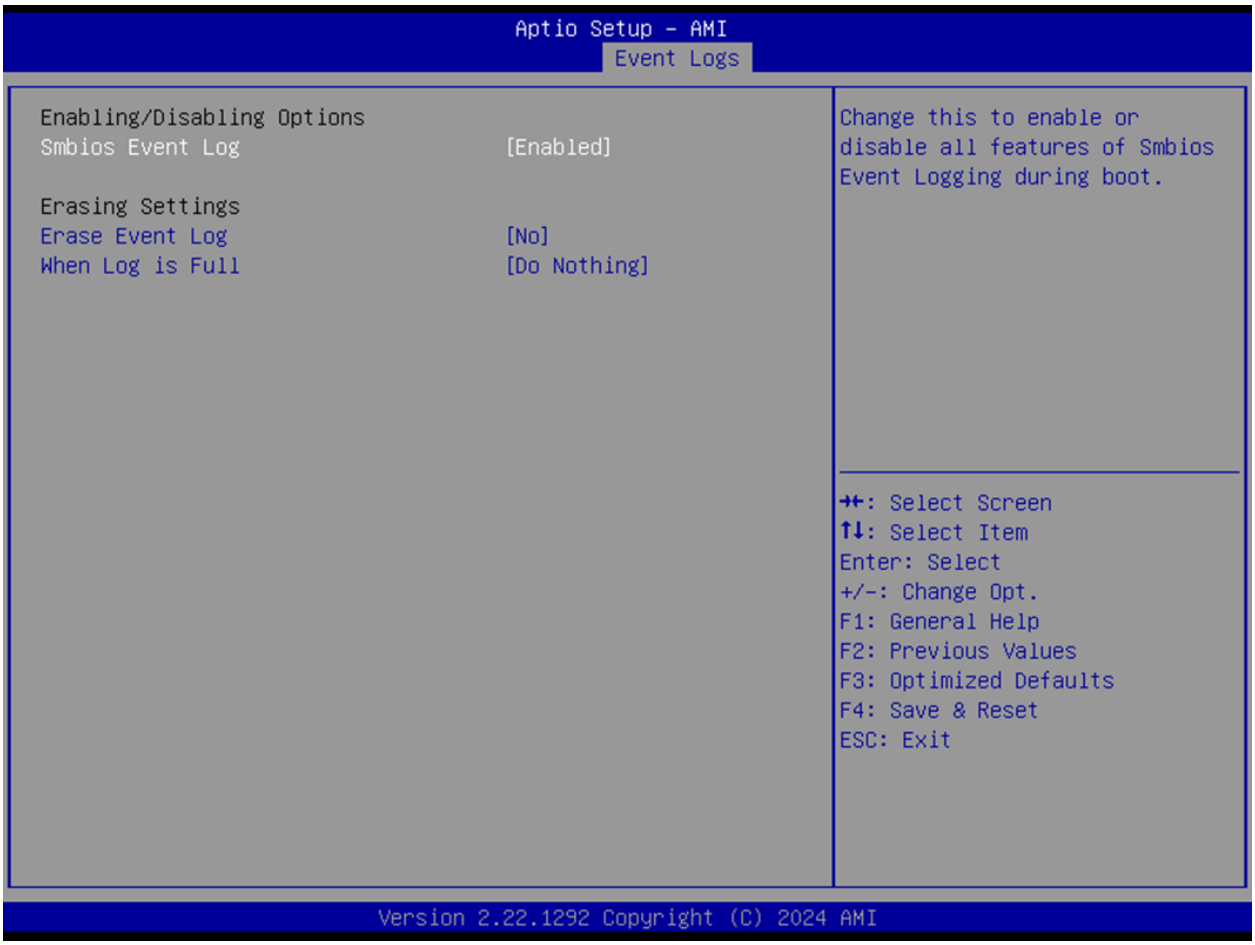


The **Event Logs** section allows you to configure and view SMBIOS event logging activity.

7.20.1 Event Log Options

- **Change SMBIOS Event Log Settings**
  - Press Enter to configure logging behavior.
  - *Opens the associated submenu.*
- **View SMBIOS Event Log**
  - Press Enter to view recorded SMBIOS event entries.
  - *Opens the associated submenu.*

7.20.2 Change SMBIOS Event Log Settings



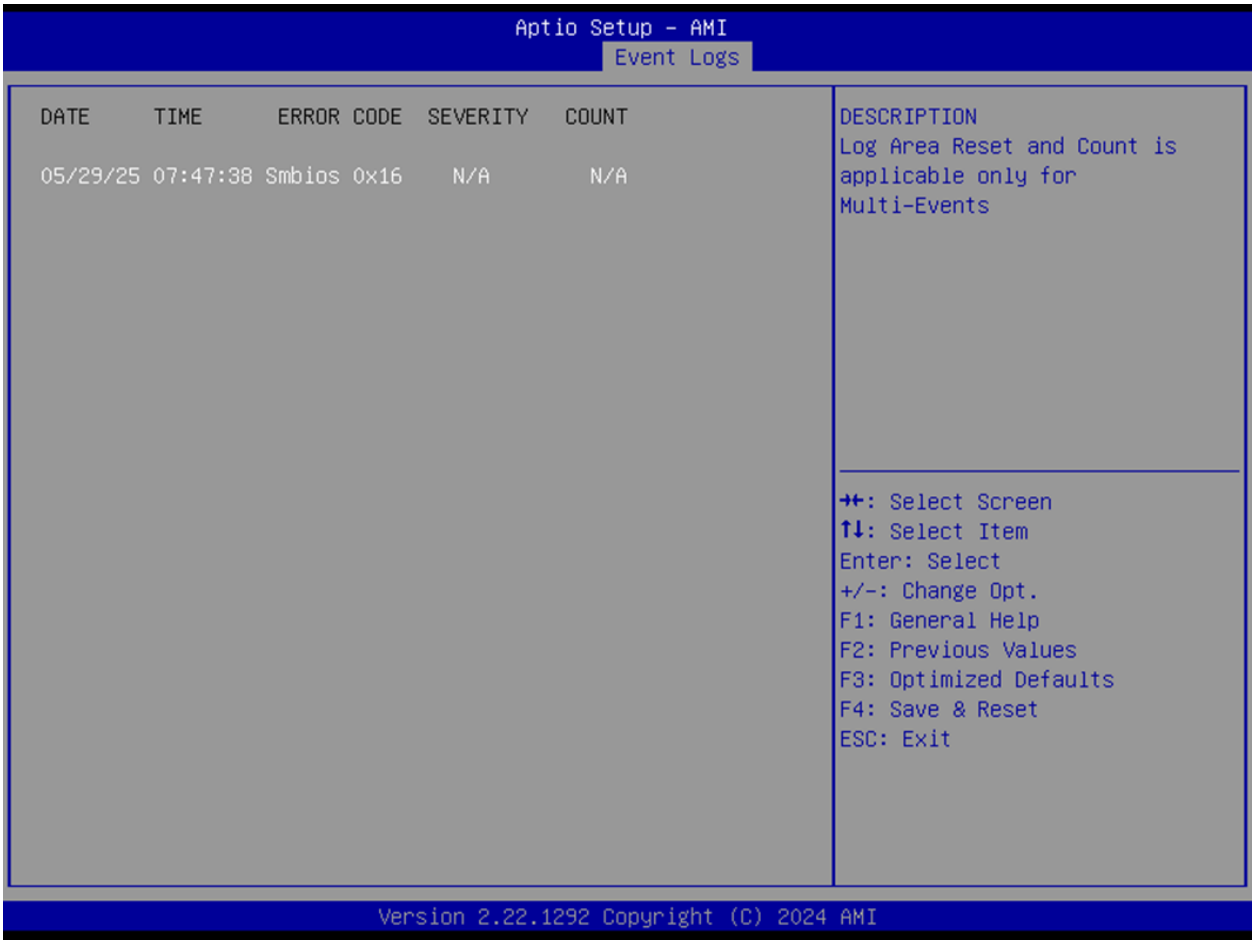
This submenu controls whether SMBIOS events are logged and how logs are handled.

- **SMBIOS Event Log**
  - Default: `Enabled`
  - Options: `Enabled`, `Disabled`
  - Enables or disables event logging during boot.
- **Erase Event Log**
  - Default: `No`
  - Options:
    * `No`
    * `Yes, Next reset`
    * `Yes, Every reset`
  - Determines if/when the event log should be cleared.
- **When Log is Full**
  - Default: `Do Nothing`
  - Options:
    * `Do Nothing`

* Erase Immediately

– Defines the system's behavior when the event log reaches capacity.

7.20.3 View SMBIOS Event Log



Displays recorded SMBIOS events with date, time, error code, severity, and count.

- **DATE / TIME / ERROR CODE / SEVERITY / COUNT**
  - Example Entry: `MM/DD/YY HH:MM:SS Smbios 0x16 N/A N/A`
  - Events are listed in chronological order.