ForceWare Graphics Driver
User's Guide

Driver Release 80 for Windows
NVIDIA Corporation
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1

INTRODUCTION

This chapter discusses the following major topics:

- "About this Guide" on page 11
- "Online Help" on page 12
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- "Release 80 Enhancements" on page 13

About this Guide

This *user's guide* is addressed to users of the control panel-based NVIDIA®
ForceWare™ graphics display driver.

This guide focuses on NVIDIA desktop consumer products, i.e, graphics cards based
on the NVIDIA **GeForce**™ series of GPUs (graphics processing units) listed in Table
2.1, "Supported NVIDIA Consumer Products".

For technical details on the features and benefits of the NVIDIA ForceWare graphics
driver, refer to the NVIDIA Web page — **www.nvidia.com**.

Other Related Documentation

- *NVIDIA ForceWare Graphics Driver: Quadro Workstation User's Guide —*
  Release 80 driver version. Refer to this document if you are primarily using the
  NVIDIA workstation products, i.e, graphics cards based on the NVIDIA Quadro®
  series of GPUs.

- *NVIDIA ForceWare Graphics Drivers nView Desktop Manager User's Guide —*
  Release 80 driver version. Refer to this document if you are using the nView™
  Desktop Manager application component of the ForceWare graphics driver.

- *NVIDIA ForceWare Graphics Driver: Release Notes —* **Release 80 driver version**.
  These Release Note documents describe performance improvements and software
  fixes in the ForceWare graphics drivers. Release notes also enable add-in-card
  (AIC) producers and original equipment manufacturers (OEMs) to monitor
  performance improvements and bug fixes in the driver.

- *Application Note — Using NVIDIA SLI Graphics Cards — Version 2.0 or later*

  Note: NVIDIA SLI multi-GPU features are intended for *advanced users* and
  available with NVIDIA SLI graphics cards.

Online Help

Context Help

You can obtain context Help for any of the settings on the NVIDIA display control
panel pages.

Also, when a setting is disabled (grayed out), placing the cursor on the setting
provides "too tip" help indicating the reason it is disabled.

For complete details on Help and tool tips, see "Using the NVIDIA Display Menu
Help and Tool Tips" on page 38.

NVIDIA Display Properties and nView Desktop Manager

The NVIDIA ForceWare graphics display driver includes two major control panel-based components — NVIDIA display properties *and* nView Desktop Manager.

In general terms, "**nView™**" represents a collection of multi-display technologies encompassing driver support, multi-display GPU architecture, and desktop management support.

- **NVIDIA display properties**, the topic of this *user's guide*, refers to the control panel-based user interface from which you can configure the advanced display properties of the current release of the NVIDIA ForceWare graphics driver.

  For details on using the NVIDIA display control panel menu, see "Accessing the NVIDIA Display Control Panel Pages" on page 29.

- **nView Desktop Manager** is a user-level application utility that focuses on making you more productive when working on your Windows® desktop. nView Desktop Manager was originally created for multi-display graphics cards but has grown to enhance single-display user desktops as well. Desktop Manager supports both single-display and multi-display configurations running with single-display, multi-display, or multiple graphics cards based on NVIDIA GPUs.

  For details on using nView Desktop Manager features, refer to the *NVIDIA ForceWare Graphics Drivers*: *nView Desktop Manager User's Guide*.

Release 80 Enhancements

This document provides a summary of the new features and enhancements provided with the NVIDIA ForceWare Release 80 graphics drivers for Windows. The changes are described in the following sections:

- "New Feature Highlights" on page 14
- "Additional Details by Driver Module" on page 14

New Feature Highlights

NVIDIA SLI™ Enhancements

- **Dynamic Enable/Disable Capability —** System reboot is no longer required after enabling or disabling SLI from the control panel.
- **Cross-card compatibility —** SLI no longer requires that graphics cards be identical, but they must still have the same core GPU.
- **SLI performance without an SLI (bridge) connector** *on selected graphics cards for the mainstream market*
- **Improved SLI performance** and a streamlined list of application profiles for OpenGL
- **TV/HDTV support** under SLI
- Ability to select the display to use for the output

NVIDIA PureVideo™ Enhancements

- Improved inverse 3:2 and 2:2 pulldown
- Improved adaptive deinterlacing

Support for the Next Generation of NVIDIA GPUs

The Release 80 driver supports the next generation GPUs as well as the new integrated GPU.

Additional Details by Driver Module

Display Driver

- Support for the next generation of GPUs
- Improved 2D performance
- Coordinates with the NVPanel to support dynamic SLI enabling/disabling

DirectX

New Features

- Support for the next generation of GPUs
- Support for dual-core CPUs

Improvements

Release 80 offers improved DirectX stability and performance for:

- NVIDIA TurboCache™
- 512 MB Cards
- Multi-display support under Windows MCE
- Windows XP x64
- CPU overhead reduction

OpenGL

New Extensions

- NV_packed_depth_stencil
- ARB_pixel_buffer_object
- GL_NV_timer_query

Performance Improvements

- Improved performance under Dualview
- Improved memory management for multiple open applications on Quadro workstation cards
- Improved performance with multiple overlapping windows
- Improved SLI performance
- Support for dual core CPUs
- Support for the next generation of GPUs

Video

Release 80 includes the following new PureVideo features and improvements:

- Improved inverse 3:2 implementation
- Improved inverse 2:2 implementation
- Adaptive deinterlacing for HD content on GeForce 6600 and later series of GPUs
- PureVideo support for the next generation of GPUs

NVIDIA Control Panel

Enhancements to the "Classic" NVIDIA Control Panel

- HDTV Overscan compensation support — Includes X-Y adjustment, and independent front-end timing adjustment features
- Dynamic SLI enable/disable capability

nView Desktop Manager

Release 80 offers the following new nView Desktop Manager features and updates:

- TV/Display Wizard Enhancements — High-definition mode setup includes a preview mode and full-screen underscan adjustment.
- nView Desktop Manager functionality, including multi-display, is available from a Remote Desktop.
- Support of MultiView for Windows XP x64.
- Ability to cycle through HDTV formats using hot keys

Note: See the Release 80 *nView Desktop Manager User's Guide* for details.

C H A P T E R

2

SYSTEM REQUIREMENTS AND DRIVER INSTALLATION

This chapter discusses the following major topics:

Supported Operating Systems

This Release 80 driver includes drivers designed for the following Microsoft$^{®}$ operating systems:

- Microsoft Windows$^{®}$ XP
    - Windows XP Media Center Edition 2005 Update Rollup2
    - Windows XP Media Center Edition 2005
    - Windows XP Media Center Edition 2004

- Windows XP Professional
- Windows XP Home Edition
- Windows XP Professional x64 Edition
- Windows Server 2003 x64 Edition
- Microsoft Windows 2000 and Windows NT® 4.0 (Service Pack 4)

Hardware — Supported NVIDIA Products

Table 2.1 lists the NVIDIA products supported by the Release 80 driver.

Note: All GPU products listed below support multiple displays (usually two displays) on a single graphics card, with the following exceptions: Graphics cards based on a GeForce3 series GPU support only one display per graphics card.

Table 2.1   Supported NVIDIA Consumer Products

Product	Windows XP 32-bit Windows 2000	Windows XP Professional x64	Windows NT4
GeForce 7800 GTX 512 — PCI-E	X	X	
GeForce 7800 GTX — PCI-E	X	X	
GeForce Go 7800 GTX [1] —PCI-E	X	X	
GeForce 6800 GS — PCI-E	X	X	
GeForce 6800 XT — PCI-E	X	X	
GeForce 6800 XE — PCI-E	X	X	
GeForce 6800 Ultra — PCI-E	X	X	AGP only
GeForce 6800 LE — PCI-E	X	X	
GeForce 6800 GT — PCI-E	X	X	AGP only
GeForce 6800 — PCI-E	X	X	
GeForce 6610 XL	X	X	X
GeForce 6600 LE	X	X	X
GeForce 6600 VE — PCI-E	X	X	
GeForce 6600 GT — PCI-E	X	X	
GeForce 6600 — PCI-E	X	X	
GeForce 6500 — PCI-E	X	X	
GeForce 6200SE with TurboCache	X	X	X
GeForce 6200 with TurboCache	X	X	X
GeForce 6200	X	X	AGP only
GeForce 6150 — PCI-E	X	X	

Table 2.1   Supported NVIDIA Consumer Products

Product	Windows XP 32-bit Windows 2000	Windows XP Professional x64	Windows NT4
GeForce 6150 LE — PCI-E	X	X	
GeForce 6100 — PCI-E	X	X	
GeForce FX 5950 Ultra	X	X	X
GeForce FX 5900 Ultra	X	X	X
GeForce FX 5900	X	X	X
GeForce FX 5800 Ultra	X	X	X
GeForce FX 5800	X	X	X
GeForce FX 5700VE	X	X	X
GeForce FX 5700LE	X	X	X
GeForce FX 5700 Ultra	X	X	X
GeForce FX 5700	X	X	X
GeForce FX 5600XT	X	X	X
GeForce FX 5600 Ultra	X	X	X
GeForce FX 5600	X	X	X
GeForce FX 5500	X	X	X
GeForce FX 5200LE	X	X	X
GeForce FX 5200 Ultra	X	X	X
GeForce FX 5200	X	X	X
GeForce PCX 5900 — PCI-E	X	X	
GeForce PCX 5750 — PCI-E	X	X	
GeForce4 MX 4000	X	X	X
GeForce4 Ti 4800SE	X	X	X
GeForce4 Ti 4800	X	X	X
GeForce4 Ti 4600	X	X	X
GeForce4 Ti 4400	X	X	X
GeForce4 TI 4200 with AGP8X	X	X	X
GeForce4 Ti 4200	X	X	X
GeForce4 MX440SE with AGP8X	X	X	X
GeForce4 MX 460	X	X	X
GeForce4 MX 440 with AGP8X	X	X	X
GeForce4 MX 440-SE	X		
GeForce4 MX 440	X	X	X
GeForce4 MX 420	X	X	X
GeForce3 Ti 500	X	X	X
GeForce3 Ti 200	X	X	X

Table 2.1 Supported NVIDIA Consumer Products

Product	Windows XP 32-bit Windows 2000	Windows XP Professional x64	Windows NT4
GeForce3	X	X	X
GeForce2 MX 400	X	X	X
GeForce2 MX 200	X	X	X
GeForce2 MX	X	X	X

i. This ForceWare driver supports a limited number of OEM notebook computers. Currently, this driver will work with GeForce G0 7800 GTX notebooks from the following OEMs:

ABS

Eurocom

Evesham

Falcon Northwest

Hypersonic

Prostar

Sager

Voodoo PC

Supported Languages

The Release 80 NVIDIA ForceWare Graphics Driver 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)	

Software — NVIDIA ForceWare Graphics Driver Installation

Make sure the current Release 80 version of the NVIDIA ForceWare graphics display driver for your Windows operating system has been installed on your computer.

Note: If you are using a mobile (laptop or notebook) computer, please be sure that you are using the "mobile" version of the NVIDIA display driver.

Consult your System Administrator if you are unsure about the version that is installed.

Minimum Hard Disk Space

The minimum hard disk space requirement for each operating system are listed in Table 2.2, Table 2.3, and Table 2.4:

Table 2.2   Hard Disk Space Requirements—English

Operating System	Minimum Hard Disk Space
Windows XP	29.50 MB
Windows 2000	29.50 MB
Windows NT 4.0	22.60 MB

Table 2.3   Hard Disk Space Requirements—Non-English Languages

Operating System	Minimum Hard Disk Space
Windows XP	21.66 MB
Windows 2000	21.66 MB
Windows NT 4.0	21.67 MB

Table 2.4   Hard Disk Space Requirements—Full International Package

Operating System	Minimum Hard Disk Space
Windows XP	51.16 MB
Windows 2000	51.16 MB
Windows NT 4.0	44.27 MB

About the NVIDIA ForceWare Driver Installation

> **Note:** If you do not have System Administrator access privileges, it is assumed that the appropriate person with System Administrator access in your organization will set up and install the Release 80 NVIDIA ForceWare graphics driver software on your computer.

- NVIDIA graphics driver installation provides both an **.inf** file-based installation method and an InstallShield (**setup.exe**) Wizard-based installation method.

  > **Note:** The InstallShield method is recommended for general users. For details, see "Installing the NVIDIA ForceWare Driver Software" on page 25.

- The installation process copies all necessary NVIDIA Release 80 ForceWare graphics driver files for operation into the appropriate directories.

  > **Note:** If you are using a mobile (laptop or notebook) computer, please be sure that you are using the "mobile" version of the NVIDIA display driver.

- The nView system files are copied to your **Windows\System** directory.

- nView Desktop Manager Profile files (*.**tvp**) are saved in the **Windows\nView** directory.

  Depending on the version of the NVIDIA driver previously installed, profiles may also be located in the **Documents and Settings\All Users\Application Data\ nView_Profiles** directory.

- As part of the install process, an uninstall is registered in your system.

- Under Windows XP, the NVIDIA driver is installed in "Dualview" display mode. However, the second display is not activated by default and must be enabled. See "Using nView Multi-Display Settings" on page 41 for instructions on how to install nView Dualview mode.

- Under Windows 2000, the NVIDIA Display Driver is installed in Span mode. See "Using nView Multi-Display Settings" on page 41 for instructions on how to install nView Dualview mode.

Preserving Settings Before Upgrading Your Software

Before uninstalling or installing software, your can preserve your nView Desktop Manager and/or NVIDIA Display settings by using the nView Desktop Manager Profiles features and following the steps below.

> **Note:** Under Windows XP/2000 and Windows NT 4.0, you must have, at least, **Power User** access privileges in order to create or save a profile. (Refer to Windows Help if you need an explanation of Power User access rights.)

1 Open the nView Desktop Manager Profiles page (Figure 2.1).

Figure 2.1 nView Desktop Manager — Sample Profiles Page

1 To preserve your current settings, you can use either the **Save** or the **New** option from the nView Desktop Manager Profiles page:

- If you want to overwrite the currently loaded profile with your changed settings, use the **Save** option. Notice that a warning message indicates that you are about to overwrite the selected profile.

- If you want to retain the currently loaded profile and want to save your changed settings to a new file, click the **New** option. Enter a name and description of the profile in the New Profile dialog box. For example, you can name this profile **My Settings**.

2 If you are an "advanced" user and want to customize certain settings in the saved profile, click **Advanced** << to expand the dialog box (Figure 2.2).

Figure 2.2　nView Desktop Manager — Save Profile Settings

3 To customize the settings, you can select or clear any of the settings check boxes.

4 Click **Save** to return to the main Profiles page.

If you created a new profile, you will see the name of the newly created profile in the profiles list.

If you overwrote a current profile, the same profile name is retained in the list.

> **Note:** nView Desktop Manager profile (`.tvp`) files are saved in the `Windows\nView` directory. Depending on the version of the NVIDIA driver previously installed, profiles may also be saved in the `Documents and Settings\All Users\Application Data\ nView_Profiles` directory.

5 Now you can uninstall your current driver for a driver upgrade.

6 After you restart your computer following an NVIDIA new driver install, you can easily load the saved profile from the Profiles page of nView Desktop Manager.

About Using Saved Profiles in Another Computer

You can easily use any saved profile (`.tvp` file in the `Windows\nView` directory) from one computer and use it in another computer, if you want. You'll need to copy it to the `Windows\nView` directory of a computer that has the NVIDIA ForceWare graphics display driver, etc. installed properly. Then this profile can be loaded from another computer from the nView Desktop Manager Profiles page just as it can from your original computer.

Installing the NVIDIA ForceWare Driver Software

1 Follow the instructions on the **www.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.

Opening the .EXE file launches the NVIDIA InstallShield Wizard.

4 Follow the instructions in the NVIDIA InstallShield Wizard to complete the installation.

Uninstalling the NVIDIA ForceWare Driver Software

Note: It is highly recommended that you follow the steps in this section to completely uninstall the NVIDIA Display Driver software before updating to a new version of the software.

To uninstall the nView software, follow these steps:

1 From the Windows taskbar, click **Start** > **Settings** > **Control Panel** to open the Control Panel window.

2 Double-click the **Add/Remove Programs** item.

3 Click the **NVIDIA Display Driver** item from the list.

4 Click **Change/Remove**.

5 Click **Yes** to continue.

A prompt appears asking whether you want to delete all of the saved nView profiles.

- If you click **Yes**, all of the nView software and all of your saved profiles will be deleted.

- If you click **No**, the nView software is removed, but the profile files are saved in the **Windows\nView** directory on your hard disk.

6 Your system now restarts.

Notes on Feature and Configuration Support

Feature Support

- To access features on the nView Display Settings page (see "nView Display Modes" on page 42), you need:
  - a multi-display graphics card based on any of the NVIDIA GPUs that support multiple displays on a single graphics card, as indicated in "Hardware — Supported NVIDIA Products" on page 18, *and*
  - at least two displays connected to the graphics card.

- When running with multiple graphics cards (i.e., two or more NVIDIA GPU-based graphics card are installed in your computer), ensure that the same version of the NVIDIA ForceWare graphics display driver is installed for each card. For a detailed discussion of using multi-display nView modes, see "Using nView Multi-Display Settings" on page 41.

- Some NVIDIA display and nView Desktop Manager features are supported by either single-display or multi-display NVIDIA GPU-based graphics cards. Therefore, to access features that are supported by single-display configurations, you only need a singe display connected, provided that the particular NVIDIA GeForce-based graphics card supports these features.

- The settings available on the NVIDIA display control panel pages may vary depending on the specific NVIDIA GeForce GPU-based graphics card you are using. For example, settings that are available for a specific graphics card such as one that is GeForce 7800 GTX-based, may not be available on a graphics card based on a GeForce4 Ti- or other older NVIDIA GeForce GPU series.

Examples in this Guide

- For example purposes, most of the NVIDIA display control panel pages shown in this guide feature an NVIDIA GeForce GPU-based graphics card. You may be using a different NVIDIA GPU-based graphics card, in which case you will see the exact name of the GPU you are using reflected in the NVIDIA GPU tab.

- The Windows XP screens shown in this document apply also to Windows 2000 functionality, unless noted otherwise.

C H A P T E R

3

NVIDIA DRIVER CONTROL PANEL ACCESS

This chapter discusses the following major topics:

NVIDIA Display Setup Wizards

After a fresh installation of the NVIDIA Release 80 graphics display driver and restarting your computer, one or both of the NVIDIA display wizards (**Display Wizard** or **TV Wizard**) are automatically invoked, depending on the types of displays that are connected to your graphics card — i.e., analog or digital display, television, or HDTV. The wizards help set up the most commonly used nView display modes, including screen resolution and output.

Note: On subsequent session using the NVIDIA display driver, you can manually start any one of these wizards by clicking either the **Display Wizard** or the **TV Wizard** button from the Desktop Management page (Figure 3.1).

To see sample Wizard pages, see Appendix C, "NVIDIA Setup Wizard Pages" on page 207.
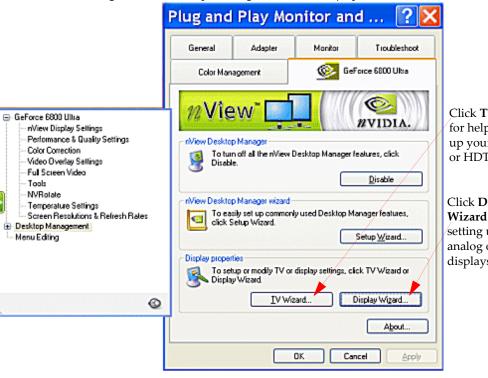
Figure 3.1 Manually Starting the NVIDIA Display Wizard

Click **TV Wizard** for help in setting up your television or HDTV display.

Click **Display Wizard** for help in setting up your analog or digital displays.

1 Click **Change/Remove**.

2 Click **Yes** to continue.

Accessing the NVIDIA Display Control Panel Pages

Once your NVIDIA ForceWare graphics display driver is installed, you can easily access the driver features from a convenient menu. You can quickly access the **NVIDIA display menu** that gives you direct access to the NVIDIA display control panel pages.

For quick access, you can use either the "Desktop Access" on page 30 or the "NVIDIA Settings Menu — Windows Taskbar Access" on page 32 access method, explained in the sections that follow.

Note: When needed, you can still access the NVIDIA display control panel pages through the Microsoft Display Properties **Settings** > **Advanced** option, as explained in "Windows Display Properties Setting Access" on page 34.

Desktop Access

1 Right click on your Windows desktop to open the desktop menu.

2 If you do not see the menu item "**NVIDIA Display**," follow the procedure in "Adding NVIDIA Menu Options to the Windows Desktop Menu" on page 137, and then continue to the next step.

3 Click **NVIDIA Display** (Figure 3.2).

Figure 3.2 NVIDIA Display Options on the Windows Desktop Menu

Note If you have two displays connected, both displays appear and are accessible on the desktop menu *only* if nView Dualview mode is enabled. One your primary display appears if any other nView display mode is enabled.

You will see one or more of the descriptive EDID display names as shown in the examples in Figure 3.2. The display names that appear are based on the number and type of display(s) that are connected to your computer *and* whether you are in nView Dualview mode. These display names are also viewable from the nView Settings page (Figure 3.9).

Note: For example, if you have multiple displays connected to an NVIDIA dual-display graphics card, in order to see both of your displays, you must be in nView Dualview mode. In nView Clone or Span mode, you can only see one display because Windows considers the displays as a "single" display in these modes. For details, see "About Renaming Displays" on page 47 and "About Renaming Displays" on page 47.

4 Select the display for which you want to view the NVIDIA display control panel.

During first use of the driver, the "default" page that opens is always the main NVIDIA GPU page as shown in Figure 3.7. On subsequent use, the actual NVIDIA control panel page that opens will be the page that was open when you last closed the NVIDIA control panel.

Shortcut to Playing Video Files on Any Display

You can now use the NVIDIA display selection shortcut feature to play video files on any selected display.

1 As shown in Figure 3.3, right click on a video file to open its context menu.

2 Select the NVIDIA option **Play On My** and then choose the display on which you want to play the video.

3 To configure full screen video display, see "Using Full Screen Video Settings" on page 129.
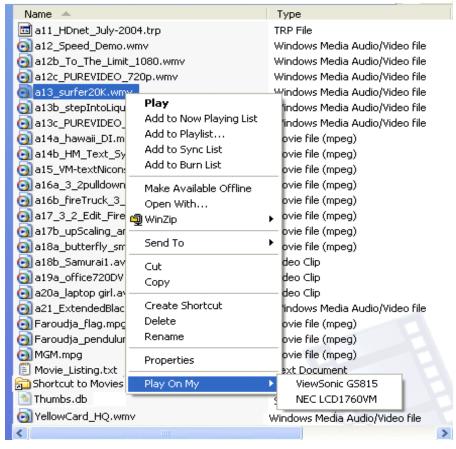
Figure 3.3   NVIDIA Display Options from a Video File Context Menu T
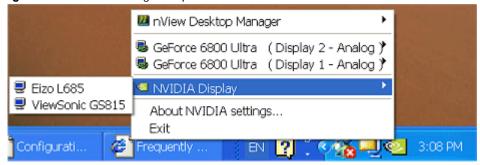
NVIDIA Settings Menu — Windows Taskbar Access

1 Make sure you have added the NVIDIA Settings menu icon to your Windows taskbar notification area. For details, see "Adding the NVIDIA Settings Menu to the Windows Taskbar" on page 134.

2 From your Windows taskbar, click the NVIDIA Settings menu icon (Figure 3.4) to display the types of menus shown in Figure 3.5 and Figure 3.6.

Figure 3.4 NVIDIA Settings Menu Icon in the Windows Taskbar Notification Area

Windows Taskbar   └─NVIDIA Settings menu icon

Figure 3.5 NVIDIA Settings Sample Menu
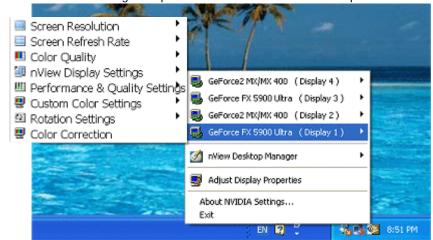
3 Click **NVIDIA Display** (Figure 3.5) and then select the type of display.

The NVIDIA display control panel appears (Figure 3.7).

Note: Figure 3.6 shows another view of the NVIDIA Settings menu. You can use this menu to quickly access the same NVIDIA ForceWare graphics display driver-based settings that you can access in the regular NVIDIA display menu shown in Figure 3.7.

Figure 3.6 NVIDIA Settings Sample Menus with Four Connected Graphics Cards

Windows Display Properties Setting Access

You can still access the NVIDIA display control panel through the Microsoft Display
Properties **Settings** > **Advanced** option, if needed.

1 Right click from your Windows desktop to open the desktop menu.

2 Select **Properties** and then the **Settings** tab.

3 Click **Advanced** and then click the NVIDIA GPU tab.

The NVIDIA display control panel with menu appears (Figure 3.7).

Using the NVIDIA Display Menu

From the NVIDIA display menu (Figure 3.7), you can access all the NVIDIA display
control panel pages where you can configure many NVIDIA driver features.

To view any of the NVIDIA display control panel pages, simply click a menu item
from the NVIDIA display menu.

Note: The nView Display Settings menu item appears only when you have more
than one display connected, as shown in Figure 3.7. Figure 3.8 shows the menu
when only one display is connected; the example is for a notebook computer.

To toggle between hiding and showing the NVIDIA display menu, click the green
button on the green button that appears on any NVIDIA display menu page (Figure
3.7). You can also click the **Additional Properties** button to show the menu when it is
hidden (Figure 3.7).

You can resize the NVIDIA display menu by directly manipulating it with your
mouse.
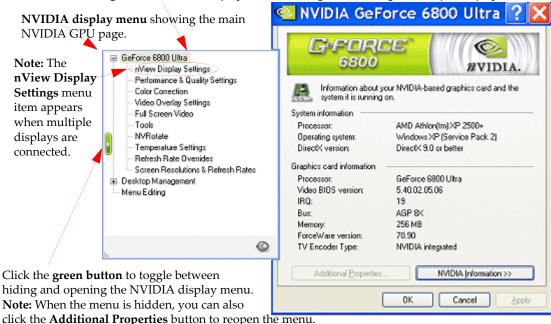
Figure 3.7 NVIDIA Display Menu Showing the GPU Page— Multiple Displays Connected

NVIDIA display menu showing the main NVIDIA GPU page.

Note: The **nView Display Settings** menu item appears when multiple displays are connected.

Click the **green button** to toggle between hiding and opening the NVIDIA display menu.
Note: When the menu is hidden, you can also click the **Additional Properties** button to reopen the menu.

System information details selected aspects of your system than could affect overall graphics performance.

Graphics card information details the hardware aspects of the currently selected NVIDIA GPU.

Click the **NVIDIA Information >>** button to open a menu from which you can choose to update your NVIDIA driver, send feedback to NVIDIA, keep current with NVIDIA news, products, and demos, and see NVIDIA display driver version and file information.

Figure 3.8 NVIDIA Display Menu — Single Display Connected

NOTE: **nView Display Settings** menu option does not appear when only one display is connected

The NVIDIA GPU Page

As mentioned previously, during first use of a newly installed NVIDIA driver, the "default" page that opens is always this main NVIDIA GPU page, as shown in the Figure 3.7 example.

This GPU page contains system and graphics card information. You can also use the **NVIDIA Information >>** button (Figure 3.7) to access a menu from which you can choose to update your NVIDIA driver, send feedback to NVIDIA, keep current with NVIDIA news, products and demos, and view NVIDIA display driver version and file information.

Other NVIDIA Display Menu Items

This section gives an overview of the pages associated with the other NVIDIA display menu items

- **nView Display Settings** page is shown in Figure 3.9.
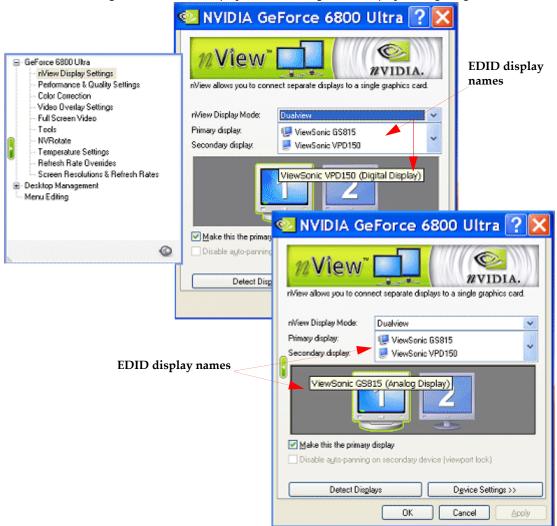
Figure 3.9 NVIDIA Display Menu Showing nView Display Settings Page

Note: This menu item only appears if you have more than one display connected. For complete details on using the nView Display Settings features, see the next chapter "Using nView Multi-Display Settings" on page 41.

• **Performance and Quality Settings —** see "Adjusting Performance and Quality Settings" on page 105

• **Video Overlay Settings —** see "Using Video Overlay Settings" on page 127

• **Full Screen Video —** see "Using Full Screen Video Settings" on page 129.

> **Note:** This menu item only appears if you have more than one display connected and the **nView Display Mode** list is *not set to* **Single display**.

- **Tools —** see "Using the Tools Page" on page 134
- **PowerMizer™ —** *for mobile computers only*; see "Adjusting PowerMizer Settings — Only for Notebook Computers" on page 154.
- **NVRotate™ —** see "Using NVRotate Settings" on page 139.
- **Temperature Settings** menu option is available on newer GPUs, such as GeForce FX, and on certain older GPUs. "Adjusting Temperature Settings" on page 141.
- **Screen Resolutions & Refresh Rates É** "Changing Screen Resolutions and Refresh Rates" on page 144
- **Desktop Manager —** see the "*NVIDIA ForceWare Graphics Drivers nView Desktop Manager User's Guide*" Release 80 driver version.
- **Menu Editing —** see "Editing the NVIDIA Display Menu" on page 151

Using the NVIDIA Display Menu Help and Tool Tips

Context Help

You can obtain context Help (Figure 3.10) for any of the settings and options on the NVIDIA display control panel page by using any *one* of these methods:

- Select or move your mouse pointer to the option for which you want help and then press **F1,** *or*
- Click the "**?**" icon located on the top right corner of the NVIDIA display control panel page you have open, move the "**?**" icon over the option for which you want help, then click your mouse again to display the help.

Figure 3.10 NVIDIA Display — Sample Context Help

Sample **context Help** for an option on an NVIDIA control panel page

Tool Tips

Windows-style tool tip (pop-up) Help appears when you hover your mouse pointer on an item that is partially obscured. For example, you can place you mouse on any of the long NVIDIA menu names that may be partially obscured (such as Performance and Quality Settings) and be able to view the name in its entirety.

Tool Tips for Disabled Settings

When an option or setting is disabled (grayed) on any NVIDIA display control panel page, you can place the mouse pointer on the disabled option for a couple of seconds to see "tool tip" help describing the reason it is disabled.

An example of this kind of tool tip Help is shown in Figure 3.11.

Figure 3.11 NVIDIA Display Menu — Sample Tool Tip for Disabled Settings

Sample **tool tip** help for **disabled settings**

C H A P T E R

4

USING NVIEW MULTI-DISPLAY SETTINGS

This chapter discusses the following major topics:

- "nView Multi-Display Applications" on page 44

- "nView Display Modes" on page 42

- "About Display Numbering" on page 47

- "nView Display Settings — Renaming a Display" on page 48

- "Using nView Dualview Mode" on page 51

- "Using nView Span Modes" on page 56

- "Using nView Clone Mode" on page 61

- "Switching Between nView Dualview and Span/Clone Modes — Windows 2000" on page 67

- "Enabling nView Multiview Mode — Only for NVIDIA Quadro NVS-based Graphics Cards" on page 67

- "Arranging Displays on the Settings Page" on page 68.

nView Display Modes

The nView Display Settings page provides several display modes for your multi-display configuration.

When using NVIDIA GPU-based graphics cards that support multiple displays, there are three ways to run multi-display configurations *under most operating systems*; Dualview, Span, or Clone mode. These nView display modes are available from the nView Display Settings page as shown in Figure 4.1 and Figure 4.2**.**

Figure 4.1   nView Single Display Mode — Windows XP/2000

nView display modes —
current setting is **Single display**

- **Single display** mode indicates that only one of your connected displays is used.

   Note: If you have only one display that is connected, you will not see the nView Display Settings option on the menu.
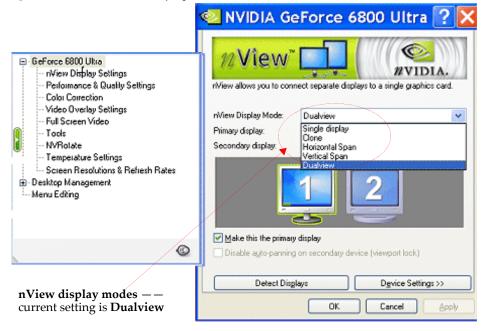
- **Clone** mode indicates that both displays in the display pair show images of the same desktop.

- **Horizontal Span** mode indicates that both displays in the display pair function as one wide virtual desktop. The width of each display is half the width of the total virtual desktop width.
- **Vertical Span** mode indicates that both displays in the display pair function as one tall virtual desktop. The height of each display is half the height of the total virtual desktop height.

Figure 4.2   nView Multi-Display Mode — Windows XP/2000

nView display modes ——
current setting is **Dualview**

- **Dualview** mode (Figure 4.2, Figure 4.3, and Figure 4.4) indicates that both displays in the display pair function as one virtual desktop. Unlike Horizontal Span or Vertical Span mode, Dualview treats each display as a separate device. This means that the Windows taskbar will not be stretched across displays and 3D applications are not accelerated as efficiently as when the application spans displays.

nView Multi-Display Applications

For extensive information on nView applications, click the **Products** tab from the NVIDIA Web site: **www.nvidia.com**

Engineering or mechanical CAD applications can use multiple displays for different directional views of an object or a building, such as a front or side view or even a wireframe model on one screen and a textured version of the same model on another. Many professional applications offer extensive graphical user interfaces, which can be left fully enabled and visible on one display, while the second display remains unobstructed for viewing the actual work.

Training and Presentation — nView **Clone mode** (see "Enabling nView Clone Mode" on page 61), where two displays show identical images, is useful for presentations. A presenter may use the smaller display on the podium, while a projector display reflects the presentation to the audience. In training applications, the instructor can see what the student is doing under nView Clone mode. The ability to see the presentation while it's being projected can be especially useful when using mobile computers.

Virtual Desktop (see "Enabling Virtual Desktop — Clone Mode" on page 63), a sub-feature of nView Clone Mode, is useful for flat panels and ana log displays with limited resolution and is used to set a larger than viewable area on the second display, which supports full pan-and-scan of the entire desktop area.

Digital content creation (DCC) applications can use one display for toolbars and palettes and the other for rendered output. Additionally, many real-time or game development environments allow the authoring tools or game engine code to be visible on one display, while showing the art or game engine in a full screen, game play-like mode on the second display.

Graphics Artists can have common applications such as Adobe Photoshop or 3D Studio Max open with the palettes and menus on one display and the other display dedicated to workspace. **Writers** can use one display for research and the other for writing.

Financial applications, such as stock trading applications, can use a pair of large digital flat panels. This would allow you to watch real-time stock data on one screen and use the other screen for trading activity.

Video editing applications would use one large computer display and one NTSC display. Since nView technology allows decoupling of refresh rates, the primary (editing) display could be a high-resolution RGB display for running the application (Adobe Premiere, for example), while the second display can be an NTSC or S-Video display for checking the video output for proper color balance and quality.

Entertainment applications can use multiple display support in several ways. Game titles, such as Microsoft's Flight Simulator 2000, support multiple displays out of the box. With nView **Clone mode**, game play can be sent to a big screen TV or even to a VCR.

Home theater systems can take advantage of the DVD capabilities of your computer. Simply hook up a large screen television as your second display and you can watch DVDs — without having to buy a dedicated DVD player. *See* "Using Full Screen Video Settings" on page 129.

Television and Movies — Using the NVIDIA display "video mirror" feature, you can watch TV and any other video while you work. *See* "Using Full Screen Video Settings" on page 129.

Accessing the Display Context Menus

The *display icons* on the nView Display Settings page display a graphical representation of your nView display configuration — i.e., the *single* (Figure 4.1) OR *pair* of displays (Figure 4.2 and onward) connected to your computer and being used by the nView display mode you selected from the **nView display modes** list.

1 Click a display image to select it as your current display.

2 Then right click the display image to display a popup context menu (Figure 4.3) from which you can adjust settings for that display.
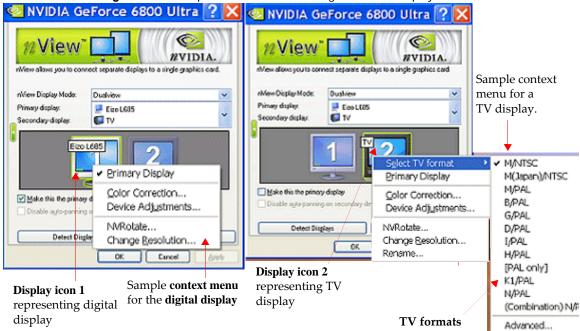
Figure 4.3   Example Context Menus for Digital and TV Displays

Sample context menu for a TV display.

Display icon 1 representing digital display

Sample **context menu** for the **digital display**

Display icon 2 representing TV display

TV formats

Available settings include:

- **Color Correction**. See "Adjusting Desktop Colors" on page 100.
- **Device adjustments**. See "Configuring Displays" on page 70.
- **Select TV format**. See "Configuring Displays" on page 70.
- **NVRotate**. See "Using NVRotate Settings" on page 139.
- **Change Resolution**. See "Changing Screen Resolutions and Refresh Rates" on page 144.

Note: You can access these same menu options by clicking the **Device Settings >>** option at the bottom of the nView Display Settings page.

About Display Numbering

When you are running in nView Single display, Clone, or Dualview mode, the numeric part of the display image identifier such as 1 (or 2), 1 and 2, 1a and 1b, or 2a and 2b reflect the Windows display number, as viewable from the Windows Display Properties page.

Note: The Windows operating system only assigns numbers to displays running in native Windows multi-display mode — i.e., Dualview, which is common to both Windows and NVIDIA — but not Clone mode, which is an NVIDIA nView-specific display mode.

nView Dualview mode. The display images on the nView Display Settings page are numbered as separate displays, 1 and 2, as in the Windows Display Properties page.

nView Clone or **Span mode**. Multiple displays running in nView Clone or nView Span mode also appear as one "Dualview" head to Windows and therefore the Windows Display Properties page displays only a single display image. The display images on the nView Display Settings, however, may be numbered as 1a and 1b (or 2a and 2b) where the numeric value remains the same with only the alphabetic part of the number (a or b) designating separate heads indicating dual display.

About Renaming Displays

In this release of the NVIDIA driver, you can also "rename" the display names that appear on your desktop context menu shown in Figure 4.4 of the previous chapter. On your nView Display Settings page, these display names are also always visible in the Primary Display and Secondary Display fields and when you rest your mouse on a display image, as shown in Figure 4.5.

Figure 4.4 nView Display Settings — Renaming a Display

1. Select **Rename** from the display's context menu to open the Rename Display dialog box.

2. Then enter a *new name* and click **OK** to show the new name on the nView Display Settings page (Fig. 5.5).
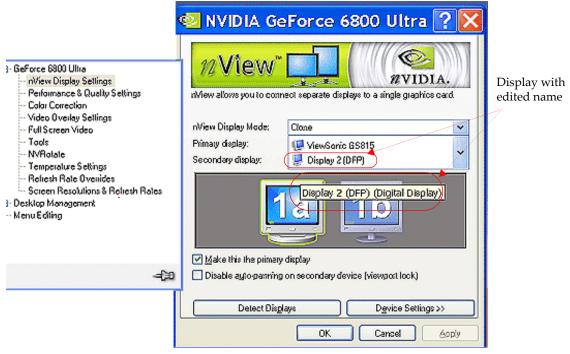
To rename a display name, follow these steps:

1 From the nView Display Settings page, right click on any of your display (monitor) icons, or click the **Device Settings >>** button to display the context menu.

2 Select **Rename** to open the Rename Display dialog box, as shown in Figure 4.4.

3 Enter a name in the **Rename** edit box and click **OK** to return to the nView Setting page.

Notice that the new name now appears on the display image and the Primary Display/Secondary display box, as shown in Figure 4.5.

Figure 4.5 nView Display Settings — Renamed Display

Display with edited name

NVIDIA Multi-Display Support

The following are sample display combinations that NVIDIA GPU-based multi-display cards support when used with the NVIDIA ForceWare graphics display driver:

- Two RGB displays with second RAMDAC (digital-to-analog converter)
- Two analog flat panels
- Two digital flat panels
- One digital flat panel and one analog flat panel
- One digital flat panel and one RGB display
- One RGB display and one TV

- One RGB display and one analog flat panel (with second RAMDAC)
- One analog flat panel and one TV
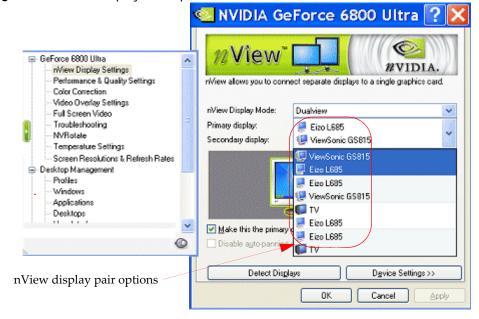
Note: Actual combinations supported on a given graphics card will vary.

Setting up a multi-display graphics card involves installing the graphics card on a computer, connecting the displays to your computer, and installing the current version of the NVIDIA ForceWare graphics display driver. After restarting your computer, the multiple display modes of the graphics cards installed are fully functional.

When using any nView multi-display mode, you can easily switch between the displays by following these steps:

1 Open the nView Display Settings page.

2 Click the **Display pairs** list and click the paired display combination you want.

For example if you have an **analog display**, a **digital display**, and a **TV** connected to your computer, your choices are as listed below and shown in Figure 4.6.

Figure 4.6   nView Display Pair Options

nView display pair options

- **Analog display + digital display**
- **Digital display + analog display**

- **TV + digital display**
- **Digital display + TV**
- **Analog display + TV**
- **TV + Analog display**

Primary and Secondary Displays

nView Display Settings

On the NVIDIA nView Display Settings page, the primary display is designated by the display icon on the left and the secondary display is designated by the display icon on the right.

Windows Display Properties Settings

On the Windows Display Properties Settings page, your can determine the **primary** display by placing your mouse pointer on a display icon where the tool tip text indicates "Primary".

Using nView Dualview Mode

Note: You must have *at least* two displays connected to your computer to be able to view the nView Span mode settings.

nView Dualview mode treats every display as a separate device. Dualview mode is sometimes called "native mode" because it is the native mode supported by Windows multi-display configurations; i.e. it is the multi-display mode defined by Microsoft and supported by Microsoft Windows operating systems.

Dualview mode is equivalent to selecting the **Extend my Windows desktop onto this monitor. . .** setting on the Windows Display Settings page, which gives you an extended workspace.

When you start **Windows 9x** or **Windows XP** using multiple displays, Windows is pre-configured for Dualview mode. This is not the case for Windows 2000. To enable Dualview in **Windows 2000**, you need to install Dualview from the nView Display Settings page, as explained in subsequent sections.

Sample nView Display Setting pages in Dualview mode are shown Figure 4.2, Figure 4.3, and Figure 4.4.

Key Features

Dualview support and functionality include the following:

- Support for advanced NVIDIA features such as **Full Screen Video Mirroring** and **Overlay**. (See "Using Full Screen Video Settings" on page 129 and "Using Video Overlay Settings" on page 127.)

  Note: Windows NT 4.0 in nView Multiview mode does not support the "video mirroring" feature.

- Windows places the taskbar on only one display *and* replicates (rather than stretches) the background on each display as shown in Figure 4.7 and Figure 4.8.

Figure 4.7 Multiple Displays in nView Dualview Mode (1)

Display 1 — resolution = 1280 x 768   **Display 2** — resolution = 800 x 600
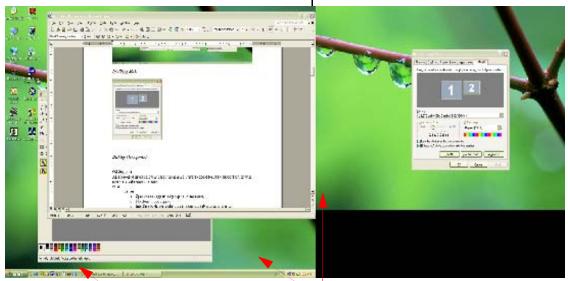
Taskbar *is not stretched* across displays.   · **Background** is not stretched across displays

Figure 4.8 Multiple Displays in nView Dualview Mode (2)

- When you maximize an application, it maximizes only to the single display, and so on. Figure 4.7 and Figure 4.8 show examples of Dualview systems where the left and right displays are running at different screen resolution. Notice that the background is not stretched across the displays and the taskbar appears on a single display instead of being stretched across displays.

Display 1 — resolution is 1280 x 768   **Display 2** — resolution is 1024 x 768

Taskbar is *not* stretched across displays.   **Background** is not stretched across displays.

- You can set different color depths per display.

- You can arrange your multi-display desktop to be any shape; it does not have to be limited to "rectangular" as in nView Span modes.

- When you run a DirectX or OpenGL application in Dualview mode, it is accelerated as long as the window does not span more than one display. If the window spans two displays, drawing is not accelerated in the window.

  Note: In Span modes, drawing is always accelerated.

- Dualview mode is supported on various combinations dual displays, as explained earlier in "nView Display Settings — Renaming a Display" on page 48.

  For example, you can have a system with the primary display as an analog display that supports up to 1600 x 1200 at 100 Hz refresh rate, while the secondary display is connected to an NTSC TV that is limited to 800 x 600 at 60 Hz refresh rate. The TV has lower resolution and refresh rate than the analog display because the TV encoder on the GPU has fewer capabilities than the analog display.

Initial Installation of nView Dualview Mode — Windows 2000

Note: When you start Windows 2000 with an NVIDIA GPU-based multi-display graphics card (or multiple NVIDIA GPU-based graphics cards), you are not yet in Dualview mode. You can confirm this when you view the Windows Display Properties Settings page and see only one display image in the display.

Follow these steps to enable Dualview.

1 Make sure your multi-display NVIDIA GPU-based graphics card is properly installed in your computer and securely connected to your displays. Make sure your displays are turned on and the NVIDIA display driver has been properly installed on your computer.

2 After Windows starts up, right click on your desktop to open the Windows desktop menu. Then select the display for which you want to open the NVIDIA display menu and select the **nView Display Settings** option.

3 Click the arrow in **nView display modes** list and select **Install Dualview (Advanced)** as shown in Figure 4.9.
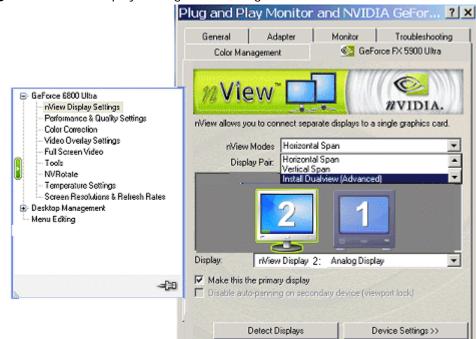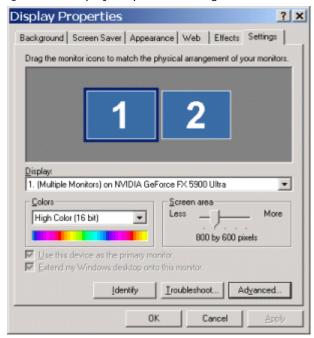
Figure 4.9   nView Display Settings — Installing Dualview in Windows 2000

4 When the prompt appears, click **Restart Now**.

Note: When the system starts up, you may see a series of Dualview installation prompts. It may take up to one minute for the first Dualview prompt to appear. Click the confirming prompts (such as, **Yes**, **OK**, or **Finish)** to follow through and then restart your computer as prompted.

5 After the system starts up, if the NVIDIA nView Desktop Manager Setup Wizard appears, run through the Wizard. (See the *NVIDIA nView Desktop Manager User's Guide* for details.)

6 From your desktop, right click to view the Window desktop menu, then click **Properties** and the **Settings** tab.

You'll notice that at least two display images appear on the Windows Display Properties Settings page, as shown in Figure 4.10, indicating Dualview mode.

Figure 4.10 Display Properties Settings — Dualview Mode (Windows 2000)

7 Click **Advanced,** the NVIDIA GPU tab, and the **nView Display Setting** menu option.

8 From the **nView Modes** list, select **Dualview**.

9 Follow the prompts to restart your computer again.

10 When you have returned to your desktop, open the **nView Display Setting** page and select **Dualview** from the nView Modes list.

Enabling nView Dualview Mode After Initial Installation — Windows 2000

Switching back and forth between Dualview and Span/Clones mode under Windows 2000 is much faster *after* the initial Dualview installation session described in the previous section. On subsequent Dualview enabling sessions, you can use fewer steps, as follows:

1 From your Windows 2000 desktop, right click to view the Windows desktop menu, then click **Properties** > **Settings** > **Advanced** and then the NVIDIA GPU tab.

2 Click **nView Display Setting** from the NVIDIA menu and select **Dualview** from the **nView Modes** list.

3 Follow the prompts to restart your computer.

4 When you have returned to your desktop, go to the nView Display Setting page and select **Dualview** from the **nView Modes** list.

   Note: To switch back to Clone, Horizontal Span, Vertical Span, or, under certain configurations, Single Display mode, you will need to restart your computer, as prompted.

Using nView Span Modes

Note: nView Span modes do not apply under Windows 9*x* operating systems.

Note: You must have *at least* two displays connected to your computer to view the Span mode settings.

nView horizontal and vertical Span modes treat multiple displays as a single large desktop. In this mode, the desktop area is spread across both displays, however the operating system treats both displays as one large display. For this reason, the refresh rate, color depth, and resolution on both displays will be identical, and cannot be changed independently. The desktop may be "stretched" horizontally or "stacked" vertically, depending on your needs, as explained in "Using Horizontal & Vertical Span Modes" on page 58.

- **nView Horizontal Span mode** allows you to extend the Windows desktop across two displays horizontally. In this mode the two displays combine to form a wide, spanned display surface, which is useful when viewing items that are wider then a single display.

- **nView Vertical Span mode** allows you to extend the Windows desktop across two displays vertically. In this mode the two displays combine to form a tall, spanned display surface, which is useful when viewing items that are taller then a single display.

nView Span modes supports the "video mirror" feature, where you may want to dedicate an application to one of the two displays or run the application across both displays. Examples include entertainment applications, digital video editing, and DVD playback. For details, see "Using Full Screen Video Settings" on page 129.

Note: Windows NT 4.0 Multiview mode does not support the Video Mirroring feature.

nView Span Modes vs. Dualview Mode Features

nView Horizontal and Vertical Span mode support and functionality include the following:

- DirectX or OpenGL applications in Span modes are fully accelerated.

- In nView Span mode, your Windows desktop is "stretched" or "spans" all of your displays. In Span mode, Windows treats the multiple displays as a single "logical" display connected to your computer —— the real "physical" displays are combined together to give you this "logical" display.

  Figure 4.11 shows an example of running Span modes under Windows XP with both of the two displays set to 1280x1024 resolution. In this configuration, Windows recognizes *only* a single display running at 2x1280x1024 or 2560x1024.

- The key point to remember when running nView Span modes is that Windows does not detect that you have two displays connected – as far as it is concerned, you have an oversized display. This is the reason that you cannot use different bit depths or resolutions per display.

  Note: This also results in nView Span modes being slightly faster than Dualview mode because Windows only has to manage one display instead of two.

- Under nView Span modes, Windows "stretches" the background wallpaper out to cover your large "logical" display and it stretches the taskbar out to fill your large "logical" display, as shown in Figure 4.11. If you maximize an application, the application will be maximized to fill the large "logical" display screen – i.e., both displays.
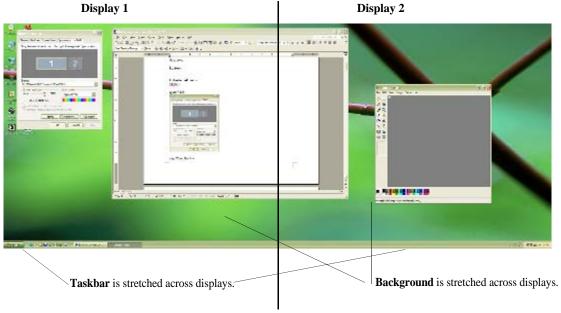
Figure 4.11 Multiple Displays in nView Horizontal Span Mode

Display 1   **Display 2**

Taskbar is stretched across displays.   **Background** is stretched across displays.

- Under Windows XP/2000, you can run nView Span modes with more than two displays. For example, if you are using a Quadro NVS-based graphics card to which you have four displays connected, you can have two sets of two spanned displays.

  If you are using a Quadro NVS-based graphics card, refer to the document titled "*NVIDIA ForceWare Driver for Windows Using nView MultiView Modes with NVIDIA Quadro NVS-based Graphics Cards*"
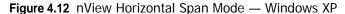
Using Horizontal & Vertical Span Modes
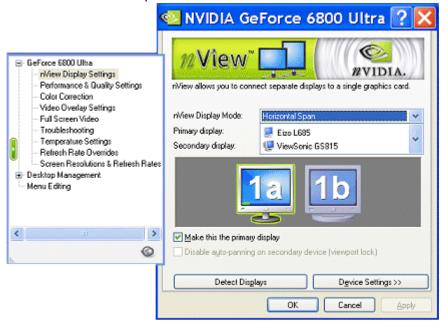
Note: Span modes do not work if you have only one display attached.

In Span mode, the Windows desktop area is spread across both displays. This mode can be set for multiple categories of displays, although display limitations may override the capabilities of your NVIDIA multi-display graphics card. For example, if the second display is an NTSC TV display, depending on the TV encoder on the graphics card, the resolution may not be set above 800 x 600 and the refresh rate cannot be set above 60 Hz. However, the computer's analog display in such a configuration may have its refresh rate and resolution set much higher. The desktop may be "stretched" horizontally or "stacked" vertically, depending on user needs.

Due to operating system differences between Windows 9*x* and Windows NT 4.0/
Windows 2000, the latter does not currently offer true multi-display support for Span
modes using one NVIDIA multi-display graphics card[5]. As a result, size of the actual
desktop is limited to twice the smaller size of the two displays.

Note: The desktop can be extended either horizontally (Figure 4.12) or vertically
(Figure 4.13).

Figure 4.12 nView Horizontal Span Mode — Windows XP

To access the nView Span modes, follow these steps:
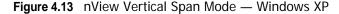
1 Click the **Horizontal** or **Vertical Span** setting on the nView Display Settings page
and click **Apply**.

2   Click **OK** and **Yes** when the messages appear.
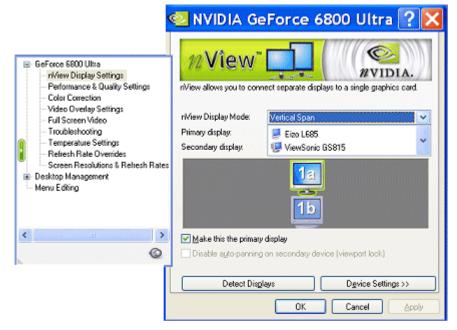
If you just switched from Standard (Dualview) to one of the Span modes, your
secondary display will be activated. If needed, click **Detect Displays** to enable the
displays.

---

5. If two graphics cards are installed, the Windows 2000 operating system does detect two devices.

3 Depending on whether you have Horizontal or Vertical Span mode enabled, you can drag your active windows, images, or icons horizontally or vertically to move them to the secondary display.

Note: Figure 4.12 and Figure 4.13 show the primary display is designated by a and the secondary display is designated by b. Both display are identified with the same number — 1 in this case (can also be another Windows display number, depending on your configuration) — because in nView Span mode, Windows doesn't treat the primary and secondary displays as two separate displays. (For details on this concept, see the section "nView Span Modes vs. Dualview Mode Features" on page 57.) From the Windows Display Properties Settings tab, if you click **Identify** when you are in nView Span mode, you will see the same number displayed on each of your active displays.

Figure 4.13 nView Vertical Span Mode — Windows XP

Using nView Clone Mode

Note: You must have *at least* two displays connected to your computer in order to see the Clone mode setting.

nView Horizontal Span, Vertical Span, Clone, and Dualview modes support advanced NVIDIA features such as Video Mirroring.

In Clone mode, two displays show identical images, which is useful for presentations. For example, Clone mode is useful when giving presentations. The presenter may have a small display or other display on the podium while a projector or presentation quality display shows the larger image to the audience.

Full support for **virtual desktops** is available for flat panels and displays with limited resolution. Virtual desktops offer full pan-and-scan of the desktop and can be configured for one or both displays. See Enabling nView Clone Mode in the next section.

In application Zoom mode (a feature of nView Desktop Manager), part of the image from the primary display is shown on the secondary display, but zoomed in. This mode can be used for image editing, close-up work in modeling or CAD applications, or image processing and mapping applications.

nView Clone mode supports the "Video Mirror" feature, where you may want to dedicate an application to one of the two displays or run the application across both displays. Examples include entertainment applications, digital video editing, and DVD playback. See "Using Full Screen Video Settings" on page 129.

Enabling nView Clone Mode

1 Click **nView Display Setting** from the NVIDIA display menu.

2 From the nView Modes list, select **Clone** and click **Apply**.

Figure 4.14 show the primary display is designated by **a** and the secondary display is designated by **b**. Both display are identified with the same number — **2** in this case (this number can be another Windows display number, depending on your configuration) — because nView Clone mode implies the two displays are duplicate desktop images and, therefore, Windows identifies them with the same number.
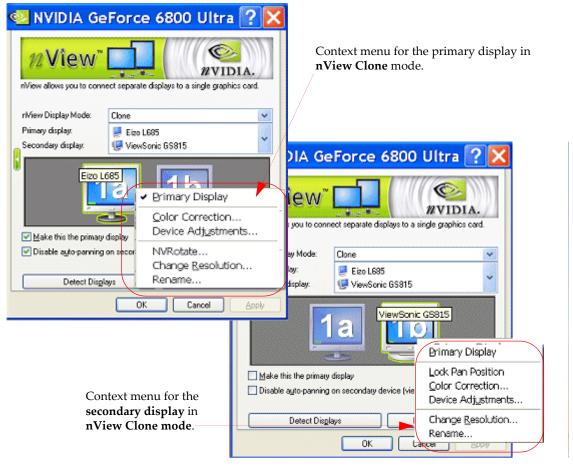
Figure 4.14 nView Clone Mode — Analog + Digital Displays with Context Menus

Context menu for the primary display in **nView Clone** mode.

Context menu for the **secondary display** in **nView Clone mode**.

From the Windows Display Properties Settings page, if you click **Identify** when you are in nView Clone mode, you will see the same number on both your displays.

Figure 4.15 shows nView Clone mode using a digital display as a primary display and a TV as a secondary display.
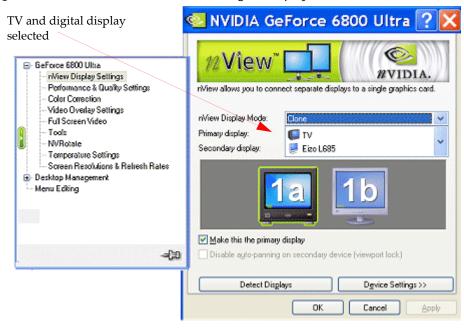
Figure 4.15 nView Clone Mode — TV + Digital Display

TV and digital display
selected

Enabling Virtual Desktop — Clone Mode

Before You Begin

If the maximum resolution of the secondary display is by default *set* to less than the current resolution of the primary display, once you enable Clone mode from the nView Display Setting page, Virtual Desktop will already be enabled.

Note: You can test if Virtual Desktop is enabled by moving your mouse vertically and horizontally across your secondary display's desktop. If the desktop scrolls as you move your cursor to the far edges of the display, then Virtual Desktop is already enabled. However, you still may want to adjust the resolutions of the primary and/or secondary device using the steps below if you want to further adjust the screen resolutions of either display.

 You can use the NVIDIA "Screen Resolution & Refresh Rates" (see "Changing Screen Resolutions and Refresh Rates" on page 144") menu option to adjust the screen resolution of your primary and/or secondary display so that the resolution of the secondary device is less than the primary, which allows you to enable Virtual Desktop, a useful feature for displays with limited resolution — newer flat panels offer high resolution. This feature lets you pan-and-scan the entire desktop area on
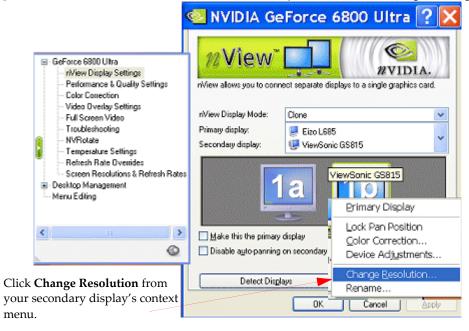
the secondary display when its resolution is set to less than the value set on the primary display.

Procedure

Follow these steps to enable Virtual Desktop:

1 From your Windows desktop, right click to view the Windows desktop menu, then click **Properties** > **Settings** > **Advanced** and then the NVIDIA GPU tab.

2 From the NVIDIA menu, click the **nView Display Setting** option.

3 From the nView Modes list, select **Clone** and click **Apply**.

   Note: If you just switched to Clone from Dualview, you'll need to follow the prompts to restart your computer. Then, when you have returned to your desktop, go to the nView Display Setting page and select **Clone** from the nView Modes list and click **Apply**.

4 From the nView Display Setting page, right click display image (i.e., **1a** or **1b**) to display the pop-up menu and click **Change Resolution** (Figure 4.16).

Figure 4.16   nView Clone Mode with Virtual Desktop Enabled — Disabling Panning

Click **Change Resolution** from your secondary display's context menu.

The Screen Resolution & Refresh Rates page appears, as shown in Figure 4.17.

Figure 4.17 Configuring Screen Resolution for Virtual Desktop

5 Use the **Screen resolution** slider to set the resolution so that the primary display's resolution is greater than the secondary display's resolution.

   Note: If you set the same screen resolution value for both primary and secondary displays, you cannot pan/scan the desktop area on the secondary display; both displays will remain static.

6 Use the **Screen resolution** slider to set the resolution so that the primary display's resolution is greater than the secondary display's resolution.

   Note: If you set the same screen resolution value for both primary and secondary displays, you cannot pan/scan the desktop area on the secondary display; both displays will remain static.

7 **Optional**: If you want, you can select a refresh rate from the list box.

8 Click **Apply** and **OK** close the Screen Resolution & Refresh Rates page and return to the nView Display Setting page.

   Note: Now that you have adjusted the screen resolutions, notice that you can move your mouse horizontally and/or vertically all the way across the

desktop on your secondary display (i.e., display **1b**) to pan and scan the desktop, thus enabling the Virtual Desktop feature.
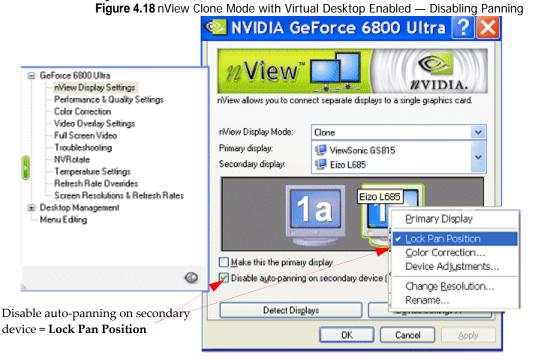
Disabling Auto-Panning (Lock Pan Position)

Disabling the pan and scan feature (virtual desktop) results in locking the current pan position on the secondary clone display, letting you effectively freeze the virtual desktop at a certain position, which is useful for presentations or fine-detail work in applications.

If you want to disable the auto-panning on your secondary display, you do *one* of the following:

• Select the check box labeled **Disable auto-panning on secondary device (viewport lock)** *or* simply

• Select the **Lock Pan Position** check box on the popup menu on your secondary display (i.e., display **1b**.)

The example in Figure 4.18 shows that the **Lock Pan Position** check box is selected, which also enables the equivalent **Disable auto-panning on the secondary device (viewport lock)** check box.

Figure 4.18 nView Clone Mode with Virtual Desktop Enabled — Disabling Panning

Disable auto-panning on secondary device = **Lock Pan Position**

Switching Between nView Dualview and Span/Clone Modes — Windows 2000

Note: Under Windows 2000, switching between nView Span/Clone and Dualview modes requires restarting your computer. (Under certain configurations, switching between Single Display mode and Dualview/Span/Clone may also require restarting your computer.)

1 From your Windows 2000 desktop, right click to view the Windows desktop menu, then click **Properties** > **Settings** > **Advanced** and then the NVIDIA GPU tab.

2 Click **nView Display Settings** from the NVIDIA menu.

3 From the nView Modes list, select **Clone**, **Horizontal Span**, or **Vertical Span** mode.

   Note: If you just switched to Clone, Horizontal Span, Vertical Span, or, under certain circumstances, Single Display mode from Dualview, you'll need to follow the prompts to restart your computer.

4 When you have returned to your desktop, go to the nView Display Settings page and select **Clone, Horizontal Span**, or **Vertical Span** mode from the nView Modes list.

   Note: To switch back to Dualview mode, you will need to restart your computer, as prompted.

Enabling nView Multiview Mode — *Only* for NVIDIA Quadro NVS-based Graphics Cards

Note: nView Multiview mode is a custom mode that is only available when using the NVIDIA Quadro NVS GPU-based series of graphics cards.

The NVIDIA Quadro NVS is a series of multi-display graphics cards for professionals in the financial and **non-linear editing (NLE)** markets.

For further details on using this mode, see the NVIDIA Application Note titled *"Using nView MultiView Modes with NVIDIA Quadro NVS-based Graphics Cards"*

Arranging Displays on the Settings Page

In nView Dualview mode, you can arranging displays on the Windows Properties Settings page to match the actual setup of your physical displays.

The examples shown in Figure 4.19 and Figure 4.20 are Windows XP, but the procedure explained below applies to all Windows operating systems.

When using multiple displays, the desktop can be extended horizontally and vertically, as well as at other angles by page. You can drag the images to the positions that represent how you want to move items between your displays.
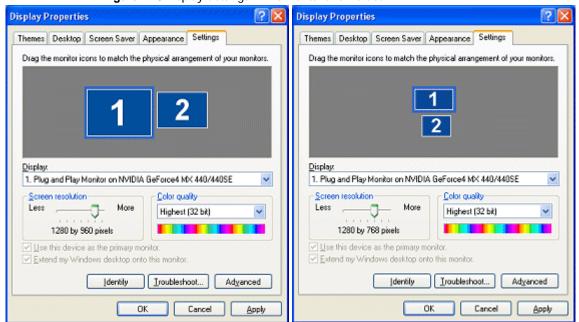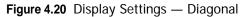
Figure 4.19 Display Settings — Horizontal and Vertical

- For example, if you're using two displays and you want to **move items from one display to the other by dragging left and right**, position the images side-by-side (Figure 4.19).

- **To move items between displays by dragging up and down**, position the images one above the other (Figure 4.19).

- **To move items between displays by dragging at an angle**, position the images diagonally (Figure 4.20). The positions of the images don't have to correspond to the physical positions of your displays. That is, you can position the images one above the other even though your displays are side-by-side.

Figure 4.20 Display Settings — Diagonal

C H A P T E R

5

CONFIGURING DISPLAYS

This chapter discusses the following major topics:

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-
-

Adjusting Analog Display Settings

If your NVIDIA GPU-based graphics card is connected to an analog display, follow the steps in this section to access the analog display's **Device Adjustment** window from which you can configure **Screen Adjustment** and **Display Timing** settings.

To access the **Device Adjustments** window for an analog display connected to your computer, follow these steps:

If you have only one display connected and you do not the see the "nView Display Settings" option on the NVIDIA display menu, you will see the "Screen Adjustment" and "Display Timing" option instead:

1   Click **Screen Adjustment** to open the Screen Adjustment page. See .

2   Click **Display Timing** to open the Display Timing page. See .

If you have more than one display connected, follow these steps.

1   Click **nView Display Settings** from the NVIDIA display menu.

2   Left click on the display image that represents your *analog display* to select it.

3   Right click on that display image and click **Device Adjustments** to open the Device Adjustment page (Figure 5.1), which contains the Screen Adjustment and the Display Timing pages.
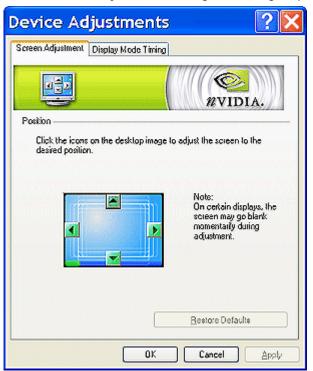
For details, see Screen Adjustment and Display Timing Settings in the next sections.

Screen Adjustment

The Screen Adjustment page is shown in Figure 5.1.

To adjust the screen position on your analog display, use the arrow positioning buttons for fine adjustments.

Figure 5.1   Screen Adjustment Settings — Analog Display

Display Timing Settings

The Display Timing page is shown in Figure 5.2. Select the proper timing mode for your analog display.

- **Auto-Detect** (default setting) allows Windows to receive the proper timing information directly from the analog display.

  Note: Some older analog displays may not support this feature.

Figure 5.2   Display Timing Settings — Analog Display

- **General Timing Formula (GTF)** is an older but widely used timing standard. However, newer display are switching to the CVT standard.

- **Discrete Monitor Timings (DMT)** timing is a set of pre-defined VESA timings. VESA updates this standard every year. If DMT timing is available for a specific mode, the NVIDIA display driver normally selects it instead of the GTF standard.

- **Coordinated Video Timings (CVT)** became the VESA standard on March 2003. CVT supports higher resolutions better than other timing standards.

- **Fixed Aspect Ratio Timing** forces the displayed image to retain the aspect ratio of the mode rather than aspect ratio of the analog display

  Note: The driver may place a black border around the displayed image, as needed.

- **Enable doublescan for lower resolution modes**. Enabling this setting greatly improves image quality at lower resolutions, which is most useful for full screen video or computer games.

Adjusting Digital Display Settings

If your NVIDIA GPU-based graphics card is connected to a **digital display**, follow the steps in this section to access the display's Device Adjustment page where you can configure some flat panel display settings.

If you have only one display connected and you do not the see the "nView Display Settings" option on the NVIDIA display menu, you will see the "Screen Adjustment" option instead.

1 Click **Screen Adjustment** to access the digital flat panel settings page (Figure 5.3).
2 See the next section Digital Display Settings for configuration details.

If you have more than one display connected, follow these steps.

1 Click **nView Display Settings** from the NVIDIA display menu.
2 Select the display image that represents your digital display and then right click and select **Device Adjustments** to open digital flat panel settings page (Figure 5.3).
3 See the next section Digital Display Settings for configuration details.

Digital Display Settings

The digital display options are shown in Figure 5.3 and explained below.

- **Display Adapter Scaling**. Select this setting if you want lower-resolution images scaled to fit the flat panel. For example, if your flat panel has a maximum resolution of 1400x1050, an image with a resolution of 1024x768 will be scaled to appear on the screen at a 1400x1050 resolution.

- **Centered Output**. Select this setting if you want to display lower-resolution images *as is* in the center of the flat panel. For example, if your flat panel has a

maximum resolution of 1400x1050, an image with a resolution of 1024x768 will be displayed in the center of the screen at a 1024x768 resolution with black borders.

Figure 5.3   Digital Display Settings

- **Monitor Scaling** is only available for digital flat panels that support multiple native resolutions.

- **Fixed Aspect Ratio Scaling**.

  Note: The availability of this setting depends on your display configuration.

  Select this setting if you want lower-resolution images scaled to fit the flat panel but preserve the aspect ratio of the image. For example, if your flat panel has a maximum resolution of 1680 x 1050, an image with a resolution of 1024 x 768 will be scaled to appear on the screen at a 1400 x 1050 resolution with black borders.

Adjusting Television Settings

If you have a television connected to your computer, follow the steps in this section to access page where you can choose the correct regional format for TV reception, choose the correct TV connection mode, and configure several TV display settings.

If your television is the only display connected to your computer and you do not the see the nView Display Settings option on the NVIDIA display menu, you will see the following options on the menu: **TV Settings** and **Screen Adjustment**

> **Note:** If you do not see the "TV Settings" or the "Screen Adjustment" pages, go to the information in the next bullet.

1 Click **TV Settings** to display the TV Settings page (Figure 5.4). For details, see TV Settings, the next section.

2 Click **Screen Adjustment** to open the TV Output page where you can configure TV display settings. For details, see "Device Adjustments — TV Output" on page 77.

If your television is the only display connected to your computer directly (or through a VCR or switch box or receiver) and you do not see the nView Display Settings option and also do not see the TV Settings and the Screen Adjustment option on the NVIDIA display menu, then follow these steps.

1 Open the Tools page by clicking the **Tools** option from the NVIDIA display menu. Figure 7.20 in Chapter 8 shows the Tools page.

2 Select the **Force TV detection** check box and click **Apply**.

3 You should now be able to see the **TV Settings** and **Screen Adjustment** options on the NVIDIA display menu.

4 Click **TV Settings** to display the TV Settings page (Figure 5.4). For details, see TV Settings, the next section.

5 Click **Screen Adjustment** to open the TV Output page where you can configure TV display settings. For details, see "Device Adjustments — TV Output" on page 77.

If you *have more than one display connected, including your television*, follow these steps.
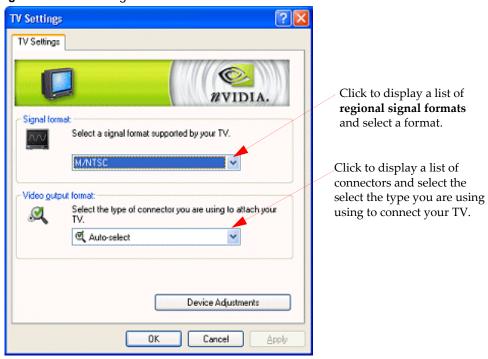
1 Click **nView Display Settings** from the NVIDIA display menu.

2 Left click on the display image that represents your **TV** to select it.

3 Then right click on that display image and select Select TV format or Device Adjustments, depending on the task you want to perform.

4 Click **Select TV format** to display a list of the common TV regional settings and choose a setting that applies to your region.

5 For additional settings, click **Advanced** to display the **TV Settings** page (Figure 5.4). See TV Settings in the next section for detailed information.

6 Click **Device Adjustments** to open the **TV Output** page where you can configure TV display settings. For details, see "Device Adjustments — TV Output" on page 77.

TV Settings

Figure 5.4 show a sample NVIDIA **TV Settings** page.

Figure 5.4   TV Settings

Click to display a list of **regional signal formats** and select a format.

Click to display a list of connectors and select the select the type you are using using to connect your TV.

Signal Format

Click the **Signal format** list to access a regional signal format that is suitable for your locale. The list that appears allows you to select the format used in the country where you live.

Note: If your country is not in the list, select the country closest to your location.

Video Output Format

Click the **Video output format** connection list to specify the type of video connector, based on the output signal format supported by your regular television or HDTV, if you have one connected. For details on configuring an HDTV, see "Configuring HDTV" on page 82.

The default setting is **Auto-select** (Figure 5.4).

If you have the proper connector cable, **S-Video Out** generally provides a higher quality output than **Composite Video Out**.

If you are not sure about the type of video connector you should specify, choose **Auto-select**.

Device Adjustments — TV Output

You can customize your TV display settings from the TV Output page shown in Figure 5.5.

Note: Availability of settings on your TV Output page can vary from those shown in Figure 5.5 and depend on the "Internal" TV encoder on your NVIDIA GPU *or* the "external" TV encoder on the NVIDIA GPU-based graphics card you are using.

Screen Positioning

Repositioning the TV screen — To reposition the TV screen (desktop), click any of the long arrow buttons displayed on the outer top, bottom, left, and right edges of the TV display icon, as shown in the TV Output page in Figure 5.5.

Note: If the TV picture becomes scrambled or is blank due to over-adjustment, simply wait 10 seconds; the picture will automatically return to its default position. You can then begin your adjustments again. Once you have positioned the desktop where you want it, click **OK** or **Apply** to save the settings before the 10 second interval has elapsed.
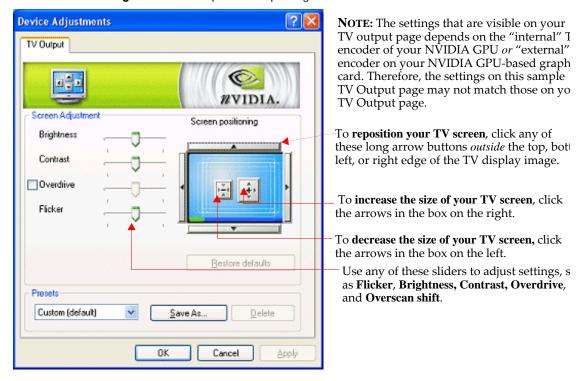
Figure 5.5 TV Output — Sample Page.

NOTE: The settings that are visible on your TV output page depends on the "internal" T encoder of your NVIDIA GPU *or* "external" encoder on your NVIDIA GPU-based graph card. Therefore, the settings on this sample TV Output page may not match those on yo TV Output page.

To **reposition your TV screen**, click any of these long arrow buttons *outside* the top, bott left, or right edge of the TV display image.

To **increase the size of your TV screen**, click the arrows in the box on the right.

To **decrease the size of your TV screen,** click the arrows in the box on the left.

Use any of these sliders to adjust settings, s as **Flicker**, **Brightness, Contrast, Overdrive**, and **Overscan shift**.

Resizing the TV Screen — To increase the size of your TV screen (desktop), click the arrows in the box on the right, *inside* the TV display image, as shown in Figure 5.5.

To decrease the size of your TV screen (desktop), click the arrows in the box on the left, *inside* the TV display image, as shown in Figure 5.5.

Brightness/Contrast/Saturation

Note: Availability of the Brightness, Contrast, and Saturation slider depends on TV encoder used on your NVIDIA GPU or NVIDIA GPU-based graphics card.

Use the **Brightness, Contrast,** and **Saturation** sliders to adjust the brightness, contrast, and saturation of the TV image.

Flicker

Use the **Flicker** slider to adjust the amount of flicker filter you want applied to the TV signal.

Note: It is recommended that you turn off the **Flicker** filter completely (move slider all the way to the left) for DVD movie playback from a hardware decoder.

Overdrive

To use the Overdrive slider, select the check box and click **Apply**.

The overdrive range is between 0% and 100%.

When you set the slider to adjust "overdrive," you are simultaneously adjusting the **Brightness** and **Contrast** slider to remove or reduce edge breaks — i.e., the balloon effect of the visible edges based on content. As you increase the overdrive value, the **Brightness** is increased and the **Contrast** is decreased by a similar amount.

Overscan Shift

Note: This feature is available on the following TV encoders — Conexant 871, 872, 873, 874, 875, and integrated encoders.

Depending on the TV encoder on the NVIDIA GPU or NVIDIA GPU-based graphics card, for some HDTV output modes, there is no available downscaler to implement overscan compensation. The **Overscan shift** slider option is available for this condition.

Using the **Overscan shift** slider, you can shift the desktop by 0% to 20% (based on the position of this slider) in response to the movement of your mouse.

For example, if you start moving the mouse cursor near the Windows taskbar **Start** button, the desktop will shift up and right so that the **Start** button becomes visible. Also, if you see a black border on your TV screen, you can use the slider to enlarge the TV screen to remove the border.

Video Border — (for HDTV)

If you are using an HDTV, most HDTV displays, such as plasmas, suffer from burn-in related artifacts which can be distracting. Selecting the **Video border** check box (Figure 5.6)applies grey borders to the unused portion of your display to reduce this effect.

Figure 5.6   HDTV Output Setting — Video Border

Select the
Video border
check box if you see
dark or black borders
on any unused portion
of your display.

Supported TV and HDTV Adjustment Features Based on TV Encoder and NVIDIA GPU

Table 5.1 lists TV encoders and the TV adjustment features they support.

Table 5.1   TV Encoders and Supported TV Adjustment Features

TV Encoders	Supported TV Adjustment Features						
	Brightness [3]	Saturation	Contrast [7]	Overdrive	Flicker	Screen Positioning	Screen Size
Integrated [1]			✓		✓	✓	✓
Chrontel [1]	✓	✓				✓	✓
Philips [1, 4]						✓	
Conexant [1, 4]			✓		✓	✓	✓
Conexant [2]	✓	✓				✓	✓

1. This category of TV encoders is supported, *at minimum*, by a GeForce MX or newer NVIDIA GPU family.

2. This category of TV encoder supports NVIDIA GPU series that are older than those listed in the previous footnote **1.**

3. When using Release 50 or later version of the NVIDIA display drivers, the **Contrast** and **Brightness** sliders are available for all NVIDIA GPU-based graphics cards that are, *at minimum*, based on the NVIDIA GeForce4 MX 420 through GeForce4 MX 460 class, independent of the TV encoder family: Also, note that any TV encoder that supports both **Contrast** and **Brightness** features automatically supports the **Overdrive** feature.

4. Conexant 875 and Philips 7108 TV encoders support HDTV.

6

CONFIGURING HDTV

This chapter explains how to initialize and configure your HDTV display under single-display and multiple-display nView Dualview and Clone configurations. The following major topics are discussed:

- "Supported Television/HDTV Formats for Analog and Digital Outputs" on page 82

- "Optimizing HDTV Viewing" on page 85

- "Notes on Startup Functionality with HDTV Connected" on page 87

- "Using HDTV in nView Display Modes" on page 87

- "Using HDTV Formats" on page 89

- "Troubleshooting HDTV Configuration" on page 96

Note: Also see Appendix B: "Using HDTV with NVIDIA GPU-Based Graphics Cards" on page 178 if your are using the GeForce 6 or later series of NVIDIA graphics cards with your HDTV for helpful hardware information.
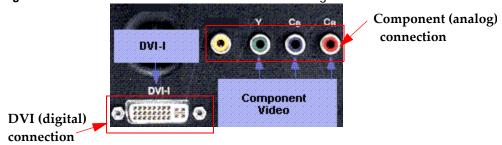
Supported Television/HDTV Formats for Analog and Digital Outputs

The ForceWare Release 80 graphics driver supports output to SDTV, EDTV, and HDTV formats over both analog and digital outputs:

- **Analog Component output (Y Pr Pb)** on HDTV-capable GPUs with a compatible connector*.

- **Digital output (DVI)** on HDTV-capable GPUs with a compatible connector.

    * Supported on NVIDIA GPU-based graphics cards with Conexant 875 or Philips 7108 TV encoders and compatible connectors, *or* on the NVIDIA GPU internal HDTV encoder for the newer GPUs.

Figure 6.1   Back View of an HDTV with DVI and Analog Connectors

NVIDIA graphics cards support the following television and HDTV formats, depending on the GPU or graphics card encoder and EDID of the TV/HDTV display:

- **NTSC** (US and Japanese)

- **PAL** (including all variations)

- **SDTV** 480i (525i); 576i (625i)

- **EDTV** 480p (525p); 576p (625p)

- **HDTV** 1080i, 720p, and 1080p

Table 6.1   Supported TV/ HDTV Formats

Connector Used	Supported TV/HDTV Format				
	NTSC — US and Japanese	**PAL** — all variations	**SDTV** — 480i (525i) — 576i (625i)	**EDTV** — 480p (525p) — 576p (625p)	**HDTV** — 1080i — 720p.
S-Video or **Composite**	✓	✓			
Component			✓	✓	✓
D-connector **Note:** Formats are restricted based on the selected D mode			✓	✓	✓
DVI — Only formats associated with the EDID or custom 861B modes are available, once they are added on the Advanced Timing page. See "Advanced Timing" on page 146.					

About D Connector Output Modes

D connector output modes support a set of HDTV formats per D mode: D1, D2, D3 and D4. The D Connector modes and its associated formats are explained in Table 6.2.

Table 6.2   D Connector Output Modes

Display	Format of the video signal to be transmitted
D1	525i
D2	525i, 525p
D3	525i, 525p, 1125i
D4	525i, 525p, 1125i, 750p'
D5	525i, 525p, 1125i, 750p, 1125p

Television and HDTV Formats and Desktop Resolutions

The number of the active lines displayed for television or HDTV formats determine the associated native desktop mode or resolution:

Television Formats

- **NTSC 525 lines** - resolution of 720 x 480 interlaced (480i)
- **PAL 625 lines** - resolution of 720 x 576 interlaced (576i)

HDTV Formats

- **480i/480p** - resolution of 720 x 480 interlaced/ resolution of 720 x 480 progressive
- **576i/576p** – resolution of 720 x 576 interlaced/ resolution of 720 x 576 progressive
- **720p** – resolution of 1280 x 720 progressive
- **1080i/1080p** – resolution of 1920 x 1080 interlaced/resolution of 1920 x 1080 progressive

If the selected resolution lines are smaller than the selected HDTV format, then black borders will be visible, but if the selected resolution lines are more than the selected HDTV format, the desktop should start panning. To select these formats, see "Using HDTV Formats" on page 89.

 If you use plasma displays with burn-in display issues, you can use the **Video border** option on the TV Output page to display grey instead of black for the borders when the selected resolution is smaller than the selected native HDTV format. See "Device Adjustments — TV Output" on page 77.

Optimizing HDTV Viewing

The NVIDIA driver provides three user-correction methods — "Underscan", "Overscan Shift", and Native — to solve the problem of the Windows desktop overscanned and cutting off the Windows taskbar **Start** button.

Table 6.3, "Optimizing HDTV Viewing" summarizes the various correction methods and reasons for use.

Table 6.3   Optimizing HDTV Viewing

User task	Recommended Corrective Method	Reasons
Watch movies	**Native**	Underscan correction always reduces the quality of the video being watched since it changes the size of the native video resolution by compressing the size of the pixels. In addition, sometimes there is additional electronic information recorded in the invisible portions of the video stream. This is not supposed to be seen directly by the user, as it can be very distracting. Underscan or overscan shift would cause this information to now become visible.
• **Browse the Web** • **Run Windows applications**	**Overscan shift Underscan**	Browsing the web requires that the end user see all information in the browser window. Either of these modes will allow the users accomplish this and provide the best web viewing experience.
Play full-screen games	**Underscan**	If the application correctly queries the graphics driver and requests the modes it supports, you will be able to play the game in the corrected underscan mode and see all of the information on your display. However, some games do not query the graphics driver. Instead, these games hard code the resolutions supported in the game directly into their code. Therefore you can use an alternative way to correct the resolution, such as checking the display for correction options.

Underscan

The **Underscan** setting (Figure 6.9) works by centering a lower resolution on the HDTV screen, the dimensions of which you can further adjust with sliders in the current release of the driver, as shown in Figure 6.10.

For component out, NVIDIA determined through market research that 15% overscan is common with many TVs (both SDTV and HDTV). NVIDIA used this information to create two custom resolutions that are optimal for Web browsing, running applications, and playing games on HDTV sets. These resolutions are:

- **720p**: 1088 x 612 (85% of the full 1280x720.)
- **1080i:** 1600 x 900 (1632 x 918 is 85% of the full 1920x1080, but that is so close to 1600x900 that 1600 x 900 is used instead.)

"Using Underscan" on page 95 explains how to use the Underscan setting.

Overscan Shift

The **Overscan shift** setting (Figure 6.7) enables you to pan the desktop, when needed, to access any display elements that appear off-screen.

The Overscan shift feature works by tracking the position of the mouse cursor and slightly shifting the display when the cursor starts to become close to an edge of the desktop. This mode looks just like "native" HDTV formats (720p, 1080i) because it runs at the full HDTV resolution, which causes certain elements of the desktop, such as the Start button and the clock on the Windows taskbar, to not be visible at all times. But as the mouse cursor gets close to these desktop elements, the NVIDIA driver intelligently shifts the desktop a little in order to move those elements into view.

"Using Overscan Shift" on page 93 explains how to use the Overscan shift setting.

Native

In the third technique, native mode, no overscan compensation is done in order to give the user a true cinematic experience. This is useful when you do not want any pixel compression (squishing) and do not want to use the mouse to shift the desktop image.

Notes on Startup Functionality with HDTV Connected

nView Single Display Mode

When you first start your computer, the HDTV display may have color distortion and may not fill the entire screen display. This is because when you first start your computer with a newly-installed driver, the TV signal format defaults to NTSC.

nView Multi-Display Mode

When two displays are connected to your computer, you will notice both displays are mirrored or "cloned" — this is nView Clone mode.

As with first-time startup on a single-display setup, in a multi-display setup you will also notice that the HDTV screen will have color distortion and may not fill the entire screen display area. Again, as in a single-display setup, this is because when you first start your computer with a newly-installed driver, the TV signal format defaults to NTSC.

Using HDTV in nView Display Modes

Note: HDTV use is not supported in nView Span mode.

Using HDTV in nView Single Display Mode

Based on the connector ("Supported Television/HDTV Formats for Analog and Digital Outputs" on page 82) in use, all the associated HDTV formats ("Supported Television/HDTV Formats for Analog and Digital Outputs" on page 82) will be available in the nView Display Settings context menu available from the TV display icons as well as from the TV Settings screen. Screen resolutions and HDTV formats ("Television and HDTV Formats and Desktop Resolutions" on page 84) can be independently selected and set.

Using HDTV as the Primary Display in nView Clone Mode

Based on the connector in use, all the associated HDTV formats ("Supported Television/HDTV Formats for Analog and Digital Outputs" on page 82) will be available in the nView Display Settings context menu available from the TV display icons as well as from the TV Settings screen.

The secondary display (an analog or digital display) will start panning if the selected primary HDTV resolution is greater than the maximum EDID mode of the secondary *or* if the selected physical secondary resolution is less than primary HDTV resolution.

If the selected primary HDTV screen resolution is lower than that of the secondary display, the resolution will be scaled up if the secondary display is an analog display or, if it is a digital display, the desktop can have a black border.

If you use plasma displays with burn-in display issues, you can use the **Video border** option on the TV Output page to display grey instead of black for the borders when the selected resolution is smaller than the selected native HDTV format. See "Device Adjustments — TV Output" on page 77.

Using HDTV as the Secondary Display in nView Clone Mode

If HDTV is secondary all of the formats that the TV natively supports or in single display are available.

If the primary resolution is smaller than the HDTV, then the HDTV needs to upscale it to fit the current format or black borders will appear around the desktop. To reduce the brightness of the border, you can use the **Video border** option on the TV Output page; see "Device Adjustments — TV Output" on page 77.

If the primary resolution is greater than the HDTV format, then HDTV will pan on the secondary display. Any format change on the secondary HDTV display causes the physical mode to change, based on the associated resolution for the selected format. See "Television and HDTV Formats and Desktop Resolutions" on page 84.

Using HDTV in nView Dualview Mode

As with nView Single Display mode, based on the connector ("Supported Television/ HDTV Formats for Analog and Digital Outputs" on page 82) in use, all the associated HDTV formats ("Supported Television/HDTV Formats for Analog and Digital

Outputs" on page 82) will be available in the nView Display Settings context menu available from the TV display icons as well as from the TV Settings screen.

Using HDTV Formats

Note: The following procedure can be used for nView **Single display**, **Clone**, or **Dualview** mode.

1 After installing the NVIDIA Release 80 graphics driver, right click on your Windows desktop.

2 If you have an HDTV connected in nView single display mode, then select the **TV** option. If you have dual displays connected, then select the **NVIDIA Display** option and then select the **TV** display option.

The NVIDIA display control panel appears.

3 Select **nView Display Settings** from the NVIDIA display menu to display the associated page.

Either a single or two display icons appear.

4 If you are in single display mode but have multiple displays connection, you can click the nView display settings list and select either **Dualview** or **Clone** mode.

5 If you are using an *HDTV with a component connection*, right click on the HDTV display image and select the **Select TV format** option to quickly see the HDTV formats (Figure 6.2). Proceed to step **5**.

If you are using an *HDTV with a DVI connection,* when you right click on the HDTV display image, the "Select TV format**"** option will appear *only if* the "Treat Digital Display as HDTV" option is selected (checked), as shown in Figure 6.3. If it is not checked, follow these steps:

a Select the **Treat Digital Display as HDTV** option and be sure to click **Apply**.

b Then right click on the HDTV display image again.

Notice that the "Treat Digital Display as HDTV" option is now checked and you can click the **Select TV format** option to quickly see the HDTV formats (Figure 6.3).

c Proceed to step **6**.
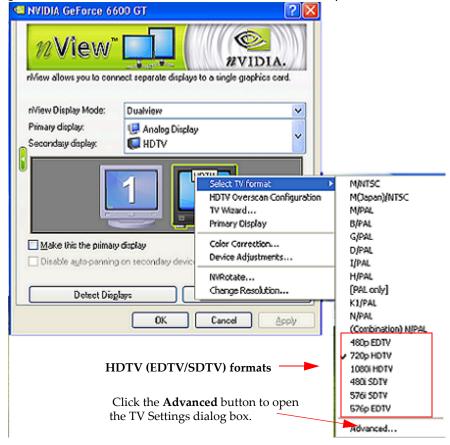
Figure 6.2   Quick Access to HDTV Formats — HDTV Component Connection

HDTV (EDTV/SDTV) formats →

Click the **Advanced** button to open
the TV Settings dialog box.

6 You can choose to select an HDTV format quickly from this list or click the
Advanced option at the bottom of the context menu to open the TV Settings dialog
box (Figure 6.4 and Figure 6.5) where you can select an HDTV format from the list
in the Signal format section.

7 If you have selected an HDTV format that requires you to adjust your HDTV
overscan configuration for optimal viewing of your desktop on your TV screen,
then click the **HDTV Overscan Configuration** option from the context menu of
your HDTV display (Figure 6.2 and Figure 6.3) *or* click the **Overscan
Compensation** button on the TV Settings page (Figure 6.4 and Figure 6.5)   to open
the HDTV Overscan Compensation dialog box (Figure 6.6).

> **Note:** By default, the **Native** (Figure 6.6) option is selected. For details about the
> native display setting, see "Native" on page 86.
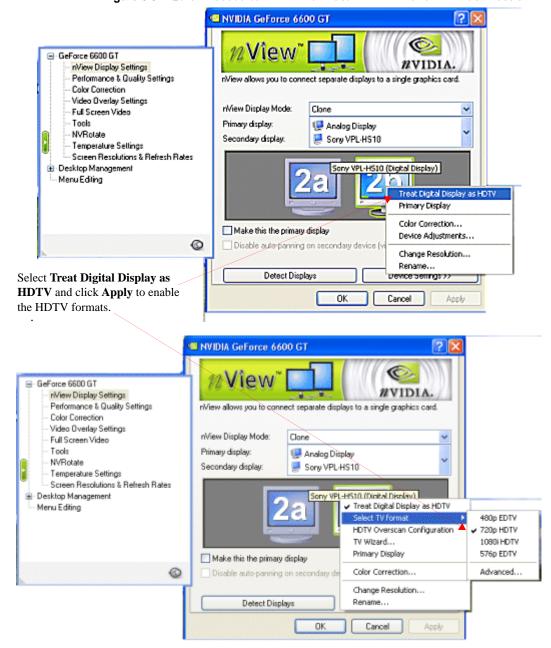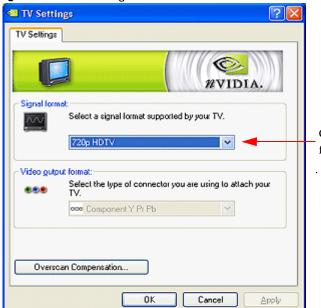
Figure 6.3 Quick Access to HDTV Formats — HDTV over DVI Connection.

Select **Treat Digital Display as HDTV** and click **Apply** to enable the HDTV formats.

Figure 6.4   TV Settings — HDTV Component Connection

Click this list to select an HDTV (EDTV/SDTV) format.

Figure 6.5   TV Settings — HDTV over DVI Connection

Click this list to select an HDTV format.
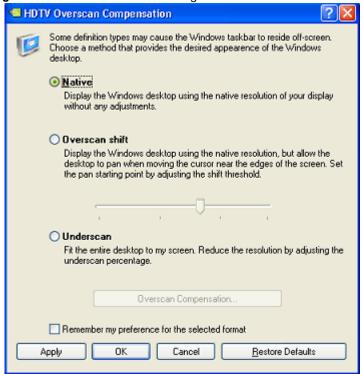
Figure 6.6   HDTV Overscan Configuration —"Native" Selected

Using Overscan Shift

As explained in "Overscan Shift" on page 86, use this option when your desktop appears larger than your HDTV screen so that part of your Windows taskbar, such as the Start button or the clock are not visible. Overscan shift will enable you to "pan" your desktop by moving your mouse over the edges of your desktop so that the hidden areas become visible.

1   From the HDTV Overscan Configuration page, select the **Overscan shift** option (Figure 6.7) and click **Apply**.

2   Use the slider to indicate to what degree you want to pan the edges of the desktop for the hidden parts to be visible. If you move the slider all the way to the left, that indicates "zero" panning. The further right you move the slider, the more you have to pan.

3   Click **OK** or **Apply** when done.

As you are applying the adjustments, you will be prompted to confirm proper settings by the messages in Figure 6.8.

Figure 6.7   HDTV Overscan Configuration —"Overscan shift" Selected
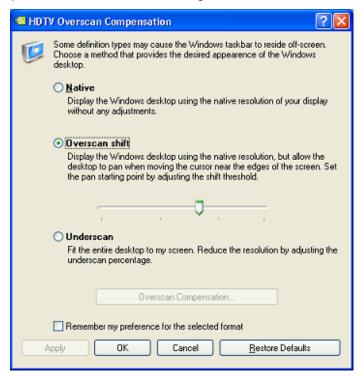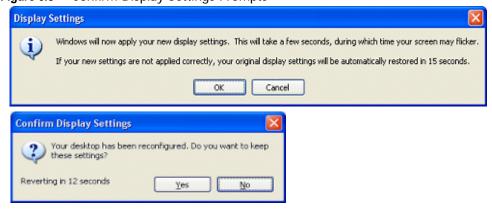
Figure 6.8   Confirm Display Settings Prompts
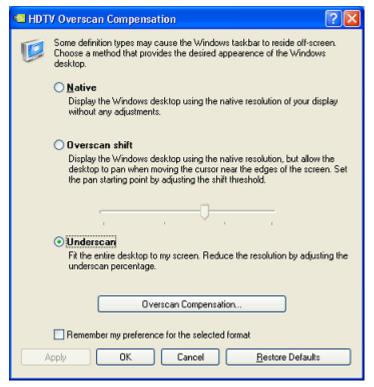
Using Underscan

As explained in "Underscan" on page 86, use this option to reduce your desktop resolution so that the entire desktop is visible on your TV screen without having to pan.

1 From the HDTV Overscan Configuration page, select the **Underscan** option (Figure 6.9) and click **Apply**.

Figure 6.9   HDTV Overscan Configuration — "Underscan" Selected

2 Click the **Overscan Compensation** button to display a screen resolution adjustment control panel (Figure 6.10).

Figure 6.10 Slider Control to Adjust Underscan to fit Desktop to HDTV Screen

3 Use the horizontal and vertical sliders to adjust your HDTV desktop size to properly fit your screen. For example, if your desktop appears smaller than your screen causing a black border around the desktop, use the sliders to enlarge the desktop to fit the screen.If the desktop is larger than the screen and you want to avoid panning, then use the sliders accordingly to adjust the desktop size so that it is fully visible without panning.

4 Click **OK** when done.

Troubleshooting HDTV Configuration

Problem: For 480i/p, 640x480 is the native solution, Can NVIDIA support this resolution?

Answer: Actually, the native resolution for 480i and 480p is 720x480. NVIDIA does fully support 640x480 also. However, Windows XP hides that mode from the user. Note that this is a Windows XP feature and, therefore, cannot be changed by NVIDIA.

To access this resolution, follow these steps:

1 Right click on your Window desktop and select **Properties** from the desktop menu. The Windows Display Properties window appears.

2 Click the **Settings** tab.

3 Click the **Advanced** button.

4 Click the **Adapter** tab.

5 Click **List All Modes** and locate the resolution.

_____

Problem: For 720p/1080i, we cannot find the resolution 1280x720 (720p) and 1920x1080 (1080i).

Answer: You are probably using nView Clone or an nView Span display mode where HDTV is the *secondary* display.

Note: When using nView Clone or an nView Span mode, the secondary display should not be set to a higher resolution than the primary. If, however, that is your current setting, you can solve the problem in one of three ways:

• Make the HDTV be the primary display.

• Assign a different display that can handle higher resolutions as the "primary".

• Do not use the nView Clone or Span modes.

_____

Problem 1: Screen is shrunk. The screen shrink should only be horizontal.

Answer: This is because 720p is 1280 pixels wide, but your desktop is only 1024 wide.

Problem 2: The horizontal edges of the screen are cut. For example, we only see half of the Windows taskbar.

Answer: This means that your HDTV has more than 18% overscan — therefore, some of the 768 lines are not visible. The solution is to use the **Overscan shift** slider on your HDTV display's NVIDIA Device Adjustment page.

See relevant sections under "Optimizing HDTV Viewing" on page 85 for a description of this feature.

See "Using Overscan Shift" on page 93 for details on using this option.

_____

Problem 1: The TV is set to full screen display. The Windows desktop display is panning.

Answer: You are not exactly seeing the "panning" feature — but rather the **Overscan shift** feature.See relevant sections under "Optimizing HDTV Viewing" on page 85 for a description of this feature.

Problem 2: The top and bottom edges of the desktop are cut. For example, we only see half of the Windows taskbar.

Answer: You need to increase the amount of overscan shift by using the **Overscan shift** slider from the HDTV display's NVIDIA Device Adjustment page. The amount required will vary, based on the type of HDTV you are using, and is not detectable.

See relevant sections under "Optimizing HDTV Viewing" on page 85 for a description of this feature.

See "Using Overscan Shift" on page 93 for details on using this option.

C H A P T E R

7

CONFIGURING KEY FORCEWARE GRAPHICS DRIVER FEATURES

This chapter explains how to configure key ForceWare graphics driver features:

Adjusting Desktop Colors
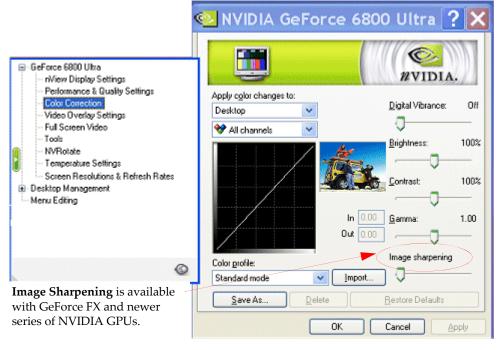
Accessing the Desktop Colors Page

> **Note:** In order to access the Color Correction page, the color setting on the Windows Display Properties Settings page must be set to 16 bit or higher. A setting of "256 colors" will not enable the Color Correction page.

Follow *any one* of these methods to access the Color Correction page (Figure 7.1).

- From the NVIDIA display menu, click **Color Correction**
- From the nView Display Settings page:
    1 Right-click one of the display images *or* click the **Device Settings >>** option.
    2 Select the **Color Correction** option.
- From the Video Overlay Settings or Full Screen Video page, click **Adjust Color**.

Figure 7.1   Color Correction Settings

Image Sharpening is available with GeForce FX and newer series of NVIDIA GPUs.

Color Correction Settings

Digital Vibrance

Note: The **Digital Vibrance Control (DVC)** feature supported by the GeForce2 MX and newer series of NVIDIA GPUs.

DVC, a mechanism for controlling color separation and intensity, boosts the color saturation of an image so that all images — including 2D, 3D, and video — appear brighter and crisper (even on flat panels) in your applications.

Digital Vibrance can be turned *off* or set to different levels from *low* to *high* as shown in Figure 7.1.

Brightness, Contrast, and Gamma

Note: The **Color profile** option on this page must be set to **Standard Mode** in order to use the **Brightness**, **Contrast**, and **Gamma** sliders.

To adjust the **Brightness**, **Contrast**, or **Gamma** values for the selected color channel, click and move the sliders until you see the desired adjustment.

Notice that the color curve graph changes as you adjust values using these sliders, which also reflects in the values of the **Input** and **Output** boxes displayed on the left of the Gamma slider.

Adjusting brightness, contrast, and gamma values helps you compensate for variations in luminance between a source image and its output on a display. This is useful when working with image processing applications to help provide more accurate color reproduction of images (such as photographs) when they are displayed on your screen.

Also, many 3D-accelerated games may appear too dark to play. Increasing the brightness and/or gamma value equally across all channels will make these games appear brighter, making them more playable.

For related information, see "Color Channels" on page 102 and "Color Curve Graph" on page 103.

Apply Color Changes to…

The **Apply color changes to** list appears at the top of the Color Correction page.

Click the list to display the settings below and then select a setting.

- **All** applies the color correction settings on this page to your Windows desktop and to video playback.

- **Desktop** applies the color correction settings to your Windows desktop.

- **Overlay/VMR** applies color correction settings on this page to video playback that uses overlay hardware.

  Note: Current generation hardware overlay does not support per-component (Red, Green, Blue) color correction, but instead exposes a single. unified color correction channel. Therefore, if you select this setting, only the **All Channels** setting in the color channels list is available. (See Color Channels in the next section.)

- **Full Screen Video** applies color correction settings on this page to any full screen video that is running on your display.

Color Channels

The color channels list appears directly above the color curve graph on the Color Correction page.

Click the color channel list to select a color channel.

You can adjust the **Red**, **Green**, and **Blue** channels by selecting each color separately or by selecting the composite choice **All channels**, which is the default setting.

Note: If you select the **Overlay/VMR** setting from the **Apply color changes to** list (see "Apply Color Changes to..." on page 102), only the **All Channels** setting is available.

When you select a color channel, notice that the following takes place:

- The color appears in the graph of the color correction curve below.

- Moving the **Brightness/Contrast/Gamma** sliders changes the appearance of the colored line/curves in the graph in real time.

For additional information on the graph of the color correction curve, see Color Curve Graph below.

Color Curve Graph

The graph below the color channels list represents the color correction curve. Input values are represented along the x-axis and shown numerically in the **In**(put) edit box. The adjusted output values are represented along the y-axis and the adjusted output values are shown numerically in the **Out**(put) edit box.

If the **Color profile** option is set to **Standard Mode**, this curve changes dynamically as you adjust the **Contrast**, **Brightness**, or **Gamma** values using the sliders.

If the **Color profile** option is set to **Advanced Mode**, you cannot use the Contrast, Brightness, or Gamma sliders but you can modify this curve in real-time by using any *one* of these methods:

- Click the curve to create a control point on it. Repeat the step to create additional points, as needed.

- Click the curve and drag the mouse to modify the curve, which also dynamically modifies the values in the **In**put and **Out**put edit boxes.

- Enter a value that is less than or equal to 1 in the **In**put and/or **Out**put edit boxes.

- Select one or more control points and then press the arrow keys on your keyboard to adjust the curve and numeric values in the **In**put/**Out**put edit boxes.

- To insert several control points, click the curve to select a point and then press **Ins** (Ins key on your keyboard) one or more times, depending on the number of points you want to add, which is limited by any other points that may already exist on the curve.

- To remove a control point, select the point and drag it out of bounds or select the point and press **Del**.

- To select multiple control points, you can either press down the **Ctrl** key and select the points you want with your mouse, or left click and drag the mouse around the items to create a box that selects the items.

If you have loaded an **ICC profile**, the color correction curves loaded from the ICC profile are displayed in the graph. Use a professional publishing application to perform color matching based on information in the ICC profile.

Image Sharpening

Note: This option is only available on GeForce FX and later NVIDIA GPU-based graphics cards.

Use the Image Sharpening slider to adjust the sharpness of the image quality by amplifying high frequency content.

Color Profile

The Color Profile option displays a list of available color correction profiles.

- Specify **Standard Mode** if you want to adjust color correction settings using the Contrast, Brightness, and Gammas sliders.

- Use **Advanced Mode** if you want to adjust color correction settings by manually inserting, dragging, and removing control points along the curve shown in the graph. See "Color Curve Graph" on page 103.

  Note: When this option is enabled, the **Contrast**, **Brightness**, or **Gamma** slider settings are not available.

- **Custom** settings you may have saved are also shown in this list. To activate a custom profile, select it from the list and click **Apply**.

Add (ICC Profile Mode)

1 Click **Add** to display a dialog box from which you can load an ICC profile that contains color correction curves.

2 Enter the file name of the ICC profile and click **OK** to load the file.

   The ICC profile just added now appears in the **Color profile** list.

Note: Once you load this ICC profile, the **Brightness**, **Gamma**, and **Contrast** sliders are disabled.

Other Settings

- **Save as** lets you save the current color settings as a custom setting. Saved settings will then be added to the **Color Profile** list as a **"custom"** setting.

- **Delete** lets you delete the custom color setting currently selected in the list.

- **Restore Defaults** restores all color values to the hardware factory settings.
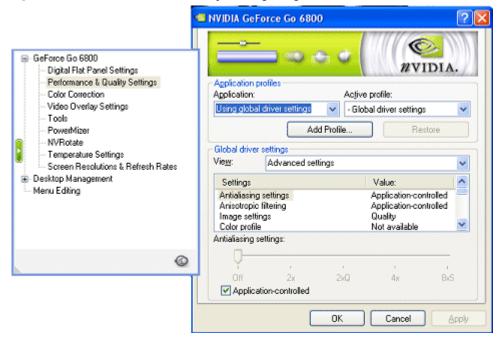
Adjusting Performance and Quality Settings

The following topics are discussed in this section:

To access the Performance and Quality Settings page, from the NVIDIA display menu, click the **Performance and Quality Settings** option (Figure 7.2).

Figure 7.2   Performance and Quality Settings Page

Note: You can use the "Application profiles" and "Global driver settings" modules independently. For example, you can use the Global driver settings to modify

your active desktop application without having to use any of the Application profiles features or settings.

- **Application profiles** refer to pre-defined saved files containing NVIDIA OpenGL and Direct3D driver settings for game-specific applications.

  Note: When you fist open the Performance & Quality page, the lists in the Application profile section is set to the default "global driver settings" state as shown in the screen image above. You can click these lists to select applications and application profiles for which you want to modify the driver settings that appear in the global driver settings list.

- **Global Driver Settings**

  The list that appears in the Global driver settings section contain OpenGL and Direct3D based settings, which you can modify. For details, see "Driver Settings — Advanced" on page 118.

  - You can change driver settings for any applications that you are currently running.

  - You can also change driver settings for existing application profiles and new application profiles you are adding and then save these settings.

Changing Global Driver Settings

To change driver settings globally for any OpenGL-based or Direct3D-based application you are running, follow these steps:

1 Make sure the **Active profile** list is set to **Global driver settings**.

2 Click **Apply**.

3 From the Global driver settings list, click a setting that you want to change.

4 Notice that the setting is highlighted and its slider appears at the bottom of the page, as shown in the example in Figure 7.3.

5 Use the slider to modify the setting to suit your needs. Refer to the following sections for additional information:

  - "Changing Global Driver Settings" on page 106
  - "Modifying an Existing Application Profile" on page 107

6 Repeat steps **3** through **5** for each driver setting you want to change.

7 Be sure to click **Apply** after each change you make to the global driver settings.

Figure 7.3   Changing Global Driver Settings

Modifying an Existing Application Profile

To modify pre-defined NVIDIA-supplied application profiles, follow these steps:

1 Set the **Active profile** list to Global driver settings and click the **Restore** button to restore all settings to their default values.

2 Then, select an application profile by using any one of these methods:

- Select the application profile directly from the **Active profile** list *OR*

- Select the application from the **Application** list. Notice that an associated profile for the selected application appears in the Active profile list. If another profile is also associated with the application you selected, you can browse the list and select that profile instead.

The driver settings of the profile you just selected appear in the driver settings list. After you select a profile, this list, previously labeled "Global driver setting," changes to "**Settings for** *<application profile name>*" as shown in Figure 7.4.

Figure 7.4 Changing Global Driver Settings
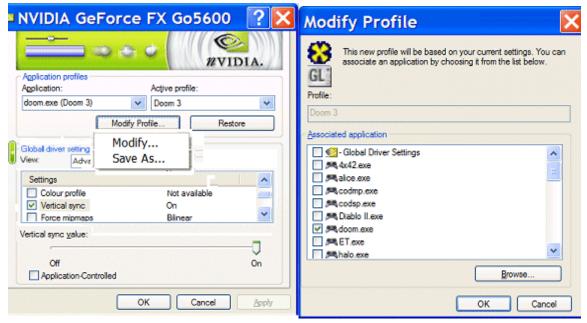
The check box next to the driver settings indicates whether the driver setting comes from driver or the selected profile.

• If the check box is selected (i.e., a check mark appears), the setting is part of the profile. If you clear a check box that has a check mark in it and click **Apply**, then the setting associated with the check box is cleared and removed from the profile.

• If the check box is empty, this means that the setting is controlled by the NVIDIA driver. If you select an empty check box (insert check mark) and click **Apply**, this means you are adding the setting to the profile.

3 From the driver settings list, click a setting that you want to change for the selected application profile. Notice that the setting is highlighted.

4 Select the check box for that setting and click **Apply**. Notice that its slider appears at the bottom of the page.

5 Use the slider to modify the setting to suit your needs. Refer to the following sections for additional information:

- "Changing Global Driver Settings" on page 106
- "Modifying an Existing Application Profile" on page 107

6 Repeat steps **2** through **5** for each driver setting you want to change.

7 Be sure to click **Apply** after each change you make to a driver setting.

8 Click the **Modify Profile** button.

Two options — **Modify** and **Save As**...— appear (Figure 7.6).

Figure 7.5 Changing Global Driver Settings

9 *If you want to associate specific applications with the modified profile,* click the **Modify** menu option and follow all the steps — a through g below.

If you do not want to associate specific application executable files with the modified profile, simply click **Save As.** . . . and then follow steps e. through f. below.

a Click **Modify** to display the Modify Profile dialog box.

b In the Associated application list, select one or more applications (check box) you want to associate with the profile you are modifying. If you want to locate and select applications not in the current list, click **Browse**.

c Click **Modify** to display the Modify Profile dialog box.

d In the Associated application list, select one or more applications (check box) you want to associate with the profile you are modifying. If you want to locate and select applications not in the current list, click **Browse**.

e Click **OK** when done to return to the previous page and click **Apply** again.

f To save the modified profile, click the **Modify** button and then click the **Save As...**menu option to display the Save Settings dialog box.

g From the **Save Settings** dialog box, you can either retain the existing name or rename the profile.

Figure 7.7 shows the profile name being retained. Figure 7.8 shows the profile being renamed.

h Click **OK** to return to the previous page and, if the Apply button is enabled, click **Apply**.

Figure 7.6 Changing Global Driver Settings
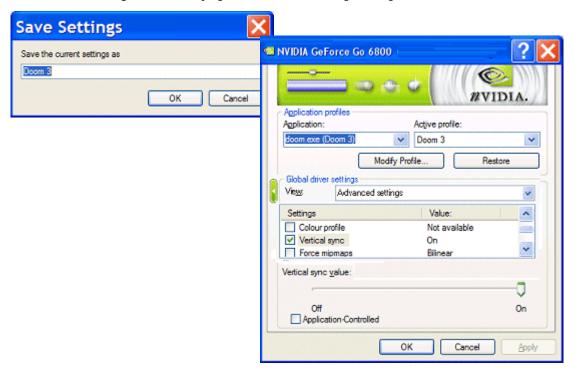
Figure 7.7 Modifying a Profile — Overwriting Existing Profile with the Same Name

If you used the existing profile name thus overwriting the profile with the new settings, as shown in Figure 7.7, notice that the **Restore** button appears (Figure 7.7) indicating that an original profile was changed. You can always restore these types of profiles to the original settings but cannot remove them from the list.

If you renamed the profile, as shown in Figure 7.8, then it is considered a "new" profile and the **Remove** button appears (Figure 7.8). You can always remove these types of profiles from the list.

Figure 7.8   Modifying a Profile — Renaming and Saving the Profile
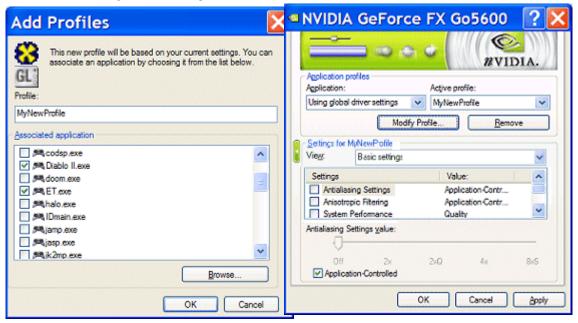
Adding a New Application Profile

You can add new application profiles, which you can also delete. To add a new application profile, follow these steps:

1   Set the **Active profile** list to **Global driver settings**.

2   Click **Apply**.

3   Click **Add** to display the **Add Profiles** dialog box.

4 In the **Associated application** list, select the check box associated with one or more of the applications you want to associate with the profile you are adding. If you want to locate applications not in the current list, click the **Browse** button.

5 Enter a name for the profile you are adding in the **Profile** text entry box, as shown in the left image in Figure 7.9.

Figure 7.9 Adding a Profile

6 Click **OK** to return to the previous page. The Application profiles list displays the new profile name, as shown in the image on the right in Figure 7.9.

7 For each driver setting you want to change for this new profile, follow these steps:

a Select the check box of the driver setting you want to change and save as part of the new profile.

b Click **Apply**.

c Clear the **Application controlled** check box and click **Apply**.

d Use the slider to set the value you want and click **Apply**.

For additional information, see "Driver Settings" on page 114 and "Driver Settings — Advanced" on page 118.

e Repeat steps a. through d. for each driver setting you want to change.

f Click **Apply**.

Adding Profiles With an SLI Configuration

If you are an advanced user running an SLI multi-GPU configuration and want to create profiles that utilize SLI rendering technology, see "SLI Rendering Mode" on page 125 and "About Using Other SLI-based Advanced Settings" on page 126.

Deleting Application Profiles

You can remove the following types of profiles — i.e., the **Remove** button is available for use when:

• You have selected a profile you have added.

• You have selected a pre-defined NVIDIA-supplied profile that you have modified and renamed.

Note: Remember that when you delete a profile that is associated with a single application or multiple applications, all NVIDIA settings for that one or multiple applications as you've set in that profile are remove.

If you have created another profile that contains any of these same applications, you may want to use that profile.

Driver Settings
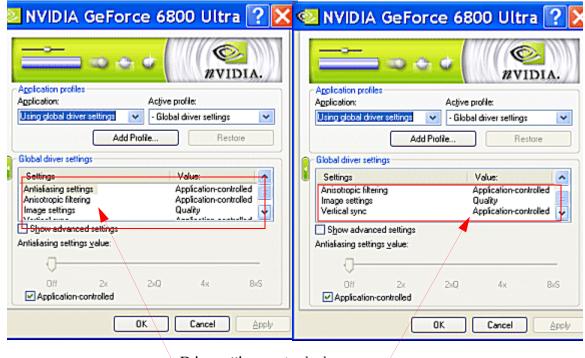
Antialiasing Settings

Antialiasing is a technique used to minimize the "stairstep" effect sometimes seen along the edges of 3D objects. Your selection can range from turning antialiasing completely off to selecting the maximum amount possible for a particular application. Use this slider to set the degree of antialiasing to be used in Direct3D and OpenGL applications.

Tips on setting antialiasing modes — Some antialiasing settings require a large amount of video memory. If the mode you requested requires more video memory than available and you see unexpected results, try selecting the next lower mode, and so on, until you achieve the desired result. You may also want to experiment with different screen resolutions, refresh rates, and/or color depths until you arrive at a setting or combination of settings for antialiasing to work.

- **Application-controlled**. To configure options with the slider, you must clear this check box and click **Apply**. If you select this check box, the configurable options are automatically disabled because your application determines the antialiasing settings. To configure options with the slider, you must clear this check box and click **Apply**.

Figure 7.10 NVIDIA Driver Settings (Standard)

Driver settings — standard

- **Off** disables antialiasing in 3D applications. Select this option if you require maximum performance in your applications.

- **2x** enables antialiasing using the 2x mode. This mode offers improved image quality and high performance in 3D applications.

- **4x** enables antialiasing using the 4x mode. This mode offers better image quality but can slightly reduce performance in 3D applications.

- **6xS** affects only Direct3D applications and enables antialiasing using the 6xS mode. This mode offers better image quality than the 4xS mode.

- **8x** enables antialiasing using the 8x mode. This mode offers better image quality than the 6xS mode for Direct3D applications and better image quality that the 4x mode for OpenGL applications.

- **16x** enables antialiasing using the 16x mode. This mode offers better image quality than the 8x mode.

Note: The following two SLI-specific antialiasing settings are available *only* if you enabled the **SLI Antialiasing** setting for the **SLI rendering mode** advanced driver setting as explained in "SLI Rendering Mode" on page 125.

- **SLI 8x**

- **SLI 16x**

Anisotropic Filtering

Anisotropic filtering is a technique used to improve the quality of textures applied to the surfaces of 3D objects when drawn at a sharp angle. Use the Anisotropic filtering slider to set the degree of anisotropic filtering for improved image quality. Enabling this option improves image quality at the expense of some performance.

- **Application-controlled.** If you select this check box, the configurable options are automatically disabled because your application determines the anisotropic filtering settings. To configure options with the slider, you must clear this check box and click Apply.

- **Off** disables anisotropic filtering.

- **1x** results in maximum application performance.

- **2x** through **8x** results in improved image quality but at some expense to application performance. Higher values yield better image quality while reducing performance.

Image Settings

Image Settings allow to have full control over the image quality in your applications. The Image Settings slider contains the following settings: High Performance, Performance, Quality, and High Quality.

- **High performance** offers the highest frame rate possible resulting in the best performance for your applications.

- **Performance** offers an optimal blend of image quality and performance. The result is optimal performance and good image quality for your applications.

- **Quality** is the default setting that results in optimal image quality for your applications.

- **High Quality** results in the best image quality for your applications. This setting is not necessary for average users who run game applications. It is designed for more advanced users to generate images that do not take advantage of the programming capability of the texture filtering hardware.

  Note: This **High Quality** setting is not necessary for average users who run game applications. It is designed for more advanced users to generate images that do not take advantage of the programming capability of the texture filtering hardware.

Table 7.1 contains a summary of all the Image Settings and the optimizations they enable. For further details, also see "Anisotropic Optimizations" on page 123 and "Trilinear Optimization" on page 122.

Table 7.1   Image Settings and Optimizations

Optimization	Image Settings		
	High Quality	**Quality**	**Performance/High Performance**
Trilinear Optimizations *enabled*	N/A (full trilinear)	Optimized trilinear	Highly optimized trilinear
Trilinear Optimizations *disabled*	N/A (full trilinear)	Full trilinear	Full trilinear
Anisotropic Optimizations** *enabled*	N/A (forced *off*)	Trilinear* with base texture	
Bilinear other textures	Bilinear all textures		
Anisotropic Optimization *disabled*	N/A (forced *off*)	Trilinear* all textures	Trilinear* all textures

* Trilinear functionality is subject to Trilinear optimization control.

** Anisotropic optimization *only affects* Direct3D applications.

Vertical Sync

Vertical Sync settings specify how vertical synchronization is handled in OpenGL applications.

- **Off** keeps vertical synchronization disabled unless an application specifically requests otherwise.

- **On** keeps vertical synchronization enabled unless an application specifically requests otherwise.

Driver Settings — Advanced

View Advanced Settings

When you select **Advanced settings** from the View list, additional advanced settings appear in the Global driver settings list. These settings, intended for advanced users, are shown in Figure 7.11 through Figure 7.15 and explained in this section.
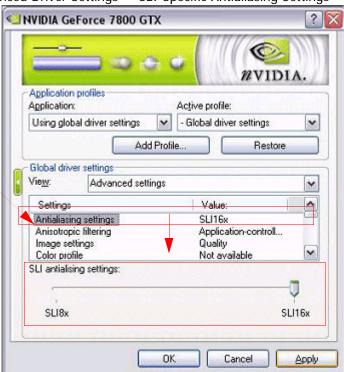
Note: Availability of the advanced settings described below may depend on the type of NVIDIA GPU that your graphics card is using and/or the type of graphics card you are using.

Antialiasing Settings (SLI-specific)

Figure 7.11 shows a sample screen with these settings. The following two SLI-specific "advanced" antialiasing settings are available *only* if you are running an SLI configuration *and* you enabled the **SLI Antialiasing** setting for the **SLI rendering**

Figure 7.11 NVIDIA Advanced Driver Settings — SLI-Specific Antialiasing Settings

NVIDIA Advanced Driver Settings
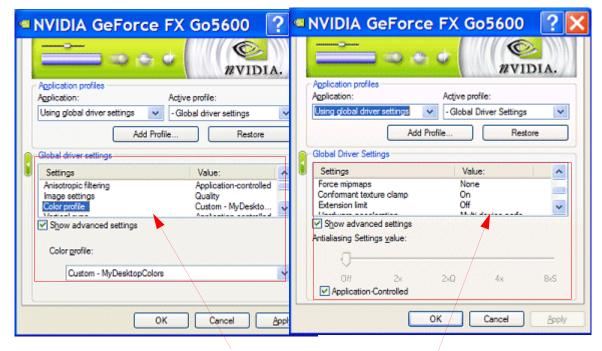
mode option as explained in "SLI Rendering Mode" on page 125.

- **SLI 8x**
- **SLI 16x**

Color Profile

Use the **Color profile** setting (Figure 7.12) to associate a color profile with the selected application profile.

Figure 7.12 NVIDIA Advanced Driver Settings — Examples

NVIDIA Advanced Driver Settings

1 Make sure you have created and saved at least one custom color profile from the Color Correction page. For details, see "Color Profile" on page 104 and "Other Settings" on page 104.

2 On the Performance & Quality page, select **View advanced settings** from the View list and click **Apply**.

3 Select **Color profile** from the driver settings list (Figure 7.12).

4 If you completed step 1, you will see the **Color profile** list box at the bottom of the page (Figure 7.12).

5 Click the list and select a color profile, then click **Apply**.

Force Mipmaps

Enabling this option enables mipmaps on applications that do not support mipmaps.

1 Make sure the **View advanced settings** option is selected from the View list.

2 Select **Force mipmaps** from the driver settings list.

3 Use the slider to set one of these values:

- **None** means do not force mipmaps on application that do not support mipmaps.
- **Bilinear** results in better image quality with better performance.
- **Trilinear** results in good image quality with lower performance.

Conformant Texture Clamp

"Texture clamping" refers to how texture coordinates are handled when they fall outside the body of the texture. Texture coordinates can be clamped to the edge or within the image.

1 Make sure the **View advanced settings** option is selected from the View list.

2 Select **Conformant texture clamp** from the driver settings list.

The available slider settings are **On** and **Off**.

Extension Limit

Note: You cannot change this setting.

By default, the driver extension string has been trimmed for compatibility with the application.

Hardware Acceleration

Hardware acceleration settings determine advanced rendering options when using multiple displays and/or graphics cards based on different classes of NVIDIA GPUs.

1 Make sure the **View advanced settings** option is selected from the View list.

2 Select **Hardware acceleration** from the driver settings list.

The available slider settings are shown in Figure 7.13 and explained.

Note: Multi-display hardware acceleration options do not apply when using nView Multiview mode in Windows NT 4.0.

- **Single-display mode**: If you have only one active display, this is the default setting. You can also specify this setting if you have problems with the multi-device modes.

- **nView Clone/Span mode** is the default setting when your nView display mode is set to nView Clone mode *or* one of the nView Span modes. If multiple NVIDIA-GPU based graphics cards in your system are in use with active displays, this setting is replaced by one of the "multi-display" modes described below.

Figure 7.13 NVIDIA Advanced Driver Settings — Hardware Acceleration

- **Multi-display compatibility mode** is available if you have two or more active displays when running in nView Dualview display mode or if you are using different classes of NVIDIA GPU-based graphics cards.

    Note: When this mode is in effect, OpenGL renders in "compatibility" mode for all displays. In this mode, when different classes of GPUs are in use, the lowest common feature set of all active GPUs is exposed to OpenGL applications. The OpenGL rendering performance is slightly slower than in single-display mode.

- **Multi-display performance mode** is available if you have two or more active displays when running in nView Dualview mode or if you are using different classes of NVIDIA GPU-based cards.

    Note: When this mode is in effect, OpenGL renders in "performance" mode for all displays. As in "compatibility" mode, when different classes of GPUs are in use, the lowest common feature set of all active GPUs is exposed to OpenGL applications. However, the rendering performance is "faster" than in compatibility mode, although switching or spanning displays may result in minor transient rendering artifacts.

Trilinear Optimization

This option enable you to have full control over trilinear optimizations in Direct3D and OpenGL applications.

1 Make sure the **View advanced settings** option is selected from the View list.

2 Select **Trilinear optimization** from the driver settings list. The available slider settings are **On** and **Off** as shown in Figure 7.14.

- **On** allows better texture filtering performance with no perceived loss of image quality. You can view the areas of the image that are affected by the trilinear optimization by enabling textures that contain colored mipmap chains that are used in typical diagnostic applications. Also see Table 7.1, "Image Settings and Optimizations" on page 117.

- **Off** disables trilinear optimizations and will result in the best image quality.
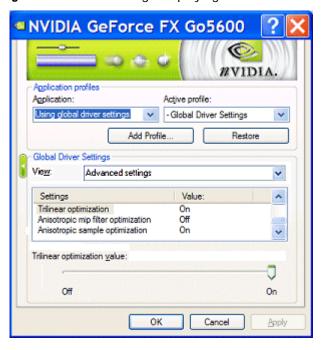
Figure 7.14 Driver Settings Displaying Trilinear & Anisotropic Optimizations

Anisotropic Optimizations

Note: In the current Release 80 driver, you have full control over anisotropic optimizations in Direct3D applications. However, note that *anisotropic optimizations are not implemented for OpenGL applications*. Therefore, if you have set Anisotropic Optimization to **On,** the resulting effect will be **Off** when running OpenGL applications.

Anisotropic Mip Filter Optimization

This option enables the NVIDIA display driver to substitute point-mipmap filtering for linear-mipmap filtering on all but the primary texture stage.

1 Make sure the **View advanced settings** option is selected from the View list.

2 Select **Anisotropic mip filter optimization** from the Global driver settings list. The available slider settings are On and Off.

- **On** forces the use of point-mipmap filtering on all but the primary texture stage. This improves performance but at some cost to image quality.

- **Off** disables anisotropic mip filter optimization for best image quality.

Anisotropic Sample Optimization

This option enables a variety of sample-related optimizations on all but the primary texture stage, thus improving performance but with a small impact on image quality.

1 Make sure the **View advanced settings** option is selected from the View list.

2 Select Anisotropic sample optimization from the Global driver settings list. The available slider settings are On and Off.

- **On** enables the use of anisotropic sample optimization for better performance.
- **Off** disables the use of anisotropic sample optimization for best image quality.

Gamma Correct Antialiasing

Note: This setting is available on newer NVIDIA GPUs, such as the GeForce 7800 GTX.

- **On** enables gamma correct antialiasing, which results in a better color calculation to help reduce jaggies and maintain the highest level of color reproduction of 3D images.
- **Off** disables gamma correct antialiasing.

Transparency Antialiasing

Note: This setting is available on newer NVIDIA GPUs, such as the GeForce 7800 GTX.
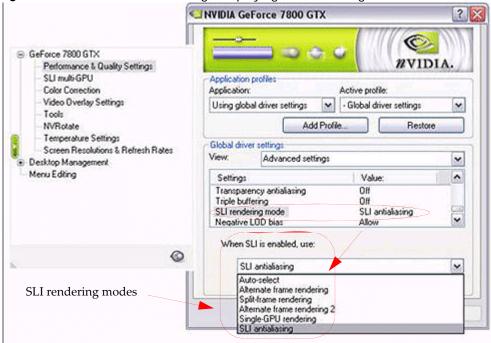
Transparency antialiasing, an advanced feature, is a technique used to minimize the visible aliasing on the edges of images with transparent textures. This improvement in 3D image quality is most noticeable in objects such as vegetation, chain-link fences, and similar objects.

To enable this feature, use the **Multisampling** setting for superior application performance or the **Supersampling** setting for superior image quality.

SLI Rendering Mode

Note: SLI rendering mode settings are available only if you are running in an SLI multi-GPU configuration (Figure 7.15).

Figure 7.15 Advanced Driver Settings Displaying SLI Rendering Modes

- In **Auto-select** mode, the NVIDIA driver automatically selects the multi-GPU rendering mode to use.

- In **Alternate frame rendering (AFR)** mode, consecutive frames are rendered by two separate groups of GPUs. Each group processes alternating frames and operates on each frame as in split-frame rendering mode.

- **Alternate frame rendering 2**, which is another version of the AFR mode, may provide better performance than using the regular AFR mode in certain applications

- In **Split-frame rendering** mode, each frame is divided into horizontal strips, with each GPU responsible for rendering one strip. Line(s) between horizontal strips *are not visible* for the user.

- Select **SLI antialiasing** if you want to enable additional SLI-specific "advanced" antialiasing settings (SLI 8x and SLI 16x) — see "Antialiasing Settings" on page 114.

- Select **Single GPU rendering** if, for example, you prefer not to use multi-GPU rendering for a specific application. The NVIDIA driver selects the GPU to use for single-GPU rendering.

Note: This is not the same as completely disabling SLI. If you are trying to solve a compatibility issue, you may want to completely disable SLI by clearing the Enable SLI multi-GPU check box on the SLI page. You will then have to restart your computer.

About Using Other SLI-based Advanced Settings

For additional information on SLI and configuring advanced SLI settings, go to the following Web address: `http://www.slizone.com/page/slizone_appprofile.html`

Negative LOD bias

To access the **Negative LOD bias** option, make sure the **View advanced settings** option is selected from the View list.

Applications sometimes use negative LOD bias to sharpen texture filtering, which sharpens the stationary image but introduces aliasing when the scene is in motion.

Anisotropic filtering provides texture sharpening without unwanted aliasing, so it is desirable to clamp LOD bias (move the **Negative LOD bias status** slider to the **Clamp** setting) when anisotropic filtering is enabled for better image quality.

The *default* setting is **Allow**.

Triple Buffering

Note: Triple buffering is not available in an SLI configuration.

- *On* — Enables triple buffering to improve the frame rate when the Vertical Sync setting is *on* and the frame rate is less than the vertical sync value.

  For example, under a 72 Hz refresh rate setting, an application that runs at 61 fps (frames per second) with Vertical Sync *off* will run at 36 fps with Vertical Sync *on* under double buffering but will run at 54 fps under triple buffering.

- *Off* — disables triple buffering.

Using Video Overlay Settings

Use the Video Overlay settings to adjust the quality of video or DVD playback on your display.

Note that these settings affect videos that are created using the hardware overlay, but have no effect on videos created using software overlays, or a "blit" process such as VMR.

Note: If any settings changes you make have no effect on the video overlay after you click **Apply**, close the video overlay and then re-open it.

Accessing the Video Overlay Settings Page

1 First, open the DVD or video application that you want to view.

2 Click **Video Overlay Settings** from the NVIDIA display menu to open the associated page (Figure 7.16). If you need help in accessing the NVIDIA display menu, see "Accessing the NVIDIA Display Control Panel Pages" on page 29

Figure 7.16   Video Overlay Settings — Windows XP/2000

Overlay Zoom Controls

Zoom Control

Zoom control lets you zoom into the rendered video. Use the drop-down menu to select the display type to zoom and use the quadrant selection to select the screen region to zoom.

- **Video Overlay** sets the zoom selection to the display on which the overlay video is rendered.

- **Both** applies the zoom selection to both the device on which the overlay video is rendered *and* the full screen display you selected for the video mirror feature (see "Using Full Screen Video Settings" on page 129).

  Note: Video players that cannot detect the presence of Video Mirror may not update the zoom factor immediately while displaying a still frame.

Out/In

The Out/In slider lets you zoom in on or out of the selected portion of the video playback screen.

Screen Region to Zoom

Select the area of the video screen on which you would like to zoom by clicking the area. You can then zoom to that portion of the screen by moving the **Out/In** slider control, below.

Overlay Color Controls

Hue and Saturation

You can independently control the hue and saturation to achieve optimal image quality when playing back videos or DVD movies on your computer.

Adjust Colors

See "Adjusting Desktop Colors" on page 100.

Restore Defaults
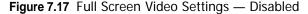
Click **Restore Defaults** to restore all color values to the hardware factory settings.

Using Full Screen Video Settings

Note: If you have only one display connected to your computer and active, you will not see the Full Screen Video menu option on the NVIDIA display menu. However, you will have access to the Video Overlay Settings menu option.

Note: You can now use the NVIDIA display selection shortcut feature to play video files on any selected display. For details, see "Shortcut to Playing Video Files on Any Display" on page 31.

Use the Full Screen Video settings page (Figure 7.17) to adjust the quality of video or DVD playback on your display(s). Note that the settings on the Full Screen Video page affect videos that are created using the hardware overlay. These settings have no effect on videos created using software overlays, or a "blit" process such as VMR.

Figure 7.17 Full Screen Video Settings — Disabled

Note: If any settings changes you make do not take effect (e.g., the controls have no effect on the video) after you click **Apply**, close the video overlay application and then re-open it.

About the Full Screen Video Mirror Feature

The full screen "video mirror" feature allows a video or DVD application to mirror its playback in full-screen mode on any one of the connected displays.

Note: The full screen "video mirror" feature is

- Not available under Windows NT 4.0.

- Supported by any NVIDIA GPU-based *multi-display* graphics card.

Accessing the Full Screen Video Page

1 First, make sure you have at least two displays connected to your computer. If you have only one display connected, you will not see the Full Screen Video menu option on the NVIDIA display menu.

2 On the nView Display Settings page, set nView mode to a multi-display mode, such as **Clone** or **Dualview**.

3 Open the DVD or video application and click **Full Screen Video** from the NVIDIA display menu.

If you need help in accessing the NVIDIA display menu, see "Accessing the NVIDIA Display Control Panel Pages" on page 29.

Figure 7.17 and Figure 7.18 show Full Screen Video settings pages.

Full-Screen Video Settings

Full Screen Device

Select the display on which you want video to be played back in full-screen mode.
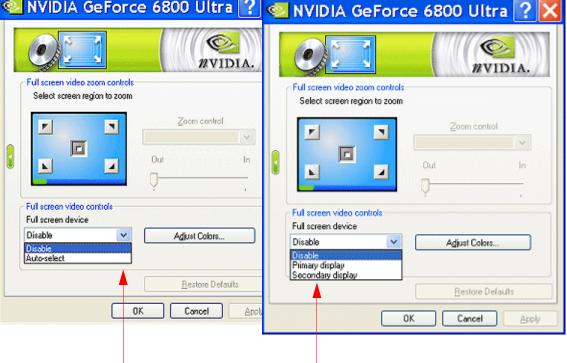
Note: After selecting any of these Full Screen Device settings, you may need to exit and restart your video application for the settings to take effect.

- **Disable** (Figure 7.17) disables Video Mirror (including the Full screen video zoom controls).

- **Primary display/Secondary display** settings (Figure 7.18) are *only* available under **nView Clone modes**.

To enable Full-Screen Device functionality in nView Clone mode, click either **Primary display** or **Secondary display** as the full screen device.

- **Auto-select** (Figure 7.18) is *only* available under **nView Dualview and Span modes**. Auto-select enables full-screen device functionality, which creates the full-screen mirror on the display on which there is no overlay. This implies that if the video being played is dragged to the other display, the full-screen mirror image will automatically switch displays.

Figure 7.18 Full Screen Video — Settings for nView Dualview/Span and Clone Modes

Auto-select option is available in **nView Dualview** and **Span** modes.

Primary display and **Secondary display** options are available in **nView Clone mode**.

Track Overlay Rotation

Select the **Track overlay rotation** check box (Figure 7.19) to link the degree of rotation you specify on the NVRotate page (*see* "Using NVRotate Settings" on page 139*)* for a video overlay between the primary and secondary displays.

Figure 7.19 Full Screen Video — Zoom Control Video Mirror Settings

Zoom controls apply to the display being used for the "**video mirror**" feature.

Select the **Track overly rotation** check box to link the degree of rotation you specified on the NVRotate page for the video overlay on the primary display to the secondary display.

Adjust Colors

See "Adjusting Desktop Colors" on page 100.

Full Screen Video Zoom Controls

Zoom Control

Zoom Control lets you zoom into the rendered video. Click the list to select the display type to zoom and use the quadrant selection to select the screen region to zoom.

• **Video Mirror** (Figure 7.19) sets the zoom selection to the secondary display on which the video mirror is rendered.

- **Both** applies the zoom selection to the both the primary and the secondary display on which the video is rendered. (See "Using Video Overlay Settings" on page 127.)

Note: Video players that cannot detect the presence of Video Mirror may not update the zoom factor immediately while displaying a still frame.

Out/In

The Out/In slider lets you zoom in on or out of the selected portion of the video playback screen.

Screen Region to Zoom

Select the area of the video screen on which you would like to zoom by clicking the area. You can then zoom to that portion of the screen by moving the **Out/In** slider control, below.

- **Out/In** slider lets you zoom in on or out of the selected portion of the video playback screen.
- **Restore Defaults** restores all color values to the hardware factory settings.

Troubleshooting Full Screen Video Problems

- If any settings changes you make do not take effect (e.g., the controls have no effect on the video) after you click **Apply**, close the video overlay application and then re-open it.
- Some applications have their own overlay color control settings. If you run one of these applications and try to use the NVIDIA color settings, both the application's color settings and the NVIDIA color settings can change the overlay attributes. This can result in an inaccurate indication of the overlay settings, or unexpected overlay settings for an overlay application. To prevent this problem, use the overlay application's color settings.

Using the Tools Page

To access the Tools page, click **Tools** from the NVIDIA display menu. If you need help in accessing the NVIDIA display menu, see "Accessing the NVIDIA Display Control Panel Pages" on page 29. Figure 7.20 shows the Tools page.

Figure 7.20 Tools Settings

Select the "**Enable taskbar icon**" check box to add a menu of NVIDIA configurable settings to your Windows taskbar notification area.

Adding the NVIDIA Settings Menu to the Windows Taskbar

The **Enable taskbar icon** check box is selected, by default, on the Tools page (Figure 7.20). When this option is selected, the NVIDIA Settings menu icon is added to the Windows taskbar notification areas, as shown in Figure 7.21.

Figure 7.21 NVIDIA Settings Menu Icon Displayed in the Windows Taskbar
Notification Area

NVIDIA Settings menu icon

Windows taskbar notification area

You can click this icon to display and use the NVIDIA Settings menu to apply any of
the NVIDIA graphics driver settings (which are normally configurable from the
NVIDIA display menu) *on the fly*. This menu also contains options for restoring
default settings and accessing the Windows Display Properties page.

You can access the following settings using the NVIDIA Settings menu icon.

- **Screen Resolution**
- **Screen Refresh Rate**
- **Color Quality**
- **nView Display Settings**
- **Performance and Quality Settings**
- **Custom Color Settings**
- **Rotation Settings**
- **Desktop Color Settings**
- **nView Desktop Manager**
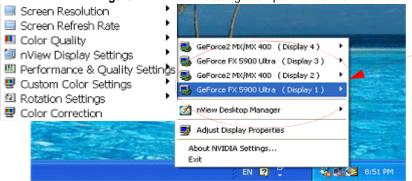
Figure 7.22 and Figure 7.23 show sample NVIDIA Settings menus.

Display Optimization Wizard

Run the **Display Optimization Wizard** to adjust your displays for optimal viewing
and representation of colors.
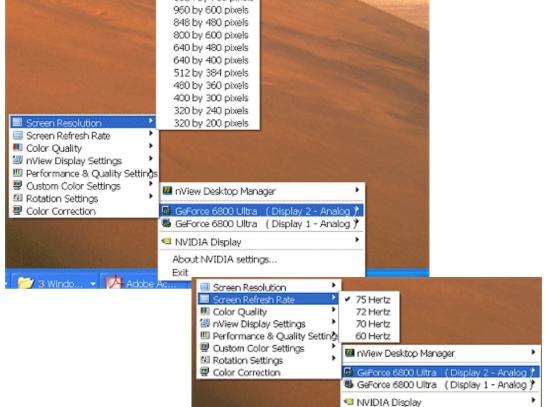
Note: *Displays in nView Clone mode cannot be optimized*. If you would like to optimize
these displays, change the display mode to another nView mode and then restart the
wizard.

Figure 7.22 NVIDIA Settings Sample Menus with Four Connected Graphics Cards

NVIDIA Settings menu showing four graphics cares are connected. You can select each to access and configure its display settings.

Figure 7.23 NVIDIA Settings Menus — Another Example

Adding NVIDIA Menu Options to the Windows Desktop Menu

When the **Enable desktop context menu** check box is selected (the *default* condition) (Figure 7.24), your connected displays appear as choices on your Windows desktop menu.

1 To access the desktop menu, right click on your desktop.

2 Select **NVIDIA Display** and one of your connected displays from the list that appears (Figure 7.24).

   You can select any of these displays to directly access the NVIDIA display properties control panel.

3 To remove the **NVIDIA Display** choices from your desktop menu, clear the check box and click **Apply** (Figure 7.24).

Forcing Detection of Connected Television
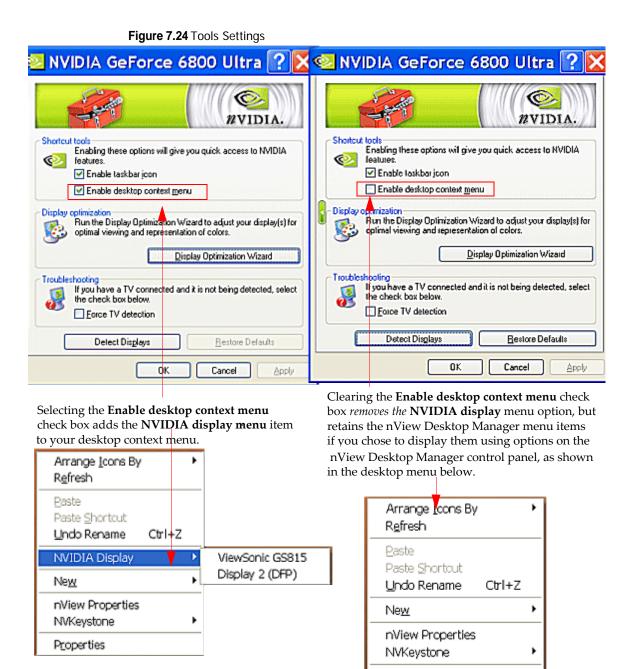
Selecting the **Force TV detection** check box can be useful in situations where the particular television model that is connected to your graphics card does not properly load the signals that allow the graphics card to detect its presence. As a result, you are not able to see the television as a display on the nView Display Settings page.

1 Select the **Force TV detection** check box and click **Apply**.

2 Restart your computer when prompted.

Once you log back in, you can view your connected television as a display on the nView Display Settings page, access the various TV formats, and configure the TV adjustment options. For details, see "Adjusting Television Settings" on page 75.

Detecting Displays

Click **Detect Displays** to detect all displays connected to your graphics card. Use this feature if you have plugged in any displays after opening the NVIDIA display control panel.

Figure 7.24 Tools Settings

Selecting the **Enable desktop context menu** check box adds the **NVIDIA display menu** item to your desktop context menu.

Clearing the **Enable desktop context menu** check box *removes the* **NVIDIA display** menu option, but retains the nView Desktop Manager menu items if you chose to display them using options on the nView Desktop Manager control panel, as shown in the desktop menu below.

Using NVRotate Settings

The NVRotate settings (Figure 7.25) let you view your Windows desktop in **Landscape** or **Portrait** mode. You can rotate your desktop by 90, 180, or 270 degrees.

Note: NVRotate is supported on GeForce2 MX and later series of NVIDIA GPUs.
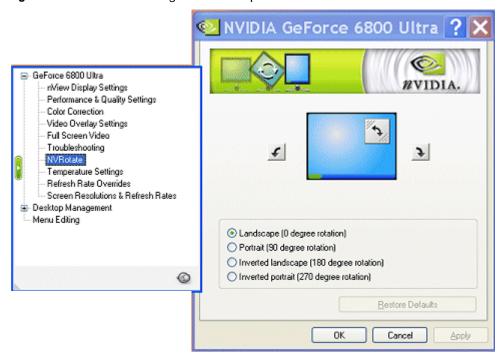
Note: If you are using the Video Mirror feature, you can also use the NVRotate feature to rotate the overlay video. If you want to apply the specified rotation to both the primary and secondary displays, use the **Track overlay rotate** setting on the **Full Screen Video** page. For details, see "Using Full Screen Video Settings" on page 129.

Accessing the NVRotate Page

To access the NVRotate page, click **NVRotate** from the NVIDIA display menu.

Figure 7.25 through Figure 7.27 show the NVRotate settings.

Figure 7.25 NVRotate Settings — Landscape Mode

Before You Use NVRotate Settings

- Rotation requires an additional video buffer equal to the settings for the rotated device. For systems with limited video memory, this can restrict the modes for which rotation can be supported.

- In nView **Clone** mode, both displays are rotated.

- In Dualview mode, either of the displays can be rotated provided there is enough memory to perform the rotation operation.

- Only 3D games and applications that include support for rotation will work in rotated modes.

- Because rotated modes consume additional system and graphics resources, you might experience slower video performance and poorer graphics quality under the following conditions:

  - You are using slower GPUs, such as those in the NVIDIA GeForce2 or older series.

  - Other demands are placed on the NVIDIA graphics driver, such as moving the application window across the desktop.

Enabling NVRotate Settings

The following desktop rotations options are available:

- **Landscape** is the "default" mode (Figure 7.25).
- **Inverted Landscape** results in a 270 degree rotation (Figure 7.26).
- **Portrait** results in a 90 degree rotation (Figure 7.27).
- **Inverted Portrait** results in a 180 degree rotation (Figure 7.27).
- **Restore Default** results in the default "Landscape" mode (Figure 7.25).

1 As shown in Figure 7.26, to perform the desktop rotation, you can click one of the three arrow buttons on the NVRotate page *or* you can click the semi-circular arrow on the top right of the screen image and drag it in the direction of the rotation.

2 Click **OK** after selecting an option for the rotation change to take effect.

Figure 7.26 NVRotate Settings — Inverted Landscape Mode

To rotate your desktop, click one of these **arrow buttons**.

or

Select one of these **options**.
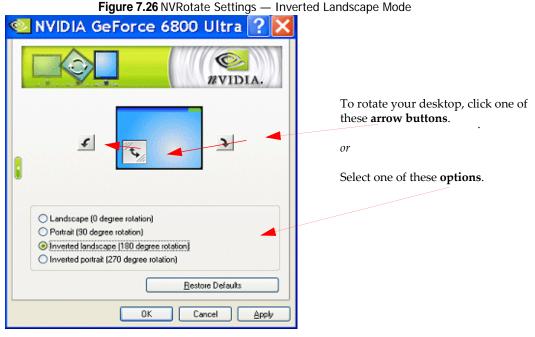
Figure 7.27 NVRotate Settings — Portrait & Inverted Portrait Mode

Adjusting Temperature Settings
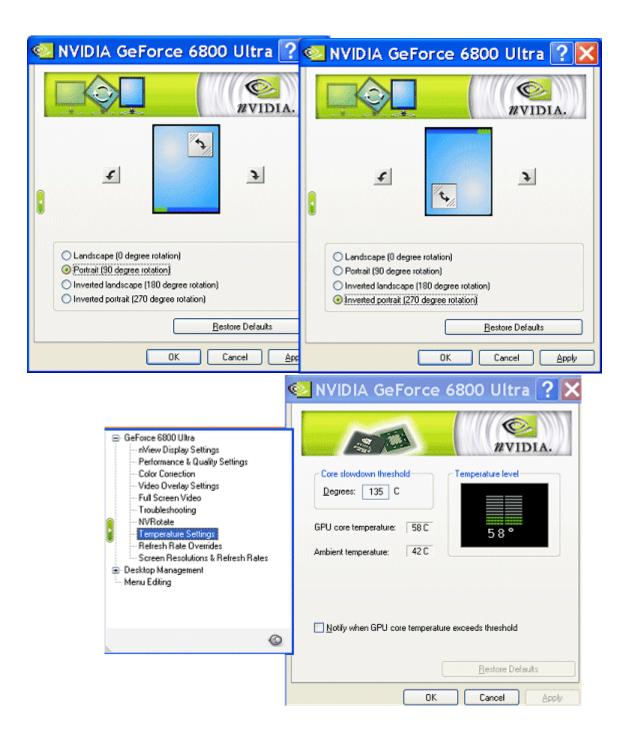
Note: The Temperature Settings page is available with GeForce FX and newer NVIDIA GPUs *and* on certain older NVIDIA GPUs only if the option has been enabled on your computer.

Temperature settings let you adjust the temperature of the selected NVIDIA GPU on your computer.:

Accessing the Temperature Settings Page

To access the Temperature Settings page, click **Temperature Settings** from the NVIDIA display menu.

Figure 7.28 Temperature Settings

Temperature Settings

Temperature Level (GPU Core Temperature)

Displays the current temperature of the selected NVIDIA GPU in your system.

Core Slowdown Threshold

Enter the value at which you want the NVIDIA GPU to slow itself down to prevent overheating.

When this value matches the **GPU core temperature** value, a dialog box automatically appears warning of the condition and the actions that have been taken to prevent possible overheating and damage to any particular GPU(s) in your system.

Note: The recommended value for this setting is the default that is preset. Any changes to this value should be made with extreme caution.

Ambient Temperature

Ambient temperature is the current temperature of the area surrounding the selected NVIDIA GPU in your system. This temperature varies greatly, depending on other heat sources located near the GPU.

Enable Heat Indicator Warning When Threshold Exceeded

When the value of the NVIDIA **GPU core temperature** matches the **Core slowdown threshold** value, the Heat Indicator dialog box automatically appears describing the situation and the actions that have been taken to prevent possible damage to any particular GPU(s) in your system.

Changing Screen Resolutions and Refresh Rates

The Screen Resolution & Refresh Rates page (Figure 7.29) lets you configure screen resolution, color quality, and screen refresh rates for each of your connected displays.

To access the Screen Resolutions & Refresh Rates page, click **Screen Resolutions & Refresh Rates** from the NVIDIA display menu. If you need help in accessing the NVIDIA display menu, see "Accessing the NVIDIA Display Control Panel Pages" on page 29.

Figure 7.29 Screen Resolution & Refresh Rates Page

Screen Resolution and Color Quality

- **Screen Resolution** lets you display available screen resolution settings for the display. Move the slider to select a different screen resolution.
- **Color quality** lets you displays available color settings for the currently selected screen resolution of the display. Use the slider to select a different color setting.

Monitor Settings

- **Screen refresh rate** displays available refresh rates for the currently selected screen resolution of the display. Click the list to select a different refresh rate.

- **Show only physical panning resolutions**. Check this box to allow modes smaller than traditional Windows desktop modes to be set on the selected display. This can cause the visible area of the display to possibly appear zoomed or to pan around the desktop, depending on the capabilities of the display.

- **Hide modes that this monitor cannot support** specifies whether to include modes that are not supported by your display.

  CAUTION: Choosing a mode that is inappropriate for your display may cause severe display problems and could damage your hardware.

Adding Custom Screen Resolutions & Refresh Rates

1 Click **Add** to display the dialog box shown in Figure 7.30.

Figure 7.30 Add Custom Resolution Dialog Box.

2 Enter the pixel settings for the resolution you want to add in the **Width** and **Height** fields.

3 Click **Add**.

4 When the confirmation message appears, click **OK**.

5 Click **OK** to return to the Screen Resolution & Refresh Rates page.

6 To enable these custom resolutions, see the next section "Enabling Custom Screen Resolutions" on page 146.

Enabling Custom Screen Resolutions

After you have added one or more custom screen resolutions, follow these steps to enable these resolutions.

1 Select the **Only show custom modes** check box to access those screen resolutions & refresh rates that you have added using the **Add** button.

Note: Custom resolutions that you can select are limited to resolutions divisible by the number "8".

2 Click **Apply**.

3 Move the **Screen resolution** slider to a custom resolution you added.

4 Click **Apply**.

The screen may go blank for a few seconds for the new setting to take effect.

Removing Custom Screen Resolutions & Refresh Rates

1 Once you have added one or more custom screen resolutions and refresh rates, follow the remaining steps to delete any of them:

2 From the Screen Resolution & Refresh Rates page, make sure the **Only show custom modes** check box is selected.

3 Move the **Screen resolution** slider to a custom resolution that you want to delete.

4 Click the **Remove** button to delete that resolution.

5 Repeat steps 3 and 4 for additional resolutions you want to remove.

Advanced Timing

The Advanced Timing page enables you to adjust timings for your NVIDIA GPU-based graphics card in order to support a variety of different display timings for ultimate flexibility for analog CRT and DVI connections.

Note: The **Advanced Timing** button is not available for certain NVIDIA GPU-based graphics cards with a DVI connector in use. DVI timing adjustment is supported for NV3*x*-based graphics cards only if they have an external TMDS, such as the SiliconImage 164. If the graphics card uses the internal TMDS, then the Advanced Timing button is not available. However, graphics cards that use the internal TMDS can support refresh rates below 60 Hz using the current NVIDIA Release 60 driver.

Note: To use the **Advanced Timing** page, you must be an *advanced user* and familiar with the concepts of display timing standards and parameters. If you are not familiar, it is recommended that you do not use the Advanced Timing page. For additional details, refer to the following documents that explain display timing standards

>> *VESA and Industry Standards and Guidelines for Computer Display Monitor Timing (DMT)* published by the Video Electronics Standards Association (VESA)

>> *Coordinated Video Timing Standard* published by VESA

>> *EIA Standard: A DTV Profile for Uncompressed High Speed Digital Interfaces* published by the Electronic Industries Alliance

1 Click the **Advanced Timing** button to open the Advanced Timing configuration page (Figure 7.31) where you can select display timing standards and custom parameters.

If an Agreement page appears, scroll down and then click the **I Agree button** to accept the agreement and open the Advanced Timing page.

Display Mode & Timing Parameters

Click the **Mode & timing** list if you want to select a "custom" timing value *or* an "EIA-861B" timing. These settings are explained below.

Note: If you rather use "standard" timings (such as DMT, GTF, CVT, and EDID), see "Display Timing Standards" on page 151 in the next section.

• **Custom values** — If you are an advanced user and would prefer to enter custom timing values in the fields provided on the Advanced Timing page, follow these steps:

   1 Select **Custom values** from the Mode & timing list and click **Apply**.

   2 Enter the values you want in the various fields as described in Table 7.1

   3 When the confirmation prompt appears, click **Yes**. Your custom settings are now in effect.

   4 To remove the custom settings you selected, click **Remove**.
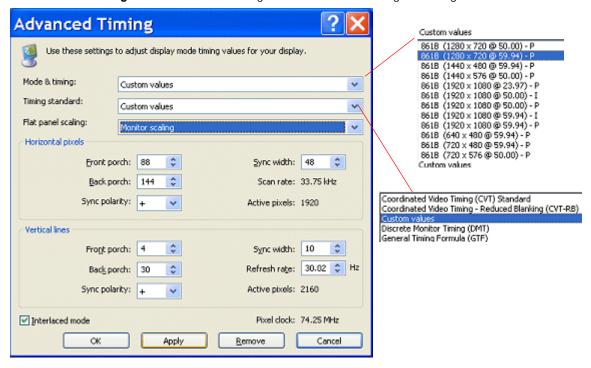
Figure 7.31 Advanced Timing — Custom Modes/Timings & Timing Standards

Table 7.2 Advanced Timing Parameters

Advanced Timing Parameter	Description
The **Horizontal pixel** group box contains horizontal advanced timing settings.	
Sync width	Click the list to specify the width of the horizontal blanking period during which the synchronization pulse triggers horizontal re-scanning.
Front porch	Click the up or down arrow to specify the horizontal blanking period that occurs between the end of the active period and the beginning of the synchronization pulse.
Back porch	Click the up or down arrow to specify the blanking period that occurs between the end of the synchronization pulse and the next active period.

Table 7.2   Advanced Timing Parameters (continued)

Advanced Timing Parameter	Description
Horizontal sync polarity	Click the up or down arrow to specify the direction of rapid, transient change in the amplitude of a signal from the baseline during the horizontal synchronization pulse. If the horizontal synchronization polarity is positive (+), the value of the horizontal synchronization pulse is higher than the baseline value. If the horizontal synchronization polarity is negative (-), the value of the horizontal synchronization pulse is lower than the baseline value. **Note:** You can select the horizontal synchronization polarity independently of the vertical synchronization polarity.
Scan rate	Scan rate indicates the measure of how many scan lines a monitor can display in one second, expressed in kHz (generally somewhere between 20 and 180 kHz). **Note:** In the case of an analog display (CRT) it is limited by the speed at which the display can move the electron beam horizontally across the screen and then return it to the beginning of the next line. **Note:** This value should not exceed the display's maximum horizontal scan frequency.
Active pixels	Indicates the number of all visible pixels in one horizontal line.
The **Vertical lines** group box contains vertical advanced timing settings.	
Sync width	Click the up or down arrow to specify the blanking period during which the synchronization pulse is active.
Front porch	Click the up or down arrow to specify the vertical blanking period that occurs between the end of the active period and the beginning of the synchronization pulse.
Back porch	Click the up or down arrow to specify the blanking period that occurs between the end of the synchronization pulse and the next active period.
Vertical sync polarity	Click the up or down arrow to specify the direction of rapid, transient change in the amplitude of a signal from a baseline during the vertical synchronization pulse. If the vertical synchronization polarity value is positive (+), the value of the vertical synchronization pulse is higher than the baseline value. If the vertical synchronization polarity value is negative (-), the value of the vertical synchronization pulse is lower than the baseline value. **Note:** You can select the vertical synchronization polarity independently of the horizontal synchronization polarity.
Refresh rate	Refresh rate refers to the frequency at which the entire screen is refreshed. Specifically, refresh rate indicates how many times per second the electron beam in the picture tube is moved from top to bottom in the case of a CRT (analog display). **Note:** This frequency is limited by the display's maximum horizontal scan rate and the current resolution, as higher resolution implies more scan lines. **Note:** The value should not exceed the display's maximum vertical scanning frequency. Specify the frequency at which your entire screen is refreshed, or retraced, to prevent the image from flickering.
Active pixels	Indicates the number of all visible pixels in one vertical line.

Table 7.2   Advanced Timing Parameters (continued)

Advanced Timing Parameter	Description
Interlaced mode	Interlaced mode refers to interlaced scanning, which is a method of sending the image to your display where even scan lines are drawn during the first field in a frame and odd scan lines are drawn during the second field in the frame. Unlike the progressive scanning method, where all the scan lines are updated in each frame, interlaced scanning results in a higher frame rate but usually causes image flicker.
Pixel clock	Pixel clock indicates how many millions of pixels are output per second. In other words, this is the frequency at which the display receives pixels from the graphics card. The value typically lies within a range 10 to 360 MHz, or the DAC maximum value.

- **EIA-861B** timing parameters, such as `861B (1920 x 1080 @ 59.94) -I` and `861B (1920 x 1080 @ 59.94) -P`

  Note: EIA (Electronic Industries Alliance) 861B timings refers to a CEA/EIA standard that consists of display timing and formats that allow the graphics card to connect to Consumer Digital Televisions over a DVI connection and configure itself for the optimum settings of that display.

  - `861B` refers to an EIA/CEA standard and would apply to certain 861 High Definition television **(HDTV)** displays.

  - `-P` means "progressive scanning," which is a method of sending an image to your display where all the scan lines are updated in each frame --- in other words, all of the scan lines are displayed sequentially. This method, used in modern computer displays, generally reduces flicker in the displayed image and results in smoother motion for videos.

  - `-I` means "interlaced scanning," which is another method of sending the image to your display where even scan lines are drawn during the first field in a frame and odd scan lines are drawn during the second field in the frame. Another way to explain this method is that two passes are used to paint an image on the screen. On the first pass, every other line is painted and on the second pass, the rest of the lines are painted.

    Unlike the "progressive scanning" method, where all the scan lines are updated in each frame, interlaced scanning results in a higher frame rate but usually causes image flicker.

Display Timing Standards

Note: If you want to use "standard" timings (such as DMT, GTF, CVT, and EDID) instead of "custom" or EIA-861B timing parameters from the Mode & timing list discussed in the previous section "Display Mode & Timing Parameters" on page 147, follow these steps:

1 Click the **Timing standard** list and select one of the display timing standards described in Table 7.3.

2 Click **Apply**.

Table 7.3   Display Timing Standards

Display Timing Standard	Description
General Timing Formula (GTF)	GTF is an older but widely used timing standard. However, newer display are switching to the CVT standard.
Discrete Monitor Timings (DMT)	DMT is a set of pre-defined VESA timings. VESA updates this standard every year. If DMT timing is available for a specific mode, the NVIDIA display driver normally selects it instead of GTF.
Coordinated Video Timings (CVT)	CVT became the VESA standard on March 2003. CVT supports higher resolutions better than other timing standards.
Coordinated Video Timings-Reduced Blanking (CVT-RB)	CVT-RB improves on the CVT standard. CVT-RB offers reduced horizontal and vertical blanking periods and allows a lower pixel clock rate and higher frame rates.
EDID Timing	EDID timing is the preferred timing standard defined by the display's EDID value. EDID is a standard data structure that defines the display's model number, timing, and other settings. **Note:** Manufacturer-defined EDIDs are available only on Plug-and-Play (PnP)-compatible displays.

Editing the NVIDIA Display Menu

Use the **Menu Editing** page to remove infrequently used NVIDIA menu items, which you can restore later.

Accessing the Menu Editing Page
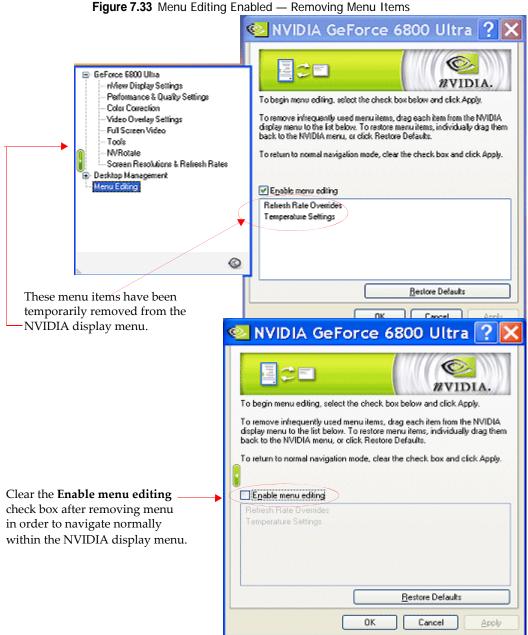
To access the Menu Editing page, click **Menu Editing** from the NVIDIA display menu (Figure 7.32).

If you need help in accessing the NVIDIA display menu, see "Accessing the NVIDIA Display Control Panel Pages" on page 29.

Figure 7.32 Menu Editing Page — Default Settings

Using Menu Editing

1 Select the **Enable menu editing** check box (Figure 7.33).

2 Remove infrequently used screens by dragging them from the NVIDIA display menu to the list box shown below the check box.

Figure 7.33 shows the **Refresh Rate Overrides** and **Temperature Settings** pages temporarily removed from the NVIDIA display menu.

3 To return to normal NVIDIA menu navigation, clear the **Enable menu editing** check box (Figure 7.33).

4 To restore the menu options back to the NVIDIA display menu, you can simply click **Restore Defaults** or if you want to remove each item manually, follow these steps:

a Select the **Enable menu editing** check box to insert the check mark.

b Drag the menu items that you want to restore back to the menu.

Figure 7.33 Menu Editing Enabled — Removing Menu Items

These menu items have been temporarily removed from the NVIDIA display menu.

Clear the **Enable menu editing** check box after removing menu in order to navigate normally within the NVIDIA display menu.

5 To return to normal NVIDIA menu navigation, clear the **Enable menu editing** check box (Figure 7.33).

Adjusting PowerMizer Settings — *Only* for Notebook Computers

When using a mobile (notebook or laptop) computer, the NVIDIA PowerMizer™ page lets you regulate the power consumption of your NVIDIA GPU.

Accessing the PowerMizer Page

To access the PowerMizer page, click **PowerMizer** from the NVIDIA display menu.

If you need help accessing the NVIDIA display menu, see "Accessing the NVIDIA Display Control Panel Pages" on page 29.

Figure 7.34 shows the **PowerMizer** page.

PowerMizer Settings

Current Battery Charge

This is the current battery charge being used by your mobile computer.

Current Power Source

Current power source can be either **AC Outlet** or **Battery**. In this example (Figure 7.34) it is AC Outlet.
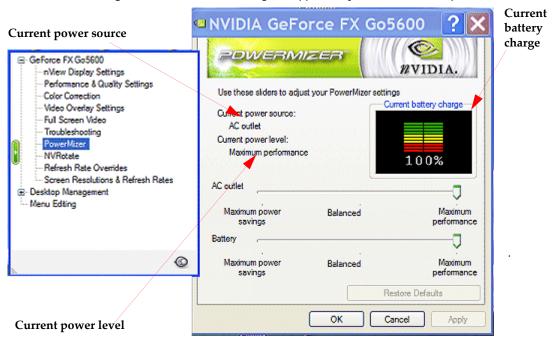
Figure 7.34 PowerMizer Settings — Applies *only* to Notebook Computers

Current power source

Current battery charge

Current power level

Current Power Level

The current power level can apply to either **AC outlet** or **Battery** power source, depending on the power source being used by your computer.

- **AC Outlet**. Adjust the power consumption from the AC power source relative to performance by setting one of the following:
  - **Maximum power savings**
  - **Maximum performance**
  - **Balanced**
- **Battery**. You can choose any one of the following options:
  - Conserve battery life by setting **Maximum Power Savings**, but at some decrease in performance.
  - Use the full graphics performance of your NVIDIA GPU by selecting **Maximum Performance.**
  - Choose a compromise between the two settings by using **Balanced**.

Using NVIDIA Scalable Link Interface (SLI)

NVIDIA SLI technology lets you install and benefit from two PCI Express (PCI-E) graphics cards in a single computer. Just as dual processors or dual core CPUs improve computer performance, SLI allows dual GPUs to significantly accelerate graphics performance.

The SLI connector offers dual GPU performance on a single display by leveraging the capabilities of two NVIDIA GPUs.

For NVIDIA nForce4 SLI media and communication processors (MCPs), there is additional logic in the silicon to improve performance.

For further information see

Note: Go to **www.slizone.com** for an up-to-date list of compatible hardware and software, and installation information.

Hardware Requirements

-
-
-

Motherboard

Your computer's motherboard must be PCI Express-based with two available and adjacent PCI Express expansion slots. Both slots must be x16 mechanical with the following allowed electrical slots:

- x16 + x16
- x16 + x8
- x16 + x4

Note: For the latest updates on SLI-Certified motherboards, see **www.slizone.com/content/slizone/build.htm.**

Examples of GeForce-based Graphics Cards Supporting SLI

NVIDIA SLI operation requires two SLI-capable graphics cards that have similar core GPUs. Examples of SLI-capable GeForce-based graphics cards are listed below.

Note: An SLI bridge connector (provided with your graphics card) must also be installed to utilize the full capabilities of SLI frame rendering.

- **GeForce 7800 GTX** series is NVIDIA's top-of-the line high-performance GPUs; unmatched in speed and image quality.

- **GeForce 7800 GT** is another SLI-supported model of the GeForce 7800 series of GPUs.

- **GeForce 6800 Ultra** — the flagship chip in the 6000 series with 16 pixel pipes and 6 vertex units delivers exceptional performance and was the first GPU to deliver support for Microsoft DirectX 9.0 Shader Model 3.0.

- **GeForce 6800 GT** has the same 16 pixel pipe and 6 vertex unit design, same GDDR3 support, and same Shader Model 3.0 support as the 6800 Ultra, but at slightly lower performance and a lower price point. In addition, the GeForce 6800 GT also offers a single slot thermal solution with lower power requirements.

- **GeForce 6800** includes 16 pixel pipes and 5 vertex units (instead of 6 vertex units in higher speed 6800 versions), and lower clock speeds to target the price-sensitive performance market.

- **GeForce 6800 LE** satisfies the entry-level performance market still with a 256-bit memory interface, but with 8 pixel pipelines and 4 vertex units.

- **GeForce 6800 XT** and **GeForce 6800 XE** are other SLI-supported models of the GeForce 6800 series of GPUs.

- **GeForce 6600 GT** delivers enthusiast-class features and performance to the midrange price point and is the only SLI-ready GPU in the mainstream segment. Additional features include:

  - GDDR3 memory clocked at 500 MHz

  - Fast 500MHz core clock

  - 128-bit memory interface, 8 pixel pipes, and 3 vertex units.

  - Supports Microsoft DirectX 9.0 Shader Model 3.0.

- **GeForce 6600** and **GeForce 6600 LE** are other SLI-supported models of the GeForce 6600 series of GPUs.

Note: For the latest updates on SLI-certified NVIDIA GPU-based graphics cards, see **www.slizone.com/content/slizone/build.htm.**

Power Supply

- Some SLI capable graphics cards may require an external power cable.

- As SLI supports up to two high-end graphics cards, the load on the computer's power supply can increase significantly. A minimum of a 450W Power Supply Unit (PSU) is recommended.

  Note: An inadequate power supply can result in erratic and unpredictable system behavior.

  Note: For the latest updates on SLI-certified power supplies, see **www.slizone.com/content/slizone/build.htm.**

Installation and Operating Instructions

Note: Before removing current graphics cards and installing two NVIDIA GeForce-based graphics cards, be sure to uninstall any current drivers and save on your Windows desktop the provided SLI drivers.

Installing the Hardware

Note: Perform the installation in a static safe environment and utilize a properly grounded anti-static wristband. Place any static sensitive components in anti-static bags.

1 Turn off the computer and remove the power cord from the power supply.

2 Gently remove or open the system enclosure.

  Refer to the owners manual that came with your computer.

3 Remove any non-SLI capable graphics cards that may occupy the x16 expansion slot and replace them with your SLI-capable graphics card.

4 Install the second SLI-capable graphics cards in the adjacent slot.

  You may also need to relocate a card. The chosen slot must be x16, x8 or x4 capable.

5 Connect the two graphics cards with the SLI bridge connector.
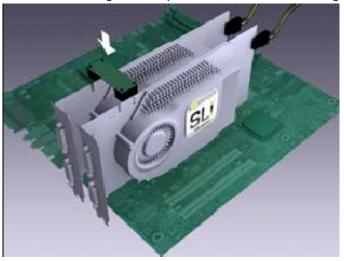
Figure 7.35 Connecting Two Graphics Cards with an SLI Bridge Connector

The SLI connector is required only for SLI Frame Rendering.

6 If your graphics cards have an auxiliary power connector, connect them to the power supply using the supplied power connector cables.

7 Replace the system's cover and reconnect your display(s) to the SLI-capable graphics card installed in the x16 expansion slot.

8 Plug the power cable back into the system.

Installing the Display Driver

Follow the steps listed below to install your driver software:

1 Turn on your computer and log into Windows.

2 Cancel the Windows "Found New Hardware Wizard" program.

This message should appear twice – one for each graphics card).

3 Run "setup.exe" in the SLI driver you saved to your desktop.

4 Follow the **Next** prompts to proceed with driver installation.

5 Once the software has been installed, choose **Yes, I want to restart my computer now** and select **Finish** to restart your computer.

Enabling SLI Mode

1 After logging back into Windows, you should see the message "SLI capable system" in the bottom right corner of the screen as shown in Figure 7.36..

Figure 7.36 Message "SLI capable system"

2 Click anywhere on the message.

If the message disappears, continue with the following steps.

3 Right click the desktop and click **Properties** > **Settings** >**Advanced**, then click the GeForce product tab.

4 Click the **SLI multi-GPU** menu item to open the SLI multi-GPU page.

5 Select the **Enable SLI multi-GPU** check box to check it and click **Apply** (Figure 7.37).

Your system can now operate in full SLI-frame rendering mode.

Viewing Load Balancing

To view the relative amount of work, or load balancing, performed by each GPU in DirectX and OpenGL applications, select the **Show GPU load balancing** check box on the NVIDIA SLI Multi-GPU page (Figure 7.37).

This option enables an SLI status bar that reflects how the GPUs are working together to render DirectX and OpenGL full-screen applications; see Figure 7.38.
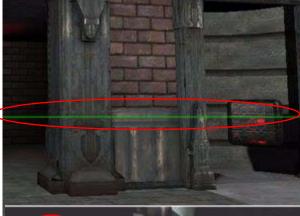
Figure 7.37 NVIDIA SLI Page — Enabling SLI Multi-GPU

Figure 7.38   Load Balancing IndicatorsLoad Balancing Indicators

AFR load balancing bar shows relative work provided by each GPU.

SFR load balancing line shows relative portion of the screen rendered by each GPU

SLI AA indicator shows the effect of SLI antialiasing modes.

A P P E N D I X

A

USING TWO NVIDIA GPU-BASED GRAPHICS CARDS (NON-SLI CONFIGURATION)

This appendix describes multi-adapter configurations (non-SLI) in the following sections:

Before You Begin

This appendix discusses an example of using two *multi-display* NVIDIA GPU-based graphics cards in one computer running Windows XP.

Note: When running Windows with multiple cards (i.e., two or more NVIDIA GPU-based graphics card are installed in your computer), the same NVIDIA driver (version) must be installed for each card.

Before Installing the NVIDIA ForceWare Graphics Display Driver

1 Make sure you have an AGP slot and a PCI slot on your computer.

2 Install the appropriate NVIDIA GPU-based PCI and AGP cards.

3 Make sure the graphics cards are securely seated in their slots.

4 Connect the appropriate displays to each card, making sure that the cable connectors are *securely* attached to the graphics cards.

5 Turn on your displays.

Examples and Setup

The examples in this appendix show the following NVIDIA-based graphics cards and configurations.

- The **GeForce FX 5900 Ultra GPU-based graphics card** is an AGP graphics card supporting multi-display nView functionality.

- The **GeForce4 MX GPU-based graphics card** is a PCI graphics card supporting nView multi-display functionality.

  Note: Depending on the number of PCI slots in your computer, you can install more than one PCI graphics cards. These examples use only one PCI graphics card.
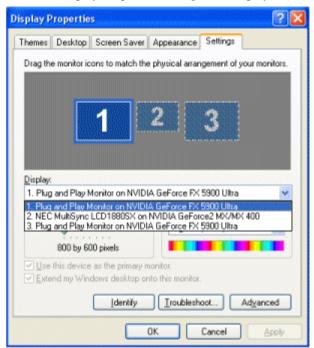
GeForce FX 5900 Ultra — Installing the NVIDIA ForceWare Graphics Display Driver

1 Start up your computer.

Your desktop will appear on one of the displays attached to one of your graphics cards. The Found New Hardware Wizard appears.

2 Click the last option labeled **Install from a list or specific location (Advanced)** to select it.

3 Click **Next**.

4 Click the last option labeled **Don't search. I will choose...** to enable it and click **Next**.

5 From the Common hardware types: list, double-click the **Display adapters** choice.

6 On the next window that appears, make sure that none of the choices is highlighted. If one is, click it to remove the highlight.

7 Click **Have Disk**.

8 Click **Browse** and locate the path containing NVIDIA ForceWare graphics display driver you want to install.

9 Click the NVIDIA **.inf** file and then click **Open**.

10 Click **OK** on the Install From Disk window.

11 Then click the name of your NVIDIA GPU-based graphics card that appears on the Model list and click **Next**.

12 Copying files will take a couple of minutes while you wait.

13 Click all prompts to continue the process.

14 Click **Finish** when that option appears

15 If there is a prompt to restart your computer, click to do so.

16 Respond to the prompts to restart your computer.

GeForce FX 5900 Ultra — Attaching the Secondary Display for nView Dualview Mode

1 From your desktop, open the Display Properties Settings page.

Three display screen images appear, one of which is active (attached) while the other two are not active, meaning connected but not attached.

In this example (Figure A.1), display numbered **1** appears active, connected, and attached to the GeForce FX 5900 Ultra graphics card. Display **2** (connected to the GeForce4 MX) and display **3** (connected to the GeForce FX 5900 Ultra graphics card) are not active (appear as grayed screen images) because they have not yet been attached.

2 Click **Identify** to identify the display.

3 Notice that the display's number, as represented on the Settings page, appears briefly on that display's desktop (Figure A.2).

Figure A.1   Display Properties Settings — **3** Displays with **1** Attached

Figure A.2   One Display With Identifying Number

4   From the Settings page, right click the inactive screen image numbered display **3** (connected to the GFX 5900 Ultra card), click **Attached**, and click **Apply**.

Figure A.3 show that display **3** is now enabled and attached.

5   Click **Identify** to identify the attached displays (**1** and **3**) on their desktops.

Notice that the attached displays' numbers, as represented on the Settings page, appear briefly on those displays' desktops (Figure A.4).
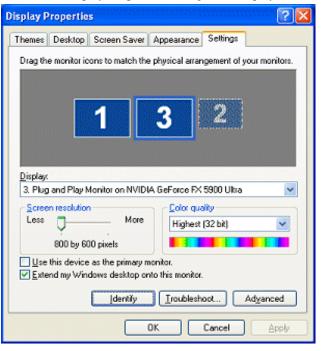
Figure A.3 Display Properties Settings — **3** Displays with **2** Attached

Figure A.4 Two Displays With Identifying Numbers

GeForce4 MX — Installing the NVIDIA ForceWare Graphics Display Driver
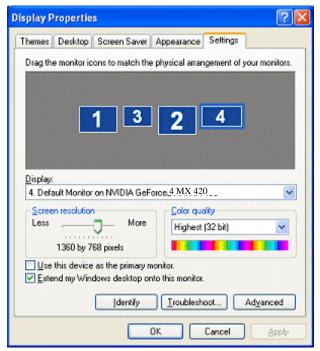
1 From the Windows Display Properties Settings page, right click the display image **2** (connected to the GeForce4 MX-based graphics card) and click **Properties**.

2 Click the **Adapter** tab and click **Properties**.

3 Click the **Driver** tab and then click **Update Driver** to display the Hardware Update Wizard.

4 Click the last option labeled **Install from a list or specific location (Advanced)** to select it.

5 Click **Next**.

6 Click the last option labeled **Don't search. I will choose...** to enable it and click **Next**.

7 Enable the check box labeled **Show compatible hardware**, if it is not checked already.

8 On the Model list, if it appears, click the NVIDIA-based graphics card for which you are about to install the NVIDIA driver. In this example, it is GeForce4 MX.

9 Click **Have Disk**.

10 Click **Browse** and locate the path containing NVIDIA ForceWare graphics display driver you want to install.

11 Click the NVIDIA **.inf** file and then click **Open**

12 Click **OK** on the Install from Disk window.

13 Click the name of your NVIDIA GPU-based graphics card (in this example, GeForce4 MX).

14 Click **Next**.

15 Click all prompts to continue the process...

16 Copying files will take a couple of minutes while you wait.

17 Click **Finish** when that option appears and then click **Close** to close the Driver window.

18 Respond to the prompts to restart your computer.

Attaching Displays for GeForce4 MX — nView Dualview Mode

1 When you have returned to your desktop, right click on the desktop to display the desktop menu and click **Properties** and the **Settings** tab.

Notice that all four of the connected displays are now represented by numbered display images, as shown in Figure A.5.

Figure A.5 Display Properties Settings — 4 Attached Displays

Remember that we already attached displays 1 and 3 for the GeForce FX 5900 Ultra-based graphics card. Now we will enable displays 2 and 4 for the GeForce4 MX-based graphics card.

2 Right click display image **2**, click **Attached** and click **Apply**. The associated display becomes enabled and displays a desktop.

3 Right click on display image **4**, click **Attached** and click **Apply**. The associated display becomes enabled and displays a desktop.

Figure A.5 and Figure A.6 show the associated Display Properties Settings page and the resulting desktops on the numbered displays.

Figure A.6   Four Displays With Identifying Numbers

Note: Attaching all the displays implies that nView Dualview mode is enabled. If you check the nView Display Settings page for either of the NVIDIA-based graphics cards that are installed, you will see that nView Dualview mode is enabled.

1 From the Windows Display Properties Settings page, right click any of the four display images.

2 Click **Properties** and then click the NVIDIA GPU ab to open the associated page.

3 Click the **nView Display Settings** menu option. Notice that the nView Modes list is set to **Dualview**.

Enabling nView Span and Clone Modes — Detaching the Secondary Display

Note: In the following steps, we'll switch from Dualview to Span or Clone mode for each of the two NVIDIA GPU-based graphics cards. You will notice that the secondary displays become detached (disabled) because nView Span and Clone modes do not detect the secondary display as separate displays.

1 Right click on either display image **2** or **4**, representing the GeForce4 MX-based graphics card.

2 Click **Properties** and then click the NVIDIA GPU-labeled tab to open the associated NVIDIA GPU (GeForce4 MX) page.

3 Click the **nView Display Settings** menu option.

4 Click the nView Modes list and select **Horizontal Span**, then click **Apply**/

5 Wait while the displays adjust modes. The resulting Windows Display Properties Settings page and desktop are shown in Figure A.7 and Figure A.8.

Figure A.7   Display Properties Settings — **4** Displays with **2** Attached
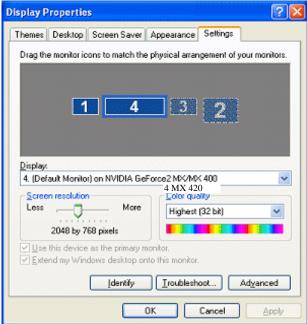
Figure A.8   Two Displays With Identifying Numbers

> **Note:** You can repeat steps 4 and 5 and chose Vertical Span or Clone mode. The result will be similar to what is shown in Figure A.7 and Figure A.8 in that the secondary displays become detached because nView Span and Clone modes do not detect the secondary display as a separate display.

Viewing Multiple NVIDIA GPU-based Graphics Cards from the NVIDIA Display Menu

You can view multiple NVIDIA GPU-based graphics cards from the NVIDIA display menu and easily access the corresponding NVIDIA display control panel pages to configure advanced display settings for each graphics card. Examples are shown in Figure A.9 and Figure A.10.

Also see "Configuring Key ForceWare Graphics Driver Features" on page 99.
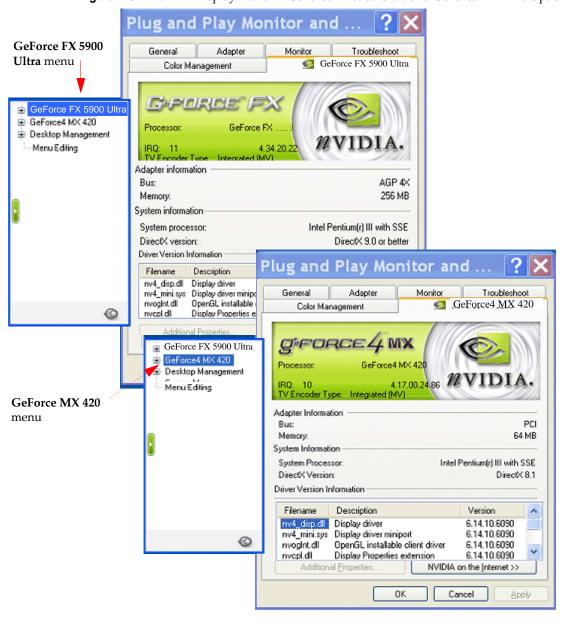
Figure A.9   NVIDIA Display Menu — GeForce FX 5900 Ultra and GeForce4 MX 420 Options

GeForce FX 5900 Ultra menu

GeForce MX 420 menu

Figure A.10 NVIDIA Display Menu Showing Both GeForce FX 5900 Ultra and GeForce4 MX
Graphics Cards

GeForce 6800 Ultra menu

GeForce4 MX menu

Viewing Multiple Card Configurations Using the NVIDIA Settings Menu Icon

You can view the multi-GPU configurations through the NVIDIA Settings menu icon on the Windows taskbar. If you don't have the NVIDIA Settings menu icon enabled, see "Adding the NVIDIA Settings Menu to the Windows Taskbar" on page 134.

1 Right click the NVIDIA Settings menu icon on your Windows task bar. A menu of configuration options appears, as shown in Figure A.11.

Figure A.11 NVIDIA Settings Taskbar Menu Displaying NVIDIA GeForce FX 5200 Ultra-based and GeForce4 MX-based Graphics Cards

GeForce FX 5900 Ultra
— display 1

GeForce4 MX 420
— display 2

Notice that both GeForce FX 5900 Ultra and GeForce4 MX 420 GPU-based graphics cards are shown in the menu.

2 To see the configuration options for each GPU-based graphics card, point to the GPU names on the menu (Figure A.11) and then move the cursor to any of the options that appear on the next menu level.

B

USING HDTV WITH NVIDIA GPU-BASED GRAPHICS CARDS

HDTV-connectivity is supported by NVIDIA GPU-based graphics cards that have the proper encoding to support HDTV display. Any NVIDIA graphics card solution for HDTV ships with an appropriate video cable — examples are shown in this appendix.

- "Supported HDTV Connectors" on page B-178
- "Sample "Component-Based" Cables Shipped with NVIDIA HDTV-Encoded Graphics Cards" on page B-181
- "Sample "Component-Based" Cables Shipped with NVIDIA HDTV-Encoded Graphics Cards" on page B-181

Supported HDTV Connectors

HDTV output using an NVIDIA GPU-based graphics card is supported under the following types of connectors:

- Component
- HDTV over DVI
- D connector

Component

The component connector path is defined and formats restricted by the encoder on the graphics card.

- **The "Component" video connection** is the "High Definition" output of the converter. "Component" connections frequently will be labeled "Y", "Pb" and "Pr". While all programming (analog, digital, and "high definition") is available on these wires, there are some disadvantages to viewing the analog and digital programming in this mode. That is discussed next.

- **The "Component" output is in the "Native Resolution" format of 1080i.** (this is important to know!) Like the Yellow "Composite" and the S-Video outputs, the "Component" output will require a Left and Right (red and white) cable connection to provide the audio signals to either the HDTV or the Home Theater system.

- **Component cables are usually a cluster of 3 cables with RCA style plugs and will be color coded Green, Blue and Red.** The HDTV jacks on the back of the converter and the HDTV display will also be color-coded and it is important that the cables are connected so that the green jack on the HDTV converter is connected to the green jack on the display, etc.

Figure B.1   Sample Component Cables.

Your NVIDIA HDTV-encoded graphics card is supplied with the "breakout pod" to which you connect the Component Y-Pb-Pr Video Cable for DVD/HDTV that came with your HDTV set.

Note: For detailed information, refer to the user documentation supplied with your HDTV set.

HDTV over DVI

HDTV over DVI (see "Using HDTV Formats" on page 89) uses the standard digital interface to transmit uncompressed HD digital video. The formats are limited by the available EIA-861B modes from the EDID or the custom modes you may have added.

So if you have an HDTV with a DVI connection, you can use a DVI cable (sample shown in Figure B.2) below.

Figure B.2   Sample DVI Cable.

D connector

The D Connector is used mostly in Japanese market and its path is also defined by the encoder but the available formats are additionally restricted by the D1 to D4 output modes.

Note: If you are using the NVIDIA Personal Cinema kit, note that *only* cables with a "component" connection can be used with an HDTV.

Figure B.3   Sample NVIDIA Personal Cinema™ A/V Cables

Sample "Component-Based" Cables Shipped with NVIDIA HDTV-Encoded Graphics Cards

Figure B.4   Sample Video Cables

A P P E N D I X

C

NVIDIA FORCEWARE GRAPHICS DISPLAY DRIVER — FEATURE HISTORY

This chapter provides information on the previous releases of the NVIDIA ForceWare graphics display driver and summarizes the features and enhancements that have been introduced in each release.

Driver Release History

Release 80 is the latest release of the NVIDIA ForceWare graphics display driver for Windows.

Table C.1 includes a summary of previous driver releases and the versions associated with them.

Note: Some versions listed may not have been released outside of NVIDIA.

Table C.1   NVIDIA Drivers for Windows

Driver Release	Name	Version	Comment
Release 80	ForceWare Release 80	80.*xx*.– 84.*xx*	Releases ongoing
Release 75	ForceWare Release 75	75.60–77.72	Releases ongoing
Release 70	ForceWare Release 70	70.20–73.xx	Releases ongoing
Release 65	ForceWare Release 65	65.20–67.xx	
Release 60	ForceWare Release 60	60.50-62.75	

Table C.1   NVIDIA Drivers for Windows (continued)

Driver Release	Name	Version	Comment
Release 55	ForceWare Release 55	56.30–58.90	
Release 50	ForceWare Release 50	50.00–54.06	
Release 40	Detonator FX	44.03–47.20	
Release 40	Detonator 40	40.60–44.02	
Release 35	Detonator 35	35.60–37.80	
Release 25	Detonator 25	26.00–32.90	
Release 20	Detonator XP	21.83–23.xx	
Release 10	Detonator 3 v1x.xx	10.00–17.xx	
Release 6	Detonator 3	6.09–8.xx	
Release 5	Detonator 2	5.00–5.xx	
Release 4	Detonator	3.00–3.xx	
Release 3	Detonator	1.83–2.42	
Release 2		1.05–1.31	

Release 80 Enhancements

See .

Release 75 Enhancements

- Support for OpenGL 2.0 Specification
- New extensions:
  - ARB_draw_buffers
  - ARB_color_buffer_float
  - ARB_half_float_pixel
  - ARB_texture_float

SLI Support Improvements

- Additional SLI support

Release 75 adds support for the following combinations of PCI Express graphics cards and NVIDIA nForce systems:

NVIDIA Product	PCI-Express Graphics Cards
NVIDIA nForce4 SLI	GeForce 7800 GTX + GeForce 7800 GTX
NVIDIA nForce Professional 2200	GeForce 7800 GTX + GeForce 7800 GTX
NVIDIA nForce Professional 2200 + NVIDIA nForce Professional 2050	GeForce 7800 GTX + GeForce 7800 GTX
All NVIDIA GPUs	GeForce 6600 + GeForce 6600

- SLI support for OpenGL workstation applications with Quadro-based PCI-Express graphics cards.

  For information on workstation application support, see the *NVIDIA Quadro Workstation User's Guide*.

- Improved SLI performance for DirectX and OpenGL applications

- Improved control of SLI rendering modes — see "Adjusting Performance and Quality Settings" on page 105.

- Improved end-user control of SLI profiles and rendering modes – see "NVIDIA Display Control Panel" on page 185 and "Adjusting Performance and Quality Settings" on page 105.

Display Driver

- Improved support for custom timings, including non-divisible by 8 resolutions on TMDS/LVDS panels, control of back-end and front-end timings, and variable overscan shift values.

  The driver can also present underscan modes on demand, and supports variable underscan ratios.

- Off-screen 2D memory management optimization

- Efficient synchronization between clients allows for sharing of off-screen resources with DirectX applications. This avoids potential performance issues with applications that use DirectX rendered surfaces in ways that conflicted with 2D caching.

- VESA Coordinated Video Timing (CVT) Support
  - Support via control panel option for analog monitors
  - Support for CVT/CVT-RB timing restriction using R&T strings

- Color compression support

- SLI Enhancements

- SLI screen capture support

- Improved performance

- Improved management of profiles between driver updates, enabling you to select which profiles to keep and which profiles to update with each new software update. This ensures that if you have setup your profiles in your current driver, you will not lose any settings when you update your driver.

- Improved high-resolution scalable desktop functionality for Quadro GPU-based workstations.

  For additional information, refer to the *NVIDIA Quadro Workstation User's Guide*.

DirectX

Improved driver stability and performance, including the following areas:

- UMA support

- 2D operations

- SLI

NVIDIA Display Control Panel

Release 75 includes enhancement to the following sections of the NVIDIA display control panel user interface:

- Additions and improvements in the Performance & Quality page (see "Adjusting Performance and Quality Settings" on page 105) include:

  - Combined DirectX and OpenGL application profiles on one page

  - All application profiles, including workstation applications, are combined into the same application profiles page.

    For additional information, refer to the *NVIDIA Quadro Workstation User's Guide*.

  - Added a **triple-buffering** option for improved frame rates

  - Added a **transparency antialiasing** option, which applies to graphics cards based on newer GPUs such as the GeForce 7800 GTX. This option enables transparent pixels (such as between fence links or leaves on trees) within textures to be used in edge blending operations to clean up jaggies in images.

- Added a **gamma correct antialiasing** option, which applies to graphics cards based on newer GPUs such as the GeForce 7800 GTX. This option enables gamma correct antialiasing for a better color calculation to help reduce jaggies and maintain the highest level of color reproduction of 3D images.

- Improved the **SLI rendering mode** options by allowing complete end-user control of SLI for any application. This provides maximum flexibility over creating application profiles for any for current and new applications.

- Underscan support has been added for full screen overlay and full screen video mirror outputs.

nView Desktop Manager

Note: Release 75 no longer supports the nView Display Wizard for Windows NT 4.0 and NVKeystone for Windows 98/Me. The driver does include enhancement to the following nView Desktop Manager sections:

- **TV/Display Wizard** is enhanced to make HDTV setup easier. Each high-definition mode can be previewed to determine the capabilities of the flat panel.

- **Desktop Manager setting —** Release 75 lets you create system-wide nView Desktop Manager settings that apply across all users.

- **Per-display desktops —** Release 75 brings support for independent per-monitor virtual desktops to nView Span mode and Multiview environments.

For details on using nView Desktop Manager features, refer to the *NVIDIA ForceWare Graphics Drivers*: *nView Desktop Manager User's Guide*.

Release 70 New Features and Enhancements

Details by Driver Module

Display Driver, DirectX, and OpenGL

Table C.1   Release 70 Graphics Driver — Performance Improvement and New Features

	Display Driver	DirectX	OpenGL

Performance Improvements	• Improved stability and robustness
	• Improved NVIDIA SLI multi-GPU functionality
	• Support for 512 MB graphics cards
	• HDTV-over-DVI functionality
		• Improved robustness
		• Multi-GPU refinements
		• Improvements in
		  - Texture management
		  - SRGB handling
		  - Anisotropic filtering
			Improved workstation performance for OpenGL applications.

New Features	• Support of the unified memory architecture of the latest Quadro and GeForce series of GPUs. • Support of the latest Quadro and GeForce series of GPUs. • Support of the **TurboCache** memory management architecture of the latest GeForce 6200 series GPUs. TurboCache dynamically allocates system memory to augment the frame buffer, resulting in increased memory bandwidth.	Support of the unified memory architecture of the latest Quadro and GeForce series of GPUs.	Support of the unified memory architecture of the latest Quadro and GeForce series of GPUs.

Video

New video processing features include:

- **Windows Media Video 9 (WMV9) video acceleration —** support for hardware accelerating decoding WMV9 video files on GeForce 6 series GPUs. To enable this feature, a software update from Microsoft is required.

Video processing improvements include:

- **Video scaling implementations** to support the newest GeForce 6 series GPUs.
- **Motion adaptive de-interlacing**
- **Color management improvements** include:
  - Color space conversion and processing amplifiers
  - Extended color range
  - Color temperature correction

NVIDIA Display

- **Improved NVIDIA display slideout menu** layout and functionality. The menu automatically resizes to fit content when you first launch the NVIDIA display control panel. You can also resize the slideout menu by dragging the window border.

- **Improved EDID** [Extended Display Identification Data] **display names** in the control panel, desktop menus, and APIs are more descriptive than the previous "Digital" and "Analog" display designators.

- **Rename displays** — You can now rename your displays from the nView Display Settings page.

- **Play-On-My-Display** — Right-click on the pop-up menu item to play video files on any connected display.

- **Tools** page — provides options for shortcuts, display optimizations, and troubleshooting. The Tools page replaces the Release 65 Troubleshooting page.

- **Improved Driver Information** and **Change Resolutions** pages.

- **Application profiles can include "color settings"** — You can now associate application-specific color settings (Digital Vibrance, Brightness, Contrast, Gamma, etc.) with video games.

- **Improved HDTV-over-DVI** user interface and support for arbitrary overscan/ underscan for HDTV-over-DVI.

- **Variable "Underscan" and "Overscan shift"—** The HDTV Overscan Configuration page now lets you adjust the HDTV underscan and overscan shift.

- **Show HDTV display formats** option on the Change Resolutions page lets you add and remove standard EIA 861b HD modes and enables HD over DVI.

- The **Advanced Timings** page now lets you modify the X and Y resolution to create a custom mode. Custom modes creation and advanced timings adjustments are combined on one page.

- **Improved SLI multi-GPU mode pages** — available with NVIDIA SLI graphics cards intended for use by *advanced users*. For details, see the document *"Application Note — Using NVIDIA SLI Graphics Cards"* Version 2.0 or later. **nView Desktop Manager**

nView Desktop Manager

New Features
- "Toggle Stereo 3D Display" hot key
- "Transparent Desktop Lock" hot key
- Improved compatibility with Windows Remote Desktop, Windows XP SP2, Windows XP 64-bit Editions, and Windows Media Center Edition.
- New **Display Optimization Wizard** (Display Calibration, Gamma)

Feature Enhancements

- **nView Desktop Manager Wizard**
  - Improved layout and usability of the wizards.
  - Improved television and HDTV support in the setup wizards and TV Wizard.
  - New **Display Optimization Wizard** (Display Calibration, Gamma)
- **Profiles** —**.tvp** file association: manage/load profiles from Windows Explorer
- **Hot Keys** enhancements include:
  - Consolidation of some actions, providing fewer hot keys and increased functionality
  - New hot keys: Activate Last Active Desktop, and Show Last Blocked Popup
- **nView Toolbar —** Added drag-n-drop window management to the display toolbars.
- **Gridlines —** New gridline creation tools to insert preset rows and columns
- **Internet Explorer Popup Preventer**—Sensitivity Adjustment
- **Window Management —** New setting to open window on next empty display

NVManagement

Improved functionality in response to customer feedback. The NVManagement application includes new switches for scripting driver settings

Driver Independence

For ForceWare graphics drivers Release 50 and later, any nView version can be installed over any driver version.

Release 65 Enhancements

SLI Support

Release 65 supports the new Scalable Link Interface (SLI) technology for improved performance using dual high-end graphics cards[1] that support SLI technology.

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1. Cards must be of the same vendor and model number.

The following combinations of PCI Express graphics cards and chipsets are supported in this release of the driver:

Chipset	PCI-Express Graphics Cards
Intel® E7525	GeForce 6800 Ultra + GeForce 6800 Ultra
	GeForce 6800 GT + GeForce 6800 GT
NVIDIA nForce4 SLI	GeForce 6800 Ultra + GeForce 6800 Ultra
	GeForce 6800 GT + GeForce 6800 GT
	GeForce 6800 + GeForce 6800
	GeForce 6600 GT + GeForce 6600 GT
NVIDIA nForce Professional 2200	GeForce 6800 Ultra + GeForce 6800 Ultra
	GeForce 6800 GT + GeForce 6800 GT
	GeForce 6800 + GeForce 6800
	GeForce 6600 GT + GeForce 6600 GT
NVIDIA nForce Professional 2200 + NVIDIA nForce Professional 2050	GeForce 6800 Ultra + GeForce 6800 Ultra
	GeForce 6800 GT + GeForce 6800 GT
	GeForce 6800 + GeForce 6800
	GeForce 6600 GT + GeForce 6600 GT

512 MB Frame Buffer Support

ForceWare Release 65 graphics drivers provide memory management techniques for supporting 512 MB versions of the new generation of NVIDIA graphics cards, such as the GeForce 6800 or Quadro FX 4000 and later.

Multi-GPU Support

Release 65 supports the new NVIDIA **Scalable Link Interface (SLI)** technology for improved performance using dual high-end graphics cards[1] that support SLI technology, such as the PCI Express based GeForce 6800 Ultra, GeForce 6800 GT, or NVIDIA Quadro FX 3400 GPU-based graphics cards.

Operating System Support

Release 65 supports Windows XP SP2 and will support the next version of Windows XP Media Center Edition—"Symphony".

Enhancements in Driver Performance

Improved Robustness

The ForceWare Release 65 graphics driver offers improved stability and robustness in DirectX and 2D graphics.

Video Enhancements

Video enhancements in Release 65 include:

- **Inverse telecine** (3:2 pulldown detection and correction) extracts the original 24 fps of film-sourced video for encoding, and prevents encoding of unnecessary frames, eliminating artifacts. To enable this feature, you must download the NVIDIA DVD Decoder for use with Windows Media Player or Windows Media Center Edition.
- **Optimized motion compensation and video processing** to take advantage of the capabilities of the newest generation of NVIDIA GPUs.
- **Support for Microsoft's Certified Output Protection Protocol (COPP)**
- **Improved media capture interface**

3D Graphics API Enhancements

- **DirectX Enhancements**
  - DirectX 9.0c Compatibility
  - Supports the capabilities of the newest generation of NVIDIA GPUs for improved DirectX shader handling and reduced CPU overhead
- **OpenGL Enhancements**
  - Improved and more efficient **vertex_buffer_object (VBO)** handling
  - More efficient memory management for improved performance under Dualview

HDTV Support Enhancements

Release 65 offers improved HDTV over DVI underscan support, exposed through the NVIDIA control panel.

Desktop Manager and Control Panel Improvements

Release 65 includes the following improvements in the Desktop Manager and NVIDIA display control panel:

- High Resolution Scalable Desktop Performance
- Desktop Manager Wizards
- Desktop Manager Hot Keys, Toolbars, and Gridlines
- Application Profiles
- Control Panel User Interface

Release 60 Enhancements

Latest GPU Support

The ForceWare Release 60 graphics drivers support the newest generation of NVIDIA GPUs, including

- Improved vertex and pixel compilers
- Video shaders

PCI Express Support

ForceWare Release 60 offers 2D and 3D graphics driver support for the PCI Express I/O, including

- DirectX support
- Enhanced OpenGL support

  Improved texture memory management and bandwidth utilization

Enhancements in Driver Performance

- Enhanced Robustness

  The ForceWare Release 60 graphics driver offers more robust stability and compatibility in DirectX support, antialiasing, and desktop rotation.

- Reduction of OCA issues

- Dynamic video memory streamlines operating system resources for large frame buffer configurations

3D Graphics API Enhancements

Direct3D

DirectX 9.0c Support

OpenGL

- New drivers for the OpenGL ARB shading language (GLSL)
- Enhanced support for Windows XP 64-Bit Edition and IA32-E.
- New extensions
  - `GL_NV_fragment_program2`
  - `GL_EXT_blend_equation_separate`
  - `NV_vertex_program3`
  - ATI_draw_buffers
  - ATI_texture_float
  - ATI_texture_mirror_once
  - GL_ARB_texture_non_power_of_two
  - GL_NVX_centroid_sample
  - GL_NVX_conditional_render

Release 55 Enhancements

The Release 55 driver offers new features not found in previous releases of the NVIDIA Driver for Windows. The following highlights the new features in Release 55:

PCI Express Support

2D and 3D graphics drivers support the PCI Express I/O.

PAE Support

2D and 3D graphics driver support systems that utilize physical address extensions (PAE)[2].

nView Desktop Manager Enhancements

- Seamless nView support between 32-bit and 64-bit processes on Windows 64-bit Edition
- Dual NVKeystone support for independent keystone trapezoids under nView Span modes.
- Per-display Desktop Management

User Interface Enhancements

- New application profiles capability lets you associate a collection of driver settings—such as antialiasing and display quality settings—with an application.
- Easy access standalone panel, independent of the Microsoft Display Properties window.
- Improved multi-adapter support.
- Improved television and HDTV controls

Video Support Enhancements

- Advanced de-interlacing and inverse 3:2 pull-down capability
- Enhanced HDTV and Media Center support

3D Graphics API Enhancements

Direct3D

- Improved antialiasing performance
- Improved shaders

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2. PAE is an extension that enables Intel compatible computers to address more than 4 GB of physical memory.

OpenGL

New extension: `GL_NV_pixel_buffer_object`

Release 50 Enhancements

The Release 50 driver offers new features not found in previous releases of the NVIDIA Driver for Windows.

New Feature Highlights

64-bit Support

Driver Release 50 offers AMD64 and IA64 operating system support.

Dynamic Memory Mapping

Dynamic memory mapping adds support for 256 MB graphics cards for video, display, and OpenGL drivers.

NVIDIA Unified Compiler

As today's GPUs become more and more programmable they are entering a similar era to that of the CPU. For CPUs, it is common for developers to implement code paths specifically optimized for AMD or Intel (e.g MMX and 3DNow!). Programmable GPUs are no different. Because architectures vary, it makes sense that one common assembly language can't cover all the nuances of specific GPU micro-architectures. In fact, different code paths make different GPUs go faster. As a result with the GeForce FX architecture, NVIDIA has implemented a GPU-specific compiler that can be used to optimize application performance.

Display Driver Changes—New Features

- **Rotation Support** for Windows Me/9x

- **Custom Resolutions** - Provides the user with the ability to construct new modes via the NVIDIA control panel.

- **Dynamic EDIDs** - Updates the master mode list with new modes contained in the connected device's EDID.

- **Support for Special Panels and Devices**
  - Large Panels
  - Wide Panels
  - Seamless Spanning Modes - Included in the mode list to support T221 style large panels.
  - Interlaced Modes for HDTV
  - DVI Device Hot Plugging
- **Frame Lock Functionality** - For synchronizing applications across multiple displays (Quadro FX 3000 only)
- **Edge Blend Functionality** - For blending the adjacent edges of overlapped displays on projection systems (Quadro FX 3000 only)

Video — New Features

- VMR support for Full-screen Video
- Support for Windows Media Center's Playback and Recording Features

PowerMizer — New Features

- Dynamic Peak Power Control
- Thermal Protection v2.0

User Interface Changes

- Dual View Support
- Change Resolution Panel
- Edge Blending and Desktop Overlap Panel
- Frame Lock Panel
- HDTV Support
- New Color Panel with Enhanced Gamma
- Overclocking Panel
- AGP Settings Panel
- Video BIOS Flash Utilities
- ATL Client Panel
- Menus for NVIDIA user components

- Device Selection drop down in the slider tray
- Panel access for non-administrator users
- Tool tips for the slider tray
- Performance and Quality Settings
- TV-Out Settings
- Device Selection
- Overlay Settings
- Full-screen Video controls

nView

- Action Toolbar
- Kinematic mouse actions
- Resolution per desktop support
- Application display exclusions and inclusions
- Internet Explorer pop-up prevention
- Monitor grids
- Keystone luma compensation
- Multiview support
- nViewCmd
- NVManagement
- Faster desktop switching
- Integrated control panels
- New Setup Wizard
- Driver independence

DirectX Graphics

- Floating point render targets
- Multi-element textures
- Improved antialiasing compatibility
- Improved shader handling and stability

- Improved render-to-texture performance

OpenGL

- Windows 9x Rotation Support
- New Extensions Supported
  - GL_ARB_occlusion_query
- Faster Vertex Processing Pipeline—Improved geometry processing and display list support
- Faster vertex and fragment program compilers.
- Improved support for ARB_vertex_buffer_object extension (vbo).
- Improved stability during mode switches, antialiasing, and UBB
- Faster texture downloads

Release 40 Enhancements

The Release 40 driver offers new features not found in previous releases of the NVIDIA Driver for Windows.

Enhanced Display Driver, DirectX, and Video Capabilities

- **Windows XP SP1**
  - Release 40 supports Windows XP SP1, including support for Windows XP Tablet PC and eHome technology.
  - Release 40 provides support for bugcheck EA callbacks, enabling OCA EA failures to be resolved more quickly while assisting to identify failure causes— such as due to chip instability or overclocking.
- **Rotation Support**

  Release 40 supports desktop rotation[3], which allows the user to rotate the desktop by 90, 180, or 270 degrees.
- **DirectX 9 Support**

  With Microsoft's release of DirectX 9 runtime, Release 40 version 42.51 and later provides support for DirectX 9, which includes the new vertex shaders, antialiasing modes, and multi-display device support.
- **Video Enhancements**

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3. Rotation is not supported on graphics cards based on the TNT, TNT2 or Vanta product families.

- Flip Sync functionality support
- Support for multiple Macrovision clients
- Simplified Video Mirror controls

- **TV Overscan Support**

  Depending on the TV encoder used, Release 40 supports TV overscan—allowing the user to eliminate the black borders around the TV display screen. This option is accessible through the NVIDIA display properties control panel.

New Graphical User Interface

- **Media Center Tray Application —** The Media Center Tray is a new application that replaces QuickTweak, and contains menu items that provide access to all NVIDIA user interface software applications.

- **New Display Properties Panel —** The NVIDIA control panel has been redesigned to make navigating easier and to improve control over the display adapter settings.

Enhanced nView Desktop Manager Features

- **Additional Operating System Support —** NVIDIA nView supports Windows NT 4.0, Windows 9X/Me, and Windows 2000/XP.

- **Zoom Support —** New fixed-frame zoom and bi-directional zoom editing capability

- **NV-Switcher —** Improved **Alt+Tab** switcher which also supports Desktop switching and is expandable to other NVIDIA features

- **Color Keyed Windows —** Allows the user to color key windows for easy identification when activating them on the desktop.

- **Taskbar and Menu Transparency**

- **New window actions and application settings.**

- **Keystone Support**[4]

OpenGL Enhancements

- **OpenGL 1.4 ICD with NVIDIA Extensions —** New extension includes ARB_vertex_program, which co-exists with NV_vertex_program.

- **Enhancements for Workstation Applications**
  - NV1x line stipple enhancements, and NV2x 2-sided lighting optimizations

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4. Keystone is not supported on graphics cards based on the TNT, TNT2 or Vanta product families.

- Immediate mode optimizations for Solid Edge, and display list tuning for UGv17.

- **Multi-Display Improvements —** New accelerated spanning mode is enabled by default.

- **Reduced Power Consumption —** Release 40 utilizes CPU cycles more efficiently, resulting in reduced power consumption without sacrificing performance.

- **Dynamic AGP/Video memory management**

Release 35 Enhancements

The Release 35 driver offers new features not found in previous releases of the NVIDIA Driver for Windows.

- **NVRotate —** The NVRotate feature lets you view your Windows desktop in Landscape or Portrait mode. You can rotate desktop by 90, 180 and 270 degrees.

- Improved and expanded NVIDIA *nView Desktop Manager* application

  nView Desktop Manager has now been redesigned with a convenient user interface and many new features and utilities designed to solve specific problems for users. Utilities such as anti-keystoning support and flat panel monitor calibration screens and utilities have been designed to improve windows multi-display usability.

  For example, **NVKeystone** can be set to compensate for keystoning effects on your windows display, allowing you to fix distorted projection images. This feature is primarily for laptop (mobile) computers.

  Note: For further details on NVKeystone and many new nView Desktop Manager features, see the *NVIDIA nView Desktop Manager User™s Guide.*

Release 25 Enhancements

The Release 25 driver offers new features not found in previous releases of the NVIDIA Driver for Windows.

- **nView**: The latest multi-monitor technology encompassing driver support, multi-monitor GPU architecture, and desktop management support.

  nView consists of two main modules:

  - **nView Display Manage**r—New support for multi-monitor functionality, including Clone modes, and Horizontal and Vertical spanning modes.

  - **nView Desktop Manager**—A control panel and desktop management engine for application window management and extension of functions, and support for multiple desktops.

- **Dualview support** for Windows 2000
- **Improved DirectX Video Acceleration (DXVA)**
- **Special support for NVIDIA NV25 capabilities:**
  - IDCT support for DirectX VA
  - Improved antialiasing compatibility and performance
  - Support for NV25 hardware overlays under OpenGL
- **Enhanced 3D Stereo functionality**
  - Support for lenticular lenses on LCDs
  - Stereo DIN connector support
  - VSYNC Off with 3D Stereo
  - Stereo API for developers
- **OpenGL enhancement**
  - New `render_to_texture` extension

Release 20 Enhancements

The Release 20 driver offers new features not found in previous releases of the NVIDIA Driver for Windows.

- OpenGL 1.3 ICD with NVIDIA extensions
- OpenGL performance optimizations
- Optimized DirectX pipeline with NVIDIA pixel and vertex shaders.
- Full support for Windows XP, including
  - Full hardware acceleration for Windows XP GUI features
  - Accelerated Windows XP 3D performance through the NVIDIA XPress Link technology

Release 10 Enhancements

The Release 10 driver offers new features not found in previous releases of the NVIDIA Driver for Windows.

- Support for Microsoft DirectX® 8
- Support for Microsoft DirectX® VA 1.0.

- NVIDIA 3D Stereo (requires installation of the optional Stereoscopic driver). The driver provides stereoscopic viewing capabilities for games and still images.
- Special support for NVIDIA GeForce3 capabilities:
  - Pixel and Vertex Shader support for DirectX 8 and OpenGL®.
  - Quincunx antialiasing option for enhanced image quality and performance.
- AMD® Athlon™ Processor and Intel® Pentium® 4 Processor optimizations
- Improved TwinView interface

Release 6 Enhancements

TwinView

TwinView is a Release 6 feature that supports connecting dual displays using a single graphics card (such as the GeForce2 MX or Quadro2 MXR) based on the NV11 chipset.TwinView includes major features such as the *Virtual Desktop*, *Video Mirror*, and *Desktop Manager* features.

TwinView supports a variety of display options, such as digital flat panels, red-green-blue (RGB) monitors, TVs, and analog flat panels. TwinView features the following display modes: Standard, Extended Desktop (Span), and Clone.

Virtual Desktop

Virtual Desktop is a TwinView feature that is useful for panels and monitors with limited resolution. Virtual Desktop is used to set a larger than viewable area on the second display, which supports full pan-and-scan of the entire desktop area. Currently, Virtual Desktop functionality is available under

- Windows NT 4.0 and Windows 2000 in TwinView Standard or Clone mode
- Windows 9*x* in TwinView Clone mode

Video Mirror

Video Mirror is a TwinView feature that allows a video or DVD application to mirror its playback in full-screen mode on any one of the connected display devices. In other words, Video Mirror allows video data that's displayed on a hardware overlay to be displayed at full-screen on a secondary display. Currently, Video Mirror functionality is available under

- Windows 2000 in TwinView Clone mode
- Windows 9*x* in TwinView Clone or Span mode
- Windows 95 in TwinView Clone mode

Desktop Manager

Desktop Manager allows the user to run an application on one or both monitors. This configuration may be useful for entertainment applications, such as DVD playback and digital video editing.

Desktop Manager functions under the TwinView Extended Desktop (Span) mode and, in addition to being supported by the NV11 chipset (i.e, the GeForce2 MX or the Quadro2 MXR graphics card), is also supported by any two NVIDIA graphics cards running in multi-monitor mode.

Digital Vibrance Control

Digital Vibrance Control (DVC), a mechanism for controlling color separation and intensity, boosts the color saturation of an image. DVC is supported by the NV11 chipset (i.e., the GeForce2 MX or Quadro2 MXR graphics card).

OpenGL

The NVIDIA OpenGL Settings control panel contains the following changes:

- Improved full-scene anti-aliasing methods
- Additional options for Windows 2000 and Windows NT 4.0
  - Force 16-bit Depth Buffer
  - Enable Advanced Multiple Monitors

Direct3D

The NVIDIA Direct3D Settings control panel contains the following changes:

- Improved full-scene anti-aliasing methods not previously available
- Removed certain obsolete options

Cursor Trails Support

Release 6 for Windows provides support for cursor trails in Windows 9*x*.

Control Panels

TwinView, Digital Vibrance Control, OpenGL, and Direct3D features have associated NVIDIA-specific windows (control panels) from which these features can be configured. These control panels are normally accessed by following one of these procedures from the Windows active desktop:

• Click Start > Settings > Control Panel > Display > Settings > Advanced

> *or*

• Click the right mouse button and select Properties > Settings > Advanced.

Release 5 Enhancements

The Release 5 driver adds capabilities in the following areas:

OpenGL

Changes have been made to the core, extensions, performance, and available features of OpenGL.

OpenGL 1.2 Core

Release 5 adds all the features that constitute the OpenGL 1.2 core capabilities:

• BGRA pixel formats
• packed pixel formats (plus R5_G6_B5 formats and reversed formats)
• rescaling vertex normals
• specular highlights after texturing
• level-of-detail control for mipmapped textures (supported in software on TNT2)
• texture coordinate edge clamping
• 3-D textures (performed in software on all platforms)
• vertex array subranges for optimizing vertex array processing
  (`glDrawRangeElements()` retains the performance of `glDrawElements()`)

OpenGL Extensions

The OpenGL extensions in Table C.1 were added or changed in Release 5.

Table C.2   OpenGL Extensions Modified in Release 5

Extension	Status	Comment
`ARB_texture_cube_map`	New	Same as `EXT_texture_cube_map`
`ARB_texture_env_add`	New	Same as `EXT_texture_env_add`
`ARB_transpose_matrix`	New	
`GL_ARB_texture_compression`	New (5.16)	To replace `S3_s3tc`
`NV_blend_square`	New	
`S3_s3tc`	New	Deprecated
`EXT_clip_volume_hint`	Removed	
`EXT_cull_vertex`	Removed	
`GL_NV_light_max_exponent`	Renamed	Was `GL_EXT_light_max_exponent`

OpenGL Performance Enhancements

A number of features are significantly improved in Release 5.

- For RIVA TNT and TNT2, polygon offset is faster.
- For GeForce 256 and Quadro, a number of improvements have been made:
  - `glDrawPixels()` and `glReadPixels()` have been made faster
  - display lists use AGP memory for better performance
  - large texture sets are handled more efficiently by the texture manager
  - vertex arrays with two-sided lighting are faster
  - compiled vertex arrays are faster for primitives that use multitextured TexCoord2f+Color4ub+Vertex3f
  - vertex array range extension is fully functional
- Control Panel enables accelerated full-scene anti-aliasing (GeForce, Quadro, GeForce2)
- multi-monitor hardware is accelerated on Windows 2000
- `GL_WGL_swap_interval` extension can change V-sync behavior
- V-sync is on by default (default behavior is selectable with the Control Panel)
- default anisotropic filtering can be triggered by checking the anisotropic filtering box on the Control Panel
- enabling `GL_POLYGON_SMOOTH` no longer forces software rendering, resulting in much better performance at some cost in visual quality

Direct3D

Release 5 contains the following Direct3D changes:

- accelerated full-scene anti-aliasing is enabled (GeForce, Quadro, GeForce2)

- limited three-stage setup is now possible

- `D3DVTXPCAPS_MATERIALSOURCE7` capability bit is now disabled (leaving the driver with DirectX 6 material source capabilities)

The following Registry keys are useful for applications that do not blit correctly:

- `FLUSHAFTERBLITENABLE` is a new Registry key that controls the wait-after-blit condition when the `DDBLT_WAIT` flag is set.

  (Default is `DISABLED`—do not wait.)

  Note: This Registry key was formerly named `WAITAFTERBLITENABLE`.

- `FORCEBLITWAITFLAGENABLE` is a new Registry key that forces the `DDBLT_WAIT` flag to be set for all blits, which prevents applications that do not check the return value from unexpectedly losing blits.

  (Default is `DISABLED`.)

- `LIMITMAXQUEUEDFBBLITSENABLE` is a new Registry key that limits the maximum number of queued blits to the front buffer to a value set by the `PRERENDERLIMIT` Registry key, which is 3 by default.

  (Default is `DISABLED`.)

Control Panel

NVIDIA now provides Control Panel tabs for Windows NT 4.0 and Windows 2000.

A P P E N D I X

D

NVIDIA SETUP WIZARD PAGES

These sections contain the wizard pages in sequence for a few different display setups.

- "NVIDIA Display Wizard — Typical Setup" on page 208
- "NVIDA Display Setup Wizard — Custom Setup" on page 209
- "NVIDIA Display Wizard — HDTV Component Connection" on page 211
- "NVIDIA Display Wizard — Analog Display with HDTV/DVI" on page 213
- "NVIDIA Display Wizard — Digital Display and Television" on page 215

NVIDIA Display Wizard — Typical Setup

Figure D.1 NVIDIA Display Wizard — Typical Setup

NVIDA Display Setup Wizard — Custom Setup

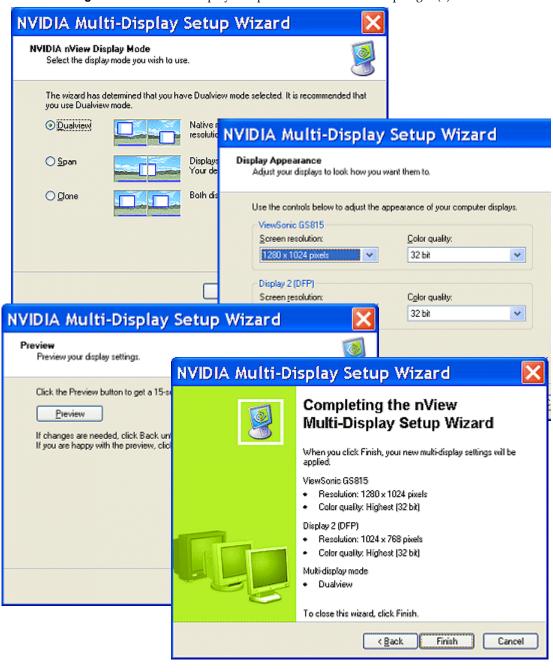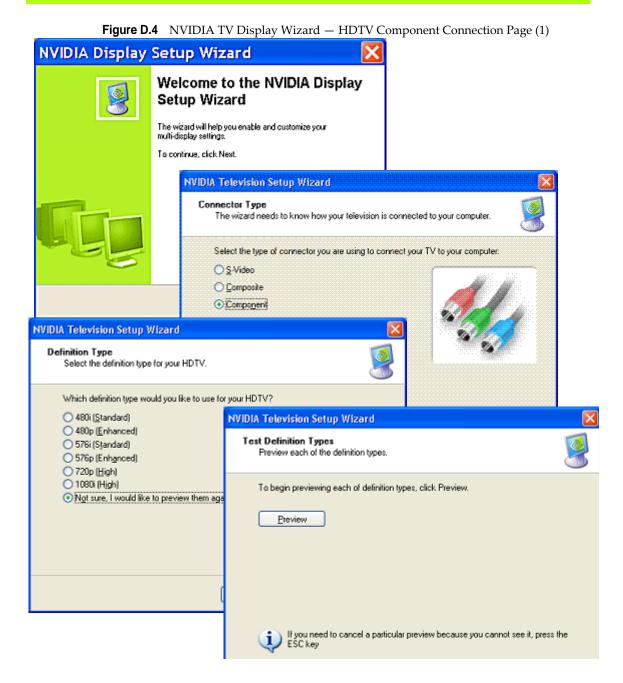**Figure D.2** NVIDIA Display Setup Wizard — Custom Setup Pages (1)

Figure D.3 NVIDIA Display Setup Wizard — Custom Setup Pages (2)

NVIDIA Display Wizard — HDTV Component Connection

Figure D.4 NVIDIA TV Display Wizard — HDTV Component Connection Page (1)
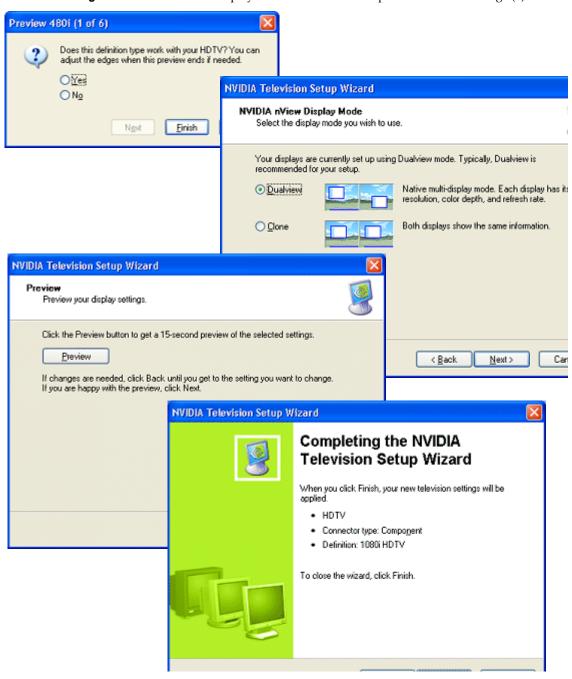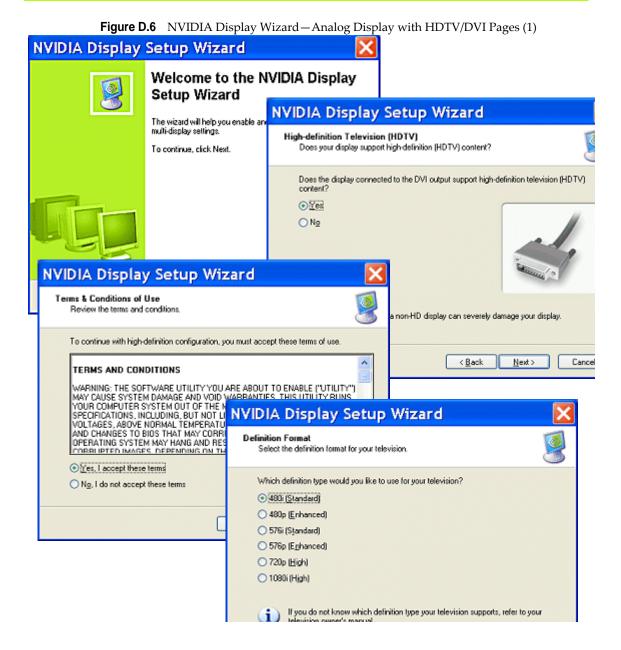
Figure D.5   NVIDIA TV Display Wizard — HDTV Component Connection Page (2)

NVIDIA Display Wizard — Analog Display with HDTV/DVI

Figure D.6   NVIDIA Display Wizard—Analog Display with HDTV/DVI Pages (1)
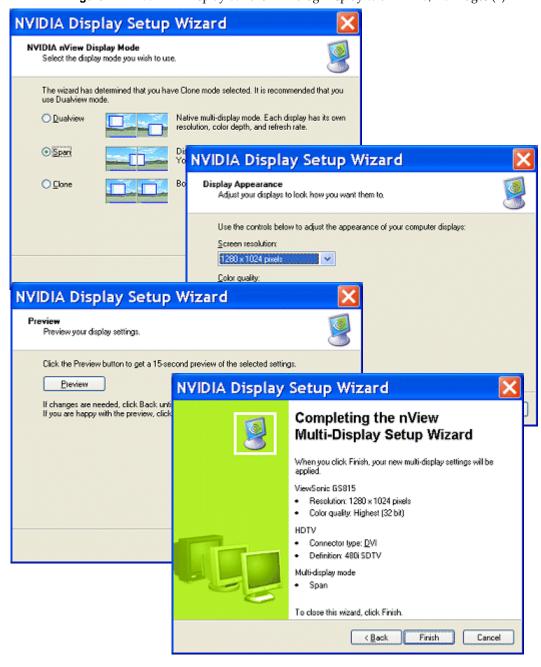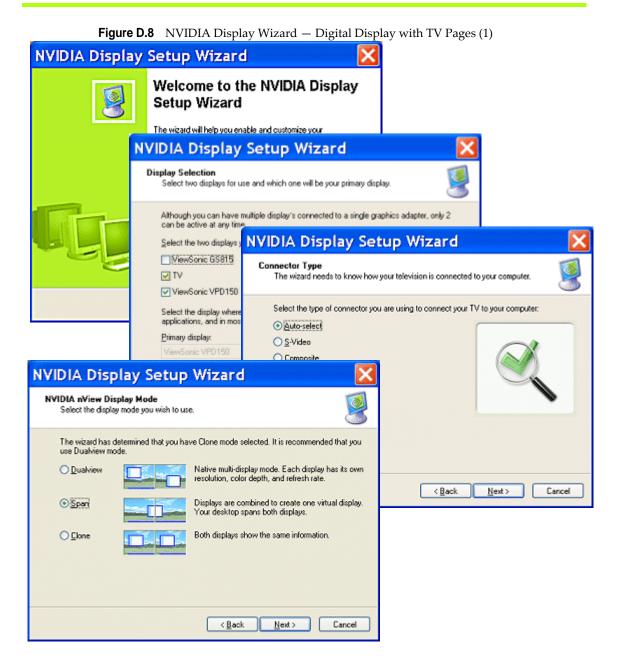
Figure D.7   NVIDIA Display Wizard—Analog Display with HDTV/DVI Pages (2)

NVIDIA Display Wizard — Digital Display and Television

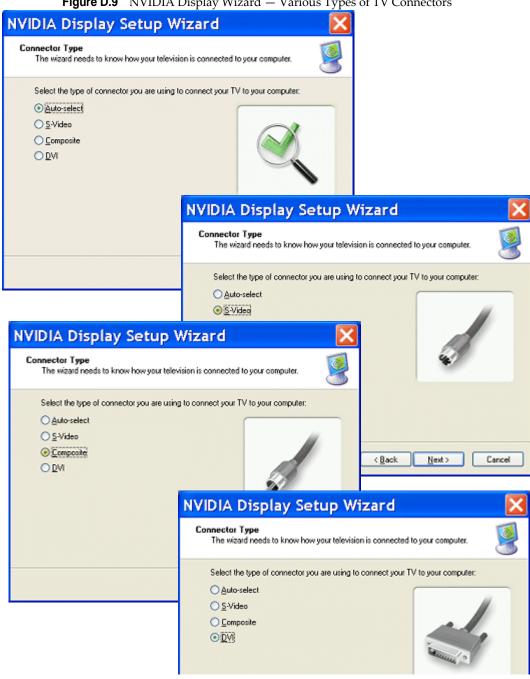**Figure D.8** NVIDIA Display Wizard — Digital Display with TV Pages (1)

Figure D.9   NVIDIA Display Wizard — Various Types of TV Connectors

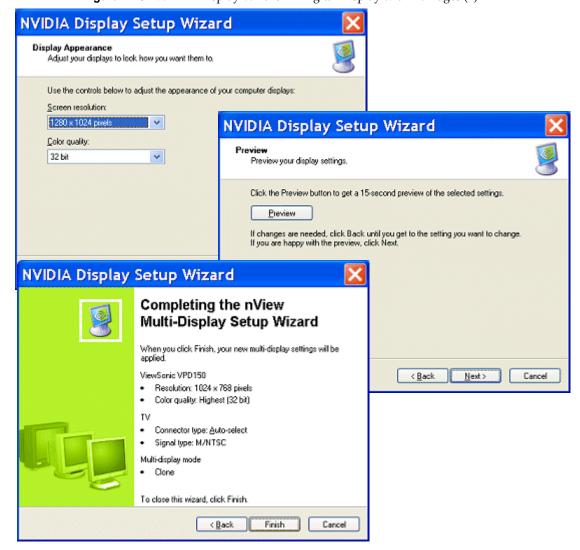**Figure D.10** NVIDIA Display Wizard — Digital Display with TV Pages (2)

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GLOSSARY

analog display — Analog display refers to your CRT display, in general. The terms CRT and analog display may be used interchangeably in this guide.

Control Panel (Microsoft Windows) — You can access the Windows Control Panel window by clicking Start > Settings > Control Panel from the Windows desktop taskbar.

control panel (**NVIDIA display**) — The NVIDIA display properties "control panel" (shown in Chapter 4, Figure 3.7 and throughout this guide) refers to the entire NVIDIA-based window with the fly-out NVIDIA display menu containing options, each of which opens to a separate configuration page.

control panel (**nView Desktop Manager**) — The nView Desktop Manager "control panel" refers to the entire nView Desktop Manager control panel window (tabbed style or NVIDIA menu style) from which you can configure nView Desktop Manager settings. For details, refer to the *nView Desktop Manager User's Guide — Release 80 Driver Version*

nView Desktop Manager is also a clickable icon in the Windows Control Panel group of icons. When you click this icon, the nView Desktop Manager "control panel" appears.

digital display — A digital display can be a digital flat panel (DFP) or, for example, a mobile (laptop or notebook) computer's LVDS internal display panel.

desktop — Desktop is your Windows on-screen work area on which windows, icons, menus, and dialog boxes appear.

dialog box — Dialog boxes are user-input windows that contain command button and various options through which you can carry out a particular command or task.

For example, in a Windows application "Save As" dialog box, you must indicate the folder to contain the document to be saved and the name of that document when saving it.

dual-card configuration — A setup where two or more displays (such as an analog display, a digital display, or a TV) are connected to two NVIDIA GPU-based graphics cards installed in the computer.

GPU — NVIDIA graphics processor (chip) products are called **graphics processing units** (GPUs). Supported NVIDIA GPUs are listed in "Hardware — Supported NVIDIA Products" on page 18. The graphics card you are using is based on an NVIDIA GPU.

HDTV — high definition television. A system for transmitting a TV signal with far greater resolution than the standard **National Television Committee (NTSC)** standards. An HDTV set requires at least two million pixels versus a common television set of 360,000.

multi-graphics card configuration — A setup where two or more displays (such as an analog display, a digital display, or a TV) are connected to two (or more) NVIDIA GPU-based graphics cards installed in the computer.

multi-display configuration — A setup where two or more displays are connected to either a multi-display NVIDIA GPU-based graphics card; *or* two (or more) NVIDIA GPU-based graphics cards.

single-display configuration — A setup where only one display is connected to the NVIDIA GPU-based graphics card in your computer.

SLI (Scalable Link Interface) technology — NVIDIA SLI multi-GPU technology takes advantage of the increased bandwidth of the PCI Express™ bus architecture to allow multiple GPUs to work together to deliver accelerated performance.

An NVIDIA SLI system consists of a PCI Express motherboard that supports two physical connectors capable of having two NVIDIA PCI Express graphics cards plugged into them. The two graphics cards must be joined together by the NVIDIA SLI connector.

With the appropriate graphics drivers installed, SLI mode can then be enabled or disabled. When SLI mode is disabled, you can use all the nView multi-display modes

that are supported, including using up to four monitors connected to the two SLI graphics cards. When SLI mode is enabled, nView multi-display modes are not available. Instead, the two graphics cards drive a single display1 to provide accelerated 3D performance in DirectX and OpenGL applications2.

Note: For details, see the Application Note "*Using NVIDIA SLI Graphics Cards*".

window — A window is any independent window on your desktop. Applications such as Microsoft® Windows® Outlook® or Explorer may have several windows which are all part of the same application. Windows can be dragged around the screen, opened and closed, and resized.

The nView Desktop Manager application (described in the *NVIDIA nView Desktop Manager User's Guide*) allows you to do even more with windows such as make them transparent or force them always to be on top of other windows.