Release 465 Driver for Windows, Version 466.47

Windows 10 / Windows 8.1 / Windows 8 / Windows 7

Release Notes

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Chapter 1. Introduction to Release Notes

This edition of *Release Notes* describes the Release 465 family of NVIDIA® graphics drivers (versions 465.*xx* to 469.*xx*) for Microsoft® Windows® 7 and later[1]. NVIDIA provides these notes to describe performance improvements and bug fixes in each documented version of the driver.

Structure of the Document

This document is organized in the following sections:

- "Release 465 Driver Changes" on page 2 gives a summary of changes, and fixed and open issues in this version.
- "The Release 465 Driver" on page 12 describes the NVIDIA products and languages supported by this driver, the system requirements, and how to install the driver.

Changes in this Edition

This edition of the *Release Notes* for Windows includes information about NVIDIA graphics driver version 466.47 WHQL and lists changes made to the driver since driver version 461.92.

These changes are discussed beginning with the chapter "Release 465 Driver Changes" on page 2.

1. Includes Windows 7, Windows 8, Windows 8.1, and Windows 10.

Chapter 2. Release 465 Driver Changes

This chapter describes open issues for version 466.47 WHQL, and resolved issues and driver enhancements for versions of the Release 465 driver up to version 466.47 WHQL

The chapter contains these sections:

Version 466.47 WHQL Highlights

This section provides highlights of version 466.47 WHQL of the NVIDIA Release 465 Driver for Windows 7, Windows 8, Windows 8.1, and Windows 10[1].

Requirement for Obtaining NVIDIA Drivers for Windows 7

Microsoft now provides only SHA-2 signed drivers. If your Windows 7 system is NOT equipped to detect SHA-2, you need to install the SHA-2 update support patches. For details as well as access to SHA-2 update support patches, see the Microsoft KBA "2019 SHA-2 Code Signing Support requirement for Windows and WSUS".

Existing Support

This release supports the following APIs:

- Open Computing Language (OpenCL™ software) 3.0 for NVIDIA® Maxwell™ and later GPUs
- OpenGL® 4.6
- Vulkan® 1.2
- DirectX 11
- DirectX 12 (Windows 10)

Software Module Versions

- NVIDIA RTX Desktop Manager - 201.66
- HD Audio Driver - 1.3.38.60
- NVIDIA PhysX System Software - 9.19.0218
- GeForce Experience - 3.22.0.32
- CUDA - 11.3

1. Supports Windows 10 (Version 1803) and later, including Windows 10 October 2020 Update (Version 2009).

- DCH NVIDIA Control Panel - 8.1.960.0

What's New in Version 466.47 WHQL

GeForce Game Ready Driver

Game Ready Drivers provide the best possible gaming experience for all major new releases. Prior to a new title launching, our driver team is working up until the last minute to ensure every performance tweak and bug fix is included for the best gameplay on day-1.

Game Ready for Days Gone

This new Game Ready Driver provides support for the launch of Days Gone on PC with increased levels of detail, higher foliage draw distances, native 4K rendering, a configurable field of view, ultra-wide monitor support, unlocked frame rates, and more. Additionally, this release also provides optimal support for Knockout City.

Learn more in our Game Ready Driver article.

New Features and Other Changes

- This driver version is required for GeForce RTX 3080, RTX 3070, and RTX 3060 TI graphics cards with LHR, which ship starting late May, 2021. Refer to the NVIDIA Blog for further details.
- See "Changes and Fixed Issues in Version 466.47" on page 8.

What's New in Release 465

- Added support for DirectX 12 Agility SDK.
- Version 466.27 and later updates the hash limiter for the GeForce RTX 3060 12GB and is required for product shipped starting mid-May. Refer to the NVIDIA Blog for details.
- Version 466.11 added security updates for driver components

  See the NVIDIA Security Bulletin 5172 for details.
- Added support for CUDA 11.3.
- Added support for extended DP-to-HDMI 2.1 PCON clock frequency range to better support 8K TVs.
- Changed the G-SYNC on-screen status indicator to be less obtrusive.

Application Profiles

Added the following SLI profiles.

- Shenmue III (*NVIDIA Turing GPUs only*)

- The Medium (*NVIDIA Turing GPUs only*)

OpenCL 3.0

Added support for OpenCL 3.0[2], the latest major version of OpenCL maintaining backward compatibility with OpenCL 1.2. NVIDIA OpenCL 3.0 continues to support existing OpenCL 1.2 functionality as well as Khronos and vendor extensions that are already supported with NVIDIA OpenCL 1.2 drivers.

- The following new features beyond existing NVIDIA OpenCL 1.2 features are supported by NVIDIA OpenCL 3.0
  - RGBA vector component naming in OpenCL C kernels
  - pragma_unroll hint
  - opencl_3d_image_writes
  - clCreate*WithProperties APIs which can be used as replacement for existing clCreateBuffer/Image APIs.
  - clSetContextDestructorCallback
  - clCloneKernel from OpenCL 2.1
  - clEnqueueSVMMigrateMem from OpenCL 2.1
- Incorporates the following experimental 2.0 features:
  - Device side enqueue
    - The current implementation is limited to 64-bit platforms only.
    - Allows kernels to be enqueued with **global_work_size** larger than the compute capability of the NVIDIA GPU. The current implementation supports only combinations of **global_work_size** and **local_work_size** that are within the compute capability of the NVIDIA GPU.

      The maximum supported CUDA grid and block size of NVIDIA GPUs is available at http://docs.nvidia.com/cuda/cuda-c-programming-guide/index.html#compute-capabilities. For a given grid dimension, the **global_work_size** can be determined by CUDA grid size x CUDA block size.
    - For executing kernels (whether from the host or the device), OpenCL 3.0 supports non-uniform ND-ranges where **global_work_size** does not need to be divisible by the

2. Khronos has recently released OpenCL 3.0 spec (https://www.khronos.org/registry/OpenCL/specs/3.0-unified/pdf/OpenCL_API.pdf)

local_work_size. This capability is not yet supported in the NVIDIA driver, and therefore not supported for device side kernel enqueues.

Note: Other OpenCL 2.X entry-points which are now optional and are not supported in NVIDIA OpenCL 3.0 will behave as described at https://www.khronos.org/registry/OpenCL/specs/3.0-unified/html/OpenCL_API.html#opencl-3.0-backwards-compatibility

Limitations in This Release

The following features are not currently supported or have limited support in this driver release:

OpenCL 3.0 Known Issues

- Device-Side-Enqueue related queries may return 0 values, although corresponding built-ins can be safely used by kernel.

  This is in accordance with conformance requirements described at https://www.khronos.org/registry/OpenCL/specs/3.0-unified/html/OpenCL_API.html#opencl-3.0-backwards-compatibility
- The denormalized results for some math functions that were flushed to zero when cl-fast-relaxed-math is passed as a compiler option on OpenCL 1.2 drivers won't be flushed to zero with OpenCL 3.0 drivers.
- Shared virtual memory - the current implementation of shared virtual memory is limited to 64-bit platforms only.

Using HDR with Games

There may be issues resulting from the interaction between in-game HDR settings and the Windows HDR settings. See the NVIDIA Knowledge Base Article 5072 (https://nvidia.custhelp.com/app/answers/detail/a_id/5072) for details.

Implicit SLI Disabled on NVIDIA Ampere GPUs

Implicit SLI, where the driver makes assumptions with application profiles to achieve GPU scaling, is disabled on NVIDIA Ampere GPUs. Explicit SLI is still supported, where the application knows the SLI state and uses extensions (such as DirectX 12 linked nodes, Vulkan device groups, or OpenGL multicast extensions) to issue commands to each device in the SLI group. See the NVIDIA Knowledge Base Article 5082 (https://nvidia.custhelp.com/app/answers/detail/a_id/5082) for more information.

Image Sharpening Feature

NVIDIA Control Panel Image sharpening controls, including GPU upscaling, are introduced in the R440 driver. Currently, the following limitations apply.

- Scaling is not supported on MSHybrid systems.
- HDR displays driven by pre-Turing GPUs will not support scaling
- Scaling will not work with VR
- Scaling will not work with displays using YUV420 format.
- Scaling uses aspect ratio scaling and will not use integer scaling
- Sharpening will not work with HDR displays
- GPU scaling engages when games are played only in full-screen mode, and not in windowed or borderless windowed mode.

- Some G-SYNC displays have a 6-tap/64-phase scaler which scales better than that offered by Turing's 5-tap/32-phase scaler.
- To avoid accidentally triggering scaling by applications or DWM, first change to the desired (< native) resolution from the NVIDIA Control Panel and then launch the application.
- Turing's 5-tap upscaler may not engage on certain monitors depending on the monitor's vblank timing.
- Turing's 5-tap upscaler may not engage if the input resolution is greater than 2560px in either the x or y dimension.
- Scaling is turned off automatically when switching display devices.
- "Restore Defaults" option in the control panel currently does not revert the upscaling resolution.

Behavior Change in NvEncCreateBitstreamBuffer API of Video Codec SDK

In the NVIDIA driver, Release 415 and later, the behavior of the Video Codec SDK API (NvEncCreateBitstreamBuffer) has been changed to return `NV_ENC_ERR_UNIMPLEMENTED` instead of `NV_ENC_SUCCESS` when the encoder instance is configured to run in the motion estimation-only mode. As an indirect consequence of this change, the AppEncME sample application from the Video Codec SDK prior to SDK version 8.2.16 will crash due to a bug in the NvEncoder class.

The latest version of the SDK fixes this bug that affects the AppEncME sample application. NVIDIA recommends downloading the latest version from https://developer.nvidia.com/nvidia-video-codec-sdk.

Connecting Displays to NVIDIA Turing GPUs in SLI Mode

To use SLI with NVIDIA Turing GPUs, all displays must be connected to the primary SLI GPU.

Turing GPU Driver Installation on Windows 10

Drivers for Turing GPUs will not be installed on systems with Windows 10 RS2 or earlier. This includes Windows 10 Threshold 1, Threshold 2, Redstone 1, and Redstone 2 operating systems.

Crescent Bay and OSVR Headsets on Multiple GPU Systems

With Release 367 and future NVIDIA drivers, Crescent Bay and Open Source Virtual Reality development kit headsets will not work with VRWorks Direct Mode in systems that contain GPUs from multiple vendors (for example, NVIDIA and Intel). For such systems, please disable the Intel integrated graphics (from the system BIOS) in order to use Direct Mode.

Changes and Fixed Issues in Version 466.47

The following sections list the important changes and the most common issues resolved in this version. This list is only a subset of the total number of changes made in this driver version. The NVIDIA bug number is provided for reference.

Fixed Issues in this Release

- [Tom Clancy's Ghost Recon Breakpoint]: The game experiences low performance / low frame rate when launched with Bar1 enabled in the SBIOS. [200721940]
- [Starbase][GeForce RTX 20/GTX 16 Series]: The game may crash. [3293977]

Open Issues in Version 466.47 WHQL

As with every released driver, version 466.47 WHQL of the Release 465 driver has open issues and enhancement requests associated with it. This section includes lists of issues that are either not fixed or not implemented in this version. Some problems listed may not have been thoroughly investigated and, in fact, may not be NVIDIA issues. Others may have workaround solutions.

Note: You may encounter issues installing the NVIDIA Control Panel from the Windows Store. See "Issues Installing the NVIDIA Control Panel from the Windows Store" on page 19 for more information.

For notebook computers, issues can be system-specific and may not be seen on your particular notebook.

Windows 10 Issues

- [NVIDIA Ampere GPU]: Colors may appear incorrect in games if sharpen Freestyle filter is used with HDR enabled. [200658208]

  This issue will be resolved in the next NVIDIA driver release.

- [HDR]: Some specific HDMI displays might show some flickering in HDR mode. [200729987]

  If you experiencing flickering issues, reboot the system.

- [World of Warcraft: Shadowlands]: Random flicker may occur in certain locations in the game [3206341]
- [Batman Arkham Knight]: The game crashes when turbulence smoke is enabled. [3202250]
- [Steam VR game]: Stuttering and lagging occur upon launching a game while any GPU hardware monitoring tool is running in the background. [3152190]
- [YouTube]: Video playback stutters while scrolling down the YouTube page. [3129705]

Issues Not Caused by NVIDIA Drivers

This section lists issues that are not due to the NVIDIA driver as well as features that are not meant to be supported by the NVIDIA driver.

Windows 10 Considerations

Cross-adapter Clone Mode

Under Windows 10, clone mode across graphics processors is handled by the Windows OS, and not by the NVIDIA driver. Consequently, there are no controls for cross-adapter clone mode in the NVIDIA Control Panel under Windows 10.

Functionality of some display controls in the NVIDIA Control Panel may be affected if cross-adapter clone mode is enabled through the Windows Control Panel. In this case, use the Windows Control Panel to adjust display settings.

Optimus Systems

Because cross-adapter clone mode is handled by the Windows 10 OS, there are no display controls in the NVIDIA Control Panel if no display is connected to the NVIDIA GPU on Optimus notebooks.

Windows 7 Considerations

Hotplug Action

Under Windows 7, the default settings are not applied when a new display is hotplugged, and there is no message balloon alert stating that a new display was detected. All display connection and detection events are handled through the Windows 7 Connecting and Configuring Displays (CCD) mechanism.

NVIDIA Control Panel Rotate Display Page

The rotation radio button labels are consistent with the Microsoft panel

Table 2.1 NVIDIA Control Panel Rotation Page Radio Buttons

Clockwise Rotation	Windows 7 Label
0 degrees	Landscape
90 degrees	Portrait

Table 2.1 NVIDIA Control Panel Rotation Page Radio Buttons

Clockwise Rotation	Windows 7 Label
180 degrees	Landscape (flipped)
270 degrees	Portrait (flipped)

Limitation

- When switching the refresh rate from 59 Hz to 60Hz, the refresh rate remains at 59 Hz.

  See the Microsoft KB article KB2006076 at http://support.microsoft.com/kb/2006076.

Operating System Issues

- [Windows 10 Fall Creators Update][HDTV]: 12 bpc is automatically applied even on HDTVs that support only 8 bpc, resulting in a scrambled display. [2007663]

  To work around, open the NVIDIA Control Panel->Change Resolution page, select "Use NVIDIA color settings", then set the Output color depth to 8 bpc.

- When upgrading from Windows 7 to Windows 8, the system fails to retrieve the installed WHQL display driver. [1024416]

  See the Microsoft KB article KB2743349 http://support.microsoft.com/kb/2743349.

Application Issues

Fixed Frame Rate Games

Some games and applications are designed to run at a fixed frame rate, and consequently do not take advantage of NVIDIA G-Sync. To prevent issues, G-Sync may be disabled for those applications.

Chapter 3. The Release 465 Driver

This chapter covers the following main topics:

About the Release 465 Driver

This driver release is from the Release 465 family of drivers (versions 465.*xx* to 469.*xx*). See "Supported NVIDIA Desktop Products" on page 27 and "Supported NVIDIA Notebook Products" on page 29 for current products supported in this release.

As part of the NVIDIA Notebook Driver Program, this is a reference driver that can be installed on supported NVIDIA notebook GPUs. However, please note that your notebook original equipment manufacturer (OEM) provides certified drivers for your specific notebook on their website. NVIDIA recommends that you check with your notebook OEM about recommended software updates for your notebook. OEMs may not provide technical support for issues that arise from the use of this driver.

Driver Security

Follow these safe computing practices:

- Only download or execute content and programs from trusted third parties.
- Run your system and programs with the least privilege necessary. Users should run without administrator rights whenever possible.
- When running as administrator, do not elevate UAC privileges for activities or programs that don't need them.

This section describes additional actions to take to mitigate specific known security issues.

Restricting/Enabling Access to GPU Performance Counters

The NVIDIA graphics driver contains a vulnerability (CVE-2018-6260) that may allow access to application data processed on the GPU through a side channel exposed by the GPU performance counters. GPU performance counters are needed by developers in order to use NVIDIA developer tools such as CUPTI, Nsight Graphics, and Nsight Compute. In order to address CVE-2018-6260 the driver (starting with version 419.67) automatically disables access for non-admin users.

For more information about CVE-2018-6260 visit the NVIDIA Security Bulletin 4772.

Access to GPU performance counters can be enabled for non-admin users who need to use NVIDIA developer tools. Enabling access to GPU performance counters can be accomplished through the NVIDIA Control Panel->*Developer->Manage GPU Performance Counters* page. Refer to the *Developer->Manage GPU Performance Counters* section of the NVIDIA Control Panel Help for instructions.

Advanced Driver Information

This section contains the following additional information about the driver:

Updating the NVIDIA VirtualLink PPC Firmware

You can update the NVIDIA VirtualLink PPC firmware from the NVIDIA Control Panel by clicking Update from the top menu and then selecting Update VirtualLink firmware.

The following is a description of the changes made in the latest version.

Version 3.2.8 (Notebook)

The following are the changes and fixed issues in the NVIDIA VirtualLink PPC firmware version 3.2.8.

- [USBC Notebook] [VirtualLink]: Some USB bus-powered type-C monitors won't light up until Windows boots. [2524391]
- [USBC Notebook] [VirtualLink] Some USB Type-C to HDMI dongles may not work. [200474652]
- [USBC Notebook] [VirtualLink] USB-C SuperSpeed does not work with Type-C hub which supports multiple (DisplayPort and USB) Alternate Modes. [200482972]

Differing GPU Voltages in SLI Mode

When non-identical GPUs are used in SLI mode, they may run at different voltages. This occurs because the GPU clocks are kept as close as possible, and the clock of the higher performance GPU is limited by that of the other. One benefit is that the higher performance GPU saves power by running at slightly reduced voltages.

An end-user gains nothing by attempting to raise the voltage of the higher performance GPU because its clocks must not exceed those of the other GPU.

3D Compatibility Mode

3D Compatibility Mode is an NVIDIA proprietary rendering mode for 3D Vision that improves the 3D experience for many key DirectX 10 and 11 games. NVIDIA continues to add game support with new driver versions.

Requirements and Compatibility

- Games must be run in DirectX 10 or DirectX 11 mode.
- Not compatible with 3D Vision Surround.

Switching Compatibility Modes

Games with 3D Compatibility Mode will launch in this mode by default. You can switch between 3D Compatibility mode and standard 3D Vision mode as follows:

1 Before starting the game, enable Advanced In-game Settings in the NVIDIA Control Panel:

   a Open the NVIDIA Control Panel and navigate to the *Stereoscopic 3D->Set up stereoscopic 3D* page and click Set Keyboard Shortcuts.

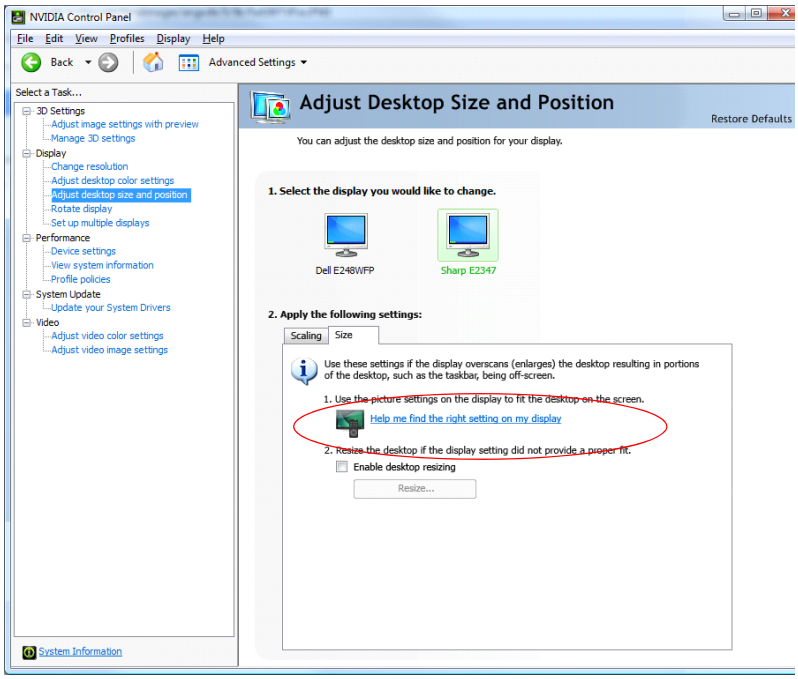
   b. Click the *Show advanced in-game settings* arrow if the section is not expanded, then select Enable advanced in-game settings.

   c. Click OK.

2. Press Ctrl+Alt+F11 during the game to toggle between 3D Compatibility mode and standard 3D Vision mode.

Help for Resizing Your HDTV Desktop

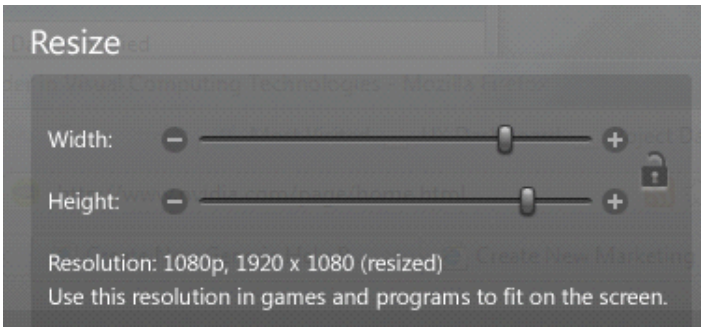
The best way to resize the screen in order to view the entire content is to use the controls provided by the display hardware. Click the link on the Size tab to view a guide to changing the settings on your display hardware.



The resize controls on the NVIDIA Control Panel are provided in case satisfactory results cannot be achieved using the controls on the display.

After resizing the HDTV desktop using the NVIDIA Control Panel Resize controls, the new custom resolution created is now added to the list of available resolutions for that display, and also added to the resolution list within the game or application.

The method for resizing the HDTV desktop was improved to provide better image quality when applying underscan. This method results in a new custom resolution being created which needs to be selected from games or applications to apply the resizing. In the example displayed in the following screen shot, the underscan has created a new resolution (1216 × 682). Although this resolution looks different, it is still in HD format. Remember to select this resolution in your game or other application in order to take advantage of it.



Note: Some games or applications may not support the new resolution.

Understanding the NVIDIA System Information Window>DirectX Information

The System Information window–accessed by clicking System Information at the bottom left corner of the NVIDIA Control Panel–provides technical information about the NVIDIA graphics cards and driver installed in the system.

It also provides the following system information:

- Operating system: For example, "Windows 7 Enterprise, 64-bit"
- DirectX runtime version: For example, "11.0"

In order to use the version of DirectX reported in the System Information window, the NVIDIA GPU and graphics driver must also support that DirectX version.

This information is provided in the *Graphics card information* section of the System Information window as follows:

- DirectX support

  (Provided in previous driver versions)

  This is the DirectX version that is supported by the NVIDIA graphics hardware and driver.

- Direct3D API version

  (Provided in later driver versions, for Windows 7 and later.)

  This is the Direct3D version that is supported by the NVIDIA graphics hardware and driver. The API version is expressed in terms of Direct3D – the graphics subsystem component of DirectX.

- Direct3D feature level

  (Provided in later driver versions, for Windows 7 and later)

Direct3D feature levels describe a subset of features within the Direct3D API version that are supported by the NVIDIA graphics hardware and driver.

Known Product Limitations

This section describes problems that will not be fixed. Usually, the source of the problem is beyond the control of NVIDIA. Following is the list of problems and where they are discussed in this document:

G-SYNC May be Enabled in Windowed Mode Even if Only *Full-screen Mode* is Specified

Issue

When playing a game in windowed mode on a G-SYNC capable (or Compatible) monitor, G-SYNC is active even if only **Full screen mode** is selected on the NVIDIA Control Panel > Display > Set Up G-SYNC page.

Explanation

This can occur under Windows 10 (20H1), with NVIDIA Volta and later GPUs, and with this release of the NVIDIA Release 460 driver and later. This combination supports multiplane overlays. With this support, Windows may grant a windowed application its own plane, in which case the plane behaves as if it were operating in full-screen mode, subsequently activating G-SYNC.

Issues Installing the NVIDIA Control Panel from the Windows Store

You may encounter issues when attempting to install the NVIDIA Control Panel from the Windows Store under Windows 10, such as

- The download process from the Windows Store freezes at the "Starting download ..." stage.
- The NVIDIA Control Panel fails to download after initiating the download from the notification popup that appears upon installing the driver.

For assistance with installing the NVIDIA Control Panel from the Microsoft Windows Store, see the NVIDIA Knowledge Base Article, NVIDIA Control Panel Windows Store App.

For information about the DCH vs Standard drivers for Windows 10, see the NVIDIA Knowledge Base Article, NVIDIA DCH/Standard Display Drivers for Windows 10 FAQ.

Windowed NVIDIA G-SYNC is Disabled for Multi-monitor System Video Playback

Issue

Beginning with Windows 10 April 2018 Update (RS4), NVIDIA G-SYNC is disabled during active video playback on multi-monitor systems.

Explanation

If hardware accelerated video is playing on one display and an application is launched on another display in windowed mode with NVIDIA G-SYNC or adaptive-sync enabled, the video stutters. This is the result of desktop compositing on displays with differing refresh rates.

To prevent the video stutter in this scenario, the driver disables NVIDIA G-SYNC during active video playback, but re-enables G-SYNC if the video is paused or closed.

Note: The issue can also occur when displays are set to different refresh rates, even when G-SYNC is not used. To resolve in this case, make sure all displays are set to the same refresh rate.

GPU Temperature Reported Incorrectly on Optimus Systems

Issue

On Optimus systems, temperature-reporting tools such as Speccy or GPU-Z report that the NVIDIA GPU temperature is zero when no applications are running.

Explanation

On Optimus systems, when the NVIDIA GPU is not being used then it is put into a low- power state. This causes temperature-reporting tools to return incorrect values.

Waking up the GPU to query the temperature would result in meaningless measurements because the GPU temperature change as a result.

These tools will report accurate temperatures only when the GPU is awake and running.

Damaged or Missing WMI Service Prevents NVIDIA Driver Installation

Issue

"Install failed" or "Install Failed, could not find compatible graphics hardware" message may appear during installation, even if the system has a compatible graphics card. This can occur when installing the NVIDIA driver or GeForce Experience software.

Cause

This issue could be the result of a corrupt WMI service on your system. The NVIDIA Installer requires the WMI service to properly install the driver or other NVIDIA software.

Resolution

You must repair the WMI service on your system in order to successfully install NVIDIA drivers. A future driver release will alert the user during installation that there is a problem with the WMI service on the system.

Screen Turns Black During Clean Driver Overinstall on Windows 8.1 Optimus Notebook

Issue

After installing a Release 325 driver earlier than version 326.09 on an Optimus notebook running Windows 8.1, a subsequent clean overinstall of a later driver results in a black screen. The screen turns black when the driver uninstalls the older driver.

Typically, you may encounter this when attempting to upgrade the NVIDIA driver after installing Windows 8.1. While installing Windows 8.1, Windows Update installs NVIDIA driver version 326.01, then during the clean overinstall the black screen occurs as the older driver is uninstalled.

Workaround - Prevention

To avoid the issue during the initial installation of Windows 8.1, do not reboot the system after Windows Update installs the NVIDIA driver. Then perform the custom clean overinstall of the newer driver.

Resolution

This issue does not occur after installing an NVIDIA driver version 326.09 or later for Windows 8.1. When driver version 326.09 or later is installed, performing a clean overinstall with a newer driver will not result in a black screen.

Total Available Graphics Memory Reported Incorrectly

Background–TAG Memory

In the Windows Display Driver Model (WDDM), Total Available Graphics (TAG) memory is reported as the sum of

- Dedicated Video Memory (video memory dedicated for graphics use)
- Dedicated System Memory (system memory dedicated for graphics use), and
- Shared System Memory (system memory shared between the graphics subsystem and the CPU).

The values for each of these components are computed according to WDDM guidelines when the NVIDIA Display Driver is loaded.

Issue

Some TAG-reporting APIs represent video memory using 32-bits instead of 64-bits, and consequently do not properly report available graphics memory when the TAG would otherwise exceed 4 gigabytes (GB). This results in under reporting of available memory and potentially undesirable behavior of applications that rely on these APIs to report available memory.

The under reporting can be extreme. For example, 6 GB might be reported as 454 MB, and 8 GB might be reported as 1259 MB.

Driver Action for GeForce-based Graphics Systems

On graphics systems with less than 2.75 GB of advertized physical memory, the NVIDIA display driver typically limits the Shared System Memory to maintain a TAG memory value of less than 4 GB[1].

- This results in reliable reporting of sub-4 GB TAG memory on systems with less than 2.75 GB of advertised physical memory.
- On systems with 2.75 GB or more of advertized physical memory, you may see different reported TAG memory values between the NVIDIA Control Panel and other reporting APIs.

Increasing 4-way SLI/Multi-GPU Performance

Issue

With some games and applications, you may experience little to no performance gain or even a performance drop with 4-way SLI or multi-GPU configurations.

Resolution

1 Open the NVIDIA Control Panel, then click Manage 3D Settings from the navigation pane.
2. Click the *Global Settings* tab, then scroll to the *Power management mode* feature, click the corresponding list arrow and select Prefer maximum performance, then click Apply.

No PhysX Acceleration Using the GPU

If after installing the PhysX System Software you find that there is no PhysX acceleration on supported applications, repeat the PhysX setup as follows:

1 Reboot the PC.
2. Open the NVIDIA Control Panel and then, under 3D Settings, click Set PhysX configuration to open that page.
3. Under Select a PhysX processor, verify that either auto-select or a specific NVIDIA GPU is selected.
4. Click Apply.

1. The WDDM guidelines dictate minimum and maximum values for the components, but the display driver may further constrain the values that are reported (within the allowed minimum and maximum).

NVIDIA PhysX Software Cannot Be Installed/Uninstalled in Windows Safe Mode

Issue

The NVIDIA PhysX System Software is not included in the NVIDIA driver installation/uninstallation under safe mode.

Explanation

The NVIDIA PhysX System Software installer is not compatible with Microsoft's policy for Windows Safe Mode. Consequently, installation or uninstallation of the PhysX System Software under safe mode would fail. To allow installation or uninstallation of the graphics driver under safe mode, the NVIDIA PhysX System Software is blocked from the process.

Do Not Use Windows Rollback for Graphics Drivers

To reinstall a previous or older NVIDIA graphics driver, do not use the Windows rollback feature. This method will not reliably restore all the previous driver files.

Instead, use the Windows Add and Remove programs to remove the current driver, and then install the older driver using setup.exe.

Uninstalling Drivers Using Device Manager is Not Supported

Issue

On all supported versions of Microsoft Windows, uninstalling the NVIDIA driver using the Windows Device Manager may not remove associated files or applications.

Explanation

Microsoft has confirmed that this behavior is by design. If you wish to uninstall the NVIDIA driver, it is recommended that you do so using Add and Remove programs.

See the Microsoft KB article 2278714.

Changing Primary Display Across SLI GPUs Slower Than Expected

Issue

On an SLI system, switching the primary (or SLI focus) display when each display in the SLI group is connected to a different GPU takes longer than expected.

Explanation

On an SLI system with each SLI GPU driving a display, the display connected to the secondary SLI GPU is the primary display (also the SLI focus display). In order to switch the primary display to the one connected to the other GPU, the primary and secondary SLI GPU configuration must also switch. In order to reassign which GPU is the primary and which is the secondary SLI GPU, the driver must be reloaded. It is the process of reloading the driver that takes the additional time.

Using HDMI Audio with Displays That Have a High Native Resolution

To use HDMI audio with some displays that have a native resolution higher than 1920 × 1080, you must set the display to a lower HD resolution.

Some HDMI displays have a native resolution that exceeds the maximum supported HD mode. For example, displays with a native resolution of 1920 × 1200 exceed the maximum supported HD mode of 1920 × 1080.

Applying this native mode results in display overscan which cannot be resized using the NVIDIA Control Panel since the mode is not an HD mode.

To avoid this situation and provide a better user experience, the driver treats certain TVs– such as the Viewsonic VX2835wm and the Westinghouse LVM- 37w3–as a DVI monitor when applying the native mode. Because the driver does not treat the TV as an HDMI in this case, the HDMI audio is not used.

Using HDMI/DisplayPort Audio in Dualview or Clone Mode

Two Audio-enabled Ports

In a multi-display configuration where both HDMI/DisplayPort audio ports are enabled, only the primary display will provide the audio.

One Audio-enabled Port

In a multi-display configuration where only one audio port is enabled, such as when one display is a DVI display, then the HDMI/DisplayPort display can provide the audio whether is it the primary or secondary display.

Flat Panel Scaling Controls Not Functional for Some TV Modes and Displays

The NVIDIA Control Panel flat panel scaling controls on the "Adjust Size & Position" page are not intended to be used for TV modes, and normally the controls are not available for TV or HDTV displays.

However, Microsoft requires that certain TV/HDTV modes be available for all digital displays, including DVI and HDMI, even if they are not HDTV.

While the NVIDIA flat panel scaling controls are available for those displays, they will not be functional for the TV modes that appear in compliance with the Microsoft requirements. The affected modes are as follows:

- 1920 × 1080i @ 50/59.94/60 Hz
- 1280 × 720p @ 50/59.94/60 Hz
- 720 × 480p @ 59.94/60 Hz
- 720 × 576p @ 50 Hz

GPU Runs at a High Performance Level in Multi-display Modes

This is a hardware limitation with desktop and older notebook GPUs, and not a software bug. When multiple displays are connected and active, the GPU will always operate with full clock speeds in order to efficiently drive multiple displays–even when no 3D programs are running.

Note: NVIDIA notebook GeForce 5xxM series and later GPUs do not have this limitation. For those GPUs the driver can adjust the performance level, depending on demand, even when driving multiple displays.

1280 × 1024 @ 60 Hz Not Available on BenQ FP241W Monitors

Even though the monitor EDID lists 1280 × 1024 @ 60 Hz, the screen turns blank when using an HDMI connection. This is an issue with the monitor and not the NVIDIA driver.

Because of this issue with the monitor, the NVIDIA driver blocks the problem mode (1280 × 1024 @ 60 Hz) and makes it unavailable.

Hardware and Software Support

Supported Operating Systems

This Release 465 driver includes drivers designed for the following Microsoft® operating systems:

- Microsoft Windows® 10[1], 64-bit
- Microsoft Windows® 8.1, 64-bit
- Microsoft Windows® 8, 64-bit
- Microsoft Windows® 7, 64-bit versions.

Support for OpenCL 3.0

Maxwell, Pascal, Volta, Turing, and NVIDIA Ampere architecture GPUs are supported.

Supported NVIDIA Desktop Products

The following table (from http://www.geforce.com/hardware) lists current NVIDIA desktop products supported by version 466.47 WHQL of the Release 465 driver. For information about desktop products not shown, please see http://www.geforce.com/hardware/desktop-gpus.

Support for products based on the NVIDIA Ampere architecture requires Windows 10 April 2018 Update (version 1803) or later.

Table 3.1 Supported NVIDIA Desktop GPUs

Consumer Products	Architecture
NVIDIA GeForce RTX 3090	NVIDIA Ampere GPU architecture
NVIDIA GeForce RTX 3080	NVIDIA Ampere GPU architecture
NVIDIA GeForce RTX 3070	NVIDIA Ampere GPU architecture
NVIDIA GeForce RTX 3060	NVIDIA Ampere GPU architecture
NVIDIA GeForce RTX 3060 Ti	NVIDIA Ampere GPU architecture
NVIDIA TITAN RTX	Turing

1. Supports Windows 10 (Version 1803) and later, including Windows 10 October 2020 Update (Version 2009)

Table 3.1 Supported NVIDIA Desktop GPUs

Consumer Products	Architecture
NVIDIA GeForce RTX 2080 SUPER	Turing
NVIDIA GeForce RTX 2070 SUPER	Turing
NVIDIA GeForce RTX 2060 SUPER	Turing
NVIDIA GeForce RTX 2080 Ti	Turing
NVIDIA GeForce RTX 2080	Turing
NVIDIA GeForce RTX 2070	Turing
NVIDIA GeForce RTX 2060	Turing
NVIDIA TITAN V	Volta
NVIDIA TITAN Xp	Pascal
NVIDIA TITAN X	Pascal
GeForce GTX 1660 SUPER	Turing
GeForce GTX 1660 Ti	Turing
GeForce GTX 1660	Turing
GeForce GTX 1650 SUPER	Turing
GeForce GTX 1650	Turing
GeForce GTX 1080 Ti	Pascal
GeForce GTX 1080	Pascal
GeForce GTX 1070 Ti	Pascal
GeForce GTX 1070	Pascal
GeForce GTX 1060 6GB	Pascal
GeForce GTX 1060 3GB	Pascal
GeForce GTX 1060	Pascal
GeForce GTX 1050 Ti	Pascal
GeForce GTX 1050 3GB	Pascal
GeForce GTX 1050	Pascal
GeForce GT 1030	Pascal
GeForce GTX TITAN X	Maxwell
GeForce GTX TITAN Z	Kepler
GeForce GTX TITAN Black	Kepler
GeForce GTX TITAN	Kepler
GeForce GTX 980 Ti	Maxwell
GeForce GTX 980	Maxwell
GeForce GTX 970	Maxwell
GeForce GTX 960	Maxwell
GeForce GTX 950	Maxwell

Table 3.1 Supported NVIDIA Desktop GPUs

Consumer Products	Architecture
GeForce GTX 780 Ti	Kepler
GeForce GTX 780	Kepler
GeForce GTX 770	Kepler
GeForce GTX 760	Kepler
GeForce GTX 760 Ti (OEM)	Kepler
GeForce GTX 750 Ti	Maxwell
GeForce GTX 750	Maxwell
GeForce GTX 745	Maxwell
GeForce GT 740	Kepler
GeForce GT 730	Kepler
GeForce GT 720	Kepler
GeForce GT 710	Kepler
GeForce GTX 690	Kepler
GeForce GTX 680	Kepler
GeForce GTX 670	Kepler
GeForce GTX 660 Ti	Kepler
GeForce GTX 660	Kepler
GeForce GTX 650 Ti BOOST	Kepler
GeForce GTX 650 Ti	Kepler
GeForce GTX 650	Kepler
GeForce GTX 645	Kepler
GeForce GT 645	Kepler
GeForce GT 640	Kepler
GeForce GT 635	Kepler
GeForce GT 630	Kepler

Supported NVIDIA Notebook Products

The following table lists current NVIDIA notebook products supported by version 466.47 WHQL of the Release 465 driver. For information about notebook products not shown, please see http://www.geforce.com/hardware/notebook-gpus.

Table 3.2 Supported NVIDIA Notebook GPUs

Consumer Products	Architecture
GeForce RTX 3080 Laptop GPU	NVIDIA Ampere
GeForce RTX 3070 Laptop GPU	NVIDIA Ampere

Table 3.2 Supported NVIDIA Notebook GPUs (continued)

Consumer Products	Architecture
GeForce RTX 3060 Laptop GPU	NVIDIA Ampere
GeForce RTX 2080	Turing
GeForce RTX 2070	Turing
GeForce RTX 2060	Turing
GeForce GTX 1660 Ti	Turing
GeForce GTX 1650	Turing
GeForce MX450	Turing
GeForce MX350	Pascal
GeForce MX330	Pascal
GeForce MX250	Pascal
GeForce MX230	Pascal
GeForce MX150	Pascal
GeForce MX130	Maxwell
GeForce MX110	Maxwell
GeForce GTX 1080 for notebooks	Pascal
GeForce GTX 1070 for notebooks	Pascal
GeForce GTX 1060 for notebooks	Pascal
GeForce GTX 1050 for notebooks	Pascal
GeForce GTX 1050 Ti for notebooks	Pascal
GeForce GTX 980 for notebooks	Maxwell
GeForce GTX 980M	Maxwell
GeForce GTX 970M	Maxwell
GeForce GTX 965M	Maxwell
GeForce GTX 960M	Maxwell
GeForce GTX 950M	Maxwell
GeForce 945M	Maxwell
GeForce 940MX	Maxwell
GeForce 940M	Maxwell
GeForce 930MX	Maxwell
GeForce 930M	Maxwell
GeForce 920MX	Maxwell
GeForce GTX 860M	Maxwell
GeForce GTX 850M	Maxwell
GeForce 840M	Maxwell
GeForce 830M	Maxwell

Supported Languages

The Release 465 Graphics Drivers supports the following languages in the main driver Control Panel:

English (USA)	German	Portuguese (Euro/Iberian)
English (UK)	Greek	Russian
Arabic	Hebrew	Slovak
Chinese (Simplified)	Hungarian	Slovenian
Chinese (Traditional)	Italian	Spanish
Czech	Japanese	Spanish (Latin America)
Danish	Korean	Swedish
Dutch	Norwegian	Thai
Finnish	Polish	Turkish
French	Portuguese (Brazil)	

Driver Installation

Minimum Hard Disk Space

The hard disk space requirement is approximately 1.5x the size of the installation download to accommodate extracted and temporary files.

Before You Begin

nTune

If you have previously installed NVIDIA nTune, NVIDIA recommends that you uninstall nTune before installing this driver. After the driver install is complete, you can reinstall NVIDIA nTune.

Notebooks

- Check to make sure that your notebook has a supported GPU (see "Supported NVIDIA Notebook Products" on page 29).
- It is recommended that you back up your current system configuration.
- If you own a Dell Inspiron 1420, Dell XPS M1330, Dell XPS M1530, or Dell Latitude D630 or D630c, it is highly recommended that you first install this Dell software update.

Installation Instructions

Obtaining NVIDIA Drivers: Microsoft now provides only SHA-2 signed drivers. If your Windows 7 system is NOT equipped to detect SHA-2, you need to install the SHA-2 update support patches. For details as well as access to SHA-2 update support patches, see the Microsoft KBA "2019 SHA-2 Code Signing Support requirement for Windows and WSUS".

1. Follow the instructions on the NVIDIA.com Web site driver download page to locate the appropriate driver to download, based on your hardware and operating system.
2. From the driver download page, click the Download button.

   The *Download Confirmation* page appears.
3. If you agree to the "License For Customer Use of NVIDIA Software", click the Agree & Download button to begin the download.

   The *File Download* dialog appears.
4. Either click Save to save the file and then run it from your PC, or click Run.

   An extraction path dialog appears prompting you to specify where on your PC you want the driver files to be installed.

5. Click OK to use the default location, or click the folder icon and specify an alternate location to install the driver files.

   The files are extracted and then the NVIDIA Installer is launched automatically.
6. At the *License Agreement* page of the Installer, click Agree and Continue.
7. Follow the instructions in the NVIDIA Installer to complete the installation.

Note: The driver presents game screenshots while the driver is installing. If you are not connected to the internet during the installation, you may see a "Navigation to the webpage was cancelled" message instead. The message can be ignored and does not affect the installation. The message won't appear if the browser cache is cleared.

Note: The NVIDIA PhysX System Software will not be included in the installation if the same version or a later version is already installed.

Note: After the driver installation, Windows 7 may default to 16-bpp color and disable the Desktop Window Manager (DWM). To work around this issue, set the color to 32-bpp and then reboot the PC.

See also the installation/uninstallation considerations explained in "Known Product Limitations" on page 18.

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