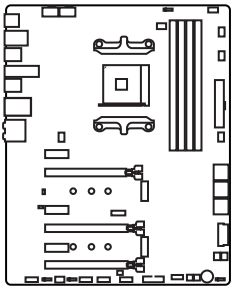
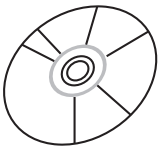
# Unpacking

Thank you for buying the MSI® **X470 GAMING M7 AC** motherboard. Check to make sure your motherboard box contains the following items. If something is missing, contact your dealer as soon as possible.



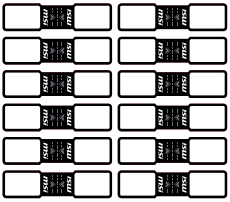
Motherboard



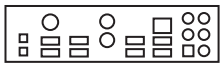
Drivers & Utilities Disc




Motherboard User Guide



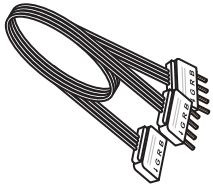
SATA Cable Labels



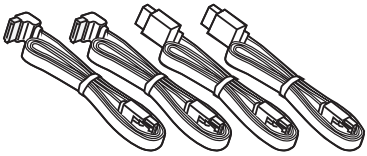
I/O Shield



SLI Bridge Connector



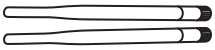
1 to 2 LED Extension Y Cable 80cm x1



SATA Cable x4



CORSAIR RGB LED Extension Cable 50cm x1



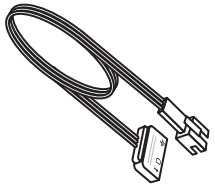
Antenna x2



M.2 Screw x2



Case Badge



Rainbow RGB LED Extension Cable 80cm x1

# Safety Information

• The components included in this package are prone to damage from electrostatic discharge (ESD). Please adhere to the following instructions to ensure successful computer assembly.

• Ensure that all components are securely connected. Loose connections may cause the computer to not recognize a component or fail to start.

• Hold the motherboard by the edges to avoid touching sensitive components.

• It is recommended to wear an electrostatic discharge (ESD) wrist strap when handling the motherboard to prevent electrostatic damage. If an ESD wrist strap is not available, discharge yourself of static electricity by touching another metal object before handling the motherboard.

• Store the motherboard in an electrostatic shielding container or on an anti-static pad whenever the motherboard is not installed.

• Before turning on the computer, ensure that there are no loose screws or metal components on the motherboard or anywhere within the computer case.

• Do not boot the computer before installation is completed. This could cause permanent damage to the components as well as injury to the user.

• If you need help during any installation step, please consult a certified computer technician.

• Always turn off the power supply and unplug the power cord from the power outlet before installing or removing any computer component.

• Keep this user guide for future reference.

• Keep this motherboard away from humidity.

• Make sure that your electrical outlet provides the same voltage as is indicated on the PSU, before connecting the PSU to the electrical outlet.

• Place the power cord such a way that people can not step on it. Do not place anything over the power cord.

• All cautions and warnings on the motherboard should be noted.

• If any of the following situations arises, get the motherboard checked by service personnel:

  ▪ Liquid has penetrated into the computer.

  ▪ The motherboard has been exposed to moisture.

  ▪ The motherboard does not work well or you can not get it work according to user guide.

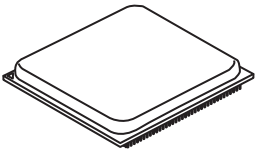
  ▪ The motherboard has been dropped and damaged.

  ▪ The motherboard has obvious sign of breakage.

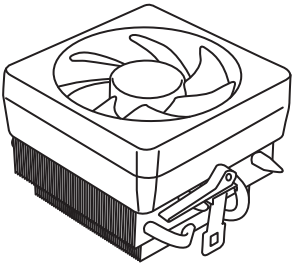
• Do not leave this motherboard in an environment above 60°C (140°F), it may damage the motherboard.

# Quick Start

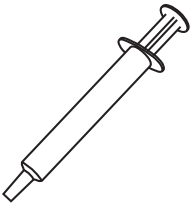
## Preparing Tools and Components



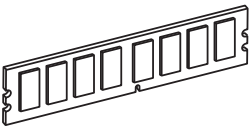
AMD® AM4 CPU



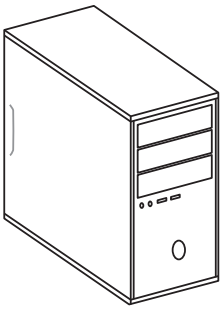
CPU Fan



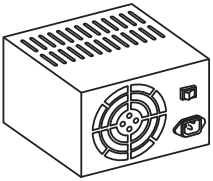
Thermal Paste



DDR4 Memory



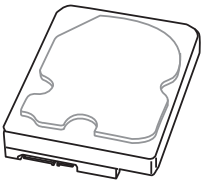
Chassis



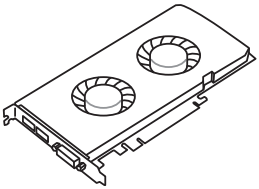
Power Supply Unit



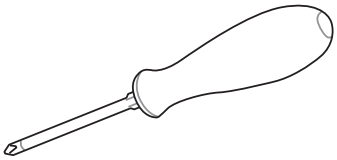
SATA DVD Drive



SATA Hard Disk Drive



Graphics Card



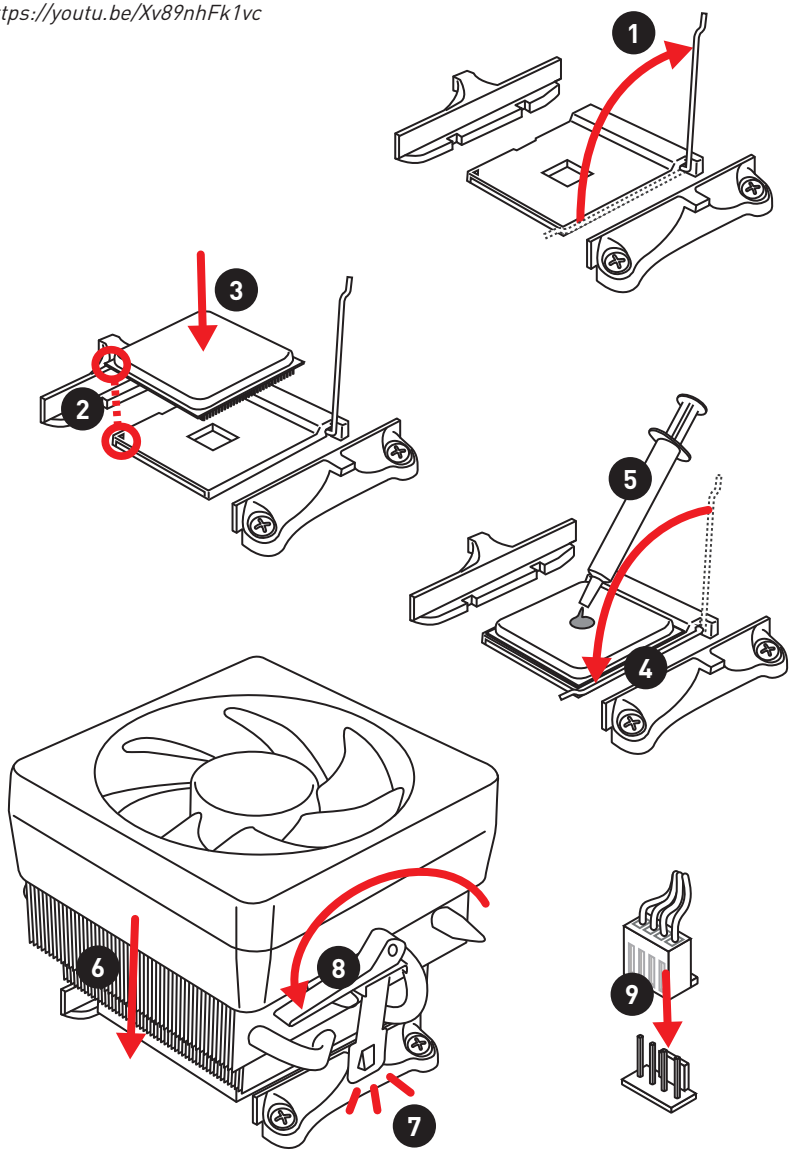
Phillips Screwdriver



A Package of Screws

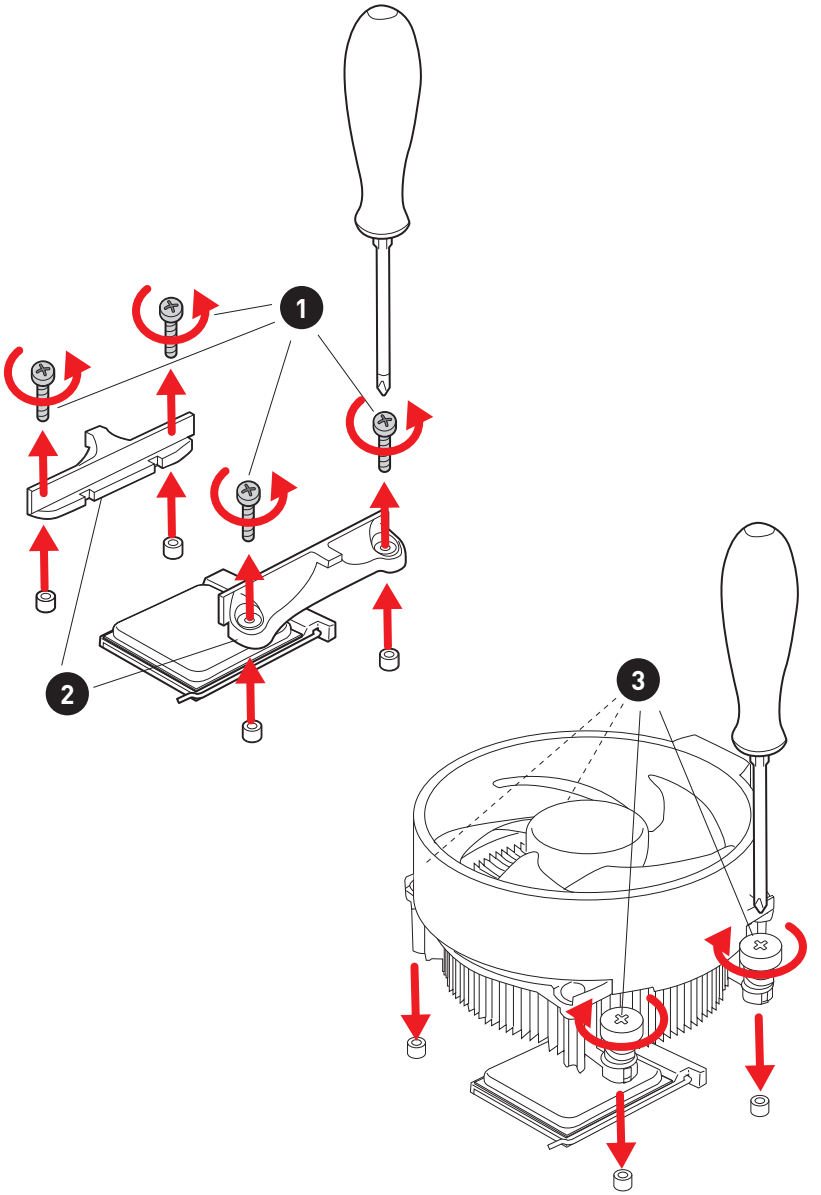
## Installing a Processor

*https://youtu.be/Xv89nhFk1vc*



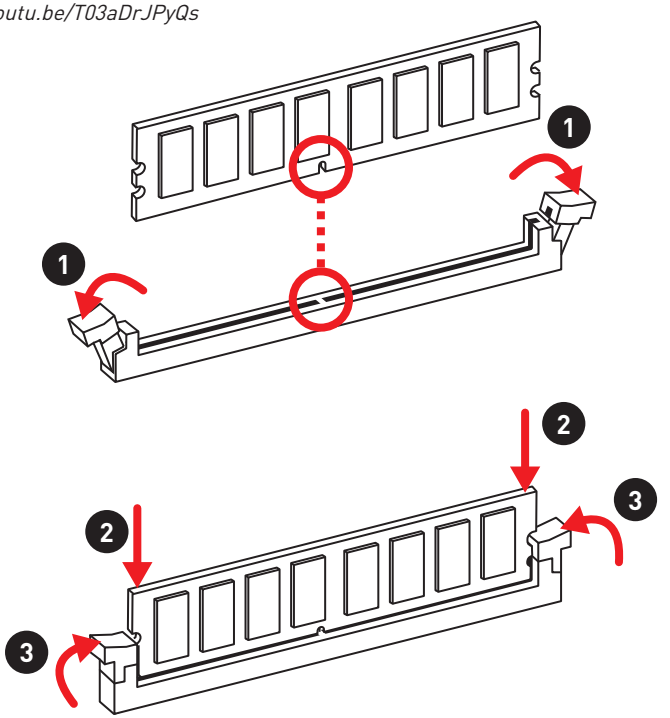
***Important***

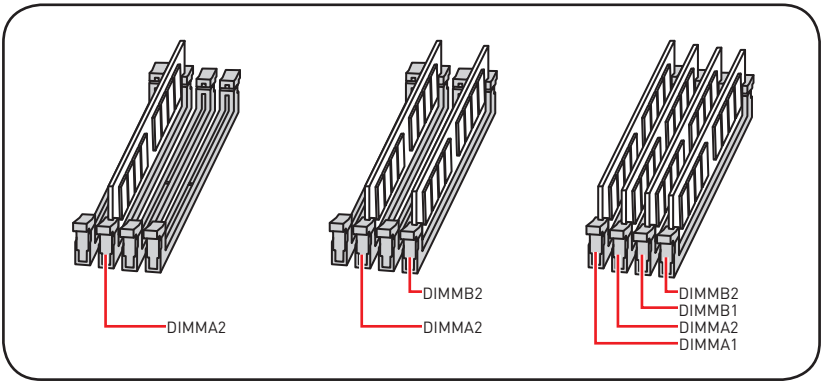
*If you are installing the screw-type CPU heatsink, please follow the figure below to remove the retention module first and then install the heatsink.*



## Installing DDR4 memory

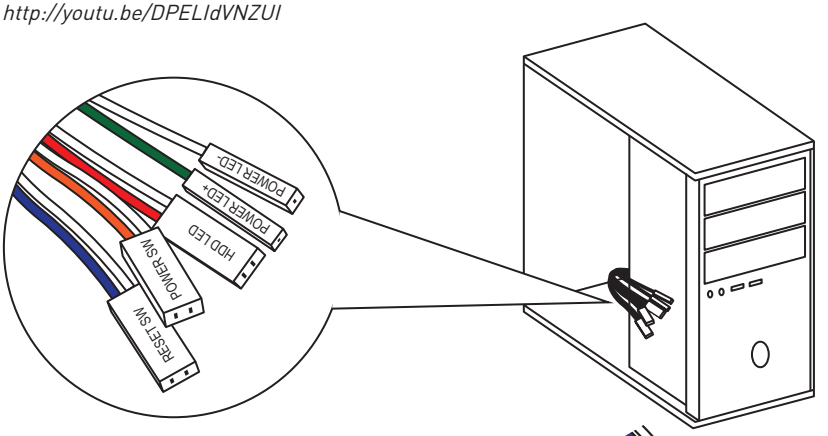
*http://youtu.be/T03aDrJPyQs*

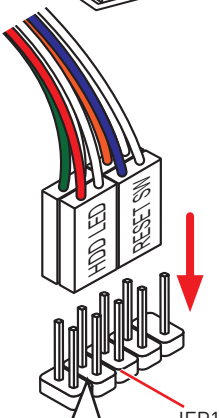


## Connecting the Front Panel Header

*http://youtu.be/DPELIdVNZUI*

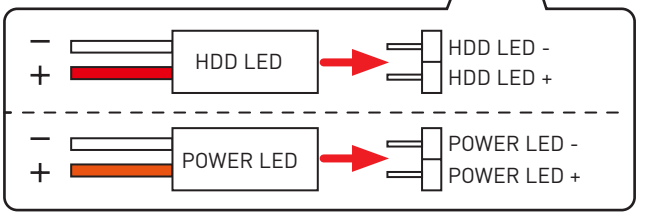


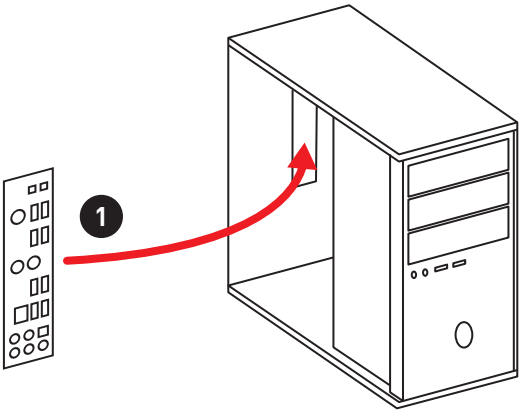


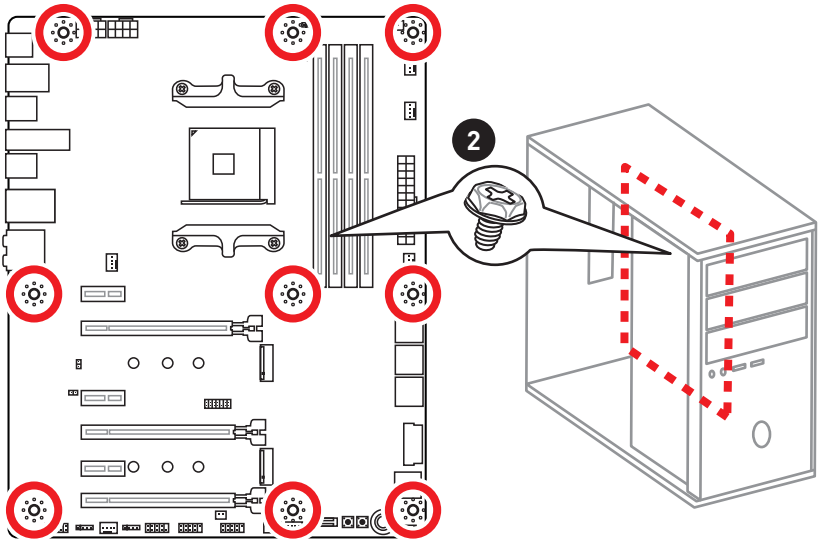


| | | | |
|---|---|---|---|
| 1 | HDD LED + | 2 | Power LED + |
| 3 | HDD LED - | 4 | Power LED - |
| 5 | Reset Switch | 6 | Power Switch |
| 7 | Reset Switch | 8 | Power Switch |
| 9 | Reserved | 10 | No Pin |



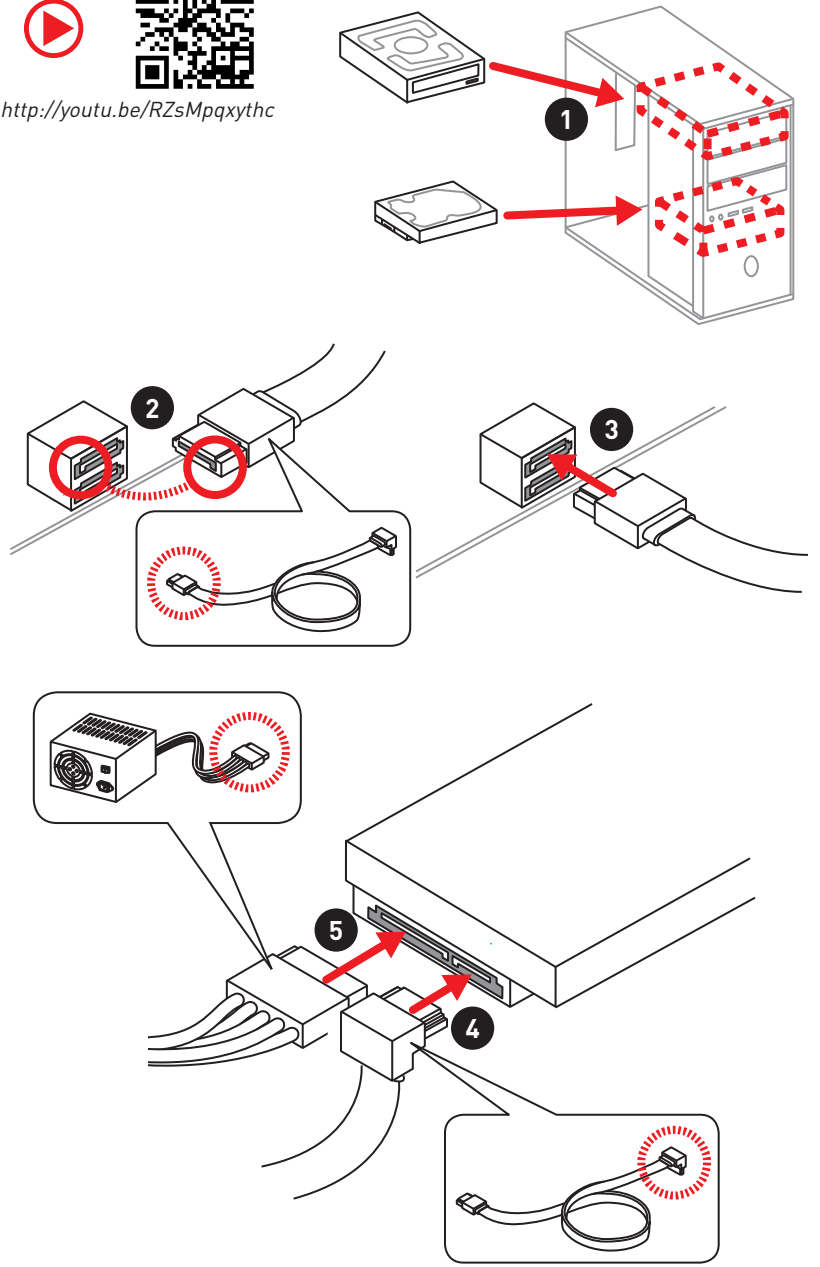
## Installing the Motherboard



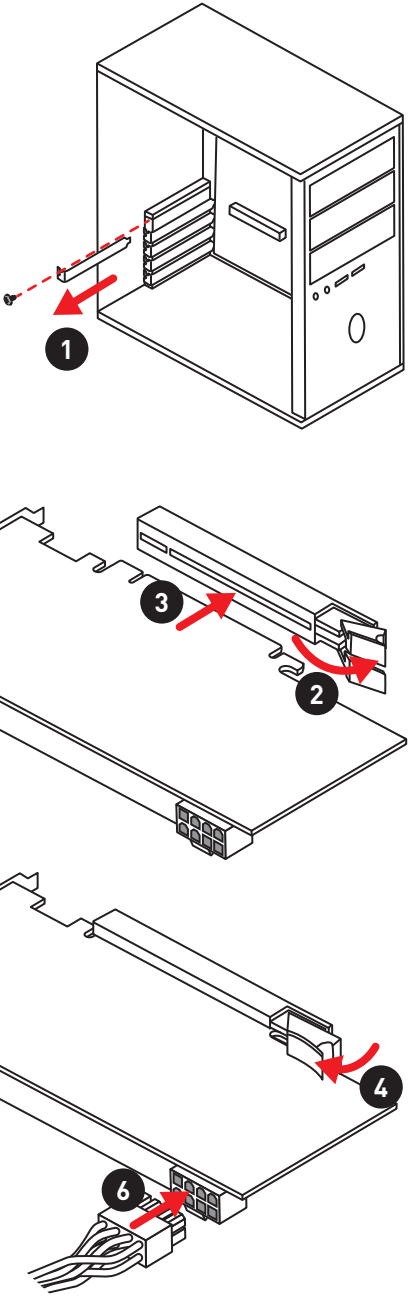
## Installing SATA Drives

*http://youtu.be/RZsMpqxythc*

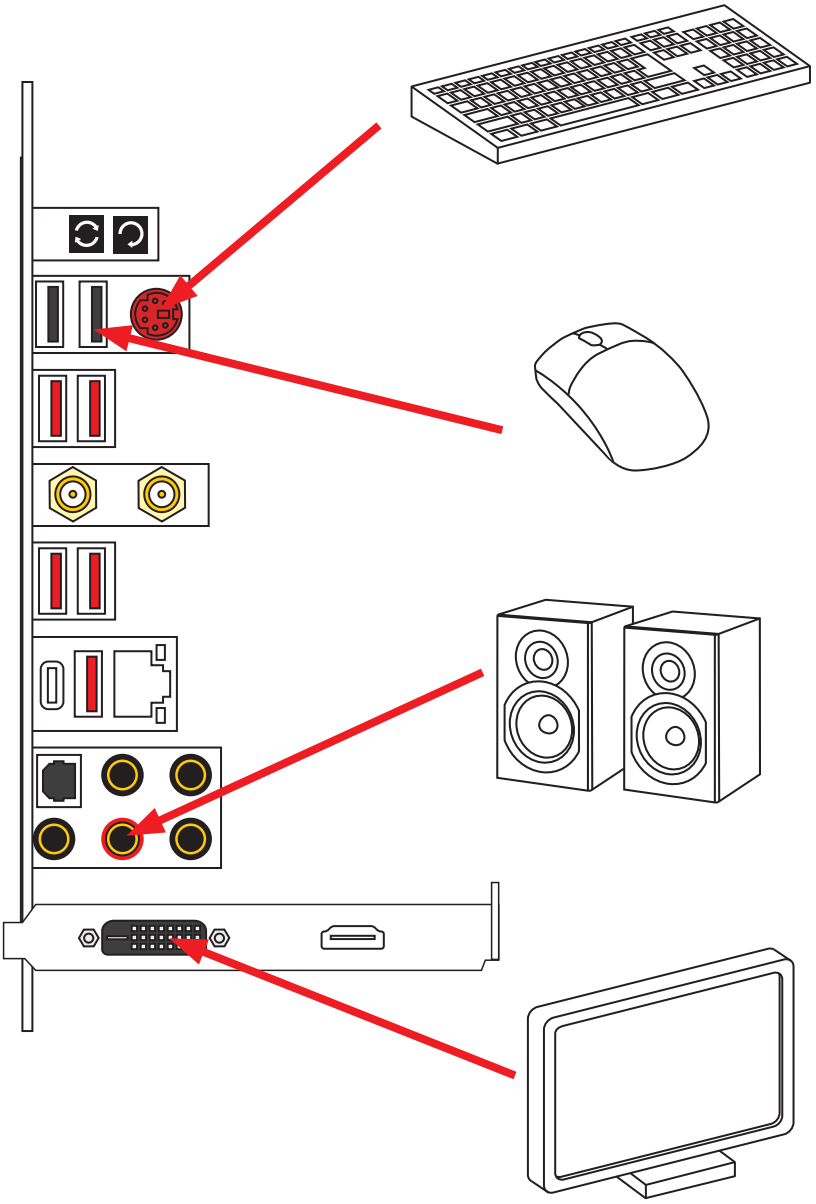


## Installing a Graphics Card

*http://youtu.be/mG0GZpr9w_A*

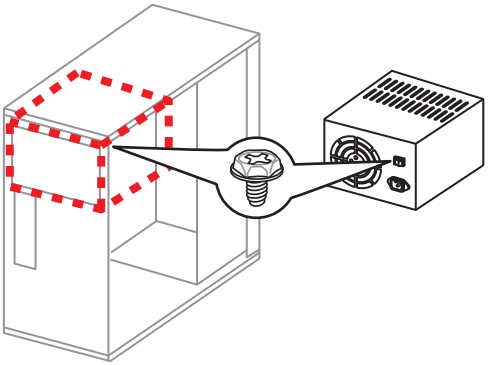


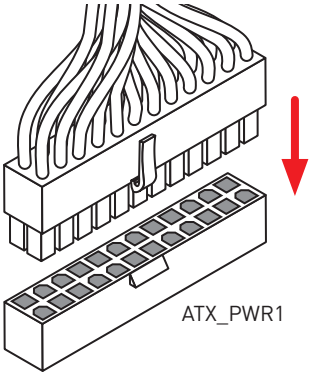
## Connecting Peripheral Devices

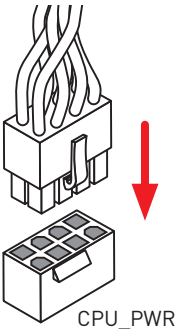


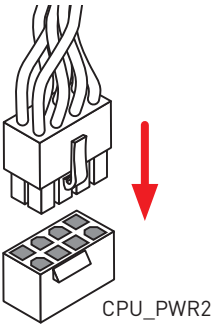
## Connecting the Power Connectors

*http://youtu.be/gkDYyR_83I4*

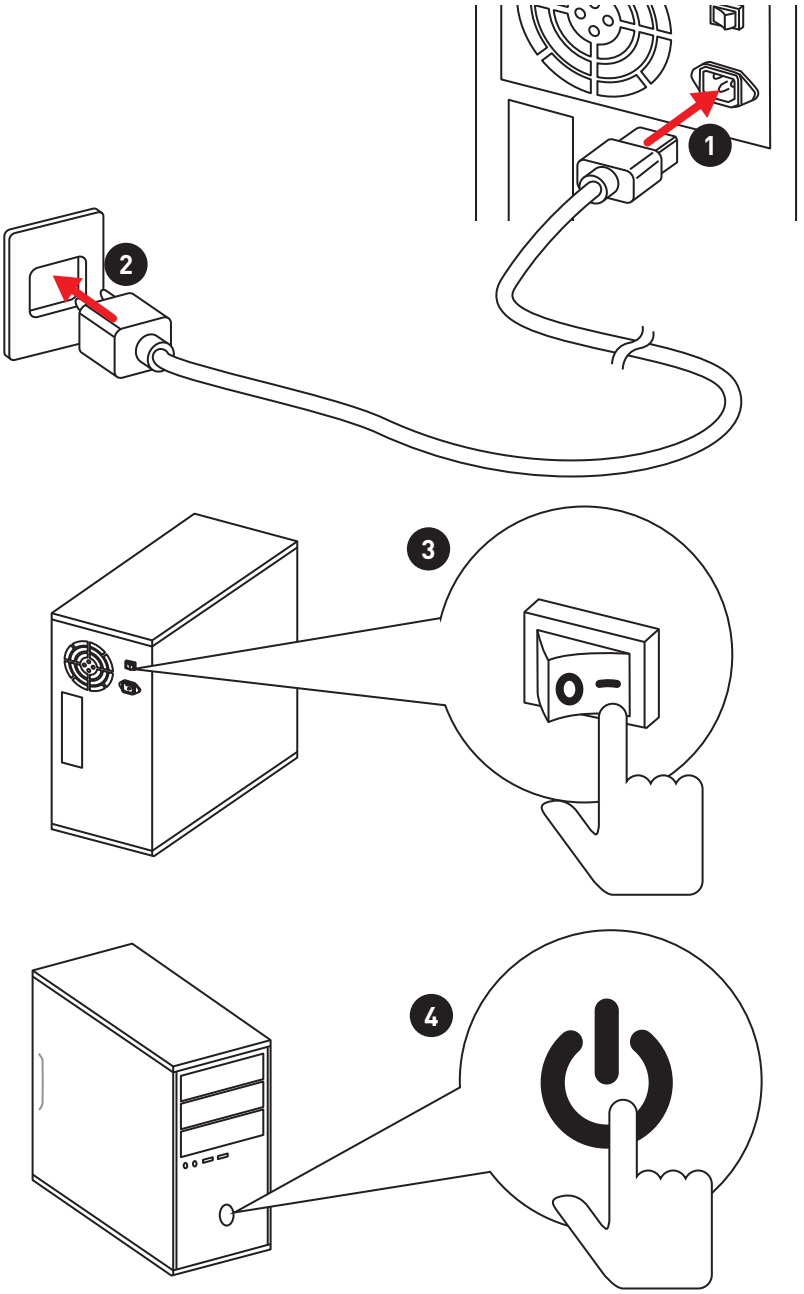




## Power On



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# Specifications

| | |
|---|---|
| **CPU** | Supports AMD® Ryzen 1st and 2nd Generation/ Ryzen™ with Radeon™ Vega Graphics/ Athlon™ with Radeon™ Vega Graphics and A-series / Athlon™ X4 Processors for Socket AM4 |
| **Chipset** | AMD® X470 Chipset |
| **Memory** | • 4x DDR4 memory slots, support up to 64GB<br>▪ Supports DDR4 1866/ 2133/ 2400/ 2667 Mhz by JEDEC, and 2667/ 2800/ 2933/ 3000/ 3066/ 3200/ 3466/ 3600 Mhz by A-XMP OC MODE*<br>• Dual channel memory architecture<br>• Supports non-ECC UDIMM memory<br>• Supports ECC UDIMM memory (non-ECC mode)<br>* A-series/ Athlon™ X4 processors support up to 2400 MHz. And the supporting frequency of memory varies with installed processor. Please refer www.msi.com for more information on compatible memory. |
| **Expansion Slots** | • 2x PCIe 3.0 x16 slots (PCIE_2, PCIE_4)<br>▪ Ryzen™ Desktop Processors support x16/x0, x8/x8 mode<br>▪ Ryzen™ with Radeon™ Vega Graphics and A-series / Athlon™ X4 processors support x8/x0 mode<br>▪ AMD® Athlon™ with Radeon™ Vega Graphics processors support x4/x0 mode<br>• 1x PCIe 2.0 x16 slot (PCIE_6, supports x4 mode)*<br>• 3x PCIe 2.0 x1 slots<br>* PCI_E3 slot will be unavailable when installing PCIe card in PCI_E5 slot.<br>* PCI_E6 slot will be unavailable when installing PCIe M.2 SSD in M2_2 slot. |
| **Multi-GPU** | • Ryzen™ Desktop Processors<br>▪ Supports 2-Way NVIDIA® SLI™ Technology<br>▪ Supports 3-Way AMD® CrossFire™ Technology<br>• Ryzen™ Desktop Processors with Radeon Vega Graphics and A-Series/Athlon™ X4 Processors<br>▪ Supports 2-Way AMD® CrossFire™ Technology |
| **LAN** | 1x Killer™ E2500 Gigabit LAN controller |

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| | |
|---|---|
| **Wirsless LAN & Bluetooth®** | Intel® Dual Band Wireless-AC 8265 card<br>• The Wireless card is pre-install in the M2_3 (M.2 Key E) slot.<br>• Supports Wi-Fi 802.11 a/b/g/n/ac, dual band (2.4GHz, 5GHz) up to 867 Mbps speed.<br>• Supports Dual Mode Bluetooth® 2.1, 2.1+EDR, 3.0, 4.0, BLE, 4.2 |
| **Storage** | • 6x SATA 6Gb/s ports (from AMD® X470 Chipset)<br>• 2x M.2 ports (Key M)*<br>▪ M2_1 slot (from AMD® processor) supports PCIe 3.0 x4 (AMD® Ryzen 1st and 2nd Generation/ Ryzen™ with Radeon™ Vega Graphics) or PCIe 3.0 x2 (AMD® Athlon™ with Radeon™ Vega Graphics and A-series / Athlon™ X4 Processors) storage devices<br>▪ M2_2 slot (from AMD® X470 Chipset) supports PCIe 2.0 x4 and SATA 6Gb/s 2242/ 2260 /2280 storage devices<br>* SATA3 port will be unavailable when installing SATA M.2 SSD in M2_2 slot.<br>* PCI_E6 slot will be unavailable when installing PCIe M.2 SSD in M2_2 slot. |
| **RAID** | AMD® X470 Chipset<br>• Supports RAID 0, RAID 1 and RAID 10 for SATA storage devices |
| **USB** | • ASMedia® ASM1143 Chipset<br>▪ 1x USB 3.1 Gen2 (SuperSpeed USB 10Gbps) Type-C port through the internal USB connector<br>• AMD® X470 Chipset<br>▪ 1x USB 3.1 Gen2 (SuperSpeed USB 10Gbps) Type-C port on the back panel<br>▪ 1x USB 3.1 Gen2 (SuperSpeed USB 10Gbps) Type-A port on the back panel<br>▪ 4x USB 3.1 Gen1 (SuperSpeed USB) ports through the internal USB connectors<br>▪ 6x USB 2.0 (High-speed USB) ports (2 Type-A ports on the back panel, 4 ports available through the internal USB connectors)<br>• AMD® CPU<br>▪ 4x USB 3.1 Gen1 (SuperSpeed USB) Type-A ports on the back panel |

Continued on next page

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| | |
|---|---|
| **Audio** | • Realtek® ALC1220 Codec<br>• 7.1-Channel High Definition Audio<br>• Supports S/PDIF output |
| **Back Panel Connectors** | • 1x Clear CMOS button<br>• 1x BIOS flash back button<br>• 1x PS/2 keyboard/ mouse combo port<br>• 2x USB 2.0 Type-A ports<br>• 4x USB 3.1 Gen1 Type-A ports<br>• 2x Antenna connectors<br>• 1x LAN (RJ45) port<br>• 1x USB 3.1 Gen2 Type-A port<br>• 1x USB 3.1 Gen2 Type-C port<br>• 5x OFC audio jacks<br>• 1x Optical S/PDIF OUT connector |
| **Internal Connectors** | • 1x 24-pin ATX 12V power connector<br>• 2x 8-pin ATX 12V power connectors<br>• 6x SATA 6Gb/s connectors<br>• 2x USB 2.0 connectors (support additional 4 USB 2.0 ports)<br>• 2x USB 3.1 Gen1 connectors (support additional 4 USB 3.1 Gen1 ports)<br>• 1x USB 3.1 Gen2 connector (supports additional 1 USB 3.1 Gen2 Type C port)<br>• 1x 4-pin CPU fan connector<br>• 1x 4-pin PUMP fan connector (supports up to 2A)<br>• 4x 4-pin system fan connectors<br>• 2x 5050 RGB LED strip 12V connectors<br>• 1x WS2812B Individually Addressable RGB LED strip 5V connector<br>• 1x CORSAIR connector<br>• 1x TPM module connector<br>• 1x Front panel audio connector<br>• 2x System panel connectors<br>• 1x Chassis Intrusion connector<br>• 1x Clear CMOS jumper<br>• 1x 2-Digit Debug Code LED |

Continued on next page

Continued from previous page

| | |
|---|---|
| **Internal Buttons** | • 1x GAME BOOST knob<br>• 1x Power button<br>• 1x Reset button |
| **I/O Controller** | NUVOTON NCT6795D Controller Chip |
| **Hardware Monitor** | • CPU/System temperature detection<br>• CPU/System fan speed detection<br>• CPU/System fan speed control |
| **Form Factor** | • ATX Form Factor<br>• 12 in. x 9.6 in. (30.4 cm x 24.4 cm) |
| **BIOS Features** | • 1x 128 Mb flash<br>• UEFI AMI BIOS<br>• ACPI 6.1, SM BIOS 2.8<br>• Multi-language |
| **Software** | • Drivers<br>• APP MANAGER<br>• COMMAND CENTER<br>• LIVE UPDATE 6<br>• MYSTIC LIGHT<br>• SUPER CHARGER<br>• GAMING APP<br>• RAMDISK<br>• X-BOOST<br>• SMART TOOL<br>• Nahimic Audio<br>• Open Broadcaster Software (OBS)<br>• Norton™ Internet Security Solution<br>• Google Chrome™, Google Toolbar, Google Drive<br>• Killer Control Center<br>• CPU-Z MSI GAMING |

Continued on next page

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| | |
|---|---|
| **Special Features** | • Audio<br>▪ Audio Boost 4<br>▪ Voice Boost<br>▪ Nahimic 2.5<br>• Network<br>▪ GAMING LAN with Killer LAN Manager<br>▪ Intel WiFi<br>• Storage<br>▪ Twin Turbo M.2<br>• Fan<br>▪ Pump Fan<br>▪ Smart Fan Control<br>• LED<br>▪ Mystic Light<br>▪ Mystic Light Extension (RGB, RAINBOW & CORSAIR)<br>▪ Mystic light SYNC<br>▪ EZ DEBUG LED<br>• Protection<br>▪ PCI-E Steel Armor<br>▪ DDR4 Steel Armor<br>▪ M.2 SHIELD FROZR<br>▪ Audio Cover<br>• Performance<br>▪ Multi GPU-SLI Technology<br>▪ Multi GPU-CrossFire Technology<br>▪ DDR4 Boost<br>▪ GAME Boost<br>▪ Lightning USB<br>▪ USB with type A+C<br>▪ X-Boost<br>▪ A-XMP<br>▪ OC Engine |

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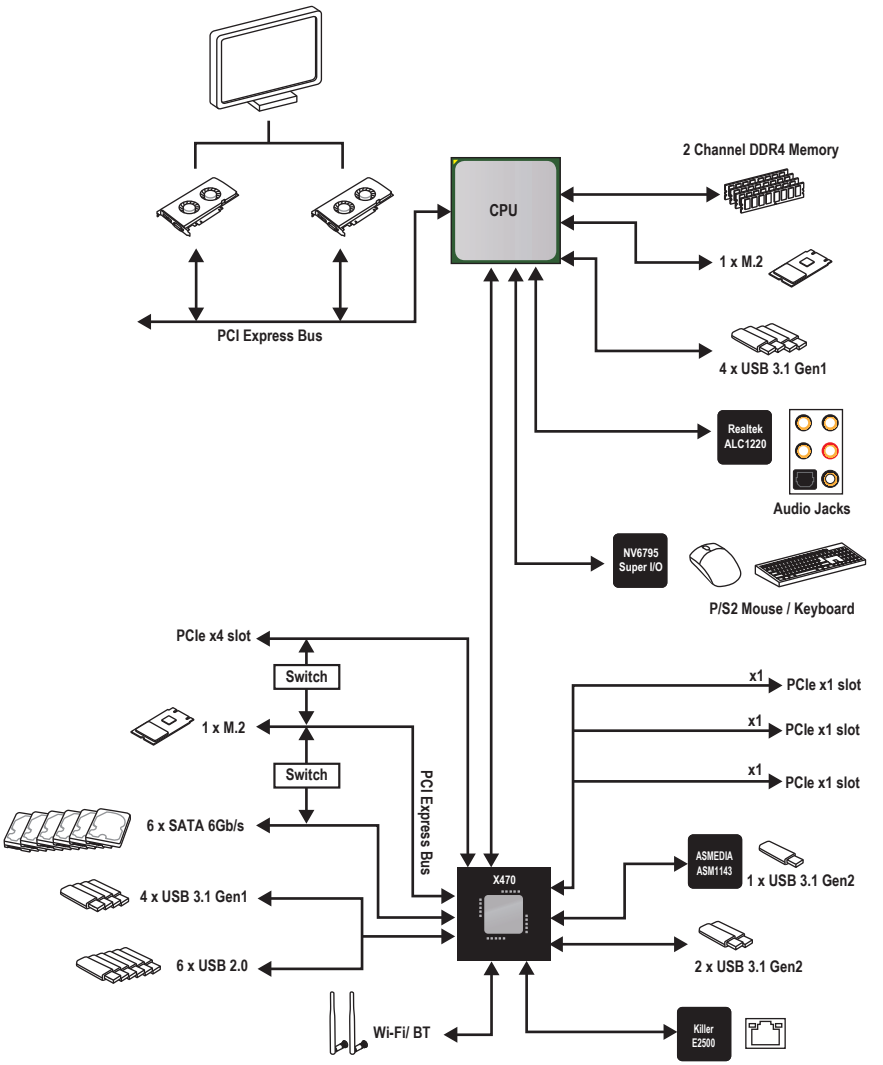
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| | |
|---|---|
| **Special Features** | • Stability<br>▪ 7000+ Quality Test<br>• VR<br>▪ VR Ready<br>• Gamer Experience<br>▪ RAMDisk<br>▪ GAMING HOTKEY<br>• BIOS<br>▪ Click BIOS 5<br>▪ BIOS FLASHBACK+<br>• Certification<br>▪ GAMING Certified |

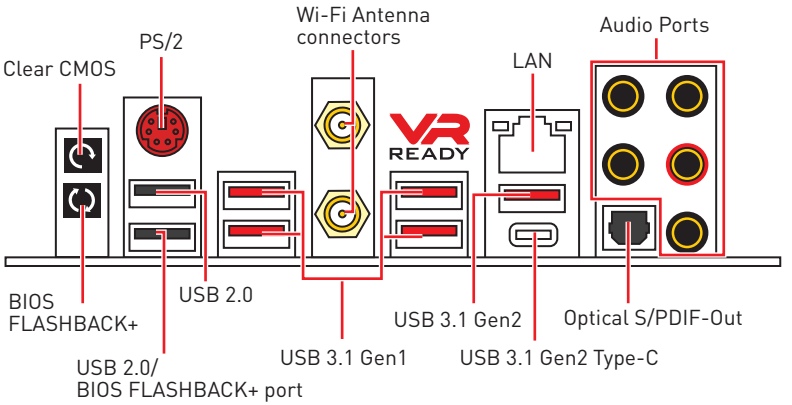
## JCORSAIR1 Connector Specification

| Supporting CORSAIR RGB Products | Maximum connection |
|---|---|
| Lighting PRO RGB LED Strip | 7 |
| HD RGB Fan | 6 |
| SP RGB Fan | 6 |
| LL RGB Fan | 5 |

# Block Diagram



# Rear I/O Panel

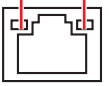



• **Clear CMOS button** - Power off your computer. Press and hold the Clear CMOS button for about 5-10 seconds to reset BIOS to default values.

• **BIOS FLASHBACK+ port** - Please refer to page 55 for Updating BIOS with BIOS FLASHBACK+.

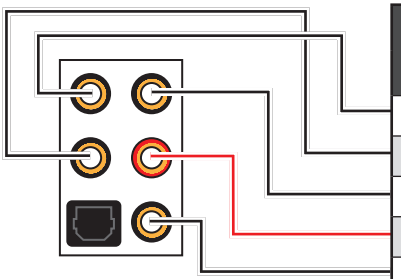
## LAN Port LED Status Table

| Link/ Activity LED | |
|---|---|
| **Status** | **Description** |
| Off | No link |
| Yellow | Linked |
| Blinking | Data activity |



| Speed LED | |
|---|---|
| **Status** | **Description** |
| Off | 10 Mbps connection |
| Green | 100 Mbps connection |
| Orange | 1 Gbps connection |

## Audio Ports Configuration



| Audio Ports | Channel | | | |
|---|---|---|---|---|
| | 2 | 4 | 6 | 8 |
| Center/ Subwoofer Out | | | ● | ● |
| Rear Speaker Out | | ● | ● | ● |
| Line-In/ Side Speaker Out | | | | ● |
| Line-Out/ Front Speaker Out | ● | ● | ● | ● |
| Mic In | | | | |

(●: connected, **Blank**: empty)

## Realtek HD Audio Manager

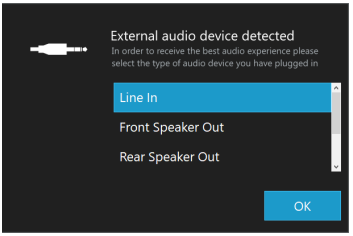
After installing the **Realtek HD Audio** driver, the **Realtek HD Audio Manager** icon will appear in the system tray. Double click on the icon to launch.




- **Device Selection** - allows you to select a audio output source to change the related options. The **check** sign indicates the devices as default.
- **Application Enhancement** - the array of options will provide you a complete guidance of anticipated sound effect for both output and input device.
- **Main Volume** - controls the volume or balance the right/left side of the speakers that you plugged in front or rear panel by adjust the bar.
- **Profiles** - toggles between profiles.
- **Advanced Settings** - provides the mechanism to deal with 2 independent audio streams.
- **Jack Status** - depicts all render and capture devices currently connected with your computer.
- **Connector Settings** - configures the connection settings.

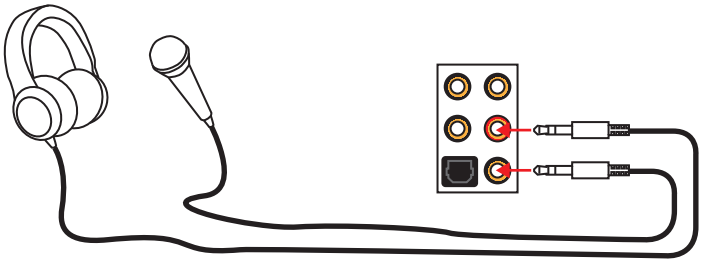
### Auto popup dialog

When you plug into a device at an audio jack, a dialogue window will pop up asking you which device is current connected.

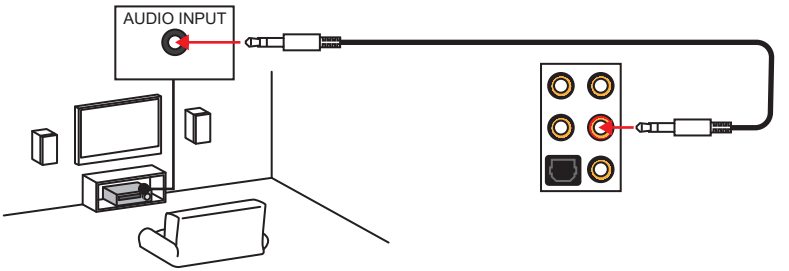



Each jack corresponds to its default setting as shown on the next page.

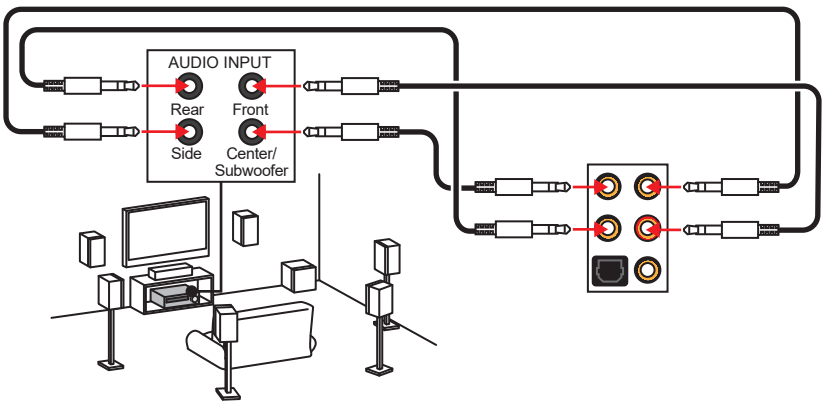
**Audio jacks to headphone and microphone diagram**



**Audio jacks to stereo speakers diagram**

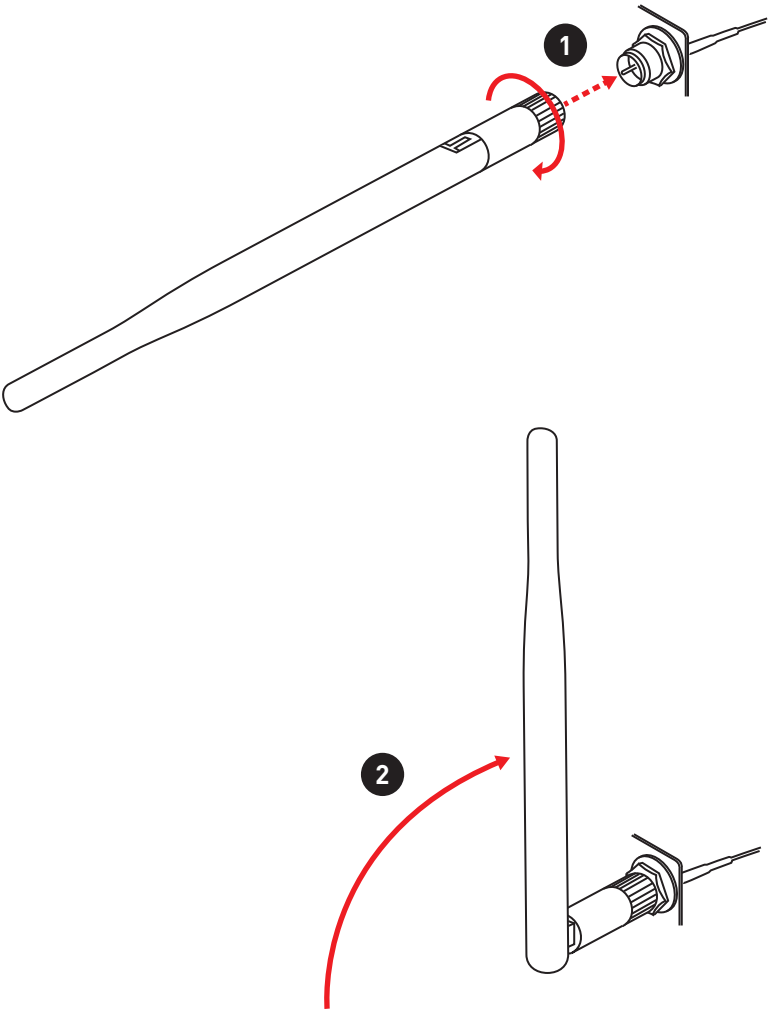



**Audio jacks to 7.1-channel speakers diagram**

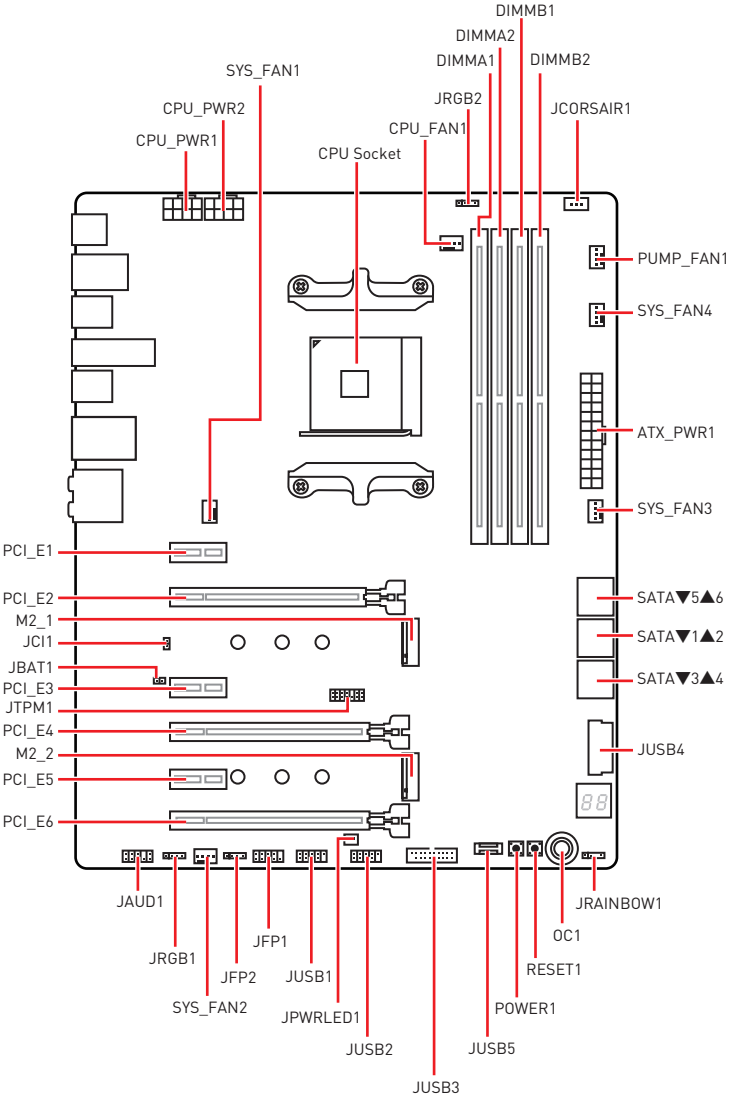


## Installing antennas

1. Screw the antennas tight to the antenna connectors as shown below.
2. Orient the antennas.



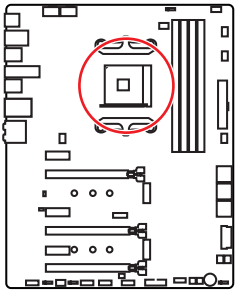
# Overview of Components

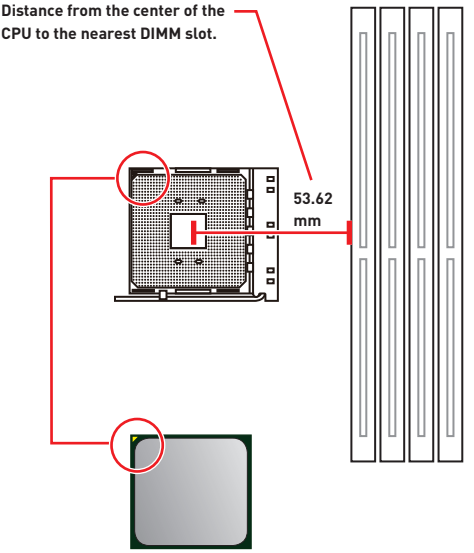


## Component Contents

| Port Name | Port Type | Page |
|---|---|---|
| CPU_FAN1, PUMP_FAN1, SYS_FAN1~4 | Fan Connectors | 42 |
| CPU_PWR1, CPU_PWR2, ATX_PWR1 | Power Connectors | 39 |
| CPU Socket | AM4 CPU Socket | 30 |
| DIMMA1, DIMMA2, DIMMB1, DIMMB2 | DIMM Slots | 33 |
| JAUD1 | Front Audio Connector | 43 |
| JBAT1 | Clear CMOS (Reset BIOS) Jumper | 45 |
| JCI1 | Chassis Intrusion Connector | 43 |
| JCORSAIR1 | CORSAIR Connector | 47 |
| JFP1, JFP2 | Front Panel Connectors | 44 |
| JPWRLED1 | LED power input | 38 |
| JRGB1, JRGB2, JRAINBOW1 | RGB LED Connectors | 46 |
| JTPM1 | TPM Module Connector | 44 |
| JUSB1~2 | USB 2.0 Connectors | 40 |
| JUSB3~4 | USB 3.1 Gen1 Connectors | 41 |
| JUSB5 | USB 3.1 Gen2 Type-C Connector | 40 |
| OC1 | GAME BOOST Knob | 31 |
| PCI_E1~6 | PCIe Expansion Slots | 34 |
| POWER1, RESET1 | Power Button, Reset Button | 45 |
| SATA1~6 | SATA 6Gb/s Connectors | 38 |

## CPU Socket






### Introduction to the AM4 CPU

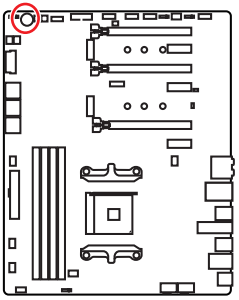
The surface of the AM4 CPU has a yellow triangle to assist in correctly lining up the CPU for motherboard placement. The yellow triangle is the Pin 1 indicator.

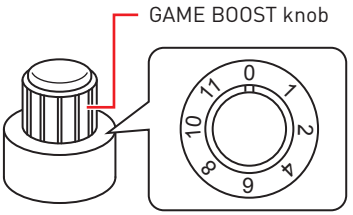
***Important***

- *When changing the processor, the system configuration could be cleared and reset BIOS to default values, due to the AM4 processor's architecture.*
- *Always unplug the power cord from the power outlet before installing or removing the CPU.*
- *When installing a CPU, always remember to install a CPU heatsink. A CPU heatsink is necessary to prevent overheating and maintain system stability.*
- *Confirm that the CPU heatsink has formed a tight seal with the CPU before booting your system.*
- *Overheating can seriously damage the CPU and motherboard. Always make sure the cooling fans work properly to protect the CPU from overheating. Be sure to apply an even layer of thermal paste (or thermal tape) between the CPU and the heatsink to enhance heat dissipation.*
- *If you purchased a separate CPU and heatsink/ cooler, Please refer to the documentation in the heatsink/ cooler package for more details about installation.*
- *This motherboard is designed to support overclocking. Before attempting to overclock, please make sure that all other system components can tolerate overclocking. Any attempt to operate beyond product specifications is not recommended. MSI® does not guarantee the damages or risks caused by inadequate operation beyond product specifications.*

## OC1: GAME BOOST Knob

This knob allows you to manually select a stage from number 0 (default) to number 11 (extreme) for overclocking the processor. The processor' s voltage and frequency will be automatically adjusted after you power on your computer.






### Using GAME BOOST Knob

To setup the GAME BOOST knob, take the following steps:

1. Set the GAME BOOST knob to hardware mode in BIOS Setup.
2. Power off the computer.
3. Rotate the GAME BOOST knob to select the overclocking stage as you desire.

| Stage | Ryzen 7 CPU Frequency (GHz) | | | |
|---|---|---|---|---|
| | 1800X | 1700X | PRO 1700X | 1700 |
| 0 | 3.6 | 3.4 | 3.4 | 3.0 |
| 1 | 3.8 | 3.6 | 3.6 | 3.2 |
| 2 | 3.85 | 3.65 | 3.65 | 3.25 |
| 4 | 3.9 | 3.7 | 3.7 | 3.3 |
| 6 | 3.95 | 3.75 | 3.75 | 3.35 |
| 8 | 4 | 3.8 | 3.8 | 3.4 |
| 10 | 4.05 | 3.85 | 3.85 | 3.45 |
| 11 | 4.1 | 3.9 | 3.9 | 3.5 |

| Stage | Ryzen 5 CPU Frequency (GHz) | | | | |
|---|---|---|---|---|---|
| | 1600X | 1600 | 1500X | 1400 | 2400G |
| 0 | 3.6 | 3.2 | 3.5 | 3.2 | 3.6 |
| 1 | 3.8 | 3.4 | 3.7 | 3.4 | 3.8 |
| 2 | 3.85 | 3.45 | 3.75 | 3.45 | 3.85 |
| 4 | 3.9 | 3.5 | 3.8 | 3.5 | 3.9 |
| 6 | 3.95 | 3.55 | 3.85 | 3.55 | 3.95 |
| 8 | 4 | 3.6 | 3.9 | 3.6 | 4 |
| 10 | 4.05 | 3.65 | 3.95 | 3.65 | 4.05 |
| 11 | 4.1 | 3.7 | 4 | 3.7 | 4.1 |

| Stage | Ryzen 3 CPU Frequency (GHz) | | |
|---|---|---|---|
| | 1300X | 1200 | 2200G |
| 0 | 3.5 | 3.1 | 3.5 |
| 1 | 3.7 | 3.3 | 3.7 |
| 2 | 3.75 | 3.35 | 3.75 |
| 4 | 3.8 | 3.4 | 3.8 |
| 6 | 3.85 | 3.45 | 3.85 |
| 8 | 3.9 | 3.5 | 3.9 |
| 10 | 3.95 | 3.55 | 3.95 |
| 11 | 4 | 3.75 | 4 |

4. Power on and then GAME BOOST will automatically overclock processor depending on the stage you selected.

To disable GAME BOOST:

1. Set the GAME BOOST knob to HW mode in BIOS Setup.
2. Power off the computer.
3. Rotate the GAME BOOST knob to 0 and then power on. The configuration parameters will be returned to default values.

***Important***

• *You can also control the GAME BOOST function in **BIOS Setup** or with **MSI COMMAND CENTER** software.*

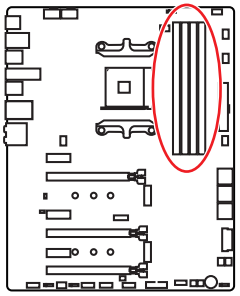
• *In order to optimize performance and improve system stability, when you activate the GAME BOOST function, please leave the settings in the **BIOS > OC** menu unchanged.*

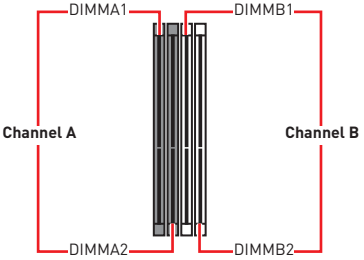
• *The success of overclocking depends on the components of your computer.*

• *We do not guarantee the GAME BOOST overclocking range or the damages/ risks caused by overclocking behavior.*

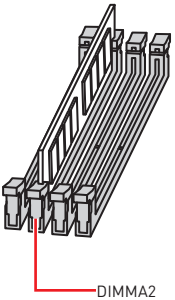
• *MSI components are recommended for better compatibility when using GAME BOOST function.*

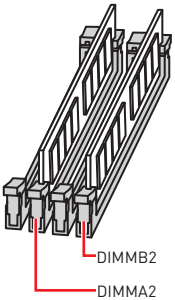
## DIMM Slots

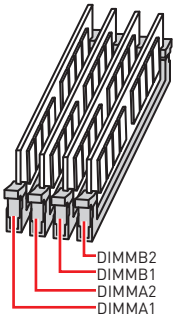





### Memory module installation recommendation



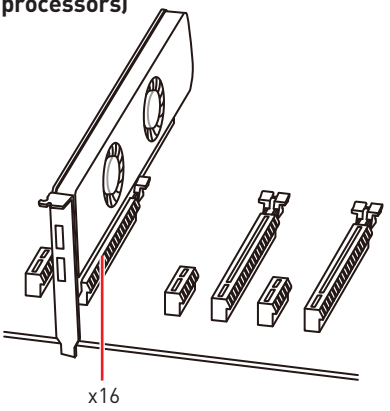

***Important***

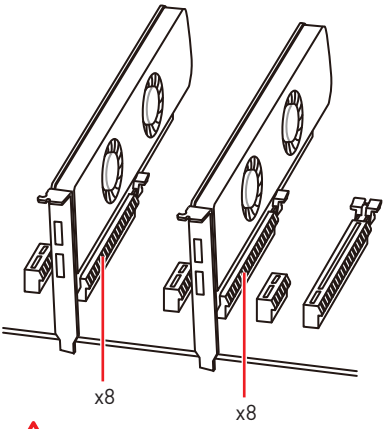
- *Always insert memory modules in the **DIMMA2** slot first.*
- *Due to chipset resource usage, the available capacity of memory will be a little less than the amount of installed.*
- *Based on the processor specification, the Memory DIMM voltage below 1.35V is suggested to protect the processor.*
- *Some memory modules may operate at a lower frequency than the marked value when overclocking due to the memory frequency operates dependent on its Serial Presence Detect (SPD). Go to BIOS and find the **DRAM Frequency** to set the memory frequency if you want to operate the memory at the marked or at a higher frequency.*
- *It is recommended to use a more efficient memory cooling system for full DIMMs installation or overclocking.*
- *The stability and compatibility of installed memory module depend on installed CPU and devices when overclocking.*
- *Due to AM4 CPU/memory controller official specification limitation, the frequency of memory modules may operate lower than the marked value under the default state. Please refer www.msi.com for more information on compatible memory.*

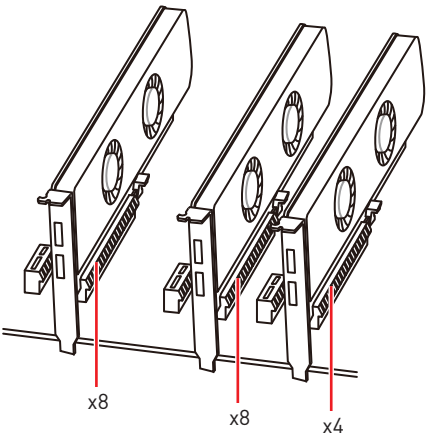
## PCI_E1~6: PCIe Expansion Slots

| Processors / Slots | RYZEN Series | Ryzen™ with Radeon™ Vega Graphics and A-series / Athlon™ X4 | Athlon™ with Radeon™ Vega Graphics |
|---|---|---|---|
| PCI_E1 | PCIe 2.0 x1 | PCIe 2.0 x1 | PCIe 2.0 x1 |
| PCI_E2 | PCIe 3.0 x16 | PCIe 3.0 x8 | PCIe 3.0 x4 |
| PCI_E3 | PCIe 2.0 x1 | PCIe 2.0 x1 | PCIe 2.0 x1 |
| PCI_E4 | PCIe 3.0 x8 | Unavailable | Unavailable |
| PCI_E5 | PCIe 2.0 x1 | PCIe 2.0 x1 | PCIe 2.0 x1 |
| PCI_E6 | PCIe 2.0 x4 | PCIe 2.0 x4 | PCIe 2.0 x4 |

**Multiple graphics cards installation recommendation (Ryzen™ series processors)**




***Important***

- *If you install a large and heavy graphics card, you need to use a tool such as **MSI Gaming Series Graphics Card Bolster** to support its weight to prevent deformation of the slot.*
- *For a single PCIe x16 expansion card installation with optimum performance, using the **PCI_E2** slot is recommended.*
- *When adding or removing expansion cards, always turn off the power supply and unplug the power supply power cable from the power outlet. Read the expansion card' s documentation to check for any necessary additional hardware or software changes.*

## PCIe bandwidth table

### For Ryzen™ Desktop processors

| Slot | Single | | | | 2-Way | | | |
|---|---|---|---|---|---|---|---|---|
| PCI_E1 (PCH) | Gen 2.0 x 1 | | | | Gen 2.0 x 1 | | | |
| PCI_E2 (CPU) | Gen 3.0 x 16* | | | | Gen 3.0 x 8* | | | |
| PCI_E3 (PCH) | Gen 2.0 x 1 | | — | | Gen 2.0 x 1 | | — | |
| PCI_E4 (CPU) | — | | | | Gen 3.0 x 8* | | | |
| PCI_E5 (PCH) | — | | Gen 2.0 x 1 | | — | | Gen 2.0 x 1 | |
| PCI_E6 (PCH) | Gen 2.0 x 4 | — | Gen 2.0 x 4 | — | Gen 2.0 x 4 | — | Gen 2.0 x 4 | — |
| M2_1 (CPU) | Gen 3.0 x 4 | | | | Gen 3.0 x 4 | | | |
| M2_2 (PCH) | — | Gen 2.0 x 4 | — | Gen 2.0 x 4 | — | Gen 2.0 x 4 | — | Gen 2.0 x 4 |

### For Ryzen™ with Radeon™ Vega Graphics and A-series / Athlon™ X4 processors

| Slot | Single | | | |
|---|---|---|---|---|
| PCI_E1 (PCH) | Gen 2.0 x 1 | | | |
| PCI_E2 (CPU) | Gen 3.0 x 8* | | | |
| PCI_E3 (PCH) | Gen 2.0 x 1 | | — | |
| PCI_E4 (CPU) | — | | | |
| PCI_E5 (PCH) | — | | Gen 2.0 x 1 | |
| PCI_E6 (PCH) | Gen 2.0 x 4 | — | Gen 2.0 x 4 | — |
| M2_1 (CPU) | Gen 3.0 x 2**/ Gen 3.0 x 4*** | | | |
| M2_2 (PCH) | — | Gen 2.0 x 4 | — | Gen 2.0 x 4 |

### For Athlon™ with Radeon™ Vega Graphics

| Slot | Single | | | |
|---|---|---|---|---|
| PCI_E1 (PCH) | Gen 2.0 x 1 | | | |
| PCI_E2 (CPU) | Gen 3.0 x 4* | | | |
| PCI_E3 (PCH) | Gen 2.0 x 1 | | — | |
| PCI_E4 (CPU) | — | | | |
| PCI_E5 (PCH) | — | | Gen 2.0 x 1 | |
| PCI_E6 (PCH) | Gen 2.0 x 4 | — | Gen 2.0 x 4 | — |
| M2_1 (CPU) | Gen 3.0 x 2**/ Gen 3.0 x 4*** | | | |
| M2_2 (PCH) | — | Gen 2.0 x 4 | — | Gen 2.0 x 4 |

(—: unavailable, *: graphics card, **: for AMD® Athlon™ with Radeon™ Vega Graphics and A-series / Athlon™ X4 Processors, ***: for AMD® Ryzen 1st and 2nd Generation/ Ryzen™ with Radeon™ Vega Graphics)

***Important***

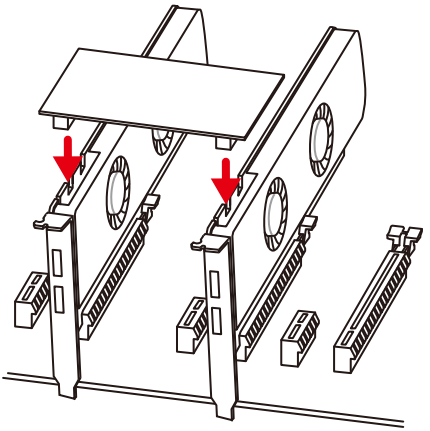
- *PCI_E3 slot will be unavailable when installing PCIe card in PCI_E5 slot.*
- *PCI_E6 slot will be unavailable when installing PCIe M.2 SSD in M2_2 slot.*

## Installing SLI graphics cards

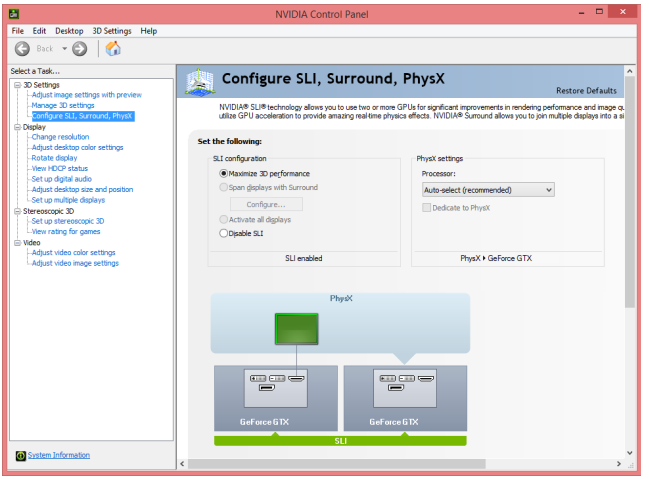
For power supply recommendations for SLI configurations, please refer to the user guide of your graphics card to make sure you meet all the system requirements.

To install SLI graphics cards:

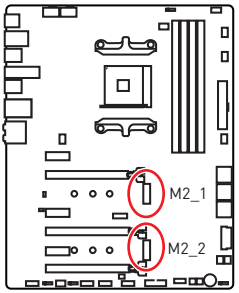
1. Turn off your computer and disconnect the power cord, install two graphics cards into the **PCI_E2** and **PCI_E4** slots.
2. Connect the two cards together using the **SLI Bridge Connector.**



3. Connect all PCIe power connectors of the graphics cards.
4. Reconnect the power cord, power up the computer and install the drivers and software included in your graphics card package.
5. Right-click the Windows desktop and select **NVIDIA Control Panel** from the menu, click on **Configure SLI, Surround, PhysX** in the left task pane and select **Maximize 3D performance** in the SLI configuration menu, and then click **Apply**.



## M2_1~2: M.2 Slots (Key M)




***Important***

- *SATA3 port will be unavailable when installing SATA M.2 SSD in M2_2 slot.*
- *PCI_E6 slot will be unavailable when installing PCIe M.2 SSD in M2_2 slot.*
- *M2_1 slot only supports PCIe mode.*

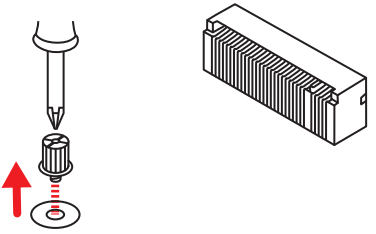
***Video Demonstration***

*Watch the video to learn how to Install M.2 SSD.*

*http://youtu.be/JCTFABytrYA*

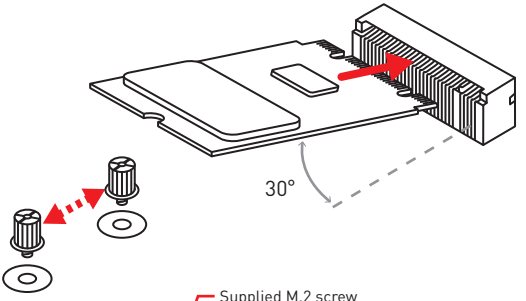
### Installing M.2 SSD

**1.** Loosen the M.2 riser screw from the motherboard.

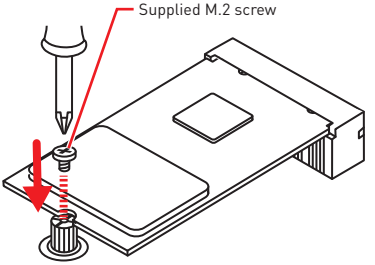


**2.** Move and fasten the M.2 riser screw to the appropriate location according your M.2 SSD size.

**3.** Insert your M.2 SSD into the M.2 slot at a 30-degree angle.

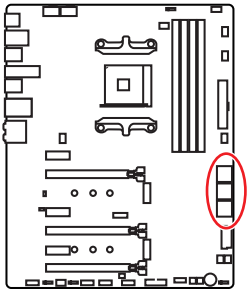


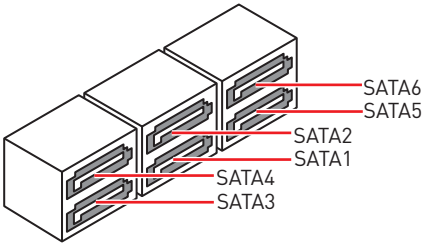

**4.** Secure the M.2 SSD in place with the supplied M.2 screw.



## SATA1~6: SATA 6Gb/s Connectors

These connectors are SATA 6Gb/s interface ports. Each connector can connect to one SATA device.



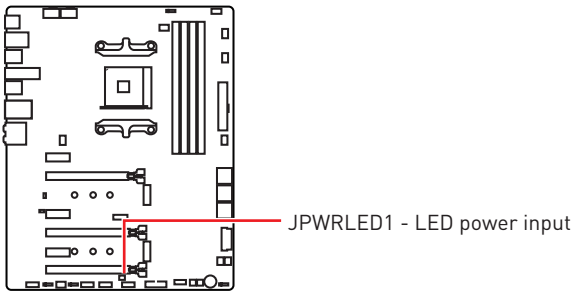



***Important***

- *SATA3 port will be unavailable when installing SATA M.2 SSD in M2_2 slot.*
- *Please do not fold the SATA cable at a 90-degree angle. Data loss may result during transmission otherwise.*
- *SATA cables have identical plugs on either sides of the cable. However, it is recommended that the flat connector be connected to the motherboard for space saving purposes.*

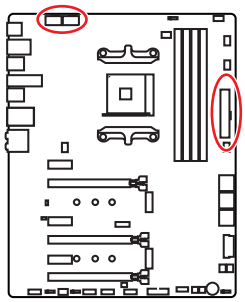
## JPWRLED1: LED power input

This connector is used by retailers to demonstrate onboard LED light effects.



## CPU_PWR1, CPU_PWR2, ATX_PWR1: Power Connectors

These connectors allow you to connect an ATX power supply.



8 4 5 1 CPU_PWR1/ CPU_PWR2

| | | | |
|---|---|---|---|
| 1 | Ground | 5 | +12V |
| 2 | Ground | 6 | +12V |
| 3 | Ground | 7 | +12V |
| 4 | Ground | 8 | +12V |

12 24 1 13 ATX_PWR1

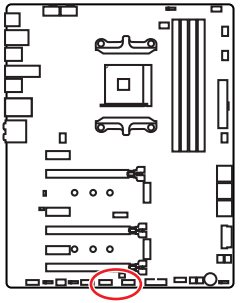
| | | | |
|---|---|---|---|
| 1 | +3.3V | 13 | +3.3V |
| 2 | +3.3V | 14 | -12V |
| 3 | Ground | 15 | Ground |
| 4 | +5V | 16 | PS-ON# |
| 5 | Ground | 17 | Ground |
| 6 | +5V | 18 | Ground |
| 7 | Ground | 19 | Ground |
| 8 | PWR OK | 20 | Res |
| 9 | 5VSB | 21 | +5V |
| 10 | +12V | 22 | +5V |
| 11 | +12V | 23 | +5V |
| 12 | +3.3V | 24 | Ground |

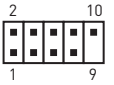
***Important***

*Make sure that all the power cables are securely connected to a proper ATX power supply to ensure stable operation of the motherboard.*

## JUSB1~2: USB 2.0 Connectors

These connectors allow you to connect USB 2.0 ports on the front panel.





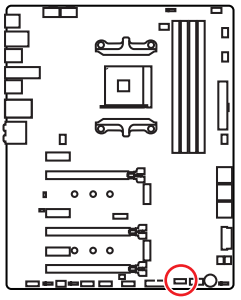

| | | | |
|---|---|---|---|
| 1 | VCC | 2 | VCC |
| 3 | USB0- | 4 | USB1- |
| 5 | USB0+ | 6 | USB1+ |
| 7 | Ground | 8 | Ground |
| 9 | No Pin | 10 | NC |

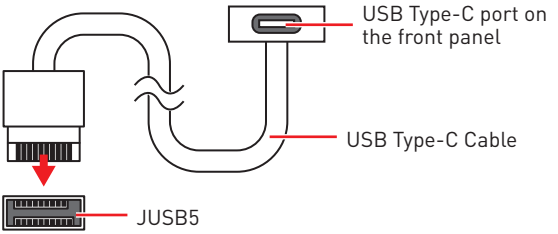
***Important***

- *Note that the VCC and Ground pins must be connected correctly to avoid possible damage.*
- *In order to recharge your iPad,iPhone and iPod through USB ports, please install MSI® SUPER CHARGER utility.*

## JUSB5: USB 3.1 Gen2 Type-C Connector

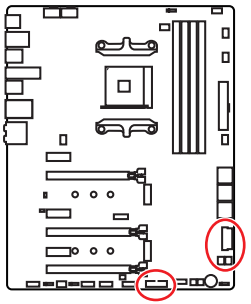
This connector allows you to connect USB 3.1 Gen2 Type-C connector on the front panel. The connector possesses a foolproof design. When you connecting the cable, be sure to connect it in the correct orientation.





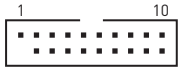
## JUSB3~4: USB 3.1 Gen1 Connectors

These connectors allow you to connect USB 3.1 Gen1 ports on the front panel.

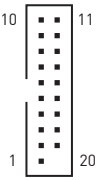


***Important***

*Note that the Power and Ground pins must be connected correctly to avoid possible damage.*




JUSB3




JUSB4

| | | | |
|---|---|---|---|
| 1 | Power | 11 | USB2.0+ |
| 2 | USB3_RX_DN | 12 | USB2.0- |
| 3 | USB3_RX_DP | 13 | Ground |
| 4 | Ground | 14 | USB3_TX_C_DP |
| 5 | USB3_TX_C_DN | 15 | USB3_TX_C_DN |
| 6 | USB3_TX_C_DP | 16 | Ground |
| 7 | Ground | 17 | USB3_RX_DP |
| 8 | USB2.0- | 18 | USB3_RX_DN |
| 9 | USB2.0+ | 19 | Power |
| 10 | NC | 20 | No Pin |

### Charger Port

The **JUSB4** connector is a charger port which can increase USB power output for fast charging your smartphone or USB-powered devices. The Charger Port is hardware controlled by motherboard chip, it can still charge your device in suspend, hibernate state or even shutdown states. However, when you boot the computer into Windows®, you will need to install the MSI® SUPER CHARGER application to turn ON/OFF the Charging mode.




***Video Demonstration***

*Watch the video to learn how to charge the smartphone with Super-Charge.*

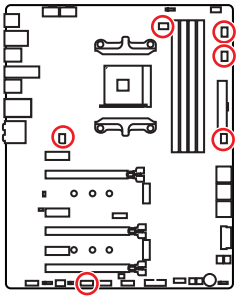
*http://youtu.be/FCyvjr5NbOw*

***Important***

*When the Charging mode is enabled, the Charger Port data syncing will be disabled.*

## CPU_FAN1, PUMP_FAN1, SYS_FAN1~4: Fan Connectors

Fan connectors can be classified as PWM (Pulse Width Modulation) Mode or DC Mode. PWM Mode fan connectors provide constant 12V output and adjust fan speed with speed control signal. DC Mode fan connectors control fan speed by changing voltage. When you plug a 3-pin (Non-PWM) fan to a fan connector in PWM mode, the fan speed will always maintain at 100%, which might create a lot of noise. CPU_FAN1 and PUMP_FAN1 can automatically detect PWM and DC mode. You can follow the instruction below to adjust the fan connector to PWM or DC Mode.



### Default Auto Mode fan connector




CPU_FAN1

### Default PWM Mode fan connector




PUMP_FAN1

### Default DC Mode fan connectors




SYS_FAN1/ SYS_FAN3/ SYS_FAN4




SYS_FAN2

### Switching fan mode and adjusting fan speed

You can switch between PWM mode and DC mode and adjust fan speed in **BIOS > HARDWARE MONITOR**.

Select **PWM** ,**DC** or **Auto** mode




There are gradient points of the fan speed that allow you to adjust fan speed in relation to CPU temperature.

***Important***

*Make sure fans are working properly after switching the PWM/ DC mode.*

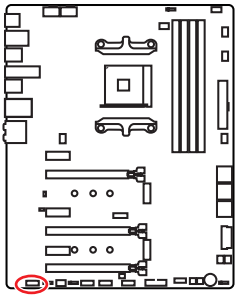
### Pin definition of fan connectors

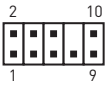
| PWM Mode pin definition | | | |
|---|---|---|---|
| 1 | Ground | 2 | +12V |
| 3 | Sense | 4 | Speed Control Signal |

| DC Mode pin definition | | | |
|---|---|---|---|
| 1 | Ground | 2 | Voltage Control |
| 3 | Sense | 4 | NC |

## JAUD1: Front Audio Connector

This connector allows you to connect audio jacks on the front panel.

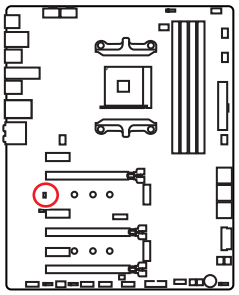





| | | | |
|---|---|---|---|
| 1 | MIC L | 2 | Ground |
| 3 | MIC R | 4 | NC |
| 5 | Head Phone R | 6 | MIC Detection |
| 7 | SENSE_SEND | 8 | No Pin |
| 9 | Head Phone L | 10 | Head Phone Detection |

## JCI1: Chassis Intrusion Connector

This connector allows you to connect the chassis intrusion switch cable.





Normal

(default)



Trigger the chassis intrusion event

### Using chassis intrusion detector

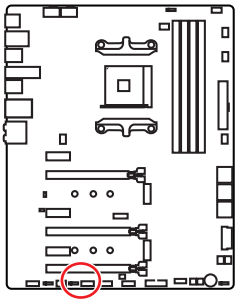
1. Connect the **JCI1** connector to the chassis intrusion switch/ sensor on the chassis.
2. Close the chassis cover.
3. Go to **BIOS > Settings > Security > Chassis Intrusion Configuration**.
4. Set **Chassis Intrusion** to **Enabled**.
5. Press **F10** to save and exit and then press the **Enter** key to select **Yes**.
6. Once the chassis cover is opened again, a warning message will be displayed on screen when the computer is turned on.

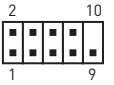
### Resetting the chassis intrusion warning

1. Go to **BIOS > Settings > Security > Chassis Intrusion Configuration**.
2. Set **Chassis Intrusion** to **Reset**.
3. Press **F10** to save and exit and then press the **Enter** key to select **Yes**.

## JFP1, JFP2: Front Panel Connectors

These connectors connect to the switches and LEDs on the front panel.





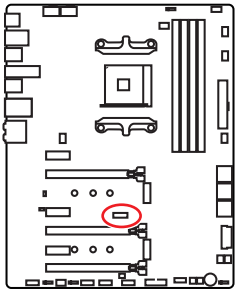

| | | | |
|---|---|---|---|
| 1 | HDD LED + | 2 | Power LED + |
| 3 | HDD LED - | 4 | Power LED - |
| 5 | Reset Switch | 6 | Power Switch |
| 7 | Reset Switch | 8 | Power Switch |
| 9 | Reserved | 10 | No Pin |

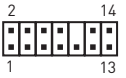



| | | | |
|---|---|---|---|
| 1 | Speaker - | 2 | Buzzer + |
| 3 | Buzzer - | 4 | Speaker + |

## JTPM1: TPM Module Connector

This connector is for TPM (Trusted Platform Module). Please refer to the TPM security platform manual for more details and usages.

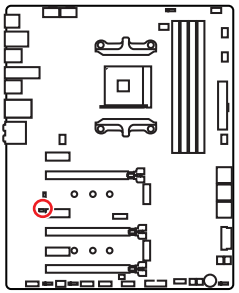





| | | | |
|---|---|---|---|
| 1 | LPC Clock | 2 | 3V Standby power |
| 3 | LPC Reset | 4 | 3.3V Power |
| 5 | LPC address & data pin0 | 6 | Serial IRQ |
| 7 | LPC address & data pin1 | 8 | 5V Power |
| 9 | LPC address & data pin2 | 10 | No Pin |
| 11 | LPC address & data pin3 | 12 | Ground |
| 13 | LPC Frame | 14 | Ground |

## JBAT1: Clear CMOS (Reset BIOS) Jumper

There is CMOS memory onboard that is external powered from a battery located on the motherboard to save system configuration data. If you want to clear the system configuration, set the jumpers to clear the CMOS memory.





Keep Data

(default)



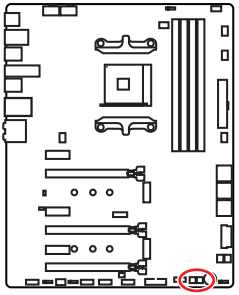
Clear CMOS/
Reset BIOS

### Resetting BIOS to default values

1. Power off the computer and unplug the power cord
2. Use a jumper cap to short **JBAT1** for about 5-10 seconds.
3. Remove the jumper cap from **JBAT1**.
4. Plug the power cord and power on the computer.

## POWER1, RESET1: Power Button, Reset Button

The Power / Reset button allows you to power on / reset the computer.





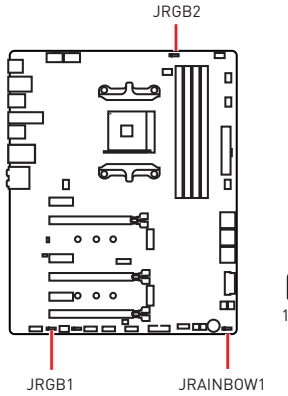
Power button



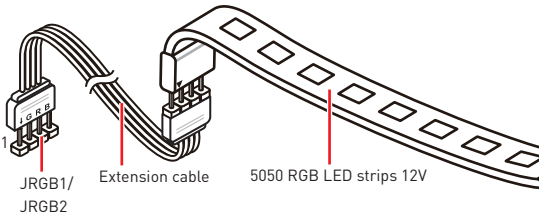
Reset button

## JRGB1, JRGB2, JRAINBOW1: RGB LED Connectors

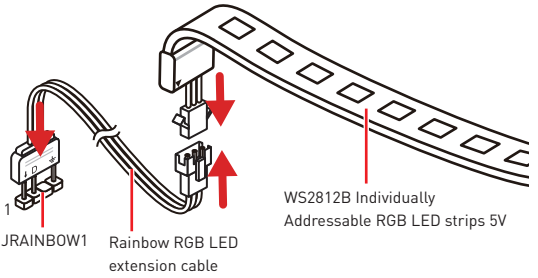
The JRGB1/JRGB2 connector allows you to connect the 5050 RGB LED strips 12V. The JRAINBOW1 connector allows you to connect the WS2812B Individually Addressable RGB LED strips 5V.




| JRGB1 JRGB2 | | | |
|---|---|---|---|
| 1 | +12V | 2 | G |
| 3 | R | 4 | B |




| JRAINBOW1 | | | |
|---|---|---|---|
| 1 | +5V | 2 | Data |
| 3 | No Pin | 4 | Ground |




***CAUTION***

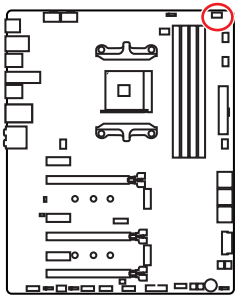
*Do not connect the wrong type of LED strips. The JRGB1/JRGB2 connector and the JRAINBOW1 connector provide different voltages, and connecting the 5V LED strip to the JRGB1/JRGB2 connector will result in damage to the LED strip.*

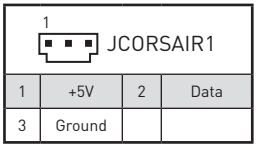
***Important***

- *The JRGB1/JRGB2 connector supports up to 2 meters continuous 5050 RGB LED strips (12V/G/R/B) with the maximum power rating of 3A (12V).*
- *The JRAINBOW1 connector supports up to 72 LEDs WS2812B Individually Addressable RGB LED strips (5V/Data/Ground) with the maximum power rating of 3A (5V).*
- *Always turn off the power supply and unplug the power cord from the power outlet before installing or removing the RGB LED strip.*
- *Please use MSI's software to control the extended LED strip.*

## JCORSAIR1: CORSAIR Connector

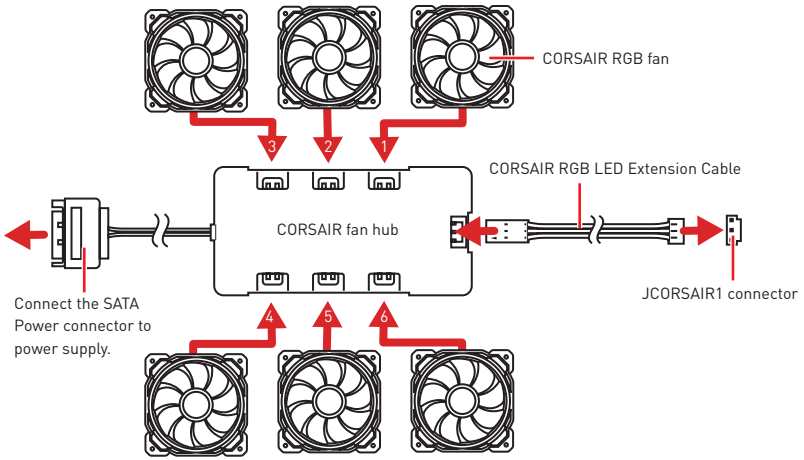
The JCORSAIR1 connector allows you to connect the CORSAIR Individually Addressable RGB LED strips 5V or CORSAIR RGB LED fans with the CORSAIR fan hub. Once all items are connected properly, you can control the CORSAIR RGB LED strips and fans with MSI's software.



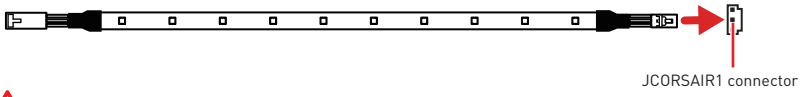



| | | | |
|---|---|---|---|
| 1 | +5V | 2 | Data |
| 3 | Ground | | |

### CORSAIR RGB LED Fan Connection




### CORSAIR Lighting Node PRO Connection



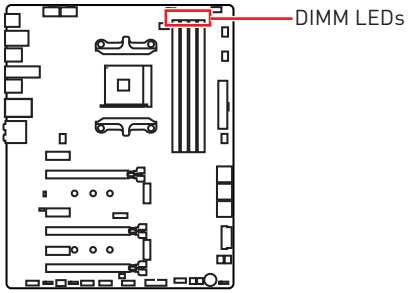

***Important***

- *Fans must start at 1 and continue in series. 1 > 2 > 3 > 4 > 5 > 6. Any fan not connected in series will break communication and the RGB LED lighting function will not work.*
- *Quantity of RGB LED Fans or RGB LED Lighting PRO strips supported may differ between models. Please refer to the motherboard specification.*
- *CORSAIR RGB LED Fan and CORSAIR Lighting Node PRO can't be used at the same time.*

# Onboard LEDs

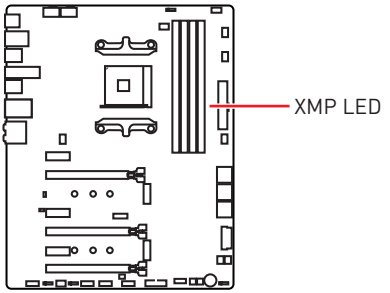
## DIMM LEDs

These LEDs indicate the memory modules are installed.



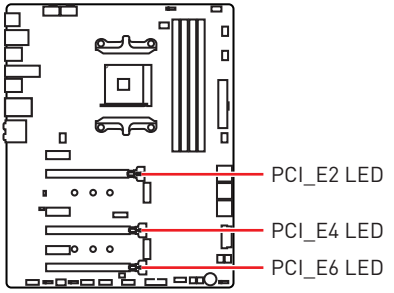

## XMP LED

This LED indicates the A-XMP (AMD-Extreme Memory Profile) mode is enabled.




## PCIe x16 slot LEDs

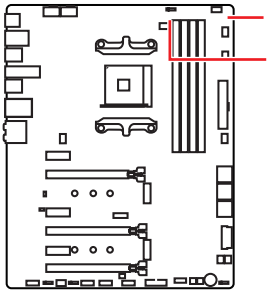
These LEDs indicate the PCIe x16 slots status.




| LED Color | PCIe slot status |
|---|---|
| Red | x16 mode |
| White | x8, x4, x1 mode |

## Fan LEDs

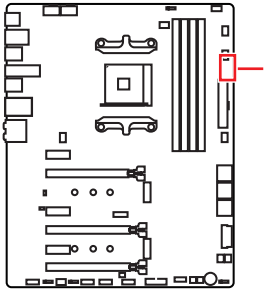
These LEDs indicate the fan control mode.




| LED Color | Fan control mode |
|---|---|
| Red | PWM mode |
| Green | DC mode |

## EZ Debug LED

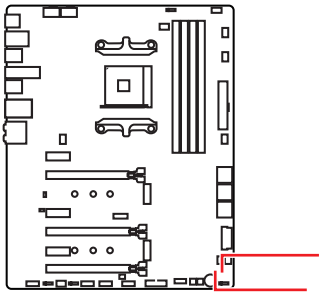
These LEDs indicate the debug status of the motherboard.



- **CPU** - indicates CPU is not detected or fail.
- **DRAM** - indicates DRAM is not detected or fail.
- **VGA** - indicates GPU is not detected or fail.
- **BOOT** - indicates the booting device is not detected or fail.

## GAME BOOST LEDs

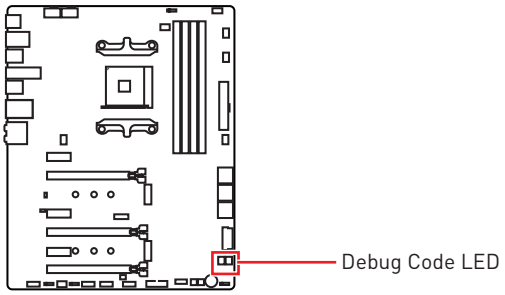
These LEDs indicate GAME BOOST control status.




| LED Color | GAME BOOST control status |
|---|---|
| Red | GAME BOOST control by physical button |
| White | GAME BOOST control by BIOS |

## Debug Code LED

The Debug Code LED displays progress and error codes during and after POST. Refer to the Debug Code LED table for details.




## Hexadecimal Character Table

| Hexadecimal | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | B | C | D | E | F |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Debug Code LED display | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | A | b | C | d | E | F |

## Boot Phases

**Security (SEC)** – initial low-level initialization

**Pre-EFI Initialization (PEI)** – memory initialization

**Driver Execution Environment (DXE)** – main hardware initialization

**Boot Device Selection (BDS)** – system setup, pre-OS user interface & selecting a bootable device (CD/DVD, HDD, USB, Network, Shell, ...)

## Debug Code LED Table

### SEC Progress Codes

| | |
|---|---|
| **01** | Power on. Reset type detection (soft/ hard) |
| **02** | AP initialization before microcode loading |
| **03** | System Agent initialization before microcode loading |
| **04** | PCH initialization before microcode loading |
| **06** | Microcode loading |
| **07** | AP initialization after microcode loading |
| **08** | System Agent initialization after microcode loading |
| **09** | PCH initialization after microcode loading |
| **0B** | Cache initialization |

### SEC Error Codes

| | |
|---|---|
| **0C - 0D** | Reserved for future AMI SEC error codes |
| **0E** | Microcode not found |
| **0F** | Microcode not loaded |

### PEI Progress Codes

| | |
|---|---|
| **10** | PEI Core is started |
| **11** | Pre-memory CPU initialization is started |
| **12 - 14** | Pre-memory CPU initialization (CPU module specific) |
| **15** | Pre-memory System Agent initialization is started |
| **16 - 18** | Pre-Memory System Agent initialization (System Agent module specific) |
| **19** | Pre-memory PCH initialization is started |
| **1A - 1C** | Pre-memory PCH initialization (PCH module specific) |

| | |
|---|---|
| **2B** | Memory initialization. Serial Presence Detect (SPD) data reading |
| **2C** | Memory initialization. Memory presence detection |
| **2D** | Memory initialization. Programming memory timing information |
| **2E** | Memory initialization. Configuring memory |
| **2F** | Memory initialization (other) |
| **31** | Memory Installed |
| **32** | CPU post-memory initialization is started |
| **33** | CPU post-memory initialization. Cache initialization |
| **34** | CPU post-memory initialization. Application Processor(s) (AP) initialization |
| **35** | CPU post-memory initialization. Boot Strap Processor (BSP) selection |
| **36** | CPU post-memory initialization. System Management Mode (SMM) initialization |
| **37** | Post-Memory System Agent initialization is started |
| **38 - 3A** | Post-Memory System Agent initialization (System Agent module specific) |
| **3B** | Post-Memory PCH initialization is started |
| **3C - 3E** | Post-Memory PCH initialization (PCH module specific) |
| **4F** | DXE IPL is started |

## PEI Error Codes

| | |
|---|---|
| **4B** | Memory not installed (For Summit CPU) |
| **E0** | Memory not installed (For Bristol CPU) |

## DXE Progress Codes

| | |
|---|---|
| **60** | DXE Core is started |
| **61** | NVRAM initialization |
| **62** | Installation of the PCH Runtime Services |
| **63** | CPU DXE initialization is started |
| **64 - 67** | CPU DXE initialization (CPU module specific) |
| **68** | PCI host bridge initialization |
| **69** | System Agent DXE initialization is started |
| **6A** | System Agent DXE SMM initialization is started |
| **6B - 6F** | System Agent DXE initialization (System Agent module specific) |
| **70** | PCH DXE initialization is started |
| **71** | PCH DXE SMM initialization is started |
| **72** | PCH devices initialization |
| **73 - 77** | PCH DXE Initialization (PCH module specific) |
| **78** | ACPI module initialization |
| **79** | CSM initialization |
| **7A - 7F** | Reserved for future AMI DXE codes |
| **90** | Boot Device Selection (BDS) phase is started |
| **91** | Driver connecting is started |
| **92** | PCI Bus initialization is started |
| **93** | PCI Bus Hot Plug Controller Initialization |
| **94** | PCI Bus Enumeration 32 |
| **95** | PCI Bus Request Resources |
| **96** | PCI Bus Assign Resources |
| **97** | Console Output devices connect |
| **98** | Console input devices connect |
| **99** | Super IO Initialization |
| **9A** | USB initialization is started |
| **9B** | USB Reset |
| **9C** | USB Detect |
| **9D** | USB Enable |
| **9E -9F** | Reserved for future AMI codes |
| **A0** | IDE initialization is started |
| **A1** | IDE Reset |
| **A2** | IDE Detect |
| **A3** | IDE Enable |
| **A4** | SCSI initialization is started |
| **A5** | SCSI Reset |
| **A6** | SCSI Detect |
| **A7** | SCSI Enable |
| **A8** | Setup Verifying Password |
| **A9** | Start of Setup |
| **AB** | Setup Input Wait |
| **AD** | Ready To Boot event |
| **AE** | Legacy Boot event |
| **AF** | Exit Boot Services event |
| **B0** | Runtime Set Virtual Address MAP Begin |
| **B1** | Runtime Set Virtual Address MAP End |
| **B2** | Legacy Option ROM Initialization |
| **B3** | System Reset |
| **B4** | USB hot plug |
| **B5** | PCI bus hot plug |

| | |
|---|---|
| **B6** | Clean-up of NVRAM |
| **B7** | Configuration Reset (reset of NVRAM settings) |
| **B8 - BF** | Reserved for future AMI codes |

### DXE Error Codes

| | |
|---|---|
| **D0** | CPU initialization error |
| **D1** | System Agent initialization error |
| **D2** | PCH initialization error |
| **D3** | Some of the Architectural Protocols are not available |
| **D4** | PCI resource allocation error. Out of Resources |
| **D5** | No Space for Legacy Option ROM |
| **D6** | No Console Output Devices are found |
| **D7** | No Console Input Devices are found |
| **D8** | Invalid password |
| **D9** | Error loading Boot Option (LoadImage returned error) |
| **DA** | Boot Option is failed (StartImage returned error) |
| **DB** | Flash update is failed |
| **DC** | Reset protocol is not available |

### S3 Resume Progress Codes

| | |
|---|---|
| **E0** | S3 Resume is stared (S3 Resume PPI is called by the DXE IPL) |
| **E1** | S3 Boot Script execution |
| **E2** | Video repost |
| **E3** | OS S3 wake vector call |
| **E4 - E7** | Reserved for future AMI progress codes |

### S3 Resume Error Codes

| | |
|---|---|
| **E8** | S3 Resume Failed |
| **E9** | S3 Resume PPI not Found |
| **EA** | S3 Resume Boot Script Error |
| **EB** | S3 OS Wake Error |
| **EC - EF** | Reserved for future AMI error codes |

### Recovery Progress Codes

| | |
|---|---|
| **F0** | Recovery condition triggered by firmware (Auto recovery) |
| **F1** | Recovery condition triggered by user (Forced recovery) |
| **F2** | Recovery process started |
| **F3** | Recovery firmware image is found |
| **F4** | Recovery firmware image is loaded |
| **F5 - F7** | Reserved for future AMI progress codes |

### Recovery Error Codes

| | |
|---|---|
| **F8** | Recovery PPI is not available |
| **F9** | Recovery capsule is not found |
| **FA** | Invalid recovery capsule |
| **FB - FF** | Reserved for future AMI error codes |

## ACPI States Codes

The following codes appear after booting and the operating system into ACPI modes.

| | |
|---|---|
| **01** | System is entering S1 sleep state |
| **02** | System is entering S2 sleep state |
| **03** | System is entering S3 sleep state |
| **04** | System is entering S4 sleep state |
| **05** | System is entering S5 sleep state |
| **10** | System is waking up from the S1 sleep state |
| **20** | System is waking up from the S2 sleep state |
| **30** | System is waking up from the S3 sleep state |
| **40** | System is waking up from the S4 sleep state |
| **AC** | System has transitioned into ACPI mode. Interrupt controller is in PIC mode. |
| **AA** | System has transitioned into ACPI mode. Interrupt controller is in APIC mode. |

# BIOS Setup

The default settings offer the optimal performance for system stability in normal conditions. You should **always keep the default settings** to avoid possible system damage or failure booting unless you are familiar with BIOS.

***Important***

• *BIOS items are continuously update for better system performance. Therefore, the description may be slightly different from the latest BIOS and should be for reference only. You could also refer to the **HELP** information panel for BIOS item description.*

• *The pictures in this chapter are for reference only and may vary from the product you purchased.*

## Entering BIOS Setup

Please refer the following methods to enter BIOS setup.

Press **Delete** key, when the **Press DEL key to enter Setup Menu, F11 to enter Boot Menu** message appears on the screen during the boot process.

### Function key

**F1**: General Help

**F2**: Add/ Remove a favorite item

**F3**: Enter Favorites menu

**F4**: Enter CPU Specifications menu

**F5**: Enter Memory-Z menu

**F6**: Load optimized defaults

**F7**: Switch between Advanced mode and EZ mode

**F8**: Load Overclocking Profile

**F9**: Save Overclocking Profile

**F10**: Save Change and Reset*

**F12**: Take a screenshot and save it to USB flash drive (FAT/ FAT32 format only).

**Ctrl+F**: Enter Search page

* When you press F10, a confirmation window appears and it provides the modification information. Select between Yes or No to confirm your choice.

## Resetting BIOS

You might need to restore the default BIOS setting to solve certain problems. There are several ways to reset BIOS:

- Go to BIOS and press **F6** to load optimized defaults.
- Short the **Clear CMOS** jumper on the motherboard.

***Important***

*Be sure the computer is off before clearing CMOS data. Please refer to the **Clear CMOS** jumper section for resetting BIOS.*

## Updating BIOS

### Updating BIOS with M-FLASH

Before updating:

Please download the latest BIOS file that matches your motherboard model from MSI website. And then save the BIOS file into the USB flash drive.

Updating BIOS:

1. Insert the USB flash drive that contains the update file into the computer.
2. Press **<Ctrl+F5>** key during POST.
3. Click on **Yes** to reboot the system and enter the flash mode.
4. Select a BIOS file to perform the BIOS update process.
5. After the flashing process is 100% completed, the system will reboot automatically.

### Updating the BIOS with Live Update 6

Before updating:

Make sure the LAN driver is already installed and the Internet connection is set properly.

Updating BIOS:

1. Install and launch MSI LIVE UPDATE 6.
2. Select **BIOS Update**.
3. Click on **Scan** button.
4. Click on **Download** icon to download and install the latest BIOS file.
5. Click **Next** and choose **In Windows mode**. And then click **Next** and **Start** to start updating BIOS.
6. After the flashing process is 100% completed, the system will restart automatically.

### Updating BIOS with BIOS FLASHBACK+

Before updating:

Please download the latest BIOS file that matches your motherboard model from MSI® website and rename the BIOS file to **MSI.ROM**. And then, save the **MSI.ROM** file to the root of USB flash drive.

Using FLASHBACK+ button:

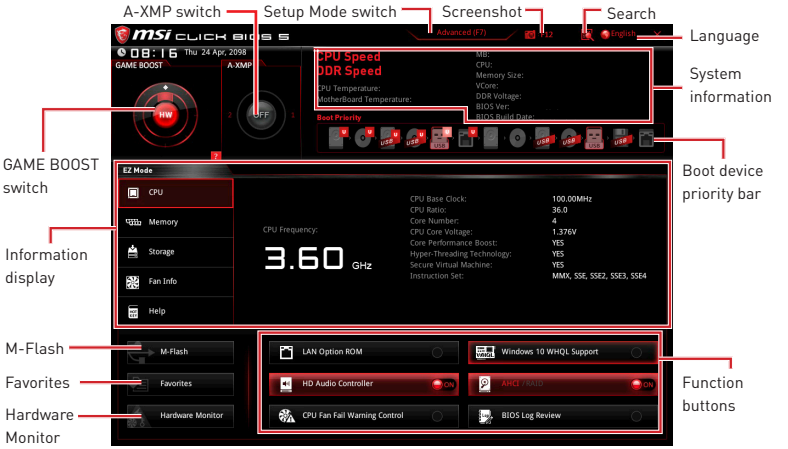
1. Connect power supply to ATX_PWR1 and CPU_PWR1. (No other components are necessary but power supply.)
2. Plug the USB flash drive that contains the MSI.ROM file into the BIOS FLASHBACK+ port on rear I/O panel.
3. Press the BIOS FLASHBACK+ button to flash BIOS, and the BIOS FLASHBACK+ LED starts flashing.
4. After the flashing BIOS process is 100% completed, the BIOS FLASHBACK+ LED stops flashing and be off.

***Important***

*Only the FAT32 format USB flash drive supports updating BIOS by **BIOS FLASHBACK+**.*

## EZ Mode

At EZ mode, it provides the basic system information and allows you to configure the basic setting. To configure the advanced BIOS settings, please enter the Advanced Mode by pressing the **Setup Mode switch** or **F7** function key.




• **GAME BOOST switch** - GAME BOOST switch - click on the center button to switch **GAME BOOST** control between **software** (**SW**) and **hardware** (**HW**) . The inner circle represents the current stage of hardware GAME BOOST and the outer circle stands for software. You can read the abilities of GAME Boost by clicking on the **question mark** in the right-bottom corner.

***Important***

*Please don't make any changes in OC menu and don't load defaults to keep the optimal performance and system stability after activating the GAME Boost function.*

• **A-XMP switch (optional)** - click on the inner circle to enable/ disable the A-XMP. Switch the outer circle to select the memory profile if any. This switch will only be available if the installed processor and memory modules support this function.

• **Setup Mode switch** - press this tab or the **F7** key to switch between Advanced mode and EZ mode.

• **Screenshot** - click on this tab or the **F12** key to take a screenshot and save it to USB flash drive (FAT/ FAT32 format only).

• **Search** - click on this tab or the **Ctrl+F** keys and the search page will show. It allows you to search by BIOS item name, enter the item name to find the item listing. Move the mouse over a blank space and right click the mouse to exit search page.

***Important***

*In search page, only the F6, F10 and F12 function keys are available.*

• **Language** - allows you to select the language of BIOS setup.

• **System information** - shows the CPU/ DDR speed, CPU/ MB temperature, MB/ CPU type, memory size, CPU/ DDR voltage, BIOS version and build date.

• **Boot device priority bar** - you can move the device icons to change the boot priority. The boot priority from high to low is left to right.

• **Information display** - click on the **CPU**, **Memory**, **Storage**, **Fan Info** and **Help** buttons on left side to display related information.

• **Function buttons** - enable or disable the **LAN Option ROM, HD audio controller, Window 10 WHQL Support, AHCI, RAID, CPU Fan Fail Warning Control** and **BIOS Log Review** by clicking on their respective button.

***Important***

• *During windows setup, the RAID driver may be required and you can find the RAID driver in MSI Driver Disc.*

• *You can use **MSI SMART TOOL** to build the Windows® installation drive that includes RAID driver.*

• *If your system currently boots to M.2 SSD RAID and you delete the RAID volume in the UEFI BIOS, your system will become un-bootable.*

• **M-Flash** - click on this button to display the **M-Flash** menu that provides the way to update BIOS with a USB flash drive.

• **Hardware Monitor** - click on this button to display the **Hardware Monitor** menu that allows you to manually control the fan speed by percentage.

• **Favorites** - press the **Favorites** tab or the **F3** key to enter **Favorites** menu. It allows you to create personal BIOS menu where you can save and access favorite/ frequently-used BIOS setting items.

▪ **Default HomePage** - allows you to select a BIOS menu (e.g. SETTINGS, OC...,etc) as the BIOS home page.

▪ **Favorite1~5** - allows you to add the frequently-used/ favorite BIOS setting items in one page.

▪ **To add a BIOS item to a favorite page (Favorite 1~5)**

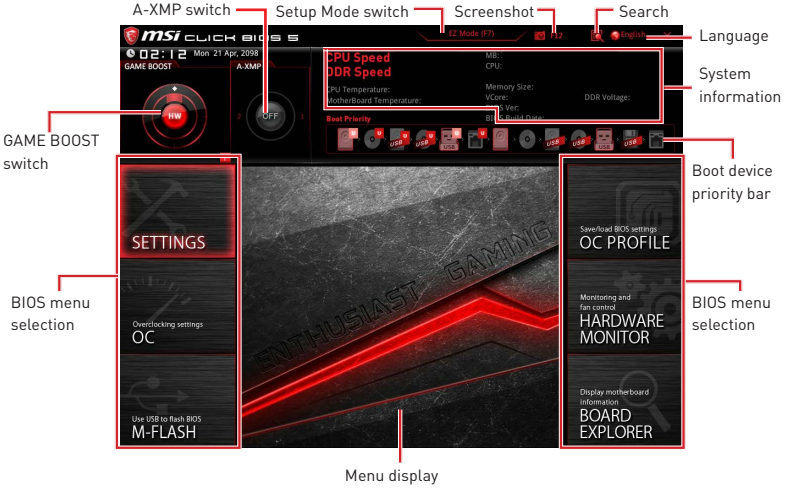
1. Move the mouse over a BIOS item not only on BIOS menu but also on search page.
2. Right-click or press **F2** key.
3. Choose a favorite page and click on **OK.**

▪ **To delete a BIOS item from favorite page**

1. Move the mouse over a BIOS item on favorite page (Favorite 1~5)
2. Right-click or press **F2** key.
3. Choose **Delete** and click on **OK**.

## Advanced Mode

Press **Setup Mode switch** or **F7** function key can switch between EZ Mode and Advanced Mode in BIOS setup.




- **GAME BOOST switch/ Setup Mode switch/ Screenshot/ Favorites/ Language/ System information/ Boot device priority bar** - please refer to the descriptions of EZ Mode Overview section.
- **BIOS menu selection** - the following options are available:
  - **SETTINGS** - allows you to specify the parameters for chipset and boot devices.
  - **OC** - allows you to adjust the frequency and voltage. Increasing the frequency may get better performance.
  - **M-FLASH** - provides the way to update BIOS with a USB flash drive.
  - **OC PROFILE** - allows you to manage overclocking profiles.
  - **HARDWARE MONITOR** - allows you to set the speeds of fans and monitor voltages of system.
  - **BOARD EXPLORER** - provides the information of installed devices on this motherboard.
- **Menu display** - provides BIOS setting items and information to be configured.

# SETTINGS




### System Status

**▶ System Date**

Sets the system date. Use tab key to switch between date elements.

The format is <day> <month> <date> <year>.

| | |
|---|---|
| <day> | Day of the week, from Sun to Sat, determined by BIOS. Read-only. |
| <month> | The month from Jan. through Dec. |
| <date> | The date from 1 to 31 can be keyed by numeric function keys. |
| <year> | The year can be adjusted by users. |

**▶ System Time**

Sets the system time. Use tab key to switch between time elements.

The time format is <hour> <minute> <second>.

**▶ SATA PortX**

Shows the information of connected SATA devices.

***Important***

*If the connected SATA device is not displayed, turn off computer and re-check SATA cable and power cable connections of the device and motherboard.*

**▶ System Information**

Shows detailed system information, including CPU type, BIOS version, and Memory (read only).

**▶ DMI Information**

Shows system information, desktop Board Information and chassis Information. (Read only).

## Advanced

**▶ PCI Subsystem Settings**

Sets PCI, PCI express interface protocol and latency timer. Press **Enter** to enter the sub-menu.

▶ **Above 4G memory/ Crypto Currency mining [Disabled]**

Enables or disables 64-bit capable devices to be decoded in above 4G address space. It is only available if the system supports 64-bit PCI decoding.

[Enabled] Allows you to utilize more than 4x GPUs.

[Disabled] Disables this function.

▶ **PCIe SlotX Lanes Configuration**

PCIe lanes configuration is for MSI M.2 Xpander / MSI M.2 Xpander-Z / Other M.2 PCIe storage card.

▶ **ACPI Settings**

Sets ACPI parameters of onboard power LED behaviors. Press **Enter** to enter the sub-menu.

▶ **Power LED [Blinking]**

Sets shining behaviors of the onboard Power LED.

[Dual Color] The power LED turns to another color to indicate the S3 state.

[Blinking] The power LED blinks to indicate the S3 state.

▶ **CPU Over Temperature Alert [Auto]**

Enables or disables the CPU overheating alert sound and message when CPU temperature is over 55 and 75 degrees centigrade.

▶ **Integrated Peripherals**

Sets integrated peripherals' parameters, such as LAN, HDD, USB and audio. Press **Enter** to enter the sub-menu.

▶ **Onboard LAN Controller [Enabled]**

Enables or disables the onboard LAN controller.

▶ **LAN Option ROM [Disabled]**

Enables or disables the legacy network Boot Option ROM for detailed settings. This item will appear when **Onboard LAN Controller** is enabled.

[Enabled] Enables the onboard LAN Boot ROM.

[Disabled] Disables the onboard LAN Boot ROM.

▶ **Network Stack [Disabled]**

Sets UEFI network stack for optimizing IPv4 / IPv6 function. This item is available when Onboard LAN Controller is Enabled.

[Enabled] Enables UEFI network stack.

[Disabled] Disables UEFI network stack.

▶ **Ipv4 PXE Support [Enabled]**

When **Enabled**, the system UEFI network stack will support Ipv4 protocol. This item will appear when **Network Stack** is Enabled.

[Enabled] Enables the Ipv4 PXE boot support.

[Disabled] Disables the Ipv4 PXE boot support.

▶ **Ipv6 PXE Support [Enabled]**

When **Enabled**, the system UEFI network stack will support Ipv6 protocol. This item will appear when **Network Stack** is enabled.

[Enabled] Enables the Ipv6 PXE boot support.

[Disabled] Disables the Ipv6 PXE boot support.

▶ **SATA Mode [AHCI Mode]**

Sets the operation mode of the onboard SATA controller.

[AHCI Mode] Specify the AHCI mode for SATA storage devices. AHCI (Advanced Host Controller Interface) offers some advanced features to enhance the speed and performance of SATA storage device, such as Native Command Queuing (NCQ) and hot-plugging.

[RAID Mode] Enables RAID function for SATA storage devices.

▶ **SATAx Hot Plug [Disabled]**

Allows user to enable or disable the SATA hot plug support.

[Enabled] Enables hot plug support for the SATA ports.

[Disabled] Disables hot plug support for the SATA ports.

▶ **HD Audio Controller [Enabled]**

Enables or disables the onboard High Definition Audio controller.

▶ **Integrated Graphics Configuration (optional)**

Adjusts integrated graphics settings for optimum system. Press **Enter** to enter the sub-menu.

▶ **Primary Video Adapter [PEG] (optional)**

Selects a graphics device as the primary boot device.

[IGD] Integrated Graphics Display.

[PEG] PCI-Express Graphics Device.

▶ **Integrated Graphics [Auto] (optional)**

If set to Force, BIOS will enable the integrated graphics controller.

▶ **UMA Frame Buffer Size [Auto] (optional)**

Selects a fixed amount of system memory allocated to the onboard graphics. This item will be available when **Integrated Graphics** is enabled.

▶ **USB Configuration**

Sets the onboard USB controller and device function. Press **Enter** to enter the sub-menu.

▶ **XHCI Hand-off [Enabled]**

Enables or disables XHCI hand-off support for the operating system without XHCI hand-off feature.

▶ **Legacy USB Support [Enabled]**

Sets Legacy USB function support.

[Auto] The system will automatically detect if any USB device is connected and enable the legacy USB support.

[Enabled] Enable the USB support under legacy mode.

[Disabled] The USB devices will be unavailable under legacy mode.

▶ **Power Management Setup**

Sets system Power Management of ErO and AC Power Loss behaviors. Press **Enter** to enter the sub-menu.

▶ **ErP Ready [Disabled]**

Enables or disables the system power consumption according to ErP regulation.

[Enabled] Optimize the system power consumption according to ErP regulation. It will not support S4 & S5 wake up by USB, PCI and PCIe devices.

[Disabled] Disables this function.

▶ **Restore after AC Power Loss [Power Off]**

Sets the system behaviors while encountering the AC power loss.

[Power Off] Leaves the system in power off state after restoring AC power.

[Power On] Boot up the system after restoring AC power.

[Last State] Restores the system to the previous state (power on/ power off) before AC power loss.

▶ **System Power Fault Protection [Disabled]**

Enables or disables the system to boot up when detecting abnormal voltage input.

[Enabled] Protect the system from unexpected power operating and remain the shut down status.

[Disabled] Disables this function.

▶ **Windows OS Configuration**

Sets Windows detailed configuration and behaviors. Press **Enter** to enter the sub-menu.

▶ **Windows 10 WHQL Support [Disabled]**

Enables the supports for Windows 10 or disables for other operating systems. Before enabling this item, make sure all installed devices & utilities (hardware & software) should meet the Windows 10 requirements.

[Enabled] The system will switch to UEFI mode to meet the Windows requirement.

[Disabled] Disables this function.

▶ **Internal GOP Configuration**

Manages the onboard Graphics Output Protocol (GOP). Press **Enter** to enter the sub-menu. This sub-menu will appear when **Windows 10 WHQL Support** is enabled.

▶ **Secure Boot**

Sets the Windows secure boot to prevent the unauthorized accessing. Press **Enter** to enter the sub-menu. This sub-menu will appear when **Windows 10 WHQL Support** is enabled.

▶ **Wake Up Event Setup**

Sets system wake up behaviors for different sleep modes. Press **Enter** to enter the sub-menu.

▶ **Wake Up Event By [BIOS]**

Selects the wake up event by BIOS or operating system.

[BIOS] Activates the following items, set wake up events of these items.

[OS] The wake up events will be defined by OS.

▶ **Resume By RTC Alarm [Disabled]**

Disables or enables the system wake up by RTC Alarm.

[Enabled] Enables the system to boot up on a scheduled time/ date.

[Disabled] Disables this function.

▶ **Date (of month) Alarm/ Time (hh:mm:ss) Alarm**

Sets RTC alarm date/ Time. If Resume By RTC Alarm is set to [Enabled], the system will automatically resume (boot up) on a specified date/hour/minute/second in these fields (using the **+** and **-** keys to select the date & time settings).

▶ **Resume By PCI-E Device [Disabled]**

Enables or disables the wake up function of installed PCI-E expansion cards, integrated LAN controllers or USB devices which are supported by third party integrated chips.

[Enabled] Enables the system to be awakened from the power saving modes when activity or input signal of PCIe device is detected.

[Disabled] Disables this function.

▶ **Resume by USB Device [Disabled]**

Disables or enables system wake up from S3/S4 by USB device.

[Enabled] Enables the system to be awakened from sleep state when activity of USB device is detected.

[Disabled] Disables this function.

▶ **Resume From S3/S4/S5 by PS/2 Mouse [Disabled]**

Enables or disables the system wake up by PS/2 mouse.

[Enabled] Enables the system to be awakened from S3/ S4/ S5 state when activity of PS/2 mouse is detected.

[Disabled] Disables this function.

▶ **Resume From S3/S4/S5 by PS/2 Keyboard [Disabled]**

Enables or disables the system wake up by PS/2 keyboard.

[Any Key] Enables the system to be awakened from S3/ S4/ S5 state when activity of any key on PS/2 keyboard is detected.

[Hot Key] Enables the system to be awakened from S3/ S4/ S5 state when activity of hot key on PS/2 keyboard is detected.

[Disabled] Disables this function.

▶ **Hot Key [Ctrl+Space]**

Selects a combination of keys as a hot key to wake the system. This item appears when you set the **Resume From S3/S4/S5 by PS/2 Keyboard** to **Hot Key**.

▶ **Secure Erase+**

Enables or disables Secure Erase+ function. **Secure Erase+** is the best way to effectively wipe all data from a SSD. Please note that data of SSD will be erased after enabling **Secure Erase+**.

▶ **Intel (R) I211 Gigabit**

Shows driver information and configuration of the Ethernet controller parameter.

## Boot

Sets the sequence of system boot devices.

▶ **Full Screen Logo Display [Enabled]**

Enables or disables to show the full screen logo while system POST.

| | |
|---|---|
| [Enabled] | Shows the logo in full screen. |
| [Disabled] | Shows the POST messages. |

▶ **Bootup NumLock State [On]**

Select the keyboard NumLock state upon bootup.

▶ **Info Block effect [Unlock]**

Sets the state of **Help** information block.

| | |
|---|---|
| [Unlock] | Sliding effect. |
| [Lock] | Fix the **Help** information block on the screen. |

▶ **AUTO CLR_CMOS [Disabled]**

Enables or disables the CMOS data to be resumed automatically when the system cannot boot to OS and reboot repeatedly.

▶ **Boot Mode Select [LEGACY+UEFI]**

Sets the system boot mode from legacy or UEFI architecture depending on OS installation requirement. This item will become un-selectable and will be configured automatically by BIOS when **Windows 10 WHQL Support** is enabled.

| | |
|---|---|
| [UEFI] | Enables UEFI BIOS boot mode support only. |
| [LEGACY+UEFI] | Enables both Legacy BIOS boot mode and UEFI BIOS boot mode. |

▶ **FIXED BOOT ORDER Priorities**

Sets device priority for system boot.

▶ **Boot Option Priorities**

These items are used to prioritize the installed boot devices.

## Security

▶ **Administrator Password**

Sets administrator password for system security. User has full rights to change the BIOS items with administrator password. After setting the administrator password, the state of this item will show **Installed**.

▶ **User Password**

Sets User Password for system security. User has limited rights to change the BIOS items with user password. This item will be available when administrator password is set. After setting the user password, the state of this item will show **Installed**.

▶ **Password Check [Setup]**

Selects a condition that will request the password.

| | |
|---|---|
| [Setup] | A password will be requested for entering the BIOS Setup. |
| [Boot] | A password will be requested for booting the system. |

▶ **Password Clear [Enabled]**

Enables or disables the clear CMOS behavior to clear a set password.

| | |
|---|---|
| [Enabled] | The password will be erased after clear CMOS. |
| [Disabled] | The password will always be kept. |

***Important***

*When selecting the Administrator / User Password items, a password box will appear on the screen. Type the password then press **Enter**. The password typed now will replace any previous set password from CMOS memory. You will be prompted to confirm the password. You may also press **Esc** key to abort the selection.*

*To clear a set password, press **Enter** when you are prompted to enter a new password. A message will confirm the password is being disabled. Once the password is disabled, you can enter the setup and OS without authorization.*

▶ **Trusted Computing**

Sets TPM (Trusted Platform Module) function.

▶ **Security Device Support [Disabled]**

Enables or disables the TPM function to build the endorsement key for accessing the system.

▶ **AMD fTPM switch [AMD CPU fTPM]**

Selects TPM device. This item will appear when **Security Device Support** is enabled.

| | |
|---|---|
| [AMD CPU fTPM] | Select it for AMD Firmware TPM. |
| [AMD CPU fTPM Disabled] | Select it for Discrete TPM. |

▶ **Device Select [Auto]**

Sets the version of the TPM device. The version must be identical with the device. Sets to **Auto**, system will detect the TPM 2.0 or TPM 1.2 model automatically.

▶ **Chassis Intrusion Configuration**

Press **Enter** to enter the sub-menu.

▶ **Chassis Intrusion [Disabled]**

Enables or disables recording messages while the chassis is opened. This function is ready for the chassis equips a chassis intrusion switch.

| | |
|---|---|
| [Enabled] | Once the chassis is opened, the system will record and issue a warning message. |
| [Reset] | Clear the warning message. After clearing the message, please return to **Enabled** or **Disabled**. |
| [Disabled] | Disables this funcion. |

## Save & Exit

▶ **Discard Changes and Exit**

Exit BIOS setup without saving any change.

▶ **Save Changes and Reboot**

Save all changes and reboot the system.

▶ **Save Changes**

Save current changes.

▶ **Discard Changes**

Discard all changes and restore to the previous values.

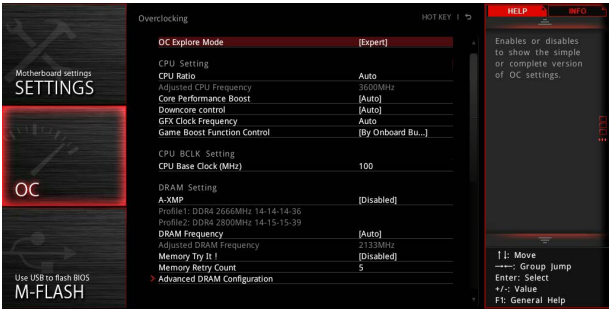
▶ **Restore Defaults**

Restore or load all default values.

▶ **Boot Override**

The installed boot-able devices will appear on this menu, you can select one of them to be the boot device.

# OC




***Important***

- *Overclocking your PC manually is only recommended for advanced users.*
- *Overclocking is not guaranteed, and if done improperly, it could void your warranty or severely damage your hardware.*
- *If you are unfamiliar with overclocking, we advise you to use **GAME BOOST** function for easy overclocking.*
- *The BIOS items in OC menu will vary with the processor.*

**▶ OC Explore Mode [Normal]**

Enables or disables to show the normal or expert version of OC settings.

[Normal] Provides the regular OC settings in BIOS setup.

[Expert] Provides the advanced OC settings for OC expert to configure in BIOS setup.

Note: We use * as the symbol for the OC settings of Expert mode.

**▶ CPU Ratio [Auto]**

Sets the CPU ratio that is used to determine CPU clock speed. This item can only be changed if the processor supports this function.

**▶ Core Performance Boost [Auto]**

Enables or disables the Core Performance Boost (CPB). This item appears when the installed CPU supports this function.

**▶ Downcore Control [Auto] (optional)**

Sets the number of processor cores to be used. This item appears when the installed CPU supports this function.

**▶ Game Boost Function Control [By Onboard Button]**

Enables the GAME BOOST function by virtual button in BIOS or physical button on motherboard. Enabling GAME BOOST function can automatically overclock the system with MSI optimized overclocking profile.

▶ **A-XMP [Disabled]**

Please enable A-XMP or select a profile of memory module for overclocking the memory. This item will be available when the installed processor, memory modules and motherboard support this function.

▶ **DRAM Frequency [Auto]**

Sets the DRAM frequency. Please note the overclocking behavior is not guaranteed.

▶ **Memory Try It ! [Disabled]**

It can improve memory compatibility or performance by choosing optimized memory preset.

▶ **Memory Retry Count [5]**

Sets counts for memory OC retrying. When memory OC has failed, setting this item as [5] will allow system to reboot 5 times with the same overclocked configuration. If overclocking has failed every time, the system will restore the defaults.

▶ **Adjusted DRAM Frequency**

Shows the adjusted DRAM frequency. Read-only.

▶ **Advanced DRAM Configuration**

Press **Enter** to enter the sub-menu. User can set the memory timing for each/ all memory channel. The system may become unstable or unbootable after changing memory timing. If it occurs, please clear the CMOS data and restore the default settings. (Refer to the Clear CMOS jumper section to clear the CMOS data, and enter the BIOS to load the default settings.)

▶ **DigitALL Power**

Press **Enter** to enter the sub-menu. Controls the digital powers related to CPU PWM.

▶ **CPU Loadline Calibration Control [Auto]**

The CPU voltage will decrease proportionally according to CPU loading. Higher load-line calibration could get higher voltage and good overclocking performance, but increase the temperature of the CPU and VRM. If set to **Auto**, BIOS will configure this setting automatically.

▶ **CPU Over Voltage Protection [Auto]**

Sets the voltage limit for CPU over-voltage protection. If set to **Auto**, BIOS will configure this setting automatically. Higher voltage provides less protection and may damage the system.

▶ **CPU Under Voltage Protection [Auto]**

Sets the voltage limit for CPU under-voltage protection. If set to **Auto**, BIOS will configure this setting automatically. Higher voltage provides less protection and may damage the system.

▶ **CPU Over Current Protection [Auto]**

Sets the current limit for CPU over-current protection. If set to **Auto**, BIOS will configure this setting 0utomatically.

| | |
|---|---|
| [Auto] | This setting will be configured automatically by BIOS. |
| [Enhanced] | Extends the current range for over-current protection. |

▶ **CPU Switching Frequency [Auto]**

Sets the PWM working speed to stabilize CPU Core voltage and minimize ripple range. Increasing the PWM working speed will cause higher temperature of MOSFET. So please make sure a cooling solution is well-prepared for MOSFET before you increase the value. If set to **Auto**, BIOS will configure this setting automatically.

▶ **CPU VRM Over Temperature Protection [Auto]**

Sets the temperature limit on CPU VRM for over-temperature protection. The CPU frequency may be throttled when CPU temperature over the specified temperature. If set to **Auto**, BIOS will configure this settings.

▶ **CPU Power Duty Control [Thermal Balance]**

Sets the current of every VRM phase and the thermal conditions of every phase component.

[Thermal Balance] Maintains the VRM thermal balance.

[Current Balance] Maintains the current VRM balance.

▶ **CPU NB Loadline Calibration Control [Auto]**

The CPU-NB voltage will decrease proportionally according to CPU-NB loading. Higher load-line calibration could get higher voltage and good overclocking performance, but increase the temperature. If set to **Auto**, BIOS will configure this setting automatically.

▶ **CPU NB Over Current Protection [Auto]**

Sets the current limit for CPU-NB over-current protection. If set to **Auto**, BIOS will configure this setting 0utomatically.

[Auto] This setting will be configured automatically by BIOS.

[Enhanced] Extends the current range for over-current protection.

▶ **CPU NB Switching Frequency [Auto]**

Sets the PWM working speed to stabilize CPU-NB voltage and minimize ripple range. Increasing the PWM working speed will cause higher temperature of MOSFET. So please make sure a cooling solution is well-prepared for MOSFET before you increase the value. If set to **Auto**, BIOS will configure this setting automatically.

▶ **CPU NB Power Duty Control [Thermal Balance]**

Sets the current of CPU-NB VRM phase and the thermal conditions of every phase component.

[Thermal Balance] Maintains the VRM thermal balance.

[Current Balance] Maintains the current VRM balance.

▶ **VR 12VIN OCP Expander [Auto]**

Expands the limitation of VR Over Current Protection with 12V input voltage. The higher expanding value indicates less protection. Therefore, please adjust the current carefully if needed, or it may damage the CPU/ VR MOS. If set to "Auto", BIOS will configure this setting automatically.

▶ **CPU Voltages control [Auto]**

These options allows you to set the voltages related to CPU. If set to **Auto**, BIOS will set these voltages automatically or you can set it manually.

▶ **DRAM Voltages control [Auto]**

These options allows you to set the voltages related to memory. If set to **Auto**, BIOS will set these voltages automatically or you can set it manually.

▶ **PROM Voltages control [Auto]**

These options allows you to set the voltages related to PROM. If set to **Auto**, BIOS will set these voltages automatically or you can set it manually.

▶ **Memory Changed Detect [Enabled]***

Enables or disables the system to issue a warning message during boot when the memory has been replaced.

[Enabled] The system will issue a warning message during boot and then you have to load the default settings for new devices.

[Disabled] Disables this function and keeps the current BIOS settings.

▶ **CPU Specifications**

Press **Enter** to enter the sub-menu. This sub-menu displays the information of installed CPU. You can also access this information menu at any time by pressing [F4]. Read only.

▶ **CPU Technology Support**

Press **Enter** to enter the sub-menu. The sub-menu shows the key features of installed CPU. Read only.

▶ **MEMORY-Z**

Press **Enter** to enter the sub-menu. This sub-menu displays all the settings and timings of installed memory. You can also access this information menu at any time by pressing [F5].

▶ **DIMMx Memory SPD**

Press **Enter** to enter the sub-menu. The sub-menu displays the information of installed memory. Read only.

▶ **CPU Features**

Press **Enter** to enter the sub-menu.

▶ **Simultaneous Multi-Threading [Enabled] (optional)**

Enables/ disables the AMD Simultaneous Multi-Threading. This item appears when the installed CPU supports this technology.

▶ **Global C-state Control [Enabled] (optional)**

Enables/ disables IO based C-state generation and DF C-states.

▶ **Opcache Control [Auto] (optional)**

Enables/ disables Opcache. Opcache stores recently decode instruction to save the decoding time when the instruction is repeated. And ist may increase the CPU performance and reduce the power consumption slightly.

▶ **IOMMU Mode (optional)**

Enables/disables the IOMMU (I/O Memory Management Unit) for I/O Virtualization.

▶ **Spread Spectrum (optional)**

This function reduces the EMI (Electromagnetic Interference) generated by modulating clock generator pulses.

| | |
|---|---|
| [Enabled] | Enables the spread spectrum function to reduce the EMI (Electromagnetic Interference) problem. |
| [Disabled] | Enhances the overclocking ability of CPU Base clock. |

***Important***

- *If you do not have any EMI problem, leave the setting at [Disabled] for optimal system stability and performance. But if you are plagued by EMI, select the value of Spread Spectrum for EMI reduction.*
- *The greater the Spread Spectrum value is, the greater the EMI is reduced, and the system will become less stable. For the most suitable Spread Spectrum value, please consult your local EMI regulation.*
- *Remember to disable Spread Spectrum if you are overclocking because even a slight jitter can introduce a temporary boost in clock speed which may just cause your overclocked processor to lock up.*

▶ **Relaxed EDC throttling [Auto] (optional)**

Relaxed EDC throttling reduces the amount of time the processor will throttle the cores.

| | |
|---|---|
| [Auto] | AMD's recommendation |
| [Enabled] | Reduce the amount of time the processor will throttle. |
| [Disabled] | Part-specific EDC throttling protection enabled. |

▶ **AMD Cool' n' Quiet [Enabled]**

The Cool' n' Quiet technology can effectively and dynamically lower CPU speed and power consumption.

▶ **SVM Mode [Enabled]**

Enables/ disables the AMD SVM (Secure Virtual Machine) Mode.

▶ **BIOS PSP Support [Enabled] (optional)**

Enables/ disables the BIOS PSP support. It manages PSP sub-item including all C2P/P2C mailbox, Secure S3, fTPM support.

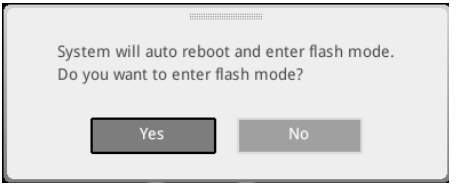
▶ **Power Supply Idle Control [Auto] (optional)**

It allows you to select the power-saving control mode for CPU when all cores are in a non-C0 state. If set to **Auto**, BIOS will configure this settings.

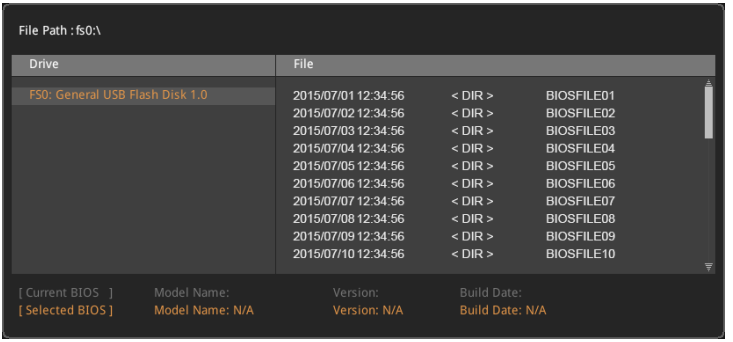
## M-FLASH

M-FLASH provides the way to update BIOS with a USB flash drive. Please down-load the latest BIOS file that matches your motherboard model from MSI website, save the BIOS file into your USB flash drive. And then follow the steps below to update BIOS.

1. Insert the USB flash drive that contains the update file into the computer.
2. Click on **M-FLASH** tab, a demand message will be prompted. Click on **Yes** to reboot and enter the flash mode.




3. The system will enter the flash mode and a file selection menu will appear after rebooting.




4. Select a BIOS file to perform the BIOS update process.
5. After the flashing process is 100% completed, the system will reboot automatically.

## OC PROFILE




**▶ Overclocking Profile 1/ 2/ 3/ 4/ 5/ 6**

Overclocking Profile 1/ 2/ 3/ 4/ 5/ 6 management. Press <Enter> to enter the sub-menu.

**▶ Set Name for Overclocking Profile 1/ 2/ 3/ 4/ 5/ 6**

Name the current overclocking profile.

**▶ Save Overclocking Profile 1/ 2/ 3/ 4/ 5/ 6**

Save the current overclocking profile.

**▶ Load Overclocking Profile 1/ 2/ 3/ 4/ 5/ 6**

Load the current overclocking profile.

**▶ Clear Overclocking Profile 1/ 2/ 3/ 4/ 5/ 6**

Clear the current overclocking profile.

**▶ OC Profile Load from ROM**

Load OC profile from BIOS ROM.

**▶ OC Profile Save to USB**

Save OC profile to the USB flash drive. The USB flash drive should be FAT/ FAT32 format only.

**▶ OC Profile Load from USB**

Load OC profile from the USB flash drive. The USB flash drive should be FAT/ FAT32 format only.

## HARDWARE MONITOR




### ▶ Temperature & Speed

Shows the current CPU temperature, system temperature and fans' speeds.

### ▶ Fan Manage

- **PWM** - allows you to select the PWM mode for fan operation.
- **DC** - allows you to select the DC mode for fan operation.
- **Auto** - allows you to select the Auto-detection mode for fan operation.
- **Fan step up/ down time** - allows you to set the period of fan step up/ down.
- **Smart Fan Mode field** - allows you to drag the gradient points to configure the fan target values for **Smart Fan** mode. **Smart Fan** can control the fan speed automatically depending on the CPU temperature to keep it with in a specific range. If the current CPU temperature reaches to the target value, the **Smart Fan** function will be activated.

***Important***

- *The changing will achieve after you save the changes and reboot the system.*
- *Make sure fans are working properly after switching the PWM/ DC mode.*

### ▶ Settings Buttons

- **All Full Speed** - configures all fans to run at full operating speed.
- **All Set Default** - configures all fans to run at default operating speed.
- **All Set Cancel** - discards current changes and restores previous operating fan speeds .

### ▶ Voltage display

Shows the current voltages of CPU, system and memory.

# A-XMP Operation

## System Requirements

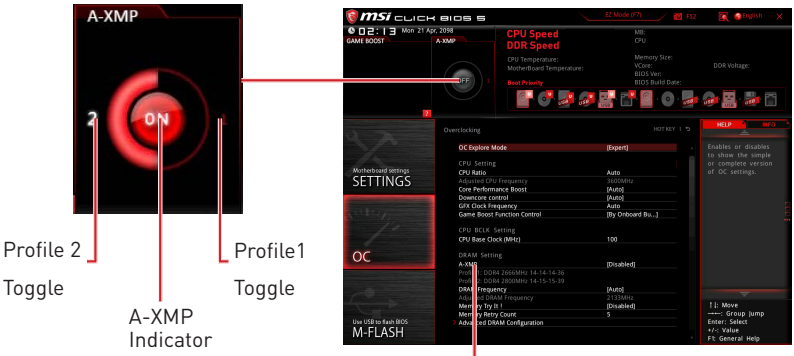
- Supported AMD® Ryzen™ series processor
- Memory module supports XMP

## How to enable A-XMP

Power on and press **Delete** key to enter BIOS Setup menu. Here are two methods below to enable A-XMP.

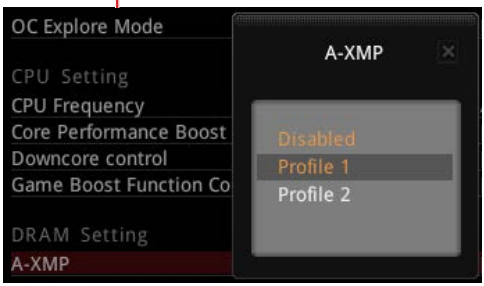
## Method 1. BIOS EZ button

Click A-XMP button 1 or 2 to enable XMP profile 1 or profile 2.




## Method 2. BIOS item

Go to **BIOS > OC > A-XMP** and change setting to Profile 1 or Profile 2.




***Note***

- *Profile 1 is downgrade profile.*
- *Profile 2 is manufacturer verifies profile.*
- *The A-XMP button and item are only available when the system is supported.*

# Software Description

## Installing Windows® 10

1. Power on the computer.
2. Insert the Windows® 10 disc into your optical drive.
3. Press the **Restart** button on the computer case.
4. Press **F11** key during the computer POST (Power-On Self Test) to get into Boot Menu.
5. Select your optical drive from the Boot Menu.
6. Press any key when screen shows **Press any key to boot from CD or DVD...** message.
7. Follow the instructions on the screen to install Windows® 10.

## Installing Drivers

1. Start up your computer in Windows® 10.
2. Insert MSI® Driver Disc into your optical drive.
3. The installer will automatically appear and it will find and list all necessary drivers.
4. Click **Install** button.
5. The software installation will then be in progress, after it has finished it will prompt you to restart.
6. Click **OK** button to finish.
7. Restart your computer.

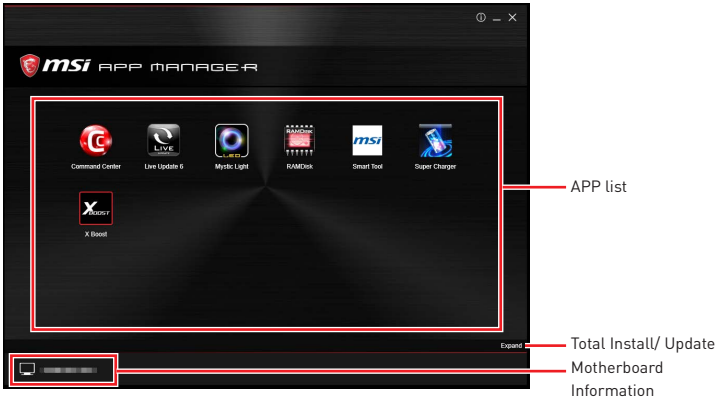
## Installing Utilities

Before you install utilities, you must complete drivers installation.

1. Insert MSI® Driver Disc into your optical drive.
2. The installer will automatically appear.
3. Click **Utilities** tab.
4. Select the utilities you want to install.
5. Click **Install** button.
6. The utilities installation will then be in progress, after it has finished it will prompt you to restart.
7. Click **OK** button to finish.
8. Restart your computer.

## APP MANAGER

APP MANAGER is a handy management application for integration of MSI applications and software interface. Providing easy shortcut entrance and real-time update information of all the MSI software and applications.




• **APP list** - shows all the applications and software be supported by this motherboard. An icon represents a entrance to the application rather than the application itself.

  ▪ **Colorful icon** - a colorful icon means that the application had have been installed successfully and is available. Double click on desired icon to access the application. A refresh icon shows to inform you that the application has a update version.

  ▪ **Gray icon** - the icon with gray painting means that the application is not available and you have to install it if needed. Double click on the gray icon and the update information will show. Click on the **INSTALL** button to install the application.

• **Motherboard Information** - shows the model name of motherboard.

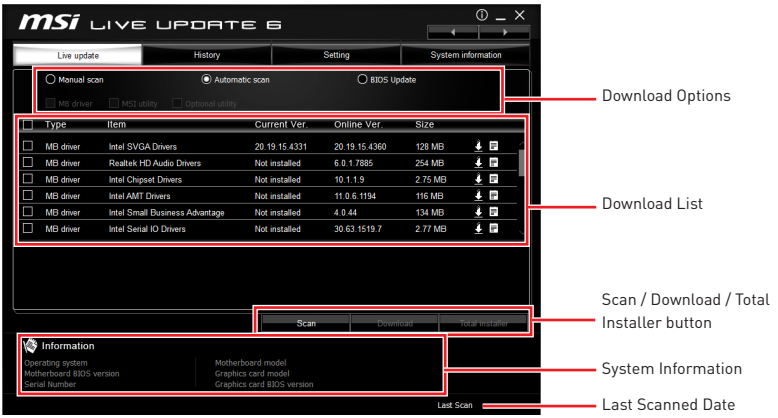
• **Total Install/ Update** - click on this tab to update/ install all the applications.

***Important***

*Please note that, once you uninstall the APP MANAGER, all the MSI applications and software will be uninstalled simultaneously.*

# LIVE UPDATE 6

LIVE UPDATE 6 is an application for the MSI® system to scan and download the latest drivers, BIOS and utilities. With LIVE UPDATE 6, you don't need to search the drivers on websites, and don't need to know the models of motherboard and graphics cards. LIVE UPDATE 6 will download the appropriate drivers automatically.

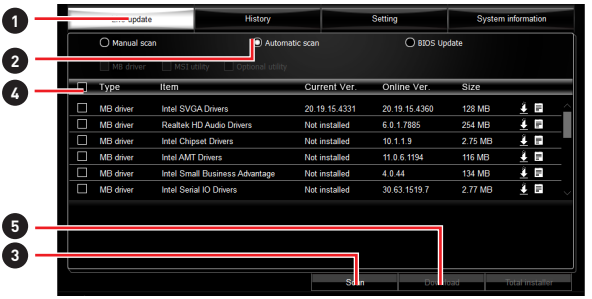



There are **Live Update, History, Setting** and **System Information** tabs at the top. You can click the tab to switch the control panel.

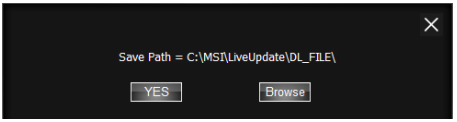
- **Live Update** - When you launch LIVE UPDATE 6, you will see the Live update tab at first. This tab allows you to select files to download. You can also read the relevant information by clicking the information icon on the right of the item listed.
- **History** - shows the downloading history.
- **Setting** - allows you to specify the frequency that LIVE UPDATE 6 remind you to update.
- **System Information** - displays the information of the system.
- **FAQ** - shows Frequently Asked Questions.
- **Online Help** - shows Online Help information.

## Updating The System

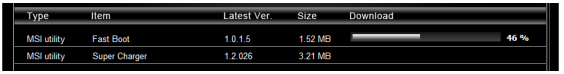
This section describes how to update your system with LIVE UPDATE 6. Please follow the steps below:



1. Select the **Live Update** tab.
2. Choose **Automatic scan**, system will automatically scan all the items and search for the latest update files. Or you can choose **Manual scan** and select the items you wish to scan.
3. Click the **Scan** button at the bottom. It may take several moments to complete the process.
4. When the download list appears, please select the items you intend to update.
5. Click **Download** button at the bottom.
6. When **Save Path** prompt, you can specify a download directory.



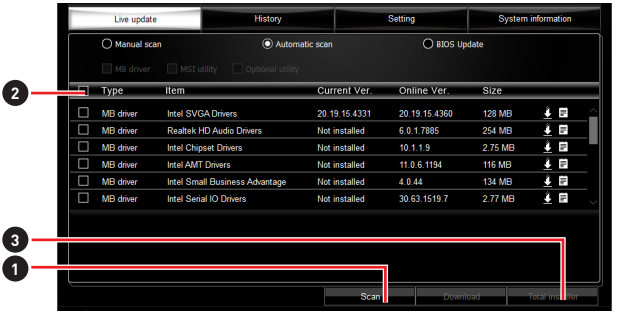

7. When downloading you will see the screen below. It may take several moments to complete the process.




8. To install the applications, simply unpack the packages and install.

## Total Installer

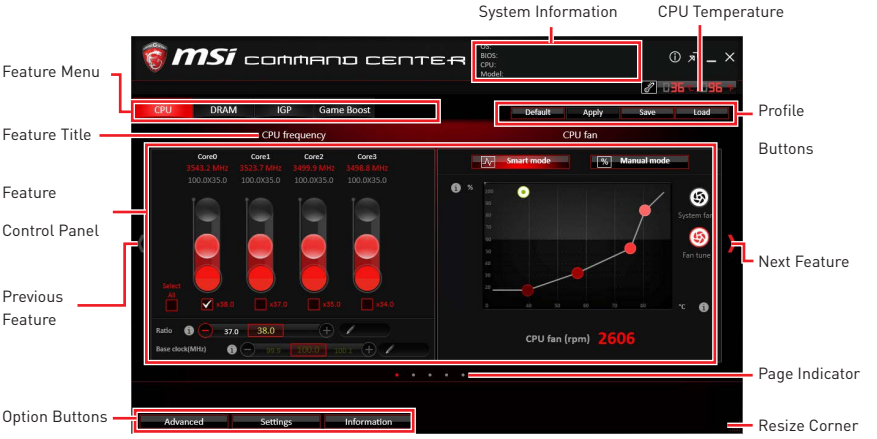
Total Installer is a convenient feature to simplify frequent installing procedure. To use Total Installer:




1. **Scan** updates in **Live Update** tab.
2. Check the **Select All** check-box you intend to update.
3. Click the **Total Installer** button. LIVE UPDATE 6 will automatically install them.
4. When prompted, click **OK** to complete the Total Installer procedure
5. Reboot your system.

# COMMAND CENTER

COMMAND CENTER is an user-friendly software and exclusively developed by MSI, helping users to adjust system settings and monitor status under OS. With the help of COMMAND CENTER, making it possible to achieve easier and efficient monitoring process and adjustments than that under BIOS. In addition, the COMMAND CENTER can be a server for mobile remote control application.




## Profile Buttons



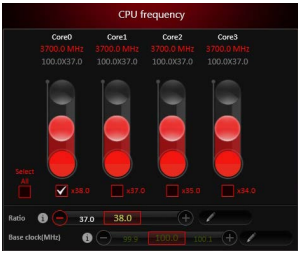

- **Default** - load the default values for the current feature.
- **Apply** - apply your changes.
- **Save** - store values in the file with individual file extension.
- **Load** - load the values from the file.

***Important***

*Every time you shut down the system, the configured setting will be restored to the factory default. If you want to use the saved settings, you have to load it every time by clicking the **Load** and **Apply** buttons.*

## CPU Frequency

CPU Frequency control panel allows you to change CPU Ratio and Base clock. You can see the current frequency of each CPU core on the top of the panel.



## CPU Fan

CPU Fan control panel provides **Smart mode** and **Manual Mode**. You can switch the control mode by clicking the **Smart Mode** and **Manual Mode** buttons on the top of the CPU Fan control panel.

- **Manual Mode** - allows you to manually control the CPU fan speed by percentage.

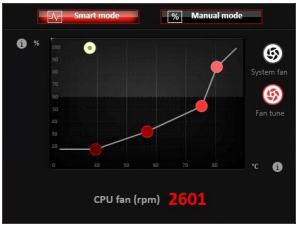
- **Smart Mode** - a linear fan speed control feature. The control panel contains 4 dots allows you to drag and adjust the Smart Speed slopes. The fan speed will be changed along these lines with CPU temperature. The white dot will create strip chart in real time.

- **System Fan Button** - to open the system fan control panel in new window.

- **Fan Tune Button** - to automatically optimize the smart fan setting.



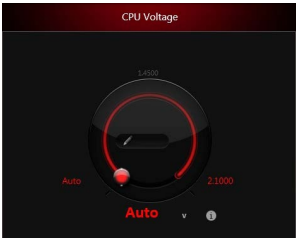
Manual Mode



Smart Mode

## CPU Voltage

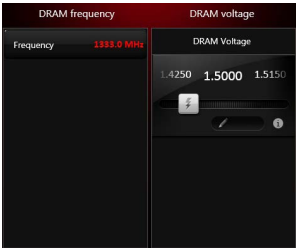
CPU Voltage control panel allows you to control the CPU voltage.




## DRAM Frequency & DRAM Voltage

- **DRAM Frequency** - Shows the DRAM clock, ratio and frequency.

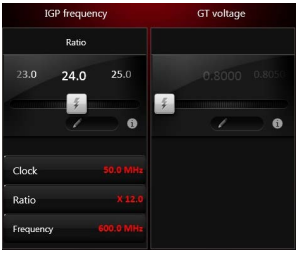
- **DRAM Voltage** - Allows you to adjust the DRAM voltage. The risky values are displayed in red.




## IGP Frequency & GT Voltage

- **IGP Frequency** - Allows you to adjust the IGP ratio, and shows the IGP clock, ratio and frequency.

- **GT Voltage** - Allows you to adjust the GT voltage. The risky values are displayed in red.



## GAME BOOST

GAME BOOST has 8 overclocking stages for you to overclock your computer. COMMAND CENTER provides the software interface instead of GAME BOOST knob on the motherboard. You can click on the center button to switch GAME BOOST control between software (SW) and hardware (HW) . The inner circle represents the current stage of hardware GAME BOOST and the outer represents software.




### Option Buttons - Advanced

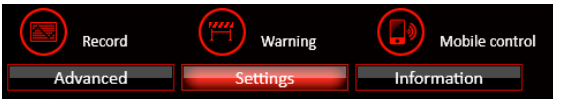
When click the **Advanced** button, The **Voltage**, **Fan** and **DRAM** icons will appear.




- **Voltage** - allows you to adjust advanced voltage values of CPU and chipset.
- **Fan** - allows you to control the system fans speed.
- **DRAM** - shows the current Advanced DRAM parameters, and allows you to change the settings by selecting values from the drop-down menu on the right hand side.
- **Sensor** - allows you to monitor your motherboard temperature and fan speed with the virtual thermal image. You can drag and drop the fan icons to new locations. When you press the **Cooling** button, all fans will run at full speed.

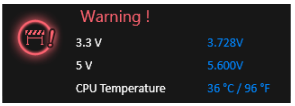
### Option Buttons - Setting

When click the **Setting** button, The **Record**, **Warning** and **Mobile Control** icons will appear.




- **Record** - allows you to monitor the status of voltage, fan speed and temperature in real time.
  - To filter record charts, select the check box next to the items.
  - When click the **Play** button, the chart pane will start to show the recording chart. If you want to check the value of a specific spot on chart, please move the orange vertical line to the spot.
  - History Record stores the data and names with date and time.
  - To make a history record: Select items and click the **Record** button. When finished, click the **Record** button again. The data will be stored in the drop-down menu.
  - To load a record, click the drop-down menu and select one from the list.
  - To delete a record, select the record that you want to delete, and click the **Trash Can** icon.

• **Warning** - contains fields of voltage, fan speed and temperature for you to set the threshold values. When system detects the status over your settings, a warning message will pop-up.




• **Mobile Control** - is only available for the motherboard with the built-in WiFi module. It allows you to enable/disable the COMMAND CENTER Remote Server. Please refer to the instruction on the Mobile Control control panel.

• **To start remote control: (optional)**

1. Download and install **MSI® COMMAND CENTER** APP to your mobile device.
2. Enable **COMMAND CENTER Remote Server** on the **Mobile Control** panel.
3. Enable **SoftAP Management**.
4. Enter **SSID** and **Password**, and then click the **Apply** button.
5. Activate Wi-Fi® on your mobile device and connect to SoftAP with the SSID.
6. Run **MSI® COMMAND CENTER** APP on your mobile device.
7. Find the IP address on the **SoftAP Management Setting** area, and enter the IP address on your **MSI® COMMAND CENTER** APP to link your system.
8. Press **Refresh** on the **MSI® COMMAND CENTER** APP to verify that monitoring and OC functions are working properly.

## Option Buttons - Information

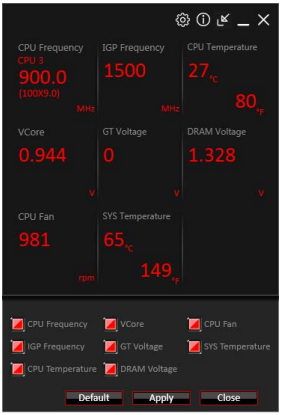
When click the **Information** button, The **Motherboard**, **CPU**, **Memory** and **HW monitor** icons will appear.




You can click the icons to open the related information.

## Gadget Mode

COMMAND CENTER provides a gadget mode to monitor the system status. You can switch between gadget mode and full mode by clicking the arrow icon on the top left.

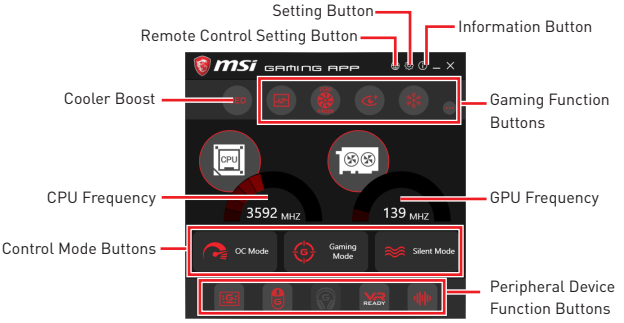



• **To arrange gadgets:**

1. Click the Spanner icon on the Gadget mode, a configuration panel will slide out.
2. Select the check box next to the items.
3. Click the **Close** button.

## GAMING APP

GAMING APP is an application designed to quickly control your system for improving gaming performance.

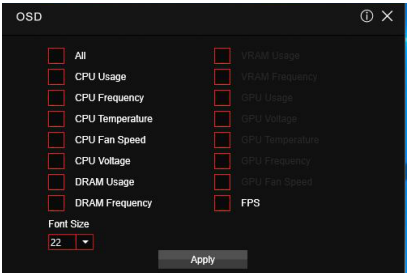



- **Setting Button** - allows you to choose running GAMING APP when Windows starts or let GAMING APP to overwrite the VGA fan control function.
- **Information Button** - shows the information of this application.
- **CPU Frequency** - shows the current CPU frequency.
- **GPU Frequency** - shows the current GPU frequency.
- **Control Mode Buttons**
  - **OC Mode** - apply turbo frequency to CPU and OC frequency to GPU.
  - **Gaming Mode** - automatically optimize the CPU ratio and the GPU clock.
  - **Silent Mode** - reverts the CPU ratio and GPU clock to the default values.
- **Gaming Function Buttons** - allows you to use **OSD** and **Eye Rest** functions.
- **Peripheral Device Function Buttons** - allows you to set the **Gaming Hotkey, Mouse Master**, **VR Ready** and **Voice Boost** functions.
- **Remote Control Setting Button** - available for the motherboards with built-in or discrete WiFi module. It allows you to set up **Name** and **Password** to link the android device and the motherboard. Please follow the steps below to complete the remote control setting.

1. Download and install the **MSI® GAMING APP** APP to your android device.
2. Set up a set of **Name** and **Password** on the **Remote Control Setting** panel, and then click the **Apply** button.
3. Connect your android device and motherboard to the same local area network.
4. Run **MSI® GAMING APP** APP on your android device.
5. Press the **Remote Control Setting** icon on the **MSI® GAMING APP** APP to find the paired device **Name** you set in the **Remote Control Setting** panel.
6. Enter the **Password** you set in the **Remote Control Setting** panel.
7. Finally, you can use the **MSI® GAMING APP** APP to control your motherboard with the android device.

## OSD Setting Panel

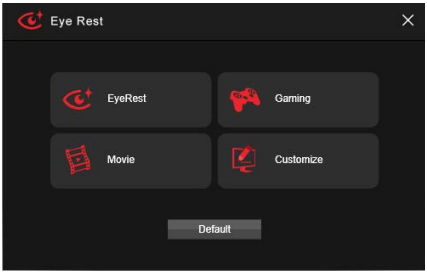
Use the OSD setting panel to specify information within on-screen display (OSD).




• **Apply Button** - applies above settings to OSD.

## Eye Rest

Eye Rest allows you to optimize the display on your monitor.




• **EyeRest** - reduces blue-light of your LED backlit screen, in order to protect your eyes.

• **Gaming** - automatically increase contrast ratio of your screen.

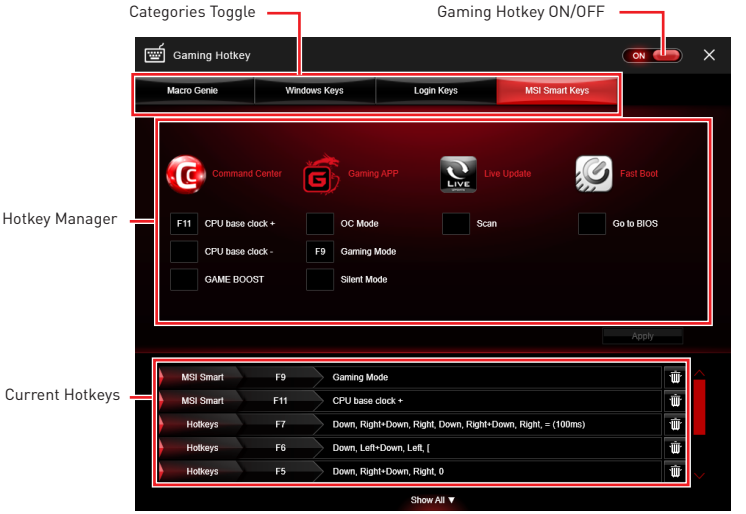
• **Movie** - automatically increase dynamic contrast ratio of your screen.

• **Customize** - allows you to adjust gamma, contrast and color balance for your screen.

• **Default** - loads the default settings.

## Gaming Hotkey

Gaming Hotkey provides instant control of the system through user defined hotkeys.



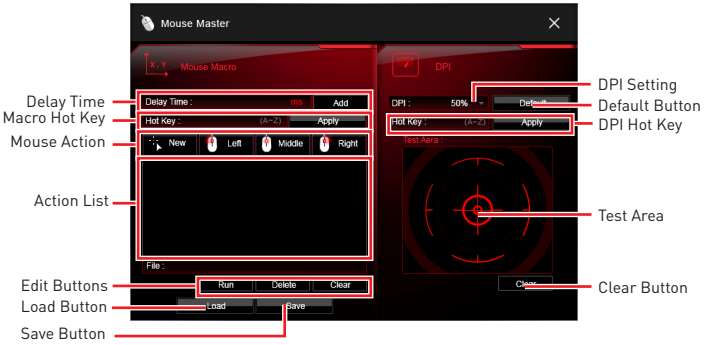

- **Gaming Hotkey ON/OFF** - allows you to turn ON/OFF the Gaming Hotkey function.
- **Categories Toggle** - allows you to toggle over the Hotkey categories.
  - **Macro Genie** - provides the keyboard and mouse macro record function and allows you to define the hotkeys for the macro recorder.
    1. Click on the **Record** button to start the keyboard and mouse macro recorder.
    2. Click on the **Stop** button to stop the recorder.
    3. Key-in a file name and set-up the parameter for the macro.
    4. Finally, click on the **Save** button to save the recorded macro.
  - **Windows Keys** - allows you to define hotkeys to replace Windows default keyboard shortcuts.
  - **Login Keys** - provides hotkey login function.
  - **MSI Smart Keys** - allows you to define hotkeys for MSI Smart Keys.
- **Hotkey Manager** - allows you to create, edit and delete hotkeys.
- **Current Hotkeys** - shows all existing hotkeys.

***Important***

- *The **Caps Lock**, **Num Lock**, **Scroll Lock**, **Window Home**, **Application** and **BackSpace** keys can not be used as Hotkeys.*
- *Some key combinations are reserved for use by Microsoft Windows and can not be assigned as a hotkey.*

## Mouse Master

Mouse Master provides mouse macro function. You can also use it to change DPI of your mouse.




- **Delay Time** - allows you to apply a delay time in mouse macro.
- **Macro Hot Key** - allows you to assign a hotkey from A to Z to activate the macro.
- **Mouse Action** - assigns mouse actions to the macro.
  - **New** - captures the mouse coordinate and add to the macro.
  - **Left** - add a left-click to the macro.
  - **Middle** - add a middle-click to the macro.
  - **Left** - add a left-click to the macro.
- **Action List** - shows the actions of the current macro.
- **Edit Buttons** - there 3 buttons for editing the macro.
  - **Run** - activates the macro.
  - **Delete** - removes the selected action from the macro.
  - **Clear** - removes all actions from the macro.
- **Load Button** - allows you to load a macro.
- **Save Button** - allows you to save the macro to a file.
- **DPI Setting** - allows you select the mouse DPI from the drop-down menu.
- **Default Button** - reverts to the default DPI setting.
- **DPI Hot Key** - allows you to assign a hotkey from A to Z to activate the DPI setting. Please note that you muse hold the hotkey to keep the DPI setting. When you release the hotkey, the DPI setting will be reverted to default.
- **Test Area** - allows you to test the mouse movement.
- **Clear Button** - clears the test area.

## VR Ready

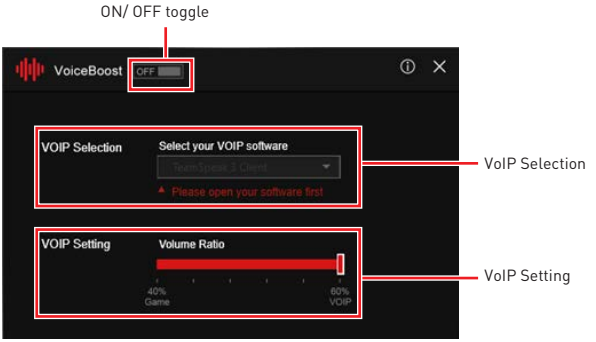
It will optimize the performance of your system to ensure everything is VR Ready.




- **VR ON/ OFF** -enables or disables VR settings.
- **Applications** - appears when you turn on the VR support. It allows you to close some applications to optimize the system for better VR experience.

## Voice Boost

Voice Boost function allows you to boost volume in voice communication tools.




- **ON/ OFF toggle** -enables or disables Voice Boost function.
- **VOIP Selection** - selects your voice communication tool.
- **VOIP Setting** - adjust the volume ratio in voice communication tool.

***Important***

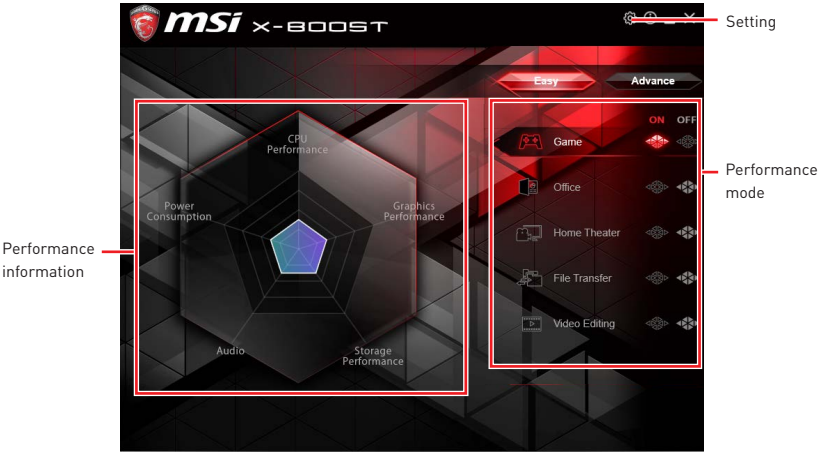
*The Voice Boost function is only available with Nahimic 2.5/ 3 and voice communication tools (TeamSpeak, Raidcall, Skype, SkypeHost and Discord).*

# X-BOOST

The MSI **X-BOOST** allows you to select the system performance mode to meet your current system environment or support faster storage access speed for your external storage or memory cards.

## Easy

In **Easy** page, you can select one system performance mode to meet the current system environment.




• **Performance mode** - moves over the mouse to any one of performance mode and click on the **ON** button to enable it.

***Important***

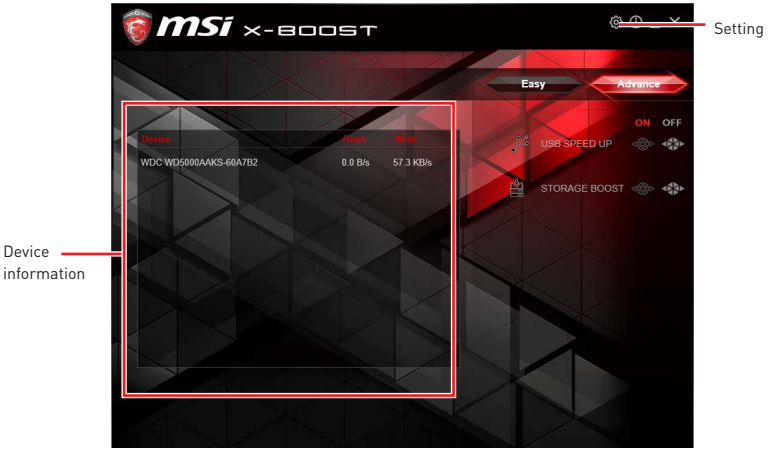
*The **Customize** mode is the default of system performance.*

• **Performance information** - displays the system performance diagram of enabled mode.

• **Setting** - enables or disables **Run X-BOOST when windows starts**.

## Advance

In **Advance** page, you can enable the **USB SPEED UP** and **STORAGE BOOST**.




- **Device information** - displays the information and current transfer rates/ access speeds of USB/ storage devices.
- **Setting** - enables or disables **Run X-BOOST when windows starts**.
- **USB SPEED UP** - supports faster data transfer rates of the USB storage devices.
- **STORAGE BOOST** - supports faster access speed of storage device.

***Important***

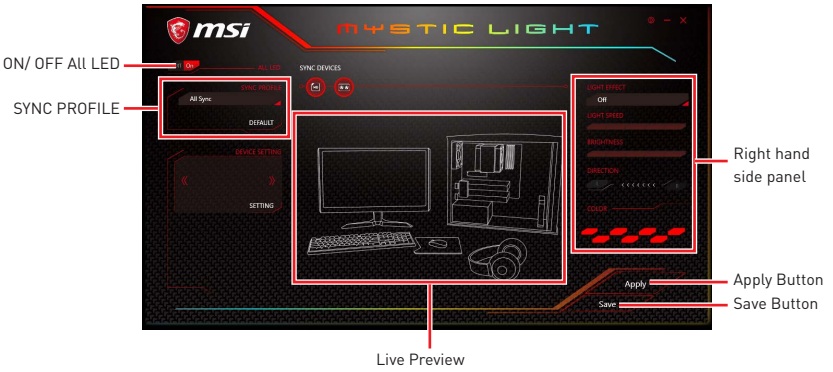
- *Please note that you can only select one mode at a time from Easy or Advance page as MSI **X-BOOST** function.*
- *The improved transfer rate/ access speed will vary with the USB/ storage device.*

# MYSTIC LIGHT

MYSTIC LIGHT is an application allows you to control LED lights of MSI products. For some earlier products, you can go to product download page to download the applicable LED control software.

## Main Screen

The Main screen is used to configure what devices need to be synchronized and LED light effect options.




• **ON/OFF All LED** - By toggling Off/On here, you disable/enable all the LED on supported gaming gear, memory, graphics card and motherboard etc.




• **SYNC PROFILE** - In this section, you may apply different LED setting to your device.

▪ **All Sync** - Default: All the Sync device bubble would appear red.



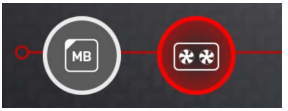

To change the LED color & effect, use the panel on the right hand side to switch to different settings.



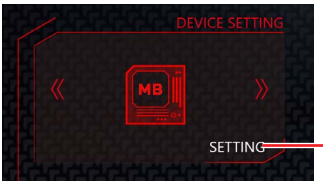

Please noted that for light effect, the option would be more or less depending on the devices you have, it will only list the light effects which are available for all included devices.

For the color section, you can always select a different color but it won't apply to the device that does not have such color.

You can also change settings for single device. To do that, you have to click the sync bubble twice and make it turn gray as below.




Then you go to **DEVICE SETTING** and click **SETTING**.




click **SETTING**

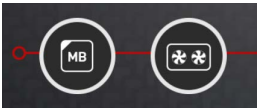
After that, the computer will open a different windows and you can modify LED there individually.



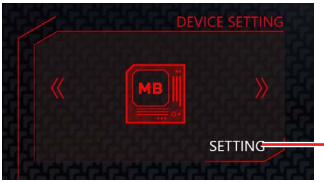

***Note:*** *The motherboard picture and name may vary according to different models.*

You can save the current settings by clicking **Save**.

- **Individual** - Default: All the Sync device bubble would appear black.




To change color for individual device, use the device setting panel below to lock on any device and click **SETTING** to customize the LED color/effect on it.




click **SETTING**

If you wish to customize multiple device at the same time, click the bubble until it turn red like below.




Use the **LIGHT EFFECT** & **COLOR** section on the main menu to make change.



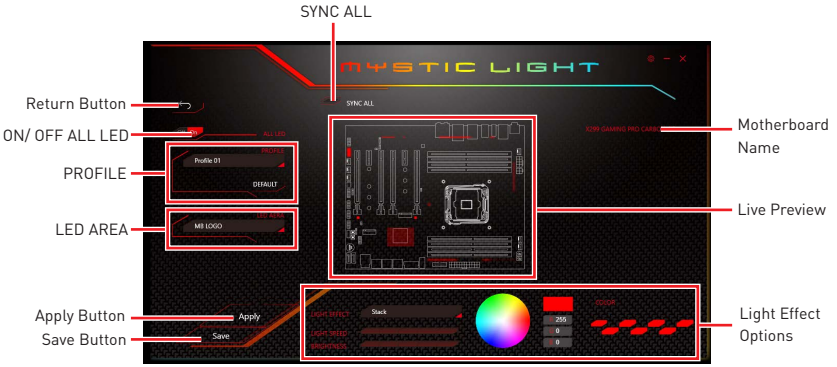

**Note:**
Currently only GTX 1080 Ti Lightning -/X/Z and GTX 1080 Ti Gaming -/X Trio supports Light Speed/Brightness and no device supports Direction.

- **Profile01~03** - Save Sync profile settings.

• **Save Button** - saves sync device settings and lighting effect settings to the current Sync Profile.

## Motherboard Screen

The motherboard screen is used to configure the LED light effect of the motherboard.




***Note:*** *The motherboard picture and name may vary according to different models.*

- **Return Button** - returns to the main screen.
- **ON/OFF ALL LED** - allows you to turn ON/ OFF all LED lights of the motherboard.
- **SYNC ALL** - allows you to synchronize all LED light effect of the motherboard.
- **Motherboard Name** - shows the name of the motherboard.
- **Live Preview** - gives you the full experience of your configuration' s look, feel while you are editing it.
- **Light Effect Options** - allow you to customize lighting effect of the sync devices.
  - **LIGHT EFFECT** - allows you to change LED light effect.
  - **LIGHT SPEED** - allows you to change LED light speed.
  - **BRIGHTNESS** - allows you to change LED light brightness.

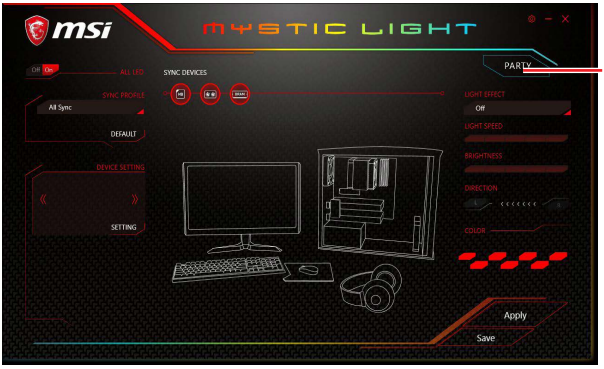
**Note:**
Currently only Z370 GODLIKE GAMING, H370 GAMING PRO CARBON and B360 GAMING PRO CARBON support Light Speed/Brightness.

  - **COLOR** - allows you to select the color for single light effects (Stack, Breathing, Flashing etc.).

- **Apply Button** - applies lighting effect settings.
- **PROFILE** - manages sets of motherboard LED light effect settings.
- **Save Button** - saves sync device settings and lighting effect settings to the current profile.
- **LED AREA** - switches to the other LED area on the motherboard.

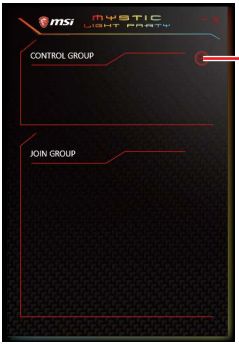
## MYSTIC LIGHT PARTY

This section allows you to control LED across different platform. The pre-requisite is that the platforms should all be connected within the same local network. Refer to device support list web page. https://www.msi.com/Landing/Mystic-Light-Party.




PARTY

Upon clicking **PARTY**, this window would pop out. On your master platform, click **+** to create a host group.

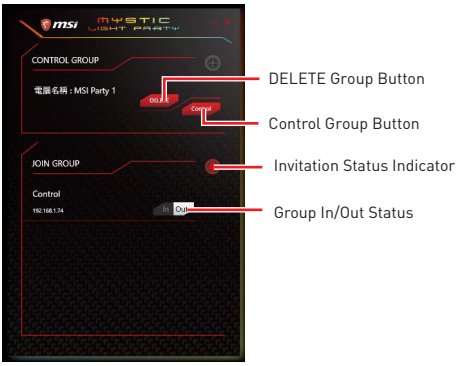



Click + to create a host group

Enter the group name (3~15 characters) and group array (13~30 columns, 5~30 rows) and click the **CREATE** button.



The group has been created. The other computers in the same local network are able to join the group with MYSTIC LIGHT software.




- **DELETE Group Button** - deletes the group.
- **Control Group Button** - enters the group control panel.
- **Invitation Status Indicator** - appears when receive an invitation to a group.
- **Group In/Out Status** - shows Group In/Out status.

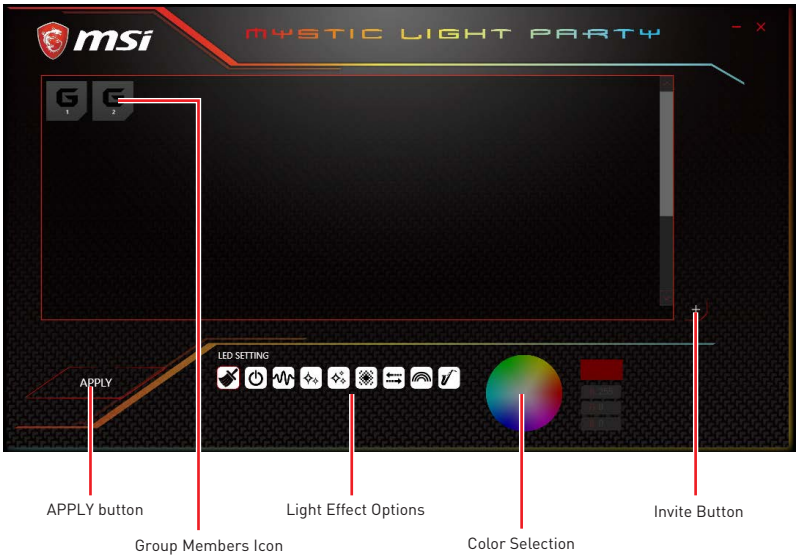
## Joining Group

On your slave platform, click **PARTY** to open MYSTIC LIGHT PARTY interface and click **In** to join the network.



## Group Control Panel

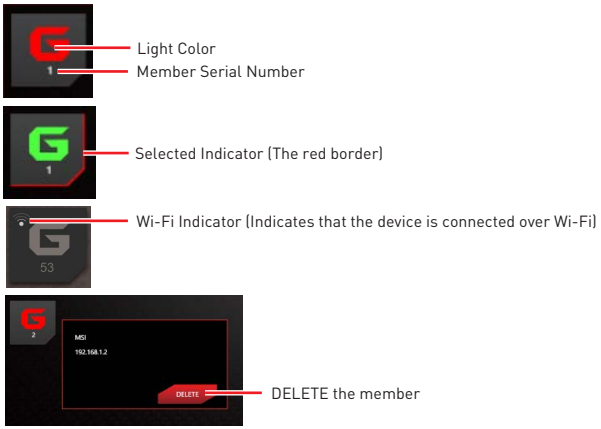
If everything is set up properly, you can see your slave platform on master platform MYSTIC LIGHT PARTY window.




At the panel below, you may apply different LED settings and color to the selected platform.

Please be aware of certain limitation on the devices such as if you apply green color to a red-only device, the LED will stay off since it has on such color or if you apply rainbow to a no-rainbow mode device, the LED will stay on constantly.

• **Group Member Icons** - displays members status, and you can select a member to delete it in the DELETE pop-up window.



- **Invite Button** - enters the INVITE screen.
- **Light Effect Options** - allow you to customize lighting effect.

| | | |
|---|---|---|
| Off | Always on | Breathe |
| Flash | Double flash | Random |
| Marquee | Rainbow | Sound beat |

- **Color Selection** - allows you to change color.

## Inviting Member

Click the Invite button in the Group Control Panel to enter the INVITE screen. Select the device you want to invite and click the INVITE button.



# SMART TOOL

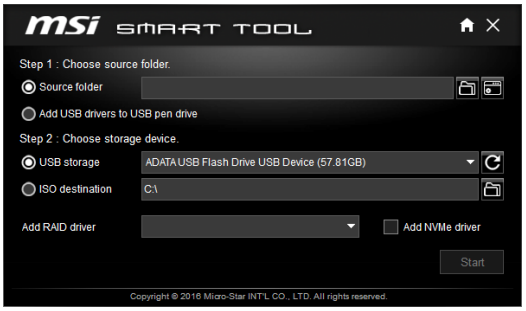
SMART TOOL is a convenient tool that can help you to create your Windows installation USB flash drive, and it can also create a super RAID.

## Main menu

After installing and activating SMART TOOL, it will display a main menu for you to choose **Smart Tool** or **SUPER RAID**. Note that the SUPER RAID is only available when your system equipped with at least 3 hard-disk drives (1 system disk and 2 data disks).

## SMART TOOL

Before you can create your Windows installation USB flash drive, you' ll need to have your Windows Installation DVD or ISO file, and also have a minimum of a 8GB USB flash drive to create your installer. Be sure to backup files on the USB drive, this process will erase it.




To create the Windows installation USB drive:

### Step1. Choose source folder

• In the **Source folder** box, click **Browse** button and select the file from the dialog box. (This option will copy all Windows installation files.)

• **Add USB drivers to USB pen driver** option allows you to add USB driver on the USB pen drive. This option appears depend on the motherboard you purchased.

### Step2. Choose Storage device

• Choose **USB storage** and select your USB flash drive in the drop-down list. In case the USB flash drive is not listed, click the **Refresh Drive** button.

• If you want to install Windows on the RAID drive, select the RAID driver version from the drop-down menu.

• If you want to add NVMe drive for your NVMe SSD drive, check the **Add NVMe driver** checkbox.

***Important***

*You can also create an installer ISO image file by selecting the **ISO destination** in Step2, and then burn it onto the DVD. However, this method does not support RAID drive.*

**Step3.** Click the **Start** button.

## SUPER RAID

This utility allows you to create a super RAID in Windows system.




To create a super RAID:

1. Use checkboxes to select the disks you want included in your RAID.
2. Choose **Speed Up** or **Backup** for RAID type.
   - Speed Up = RAID0
   - Backup = RAID1
3. Click **Start**.
4. When prompt **Finish!,** click **OK**.

***Important***

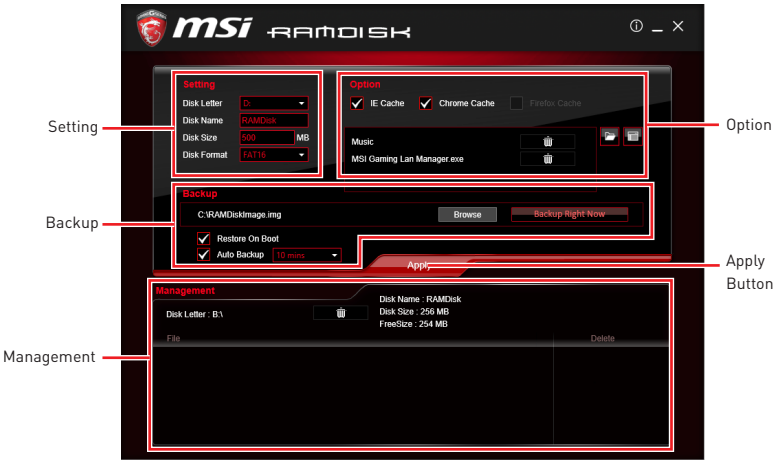
*SUPER RAID can't includ the system disk.*

# RAMDISK

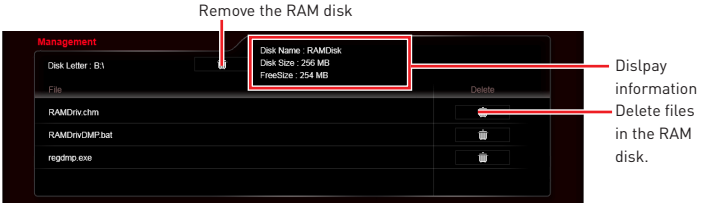
RAMDISK creates a virtual RAM drive using the available memory in your computer, the performance of the RAMDISK is faster than an SSD and hard drive. RAMDISK allows you to store any temporary information on it. Furthermore, using the RAMDISK will extend your SSD's life by sparing it from excessive reading and writing.

## Creating a RAM Disk

When **RAMDISK** is started, it will create a default RAM disk. If you want to change settings, refer to following instructions.



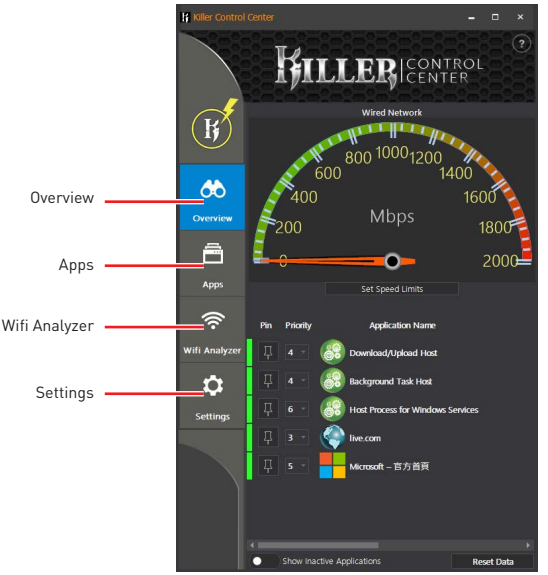

- **Setting** - specify **Letter**, **Name**, **Size** and **Format** of the RAM disk.
- **Option** - select browser temporary files to save/load on the RAM disk. You can also add software files to improve reading speed.
- **Backup** - specify backup and restore settings to prevent data loss. All files will be lost each time the RAMDISK is stopped if you do not backup.
  - **Browse Button** - set the path to the image file.
  - **Backup Right Now Button** - manually backup files.
  - **Restore On Boot** - check this box to have the image file loaded automatically when RAMDISK starts.
  - **Auto Backup** - check this box to backup automatically over a period of time.
- **Apply Button** - allows you to apply changes.
- **Management** - shows RAMDISK information and allows you to delete files.



## Killer Control Center

The Killer Control Center software can be installed with the Killer LAN driver. Once installed, the Killer Control Center icon would appear in system tray (bottom right of the screen). Right click on the icon to open application window.

In case no icon appears in system tray, you may activate Killer Control Center manually by double clicking the Killer Control Center icon on the desktop.




• **Overview** - displays network traffic on your system in the form of a speed-o-meter at the top. And also list all applications/domains that are passing traffic.

• **Apps** - displays currently using network bandwidth applications.

• **Wifi Analyzer** - shows the Wireless network around you.

• **Settings** - allows you to setup bandwidth. And also shows your ethernet setting information.

### Configuring Bandwidth

Before using the Killer network for the first time, you should configure default Internet upload and download speed.

To configure bandwidth:

1. Select the **Settings** page in Killer Control Center.
2. Enter a value into the **Download Speed** field.
3. Enter a value into the **Upload Speed** field.
4. Check **OK** to allow the Killer Control Center to manage the bandwidth.

## Nahimic 2.5

Nahimic 2.5 is designed to offer the best audio experience it contains 6 audio effects, 3 microphone effects, HD Audio Recorder2 and Sound Tracker.

### Installation and Update

Nahimic 2.5 is included in the audio driver. If you need to install it or update it, please use the **Driver Disc** with your motherboard or download the driver from MSI' s official website.

### Audio Tab

From this tab, you can access all of Nahimic 2.5' s audio effects, audio profiles and settings.




• **Display & Volume** - displays the type of audio rendering device currently being used as output, as well as its current volume. This section can display the volume of the internal (built-in) speakers, headphones and external speakers.

  ▪ **Mute** - mutes the current audio output device.

  ▪ **Device properties** - allows you to change the format, sample rate, bit rate and the channel gain of the current device (if these options are available for the current device). Clicks on this button and a device properties panel will show.

• **Profiles** - allows you to adjust the 7 audio effects to your current listening experience. All profiles can be modified as you wish.

• **Profiles Editing Buttons** - allows you to create, edit, open, save and delete a profile.

• **Audio Effects** - allows you to separately control any of the 6 audio effects.

  ▪ **Bass Boost** - Increases the energy in low frequencies up to +12 dB on a frequency range optimized for the audio rendering device in use. Each audio effect can be disabled by clicking on it.

  ▪ **Virtual Surround**

    ◦ **Gaming and Movies** - virtualizes the multichannel audio stream and downmixes it in order to retrieve a multichannel listening experience over your stereo headphones or speakers.

- **Music** - expands the stereo for a wider sound stage. Each audio effect can be disabled by clicking on it.

▪ **Reverb** - increases the feeling of space by applying different types of reverbs corresponding to different room sizes.

▪ **Treble Enhancer** - Increases the energy in high frequencies up to +12 dB.

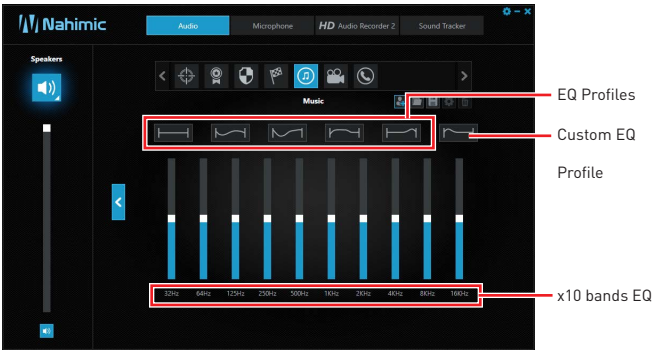
▪ **Smart Loudness** - maintains a constant volume for all elements of the audio experience to making them all sound softer, balanced or louder.

▪ **Voice Clarity** - boosts the speech in movies, video games and incoming communication from +0 through +12 dB (0 to 100%).

• **Reset Button** - restores the current profile to its default values.

• **On/Off Button** - allows you to turn on and off all Nahimic 2.5' s audio effects in one click.

• **EQ Profile Page** - by clicking the arrow button, you can also access a second page that contains the x10 bands EQ and EQ profiles.



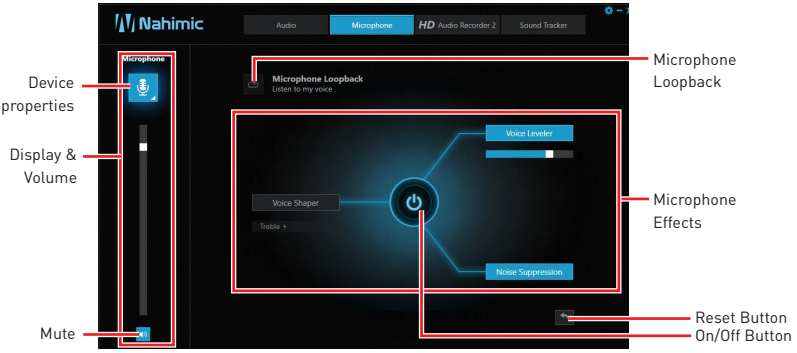

▪ **EQ Profiles** - allows you to choose between 6 EQ profiles to fit your audio experience

▪ **Custom EQ Profile** - you can change the x10 bands of the Custom EQ profile so as to make it fit your current needs.

▪ **x10 bands EQ** - x10 bands EQ, from 32Hz to 16KHz.

## Microphone Tab

From this tab, you can access all of Nahimic 2.5' s microphone effects and settings.




• **Display & Volume** - displays the type of audio recording device currently being used as input, as well as its current volume.

  ▪ **Mute** - mutes the current device.

  ▪ **Device properties** - allows you to boost the volume and modify the left/ right balance of microphone. Clicks on this button and a device properties panel will show.

• **Microphone Loopback** - turns the microphone loopback On/Off. In order to avoid any feedback (Larsen effect).

• **Microphone Effects** - allows you to separately control any of the 3 microphone effects.

  ▪ **Voice Shaper** - applies a filter to the voice.

  ▪ **Voice Leveler** - levels the volume of your voice in order to avoid any saturation and maintains a constant and clear communication. Voice Leveler can be adjusted with a 0 to 100% slider.

  ▪ **Noise Reduction** - removes the remaining sound that the Noise Gate has left on top of your words and sentences.

• **On/Off Button** - allows you to turn on and off all Nahimic 2.5' s microphone effects in one click.

• **Reset Button** - restores the default values.

## HD Audio Recorder 2

From this tab, you can access  the audio launchpad and HD Audio Recorder 2 settings.



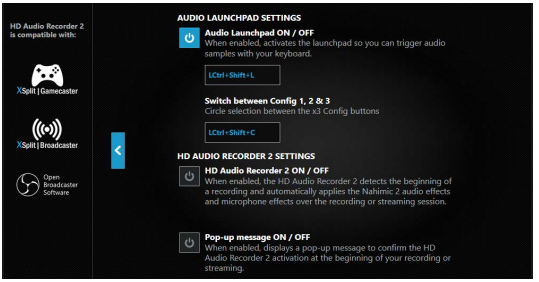

• **Audio Launchpad effects** - allows streamers to use prerecorded sounds during a livestream. These sounds can also be heard by viewers. This tool will allow you to create your true audio identity. That way, your livestreams will be more personal and animated. Thanks to the Audio Launchpad, you can trigger audio samples of your choice with your keyboard or gamepad during your streaming sessions. This tool is very simple to use: by clicking on a pad, you will trigger a sound.

▪ **Pad Properties** - every pad can be customized by clicking the properties button that will appear in its bottom right when hovering over it with your mouse.
On the Pad Properties panel you can choose:

- The sound assigned to each pad.
- The keyboard hotkey assigned to each pad.
- The color assigned to each pad.

▪ **Config 1, 2 & 3** - allows you to prepare 3 completely different configurations so as to adapt the Launchpad to the content you are streaming. Each configuration has 6 customizable pads. The 3 configurations are independent, meaning Config 1 cannot be used at the same time than Config 3.

• **Control Page** - by clicking the arrow button, you can access the control page.



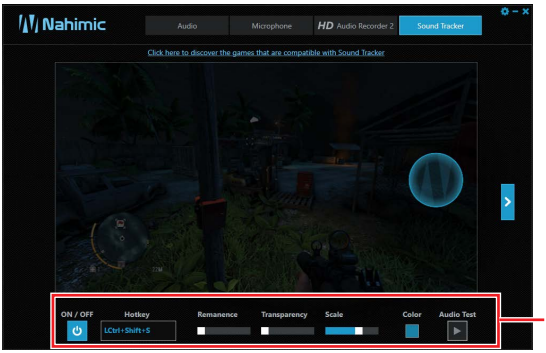

▪ **Audio Launchpad ON/OFF** - switches the Audio Launchpad on or off.

▪ **HD Audio Recorder 2** - The HD Audio Recorder 2 is, by default, automatically launched when a broadcast recording session is detected. The launch of the HD Audio Recorder 2 enables HD audio processing over a recording without any need for adjustments. You can disable the HD Audio Recorder 2 by switching this option OFF.

▪ **Pop-up message ON/OFF** - switches the pop-up message on or off.

## Sound Tracker

The Sound Tracker is an FPS oriented feature that provides a visual indication localizing the source of the strongest sound while in a game. The Sound Tracker captions the 5.1 and 7.1 sound streams processed by your audio system, and is displayed in all applications and games using DirectX 9, 9c, 10 and 11. Please remember Sound Tracker is only available if you are using an audio device that supports Nahimic 2.5 effects.




- **ON / OFF button and hotkey** - switches the Sound Tracker on or off.
- **Hotkey** - use the CTRL + SHIFT + S to turn ON / OFF the Sound Tracker.
- **Remanence** - adjust the remanence of the arrow. The higher the remanence is, longer will be the delay the arrow takes to disappear after the last sound was played.
- **Transparency** - allows you to adjust the transparency of the Sound Tracker, making it look more or less discrete.
- **Scale** - allows you to adjust the scale of the Sound Tracker, making it look bigger or smaller.
- **Color** - Click the colored square to open the color edition window of the arrow. You can apply the color you want to the arrow.
- **7.1 Audio Test** - launch a 7.1 audio sample allowing you to preview how the radar will react in your game.

# RAID Configuration

Below are the different types of a RAID.

**RAID 0** breaks the data into blocks which are written to separate hard drives. Spreading the hard drive I/O load across independent channels greatly improves I/O performance.

**RAID 1** provides data redundancy by mirroring data between the hard drives and provides enhanced read performance.

**RAID 10** uses four hard drives to create a combination of RAID 0 and 1 by forming a RAID 0 array from two RAID 1 arrays.

### RAID level comparison

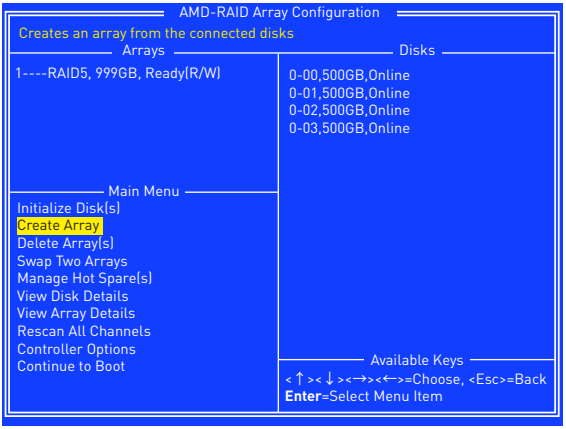
| | RAID 0 | RAID 1 | RAID 10 |
|---|---|---|---|
| Minimum # drives | 2 | 2 | 4 |
| Data protection | None | Excellent | Excellent |
| Read performance | Excellent | OK | OK |
| Write performance | Excellent | Good | Good |
| Capacity utilization | 100% | 50% | 50% |

***Important***

*All the information/ volumes/ pictures listed in your system might differ from the illustrations in this appendix.*

## Using AMD RAID Controller BIOS Configuration Utility

Enter BIOS and change the SATA Mode setting to **RAID Mode**, press **F10** to save the changing, and then reboot. When booting the system, press **Ctrl+R** when the BIOS banner displays. After entering AMD RAID Controller BIOS Configuration Utility, the following screen is displayed.



### Using the utility to accomplish the procedures

• **Initialize Disk(s)** - To initialize a new disk drive for data storage.

• **Create Array** - Create arrays at different RAID levels (depending on the license level for the system)

• **Delete Array(s)** - Delete an array.

• **Swap Two Arrays** - Change the array order, especially for the AMD-RAID bootable array.

• **Manage Hot Spare(s)** - Allows selection of global and dedicated hot spares.

• **View Disk Details** - View information about each disk.

• **View Array Details** - View information about each array.

• **Rescan All Channels** - Rescan all channels to detect new or removed disks and arrays.

• **Controller Options** - Change INT13 boot support, turn off Critical arrays or warning for Offline arrays while booting, or change the number of disks that can be spun-up when the system is powered-on.

• **Continue to Boot** - Exit the BIOS Configuration Utility and continue booting the system.

### Understanding the Colour Code

Colour codes indicate the type or status of information at the BIOS Configuration Utility.

• **White text** - Indicates an available option or informational text.

• **Black text, yellow highlighting** - Indicates an option or device for which action might be taken.

• **Yellow text** - Indicates information about the yellow-highlighted option.

• **Green text** - Indicates an item that has been selected.

• **Light blue text** - Indicates that the item cannot be selected.

• **Magenta text** - Indicates items that are related to spares or boot options.

• **Red text** - Indicates a failed virtual or physical disk or a warning. For example, informational text might be red if an option is not available.

## Initialize Disks

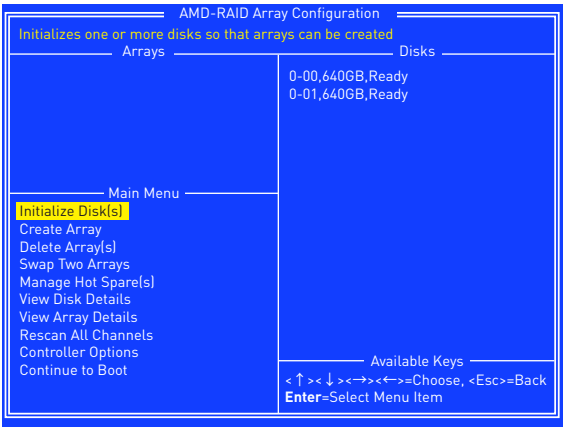
New disks and legacy disks must be initialized before they can be used to create an AMD-RAID array. Initialization writes AMD-RAID configuration information (metadata) to a disk.

***Important***

- *If a disk is part of an AMD-RAID array, the disk cannot be selected for initialization. To initialize the disk anyway, delete the AMD-RAID array. Data on the disk is deleted during initialization so ensure the correct disks are chosen to initialize.*
- *A legacy disk can contain valid data. When a legacy disk is initialized, all data on the disk is lost.*

### To initialize disks

1. At the **Main Menu**, use the **arrow keys** to highlight **Initialize Disk(s).**




2. Press **Enter** to select Initialize Disk(s).
3. Select the disks to initialize by pressing **Insert** key.
4. Press **Enter** to initialize the selected disks.
5. Press the **C** key to confirm the initialization.

## Create Arrays

Arrays can be created after the disks are initialized.

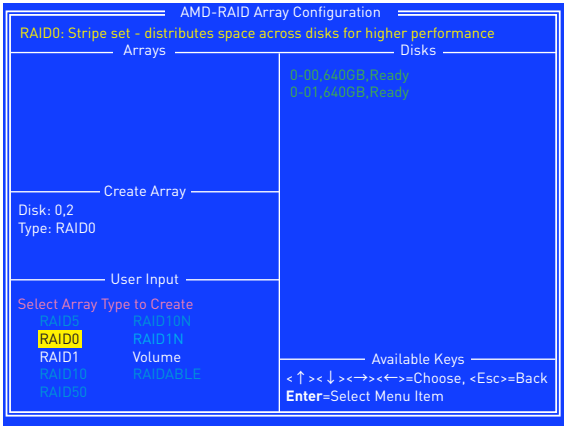
***Important***

- *For redundant arrays, the Create process is not finished until after the operating system and AMD-RAID OS drivers have been installed and the system has booted to the operating system. However, the arrays are immediately available to use for either a bootable array or a data array.*

- *If the system is booted from an AMD-RAID bootable array, the first array in the Arrays section must be the bootable array. The system boots only from the first array in the Arrays section. As necessary, use the Swap Two Arrays feature to swap arrays and place the bootable array in the first position.*

### To create an array

1. At the **Main Menu**, use the **arrow keys** to highlight **Create Array** and press **Enter**.
2. Select the disks with which to create the array by pressing **Insert** key.




3. Press **Enter** to include the selected disks in the array.
4. In the User Input section, use the **arrow keys** to select an array type. Only array types that can be created with the selected disks are available.
5. Press **Enter**.
6. Select an array size.
7. Press **Enter** when either the desired size or the maximum available size is reached.
8. Select a caching level using the **arrow keys** and press **Enter**.
9. Press **C** to confirm the array settings.

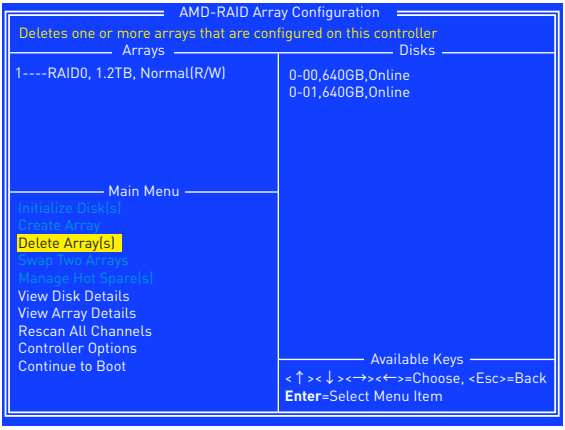
## Delete Arrays

***Important***

*Deleting an array permanently destroys all data that is on the array. This action cannot be undone and it is very unlikely the data can be recovered.*

### To delete an array

1. At the **Main Menu**, use the **arrow keys** to highlight **Delete Array** and press **Enter**.




2. Select the arrays to delete by pressing **Insert** key.
3. Press **Enter** to delete the selected arrays.
4. Press **C** to confirm the deletion.

## Swap Arrays

Use the Swap Two Arrays option to arrange arrays in a different order.

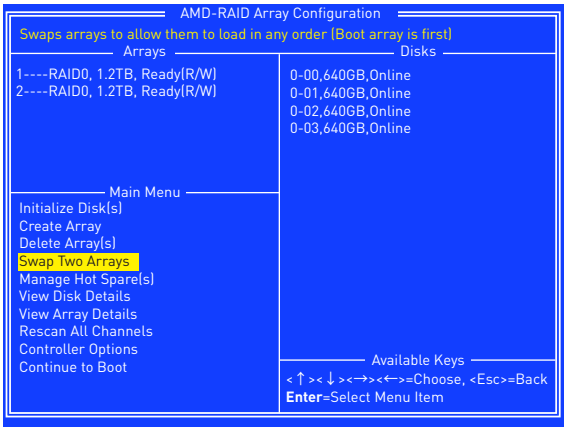
***Important***

*If more than one array is created, install the operating system to any of them. However, a small amount of boot information is always written to a disk(s) in the first array (Array 1) of the Array section, regardless on which array the operating system is installed.*

*If anything happens to a disk in Array 1, the system might not be able to boot. It is recommended that the user install the operating system on an AMD-RAID bootable array at a redundant RAID level such as RAID1 or RAID5 and swap the array into the first position, if it is not already Array 1.*

### To swap arrays

1. At the **Main Menu**, use the **arrow keys** to highlight **Swap Two Array** and press **Enter**.

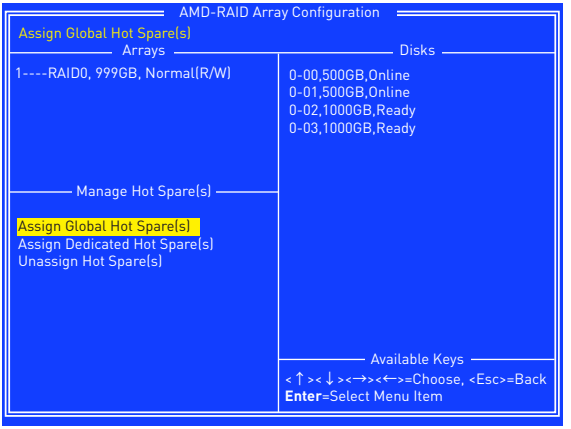



2. Select the arrays to swap by pressing **Insert** key.
3. Press **Enter** to swap the arrays.

## Manage Spares

This option allows the user to assign or unassign global or dedicated spares.

At the Main Menu, use the **arrow keys** to highlight **Manage Host Spare(s)** and press **Enter** to enter submenu.




### To assign global spares

1. At the Manage Host Spare(s) submenu, use the **arrow keys** to highlight **Assign Global Hot Spare(s)** and press **Enter**.
2. Select the disks to assign as global spares by pressing **Insert** key.
3. Press **Enter** to assign the selected disks as global spares.

### To assign dedicated spares

1. At the Manage Host Spare(s) submenu, use the **arrow keys** to highlight **Assign Dedicated Hot Spare(s)** and press **Enter**.
2. Select the disks to assign as dedicated spares by pressing **Insert** key.
3. Press **Enter** to assign dedicated spares.
4. Press **C** to continue.

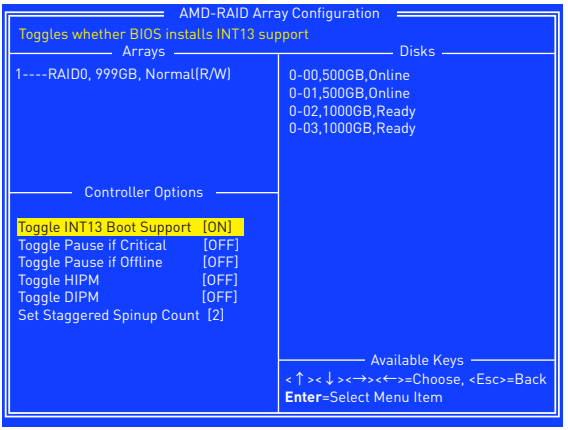
### To unassign spares

1. At the Manage Host Spare(s) submenu, use the **arrow keys** to highlight **Unassign Hot Spare(s)** and press **Enter**.
2. Select the disks to unassign as spares by pressing **Insert** key.
3. Press **Enter** to unassign the selected disks.
4. Press **C** to continue.

## Change the Controller Options

Controller Options allows the user to configure options for the boot sequence.

At the Main Menu, use the **arrow keys** to highlight **Controller Options** and press **Enter** to enter submenu.




## Booting the system from an array

This option allows the user to enable boot support.

It is recommended that this option be disabled only if the system is booted from another device.

1. At the Controller Options submenu, use the **arrow keys** to highlight **Toggle INT13 Boot Support**.
2. Press **Enter** to toggle between **On** and **Off**.

## Pausing the boot sequence for warning messages

When the Pause feature is enabled and an array goes critical, offline, or there is another problem with the system, the boot process stops and an error message is displayed on the screen. The user must press Enter to continue booting.

If the Pause feature is disabled, error messages are displayed briefly, but the system continues to boot.

1. At the Controller Options submenu, use the **arrow keys** to highlight **Toggle Pause if Critical** and press **Enter**.
2. Set pauses to the boot sequence for critical/ offline warnings. Use the **arrow keys** to highlight Toggle Pause if Critical/ Toggle Pause if Offline.
3. Press **Enter** to toggle between **On** and **Off**.

## Change the Staggered Spinup Count

Depending on a system's power supply load-rating, you might want to limit the number of disks that are spun-up together when a system is powered on.

1. At the Controller Options submenu, use the **arrow keys** to highlight **Set Staggered Spinup Count** and press **Enter**. The number within the brackets changes colour to indicate it is selected.
2. Use the **arrow keys** to change the number within the brackets. The minimum is 1 and the maximum is 8.
3. Press **Enter** to save the setting.

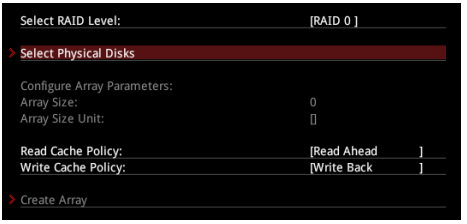
## Using UEFI to create a 2.2TB RAID

If you plan to create a RAID volume greater than 2.2TB, you can only manually create the RAID array in UEFI mode. The steps are described below.

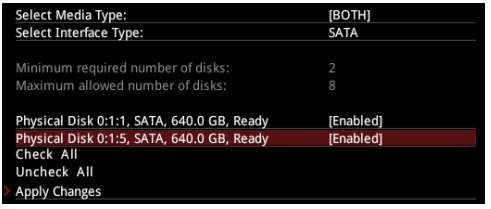
***WARNING***

*Create raid array will erase all the data stored on hard drives! Make sure to back up your files! There is no way to reverse the process!*

1. Power on and press **Delete** key to enter BIOS Setup menu.
2. Press **F7** to switch to Advanced mode from EZ mode.
3. Go to **BIOS > SETTINGS > Advanced > Integrated Peripherals > SATA Mode** and change setting to **RAID Mode**.
4. Go to **BIOS > SETTINGS > Advanced > Windows OS Configuration > Windows 10 WHQL Support** and change setting to **Enabled.**
5. Press **F10** to save configuration and exit, and then reboot and press **Delete** key to enter BIOS Setup menu.
6. Go to **BIOS > SETTINGS > Advanced > RAIDXpert2 Configuration Utility > Array Management > Create Array** sub-menu**.**




7. Select **RAID Level** for disk arrays.
8. Enter **Select Physical Disks** sub-menu, select member disks by changing the Physical Disk setting to **Enabled**.




9. Select **Apply Changes** to apply and go back to previous sub-menu.
10. Select **Create Array** to create the RAID volume.



## Installing RAID Driver

### New Operating System Installation

The following details the installation of the drivers while installing operating system.

1. During the operating system installation, after selecting the location to install Windows click on **Load driver** button to install a third party RAID driver.
2. When prompted, insert the USB flash drive with **AMD RAID Drivers** and then click **Browse**.

   ▪ To make an **AMD RAID Drivers** USB flash drive. Insert the MSI Driver Disc into the optical drive. Copy all the contents in \\Chipset\Packages\Drivers\SBDrv\RAID_AM4
3. Navigate to the directory containing the saved AMD RAID drivers, then click **OK**.
4. Select the **(rcbottom.inf)** driver, click **Next**.
5. When prompted, click **OK.**
6. Click **Browse** and navigate to the directory containing the saved AMD RAID drivers again, then click **OK**.
7. Select the **(rcraid.inf)** driver, click **Next**.
8. You have successfully installed the RAID driver, and Windows setup should continue.
9. Leave the disk/ USB drive in the computer until the system reboots itself. Windows setup will need to copy the files after the RAID volume is formatted, and Windows setup starts copying files.

### Existing Windows Driver Installation

1. Insert the MSI Driver Disc into the optical drive.
2. The Disc will auto-run and the setup screen will appear.
3. Under the **Driver tab**, click on AMD chipset drivers by your need. The AMD chipset drivers includes RAID Driver.
4. The drivers will be automatically installed.

### Confirming Windows Driver Installation

1. From Windows, open the Control Panel from My Computer followed by the System icon.
2. Choose the **Hardware tab**, then click the Device Manager tab.
3. Click the **+** in front of the RAID Controllers hardware type. The driver AMD RAID Controller should appear.

# Troubleshooting

Before sending the motherboard for RMA repair, try to go over troubleshooting guide first to see if your got similar symptoms as mentioned below.

### The power is not on.

• Connect the AC power cord to an electrical outlet securely.

• Check if all ATX power connectors like **ATX_PWR1, CPU_PWR1** are connected from the power supply to the motherboard?

• Some power supply units have a power button on the rear side, make sure the button is turned on.

• Check if the power switch cable is connected to **JFP1** pin header properly.

• Verify the **Clear CMOS** jumper **JBAT1** is set to **Keep DATA**.

• Test with another known working power supply of equal or greater wattage.

### The power is on, but no signal to monitor

• Connect the monitor power cord to a electrical outlet securely.

• Make sure the monitor is turned on.

• Select different inputs on the monitor.

• If 3 long beeps are heard, remove all memory modules and try to install only one memory module in the **DIMMA2** slot first and then restart the computer.

• If 1 long 2 short beeps are heard, remove and reinstall the graphics card and then restart the computer.

• Test with another known working graphics card.

### The computer does not boot after updating the BIOS

• Clear the CMOS.

• Use the secondary BIOS to bootup the system (Only for motherboard with Dual BIOS)

### Lost BIOS password

• Clear the CMOS, but that will cause you to lose all customized settings in the BIOS.

### There is no audio

• Adjust the volume.

• Connect the speakers/headphones to audio ports on the motherboard rear IO panel.

• Remove secondary speakers/ headphones, HDMI cables, USB audio devices.

• Test with another known working speaker or headphone.

### There is no network

• Make sure the network chipset driver has been installed.

• Verify if the network cable is properly connected and make sure the LAN port LEDs are properly illuminated.

• Verify your TCP/IP settings.

• Restart or reset your router.

• Test with another known working LAN cable.

### The USB device is not working

• Make sure your USB drive driver has been installed.

• Verify if USB device is listed in Windows® Device Manager.

• Connect the USB device to other USB port on the motherboard rear IO panel.

# Regulatory Notices

## FCC Compliance Statement

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Caution: Changes or modifications not expressly approved by the party responsible for compliance could void the user' s authority to operate the equipment.

Tested to comply with FCC standards
FOR HOME OR OFFICE USE

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

## CE Conformity

Products bearing the CE marking comply with one or more of the following EU Directives as may be applicable:
RED 2014/53/EU; Low Voltage Directive 2014/35/EU; EMC Directive 2014/30/EU; RoHS Directive 2011/65/EU.
Compliance with these directives is assessed using applicable European Harmonized Standards.
The point of contact for regulatory matters is MSI, MSI-NL Eindhoven 5706 5692 ER Son.

## B급 기기 (가정용 방송통신기자재)

이 기기는 가정용(B급) 전자파적합기기로서 주로 가정에서 사용하는 것을 목적으로 하며, 모든 지역에서 사용할 수 있습니다.

## クラスB情報技術装置

この装置は、クラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。取扱説明書に従って正しい取り扱いをして下さい

VCCI-B

## C-Tick Compliance

N1996

## Battery Information

European Union:

Batteries, battery packs, and accumulators should not be disposed of as unsorted household waste. Please use the public collection system to return, recycle, or treat them in compliance with the local regulations.

Taiwan:

廢電池請回收
For better environmental protection, waste batteries should be collected separately for recycling or special disposal.

California, USA:

The button cell battery may contain perchlorate material and requires special handling when recycled or disposed of in California.
For further information please visit:
http://www.dtsc.ca.gov/hazardouswaste/perchlorate/

CAUTION: There is a risk of explosion, if battery is incorrectly replaced.
Replace only with the same or equivalent type recommended by the manufacturer.

## Chemical Substances Information

In compliance with chemical substances regulations, such as the EU REACH Regulation (Regulation EC No. 1907/2006 of the European Parliament and the Council), MSI provides the information of chemical substances in products at:
http://www.msi.com/html/popup/csr/evmtprtt_pcm.html

## Environmental Policy

- The product has been designed to enable proper reuse of parts and recycling and should not be thrown away at its end of life.
- Users should contact the local authorized point of collection for recycling and disposing of their end-of-life products.
- Visit the MSI website and locate a nearby distributor for further recycling information.
- Users may also reach us at gpcontdev@msi.com for information regarding proper Disposal, Take-back, Recycling, and Disassembly of MSI products.

## WEEE (Waste Electrical and Electronic Equipment) Statement

ENGLISH
To protect the global environment and as an environmentalist, MSI must remind you that...
Under the European Union ("EU") Directive on Waste Electrical and Electronic Equipment, Directive 2002/96/EC, which takes effect on August 13, 2005, products of "electrical and electronic equipment" cannot

be discarded as municipal wastes anymore, and manufacturers of covered electronic equipment will be obligated to take back such products at the end of their useful life. MSI will comply with the product take back requirements at the end of life of MSI-branded products that are sold into the EU. You can return these products to local collection points.

DEUTSCH
Hinweis von MSI zur Erhaltung und Schutz unserer Umwelt
Gemäß der Richtlinie 2002/96/EG über Elektro- und Elektronik-Altgeräte dürfen Elektro- und Elektronik-Altgeräte nicht mehr als kommunale Abfälle entsorgt werden. MSI hat europaweit verschiedene Sammel- und Recyclingunternehmen beauftragt, die in die Europäische Union in Verkehr gebrachten Produkte, am Ende seines Lebenszyklus zurückzunehmen. Bitte entsorgen Sie dieses Produkt zum gegebenen Zeitpunkt ausschliesslich an einer lokalen Altgerätesammelstelle in Ihrer Nähe.

FRANÇAIS
En tant qu'écologiste et afin de protéger l'environnement, MSI tient à rappeler ceci...
Au sujet de la directive européenne (EU) relative aux déchets des équipement électriques et électroniques, directive 2002/96/EC, prenant effet le 13 août 2005, que les produits électriques et électroniques ne peuvent être déposés dans les décharges ou tout simplement mis à la poubelle. Les fabricants de ces équipements seront obligés de récupérer certains produits en fin de vie. MSI prendra en compte cette exigence relative au retour des produits en fin de vie au sein de la communauté européenne. Par conséquent vous pouvez retourner localement ces matériels dans les points de collecte.

РУССКИЙ
Компания MSI предпринимает активные действия по защите окружающей среды, поэтому напоминаем вам, что....
В соответствии с директивой Европейского Союза (ЕС) по предотвращению загрязнения окружающей среды использованным электрическим и электронным оборудованием (директива WEEE 2002/96/EC), вступающей в силу 13 августа 2005 года, изделия, относящиеся к электрическому и электронному оборудованию, не могут рассматриваться как бытовой мусор, поэтому производители вышеперечисленного электронного оборудования обязаны принимать его для переработки по окончании срока службы. MSI обязуется соблюдать требования по приему продукции, проданной под маркой MSI на территории ЕС, в переработку по окончании срока службы. Вы можете вернуть эти изделия в специализированные пункты приема.

ESPAÑOL
MSI como empresa comprometida con la protección del medio ambiente, recomienda:
Bajo la directiva 2002/96/EC de la Unión Europea en materia de desechos y/o equipos electrónicos, con fecha de rigor desde el 13 de agosto de 2005, los productos clasificados como "eléctricos y equipos electrónicos" no pueden ser depositados en los contenedores habituales de su municipio, los fabricantes de equipos electrónicos, están obligados a hacerse cargo de dichos productos al termino de su período de vida. MSI estará comprometido con los términos de recogida de sus productos vendidos en la Unión Europea al final de su periodo de vida. Usted debe depositar estos productos en el punto limpio establecido por el ayuntamiento de su localidad o entregar a una empresa autorizada para la recogida de estos residuos.

NEDERLANDS
Om het milieu te beschermen, wil MSI u eraan herinneren dat....
De richtlijn van de Europese Unie (EU) met betrekking tot Vervuiling van Electrische en Electronische producten (2002/96/EC), die op 13 Augustus 2005 in zal gaan kunnen niet meer beschouwd worden als vervuiling. Fabrikanten van dit soort producten worden verplicht om producten retour te nemen aan het eind van hun levenscyclus. MSI zal overeenkomstig de richtlijn handelen voor de producten die de merknaam MSI dragen en verkocht zijn in de EU. Deze goederen kunnen geretourneerd worden op lokale inzamelingspunten.

SRPSKI
Da bi zaštitili prirodnu sredinu, i kao preduzeće koje vodi računa o okolini i prirodnoj sredini, MSI mora da vas podesti da...
Po Direktivi Evropske unije ("EU") o odbačenoj ekektronskoj i električnoj opremi, Direktiva 2002/96/EC, koja stupa na snagu od 13. Avgusta 2005, proizvodi koji spadaju pod "elektronsku i električnu opremu" ne mogu više biti odbačeni kao običan otpad i proizvođači ove opreme biće prinuđeni da uzmu natrag ove proizvode na kraju njihovog uobičajenog veka trajanja. MSI će poštovati zahtev o preuzimanju ovakvih proizvoda kojima je istekao vek trajanja, koji imaju MSI oznaku i koji su prodati u EU. Ove proizvode možete vratiti na lokalnim mestima za prikupljanje.

POLSKI
Aby chronić nasze środowisko naturalne oraz jako firma dbająca o ekologię, MSI przypomina, że...
Zgodnie z Dyrektywą Unii Europejskiej ("UE") dotyczącą odpadów produktów elektrycznych i elektronicznych (Dyrektywa 2002/96/EC), która wchodzi w życie 13 sierpnia 2005, tzw. "produkty oraz wyposażenie elektryczne i elektroniczne " nie mogą być traktowane jako śmieci komunalne, tak więc producenci tych produktów będą zobowiązani do odbierania ich w momencie gdy produkt jest wycofywany z użycia. MSI wypełni wymagania UE, przyjmując produkty (sprzedawane na terenie Unii Europejskiej) wycofywane z użycia. Produkty MSI będzie można zwracać w wyznaczonych punktach zbiorczych.

TÜRKÇE
Çevreci özelliğiyle bilinen MSI dünyada çevreyi korumak için hatırlatır:
Avrupa Birliği (AB) Kararnamesi Elektrik ve Elektronik Malzeme Atığı, 2002/96/EC Kararnamesi altında 13 Ağustos 2005 tarihinden itibaren geçerli olmak üzere, elektrikli ve elektronik malzemeler diğer atıklar gibi çöpe atılamayacak ve bu elektonik cihazların üreticileri, cihazların kullanım süreleri bittikten sonra ürünleri geri toplamakla yükümlü olacaktır. Avrupa Birliği'ne satılan MSI markalı ürünlerin kullanım süreleri bittiğinde MSI ürünlerin geri alınması isteği ile işbirliği içerisinde olacaktır. Ürünlerinizi yerel toplama noktalarına bırakabilirsiniz.

ČESKY
Záleží nám na ochraně životního prostředí - společnost MSI upozorňuje...
Podle směrnice Evropské unie ("EU") o likvidaci elektrických a elektronických výrobků 2002/96/

EC platné od 13. srpna 2005 je zakázáno likvidovat "elektrické a elektronické výrobky" v běžném komunálním odpadu a výrobci elektronických výrobků, na které se tato směrnice vztahuje, budou povinni odebírat takové výrobky zpět po skončení jejich životnosti. Společnost MSI splní požadavky na odebírání výrobků značky MSI, prodávaných v zemích EU, po skončení jejich životnosti. Tyto výrobky můžete odevzdat v místních sběrnách.

MAGYAR
Annak érdekében, hogy környezetünket megvédjük, illetve környezetvédőként fellépve az MSI emlékezteti Önt, hogy ...
Az Európai Unió („EU") 2005. augusztus 13-án hatályba lépő, az elektromos és elektronikus berendezések hulladékairól szóló 2002/96/EK irányelve szerint az elektromos és elektronikus berendezések többé nem kezelhetőek lakossági hulladékként, és az ilyen elektronikus berendezések gyártói kötelessé válnak az ilyen termékek visszavételére azok hasznos élettartama végén. Az MSI betartja a termékvisszavétellel kapcsolatos követelményeket az MSI márkanév alatt az EU-n belül értékesített termékek esetében, azok élettartamának végén. Az ilyen termékeket a legközelebbi gyűjtőhelyre viheti.

ITALIANO
Per proteggere l'ambiente, MSI, da sempre amica della natura, ti ricorda che....
In base alla Direttiva dell'Unione Europea (EU) sullo Smaltimento dei Materiali Elettrici ed Elettronici, Direttiva 2002/96/EC in vigore dal 13 Agosto 2005, prodotti appartenenti alla categoria dei Materiali Elettrici ed Elettronici non possono più essere eliminati come rifiuti municipali: i produttori di detti materiali saranno obbligati a ritirare ogni prodotto alla fine del suo ciclo di vita. MSI si adeguerà a tale Direttiva ritirando tutti i prodotti marchiati MSI che sono stati venduti all'interno dell'Unione Europea alla fine del loro ciclo di vita. È possibile portare i prodotti nel più vicino punto di raccolta

## 日本JIS C 0950材質宣言

日本工業規格JIS C 0950により、2006年7月1日以降に販売される特定分野の電気および電子機器について、製造者による含有物質の表示が義務付けられます。
http://www.msi.com/html/popup/csr/cemm_jp.html
http://tw.msi.com/html/popup/csr_tw/cemm_jp.html

## India RoHS

This product complies with the "India E-waste (Management and Handling) Rule 2011" and prohibits use of lead, mercury, hexavalent chromium, polybrominated biphenyls or polybrominated diphenyl ethers in concentrations exceeding 0.1 weight % and 0.01 weight % for cadmium, except for the exemptions set in Schedule 2 of the Rule.

## Türkiye EEE yönetmeliği

Türkiye Cumhuriyeti: EEE Yönetmeliğine Uygundur

## Україна обмеження на наявність небезпечних речовин

Обладнання відповідає вимогам Технічного регламенту щодо обмеження використання деяких небезпечних речовин в електричному та електронному обладнані, затвердженого постановою Кабінету Міністрів України від 3 грудня 2008 № 1057.

## Việt Nam RoHS

Kể từ ngày 01/12/2012, tất cả các sản phẩm do công ty MSI sản xuất tuân thủ Thông tư số 30/2011/TT-BCT quy định tạm thời về giới hạn hàm lượng cho phép của một số hóa chất độc hại có trong các sản phẩm điện, điện tử"

## Wireless Radio Use

This device is restricted to indoor use when operating in the 2.4GHz, 5GHz frequency band.

Cet appareil doit être utilisé à l' intérieur.

당해 무선설비는 운용중 전파혼신 가능성이 있음.

この製品は、周波数帯域 2.4GHz, 5GHz で動作しているときは、屋内においてのみ使用可能です。

**NCC無線設備警告聲明**
工作頻率2.4GHz, 5GHz該頻段限於室內使用。
經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。
低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。前項合法通信，指依電信法規定作業之無線電通信。低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

**Products with radio functionality (EMF)**
This product incorporates a radio transmitting and receiving device. For computers in normal use, a separation distance of 20 cm ensures that radio frequency exposure levels comply with EU requirements. Products designed to be operated at closer proximities, such as tablet computers, comply with applicable EU requirements in typical operating positions. Products can be operated without maintaining a separation distance unless otherwise indicated in instructions specific to the product.

**Restrictions for products with radio functionality**
CAUTION: IEEE 802.11x wireless LAN with 5.15–5.35 GHz frequency band is restricted for indoor use only in all European Union member states, EFTA (Iceland, Norway, Liechtenstein), and most other European countries (e.g., Switzerland, Turkey, Republic of Serbia). Using this WLAN application outdoors might lead to interference issues with existing radio services.

**Radio frequency bands and maximum power levels**

| | |
|---|---|
| Features | :802.11 a/b/g/n/ac, BT |
| Frequency Range | :2.4GHz, 5GHz |
| Modulation | :FHSS, DSSS, OFDM |
| Power Output | :10, 20, 23 |
| Channel Band Width | :1, 5, 20 ,40 , 80MHz |

## 产品中有害物质的名称及含量

| 部件名称 | 有害物质 | | | | | |
|---|---|---|---|---|---|---|
| | 铅 (Pb) | 汞 (Hg) | 镉 (Cd) | 六价铬 (Cr(VI)) | 多溴联苯 (PBB) | 多溴二苯醚 (PBDE) |
| 印刷电路板组件* | × | ○ | ○ | ○ | ○ | ○ |
| 电池** | × | ○ | ○ | ○ | ○ | ○ |
| 外部信号连接头 | × | ○ | ○ | ○ | ○ | ○ |
| 线材 | × | ○ | ○ | ○ | ○ | ○ |

本表格依据 SJ/T 11364 的规定编制。

○: 表示该有害物质在该部件所有均质材料中的含量均在 GB/T 26572 规定的限量要求以下。

×: 表示该有害物质至少在该部件的某一均质材料中的含量超出 GB/T 26572 规定的限量要求，但所有部件都符合欧盟RoHS要求。

* 印刷电路板组件: 包括印刷电路板及其构成的零部件。

** 电池本体上如有环保使用期限标识，以本体标识为主。

■ 上述有毒有害物质或元素清单会依型号之部件差异而有所增减。

■ 產品部件本体上如有环保使用期限标识，以本体标识为主。

## 限用物質含有情況標示聲明書

| 單元 | 限用物質及其化學符號 | | | | | |
|---|---|---|---|---|---|---|
| | 鉛 (Pb) | 汞 (Hg) | 鎘 (Cd) | 六價鉻 ($Cr^{+6}$) | 多溴聯苯 (PBB) | 多溴二苯醚 (PBDE) |
| 電路板 | ○ | ○ | ○ | ○ | ○ | ○ |
| 電子元件 | — | ○ | ○ | ○ | ○ | ○ |
| 金屬機構件 | — | ○ | ○ | ○ | ○ | ○ |
| 塑膠機構件 | ○ | ○ | ○ | ○ | ○ | ○ |

備考1. “超出0.1 wt %” 及 “超出0.01 wt %” 係指限用物質之百分比含量超出百分比含量基準值。

備考2. “○” 係指該項限用物質之百分比含量未超出百分比含量基準值。

備考3. “—” 係指該項限用物質為排除項目。


## Copyright

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## Technical Support

If a problem arises with your system and no solution can be obtained from the user guide, please contact your place of purchase or local distributor. Alternatively, please try the following help resources for further guidance.

- Visit the MSI website for technical guide, BIOS updates, driver updates, and other information: http://**www.msi.com**
- Register your product at: http://**register.msi.com**

## Revision History

Version 1.0, 2018/03, First release
Version 1.1, 2018/03, Update OC knob
Version 1.2, 2018/10, Add new CPU
Version 1.3, 2019/04, Update M2_1 spec.