# TUF Z270 MARK 1

**BIOS Manual**

Motherboard

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# Contents

# BIOS Setup

## 1.1     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, rename it as **Z270TUF1.CAP** for this motherboard.

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

# 1.2 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.

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• 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 **1.10 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 section **1.1.7 Jumpers** in your user manual for information on how to erase the RTC RAM.

• The BIOS setup program does not support Bluetooth devices.

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### BIOS menu screen

The BIOS Setup program can be used under two modes: **EZ Mode** and **Advanced Mode**. You can change modes from **Setup Mode** in **Boot menu** or by pressing the <F7> hotkey.

## 1.2.1 EZ Mode

By default, the EZ Mode screen appears when you enter the BIOS setup program. The EZ Mode provides you an overview of the basic system information, and allows you to select the display language, system performance, mode and boot device priority. To access the Advanced Mode, select **Advanced Mode** or press the <F7> hotkey for the advanced BIOS settings.

> The default screen for entering the BIOS setup program can be changed. Refer to the **Setup Mode** item in section **Boot menu** for details.

**Displays the system properties of the selected mode. Click < or > to switch EZ System Tuning modes**

**Displays the CPU/motherboard temperature, CPU voltage output, CPU/chassis/power fan speed, and SATA information**

**Selects the display language of the BIOS setup program**

**Creates storage RAID and configures system overclocking**

UEFI BIOS Utility – EZ Mode

04/30/2181 Monday  01:20 ⚙ | ⊕ English   ♀ EZ Tuning Wizard(F11)

**Information**
TUF Z270 MARK 1   BIOS Ver. 0701
Intel(R) Core(TM) i7-7700K CPU @ 4.20GHz
Speed: 4200 MHz
Memory: 16384 MB (DDR4 2400MHz)

**CPU Temperature**

37°C

**CPU Core Voltage**
1.200 V
Motherboard Temperature
28°C

**EZ System Tuning**
Click the icon below to apply a pre-configured profile for improved system performance or energy savings.
Quiet
Performance
Energy Saving

< Normal >

**DRAM Status**
DIMM_A1: N/A
DIMM_A2: CRUCIAL 16384MB 2400MHz
DIMM_B1: N/A
DIMM_B2: N/A

**SATA Information**
P5: ST3160812AS (160.0GB)
P6: ST3160812AS (160.0GB)

**X.M.P.**
Disabled

**Intel Rapid Storage Technology**
On   Off

**Boot Priority**
Choose one and drag the items.   Switch all

UEFI: JetFlashTranscend 4GB 8.07, Partition 1 (3830MB)

**FAN Profile**
CPU FAN
1251 RPM
CHA1 FAN N/A
CHA2 FAN N/A
CHA3 FAN N/A
CHA4 FAN N/A
CHA5 FAN N/A
HAMP N/A
CPU OPT FAN N/A

**CPU FAN**

QFan Control

P5: ST3160812AS (152627MB)

P6: ST3160812AS (152627MB)

JetFlashTranscend 4GB 8.07 (3830MB)

✦ Boot Menu(F8)

Default(F5)   Save & Exit(F10)   Advanced Mode(F7)→   Search on FAQ

**Enables or disables the SATA RAID mode for Intel Rapid Storage Technology**

**Displays the CPU Fan's speed. Click the button to manually tune the fans**

**Loads optimized default settings**

**Saves the changes and resets the system**

**Click to go to Advanced mode**

**Search on the FAQ**

**Click to display boot devices**

**Selects the boot device priority**

> The boot device options vary depending on the devices you installed to the system.

## 1.2.2 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.

To switch from EZ Mode to Advanced Mode, click **Advanced Mode(F7)** or press the <F7> hotkey.

**Configuration fields**
**Pop-up Menu**
**Menu bar**          **Language**        **MyFavorite(F3)**    **Qfan Control(F6)**    **EZ Tuning Wizard(F11)**    **Hot Keys**          **Scroll bar**



**Menu items**              **General help**              **Last modified settings**        **Go back to EZ Mode**

**Search on the FAQ**

**Displays the CPU temperature, CPU, and memory voltage output**

**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 |
| Monitor | For displaying the system temperature, power status, and changing the fan 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 |

**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, Monitor, Boot, Tool, and Exit) on the menu bar have their respective menu items.

**Submenu items**

A greater than 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 **1.3 My Favorites** for more information.

**QFan Control (F6)**

This button above the menu bar displays the current settings of your fans. Use this button to manually tweak the fans to your desired settings.

Refer to section **1.2.3 QFan Control** for more information.

**EZ Tuning Wizard (F11)**

This button above the menu bar allows you to view and tweak the overclocking settings of your system. It also allows you to change the motherboard's SATA mode from AHCI to RAID mode.

Refer to section **1.2.4 EZ Tuning Wizard** for more information.

**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:

**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.

**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.

## 1.2.3    QFan Control

The QFan Control allows you to set a fan profile or manually configure the operating speed of your CPU and chassis fans.

**Click to select a fan to be configured**

**Click to activate PWM Mode**

**Click to activate DC Mode**

Q-Fan Control
Select your target fan and then move the slider to select any of these profiles: Standard, Silent, Turbo and Full Speed. You can also move the slider to Manual and manually configure the fan's operating speed.

PWM          DC

⊘ Optimize All

CPU FAN
CHA1 FAN
CHA2 FAN
CHA3 FAN
CHA4 FAN
CHA5 FAN
HAMP FAN
EXT FAN1
EXT FAN2
EXT FAN3
ASST FAN
W. PUMP+

%
100

50

0          30          70          100    ℃

Standard    Silent    Turbo    Full Speed    Manual

Undo          Apply          Exit (ESC)

**Select a profile to apply to your fans**

**Click to apply the fan setting**

**Click to undo the changes**

**Click to go back to main menu**

**Select to manually configure your fans**

## Configuring fans manually

Select **Manual** from the list of profiles to manually configure your fans' operating speed.



**Speed points**

**Select to manually configure your fans**
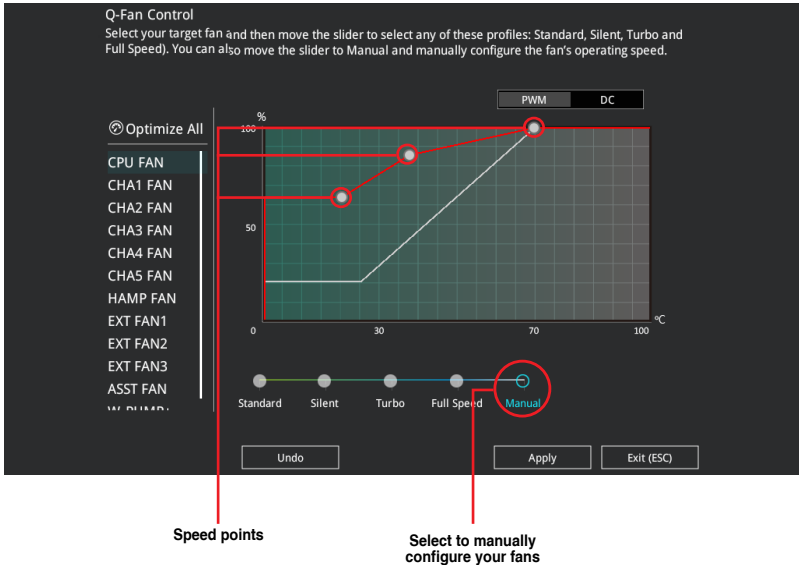
To configure your fans:

1. Select the fan that you want to configure and to view its current status.

2. Click and drag the speed points to adjust the fans' operating speed.

3. Click **Apply** to save the changes then click **Exit (ESC)**.

## 1.2.4    EZ Tuning Wizard

EZ Tuning Wizard allows you to easily overclock your CPU and DRAM, computer usage, and CPU fan to their best settings. You can also set RAID in your system using this feature.



**OC setup**          **RAID setup**
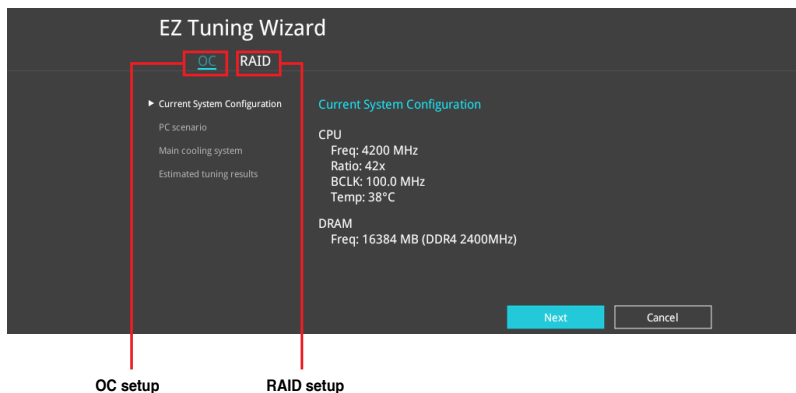
### OC Tuning

To start OC Tuning:

1.    Press <F11> on your keyboard or click ⏻ EZ Tuning Wizard(F11) from the BIOS screen to open EZ Tuning Wizard screen.

2.    Click **OC** then click **Next**.

3.    Select a PC scenario **Daily Computing** or **Gaming/Media Editing,** then click **Next**.
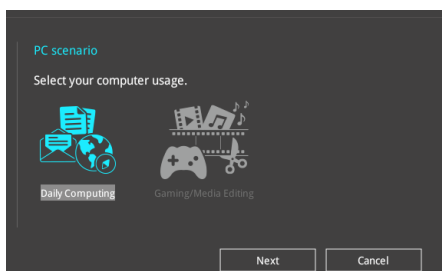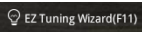
4. Select a Main Cooling System **BOX cooler, Tower cooler, Water cooler,** or **I'm not sure,** then click **Next**.
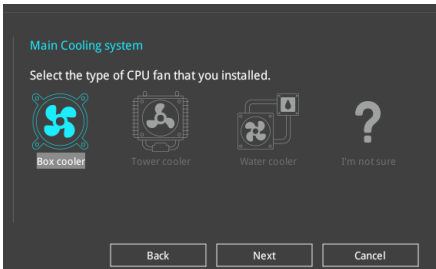


5. After selecting the Main Cooling System, click **Next** then click **Yes** to start the OC Tuning.

## Creating RAID

To create RAID:

1. Press <F11> on your keyboard or click ⟨EZ Tuning Wizard(F11)⟩ from the BIOS screen to open EZ Tuning Wizard screen.

2. Click **RAID** then click **Next**.

- Ensure that your HDDs have no existing RAID volumes.

- Ensure to connect your HDDs to Intel® SATA connectors.

3. Select the port that you want to set to [RAID] mode, **PCIE** or **SATA**, then click **Next**.
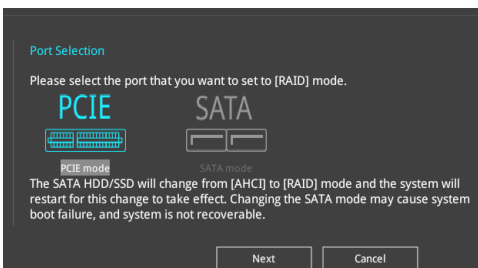
4.    Check the available storage disk drives, then click **Next**.



```
Storage Configuration

Welcome to the EZ RAID Setup Wizard.
This wizard helps you easily to configure the RAID system on your storage disk drives
for increased performance and reliable data storage solution.

Available storage disk drives:
   Port: Model Number:              Port: Model Number:
   Size:                            Size:

                        Next            Cancel
```
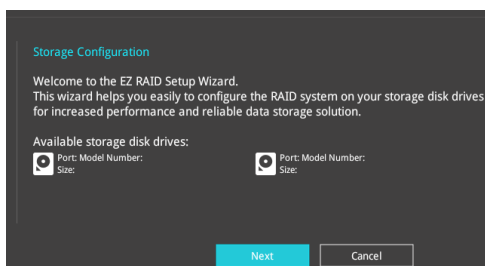
5.    Select the type of storage for your RAID, **Easy Backup** or **Super Speed**, then click **Next**.



```
Storage Function Selection

Which function do you want for your storage disk drive?

   Easy Backup          Super Speed

            Back          Next          Cancel
```
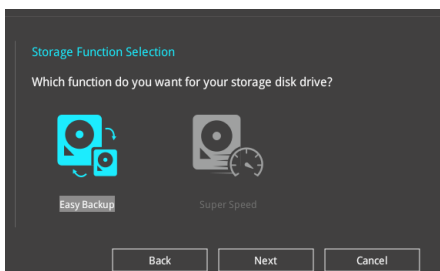
a.    For Easy Backup, click **Next** then select from **Easy Backup (RAID 1)** or **Easy Backup (RAID 10)**.



```
Storage Function Selection

Select the RAID type for your selected storage function

   Easy Backup (RAID1)          Easy Backup (RAID10)

            Back          Next          Cancel
```
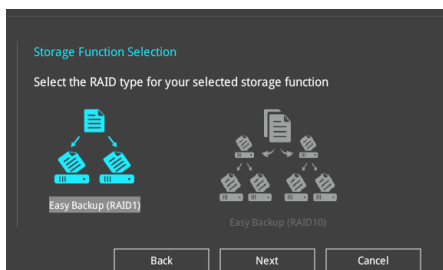
You can only select Easy Backup (RAID 10) if you connect four (4) HDDs.

b.     For Super Speed, click **Next** then select from **Super Speed (RAID 0)** or **Super Speed (RAID 5)**.
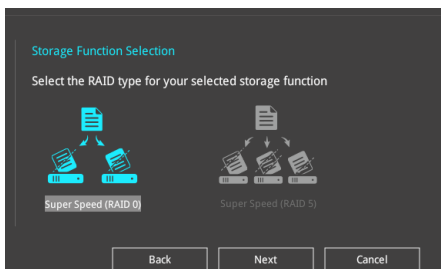


6.     After selecting the type of RAID, click **Next** then click **Yes** to continue the RAID setup.

7.     After the RAID setup is done, click **Yes** to exit the setup then click **OK** to reset your system.

# 1.3     My Favorites

My Favorites is your personal space where you can easily save and access your favorite BIOS items. My Favorites comes with several performance, power saving, and fast boot related items by default. You can personalize this screen by adding or removing items.
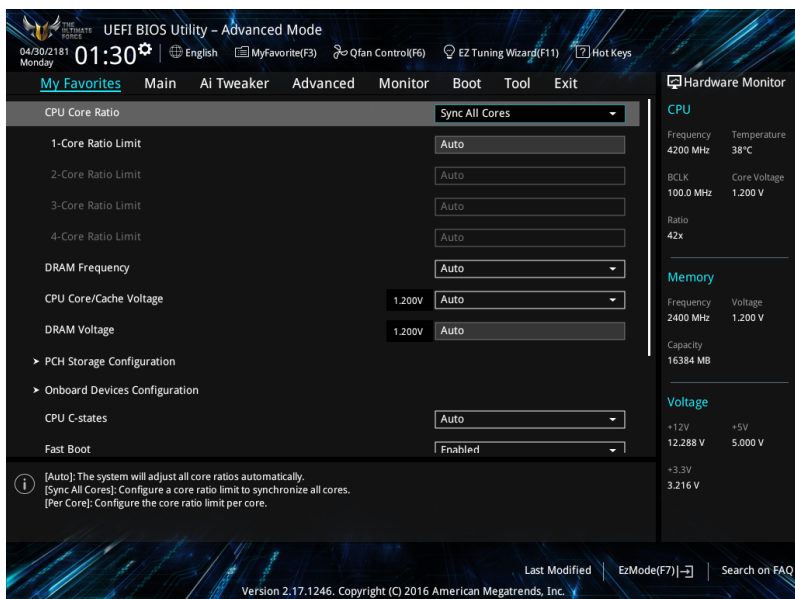
## Adding items to My Favorites

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.
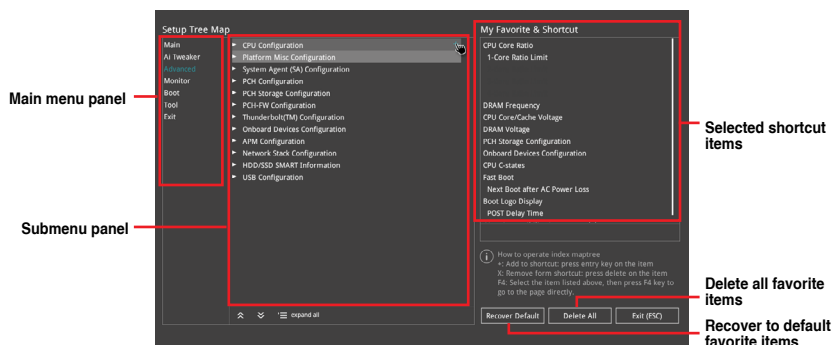


3. Select an item from main menu panel, then click the submenu that you want to save as favorite from the submenu panel and click ➕ or press <Enter> on your keyboard.

> 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.

# 1.4 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.
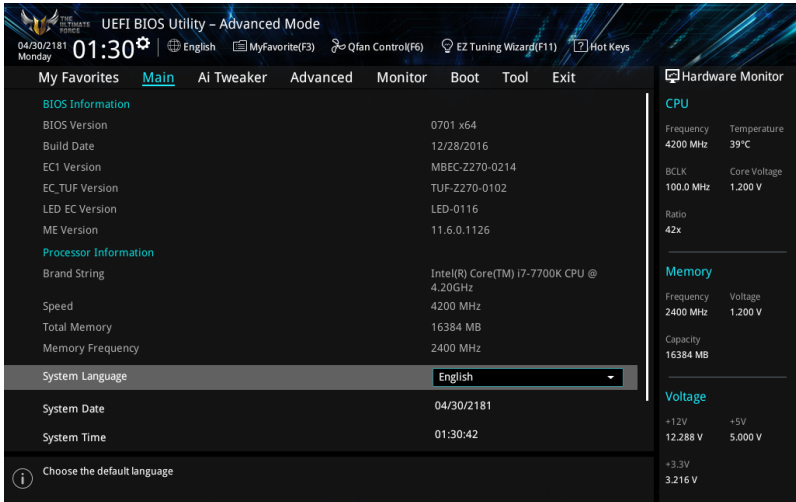


## Security

The Security menu items allow you to change the system security settings.
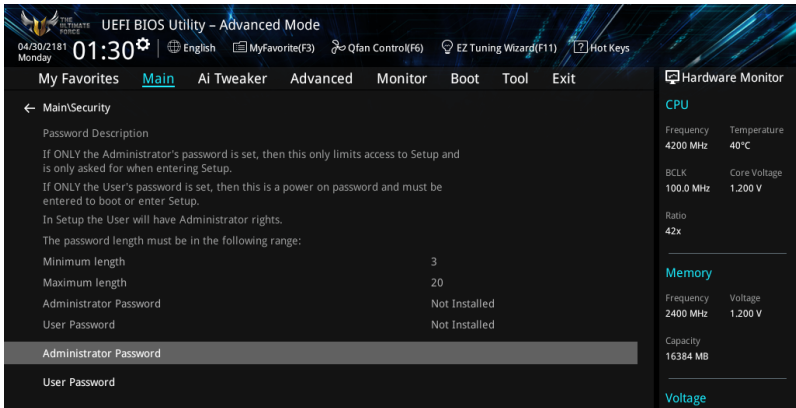


- If you have forgotten your BIOS password, erase the CMOS Real Time Clock (RTC) RAM to clear the BIOS password. See section **1.1.7 Jumpers** in your user manual for information on how to erase the RTC RAM.

- 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]**.

# 1.5 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 CPU and DIMM model you installed on the motherboard.

Scroll down to display other BIOS items.
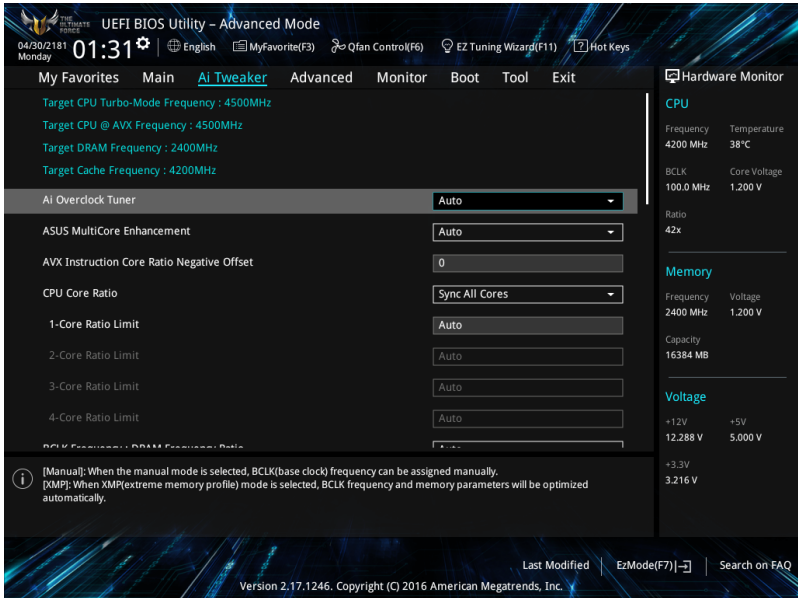


## Ai Overclock Tuner

This item allows you to select the CPU overclocking options to achieve the desired CPU internal frequency. Select any of these preset overclocking configuration options:

[Auto]          Loads the optimal settings for the system.

[Manual]        Automatically optimizes the CPU ratio and BCLK frequency.

[XMP]           If you install memory modules supporting the eXtreme Memory Profile (XMP) Technology, choose this item to set the profiles supported by your memory modules for optimizing the system performance.

> ✎ The **[X.M.P.]** configuration option appears only when you install memory modules supporting the eXtreme Memory Profile(X.M.P.) Technology.

When the Ai Overclock Tuner is set to **[Manual]** or **[XMP]**, the following items appear.

**BCLK Frequency**

This item allows you to set the BCLK (base clock) frequency to enhance the system performance. Use the <+> or <-> to adjust the value. The values range from 80.0 MHz to 300.0 MHz.

We recommend you to set the value based on the CPU specification, as high BCLK frequencies may damage the CPU permanently.

## ASUS MultiCore Enhancement

[Auto]          This item allows you to maximize the oveclocking performance optimized by ASUS core ratio settings.

[Disabled]      This item allows you to set to default core ratio settings.

## AVX Instruction Core Ratio Negative Offset

This item allows you to subtract a value from your core ratio at which AVX applications run.

Configuration options: [Auto] [1] – [31]

## CPU Core Ratio

This item allows you to set the CPU core ratio limit per core or synchronize automatically to all cores.

Configuration options: [Auto] [Sync All Cores] [Per Core]

When the CPU Core Ratio is set to **[Sync All Cores]**, the following item appears.

**1-Core Ratio Limit**
Enter **[Auto]** to apply the CPU default Turbo Ratio setting or manually assign a 1-Core Limit value that must be higher than or equal to the 2-Core Ratio Limit.

When the CPU Core Ratio is set to **[Per Core]**, the following item appears.

**1-Core Ratio Limit**
Enter **[Auto]** to apply the CPU default Turbo Ratio setting or manually assign a 1-core ratio limit that must be higher than or equal to the 2-core ratio limit.

**2-Core Ratio Limit**
Enter **[Auto]** to apply the CPU default Turbo Ratio setting or manually assign a 2-core ratio limit that must be higher than or equal to the 3-core ratio limit.

If you assign a value for 2-Core Ratio Limit, do not set the 1-Core Ratio Limit to **[Auto]**.

**3-Core Ratio Limit**
Enter **[Auto]** to apply the CPU default Turbo Ratio setting or manually assign a 3-core ratio limit that must be higher than or equal to the 4-core ratio limit.

If you assign a value for 3-Core Ratio Limit, do not set the 1-Core Ratio Limit and 2-Core Ratio Limit to **[Auto]**.

**4-Core Ratio Limit**
Enter **[Auto]** to apply the CPU default Turbo Ratio setting or manually assign a 4-core ratio limit that must be lower than or equal to the 3-core ratio limit.

If you assign a value for 4-Core Ratio Limit, do not set the 1-Core Ratio Limit, 2-Core Ratio Limit, and 3-Core Ratio Limit to **[Auto]**.

## BCLK Frequency : DRAM Frequency Ratio

[Auto]          The BCLK frequency to DRAM frequency ratio will be set to the optimized setting.

[100:133]       The BCLK frequency to DRAM frequency ratio will be set to 100:133.

[100:100]       The BCLK frequency to DRAM frequency ratio will be set to 100:100.

## DRAM Odd Ratio Mode

This item allows you to enable or disable availability of odd DRAM ratios for improved granularity.

Configuration options: [Enabled] [Disabled]

## DRAM Frequency

This item allows you to set the memory operating frequency. The configurable options vary with the BCLK (base clock) frequency setting. Select the auto mode to apply the optimized setting.

Configuration options: [Auto] [DDR4-800MHz] - [DDR4-4266MHz]

## TPU

This item allows you to automatically overclock the CPU and DRAM frequencies and voltage for an enhanced system performance.

[Keep Current Settings]  Keep the current settings without changing anything.
[TPU I]                  Applies air cooling overclocking conditions.
[TPU II]                 Applies water cooling overclocking conditions.

Ensure to use water cooling device before selecting **[TPU II].**

### EPU Power Saving Mode

The ASUS EPU (Energy Processing Unit) sets the CPU in its minimum power consumption settings. Enabling this item will apply lower CPU Core/Cache Voltage and help save energy consumption. Set this item to disabled if you are over clocking the system.

Configuration options: [Disabled] [Enabled]

### Load CPU 5G OC Profile

Select this item to easily overclock the Intel 7th generation Core processors (K-series only) to 5GHz.

Overclockability may vary by processors and does not guarantee stability.

### CPU SVID Support

Disable this item to stop the CPU from communicating with the external voltage regulator.

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

### DRAM Timing Control

The subitems in this menu allow you to set the DRAM timing control features. Use the <+> or <-> keys to adjust the value. To restore the default setting, type [auto] using the keyboard and press the <Enter> key.

Changing the values in this menu may cause the system to become unstable! If this happens, revert to the default settings.

**Primary Timings**

**DRAM CAS# Latency**

Configuration options: [Auto] [1] – [31]

**DRAM RAS# to CAS# Delay**

Configuration options: [Auto] [1] – [31]

**DRAM RAS# ACT Time**

Configuration options: [Auto] [1] – [63]

**DRAM COMMAND Rate**

Configuration options: [Auto] [1N] [2N] [3N] [N:1]

**Secondary Timings**

**DRAM RAS# to RAS# Delay L**

Configuration options: [Auto] [1] – [15]

**DRAM RAS# to RAS# Delay S**

Configuration options: [Auto] [1] – [15]

**DRAM REF Cycle Time**

Configuration options: [Auto] [1] – [1023]

**DRAM Refresh Interval**

Configuration options: [Auto] [1] – [65535]

**DRAM WRITE Recovery Time**

Configuration options: [Auto] [1] – [31]

**DRAM READ to PRE Time**

Configuration options: [Auto] [1] – [15]

**DRAM FOUR ACT WIN Time**

Configuration options: [Auto] [1] – [63]

**DRAM WRITE to READ Delay**

Configuration options: [Auto] [1] – [15]

**DRAM WRITE to READ Delay L**

Configuration options: [Auto] [1] – [15]

**DRAM WRITE to READ Delay S**

Configuration options: [Auto] [1] – [15]

**DRAM CKE Minimum Pulse Width**

Configuration options: [Auto] [0] – [15]

**DRAM Write Latency**

Configuration options: [Auto] [1] – [31]

**Skew Control**

> **ODT RTT WR (CHA)**
> Configuration options: [Auto] [0 DRAM CLOCK] [80 DRAM CLOCK] [120 DRAM CLOCK] [240 DRAM CLOCK] [255 DRAM CLOCK]

> **ODT RTT PARK (CHA)**
> Configuration options: [Auto] [0 DRAM CLOCK] [34 DRAM CLOCK] [40 DRAM CLOCK] [48 DRAM CLOCK] [60 DRAM CLOCK] [80 DRAM CLOCK] [120 DRAM CLOCK] [240 DRAM CLOCK]

> **ODT RTT NOM (CHA)**
> Configuration options: [Auto] [0 DRAM CLOCK] [34 DRAM CLOCK] [40 DRAM CLOCK] [48 DRAM CLOCK] [60 DRAM CLOCK] [80 DRAM CLOCK] [120 DRAM CLOCK] [240 DRAM CLOCK]

> **ODT RTT WR (CHB)**
> Configuration options: [Auto] [0 DRAM CLOCK] [80 DRAM CLOCK] [120 DRAM CLOCK] [240 DRAM CLOCK] [255 DRAM CLOCK]

> **ODT RTT PARK (CHB)**
> Configuration options: [Auto] [0 DRAM CLOCK] [34 DRAM CLOCK] [40 DRAM CLOCK] [48 DRAM CLOCK] [60 DRAM CLOCK] [80 DRAM CLOCK] [120 DRAM CLOCK] [240 DRAM CLOCK]

> **ODT RTT NOM (CHB)**
> Configuration options: [Auto] [0 DRAM CLOCK] [34 DRAM CLOCK] [40 DRAM CLOCK] [48 DRAM CLOCK] [60 DRAM CLOCK] [80 DRAM CLOCK] [120 DRAM CLOCK] [240 DRAM CLOCK]

**ODT_READ_DURATION**
Configuration options: [Auto] [0] - [7]

**ODT_READ_DELAY**
Configuration options: [Auto] [0] - [7]

**ODT_WRITE_DURATION**
Configuration options: [Auto] [0] - [7]

**ODT_WRITE_DELAY**
Configuration options: [Auto] [0] - [7]

**Data Rising Slope**
Configuration options: [Auto] [0] - [15]

**Data Rising Slope Offset**
Configuration options: [Auto] [0] - [1]

**Cmd Rising Slope**
Configuration options: [Auto] [0] - [15]

**Cmd Rising Slope Offset**
Configuration options: [Auto] [0] - [1]

**Ctl Rising Slope**
Configuration options: [Auto] [0] - [15]

**Ctl Rising Slope Offset**
Configuration options: [Auto] [0] - [1]

**Clk Rising Slope**
Configuration options: [Auto] [0] - [15]

**Clk Rising Slope Offset**
Configuration options: [Auto] [0] - [1]

**Data Falling Slope**
Configuration options: [Auto] [0] - [15]

**Data Falling Slope Offset**
Configuration options: [Auto] [0] - [1]

**Cmd Falling Slope**
Configuration options: [Auto] [0] - [15]

**Cmd Falling Slope Offset**
Configuration options: [Auto] [0] - [1]

**Ctl Falling Slope**
Configuration options: [Auto] [0] - [15]

**Ctl Falling Slope Offset**
Configuration options: [Auto] [0] - [1]

**Clk Falling Slope**
Configuration options: [Auto] [0] - [15]

**Clk Falling Slope Offset**
Configuration options: [Auto] [0] - [1]

**RTL IOL control**

**DRAM RTL INIT Value**
Configuration options: [Auto] [0] - [127]

**DRAM RTL (CHA DIMM0 Rank0)**
Configuration options: [Auto] [0] - [127]

**DRAM RTL (CHA DIMM0 Rank1)**
Configuration options: [Auto] [0] - [127]

**DRAM RTL (CHA DIMM1 Rank0)**
Configuration options: [Auto] [0] - [127]

**DRAM RTL (CHA DIMM1 Rank1)**
Configuration options: [Auto] [0] - [127]

**DRAM RTL (CHB DIMM0 Rank0)**
Configuration options: [Auto] [0] - [127]

**DRAM RTL (CHB DIMM0 Rank1)**
Configuration options: [Auto] [0] - [127]

**DRAM RTL (CHB DIMM1 Rank0)**
Configuration options: [Auto] [0] - [127]

**DRAM RTL (CHB DIMM1 Rank1)**
Configuration options: [Auto] [0] - [127]

**DRAM IOL (CHA DIMM0 Rank0)**
Configuration options: [Auto] [0] - [15]

**DRAM IOL (CHA DIMM0 Rank1)**
Configuration options: [Auto] [0] - [15]

**DRAM IOL (CHA DIMM1 Rank0)**
Configuration options: [Auto] [0] - [15]

**DRAM IOL (CHA DIMM1 Rank1)**
Configuration options: [Auto] [0] - [15]

**DRAM IOL (CHB DIMM0 Rank0)**
Configuration options: [Auto] [0] - [15]

**DRAM IOL (CHB DIMM0 Rank1)**
Configuration options: [Auto] [0] - [15]

**DRAM IOL (CHB DIMM1 Rank0)**
Configuration options: [Auto] [0] - [15]

**DRAM IOL (CHB DIMM1 Rank1)**
Configuration options: [Auto] [0] - [15]


**IO Latency offset**

**CHA IO_Latency_offset**
Configuration options: [Auto] [0] - [127]

**CHB IO_Latency_offset**
Configuration options: [Auto] [0] - [127]

**IO Latency RFR delay**

> **CHA RFR delay**
> Configuration options: [Auto] [0] - [127]
>
> **CHB RFR delay**
> Configuration options: [Auto] [0] - [127]

**Third Timings**

**tRDRD_sg**
Configuration options: [Auto] [0] - [63]

**tRDRD_dg**
Configuration options: [Auto] [0] - [63]

**tRDWR_sg**
Configuration options: [Auto] [0] - [63]

**tRDWR_dg**
Configuration options: [Auto] [0] - [63]

**tWRWR_sg**
Configuration options: [Auto] [0] - [63]

**tWRWR_dg**
Configuration options: [Auto] [0] - [63]

**tWRRD_sg**
Configuration options: [Auto] [0] - [127]

**tWRRD_dg**
Configuration options: [Auto] [0] - [63]

**tRDRD_dr**
Configuration options: [Auto] [0] - [63]

**tRDRD_dd**
Configuration options: [Auto] [0] - [63]

**tRDWR_dr**
Configuration options: [Auto] [0] - [63]

**tRDWR_dd**
Configuration options: [Auto] [0] - [63]

**tWRWR_dr**
Configuration options: [Auto] [0] - [63]

**tWRWR_dd**
Configuration options: [Auto] [0] - [63]

**tWRRD_dr**
Configuration options: [Auto] [0] - [63]

**tWRRD_dd**

Configuration options: [Auto] [0] - [63]

**TWRPRE**

Configuration options: [Auto] [0] - [127]

**TRDPRE**

Configuration options: [Auto] [0] - [15]

**tREFIX9**

Configuration options: [Auto] [0] - [127]

**OREF_RI**

Configuration options: [Auto] [0] – [255]


**Misc.**

**MRC Fast Boot**

Allows you to enable, disable or automatically set the MRC fast boot.
Configuration options: [Auto] [Enabled] [Disabled]

**DRAM CLK Period**

Configuration options: [Auto] [1] – [40]

**Memory Scrambler**

Set this item to enable or disable memory scrambler support.
Configuration options: [Enabled] [Disabled]

**Channel A DIMM Control**

Allows you to enable or disable the Channel A DIMM slots.
Configuration options: [Enable Both DIMMS] [Disable DIMM0] [Disable DIMM1]
[Disable Both DIMMS]

**Channel B DIMM Control**

Allows you to enable or disable the Channel B DIMM slots.
Configuration options: [Enable Both DIMMS] [Disable DIMM0] [Disable DIMM1]
[Disable Both DIMMS]

**MCH Full Check**

Enable this item to enhance the stability of your system. Disable this item to enhance
the DRAM overclocking capability.
Configuration options: [Auto] [Enabled] [Disabled]

**DLLBwEn**

Configuration options: [Auto] [1] - [7]

**DRAM SPD Write**

Configuration options: [Enabled] [Disabled]

## External DIGI+ Power Control

### CPU Load-line Calibration

Load-line is defined by Intel® specification and affects CPU power voltage. The CPU working voltage decreases proportionally to CPU loading. Higher load-line calibration could get higher voltage and good overclocking performance, but increases the CPU and VRM thermal conditions. Select from levels 1 to 7 to adjust the load-line slope. Configuration options [Auto] [Level 1] - [Level 7]

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

This item allows you to set the shut off current limit for external 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: [Auto] [100%] [110%] [120%] [130%] [140%]

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

### CPU VRM Switching Frequency

This item affects the VRM transient response speed and the component thermal production. Select [**Manual**] to configure a higher frequency for a quicker transient response speed.
Configuration options: [Auto] [Manual]

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

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

#### Fixed CPU VRM Switching Frequency (KHz)
This item allows you to set a higher frequency for a quicker transient response speed. Use the <+> or <-> to adjust the value. The values range from 250 KHz to 500 KHz with an interval of 50 KHz.

Do not remove the thermal module when the manual mode is selected. The thermal conditions should be monitored.

> The following item appears only when the CPU VRM Switching Frequency is set to [**Auto**].

**VRM Spread Spectrum**

This item allows to enhance the system stability.

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

### CPU Power Duty Control

DIGI + VRM Duty Control adjusts the current of every VRM phase and the thermal conditions of every 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. The thermal conditions should be monitored.

### CPU Power Phase Control

This item allows you to set the power phase control of the CPU.

[Auto]                      Automatically set the phase control mode.
[Standard]                The phase control will be based on the CPU command.
[Optimized]              Set to the ASUS optimized phase tuning profile.
[Extreme]                Set to the full phase mode.

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

### CPU Graphics Load-line Calibration

The load-line is defined by the Intel VRM specification and affects the CPU Graphics power voltage. The CPU Graphics working voltage will decrease proportionally depending on the CPU Graphics loading.
Configuration options: [Auto] [Level 0] - [Level 7]

> The boosted performance may vary depending on the CPU Graphics specification. DO NOT remove the thermal module.

### CPU Graphics Current Capability

This item adjusts the total power range for CPU Graphics overclocking. A higher value setting provides higher power consumption delivery and extends the overclocking frequency range simultaneously.
Configuration options: [Auto] [100%] [110%] [120%] [130%] [140%]

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

---

**CPU Graphics Switching Frequency**

The switching frequency will affect the CPU Graphics transient response speed and the component thermal production.
Configuration options: [Auto] [Manual]

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

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

### Fixed CPU Graphics Switching Frequency(KHz)
This item allows you to set a higher frequency for a quicker transient response speed. Use the <+> or <-> to adjust the value. The values range from 250 KHz to 500 KHz with an interval of 50 KHz.

**CPU Graphics Power Phase Control**

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

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

**CPU Core/Cache Boot Voltage**

Configuration options: [Auto] [0.600] - [1.700]

**DMI Boot Voltage**

Configuration options: [Auto] [0.3000] - [1.9000]

**CPU System Agent Boot Voltage**

Configuration options: [Auto] [0.7000] - [1.8000]

**CPU VCCIO Boot Voltage**

Configuration options: [Auto] [0.9000] - [1.8000]

**CPU Standby Boot Voltage**

Configuration options: [Auto] [0.700] - [2.200]

## Internal CPU Power Management
The subitems in this menu allow you to set the CPU ratio and features.

**Intel(R) SpeedStep(tm)**

Allows the operating system to dynamically adjust the processor voltage and cores frequency to decrease the average power consumption and decrease average heat production. Configuration options: [Auto] [Enabled] [Disabled]

**Turbo Mode**

Allows you to enable your processor cores to run faster than the base operating frequency when it is below power, current and specification limit. Configuration options: [Disabled] [Enabled]

**Turbo Mode Parameters**

The following items appear only when you set the Turbo Mode to **[Enabled]**.

**Long Duration Package Power Limit**
As know as the power limit 1 in Watts. The default value will be the TDP (thermal design power). The turbo ratio can be maintained for a duration to exceed the TDP for the maximum system performance.

Configuration options: [Auto] [1] - [4095]

**Package Power Time Window**
As know as the power limit 1 in seconds. The value indicates the maintained duration for the turbo ratio to exceed TDP (thermal design power).

Configuration options: [Auto] [1] - [127]

**Short Duration Package Power Limit**
Also know as the power limit 2 in Watts. It is the second power limit to provide a rapid protection when the package power exceed power limit 1. The default setting is 1.25 times the power limit 1. According to Intel, the platform must be capable of supporting the duration for up to 10 msec when the turbo ratio exceeds the power limit 2. The ASUS motherboards can support the duration for a longer time.

Configuration options: [Auto] [1] - [4095]

**IA AC Load Line**

This item allows you to set the AC loadline defined in 1/100 mOhms. Use the <+> and <-> keys to adjust the value.
Configuration options: [Auto] [0.01] - [62.49]

**IA DC Load Line**

This item allows you to set the DC loadline defined in 1/100 mOhms. Use the <+> and <-> keys to adjust the value.
Configuration options: [Auto] [0.01] - [62.49]

## Tweaker's Paradise

**FCLK Frequency for Early Power On**

This item allows you to set the FCLK Frequency for Early Power On.
Configuration options: [Auto] [Normal (800 MHz)] [1GHz] [400 MHz]

**Initial BCLK Frequency**

This item allows you to start overclocking the system from the initial BCLK (base clock) frequency to the assigned BCLK frequency. Use the <+> or <-> to adjust the value. The values range from 40.0000 MHz to 650.0000 MHz.

**BCLK Amplitude**

This item allows you to set the magnitude of the base clock driven for the processor.
Configuration options: [Auto] [700mV] [800mV] [900mV] [1000mV]

**BCLK Spread Spectrum**

This item allows you to reduce the EMI. Disable to get more accurate base clocks.
Configuration options: [Auto] [Disabled]

**BCLK Frequency Slew Rate**

Configuration options: [Auto] [40us/MHz] [80us/MHz]

**VPPDDR Voltage**

Configuration options: [Auto] [1.86500] - [2.70000]

**DMI Voltage**

Configuration options: [Auto] [0.30000] - [1.90000]

**Internal PLL Voltage**

Configuration options: [Auto] [0.900] - [1.845]

## CPU Core/Cache Current Limit Max.

This item allows you to configure a higher current limit to prevent a frequency or power throttling when overclocking. Use the <+> and <-> keys to adjust the value.

Configuration options: [Auto] [0.00] - [255.50]

## Min. CPU Cache Ratio

This item allows you to set the minimum possible CPU cache ratio. Use the <+> and <-> keys to adjust the value.

Configuration options: [Auto] [8] - [26]

## Max. CPU Cache Ratio

This item allows you to set the maximum possible CPU cache ratio. Use the <+> and <-> keys to adjust the value.

Configuration options: [Auto] [8] - [26]

## Extreme Over-voltage

Enable this item to allow higher voltages for overclocking, but the CPU lifetime will not be guaranteed.

Configuration options: [Disabled] [Enabled]

> This item can only be enabled when the onboard CPU_OV jumper is switched on.

## BCLK Aware Adaptive Voltage

When this option is enabled, pcode will be aware of the BCLK frequency when calculating the CPU V/F curves. This is ideal for BCLK OC to avoid high voltage overrides. Uses OC Mailbox command 0x15.

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

## CPU Core/Cache Voltage

Configures the mode of Voltage fed to the cores of the processor.

Configuration options: [Auto] [Manual Mode] [Offset Mode] [Adaptive Mode]

The following items appear only when you set the CPU Core/Cache Voltage to **[Manual Mode]**.

**CPU Core Voltage Override**

Allows you to configure the CPU Core voltage.
Configuration options: [Auto] [0.600] - [1.700]

The following items appear only when you set the CPU Core/Cache Voltage to **[Offset Mode]**.

**Offset Mode Sign**

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

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

**CPU Core Voltage Offset**

This item allows you to configure the CPU core voltage offset value.
Configuration options: [Auto] [0.005] - [0.635]

The following items appear only when you set the CPU Core/Cache Voltage to **[Adaptive Mode]**.

**Offset Mode Sign**

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

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

**Additional Turbo Mode CPU Core Voltage**

This item allows you to configure the CPU core voltage offset value.
Configuration options: [0.250] - [1.520]

**Offset Voltage**

This item allows you to configure the CPU core voltage offset value.
Configuration options: [Auto] [0.001] - [0.999]

## DRAM Voltage

Configuration options: [Auto] [1.0032] - [2.0064]

## CPU VCCIO Voltage

Configuration options: [Auto] [1.50640] - [1.79390]

## CPU System Agent Voltage

Configuration options: [Auto] [0.70000] - [1.80000]

## CPU Graphics Voltage Mode [Auto]

Configures the mode of Voltage fed to the CPU graphics.
Configuration options: [Auto] [Manual Mode] [Offset Mode]

> The following item appears only when you set the CPU Graphics Voltage Mode to **[Manual Mode]**.

### CPU Graphics Voltage Override

Allows you to configure the CPU Graphics Voltage.
Configuration options: [Auto] [0.600] - [1.700]

> The following items appear only when you set the CPU Graphics Voltage Mode to **[Offset Mode]**.

### Offset Mode Sign

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

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

### CPU Graphics Voltage Offset [Auto]

This item allows you to configure the CPU core voltage offset value.
Configuration options: [Auto] [0.005] - [0.635]

## PCH Core Voltage

Configuration options: [Auto] [0.70000] - [1.80000]

## CPU Standby Voltage

Configuration options: [Auto] [0.800] - [1.600]

## DRAM REF Voltage Control

### DRAM CTRL REF Voltage on CHA/CHB

Configures the DRAM reference voltage on the control lines. The reference voltage will be the DRAM voltage times the configured value.
Configuration options: [Auto] [0.39500] - [0.63000]

### DRAM DATA REF Voltage on CHA DIMM0 Rank0 BL0-7

Configures the DRAM Data REF Voltage.
Configuration options: [Auto] [0] - [63]

### DRAM DATA REF Voltage on CHA DIMM0 Rank1 BL0-7

Configures the DRAM Data REF Voltage.
Configuration options: [Auto] [0] - [63]

### DRAM DATA REF Voltage on CHA DIMM1 Rank0 BL0-7

Configures the DRAM Data REF Voltage.
Configuration options: [Auto] [0] - [63]

### DRAM DATA REF Voltage on CHA DIMM1 Rank1 BL0-7

Configures the DRAM Data REF Voltage.
Configuration options: [Auto] [0] - [63]

**DRAM DATA REF Voltage on CHB DIMM0 Rank0 BL0-7**

Configures the DRAM Data REF Voltage.
Configuration options: [Auto] [0] - [63]

**DRAM DATA REF Voltage on CHB DIMM0 Rank1 BL0-7**

Configures the DRAM Data REF Voltage.
Configuration options: [Auto] [0] - [63]

**DRAM DATA REF Voltage on CHB DIMM1 Rank0 BL0-7**

Configures the DRAM Data REF Voltage.
Configuration options: [Auto] [0] - [63]

**DRAM DATA REF Voltage on CHB DIMM1 Rank1 BL0-7**

Configures the DRAM Data REF Voltage.
Configuration options: [Auto] [0] - [63]

# 1.6 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.

## 1.6.1 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.
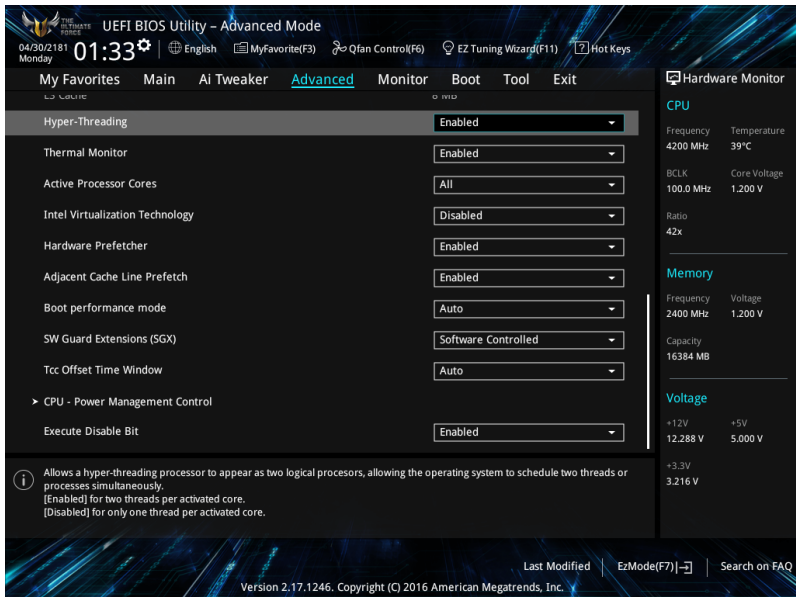


### Hyper-Threading

This item allows you to enable or disable the Hyper-Threading for logical processor threads.

Configuration options: [Enabled] [Disabled]

### Thermal Monitor

This item allows you to enable or disable the Thermal Monitor.

Configuration options: [Disabled] [Enabled]

### Active Processor Cores

This item allows you to select the number of CPU cores to activate in each processor package.

Configuration options: [All] [1] [2] [3]

### Intel Virtualization Technology

When set to **[Enabled]**, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.

Configuration options: [Disabled] [Enabled]

### Hardware Prefetcher

This item allows the CPU to prefetch commands and data in the L2 cache, reduces the DRAM loading time and improves the system performance.

Configuration options: [Disabled] [Enabled]

### Adjacent Cache Line Prefetch

This item allows the mid level cache (L2) to prefetch adjacent cache lines, reducing the DRAM loading time and improves the system performance.

Configuration options: [Disabled] [Enabled]

### Boot Performance Mode

This item allows you to select the CPU performance state during system boot before the operating system takes control. The CPU runs at a selected performance ratio based on CPU configuration.

Configuration options: [Max Battery] [Max Non-Turbo Performance] [Turbo Performance] [Auto]

### SW Guard Extensions (SGX)

This item allows you to enable or disable Software Guard Extensions (SGX).

Configuration options: [Disabled] [Software Controlled]

### Tcc Offset Time Window

This item allows you to set the TCC Offset Time Window for Running Average Temperature Limit (RATL) feature. RATL allows setting an average max thermal temperature. Temperatures within the time window can get higher than the temperature threshold but only the average is used to cause frequency clipping.

Configuration options: [Auto] [Disabled] [5 ms] - [448 sec]

### CPU Power Management Configuration

This item allows you to manage and configure the CPU's power.

#### Intel(R) SpeedStep(tm)

This item allows more than two frequency to be supported.
Configuration options: [Auto] [Enabled] [Disabled]

#### Turbo Mode

This item allows you to automatically set the CPU cores to run faster than the base operating frequency when it is below the operating power, current and temperature specification limit.
Configuration options: [Enabled] [Disabled]

**CPU C-states**

This item allows you to set the power saving of the CPU states.

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

> The following items appear only when you set the CPU C-states to **[Enabled]**.

**Enhanced C-States**
When enabled, CPU will switch to minimum speed when all cores enter C-State.

Configuration options: [Enabled] [Disabled]

**CPU C3 Report**
This item allows you to disable or enable the CPU C3 report to the operating system.

Configuration options: [Enabled] [Disabled]

**CPU C6 Report**
This item allows you to disable or enable the CPU C6 report to the operating system.

Configuration options: [Enabled] [Disabled]

**CPU C7 Report**
This item allows you to disable or enable the CPU C7 report to the operating system.

Configuration options: [CPU C7] [CPU C7s] [Disabled]

**CPU C8 Report**
This item allows you to disable or enable the CPU C8 report to the operating system.

Configuration options: [Enabled] [Disabled]

**Package C State Limit**
This item allows you to set the C-state limit for the CPU package.
Configuration options: [Auto] [C0/C1] [C2] [C3] [C6] [C7] [C7s] [C8]

**CFG Lock**

This item allows you to disable or enable the CFG Lock.

Configuration options: [Enabled] [Disabled]

**Intel(R) Speed Shift Technology**

This item allows you to disable or enable Intel(R) Speed Shift Technology support. When enabled, CPPC v2 interface allows hardware controlled P-states.
Configuration options: [Enabled] [Disabled]

## Execute Disable Bit

Execute Disable prevents certain classes of malicious buffer overflow attacks when combined with a supporting OS (SuSE Linux 9.2, RedHat Enterprise 3 Update 3).

Configuration options: [Disabled] [Enabled]

## 1.6.2 Platform Misc Configuration

The items in this menu allow you to configure the platform-related features.
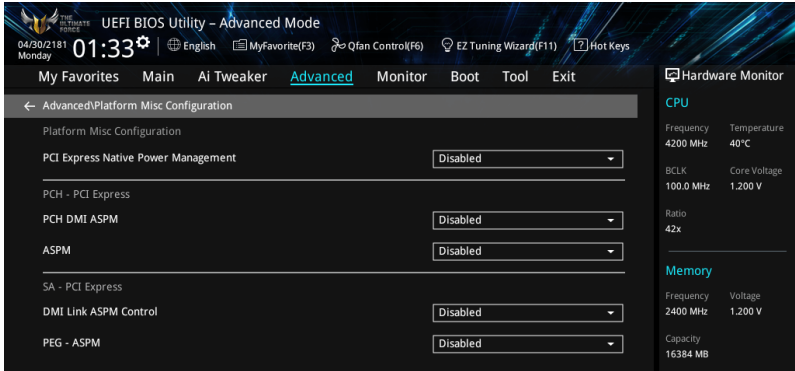


### PCI Express Native Power Management

This item allows you to enhance the power saving feature of PCI Express and perform ASPM operations in the operating system.

Configuration options: [Disabled] [Enabled]

> The following item appears only when you set the PCI Express Native Power Management to **[Enabled]**.

#### Native ASPM

[Enabled]    Windows® Vista OS controls the ASPM (active state power management) support for devices.

[Disabled]    BIOS controls the ASPM support for the device.

### PCH - PCI Express

### PCH DMI ASPM

This item allows you to control the Active State Power Management on both NB (NorthBridge) side and SB (SouthBridge) side of the DMI Link.

Configuration options: [Disabled] [Enabled]

### ASPM

This item allows you to select the ASPM state for energy-saving conditions.

Configuration options: [Disabled] [L0s] [L1] [L0sL1] [Auto]

**SA - PCI Express**

**DMI Link ASPM Control**

This item allows you to control the Active State Power Management on both CPU and PCH (platform controller hub) Both DMI link ASPM control items of the CPU and PCH sides must be enabled for the ASPM to take effect.

Configuration options: [Disabled] [L1]

**PEG - ASPM**

This item allows you to select the ASPM state for energy-saving conditions, or use the ASUS optimized energy saving profile.

Configuration options: [Disabled] [Auto] [ASPM L0s] [ASPM L1] [ASPM L0sL1]

# 1.6.3    System Agent (SA) Configuration
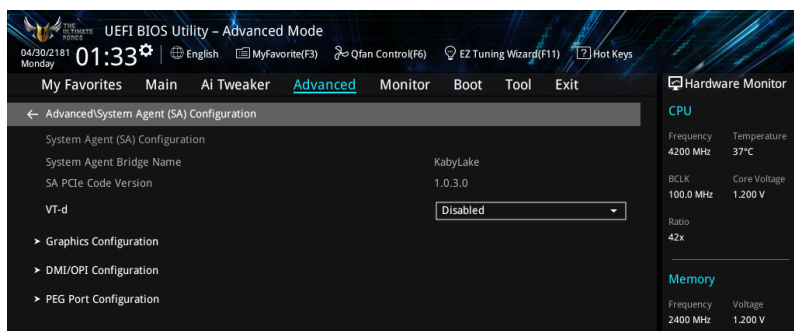


**VT-d**

Allows you to enable virtualization technology function on memory control hub.

Configuration options: [Enabled] [Disabled]

**Graphics Configuration**

This item allows you to select a primary display from CPU and PCIe graphical devices.

**Primary Display**

This item allows you to select the primary display from CPU and PCIe devices.
Configuration options: [Auto] [IGFX] [PEG]

**iGPU Multi-Monitor**

This item allows you to enable the iGPU Multi-Monitor. The iGPU shared system memory size is fixed 64 MB.
Configuration options: [Disabled] [Enabled]

**RC6(Render Standby)**

This item allows you to enable check of render standby support.
Configuration options: [Disabled] [Enabled]

### DVMT Pre-Allocated

This item allows you to select the DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory size used by the Internal Graphics Device.
Configuration options: [32M] - [1024M]

## DMI/OPI Configuration

This item allows you to control various DMI (direct media interface) functions.

### DMI Max Link Speed

Set this item to **[Enabled]** to set DMI speed.
Configuration options: [Auto] [Gen1] [Gen2] [Gen3]

## PEG Port Configuration

This item allows you to configure the PEG Port settings.

### PCIEx16_1 Link Speed

This item allows you to configure the PCIEx16_1 slot.
Configuration options: [Auto] [Gen1] [Gen2] [Gen3]

### PCIEx16_2 Link Speed

This item allows you to configure the PCIEx16_2 slot.
Configuration options: [Auto] [Gen1] [Gen2] [Gen3]

### PCIe Spread Spectrum Clocking

This item allows you to enable or disable Spread Spectrum Clocking for compliance testing.
Configuration options: [Auto] [Disabled] [Enabled]

## 1.6.4    PCH Configuration
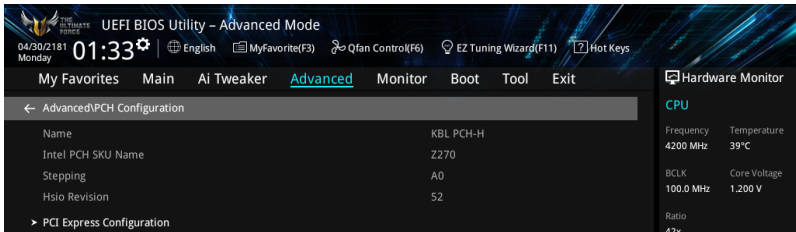


## PCI Express Configuration

This item allows you to configure the PCI Express slots.

### PCIe Speed

This item allows your system to automatically select the PCI Express port speed.
Configuration options: [Auto] [Gen1] [Gen2] [Gen3]

## 1.6.5 PCH Storage Configuration

While entering Setup, the BIOS automatically detects the presence of SATA devices. The SATA Port items show **Empty** if no SATA device is installed to the corresponding SATA port.

Scroll down to display the other BIOS items.
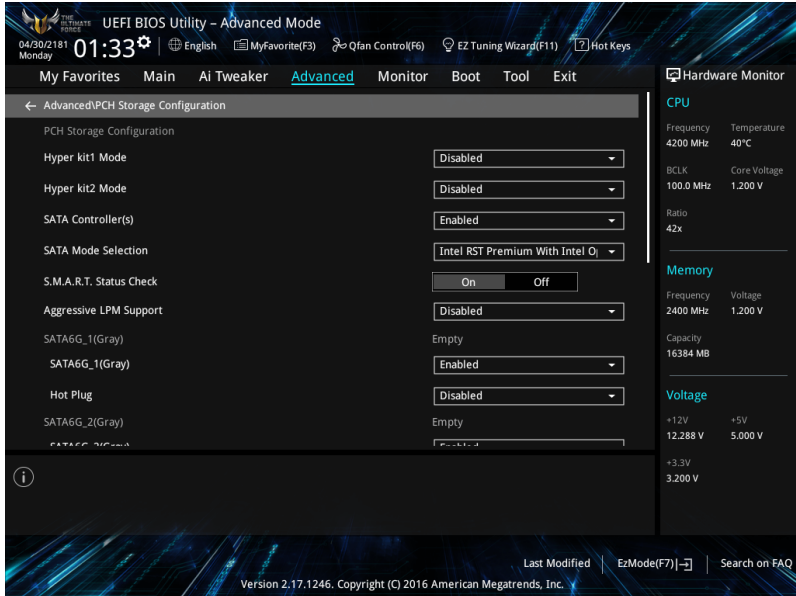


### Hyper kit1 Mode

Disable this option for M.2_1 devices. Enable this option for "ASUS Hyper kit" card.

Configuration options: [Disabled] [Enabled]

### Hyper kit2 Mode

Disable this option for M.2_2 devices. Enable this option for "ASUS Hyper kit" card.

Configuration options: [Disabled] [Enabled]

### SATA Controller(s)

This item allows you to enable or disable the SATA Device.

Configuration options: [Disabled] [Enabled]

### SATA Mode Selection

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. |
| [Intel RST Premium With Intel Optane System Acceleration (RAID)] | Set to [Intel RST Premium With Intel Optane System Acceleration (RAID)] when you want to create a RAID configuration from the SATA hard disk drives. |

### S.M.A.R.T. Status Check

S.M.A.R.T. (Self-Monitoring, Analysis and Reporting Technology) is a monitoring system that shows a warning message during POST (Power-on Self Test) when an error occurs in the hard disks.

Configuration options: [On] [Off]

### Aggressive LPM support

This item is designed for LPM (link power management) support with a better energy saving conditions. When disabled, the hot plug function of SATA ports are disabled.

Configuration options: [Disabled] [Enabled]

### SATA6G_1(Gray) - SATA6G_6(Gray)

#### SATA6G_1(Gray) - SATA6G_6(Gray)

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

#### Hot Plug

These items appears only when the SATA Mode Selection is set to [**AHCI**] and allows you to enable or disable SATA Hot Plug Support.
Configuration options: [Disabled] [Enabled]

---

## 1.6.6 PCH-FW Configuration

This item allows you to configure the firmware TPM.
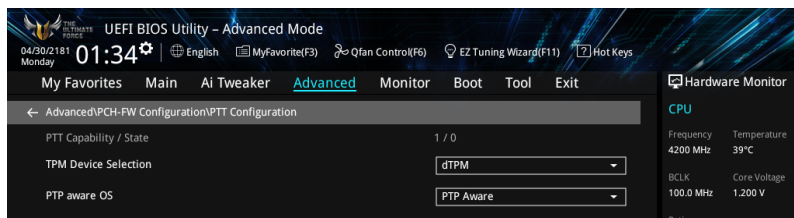


### PTT Configuration

#### TPM Device Selection

This item allows you to select the TPM device.
Configuration options: [dTPM] [PTT]

#### PTP aware OS

This item allows you to select whether or not the OS will be PTP aware.
Configuration options: [PTP aware] [Not PTP aware]

## 1.6.7 Thunderbolt(TM) Configuration

The items in this menu allow you to configure Thunderbolt settings.

### Thunderbolt(TM) Support

This item allows you to disable or enable the Intel Thunderbolt Technology.
Configuration options: [Fully Disabled] [Disabled] [Enabled]

### ThunderBolt (TM) PCIe Support

This item allows you to disable or enable the ThunderBolt PCIe Support.
Configuration options: [Disabled] [Enabled]
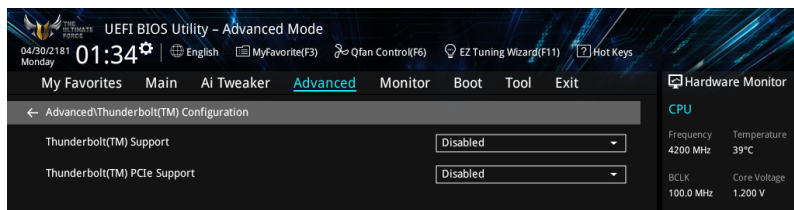
# 1.6.8 Onboard Devices Configuration

Scroll down to view the other BIOS items.
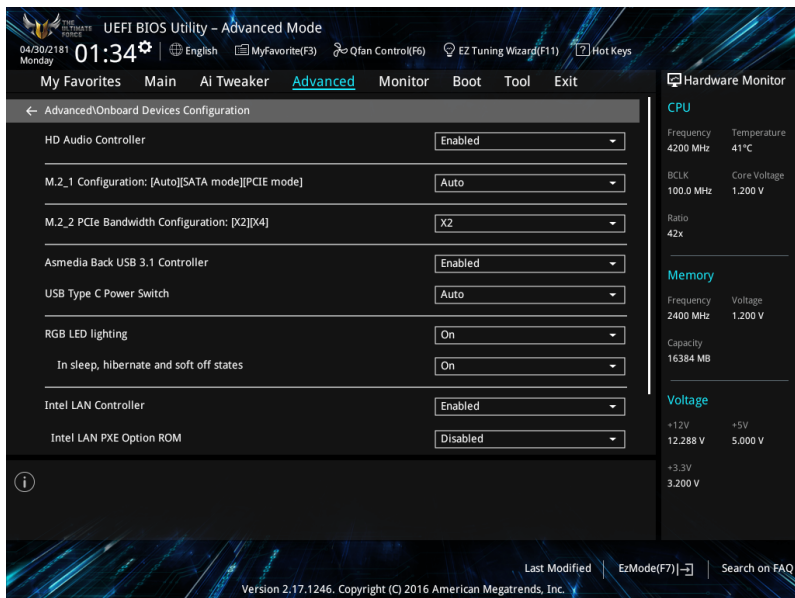


## HD Audio Controller

This item allows you to use the Azalia High Definition Audio Controller

Configuration options: [Disabled] [Enabled]

## M.2_1 Configuration: [Auto][SATA mode][PCIE mode]

[Auto]          Auto-detects the M.2 device mode. If a SATA device is detected, SATA6G_1 will be disabled.

[SATA mode]     Only supports M.2 SATA devices. Please note that SATA6G_1 port cannot be used in this mode.

[PCIE mode]     Only supports M.2 PCIE devices.

## M.2_2 PCIe Bandwidth Configuration: [X2][X4]

[X2]            Run at X2 mode with SATA6G_56 enabled.

[X4]            Run at X4 mode for higher performance with SATA6G_56 disabled.

### ASMedia Back USB 3.1 Controller

This item allows you to enable or disable the ASMedia Back USB 3.1 Controller.

Configuration options: [Disabled] [Enabled]

### USB Type C Power Switch

[Auto]          The system will automatically detect your USB Type C devices and provide
                suitable power if needed.

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

### RGB LED lighting

This item allows you to turn the RGB LED lighting on or off.

Configuration options: [On] [Off]

> The following item appears only when you set the RGB LED lighting to **[On]**.

#### In sleep, hibernate and soft off states

This item allows you to turn the RGB LED lighting on or off in S3(sleep), S4(hibernate)
and S5(soft off) states.
Configuration options: [On] [Off]

### Intel LAN Controller (LAN1-LAN2)

This item allows you to enable or disable the Intel LAN1/2 controllers.

Configuration options: [Disabled] [Enabled]

> The following item appears only when you set the Intel LAN Controller to **[Enabled]**.

#### Intel LAN PXE OPROM (LAN1-LAN2)

This item allows you to enable or disable the PXE OptionRom of the Intel® LAN
controller.
Configuration options: [Disabled] [Enabled]

## 1.6.9 APM Configuration
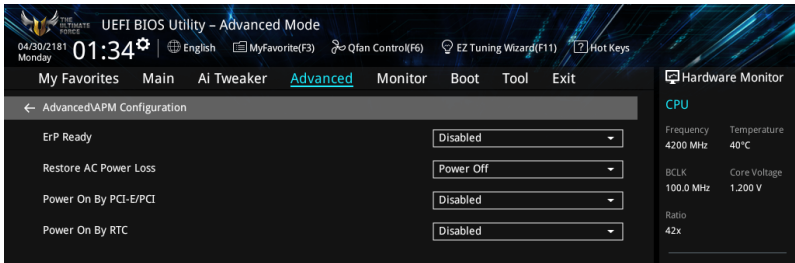


### ErP Ready

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)]

### 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]

### Power On By PCI-E/PCI

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]

## 1.6.10    Network Stack Configuration
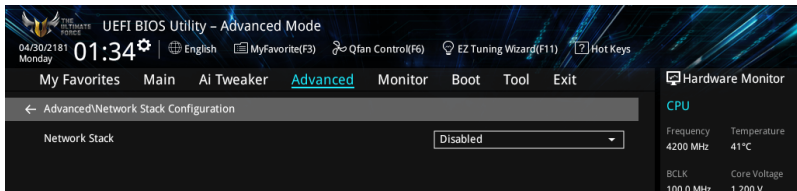


**Network stack**

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

> The following item appears only when you set the Network Stack to **[Enabled]**.

### Ipv4/Ipv6 PXE Support

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

## 1.6.11    HDD/SSD SMART Information

This menu displays the SMART information of the connected devices.
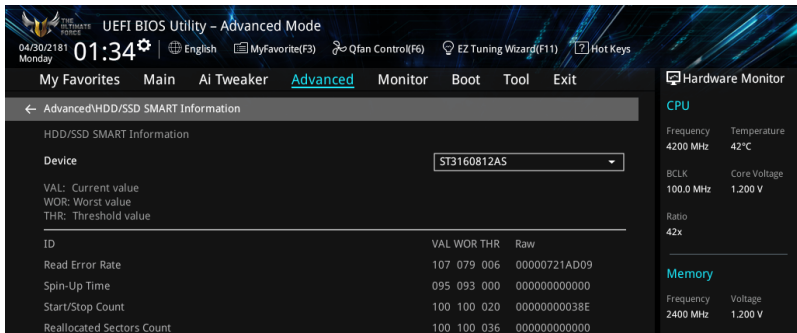


> NVM Express devices do not support SMART information.

## 1.6.12    USB Configuration

The items in this menu allow you to change the USB-related features.



---
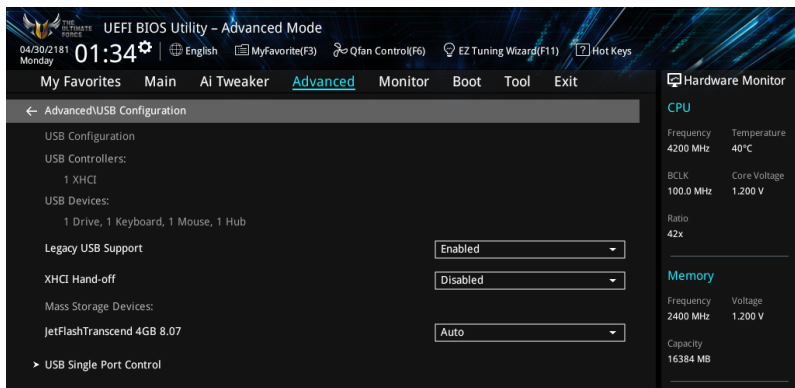
The **Mass Storage Devices** item shows the auto-detected values. If no USB device is detected, the item shows **None**.

---

### 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.

### USB Single Port Control

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

---

Refer to section **1.1.2 Motherboard layout** in your user manual for the location of the USB ports.

---

# 1.7 Monitor menu

The Monitor menu displays the system temperature/power status, and allows you to change the fan settings.

Scroll down to display the other BIOS items.
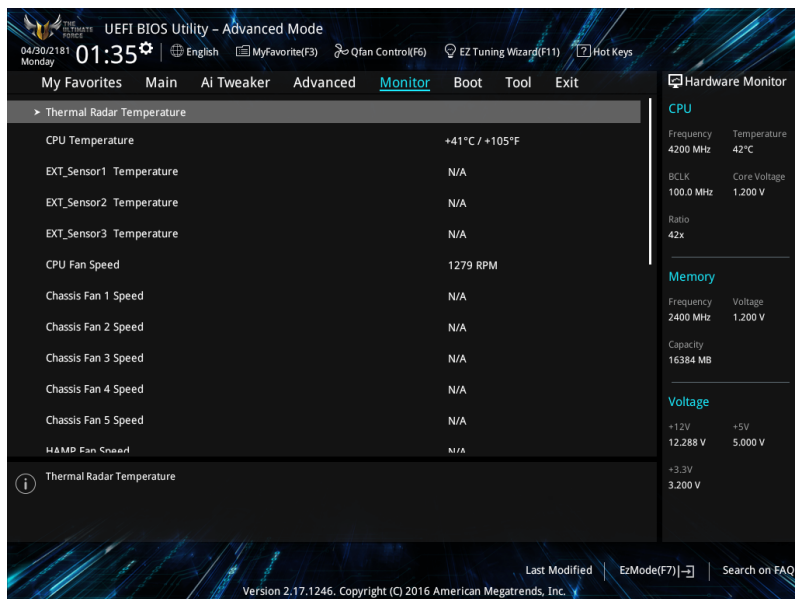


**Thermal Radar Temperature, CPU Temperature, EXT_SENSOR1-3 Temperature [xxx°C/xxx°F]**

The onboard hardware monitor automatically detects and displays the CPU, thermal radar, and EXT_SENSOR1-3 temperatures. Select **[Ignore]** if you do not wish to display the detected temperatures.

**CPU Fan Speed, CPU Optional Fan, Chassis Fan 1-5 Speed, HAMP Fan Speed, Extension Fan 1-3, ASST Fan Speed, W_PUMP+ Speed [xxxx RPM]**

The onboard hardware monitor automatically detects and displays the CPU, chassis, and power fan speed in rotations per minute (RPM). If the fan is not connected to the motherboard, the field shows N/A. Select **[Ignore]** if you do not wish to display the detected speed.

**CPU Core Voltage, 3.3V Voltage, 5V Voltage, 12V Voltage [x.xxxx V]**

The onboard hardware monitor automatically detects the voltage output through the onboard voltage regulators. Select **[Ignore]** if you do not want to detect this item.

### Q-fan Configuration

**Q-fan Tuning**

Click this item to automatically detect the lowest speed and configure the minimum duty cycle for each fan.

## CPU Q-Fan Control

This item allows you to set the CPU Q-Fan operating mode.

[Auto]          Detects the type of CPU fan installed and automatically switches the control modes.

[PWM Mode]      Enables the CPU Q-Fan Control feature in PWM mode for 4-pin CPU fan.

[DC Mode]       Enables the CPU Q-Fan Control feature in DC mode for 3-pin CPU fan.

[Disabled]      Disables the Q-Fan Control.

---

The following items appear only when you set the CPU Q-Fan Control to **[Auto]**, **[PWM Mode]**, and **[DC Mode]**.

---

**CPU Fan Step Up**

This item allows you to set the value of the CPU fan step up.
Configuration options: [0 sec] [2.1 sec] [2.8 sec] [3.6 sec] [4.2 sec] [5.0 sec] [6.3 sec] [8.5 sec] [12 sec] [25 sec]

**CPU Fan Step Down**

This item allows you to set the value of the CPU fan step down.
Configuration options: [0 sec] [2.1 sec] [2.8 sec] [3.6 sec] [4.2 sec] [5.0 sec] [6.3 sec] [8.5 sec] [12 sec] [25 sec]

**CPU Fan Speed Low Limit**

This item allows you to set the low limit warning for CPU Fan speed.
Configuration options: [Ignore] [200 RPM] [300 RPM] [400 RPM] [500 RPM] [600 RPM]

**CPU Fan Profile**

This item allows you to set the appropriate performance level of the CPU fan.

[Standard]      Set to make the CPU fan adjust automatically depending on the CPU temperature.

[Silent]        Set to minimize the fan speed for quiet CPU fan operation.

[Turbo]         Set to achieve maximum CPU fan speed.

[Manual]        Set to assign the detailed fan speed control parameters.

---

The following items appear only when you set the CPU Fan Profile to **[Manual]**.

---

**CPU Upper Temperature**
Use the <+> and <-> keys to adjust the upper limit of the CPU temperature. The CPU fan will operate at the maximum duty cycle when the CPU temperature is higher than the limit.

**CPU Fan Max. Duty Cycle(%)**
Use the <+> and <-> keys to adjust the maximum CPU fan duty cycle. When the CPU temperature reaches the upper limit, the CPU fan will operate at the maximum duty cycle.

**CPU Middle Temperature**
Use the <+> and <-> keys to adjust the CPU middle temperature.

**CPU Fan Middle Duty Cycle(%)**
Use the <+> or <-> keys to adjust the CPU fan middle duty cycle.

**CPU Lower Temperature**
Use the <+> or <-> keys to adjust the lower limit of the CPU temperature. The CPU fan will operate at the minimum duty cycle when the CPU temperature is lower than the limit.

**CPU Fan Min. Duty Cycle(%)**
Use the <+> and <-> keys to adjust the minimum CPU fan duty cycle. When the CPU temperature is lower than the lower limit, the CPU fan will operate at the minimum duty cycle.

## Chassis Fan(s) Configuration

## Chassis Fan 1-5 Q-Fan Control

This item allows you to set the chassis fan operating mode.

| | |
|---|---|
| [Auto] | Detects the type of chassis fan installed and automatically switches the control modes. |
| [PWM Mode] | Enables the Chassis Fan Q-Fan Control feature in PWM mode for 4-pin chassis fan. |
| [DC Mode] | Enables the Chassis Fan Q-Fan Control feature in DC mode for 3-pin chassis fan. |
| [Disabled] | Disables the Q-Fan control. |

### Chassis Fan 1-5 Q-Fan Source

The assignment fan will be controlled according to the selected temperature source. Configuration options: [CPU] [MotherBoard] [PCH Core] [VCORE] [VCORE(BACK)] [DRAM] [PCH] [USB3.1] [PCIE-1] [PCIE-2] [T_SENSOR1] [T_SENSOR2] [T_SENSOR3] [EXT_Sensor1] [EXT_Sensor2] [EXT_Sensor3]

For EXT_Sensor1-3, connect a Thermistor cable to the EXT_TS1-3 header then place the other end to the component to get the temperature.

### Chassis Fan 1-5 Step Up

This item allows you to set the value of the chassis fan step up.
Configuration options: [0 sec] [12 sec] [25 sec] [51 sec] [76 sec] [102 sec] [127 sec] [153 sec] [178 sec] [204 sec]

### Chassis Fan 1-5 Step Down

This item allows you to set the value of the chassis fan step down.
Configuration options: [0 sec] [12 sec] [25 sec] [51 sec] [76 sec] [102 sec] [127 sec] [153 sec] [178 sec] [204 sec]

**Chassis Fan 1-5 Fan Speed Low Limit**

This item allows you to disable or set the chassis fan warning speed.
Configuration options: [Ignore] [200 RPM] [300 RPM] [400 RPM] [500 RPM] [600 RPM]

**Chassis Fan 1-5 Profile**

This item allows you to set the appropriate performance level of the chassis fan.

[Standard]     Sets to [Standard] to make the chassis fan automatically adjust
                depending on the chassis temperature.

[Silent]       Sets to [Silent] to minimize the fan speed for quiet chassis fan
                operation.

[Turbo]        Sets to [Turbo] to achieve maximum chassis fan speed.

[Manual]       Sets to [Manual] to assign detailed fan speed control parameters.

The following four items appear only when you set Chassis Fan 1-2 Profile to **[Manual].**

**Chassis Fan 1-5 Upper Temperature**
Use the <+> or <-> keys to adjust the upper limit of the Chassis Fan 1-5
temperature. The Chassis Fan 1-5 will operate at the maximum duty cycle
when the temperature source is higher than the limit.

**Chassis Fan 1-5 Max. Duty Cycle (%)**
Use the <+> or <-> keys to adjust the maximum Chassis Fan 1-5 duty
cycle. When the temperature source reaches the upper limit, the Chassis
Fan 1-5 will operate at the maximum duty cycle.

**Chassis Fan 1-5 Middle Temperature**
Use the <+> or <-> keys to adjust the middle limit of the Chassis Fan 1-5
temperature.

**Chassis Fan 1-5 Middle. Duty Cycle (%)**
Use the <+> or <-> keys to adjust the Chassis Fan 1-5 middle duty cycle.

**Chassis Fan 1-5 Lower Temperature**
Use the <+> or <-> keys to adjust the lower limit of the Chassis Fan 1-5
temperature. The Chassis Fan 1-5 will operate at the minimum duty cycle
when the temperature source is lower than the limit.

**Chassis Fan 1-5 Min. Duty Cycle(%)**
Use the <+> or <-> keys to adjust the minimum Chassis Fan 1-5 duty cycle.
When the temperature source is under the limit, the Chassis Fan 1-5 will
operate at the minimum duty cycle.

**HAMP Fan Control**

This item allows you to set the HAMP Fan operating mode.

[Auto]          Detects the type of HAMP Fan installed and automatically switches the control modes.

[PWM Mode]      Enables the HAMP Fan Control feature in PWM mode for 4-pin HAMP Fan.

[DC Mode]       Enables the HAMP Fan Control feature in DC mode for 3-pin HAMP Fan.

[Disabled]      Disables the HAMP Fan Control.

**HAMP Fan Q-Fan Source**

The assignment fan will be controlled according to the selected temperature source. Configuration options: [CPU] [MotherBoard] [PCH Core] [VCORE] [VCORE(BACK)] [DRAM] [PCH] [USB3.1] [PCIE-1] [PCIE-2] [T_SENSOR1] [T_SENSOR2] [T_SENSOR3] [EXT_Sensor1] [EXT_Sensor2] [EXT_Sensor3]

> For EXT_Sensor1-3, connect a Thermistor cable to the EXT_TS1-3 header then place the other end to the component to get the temperature.

**HAMP Fan Step Up**

This item allows you to set the value of the HAMP fan step up.
Configuration options: [0 sec] [12 sec] [25 sec] [51 sec] [76 sec] [102 sec] [127 sec] [153 sec] [178 sec] [204 sec]

**HAMP Fan Step Down**

This item allows you to set the value of the HAMP fan step down.
Configuration options: [0 sec] [12 sec] [25 sec] [51 sec] [76 sec] [102 sec] [127 sec] [153 sec] [178 sec] [204 sec]

**HAMP Fan Speed Low Limit**

This item allows you to disable or set the HAMP fan warning speed.
Configuration options: [Ignore] [200 RPM] [300 RPM] [400 RPM] [500 RPM] [600 RPM]

**HAMP Fan Profile**

This item allows you to set the appropriate performance level of the HAMP Fan.

[Standard]      Sets to [Standard] to make the chassis fan automatically adjust depending on the chassis temperature.

[Silent]        Sets to [Silent] to minimize the fan speed for quiet chassis fan operation.

[Turbo]         Sets to [Turbo] to achieve maximum chassis fan speed.

[Manual]        Sets to [Manual] to assign detailed fan speed control parameters.

**HAMP Fan Upper Temperature**
Use the <+> or <-> keys to adjust the upper limit of the HAMP Fan temperature. The HAMP Fan will operate at the maximum duty cycle when the temperature source is higher than the limit.

**HAMP Fan Max. Duty Cycle (%)**
Use the <+> or <-> keys to adjust the maximum HAMP Fan duty cycle. When the temperature source reaches the upper limit, the HAMP Fan will operate at the maximum duty cycle.

**HAMP Fan Middle Temperature**
Use the <+> or <-> keys to adjust the middle limit of the HAMP Fan temperature.

**HAMP Fan Middle. Duty Cycle (%)**
Use the <+> or <-> keys to adjust the HAMP Fan middle duty cycle.

**HAMP Fan Lower Temperature**
Use the <+> or <-> keys to adjust the lower limit of the HAMP Fan temperature. The HAMP Fan will operate at the minimum duty cycle when the temperature source is lower than the limit.

**HAMP Fan Min. Duty Cycle(%)**
Use the <+> or <-> keys to adjust the minimum HAMP Fan duty cycle. When the temperature source is under the limit, the HAMP Fan will operate at the minimum duty cycle.

**ASST Fan(s) Configuration**

**ASST Fan Control**

This item allows you to set the ASST Fan operating mode.

[Disabled]       Disable the Extension Fan Q-Fan control feature.

[DC mode]        Enable the Extension Fan Q-Fan control in DC mode for 3-pin extension fan.

[PWM mode]       Enable the Extension Fan Q-Fan control in PWM mode for 4-pin extension fan.

**ASST Fan Q-Fan Source**

The assignment fan will be controlled according to the selected temperature source. Configuration options: [CPU] [MotherBoard] [PCH Core] [VCORE] [VCORE(BACK)] [DRAM] [PCH] [USB3.1] [PCIE-1] [PCIE-2] [T_SENSOR1] [T_SENSOR2] [T_SENSOR3] [EXT_Sensor1] [EXT_Sensor2] [EXT_Sensor3]

For EXT_Sensor1-3, connect a Thermistor cable to the EXT_TS1-3 header then place the other end to the component to get the temperature.

**ASST Fan Speed Low Limit**

This item allows you to disable or set the assist fan warning speed. Configuration options: [Ignore] [200 RPM] [300 RPM] [400 RPM] [500 RPM] [600 RPM]

**ASST Fan Profile**

This item allows you to set the appropriate performance level of the ASST Fan.

[Standard]    Sets to [Standard] to make the chassis fan automatically adjust depending on the chassis temperature.

[Silent]       Sets to [Silent] to minimize the fan speed for quiet chassis fan operation.

[Turbo]       Sets to [Turbo] to achieve maximum chassis fan speed.

[Manual]      Sets to [Manual] to assign detailed fan speed control parameters.

**Ext. Fan(s) Configuration**

**ASUS FAN EXTENSION CARD is required to configure these items**

**Extension Fan 1-3 Q-Fan Control**

[Disabled]    Disable the Extension Fan Q-Fan control feature.

[DC mode]    Enable the Extension Fan Q-Fan control in DC mode for 3-pin extension fan.

[PWM mode]  Enable the Extension Fan Q-Fan control in PWM mode for 4-pin extension fan.

**Extension Fan 1-3 Q-Fan Source**

The assignment fan will be controlled according to the selected temperature source. Configuration options: [CPU] [MotherBoard] [PCIEX16_1 Slot] [PCIEX16_3 Slot] [VRM] [PCH] [T_SENSOR1] [EXT_Sensor1] [EXT_Sensor2] [EXT_Sensor3] [Multiple Sources]

For EXT_Sensor1-3, connect a Thermistor cable to the EXT_TS1-3 header then place the other end to the component to get the temperature.

**Extension Fan 1-3 Fan Speed Low Limit**

This item allows you to disable or set the extension fan warning speed. Configuration options: [Ignore] [200 RPM] [300 RPM] [400 RPM] [500 RPM] [600 RPM]

**Extension Fan 1-3 Profile**

This item allows you to set the appropriate performance level of the extension fan.

[Standard]    Set to make the extension fan adjust automatically depending on the CPU temperature.

[Silent]       Set to minimize the fan speed for quiet extension fan operation.

[Turbo]       Set to achieve maximum extension fan speed.

[Manual]      Set to assign the detailed fan speed control parameters.

**Extension Fan 1-3 Upper Temperature**
Use the <+> or <-> keys to adjust the upper limit of the extension fan temperature. The extension fan will operate at the maximum duty cycle when the temperature source is higher than the limit.

**Extension Fan 1-3 Max. Duty Cycle (%)**
Use the <+> or <-> keys to adjust the maximum extension fan duty cycle. When the temperature source reaches the upper limit, the extension fan will operate at the maximum duty cycle.

**Extension Fan 1-3 Middle Temperature**
Use the <+> or <-> keys to adjust the middle limit of the extension fan temperature.

**Extension Fan 1-3 Middle. Duty Cycle (%)**
Use the <+> or <-> keys to adjust the extension fan middle duty cycle.

**Extension Fan 1-3 Lower Temperature**
Use the <+> or <-> keys to adjust the lower limit of the extension fan temperature. The extension fan will operate at the minimum duty cycle when the temperature source is lower than the limit.

**Extension Fan 1-3 Min. Duty Cycle(%)**
Use the <+> or <-> keys to adjust the minimum extension fan duty cycle. When the temperature source is under the limit, the extension fan will operate at the minimum duty cycle.

**Allow Fan Stop**
This item allows your fans to run at 0% duty cycle when the temperature of the source drops below the lower temperature.

Configuration options: [Disabled] [Enabled]

**W_PUMP+ Control**

| | |
|---|---|
| [Disabled] | Disable the Water Pump control feature. |
| [Auto] | Detects the type of water pump installed and automatically switches the control modes. |
| [DC mode] | Enable the Water Pump control in DC mode for 3-pin chassis fan. |
| [PWM mode] | Enable the Water Pump control in PWM mode for 4-pin chassis fan. |

**Water Pump Upper Temperature**
Use the <+> or <-> keys to adjust the upper limit of the water pump temperature.

**Water Pump Max. Duty Cycle (%)**
Use the <+> or <-> keys to adjust the maximum water pump duty cycle. When the CPU temperature reaches the upper limit, the Water Pump will operate at the maximum duty cycle.

**Water Pump Middle Temperature**
Use the <+> or <-> keys to adjust the middle limit of the water pump temperature.

**Water Pump Middle. Duty Cycle (%)**
Use the <+> or <-> keys to adjust the maximum water pump duty cycle. When the CPU temperature reaches the upper limit, the water pump will operate at the maximum duty cycle.

**Water Pump Lower Temperature**
Use the <+> or <-> keys to adjust the lower limit of the water pump temperature. The water pump will operate at the minimum duty cycle when the temperature is lower than the limit.

**Water Pump Min. Duty Cycle(%)**
Use the <+> or <-> keys to adjust the minimum water pump duty cycle. When the CPU temperature is under the limit, the water pump will operate at the minimum duty cycle.

**Fan Overtime**

This item allows you to set the fan overtime (in minutes) that the fans will run prior to system shutdown. These assistant fans will dissipate any remaining heat and extend the longevity of the critical components.

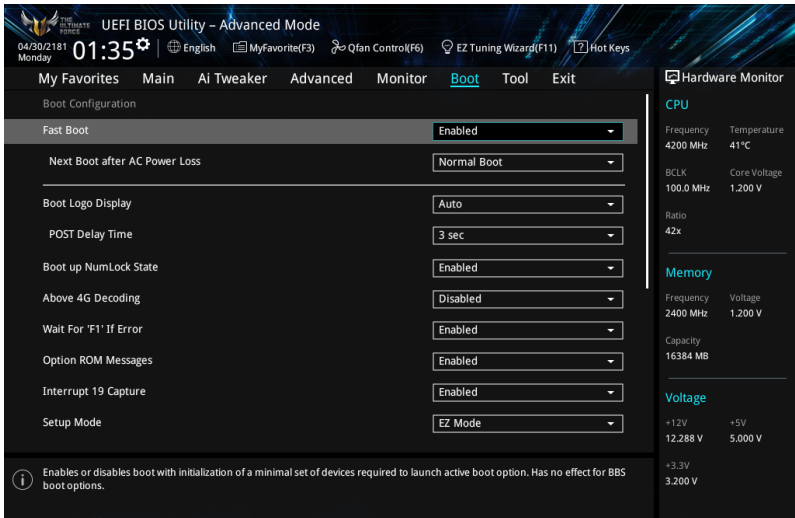Configuration options: [Disabled] [1 minute] [3 minutes] [5 minutes] [10 minutes]

## Chassis Intrude Detection Support

Enable this item for chassis intrude detection functions.

Configuration options: [On] [Off]

# 1.8 Boot menu

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



## 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 items appear only when you set the 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 the 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. The values range from 0 to 10 seconds.

> This feature only works when set under normal boot.

> The following items appear only when you set the 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]

## Bootup NumLock State

This item allows you to enable or disable power-on state of the NumLock.

Configuration options: [Disabled] [Enabled]

## Above 4G Decoding

This item enables or disables 64-bit capable devices to be decoded in above 4G address space if your system supports 64-bit PCI Decoding.

Configuration options: [Enabled] [Disabled]

## 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

[Enabled]          The Option ROM Messages will be shown during the POST.

[Disabled]         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.

## Setup Mode

[Advanced Mode]   This item allows you to go to Advanced Mode of the BIOS after POST.

[EZ Mode]          This item allows you to go to EZ Mode of the BIOS after POST.

## 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

[Auto]          The system automatically detects the bootable devices and the add-on devices.

[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.

The following items appear only when you set the Launch CSM to **[Enabled]**.

### Boot Device Control
This item allows you to select the type of devices that you want to boot.

Configuration options: [UEFI and Legacy OPROM] [Legacy OPROM only] [UEFI only]

### Boot from Network Devices
This item allows you to select the type of network devices that you want to launch.

Configuration options: [Legacy only] [UEFI driver first] [Ignore]

### Boot from Storage Devices
This item allows you to select the type of storage devices that you want to launch.

Configuration options: [Legacy only] [UEFI driver first] [Ignore]

### 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 launch.

Configuration options: [Legacy only] [UEFI driver first]

## 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 Secure Boot Keys**

This item allows you to save the PK (Platform 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.

> **Delete PK**
> 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]
>
> **Load Default PK**
> This item allows you to load the downloaded PK from a USB storage device.

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).

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

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.

**Delete the db**
This item allows you to delete the db file from your system.

Configuration options: [Yes] [No]

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

**Append Default db**
This item allows you to load the additional db from a storage device so that more images can be loaded securely.

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.

**Delete the dbx**
This item allows you to delete the dbx file from your system.

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

Configuration options: [Yes] [No]

**Append Default dbx**
This item allows you to load the additional dbx from a storage device so that more db's images cannot be loaded.

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.

## 1.9 Tool menu

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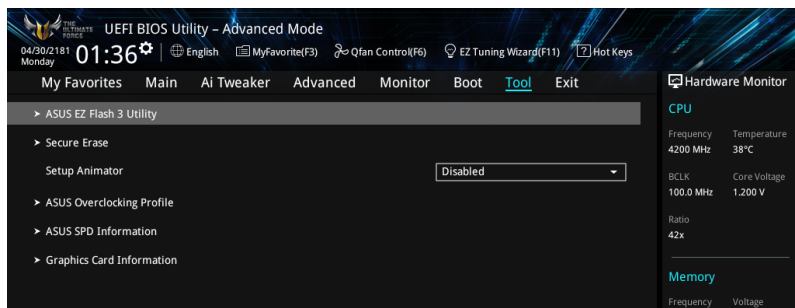


## 1.9.1 ASUS EZ Flash 3 Utility

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 **1.11.2 ASUS EZ Flash 3**.

## 1.9.2 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.

> Secure Erase is only available in AHCI mode. Ensure to set the SATA mode to AHCI. Click **Advanced > PCH Storage Configuration > SATA Mode Selection > AHCI.**

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

> Check the ASUS support site for a full list of SSDs tested with Secure Erase. The drive may become unstable if you run Secure Erase on an incompatible SSD.

> • 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 **1.1.2 Motherboard layout** in your user manual.

**Displays the available SSDs**
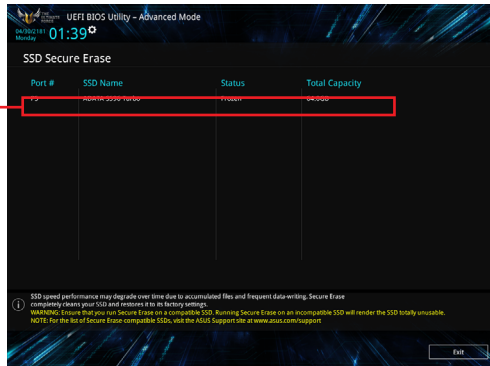


> **Status definition:**
>
> • **Frozen.** The frozen state is the result of a BIOS protective measure. The BIOS guards drives that do not have password protection by freezing them prior to booting. If the drive is frozen, a power off or hard reset of your PC must be performed to proceed with the Secure 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.
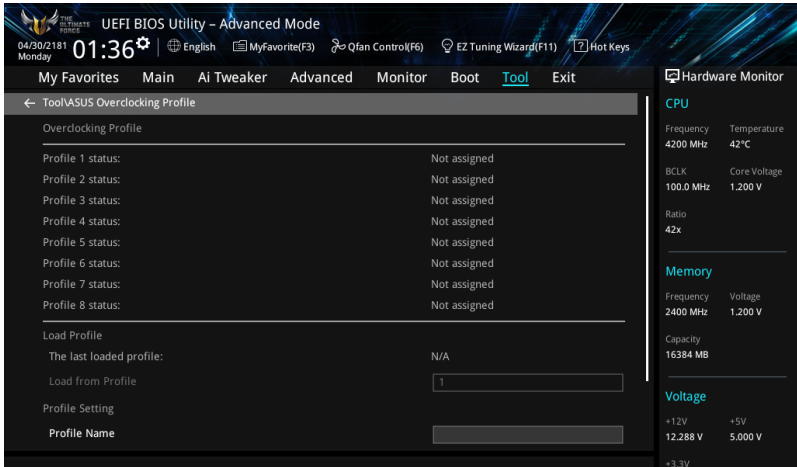
### 1.9.3　Setup Animator

This item allows you to enable or disable the Setup animator.

Configuration options: [Disabled] [Enabled]

### 1.9.4　ASUS Overclocking 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.

## 1.9.5    ASUS SPD Information

This item allows you to view the DRAM SPD information.



## 1.9.6    Graphics Card Information

This item displays the information and recommended configuration for the PCIE slots that the graphics card is installed in your system.

> This feature is only supported on selected ASUS graphics cards.



**GPU Post**

This item displays the information and recommended configuration for the PCIE slots that the graphics card is installed in your system.
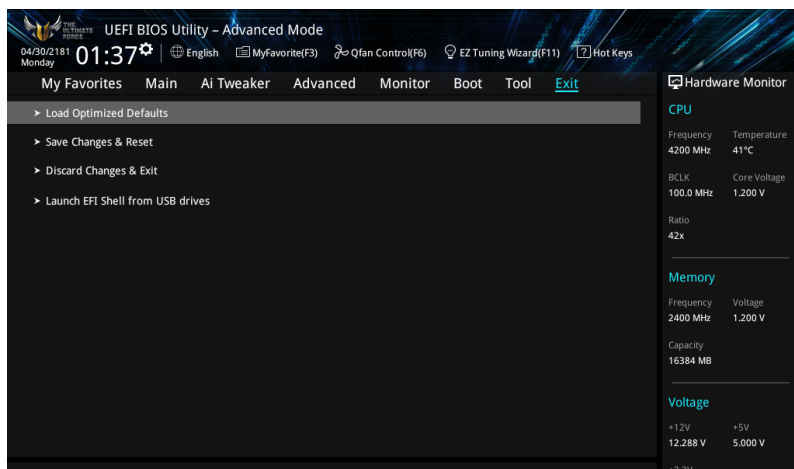
**Bus Interface**

This item allows you to select the bus interface.

Configuration options: [PCIEX16_1] [PCIEX16_2]

# 1.10    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.

# 1.11 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.

## 1.11.1 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.

## 1.11.2 ASUS EZ Flash 3

ASUS EZ Flash 3 allows you to download and update to the latest BIOS through the Internet without having to use a bootable floppy disk or an OS-based utility.

Updating through the Internet varies per region and Internet conditions. Check your local Internet connection before updating through the Internet.

**To update the BIOS by USB:**

1.   Enter the Advanced Mode of the BIOS setup program. Go to the Tool menu to select **ASUS EZ Flash 3 Utility** and press <Enter>.

2.   Insert the USB flash disk that contains the latest BIOS file to the USB port.

3.   Select **via Storage Device(s)**.
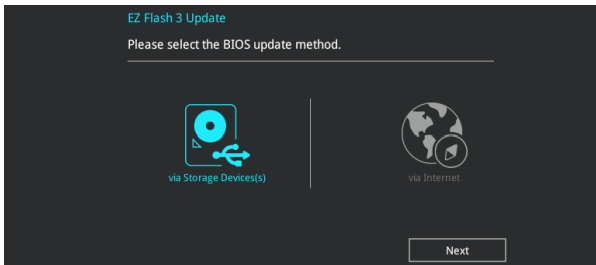


4.   Press the Up/Down arrow keys to find the USB flash disk that contains the latest BIOS, and then press <Enter>.

5.   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.
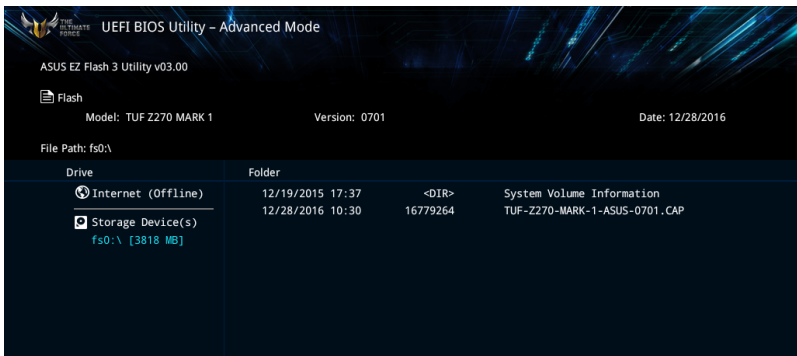
- This function can support devices such as a USB flash disk with FAT 32/16 format and single partition only.

- DO NOT shut down or reset the system while updating the BIOS to prevent system boot failure!

Ensure to load the BIOS default settings to ensure system compatibility and stability. Select the Load Optimized Defaults item under the Exit menu. See section **1.10 Exit Menu** for details.

**To update the BIOS by Internet:**

1. Enter the Advanced Mode of the BIOS setup program. Go to the Tool menu to select **ASUS EZ Flash 3 Utility** and press <Enter>.

2. Select **via Internet**.



EZ Flash 3 Update

Please select the BIOS update method.

via Storage Devices(s)     via Internet

Next
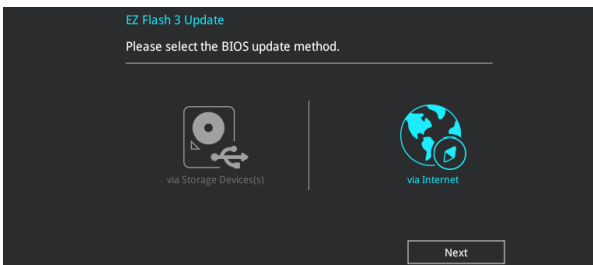
3. Press the Left/Right arrow keys to select an Internet connection method, and then press <Enter>.



Network Connection

Please select the Internet connection type.

DHCP     PPPoE     Fixed IP

Next     Cancel

4. Follow the onscreen instructions to complete the update.

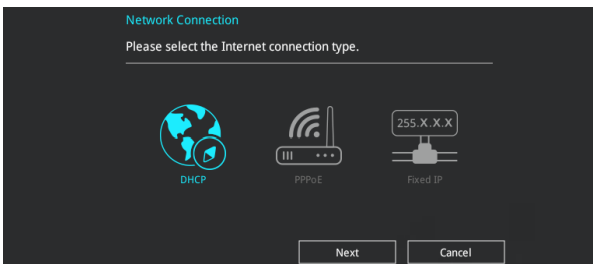5. Reboot the system when the update process is done.

Ensure to load the BIOS default settings to ensure system compatibility and stability. Select the Load Optimized Defaults item under the Exit menu. See section **1.10 Exit Menu** for details.

## 1.11.3    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!

Free Manuals Download Website

[http://myh66.com](http://myh66.com)

[http://usermanuals.us](http://usermanuals.us)

[http://www.somanuals.com](http://www.somanuals.com)

[http://www.4manuals.cc](http://www.4manuals.cc)

[http://www.manual-lib.com](http://www.manual-lib.com)

[http://www.404manual.com](http://www.404manual.com)

[http://www.luxmanual.com](http://www.luxmanual.com)

[http://aubethermostatmanual.com](http://aubethermostatmanual.com)

Golf course search by state

[http://golfingnear.com](http://golfingnear.com)

Email search by domain

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Auto manuals search

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