



# Release 346 Quadro, NVS, Tesla, GRID, & Notebook Drivers - Version 348.17

RN-WQ34817-01\_v01 | May 28, 2015  
Windows 7, Windows 8, & Windows 8.1

## Release Notes



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# 01 INTRODUCTION TO RELEASE NOTES

This edition of *Release Notes* describes the Release 346 family of NVIDIA Quadro, NVS, Tesla, GRID, and Quadro Notebook Drivers for Microsoft® Windows® 7 and later<sup>1</sup>. 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 346 Driver Changes](#)” on page 2 gives a summary of changes, and fixed and open issues in this version.
- ▶ “[The Release 346 Driver](#)” on page 30 describes the NVIDIA products and languages supported by this driver, the system requirements, and how to install the driver.
- ▶ “[Mode Support for Windows](#)” on page 41 lists the default resolutions supported by the driver.
- ▶ “[NVIDIA Tesla Compute Cluster Mode](#)” on page 49 describes the Tesla Compute Cluster mode.

## Changes in this Edition

This edition of the *Release Notes* for Windows 7 and later includes information about NVIDIA graphics driver version 348.17, and lists changes made to the driver since version 341.21. These changes are discussed beginning with the chapter “[Release 346 Driver Changes](#)” on page 2.

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

## 02 RELEASE 346 DRIVER CHANGES

This chapter describes open issues for version 348.17, and resolved issues and driver enhancements for versions of the Release 346 driver up to version 348.17. The chapter contains these sections:

- ▶ “Version 348.17 Highlights” on page 3
- ▶ “Advanced Instructions for this Release” on page 8
- ▶ “Changes in Version 348.17” on page 14
- ▶ “Changes in Version 348.07” on page 15
- ▶ “Changes in Version 347.88” on page 16
- ▶ “Changes in Version 347.52” on page 17
- ▶ “Changes in Version 347.09” on page 17
- ▶ “Open Issues in Version 348.17” on page 18
- ▶ “Not NVIDIA Issues” on page 19
- ▶ “Known Product Limitations” on page 24

## Version 348.17 Highlights

This section provides highlights of version 348.17 of the NVIDIA Release 346 Driver for Windows Vista and later.

- ▶ Existing Support
- ▶ What's New in Version 348.17
- ▶ What's New in Release 346
- ▶ Discontinued and Unsupported Features in this Release
- ▶ Limitations in This Release

### Existing Support

This release supports the following APIs:

- ▶ Open Computing Language (OpenCL) 1.1.
- ▶ OpenGL 4.5
- ▶ DirectX 11
- ▶ CUDA 7.0

### What's New in Version 348.17

- ▶ This driver offers performance improvements over previous driver versions, including workstation compatibility fixes.
- ▶ This driver installs **nView Desktop Manager** version 146.33.
- ▶ See “Changes in Version 348.17” on page 14 for the list of bug fixes.



## What's New in Release 346

The section summarizes the following driver changes in Release 346 since Release 340:

### Quadro ODE Driver

Release 346 is the eighth 'Optimal Drivers for Enterprise'(ODE) branch release. ODE branches are dedicated to relatively long term stability for ISV certification, OEMs, and Enterprise customers.

### New Features Supported

- ▶ OpenGL hardware acceleration on Windows Remote Desktop.
- ▶ Force stereo toggling even when no stereoscopic 3D application is running.
- ▶ Option to pre-allocate GPU memory for Quadro features such as stereoscopic 3D or swap groups which prevents display mode-sets when enabling the features.

### New Product Support

- ▶ Driver version 347.88 added support for the following Quadro products:
  - Quadro M6000
  - Quadro K1200

### Legacy Product Support

- ▶ See [Legacy Support for Tesla architecture GPUs](#).

## Discontinued and Unsupported Features in this Release

### Discontinued Features

- ▶ The NVIDIA® AutoCAD Performance driver is no longer integrated in the graphics driver.

Standalone versions or version updates can still be downloaded from the NVIDIA driver download page.

- ▶ The following features are removed from the NVIDIA Control Panel
  - The Views option
 

You no longer need to select between Standard and Advanced views for many NVIDIA Control Panel controls.
  - The Profiles menu
- ▶ Support for Quadro SDI products is discontinued for Windows 8 and later operating systems.
- ▶ Legacy Support for Curie generation of Workstation products

Beginning with Release 310, the NVIDIA professional drivers no longer support the Curie generation of Workstation products.

NVIDIA Quadro FX 5500	NVIDIA Quadro FX 3500M
NVIDIA Quadro FX 4500 X2	NVIDIA Quadro FX 2500M
NVIDIA Quadro FX 4500	NVIDIA Quadro FX 1500M
NVIDIA Quadro FX 4400	NVIDIA Quadro FX 560M
NVIDIA Quadro FX 4400G	NVIDIA Quadro FX 560M
NVIDIA Quadro FX 4000	NVIDIA Quadro FX 350M
NVIDIA Quadro FX 470	NVIDIA Quadro NVS 120M
NVIDIA Quadro FX 350	
NVIDIA Quadro VX 200	
NVIDIA Quadro NVS 440	
NVIDIA Quadro NVS 285	

Release 304 drivers continue to support Curie generation Workstation products, and NVIDIA will continue to address driver issues for these products in driver branches up to and including Release 304. However, future driver enhancements and optimizations in driver releases after Release 304 will not support Curie generation products.

### ► Legacy Support for Tesla architecture GPUs

Beginning with Release 343, the NVIDIA graphics drivers no longer support the Tesla generation of NVIDIA GPUs. These products are identified in the section [Supported NVIDIA Products](#) and [Supported NVIDIA Notebook Products](#).

The Release 340 drivers will continue to support these products until April 1, 2016, and the NVIDIA support team will continue to address driver issues for these products in driver branches up to and including Release 340. However, future driver enhancements and optimizations in driver releases after Release 340 will not support these products.

The following is a summary of legacy Workstation products beginning with Release 343 drivers:

- Quadro FX/CX/VX Workstation products
- Select Quadro NVS Workstation products
- Quadro FX and NVS Notebook Products
- Quadro Plex 2200

See the section [Supported NVIDIA Products](#) and [Supported NVIDIA Notebook Products](#) for specific products.

## Limitations in This Release

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

### ▶ **Video Memory Support**

For Windows 7 and Windows Vista 64-bit, this driver recognizes up to the total available video memory on Quadro cards for Direct3D and OpenGL applications.

For Windows 7 and Windows Vista 32-bit, this driver recognizes only up to 4 GB of video memory on Quadro cards for DirectX, OpenGL, and CUDA applications.

### ▶ **NVIDIA Control Panel Display Category**

- The Graph tab on the Adjust Desktop Color Settings page is not available.

## Advanced Instructions for this Release

This section clarifies instructions for successfully accomplishing the following tasks:

- ▶ Docking/Undocking Notebooks with Mosaic
- ▶ Turning Off V-Sync to Boost Performance
- ▶ NVIDIA Application Configuration Engine (ACE)
- ▶ Using the WDDM Driver Model with Tesla GPU GOMs
- ▶ SLI Multi-OS – GPU Assignment in System Virtualization

### Docking/Undocking Notebooks with Mosaic

When using a docked Quadro notebook that is configured for NVIDIA Mosaic, you must disable Mosaic before undocking the notebook.

### Turning Off V-Sync to Boost Performance

To get the best benchmark and application performance measurements, turn V-Sync off as follows:

- 1 Open the NVIDIA Control Panel and make sure that *Advanced Settings* is selected from the control panel tool bar.
- 2 From the *Select a Task* pane, under 3D Settings, click **Manage 3D Settings**, then click the Global Settings tab.
- 3 From the Global presets pull-down menu, select **Base profile**.
- 4 From the Settings list box, select **Vertical sync** and change its value to **Force off**, then click **Apply**.
- 5 From the Global presets pull-down menu, select **3D App - Default Global Settings** (the driver's default profile) or use the application profile that matches the application you are testing, then click **Apply**.

***Be sure to close the NVIDIA Control Panel completely*** —leaving it open will affect benchmark and application performance.

### NVIDIA Application Configuration Engine (ACE)

This driver includes the NVIDIA Application Configuration Engine (ACE), which automatically detects the workstation application and configures the appropriate profile settings in the NVIDIA Control Panel.

See the *NVIDIA Quadro Professional Drivers: NVIDIA Control Panel Quick Start Guide* for more information about this feature.

## Using the WDDM Driver Model with Tesla GPU GOMs

### Tesla GPU Operation Modes

Tesla K20X and K20 GPU Accelerators offer the ability to specify the GPU operation mode using NV-SMI/NVML. (refer to: <https://developer.nvidia.com/nvidia-management-library-nvml>).

By setting the GPU operation mode, developers can selectively turn off certain features in the GPU to get the best performance per watt for certain workloads.

The following are the supported GOMs:

- ▶ **Compute-Only:** For running compute tasks only.  
By default the Tesla K20X and K20 accelerator boards ship in this mode.
- ▶ **Low-Double Precision:** For graphics applications that don't require high bandwidth double precision.  
This is recommended for workloads that are not sensitive to double precision but at the same time need graphics capabilities.
- ▶ **All On:** This is recommended only when the workload needs full double precision as well as graphics capabilities.

### WDDM and TCC Driver Models

Along with the GPU operation mode, the developer needs to select the compatible driver model for the Tesla K20X and K20.

- ▶ **Tesla Compute Cluster (TCC):** Optimized for running compute workloads.
- ▶ **Windows Device Driver Model (WDDM):** Designed for graphics application and not recommended for compute workloads.

## Compatibility Between GOM and Driver Models

Table 1 shows which GPU operation modes are compatible with which driver models.

Table 1 GOM and Driver Model Compatibility

GOM	TCC Driver Model	WDDM Driver Model	Use Case Support
All On	YES	YES	All use cases are supported.
Compute-Only	YES	NO	The following are <b>unsupported</b> : X11 and those that require X11 (GLInterop, OCL conformance and VIPER) 32-bit Windows OS
Low Double Precision	YES	YES	All use cases supported.

The compute-only GOM is supported only on the TCC driver model, while the WDDM driver model supports only GOM modes that enable graphics.

The compute-only GOM and WDDM are incompatible and should not be used simultaneously.

***The Tesla K20 Active Accelerators for workstations ship in “compute-only” mode and cannot be modified. Therefore, use only the TCC driver model with these products.***

## Using the WDDM Driver Model

To use the WDDM driver model with Tesla K20x and K20 GPU Accelerators for servers, first switch the GOM mode from compute-only to All On, then switch from TCC to WDDM.

***Do not attempt to specify the driver model by editing the registry.*** Doing so can result in compute-only GOM and WDDM being configured simultaneously, which might require a clean installation of the driver to fix.

***Always use NVIDIA-provided tools to specify a processing mode or to switch between driver models.*** Such tools include nvidia-smi or the NVIDIA Control Panel->Manage Maximus Settings page. These tools provide warnings in the case of a conflict.

## SLI Multi-OS - GPU Assignment in System Virtualization

On systems with two or more graphics cards installed, this driver supports a hypervisor's ability to directly assign GPUs to guest virtual machines (VMs). This direct assignment allows each guest VM to run on their own operating system with their own GPU and driver. The assignment allows full GPU performance and functionality in the guest VM.

### Hardware Platform Requirements

To make use of GPU passthrough with virtual machines running Windows and Linux, the hardware platform must support the following features:

- ▶ A CPU with hardware-assisted instruction set virtualization: Intel VT-x or AMD-V.
- ▶ Platform support for I/O DMA remapping.

On Intel platforms the DMA remapper technology is called Intel VT-d.

On AMD platforms it is called AMD IOMMU.

Support for these feature varies by processor family, product, and system, and should be verified at the manufacturer's website.

### Supported Hypervisors

The following hypervisors are supported:

Hypervisor	Notes
Citrix XenServer	Version 6.0 and later.
VMware vSphere (ESX / ESXi)	Version 5.1 and later.
Parallels Workstation Extreme	Version 4 and later

### Supported Graphics Cards

The following GPUs are supported for device passthrough:

GPU Family	Boards supported
Kepler	<u>GRID</u> : K1, K2, K520, K340 <u>Quadro</u> : K2000, K4000, K5000, K6000 <u>Tesla</u> : K10, K20, K20x, K20Xm, K20c, K20s, K40m, K40c, K40s, K40st, K40t, K80
Fermi	<u>Quadro</u> : 2000, 4000, 5000, 6000 <u>Quadro-MXM</u> : 1000M, 3000M <u>Tesla</u> : C2050, C2075, M2050, M2070, M2070Q



## Notes and Known Issues

### VMware

- PCI I/O hole may need to be changed for Windows 64-bit VMs.

Windows 64-bit VMs may require that you edit the VM configuration file to configure a larger PCI I/O hole for the GPU.

- Access Control Services is required on some switches.

Starting with ESX 5.0 Update 1, Access Control Services (ACS) is required on any switches in the PCIe hierarchy above a PCIe device that is to be used for passthrough. If ACS is not present, ESX will not allow the device to be assigned directly to a VM.

To allow assignment of devices below switches that do not support ACS, you can disable the ACS check as follows:

```
esxcfg-advcfg -k true disableACSCheck
```

- Configuring passthrough to a Windows Server 2008R2 VM.

The VMware WDDM driver must be manually installed on Windows Server 2008 R2.

Follow the steps provided at <http://communities.vmware.com/message/1423263#1425288>.

- MSI translation must be disabled.

Blue-screen crashes may occur on VMs with assigned GPUs if MSI is initially enabled for passthrough devices.

To avoid this issue, disable MSI translation by setting *pciPassthru0.msiEnabled = "FALSE"* in the VM's VMX file.

### Citrix XenServer

- XenServer 6.1 workaround for 64-bit MMIO failures on PCI passthrough.

Dom0 kernel may relocate GPU BARs to an invalid location immediately beyond the end of physical RAM. There are two workaround options to address this condition:

**Workaround option #1:** Add 'pci=use\_crs' to the kernel parameters by running the following command in Dom0:

```
/opt/xensource/libexec/xen-cmdline --set-dom0 pci=use_crs
```

**Workaround option #2:** Install the hotfix provided by Citrix at <http://support.citrix.com/article/CTX137645>):

### Multi-Monitor Support on GRID

Multi-monitor support on GRID boards K1 and K2 requires the following VBIOS versions:

- GRID K1: *80.07.AF.00.00 or later*

- GRID K2: **80:04:BA:00.00** or later

## Changes in Version 348.17

The following sections list the important changes and the most common issues resolved since driver version 348.07.

### Windows Vista/Windows 7/Windows 8 Fixed Issues

- ▶ [Quadro K6000][Houdini]: OpenCL 1.2 with 64 bit addressing can't access more than 4GB total memory.
- ▶ [Quadro K5000][SLI][AutoDesk VRED]: Application performance drops with SLI enabled.
- ▶ [Quadro K4200][Hypermesh]: Performance is low compared to competitor's graphics card. ]
- ▶ [Notebook][Quadro 2100M][3dsMax 2015]: The application show the Intel HD Graphics as the display driver used instead of NVIDIA Graphics.
- ▶ [Mari 2.0][Nuke 7.0]: The applications are launched on the integrated graphic instead of the NVIDIA GPU.

## Changes in Version 348.07

The following sections list the important changes and the most common issues resolved since driver version 347.88.

### Windows Vista/Windows 7/Windows 8 Fixed Issues

- ▶ [Quadro M6000]: The GPU is not supported by the driver.
- ▶ [Quadro K5000][Creo3]: The application crashes when rendering high-resolution images.
- ▶ [Quadro K5000][Bunkspeed Shot 2014]: The application crashes.
- ▶ [Quadro][Presto]: Switching machines via DisplayPort KVM switch results in application draw issue.
- ▶ [CUDA]: Some CUDA calls aren't returning out-of-memory errors, causing the driver to terminate applications.

## Changes in Version 347.88

The following sections list the important changes and the most common issues resolved since driver version 347.52.

### Windows Vista/Windows 7/Windows 8 Fixed Issues

- ▶ [Quadro K6000][Quadro -Sync]: Image rendering lags intermittently.
- ▶ [Quadro K5000][VRED]: Images are not rendered properly in OpenGL cluster mode.
- ▶ [Quadro K5200][Cinema 4D]: Deadlock occurs in glIsTexture.
- ▶ [Quadro K2200M][Media Composer 7.0]: ilgpu\_console unit test benchmark freezes at the Viewer unit test with an “OpenGL (Not Responding)” window.
- ▶ [Quadro K2200][Catia V5]: The application response slows down when switching back and forth between several models.
- ▶ [Quadro K2200/K2000/K4200][SketchUp Pro 2015]: OpenGL “lost connection” error occurs.
- ▶ [Quadro Notebook][Optimus][TouchDesigner]: Crash occurs in cudaGraphicsGLRegisterBuffer.
- ▶ [Quadro][Mari2.6v4]: Image issues occur when using backface cull.
- ▶ [Quadro]: The driver hangs during wglMakeCurrent() call.
- ▶ [Luxmark]: There is no DRS profile available for the application.
- ▶ [Petrel]: Profile update needed.
- ▶ [Catia]: Runtime exceptions occur.
- ▶ [DCC/CAD Applications]: Application windows flicker when Aero is off.

## Changes in Version 347.52

The following are the important changes and the most common issues resolved since driver version 347.25.

- ▶ Driver version 347.52 adds security updates for the driver components `nvlddmkm.sys` and `nv4_mini.sys`.

## Changes in Version 347.09

The following sections list the important changes and the most common issues resolved since driver version 341.21.

### Windows Vista/Windows 7/Windows 8 Fixed Issues

- ▶ [Quadro K6000][ATP Infra]: The application is unable to create a base snapshot when it encounters low disk space.
- ▶ [Tesla K20/K40][Iray Viewer]: NVIDIA Control Panel->Workstation->Manage GPU Utilization page indicates that the CUDA application is not utilizing Tesla GPUs.

## Open Issues in Version 348.17

As with every released driver, version 348.17 of the Release 346 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.

### Windows Vista/Windows 7 64-bit Issues

- ▶ [GRID K2][Adobe Illustrator]: GPU acceleration not available in GRID GPU passthrough mode.
- ▶ [Kepler-class GPUs]: 10-bit support doesn't work if a 10-bit capable monitor is connected to DVI when the computer boots, and then later transferred to the DisplayPort connector.
- ▶ [Quadro 4000/K5000]: Rendering fails with `GL_INVALID_OPERATION` error in the draw call.
- ▶ [Quadro][Eyeon Fusion]: With Aero/desktop compositing and Quad-buffer stereo enabled, the application child windows flicker.

## Not NVIDIA Issues

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 for Windows Vista/Windows 7.

- ▶ “Windows Vista Considerations” on page 19
- ▶ “Windows 7 Considerations” on page 19
- ▶ “Unsupported Features” on page 20
- ▶ “OpenGL Application Issues” on page 22
- ▶ “OpenGL Application Issues” on page 22
- ▶ “Application Issues” on page 22
- ▶ “Other Issues” on page 23

## Windows Vista Considerations

These are behaviors that may be different from Windows XP and are related directly to the Windows Vista operating system.

- ▶ **Gamma ramps are inconsistent between single and two-headed systems.**
- ▶ **NVIDIA TurboCache**

Windows Vista now controls the allocation of system memory to the GPU for TurboCache functions. The Windows Vista Display Properties pages show the shared system memory (SSM), or how much memory is allocated for NVIDIA GPUs to use for TurboCache.

For more information on graphics memory reporting under Windows Vista, visit <http://www.microsoft.com/whdc/device/display/graphicsmemory.mspx>.

## Windows 7 Considerations

### Windows DWM Disabled for SLI Mosaic Mode

Due to compatibility issues, when using SLI Mosaic mode the driver turns off the Windows 7 Desktop Window Manager (DWM). As a result, DWM-managed desktop features such as Windows Aero or Windows Flip 3D will not be available.

### Hotplug Action

Unlike the hotplug activity under Windows Vista, 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. Under Windows 7, 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 changed slightly under Windows 7 to be consistent with the Microsoft panel

**Table 2.1** NVIDIA Control Panel Rotation Page Radio Buttons

Clockwise Rotation	Windows 7 Label	Windows Vista Label
0 degrees	Landscape	No rotation (Landscape)
90 degrees	Portrait	90 degrees to the right (Inverted Portrait)
180 degrees	Landscape (flipped)	180 degree rotation (Inverted landscape)
270 degrees	Portrait (flipped)	90 degrees to the left (Portrait)

### 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>.*

## Unsupported Features

The following are features and functionality that were available in driver releases supporting Windows XP, but are not—and will not be—available in driver releases for Windows Vista:

- ▶ **High resolution scaling desktop (HRSD)**
- ▶ **MultiView Display Mode** (for NVIDIA Quadro NVS graphics cards)
- ▶ **NVKeystone**
- ▶ **Unified back buffer (UBB) controls**
- ▶ **OpenGL Video Overlays**  
This is an operating system limitation.
- ▶ **Overclocking**  
GPU overclocking is no longer supported in the default GPU driver control panel. This feature is available in the NVIDIA System Tools software, which you can download from [NVIDIA.com](http://NVIDIA.com).
- ▶ **GPU Temperature Monitoring**  
Temperature monitoring is no longer supported in the default GPU driver control panel. This feature is available in the NVIDIA System Tools software, which you can download from [NVIDIA.com](http://NVIDIA.com).
- ▶ **AGP Settings Adjustment**

- ▶ **Video Zoom**
- ▶ **Pan & Scan** - the process of panning across the desktop in order to display a desktop on a monitor with lower resolution
- ▶ **Per-display Desktop Color Setting Adjustments**

For Clone mode, the desktop color setting adjustments through the NVIDIA Control Panel can only be made across all displays in a system, and not on a per-display basis.
- ▶ **Per-display Video Color Setting Adjustments**

For Dualview mode, the video color setting adjustments through the NVIDIA Control Panel can only be made across all displays in a system, and not on a per-display basis.
- ▶ **Edge Blending**
- ▶ **Run display optimization wizard**
- ▶ **Run multiple display wizard**
- ▶ **Run television setup wizard**
- ▶ **nView Horizontal and Vertical Span Modes**

Due to architectural changes in the new Windows Vista Window Display Driver Model (WDDM), span mode is available only with NVIDIA Mosaic Technology.
- ▶ **Display/Connection Wizard** (such as was provided with Windows Media Center Edition)
- ▶ **DVD/MPEG Extensions** (such as was provided with Windows Media Center Edition)
- ▶ **Audio Extensions** (such as was provided with Windows Media Center Edition)

## OpenGL Application Issues

The following are known compatibility issues for OpenGL applications developed under Windows XP:

- ▶ Mixed GDI and OpenGL rendering does not work.
  - A number of applications use GDI to render UI components and object highlighting. This is not supported in the Windows Vista driver model.
  - NVIDIA recommends converting GDI rendering to OpenGL.
  - The following are some applications that are known to have this issue:
    - Maya 7.01
- ▶ Applications, Tools, and Benchmarks not Supported Under Windows Vista
  - GLperf
  - 3ds max 8 (later releases may be supported)
  - CATIA V5R15 (V5R16 is supported)
  - PTC's CDRS 2001
- ▶ Front buffered rendering may be slow, especially when DWM is enabled.
  - Flushing the rendering queue while rendering to the front buffer may cause the window manager to recomposite. Applications should therefore minimize the frequency with which they flush the rendering queue.

## Application Issues

- ▶ [Quadro K2200][Bunkspeed Shot 2014]: Render Argument exception occurs in Accurate Mode, and Internal Rendering Error occurs with Fast Mode.
  - Quadro K2200/K60 are not supported by Bunkspeed software.*
- ▶ Softimage–The application crashes when thumbing the CgFX scene model while in wireframe display mode.
- ▶ Solidworks 2009–Application profile is not shown in the NVIDIA Control Panel when SolidWorks 2009 is installed.
  - This is an issue with the application shortcut.*
- ▶ ArchiCAD–the driver crashes when navigating 3D shadows.
- ▶ ArchiCAD12–OpenGL speed is half as fast on Windows Vista than on Windows XP.
- ▶ CATIA V5R20–not all drawing elements appear if the drawing is created using Approximate mode.

## Other Issues

- ▶ Quadro 6000: OpenCL/OpenGL interoperability performance suffers with `clEnqueueReleaseGLObjects`.

*To avoid this issues, use CUDA.*

- ▶ The Windows Vista display mode switches from Aeroglass to Basic when a quad-buffer for stereo is created.

*Quad-buffered windowed stereo is only supported with Aeroglass turned off.*

- ▶ The NVIDIA Control Panel->Set Up Multiple Displays page does not provide the capability of setting the dual monitor order under Windows Vista as it does under Windows XP.

*This capability is provided through the Windows Vista Display Properties Settings page.*

# 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:

- ▶ “System Should not Enter Sleep/Hibernate Mode With SDI Capture in Progress” on page 24
- ▶ “Once Installed, the SDI Capture Driver Release Must Always Match the Graphics Driver” on page 25
- ▶ “Some APIs do not Report Total Available Graphics Memory Correctly” on page 25
- ▶ “Using HDMI/DisplayPort Audio with Displays that have a High Native Resolution” on page 27
- ▶ “Using HDMI/DisplayPort Displays that do not Support Audio” on page 27
- ▶ “Using HDMI/DisplayPort Audio in Dualview or Clone Mode Configurations” on page 28
- ▶ “GPU Runs at a High Performance Level (full clock speeds) in Multi-display Modes” on page 28
- ▶ “Aero Must be Enabled for Windowed SLI AFR Mode Under Vista” on page 28
- ▶ “SLI Connector Requirement on NVIDIA Quadro SLI Cards” on page 29
- ▶ “Applying Workstation Application Profiles” on page 29
- ▶ “1280x1024 @ 60 Hz not Available on BenQ FP241W Monitors” on page 29
- ▶ “Gigabyte GA-6BX Motherboard” on page 29

## System Should not Enter Sleep/Hibernate Mode With SDI Capture in Progress

SDI capture programs will become non-responsive upon resume from sleep or hibernate modes.

This is not a typical use case, so power management tests should not be performed when testing SDI.

## Once Installed, the SDI Capture Driver Release Must Always Match the Graphics Driver

To use the Quadro SDI Capture card, you need to install the NVIDIA WDM driver for the Quadro SDI Capture card after installing the Quadro professional driver. The WDM driver version must be from the same branch as the installed NVIDIA graphics driver.

If at a later time you install a different Quadro professional driver version—for example, when upgrading from a Release 260 driver to a Release 265 driver—you must reinstall the WDM driver from the same driver branch as well—in this example, Release 265.

You must install the updated WDM driver even if you remove the SDI Capture card and uninstall the WDM driver. Portions of the old WDM driver remain on the system, and the resulting mismatch with the updated graphics driver results in a faulty driver installation. Installing a matching WDM driver corrects this issue.

## Some APIs do not Report Total Available Graphics Memory Correctly

### 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

NVIDIA has found that 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 reported memory can be severely reduced. For example, 6 GB might be reported as 454 MB, and 8 GB might be reported as 1259 MB.

## NVIDIA Action for Some GeForce-based Systems

For GeForce GPUs with 2.75 GB or less of video memory, the NVIDIA display driver constrains TAG memory to just below 4 GB<sup>1</sup>. In this scenario, the Shared System Memory component of TAG is limited first, before limiting Dedicated Video Memory.

This is a policy decision within the driver, and results in reliable reporting of sub-4 GB TAG memory.

## When TAG Reporting Would Not Be Limited

For GeForce-based GPUs with more than 2.75 GB of video memory, as well as all Quadro and Tesla GPUs, the NVIDIA display driver does not constrain TAG memory reporting.

The disadvantage of constraining TAG on systems with larger amounts of video and system memory is that memory which otherwise would be available for graphics use is no longer available. Since shared system memory is limited first, driver components and algorithms utilizing shared system memory may suffer performance degradation when TAG is constrained.

Since these and similar scenarios are prevalent in many Workstation applications, the NVIDIA driver avoids constraining TAG on all Quadro and Tesla-based systems. Likewise, the driver does not constrain TAG for GeForce-based systems with more than 2.75 GB of video memory.

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).

## Using HDMI/DisplayPort Audio with Displays that have a High Native Resolution

*To use HDMI/DisplayPort audio with some displays that have a native resolution higher than 1920x1080, you must set the display to a lower HD resolution.*

Some HDMI TV's have a native resolution that exceeds the maximum supported HD mode. For example, TVs with a native resolution of 1920x1200 exceed the maximum supported HD mode of 1920x1080.

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 Displays that do not Support Audio

*Some HDMI/DisplayPort displays do not support audio, or have issues with Quadro FX family and earlier NVIDIA graphics cards.*

The NVIDIA driver attempts to identify such displays and automatically disables the audio. For example, the NVIDIA driver disables HDMI audio for all Philips HDMI TVs, as these have been identified as having issues with Quadro FX family and earlier NVIDIA graphics cards.

There may be cases where either the driver disables audio even though there is no problem, or does not disable the audio when in fact the audio does not work. The following sections describe these situations and provides guidance for handling them.

### Corrupted video and no audio

The driver has not disabled audio and the display's audio signal is incompatible with the graphics card, causing video corruption.

With a different display connected in order to establish video, disable audio for the HDMI display using the NVIDIA Control Panel-> Change Resolution page. From the connector list, select **HDMI-HDTV (Audio Disabled)**.



## Video but no audio

- ▶ Check the connector list on the NVIDIA Control Panel->Change Resolution page.
- ▶ If **HDMI-HDTV (Audio Disabled)** is selected and you want to test whether your HDMI audio does, in fact, work, then select **HDMI-HDTV (Audio Enabled)** and the driver will prompt you with instructions for testing HDMI audio with the display.
- ▶ If **HDMI-HDTV (Audio Enabled)** is selected, then the driver has not successfully detected that an incompatible display is connected.  
*Future drive versions will properly identify such displays and disable audio.*
- ▶ If there is no HDMI connector option in the NVIDIA Control Panel->Change Resolution page, the display does not support audio and has properly reported this to the NVIDIA driver.

## Using HDMI/DisplayPort Audio in Dualview or Clone Mode Configurations

### 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.

## GPU Runs at a High Performance Level (full clock speeds) in Multi-display Modes

This is a hardware limitation and not a software bug. Even when no 3D programs are running, the driver will operate the GPU at a high performance level in order to efficiently drive multiple displays. In the case of SLI or multi-GPU PCs, the second GPU will always operate with full clock speeds; again, in order to efficiently drive multiple displays. Today, all hardware from all GPU vendors have this limitation.

## Aero Must be Enabled for Windowed SLI AFR Mode Under Vista

Windows 7 Aero must be enabled in order to achieve SLI acceleration using windowed AFR mode.

## SLI Connector Requirement on NVIDIA Quadro SLI Cards

The SLI connector that links two SLI cards is needed for proper SLI operation. However, the connector can be removed if you do not intend to enable SLI mode. If you remove the connector, then you must make sure that SLI mode is disabled from the NVIDIA control panel. Enabling SLI mode without the SLI connector installed will result in video corruption.

## Applying Workstation Application Profiles

### ► Background

The workstation application profiles are software settings used by the NVIDIA Display Drivers to provide optimum performance when using a selected application. The profile also works around known application issues and bugs.

If there is an available setting for an application, it should be used, otherwise incorrect behavior or reduced performance is likely to occur.

### ► Issues

Configuration changes require that you restart the application.

Once an application is running, it does not receive notification of configuration changes. Therefore, if you change the configuration while the application is running, you must exit and restart the application for the configuration changes to take effect.

## 1280x1024 @ 60 Hz not Available on BenQ FP241W Monitors

Even though the monitor EDID lists 1280x1024 @ 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 (1280x1024 @ 60 Hz) and makes it unavailable.

## Gigabyte GA-6BX Motherboard

This motherboard uses a LinFINITY regulator on the 3.3-V rail that is rated to only 5 A—less than the AGP specification, which requires 6 A. When diagnostics or applications are running, the temperature of the regulator rises, causing the voltage to the NVIDIA chip to drop as low as 2.2 V. Under these circumstances, the regulator cannot supply the current on the 3.3-V rail that the NVIDIA chip requires.

This problem does not occur when the graphics board has a switching regulator or when an external power supply is connected to the 3.3-V rail.

## 03 THE RELEASE 346 DRIVER

This chapter covers the following main topics:

- ▶ “Hardware and Software Support” on page 30
- ▶ “Driver Installation” on page 39

### Hardware and Software Support

#### Supported Operating Systems

The Release 346 driver, version 348.17, has been tested with

- ▶ Microsoft Windows® 8.1, and supports both 32-bit and 64-bit versions.
- ▶ Microsoft Windows® 8, and supports both 32-bit and 64-bit versions.
- ▶ Microsoft Windows® 7, and supports both 32-bit and 64-bit versions.

## Supported NVIDIA Products

The following tables list the NVIDIA products supported by the Release 346 driver, version 348.17.

- ▶ Table 3.1, “Supported NVIDIA Quadro & NVS Products” on page 31
- ▶ Table 3.2, “Supported NVIDIA Quadro Sync Products” on page 33
- ▶ Table 3.3, “Supported NVIDIA Quadro G-Sync II Products” on page 33
- ▶ Table 3.4, “Supported NVIDIA Quadro SDI Products” on page 33
- ▶ Table 3.5, “Supported NVIDIA Quadro Plex Products” on page 34
- ▶ Table 3.6, “Supported NVIDIA Quadro Blade/Embedded Graphics Board Series” on page 34
- ▶ Table 3.7, “Supported NVIDIA Tesla Products” on page 35
- ▶ Table 3.8, “Supported NVIDIA GRID Products” on page 35

### NVIDIA Quadro & NVS Product

Table 3.1 Supported NVIDIA Quadro & NVS Products

Product	Notes
NVIDIA Quadro M6000	
NVIDIA Quadro K6000	
NVIDIA Quadro K5200	
NVIDIA Quadro K5000	
NVIDIA Quadro K4200	
NVIDIA Quadro K4000	
NVIDIA Quadro K2200	
NVIDIA Quadro K2000	
NVIDIA Quadro K1200	
NVIDIA Quadro K620	
NVIDIA Quadro K600	
NVIDIA Quadro K420	
NVIDIA Quadro 6000	
NVIDIA Quadro 5000	
NVIDIA Quadro 4000	
NVIDIA Quadro 2000D	
NVIDIA Quadro 2000	
NVIDIA Quadro 600	
NVIDIA Quadro 410	
NVIDIA Quadro 400	Not supported

Table 3.1 Supported NVIDIA Quadro &amp; NVS Products (continued)

Product	Notes
NVIDIA Quadro FX 5800	Not supported
NVIDIA Quadro FX 5600	Not supported
NVIDIA Quadro FX 4800	Not supported
NVIDIA Quadro FX 4700 X2	Not supported
NVIDIA Quadro FX 4600	Not supported
NVIDIA Quadro FX 3800	Not supported
NVIDIA Quadro FX 3700	Not supported
NVIDIA Quadro FX 3450	Not supported
NVIDIA Quadro FX 1800	Not supported
NVIDIA Quadro FX 580	Not supported
NVIDIA Quadro FX 570	Not supported
NVIDIA Quadro FX 380	Not supported
NVIDIA Quadro FX 380 LP (low profile)	Not supported
NVIDIA Quadro FX 370	Not supported
NVIDIA Quadro FX 370 LP (low profile)	Not supported
NVIDIA Quadro CX	Not supported
NVIDIA NVS 510	
NVIDIA NVS 315	
NVIDIA NVS 310	
NVIDIA NVS 300	Not supported
NVIDIA Quadro NVS 450	Not supported
NVIDIA Quadro NVS 420	Not supported
NVIDIA Quadro NVS 295	Not supported
NVIDIA Quadro NVS 290	Not supported

## NVIDIA Quadro Sync Products

Table 3.2 Supported NVIDIA Quadro Sync Products

Product	Notes
NVIDIA Quadro K6000	
NVIDIA Quadro K5200	
NVIDIA Quadro K5000	
NVIDIA Quadro K4200	

## NVIDIA Quadro G-Sync II Products

Table 3.3 Supported NVIDIA Quadro G-Sync II Products

Product	Notes
NVIDIA Quadro 6000	
NVIDIA Quadro 5000	
NVIDIA Quadro FX 5800	Not supported
NVIDIA Quadro FX 4800	Not supported
NVIDIA Quadro FX 5600	Not supported
NVIDIA Quadro FX 4600	Not supported

## NVIDIA Quadro SDI Products

Table 3.4 Supported NVIDIA Quadro SDI Products

Product	Notes
NVIDIA Quadro K6000	
NVIDIA Quadro K5200	
NVIDIA Quadro K5000	
NVIDIA Quadro K4200	
NVIDIA Quadro K4000	
NVIDIA Quadro 6000	
NVIDIA Quadro 5000	
NVIDIA Quadro 4000	
NVIDIA Quadro FX 5800 SDI	Not supported
NVIDIA Quadro CX SDI	Not supported
NVIDIA Quadro FX 5600 SDI	Not supported
NVIDIA Quadro FX 4800 SDI	Not supported
NVIDIA Quadro FX 4600 SDI	Not supported

Table 3.4 Supported NVIDIA Quadro SDI Products (continued)

Product	Notes
NVIDIA Quadro FX 3800 SDI	Not supported



Note: Quadro SDI products are not supported under Windows 8.

## NVIDIA Quadro Plex Products

Table 3.5 Supported NVIDIA Quadro Plex Products

Product	Notes
NVIDIA Quadro Plex 7000	
NVIDIA Quadro Plex D Series	Not supported
NVIDIA Quadro Plex S Series	Not supported
NVIDIA Quadro Plex Model IV	Not supported

## NVIDIA Quadro Blade/Embedded Graphics Board

Table 3.6 Supported NVIDIA Quadro Blade/Embedded Graphics Board Series

Product	Notes
NVIDIA Quadro K3100M	
NVIDIA Quadro 4000M	
NVIDIA Quadro 3000M	
NVIDIA Quadro 1000M	
NVIDIA Quadro 500M	
NVIDIA Quadro FX 3600M	Not supported
NVIDIA Quadro FX 2800M	Not supported
NVIDIA Quadro FX 880M	Not supported
NVIDIA Quadro FX 770M	Not supported
NVIDIA Quadro FX 370M	Not supported

## NVIDIA Tesla Products

The Tesla driver package is designed for systems that have one or more Tesla products installed.

- Only one GHIC can be connected to the server in a Tesla system.

- This release of the Tesla driver supports CUDA C/C++ applications and libraries that rely on the CUDA C Runtime and/or CUDA Driver API.

Table 3.7 Supported NVIDIA Tesla Products

Product	Notes
<b>Tesla K-Series Products</b>	
NVIDIA Tesla K80	64-bit OS only
NVIDIA Tesla K40(m/c/s/st/t)	64-bit OS only
NVIDIA Tesla K20(x/c/m/Xm/s)	64-bit OS only
NVIDIA Tesla K10	
<b>Tesla S-Class Products</b>	
NVIDIA Tesla S2050	
NVIDIA Tesla S1070	
<b>Tesla M-Class Products</b>	
NVIDIA Tesla M2090	
NVIDIA Tesla M2075	
NVIDIA Tesla M2070	
NVIDIA Tesla M2070Q	
NVIDIA Tesla M2050	
<b>NVIDIA Tesla M1060</b>	<b>Not supported</b>
<b>Tesla C-Class Products</b>	
NVIDIA Tesla C2075	
NVIDIA Tesla C2070	
NVIDIA Tesla C2050	
<b>NVIDIA Tesla C1060</b>	<b>Not supported</b>
<b>NVIDIA Tesla C870</b>	<b>Not supported</b>

## NVIDIA GRID Products

Table 3.8 Supported NVIDIA GRID Products

Product	Notes
NVIDIA GRID K2	Windows 7 Windows 8
NVIDIA GRID K1	Windows 7 Windows 8



## Supported NVIDIA Notebook Products

The notebook driver is part of the NVIDIA Verde Notebook Driver Program, and 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.

The following tables list the NVIDIA notebook products supported by the Release 346 driver, version 348.17:



### Note:

Hybrid Power technology is not supported by this release.

The following Sony VAIO notebooks are supported: Sony VAIO F Series with NVIDIA GeForce 310M, GeForce 315M (All-in-One system), GeForce GT 330M, GeForce GT 425M, GeForce GT 520M, or GeForce GT 540M (All-in-One system). Other Sony VAIO notebooks are not supported at this time (please contact Sony for driver support).

Fujitsu notebooks are not supported by this release (Fujitsu Siemens notebooks are supported).

Table 3.9 NVIDIA NVS and Quadro NVS Notebook GPU Support

Quadro Notebook Products	Notes
NVS 5400M	
NVS 5200M	
NVS 5100M	Not supported
NVS 4200M	
NVS 3100M	Not supported
NVS 2100M	Not supported
Quadro NVS 320M	Not supported
Quadro NVS 160M	Not supported
Quadro NVS 150M	Not supported
Quadro NVS 140M	Not supported
Quadro NVS 135M	Not supported
Quadro NVS 130M	Not supported

Table 3.10 Supported NVIDIA Quadro M and Quadro FX M GPUs

Consumer Products	Notes
Quadro K5000M	
Quadro K5100M	
Quadro K4000M	
Quadro K4100M	
Quadro K3000M	
Quadro K3100M	
Quadro K2000M	
Quadro K2100M	
Quadro K1000M	
Quadro K1100M	
Quadro K610M	
Quadro K510M	
Quadro K500M	
Quadro 5010M	
Quadro 5000M	
Quadro 4000M	
Quadro 3000M	
Quadro 2000M	
Quadro 1000M	
Quadro FX 3800M	Not supported
Quadro FX 3700M	Not supported
Quadro FX 3600M	Not supported
Quadro FX 2800M	Not supported
Quadro FX 2700M	Not supported
Quadro FX 1800M	Not supported
Quadro FX 1700M	Not supported
Quadro FX 1600M	Not supported
Quadro FX 880M	Not supported
Quadro FX 770M	Not supported
Quadro FX 570M	Not supported
Quadro FX 380M	Not supported
Quadro FX 370M	Not supported
Quadro FX 360M	Not supported

## Supported Languages

The Release 346 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 for 32-bit is minimum 220 MB for English-only, and 300 MB for International.

The hard disk space requirement for 64-bit is minimum 320 MB for English-only, and 400 MB for International.

The hard disk space requirement for 32-bit is minimum 295 MB.

The hard disk space requirement for 64-bit is minimum 395 MB.

## 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 36).
- ▶ It is recommended that you back up your current system configuration.
- ▶ If you own a Dell Inspiron 1420, Dell XPS M1330, or Dell XPS M1530, or Dell LatitudeD630 or D630c, it is highly recommended that you first install this [Dell software update](#).

### SLI Mosaic Mode

You must make sure SLI Mosaic mode is disabled before installing a new driver over a previously installed driver. If SLI Mosaic mode is active on your displays when you install the new driver, the driver will not install properly.

## Installation Instructions

**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** Click the driver download link.

The license agreement dialog box appears.

- 3 Click **Accept** if you accept the terms of the agreement, then either open the file or save the file to your PC and open it later.
- 4 Open the NVIDIA driver installation .EXE file to launch the NVIDIA InstallShield Wizard.
- 5 Follow the instructions in the NVIDIA InstallShield Wizard to complete the installation.



**Note:** If you are overinstalling the driver (installing over a previous driver without first removing the previous driver), then you must reboot your computer in order to complete the installation.

# APPENDIX A MODE SUPPORT FOR WINDOWS

This chapter details the Windows modes supported by the Release 346 driver for NVIDIA products. It contains these sections:

- ▶ “General Mode Support Information” on page 42
- ▶ “Default Modes Supported by GPU” on page 43
- ▶ “Modes Supported by TV Encoders” on page 48

## General Mode Support Information

The NVIDIA graphics driver includes a standard list of display modes that are supported by default. These modes are listed in the section “[Default Modes Supported by GPU](#)” on page 43.

The actual modes available depend on the capabilities of the display. In addition, the NVIDIA graphics driver has a “dynamic EDID detection” capability and will make available *additional* modes that are listed in the display EDID, provided the graphics hardware can support it.

The NVIDIA graphics driver also supports the high resolutions available with the displays listed in [Table A.1](#) as well as the non-standard modes listed in [Table A.2](#).

Table A.1 Modes Supported for High Resolution Displays

Display	Maximum Resolution
Apple 30" Cinema HD Display (Dual link DVI)	2560x1600 @ 60 Hz
Dell WFP 3007 (Dual Link DVI)	2560x1600 @ 60 Hz
HP LP3065 dual-link DVI flat panel	2560x1600 @ 60Hz.

Table A.2 Non-standard Modes Supported

Resolution		
1680 x 1050		
1366 x 768		

## Default Modes Supported by GPU

This section lists the modes that are included by default in the driver INF for the following product families:

- ▶ “Tesla, Quadro, & NVS GPUs” on page 44
- ▶ “Quadro Notebook GPUs” on page 46

## Understanding the Mode Format

Figure A.1 gives an example of how to read the mode information presented in this section.

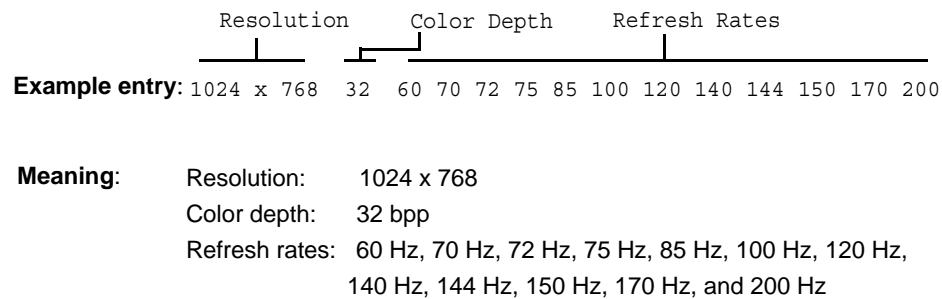


Figure A.1 Mode Format

### Note:

- Horizontal spanning modes of 3840x1080 and above, and vertical spanning modes of 1920x2160 and above generally require at least 32 MB of video memory at 32 bpp.
- An “i” next to the refresh rate indicates an interlaced refresh rate.



## Tesla, Quadro, & NVS GPUs

This sections lists the supported display resolutions, color depths, and refresh rates for the products listed in [“Supported NVIDIA Products”](#) on page 31.

### Standard Modes

640 x 480	8	60 70 72 75 85 100 120 140 144 150 170 200 240
720 x 480	8	60
720 x 576	8	50
800 x 600	8	60 70 72 75 85 100 120 140 144 150 170 200 240
1024 x 768	8	60 70 72 75 85 100 120 140 144 150 170 200 240
1152 x 864	8	60 70 72 75 85 100 120 140 144 150 170 200
1280 x 720	8	60
1280 x 768	8	60 70 72 75 85 100 120 140 144 150 170
1280 x 800	8	60 70 72 75 85 100 120 140 144 150 170
1280 x 960	8	60 70 72 75 85 100 120 140 144 150 170
1280 x 1024	8	60 70 72 75 85 100 120 140 144 150 170
1360 x 768	8	60 70 72 75 85 100 120 140 144 150 170
1600 x 900	8	60 70 72 75 85 100 120 140 144 150
1600 x 1024	8	60 70 72 75 85 100 120
1600 x 1200	8	60 70 72 75 85 100 120
1680 x 1050	8	60
1920 x 1080	8	60
1920 x 1200	8	60 70 72 75 85 100
1920 x 1440	8	60 70 72 75 85
2048 x 1536	8	60
-----		
640 x 480	16	60 70 72 75 85 100 120 140 144 150 170 200 240
720 x 480	16	60
720 x 576	16	50
800 x 600	16	60 70 72 75 85 100 120 140 144 150 170 200 240
1024 x 768	16	60 70 72 75 85 100 120 140 144 150 170 200 240
1152 x 864	16	60 70 72 75 85 100 120 140 144 150 170 200
1280 x 720	16	60
1280 x 768	16	60 70 72 75 85 100 120 140 144 150 170
1280 x 800	16	60 70 72 75 85 100 120 140 144 150 170
1280 x 960	16	60 70 72 75 85 100 120 140 144 150 170
1280 x 1024	16	60 70 72 75 85 100 120 140 144 150 170
1360 x 768	16	60 70 72 75 85 100 120 140 144 150 170
1600 x 900	16	60 70 72 75 85 100 120 140 144 150
1600 x 1024	16	60 70 72 75 85 100 120
1600 x 1200	16	60 70 72 75 85 100 120
1680 x 1050	16	60
1920 x 1080	16	60
1920 x 1200	16	60 70 72 75 85 100

1920 x 1440	16	60 70 72 75 85
2048 x 1536	16	60
-----		
640 x 480	32	60 70 72 75 85 100 120 140 144 150 170 200 240
720 x 480	32	60
720 x 576	32	50
800 x 600	32	60 70 72 75 85 100 120 140 144 150 170 200 240
1024 x 768	32	60 70 72 75 85 100 120 140 144 150 170 200 240
1152 x 864	32	60 70 72 75 85 100 120 140 144 150 170 200
1280 x 720	32	60
1280 x 768	32	60 70 72 75 85 100 120 140 144 150 170
1280 x 800	32	60 70 72 75 85 100 120 140 144 150 170
1280 x 960	32	60 70 72 75 85 100 120 140 144 150 170
1280 x 1024	32	60 70 72 75 85 100 120 140 144 150 170
1360 x 768	32	60 70 72 75 85 100 120 140 144 150 170
1600 x 900	32	60 70 72 75 85 100 120 140 144 150
1600 x 1024	32	60 70 72 75 85 100 120
1600 x 1200	32	60 70 72 75 85 100 120
1680 x 1050	32	60
1920 x 1080	32	60
1920 x 1200	32	60 70 72 75 85 100
1920 x 1440	32	60 70 72 75 85
2048 x 1536	32	60
-----		

## Quadro Notebook GPUs

This sections lists the supported display resolutions, color depths, and refresh rates for the products listed in [“Supported NVIDIA Notebook Products”](#) on page 36.

### Standard Modes

640 x 480	8	60 70 72 75 85 100 120 140 144 150 170 200 240
720 x 480	8	60
720 x 576	8	50
800 x 600	8	60 70 72 75 85 100 120 140 144 150 170 200 240
1024 x 768	8	60 70 72 75 85 100 120 140 144 150 170 200 240
1152 x 864	8	60 70 72 75 85 100 120 140 144 150 170 200
1280 x 720	8	60
1280 x 768	8	60 70 72 75 85 100 120 140 144 150 170
1280 x 800	8	60 70 72 75 85 100 120 140 144 150 170
1280 x 960	8	60 70 72 75 85 100 120 140 144 150 170
1280 x 1024	8	60 70 72 75 85 100 120 140 144 150 170
1360 x 768	8	60 70 72 75 85 100 120 140 144 150 170
1600 x 900	8	60 70 72 75 85 100 120 140 144 150
1600 x 1024	8	60 70 72 75 85 100 120
1600 x 1200	8	60 70 72 75 85 100 120
1680 x 1050	8	60
1920 x 1080	8	60
1920 x 1200	8	60 70 72 75 85 100
1920 x 1440	8	60 70 72 75 85
2048 x 1536	8	60
-----		
640 x 480	16	60 70 72 75 85 100 120 140 144 150 170 200 240
720 x 480	16	60
720 x 576	16	50
800 x 600	16	60 70 72 75 85 100 120 140 144 150 170 200 240
1024 x 768	16	60 70 72 75 85 100 120 140 144 150 170 200 240
1152 x 864	16	60 70 72 75 85 100 120 140 144 150 170 200
1280 x 720	16	60
1280 x 768	16	60 70 72 75 85 100 120 140 144 150 170
1280 x 800	16	60 70 72 75 85 100 120 140 144 150 170
1280 x 960	16	60 70 72 75 85 100 120 140 144 150 170
1280 x 1024	16	60 70 72 75 85 100 120 140 144 150 170
1360 x 768	16	60 70 72 75 85 100 120 140 144 150 170
1600 x 900	16	60 70 72 75 85 100 120 140 144 150
1600 x 1024	16	60 70 72 75 85 100 120
1600 x 1200	16	60 70 72 75 85 100 120
1680 x 1050	16	60
1920 x 1080	16	60
1920 x 1200	16	60 70 72 75 85 100

1920 x 1440	16	60 70 72 75 85
2048 x 1536	16	60
-----		
640 x 480	32	60 70 72 75 85 100 120 140 144 150 170 200 240
720 x 480	32	60
720 x 576	32	50
800 x 600	32	60 70 72 75 85 100 120 140 144 150 170 200 240
1024 x 768	32	60 70 72 75 85 100 120 140 144 150 170 200 240
1152 x 864	32	60 70 72 75 85 100 120 140 144 150 170 200
1280 x 720	32	60
1280 x 768	32	60 70 72 75 85 100 120 140 144 150 170
1280 x 800	32	60 70 72 75 85 100 120 140 144 150 170
1280 x 960	32	60 70 72 75 85 100 120 140 144 150 170
1280 x 1024	32	60 70 72 75 85 100 120 140 144 150 170
1360 x 768	32	60 70 72 75 85 100 120 140 144 150 170
1600 x 900	32	60 70 72 75 85 100 120 140 144 150
1600 x 1024	32	60 70 72 75 85 100 120
1600 x 1200	32	60 70 72 75 85 100 120
1680 x 1050	32	60
1920 x 1080	32	60
1920 x 1200	32	60 70 72 75 85 100
1920 x 1440	32	60 70 72 75 85
2048 x 1536	32	60
-----		

## Modes Supported by TV Encoders

Table A.3 and Table A.4 list the NTSC, PAL, and HDTV TV-Out modes supported by the NVIDIA driver.

Table A.3 Mode Support for S-Video and Composite Out

Resolution	Bit depth	Comments
320x200	8, 16, 32	DirectDraw mode; not selectable as a Windows desktop
320x240	8, 16, 32	DirectDraw mode; not selectable as a Windows desktop
640x400	8, 16, 32	DirectDraw mode; not selectable as a Windows desktop
640x480	8, 16, 32	
720x480	8, 16, 32	Overscans (for video)
720x576	8, 16, 32	Overscans (for video)
800x600	8, 16, 32	
1024x768	8, 16, 32	Conexant 25871 only

Table A.4 Mode Support for Component YPrPb Out and DVI Out

Resolution	Comments
480i (SDTV)	Supported on graphics boards with Conexant 875 or Philips 7108 TV encoders and compatible connectors, and compatible GeForce 8 Series and later GPUs.
480p (EDTV)	
720p (HDTV)	
1080i (HDTV)	
576i (PAL)	
576p (PAL)	

The driver supports manual overscan correction for component and DVI outputs. See the online NVIDIA Control Panel Help for instructions on how to use the overscan correction features.

# APPENDIX B NVIDIA TESLA COMPUTE CLUSTER MODE

This chapter describes the Tesla Compute Cluster (TCC) mode.

- ▶ “About Tesla Compute Cluster Mode” on page 49
- ▶ “Operating on Systems with non-TCC NVIDIA GPUs” on page 51
- ▶ “Setting TCC Mode for Tesla Products” on page 51

## About Tesla Compute Cluster Mode

### TCC Overview

Tesla Compute Cluster (TCC) mode is designed for compute cluster nodes that have one or more Tesla products installed.

### Benefits

- ▶ TCC drivers make it possible to use NVIDIA GPUs in nodes with non-NVIDIA integrated graphics.
- ▶ NVIDIA GPUs on systems running the TCC drivers will be available via Remote Desktop, both directly and via cluster management systems that rely on Remote Desktop.
- ▶ NVIDIA GPUs will be available to applications running as a Windows service (i.e. in Session 0) on systems running the Tesla driver in TCC mode.

## TCC Does not Support Graphics Acceleration

- ▶ TCC mode does not provide CUDA–DirectX/OpenGL interoperability. It is a “non-display” driver, and NVIDIA GPUs using this driver will not support DirectX or OpenGL hardware acceleration.

## Running CUDA Applications

- ▶ This release of the Tesla driver supports CUDA C/C++ applications and libraries that rely on the CUDA C Runtime and/or CUDA Driver API.
- ▶ NVIDIA GPUs running the Tesla driver in TCC mode will be available for CUDA applications running via services or Remote Desktop.
- ▶ In this release, all GPUs will be in compute exclusive mode. As a result, only one CUDA context may exist on a particular device at a time.
- ▶ SDK applications that use graphics will not run properly under TCC mode. The following are examples of CUDA SDK applications that are not supported:

bicubicTexture	boxFilter	cudaDecodeD3D9	smokeParticles
cudaDecodeGL	fluidsD3D9	fluidsGL	SobelFilter
imageDenoising	Mandelbrot	marchingCubes	volumeRender
nbody	oceanFFT	particles	
postProcessGL	recursiveGaussian	simpleD3D10	
simpleD3D10Texture	simpleD3D11Texture	simpleD3D9	
simpleD3D9Texture	simpleGL	simpleTexture3D	

## Operating on Systems with non-TCC NVIDIA GPUs

- ▶ NVIDIA GPUs running under TCC mode may coexist with other display devices.
- ▶ The Tesla driver is overinstalled over any NVIDIA display driver in the system—the NVIDIA Tesla driver then becomes the only driver for all NVIDIA GPUs in the system.

If the Tesla driver is uninstalled at a later time, the previous driver is not restored.

- ▶ NVIDIA GPUs that do not support TCC mode will appear as “VGA adapters” in the Windows Device Manager and can be used to drive displays.

Non-supported NVIDIA GPUs can still function as CUDA devices, but the GPU’s graphics functionality is not available to applications.

## Setting TCC Mode for Tesla Products

The following table shows the default TCC/non-TCC mode for supported Tesla products.

Table B.1 Default TCC Mode for Tesla Products

Tesla Product	Default Mode	Notes
K20Xm	TCC	Windows 7 64-bit, Windows 8 64-bit Windows Server 2012 64-bit
K20c	TCC	Windows 7 64-bit, Windows 8 64-bit Windows Server 2012 64-bit
K20m	non-TCC	Windows 7 64-bit, Windows 8 64-bit Windows Server 2012 64-bit
C1060	TCC	Windows Server 2012 64-bit
C2075	TCC	Windows 7, Windows Server 2008 & Windows Server 2008 R2 Windows Server 2012 64-bit
	non-TCC	Windows Vista
C2050	TCC	Windows Server 2008 & Windows Server 2008 R2 Windows Server 2012 64-bit
	non-TCC	Windows Vista, Windows 7
C2070	TCC	Windows Server 2008 & Windows Server 2008 R2 Windows Server 2012 64-bit
	non-TCC	Windows Vista, Windows 7
S2050	TCC	
S1070	TCC	
M1060	TCC	
M2050	TCC	
M2070	TCC	
M2075	TCC	



Table B.1 Default TCC Mode for Tesla Products

Tesla Product	Default Mode	Notes
M2070-Q	non-TCC	
M2090	TCC	

To change the TCC mode, use the NVIDIA `smi` utility as follows:

```
nvidia-smi -g (GPU ID) -dm (0 for WDDM, 1 for TCC)
```



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