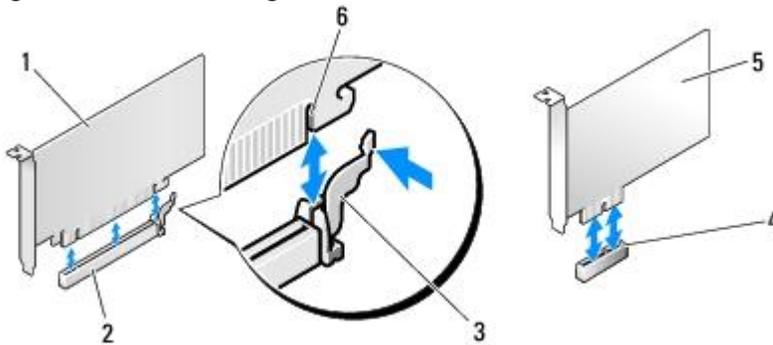


# GPU Troubleshooting Guide

## **No Video / GPU not Recognized – Ensure GPU is Seated Properly:**

Oftentimes when a new GPU is installed, it may not be seated correctly in the PCIe slot. This is particularly true if the bracket fits tightly between the motherboard and the case, or the PCIe slot securing tab is blocking the read portion of the card from seating properly.

If you are installing a PCI Express card into the x16 card connector, position the card so that the securing slot is aligned with the securing tab.



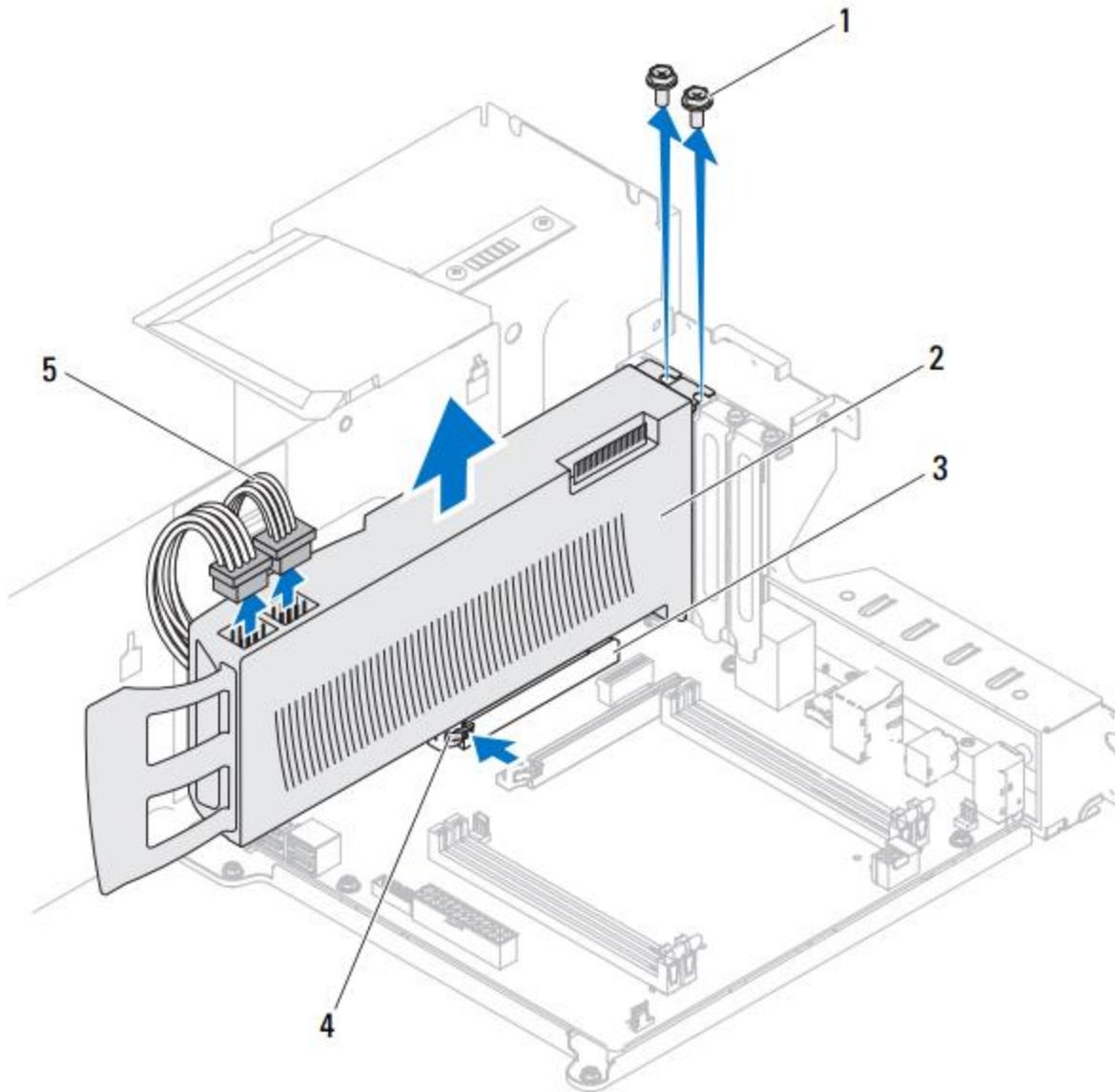
1	PCI-E x16 card	2	PCI-E x16 card slot
3	securing tab	4	PCI-E x1 card slot
5	PCI-E x1 card	6	securing slot

- Align the card in the connector and press down firmly. Ensure that the card is fully seated in the connector slot.
- Replace and tighten the screw to secure the card in the slot.
- Connect any cables that should be attached to the card.

## **No Video / GPU not Recognized – Ensure PCIe Power Connectors are Attached:**

Higher-end GPUs require discrete power from the PSU, which is supplied via 1 or 2 PCIe power connectors. These connectors are either 6 or 8-pins. A GPU with two connectors can have identical pin layouts (6+6 or 8+8), or differing pin layouts (6+8). If your GPU has two PCIe power connectors, both must be connected in order for the GPU to operate. If your GPU has 8-pin connectors, your PSU must be able to provide 8-pin PCIe power leads. Failure to provide the required power to the card will typically result in no video. Some GPUs may even make a squealing or chirping noise if it detects that the PCIe power connectors are not attached.

Check to make sure that your GPU has the correct power leads attached, and that they are seated properly in each connector.



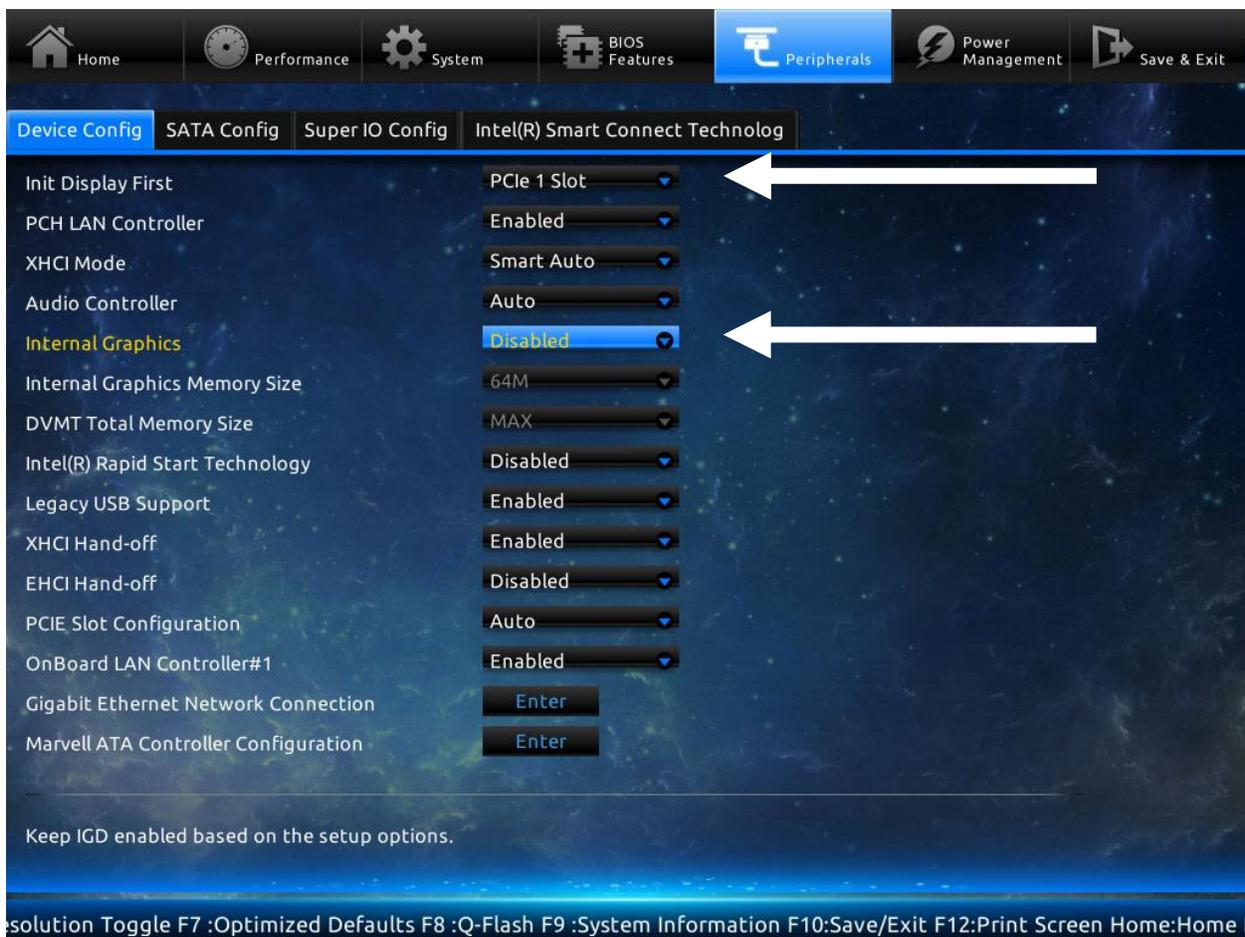
1	Screws	2	graphics card (GPU)
3	PCI-E x16 connector	4	securing tab
5	PCI-E power cables (1 or 2)		

- Align the graphics card with the PCI-Express x16 card connector on the system board.
- Place the card in the connector and press down firmly. Ensure that the card is firmly seated.
- Replace the screws that secure the graphics card to the chassis.
- Connect the power cables to the graphics card. GPUs will typically require 1 or 2 PCIe power connectors, either 6 or 8-pin. If two connectors are present on your GPU, both must be attached. If your GPU has an 8-pin connector, you must use an 8-pin PCIe power lead from the PSU.

## **No Video – For Systems with Onboard / Integrated Graphics:**

Some motherboards are equipped with onboard or integrated graphics. If you are installing a GPU in such a system for the *first time*, the BIOS will typically be set to display only through the onboard video port. In order for your GPU to be utilized by the system, you disable the “onboard” or “internal” graphics, must set the BIOS to “external” graphics, also referred to in BIOS settings as “PCIe”, or “PEG” (Primary External Graphics). Your BIOS may also have a setting referred to as “Init Display First”, this should be set to “external”, “PCIe”, or “PEG” as well. After you have made changes to your BIOS settings, remember to save your changes, exit the BIOS, and restart the computer.

- Setting the graphics from onboard to external can be challenging as the two video devices can conflict with one another during initial setup. For some computers, the BIOS can have video output set to “Auto” by default, resulting in either the onboard video as the primary adapter, or when detected, PCIe as the primary adapter.
- It may be helpful to set the BIOS to “external”, “PCIe” or “PEG” *before* installing the new GPU, if possible. Some systems won’t provide the option until a PCIe video card is detected.



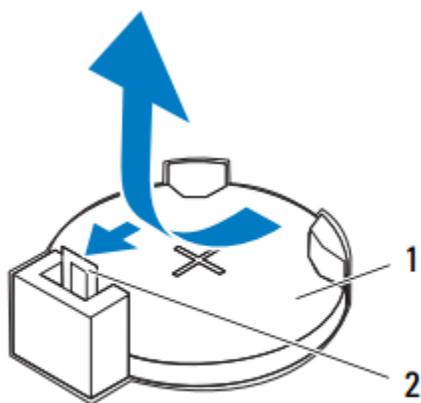
### ***No Video – Reset the Motherboard CMOS:***

In extreme cases, it may be necessary to reset the CMOS on your motherboard in order for the GPU to be recognized. This can typically be done in one of three ways. The easiest way is to enter the BIOS and select “Load setup defaults” or “Load optimized defaults”, and then save. If that does not resolve the problem, then you can clear the CMOS by turning the computer off, and either using a jumper switch on the motherboard, or removing the CMOS battery and then replacing it again.

Many motherboards contain a jumper that can be used to clear CMOS settings if your BIOS is not accessible. This is particularly useful if the BIOS is password-protected and you don’t know the password. The exact location of the jumper can be found in the motherboard (or computer) manual. You should consult the manual for more detailed instructions if you want to use the motherboard jumper.

The process is similar on most computers. Unplug the power supply to ensure that the computer is not receiving any power. Open the computer’s case and locate the jumper named “CLEAR CMOS”, or “CLEAR”, “CLR CMOS”, “PASSWORD”, or “CLR PWD” – it will often be near the CMOS battery. Set the jumper to the “clear” position, plug in and power on your computer for several seconds, then turn it off again, set the jumper to the original position, and restart the computer as normal.

If your motherboard does not have a CLEAR CMOS jumper, you can often clear its CMOS settings by removing the CMOS battery and replacing it again. The CMOS battery provides power used to save the BIOS settings, removing the battery will remove the source of power and clear the settings. Unplug the power supply to ensure that the computer is not receiving any power. Locate the round, flat, silver battery (CR2032) on the motherboard and carefully remove it. Wait a few minutes before reseating the battery to ensure that all power from the capacitors is drained. Then plug in and power on your computer as normal.



**1** coin-cell battery

**2** battery-release lever

### ***No Video – Certified Windows 8 PC with Integrated Graphics and Secure Boot:***

When a GPU is installed in a motherboard with UEFI enabled in the system BIOS, or if the system is a certified Windows 8 PC with Secure Boot enabled, the system may not boot. UEFI is a new system BIOS feature that is provided on most new motherboards. A UEFI system BIOS is required in order for the Windows 8 Secure Boot feature to work. Secure Boot is enabled by default on certified Windows 8 PCs.

In order to get the PC to boot with a GPU that does not contain UEFI firmware, the end-user must first disable the secure boot feature in the system's SBIOS before installing the graphics card.

- Some system SBIOS's incorporate a feature called compatibility boot. These systems will detect a non-UEFI-enabled firmware VBIOS and allow the user to disable secure boot and then proceed with a compatibility boot. If the system contains a system SBIOS that supports compatibility boot, the user will need to disable secure boot when asked during boot process

Manually disable secure boot by following these steps:

- 1) Power down the system
- 2) Remove the newly installed GPU
- 3) Boot the system using integrated graphics
- 4) Enter CMOS settings. CMOS settings can usually be accessed during boot, typically by pressing one of F1, F2, F8, F12, or Delete (depends on the system firmware)
- 5) Set Secure Boot to "disabled"
- 6) If there is an option, set CSM (or compatibility or legacy mode) to "enabled".
- 7) Save the new settings
- 8) Power down the system
- 9) Reinstall the new GPU
- 10) The system should now boot

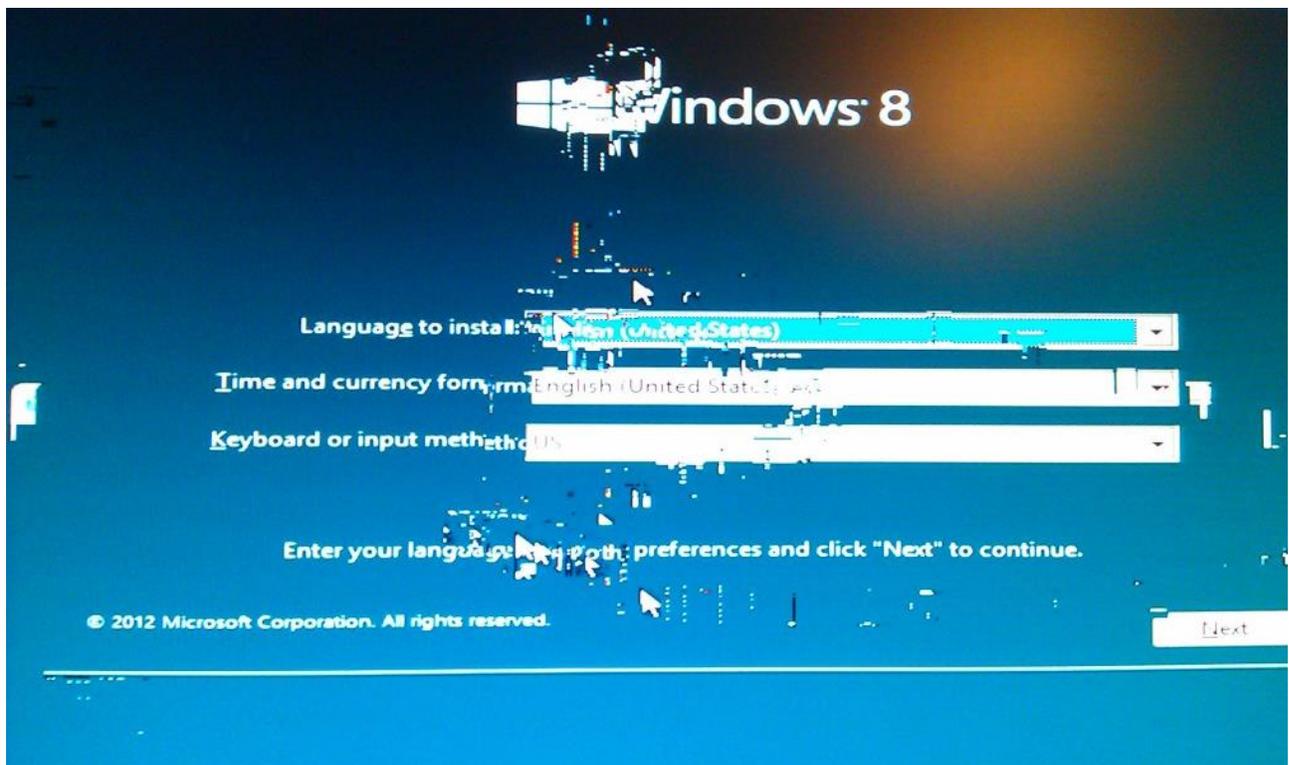
### ***Display Problems – Monitor Loses Signal While Gaming:***

A relatively common troubleshooting issue is when video signal is lost, either during games when the GPU is under load, or randomly. This particular problem is difficult to diagnose, as many issues could be the cause of the signal loss. For instance, it may be a faulty GPU, however it can also be caused by driver issues, overheating, inappropriate overclocking and over/undervolting, under-powered or failing PSU, loose video cable connections, faulty video cables, and faulty monitors. If you have checked that the video cable is secure, and know that the monitor is not faulty, then begin by diagnosing the drivers, examine GPU and system temperatures, reset all clock speeds and voltages to their stock settings, and check the power supply to see if it may be under-powered or failing.

## ***Display Problems – Artifacts at Idle, Artifacts under Load:***

With GPUs, display artifacts are visual artifacts that may be generated whenever a hardware component such as the processor, memory chip, or cabling malfunctions, causing data corruption. Malfunctions may be caused by physical damage, overheating, insufficient voltage, and sometimes due to GPU overclocking, etc. Common types of hardware artifacts include tearing, texture corruption, and T-vertices in 3D graphics. Determining what is causing the artifacting, and when it occurs is important in troubleshooting your GPU.

**Artifacts at Idle:** When you start your computer and notice display artifacts either during POST, or when Windows is running with no significant load on the GPU, it is a likely indicator that your video card has a hardware fault. It is possible that a failing PSU could also be responsible, though the power requirements of a system at idle are relatively low, thus making that possibility less likely.



**Artifacts under Load:** If you notice artifacting that only occurs under load, such as playing a game or running a stress test, it may be a hardware fault with your GPU, or a number of other possibilities. For example, when GPUs overheat, particularly in regards to memory temperature, artifacting will worsen as heat increases. Ensure that your case has sufficient airflow, and that GPU fan speeds are set properly. Similarly, overclocking and overvolting can also produce artifacts when under load, which is caused either by overclocking / overvolting beyond the manufacturer's recommended specifications, or by associated overheating. If you are overclocking / overvolting your GPU and experience artifacting, reset the card to stock clock speeds and voltages. An under-powered or failing PSU can also cause artifacts by

supplying the video card with insufficient power when stressed. If you suspect the PSU, try swapping out another power supply that is of equal or greater wattage, and of equal or better quality. Refer to the power requirements for your video card and system, and use 80+ bronze, silver, or gold PSUs.



### ***Poor System Stability – Driver Conflicts and Outdated Versions:***

Poor game performance, crashes, or hangs can be caused by graphics driver conflicts. This is especially true when you have replaced an older GPU with new card, yet have not changed the drivers or settings. Ensuring the previous graphics driver are thoroughly uninstalled before installing an updated version is an important step to prevent driver conflicts and improve system performance.

- Uninstall the old drivers, even if they are current, and restart the computer. Then install the latest version of the drivers, and restart the computer.

Graphics driver updates are released periodically to address reported issues, improve system stability, and performance. For Windows users, both AMD and NVidia have auto-detect tools to determine what version of the graphics driver you are using, and if it is up to date.

### ***Poor System Stability – Overclocking and Overvolting / Undervolting:***

Overclocking, overvolting or modifying your card may invalidate your warranty, in addition it may severely damage the GPU's processor, memory, and Voltage Regulator Modules (VRM). Simple overclocking of the core or memory using Catalyst Control Center will likely be safe, however going beyond manufacturers stock specifications may produce catastrophic results for your hardware.

- If you are not comfortable or familiar with modifying the clock speeds and voltage of your GPU, or if you're unsure of the safe operating range of your card, *LEAVE IT AT STOCK SETTINGS*.

**Overclocking:** Overclocking the core processor can improve game performance, but may also impact the system's stability. For example, increased heat output and power consumption from the overclocked hardware can lead to crashes, hangs, and artifacting. Restoring the system to its default clock and voltage settings can rule out overclocking as a possible cause.

**Increasing voltage (overvolting):** Overvolting a GPU is often a necessity when attempting to reach higher and higher clock speeds. Overvolting can cause damage by increasing component heat, particularly core transistor, memory module, and VRM temperature. Even if the GPU's core heat is still within a safe margin, the memory or VRM temperature may be overheating and go unnoticed as sensors do not typically report for those components. Any component that is running at a higher temperature, or with additional voltage will likely degrade more quickly, thus reducing the lifespan of your equipment. Stability typically becomes more and more difficult to achieve the farther one pushes their GPU. If you notice artifacting / flickering on the screen, the GPU shuts off, or there is a burning smell, reduce your clock speeds and voltage to stock settings immediately.

**Reducing voltage (undervolting):** Undervolting is typically utilized to reduce temperature of the core and other components. With a lower voltage, you tend to have less "headroom" to increase clock speeds. Undervolting a GPU too far can still cause damage to the equipment, though the effects are far less pronounced than with overvolting. The primary issue with undervolting is a lack of stability, where the core and other components do not have enough voltage to perform the required tasks. If you notice artifacting / flickering on the screen, or the GPU shuts off, reset your clock speeds and increase voltage to stock settings.

### ***Poor System Stability – System Crashes or Shuts Down When Playing Games:***

If your system is experiencing crashes, blue screens, or shuts down completely when playing games or the GPU is under load, and you have already determined that the drivers and game settings are not the issue, then the problem may be hardware related.

**Faulty / under-powered PSU:** the power supply is the single most important component in a system because it provides the necessary power to allow all other hardware to work. A defective or inadequate power supply can cause the system to experience the following issues, typically while under load:

- System instability – No boot, random reboots or hangs
- Performance instability – Random application crashes or hangs
- Display artifacting – Dots, lines, flashes on the screen
- Display abnormality – Additional monitor(s) in a multi monitor setup does not work or randomly stops working

**Heat / Ventilation:** If there is an excess amount of heat in a system it can be a common cause of system crashing, hanging or poor performance. Ensure the system has ample airflow, cooling, and proper ventilation to help prevent hardware components from overheating. For example, rearrange cables to avoid blocking the airflow to the graphics card and visually inspect that all fans are dust-free and working. It is also important to check that the CPU and PSU fans are working correctly, and that those components are not overheating, causing poor system stability or performance.

**Faulty Hardware:** If you have completed the above troubleshooting suggestions, you may have faulty hardware, which can cause crashes, hanging, artifacting, and poor performance. Troubleshooting faulty hardware involves a process of elimination to rule out each piece of hardware individually. Two suggested methods of ruling out the various components of the system's hardware include:

- Replace the suspected hardware component, or swap it between available systems to see if the issue follows the hardware.
- Run a stress-test on the hardware component to determine if it passes or fails (though this can be misleading, as a faulty power supply for example, might cause a GPU to stop working or produce artifacts when stressed, falsely indicating a problem with the video card).

## **Other Troubleshooting Areas**

### ***Updating Motherboard BIOS and Chipset:***

BIOS and chipset updates to the motherboard can help resolve system crashes or hangs. To obtain the latest update for the motherboard's BIOS and chipset, visit the motherboard's or system manufacturer's website.

### ***Game Patches and Updates:***

Have you installed patches the developers released for their game? Game patches often address known issues as they are uncovered in previous versions. It is also important to obtain these patches directly from the game developer.

### ***Operating System Updates:***

It is important to keep the Operating System updated by installing the latest service packs and updates. These updates can help improve the stability of the system.

### ***DirectX:***

DirectX is an application programming interface (API) required to run games. To ensure DirectX is updated on your system, use Microsoft's DirectX End-User Runtime Web Installer. Some games require specific extensions for DirectX in order to run. These extensions are installed during the installation of the game by offering the choice to install those options. If these extensions were not installed, the game will not run. If the choice was made to not install the required DirectX extensions, reinstall the game and ensure that all required game components are present.

### ***Background Applications:***

A game may crash or hang because other applications are running in the background. Anti-virus and security software, remote desktop utilities, system monitoring or overclocking utilities, and messenger programs are examples of background applications. To rule out the possibility that a background application is the cause of poor performance, a crash, or hang, it is suggested to temporarily disable the application(s) in question before running the game. Using the Windows Task Manager, it is easy to identify why applications are using what resources, such as CPU operations and RAM usage. .

### ***Network Bottleneck:***

Many games contain an online component that requires a network connection with sufficient bandwidth to carry the necessary amount of game data between the local computer system and the game's host server. Poor game performance can sometimes be attributed to high latency (the delay in the communication of data).

### ***CPU Bottleneck:***

Many games do an excellent job of utilizing the processing power of the graphics card. However, some games rely more heavily on the CPU, and this can become a bottleneck that leads to less than expected performance. Monitoring the CPU's usage while playing a game can help determine if the CPU is bottlenecking the performance. If the CPU runs at a constant 100% this can be an indication the CPU is a bottleneck. A faster CPU may be needed if a CPU bottleneck is regularly experienced.

### ***System Reformat / Recovery:***

Despite best efforts, the integrity of an operating system's registry and system files can be compromised over time. If the crash, hang or poor performance persists after all other troubleshooting and debugging steps have been tried, formatting the hard-drive and reinstalling the operating system will help rule out a corrupted OS as the cause.