PRO WS WRX80E-SAGE SE WIFI

BIOS Manual

Motherboard

Contents

BIOS Setup

1.   Knowing BIOS

The new ASUS UEFI BIOS is a Unified Extensible Interface that complies with UEFI architecture, offering a user-friendly interface that goes beyond the traditional keyboard-only BIOS controls to enable a more flexible and convenient mouse input. You can easily navigate the new UEFI BIOS with the same smoothness as your operating system. The term "BIOS" in this user manual refers to "UEFI BIOS" unless otherwise specified.

BIOS (Basic Input and Output System) stores system hardware settings such as storage device configuration, overclocking settings, advanced power management, and boot device configuration that are needed for system startup in the motherboard CMOS. In normal circumstances, the default BIOS settings apply to most conditions to ensure optimal performance. **DO NOT change the default BIOS settings** except in the following circumstances:

- An error message appears on the screen during the system bootup and requests you to run the BIOS Setup.

- You have installed a new system component that requires further BIOS settings or update.

Inappropriate BIOS settings may result to instability or boot failure. **We strongly recommend that you change the BIOS settings only with the help of a trained service personnel**.

- When downloading or updating the BIOS file for your motherboard, rename it as **XXXXX.CAP**. The name of the CAP file varies depending on models. Refer to the user manual that came with your motherboard for the name.

- The screenshots in this manual are for reference only, please refer to the latest BIOS version for settings and options.

- BIOS settings and options may vary due to different BIOS release versions. Please refer to the latest BIOS version for settings and options.

2.   BIOS setup program

Use the BIOS Setup to update the BIOS or configure its parameters. The BIOS screen include navigation keys and brief onscreen help to guide you in using the BIOS Setup program.

Entering BIOS at startup

To enter BIOS Setup at startup, press <Delete> or <F2> during the Power-On Self Test (POST). If you do not press <Delete> or <F2>, POST continues with its routines.

Entering BIOS Setup after POST

To enter BIOS Setup after POST:

- Press <Ctrl>+<Alt>+<Delete> simultaneously.

- Press the reset button on the system chassis.

- Press the power button to turn the system off then back on. Do this option only if you failed to enter BIOS Setup using the first two options.

After doing either of the three options, press <Delete> key to enter BIOS.

- The BIOS setup screens shown in this section are for reference purposes only, and may not exactly match what you see on your screen.

- Ensure that a USB mouse is connected to your motherboard if you want to use the mouse to control the BIOS setup program.

- If the system becomes unstable after changing any BIOS setting, load the default settings to ensure system compatibility and stability. Select the **Load Optimized Defaults** item under the **Exit** menu or press hotkey **<F5>**. See section **Exit menu** for details.

- If the system fails to boot after changing any BIOS setting, try to clear the CMOS and reset the motherboard to the default value. See your motherboard manual for information on how to erase the RTC RAM.

- The BIOS setup program does not support Bluetooth devices.

BIOS menu screen

The BIOS Setup program will load in **Advanced Mode**.

The BIOS settings and options for each motherboard may differ slightly with the options in this manual. Please refer to the BIOS of your motherboard for the settings and options.

2.1   Advanced Mode

The Advanced Mode provides advanced options for experienced end-users to configure the BIOS settings. The figure below shows an example of the Advanced Mode. Refer to the following sections for the detailed configurations.

Pop-up Menu
Submenu items
Menu bar
Language   MyFavorite(F3)   Search(F9)   ReSize BAR   Scroll bar

Configuration fields   General help
Menu items   Last modified settings   Hot keys   Search on FAQ
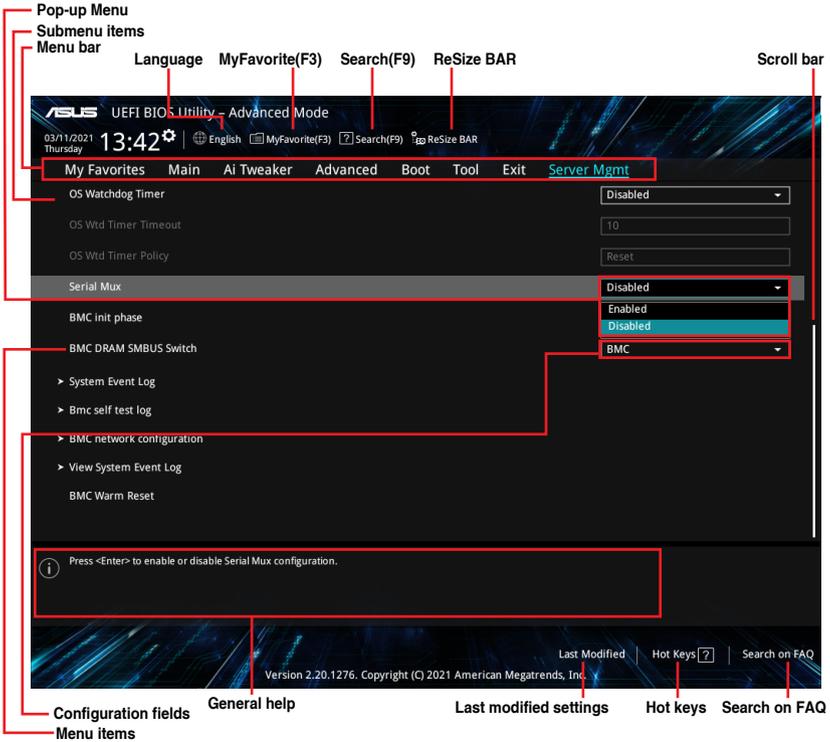
Menu bar

The menu bar on top of the screen has the following main items:

My Favorites	For saving the frequently-used system settings and configuration.
Main	For changing the basic system configuration.
Ai Tweaker	For changing the overclocking settings.
Advanced	For changing the advanced system settings.
Boot	For changing the system boot configuration.
Tool	For configuring options for special functions.
Exit	For selecting the exit options and loading default settings.
Server Mgmt	For changing the Server Mgmt settings.

Menu items

The highlighted item on the menu bar displays the specific items for that menu. For example, selecting **Main** shows the Main menu items.

The other items (My Favorites, Ai Tweaker, Advanced, Boot, Tool, Exit, and Server Mgmt) on the menu bar have their respective menu items.

Submenu items

An arrow sign (>) before each item on any menu screen means that the item has a submenu. To display the submenu, select the item and press <Enter>.

Language

This button above the menu bar contains the languages that you can select for your BIOS. Click this button to select the language that you want to display in your BIOS screen.

My Favorites (F3)

This button above the menu bar shows all BIOS items in a Tree Map setup. Select frequently-used BIOS settings and save it to MyFavorites menu.

Refer to section **My Favorites** for more information.

Search (F9)

This button allows you to search for BIOS items by entering its name, enter the item name to find the related item listing.

ReSize Bar

This button allows you to turn ReSize BAR function on or off.

[On]   Enable ReSize BAR support to fully harness GPU memory.

[Off]   ReSize BAR support will be disabled.

Hot keys

This button above the menu bar contains the navigation keys for the BIOS setup program. Use the navigation keys to select items in the menu and change the settings.

Search on FAQ

Move your mouse over this button to show a QR code, scan this QR code on your mobile device to connect to the BIOS FAQ web page of the ASUS support website. You can also scan the following QR code:

Scroll bar

A scroll bar appears on the right side of a menu screen when there are items that do not fit on the screen. Press the Up/Down arrow keys or <Page Up> / <Page Down> keys to display the other items on the screen.

General help

At the bottom of the menu screen is a brief description of the selected item. Use <F12> key to capture the BIOS screen and save it to the removable storage device.

Configuration fields

These fields show the values for the menu items. If an item is user-configurable, you can change the value of the field opposite the item. You cannot select an item that is not user-configurable.

A configurable field is highlighted when selected. To change the value of a field, select it and press <Enter> to display a list of options.

Last Modified button

This button shows the items that you last modified and saved in BIOS Setup.

3. My Favorites

My Favorites is your personal space where you can easily save and access your favorite BIOS items. You can personalize this screen by adding or removing items.
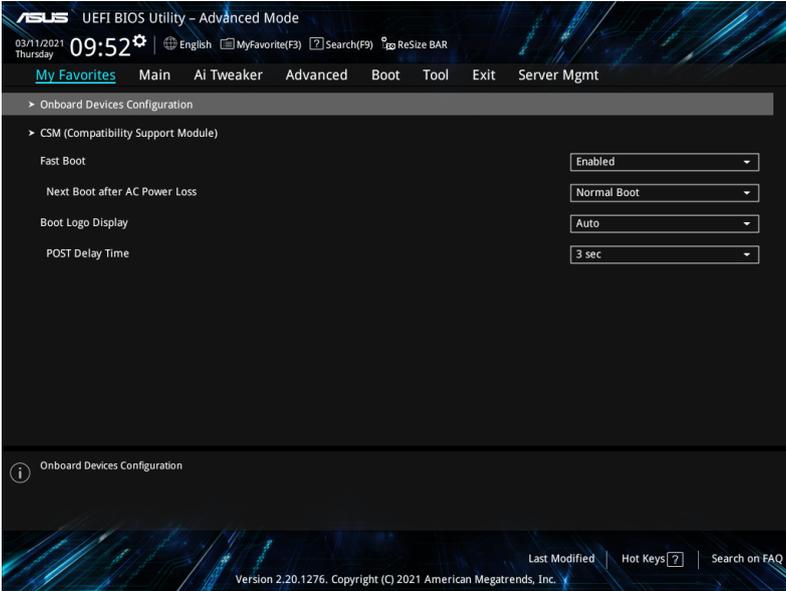
Adding items to My Favorites

To add BIOS items:

1.   Press <F3> on your keyboard or click **MyFavorites(F3)** from the BIOS screen to open Setup Tree Map screen.

2.   On the Setup Tree Map screen, select the BIOS items that you want to save in My Favorites screen.

Main menu panel

Submenu panel

Selected shortcut items

Delete all favorite items

Recover to default favorite items
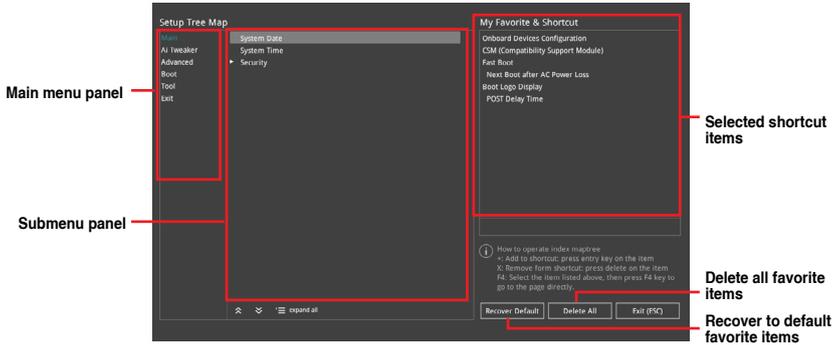
3.   Select an item from main menu panel, then click the submenu that you want to save as favorite from the submenu panel and click ➕ or press <Enter> on your keyboard.

> You cannot add the following items to My Favorite items:
>
> • Items with submenu options.
>
> • User-managed items such as language and boot order.
>
> • Configuration items such as Memory SPD Information, system time and date.

4.   Click **Exit (ESC)** or press <Esc> key to close Setup Tree Map screen.

5.   Go to My Favorites menu to view the saved BIOS items.

4.   Main menu

The Main menu screen appears when you enter the Advanced Mode of the BIOS Setup program. The Main menu provides you an overview of the basic system information, and allows you to set the system date, time, language, and security settings.
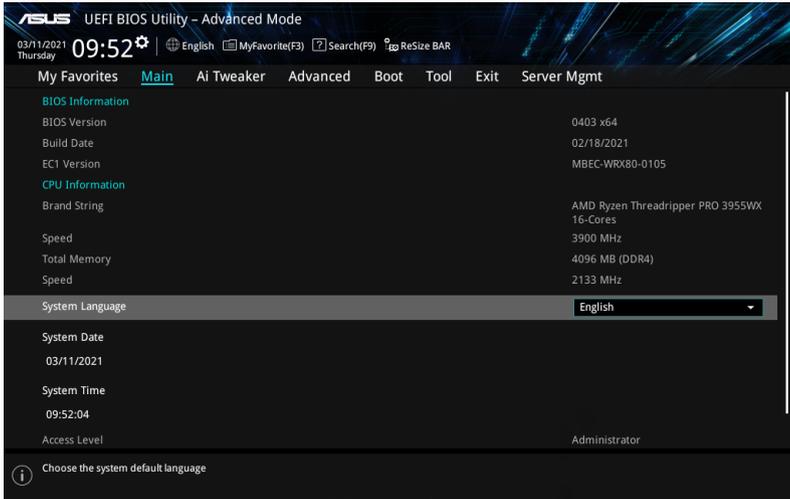
4.1   Security

The Security menu items allow you to change the system security settings.
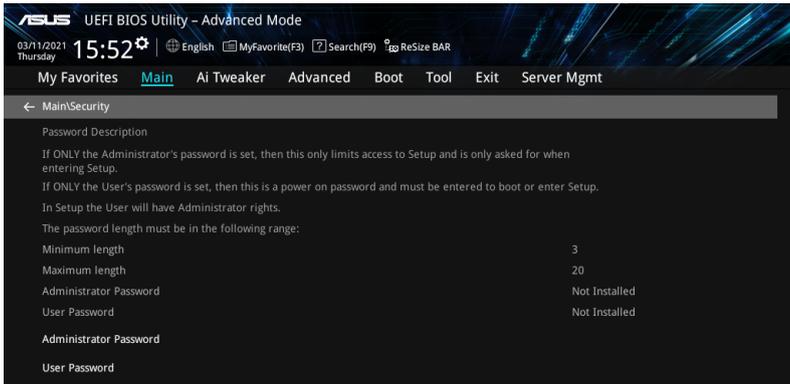
- If you have forgotten your BIOS password, erase the CMOS Real Time Clock (RTC) RAM to clear the BIOS password. See the motherboard for information on how to erase the RTC RAM via the Clear CMOS jumper.

- The Administrator or User Password items on top of the screen show the default **[Not Installed]**. After you set a password, these items show **[Installed]**.

Administrator Password

If you have set an administrator password, we recommend that you enter the administrator password for accessing the system. Otherwise, you might be able to see or change only selected fields in the BIOS setup program.

To set an administrator password:

1.   Select the **Administrator Password** item and press <Enter>.

2.   From the **Create New Password** box, key in a password, then press <Enter>.

3.   Re-type to confirm the password then select **OK**.

To change an administrator password:

1.   Select the **Administrator Password** item and press <Enter>.

2.   From the **Enter Current Password** box, key in the current password, then press <Enter>.

3.   From the **Create New Password** box, key in a new password, then press <Enter>.

4.   Re-type to confirm the password then select **OK**.

To clear the administrator password, follow the same steps as in changing an administrator password, but leave other fields blank then select **OK** to continue. After you clear the password, the **Administrator Password** item on top of the screen shows **[Not Installed]**.

User Password

If you have set a user password, you must enter the user password for accessing the system. The User Password item on top of the screen shows the default **[Not Installed]**. After you set a password, this item shows **[Installed]**.

To set a user password:

1.   Select the **User Password** item and press <Enter>.

2.   From the **Create New Password** box, key in a password, then press <Enter>.

3.   Re-type to confirm the password then select **OK**.

To change a user password:

1.   Select the **User Password** item and press <Enter>.

2.   From the **Enter Current Password** box, key in the current password, then press <Enter>.

3.   From the **Create New Password** box, key in a new password, then press <Enter>.

4.   Re-type to confirm the password then select **OK**.

To clear the user password, follow the same steps as in changing a user password, but leave other fields blank then select **OK** to continue. After you clear the password, the **User Password** item on top of the screen shows **[Not Installed]**.

5.   Ai Tweaker menu

The Ai Tweaker menu items allow you to configure overclocking-related items.

> ⚠️ Be cautious when changing the settings of the Ai Tweaker menu items. Incorrect field values can cause the system to malfunction.

> 📝 The configuration options for this section vary depending on the motherboard model, as well as the CPU and DIMM model you installed on the motherboard.

Scroll down to display other BIOS items.
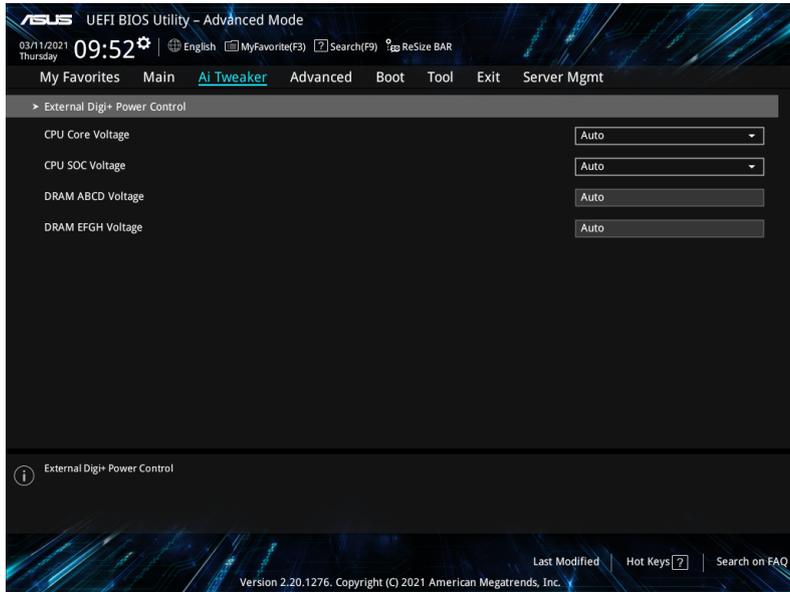
External Digi+ Power Control

VRM Intialization Check

When any error occurs during VRM Initialization, the system will hang at POSTcode 76/77 if this function is enabled.
Configuration options: [Enabled] [Disabled]

CPU Load-line Calibration

CPU Load Line Calibration is defined by AMD VRM spec and affects CPU voltage. The CPU working voltage will decrease proportionally to CPU loading. Higher value could get higher voltage and good overclocking performance but increase the CPU and VRM thermal.
Configuration options [Auto] [Level -2] - [Level 8]

> 📝 The actual performance boost may vary depending on your CPU specification.

⚠️ DO NOT remove the thermal module. The thermal conditions should be monitored.

CPU Current Capability

A higher value brings a wider total power range and extends the overclocking frequency range simultaneously.
Configuration options: [Auto] [100%] - [140%]

✏️ Configure higher values when overclocking or under a high loading for extra power support.

CPU VRM Switching Frequency

Sets the VRM switching frequency. VRM switching frequency affects transient response and VRM component temperatures. Setting a higher switching frequency will result in better transient response at the expense of higher VRM temperatures. Active cooling of the VRM heatsink is recommended when running high CPU voltage and high load-line calibration values.
Configuration options: [Auto] [Manual]

⚠️ DO NOT remove the thermal module. The thermal conditions should be monitored.

✏️ The following item appears only when you set **CPU VRM Switching Frequency** to **[Manual]**.

CPU Voltage Frequency

Switching Frequency will affect the VRM transient response and component thermal. Higher frequency gets quicker transient response. Use the <+> or <-> to adjust the value. The values range from 300kHz to 800kHz with an interval of 50kHz.

✏️ The following item appears only when you set **CPU VRM Switching Frequency** to [**Auto**].

VRM Spread Spectrum

This item allows you to reduce the magnitude of peak noise from the VRM. Enable to reduce peak noise. Disable this setting when overclocking.
Configuration options: [Auto] [Disabled] [Enabled]

CPU Power Duty Control

DIGI+ VRM Duty Control adjusts the current and thermal of every VRM phase component.
[T. Probe]   Select to set the VRM thermal balance mode.
[Extreme]   Select to set the VRM current balance mode.

⚠️ DO NOT remove the thermal module when setting this item to **[Extreme]**. The thermal conditions should be monitored.

CPU Power Phase Control

This item allows you to set the power phase control of the CPU.
Configuration options: [Auto] [Standard] [Optimized] [Power Phase Response]

DO NOT remove the thermal module when setting this item to **[Power Phase Response]**. The thermal conditions should be monitored.

The following item appears only when **CPU Power Phase Control** is set to **[Power Phase Response]**.

Manual Adjustment

Configuration options: [Ultra Fast] [Fast] [Medium] [Regular]

CPU Power Thermal Control

This item allows you to set the VRM thermal cut-off trip point. 115 Celsius is default and recommended for all overclocking and normal use. Can be set to a lower value if a lower thermal cut-off point is preferred. Use the <+> or <-> to adjust the value.

DO NOT remove the VRM heatsink. The thermal conditions should be monitored.

VDDSOC Load Line Calibration

Configuration options: [Auto] [Level 1] [Level 2] [Level 3] [Level 4] [Level 5] [Level 6] [Level 7] [Level 8]

VDDSOC Current Capability

Configuration options: [100%] [110%] [120%] [130%] [140%]

Configure higher values when overclocking or under a high loading for extra power support.

VDDSOC Switching Frequency

Configuration options: [Auto] [Manual]

The following item appears only when **VDDSOC Switching Frequency** is set to **[Manual]**.

Fixed VDDSOC Switching Frequency (KHz)

The switching frequency will affect the VDDSOC transient response speed and the component thermal production. Configure a higher frequency to get a quicker transient response speed. Use the <+> or <-> to adjust the value. The values range from 300kHz to 800kHz with an interval of 50kHz.

VDDSOC Power Thermal Control

A higher temperature brings a wider VDDSOC power thermal range and extends the overclocking tolerance to enlarge O.C. potential. Use the <+> or <-> to adjust the value.

DRAM Current Capability (CHA, CHB, CHC, CHD)

This item allows you to set the shut off current limit for external DRAM voltage regulator. A higher setting will allow the voltage regulator to supply more current while a lower setting will cause the voltage regulator to shut off the system when the supplied current is higher than the set value.
Configuration options: [100%] [110%] [120%] [130%]

Configure higher values when overclocking or when using high current memory stress tests. Auto is configured to work with all configurations by default and should not need adjustments unless running very high memory frequencies with high density modules.

DRAM Current Capability (CHE, CHF, CHG, CHH)

This item allows you to set the shut off current limit for external DRAM voltage regulator. A higher setting will allow the voltage regulator to supply more current while a lower setting will cause the voltage regulator to shut off the system when the supplied current is higher than the set value.
Configuration options: [100%] [110%] [120%] [130%]

Configure higher values when overclocking or when using high current memory stress tests. Auto is configured to work with all configurations by default and should not need adjustments unless running very high memory frequencies with high density modules.

DRAM Power Phase Control (CHA, CHB, CHC, CHD)

[Optimized]   Sets the ASUS optimized phase profile.
[Extreme]   Sets full phase mode.

DRAM Power Phase Control (CHE, CHF, CHG, CHH)

[Optimized]   Sets the ASUS optimized phase profile.
[Extreme]   Sets full phase mode.

DRAM Switching Frequency (CHA, CHB, CHC, CHD)

This item allows you to set the VRM switching frequency. VRM switching frequency affects transient response and VRM component temperatures. Setting a higher frequency will result in better transient response at the expense of more switching noise.
Configuration options: [Auto] [Manual]

The following item appears only when **DRAM Switching Frequency (CHA, CHB, CHC, CHD)** is set to **[Manual]**.

Fixed DRAM Switching Frequency (KHz)(CHA, CHB, CHC, CHD)

The DRAM switching frequency will affect the overclocking range and the system stability. Configure a higher frequency to increase the overclocking range or a lower frequency to enhance the system stability. Use the <+> or <-> to adjust the value. The values range from 300kHz to 500kHz with an interval of 50kHz.

DRAM Switching Frequency (CHE, CHF, CHG, CHH)

This item allows you to set the VRM switching frequency. VRM switching frequency affects transient response and VRM component temperatures. Setting a higher frequency will result in better transient response at the expense of more switching noise.
Configuration options: [Auto] [Manual]

Fixed DRAM Switching Frequency (KHz)(CHE, CHF, CHG, CHH)

The DRAM switching frequency will affect the overclocking range and the system stability. Configure a higher frequency to increase the overclocking range or a lower frequency to enhance the system stability. Use the <+> or <-> to adjust the value. The values range from 300kHz to 500kHz with an interval of 50kHz.

CPU Core Voltage

Configures the mode of Voltage fed to the cores of the processor. Increase to help CPU Core Frequency overclock.
Configuration options: [Auto] [Manual Mode] [Offset Mode]

CPU Core Voltage Override

Allows you to configure the CPU Core voltage. Use the <+> or <-> to adjust the value.
Configuration options: [Auto] [0.750V] - [1.700V]

CPU Offset Mode Sign

[+]   To offset the voltage by a positive value.
[–]   To offset the voltage by a negative value.

CPU Core Voltage Offset

Use the <+> or <-> to adjust the value.
Configuration options: [Auto] [-0.450V] - [0.450V]

CPU SOC Voltage

Increase to help Memory Frequency overclock.
Configuration options: [Auto] [Manual Mode] [Offset Mode]

VDDSOC Voltage Override

Allows you to configure the CPU Core voltage. Use the <+> or <-> to adjust the value.
Configuration options: [Auto] [0.750V] - [1.500V]

VDDSOC Offset Mode Sign

[+]   To offset the voltage by a positive value.
[–]   To offset the voltage by a negative value.

VDDSOC Voltage Offset

Use the <+> or <-> to adjust the value.
Configuration options: [Auto] [-0.600V] - [0.600V]

DRAM ABCD Voltage

Increase to help Memory Frequency overclock. Use the <+> or <-> to adjust the value.
Configuration options: [Auto] [0.500V] - [2.000V]

DRAM EFGH Voltage

Increase to help Memory Frequency overclock. Use the <+> or <-> to adjust the value.
Configuration options: [Auto] [0.500V] - [2.000V]

6.   Advanced menu

The Advanced menu items allow you to change the settings for the CPU and other system devices.

> ⚠️ Be cautious when changing the settings of the Advanced menu items. Incorrect field values can cause the system to malfunction.
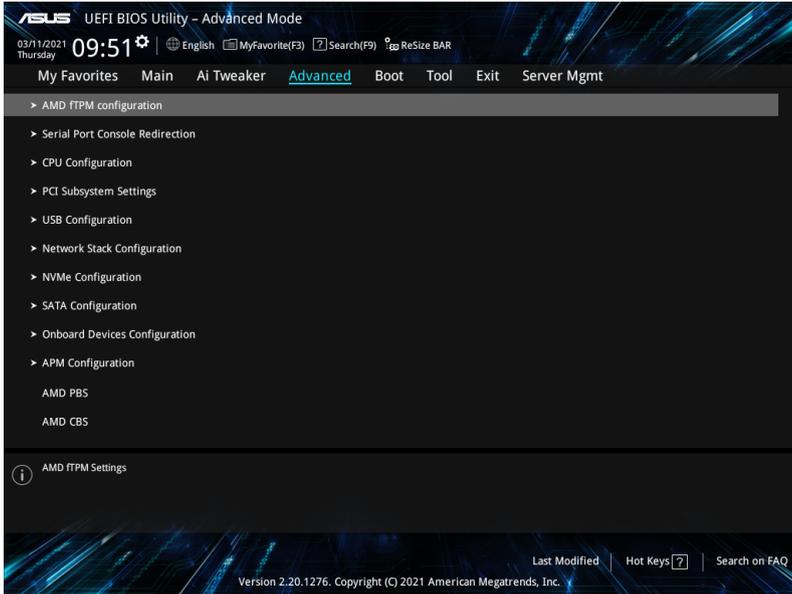
6.1 AMD fTPM configuration

The items in this menu show the AMD fTPM configuration options.
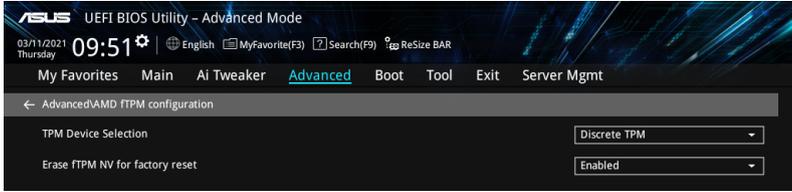
TPM Device Selection

This item allows you to select Firmware TPM or Discrete TPM.

[Firmware TPM]   Enables AMD CPU fTPM.

[Discrete TPM]   Disables AMD CPU fTPM.

> When Firmware TPM is set to Discrete TPM, TPM will be disabled and all saved data on it will be lost.

Erase fTPM NV for factory reset

This item allows you to enable or disable fTPM reset for newly installed CPUs.

[Disabled]   Keep previous fTPM records and continue system boot, fTPM will not be enabled with the new CPU unless fTPM is reset (reinitialized). Swapping back to the old CPU may allow you to recover TPM related keys and data.

[Enabled]   Reset fTPM, if you have Bitlocker or encryption-enabled system, the system will not boot without a recovery key.

6.2 Serial Port Console Redirection

The items in this menu show the Serial Port Console Redirection options.
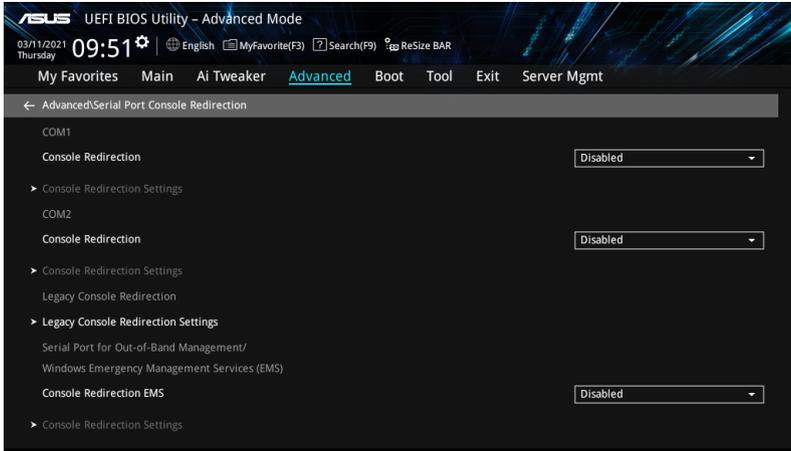
COM1 / COM2

Console Redirection

Allows you to enable or disable the console redirection feature.
Configuration options: [Disabled] [Enabled]

> The following item appears only when **Console Redirection** for COM1 or COM2 is set to **[Enabled]**.

Console Redirection Settings

These items become configurable only when you enable the Console Redirection item. The settings specify how the host computer and the remote computer (which the user is using) will exchange data. Both computers should have the same or compatible settings.

Terminal Type

Allows you to set the terminal type.

[VT100]	ASCII char set.
[VT100+]	Extends VT100 to support color, function keys, etc.
[VT-UTF8]	Uses UTF8 encoding to map Unicode chars onto 1 or more bytes.
[ANSI]	Extended ASCII char set.

Bits per second

Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds.
Configuration options: [9600] [19200] [38400] [57600] [115200]

Data Bits

Configuration options: [7] [8]

Parity

A parity bit can be sent with the data bits to detect some transmission errors. [Mark] and [Space] parity do not allow for error detection. They can be used as an additional data bit.

[None]	None
[Even]	Parity bit is 0 if the num of 1's in the data bits is even.
[Odd]	Parity bit is 0 if num of 1's in the data bits is odd.
[Mark]	Parity bit is always 1.
[Space]	Parity bit is always 0.

Stop Bits

Stop bits indicate the end of a serial data packet. (A start bit indicates the beginning.) The standard setting is 1 stop bit. Communication with slow devices may require more than 1 stop bit.
Configuration options: [1] [2]

Flow Control

Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a "stop" signal can be sent to stop the data flow. Once the buffers are empty, a "start" signal can be sent to re-start the flow. Hardware flow control uses two wires to send start/stop signals.
Configuration options: [None] [Hardware RTS/CTS]

VT -UTF8 Combo Key Support

This allows you to enable the VT -UTF8 Combination Key Support for ANSI/VT100 terminals.
Configuration options: [Disabled] [Enabled]

Recorder Mode

With this mode enabled only text will be sent. This is to capture Terminal data.
Configuration options: [Disabled] [Enabled]

Resolution 100x31

This allows you enable or disable extended terminal solution.
Configuration options: [Disabled] [Enabled]

Putty Keypad

This allows you to select the FunctionKey and Keypad on Putty.
Configuration options: [VT100] [LINUX] [XTERMR6] [SCO] [ESCN] [VT400]

Legacy Console Redirection Settings

Redirection COM Port

Allows you to select a COM port to display redirection of Legacy OS and Legacy OPROM Messages.
Configuration options: [COM1] [COM2]

Resolution

This allows you to set the number of rows and columns supported on the Legacy OS.
Configuration options: [80x24] [80x25]

Redirection After POST

The default setting for this option is set to [Always Enable].

[Bootloader] The legacy Console Redirection is disabled before booting to legacy OS.

[Always Enable] Legacy Console Redirection is enabled for legacy OS.

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

Console Redirection EMS

Allows you to enable or disable the console redirection feature.
Configuration options: [Disabled] [Enabled]

> The following item appears only when **Console Redirection EMS** is set to **[Enabled]**.

Console Redirection Settings

Out-of-Band Mgmt Port

Microsoft Windows Emergency Management Services (EMS) allow for remote management of a Windows Server OS through a serial port.
Configuration options: [COM1] [COM2]

Terminal Type EMS

VT-UTF8 is the preferred terminal type for out0of-band management. The next best choice is VT100+, and then VT100. See above, in Console Redirection Settings page for more help with Terminal Type/Emulation.
Configuration options: [VT100] [VT100+] [VT-UTF8] [ANSI]

Bits per second EMS

Selects serial port transmission speed. The speed must be matched on the other side. Long or noisy lines may require lower speeds.
Configuration options: [9600] [19200] [57600] [115200]

Flow Control EMS

Flow control can prevent data loss from buffer overflow. When sending data, if the receiving buffers are full, a "stop" signal can be sent to stop the data flow. Once the buffers are empty, a "start" signal can be sent to re-start the flow. Hardware flow control uses two wires to send start/stop signals.
Configuration options: [None] [Hardware RTS/CTS] [Software Xon/Xoff]

6.3 CPU Configuration

The items in this menu show the CPU-related information that the BIOS automatically detects.

The items in this menu may vary based on the CPU installed.

Scroll down to display other BIOS items.
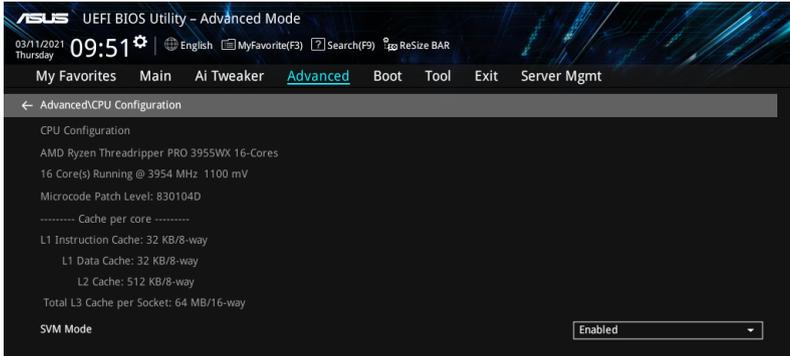
SVM Mode

This item allows you enable or disable CPU Virtualization.
Configuration options: [Disabled] [Enabled]

6.4 PCI Subsystem Settings

Allows you to configure PCI, PCI-X, and PCI Express Settings.
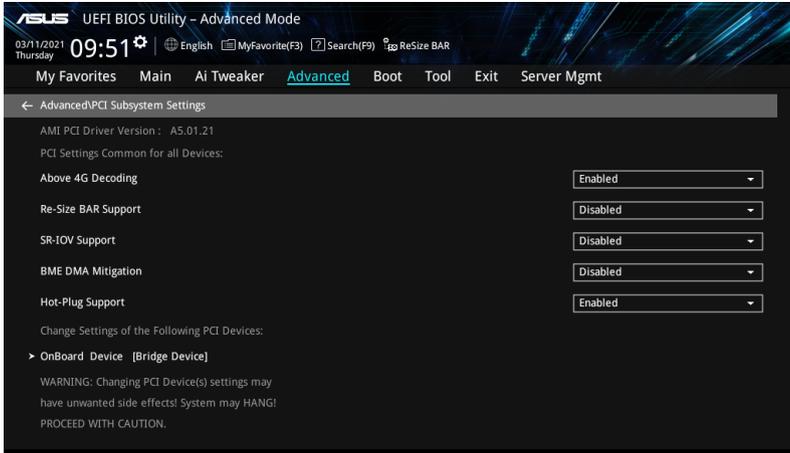
Above 4G Decoding

Allows you to enable or disable 64-bit capable devices to be decoded in above 4G address space. It only works if the system supports 64-bit PCI decoding.
Configuration options: [Disabled] [Enabled]

> The following item appears only when **Above 4G Decoding** is set to **[Enabled]**.

Re-Size BAR Support

If system has Resizable BAR capable PCIe Devices, this option enables or disables Resizable BAR Support. (Only if system supports 64-bit PCI Decoding).
Configuration options: [Disabled] [Auto]

SR-IOV Support

Allows you to enable or disable Single Root IO Virtualization Support if the system has SR-IOV capable PCIe devices.
Configuration options: [Disabled] [Enabled]

BME DMA Mitigation

This allows you to enable or disable re-enabling Bus Master Attribute disabled during Pci enumeration for PCI Bridges after SMM locked.
Configuration options: [Disabled] [Enabled]

Hot-Plug Support

This allows you to globally enable or disable Hot-Plug support for the entire system. If system has Hot-Plug capable Slots and this option is set to Enabled, it provides a Setup screen for selecting PCI resource padding for Hot-Plug.
Configuration options: [Disabled] [Enabled]

Onboard Device [Bridge Device]

The options in this submenu allows you to change On Board PCI Device or PCI Slot Settings.

⚠️ Changing PCI Device(s) settings may have unwanted side effects! System may HANG! PROCEED WITH CAUTION.

PCI Latency Timer

This option allows you to set the value to be programmed into PCI Latency Timer Register.
Configuration options: [32 PCI Bus Clocks] [64 PCI Bus Clocks] [96 PCI Bus Clocks] [128 PCI Bus Clocks] [160 PCI Bus Clocks] [192 PCI Bus Clocks] [224 PCI Bus Clocks] [248 PCI Bus Clocks]

PCI-X Latency Timer

This option allows you to set the value to be programmed into PCI Latency Timer Register.
Configuration options: [32 PCI Bus Clocks] [64 PCI Bus Clocks] [96 PCI Bus Clocks] [128 PCI Bus Clocks] [160 PCI Bus Clocks] [192 PCI Bus Clocks] [224 PCI Bus Clocks] [248 PCI Bus Clocks]

VGA Palette Snoop

This option enables or disables VGA Palette Registers Snooping.
Configuration options: [On] [Off]

PERR# Generation

This option enables or disables PCI Device to Generate PERR#.
Configuration options: [On] [Off]

SERR# Generation

This option enables or disables PCI Device to Generate SERR#.
Configuration options: [On] [Off]

Disable Above 4G Decoding

This item enables or disables 64-bit capable devices to be allocated in above 4G address space.
Configuration options: [On] [Off]

Disable Above 4G Decoding

This item enables or disables BIOS built-in Hot-Plug support for currently selected On Board Device or Slot.
Configuration options: [On] [Off]

Disable PCIe Init

This item enables or disables BIOS built-in PCI Express Initialization for currently selected and down stream PCI Device(s).
Configuration options: [On] [Off]

PCI Express GEN 1 Settings

The items in this submenu allow you to change PCI Express GEN 1 Settings of this Device.

Relaxed Ordering

This option allows you to enable or disable PCI Express Device Relaxed Ordering.
Configuration options: [On] [Off]

Extended Tag

If this option is set to **[On]**, it allows Device to use 8-bit Tag field as requester.
Configuration options: [On] [Off]

No Snoop

This option allows you to enable or disable PCI Express No Snoop.
Configuration options: [On] [Off]

Maximum Payload

This option allows you to set Maximum Payload of PCI Express Device or allow System BIOS to select the value.
Configuration options: [Auto] [128 Bytes] [256 Bytes] [512 Bytes] [512 Bytes] [1024 Bytes] [2048 Bytes] [4096 Bytes]

Maximum Read Request

This option allows you to set Maximum Request Size of PCI Express Device or allow System BIOS to select the value.
Configuration options: [Auto] [128 Bytes] [256 Bytes] [512 Bytes] [512 Bytes] [1024 Bytes] [2048 Bytes] [4096 Bytes]

ASPM Support

This option allows you to set the ASPM Level.
[Disabled]   Disables ASPM.
[Auto]   BIOS auto configure.
[Force L0s]   Force all links to L0s State.

> Enabling ASPM may cause some PCI-E devices to fail!

Extended Synch

If this option is set to **[On]**, allows generation of Extended Synchronization patterns.
Configuration options: [On] [Off]

Clock Power Management

If supported by hardware and is set to [On], the device is permitted to use CLKREQ# signal for power management of Link clock in accordance to protocol defined in appropriate form factor specification.
Configuration options: [On] [Off]

Link Training Retry

This option allows you to define the number of Retry Attempts software will take to retrain the link if previous training attempt was unsuccessful.
Configuration options: [Disabled] [2] [3] [5]

Link Training Timeout (uS)

This option allows you to define the number of Microseconds software will wait before polling 'Link Training' bit in Link Status register. Use the <+> or <-> to adjust the value. Values range from 10uS to 10000uS with an interval of 10uS.

Disable Empty Links

In order to save power, software will disable unpopulated PCI Express links, if this option is set to 'Disable Link'.
Configuration options: [On] [Off]

PCI Hot-Plug Settings

The items in this submenu allow you to change Build time Defined Hot-Plug Settings.

PCI Buses Padding

Pad PCI Buses behind the bridge for Hot-Plug.
Configuration options: [Disabled] [1] - [10]

IO Resources Padding

Pad PCI I/O Resources behind the bridge for Hot-Plug.
Configuration options: [Disabled] [4 K] [8 K] [16 K] [32 K]

MMIO 32 bit Resources Padding

Pad PCI MMIO 32-bit Resources behind the bridge for Hot-Plug.
Configuration options: [Disabled] [1 M] [2 M] [4 M] [8 M] [16 M] [32 M] [64 M] [128 M] [256 M] [512 M]

PFMMIO 32 bit Resources Padding

Pad PCI MMIO 32-bit Prefetchable Resources behind the bridge for Hot-Plug.
Configuration options: [Disabled] [1 M] [2 M] [4 M] [8 M] [16 M] [32 M] [64 M] [128 M] [256 M] [512 M]

PFMMIO 64 bit Resources Padding

Pad PCI MMIO 64-bit Prefetchable Resources behind the bridge for Hot-Plug.
Configuration options: [Disabled] [1 M] [2 M] [4 M] [8 M] [16 M] [32 M] [64 M] [128 M] [256 M] [512 M] [1 G] [2 G] [4 G] [8 G]

Due to the Bridge Architecture Specification Software can not apply selected padding for 64 and 32 bit PFMMIO window at the same time. User must pick which PFMMIO they want to pad by setting another resource to Disable state. If both PFMMIO are set, 32 bit resource will be used.

6.5   USB Configuration

The items in this menu allow you to change the USB-related features.
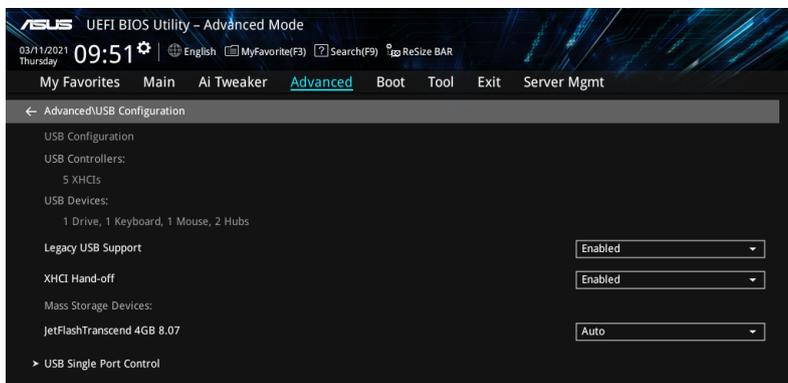
The **Mass Storage Devices** item shows the auto-detected values. If no USB device is detected, the item shows **None**.

Legacy USB Support

[Enabled]	Your system supports the USB devices in legacy operating systems.
[Disabled]	Your USB devices can be used for BIOS setup only and cannot be recognized in the boot devices list.
[Auto]	Your system automatically detects the presence of USB devices at startup. If any USB devices are detected, the legacy USB support is enabled.

XHCI Hand-off

[Enabled]	Enables the support for operating systems without an XHCI hand-off feature.
[Disabled]	Disables the XHCI Hand-off support.

Mass Storage Devices

Allows you to select the mass storage device emulation type for devices connected. Configuration options: [Auto] [Floppy] [Forced FDD] [Hard Disk] [CD-ROM]

USB Single Port Control

This item allows you to enable or disable the individual USB ports.

Refer to section **Motherboard layout** in your motherboard user manual for the location of the USB ports.

6.6 Network Stack Configuration

The items in this menu allow you to enable or disable the UEFI network stack
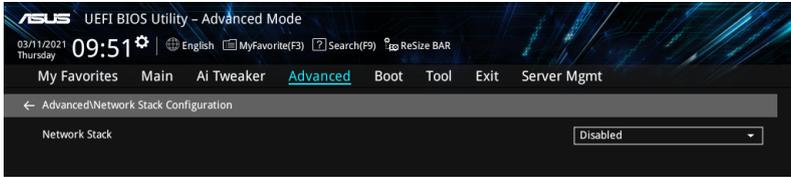
Network stack

This item allows you to disable or enable the UEFI network stack.
Configuration options: [Disable] [Enable]

> The following items appear only when **Network Stack** is set to **[Enabled]**.

Ipv4/Ipv6 PXE Support

This item allows you to enable or disable the Ipv4/Ipv6 PXE wake event.
Configuration options: [Disabled] [Enabled]

6.7 NVMe Configuration

This menu displays the NVMe controller and Drive information of the connected devices.
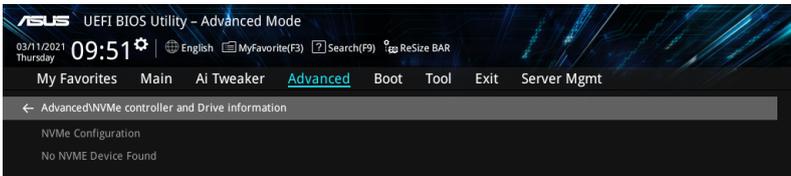
Device

> The devices and names shown in the NVMe configuration list depends on the connected devices. If no devices are connected, No NVMe Device Found will be displayed.

Self Test Option [Short]

This option allows you to select either Short or Extended Self Test. Short option will take couple of minutes, and the extended option will take several minutes to complete.
Configuration options: [Short] [Extended]

Self Test Action [Controller Only Test]

This item allows you to select either to test Controller alone or Controller and NameSpace. Selecting Controller and Namespace option will take a lot longer to complete the test.
Configuration options: [Controller Only Test] [Controller and NameSpace Test]

Run Device Self Test

Press <Enter> to perform device self test for the corresponding Option and Action selected by the user. Pressing the <ESC> key will abort the test. The results shown below is the most recent result logged in the device.

6.8   SATA Configuration

While entering Setup, the BIOS automatically detects the presence of SATA devices. The SATA Port items show **Not Present** if no SATA device is installed to the corresponding SATA port.
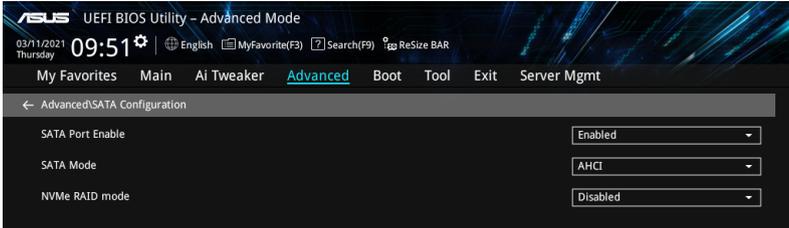
SATA Port Enable

This item allows you to enable or disable the SATA Device.
Configuration options: [Disabled] [Enabled]

> The following item appears only when **SATA Port Enable** is set to **[Enabled]**.

SATA Mode

This item allows you to set the SATA configuration.

[AHCI]   Set to [AHCI] when you want the SATA hard disk drives to use the AHCI (Advanced Host Controller Interface). The AHCI allows the onboard storage driver to enable advanced Serial ATA features that increases storage performance on random workloads by allowing the drive to internally optimize the order of commands.

[RAID]   Set to [RAID] when you want to create a RAID configuration from the SATA hard disk drives.

NVMe RAID Mode

This item allows you to enable or disable the NVMe RAID mode.
Configuration options: [Disabled] [Enabled]

6.9 Onboard Devices Configuration

The items in this menu allow you to switch between PCIe Lanes and configure onboard devices.
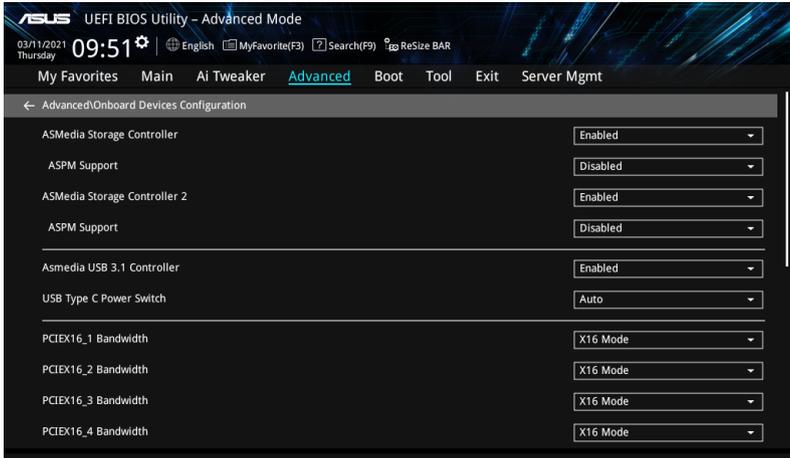
ASMedia Storage Controller

This item allows you to enable or disable the ASMedia storage controller.
Configuration options: [Disabled] [Enabled]

> The following items appear only when **ASMedia Storage Controller** is set to **[Enabled]**.

ASPM Support

This item allows you to enable or disable the controller ASPM (Actice State Power Management) for energy saving support.
Configuration options: [Disabled] [Enabled]

ASMedia Storage Controller 2

This item allows you to enable or disable the ASMedia storage controller 2.
Configuration options: [Disabled] [Enabled]

> The following items appear only when **ASMedia Storage Controller 2** is set to **[Enabled]**.

ASPM Support

This item allows you to enable or disable the controller ASPM (Actice State Power Management) for energy saving support.
Configuration options: [Disabled] [Enabled]

Asmedia USB 3.1 Controller

This item allows you to enable or disable the Asmedia USB 3.1.
Configuration options: [Disabled] [Enabled]

USB Type C Power Switch

[Auto]   The system automatically detects the USB type C devices and provides the required power.

[Enabled]   The USB type C port will always provide power to your devices.

> ⚠️ Improper connections may damage the system permanently.

PCIEX16_1-7 Bandwidth

[x16 Mode]   Run x16 mode.

[PCIe RAID Mode] Run x4+x4+x4+x4 mode to create a RAID arrat for up to 4 PCIE devices.

> 📝 Use PCIE RAID mode when installing the Hyper M.2 x16 card or other M.2 adapter cards. Installing other devices when using PCIE RAID mode may cause your PC to fail to boot.

U.2_1 mode

The U.2_1 slot shares bandwidth with M.2_2, when M.2_2 slot is being populated, U.2_1 slot will be disabled.
Configuration options: [PCI-E] [SATA]

U.2_2 mode

The U.2_2 slot shares bandwidth with M.2_3, when M.2_3 slot is being populated, U.2_1 slot will be disabled.
Configuration options: [PCI-E] [SATA]

Wi-Fi 6 (802.11ax) Controller

This option allows you to enable or disable Wi-Fi 6 (802.11ax) Controller.
Configuration options: [Disabled] [Enabled]

Bluetooth Controller

This option allows you to enable or disable Bluetooth Controller.
Configuration options: [Disabled] [Enabled]

Intel LAN Controller

This option allows you to enable or disable Intel LAN.
Configuration options: [Disabled] [Enabled]

> 📝 The following items appear only when **Intel LAN Controller** is set to **[Enabled]**.

Intel LAN OPROM

This option allows you to enable or disable launch of Intel PXE OPROM
Configuration options: [Disabled] [Enabled]

HD Audio Controller

This item allows you to use the Azalia High Definition Audio Controller.
Configuration options: [Disabled] [Enabled]

Serial Port Configuration

This submenu allows you to set parameters for Serial Port.

> This item will only function if there is a serial port (COM) connector on your motherboard.

Serial Port

This item allows you to enable or disable the Serial port.
Configuration options: [Enabled] [Disabled]

> The following item appears only when **Serial Port** is set to **[Enabled]**.

Change settings

This item allows you to select an optimal setting for super IO device.
Configuration options: [IO=3F8h; IRQ=4] [IO=2F8h; IRQ=3] [IO=3E8h; IRQ=4]
[IO=2E8h; IRQ=3]

6.10   APM Configuration
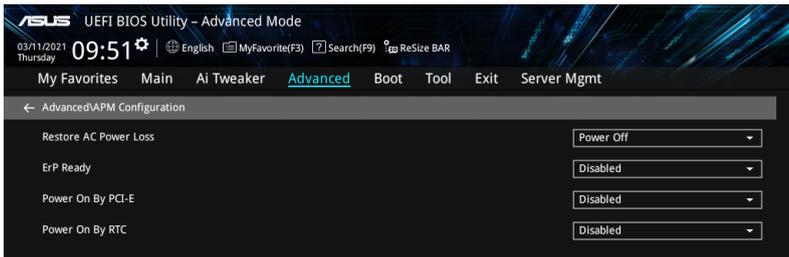
Restore AC Power Loss

This item allows your system to go to ON state, OFF state, or both states after an AC power
loss. When setting your system to [Last State], it goes to the previous state before the AC
power loss.
Configuration options: [Power Off] [Power On] [Last State]

ErP Ready

This item allows you to switch off some power at S4+S5 or S5 to get the system ready for
ErP requirement. When set to **[Enabled]**, all other PME options are switched off.
Configuration options: [Disabled] [Enabled (S4+S5)] [Enabled (S5)]

Power On By PCI-E

This item allows you to enable or disable the Wake-on-LAN function of the onboard LAN
controller or other installed PCI-E LAN cards.
Configuration options: [Disabled] [Enabled]

Power On By RTC

This item allows you to enable or disable the RTC (Real-Time Clock) to generate a wake
event and configure the RTC alarm date. When enabled, you can set the days, hours,
minutes, or seconds to schedule an RTC alarm date.
Configuration options: [Disabled] [Enabled]

6.11   AMD PBS

The items in this menu shows the AMD PBS Setup page.
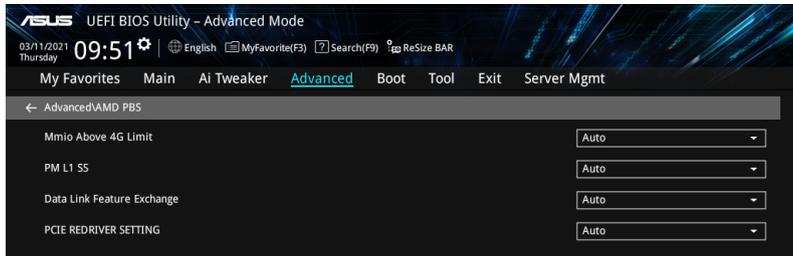
This item is only available when **Above 4G Decoding** in **PCI Subsystem Settings** is set to **[Enabled]**.

Mmio Above 4G Limit

This item allows you to set PCI-E device aperture range to 38~43 bits limit.
Configuration options: [Auto] [38] - [43]

PM L1 SS

This item allows you to enable PM L1 SS and ASPM L1 SS.
Configuration options: [Auto] [Disabled] [L1.1] [L1.2] [L1.1_L1.2]

Data Link Feature Exchange

This item allows you to enable or disable Data Link Feature Exchange, try disabling this option if any legacy endpoint cannot boot. Selecting [Auto] will disable DLF on all non x16 PCIe slots.
Configuration options: [Auto] [Disabled] [Enabled]

PCIE REDRIVER SETTING

This item allows you to configure PCIE REDRIVER TX/RX Setting.
Configuration options: [Auto] [Manual]

The following items appear only when **PCIE REDRIVER SETTING** is set to **[Manual]**.

PCIE REDRIVER TX (SLOT5)

Configuration options: [Disabled] [Enabled]

The following items appear only when **PCIE REDRIVER TX (SLOT5)** is set to **[Enabled]**.

Equalizer Setting (db)

EQ[2:0] are the selection pins for the equalization selection. It corresponds to @1.25GHz_@2.5GHz_@4GHz_@8GHz in turn.
Configuration options: [0.2_1.0_2.3_5.6] [0.2_1.1_2.6_6.2] [1.8_2.7_3.9_7.0]
[2.1_3.3_4.8_8.5] [3.0_4.2_5.8_9.4] [3.2_4.6_6.5_10.4] [4.3_5.8_7.8_11.7]
[4.5_6.5_8.8_13.0]

Flat Gain Setting (db)

FG[1:0] are the selection bits for the DC gain.
Configuration options: [-3.5] [-2] [-0.5] [1]

Swing Setting (mVp-p)

SW[1:0] are the selection bits for the output swing value.
Configuration options: [800] [1000] [1100] [1200]

PCIE REDRIVER RX (SLOT5)

Configuration options: [Disabled] [Enabled]

The following items appear only when **PCIE REDRIVER RX (SLOT5)** is set to **[Enabled]**.

Equalizer Setting (db)

EQ[2:0] are the selection pins for the equalization selection. It corresponds to
@1.25GHz_@2.5GHz_@4GHz_@8GHz in turn.
Configuration options: [0.2_1.0_2.3_5.6] [0.2_1.1_2.6_6.2] [1.8_2.7_3.9_7.0]
[2.1_3.3_4.8_8.5] [3.0_4.2_5.8_9.4] [3.2_4.6_6.5_10.4] [4.3_5.8_7.8_11.7]
[4.5_6.5_8.8_13.0]

Flat Gain Setting (db)

FG[1:0] are the selection bits for the DC gain.
Configuration options: [-3.5] [-2] [-0.5] [1]

Swing Setting (mVp-p)

SW[1:0] are the selection bits for the output swing value.
Configuration options: [800] [1000] [1100] [1200]

PCIE REDRIVER TX (SLOT6)

Configuration options: [Disabled] [Enabled]

The following items appear only when **PCIE REDRIVER TX (SLOT6)** is set to **[Enabled]**.

Equalizer Setting (db)

EQ[2:0] are the selection pins for the equalization selection. It corresponds to
@1.25GHz_@2.5GHz_@4GHz_@8GHz in turn.
Configuration options: [0.2_1.0_2.3_5.6] [0.2_1.1_2.6_6.2] [1.8_2.7_3.9_7.0]
[2.1_3.3_4.8_8.5] [3.0_4.2_5.8_9.4] [3.2_4.6_6.5_10.4] [4.3_5.8_7.8_11.7]
[4.5_6.5_8.8_13.0]

Flat Gain Setting (db)

FG[1:0] are the selection bits for the DC gain.
Configuration options: [-3.5] [-2] [-0.5] [1]

Swing Setting (mVp-p)

SW[1:0] are the selection bits for the output swing value.
Configuration options: [800] [1000] [1100] [1200]

PCIE REDRIVER RX (SLOT6)

Configuration options: [Disabled] [Enabled]

Equalizer Setting (db)

EQ[2:0] are the selection pins for the equalization selection. It corresponds to @1.25GHz_@2.5GHz_@4GHz_@8GHz in turn.
Configuration options: [0.2_1.0_2.3_5.6] [0.2_1.1_2.6_6.2] [1.8_2.7_3.9_7.0] [2.1_3.3_4.8_8.5] [3.0_4.2_5.8_9.4] [3.2_4.6_6.5_10.4] [4.3_5.8_7.8_11.7] [4.5_6.5_8.8_13.0]

Flat Gain Setting (db)

FG[1:0] are the selection bits for the DC gain.
Configuration options: [-3.5] [-2] [-0.5] [1]

Swing Setting (mVp-p)

SW[1:0] are the selection bits for the output swing value.
Configuration options: [800] [1000] [1100] [1200]

PCIE REDRIVER TX (SLOT7)

Configuration options: [Disabled] [Enabled]

Equalizer Setting (db)

EQ[2:0] are the selection pins for the equalization selection. It corresponds to @1.25GHz_@2.5GHz_@4GHz_@8GHz in turn.
Configuration options: [0.2_1.0_2.3_5.6] [0.2_1.1_2.6_6.2] [1.8_2.7_3.9_7.0] [2.1_3.3_4.8_8.5] [3.0_4.2_5.8_9.4] [3.2_4.6_6.5_10.4] [4.3_5.8_7.8_11.7] [4.5_6.5_8.8_13.0]

Flat Gain Setting (db)

FG[1:0] are the selection bits for the DC gain.
Configuration options: [-3.5] [-2] [-0.5] [1]

Swing Setting (mVp-p)

SW[1:0] are the selection bits for the output swing value.
Configuration options: [800] [1000] [1100] [1200]

PCIE REDRIVER RX (SLOT7)

Configuration options: [Disabled] [Enabled]

Equalizer Setting (db)

EQ[2:0] are the selection pins for the equalization selection. It corresponds to @1.25GHz_@2.5GHz_@4GHz_@8GHz in turn.
Configuration options: [0.2_1.0_2.3_5.6] [0.2_1.1_2.6_6.2] [1.8_2.7_3.9_7.0] [2.1_3.3_4.8_8.5] [3.0_4.2_5.8_9.4] [3.2_4.6_6.5_10.4] [4.3_5.8_7.8_11.7] [4.5_6.5_8.8_13.0]

Flat Gain Setting (db)

FG[1:0] are the selection bits for the DC gain.
Configuration options: [-3.5] [-2] [-0.5] [1]

Swing Setting (mVp-p)

SW[1:0] are the selection bits for the output swing value.
Configuration options: [800] [1000] [1100] [1200]

PCIE REDRIVER TX (M.2_2)

Configuration options: [Disabled] [Enabled]

The following items appear only when **PCIE REDRIVER RX (M.2_2)** is set to **[Enabled]**.

Equalizer Setting (db)

EQ[2:0] are the selection pins for the equalization selection. It corresponds to
@1.25GHz_@2.5GHz_@4GHz_@8GHz in turn.
Configuration options: [0.2_1.0_2.3_5.6] [0.2_1.1_2.6_6.2] [1.8_2.7_3.9_7.0]
[2.1_3.3_4.8_8.5] [3.0_4.2_5.8_9.4] [3.2_4.6_6.5_10.4] [4.3_5.8_7.8_11.7]
[4.5_6.5_8.8_13.0]

Flat Gain Setting (db)

FG[1:0] are the selection bits for the DC gain.
Configuration options: [-3.5] [-2] [-0.5] [1]

Swing Setting (mVp-p)

SW[1:0] are the selection bits for the output swing value.
Configuration options: [800] [1000] [1100] [1200]

PCIE REDRIVER RX (M.2_2)

Configuration options: [Disabled] [Enabled]

The following items appear only when **PCIE REDRIVER RX (M.2_2)** is set to **[Enabled]**.

Equalizer Setting (db)

EQ[2:0] are the selection pins for the equalization selection. It corresponds to
@1.25GHz_@2.5GHz_@4GHz_@8GHz in turn.
Configuration options: [0.2_1.0_2.3_5.6] [0.2_1.1_2.6_6.2] [1.8_2.7_3.9_7.0]
[2.1_3.3_4.8_8.5] [3.0_4.2_5.8_9.4] [3.2_4.6_6.5_10.4] [4.3_5.8_7.8_11.7]
[4.5_6.5_8.8_13.0]

Flat Gain Setting (db)

FG[1:0] are the selection bits for the DC gain.
Configuration options: [-3.5] [-2] [-0.5] [1]

Swing Setting (mVp-p)

SW[1:0] are the selection bits for the output swing value.
Configuration options: [800] [1000] [1100] [1200]

6.12   AMD CBS

The items in this menu shows the AMD Common BIOS Specifications.
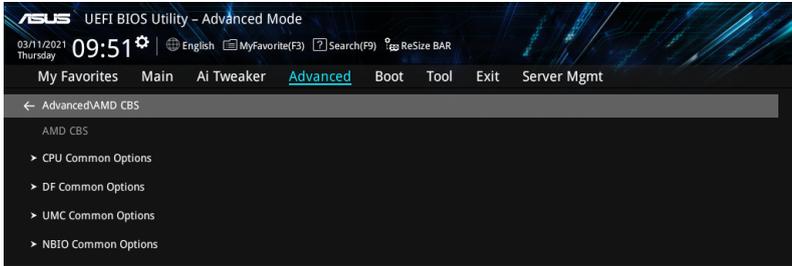
CPU Common Options

Performance

Prefetcher settings

L1 Stream HW Prefetcher

This item allows you to enable or disable L1 Stream HW Prefetcher.
Configuration options: [Auto] [Disabled] [Enabled]

L2 Stream HW Prefetcher

This item allows you to enable or disable L2 Stream HW Prefetcher.
Configuration options: [Auto] [Disabled] [Enabled]

Platform First Error Handling

Enable or disable PFEH, cloack individual banks, and mask deferred error interrupts
from each bank. This feature must be disabled on B1 stepping.
Configuration options: [Enabled] [Disabled] [Auto]

Core Performance Boost

This item allows you to disable Core Performance Boost.
Configuration options: [Auto] [Disabled]

Global C-state Control

This item allows you to control IO based C-state generation and DF C-states.
Configuration options: [Auto] [Disabled] [Enabled]

DF Common Options

Scrubber

DRAM scrub time

This item allows you to set a number of hours to scrub memory.
Configuration options: [Disabled] [1 hour] - [48 hours] [Auto]

Poison scrubber control

Configuration options: [Disabled] [Enabled] [Auto]

Redirect scrubber control

Configuration options: [Disabled] [Enabled] [Auto]

Redirect scrubber limit

Controls the number or redirect scrubs allowed at any one time.
Configuration options: [2] [4] [8] [Infinite] [Auto]

Memory Addressing

NUMA nodes per socket

Specifies the number of desired NUMA nodes per socket. Zero will attempt to interleave the two sockets together.
Configuration options: [NPS0] [NPS1] [NPS2] [NPS4] [Auto]

Memory interleaving

This item allows for disabling memory channel interleaving.
Configuration options: [Disabled] [Auto]

NUMA nodes per socket will be honored regardless of this setting.

Memory interleaving size

This item controls the memory interleaving size. The valid values are AUTO, 256 bytes, 512 bytes, 1 Kbytes, or 2 Kbytes. This also determines the starting address of the interleave (bit 8, 9, 10, or 11).
Configuration options: [256 Bytes] [512 Bytes] [1 KB] [2 KB] [Auto]

1TB remap

Attempt to remap DRAM out of the space just below the 1TB boundary. The ability to remap depends on DRAM configuration, NPS, and interleaving selection, and may not always be possible.
Configuration options: [Do not remap] [Attempt to remap] [Auto]

DRAM map inversion

Inverting the map will cause the highest memory channels to get assigned the lowest addresses in the system.
Configuration options: [Disabled] [Enabled] [Auto]

ACPI

ACPI SRAT L3 Cache As NUMA Domain

[Disabled]   Memory Addressing \ NUMA nodes per socket will be declared.
[Enabled]   Each CCX in the system will be declared as a separate NUMA Domain.
[Auto]   Auto.

ACPI SLIT Distance Control

This option determines how the SLIT distances are declared.
Configuration options: [Auto] [Manual]

The following item appears only when **ACPI SLIT Distance Control** is set to **[Auto]**.

ACPI SLIT remote relative distance

This item allows you to set the remote socket distance for 2P systems as near (2.8) or far (3.2).
Configuration options: [Near] [Far] [Auto]

The following items appear only when **ACPI SLIT Distance Control** is set to **[Manual]**.

ACPI SLIT same socket distance

Specify the distance to other physical domains within the same socket.

ACPI SLIT remote socket distance

Specify the distance to domains the remote socket.

ACPI SLIT local SLink distance

Specify the distance to an SLink domain on the same socket.

ACPI SLIT remote SLink distance

Specify the distance to an SLink domain on the other socket.

ACPI SLIT local inter-SLink distance

Specify the distance between two SLink domains on the same socket.

ACPI SLIT remote inter-SLink distance

Specify the distance between two SLink domains, each on a different socket.

Link

GMI encryption control

This item allows you to control the GMI link encryption.
Configuration options: [Disabled] [Enabled] [Auto]

xGMI encryption control

This item allows you to control the xGMI link encryption.
Configuration options: [Disabled] [Enabled] [Auto]

CAKE CRC perf bounds control

Configuration options: [Auto] [Manual]

The following item appears only when **CAKE CRC perf bounds control** is set to **[Manual]**.

CAKE CRC perf bounds

This item specifies the amount of performance loss that is acceptable to enable CRC protection. Units are in 0.00001%, RangeL disabled (0) - 10% (1000000).

4-link xGMI max speed

Configuration options: [6.4Gbps] [7.467Gbps] [8.533Gbps] [9.6Gbps] [10.667Gbps] [11Gbps] [12Gbps] [13Gbps] [14Gbps] [15Gbps] [16Gbps] [17Gbps] [18Gbps] [19Gbps] [20Gbps] [21Gbps] [22Gbps] [23Gbps] [24Gbps] [25Gbps] [Auto]

3-link xGMI max speed

Configuration options: [6.4Gbps] [7.467Gbps] [8.533Gbps] [9.6Gbps] [10.667Gbps] [11Gbps] [12Gbps] [13Gbps] [14Gbps] [15Gbps] [16Gbps] [17Gbps] [18Gbps] [19Gbps] [20Gbps] [21Gbps] [22Gbps] [23Gbps] [24Gbps] [25Gbps] [Auto]

xGMI TXEQ Mode

This option allows you to select the XGMI TXEQ/RX viewing mode.
Configuration options: [TXEQ_Disabled] [TXEQ_Lane] [TXEQ_Link] [TXEQ_RX_Vet] [Auto]

Disable DF to external downstream IP SyncFloodPropagation

This item allows you to enable or disable Error propagation to UMC or any downstream slaves e.g. FCH. Use this to avoid reset in failure scenario.
Configuration options: [Sync Flood disabled] [Sync Flood enabled] [Auto]

Disable DF sync flood propagation

This item allows you to enable or disable propagation from PIE to other DF components and eventually to SDP ports.
Configuration options: [Sync Flood disabled] [Sync Flood enabled] [Auto]

Freeze DF module queues on error

This item allows you to enable or disable freezing of all DF queues on error and also forces a sync flood on HWA even if MCAs are disabled.
Configuration options: [Disabled] [Enabled] [Auto]

CC6 memory region encryption

This item allows you to control whether or not the CC6 save/restore memory is encrypted.
Configuration options: [Disabled] [Enabled] [Auto]

Memory Clear

This item allows you to enable or disable memory clear. When this item is set to [Disabled], BIOS does not implement MemClear after memory training (only if non-ECC DIMMs are used).
Configuration options: [Disabled] [Enabled] [Auto]

UMC Common Options

DDR4 Common Options

DRAM Timing Configuration

This item allows you to enable DRAM timing configuration.

> ⚠️ Damage caused by use of your AMD processor outside of specification or in excess of factory settings are not covered by your system manufacturers warranty.

> 🖉 The following items appear only when **[Accept]** is selected for **DRAM Timing Configuration**.

Overclock

Configuration options: [Auto] [Enabled]

Memory Clock Speed

Specifies the memory clock frequency.
Configuration options: [Auto] [667MHz] [800MHz] [933MHz] [1067MHz]
[1200MHz] [1333MHz] [1367MHz] [1433MHz] [1467MHz] [1500MHz]
[1533MHz] [1567MHz] [1600MHz] [1633MHz] [1667MHz] [1700MHz]
[1733MHz] [1767MHz] [1800MHz] [1833MHz] [1867MHz] [1900MHz]
[1933MHz] [1967MHz] [2000MHz] [2033MHz] [2067MHz] [2100MHz]
[2133MHz] [2167MHz] [2200MHz] [2233MHz] [2267MHz] [2300MHz]
[2333MHz] [2367MHz] [2400MHz] [2433MHz] [2467MHz] [2500MHz]
[2550MHz] [2600MHz] [2650MHz] [2700MHz] [2750MHz] [2800MHz]
[2850MHz] [2900MHz] [2950MHz] [3000MHz] [333MHz] [400MHz]
[533MHz] [1050MHz] [1066MHz]

Tcl

Specifies the CAS latency.
Configuration options: [Auto] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk]
[0Dh Clk] [0Eh Clk] [0Fh Clk] [10h Clk] [11h Clk] [12h Clk] [13h Clk] [14h
Clk] [15h Clk] [16h Clk] [17h Clk] [18h Clk] [19h Clk] [1Ah Clk] [1Bh Clk]
[1Ch Clk] [1Dh Clk] [1Eh Clk] [1Fh Clk] [20h Clk] [21h Clk]

Trcdrd

Specifies the RAS# Active to CAS# Read Delay Time.
Configuration options: [Auto] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk]
[0Dh Clk] [0Eh Clk] [0Fh Clk] [10h Clk] [11h Clk] [12h Clk] [13h Clk] [14h
Clk] [15h Clk] [16h Clk] [17h Clk] [18h Clk] [19h Clk] [1Ah Clk] [1Bh Clk]

Trcdwr

Specifies the RAS# Active to CAS# Write Delay Time.
Configuration options: [Auto] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk]
[0Dh Clk] [0Eh Clk] [0Fh Clk] [10h Clk] [11h Clk] [12h Clk] [13h Clk] [14h
Clk] [15h Clk] [16h Clk] [17h Clk] [18h Clk] [19h Clk] [1Ah Clk] [1Bh Clk]

Trp

Specifies the Row Precharge Delay Time.
Configuration options: [Auto] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk]
[0Dh Clk] [0Eh Clk] [0Fh Clk] [10h Clk] [11h Clk] [12h Clk] [13h Clk] [14h
Clk] [15h Clk] [16h Clk] [17h Clk] [18h Clk] [19h Clk] [1Ah Clk] [1Bh Clk]

Tras

Specifies the Active to Precharge Delay Time.
Configuration options: [Auto] [15h Clk] [16h Clk] [17h Clk] [18h Clk] [19h
Clk] [1Ah Clk] [1Bh Clk] [1Ch Clk] [1Dh Clk] [1Eh Clk] [1Fh Clk] [20h Clk]
[21h Clk] [22h Clk] [23h Clk] [24h Clk] [25h Clk] [26h Clk] [27h Clk] [28h
Clk] [29h Clk] [2Ah Clk] [2Bh Clk] [2Ch Clk] [2Dh Clk] [2Eh Clk] [2Fh Clk]
[30h Clk] [31h Clk] [32h Clk] [33h Clk] [34h Clk] [35h Clk] [36h Clk] [37h
Clk] [38h Clk] [39h Clk] [3Ah Clk]

Trc Ctrl

Specifies Trc.
Configuration options: [Auto] [Manual]

Trc

Specifies Active to Active/Refresh Delay Time. Valid values 87h-1Dh.

TrrdS

Specifies the Activate to Activate Delay Time, different back group (tRRD_S).
Configuration options: [Auto] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk]

TrrdL

Specifies the Activate to Activate Delay Time, same back group (tRRD_L).
Configuration options: [Auto] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk]

Tfaw Ctrl

Specifies Tfaw.
Configuration options: [Auto] [Manual]

Tfaw

Specifies the Four Activate Window Time. Valid values 36h-6h.

TwtrS

Specifies the Minimum Write to Read Time, different bank group.
Configuration options: [Auto] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk]

TwtrL

Specifies the Minimum Write to Read Time, same bank group.
Configuration options: [Auto] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk]

Twr Ctrl

Specifies Twr.
Configuration options: [Auto] [Manual]

Twr

Specifies the Minimum Write Recovery Time. Valid values 51h-Ah.

Trcpage Ctrl

Specifies Trcpage.
Configuration options: [Auto] [Manual]

Trcpage

SDRAM Optional Features (tMAW MAC). Valid values 3FFh-0h.

TrdrdScL Ctrl

Specifies TrdrdScL.
Configuration options: [Auto] [Manual]

The following item appears only when **TrdrdScL Ctrl** is set to **[Manual]**.

TrdrdScL

Specifies the CAS to CAS Delay Time, same bank group. Valid values Fh-1h.

TwrwrScL Ctrl

Specifies TwrwrScL.
Configuration options: [Auto] [Manual]

The following item appears only when **TwrwrScL Ctrl** is set to **[Manual]**.

TwrwrScL

Specifies the CAS to CAS Delay Time, same bank group. Valid values 3Fh-1h.

Trfc Ctrl

Specifies Trfc.
Configuration options: [Auto] [Manual]

The following item appears only when **Trfc Ctrl** is set to **[Manual]**.

Trfc

Specifies the Refresh Recovery Delay Time (tRFC1). Valid values 3DEh-3Ch.

Trfc2 Ctrl

Specifies Trfc2.
Configuration options: [Auto] [Manual]

The following item appears only when **Trfc2 Ctrl** is set to **[Manual]**.

Trfc2

Specifies the Refresh Recovery Delay Time (tRFC2). Valid values 3DEh-3Ch.

Trfc4 Ctrl

Specifies Trfc4.
Configuration options: [Auto] [Manual]

The following item appears only when **Trfc4 Ctrl** is set to **[Manual]**.

Trfc4

Specifies the Refresh Recovery Delay Time (tRFC4). Valid values 3DEh-3Ch.

Tcwl

Specifies the CAS Write Latency.
Configuration options: [Auto] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Eh Clk] [10h Clk] [12h Clk] [14h Clk]

Trtp

Specifies theRead CAS# to Precharge Delay Time.
Configuration options: [Auto] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk]

Tcke

Specifies the CKE minimum high and low pulse width in memory clock cycles.
Configuration options: [Auto] [1 Clk] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk] [10h Clk] [11h Clk] [12h Clk] [13h Clk] [14h Clk] [15h Clk] [16h Clk] [17h Clk] [18h Clk] [19h Clk] [1Ah Clk] [1Bh Clk] [1Ch Clk] [1Dh Clk] [1Eh Clk] [1Fh Clk]

Trdwr

Specifies the Read to Write turnaround timing.
Configuration options: [Auto] [1 Clk] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk] [10h Clk] [11h Clk] [12h Clk] [13h Clk] [14h Clk] [15h Clk] [16h Clk] [17h Clk] [18h Clk] [19h Clk] [1Ah Clk] [1Bh Clk] [1Ch Clk] [1Dh Clk] [1Eh Clk] [1Fh Clk]

Twrrd

Specifies the Write to Read turnaround timing.
Configuration options: [Auto] [1 Clk] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk]

TwrwrSc

Specifies the Write to Write turnaround timing in the same chipselect.
Configuration options: [Auto] [1 Clk] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk]

TwrwrSd

Specifies the Write to Write turnaround timing in the same DIMM.
Configuration options: [Auto] [1 Clk] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk]

TwrwrDd

Specifies the Write to Write turnaround timing in a different DIMM.
Configuration options: [Auto] [1 Clk] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk]

TrdrdSc

Specifies the Read to Read turnaround timing in the same chipselect.
Configuration options: [Auto] [1 Clk] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk]

TrdrdSd

Specifies the Read to Read turnaround timing in the same DIMM.
Configuration options: [Auto] [1 Clk] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk]

TrdrdDd

Specifies the Read to Read turnaround timing in a different DIMM.
Configuration options: [Auto] [1 Clk] [2 Clk] [3 Clk] [4 Clk] [5 Clk] [6 Clk] [7 Clk] [8 Clk] [9 Clk] [0Ah Clk] [0Bh Clk] [0Ch Clk] [0Dh Clk] [0Eh Clk] [0Fh Clk]

ProcODT

Specifies the Processor ODT.
Configuration options: [Auto] [High Impedance] [480 ohm] [240 ohm] [160 ohm] [120 ohm] [96 ohm] [80 ohm] [68.6 ohm] [60 ohm] [53.3 ohm] [48 ohm] [43.6 ohm] [40 ohm] [36.9 ohm] [34.3 ohm] [32 ohm] [30 ohm] [28.2 ohm]

DRAM Controller Configuration

DRAM Power Options

Power Down Enable

This item allows you to enable or disable power down mode.
Configuration options: [Disabled] [Enabled] [Auto]

Cmd2T

Select between 1T and 2T mode on ADDR/CMD.
Configuration options: [Auto] [1T] [2T]

Gear Down Mode

Configuration options: [Auto] [Disabled] [Enabled]

CAD Bus Configuration

CAD Bus Timing User Controls

This item allows you to set the CAD bus signals to Auto or Manual.
Configuration options: [Auto] [Manual]

The following items appear only when you set CAD Bus Timing User Controls to **[Manual]**.

AddrCmdSetup

This item allows you to setup time on CAD bus signals. Valid values 3Fh - 0h.
Configuration options: [0] - [39]

CsOdtSetup

This item allows you to setup time on CAD bus signals. Valid values 3Fh - 0h.
Configuration options: [0] - [39]

CkeSetup

This item allows you to setup time on CAD bus signals. Valid values 3Fh - 0h.
Configuration options: [0] - [39]

CAD Bus Drive Strength User Controls

This item allows you to set the CAD bus signals to Auto or Manual.
Configuration options: [Auto] [Manual]

The following items appear only when you set **CAD Bus Drive Strength User Controls** to **[Manual]**.

ClkDrvStren

Configuration options: [Auto] [120.0 Ohm] [60.0 Ohm] [40.0 Ohm] [30.0 Ohm] [24.0 Ohm] [20.0 Ohm]

AddrCmdDrvStren

Configuration options: [Auto] [120.0 Ohm] [60.0 Ohm] [40.0 Ohm] [30.0 Ohm] [24.0 Ohm] [20.0 Ohm]

Cs0dtDrvStren

Configuration options: [Auto] [120.0 Ohm] [60.0 Ohm] [40.0 Ohm] [30.0 Ohm] [24.0 Ohm] [20.0 Ohm]

CkeDrvStren

Configuration options: [Auto] [120.0 Ohm] [60.0 Ohm] [40.0 Ohm] [30.0 Ohm] [24.0 Ohm] [20.0 Ohm]

Data Bus Configuration

Data Bus Configuration User Controls

This item allows you to specify the mode for drive strength.
Configuration options: [Auto] [Manual]

The following items appear only when you set **Data Bus Configuration User Controls** to **[Manual]**.

RttNom

Configuration options: [Rtt_Nom Disable] [RZQ/4] [RZQ/2] [RZQ/6] [RZQ/1] [RZQ/5] [RZQ/3] [RZQ/7] [Auto]

RttWr

Configuration options: [Dynamic ODT Off] [RZQ/2] [RZQ/1] [Hi-Z] [RZQ/3] [Auto]

RttPark

Configuration options: [Rtt_PARK Disable] [RZQ/4] [RZQ/2] [RZQ/6] [RZQ/1] [RZQ/5] [RZQ/3] [RZQ/7] [Auto]

Common RAS

Data Poisoning

Configuration options: [Enabled] [Disabled] [Auto]

DRAM Post Package Repair

This item allows you to enable or disable DRAM POST Package Repair.
Configuration options: [Enable] [Disable] [Default]

RCD Parity

Configuration options: [Enabled] [Disabled] [Auto]

DRAM Address Command Parity Retry

Configuration options: [Enabled] [Disabled] [Auto]

The following item appears only when you set **DRAM Address Command Parity Retry** to **[Enabled]**.

Max Parity Error Replay

The values in hex, 1, 2, or 3 is invalid.
Configuration options: [0] - [39]

Disable Memory Error Injection

Configuration options: [False] [True]

ECC Configuration

DRAM ECC Symbol Size

Configuration options: [x4] [x8] [x16] [Auto]

DRAM ECC Enable

This option allows you to enable or disable DRAM ECC. Auto will set ECC to enable.
Configuration options: [Disabled] [Enabled] [Auto]

DRAM UECC Retry

This option allows you to enable or disable DRAM UECC Retry.
Configuration options: [Disabled] [Enabled] [Auto]

Security

TSME

Configuration options: [Disabled] [Enabled] [Auto]

Data Scramble

Configuration options: [Disabled] [Enabled] [Auto]

Phy Configuration

PMU Training

DFE Read Training

Perform 2D Read Training with DFE on.
Configuration options: [Disabled] [Enabled] [Auto]

FFE Training

Perform 2D Write Training with DFE on.
Configuration options: [Disabled] [Enabled] [Auto]

PMU Pattern Bits Control

Configuration options: [Auto] [Manual]

The following item appears only when you set **PMU Pattern Bits Control** to **[Manual]**.

PMU Pattern Bits

Configuration options: [0] - [A]

MR6VrefDQ Control

Configuration options: [Auto] [Manual]

The following item appears only when you set **MR6VrefDQ Control** to **[Manual]**.

MR6VrefDQ

Configuration options: [0] - [7F]

CPU Vref Training Seed Control

Configuration options: [Auto] [Manual]

The following item appears only when you set **CPU Vref Training Seed Control** to **[Manual]**.

CPU Vref Training Seed

Configuration options: [0] - [FF]

DRAM Memory Mapping

Chipselect Interleaving

This item allows you to set interleave memory blocks across the DRAM chip selects for node 0.
Configuration options: [Disabled] [Auto]

BankGroupSwap

Configuration options: [Enabled] [Disabled] [Auto]

Please set **BankGroupSwapAlt** to **[Disabled]** if **BankGroupSwap** is set to **[Enabled]**.

BankGroupSwapAlt

Configuration options: [Enabled] [Disabled] [Auto]

The following item appears only when you set **BankGroupSwapAlt** to **[Enabled]**.

Address Hash Bank 2 ColXor

Configuration options: [0] - [FFF]

Address Hash Bank

This item allows you to enable or disable bank address hashing.
Configuration options: [Enabled] [Disabled] [Auto]

Address Hash CS

This item allows you to enable or disable CS address hashing.
Configuration options: [Enabled] [Disabled] [Auto]

Address Hash Rm

This item allows you to enable or disable RM address hashing.
Configuration options: [Enabled] [Disabled] [Auto]

Memory MBIST

MBIST Enable

This item allows you to enable or disable Memory MBIST.
Configuration options: [Enabled] [Disabled]

The following items appear only when **MBIST Enable** is set to **[Enabled]**.

MBIST Test Mode

This item allows you to select the MBIST Test Mode - Interface Mode (Tests Single and Multiple CS transactions and Basic Connectivity) or Data Eye Mode (Measures Voltage vs. Timing).
Configuration options: [Interface Mode] [Data Eye Mode] [Both] [Auto]

MBIST Aggressors

This item allows you to enable or disable Memory Aggressor test.
Configuration options: [Enabled] [Disabled] [Auto]

MBIST Per Bit Slave Die Reporting

Reports 2D Data Eye Results in ABL Log for each DQ, Chipselect, and Channel.
Configuration options: [Enabled] [Disabled] [Auto]

Data Eye

> **Pattern Select**
>
> Configuration options: [PRBS] [SS0] [Both]
>
> **Pattern Length**
>
> This token helps to determine the pattern length. The possible options are N=3...12.
> Configuration options: [3] - [9]
>
> **Aggressor Channel**
>
> This helps read the aggressors channels. If set to [Enabled], you can read from one or more than one aggressor channel. The default is set to [Disabled].
> Configuration options: [Disabled] [1 Aggressor Channel] [3 Aggressor Channels] [7 Aggressor Channels]
>
> **Aggressor Static Lane Control**
>
> Configuration options: [Disabled] [Enabled]

The following items appear only when **Aggressor Static Lane Control** is set to **[Enabled]**.

> **Aggressor Static Lane Select Upper 32 bits**
>
> Static Lane Select for Upper 32 bits. The bit mask represents the bits to be read.
> Configuration options: [0] - [99999999]
>
> **Aggressor Static Lane Select Lower 32 bits**
>
> Static Lane Select for Lower 32 bits. The bit mask represents the bits to be read.
> Configuration options: [0] - [99999999]

Aggressor Static Lane Select ECC

Static Lane Select for ECC Lanes. The bit mask represents the bits to be read.
Configuration options: [0] - [9]

Aggressor Static Lane Value

Configuration options: [0] - [9]

Target Static Lane Control

Configuration options: [Disabled] [Enabled]

The following items appear only when **Target Static Lane Control** is set to **[Enabled]**.

Target Static Lane Select Upper 32 bits

Static Lane Select for Upper 32 bits. The bit mask represents the bits to be read.
Configuration options: [0] - [99999999]

Target Static Lane Select Lower 32 bits

Static Lane Select for Lower 32 bits. The bit mask represents the bits to be read.
Configuration options: [0] - [99999999]

Target Static Lane Select ECC

Static Lane Select for ECC Lanes. The bit mask represents the bits to be read.
Configuration options: [0] - [9]

Target Static Lane Value [0]

Configuration options: [0] - [9]

Worst Case Margin Granularity [Per Chip Select]

Configuration options: [Per Chip Select] [Per Nibble]

Read Voltage Sweep Step Size

This option determines the step size for Read Data Eye voltage sweep.
Configuration options: [1] [2] [4]

Read Timing Sweep Step Size

This option supports step size for Read Data Eye.
Configuration options: [1] [2] [4]

Write Voltage Sweep Step Size

This option determines the step size for write Data Eye voltage sweep.
Configuration options: [1] [2] [4]

Write Timing Sweep Step Size

This option supports step size for write Data Eye.
Configuration options: [1] [2] [4]

NBIO Common Options

IOMMU

This item allows you to enable or disable IOMMU.
Configuration options: [Disabled] [Enabled] [Auto]

DMAr Support

This item allows you to enable or disable DMAr system protection during POST.
Configuration options: [Disabled] [Enabled] [Auto]

ACS Enable

AER must be enabled for ACS enable to work.
Configuration options: [Disable] [Enable] [Auto]

PCIe Ten Bit Tag Support

This item enables PCIe ten bit tags for supported devices. [Auto] = [Disabled].
Configuration options: [Disable] [Enable] [Auto]

SMU Common Options

cTDP Control

[Auto]   Use the fused TDP.
[Manual]   User can set customized TDP.

cTDP

This item allows you to customize cTDP.

EfficiencyModeEn

[Auto]   Use performance optimized CCLK DPM settings.
[Enabled]   Use performance optimized CCLK DPM settings.

Power Package Limit Control

[Auto]   Use the fused PPT.
[Manual]   User can set customized PPT.

Power Package Limit

This item allows you to customize PPT.

APBDIS

[0]   Not APBDIS (mission mode)
[1]   APBDIS
[Auto]   Auto

DF Cstates

Configuration options: [Disabled] [Enabled] [Auto]

CPPC

Configuration options: [Disabled] [Enabled] [Auto]

CPPC Preferred Cores

[Enabled]	CPPC highest capability register of each thread will have a different value to express the AMD recommended scheduling order to OS. CPPC must be enabled for this parameter to have effect.
[Disabled]	Does not declare AMD preferred scheduling order to OS.
[Auto]	Auto.

NBIO LCLK DPM

NBIO DPM Control

This setting controls how the NBIO Power Management is controlled.

[Auto]	Default SMU control.
[Manual]	Allows individual NBIO DPM Levels to be set.

The following items appear only when **NBIO DPM Control** is set to **[Manual]**.

Socket 0-1 NBIO 0-3 Target DPM Level

[Auto]	Default SMU Control for the specified NBIO.
[1]	DPM Value for specified NBIO is 300 MHz.
[2]	DPM Value for specified NBIO is 600 MHz.

Early Link Speed

This item allows you to set Early Link Speed.
Configuration options: [Auto] [Gen1] [Gen2]

Preferred IO

[Auto]	Default.
[Manual]	Set Bus number manually.

The following items appear only when **Preferred IO** is set to **[Manual]**.

Preferred IO Bus

Configure the preferred IO bus number.

CV test

Set this to **[Enabled]** to support running PCIECV tool. Selecting **[Auto]** will preserve h/w defaults.
Configuration options: [Auto] [Disabled] [Enabled]

Loopback Mode

This item allows you to enable or disable PCIe Loopback Mode.
Configuration options: [Auto] [Disabled] [Enabled]

7.   Boot menu

The Boot menu items allow you to change the system boot options.
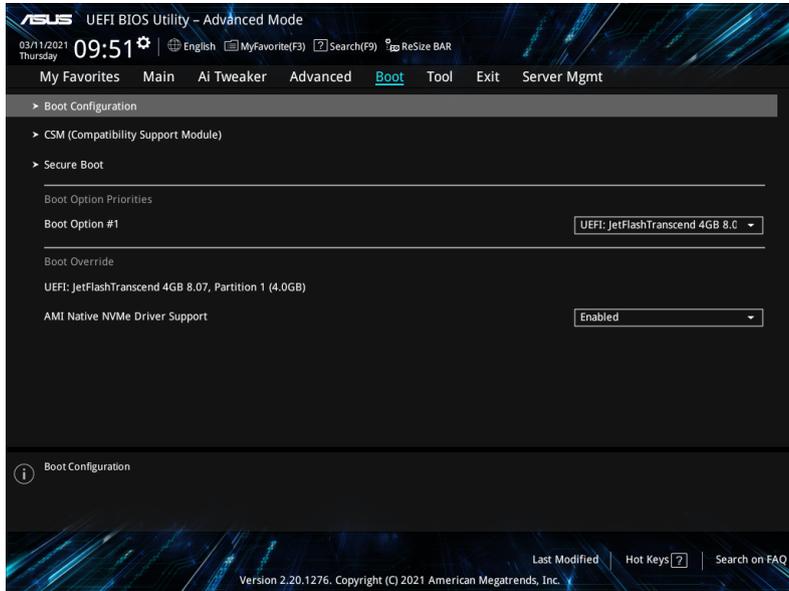
Boot Configuration

Fast Boot

[Disabled]   Allows your system to go back to its normal boot speed.

[Enabled]   Allows your system to accelerate the boot speed.

> The following item appears only when you set **Fast Boot** to **[Enabled]**.

Next Boot after AC Power Loss

[Normal Boot]   Returns to normal boot on the next boot after an AC power loss.

[Fast Boot]   Accelerates the boot speed on the next boot after an AC power loss.

Boot Logo Display

[Auto]   Sets the boot logo to display during POST.

[Full Screen]   Sets the boot logo display in full screen during POST.

[Disabled]   Disables the boot logo display during POST.

The following item appears only when you set **Boot Logo Display** to **[Auto]** and **[Full Screen]**.

Post Delay Time

This item allows you to select a desired additional POST waiting time to easily enter the BIOS Setup. You can only execute the POST delay time during normal boot.
Configuration options: [0 sec] - [10 sec]

This feature only works when set under normal boot.

The following item appears only when you set **Boot Logo Display** to **[Disabled]**.

Post Report

This item allows you to select a desired POST report waiting time.
Configuration options: [1 sec] - [10 sec] [Until Press ESC]

Boot up NumLock State

This item allows you to enable or disable power-on state of the NumLock.
Configuration options: [On] [Off]

Wait For 'F1' If Error

This item allows your system to wait for the <F1> key to be pressed when error occurs.
Configuration options: [Disabled] [Enabled]

Option ROM Messages

[Force BIOS]   The Option ROM Messages will be shown during the POST.
[Keep Current]   Only the ASUS logo will be shown during the POST.

Interrupt 19 Capture

[Enabled]   Execute the trap right away.
[Disabled]   Execute the trap during legacy boot.

Primary Display

This item allows you to select Onboard VGA Header when accessing BIOS menu through KVM video output.
Configuration options: [On] [Off]

Chassis Intrusion Detection Support

Set this item to **[Enabled]** to enable the chassis intrusion detection function.
Configuration options: [Disabled] [Enabled]

CSM (Compatibility Support Module)

This item allows you to configure the CSM (Compatibility Support Module) items to fully support the various VGA, bootable devices and add-on devices for better compatibility.

Launch CSM

[Enabled]   For better compatibility, enable the CSM to fully support the non-UEFI driver add-on devices or the Windows® UEFI mode.

[Disabled]   Disable the CSM to fully support the non-UEFI driver add-on devices or the Windows® UEFI mode.

- When CSM is enabled, the primary display will be switched to onboard VGA header. Please use a VGA cable for BIOS display.
- The following items appear only when **Launch CSM** is set to **[Enabled]**.

Boot Device Control

This item allows you to select the devices boot-up mode by the device's specification. Devices with the selected mode will appear in the boot priority list.
Configuration options: [UEFI and Legacy OPROM] [Legacy OPROM only] [UEFI only]

Boot from Network Devices

This item allows you to select the type of onboard LAN controllers and installed LAN cards. Network device will run the selected type during the system boot. Selecting **[Ignore]** will accelerate the boot up time without running network devices during POST (Power-On Self-Test)
Configuration options: [Ignore] [Legacy only] [UEFI only]

Boot from Storage Devices

This item allows you to select the type of storage devices to run first during system boot. It is recommended to select either Legacy only or UEFI drivers first by the device's specification for better stability. Selecting **[Ignore]** will accelerate the boot up time without running network devices during POST (Power-On Self-Test)
Configuration options: [Ignore] [Legacy only] [UEFI only]

Boot from PCI-E/PCI Expansion Devices

This item allows you to select the type of PCI-E/PCI expansion devices that you want to run first during the system boot. Selecting **[Ignore]** will accelerate the boot up time without running network devices during POST (Power-On Self-Test)
Configuration options: [Ignore] [Legacy only] [UEFI only]

Secure Boot

This item allows you to configure the Windows® Secure Boot settings and manage its keys to protect the system from unauthorized access and malwares during POST.

OS Type

[Windows UEFI Mode]   This item allows you to select your installed operating system. Execute the Microsoft® Secure Boot check. Only select this option when booting on Windows® UEFI mode or other Microsoft® Secure Boot compliant OS.

[Other OS]   Get the optimized function when booting on Windows® non-UEFI mode. Microsoft® Secure Boot only supports Windows® UEFI mode.

Key Management

Install Default Secure Boot keys

This item allows you to immediately load the default Security Boot keys, Platform key (PK), Key-exchange Key (KEK), Signature database (db), and Revoked Signatures (dbx). When the default Secure boot keys are loaded, the PK state will change from Unloaded mode to loaded mode.

Clear Secure Boot keys

This item appears only when you load the default Secure Boot keys. This item allows you to clear all default Secure Boot keys.

Save all Secure Boot variables

This item allows you to save all the secure boot keys to a USB storage device.

PK Management

The Platform Key (PK) locks and secures the firmware from any permissible changes. The system verifies the PK before your system enters the OS.

> **Save To File**
>
> This item allows you to save the PK to a USB storage device.
>
> **Set New key**
>
> This item allows you to load the downloaded PK from a USB storage device.
>
> **Delete key**
>
> This item allows you to delete the PK from your system. Once the PK is deleted, all the system's Secure Boot keys will not be active.
> Configuration options: [Yes] [No]

The PK file must be formatted as a UEFI variable structure with time-based authenticated variable.

KEK Management

The KEK (Key-exchange Key or Key Enrollment Key) manages the Signature database (db) and Revoked Signature database (dbx).

Key-exchange Key (KEK) refers to Microsoft® Secure Boot Key-Enrollment Key (KEK).

> **Save to file**
>
> This item allows you to save the KEK to a USB storage device.
>
> **Set New key**
>
> This item allows you to load the downloaded KEK from a USB storage device.
>
> **Append Key**
>
> This item allows you to load the additional KEK from a storage device for an additional db and dbx loaded management.
>
> **Delete key**
>
> This item allows you to delete the KEK from your system.
> Configuration options: [Yes] [No]

The KEK file must be formatted as a UEFI variable structure with time-based authenticated variable.

DB Management

The db (Authorized Signature database) lists the signers or images of UEFI applications, operating system loaders, and UEFI drivers that you can load on the single computer.

Save to file

This item allows you to save the db to a USB storage device.

Set New key

This item allows you to load the downloaded db from a USB storage device.

Append Key

This item allows you to load the additional db from a storage device for an additional db and dbx loaded management.

Delete key

This item allows you to delete the db file from your system.
Configuration options: [Yes] [No]

The db file must be formatted as a UEFI variable structure with time-based authenticated variable.

DBX Management

The dbx (Revoked Signature database) lists the forbidden images of db items that are no longer trusted and cannot be loaded.

Save to file

This item allows you to save the dbx to a USB storage device.

Set New key

This item allows you to load the downloaded dbx from a USB storage device.

Append Key

This item allows you to load the additional dbx from a storage device for an additional db and dbx loaded management.

Delete key

This item allows you to delete the dbx file from your system.
Configuration options: [Yes] [No]

The dbx file must be formatted as a UEFI variable structure with time-based authenticated variable.

Boot Option Priorities

These items specify the boot device priority sequence from the available devices. The number of device items that appears on the screen depends on the number of devices installed in the system.

- To access Windows® OS in Safe Mode, press <F8 > after POST (Windows® 8 not supported).

- To select the boot device during system startup, press <F8> when ASUS Logo appears.

Boot Override

These item displays the available devices. The number of device items that appear on the screen depends on the number of devices installed in the system. Click an item to start booting from the selected device.

AMI Native NVMe Driver Support

This item allows you to enable or disable AMI Native NVMe driver.
Configuration options: [Disabled] [Enabled]

8. Tool menu

The Tool menu items allow you to configure options for special functions. Select an item then press <Enter> to display the submenu.
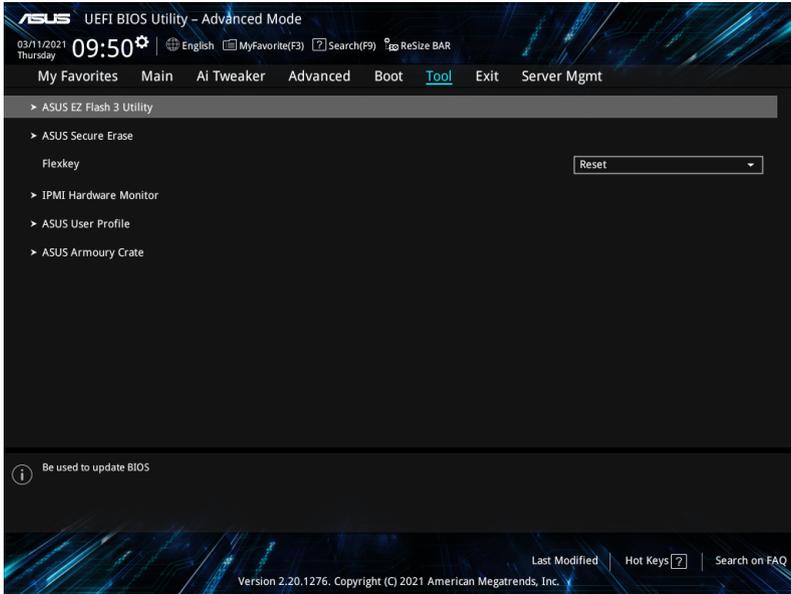
Flexkey

[Reset]   Reboots the system.
[DirectKey]   Boot directly into the BIOS.

8.1   ASUS EZ Flash 3 Utility

This item allows you to run ASUS EZ Flash 3. When you press <Enter>, a confirmation message appears. Use the left/right arrow key to select between [Yes] or [No], then press <Enter> to confirm your choice.

For more details, refer to section **ASUS EZ Flash 3**.

8.2 ASUS Secure Erase

SSD speeds may lower over time as with any storage medium due to data processing. Secure Erase completely and safely cleans your SSD, restoring it to factory performance levels.

To launch Secure Erase, click **Tool > ASUS Secure Erase** on the Advanced mode menu.

> - The time to erase the contents of your SSD may take a while depending on its size. Do not turn off the system during the process.
>
> - Secure Erase is only supported on Intel SATA port. For more information about Intel SATA ports, refer to section **Motherboard layout** in your user manual.

Displays the available SSDs

SSD Secure Erase			
Port #	SSD Name	Status	Total Capacity
P4	ADATA S596 Turbo	Ready	64.0GB

SSD speed performance may degrade over time due to accumulated files and frequent data-writing. Secure Erase completely cleans your SSD and restores it to its factory settings.
WARNING: Ensure that you run Secure Erase on a compatible SSD. Running Secure Erase on an incompatible SSD will render the SSD totally unusable.
NOTE: For the list of Secure Erase-compatible SSDs, visit the ASUS Support site at www.asus.com/support

> **Status definition:**
>
> - **Frozen.** The frozen state is the result of a BIOS protective measure. The BIOS guards drives that do not have password protection by freezing them prior to booting. If the drive is frozen, a power off or hard reset of your PC must be performed to proceed with the Secure Erase.
>
> - **Locked.** SSDs might be locked if the Secure Erase process is either incomplete or was stopped. This may be due to a third party software that uses a different password defined by ASUS. You have to unlock the SSD in the software before proceeding with Secure Erase.

8.3 IPMI Hardware Monitor

Allows you to run the IPMI hardware monitor.

```
                         ASUSTek. IPMI Hardware Monitor
    ┌─ FAN speed ─┐                              ┌─ Voltage ─┐
    CPU_FAN            :     N/A                 +VCORE          :     1.384 V
    CPU_OPT            :     N/A                 +VSOC           :     0.942 V
    CHA_FAN1           :     N/A                 +VDDIO_ABCD     :     1.218 V
    CHA_FAN2           :     N/A                 +VDDIO_EFGH     :     1.218 V
    CHA_FAN3           :     N/A                 +CPU_1.8V       :     1.770 V
    CHA_FAN4           :     N/A                 +CPU_3.3V       :     3.424 V
    CHA_FAN5           :     N/A                 +PCH_CLD0       :     1.188 V
    CHA_FAN6           :     2100 RPM            +CPU_1.8V_S5    :     1.820 V
    SOC_FAN            :     2700 RPM            +12V            :    12.240 V
    CHIPSET_FAN        :     N/A                 +5V             :     5.016 V
                                                +3.3V           :     3.328 V
                                                +5V_ALW         :     4.968 V
    ┌─ Temperature ─┐                           +3.3V_ALW       :     3.296 V
    CPU Temp.          :     41 °C              VBAT            :     3.280 V
    T_SENSOR Temp.     :     N/A
    DIMMA1 Temp        :     N/A
    DIMMA1 Temp        :     N/A
    DIMMA1 Temp        :     N/A
    DIMMA1 Temp        :     N/A
    DIMMA1 Temp        :     N/A
    DIMMA1 Temp        :     N/A
    DIMMA1 Temp        :     N/A
    DIMMA1 Temp        :     N/A
    DIMMA1 Temp        :     46 °C

    [q]: Exit
```

8.4   ASUS User Profile

This item allows you to store or load multiple BIOS settings.
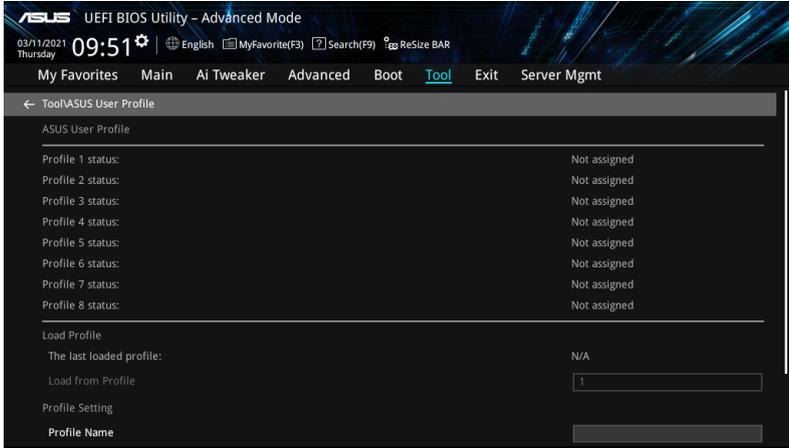
Load from Profile

This item allows you to load the previous BIOS settings saved in the BIOS Flash. Key in the profile number that saved your BIOS settings, press <Enter>, and then select **Yes**.

> • DO NOT shut down or reset the system while updating the BIOS to prevent the system boot failure!
>
> • We recommend that you update the BIOS file only coming from the same memory/ CPU configuration and BIOS version.

Profile Name

This item allows you to key in a profile name.

Save to Profile

This item allows you to save the current BIOS settings to the BIOS Flash, and create a profile. Key in a profile number from one to eight, press <Enter>, and then select **Yes**.

Load/Save Profile from/to USB Drive

This item allows you to load or save profile from your USB drive, load and save profile to your USB drive.

8.5   ASUS Armoury Crate

This item allows you to enable or disable downloading and installing of the Armoury Crate app in the Windows® OS. The Armoury Crate app can help you manage and download the latest drivers and utilities for your motherboard.
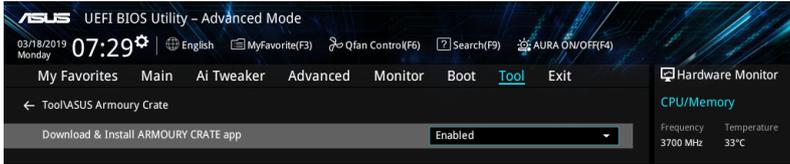

Download & Install ARMOURY CRATE app

This item allows you to enable Armoury Crate download process. Armoury Crate app can help you manage and download the latest ROG drivers and utilities updates for your motherboard.
Configuration options: [Disabled] [Enabled]

9.   Exit menu

The Exit menu items allow you to load the optimal default values for the BIOS items, and save or discard your changes to the BIOS items. You can access the EZ Mode from the Exit menu.
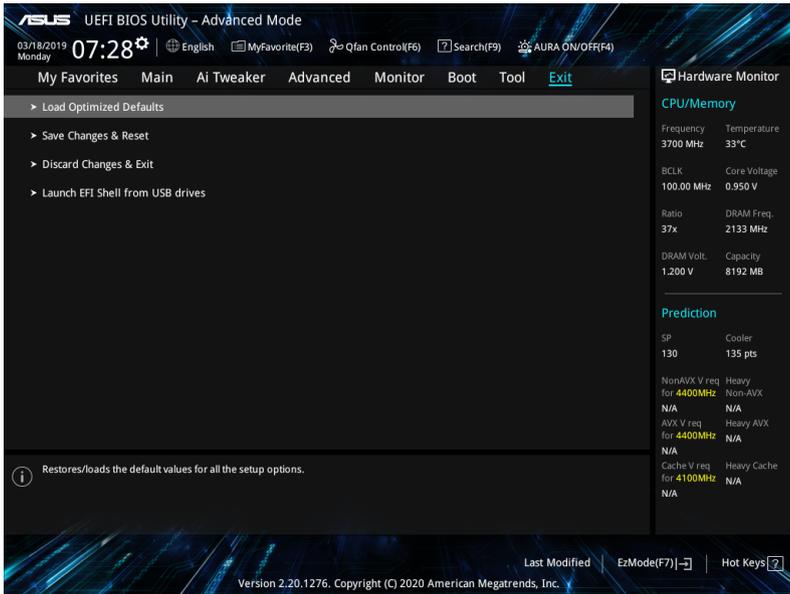
Load Optimized Defaults

This option allows you to load the default values for each of the parameters on the Setup menus. When you select this option or if you press <F5>, a confirmation window appears. Select **OK** to load the default values.

Save Changes & Reset

Once you are finished making your selections, choose this option from the Exit menu to ensure the values you selected are saved. When you select this option or if you press <F10>, a confirmation window appears. Select **OK** to save changes and exit.

Discard Changes & Exit

This option allows you to exit the Setup program without saving your changes. When you select this option or if you press <Esc>, a confirmation window appears. Select **Yes** to discard changes and exit.

Launch EFI Shell from USB drives

This option allows you to attempt to launch the EFI Shell application (shellx64.efi) from one of the available filesystem devices.

10.   Server Mgmt menu

The Server Management menu displays the server management status and allows you to change the settings.
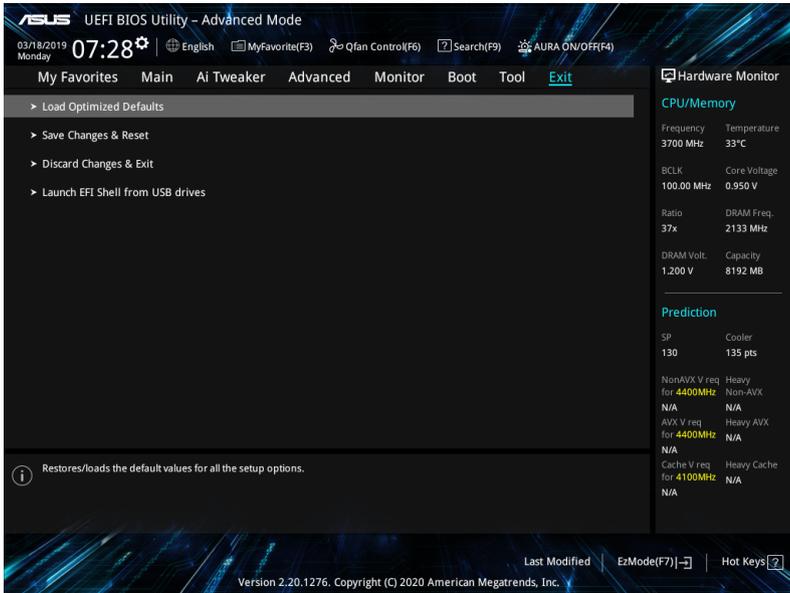
BMC Support

Allows you to enable or disable interfaces to communicate with BMC.
Configuration options: [Disabled] [Enabled]

> The following items are available only when **BMC Support** is set to **[Enabled]**.

FRB-2 Timer

Allows you to enable or disable FRB-2 timer (POST timer).
Configuration options: [Disabled] [Enabled]

> The following items are configurable only when **FRB-2 Timer** is set to **[Enabled]**.

FRB-2 Timer timeout

Allows you to enter the FRB-2 Timer Expiration value between 1 to 30 mins.
Configuration options: [1] - [30]

FRB-2 Timer Policy

Allows you to select the how the system should respond in FRB-2 Timer expires.
Configuration options: [Do Nothing] [Reset] [Power Down] [Power Cycle]

OS Watchdog Timer

This item allows you to start a BIOS timer which can only be shut off by Intel Management Software after the OS loads. Helps determine that the OS successfully loaded or follows the OS Boot Watchdog Timer policy.
Configuration options: [Disabled] [Enabled]

> The following items are configurable only when **OS Watchdog Timer** is set to **[Enabled]**.

OS Wtd Timer Timeout

Allows you to enter a value from 1 to 30 mins for the OS Boot Watchdog Timer Expiration.
Configuration options: [0] - [30]

OS Wtd Timer Policy

This item allows you to configure how the system should respond if the OS Boot Watch Timer expires.
Configuration options: [Do Nothing] [Reset] [Power Down]

Serial Mux

This item allows you to enable or disable Serial Mux configuration.
Configuration options: [Disabled] [Enabled]

BMC init phase

Configuration options: [PEI phase] [BDS phase]

BMC DRAM SMBUS Switch

Configuration options: [BIOS] [BMC]

System Event Log

The items in this submenu allow you to configure the SEL event log configurations.

> All values changed here do not take effect until computer is restarted.

SEL Components

This item allows you to enable or disable event logging for error/progress codes during boot.
Configuration options: [Disabled] [Enabled]

> The following items are configurable only when **SEL Components** is set to **[Enabled]**.

Erase SEL

This item allows you to select options for erasing SEL.
Configuration options: [No] [Yes, On next reset] [Yes, on every reset]

When SEL is Full

This item allows you to select options for reactions to a full SEL.
Configuration options: [Do Nothing] [Erase Immediately] [Delete Oldest Record]

Log EFI Status Codes

This item allows you to disable the logging of EFI Statis Codes, or log only error codes or only progress code, or both.
Configuration options: [Disabled] [Both] [Error code] [Progress code]

BMC self test log

This item logs the report returned by BMC self test command.

Erase Log

This item allows you to select options for erasing Log.
Configuration options: [No] [Yes, on every reset]

When log is Full

This item allows you to select the action to be taken when log is full.
Configuration options: [Clear Log] [Do not log any more]

BMC network configuration

The items in this submenu allow you to configure the BMC network parameters. Scroll using <Page Up> / <Page Down> keys to see more items.

Configure IPV4 support

Lan channel 1 / Lan channel 2

Configuration Address source [Unspecified]

Allows you to set the LAN channel parameters statically or dynamically (by BIOS or by BMC). **[Unspecified]** option will not modify any BMC network parameters during BIOS phase.
Configuration options: [Unspecified] [Static] [DynamicBmcDhcp] [DynamicBmcNonDhcp]

> The following items are available only when **Configuration Address source** is set to **[Static]**.

Station IP address

Allows you to set the station IP address.

Subnet mask

Allows you to set the subnet mask. We recommend that you use the same Subnet Mask you have specified on the operating system network for the used network card.

Router IP Address

Allows you to set the router IP address.

Router MAC Address

Allows you to set the router MAC address.

Configure IPV6 support

Lan channel 1 / Lan channel 2

IPV6 support

Allows you to enable or disable IPV6 support.
Configuration options: [Enabled] [Disabled]

The following items appear only when **IPV6 support** is set to **[Enabled]**.

Configuration Address source

Allows you to set the LAN channel parameters statically or dynamically (by BIOS or by BMC). [Unspecified] option will not modify any BMC network parameters during BIOS phase.
Configuration options: [Unspecified] [Static] [DynamicBmcDhcp]

The following items are available only when **Configuration Address source** is set to **[Static]**.

Station IPV6 address

Allows you to set the station IPV6 address.

Prefix Length

Allows you to set the prefix length (maximum of Prefix Length is 128).

Configuration Router LAN1/2 Address

Allows you to set the LAN channel parameters statically or dynamically (by BIOS or by BMC). Unspecified option will not modify any BMC network parameters during BIOS phase.
Configuration options: [Unspecified] [Static] [DynamicBmcDhcp]

The following items are available only when **Configuration Router LAN1/2 Address** is set to **[Static]**.

IPV6 Router1 IP Address

Allows you to set the IPV6 Router1 IP address.

IPV6 Router1 Prefix Length Lan1/2

Allows you to set the IPV6 router prefix length (maximum of IPV6 Router Prefix Length is 128).

IPV6 Router1 Prefix Value Lan1/2

Allows you to change the IPV6 router prefix value.

View System Event Log

This item allows you to view the system event log records. Scroll using <Page Up> / <Page Down> keys to see more items.

BMC Warm Reset

This item allows you to perform a warm reset of BMC.

11. Updating BIOS

The ASUS website publishes the latest BIOS versions to provide enhancements on system stability, compatibility,and performance. However, BIOS updating is potentially risky. If there is no problem using the current version of BIOS, DO NOT manually update the BIOS. Inappropriate BIOS updating may result to system's failure to boot. Carefully follow the instructions in this chapter to update your BIOS when necessary.

Visit http://www.asus.com to download the latest BIOS file for this motherboard.

The following utilities allow you to manage and update the motherboard BIOS setup program.

1. EZ Update: Updates the BIOS in Windows® environment.

2. ASUS EZ Flash 3: Updates the BIOS using a USB flash drive.

3. ASUS CrashFree BIOS 3: Restores the BIOS using the motherboard support DVD or a USB flash drive when the BIOS file fails or gets corrupted.

11.1   EZ Update

The EZ Update is a utility that allows you to update the motherboard BIOS in Windows® environment.

- EZ Update requires an Internet connection either through a network or an ISP (Internet Service Provider).

- This utility is available in the support DVD that comes with the motherboard package.

11.2   ASUS EZ Flash 3

ASUS EZ Flash 3 allows you to download and update to the latest BIOS using a USB drive.

To update the BIOS:

1.   Insert the USB flash drive that contains the latest BIOS file to the USB port.

2.   Enter the Advanced Mode of the BIOS setup program. Go to the Tool menu to select **ASUS EZ Flash Utility** and press <Enter>.

3.   Press the Left arrow key to switch to the Drive field.

4.   Press the Up/Down arrow keys to find the USB flash drive that contains the latest BIOS, and then press <Enter>.

5.   Press the Right arrow key to switch to the Folder Info field.

6.   Press the Up/Down arrow keys to find the BIOS file, and then press <Enter> to perform the BIOS update process. Reboot the system when the update process is done.
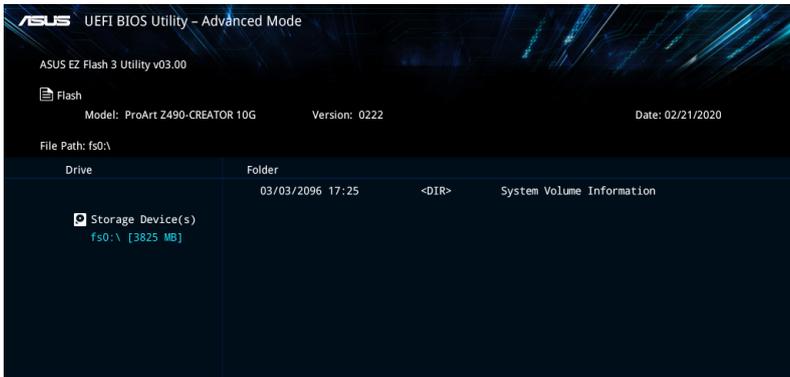
11.3   ASUS CrashFree BIOS 3

The ASUS CrashFree BIOS 3 utility is an auto recovery tool that allows you to restore the BIOS file when it fails or gets corrupted during the updating process. You can restore a corrupted BIOS file using the motherboard support DVD or a USB flash drive that contains the BIOS file.

> The BIOS file in the motherboard support DVD may be older than the BIOS file published on the ASUS official website. If you want to use the newer BIOS file, download the file at https://www.asus.com/support/ and save it to a USB flash drive.

Recovering the BIOS

To recover the BIOS:

1.   Turn on the system.

2.   Insert the motherboard support DVD to the optical drive, or the USB flash drive containing the BIOS file to the USB port.

3.   The utility automatically checks the devices for the BIOS file. When found, the utility reads the BIOS file and enters ASUS EZ Flash 3 automatically.

4.   The system requires you to enter BIOS Setup to recover the BIOS setting. To ensure system compatibility and stability, we recommend that you press <F5> to load default BIOS values.

> DO NOT shut down or reset the system while updating the BIOS! Doing so can cause system boot failure!

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