

**Z390 Series
Feature Manual**



Motherboard

E14844
First Edition
November 2018

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Conventions used in this guide

To ensure that you perform certain tasks properly, take note of the following symbols used throughout this manual.



DANGER/WARNING: Information to prevent injury to yourself when trying to complete a task.



CAUTION: Information to prevent damage to the components when trying to complete a task.



IMPORTANT: Instructions that you **MUST** follow to complete a task.



NOTE: Tips and additional information to help you complete a task.

About this guide

This feature manual describes the software of the support DVD or USB that comes with the motherboard package. Most of the applications in the support DVD or USB have wizards that will conveniently guide you through the installation. View the online help or readme file that came with the software application for more information.



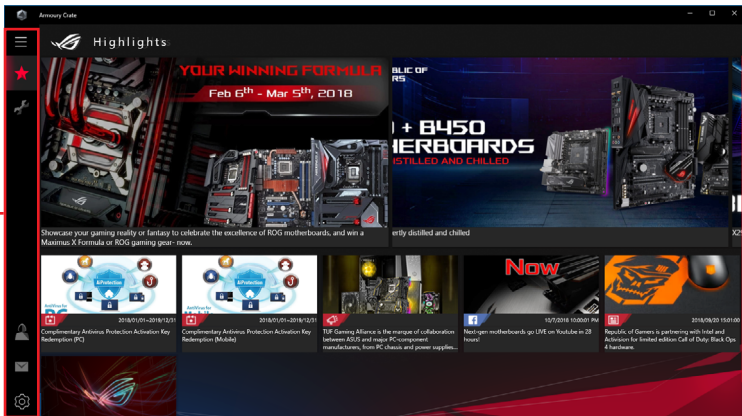
-
- Supported features may vary depending on the motherboard model.
 - Motherboard settings and hardware options vary. Use the setup procedures presented in this feature manual for reference only.
 - The screenshots in this manual are for reference only and can vary depending on motherboard model.
 - The contents of the support DVD or USB are subject to change at any time without notice. Visit www.asus.com for updates.
-

Armoury Crate

Armoury Crate is a unified motherboard software center for downloading and updating your drivers and utilities for your motherboard. The Armoury Crate Highlights section also provides various news and stories from ROG at a glance.



Armoury Crate is only supported on Windows® 10 RS3 or later.



Menu

Click the menu icon to show or hide the side menu titles.



Highlights

Displays news and stories from ROG.



Tools

Scans your system and provides the latest drivers and utilities for you to download. You can also view the manuals, documents, and individual kits for your system.



User Center

Log in to your ASUS account to edit your profile, register your product, or enter events, and view your activities.



Inbox

Check your personal messages from ASUS and view your event information.

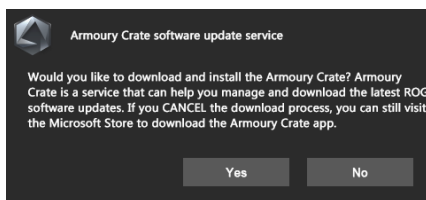


Settings

Adjust settings for Armoury Crate and view software information.

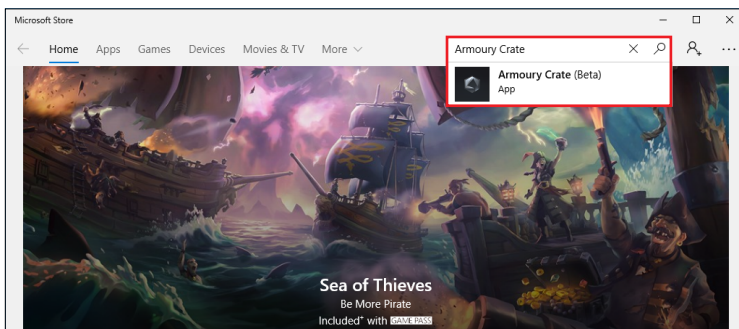
Downloading and installing Armoury Crate

On the first boot up of your PC with the supported OS, the system will prompt you with an option to download and install the Armoury Crate app.

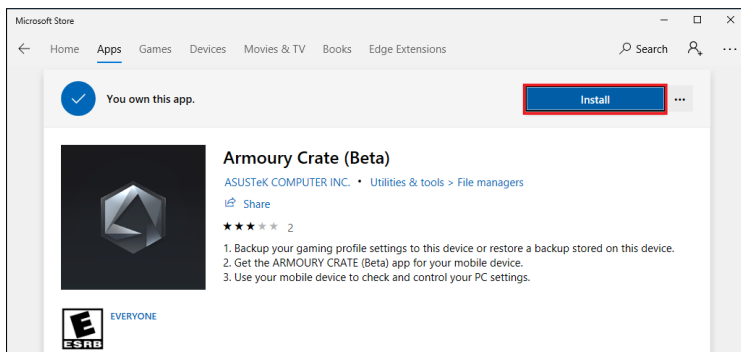


If the prompt does not appear or you have canceled the installation, you can still follow the steps below to install the Armoury Crate app:

1. Install or update your Windows® OS to Windows® 10 RS3
2. Launch the  Microsoft Store and search for **Armoury Crate**.

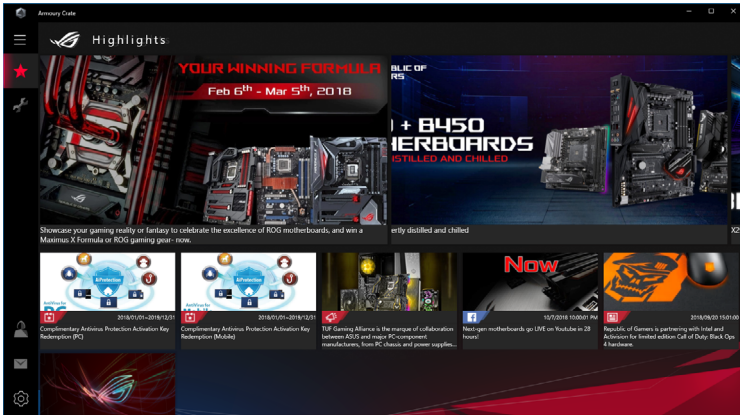


3. Click **Install**, then follow the onscreen instructions to complete.



Highlights

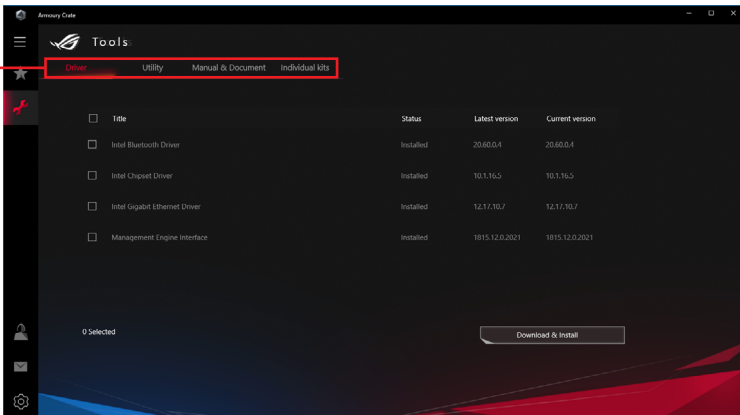
Display news, stories, and on-going events from ROG. You can also browse through various wallpapers and download them.



Tools

Scans your system and provides the latest drivers and utilities for you to download. You can also view the manuals, documents, and individual kits for your system.

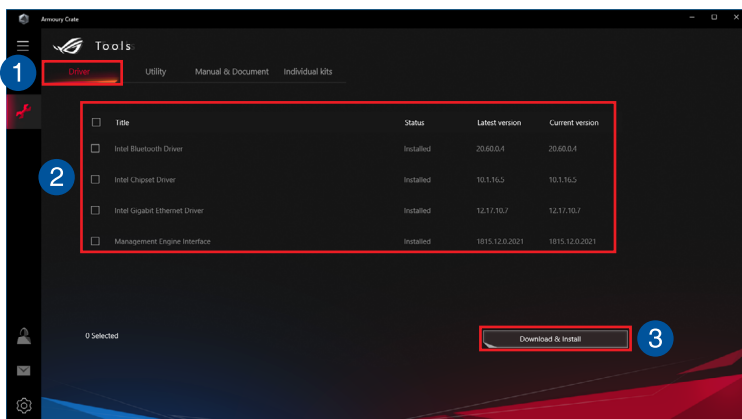
Click to view the Driver, Utility, Manual & Document, or Individual kits page



Downloading drivers for your motherboard

Armoury Crate can detect and download drivers or driver updates for your system.

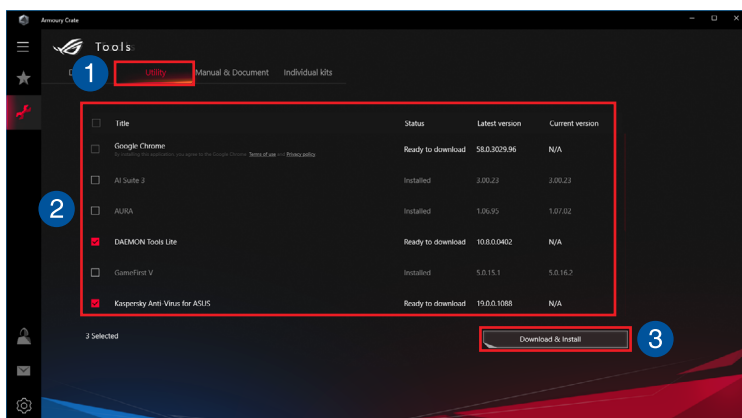
1. In the Tools page, click on the **Driver** tab. The available drivers will be displayed.
2. Check and select the items that you would like to install.
3. Click **Download & Install** and follow the onscreen instructions to complete.



Downloading utilities for your motherboard

Armoury Crate can detect and download utilities or utility updates for your system.

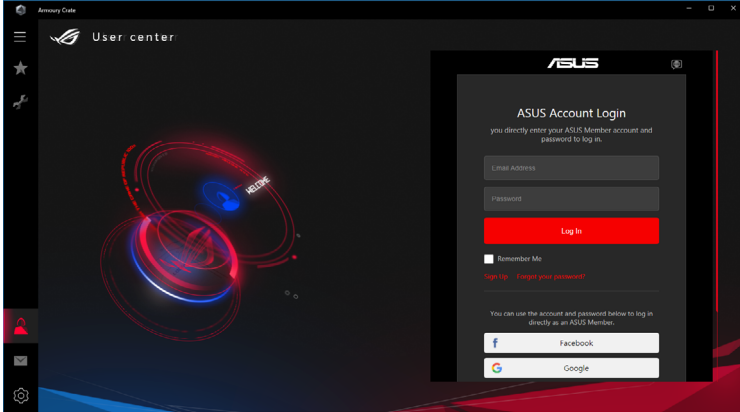
1. In the Tools page, click on the **Utility** tab. The available utilities will be displayed.
2. Check and select the items that you would like to install.
3. Click **Download & Install** and follow the onscreen instructions to complete.



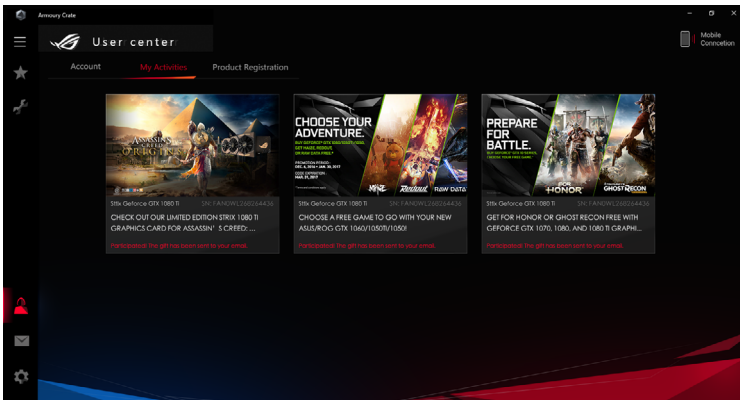
User Center

Log in to your ASUS account to manage, edit your profile, and register your product. You can also enter events and view your activities here.

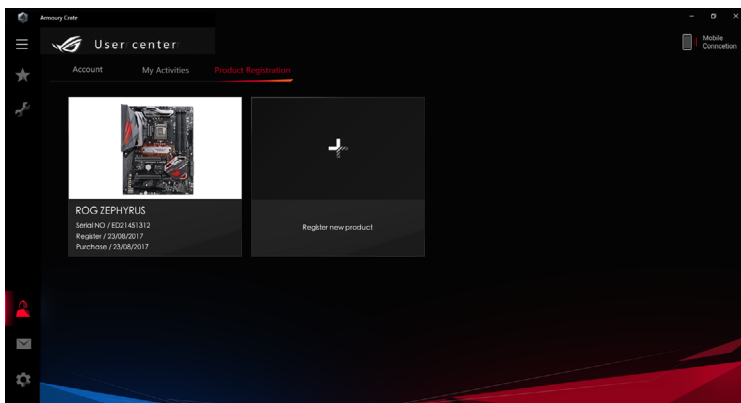
Account



My Activities

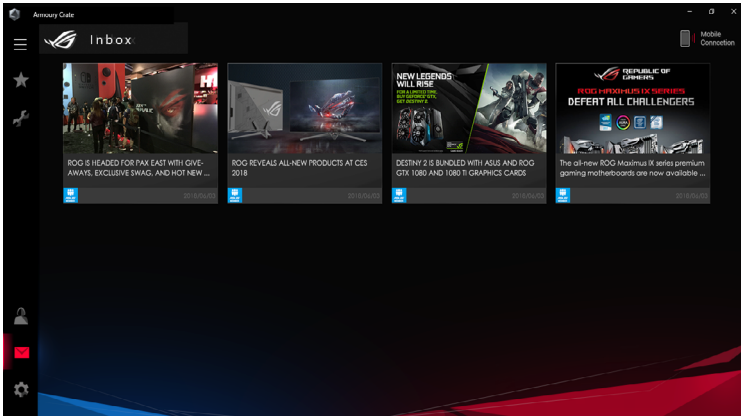


Product Registration



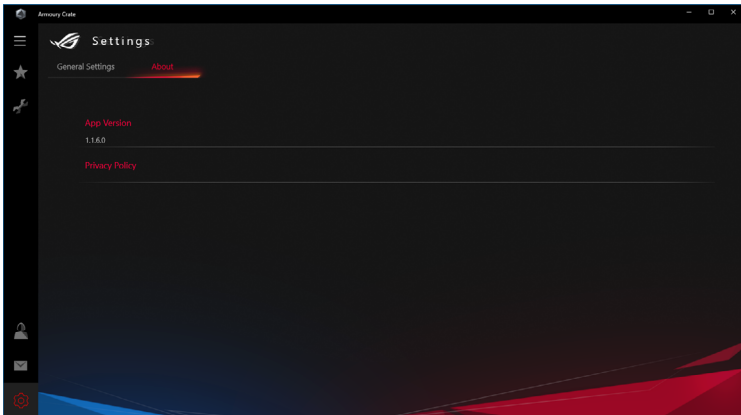
Inbox

Check your personal messages from ASUS and view your event information.




Settings

Adjust settings for Armoury Crate and view software information.

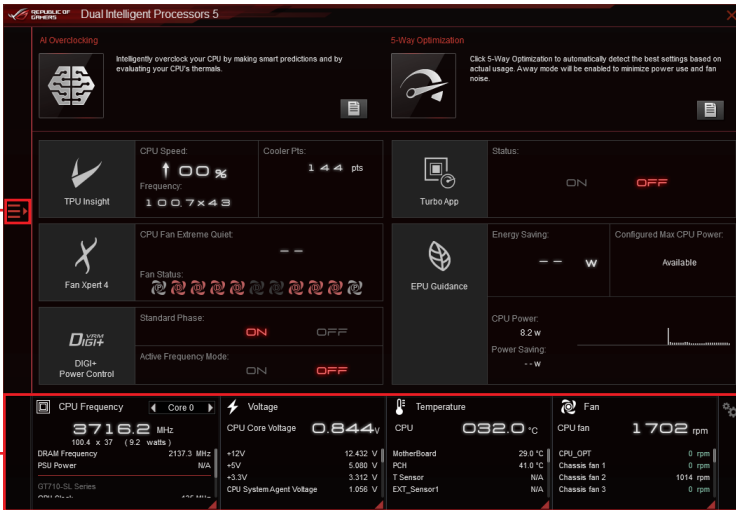


AI Suite 3

The AI Suite 3 main menu gives you easy-access controls and insight to what's going on with your computer - allowing you to optimize performance settings while at the same time ensuring system stability.

The AI Suite main menu includes a quick-access menu bar that allows you to swiftly launch any of the integrated ASUS utilities. Click the  icon on the left to launch the menu bar.

Launch AI Suite 3 menu bar

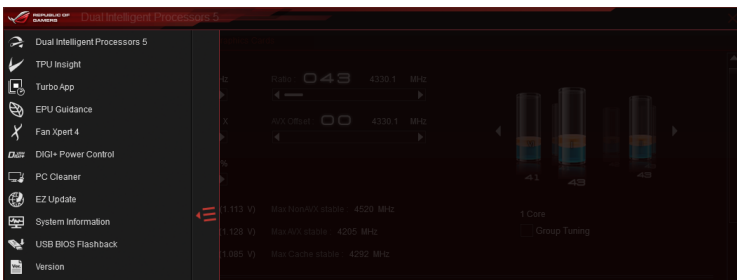


Displays a quick overview of your system status



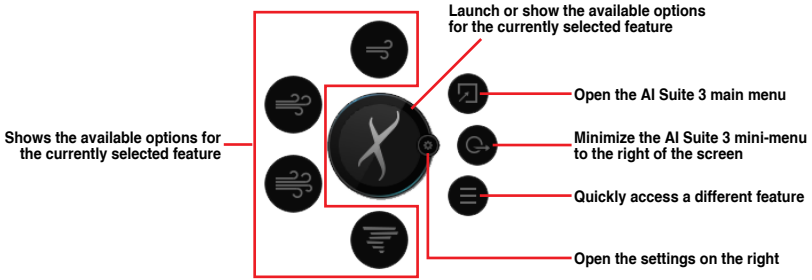
Some functions in the AI Suite 3 main menu in this user guide may vary depending on the motherboard model.

AI Suite 3 main menu bar



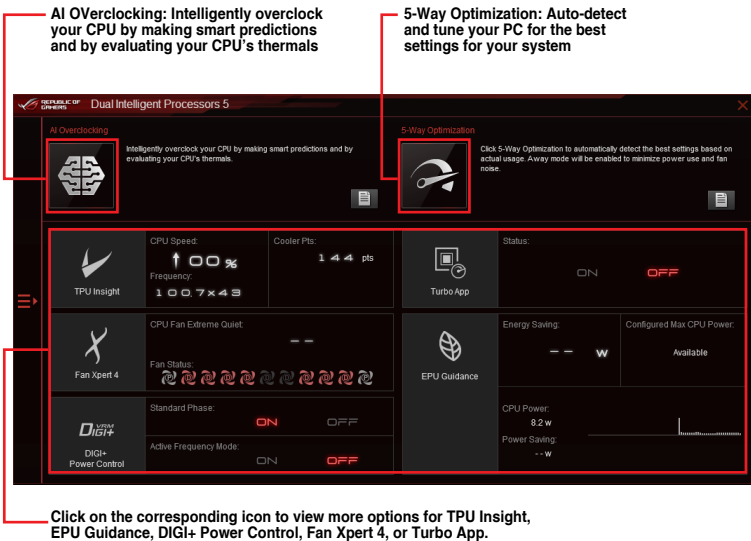
AI Suite 3 mini-menu

The AI Suite 3 mini-menu appears on the desktop and can be conveniently accessed and moved around. The AI Suite 3 mini-menu allows you to quickly access the important features in the AI Suite 3.



Dual Intelligent Processors 5

ASUS Dual Intelligent Processors 5 combines TPU Insight, EPU Guidance, DIGI+ Power Control, Fan Xpert 4, and Turbo App functions to push the system's performance to its optimal potential. It automatically balances the system's performance, power saving, and fan settings via the user-friendly AI Suite 3 utility.



DO NOT remove your fan during the tuning process.

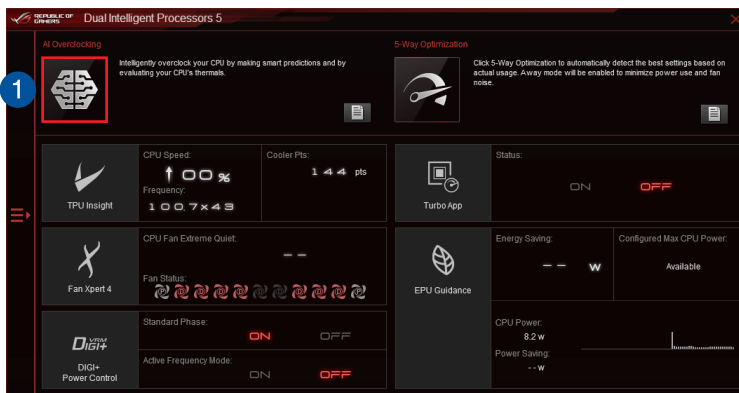
Using AI Overclocking

By dynamically estimating a minimum CPU voltage for your target frequency, the AI Overclocking feature helps you find the optimum operating point for your CPU without the need to enter the BIOS.



This function is only enabled when using an unlocked CPU.

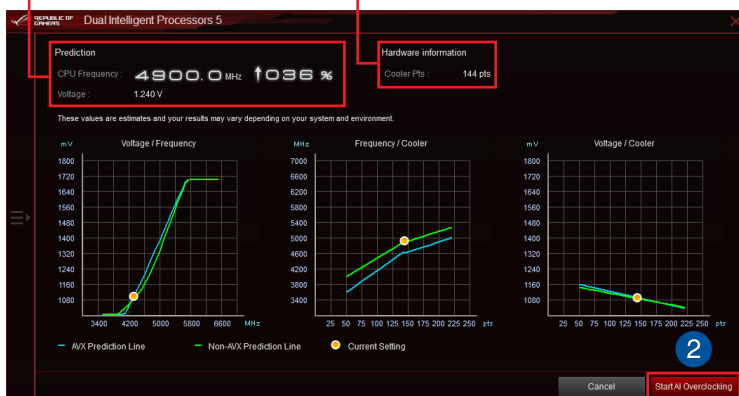
1. In the Dual Intelligent Processors 5 page, click the **AI Overclocking** icon.



2. A summary page will appear, click the **Start AI Overclocking** button.

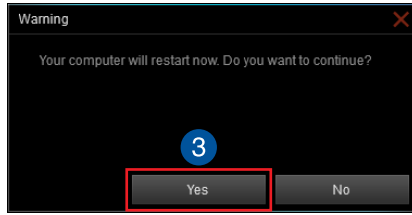
This shows a predicted CPU frequency and voltage based on the Cooler Pts

This shows an estimate of the cooling score (Cooler Pts) of your current setup



The **Cooler Pts** are generally less than 120 pts for Small Air Coolers, 140-150 pts for Good Air Coolers, 150-155 pts for AIO Coolers, and greater than 160 pts for Custom Water Cooling Loops.

- When prompted, click **Yes** to restart the computer and start AI Overlocking.



- After the system restarts, the AI Overlocking results will be shown. Click **Back** to return to AI Suite 3.



Refer to the **Appendix** for more overclocking scenarios.

TPU Insight

The Turbo Processing Unit (TPU) Insight provides AI Suite 3 with the intelligence needed to automatically fine-tune voltages, monitor system stats, and adjust overclocking. This overclocking tool has been updated with AI Overclocking prediction values to allow for easy experimentation with different settings.

CPU Frequency

The screenshot shows the 'Dual Intelligent Processors 5' interface for CPU Frequency settings. The window is titled 'CPU Frequency' and includes a 'Graphics Cards' tab. The main settings area contains several adjustable parameters:

- BCLK Frequency:** 100.70 MHz (with left and right arrow controls)
- Ratio:** 43 (with left and right arrow controls)
- CPU Cache Ratio:** 40 X (with left and right arrow controls)
- AVX Offset:** 00 (with left and right arrow controls)
- Optimism Scale:** 100 % (with a slider control)

Below these are target voltage and frequency values:

- NonAVX V req for Target: 1.12 V (1.113 V) Max NonAVX stable: 4520 MHz
- AVX V req for Target: 1.135 V (1.128 V) Max AVX stable: 4205 MHz
- Cache V req for Target: 1.09 V (1.085 V) Max Cache stable: 4292 MHz

At the bottom, there is a 'CPU Core Voltage(Adaptive)' section with 'Adaptive' and 'User' radio buttons, and an 'OC Voltage' slider. The 'Adaptive' option is selected. Below this are 'Load Profile' and 'Save Profile' buttons. On the right side, there is a 'Group Tuning' section with a '1 Core' radio button and a 'Group Tuning' checkbox. A core selection interface shows three cores with bars representing their status.

Annotations with red lines point to various controls:

- Click ◀ or ▶ to adjust the Base Clock Frequency, CPU Ratio, and CPU Cache Ratio
- Tick to enable Group Tuning
- Click ◀ or ▶ to select which core to adjust
- Scroll down for more options
- Click to load the saved profile
- Click to save the adjustment into a profile
- Adjust the CPU voltages and DRAM voltages
- Click to apply the changes
- Click to undo the changes



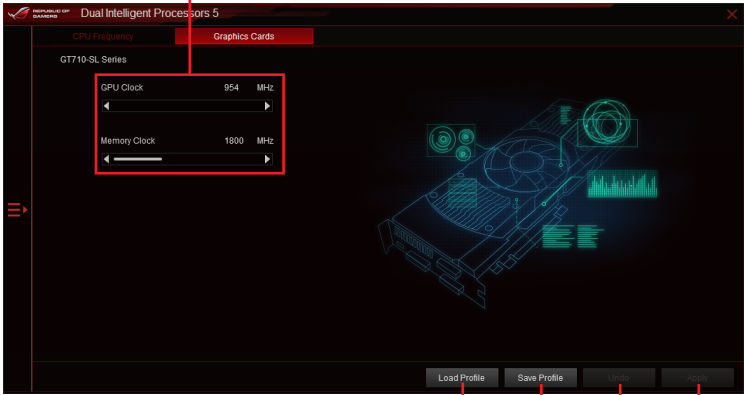
Refer to the CPU documentation before adjusting CPU voltage settings. Setting a high voltage may damage the CPU permanently, and setting a low voltage may lead to an unstable system.



- For system stability, the TPU settings are not saved in the BIOS and are not loaded during system bootup. Save your overclocking settings as a TPU profile and manually load this profile after system bootup.
- Set the CPU Core Ratio item in the BIOS to **[Auto]** before adjusting the CPU Frequency in TPU Insight.
- The CPU Frequency bars show the status of the CPU cores, which vary with your CPU model.

Graphics Cards

Click ◀ or ▶ to adjust the GPU Clock and Memory Clock frequency



Click to load the saved profile

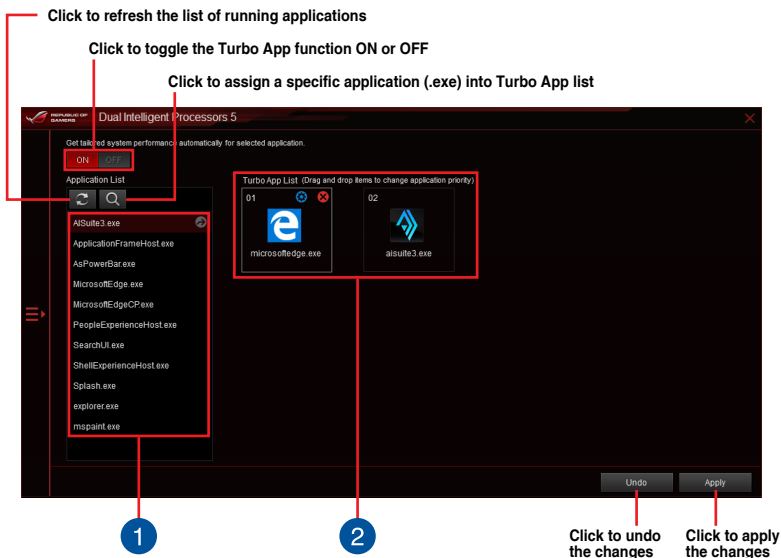
Click to save the changes to a profile

Click to undo the changes


Click to apply the changes

Turbo App

Turbo App allows you to customize the system performance of your applications. When an application is on the Turbo App List, you can drag and drop the application to change the priority of the selected application.



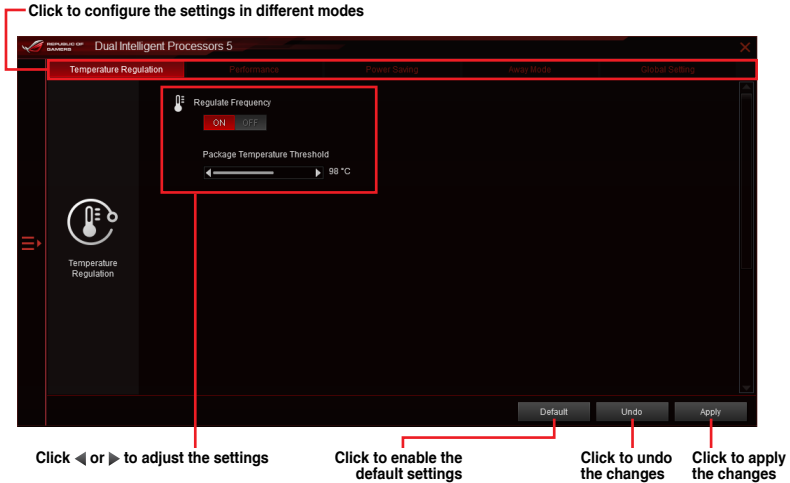
1 Applications list pane
Displays all the running applications on your system.

2 Turbo App List pane
Displays the applications added to the Turbo App List. Click the  icon for more settings.

* Only applications on the Turbo App List can be configured.

EPU Guidance

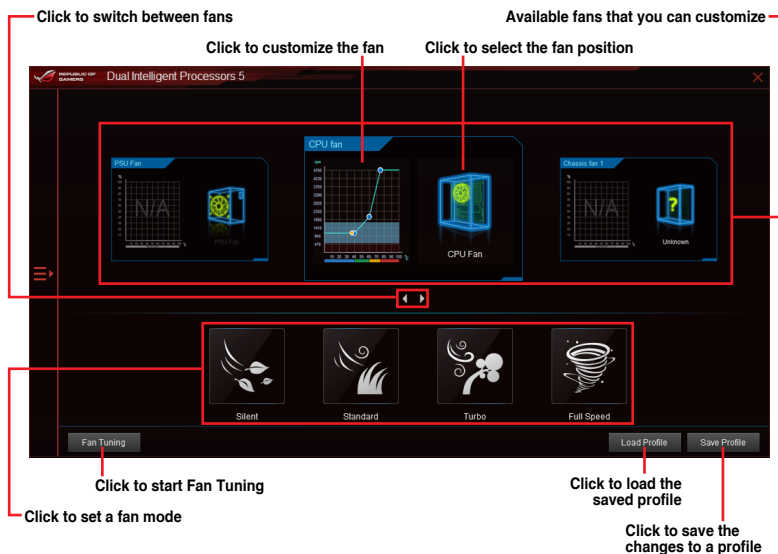
Energy Processing Unit (EPU) Guidance enables system-wide power-saving and automatically optimizes consumption to maximize power savings. The system-wide energy optimization also reduces fan noise and extends the lifespan of your hardware components. The new Temperature Regulation feature allows you to set a threshold for the system to balance temperatures and performance.



- When you enable Configured Max CPU Power for advanced energy saving condition, the CPU frequency may display 800 MHz in the Windows® OS information of your computer. However, the true CPU frequency varies depending on the wattage that you manually set. You can adjust the CPU wattage from the lowest base on your preferred default value.
- Configured Max CPU Power may decrease the total power delivery to the CPU and affects the CPU performance under system heavy load. To restore your system to its default settings, reboot your computer.

Fan Xpert 4

Fan Xpert 4 provides customizable fan settings for a cooler and quieter computing environment. With its Auto Tuning feature, Fan Xpert 4 automatically tweaks the settings of the CPU and chassis fans to achieve their best cooling performance. Fan Xpert 4 also supports hardware level PWM/DC combo mode for the CPU, chassis fans, and fans connected to the fan extension card. You can also reduce the CPU fan speed below the default minimum for a noiseless operation during light loads.



- DO NOT remove your fan during the tuning process.
- To prevent the water pump from not working properly due to different water pump manufacturers, the water pump header does not support the **Fan Tuning** function.



- When the CPU temperature reaches 75°C, the fan will automatically run at full speed to protect the CPU from overheating.
- If your fan is installed with an external control kit for rotation speed control, Fan Xpert 4 may not be able to detect the fan speed correctly.
- Fan Xpert 4 does not support 2-pin fans. If you have installed a 2-pin fan, it will only run at its full speed.
- If the CPU or chassis fans have been changed, the **Fan Tuning** process should be performed again.

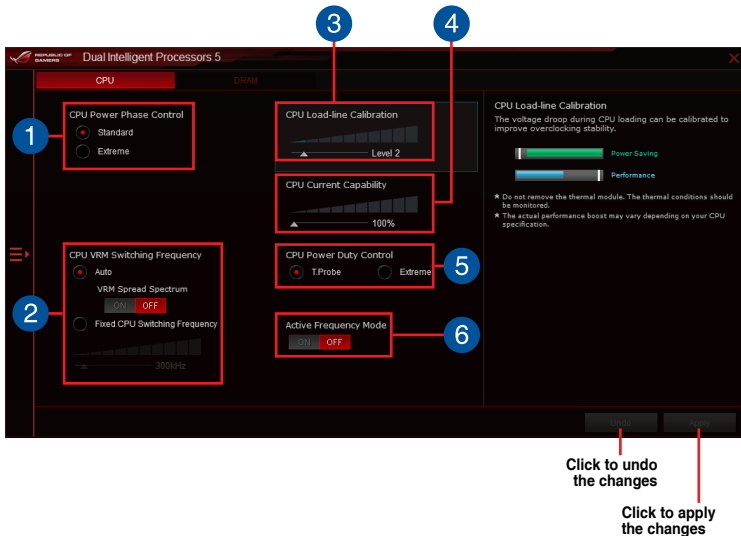
DIGI+ Power Control

ASUS DIGI+ Power Control features the revolutionary and innovative digital VRM and DRAM Voltage controllers. These controllers offer ultra-precise memory and voltage tuning for optimal system efficiency, stability, and performance.



- The actual performance boost may vary depending on your CPU and DRAM specification.
- Ensure that the cooling modules are properly installed in your motherboard to monitor the thermal conditions.

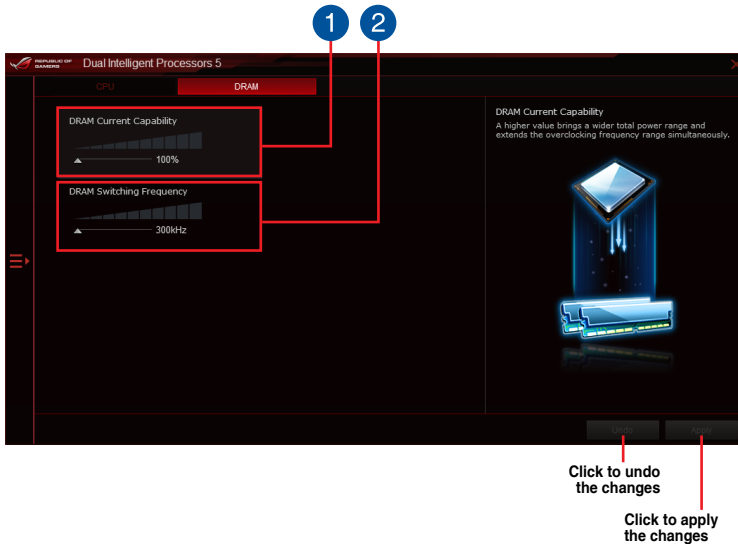
Adjusting the CPU Power



- 1 CPU Power Phase Control**
This item allows you to set the power phase control of the CPU. Set this item to **Extreme** for the full phase mode.
- 2 CPU VRM Switching Frequency**
This item affects the VRM transient response speed and the component thermal production. Select **Auto** and turn on **VRM spread spectrum** to enhance system stability, or select **Fixed CPU Switching Frequency** to manually configure a higher frequency for a quicker transient response speed.
- 3 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.

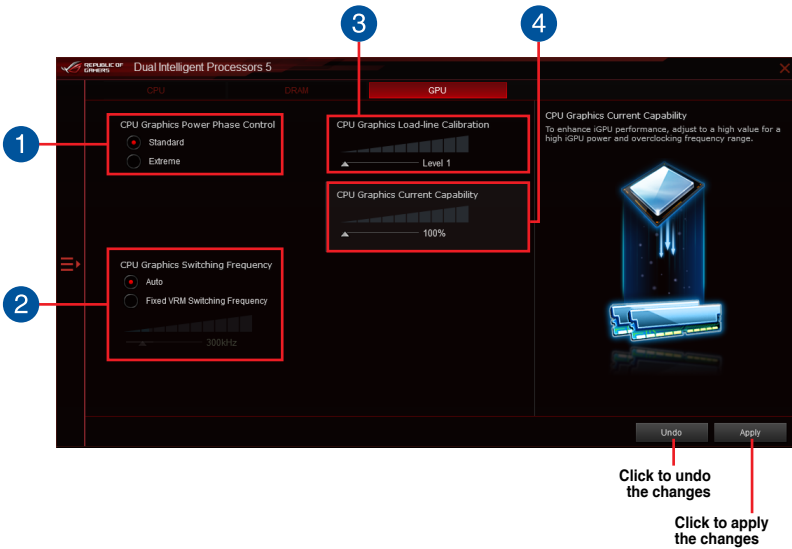
- 4 **CPU Current Capability**
This item allows you to set the shut off current limit for external voltage regulator. A higher setting will allow the voltage regulator to supply more current while a lower setting will cause the voltage regulator to shut off the system when the supplied current is higher than the set value.
- 5 **CPU Power Duty Control**
CPU power duty control adjusts the duty cycle of each VRM phase based upon current and/or temperature.
- 6 **Active Frequency Mode**
Turn on Active Frequency Mode to let the system automatically set a range of VRM frequencies depending on the current pull of the system.

Adjusting the DRAM Power



- 1 **DRAM Current Capability**
This item allows you to set the shut off current limit for external DRAM voltage regulator. A higher setting will allow the voltage regulator to supply more current while a lower setting will cause the voltage regulator to shut off the system when the supplied current is higher than the set value.
- 2 **DRAM Switching Frequency**
This item affects the VRM transient response speed and the component thermal production. A higher frequency will result in quicker transient response speed.

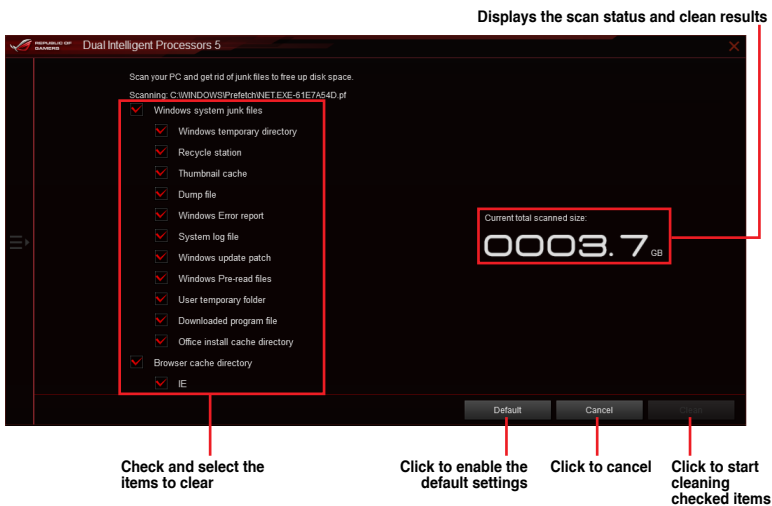
Adjusting the GPU Power



- 1 CPU Graphics Power Phase Control**
Increase the phase number under a heavy system load to get more transient and better thermal performance. Reduce the phase number under a light system load to increase the VRM efficiency.
- 2 CPU Graphics VRM Switching Frequency**
Enables spread spectrum to enhance system stability.
- 3 CPU Graphics Load-line Calibration**
It allows you to adjust the voltage range to control the CPU Graphics Load-line. Adjust to a high value for system performance or to a low value for power efficiency.
- 4 CPU Graphics Current Capability**
CPU Graphics Current Capability provides a wider total power range for overclocking. A higher value brings a wider total power range and extends the overclocking frequency range simultaneously.

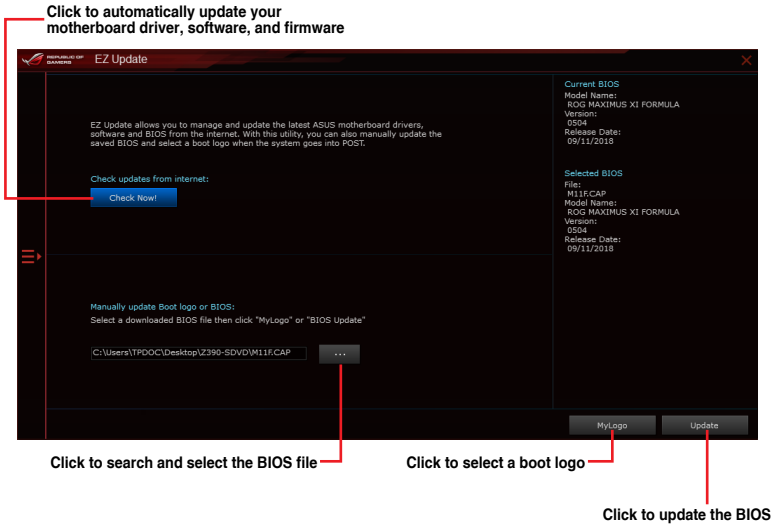
PC Cleaner

PC Cleaner allows you to clean the system junk files by scanning and deleting selected files.



EZ Update

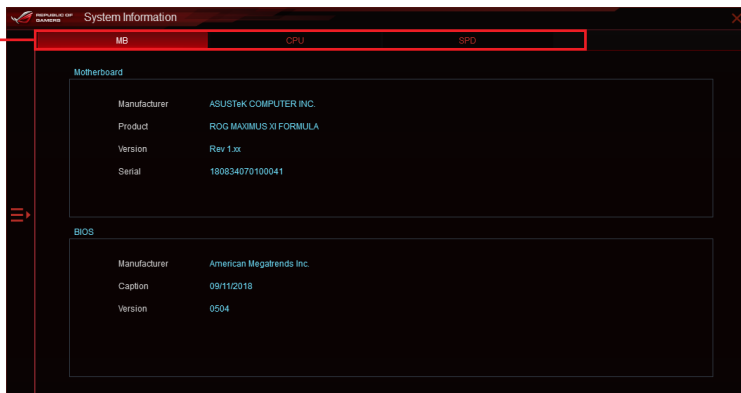
EZ Update is a utility that allows you to automatically update your motherboard's software, drivers and BIOS easily. With this utility, you can also manually update the BIOS and select the boot logo that displays during POST.



System Information

This utility allows you to get detailed information of the motherboard, CPU, and memory settings.

Click to view the motherboard, processor, or SPD information.

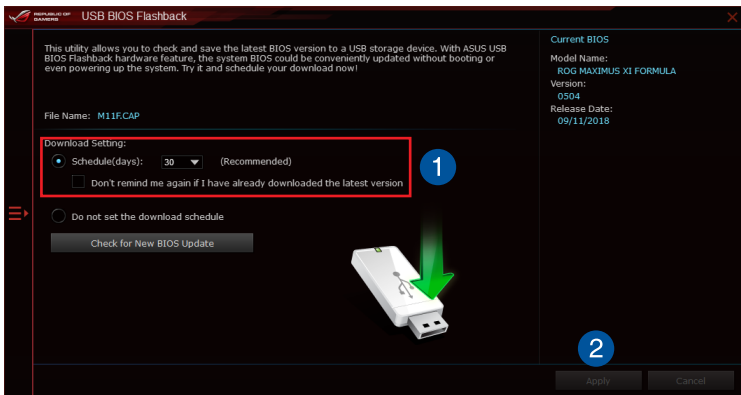


USB BIOS Flashback

USB BIOS Flashback allows you to check and save the latest BIOS version to a USB storage device. The downloaded BIOS file can be used to update your system's BIOS. Use this utility to quickly check for the latest available BIOS and set the BIOS download schedule.

Scheduling the BIOS download

1. In the Download Setting field, tick **Schedule (days)**, then select the number of days for the BIOS download schedule.
2. Click **Apply** to save the BIOS download schedule. Click **Cancel** to cancel the download schedule.



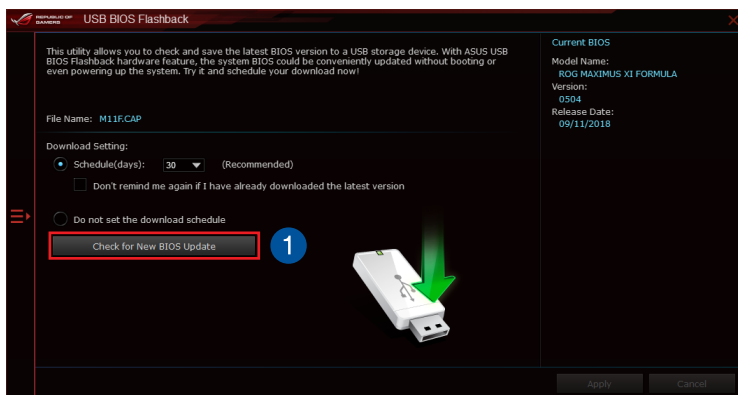
Downloading the latest BIOS to a USB storage device



Before you start downloading, ensure that you have installed the USB storage device to your computer's USB port that supports USB BIOS Flashback. Refer to section **Rear I/O connection** of your motherboard's user manual for more details.

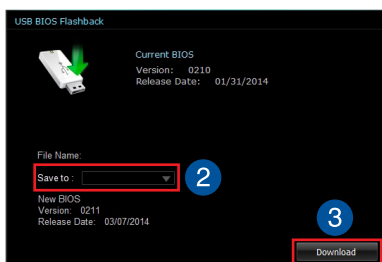
1. From the USB BIOS Flashback screen, Click **Check for New BIOS Update**.

Wait for the system to check the latest BIOS version.



2. After the utility detects a new BIOS, Click the **Save to:** field, then select the USB flash drive.

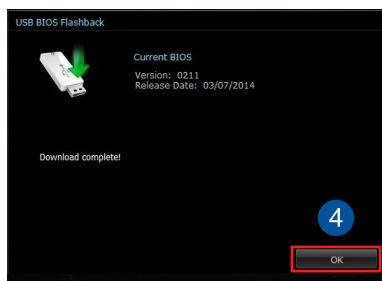
3. Click **Download** to start downloading the latest BIOS.



4. After the download is complete, Click **OK** to complete.



Please refer to section **BIOS update utility** of your motherboard's user manual for more details on updating your BIOS using the downloaded BIOS file.

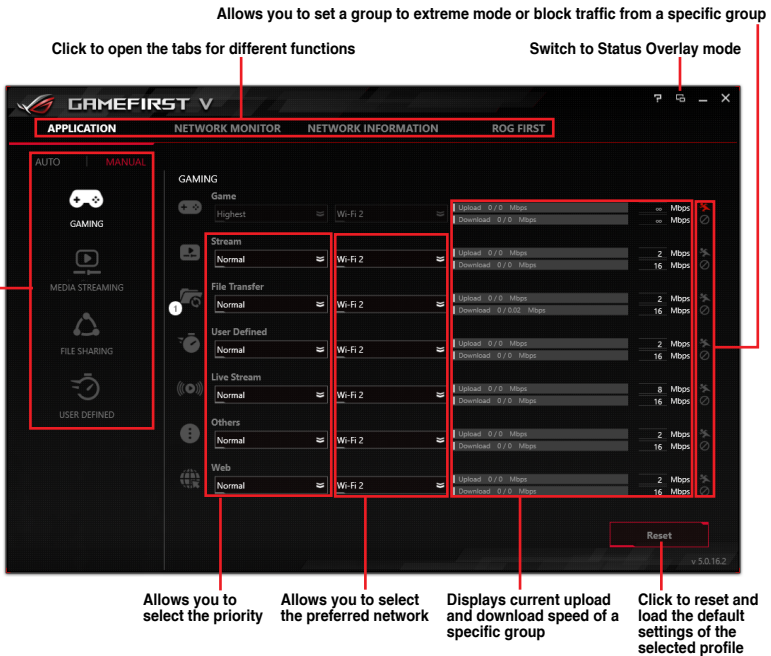


GameFirst V

GameFirst V is a network management software that features packet-prioritized profiles (Smart, Auto, Game, Media Streaming, File Sharing, and User Defined) facilitating different scenarios. You can also manually allocate bandwidth and adjust priority settings of each application to run faster and smoother.

Application

Displays the current profile, network preference settings, and the network speed for each type of scenario. You can also configure the priority and preferred network for each scenario.



Auto mode

Auto

Optimize bandwidth allocation when games are detected.

Smart

Optimize the currently active apps for performance.

Manual mode

Game Mode

Give game packets top priority.

Media Streaming Mode

Give media-streaming packets top priority.

File Sharing Mode

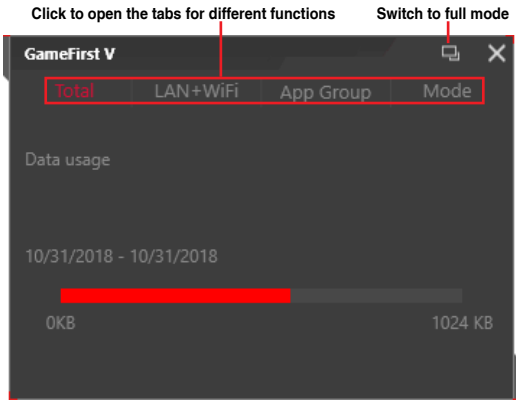
Give file-sharing packets top priority.

User Defined Mode

Manually adjust the priority of each application.

Status Overlay

The status overlay allows you to monitor the network traffic and quickly switch between different mode settings

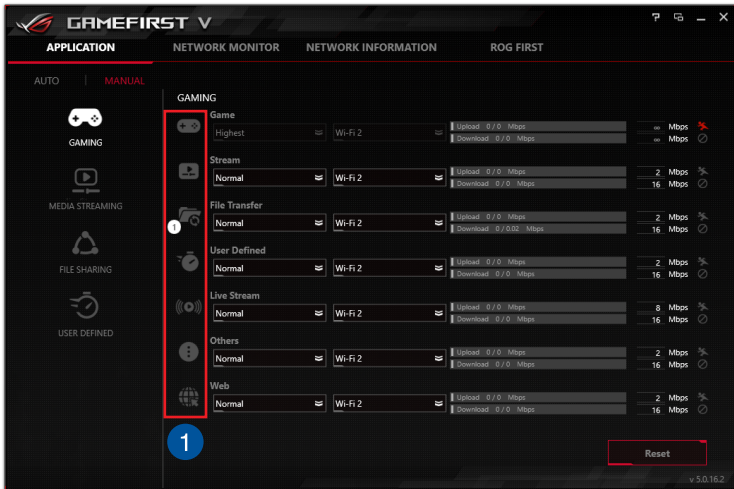



Categorizing apps into different groups

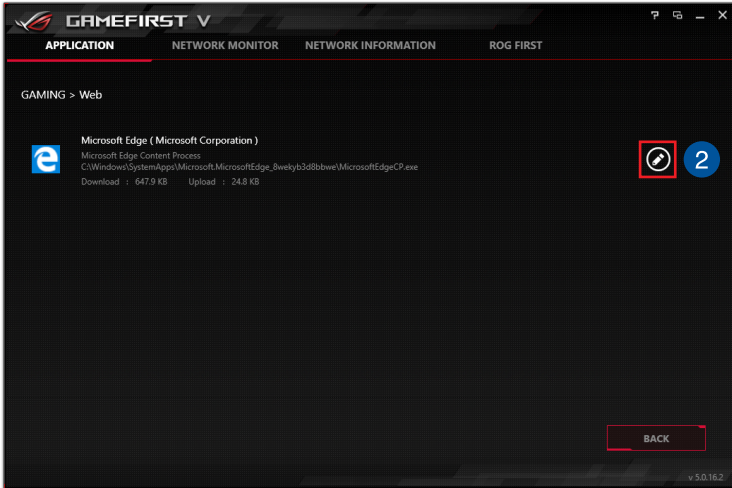
All the apps using network bandwidth are automatically placed into different groups, and the network bandwidth of all the apps in a group can be controlled together at the same time.

To categorize an app into a different group from its default group:

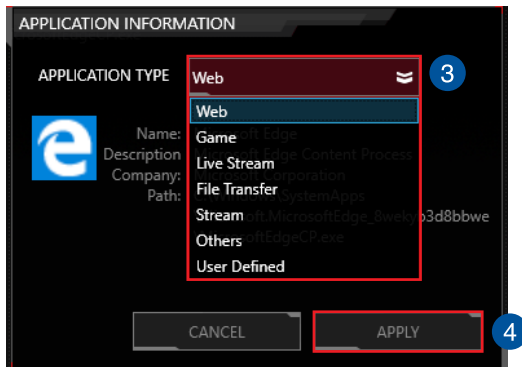
1. Click on the icon of a group.



2. Click on the  icon next to the app that you would like to edit.



3. From the drop-down menu, select a group for this app.
4. Click **Apply** to complete.

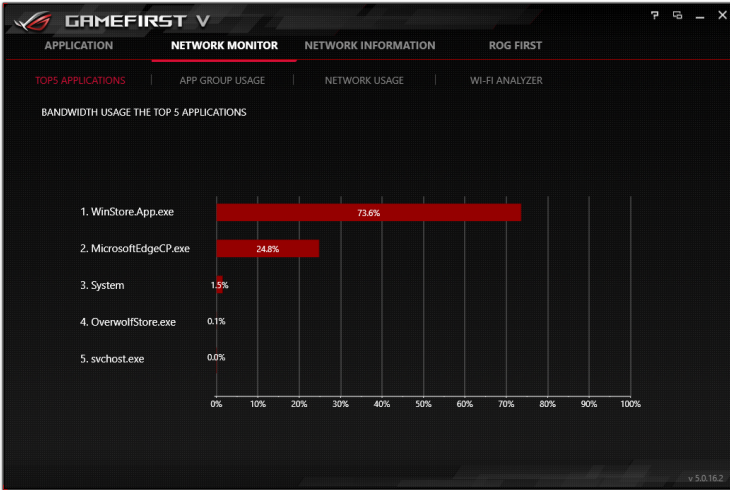


Network Monitor

Network Monitor displays detailed network usage that your system is currently using.

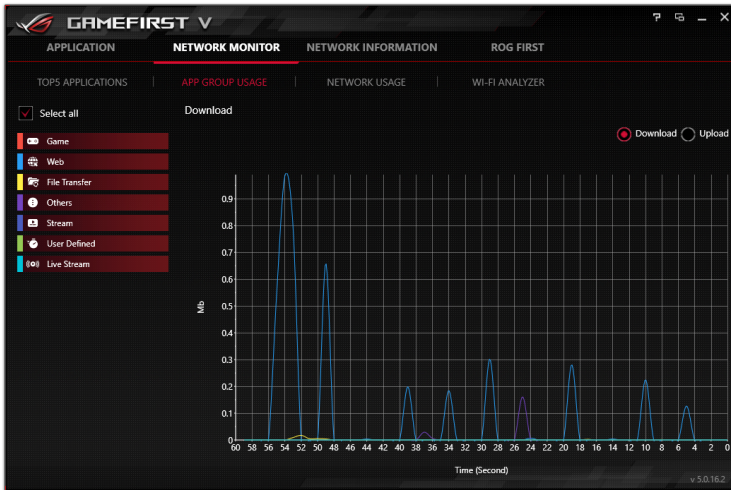
Top 5 Applications

Displays the top 5 bandwidth consuming applications currently used.



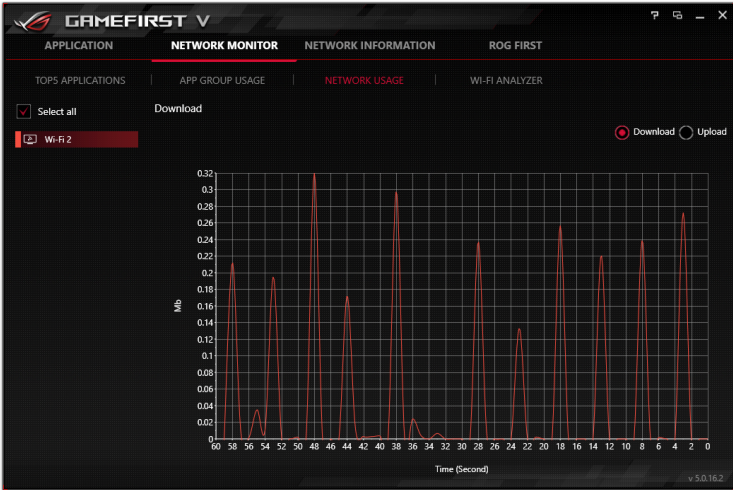
App Group Usage

Displays the individual downloading and uploading bandwidth of currently used applications.



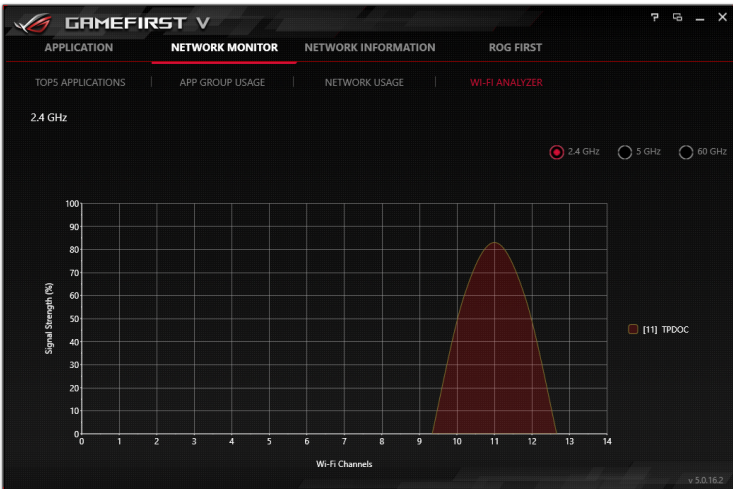
Network Usage

Displays the total downloading and uploading bandwidth of the currently used applications. You may also toggle and display the downloading and uploading bandwidth of each connection.



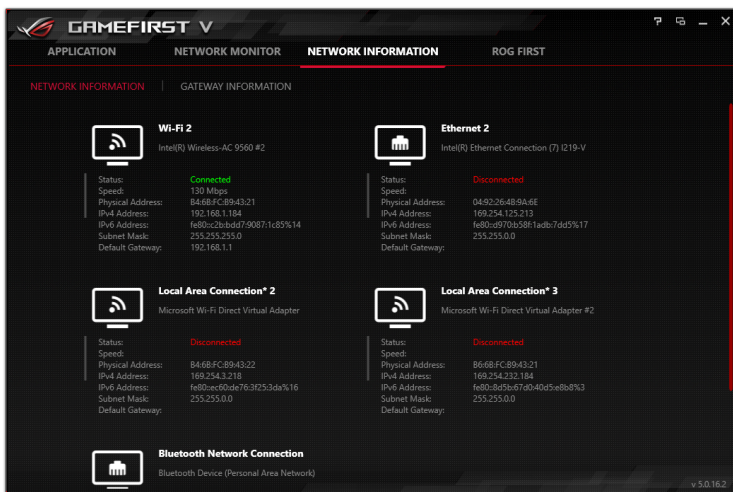
Wi-Fi Analyzer

Displays the network traffic for each channel to help you select a smooth path.



Network Information

Displays information about the physical network card such as speed, physical address, IP address, subnet mask, and default gateway.



ROG First

Discover and match ROG routers to turn on its QoS feature with just a click to achieve ultra-fast experiences in games.



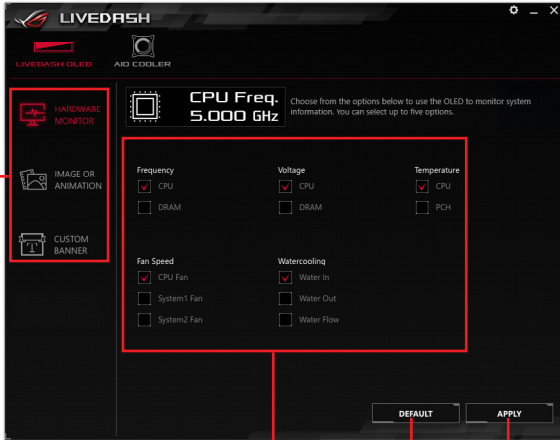
LiveDash

LiveDash allows you to adjust the information displayed on the onboard OLED panel or select different animation effects.

LiveDash OLED

Hardware monitor

This mode displays the checked items that you would like to display on the OLED panel.



Select different display modes for the OLED panel

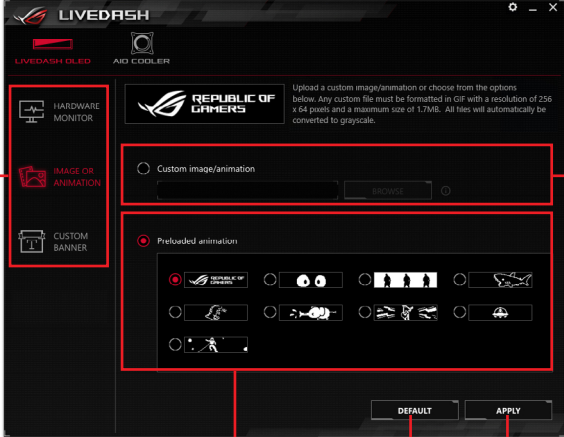
Select the items that you would like to display on the OLED panel

Click to enable the default settings

Click to apply the changes

Image or Animation

This mode allows you to display a custom image or animation on the OLED panel.



SELECT DIFFERENT DISPLAY MODES FOR THE OLED PANEL

SELECT A PRELOADED ANIMATION TO DISPLAY ON THE OLED PANEL

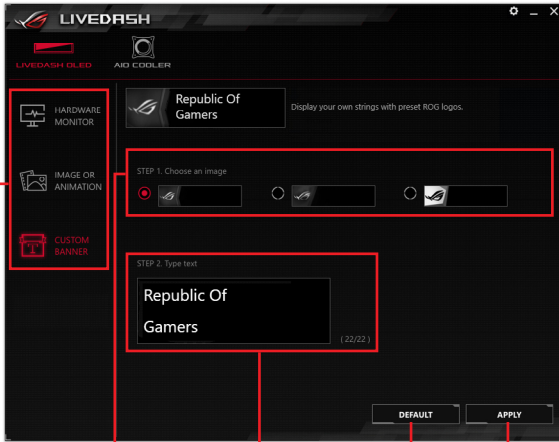
CLICK TO ENABLE THE DEFAULT SETTINGS

CLICK TO APPLY THE CHANGES

BROWSE YOUR COMPUTER AND CHOOSE A CUSTOM IMAGE OR ANIMATION TO DISPLAY ON THE OLED PANEL

Custom Banner

This mode allows you to add custom strings with preset ROG logos to create custom banners.



Select different display modes for the OLED panel


Select a preset image for your banner

Enter your custom strings here

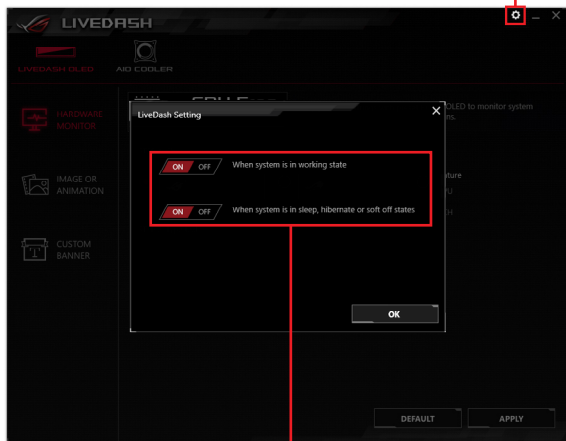
Click to enable the default settings

Click to apply the changes

LiveDash Settings

Click the  icon on the top right corner to access the LiveDash Settings and turn the LiveDash OLED on or off when the system is in different states.

Click to configure the LiveDash settings



Set when the LiveDash OLED will be turned on

AIO Cooler

Hardware monitor

This mode displays the checked items that you would like to display on the OLED panel on your AIO cooler.

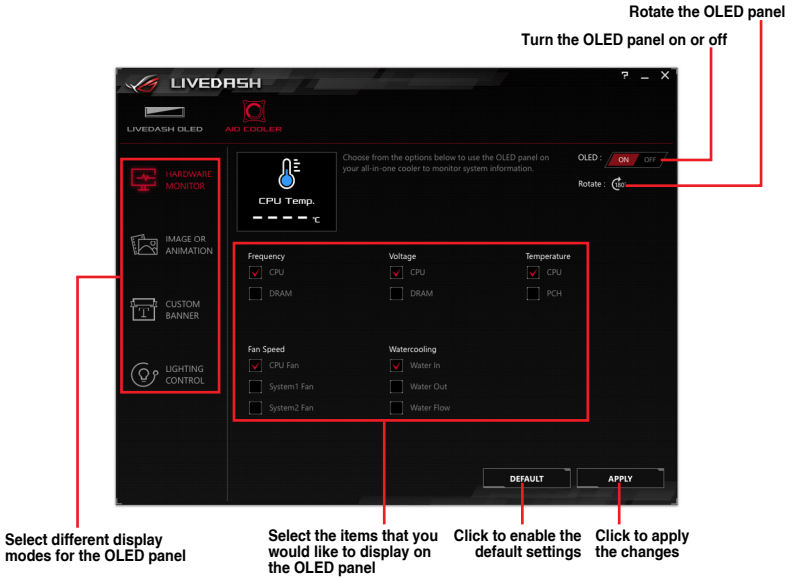
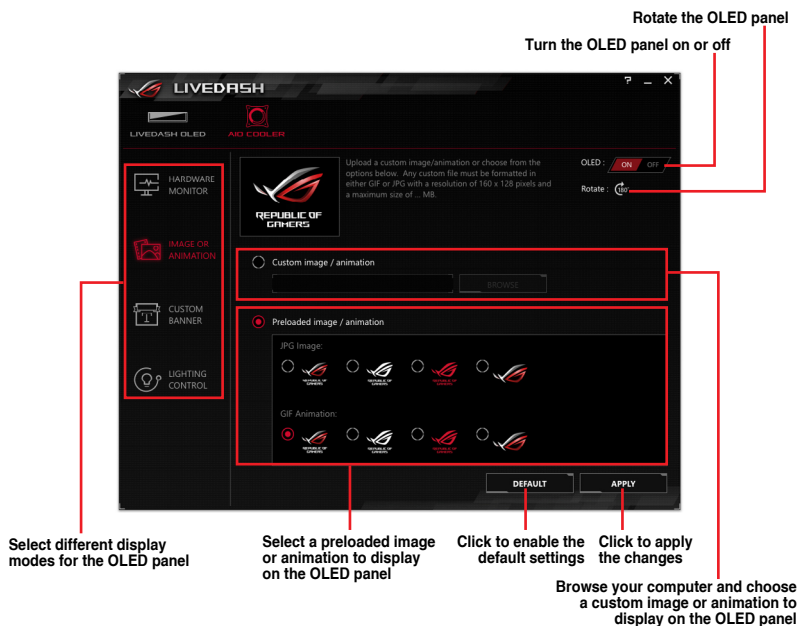


Image or Animation

This mode allows you to display a custom image or animation on the OLED panel.



Custom Banner

This mode allows you to add custom strings with preset ROG logos to create custom banners.

Rotate the OLED panel

Turn the OLED panel on or off

Select different display modes for the OLED panel

Select a preset image for your banner

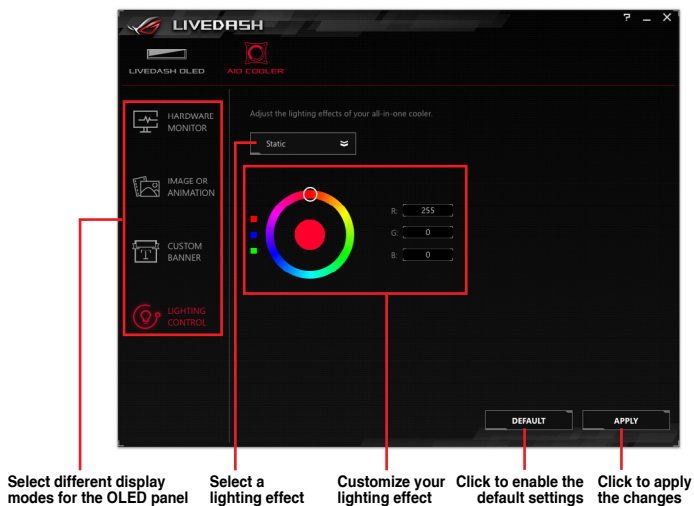
Enter your custom strings here

Click to enable the default settings

Click to apply the changes

Music EQ

This mode allows you to display an EQ visualization synchronized with your audio output.



Select different display modes for the OLED panel

Select a lighting effect

Customize your lighting effect

Click to enable the default settings

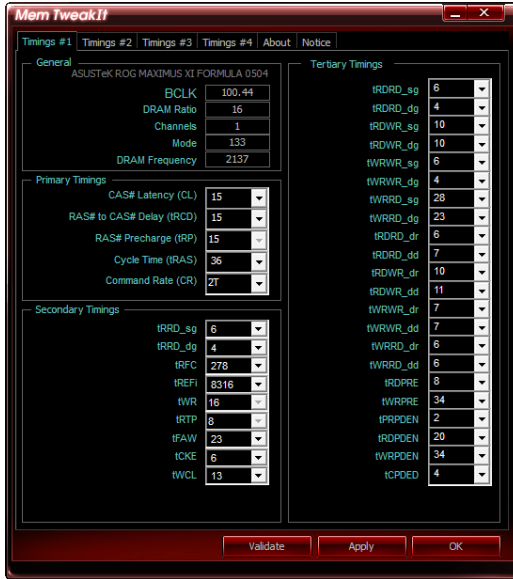
Click to apply the changes

MemTweakIt

MemTweakIt is a software that you can use to view all levels of memory timings. You can validate your MemTweakIt settings to generate a memory efficiency score that you can share and compare with other users on the ROG website.



MemTweakIt functions depends on the chipset of the motherboard. Each chipset has different options.

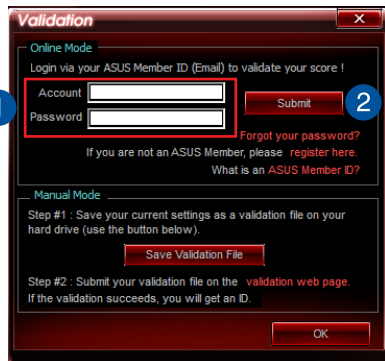


Validating and saving your MemTweakIt settings online

1. Click the **Validate** button, then enter your ASUS account ID and password.
2. Click **Submit** to send your configuration for validation.



Your configuration will be displayed on the MemTweakIt webpage.

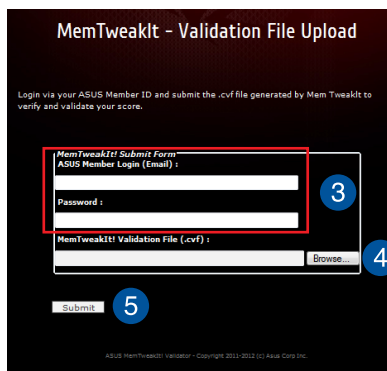


Validating and saving your MemTweakIt settings manually

1. Click the **Validate** button, then click **Save Validation File**.
2. Key in a file name for your configuration file and click **Submit**, then click **validation web page**.



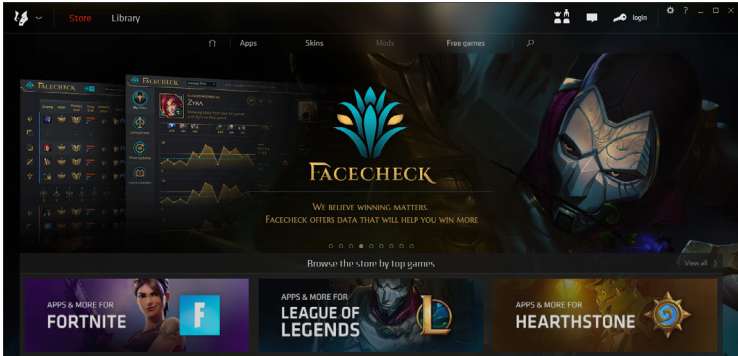
3. In the **MemTweakIt - Validation File Upload** window, enter your ASUS account ID and password.
4. Click **Browse**, locate the saved .cvf file and click **Open**.
5. Click **Submit** to send your configuration for validation.



Your configuration will be displayed on the MemTweakIt webpage.

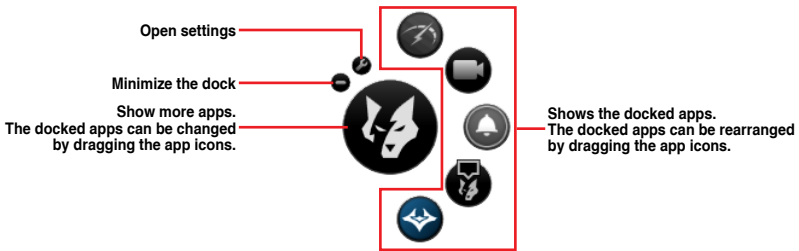
Overwolf

Overwolf is the Appstore for PC gamers that adds epic overlay apps to your favorite games to help you enjoy your gaming experience even more.



Overwolf dock

The Overwolf dock appears on the desktop and can be conveniently accessed and moved around. The Overwolf dock allows you to quickly access the apps in the Overwolf.



RAMCache III

RAMCache III provides a user-friendly and transparent solution to increase your PC overall performance by utilizing the system memory (DRAM) that is not in use. RAMCache III allocates a cache of RAM between the computer hard disk and the applications, then reads your performance needs in real time regarding the applications you are currently using and the disk I/O demands. RAMCache III copies the most frequently used data from the disk to the RAM cache where it can be processed faster, and then automatically writes it back to the disk – thus accelerating the computer overall performance with a minimized risk of data loss.

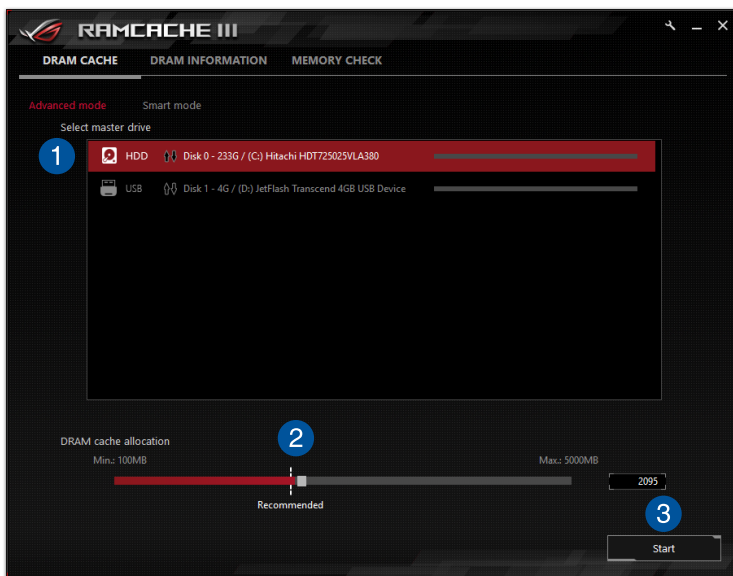
DRAM Cache

RAMCache III will dynamically and automatically boost the disk(s) that you are using the most in real time in regards to the applications that you are currently using and the disk I/O demands.

Creating a RAMCache using Advanced mode

Advanced Mode will allow you to allocate RAM cache from a selected disk.

1. Select a disk or partition to cache.
2. Drag the slider to select the cache size.
3. Click **Start** to create the cache.

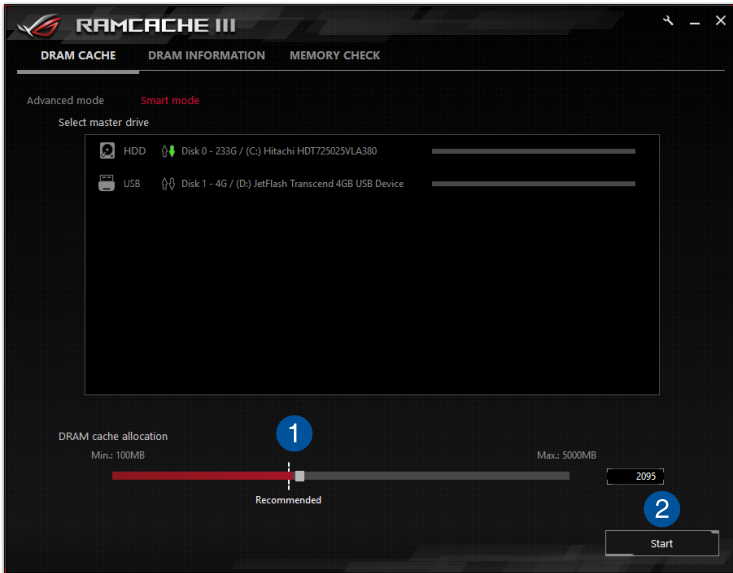


- You can only cache one partition at a time.
- Min and Max amounts of RAM at disposal is automatically updated.

Creating a RAMCache using Smart mode

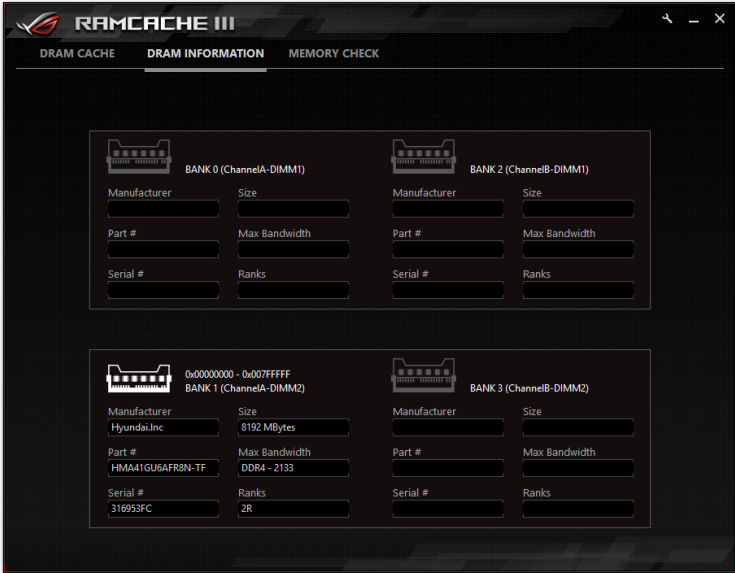
Smart Mode will automatically allocate RAM cache from all disks.

1. Drag the slider to select the cache size.
2. Click **Start** to create the cache.



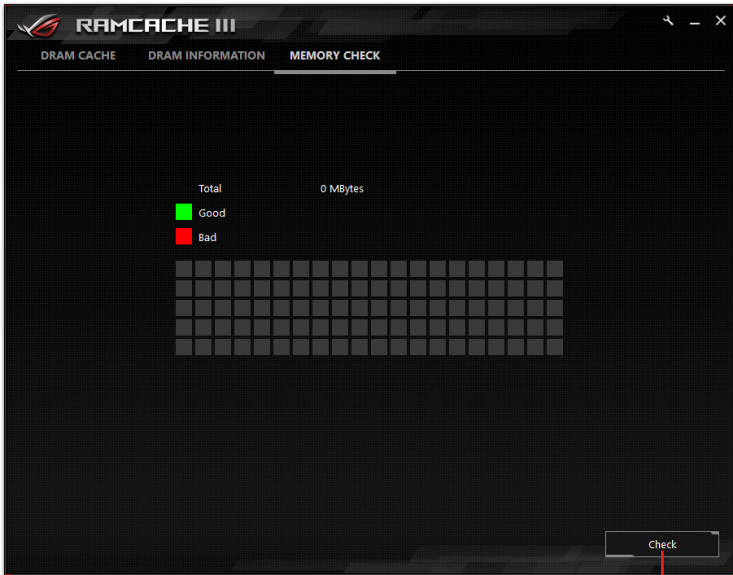
DRAM Information

This section lets you monitor your system DIMM information and configuration.



Memory Check

This feature lets you check the health status of the DIMM resources that you are using to cache your data. Any unhealthy section in the DIMM will be represented by a red square.



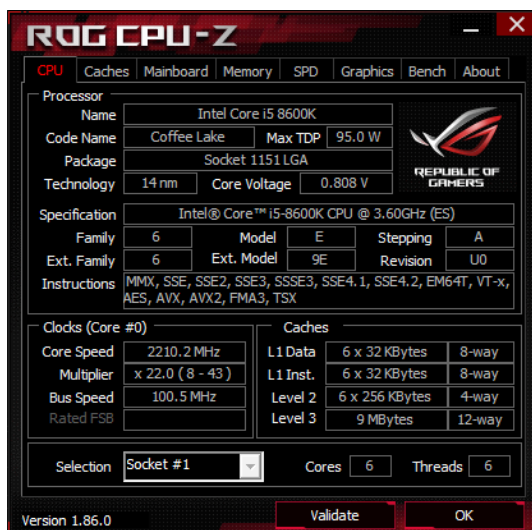
Click to start memory check



You must activate the **DRAM CACHE** function first before you can utilize **MEMORY CHECK**.

ROG CPU-Z

This utility gathers information about the main devices installed in your system and displays it in an ROG custom layout. ROG CPU-Z provides you with information and the status of your CPU, motherboard, memory, graphics card, and other components installed on your system. You can generate a report about your system info and send or post it on the CPU-Z website.



The screenshot shows the ROG CPU-Z utility window. The title bar reads "ROG CPU-Z" with a red ROG logo. The interface has a dark theme with red accents. At the top, there are tabs for "CPU", "Caches", "Mainboard", "Memory", "SPD", "Graphics", "Bench", and "About". The "CPU" tab is selected. The main content area displays the following information:

- Processor:**
 - Name: Intel Core i5 8600K
 - Code Name: Coffee Lake | Max TDP: 95.0 W
 - Package: Socket 1151 LGA
 - Technology: 14 nm | Core Voltage: 0.808 V
- Specification:** Intel® Core™ i5-8600K CPU @ 3.60GHz (ES)
 - Family: 6 | Model: E | Stepping: A
 - Ext. Family: 6 | Ext. Model: 9E | Revision: U0
 - Instructions: MMX, SSE, SSE2, SSE3, SSSE3, SSE4.1, SSE4.2, EM64T, VT-x, AES, AVX, AVX2, FMA3, TSX
- Clocks (Core #0):**
 - Core Speed: 2210.2 MHz
 - Multiplier: x 22.0 (8 - 43)
 - Bus Speed: 100.5 MHz
 - Rated FSB: [Empty]
- Caches:**
 - L1 Data: 6 x 32 KBytes | 8-way
 - L1 Inst: 6 x 32 KBytes | 8-way
 - Level 2: 6 x 256 KBytes | 4-way
 - Level 3: 9 MBytes | 12-way
- Selection:** Socket #1 (dropdown menu)
- Cores:** 6 | **Threads:** 6

At the bottom left, it says "Version 1.86.0". At the bottom right, there are "Validate" and "OK" buttons.

Sonic Studio III

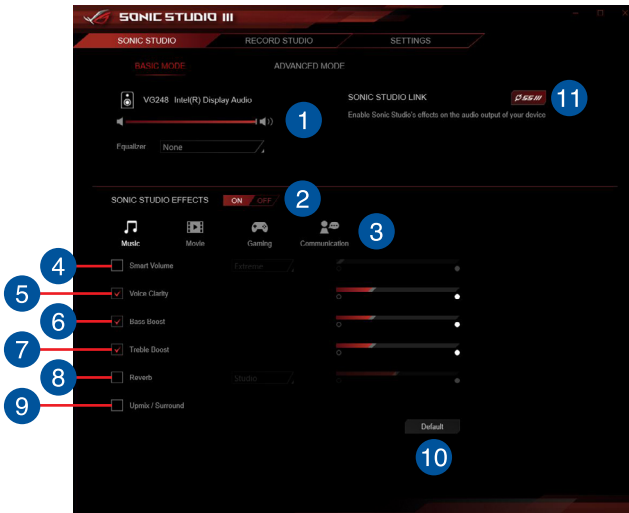
Sonic Studio III is an audio suite that offers basic and advanced controls that will help customize lots of audio options. Customize audio effects through the Sonic Studio Basic Mode, Sonic Studio Advanced Mode, and Record Studio, then save all the settings made to cloud or your computer.



Sonic Studio III supports Realtek® Audio Driver.

Sonic Studio Basic Mode

Access all Sonic Studio's audio effects and profiles in the Basic Mode tab. The default device's volume may also be adjusted.



- 1 Default Output Device management**
Adjust the equalizer and volume for the default audio output device.



The Equalizer option only appears when an analog device is selected as the default device.

- 2 Sonic Studio Effects**
This item allows you to enable or disable all the audio effects of Sonic Studio.

3

Audio profiles

This item allows you to select an audio profile and adjust it to your listening experience.

Music profile: This profile is customized for stereo or 5.1 music.

Movie profile: This profile is customized for video and movie contents.

Gaming profile: This profile is customized for stereo or multi-channel video games, and particularly First Person Shooters.

Communication profile: This profile is customized for improved communication.

4

Smart Volume

Check this box to maintain a constant volume for all elements of the audio experience (dialogs, soundtrack, explosions, etc.). Select from soft, balanced, or extreme.

5

Voice Clarity

Check this box to enable Voice Clarity. Voice clarity extracts and boost the frequency of the human voice for crystal clear in-game communications and dialogues in movies.

6

Bass Boost

Check this box to boosts the bass effects. Use the slider to adjust the sound of the bass effect.

7

Treble Boost

Check this box to boosts the treble effects. Use the slider to adjust the sound of the treble effect.

8

Reverb

Check this box to enable Reverb. This item increases the feeling of spaciousness and lets you choose other reverb presets.

9

Upmix / Surround

Check this box to enable Upmix / Surround. This item recreates a multichannel listening experience over your stereo headphones or speakers.

10

Default

Click this button to load all default settings.

11

Sonic Studio Link

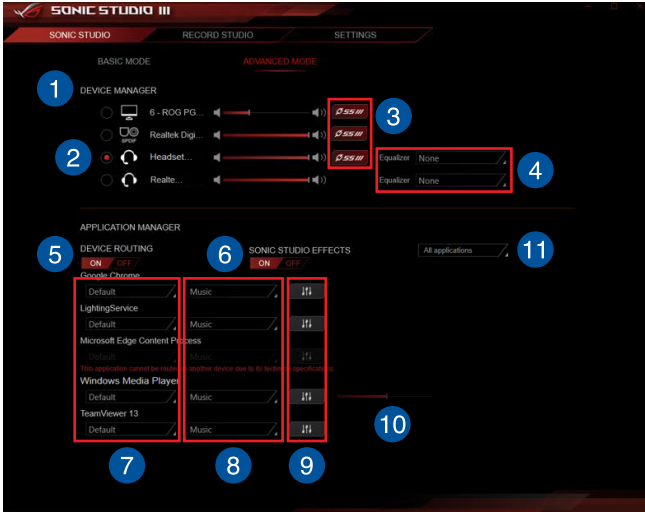
Click this button to enable the Sonic Studio Link function and inject the APO (Audio Processing Object) to any connected device, including Bluetooth headphones, connected speakers, and VR headsets.

Sonic Studio Advanced Mode

Advanced mode allows you to adjust all the applications that have played or are currently playing an audio stream, and also gives you an overview of all available output devices. You may adjust the profile and device to play the audio for each application individually.



Switching to Advanced mode will disable Basic Mode.



- 1 Device Manager list**
This list displays all available output devices.
- 2 Default device**
Check this box to set a device as the default audio output device.
- 3 Sonic Studio Link**
Click this button to enable the Sonic Studio Link function for the device. APO (Audio Processing Object) will be injected across all the devices with Sonic Studio Link enabled.
- 4 Equalizer settings**
This item allows you to set 2 types of equalizers depending on your device.

For Speakers: You can apply a 10-band EQ to the speakers, or choose from a list of specific equalizer parameters.

For Headphones: You can apply specific corrections depending on your headset, or use a 10-band EQ while selecting **Custom**.

5

Device routing

This item allows you to customize playback of audio streams on different devices. You may enable or disable this function by clicking on the **ON** or **OFF** button.



This will allow Sonic Studio 3 to easily assign different audio outputs to the front and rear panel.

6

Sonic Studio effects

This item allows you to set different music profiles for each audio stream. You may enable or disable this function by clicking on the **ON** or **OFF** button.



- This option is only available when the onboard audio output is selected as the playback device.
 - For more information on the different music profiles, refer to **Sonic Studio Basic Mode**.
-

7

Device settings

This item allows you to select which device to use for each application.

8

Profile settings

This item allows you to select which profile to use for each application. Changes made to the Music, Movie, and Gaming profiles are applied to all applications using the same profile. Changes made to the Custom profile are only applied to the selected application.

9

10-band EQ settings

Click on this button to access the 10-band EQ. For more information, refer to **10-band Equalizer**.

10

Volume

This item allows you to adjust the volume of each application.



This option is only available when the application is currently playing an audio stream.

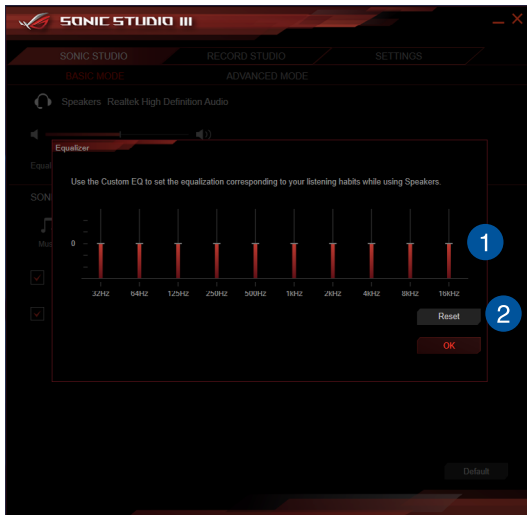
11

Application filter

To display applications which are currently playing an audio stream, select **Current applications** from the drop-down menu. Select **All applications** to display all applications which have played or are currently playing an audio stream.

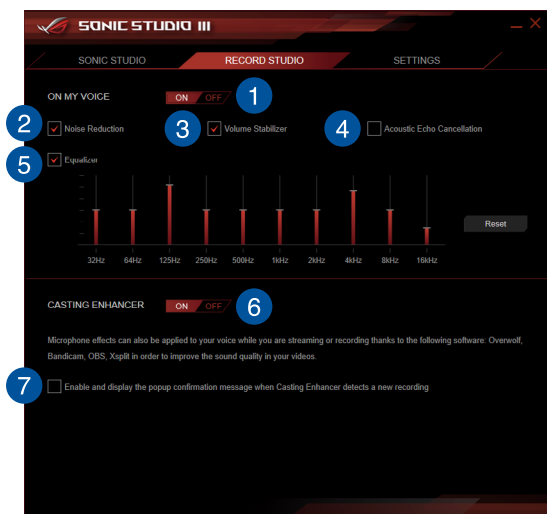
10-band Equalizer

Adjust the sliders of the 10-band Equalizer to customize your own audio settings for a specific device.



- 1 Custom EQ**
You may adjust each slider to customize the audio settings for the device.
- 2 Reset**
Click this reset to Flat for all frequencies.

Record Studio



- 1 On my voice switch**
Turn all ON MY VOICE effects **ON** or **OFF**.
- 2 Noise Reduction**
Check this box to enable Noise Reduction. This item removes the remaining voice on top of your voice or your friend's voice.
- 3 Volume Stabilizer**
Check this box to enable Volume Stabilizer on your voice or on incoming voice to maintain constant and clear communication.
- 4 Acoustic Echo Cancellation**
Check this box to enable Acoustic Echo Cancellation. This item removes the echo which appears in noisy environments.
- 5 Equalizer**
Check this box to enable the Equalizer. This item allows you to set a 10-band EQ for your voice when using a microphone.

6

Casting Enhancer

Turn Casting Enhancer **ON** or **OFF**.

The Casting Enhancer feature supports the following software:

- XSplit Broadcaster
- XSplit Gamecaster
- OBS (Open Broadcaster Software)
- Bandicam
- Overwolf



Specifications are subject to change without notice. Please refer to ASUS website for the latest specifications.

7

Casting Enhancer popup

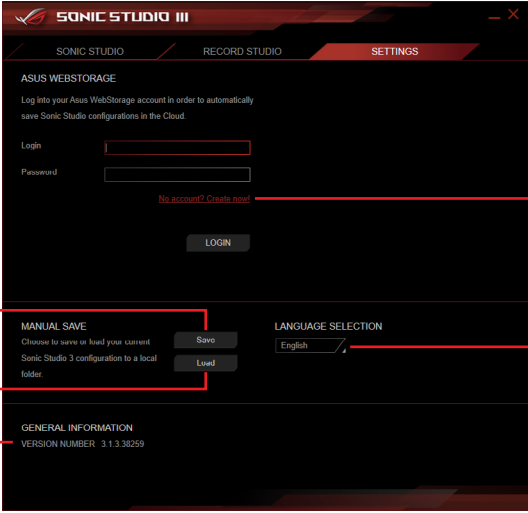
Show a popup confirmation message when Casting Enhancer detects a new recording.



Games in exclusive display mode (fullscreen) will not display the popup confirmation message.

Settings

The Settings menu allows you to automatically or manually save and read Sonic Studio III settings, change the language of your Sonic Studio III, and display the version number of your Sonic Studio III.



The screenshot shows the 'SETTINGS' tab of the Sonic Studio III application. It is divided into three sections: 'ASUS WEBSTORAGE', 'MANUAL SAVE', and 'GENERAL INFORMATION'. The 'ASUS WEBSTORAGE' section has a login form with 'Login' and 'Password' fields, a 'LOGIN' button, and a link for 'No account? Create now!'. The 'MANUAL SAVE' section has 'Save' and 'Load' buttons. The 'LANGUAGE SELECTION' section has a dropdown menu currently set to 'English'. The 'GENERAL INFORMATION' section displays the 'VERSION NUMBER 3.1.3.38259'. Red callout lines point from text labels to these specific elements.

Click to save your Sonic Studio III settings to your computer

Click to load Sonic Studio III settings from your computer

Displays the version number

Click to create an ASUS WebStorage account

Select and change the language of Sonic Studio III

Using the Auto-save feature:

To use this feature, ensure that you are connected to the ASUS WebStorage. If you do not have an ASUS WebStorage account, you can create one by clicking on the **No Account? Create now!** link.



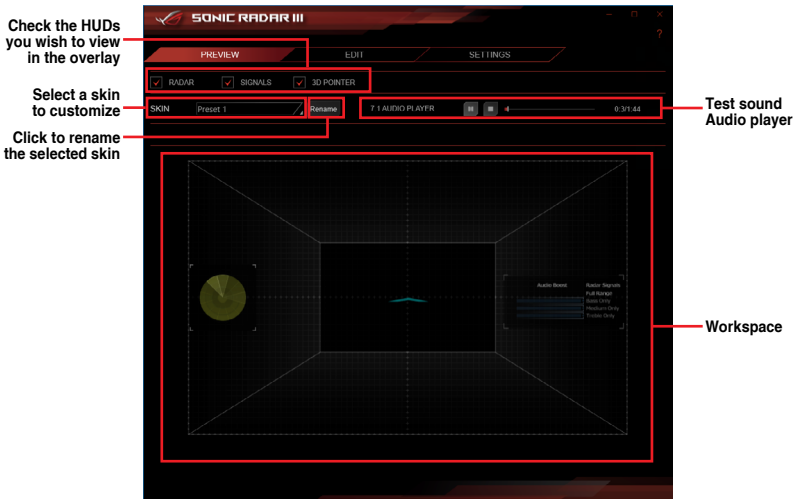
A new .roga file will be created when you connect to the ASUS WebStorage for the first time, this file contains the current settings of your Sonic Studio III.

Sonic Radar III

Sonic Radar III is designed for First Person Shooting (FPS) games and shows the precise direction and intensity of where a sound is coming from. It features a simple and friendly user-interface and also features sound enhancers to amplify desired sound effects.

Preview Mode

Preview Mode allows you to test Sonic Radar and its overlays using the Audio Player test sound. The test sound is recorded in a multi-channel video game, click the Play button to play the test sound. You may pause or stop the test sound at anytime, or drag the progress bar to a desired moment in the test sound.

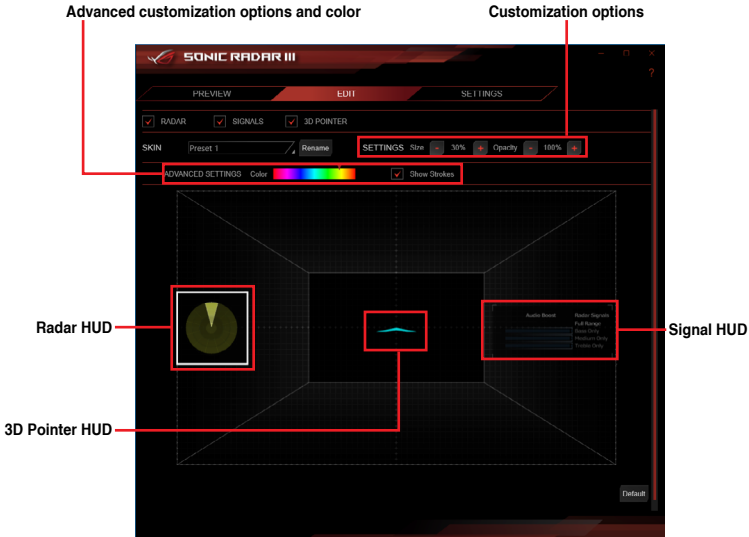


Edit Mode

Edit Mode allows you to customize the Signal, Radar, and 3D Pointer HUDs. You can adjust the color style, opacity, and size of each HUD by selecting the HUD that you wish to customize, or drag and drop the HUD to reposition it.



Customization options may differ between different HUDs



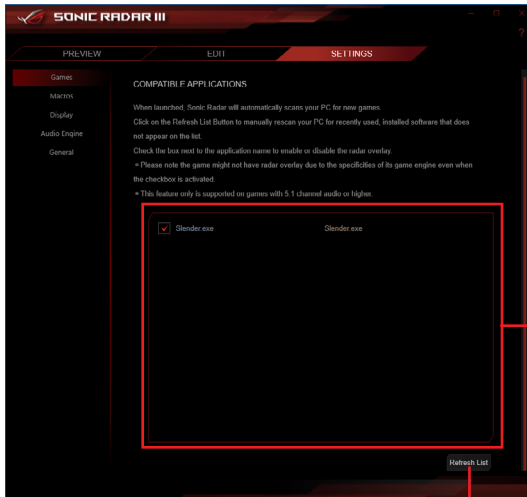
Settings

Games

The Games tab displays all applications which support the Sonic Radar III overlay, and allows you to enable or disable the overlay for each application. Sonic Radar III certifies a huge list of games, allowing full compatibility of the overlay on numerous softwares.



Certified applications are enabled by default when you launch them the first time. Other compatible applications appear at the bottom of the list.

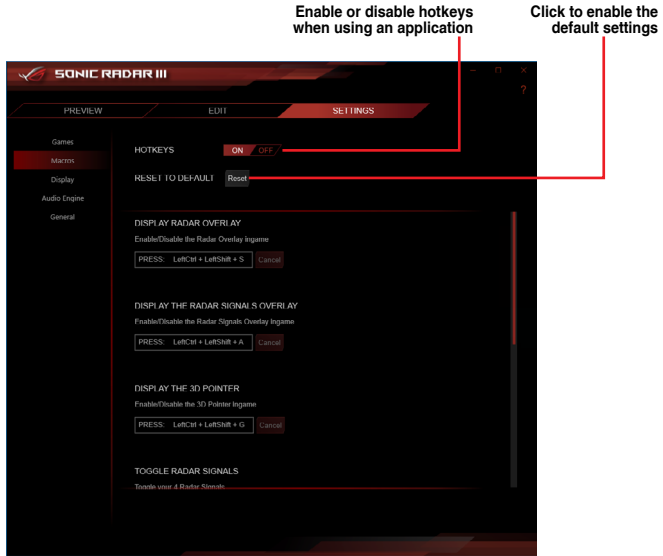


Applications list

Click to refresh the applications list when a new application has been installed and needs to be added to the list

Macros

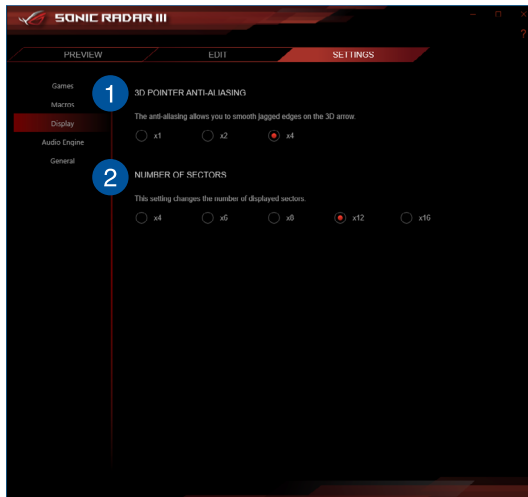
The Macros tab allows you to configure hotkeys to quickly access Sonic Radar III features.



Title	Function
Display Radar Overlay	Hide or show the Radar in the overlay.
Display the Radar Signals Overlay	Hide or show the Radar Signals in the overlay.
Display the 3D Pointer	Hide or show the 3D arrow in the overlay.
Toggle Radar Signals	Switch between the range of frequency values that have been set for the product.
Trigger Audio Boost	Activate the audio filter for the selected Radar Signal for a limited duration.
Switch between Skins	Select the next Skin preset from the list of factory skins.
Switch between Skins (backwards)	Select the previous Skin preset from the list of factory skins.

Display

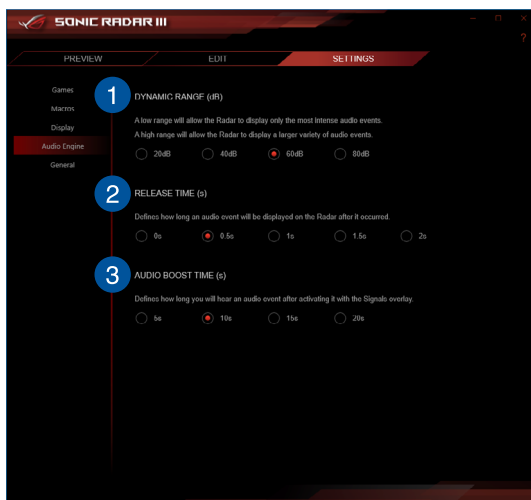
The Display tab allows you to adjust the settings of the visual appearance of the overlay.



- 1 3D Pointer Anti Aliasing**
This setting allows you to adjust how pixelated the 3D pointer will be.
- 2 Number of Sectors**
This setting allows you to select the amount of sectors (4-16 sectors) you want in the radar. The more sectors you display, the more accurate the Radar becomes.

Audio Engine

The Audio Engine tab allows you to adjust settings related to the audio content of your application.



- 1 Dynamic Range**

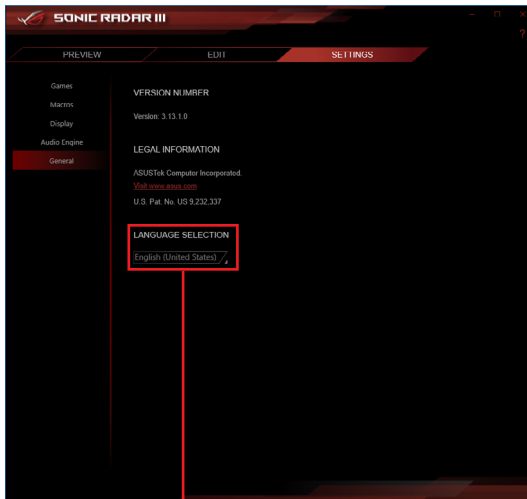
This setting allows you to select how precise your Sonic Radar should be. Choose a low value if you wish to display only the most important audio elements in your application.
- 2 Release Time(s)**

This setting allows you to set how long the sectors and 3D Pointer should be displayed after the sound has stopped.
- 3 Audio Boost Time(s)**

This setting allows you to set how long the selected range of frequencies should be played. This only applies to selected signals turned **ON** in the signals overlay.


General

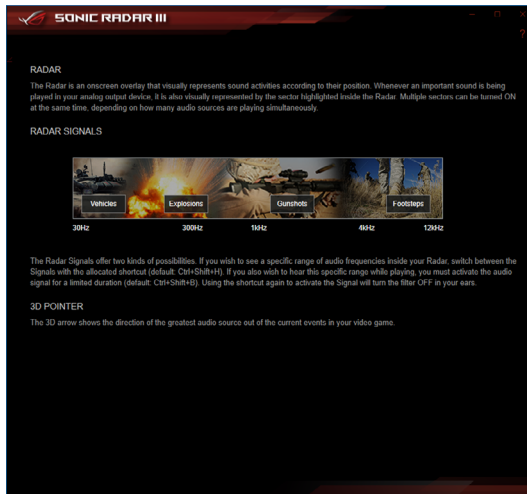
The General settings tab allows you to select the language of your Sonic Radar III and displays the version number and legal information.



Select the language of your Sonic Radar III

Help menu

Click on the  button to view information on the different HUDs and their functions.



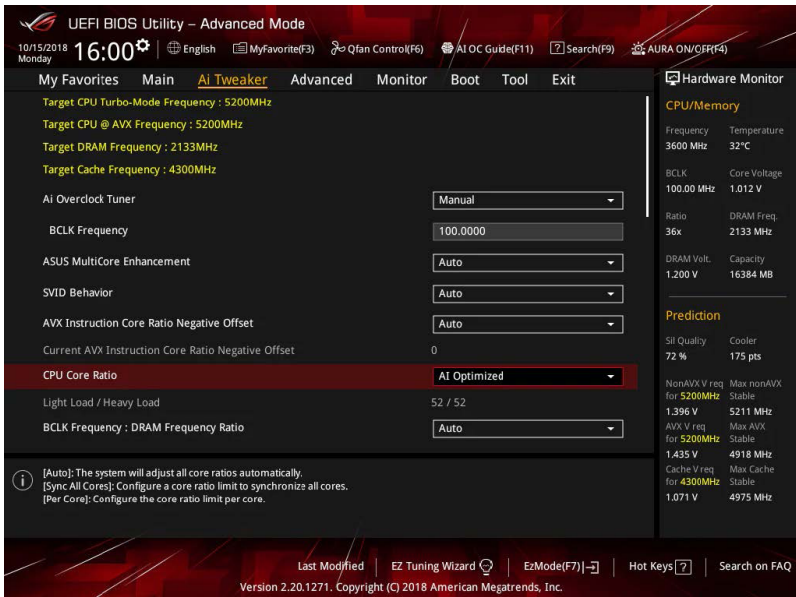
Appendix

How to overclock your system using AI overclocking

Overclocking your system means dipping into untapped potential for better performance. The idea of pushing your CPU past the stock defaults in pursuit of lofty gains is tempting for anyone, but the process can be daunting for beginners. For years, we've been baking loads of tweaking options into our motherboards, including automated tools like 5-Way Optimization and OC Tuner that make it easy for inexperienced users to test the limits of their systems with just a few clicks. Our latest generation of Z390 motherboards (<https://www.asus.com/us/search/results.aspx?SearchKey=z390>) takes automatic tuning to a whole new level with intelligent prediction. AI Overclocking is faster and more efficient than other methods, and it allows you to overclock a system in just a few short steps from the UEFI or desktop. Naturally, we had to take it for a test drive. This guide provides a walk-through for how to overclock your system using AI Overclocking.

Gather intelligence for prediction

Our new auto-tuner takes all the guesswork out of overclocking your processor. It's smarter than the pre-baked profiles used by some solutions because it tailors settings to your individual system. Our proprietary algorithm rates the silicon quality of your CPU and the cooling capabilities of your PC before producing a score for each. The resulting Sil Quality and Cooler Score form the basis for the optimized configuration suggested for your rig.



After applying that config, you can set AI Overclocking to keep training, and it will continue monitoring system vitals like temperature, power draw, and fan speeds to assess the effectiveness of your cooling. If your Cooler Score changes, AI adjusts the overclock accordingly. This safeguard ensures your system remains stable through seasonable temperature changes, component upgrades, and dust buildup that can affect cooling efficiency.

Click here to overclock

We've been working on a brand new build here in the office. It's based on our Strix Z390-I Gaming motherboard and uses Intel's 9th Generation Core i7-9700K CPU. This eight-core processor has a 3.6GHz base frequency, and when all its cores are active, Turbo takes the clock speed up to 4.6GHz. Since we're cooling the chip with our latest ROG Ryuo 240 AIO liquid cooler, we're hoping to push the top speed even higher.

The screenshot shows the UEFI BIOS Utility - EZ Mode interface. At the top, it displays the date and time (10/13/2018 Saturday 03:14), language (English), and various utility icons. The main area is titled "AI Overclocking Guide" and contains a list of steps for setting up an overclock. The steps are:

1. Load UEFI defaults by pressing F5, then press F10, and select save and reboot.
2. Enter the operating system and run Cinebench or your preferred workload/stress test.
3. After the test has been run for the desired time, reboot the system, and then enter UEFI.
4. Set the Core Ratio function to 'AI Optimized'. The motherboard will proceed to adjust the overclocking settings according to the cooler score (in-depth details provided later in the guide).
5. Save by pressing F10, and reboot the system.
6. Enter the operating system and rerun your preferred stress test. If the system is stable, no further changes are required. Please note that the CPU frequency applied by the AI Overclocking utility is based upon Prime 95 26.6 (non-AVX) stability. This is due to limitations of the AVX Offset parameter and also because CPU overclocking margins are limited when running AVX workloads. However, we recognize some users run software that contain AVX code, so we have included AVX-related CPU voltage and frequency guidelines within the AI Overclocking monitoring pane of UEFI; please refer to the "AVX V req" and "Max AVX Stable Frequency" values, and manually set to CPU Vcore and the CPU ratio accordingly. And, if using Adaptive Vcore mode, please check the recommended headline values within the AI Feature menu and then apply the highest displayed value to the "CPU load-line calibration" setting within the External DIGI+ Power Control section.
7. By default, the AI Overclocking feature caters for environmental temperature changes, so it may alter the CPU frequency when you reboot the system. There is no need to make adjustments unless you would like to lock the overclock to a preferred frequency. If you prefer to disable the temperature tracking feature, simply set the Cooler Score setting to 'stop training' within the AI Features menu.

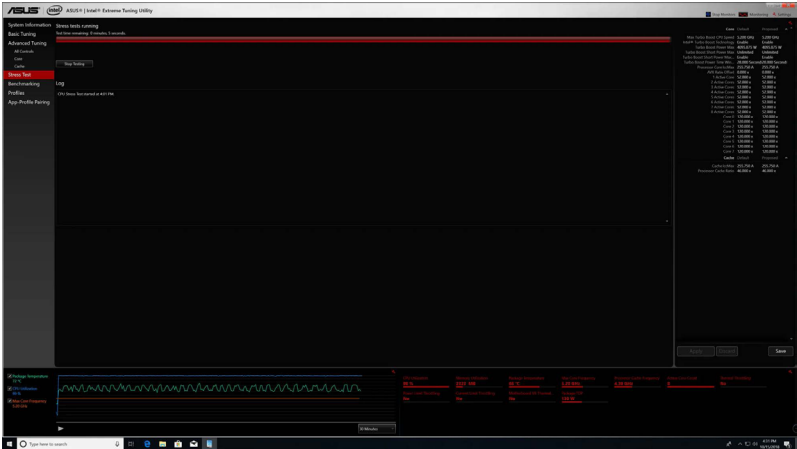
Note: Provided you don't swap/change the processor, any parameter adjustments applied by the AI overclocking feature are due to cooler efficiency score changes.

After following these steps, if you'd like to make manual adjustments, please read the remainder of this guide for a detailed breakdown of each function of AI Overclocking. In fact, it's wise to read the entire guide before you start because it provides valuable insights related to how the utility works.

At the bottom of the guide, there are four buttons: Previous, Next, Enable AI, and Cancel.

The easiest way to use AI Overclocking is through the UEFI, which doesn't require installing any software. There's even a guide embedded in the BIOS that outlines the process. To see it, enter the UEFI by pressing the Delete key when the system first boots, and then click AI OC Guide at the top of the screen. When you're in the UEFI, pressing F11 also brings up the guide.

The first step is loading the UEFI defaults by pressing F5, and then F10 to save and reboot. This establishes a stable baseline so that AI OC can evaluate your system. Next, boot into the operating system and run a stress test. You can use Blender, Prime95, Aida64, ROG RealBench, the Intel Extreme Tuning Utility, or anything else that loads up the CPU. AI Overclocking is better able to determine the limits of your machine with longer and more intensive workloads, but that doesn't mean you need to settle in for a full day of stress testing. I chose to use Intel XTU and set the test for 30 minutes, which is long enough to get the system's blood pumping.

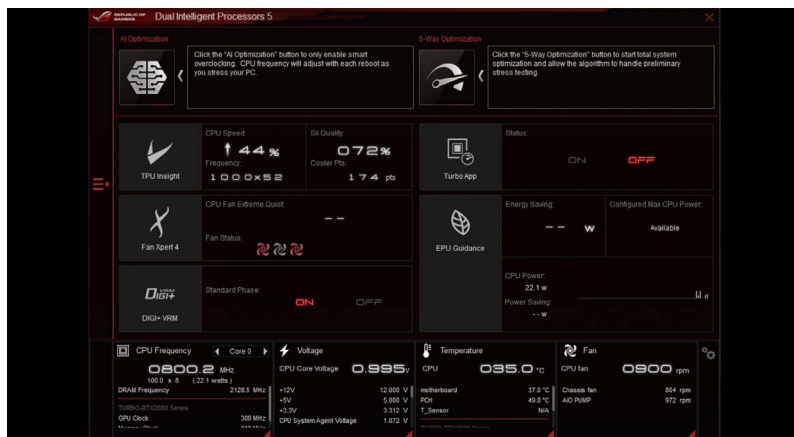


Once the test finished, I headed back to the BIOS and navigated to the AI Tweaker section. Setting the CPU Core Ratio to AI Optimized is all that's required to enable AI Overclocking. The automated intelligence gave our system cooling a score of 175 and rated our CPU's Sil Quality at 72%. It predicted an optimal all-core clock speed of 5.2GHz, which is an impressive 800MHz higher than the chip's default frequency when fully loaded. AI Overclocking applies its optimized settings automatically, so all you have to do is hit F10 to save and reboot.

After saving the AI Overclock config, I headed back to the desktop to check stability with another stress test. The system passed with flying colors. Although the CPU temperature briefly reached 80°C, it averaged only 69°C for the entirety of the 30-minute Intel XTU stress test.

And ... That's all. The process is really easy, and predictions are generated almost instantly. The entire procedure barely took longer than the hour we spent on stress tests. Longer stress tests can provide a more accurate read on your system's limits, but you can also use a shorter test to get a quick assessment and then rely on continuous training to hone the prediction.

It's worth noting that AI Overclocking does not adjust the AVX instruction offset due to limitations associated with this parameter. AVX workloads generate more heat and typically require lower clock speeds, so if you run software that uses those instructions, we recommend manually adjusting the offset value to compensate. The same algorithm that sets the all-core frequency also predicts the maximum stable AVX frequency, so it's easy to check the prediction and modify the offset appropriately. This is also covered in the step-by-step guide included in the UEFI.



Man vs machine

To see if I could do better than our algorithm, I disabled the auto-tuner and tried to reach higher speeds than the 5.2GHz it recommended. This time, I booted back to the desktop for software tweaking with the latest version of AI Suite. I first tried to dial up the multiplier by one step, taking it to 53X for 5.3GHz, but the system locked up. Incrementally increasing the base clock to 101MHz got me to 5.252GHz without issues, but that's only about 1% higher than what AI OC achieved, and it took a lot longer. I tried to push things further by adjusting the voltage but didn't have any success.

AI Overclocking is an amazingly quick tuning utility that goes beyond standard automated overclocking tools and remains vigilant in the face of changing system needs. It's a handy weapon for beginners looking for an easy path to higher speeds and a useful tool for experts who want to get to a stable baseline with minimal fussing, but it's only available on select boards in the ASUS Z390 family. Check out our introduction to Z390 gaming motherboards (<https://rog.asus.com/articles/maximus-motherboards/introducing-rog-maximus-strix-z390-gaming-motherboards/>) in the ROG Maximus and Strix families, and don't miss the full ASUS lineup in the complete Z390 motherboard guide (<https://edgeup.asus.com/2018/z390-motherboard-guide-coffee-lake-8-core/>) at Edge Up. We have boards for everyone from beginners and first-time builders to hardcore enthusiasts and prosumers, and most of them support AI Overclocking.