Release 620 Studio Driver for Windows, Version 621.14

Windows 11 / Windows 10

Release Notes

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Chapter 1. Introduction to Release Notes

This edition of **Release Notes** describes the Release 620 family of NVIDIA® graphics drivers (versions 620.*xx* to 624.*xx*) for Microsoft® Windows® 10 and Windows 11. NVIDIA provides these notes to describe performance improvements and bug fixes in each documented version of the driver.

1.1 Structure of the Document

This document is organized in the following sections:

- Release 620 Studio Ready Driver Changes gives a summary of changes, and fixed and open issues in this version.
- The Release 620 Studio Ready Driver describes the NVIDIA products and languages supported by this driver, the system requirements, and how to install the driver.

1.2 Changes in this Edition

This edition of the *Release Notes* for Windows includes information about NVIDIA graphics driver version 621.14 WHQL and lists changes made to the driver since driver version 617.42.

These changes are discussed beginning with the chapter The Release 515 Studio Ready Driver.

Chapter 2. Release 620 Studio Ready Driver Changes

This chapter describes open issues for version 621.14 WHQL, and resolved issues and driver enhancements for versions of the Release 620 driver up to version 621.14 WHQL

The chapter contains these sections:

- Version 621.14 WHQL Highlights
- Changes and Fixed Issues in Version 621.14
- Open Issues in Version 621.14 WHQL
- Issues Not Caused by NVIDIA Drivers

2.1 Version 621.14 WHQL Highlights

This section provides highlights of version 621.14 WHQL of the NVIDIA Release 620 Driver for Windows 10[1] and Windows 11.

- Existing Support
- Software Module Versions
- What's New in the NVIDIA Studio Driver Version 621.14 WHQL
- What's New in Release 620
- Limitations in This Release

1. Supports Windows 10 (Version 1803) and later, including Windows 10 May 2021 Update (Version 21H2).

2.2 Existing Support

This release supports the following APIs:

- Open Computing Language (OpenCLTM software) 3.0 for NVIDIA® MaxwellTM and later GPUs
- OpenGL® 4.6
- Vulkan® 1.4
- DirectX 11
- DirectX 12

2.3 Software Module Versions

- HD Audio Driver — 1.4.6.6
- NVIDIA PhysX System Software — 9.26.0904
- CUDA — 13.5
- DCH NVIDIA Control Panel — 8.1.969.0

2.4 What's New in the NVIDIA Studio Driver Version 621.14 WHQL

2.4.1 NVIDIA Studio Driver

NVIDIA Studio Drivers provide artists, creators, and 3D developers the best performance and reliability when working with creative applications. To achieve the highest level of reliability, Studio Drivers undergo extensive testing against multi-app creator workflows and multiple revisions of the top creative applications from Adobe to Autodesk and beyond.

2.4.1.1 Applications

The November NVIDIA Studio Driver provides optimal performance and support for the latest new creative applications and updates including OBS Studio 33, Chaos Vantage, llama.cpp, PyTorch, Topaz Gigapixel, Maxon Redshift, and DaVinci Resolve 21.1.1 as well as support for DLSS 4.5 Ray Reconstruction within Blender 5.3 and Autodesk Arnold 7.5.4.0.

2.4.1.2 Other Changes

- Refer to Changes and Fixed Issues in Studio Driver Version 621.14 and What's New in Release 620.

2.5 What's New in Release 620

- Adds support for CUDA 13.5.
- Adds the latest performance improvements, bug fixes, and driver enhancements.

2.5.1 NVIDIA OpenCL Vulkan Interop

Starting with R620 driver version 511.65, the NVIDIA OpenCL driver has added support for the following new provisional extension specifications released by Khronos. The specifications are for OpenCL external semaphore and external memory.

- https://www.khronos.org/registry/OpenCL/specs/3.0-unified/html/OpenCL_Ext.html#cl_khr_semaphore
- https://www.khronos.org/registry/OpenCL/specs/3.0-unified/html/OpenCL_Ext.html#cl_khr_external_semaphore
- https://www.khronos.org/registry/OpenCL/specs/3.0-unified/html/OpenCL_Ext.html#cl_khr_external_memory

NVIDIA is seeking developer feedback on this new extension support.

2.5.2 OpenCL External semaphore and memory extensions

The set of new External Memory and Semaphore Sharing extensions provides a generic framework that enables OpenCL to import external memory and semaphore handles exported by external APIs—using a methodology that will be familiar to Vulkan developers—and then use those semaphores to synchronize with the external runtime, coordinating the use of shared memory.

The following key features are supported as part of these extensions:

- Importing memory into buffers using FD, Win32 KMT and NT handles
- Importing memory into images using FD, Win32 KMT and NT handles
- Importing binary semaphores using FD, Win32 KMT and NT handles
- Synchronizing using Wait and Signal on imported semaphores
- Using buffers and images imported in OpenCL kernels and other APIs such as other regular cl_mem.

2.5.2.1 Limitations of the Current Implementation

- Support for importing external memory and semaphores using FD handles on Linux and Win32 NT and KMT handles on Windows. No other handle types are currently available.
- Support for binary semaphores only.
- No support for exporting semaphore or memory from OpenCL.
- `clEnqueueAcquireExternalMemObjectsKHR` and `clEnqueueReleaseExternalMemObjectsKHR` APIs are currently not required as execution hand-off can be managed through semaphore wait and signal. However, these may be required in the future for correct functionality.

2.5.3 NVIDIA OpenCL Compiler Upgrade

The NVIDIA OpenCL driver used an older OpenCL Just-In-Time (JIT) compiler based on the legacy 3.4 versions of the Clang front-end and NVVM optimizer. NVIDIA has been working on upgrading its OpenCL JIT compiler to use a newer version 7.0 of the Clang front-end and NVVM optimizer component.

NVIDIA introduced this new OpenCL compiler as an opt-in feature in 510 driver release (511.09 on Windows and 510.54 on Linux), with the default OpenCL compiler remaining the same. With 621.14, NVIDIA OpenCL will use the new Clang + NVVM 7.0 based compiler as the default compiler, replacing the old compiler.

As part of this driver installation, a new compiler library should be visible in the system folder as `libnvidia-nvvm.so/nvvm*.dll` instead of the old `libnvidia-compiler.so*/nvcompiler*.dll`. The driver will pick up the newer compiler library by default.

2.5.3.1 NVVM 7.0 New Compiler Features

The new NVVM 7.0 based compiler takes advantage of years of development in the Clang+LLVM framework. In addition to several minor bug fixes and diagnostic improvements, this compiler introduces the following noteworthy features:

- **16-bit floating point (half) type**

  16-bit floating point types or “half” type is available as a native data type in the new compiler. This type is enabled by the `cl_khr_fp16` feature guard pragma.

  Example:

```
#pragma OPENCL EXTENSION cl_khr_fp16 : enable

half scalar_arith(half n, half k) {
  half w = n + k;
  half x = n - k;
  half y = w * x;
  half z = y / x;
  return -z;
}
__kernel void foo(__global int* x) {
  half a = 3.5H, b = 4.5H;
  if (scalar_arith(a, b) == -8.0)
  *x = 1;
  return;
}
```

- **128-bit integer type**

  128-bit integer types or “(un)signed long long” is available as a native data type in the new compiler. This type is enabled by default and does not require any macros to be defined.

  Example:

```
typedef unsigned long long ULL;
typedef long long LL;

LL scalar_arith(ULL n, ULL k) {
```

```
  LL w = n + k;
  LL x = n - k;
  LL y = w * x;
  LL z = y / x;
  return -z;
}

__kernel void foo(__global int* x) {
  ULL a = 0x123456789ABCDEF0ULL;
  ULL b = 0xFEDCBA9876543210ULL;
  if (scalar_arith(a, b) < 0)
  *x = 1;
  return;
}
```

- **Upgraded math libraries**

  The built-in standard math functions (e.g. sin(), cos()) have been upgraded to be on par with CUDA C++. This ensures that your application benefits from high-performance math routines optimized for the latest GPU architectures.

2.5.3.2 Clang Release Notes

The public LLVM release notes for Clang 3.4 – Clang 7.0 mentioned below summarize the behavioral changes between old and new compiler bases.

- Clang 4: https://releases.llvm.org/4.0.0/tools/clang/docs/ReleaseNotes.html
- Clang 5: https://releases.llvm.org/5.0.0/tools/clang/docs/ReleaseNotes.html
- Clang 6: https://releases.llvm.org/6.0.0/tools/clang/docs/ReleaseNotes.html
- Clang 7: https://releases.llvm.org/7.0.0/tools/clang/docs/ReleaseNotes.html

2.5.3.3 Known Issues with NVVM 7.0-based Compiler

The new Clang/NVVM 7.0 based compiler has stricter error checking compared to the previous compiler. The following use-cases which were allowed with the older compiler may now throw an error.

- Updating `const` variables after they have been assigned.
- Using address spaces other than `global` for kernel pointer parameters.
- Using `variadic` arguments in functions and blocks.

2.6 Discontinued Support

- Applications compiled using older presets and older rate control modes are supported by the drivers up until now. R580 will be the last driver branch to have this support.

  Starting with the R590 branch, driver support for these older NVENC presets and rate control modes will be removed. Therefore, all applications compiled with older presets and rate control modes will stop working if upgraded to R590 branch drivers (59x.xx). Users need to upgrade to Video Codec SDK version 10.0 or above and use the new

presets and rate control modes. Users can refer to the migration guide present in Video Codec SDK for migrating to newer presets and rate control modes.

- Release 470 was the last driver branch to support Quadro desktop GPUs based on the Kepler architecture.
- NvIFR OpenGL support.

  Release 470 was the last driver branch to support this functionality. NvIFR header files, samples and documentation have been removed from the NVIDIA Capture SDK 7.1.9 release. Future drivers will remove NvIFR.dll and any other reference to NvIFR. For details, see the NVIDIA Video Codec SDK page.

2.7 Limitations in This Release

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

2.7.1 NVENC Presets in Video Codec SDK

- Applications compiled using older NVENC presets and rate control modes would stop working on R590 drivers and above. R580 are the last drivers to support them. The new presets and rate control modes were added in Video Codec SDK 10.0. Therefore, all applications must migrate to Video Codec SDK 10.0 (or above) and use the new presets and rate control modes to keep continuing working on R590 drivers and above. Users can refer to the migration guide present in the Video Codec SDK to help migrate.

2.7.2 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
- Shared virtual memory - the current implementation of shared virtual memory is limited to 64-bit platforms only.

2.7.3 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.

2.7.4 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.

2.7.5 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.
- Vulkan / OpenGL applications are currently not supported for sharpening
- 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 ration 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 monitors, such as R2 and R3 monitors, 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, based 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.

2.7.6 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.

2.7.7 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.

2.7.8 Turing GPU Driver Installation

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.

2.7.9 Crescent Bay and OSVR Headsets on Multiple GPU Systems

Crescent Bay and Open Source Virtual Reality development kit headsets do 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) to use Direct Mode.

Chapter 3. Changes and Fixed Issues in Studio Driver Version 621.14

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.

3.1 Fixed Issues in Version 621.14 WHQL

3.1.1 Fixed Application Issues

- Wuthering Waves: May crash during gameplay when using NVIDIA Freestyle filters with DLSS Frame Generation enabled. [5747079]
- Star Citizen: Resolves a crash that may be seen when using Vulkan API. [6680590]
- Surviving Mars: Relaunched may crash during gameplay after updating to R595 drivers. [5965452]

3.1.2 Fixed General Issues

- Fixed an issue where video playback may freeze or black screen on some GeForce RTX 50 Series GPUs/RTX Spark after updating to GRD 621.01. [6979343]
- QHD monitor running at 360 Hz may have occasional black flash during gameplay. [4846825]
- When gaming on a 360Hz G-SYNC Pulsar monitor, FPS may drop to 320FPS. [6408986]
- Meta Horizon Link stream may freeze when connected over USB. [6292679]
- Intermittent dimming may be observed on certain ASUS notebooks after updating to R615 drivers. [6807011]

3.2 Open Issues in Version 621.14 WHQL

As with every released driver, version 621.14 WHQL of the Release 620 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 for more information.

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

- N/A

3.3 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
- Operating System Issues
- Application Issues

3.4 Windows 10 Considerations

3.4.1 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.

3.4.2 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.

3.5 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.

3.6 Application Issues

3.6.1 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 4. The Release 620 Studio Ready Driver

This chapter covers the following main topics:

- About the Release 620 Studio Ready Driver
- Driver Security
- Advanced Driver Information
- Known Product Limitations
- Hardware and Software Support
- Driver Installation

4.1 About the Release 620 Studio Ready Driver

This driver release is from the Release 620 family of drivers (versions 620.*xx* to 624.*xx*). See Supported NVIDIA Desktop Products and Supported NVIDIA Notebook Products 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.

4.2 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. For guidance regarding driver or software package updates to address security concerns, visit the NVIDIA Product Security page.

4.3 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 to use NVIDIA developer tools such as CUPTI, Nsight Graphics, and Nsight Compute. 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.

4.4 Advanced Driver Information

This section contains the following additional information about the driver:

- Updating the NVIDIA VirtualLink PPC Firmware
- Differing GPU Voltages in SLI Mode
- 3D Compatibility Mode
- Help for Resizing Your HDTV Desktop
- Understanding the NVIDIA System Information Window > DirectX Information

4.5 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.

4.5.1 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]

4.6 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.

4.7 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.

4.7.1 Requirements and Compatibility

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

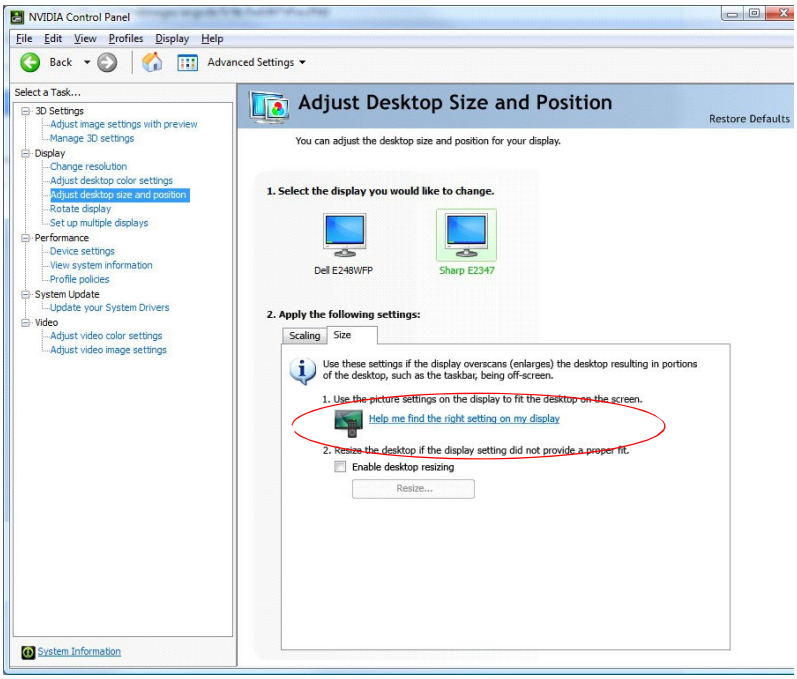
4.7.2 Switching Compatibility Modes

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.

4.8 Help for Resizing Your HDTV Desktop

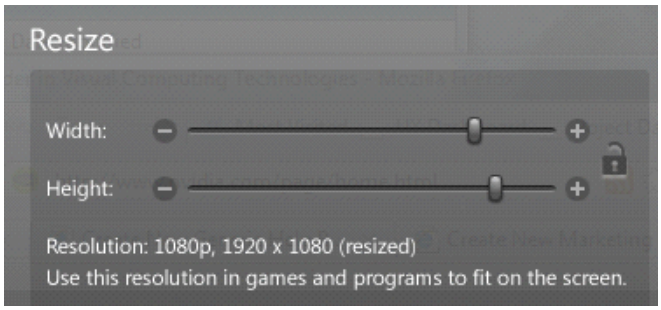
The best way to resize the screen to view the entire content is to use the controls provided by the display hardware. Click the link on the **Size** tab to view a guide to changing the settings on your display hardware.



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 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 to take advantage of it.



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

4.9 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:

- DirectX runtime version: For example, “12.0”

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:

- Direct3D API version

  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

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

Chapter 5. 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:

- NVIDIA GeForce RTX 30-Series/RTX 20-Series Bandwidth Limit
- G-SYNC May be Enabled in Windowed Mode Even if Only *Full-screen Mode* is Specified
- Issues Installing the NVIDIA Control Panel from the Windows Store
- Windowed NVIDIA G-SYNC is Disabled for Multi-monitor System Video Playback
- GPU Temperature Reported Incorrectly on Optimus Systems
- Damaged or Missing WMI Service Prevents NVIDIA Driver Installation
- Total Available Graphics Memory Reported Incorrectly
- Increasing 4-way SLI/Multi-GPU Performance
- No PhysX Acceleration Using the GPU
- NVIDIA PhysX Software Cannot Be Installed/Uninstalled in Windows Safe Mode
- Do Not Use Windows Rollback for Graphics Drivers
- Uninstalling Drivers Using Device Manager is Not Supported
- Changing Primary Display Across SLI GPUs Slower Than Expected
- Using HDMI Audio with Displays That Have a High Native Resolution
- Using HDMI/DisplayPort Audio in Dualview or Clone Mode
- Flat Panel Scaling Controls Not Functional for Some TV Modes and Displays

5.1 NVIDIA GeForce RTX 30-Series/RTX 20-Series Bandwidth Limit

The maximum number of HDMI or DisplayPort displays that an NVIDIA GeForce RTX 30-series or RTX 20-series GPU can drive at the same time may be limited to two displays under the following conditions:

- NVIDIA GeForce RTX 30-series GPUs
  - When driving a Display Stream Compression (DSC) - capable DisplayPort or HDMI display where the horizontal resolution is greater than 5120 pixels or that requires high clock bandwidth; for example, 3840x2160 @ 160 Hz.

- When driving a YCbCr 4:2:0 HDMI display where the horizontal resolution is greater than 5120 pixels or that requires high clock bandwidth; for example, 3840x2160 @ 160 Hz.

> Similarly, NVIDIA GeForce RTX 20-series GPUs

- When driving a Display Stream Compression (DSC) - capable DisplayPort display where the horizontal resolution is greater than 5120 pixels or that requires high clock bandwidth; for example, 3840x2160 @ 160 Hz.

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

5.2.1 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.

5.2.2 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.

5.3 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.

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

5.4.1 Issue

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

5.4.2 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.

5.5 GPU Temperature Reported Incorrectly on Optimus Systems

5.5.1 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.

5.5.2 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.

5.6 Damaged or Missing WMI Service Prevents NVIDIA Driver Installation

5.6.1 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.

5.6.2 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.

5.6.3 Resolution

You must repair the WMI service on your system 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.

5.7 Total Available Graphics Memory Reported Incorrectly

5.7.1 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.

5.7.2 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.

5.8 Driver Action for GeForce-based Graphics Systems

On graphics systems with less than 2.75 GB of advertised 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 advertised physical memory, you may see different reported TAG memory values between the NVIDIA Control Panel and other reporting APIs.

5.9 Increasing 4-way SLI/Multi-GPU Performance

5.9.1 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.

5.9.2 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, select **Prefer maximum performance**, then 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).

5.10 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**.

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

5.11.1 Issue

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

5.11.2 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.

5.12 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.

5.13 Uninstalling Drivers Using Device Manager is Not Supported

5.13.1 Issue

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

5.13.2 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.

5.14 Changing Primary Display Across SLI GPUs Slower Than Expected

5.14.1 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.

5.14.2 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). To switch the primary display to the one connected to the other GPU, the primary and secondary SLI GPU configuration must also switch. 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 additional time.

5.15 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.

5.16 Using HDMI/DisplayPort Audio in Dualview or Clone Mode

5.16.1 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.

5.16.2 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.

5.17 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

5.18 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 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.

Chapter 6. Hardware and Software Support

- Supported Operating Systems
- Support for OpenCL 3.0
- Supported NVIDIA GeForce Desktop Products
- Supported NVIDIA GeForce Notebook Products
- Supported NVIDIA Quadro & NVS Products
- Supported NVIDIA Quadro Sync II
- Supported NVIDIA Quadro Sync Products
- Supported NVIDIA Quadro Blade/Embedded Graphics Boards
- Supported NVIDIA Quadro Notebook GPUs
- Supported Languages

6.1 Supported Operating Systems

This Release 620 driver includes drivers designed for the following Microsoft® operating systems:

- Microsoft Windows® 11
- Microsoft Windows® 10[1], 64-bit

1. Supports Windows 10 (Version 1803) and later, including Windows 10 May 2021 Update (Version 21H2)

6.2 Support for OpenCL 3.0

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

6.3 Supported NVIDIA GeForce Desktop Products

The following table (from https://www.nvidia.com/en-us/geforce/graphics-cards/)) lists current NVIDIA desktop products supported by version 621.14 WHQL of the Release 620 driver. For information about desktop products not shown, please see https://www.nvidia.com/en-us/geforce/graphics-cards/).

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

Table 1. Supported NVIDIA GeForce Desktop GPUs

Consumer Products	Architecture
NVIDIA GeForce RTX 5090	NVIDIA Blackwell architecture
NVIDIA GeForce RTX 5090D	
NVIDIA GeForce RTX 5080	
NVIDIA GeForce RTX 5070 Ti	
NVIDIA GeForce RTX 5070	
NVIDIA GeForce RTX 5060 Ti	
NVIDIA GeForce RTX 5050	
NVIDIA GeForce RTX 4090	NVIDIA Ada Lovelace GPU architecture
NVIDIA GeForce RTX 4090 D	
NVIDIA GeForce RTX 4080	
NVIDIA GeForce RTX 4070 Ti SUPER	
NVIDIA GeForce RTX 4070 Ti	
NVIDIA GeForce RTX 4070 SUPER	
NVIDIA GeForce RTX 4070	
NVIDIA GeForce RTX 4060 Ti 16GB	
NVIDIA GeForce RTX 4060 Ti	
NVIDIA GeForce RTX 4060	
NVIDIA TITAN RTX	Turing
NVIDIA GeForce RTX 3090 Ti	NVIDIA Ampere GPU architecture
NVIDIA GeForce RTX 3090	
NVIDIA GeForce RTX 3080 Ti	
NVIDIA GeForce RTX 3080	
NVIDIA GeForce RTX 3070 Ti	
NVIDIA GeForce RTX 3070	
NVIDIA GeForce RTX 3060 Ti	
NVIDIA GeForce RTX 3060	
NVIDIA GeForce RTX 3050	

Consumer Products	Architecture
NVIDIA GeForce RTX 2080 Ti	Turing
NVIDIA GeForce RTX 2080 SUPER	
NVIDIA GeForce RTX 2080	
NVIDIA GeForce RTX 2070 SUPER	
NVIDIA GeForce RTX 2070	
NVIDIA GeForce RTX 2060 SUPER	
NVIDIA GeForce RTX 2060	
GeForce GTX 1660 SUPER	
GeForce GTX 1660 Ti	
GeForce GTX 1660	
GeForce GTX 1650 SUPER	
GeForce GTX 1650	
GeForce GTX 1630	

6.4 Supported NVIDIA GeForce Notebook Products

The following table lists current NVIDIA notebook products supported by version 621.14 WHQL of the Release 620 driver. For information about notebook products not shown, please see https://www.nvidia.com/en-us/geforce/graphics-cards/).

Table 2. Supported NVIDIA Notebook GPUs

Consumer Products	Architecture
GeForce RTX 5090 Laptop GPU	NVIDIA Blackwell
GeForce RTX 5080 Laptop GPU	
GeForce RTX 5070 Ti Laptop GPU	
GeForce RTX 5070 (12GB) Laptop GPU	
GeForce RTX 5070 Laptop GPU	
GeForce RTX 5060 Laptop GPU	
GeForce RTX 5050 Laptop GPU	
GeForce RTX 4090 Laptop GPU	NVIDIA Ada Lovelace
GeForce RTX 4080 Laptop GPU	
GeForce RTX 4070 Laptop GPU	
GeForce RTX 4060 Laptop GPU	
GeForce RTX 4050 Laptop GPU	
GeForce RTX 3080 Ti Laptop GPU	NVIDIA Ampere

Consumer Products	Architecture
GeForce RTX 3080 Laptop GPU	
GeForce RTX 3070 Ti Laptop GPU	
GeForce RTX 3070 Laptop GPU	
GeForce RTX 3060 Laptop GPU	
GeForce RTX 3050 Ti Laptop GPU	
GeForce RTX 3050 Laptop GPU	
GeForce RTX 2080 SUPER Laptop GPU	Turing
GeForce RTX 2080 Laptop GPU	
GeForce RTX 2070 Laptop GPU	
GeForce RTX 2060 Laptop GPU	
GeForce GTX 1660 Ti Laptop GPU	
GeForce GTX 1650 Laptop GPU	

6.5 Supported Languages

The Release 620 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)	

Chapter 7. Driver Installation

7.1 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.

7.2 Before You Begin

7.2.1 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.

7.2.2 Notebooks

- Check to make sure that your notebook has a supported GPU (see Supported NVIDIA Notebook Products).
- 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 the latest software updates from Dell.

7.3 Installation Instructions

1. Follow the instructions on the NVIDIA.com website 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.

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Softfloat Release 3e (http://www.jhauser.us/arithmetic/SoftFloat.html) is provided under the following terms:

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