

# Spirit Q270-AS (SFF) User Guide



Rev 2.0. August 2018

## Please Read This First

Thank you for buying a Northern Micro Spirit Q270-AS computer. Northern Micro is committed to providing our customers with the best value on the market today. This means building the systems that meet your specific needs and supporting you with any issues that you may encounter.

All Northern Micro Spirit computers are assembled and tested in our manufacturing facility in Ottawa. A full Service & Support *network* across Canada stands behind every Spirit system we build.

The computer you have purchased is optimized for today's Operating Systems and applications; however, in the future, you may come upon situations that demand greater processing power or speed. Thanks to the latest advances in computer *hardware* technology, your Spirit Q270-AS is completely upgradable. Contact your Northern Micro Sales or Service representative for advice on how to upgrade your computer should the need arise.

The Spirit Q270-AS is [Energy Star](#) and [EPEAT](#) Gold certified. These environmental standards ensure that the computer can take advantage of energy saving features. Your Spirit Q270-AS is designed to run in sleep mode when user inactivity reaches 30 minutes. Your monitor is designed to run in display sleep mode when user inactivity reaches 15 minutes. You can "wake up" the computer or display by moving the mouse or by hitting any key on the keyboard. If connected to a network, Wake-on-LAN features can be enable to allow network administrators to wake up the computer remotely or on a given schedule. The Spirit Q270-AS is certified to meet power management criteria of the Microsoft logo program and is equipped with an [80 Plus](#) Gold power supply.

This manual has been prepared for both advanced and novice users. You will find general PC information as well as detailed specifications about the system you have purchased.



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- [Northern Micro Sales and Service & Support Departments can be reached at: 1-800-563-1007.](#)
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[Northern Micro](#) is one of Canada's leading *hardware* integrators and custom manufacturers of mid-range and high-end PCs and workstations.

Our mission is to provide customized high quality computer *hardware* products and services to meet the advanced technical needs of highly knowledgeable customers who seek to maximize their productivity.

To be fully responsive to our customers' wants and needs, we also:

- carry brand name computer products;
- supply *network peripheral* equipment and multi-media products;
- supply *server* / *storage* and printing solutions.

Through all facets of the operation, we are driven by our quality philosophy.

Northern Micro's quality policy, communicated within and beyond the corporation, reads as follows:



"Northern Micro is committed to delivering the ultimate customer satisfaction by providing reliable, innovative and flexible computing solutions and by continuously improving our product and service offerings".

In essence, Northern Micro, its management and its employees strive to be their customers' personal computer *hardware* specialists. Northern Micro's focus is on quality and customer satisfaction, and to provide products and services in complementary areas of specialization. We strongly believe in treating customers as members of our own family.

Additionally read our [Privacy Statement](#).

## Energy Star®

The Northern Micro Spirit Q270-AS is certified to meet [Energy Star](#) requirements. [ENERGY STAR](#) is a voluntary program that helps businesses and individuals save money and protect our climate through superior energy efficiency. Governments around the world, including Canada's, have embraced the Energy Star program. Through its partnerships with 18,000 private and public sector organizations, ENERGY STAR delivers the technical information and tools that organizations and consumers need to choose energy-efficient solutions and best management practices.

An ENERGY STAR qualified computer delivers substantial savings over a conventional computer. Power management is important to saving energy, especially since computers are often in use more hours per day than they used to be. ENERGY STAR power management features place computers (CPU, hard drive, etc.) into a low-power "sleep mode" after a designated period of inactivity. Simply hitting a key on the keyboard or moving the mouse awakens the computer in a matter of seconds. Additionally, ENERGY STAR qualified computers with networking capabilities have the ability to enable and disable Wake On LAN for Sleep mode, allowing greater use of low power modes without a loss of IT system maintenance capabilities.





Legend



▪ Important



▪ Caution



▪ Danger



▪ Note

## Contact Us

### Northern Micro Locations

Northern Micro is a Canada-wide operation with offices in Halifax, Québec City and Ottawa. Our headquarters and manufacturing plant are located in Ottawa.

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[quebec@nmicro.ca](mailto:quebec@nmicro.ca)

### On-Line Support

Northern Micro has been continuously investing time and resources to improve and provide you with a wide range of on-line support:

- The [Service and Support Site](#) where you can *download* the latest device drivers and *BIOS* upgrade; visit our PC Archives for specifications, manuals and; place service calls, etc.

## Unpacking your Computer

The Spirit Q270-AS is packed with corrugated cardboard to keep it in place during transit. To unpack it, cut the tape holding the flaps, fold back the flaps, and carefully slide the PC and the packing material up out of the box.

Here's what you will find in the box:

- *Mouse*
- Keyboard
- Power cord
- Spirit System



- Save all cartons and packing material for future shipping and transportation.



- To repack the PC, reverse the above instructions.

# Initial Computer Setup

## Setting up your Computer

After unpacking your computer and checking all the items in the box, you are ready to set up and start your computer.

- Place the computer on a flat space.
- Locate your *monitor* and computer in a dust and moisture-free area where there will be minimal glare on the screen.
- Connect the *monitor* cable to the video connector at the back of the computer.
- Connect the *mouse* and keyboard cables to the matching connectors at the back of the computer.
- Plug the *monitor* power cord into a dedicated electrical outlet or a surge-protected power bar.
- Plug the system power cord into the back of the system in the matching connector; then plug the cord into the power bar.

## Starting up the Computer for the first time

Turn on the devices in the following order:

1. *Monitor*
2. External devices (*USB* or other)
3. System power

## Front Panel

### USB Ports

There are two (2) additional **USB** 3.0 Ports on the Front panel of the computer.

### Audio Ports

For convenience there is 1 (one) Microphone port and 1 (one) stereo line out (headphone) port on the front panel.

### System Power Switch

The system power switch is located on the front of the case. You should always be certain that the power is turned off before modifying the **hardware** configuration in any way. Pushing the power switch for less than 4 seconds places the system into sleep mode (if enabled in Setup). When the power button is pressed for more than 4 seconds, the system enters the Soft-Off mode.

### Indicator Light

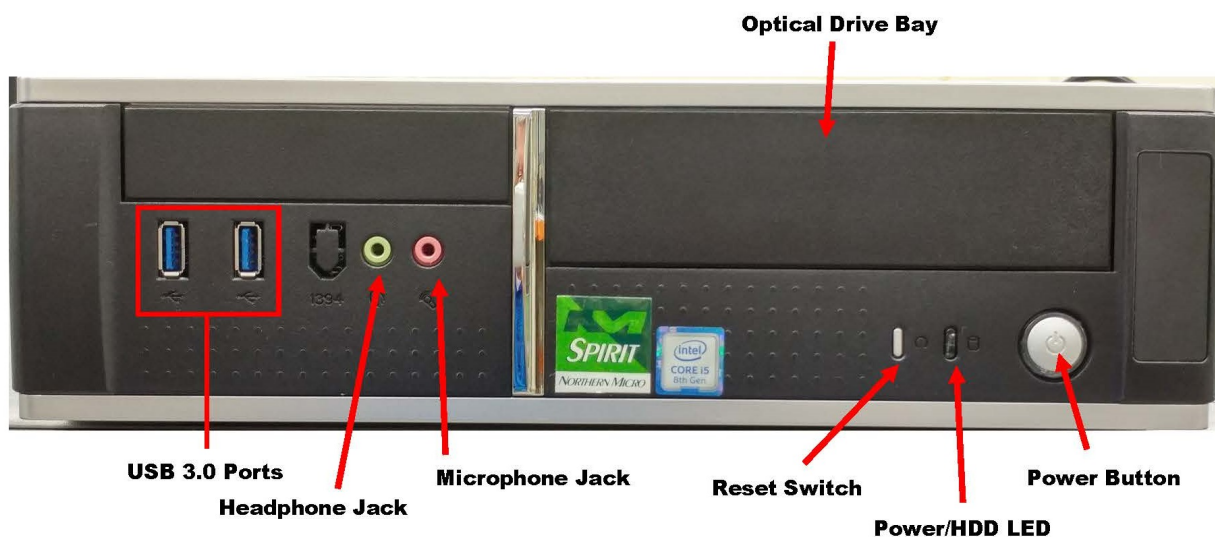
This light indicates the operation status of your computer.

### Reset Button

The reset button allows you to restart the system without turning the power off. If you encounter any problems while using unfamiliar **software** you can always restart quickly from the **RAM** (Random Access **Memory**.) You will have to use a pen, pencil or other small object to press the recessed Reset button. This feature was added to prevent accidental reset of the unit.



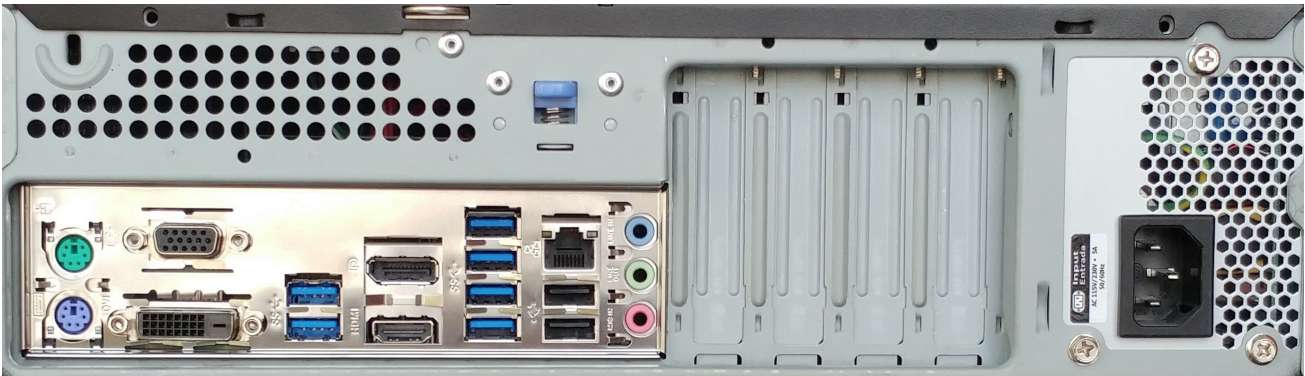
- Any data not saved to disk will be lost





## Back Panel

The back panel has all the connections that lead from the system unit to external peripherals and the power source.



- Turn off all power switches before connecting or disconnecting cables/wires!
- Ensure that cables/wires are attached to the *peripheral* device first and connect to the outlet unit later.
- Turn the system unit power switch off before you plug the power cable into an electrical outlet.



- See details on [Rear Panel Connectors](#).

## Removing the Case Cover

Removing the case cover from your Spirit computer requires no tools.

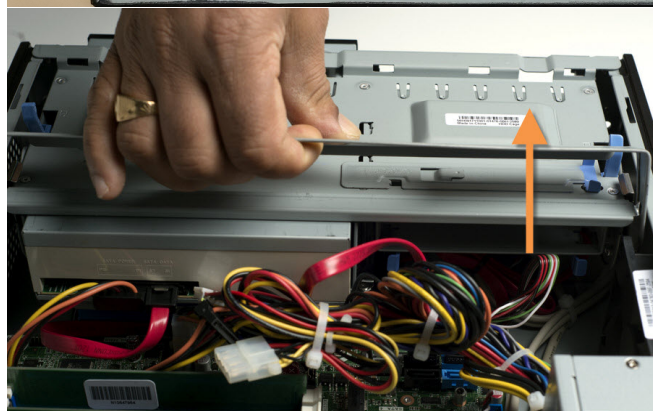
1. Press down on the release lever.



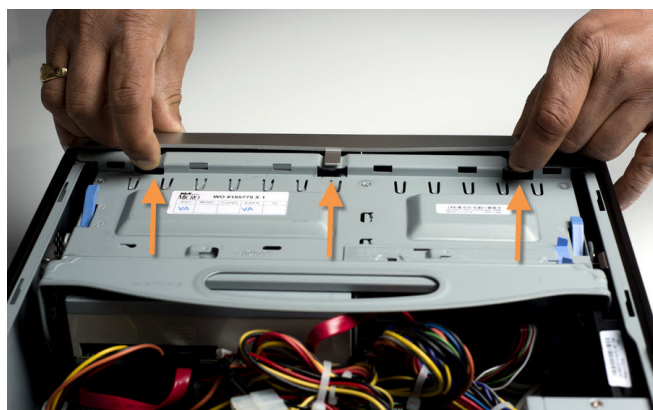
2. Slide the cover back towards the back.



3. To remove the front faceplate pull up the three tabs (see photo) and move them toward yourself.



4. For better visibility, remove the drive cage by pulling it up and toward yourself as shown in the picture below. Two blue thumb screws must first be removed at the front of the case.

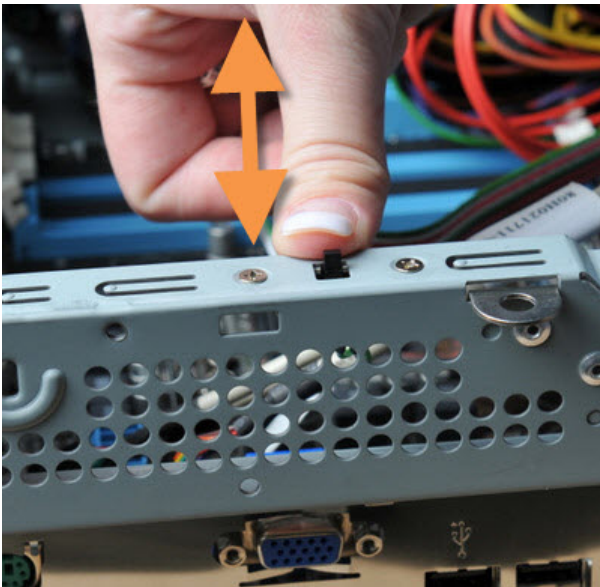


## Chassis Intrusion

The board supports a chassis security feature that detects if the chassis cover is removed. The security feature uses a mechanical switch on the chassis that attaches to the chassis intrusion header. When the chassis cover is removed, the mechanical switch is in the closed position.



- [The removal of the case cover while the system is powered on will register a Chassis Intrusion Alert detected by the Chassis Intrusion lead on the motherboard.](#)



# Power Supply Specifications

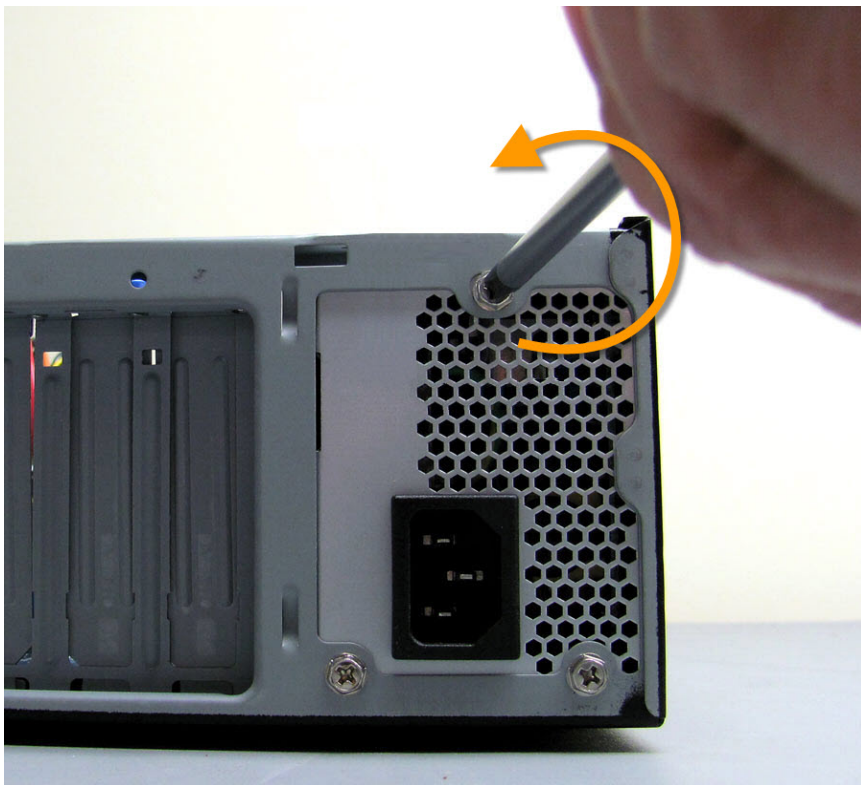
	SFF
Watts	300
Form Factor	TFX
UL, CSA, QPS	X
FCC, 1CES-003	X
+5, +12, +3.3	X
80 Plus Gold Certified X	X



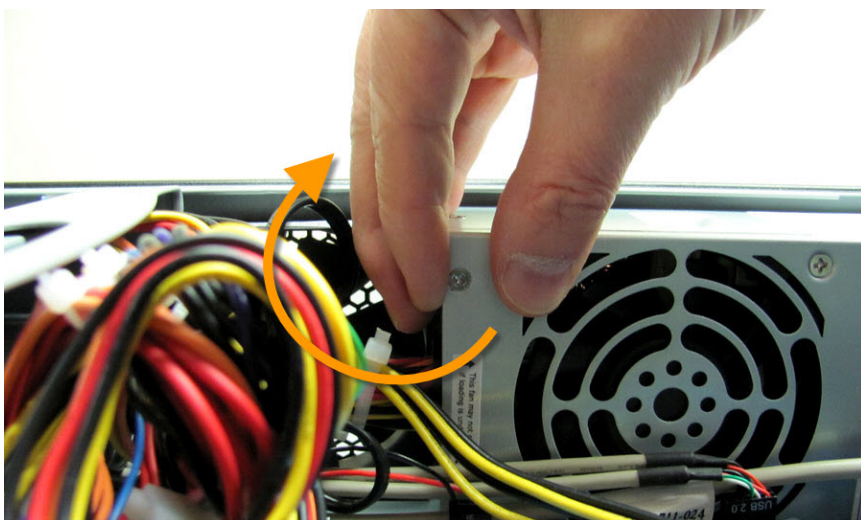


## Power Supply Removal

1. Remove the power supply screws.



2. Lift-out the power Supply.



## Final Power Connection Procedure

- Connect the 2 x 4 power supply cable to the matching 2 x 4 power connector on the board.
- Connect the 2 x 12 power supply cable to the matching 2 x 12 power connector on the board.



- Failure to use an appropriate power supply and / or not connecting the 12V (2x2) power connector to the desktop board may result in damage to the board, or the system may not function properly.

1. After all connections are made, close the system case cover.
2. Make sure that all switches are in the off position.
3. Connect the power supply cord into the power supply located on the back of your system case.
4. Connect the power cord onto a power outlet that is equipped with a *surge protector*.
5. You may then turn on your devices in the following order:
  - *Monitor*
  - External Devices
  - System Power
6. The power LED on the front panel of the system case will light, as will the *monitor* LED. The system will then run power-on tests. While the tests are running, additional messages will appear on the screen. If you do not see anything within 30 seconds from the time you turn on the power, the system may have failed a power-on test. Recheck your settings and connections or call Northern Micro for assistance.
7. During power-on, hold down the **del** key to enter *BIOS* setup.



## Before you Proceed

Take note of the following precautions before you install motherboard components or change any motherboard settings.



- Unplug the power cord from the wall socket before touching any component.
- Use a grounded wrist strap or touch a safely grounded object or to metal object, such as the power supply case, before handling components to avoid damaging them due to static electricity
- Hold components by the edges to avoid touching the ICs on them.
- Whenever you un-install any component, place it on a grounded anti-static pad or in the bag that came with the component.
- Before you install or remove any component, ensure that the power supply is switched off or the power cord is detached from the power supply. Failure to do so may cause severe damage to the motherboard, peripherals, and/or components.

## Onboard LED

The motherboard comes with a standby power LED that lights up to indicate that the system is ON or in sleep mode. This is a reminder that you should shut down the system and unplug the power cable before removing or plugging in any motherboard component. The system power LED lights up when you turn on the system power, and blinks when the system is in sleep mode.

## Product Highlights



### LGA1151 socket for Intel 7th Generation and 6th Generation Core i7® / Core i5® / Core i3® / Celeron Processors

This motherboard supports Intel® 7th Generation and 6th generation Core™ i7/i5/i3/Pentium®/Celeron® processors in the LGA1151 package, with graphics, *memory* and *PCI Express* controllers integrated to support onboard graphics *output* with dedicated chipsets, 2-channel (4 DIMM) DDR4 *memory* and 16 PCI Express 3.0/2.0 lanes for great graphics performance.

### Intel Q270 Chipset



The Intel® Q270 is a single-chipset design that supports 7th & 6th-generation Intel LGA1151 Core™ i7 / Core i5 / Core i3 / Pentium® / Celeron® processors. It provides improved performance by utilizing serial point-to-point links, allowing increased bandwidth and stability. It natively supports up to six USB 3.0 ports, six SATA 6Gbit/s ports, and PCIe 3.0 lane speed support for faster data retrieval. Intel® Q270 chipset also supports iGPU functionality, so you'll enjoy the very latest Intel integrated graphics performance.



### Dual-Channel DDR4 2133MHz support

The motherboard supports DDR4 *memory* that features data transfer rates of 2400 / 2133 *MHz* to meet the higher *bandwidth* requirements of the latest 3D graphics, *multimedia*, and *Internet* applications. The dual-channel DDR4 architecture enlarges the *bandwidth* of your system *memory* to boost system performance.



### Native SATA 6.0 Gb/s support

The Intel® Q270 Express Chipset natively supports next-generation Serial ATA (*SATA*) *storage interface*. This motherboard delivers up to 6.0 Gb/s data transfer rates. Additionally, get enhanced scalability, faster data retrieval, double the *bandwidth* of current bus systems.



### Complete USB 3.0 Integration

ASUS facilitates strategic *USB* 3.0 accessibility for both the front and rear panel – 10 USB3.0 ports in total. Experience the latest plug & play connectivity at speeds up to 10 times faster than *USB* 2.0. This motherboard affords greater convenience to high speed connectivity.

### Intel vPro

Intel® vPro™ Technology allows IT organizations to remotely manage corporate PCs, even when they are powered off or with non-functional operating systems. It features Intel® Active Management Technology



and offers a lighter-weight form of virtualization to audit all Intel® AMT-based platforms in a networked environment. PCs with Intel® vPro™ Technology allow IT departments to remotely retrieve assets and hardware/software inventories, contain security threats, resolve system problems, and increase the uptime of desktops with lower maintenance costs.

### PCI Express 3.0



**PCI Express**® 3.0 (PCIe 3.0) is the latest **PCI Express** bus standard with improved encoding schemes that provide twice the performance of the current PCIe 2.0. The total **bandwidth** for a x16 link reaches a maximum of 32Gb/s, double the 16 Gb/s of PCIe 2.0 (in x16 mode). As such, PCIe 3.0 provides users an unprecedented data speeds, combined with the convenience and seamless transition offered by complete backward compatibility with PCIe 1.0 and PCIe 2.0 devices. PCIe 3.0 will become a must-have feature for users who wish to improve and optimize graphic performance, as well as have the latest technology available to them.

***\* PCI 3.0 speed is supported by Intel® 3rd and 4th generation Core™ processors***



### Innovative ASUS features

**ASUS UEFI BIOS**

**ASUS exclusive interface**

**Quick and Easy information for enhanced system control**

### ASUS 5X Protection III

The Asus Prime Q270M-C motherboard is engineered with industry-leading 5X Protection III, employing the finest components, excellent circuit design, and exacting standards to guarantee the quality and long-term durability of your motherboard. This includes:



- SafeSlot Core - Fortified PCIe with solid soldering
- LANGuard - Pumped-up Throughput. 2.5X higher surge tolerance
- Overvoltage Protection - Excellent circuit-protecting power design
- DIGI + VRM - Precision control for stable power
- Stainless-Steel Back I/O - 3X corrosion resistance for greater durability



Item #	Connectors / Jumpers/ Slots / LED	Item #	Connectors / Jumpers/ Slots / LED
1	CPU and Chassis fan connectors (4-pin CPU_Fan, 4-pin CHA_FAN 1/2)	12	USB 2.0 connectors (10-1 pin USB78)
2	ATX power connectors (24-pin EATXPWR, 8-pin EATX12V)	13	Clear RTC RAM (2-pin CLRTC)
3	M.2 socket 3	14	LPC Debug header
4	Intel LGA1151 CPU socket	15	LPT connector (26-1 pin LPT)
5	DDR4 DIMM slots	16	Serial port connector (10-1 pin COM)
6	Intel Q270 Serial ATA 6.0Gb/s connectors (7-pin SATA6G_1~6 )	17	Front Panel audio connector (10-1 pin AAFP)
7	USB 3.0 connector (20-1 pin USB3_12, USB3_910)	18	PCI slot
8	System panel connector (10-1 pin F_Panel)	19	Mono out header (2-pin MONO_OUT)
9	Speaker connector (4-pin SPEAKER)	20	PCI Express 3.0/2.0 x1 slots
10	Chassis Intrusion header (4-1 pin CHASSIS)	21	PCI Express 3.0/2.0 x16 slots
11	Intel ME jumper (3-pin DIS_ME)		



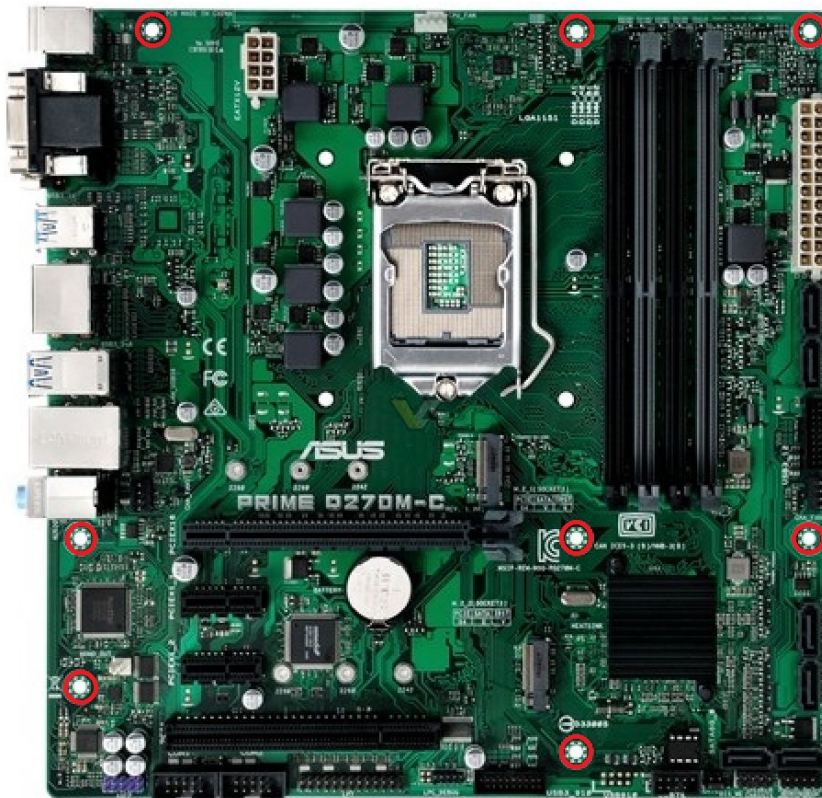
## Motherboard Installation and Removal

Before removing the Motherboard, ensure the power is off by checking the indicator light. (See section [Before you proceed](#))

When lit, the onboard LED indicates that the system is ON, in sleep mode or in soft-off mode, not powered OFF.

### Placement Direction

When installing the motherboard, make sure that you place it into the chassis in the correct orientation. The edge with External ports goes to the rear part of the chassis as indicated on the left side of the photo below.



- Place eight screws into the holes indicated by the red circles to secure the motherboard to the chassis. DO NOT overtighten the screws! Doing so can damage the motherboard.



- Before you start, always make sure the computer is turned off. Observe standard static-electricity discharge precautions. You can damage your expansion card, the motherboard, or both, by not being careful about this.



1. Unplug the system's power cable from the back of the unit.
2. Remove the case cover.(Please see instruction on cover removal [Removing the Case Cover](#).)
3. Disconnect all cables and wires connected to the motherboard and expansion cards
4. Remove all expansion cards and remove all screws holding the motherboard in place.
5. Lift the motherboard out by pulling it up and away from the back of the case.



- 
- Take note of where and how cables are connected for re-installation
-

## Specifications Summary

### Prime Q270M-C motherboard specifications summary

<b>CPU</b>	LGA1151 socket for 7th/6th Generation Intel® Core™ i7/ i5/ i3/Pentium®/ Celeron® Processors* Supports 14nm CPU Supports Intel® Turbo Boost Technology 2.0** * The Intel® Turbo Boost Technology 2.0 support depends on the CPU types. ** Refer to <a href="http://www.asus.com">www.asus.com</a> for Intel® CPU support list.
<b>Chipset</b>	Intel® Q270 Chipset
<b>Memory</b>	4 x DIMM, max. 64GB, DDR4 2400MHz, non-ECC, unbuffered memory Dual-channel memory architecture Supports Intel® Extreme Memory Profile (XMP) * Hyper DIMM support is subject to the physical characteristics of individual CPUs. Please refer to Memory QVL for details. ** Refer to <a href="http://www.asus.com">www.asus.com</a> for the latest Memory QVL (Qualified Vendors List).
<b>Graphics</b>	Integrated graphics processor Multi-VGA output support: DP/HDMI/DVI-D/D-Sub ports - Supports DisplayPort with max. resolution of 4096 x 2304 @60Hz - Supports HDMI with max. resolution of 4096x2160@24Hz / 2560x1600@60Hz - Supports DVI-D with max. resolution of 1920 x 1200 @60Hz - Supports D-Sub with max. resolution of 1920 x 1200 @60Hz Support up to three displays simultaneously Support Intel® InTru™ 3D, Quick Sync Video, Intel® Clear Video HD Technology, and Intel® Insider™ Maximum shared memory of 1024 MB
<b>Expansion slots</b>	1 x PCI Express 3.0/2.0 x16 slot 2 x PCI Express 3.0/2.0 x1 slots 1 x PCI slot
<b>LAN</b>	Intel® I219LM Gigabit LAN Controller
<b>Audio</b>	Realtek ALC887 8-channel High Definition Audio CODEC - Supports jack-detection and front panel jack-retasking
<b>USB</b>	10 x USB 3.0/2.0 ports (4 ports at midboard, 6 ports at back panel) 4 x USB 2.0/1.1 ports (2 ports at midboard, 2 ports at back panel)

Storage	<p>Intel® Q270 Chipset:</p> <ul style="list-style-type: none"> <li>- 6 x Serial ATA 6.0 Gb/s connectors</li> <li>- 2 x M.2 Sockets with M Key, type 2242/2260/2280 storage devices with IRST support, (M.2_1 @ SATA &amp; PCIE mode, M.2_2 @ PCIE mode)</li> <li>- Ready for Intel® Optane Memory*</li> <li>- Supports Raid 0,1,5,10</li> </ul> <p>* Intel® Optane Technology is only supported when using 7th Generation Intel® Processors. Before using Intel® Optane memory modules, ensure that you have updated your motherboard drivers and BIOS to the latest version from ASUS support website.</p>
ASUS unique features	<p><b>Dependable stability:</b></p> <p><b>ASUS 5X PROTECTION III:</b></p> <ul style="list-style-type: none"> <li>- SafeSlot Core - Fortified PCIe with solid soldering</li> <li>- LANGuard - Surge-protected networking</li> <li>- Overvoltage Protection - World-class circuit-protecting power design</li> <li>- ESD Guards - Electrostatic discharge protection</li> <li>- Stainless Steel Back I/O - 3X corrosion-resistance for greater durability</li> </ul> <p><b>Superb performance:</b></p> <p><b>UEFI BIOS:</b></p> <ul style="list-style-type: none"> <li>- Most advanced options with fast response time</li> </ul> <p><b>Easy PC DIY:</b></p> <p><b>Safe motherboard mounting</b></p> <ul style="list-style-type: none"> <li>- Component-free areas to minimize damage risk</li> </ul> <p><b>Q-Design</b></p> <ul style="list-style-type: none"> <li>- ASUS Q-DIMM</li> <li>- ASUS Q-Slot</li> </ul>
Rear panel I/O ports	<p>1 x PS/2 keyboard port (purple)</p> <p>1 x PS/2 mouse port (green)</p> <p>1 x DVI-D port</p> <p>1 x D-Sub port</p> <p>1 x HDMI port</p> <p>1 x DisplayPort</p> <p>1 x LAN (RJ-45) port</p> <p>2 x USB 2.0/1.1 ports</p> <p>6 x USB 3.0/2.0 ports</p> <p>3 x Audio jacks support 8-channel audio output*</p> <p>* Use a chassis with HD audio module in the front panel to support an 8-channel audio output.</p>
Internal connectors/ switches/ buttons	<p>2 x USB 3.0/2.0 connectors support additional 4 USB 3.0/2.0 ports</p> <p>1 x USB 2.0/1.1 connector supports additional 2 USB 2.0/1.1 ports</p> <p>6 x SATA 6.0 Gb/s connectors</p> <p>1 x CPU fan connector</p> <p>2 x Chassis fan connectors</p> <p>1 x Front panel audio connector (AAFP)</p> <p>1 x System panel connector</p>

<b>Internal connectors/ switches/ buttons</b>	1 x Speaker connector 1 x LPT header 2 x COM connectors 1 x MONO-out header (with Amp IC) 1 x Chassis intrusion header 1 x Clear CMOS header 1 x 24-pin ATX power connector 1 x 8-pin ATX 12V power connector 1 x DIS ME jumper 1 x LPC debug header TPM 2.0 IC Onboard
<b>BIOS features</b>	128 Mb Flash ROM, UEFI AMI BIOS, PnP, DMI3.0, WfM2.0, SM BIOS 3.0, ACPI 5.1, Multi-language BIOS, ASUSbackup, LOGO flash, ME update, DMI value edit, BIOS value edit
<b>Manageability</b>	WfM 2.0, DMI 3.0, WOL, WOR, PXE
<b>Support DVD</b>	Drivers
<b>Operating systems</b>	Windows® 10 (64-bit) Windows® 8.1 (64-bit)* Windows® 7 (64-bit/32-bit)* * Windows® 8.1 (64-bit) and Windows® 7 (32/64-bit) are only supported when using 6th Generation Intel® Processors.
<b>Form factor</b>	mATX form factor: 9.6"x 9.6" (24.4cm x 24.4cm)

## Expansion Slots

In the future, you may need to install expansion cards. The following sub-sections describe the slots and the expansion cards that they support.



- Unplug the power cord before adding or removing expansion cards. Failure to do so may cause you physical injury and damage motherboard components.

### Installing an Expansion Card

1. Before installing the expansion card, read the documentation that came with it and make the necessary *hardware* settings for the card.
2. Remove the system unit cover (if your motherboard is already in a chassis).
3. Remove the bracket opposite the slot that you intend to use.
4. Align the card connector with the slot and press firmly until the card is completely seated on the slot.
5. Secure the card to the chassis.
6. Replace the system cover.

### Configuring an expansion card

After installing the expansion card, configure it by adjusting the *software* settings.

1. Turn on the system and change the necessary *BIOS* settings, if any. See [BIOS setup](#) for more details.
2. Assign an IRQ to the card.
3. Install the *software* drivers for the expansion card.



- When using PCI cards on shared slots, ensure that the drivers support "Share IRQ" or that the cards do not need IRQ assignments. Otherwise, conflicts will arise between the two PCI groups, making the system unstable and the card inoperable.

### PCI Slot

The PCI slots support cards such as a LAN card, *SCSI* card, *USB* card, and other cards that comply with PCI specifications.

### PCI Express 3.0/2.0 x1 slots

This motherboard supports *PCI Express* x1 *network* cards, *SCSI* cards, and other cards that comply with the *PCI Express* specifications.

### PCI Express 3.0/2.0 x16 slot

This motherboard has a *PCI Express* 3.0 x16 slot that supports *PCI Express* x16 3.0/2.0 graphic cards complying with the PCI Express specifications.

### IRQ Assignments for this motherboard

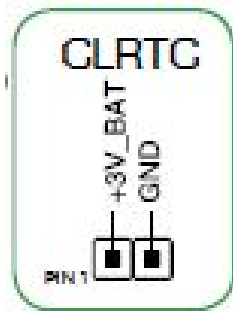
	A	B	C	D
HD Audio	shared	–	–	–
XHCI Controller	shared	–	–	–
SATA Controller	shared	–	–	–
LAN1 I219LM	shared	–	–	–
PCIEx16	shared	–	–	–
PCIEx1_1	–	–	shared	–
PCIEx1_2	–	–	–	shared
PCI1	–	shared	–	–
M.2_1	shared	–	–	–
M.2_2	shared	–	–	–



## Jumpers

### Clear RTC RAM (2-pin CLRTC)

This jumper allows you to clear the Real Time Clock (RTC) *RAM* in *CMOS*. You can clear the *CMOS memory* of date, time, and system setup parameters by erasing the *CMOS* RTC *RAM* data. The onboard button cell battery powers the *RAM* data in *CMOS*, which includes system setup information such as system passwords.



- Risk of explosion if battery is replaced by an incorrect type. Dispose of batteries according to the manufacturer's instructions.

### To Erase the RTC RAM

1. Turn OFF the computer and unplug the power cord
2. Use a metal object such as a screwdriver to short the two pins.
3. Plug the power cord in and turn ON the computer.
4. Hold down the **DEL** key during the *boot* process and enter the *BIOS* setup to re-enter the data.



- If the steps above do not help, remove the onboard battery and short the two pins again to clear the CMOS RTC RAM data. After clearing the CMOS, reinstall the battery.
- You do not need to clear the RTC when the system hangs due to overclocking. For system failure due to overclocking, use the CPU Parameter Recall (C.P.R.) feature. Shut down and reboot the system, then the BIOS automatically resets parameter settings to default values.

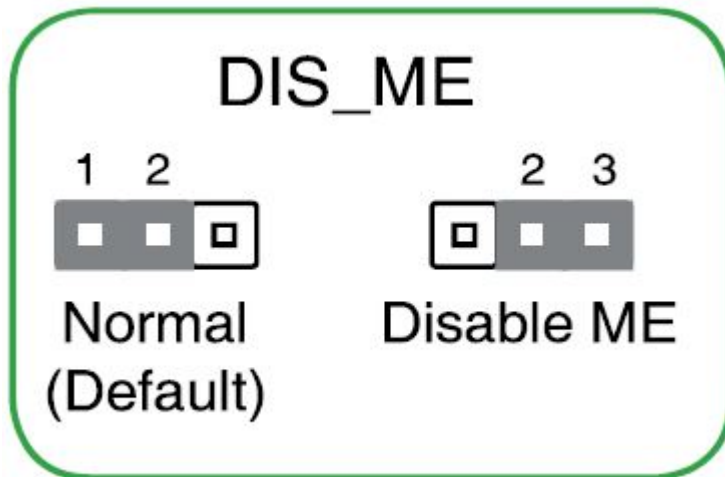
### Chassis Intrusion header (4-pin CHASSIS)

This header is for the chassis-mounted intrusion detection sensor or switch. The chassis intrusion sensor or switch sends a high-level signal when the chassis cover is removed. The

signal is then generated as a chassis intrusion event.

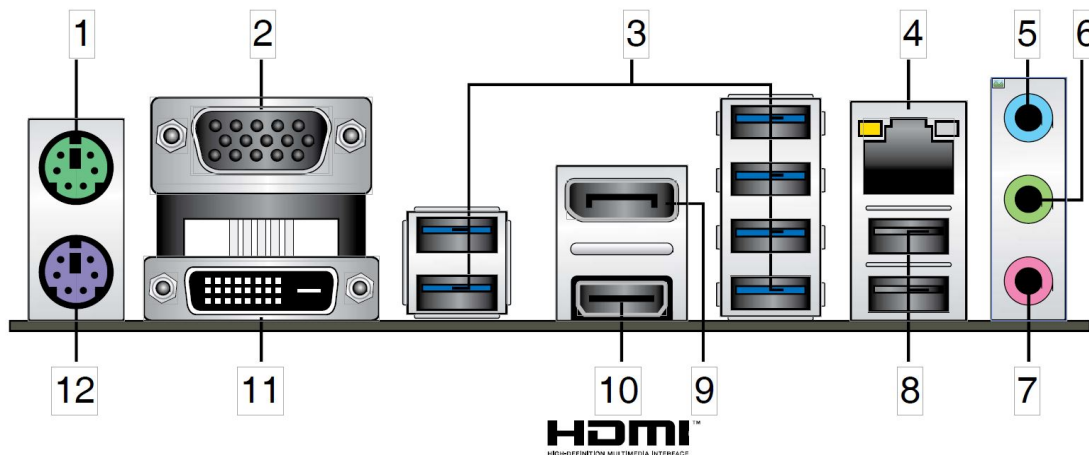
### Intel ME jumper (3-pin DIS\_ME)

This jumper allows you to enable or disable the Intel ME function. Set this jumper to pins 1-2 to enable (default) the Intel ME function and to pins 2-3 to disable it.



- [Disable the Intel ME function only when you want to update it.](#)

## Rear Panel Connectors



1. **PS/2 *Mouse* Port (green).** This port is for a PS/2 *mouse*.
2. **Video Graphics Adapter (VGA) port.** This 15-pin is for a VGA *monitor* or other VGA-compatible devices.
3. **USB 3.0 ports 6.** These 9-pin Universal Serial Bus (USB) ports connect to USB 3.0/2.0 devices.



USB 3.0 devices can be used for data *storage* only.

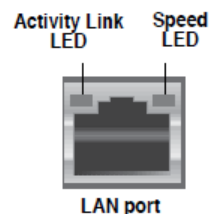
We strongly recommend that you connect USB 3.0 devices to USB 3.0 ports for faster and better performance for your USB 3.0 devices.

Due to the design of the Intel® 200 series chipset, all USB devices connected to the USB 2.0 and USB 3.0 ports are controlled by the xHCI controller. Some legacy USB devices must update their firmware for better compatibility.

4. **LAN (RJ-45)port.** This port allows Gigabit connection to a Local Area *Network* (LAN) through a *network* hub. Refer to the table below for the LAN port LED indications.

### LAN port LED indications

Activity/Link LED		Speed LED	
Status	Description	Status	Description
Off	No link	OFF	10Mbps connection
Orange	Linked	ORANGE	100Mbps connection
Orange (Blinking)	Data activity	GREEN	1Gbps connection
Orange (Blinking then steady)	Ready to wake up from S5 mode		



5. **Line In port (light blue).** This port connects the CD, *DVD* player, or other audio sources.

6. **Line Out port (lime).** This port connects to a headphone or a speaker. In 4.1, 5.1 and 7.1-channel configurations, the function of this port becomes Front Speaker Out.
7. **Microphone port (pink).** This port connects a microphone.



- Refer to the audio configuration table below for the function of the audio ports in 2.1, 4.1, 5.1 or 7.1 channel configuration.

Port	Headset 2.1-channel	4.1-channel	5.1-channel	7.1-channel
Light Blue (Rear panel)	Line In	Rear Speaker Out	Rear Speaker Out	Rear Speaker Out
Lime (Rear panel)	Line Out	Front Speaker Out	Front Speaker Out	Front Speaker Out
Pink (Rear panel)	Mic In	Mic In	Bass/Center	Bass/Center
Lime (Front panel)	-	-	-	Side Speaker Out



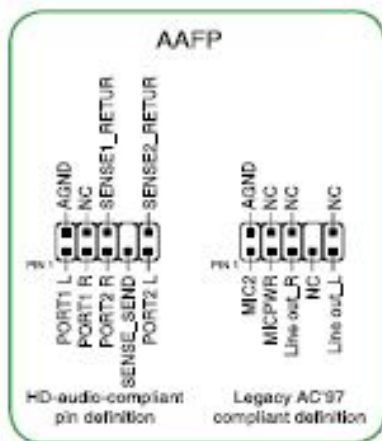
- To configure an 7.1-channel audio *output*: Use a chassis with HD audio module in the front panel to support a 7.1-channel audio *output*.

8. **USB 2.0 ports.** These 4-pin Universal Serial Bus (*USB*) ports are available for connecting *USB* 2.0/1.1 devices.
9. **DisplayPort** . This port is for a DisplayPort compatible device.
10. **HDMI Port.** This port is for a High-Definition *Multimedia Interface* (HDMI) connector, and is HDCP compliant allowing playback of HD *DVD*, Blu-ray and other protected content.
11. **DVI-D port.** This port is for a *DVI*-D compatible device. *DVI*-D can't be converted to *output* RGB Signal to CRT and isn't compatible with *DVI*-I.
12. **PS/2 Keyboard Port (purple).** This port is for a PS/2 keyboard.

## Internal Connectors

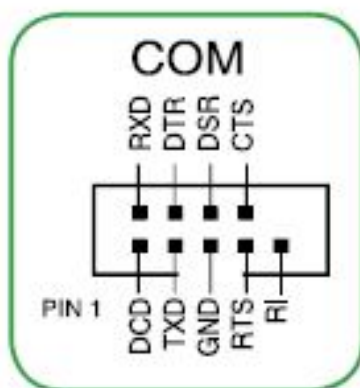
### Front Panel Audio Connector (10-1pin AAFP)

This connector is a chassis-mounted front panel audio I/O module that supports either HD Audio or the legacy AC'97 audio standard. Connect one end of the front panel audio I/O module cable to this connector.



### Serial Port Connector (10-1 pin COM1)

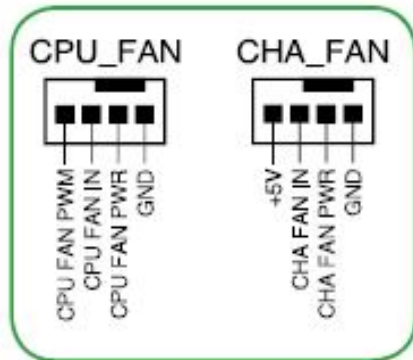
This connector is for a serial (COM) port. Connect the serial port module cable to this connector, then install the module to a slot opening at the back of the system chassis.



- The COM module is purchased separately.

## CPU and Chassis Fan Connectors (4-pin CPU\_FAN, 4-pin CHA\_FAN1/2)

Connect the fan cables to the fan connectors on the motherboard, ensuring that the black wire of each cable matches the ground pin of the connector.



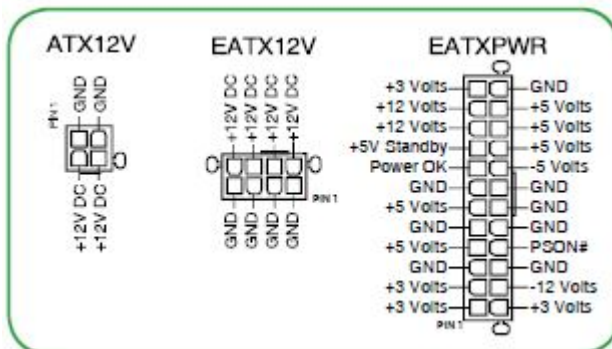
- Do not forget to connect the fan cables to the fan connectors. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! Do not place jumper caps on the fan connectors!



- The CPU\_FAN connector supports a CPU fan of maximum 1A (12W) fan power.

## ATX Power Connectors (24-pin EATXPWR, 8-pin EATX12V)

These connectors are for ATX power supply plugs. The power supply plugs are designed to fit these connectors in only one orientation. Find the proper orientation and push down firmly until the connectors completely fit.



- For a fully configured system we recommend that you use a power supply



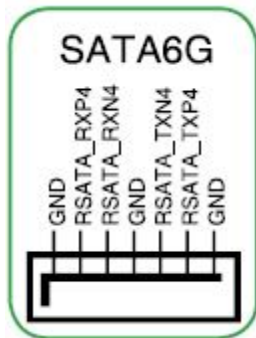


unit (PSU) that complies with ATX12 V Specification 2.0 (or later version) and provides minimum power of 300W. This PSU type has 24-pin and 4-pin power plugs.

- DO NOT forget to connect the 4-pin / 8-pin ATX+12V power plug. Otherwise, the system will not *boot* up.
  - We recommend that you use a PSU with higher power *output* when configuring a system with more power-consuming devices. The system may become unstable or may not *boot* up if the power is inadequate.
- 

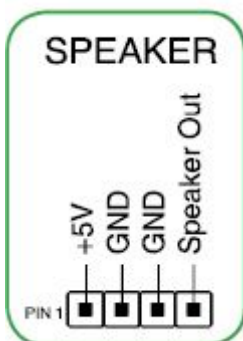
### Serial ATA 6.0GB/s connectors (7-pin SATA6G)

These connectors connect to Serial ATA 6.0GB/s hard disk drives via Serial ATA 6.0GB/s signal cables.



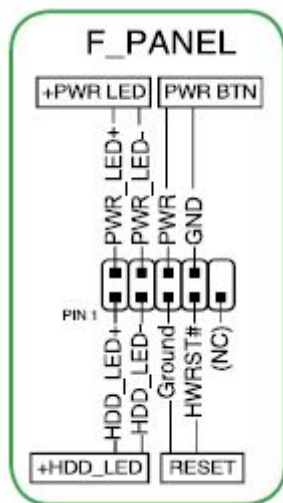
### Speaker Connector (4-pin SPEAKER)

The 4-pin connector is for the chassis mounted system warning speaker. The speaker allows you to hear system beeps and warnings.



### System Panel Connector (10-1 pin F\_PANEL)

This connector supports several chassis mounted functions.



### System power LED (2-pin PWR\_LED)

This 2-pin connector is for the system power LED. Connect the chassis power LED cable to this connector. The system power LED lights up when you turn on the system power, and blinks when the system is in sleep mode.

### Hard *disk drive* activity LED (2-pin HDD\_LED)

This 2-pin connector is for the HDD Activity LED. Connect the HDD Activity LED cable to this connector. The IDE LED lights up or flashes when data is read from or written to the HDD.

### ATX power/soft-off button (2-pin PWR\_BTN)

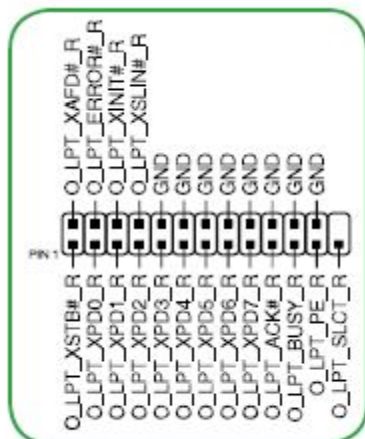
This connector is for the system power button.

### Reset button (2-pin RESET)

This 2-pin connector is for the chassis-mounted reset button for system reboot without turning off the system power.

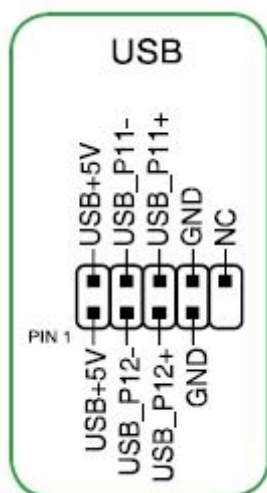
## [LPT Connector \(26-1 pin LPT\)](#)

The LPT (Line Printing Terminal) connector supports devices such as a *printer*. LPT standardizes as IEEE 1284, which is the parallel port *interface* on PC-compatible computers.



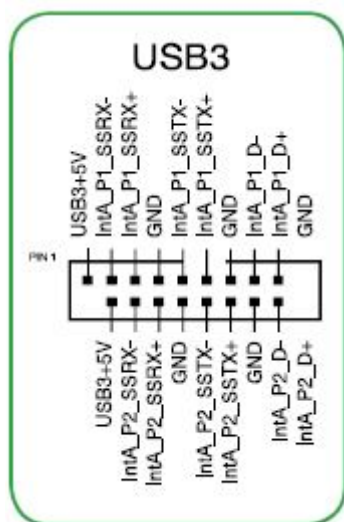
### USB 2.0 Connectors (10-1 pin)

These connectors are for **USB** 2.0 ports. Connect the **USB** module cable to any of these connectors, then install the module to a slot opening at the back of the system chassis. These **USB** connectors comply with **USB** 2.0 specification that supports up to 480 Mbps connection speed.



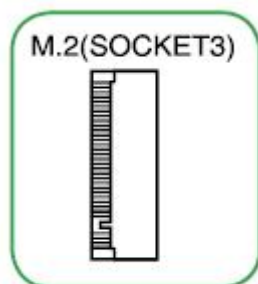
### USB 3.0 Connector (20-1 pin)

This connector allows you to connect a **USB** 3.0 module for additional **USB** 3.0 front or rear ports. You can enjoy the benefits of USB 3.0, including faster data transfer speeds up to 5 Gbps, faster charging time for USB-chargeable devices, optimized power efficiency, and backward compatibility with USB 2.0.



### **M.2 socket 3**

This socket allows you to install an M.2 (NGFF) SSD module. PCIe storage in M.2 format is much faster than traditional hard drives.



- This socket supports M Key and 2242/2260/2280/22110 or 2242/2260/22110 storage device modules.
- When using Intel Desktop Responsiveness technologies with PCIe/SATA M.2 devices, ensure that the Windows UEFI is setup under RAID mode..

## Video Connectors

The *monitor* is connected to the computer system via the 15 pin VGA, *DVI* -D, HDMI or Display Port *output* ports from the motherboard.

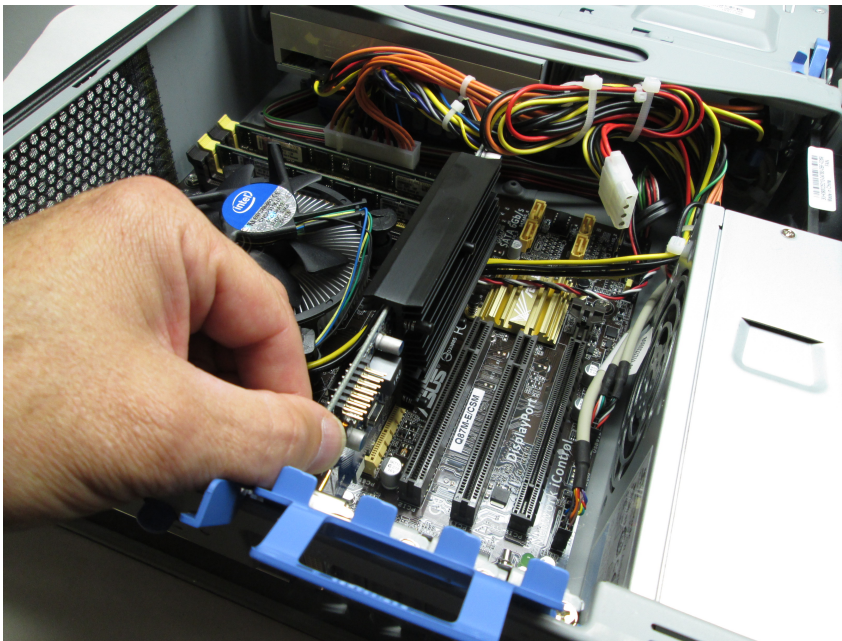


## Removing & Installing a Video Card



- Please see instruction on cover removal [Removing the Case Cover](#)

- To remove a PCI type adapter, unlock the expansion card holder.
- Gently grasp the adapter by its edges and ease it out of the slot





## PCI Adapter Cards



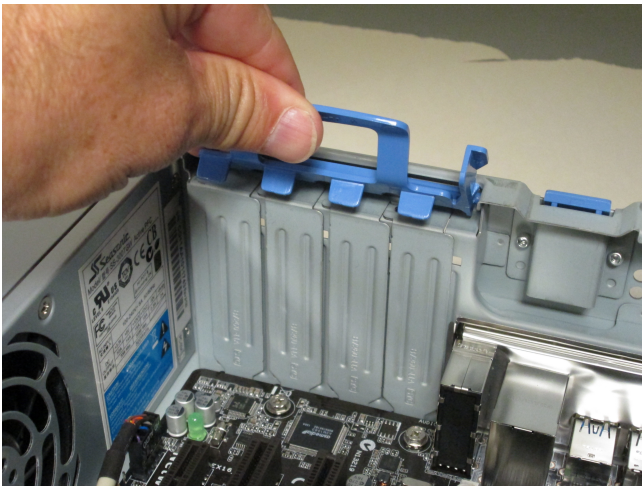
- Please see instruction on cover removal [Removing the Case Cover](#)

### PCI slots

The PCI slots support cards such as a LAN card, *SCSI* card, *USB* card, and other cards that comply with PCI specifications.

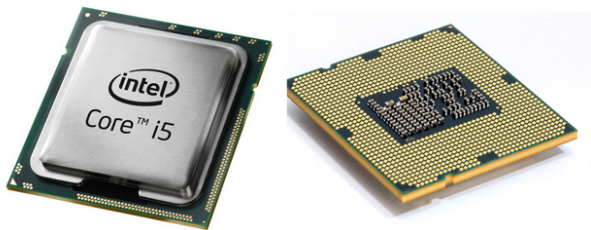
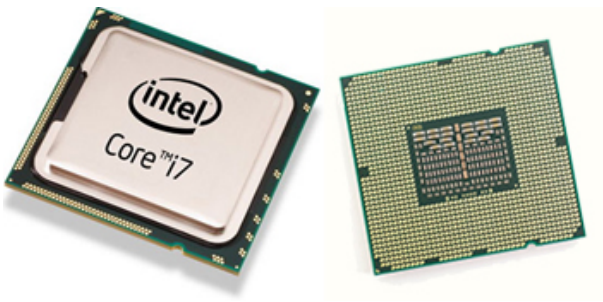
### Removal/Install of a PCI Adapter Card

- To remove a PCI type adapter, unlock and then flip up the expansion card holder.
- Gently grasp the adapter by its edges and ease it out of the slot.



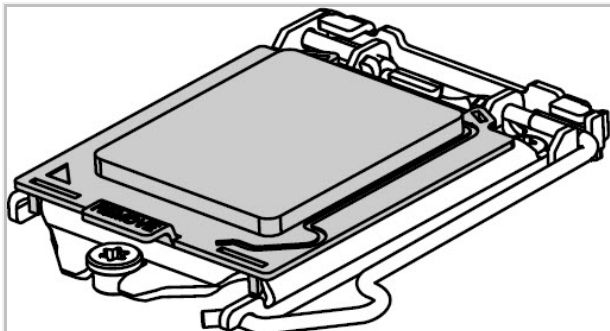
## CPU Overview / Specs

The motherboard comes with a surface mount LGA1151 socket designed for the Intel 6th or 7th Generation Core i7®/Core i5® / Core i3® / Pentium® / Celeron® Processors.

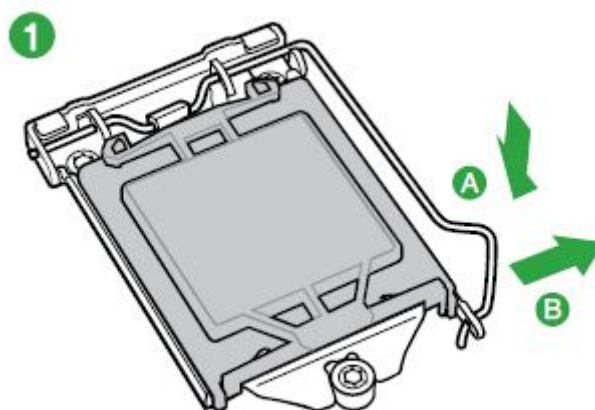


- Unplug all power cables before installing the CPU.

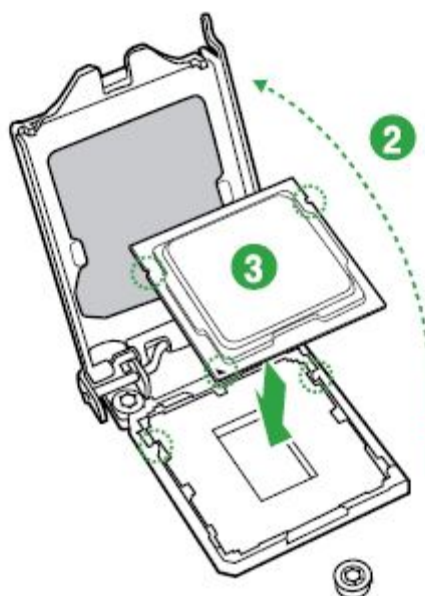
## Installing a CPU



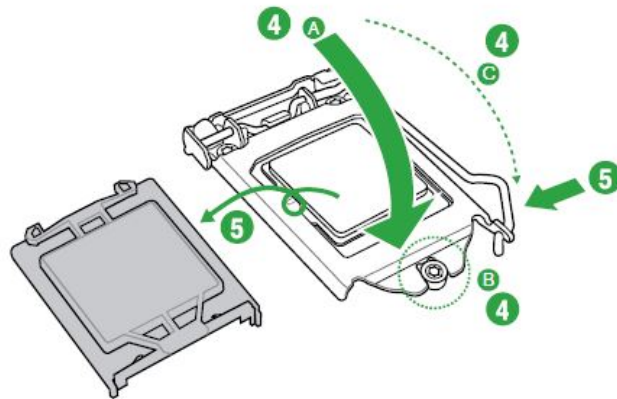
1. Push the lever down to unclip it (A) and move slightly to the right (B) to lift it.



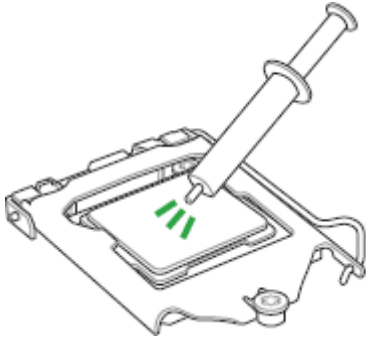
2. Open the load plate (2) and carefully insert the CPU (3). Do not touch the socket contacts or the bottom of the processor. Hold processor with your thumb and index fingers, oriented as shown. Ensure your fingers align to the socket cutouts. Align the notches with the socket. Lower the processor straight down without tilting or sliding the processor in the socket.



3. Slowly lower the load plate (4) and lock into place (5). If the protective cover does not get pushed aside, remove it from the load plate. Do not discard the protective cover. Always use it to replace the socket cover if the processor is removed from the socket.

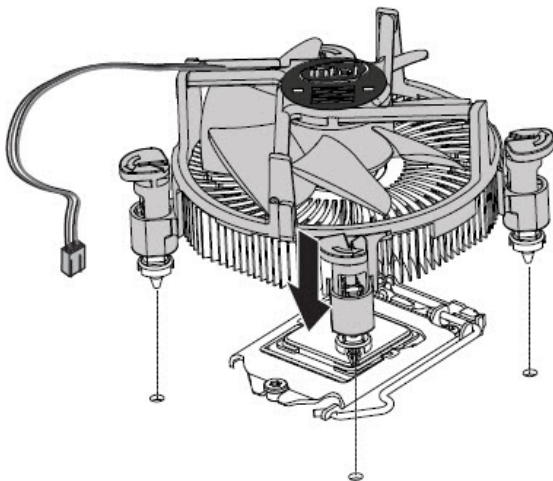


## Installing / Removal of a CPU Heatsink & Fan

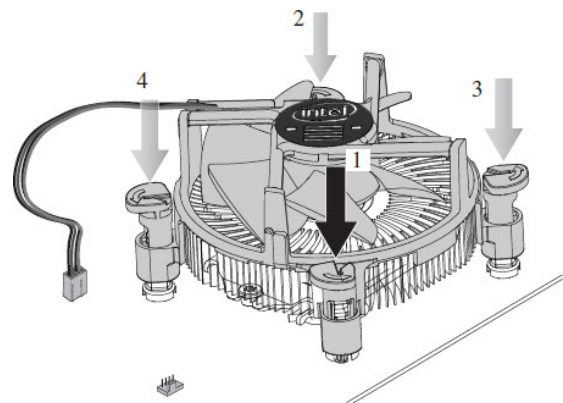


Apply the Thermal Interface Material to the CPU heatsink and CPU before you install the heatsink and fan if necessary.

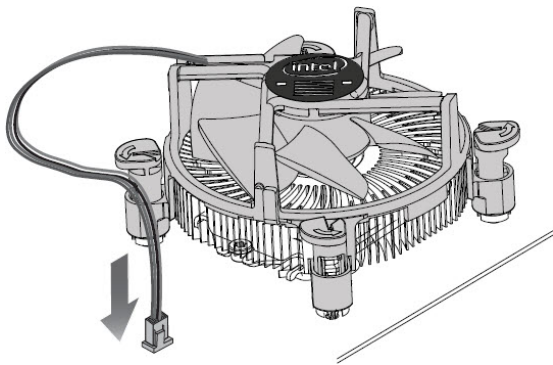
1. With the MOTHERBOARD INSTALLED IN THE CHASSIS, place the fan-heatsink onto the motherboard, aligning the fasteners through the holes. It is important to align the fasteners through the holes properly or you risk damaging the bottom of the fasteners. Also be careful not to damage the thermal *interface* material attached to the bottom of the fan heatsink.



2. Push down on the top of each of the fasteners in an alternate pattern, as shown below, while holding the fan heat sink in place. You should hear a "click" when pushing down each fastener. Check that all four fasteners are securely attached by gently pulling up on each fastener. Having an unattached fastener will prevent a good seal between the fan-heatsink and processor and could result in unreliable operation of the processor.

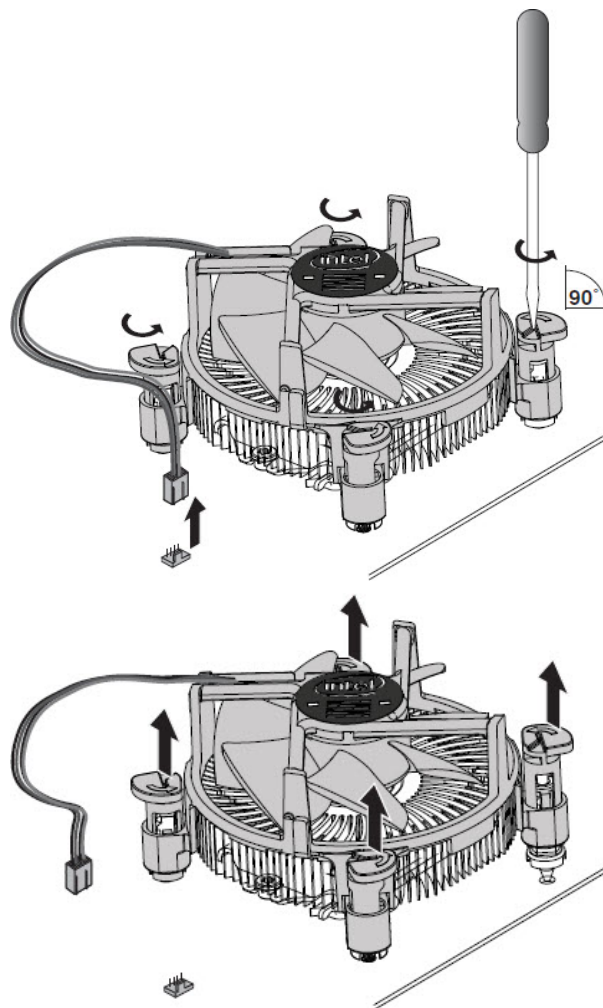


3. Connect the processor 4-wire fan cable connector to the motherboard 4-pin CPU fan header.

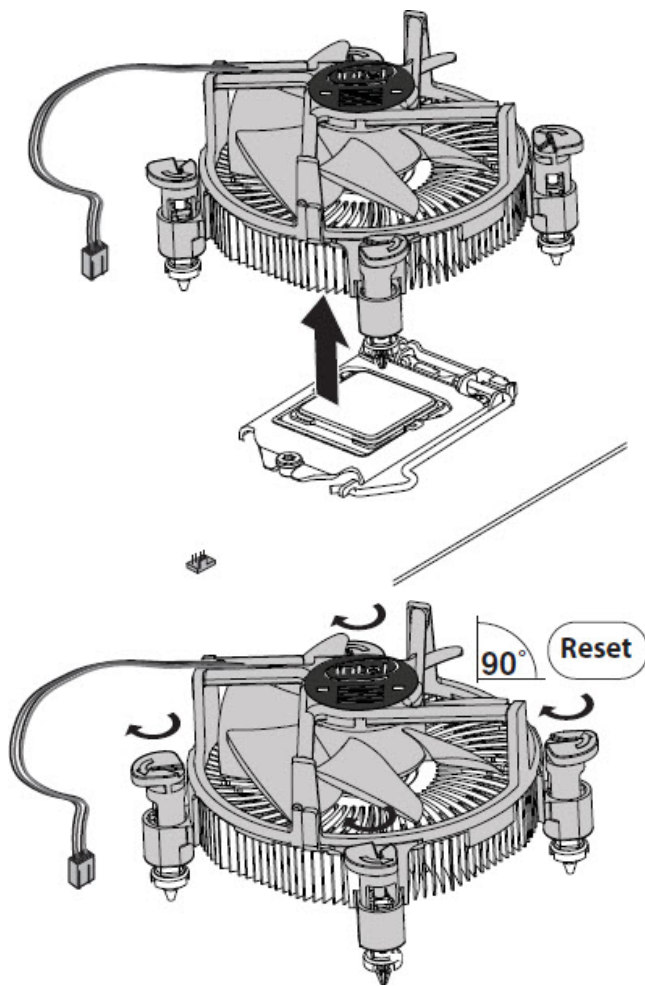


- Do not forget to connect the CPU fan connector! *Hardware* errors can occur if you fail to plug this connector.

### To un-install the CPU heatsink and fan assembly







## System Memory Overview

The motherboard comes with four Double Data Rate 4 (DDR4) Dual Inline *Memory* Modules (DIMM) sockets. A DDR4 module has the same physical dimensions as a DDR3 DIMM but is notched differently to prevent installation on a DDR3 DIMM socket. DDR4 modules are developed for better performance.

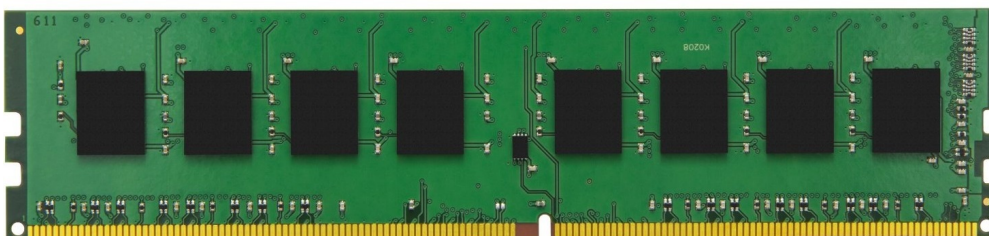


- According to the Intel CPU specifications, DIMM voltage below 1.35 V is recommended to protect the processor.

This diagram illustrates the location of the DDR4 DIMM sockets:



Channel	Sockets
Channel A	DIMM_A1 & DIMM_A2
Channel B	DIMM_B1 & DIMM_B2



## System Memory Configuration

You may install 1GB, 2GB, 4GB, 8GB and 16GB unbuffered non-ECC DDR4 DIMMs into the DIMM sockets.



- You may install varying *memory* sizes in Channel A and Channel B. The system maps the total size of the lower-sized channel for the dual-channel configuration. Any excess *memory* from the higher-sized channel is then mapped for single-channel operation.
- Always install DIMMs with the same CAS latency for optimum compatibility. We recommend that you obtain *memory* modules from the same vendor.
- Due to the *memory* address limitation on 32-bit Windows OS, when you install 4GB or more *memory* on the motherboard, the actual usable *memory* for the OS can be about 3GB or less. For effective use of *memory*, we recommend that you do any of the following:
  - Use a maximum of 3GB system *memory* if you are using a 32-bit Windows operating system.
  - Install a 64-bit Windows OS when you want to install 4GB or more on the motherboard.
- The maximum 64GB *memory* can be supported with DIMMs of 16GB.

The current list of *memory* DIMMs qualified for use on the motherboard can be found at [https://www.asus.com/ca-en/Motherboards/PRIME-Q270M-C-CSM/HelpDesk\\_QVL/](https://www.asus.com/ca-en/Motherboards/PRIME-Q270M-C-CSM/HelpDesk_QVL/).

## Installing System Memory



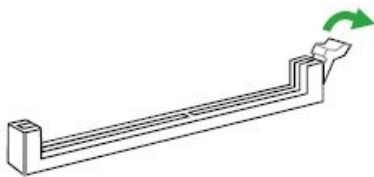
- Please see instruction on cover removal [Removing the Case Cover](#)

The motherboard now uses the new Q-DIMM sockets making insertion and removal of DIMMs easier. These sockets have a maneuverable clip on only one side, with the other side having a stationary clip.

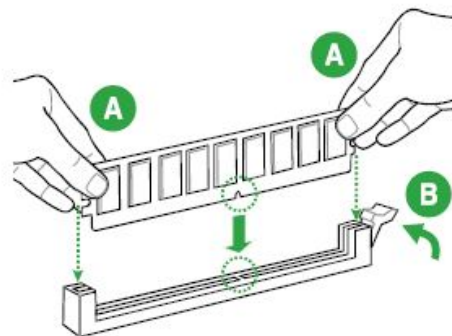
To install a RAM module (DIMM):

1. Align a DIMM on the socket such that the notches on the DIMM matches the break on the socket.
2. Firmly insert the DIMM into the socket until the retaining clips snap into place and the DIMM is properly seated when a click is heard.

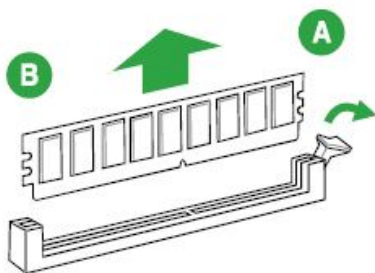
1



2



To remove a DIMM



- A DDR4 DIMM is keyed with a notch so that it fits in only one direction. To avoid damaging the DIMM, do not force a DIMM into a socket .
- The DDR4 DIMM sockets do not support DDR DIMMs. Do not install DDR DIMMs into the DDR4 DIMM sockets.



- 
- It is not necessary to enter the setup after changing the *memory* configuration, the system automatically detects the new configuration.
- 



- 
- Disconnect the power supply before adding or removing DIMMs or other system components in order to not cause damage to the motherboard and the components.
-

## Removing System Memory

1. Press down on the maneuverable side of the clip.
2. Pull the DIMM straight up.



- Support the DIMM lightly with your fingers when pressing the retaining clips. The DIMM might get damaged when it flips out with extra force.



## Hard Drive Removal / Installation



- It is not necessary to run setup after replacing the hard drive. The system will auto detect the changed configuration.



- Please see instruction on cover removal [Removing the Case Cover](#)

- Open the computer case and locate the hard drive. The hard drive is actually an M.2 Solid State Drive (SSD).
- Step 1 - Insert the M.2 card firmly into the M.2 slot ensuring the pins and notches align correctly (parallel to the motherboard). Please note that the motherboard has two M.2 slots available for storage (B keyed card compatible) and one M.2 slot for WiFi, Bluetooth or cellular cards (E keyed card compatible). SSD's must be inserted in one of the two B keyed slots.
- Step 2 - Using the screw that accompanies the replacement SSD, screw the non-keyed end of the M.2 card into the motherboard hole that aligns with the hole in the M.2 card.

**Step 1**



**Step 2**



## **Unpacking and Handling**

Hard drives are precision instruments and should be handled with care during unpacking and installation; they can be damaged by rough handling, shock, vibration, or electrostatic discharge (ESD). Be aware of the following precautions when handling your hard drive .

- Do not unpack your hard drive until you are ready to install it.
- Your hard drive is packaged in a static shielding bag. Use this bag to place your hard drive on after unpacking.
- Save the packing materials in case you need to return your hard drive.
- Articles of clothing generate static electricity. Do not allow clothing to come in direct contact with the hard drive or circuit board components.
- Handle the hard drive by the sides only. Avoid touching the circuit board components.
- Do not drop or knock the hard drive.
- Do not stack hard drives or stand your hard drive on its edge.

## Software / Operating System

*Software* is the set of instructions used to direct the microprocessor . There are three layers of *software* :

### **BIOS (basic input / output system):**

Startup *software* resident on the main-board, which tells the microprocessor where to find other *software* .

### **Operating System:**

Operating *software* (e.g. Windows 10, *LINUX*) is a basic set of instructions for running the computer that acts as a platform on which other programs run.

### **Application Software:**

Specialized *software* for carrying out specific tasks such as word processing, graphics, data processing, *database* management or *network* management.

With your computer, you will also receive utility programs and device drivers, which are used to customize computer operation to suit either *hardware* or *software* requirements.

## Installing an Operating System

This motherboard supports Windows XP / 7 / 8 / 10 Operating Systems (OS). Always install the latest OS version and corresponding updates to maximize the features of your hardware.



- Motherboard settings and *hardware* options vary. Refer to your OS documentation for detailed information.

## Support DVD Information

The Support *DVD* that comes with the motherboard package contains the drivers, *software* applications, and utilities that you can install to avail all motherboard features.



- The contents of the Support *DVD* are subject to change at any time without notice. Visit the ASUS website at [www.asus.com](http://www.asus.com) for updates.

## To run the Support DVD

Place the Support *DVD* to the optical drive. If Autorun is enabled in your computer, the *DVD* automatically displays the Specials screen. Click each tab to display their respective menus.



- The following screen is for reference only.



Click an icon to display Support DVD/ motherboard information

Click an item to install



- If Autorun is NOT enabled on your computer, browse the contents of the Support *DVD* to locate the file ASSETUP.EXE from the BIN *folder*. Double-click the ASSETUP.EXE to run the *DVD*.

## Optical Drive

Your system may include an Optical drive. Your drive is capable of reading compact discs meeting international standards, such as Photo CD, CD-I, ISO 9660, multi-session, CD-extra and XA (extended Architecture) disks. Your drive can also read **DVD** disks.



- In case of power failure, or if for some reason an Optical disk refuses to eject, gently insert a large straightened paper clip in the small opening (emergency eject) at the front of the Optical drive.

## Optical Drive Removal



- Please see instruction on cover removal [Removing the Case Cover](#)

- Disconnect Optical drive power and data cables.
- Lift the blue release mechanism to release the optical drive.
- Pull the Optical drive towards the front and out from the Disc cage





## Managing and Updating your BIOS



- Save a copy of the original motherboard **BIOS** file to a **USB** flash disk in case you need to restore the **BIOS** in the future. Copy the original motherboard **BIOS** using the ASUS Update utility.

### UEFI BIOS - Graphics Mode

#### ASUS EZ Update Utility

EZ Update is a utility that allows you to automatically update your motherboard's softwares, drivers and the BIOS version easily. With this utility, you can also manually update the saved BIOS and select a boot logo when the system goes into POST.



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

#### Launching EZ Update

1. Place the support **DVD** in the optical drive. The **Specials** menu appears.
2. Click the **Utilities** tab, then click **AI Suite 3**.
3. Follow the onscreen instructions to complete the update.

Click to  
automatically  
update your  
motherboard's  
driver, software  
and firmware



Click to find and  
select the BIOS  
from file

Click to select  
a boot logo

Click to  
update the  
BIOS



## ASUS EZ Flash 3

The ASUS EZ Flash 3 feature allows you to update the *BIOS* without using an OS-based utility.



- Before you start using this utility, *download* the latest *BIOS* file from the ASUS website at [www.asus.com](http://www.asus.com).
- Check your local Internet connection before updating through the Internet.
- Ensure the BIOS default settings are loaded to ensure system compatibility and stability. Select the Load Optimized Defaults item under the Exit menu.



### *To update the BIOS using EZ Flash 3:*

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

#### Via USB

- a. Insert the *USB* flash disk that contains the latest *BIOS* file into the *USB* port, then select **by USB**
- b. Press <Tab> to switch to the **Drive** field.
- c. Press the Up/Down arrow keys to find the *USB* flash *disk* that contains the latest *BIOS*, and then press <Enter> .

- d. Press <Tab> **to switch** to the Folder Info field.
- e. Press the Up/Down arrow keys **to find** the *BIOS* file, and then press <Enter> to perform the *BIOS* update process. Reboot the system when the update process is done.

#### Via the Internet

- a. Select **by Internet**
- b. Press the Left/Right arrow keys to select an Internet connection method, and then press <Enter> .
- c. Follow the on screen instructions to complete the update. Reboot the system when the update process is done.



- 
- **DO NOT** shut down or reset the system while updating the *BIOS* to prevent system *BOOT* Failure!
- 

### **ASUS CrashFree BIOS 3 Utility**

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



- 
- Before using this utility, rename the *BIOS* file in the removable device into **Q270C.CAP**
  - The *BIOS* file in the support *DVD* may not be the latest version. **Download** the latest version *BIOS* file from the ASUS website at [www.asus.com](http://www.asus.com) .
- 

#### ***Recovering the BIOS***

1. Turn on the system.
2. Insert the support *DVD* into the optical drive or the *USB* flash drive that contains the *BIOS* file into the *USB* port.
3. The utility automatically checks the devices for the *BIOS* file. When found, the utility reads the *BIOS* file and enters ASUS EZ Flash 3 utility automatically.
4. The system requires you to enter *BIOS* Setup to recover *BIOS* setting. To ensure system compatibility and stability, we recommend that you press <F5> to load default *BIOS* values.



- 
- **Do NOT** shut down or reset the system while updating the *BIOS*! Doing so can cause system *boot* failure!
-

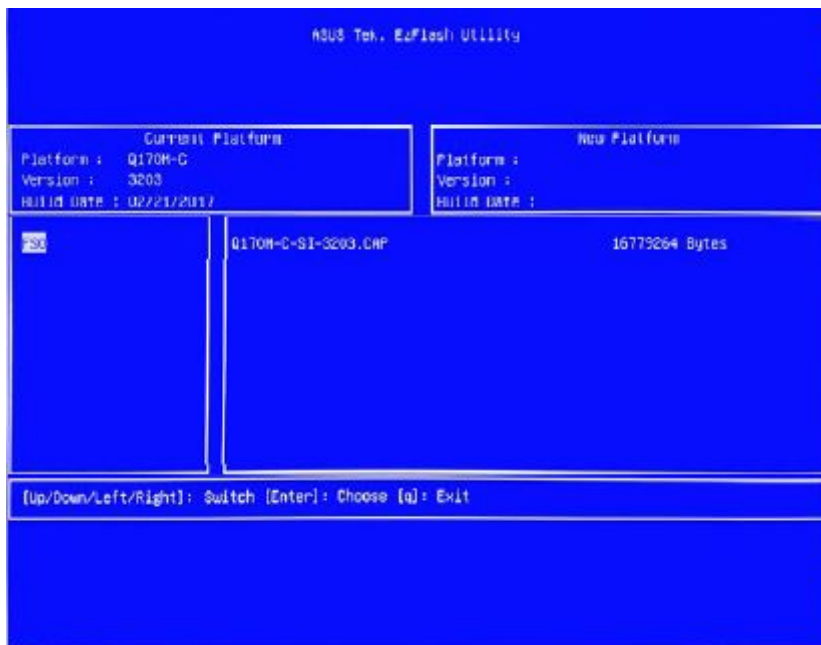
## UEFI BIOS - Text Mode

### ASUS EZ Flash

The Asus EZ Flash feature allows you to update the BIOS without using an OS-based utility.



- Before you start using this utility, *download* the latest *BIOS* file from the ASUS website at [www.asus.com](http://www.asus.com).
- Check your local Internet connection before updating through the Internet.



#### **To update the BIOS using EZ Flash:**

1. Insert the USB flash disk containing the latest BIOS into the USB port.
2. Press <Alt> + <F2> during POST to enter Asus EZ Flash utility.
3. Press the Up/Down arrow keys to find the USB flash disk containing the latest BIOS.
4. Press the Left/Right arrow keys to switch to the Folder Info field.
5. Press the Up/Down arrow keys to find the BIOS file, and then press <Enter> to perform the BIOS update process. Reboot the system when the update process

is complete.



- This function supports USB flash disks with FAT 32/16 format and single partition only.
- DO NOT shut down or reset the system while updating the BIOS to prevent system boot failure.

## ASUS BIOS Updater

The ASUS *BIOS* Updater allows you to update the *BIOS* in a DOS environment.



- The succeeding utility screens are for reference only. The actual utility screen displays may not be same as shown.

### ***Before Updating the BIOS***

1. Prepare the motherboard support *DVD* and a *USB* flash drive.
2. *Download* the latest *BIOS* file and *BIOS* Updater from the ASUS website at <http://support.asus.com> and save them on your *USB* flash drive.

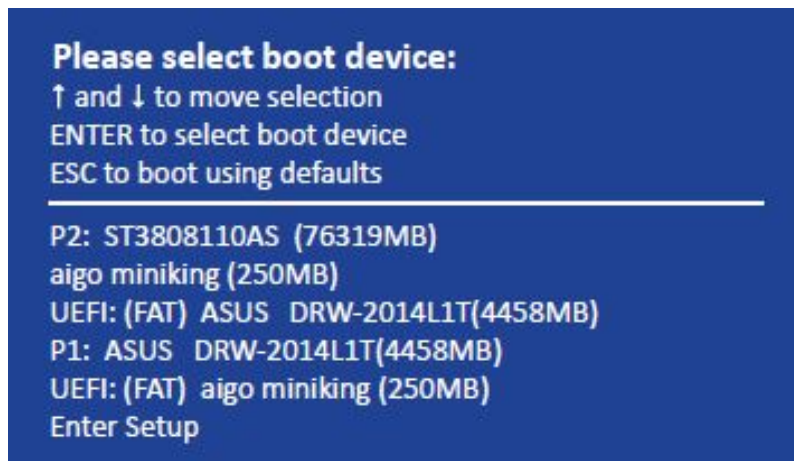


- NTFS is not supported under a FreeDOS environment. Ensure that your *USB* flash drive is in a single partition and in FAT32/16 format.

3. Turn off the computer.
4. Ensure that your computer has a DVD optical drive.

### ***Booting the system in DOS environment***

1. Insert the *USB* flash drive with the latest *BIOS* file and *BIOS* Updater into the *USB* port.
2. *Boot* your computer then press <F8> to launch the select boot device screen.
3. When the select boot device screen appears, insert the support *DVD* into the optical drive and select the optical drive as the *boot* device.



4. When the booting message appears, press <Enter> within five (5) seconds to enter the **FreeDOS prompt**.

```
ISOLINUX 3.20 2006-08-26 Copyright (C) 1994-2005 H. Peter Anvin
A Bootable DVD/CD is detected. Press ENTER to boot from the DVD/CD.
If no key is pressed within 5 seconds, the system will boot next priority
device automatically. boot:
```

5. At the FreeDOS prompt, type **d:** and press <Enter> to switch the disk from Drive C (optical drive) to Drive D (USB flash drive).

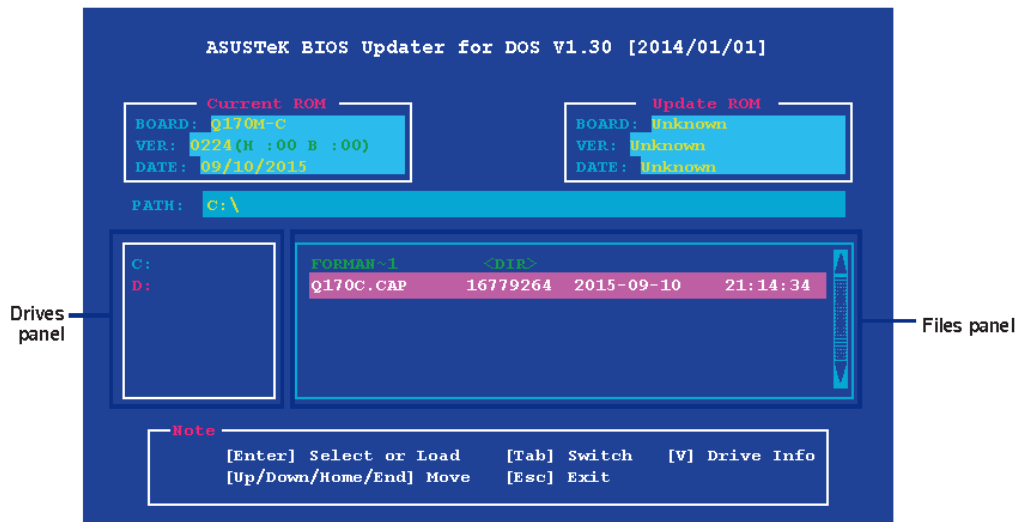
```
Welcome to FreeDOS (http://www.freedos.org) !
C: /> d:
D: />
```

### **Updating the BIOS file**

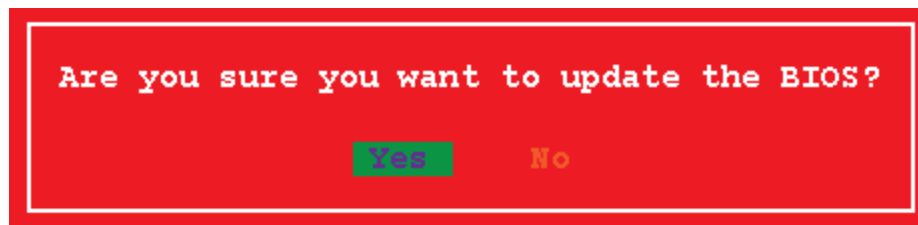
1. At the FreeDOS prompt, type **bupdater /pc /g** and press <Enter>.

```
D:\>bupdater /pc /g
```

2. The **BIOS** Updater screen appears as below.



3. Press <Tab> to switch from Files panel to Drives panel then **select D:**
4. Press <Tab> to switch from Drives panel to Files panel and use the <Up/Down/Home/End> keys to select the **BIOS** file and press <ENTER>.
5. After the BIOS Updater checks the selected BIOS file, select Yes to confirm the **BIOS** update is done, then press <Enter>.



- The BIOS Backup feature is not supported due to security regulations.

6. When BIOS update is done, press <ESC> to exit **BIOS** Updater. Restart your computer.



- DO NOT shut down or reset the system while updating the BIOS to prevent system boot failure.
- Ensure to load the **BIOS** default settings to ensure system compatibility and stability. Select the **Load Optimized Defaults** item under the Exit Menu.

## BIOS Setup Program

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

### Entering the BIOS setup at Startup

- Press <Delete> or <F2> during the Power-OnSelf Test (*POST*). If you do not press <Delete> or <F2>, *POST* continues with its routines.

### Entering BIOS Setup after POST

To enter *BIOS* setup after *POST*, do one of the following:

- Press <Ctrl>+<Alt>+<Del> simultaneously.
- Press the reset button on the system chassis.
- Press the power button to turn the system off then back on. Do this option only if you failed to enter *BIOS* Setup using the first two options.



- Using the power button, reset button, or the **CTRL + ALT + DEL** keys to force reset from a running *operating system* can cause damage to your data or system. We recommend to always shut down the system properly from the *operating system*.

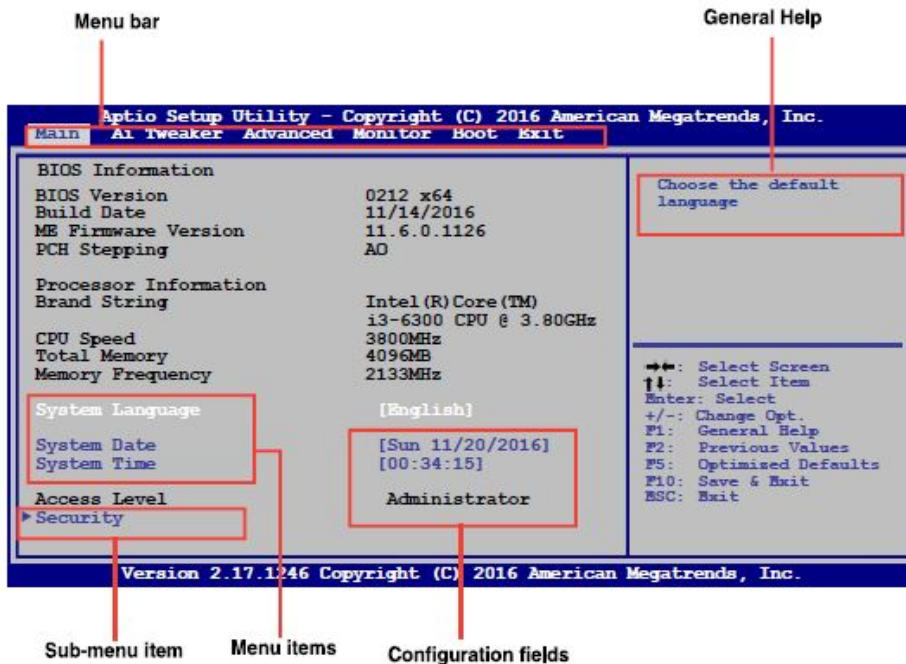


- The *BIOS* Setup screens shown in this section are for reference purposes only, and may not exactly match what you see on the screen.
- Visit the ASUS website at [www.asus.com](http://www.asus.com) to *download* the latest *BIOS* file for this motherboard.
- Ensure that a *USB mouse* is connected to your motherboard if you want to use the *mouse* to control the *BIOS* setup program.
- If the system becomes unstable after changing any *BIOS* setting, load the default settings to ensure system compatibility and stability. Select **Load Optimized Defaults** item under the exit Menu. See the **Exit Menu** for more details.
- If the system fails to *boot* after changing any *BIOS* setting, try to clear the *CMOS* and reset the motherboard to the default value. See the **Jumpers** section for information on how to erase the RTC *RAM*.



## BIOS Menu Screen

The Main screen of the BIOS looks like this. Along the top of the screen is a menu bar that includes Main, Ai Tweaker, Advanced, Monitor, Boot and Exit.



## Menu Bar

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

<b>Main</b>	For changing the basic system configuration settings like language, date/time and setting a BIOS password
<b>Ai Tweaker</b>	For changing power, speed and overclocking settings
<b>Advanced</b>	For changing the advanced system settings by experienced technicians
<b>Monitor</b>	For displaying the system temperature, power status, and changing the fan settings as well the chassis intrusion settings
<b>Boot</b>	For changing the system <i>boot</i> configuration
<b>Exit</b>	For selecting the exit options and loading default settings

## Menu items

The highlighted item on the menu bar displays the specific items for that menu. For example, selecting **Main** shows the Main menu items. The other items (Ai Tweaker, Advanced, Monitor, *Boot* and Exit) on the menu bar have their respective menu items.

## Submenu items

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

## Language

The language of the BIOS is displayed on the MAIN page and can be changed.

## Q-Fan Control

Q-fan configuration in the Monitor menu can be used to manually tweak the fans to your desired settings.

## Navigation keys

At the bottom right corner of the menu screen are the navigation keys for the *BIOS* setup program. Use the navigation keys to select items in the menu and change the settings.

## General help

At the top right corner of the menu screen is a brief description of the selected item. On any menu, use <F1> key to display a list of available function keys.

## Configuration fields

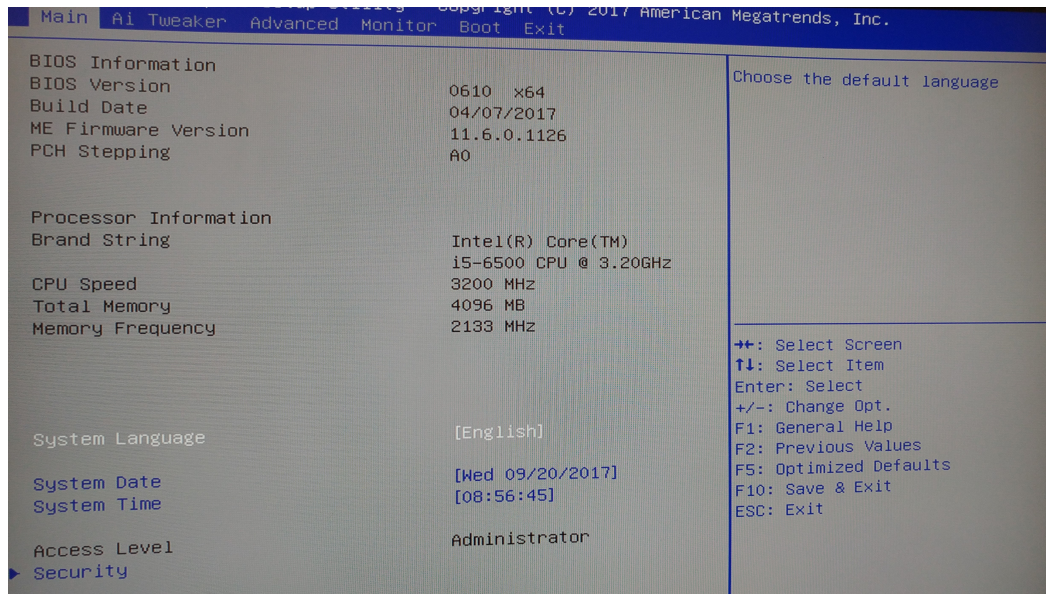
These fields show the values for the menu items. If an item is user-configurable, you can change the value of the field opposite the item. You cannot select an item that is not user-configurable. A configurable field is highlighted when selected. To change the value of a field, select it and press <Enter> to display a list of options.



- 
- You can only use the alphanumeric characters to enter your notes.
-

## Main Menu

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



### System Language [English]

Allows you to choose the **BIOS** language version from the options. Configuration options: [English] [French] [Deutsch] [Español] [Русский] [Korean]

### System Date [Dayxx/xx/xxxx]

Allows you to set the system date.

### System Time [xx:xx:xx]

Allows you to set the system time.

### Security

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



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

## Administrator Password

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

### *To set an administrator password:*

1. Select the **Administrator Password** item and press <Enter>.
2. From the **Create New Password** box, key in a password, then press <Enter>.
3. Confirm the password when prompted.

### *To change an administrator password:*

1. Select the **Administrator Password** item and press <Enter>.
2. From the **Enter Current Password** box, key in the current password, then press <Enter>.
3. From the **Create New Password** box, key in a new password, then press <Enter>.
4. Confirm the password when prompted.

To clear the administrator password, follow the same steps as in changing an administrator password, but press <Enter> when prompted to create/confirm the password. After you clear the password, the **Administrator Password** item on top of the screen shows **Not Installed**.

## User Password

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

### *To set a user password:*

1. Select the **User Password** item and press <Enter>.
2. *From* the **Create New Password** box, key in a password, then press <Enter>.
3. Confirm the password when prompted.

### *To change a user password:*

1. Select the **User Password** item and press <Enter>.
2. From the **Enter Current Password** box, key in the current password, then press <Enter>.
3. From the **Create New Password** box, key in a new password, then press <Enter>.
4. Confirm the password when prompted.

To clear the user password, follow the same steps as in changing a user password, but press <Enter> when prompted to create/confirm the password. After you clear the password, the **User Password** item on top of the screen shows **Not Installed**.

## Ai Tweaker Menu

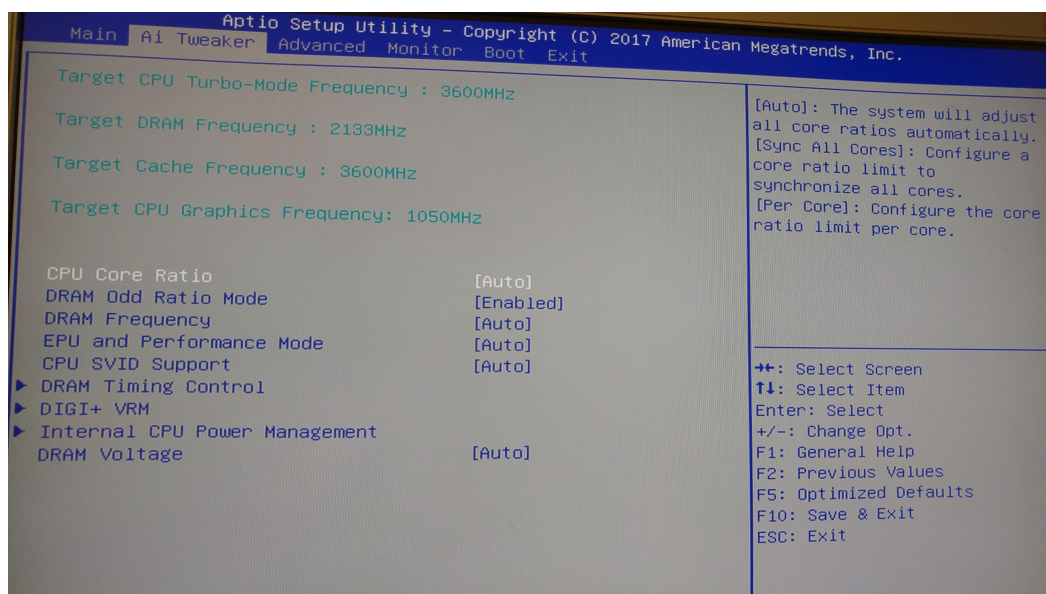
The Ai Tweaker menu items allows you to configure power and speed settings as well as overclocking-related items.



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



- The configuration options for this section vary depending on the CPU and DIMM model you installed on the motherboard.



The following are amongst the many settings that can be adjusted using the Ai Tweaker. For a complete list of adjustable settings please refer to the current motherboard manual.

### CPU Core Ratio [Auto]

Provides the following choices.

- |                  |                                                                                    |
|------------------|------------------------------------------------------------------------------------|
| [Auto]           | The optimum settings and voltage are increased automatically when required.        |
| [Sync All Cores] | The CPU runs at the same clock frequency regardless of the number of active cores. |
| [Per Core]       | Each core can be set to a different clock frequency.                               |

### DRAM Frequency [Auto]

Allows you to set the *memory* operating frequency.

Configuration options: Many choices ranging from [DDR4-800MHz] to [DDR4 - 4266MHz]



- Selecting a very high *memory* frequency may cause the system to become unstable! If this happens, revert to the default setting.

## DRAM Timing Control

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



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

## DRAM Voltage [Auto]

Allows you to set the DRAM voltage. The values range from 1.200V to 1.500V.



- According to Intel CPU specifications, DIMMs with voltage requirement over 1.35V may damage the CPU permanently. We recommend that you install the DIMMs with the voltage requirement below 1.35V.

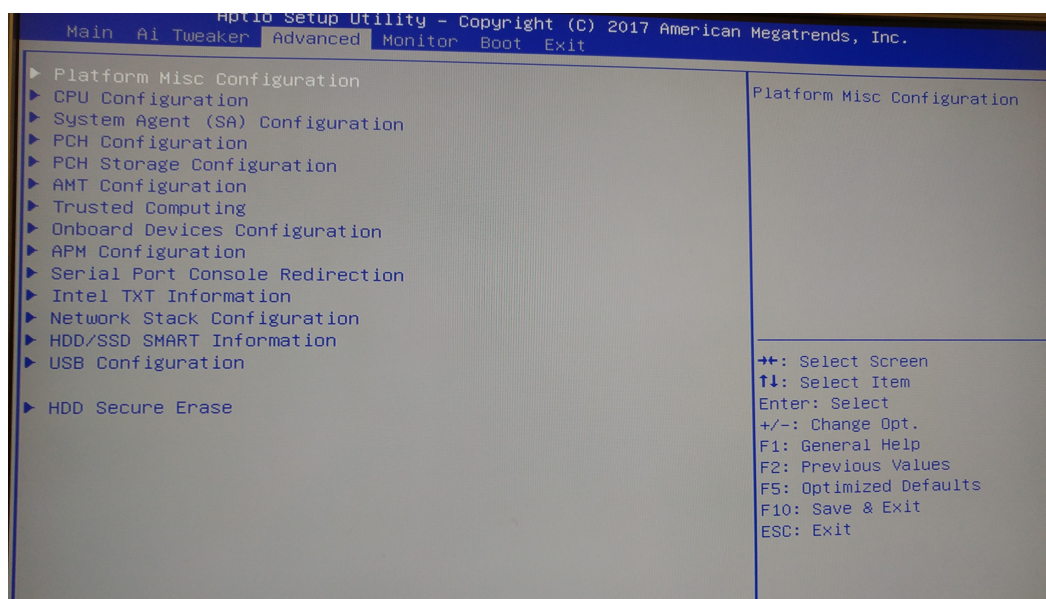


## Advanced Menu

The Advanced Menu item allows you to change the settings for the CPU and other system devices.



- Be cautious when changing the settings of the Advanced menu items. Incorrect field values can cause the system to malfunction.



## Trusted Computing

The items in this menu allow you to set the **TPM** (Trusted Platform Module) feature.



- Due to a Windows 7 limitation, before Windows 7 64-bit installation, select **Other OS** item under the Boot menu from Advanced Mode > Boot > Secure Boot > Other OS.

### **Security Device Support [Enabled]**

Enables or disables the BIOS support for security devices. OS will not show Security Device. TCG EFI protocol and INT1A interface will not be available. Configuration options: [Disabled][Enabled]

### **Pending Operation [None]**

This item allows you to schedule an operation for the Security Device. Configuration options: [None] [TPM clear]



## CPU Power Management

The sub-items in this menu allow you to set the CPU ratio and features.

### **Intel SpeedStep Technology [Auto]**

Allows you to enable or disable the Enhanced Intel<sup>®</sup> SpeedStep Technology (*EIST*).

[Disabled] Disables this function.

[Enabled] The *operating system* dynamically adjusts the processor voltage and core frequency which may result in decreased average consumption and decreased average heat production.

### **Turbo Mode [Enabled]**

This item appears only when you set the previous item to [Enabled].

[Enabled] Allows processor cores to run faster than marked frequency in specific conditions.

[Disabled] Disables this function.



- 
- Turbo mode is available on selected CPU models only
  - The following first three items appear only when you set the Turbo Mode to **[Enabled]**.
- 

### **Long Duration Package Power Limit [Auto]**

Allows you to limit the turbo ratio's long duration power. Use the <+> and <-> keys to adjust the value.

### **Package Power Time Window [Auto]**

Allows you to set the package power time window. Use the <+> and <-> keys to adjust the value.

### **Short Duration Package Power Limit [Auto]**

Allows you to limit the turbo ratio's long duration power. Use the <+> and <-> keys to adjust the value.

## CPU Configuration

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



- 
- The items shown in the submenu may be different due to the CPU you installed.
- 

### **Active Processor Cores [All]**

Allows you to choose the number of CPU cores to activate in each processor package.

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

### **Intel Virtualization Technology [Enabled]**

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

[Enabled] Allows a *hardware* platform to run multiple operating systems separately and

simultaneously, enabling one system to virtually function as several systems.

[Disabled] Disables this function.

#### **Hardware Prefetcher [Enabled]**

This item allows you to turn on/off the MLC streamer prefetcher.

[Enabled] Allows a *hardware* platform to automatically analyze the requirements and prefetch data and codes for the CPU.

[Disabled] Disables this function.

#### **Adjacent Cache Line Prefetcher [Enabled]**

[Enabled] Allows a *hardware* platform to perform adjacent *cache* line prefetching.

[Disabled] Disables this function.

#### **CPU Power Management Configuration**

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

##### **Intel SpeedStep Technology [Enabled]**

Allows you to enable or disable the Intel SpeedStep Technology (*EIST*).

[Auto] Automatic configuration

[Disabled] The CPU runs at its default speed.

[Enabled] The *operating system* controls the CPU speed.

##### **Turbo Mode [Enabled]**

Allows you to set the processor cores to run faster than the marked frequency in a specific condition. This mode is only available on selected CPU models.

[Enabled] Allows processor cores to run faster than marked frequency in specific condition.

[Disabled] Disables this function.

##### **CPU C States [Auto]**

[Auto] Automatic configuration

[Enabled] Enables the CPU C states.

[Disabled] Disables the CPU C states.

##### **CFG Lock [Disabled]**

This item allows you to configure the MSR 0xE2[15], CFG lock bit. Allows you to disable or enable the whole C-State package support. Configuration options: [Disabled]

[Enabled]

## **PCH Configuration**

#### **DeepSx Power Policies [Disabled]**

Allows you to configure the DeepSx Mode. Configuration options: [Disabled] [Enabled in S5] [Enabled in S4-S5].

## **SATA Configuration**

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

#### **PCH Storage Configuration**

##### **SATA Mode Selection [AHCI]**

Allows you to set the *SATA* configuration.

[Disabled] Disable the **SATA** function.

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

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

#### **Aggressive LPM Support [Auto]**

This item appears only when you set **SATA** Mode Selection to [AHCI] and allows you to enable or disable PCH entering link power state aggressively. Configuration options: [Auto] [Disabled] [Enabled]

#### **SmartSelfTest [On]**

S.M.A.R.T. (Self-Monitoring Analysis and Reporting Technology) is a **monitor** system. When read/write of your hard disk errors occur, this feature allows the hard disk to report warning messages during the POST. Configuration options: [On] [Off]

#### **SATA6G\_1~6 [Gray] [Enabled]**

Allow you to enable/disable the SATA6G\_1~6 port. Configuration options: [Enabled] [Disabled]

## **System Agent Configuration**

#### **VT-d [Disabled]**

Allows you to enable or disable VT-d function on MCH. Configuration options: [Enabled] [Disabled]

#### **CPU Audio Device [Enabled]**

Allows you to enable or disable CPU SA Audio Device. Configuration options: [Enabled] [Disabled]

#### **Graphics Configuration**

Allows you to select the primary display from iGPU and PCIe graphical devices.

##### **Primary Display [Auto]**

Allows you to decide which graphics controller to use as the primary **boot** device.

Configuration options: [Auto] [iGFX] [PEG]

##### **Render Standby [Auto]**

Allows you to enable or disable Intel Render Standby support to reduce iGPU power use when the system is idle.

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

##### **iGPU Multi-Monitor [Disabled]**

Allows you to enable the iGPU Multi-Monitor. For LucidLogix Virtu MVP function support, set this item to [Enabled] to empower both integrated and discrete graphics. The iGPU shared system **memory** size will be fixed at 64MB.

Configuration options: [Disabled] [Enabled]

#### **DMI/OPI Configuration**

Allows you to control various DMI functions.

##### **DMI Gen 2 [Auto]**

Allows you to enable or disable DMI Gen 2. Configuration options: [Auto] [Enabled] [Disabled]

### **PEG Port Configuration**

Allows you to configure the NB *PCI Express* settings.

#### **PCIEX16\_1 Link Speed [Auto]**

Allows you to configure the PCIEX16\_1 speed.

Configuration options: [Auto] [Gen1] [Gen2] [Gen3]

### **Memory Configuration**

#### **Memory Remap [Enabled]**

Allows you to enable or disable remapping the *memory* above 4GB.

[Enabled] Enables the function.

[Disabled] Disables this function.

### **AMT Configuration**

The items in this menu allow you to change the Intel® Active Management Technology (AMT) feature.

#### **USB Provisioning of AMT [Enabled]**

Allow you to enable or disable the Intel® Active Management Technology (AMT) in the *BIOS* extension. Configuration options: [Enabled] [Disabled]



- iAMT H/W is always enabled. This option just controls the *BIOS* extension execution. If enabled, this requires additional firmware in the SPI device.
- The following two items become configurable only when you set the WatchDog Timer item to [Enabled].

### **Secure Erase Configuration**

#### **Secure Erase Mode**

[Simulated]

[Real]

#### **Force Secure Erase**

[Disable]

[Enable]

#### **OEM Flag Settings**

#### **AMT BIOS**

[Enable]

[Disable]

#### **MEBx hotkey pressed**

[Disable]

[Enable]

#### **MEBx selection screen**

[Disable]

[Enable]

#### **Un-Configure ME**

[Disable]

[Enable]

### **USB Configuration**

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



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

#### **LegacyUSB Support[Enabled]**

- [Enabled] Enables the support for *USB* devices on legacy operating systems (OS).  
[Disabled] The *USB* devices can be used only for the *BIOS* setup program.  
[Auto] Allows the system to detect the presence of *USB* devices at startup. If detected, the *USB* controller legacy mode is enabled. If no *USB* device is detected, the legacy *USB* support is disabled.

#### **XHCI Hand-off[Disabled]**

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

#### **USB SinglePort Control**

##### **USB3\_1~10 [Enabled]**

Allows you to enable or disable the USB3.0 port 1~10 individually. Configuration options: [Enabled] [Disabled].

##### **USB3, 5~8 [Enabled]**

Allows you to enable or disable the USB port 5~8 individually. Configuration options: [Enabled] [Disabled].

### **Platform Misc Configuration**

The items in this menu allow you to configure the Platform Misc.

#### **PCI Express Native Power Management [Disabled]**

Allows you to enable or disable PCI Express native power management. Configuration options: [Enabled] [Disabled]

### **Onboard Devices Configuration**

#### **HD Audio Controller [Enabled]**

- [Enabled] Enables the High Definition Audio Device.  
[Disabled] Disables the High Definition Audio Device.



- 
- The following item appears only when you set the HD Audio Controller item to [Enabled].
- 

#### **DVI Port Audio [Disabled]**

Allows you to enable or disable the DVI port audio. Configuration options: [Enabled]  
[Disabled]

#### **Charging USB devices in Power State S5 [Disabled]**

Allows you to set the front panel audio connector (AAFP) mode to legacy AC'97 or high-definition audio depending on the audio standard that the front panel audio module supports.

[Enabled] Charges USB devices even when the system is in Power State S5.

[Disabled] Disables this function.

#### **Intel LAN Controller [Enabled]**

[Enabled] Enables the Intel LAN controller.

[Disabled] Disables the controller.

#### **Intel PXE Option ROM [Disabled]**

This item appears only when you set the previous item to [Enabled] and allows you to enable or disable the PXE Option ROM of the Intel LAN controller. Configuration options: [On] [Off]

#### **Serial Port Configuration**

The sub-items in this menu allow you to set the serial port configuration.

##### **Serial Port [Enabled]**

Allows you to enable or disable the serial port (COM). Configuration options:  
[Enabled] [Disabled]

##### **Change Settings [IO=3F8h; IRQ=4]**

This item appears only when you set the Serial Port to [On] and allows you to select the Serial Port base address. Configuration options: [IO=3F8h; IRQ=4] [IO=2F8h; IRQ=3] [IO=3E8h; IRQ=4] [IO=2E8h; IRQ=3]

#### **Serial Port 1 Configuration**

The sub-items in this menu allow you to set the serial port 1 configuration.

##### **Serial Port 2 [Enabled]**

Allows you to enable or disable the serial port (COM). Configuration options:  
[Enabled] [Disabled]

##### **Change Settings [IO=2F8h; IRQ=3]**

This item appears only when you set the Serial Port to [On] and allows you to select the Serial Port base address. Configuration options: [IO=3F8h; IRQ=4] [IO=2F8h; IRQ=3] [IO=3E8h; IRQ=4] [IO=2E8h; IRQ=3]

#### **Parallel Port Configuration**

The sub-items in this menu allow you to set the parallel port configuration.

##### **Parallel Port [Enabled]**

Allows you to enable or disable the parallel port (LPT/LPTE).

Configuration options: [Enabled] [Disabled]

##### **Change Settings [Auto]**

Allows you to select an optimal setting for Super I/O devices. Configuration options:

[Auto] [IO=378h; IRQ=5;] [IO=378h; IRQ=5,6,7,9,10,11,12;] [IO=278h;

IRQ=5,6,7,9,10,11,12;] [IO=3BC; IRQ=5,6,7,9,10,11,12;]

##### **Device Mode [STD *Printer* Mode]**

Allows you to select the PrinterPort mode. Configuration options: [STD *Printer* Mode][SPP Mode] [EPP-1.9 and SPP Mode][EPP-1.7 and SPP Mode][ECP Mode][ECP and EPP 1.9 Mode][ECP and EPP 1.7 Mode]

## Serial Port Console Redirection

### **ConsoleRedirection[Disabled]**

Enables or disables the console redirection feature. When enabled, it allows you to maintain a system from a remote location by redirecting keyboard input and text *output* through the serial port. Configuration options: [On][Off]

### **Console Redirection Settings**

The following items become configurable only when you set the previous item to [On].

#### **Terminal Type [VT-UTF8]**

VT-UTF8 is the preferred terminal type for out-of-band management. The next best choice is VT100+ and then VT100. Configuration options: [VT100] [VT100+] [VT-UTF8] [ANSI]

#### **Bits per second [115200]**

Allows you to select the transmission speed of the serial port. Configuration options: [9600] [19200] [57600] [115200]

#### **Flow Control [None]**

Flow control prevents data loss from buffer overflow. This item allows you to set the flow control. Configuration options: [None] [*Hardware* RTS/CTS] [*Software* Xon/Xoff]

## APM Configuration

### **RestoreAC PowerLoss [PowerOff]**

[Power On] The system goes into on state after an AC power loss.

[Power Off] The system goes into off state after an AC power loss.

[Last State] The system goes into either off or on state, whatever the system state was before the AC power loss.

### **PowerOn By PCIE/PCI [Disabled]**

[Disabled] Disables the PCIE/PCI devices to generate a wake-on-LAN feature of the Intel®/Realtek LAN device.

[Enabled] Enables the PCIE/PCI devices to generate a wake-on-LAN feature of the Intel®/Realtek LAN device.

### **PowerOn By Ring [Disabled]**

[Disabled] Disables Ring to generate a wake event.

[Enabled] Enables Ring to generate a wake event.

### **PowerOn By RTC [Disabled]**

[Disabled] Disables RTC to generate a wake event.

[Enabled] When set to [Enabled], the items RTC Alarm Date (Days) and Hour/Minute/Second will become user-configurable with set values.

## Network Stack Configuration

### **NetworkStack [Disabled]**

This item allows user to disable or enable the UEFI *network* stack. Configuration options:

[Disabled] [Enabled]



- 
- The following two items appear only when you set the previous item to [Enabled].
-



***Ipv4 PXE Support[Enabled]***

This item allows user to disable or enable the Ipv4 *PXE Boot* support. Configuration options:  
[Disable Link] [Enabled]

***Ipv6 PXE Support[Enabled]***

This item allows user to disable or enable the Ipv6 *PXE Boot* support. Configuration options:  
[Disable Link] [Enabled]

***Intel TXT Information***

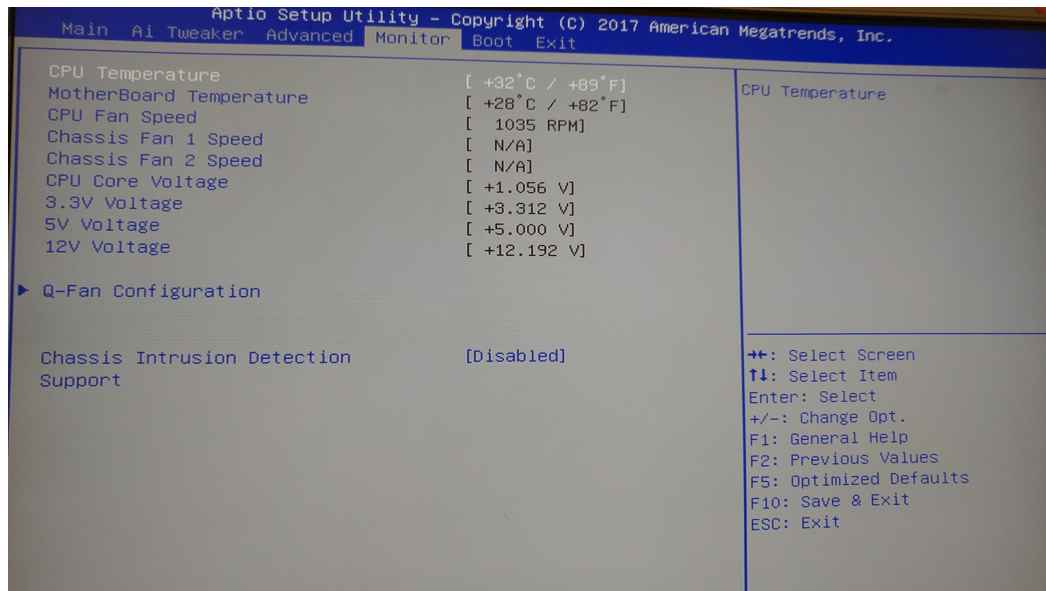
This item displays the Intel TXT information.

***HDD/SSD SMART Information***

This item displays the SMART information.

## Monitor Menu

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



Scroll down to display the following items:

### MotherboardTemperature[xxx/C/xxx/F]

The onboard *hardware monitor* automatically detects and displays the CPU and motherboard temperatures. Select Ignore if you do not wish to display the detected temperatures.

### CPU / Chassis Fan 1/2 Speed [xxxx RPM] or [Ignore] / [N/A]

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

### CPU Core Voltage,3.3V Voltage,5V Voltage,12V Voltage

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

## Q-Fan Configuration

### Q-Fan Tuning

Click [OK] button to detect the lowest speed and configure the minimum duty circle for each fan. Do not shut down or reset your system during the tuning progress. Configuration options: [Ok] [Cancel]

#### CPU Q-Fan Control [Auto]

[Disabled] Disables the CPU Q-Fan control feature.  
[DC Mode] Enables the CPU Q-Fan control feature.

#### CPU Fan Speed Low Limit [200RPM]

This item appears only when you enable the CPU Q-Fan Control feature and allows you to disable or set the CPU fan warning speed.

Configuration options: [Ignore][100 *RPM*][200 *RPM*][300 *RPM*][400 *RPM*][500 *RPM*]

#### CPU Fan Profile[Standard]

This item appears only when you enable the CPU Q-Fan Control feature and allows you to set the appropriate performance level of the CPU fan.

[Standard] Sets to [Standard] to make the CPU fan automatically adjust depending on the CPU temperature.  
[Silent] Sets to [Silent] to minimize the fan speed for quiet CPU fan operation.  
[Turbo] Sets to [Turbo]to achieve maximum CPU fan speed.  
[Manual] Sets to [Manual]to assign detailed fan speed control parameters.



- 
- The following four items appear only when you set CPU Fan Profile to [Manual]
- 

### Chassis 1/2 Q-Fan Control [Enabled]

[Enabled] Enables the Chassis Q-Fan control feature.  
[Disabled] Disables the Chassis Q-Fan control feature.

#### Chassis 1/2 Fan Speed Low Limit [600*RPM*]

This item appears only when you enable the **Chassis Q-Fan Control** feature and allows you to disable or set the chassis fan warning speed.

Configuration options: [Ignore][200 *RPM*][300 *RPM*][400 *RPM*][500 *RPM*][600 *RPM*]

#### Chassis Fan Profile[Standard]

This item appears only when you enable the **Chassis Q-Fan Control** feature and allows you to set the appropriate performance level of the chassis fan.

[Standard] Sets to [Standard]to make the chassis fan automatically adjust depending on the chassis temperature.  
[Silent] Sets to [Silent]to minimize the fan speed for quiet chassis fan operation.  
[Turbo] Sets to [Turbo]to achieve maximum chassis fan speed.  
[Manual] Sets to [Manual]to assign detailed fan speed control parameters.



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

**ChassisUpperTemperature[70]**

Use the <+> and <-> keys to adjust the upper limit of the CPU temperature. The values range from 40°C to 90°C.

**ChassisFan Max. Duty Cycle(%)[100]**

Use the <+> and <-> keys to adjust the maximum chassis fan duty cycle. The values range from 60% to 100%. When the chassis temperature reaches the upper limit, the chassis fan will operate at the maximum duty cycle.

**ChassisLowerTemperature[40]**

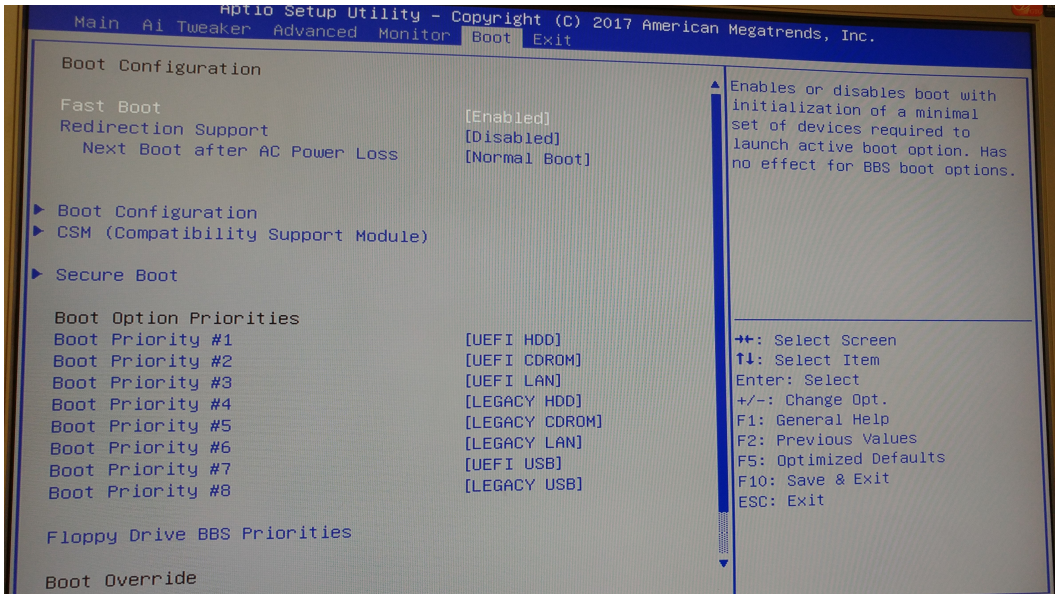
Displays the lower limit of the chassis temperature.

**CPU Fan Min. Duty Cycle(%)[60]**

Use the <+> and <-> keys to adjust the minimum chassis fan duty cycle. The values range from 60% to 100%. When the chassis temperature is under 40°C, the chassis fan will operate at the minimum duty cycle.

## Boot Menu

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



### Fast Boot [Enabled]

- [Enabled] Select to accelerate the *boot* speed.
- [Disabled] Select to go back to normal *boot*.



- The following six items appear when you set **Fast Boot** to [Enabled].

### Redirection Support [Disabled]

[Disabled]	Select to disable the redirection support.
[Enabled]	Select to enable the redirection support.

### Next Boot after AC Power Loss [Normal Boot]

[Normal <i>Boot</i> ]	Returns to normal <i>boot</i> on the next <i>boot</i> after AC power loss
[Fast <i>Boot</i> ]	Accelerates the <i>boot</i> speed on the next <i>boot</i> after AC power loss.

## Boot Configuration

### **Boot Logo Display [Enabled]**

- [Auto] Adjust automatically for Windows requirement
- [Full Screen] Maximize the boot logo size.
- [Disabled] Hide the *boot* logo during *POST*.

### **POST Delay Time [3 sec]**

This item appears only when you set *Boot* Logo Display to [Enabled]. This item allows you to select the desired additional *POST* waiting time to easily enter the *BIOS* setup. You can only execute the *POST* delay time during Normal *Boot*. The values range from 0 to 10 seconds.



- 
- This feature will only work under normal *boot*.
- 

### **Boot NumLock State [ON]**

- [Enabled] Sets the power-on state of the NumLock to [Enabled].
- [Disabled] Sets the power-on state of the NumLock to [Disabled].

### **Wait for 'F1' If Error [Enabled]**

When this item is set to [Enabled], the system waits for the F1 key to be pressed when error occurs.

Configuration options: [Disabled] [Enabled]

### **Option ROM Messages [Force BIOS]**

- [Force *BIOS*] The third-party *ROM* messages will be forced to display during the *boot* sequence.
- [Keep Current] The third-party *ROM* messages will be displayed only if the third-party manufacturer had set the add-on device to do so.

### **Interrupt 19 Capture [Disabled]**

- [Enabled] Allows the option ROMs to trap Interrupt 19.
- [Disabled] Disables this function.

## **CSM (Compatibility Support Module)**

Allows you to configure the CSM (Compatibility Support Module) items to fully support the

various VGA, bootable devices and add-on devices for better compatibility.

### Launch CSM [Enabled]

- [Auto] The system automatically detects the bootable devices and the add-on devices.
- [Enabled] For better compatibility, enable the CSM to fully support the non-UEFI driver add-on devices or the Windows® UEFI mode.
- [Disabled] Disable the CSM to fully support the Windows® Security Update and Security *Boot*.



- 
- The following four items appear when you set Launch CSM to [Enabled].
- 

### Boot Devices Control [UEFI and Legacy OpROM]

Allows you to select the type of devices that you want to *boot* up. Configuration options: [UEFI and Legacy OPRom] [Legacy OPRom only] [UEFI only]

### Boot from Network Devices [Legacy only]

Allows you to select the type of *network* devices that you want to launch. Configuration options: [Legacy only] [UEFI driver first] [Ignore]

### Boot from Storage Devices [Legacy only]

Allows you to select the type of *storage* devices that you want to launch. Configuration options: [Legacy only] [UEFI driver first] [Ignore]

### Boot from PCI-E/PCI Expansion Devices [Legacy only]

Allows you to select the type of PCI-E/PCI expansion devices that you want to launch. Configuration options: [Legacy only] [UEFI driver first]

## Secure Boot

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

### OS Type [Windows UEFI mode]

Allows you to select your installed *operating system*.

[Windows UEFI mode]	Executes the Microsoft® Secure <i>Boot</i> check. Only select this option when booting on Windows® UEFI mode or other Microsoft® Secure <i>Boot</i> compliant OS.
[Other OS]	Get the optimized function when booting on Windows® non-UEFI mode, Windows® Vista/XP, or other Microsoft® Secure <i>Boot</i> non-compliant OS. Only on Windows® UEFI mode that Microsoft® Secure <i>Boot</i> can function properly.

## Key Management



This item allows you to manage the Secure *Boot* keys.

### Install Default Secure Boot keys

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

### Clear Secure *Boot* keys

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

### Save Secure *Boot* keys

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

### PK Management

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

#### Delete PK

Allows you to delete the PK from your system. Once the PK is deleted, all the system's Secure *Boot* keys will not be active.

Configuration options: [Yes] [No]

#### Set New Key

Allows you to set a new key from your system. Press [Yes] to load factory default PK or select [No] to load it from a file on external media Configuration options: [Yes] [No]



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

### KEK Management

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



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

#### Delete Key

Allows you to delete the Key from your system. Configuration options: [Yes] [No]

#### Set New Key

Allows you to set a new key.

#### Append Key

Allows you to load the additional KEK from a *storage* device for an additional db and dbx loaded management.



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

### DB Management

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

single computer.

**Delete key**

Allows you to delete the Key from your system. Configuration options: [Yes] [No]

**Set New Key**

Allows you to set a new key.

**Append key**

Allows you to load the additional KEK from a *storage* device for an additional db and dbx loaded management.



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

## DBX Management

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

**Delete key**

Allows you to delete the Key from your system. Configuration options: [Yes] [No]

**Set New Key**

Allows you to set a new key.

**Append key**

Allows you to load the additional KEK from a *storage* device for an additional db and dbx loaded management.



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

## Boot Option Priorities

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



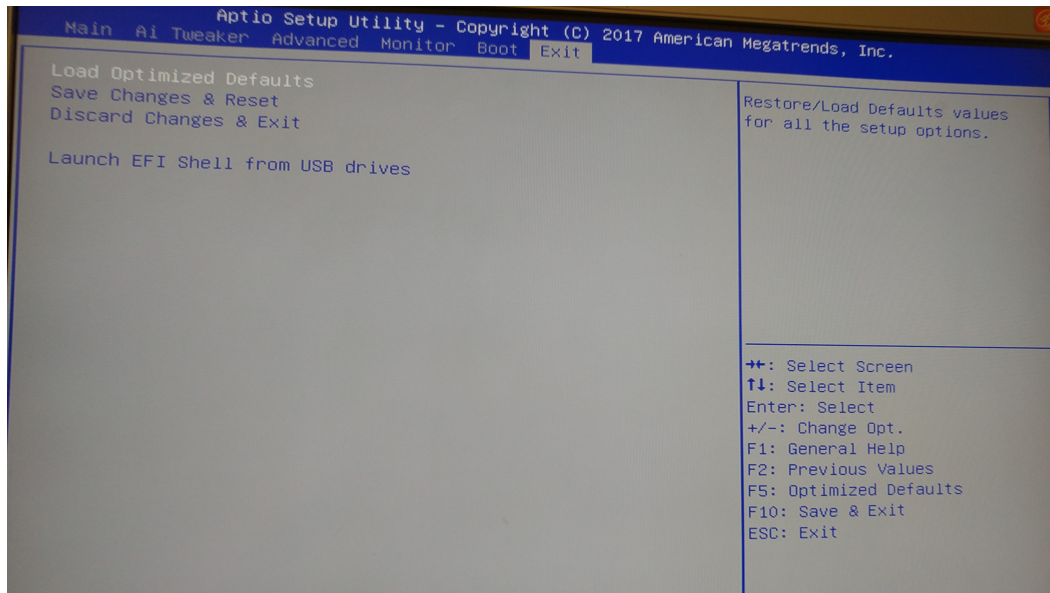
- 
- To select the *boot* device during the system startup, press <F8> when ASUS Logo appears.
  - To access Windows OS in Safe Mode, press <F8> after *POST* or press <F5> when Asus Logo appears.
- 

## Boot Override

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

## Exit Menu

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



### **Load Optimized Defaults**

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

### **Save Changes & Reset**

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

### **Discard Changes & Exit**

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

### **Launch EFI Shell from file system device**

This option allows you to attempt to launch the EFI Shell *application* (shellx64.efi) from one of the available devices that have a file system.

## How to Place a Service Call

Northern Micro provides support for your Spirit system from coast to coast. This section features our main service calls procedures.

### Via telephone

Customers can contact our National Call Centre at **1-800-563-1007 (extension 241)**. Our regular business hours are Monday to Friday from 8:00AM-5:00PM.

### Via the Internet

You are also invited to use our self-serve services on the Web. To place your service call, please go to <http://northernmicro.com/warranty-service/>.

### Via our Portal

Service calls can also be placed via our portal. Access to the portal can be requested by contacting [PortalRequest@nmicro.ca](mailto:PortalRequest@nmicro.ca).

### General procedures:

To speed-up the process, our bilingual call coordinators will ask you for:

- product type and serial number;
- problem description;
- address, phone numbers, etc.

Once your work order is registered, a technician will contact you within the next hour during regular business hours.

Your dedicated technician will make a diagnostic and will offer suggestions. He or she will also determine if the problem is *software* or *hardware* related. If the problem is related to *hardware*, a technician will be deployed on site to solve the problem. If the problem is related to *software* and a technician is deployed on site, some charges may apply. Please note that most problems are solved over the phone. In either case, the technician will communicate with the client to confirm the time of the visit.

## Replacing CMOS Battery

When you turn your computer off, the CMOS chip stores information about date and time and configuration details necessary to start and run the system. A small button cell (coin) battery provides the power for the CMOS chip memory.

Replacement batteries are available from Northern Micro's service department. After you replace the battery, you must reset the date and time and restore the configuration settings. To do so, run the setup utility. See BIOS Setup Program to find out how to run the setup utility.

Generally CMOS batteries last for about five years. Here are some signs that your CMOS battery needs to be replaced.

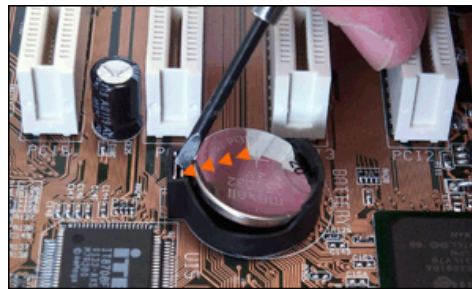
1. **Invalid configuration** will appear on your screen.
2. **Run Setup** appears on your screen.
3. **Press F1 to continue** appears on your screen.
4. **Invalid drive specification** appears on the screen after you've pressed F1.
5. **Clock Error** or **Clock Message** appears on your screen.
6. The clock on the computer loses time.
7. The computer is constantly showing the wrong date

To replace the CMOS battery, push the adjacent retention clip and the battery will pop out of the socket.

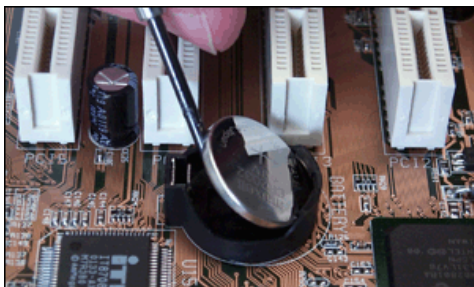
The battery is held by a retention clip.



Press the clip as shown.



and gently ease the battery out of the socket.



Install the replacement battery (CR2032 button cell) by pushing it into the socket until it snaps into place.

## Troubleshooting

1. [No display when power on](#)
2. [Can't enter OS](#)
3. [Power supply does not work well](#)
4. [The PC works very slowly](#)
5. [CPU fan is too noisy](#)
6. [Freeze frequently](#)
7. [Can't connect to the Internet](#)
8. [4GB of Memory Installed Computer only Recognizes 3.0GB or less](#)
9. [Audio is abnormal](#)
10. [How to have dual video output](#)
11. [BIOS Errors](#)

### [No display when power on](#)

#### Solution

Make sure all cables are connected well and the power is on:

- Clear the *CMOS*
- Keep the necessary components (a CPU, a *memory* module, and a graphic card) on board to test:
- If the PC does *POST* well with the minimum system components:
  - Please plug in the other components one by one to find out which one may cause this problem.
  - If the PC still cannot *POST* at all:
    - The power LED on the motherboard is on and the CPU fan works well, please connect the speaker connector to check if there are any beeps
    - *Memory* issue: Beep (1 long 2 short)
      - Clean the golden contacts of the *memory* module
      - Clean the *memory* slots
      - Leave only one *memory* module to test
      - If convenient, please change different *memory* modules to test again
    - Graphics card issue: Beep (1 long 3 short)
      - Clean the golden contacts of the graphics card
      - Clean the graphics card slots

- Try to test the onboard graphics card if there is onboard video integrated
- If convenient, please change to a different graphic card to test again
- CPU (processor) issue: Beep (5 short)
  - Check whether the CPU is in the motherboard manufacturer's CPU support list
  - Check whether there is any damage to your CPU or CPU socket.
  - Check whether the CPU fan is correctly connected
  - Check whether the ATX\_12V power cable is connected well
  - If possible try to test with another CPU
- The power LED on the motherboard is off and the CPU fan does not work well
  - Check the power pin
  - Check the power supply, try exchanging the power supply for another good one

## Cannot enter OS

### **Solution**

- During *POST*
  - Un-plug any newly added devices to see if the issue disappears.
  - Keep the necessary components (a CPU, a *memory* module, and a graphic card) on board to test
  - If the problem is solved with minimum system *hardware*, please add the devices one by one and find out which part is at fault
  - If the problem still remains with minimum system *hardware*, please contact your Service Center
- During Windows LOGO loading
  - If the PC can enter safe mode successfully, please enter OS safe mode and uninstall the newly installed driver or *software*
  - If the PC cannot enter safe mode, please try re-installing the OS. Before re-installing, please back up the important data first.

## Power supply does not work well

### **Solution**

- Different areas have different voltage supplies, please check the voltage selector on the power supply (115v/230v).
- The power cable works fine: When power is on, the power LED on the motherboard is on:
  - Can *boot* up via the power pin on the motherboard, please check if all the *hardware* devices are connected well.
  - Can't *boot* up via the power pin, please contact your Service Center.
- When power is on, the power LED on the motherboard is still off: If convenient, please test the power supply in another PC which is working fine.
- The power cable is faulty, please change the power cable to check if this might be the problem.



## The PC works very slowly

### **Solution**

- Before entering the *Operating System*
  - Hangs during *POST*, try to determine which device is always being searched when the PC hangs:
  - Take off the unnecessary device to see if that speeds up the PC.
  - Change the *hardware* one by one
- Hangs at the Windows Login
  - Enter safe mode to see if the issue is still evident
  - Re-install the drivers
  - Re-install a new "clean" *Operating System*
- After entering the OS, it takes a long time to see the desktop
  - Click "Start"—"Run", input "msconfig", enter "System Configuration Utility"—"Startup", cancel the unnecessary *boot* up items
  - Check if caused by any incompatible *software*
  - Please optimize the system
- Only runs slowly when using some special *software*
  - Check if the system configuration fulfils the minimum requirement of the *software*
  - End the process which takes up the most CPU usage
  - Please optimize the system
- Only runs slowly when connect to the *internet*
  - Change the *network* cable to see if the speed changes
  - Scan for any *virus*
  - Please optimize the system
- An abnormally high temperature causes the slow speed
  - Check the fan settings in the *BIOS*
  - Improve the heat transfer conditions
  - Please optimize the system

## CPU fan is too noisy

### **Solution**

- Check if the CPU fan is damaged and whether the fan is well connected to the motherboard
- Please clean the CPU fan since this problem may be caused by dust. Please put on some CPU lube if necessary
- Please check if the CPU fan always runs at a high speed
- Check if the settings in the *BIOS* is correct

- Please check if the problem only appears when the CPU load is high.

## Freezes frequently

### **Solution**

#### ***Freeze/ Hang during POST***

- If some new *hardware* has been installed, please un-plug the new *hardware* for a test
- If there is no new *hardware* added, please only keep the necessary components to have a check

#### ***After POST and before entering OS***

- If you could enter safe mode successfully, please enter safe mode to un-install the drivers and the *software*
- If not, please re-install a new clean OS

#### ***After entering OS***

- Freezes/Hangs frequently and unpredictably
  - If the Temperature is abnormal, please check the CPU temperature and the heat transfer of the chassis.
  - If the temperature is OK, please scan your PC for any *virus*
- Freezes/Hangs when running certain *applications* or games
  - Please update by loading any new patch available from the corresponding website

## Cannot connect to the Internet

### **Solution**

- Check the LAN settings in the *BIOS*
- Install a new clean OS and install the chipset and LAN drivers *download*ed from the official website
- The *network* adapter might not be recognized in Device Manager
  - If there is yellow question mark or exclamation mark before the *network* card in the Device Manager, please re-install the OS and drivers. If the problem persists, please contact our service center.
  - If there is no yellow question mark or exclamation mark before the *network* card:
    - In Control Panel/*Network* Connections/Local Area Connection, the *network* cable is shown as "un-plugged(X)", please check the *network* cable/router/switch/ *modem*/other *network* peripherals and *network* port, or plug *network* cable to another system
    - In Control Panel/*Network* Connections/Local Area Connection is disabled (grey), please enable (right click and choose "Enable") it for a test. If the problem persists, please turn off the *firewall*, search for and kill any *virus*, reinstall the OS and drivers. If the problem still exists, please contact our service center
    - In Control Panel/*Network* Connections/Local Area Connection is shown as "Limited or no connectivity" (yellow exclamation mark)", please do some troubleshooting using the following steps:

- Right click and choose "repair"
- Un-plug and re-plug the *network* cable
- Check *server* DHCP settings, IP configuration, seek advice from your *Internet* Service Provider
- Restart
- Re-connect the *network* or access IP
- Skip the router and connect to the *Modem* directly
- Turn off other computers in the same *network* to avoid any IP conflicts
- There is no abnormal situation in Control Panel/*Network* Connections/Local Area Connection, please do some troubleshooting using the following steps:
  - Try to access the IP or Static IP automatically
  - Un-plug and re-plug the *network* cable
  - Check *server* DHCP settings, IP configuration, seek advice from ISP
  - Restart
  - Re-connect the *network* or access IP
  - Turn off other computers in the same *network* to avoid any IP conflicts
  - Check the MAC address (You can follow the commands: " Start"—" All Programs"—" Run", Please input " cmd", and then input " ipconfig/all" to check MAC address
  - If the *network* card is not recognized in Device Manager, please contact our service center

## 4GB of Memory Installed, Computer only Recognizes 3.0GB or less

### **Solution**

- If you installed a total of 4GB of *memory*, the system will detect less than 4GB of total *memory* because of address space allocation for other critical functions, such as:
  - System *BIOS* (including motherboard, add-on cards, etc...)
  - Motherboards resources
  - *Memory* mapped I/O configuration for AGP/PCI-Ex/PCI
  - Other *memory* allocations for PCI devices
- Different onboard devices and different add-on cards (devices) will result in a different total *memory* size.
  - e.g. more PCI cards installed will require more *memory* resources, resulting in less free *memory* for other uses.
- On an SLI system, since *PCI Express* graphic cards will occupy around 256MB, another 256MB will be occupied after you install a 2nd *PCI Express* graphic card. Hence, only 2.75GB of *memory* is left if two SLI cards are installed while 3.0GB *memory* is left with one graphic card.
- This limitation applies to most chipsets and to Microsoft Windows 32-bit version operating systems.
- With a Windows 32-bit version of the *operating system*, we recommend that you have less than 3GB of total *memory* installed. If more than 3GB *memory* is required for your system, then these two conditions must be met:

1. The *memory* controller which supports *memory* swap functionality must be used. Chipsets later than Intel 975X, 955X, Nvidia NF4 SLI Intel Edition, Nvidia NF4 SLI X16, and AMD K8 CPU architecture support *memory* swap function.
2. Installation of a Windows 64-bit *Operating System*, which can address more than 4GB of *memory*.

## Audio is abnormal

### **Solution**

#### **Abnormal input/ *output***

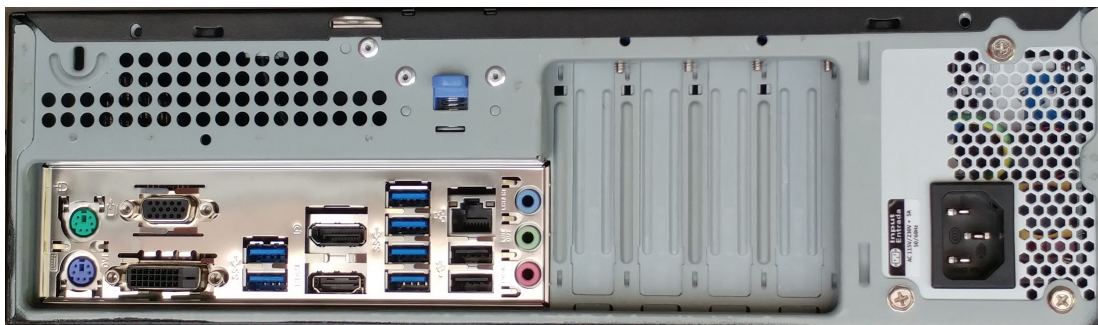
- There is a yellow question mark before the audio device in Device Manager
  - First please install the patch "MICROSOFT UAA Function Driver for High Definition Audio" for the *Operating System*
- Re-install the audio driver
- There is a yellow exclamation mark before the audio device in Device Manager
  - First un-install all the drivers related to the audio device and install the patch "MICROSOFT UAA Function Driver for High Definition Audio" for the Operating System
  - Restart the PC, if the problem still persists, please recover the system or re-install the *Operating System* and load the latest audio device driver
- The audio device could not be recognized in Device Manager
  - Load the default *BIOS*, making sure the onboard audio function is enabled in *BIOS*
  - Re-install a new clean Operating System
- No *output* or input from the rear panel
  - Adjust the audio settings in the Control Panel
  - Update the Audio driver
  - Change the Audio device, such as the microphone, earphone or speaker
- No *output* or input from the front panel
  - Please check if there is any *output*/ input from the rear panel, if not, please do some troubleshooting
  - Change to [*AC97*] mode in the *BIOS* (if the front panel module is *AC97* compliant)
  - Adjust the audio settings in the control panel
  - Check if the front panel is connected correctly
  - Try swapping for another chassis front panel connector
- **Abnormal Sound:** Sound is low
  - Adjust the audio settings in the control panel
  - Close some sound resources which have not been used for a while, such as SPDIF, MIC
  - Update the audio driver
  - Change the Audio device, such as the microphone, earphone or speaker
- **Sound with Noise:**

- If caused by a magnetic field, please move the computer away from the field to see if that is the problem
- Adjust the audio settings in the control panel
- Close some sound resources which have not been used for a while, such as SPDIF/F, MIC
- Update the audio driver
- Change the Audio device, such as the microphone, earphone or speaker

## How to have dual video output

### Solution

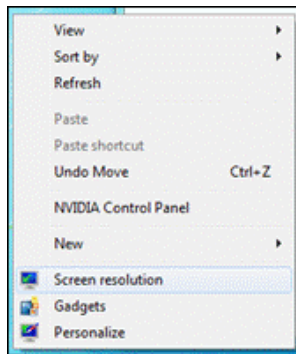
1. First, please check the rear panel of your computer.



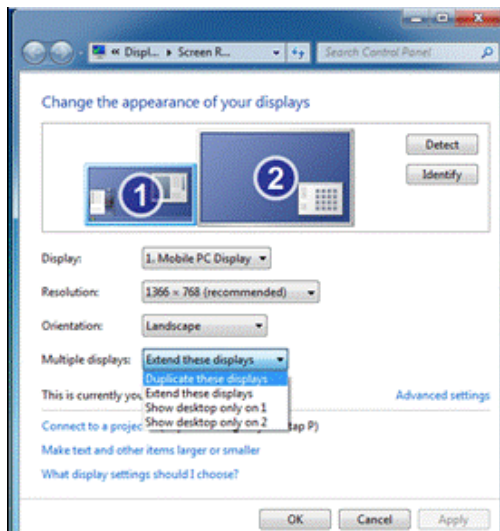
- 
- Discrete graphic card is optional. For dual display, discrete graphic card is not necessary. The onboard graphics card also provides support for this feature.
- 

- 
- Our Desktop PCs commonly support VGA, *DVI*, DisplayPort and HDMI ports. The display *output* ports may vary with different models. If you are having issues building dual display *output* or other problem, please contact our service desk for further troubleshooting. Please make sure to describe the symptom in detail.
- 

2. Connect one end of the cables to the two different monitors and the other ends to the video ports on the back of the computer. If the connections of your monitors do not match the video connections of your computer, you may require a cable adapter that allows you to get the video signal to the *monitor*. At the bottom of this page there are photos of the various cables and some popular cable adapters.
3. How to set the *output* mode in system:
  - Connect two monitors to your computer and connect the power cords to the monitors for the system to detect automatically. If only one *monitor* receives the signal, please right click on desktop and select Screen resolution.



Select the **Duplicate these displays** in **Multiple displays** scroll down list:



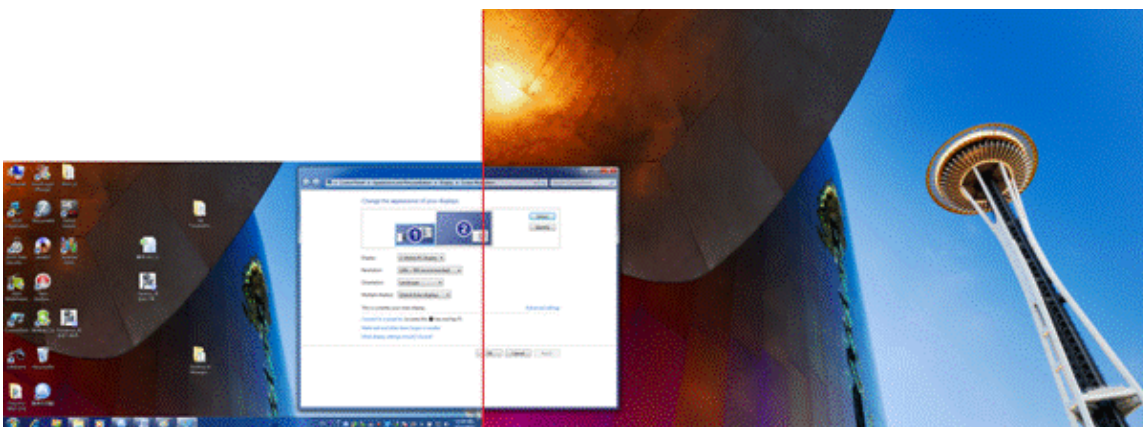
Then it will show the same desktop on your monitors. The maximum resolution is limited by the highest resolution support of your monitors.

If you select "Extend these displays", it will allow you set the resolution of each *monitor* separately.

In this mode, it allows you to show different information on two monitors. Just drag the window out of the current desktop then you will see it in the second desktop.

**Display on *Monitor* 1:**

**Display on *Monitor* 2:**



If the connections and settings are all correct but dual display still isn't functioning, please reinstall the most recent graphics card driver.

**VGA to VGA****DVI-D to DVI-D****HDMI to HDMI****DisplayPort to DisplayPort****DVI-I to VGA****DVI to HDMI**

## BIOS Errors

BIOS errors will cause beeping sounds when the computer is trying to POST. The quantity and duration of the beeps indicate where the error occurs. The following table gives the most common beep patterns.

<b>BIOS Beep</b>	<b>Description</b>	<b>Troubleshooting Techniques</b>
<b>One short beep</b>	No keyboard detected Graphics Card detected	<ul style="list-style-type: none"> <li>• Plug in keyboard, if not already done.</li> <li>• Remove and reinsert keyboard's USB connection to computer.</li> <li>• Try plugging keyboard into a different USB port on the system.</li> </ul>
<b>Two short beeps</b>	When using <a href="#">Asus Crashfree</a> to recover BIOS, the new BIOS is successfully recognized	<ul style="list-style-type: none"> <li>• No troubleshooting required.</li> </ul>
<b>One continuous beep followed by two short beeps then a pause (repeated)</b>	No RAM memory detected	<ul style="list-style-type: none"> <li>• Reseat the RAM modules.</li> <li>• Try installing the RAM in different DIMM slots.</li> <li>• Try using a different RAM module.</li> </ul>
<b>One continuous beep followed by three short beeps</b>	No graphics card or integrated graphics detected	<ul style="list-style-type: none"> <li>• Ensure that the graphics card is installed and seated correctly in the first PCIe slot. Reseat if needed.</li> <li>• Check to see if the graphics card requires extra power directly from the power supply. Refer to Graphics card literature.</li> </ul>
<b>One continuous beep followed by four short beeps</b>	Failure of hardware component	<ul style="list-style-type: none"> <li>• Call Northern Micro for support.</li> </ul>



## TPM

**TPM** (Trusted Platform Module) is an integrated chip on the motherboard that stores keys, passwords and digital certificates. It is specifically designed to enhance platform security above-and-beyond the capabilities of today's **software** by providing a protected space for key operations and other security critical tasks. The information stored is typically much more resistant to attacks; both **software** and theft. **TPM** protects encryption and signature keys at their most vulnerable stages i.e operations when the keys are being used unencrypted in plain-text form. Access to data could be denied if the **boot** sequence is not as expected making email, secure web access and data protection much more secure.

Systems with TPMs offer improved, **hardware** -based security in numerous applications, such as file and **folder** encryption, local password management, S-MIME e-mail, VPN and PKI authentication and wireless authentication for 802.1x.

### ***How do TPMs compare with smart cards or biometrics?***

They are complementary to the **TPM**, which is considered a fixed token that can be used to enhance user authentication, data, communications, and/or platform security. A smart card is a portable token traditionally used to provide more secure authentication for a specific user across multiple systems, while biometrics are providing that functionality in an increasing number of systems. Both technologies can have a role in the design of more secure computing environments.

### ***Can the Trusted Platform Module control what software runs?***

No. There is no ability to do this. The subsystem can only act as a 'slave' to higher level services and applications by storing and reporting pre-runtime configuration information. Other applications determine what is done with this information.

### ***How does Microsoft's BitLocker technology relate to the TPM***

Microsoft BitLocker™ Drive Encryption is designed to make use of a Trusted Platform Module (**TPM**) 1.2 to protect critical system files and user data and to help ensure that a computer running Windows Vista has not been tampered with while the system was offline.

### ***Is the TPM required for BitLocker?***

For BitLocker™ to make use of a **TPM**, it must be a version 1.2. While it is possible to use BitLocker™ without a **TPM** by storing the keying material on a **USB** flash drive, this is not the preferred customer configuration, nor is it expected to be typical usage due to the cost and manageability challenges associated with this mode of use.

## Warning of Potential Data Loss

Take precautions to mitigate the chance of data loss. Data encrypted by any program utilizing the Trusted Platform Module (*TPM*) may become inaccessible or unrecoverable if any of the following occurs:

- **Lost Password:** Loss of any of the passwords associated with the *TPM* will render encrypted data inaccessible. No password recovery is available.
- **Hard Drive Failure:** In the event of a failure of a hard disk (or other *storage* media) that contains encrypted data, an image of the hard disk (or other *storage* media) must be restored from backup before access to encrypted data may become available. The owner/user should backup the system hard disk on a regular basis.
- **Motherboard Failure:** In the event of a platform failure and/or replacement of the motherboard, recovery procedures may allow migratable keys to be recovered and may restore access to encrypted data. All non-migratable keys and their associated data will be lost.
- **Loss of Trusted Platform Module Ownership:** Trusted Platform Module Ownership/contents may be cleared (via a *BIOS* switch) to allow for the transfer of a system to a new owner. If *TPM* ownership is cleared, either intentionally or in error, recovery procedures may allow the migratable keys to be recovered and may restore access to encrypted data

## Introduction to Environmental Program

Northern Micro, in an effort to become more environmentally conscious has embarked on a number of programs over the years that pertain to environmental stewardship and comply with applicable laws and restrictions. These programs guide the organization to develop products that safely reduce or eliminate environmentally hazardous materials, promote a "reuse and recycle" End of Life Management model and improve energy efficiency.

At Northern Micro we strive for continuous improvement of our environmental system by incorporating the best possible practices through our waste management and IT products recycling initiatives.

We understand that the achievement of reducing the amount of pollution and waste into our natural environment must rely, to a large extent, on each individual member of the corporate team. As such, all employees, with the full support of management, contribute to the goal of reducing, reusing and recycling our products and the waste we produce.

In this regard, Northern Micro also works with committed partners that exhibit a focus on Sustainable Development and Green procurement. The following are some organizations and programs that promote safe Environmental stewardship and in which Northern Micro participates as part of its overall commitment to our environmental policy.

- Electronics Product Stewardship Canada (EPSC)
- Call2Recycle (formerly named Rechargeable Battery Recycling Corporation (RBRC))
- EPEAT (a program of the Green Electronics Council)
- Energy Star, Microsoft WHQL, 80+ and TCO Development.

## Environmental Policy

"Northern Micro is committed to continually reducing the amount of Pollution created in its manufacturing plant by offering recycling solutions for IT equipment and by properly reducing, reusing and recycling its packaging material. Northern Micro maintains an Environmental Management system that it is proud of and one that complies with all of its legal and other defined environmental requirements."

## Environmental Program

### **ISO14001**

Northern Micro is dedicated to providing computer products and services that meet or exceed the quality, operational performance and life cycle cost requirements of our customers. In an effort to continually improve our system we have implemented our Environmental Management System (EMS), which also meets the requirements of the ISO-14001 Environmental Management System. The Environmental Management System assures that NM computer products, their manufacturing, their delivery, and their recycling are processed under the control of the system. The System is designed to adhere to ISO 14001:2004 standard. The system assures conformance to legal and the company's environmental policy and provides objective evidence of effective control.

Northern Micro attained its ISO 14001 certification in November 2006.

### **IEEE1680**

The policy focuses on areas which address all stages of the product life cycle. IEEE 1680 is the first U.S. standard to supply environmental guidelines for institutional purchasing decisions involving desktop and laptop computers and monitors. It offers criteria in eight categories - materials selection, environmentally sensitive materials, design for end of life, end-of-life management, energy conservation, product longevity and life-cycle extension, packaging, and corporate performance. IEEE 1680 and its product registration and verification system are part of the Electronic Products Environmental Assessment Tool (EPEAT).

### **EPEAT**

EPEAT is a program of the Green Electronics Council and provides a procurement tool to help institutional purchasers in the public and private sectors evaluate, compare and select desktop computers, notebooks and monitors based on their environmental attributes. EPEAT also provides a clear and consistent set of performance criteria for the design of products, and provides an opportunity for manufacturers to secure market recognition for efforts to reduce the environmental impact of its products. Northern Micro EPEAT certified products are listed on the EPEAT's web site (<http://www.epeat.net>).

### **RoHS**

RoHS (Reduction of Hazardous Substances) - The reduction and/or elimination of environmentally sensitive materials and hazardous substances. As of July 31st 2005, all Northern Micro systems refreshed on the NMSO (National Master Standing Offer) utilize RoHS compliant components.

Flame retardants and plasticizers - The elimination of intentionally added flame retardants and plasticizers in certain applications.

Recycled plastics content - Ensuring that the product contains less than 5.0% *post* consumer recycled plastic.

Renewable/bio based plastic materials - A declaration as to whether the product contains renewable/biobased plastic materials greater than 5.0%, measured as a percentage of total plastic (by weight) in each product.

Toxics in packaging - Ensuring a reduction/elimination of intentionally added toxics in packaging

## Other Environmental practices employed by Northern Micro

- **Power Management** - Ensuring maximum efficiency without sacrificing performance in product design.
- **Thermal Consideration** - Ensuring the proper case/motherboard/CPU configuration is developed to maintain the required Thermal levels.
- **Acoustic Levels** - Ensuring systems conform to ISO 9296 declaration methodology and employing the ISO 7779 test methodology for acoustic levels.

## Energy Star, Microsoft WHQL and 80 PLUS

- **ENERGY STAR** is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy to help save money and protect the environment through energy efficient products and practices. Northern Micro is an active participant in the Energy Star and certifies its products as Energy Star compliant (as listed on their web site <http://www.energystar.gov/> )
- The **Microsoft WHQL** program is used to qualify products that conform to industry standards for computer and related equipment. Among the criteria being measured are Power Management features (Wake On-LAN, *ACPI*, Sleep/Suspend/Hibernate) which greatly enhance the longevity of key system components, reduce power requirements and offer overall improved efficiency and performance to the user and the environment.
- The **80 PLUS program** is one of the latest power conservation initiatives that promote the maximum operating efficiency of power supplies within computer equipment. The performance specification requires power supplies in computers and servers to be 80% or greater energy efficient at 20%, 50% and 100% of rated load with a true power factor of 0.9 or greater.
- **TCO Development** ensures that certified products are tested to conform to standards developed by them and which create a better working environment for office users. Northern Micro uses TCO '03 certified LCD *monitor* products from its partners.

## EPSC

The EPSC (<http://www.epsc.ca/>) is a not-for-profit organization and works with an array of partners and stakeholders to design, promote and implement sustainable solutions for Canada's electronic waste problem. These industry leaders are aware of both the pressures on municipalities for landfill management and the environmental necessity to handle the potentially hazardous content of electronics products and reuse the valuable resources they contain. EPS Canada was created to work with both industry and government to develop a flexible, workable Canadian solution. Northern Micro is an active member of the EPSC. The EPSC has recognized both Environment Canada's ECO Logo and the corresponding US EPEAT programs as tools for developing environmentally friendly solutions.

## Call2Recycle (formerly RBRC)

Call2Recycle (<http://www.call2recycle.ca/>), through their North American wide program recycles used portable rechargeable batteries and old cell phones typically found in cordless power tools, cellular and cordless phones, laptop computers,

camcorders, digital cameras, and remote control toys. Call2Recycle recycles the battery chemistries: Nickel Cadmium (Ni-Cd), Nickel Metal Hydride (Ni-MH), Lithium Ion (Li-ion) and Small Sealed Lead (Pb). Call2Recycle is dedicated to keeping rechargeable batteries and cell phones out of our nation's solid waste stream and preserving natural resources. Northern Micro participates in the Call2Recycle program and offers this free service to its clients for all batteries meeting the above specifications regardless of when and through whom they were purchased as Northern Micro is also a collection center for this program. Batteries can be dropped off at any Northern Micro location for recycling.

## Electrostatic Discharge (ESD)

ESD: Short for electrostatic discharge: the rapid discharge of static electricity from one conductor to another of a different potential.

### Static Electricity: Creating Charge

Under certain conditions (low humidity, carpeted floors, etc.) static electricity will build up. Contact with these sensitive components may cause the build-up to discharge into the integrated circuitry of the component; a powerful enough discharge may damage or destroy the component.

Electrostatic discharge can change the electrical characteristics of a semiconductor device, degrading or destroying it. Electrostatic discharge also may upset the normal operation of an electronic system, causing premature equipment malfunction or failure.

### Static Electricity Precautions

To protect components against damage from static electric discharge, you should follow some basic precautions whenever you handle them:

- Use a grounding wrist strap. The strap will have an 'alligator' clip at the end of a shielded wire lead. Clip it to a grounded object. Any static electricity will then harmlessly discharge through the strap. Put on and connect the strap before you handle the components.
- Use an anti-static pad. Put any components on the pad whenever you work on them outside the computer. If you don't have a pad, put the components on the anti-static bag they came in.



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- Both the wrist strap and pad are inexpensive and are generally available from computer supply companies.
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## Location & Electrical Service

- Position your system unit, *monitor* and cables/wires away from direct sunlight, moisture, dust, oil and thoroughfares.
- Do not submit your equipment to harsh jarring.
- Ensure that all ventilation outlets are always free from obstruction.
- In the event of mechanical/power failure or damage, do not attempt to repair the system unit, *monitor*/s or cables/wires. Refer all such problems to experienced service personnel.
- Ensure that the back of the system unit is at least 3 inches away from anything that might obstruct the ventilation outlets and cause over-heating.
- Ensure that the power source is grounded correctly. This product is equipped with a 3-wire grounding-type plug. This plug will only fit into a grounded power outlet.



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- It is recommended not to service this product yourself, as opening and removing covers exposes dangerous voltage areas and other risks. Refer all servicing to service persons.
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## Cleaning & Moving Your Computer

### The computer:

- Keep it in a dry, clean space and stand it on a flat surface
- Minimize exposure to dust – don't get the power switches or other controls wet
- If you move it from a very cold environment to a warm environment, give the components time to reach room temperature before switching them on
- Use a mild cleaning solution (no detergents!) and a damp cloth to clean exterior surfaces
- Occasionally remove dust from interior surfaces, taking care not to touch or damage connections or chips

### The keyboard:

- Keep food and drinks away from the keyboard
- Use a mild cleaning solution and a damp cloth to clean exterior surfaces

### The monitor:

- Don't touch the screen with hard objects such as pens and pencils
- Remove dust from the surface by blowing it or wiping it gently with a dry cloth; then use a soft cloth with nonabrasive liquid glass cleaner
- Check cleaner instructions to be sure that it is safe for glass

### The mouse:

- When your *mouse* doesn't obey you, it's time to clean it, use a mild cleaning solution (no detergents!) and a damp cloth to clean exterior surfaces

### Moving the computer:

- It's possible to damage data on the hard disk when you move your computer, so you should back up all critical data first. Remove all data disks from the drives. Turn off the computer and all peripherals. Unplug the power cord and disconnect all cables. If you aren't familiar with the panel setup on your computer, sketch the location of cables first
- Pack the computer and peripherals in well-cushioned packing cartons, preferably the original boxes

## Information Backup

It's wise to make backup copies of your original *software* disc in the event that the original is damaged. For the same reason, you should frequently back up important data while you are working. Save your work to the hard disk regularly (some programs do this automatically or offer auto backup as an option). More importantly, save the data to a backup such as a tape drive, disc, removable hard disk or network several times during each work session. If your hard disk crashes or a power failure destroys your file or your office is broken into, you will be thankful you did.

If your data is critical, it's advisable to make a second backup and keep this in a fireproof safe or a safe location out of the office.

# Hard Drive Maintenance

## Traditional Hard Disks

Traditional hard disks are a rigid magnetic-sensitive disk mounted on a single spindle. Each disk has one or two read and write heads (for one or both sides), which float above the surface of the disk. The disk spins at a constant rate, and the heads move across the surface to locate information as required.

Each disk is segmented into tracks, which are themselves divided into sectors. The address of a piece of information includes both the track and sector.



## Solid State Disks

Solid State disks (SSD) are a data *storage* device using integrated circuit assemblies as *memory* to store data persistently. SSD technology uses electronic interfaces compatible with traditional hard disk drives. SSDs have no moving mechanical components, using flash *memory* instead of magnetic disks. They can be used in place of traditional magnetic hard disk drives or along side traditional drives for more *storage* or as a faster way to *boot* the computer.



## Fragmented files

After storing and removing many pieces of data, the hard disk can get fragmented — information for the same file may be scattered everywhere. On traditional disks, when you call up that file, the heads must move many times back and forth to recall the information. Defragmenting the disk puts these pieces back together and gets your computer running fast again.

Your **operating system** may offer a feature to consolidate your disk. There are also several programs available that examine and, if necessary, defragment the disk.

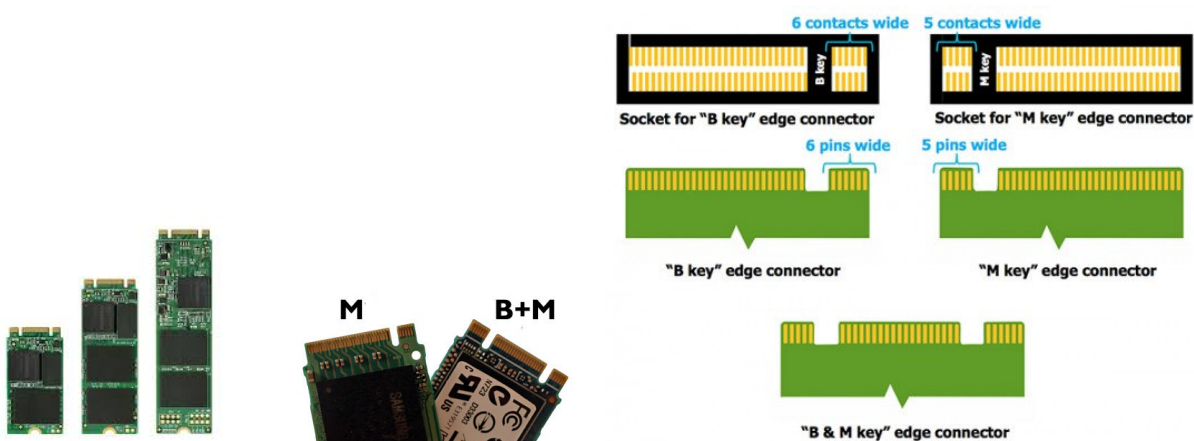
## Erased files

If you erased a file by mistake, most operating systems offer an undelete or restore feature to recover some or all of your material. The more work you do on the computer after deleting the program, the lower the probability of full recovery.

The fact that erased files remain on the disk may be a concern for some security applications. If security-sensitive information is erased and the computer or file passes to another person, security may be breached. To prevent this from happening, you can do a low-level format on a hard drive, or reformat an external storage device such as a USB key. Programs for low-level **operating system** formats are readily available.

## M.2 Storage

With computers shrinking in size, a new form factor for solid state storage has started to become popular. The M.2 form factor is an expansion card that fits into a dedicated slot on some motherboards. These cards can run on the PCI Express 3.0 bus (PCIe), the Serial ATA 3.0 bus (SATA) or the Universal Serial Bus 3.0 (USB) depending on the motherboard configuration. M.2 slots can also be used for other purposes such as Wi-Fi cards, Bluetooth cards, satellite navigation modules, near field communication modules (NFC), wireless WAN (WWAN) modules and Wireless Gigabit Alliance modules (WiGig) but can be limited by the motherboard configuration. M.2 modules come in different lengths since there are chips on only one side of the card. The dimensions of the M.2 modules are evident in their names. The first two digits of the M.2 size indicates the width and the remaining digits indicate the length. For example, an M.2 2280 card is 22mm wide and 80mm in length. The most commonly supported form factors are 2242 and 2280 but there are also some cards that are 2230, 2260 and 22110. M.2 cards are also keyed differently which can be used by manufacturers to provide more lanes of bandwidth. The slot on the motherboard determines which keying is required. Currently, the keying is labelled B, M or B+M.



## Passwords

A power-on password locks the keyboard and *mouse* to prevent unauthorized people from using your computer. When the computer is turned on, it prompts the user for a password. Entering the correct password unlocks the keyboard and *mouse*.

Another option is to set a supervisor password, which restricts access to the setup utility only. This is critical because passwords can be disabled through the setup. Make sure you store your password in a secure place. If you forget your supervisor password, you will have to remove your battery and reconfigure your computer to get it working again.

## Computer Viruses

Like viruses that infect humans, a computer *virus* contains instructions for its own proliferation and is potentially very harmful. Though some computer viruses are just playful, most are dangerous for your computer and data. For example, some viruses destroy the file allocation tables, so that your computer cannot locate files or *software*. Some viruses are programmed to become active on a certain date (e.g. April 1 or Friday 13) or when you execute a certain command.

Programs are available that scan diskettes and hard drives for viruses. Some of these programs will also remove the *virus*. These programs can be set to test the computer for viruses every time you power up. To protect your computer from viruses, you should also scan every outside disk before using it. Write-protect your *software* diskettes so that they cannot be infected. Avoid programs and diskettes from unknown sources. Only buy *software* in sealed packages.

Networks, the *Internet* and bulletin board services represent special risks. Use only well known electronic bulletin boards. If you plan to *download software* from the bulletin board, ask the service what steps it is taking to guard against viruses.

If your computer is behaving erratically, it may be infected by a *virus*. Check out the problem before proceeding further.



# System Safety

## Electrical safety

Electric current from power, telephone and communications cables can be hazardous. To avoid any shock hazard, disconnect all power cords and cables as described below:

### ***Before removing the cover:***

- Turn off the computer and all peripherals, such as monitors, printers and external devices.
- Unplug all power cords from electrical outlets.
- Disconnect all communications cords from external receptacles.
- Disconnect all cables and power cords from the back panel of the computer.
- Never remove the power supply cover. If you suspect a problem with this part, call Northern Micro service at 613-226-1117.

### ***Re-configuring***

- To keep the computer from being damaged, NEVER reconfigure the board while the power is ON.
- If you wish to reconfigure the computer at any time, ensure that the power is turned OFF before changing any *hardware* settings, such as DIP switches or jumpers.



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- Risk of explosion if battery is replaced by an incorrect type. Dispose of batteries according to the manufacturer's instructions.
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## Monitor Safety Instructions

- Never insert anything metallic into the *monitor* openings. Doing so may create the danger of electric shock.
- To avoid electric shock, never touch the inside of the *monitor*. Only a qualified technician should open the monitor's case.
- Never use your *monitor* if the power cord has been damaged. Do not allow anything to rest on the power cord, and keep the cord away from areas where people can trip over it.
- Be sure to hold the plug, not the cord, when disconnecting the *monitor* from an electric socket.
- Openings in the *monitor* cabinet are provided for ventilation. To prevent overheating, these openings should not be blocked or covered. Also, avoid using the *monitor* on a bed, sofa, rug, or other soft surface. Doing so may block the ventilation openings in the bottom of the cabinet. If you put the *monitor* in a bookcase or some other enclosed space, be sure to provide adequate ventilation.
- Put your *monitor* in a location with low humidity and a minimum of dust.
- Do not expose the *monitor* to rain or use it near water. If the *monitor* accidentally gets wet, unplug it and contact an authorized dealer immediately. You can clean the *monitor* with a damp cloth when necessary, but be sure to unplug the *monitor* first.
- Place the *monitor* on a solid surface and treat it carefully. The screen is made of glass and can be damaged if dropped, hit or scratched.
- Locate your *monitor* near an easily accessible AC outlet.
- If your *monitor* does not operate normally, in particular, if there are any unusual sounds or smells coming from it, unplug it immediately and contact a service center.
- High temperatures can cause problems. Do not use your *monitor* in direct sunlight; keep it away from heaters and other sources of heat.
- Unplug the *monitor* when it is going to be left unused for an extended period of time.
- Unplug your *monitor* from the AC outlet before any service.



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- To reduce the risk of electric shock, do not remove cover (or back). No user-serviceable parts inside. Refer servicing to qualified service personnel.
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## DOC Requirements



- A shielded power cord is required to meet ICES-003 emission limits and also to prevent interference to nearby radio and television reception. It is essential that only the attached power cord be used.
- Use only shielded cables to connect I/O devices to this computer.
- You are cautioned that changes or modifications not expressly approved by the party responsible for compliance could void your authority to operate the equipment. This digital apparatus does not exceed the Class B limits for radio noise emissions from digital apparatus as set out in the radio interference regulations of Industry Canada.

This equipment has been tested and found to comply with the Industry Canada ICES-003, Issue 2 Rev. 1, Digital Apparatus, Class B requirement. 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.

## Warranty Policy

**Limited Warranty:** All Northern Micro products shall be free from defects in materials and workmanship at the time of original sale by Northern Micro. All Northern Micro products are in accordance with our published specifications or those specifications agreed to by Northern Micro and the purchaser at the time of original sale.

**Warranty Period:** Any Warranty Period purchased from Northern Micro is from the date of Customer purchase of the product. All defects must be reported to Northern Micro during the Warranty Period.

**Warranty Rights:** For any product found to be defective, and reported to Northern Micro to be defective within the Warranty Period, Northern Micro, at its option, will repair or replace the defective product. Any repaired or replaced product will assume the remaining warranty coverage or will be covered for ninety (90) days from the date of repair or exchange, whichever is longer.

**Exclusions From Warranty:** Any improper installation or use, operation beyond capacity, accidents not attributable to Northern Micro, substitution of parts not approved by Northern Micro or any alteration or repair by others in such manner as in Northern Micro's judgment affects the product materially and adversely shall void this Limited Warranty.

**Limitation of Remedies:** Northern Micro's obligation for defective product is limited to repairing or replacing the product, or parts thereof, as expressly stated in this Limited Warranty. In no event shall Northern Micro be liable for any direct, indirect, incidental, consequential, or special damages arising out of the operation, or failure of operation, of the product. Northern Micro shall not be liable for any costs of procurement of substitute goods, loss of profits, personnel costs, payments to third parties, or any consequential, incidental, and/or other damages of any kind resulting from a breach of any applicable express or implied warranty, or otherwise with respect to the sale of any Northern Micro product.

**Exclusion of Other Warranties:** The above Limited Warranty constitutes the sole and exclusive warranty and remedy with respect to any defective Northern Micro product and is in lieu of all other obligations or liabilities of Northern Micro. All other warranties, expressed or implied are hereby disclaimed, including but not limited to any warranty of merchantability or fitness for any particular purpose. Northern Micro's liability, whether based on contract, warranty, strict liability, tort, or any other basis, shall not exceed the price of the product whose defect or damage is the basis of the claim.