ForceWare Graphics Driver
Quadro Workstation User's Guide

Driver Version: Release 80 for Windows
NVIDIA Corporation
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nVIDIA.

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Table of Contents

5. Configuring Displays

6. Configuring HDTV

7. Configuring Key ForceWare Graphics Driver Features

8. Using NVIDIA Direct Access

9. Using NVIDIA Scalable Link Interface (SLI)

D. Glossary

List of Tables

List of Figures

C H A P T E R

1

INTRODUCTION

This chapter discusses the following major topics:

- "About this Guide" on page 1
- "Online Help" on page 2
- "NVIDIA Display Properties and nView Desktop Manager" on page 3
- "Release 80 Enhancements" on page 3

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 workstation products, i.e, graphics cards based on the
NVIDIA **Quadro**™ series of GPUs (graphics processing units) listed in "Supported
NVIDIA Workstation Products" on page 8.

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: User's Guide* — **Release 80 driver version**. Refer to this document if you are primarily using the NVIDIA desktop consumer products, i.e, graphics cards based on the NVIDIA GeForce® 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.

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 27.

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 18.

- **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

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 select 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 which display to use for the output
- Additional SLI Support

  Release 80 adds support for the following combinations of PCI Express graphics cards & chipsets:

Chipset	PCI-Express Graphics Cards
NVIDIA nForce4 SLI	
NVIDIA nForce4 SLI—Intel Edition	GeForce 7800 GT + GeForce 7800 GT
NVIDIA nForce Professional 2200	GeForce 6800 XT + GeForce 6800 XT GeForce 6800 XE + GeForce 6800 XE
NVIDIA nForce Professional 2200 + NVIDIA nForce Professional 2050	

NVIDIA PureVideo™ Enhancements

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

Support for the Next Generation of NVIDIA GPUs

Additional Details by Driver Module

DirectX

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

OpenGL

- New Extensions
  - NV_packed_depth_stencil
  - ARB_pixel_buffer_object
  - GL_NV_timer_query

- 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 higher GPUs
- PureVideo support for the next generation of GPUs

Classic NVIDIA Control Panel

- HDTV Overscan compensation support

  Includes X-Y adjustment, and independent front-end timing adjustment features
- Dynamic SLI enable/disable capability
- New Direct Access page — Allows direct access to DDC/CI display controls on monitors that support it.

C H A P T E R

2

SYSTEM REQUIREMENTS

This chapter discusses the following major topics:

- "Supported Operating Systems" on page 7
- "Hardware — Supported NVIDIA Products" on page 8
- "Supported Languages" on page 9
- "Software — NVIDIA ForceWare Graphics Driver Installation" on page 10
- "Notes on Feature and Configuration Support" on page 15

Supported Operating Systems

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

- Microsoft Windows$^®$ XP
    - 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

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 exception of the Quadro NVS 400 GPU, which supports up to four displays per graphics card.

Table 2.1   Supported NVIDIA Workstation Products

Product	Windows XP 32-bit Windows 2000	Windows XP Professional x64	Windows NT4
NVIDIA Quadro FX 4500	X	X	
NVIDIA Quadro FX 4400	X		X
NVIDIA Quadro FX 4000 SDI	X		X
NVIDIA Quadro FX 4000		X	
NVIDIA Quadro FX 3450	X	X	X
NVIDIA Quadro FX 3400	X	X	X
NVIDIA Quadro FX 330	X		X
NVIDIA Quadro FX 3000G	X		X
NVIDIA Quadro FX 3000	X	X	X
NVIDIA Quadro FX 2000	X	X	X
NVIDIA Quadro FX 1400	X		X
NVIDIA Quadro FX 1300	X		X
NVIDIA Quadro FX 1100	X	X	X
NVIDIA Quadro FX 1000	X	X	X
NVIDIA Quadro FX 700	X	X	X
NVIDIA Quadro FX 600	X	X	X
NVIDIA Quadro FX 540	X		X
NVIDIA Quadro FX 500	X	X	X
NVIDIA Quadro4 980 XGL	X	X	X
NVIDIA Quadro4 900 XGL	X	X	X
NVIDIA Quadro4 780 XGL	X	X	X
NVIDIA Quadro4 750 XGL	X	X	X
NVIDIA Quadro4 700 XGL	X	X	X
NVIDIA Quadro4 580 XGL	X		X
NVIDIA Quadro4 550 XGL	X	X	X
NVIDIA Quadro4 500 XGL	X		X
NVIDIA Quadro4 400 NVS	X		X

Table 2.1   Supported NVIDIA Workstation Products (continued)

Product	Windows XP 32-bit Windows 2000	Windows XP Professional x64	Windows NT4
NVIDIA Quadro4 380 XGL	X	X	X
NVIDIA Quadro4 200 NVS	X		X
NVIDIA Quadro NVS 400	X		X
NVIDIA Quadro NVS 285 PCI	X	X	X
NVIDIA Quadro NVS 280 PCI	X	X	X
NVIDIA Quadro NVS 280	X		X
NVIDIA Quadro NVS 200	X		X
NVIDIA Quadro NVS	X		X
NVIDIA Quadro2 MXR	X		X
NVIDIA Quadro DCC	X		X

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

Minimum Hard Disk Space Requirement

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 (all editions)	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 (all editions)	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 (all editions)	51.16 MB
Windows 2000	51.16 MB
Windows NT 4.0	44.27 MB

Additional Operating System Requirements

The operating systems in Table 2.5 require the additional packages listed in order to be supported by NVIDIA.

Table 2.5 Additional Operating System Requirements

Operating System	Additional Requirements
Windows NT 4.0	Service Pack 4

Driver Installation Instructions

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.

- 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 Me and Windows XP, the NVIDIA driver is installed in "Dualview mode" display. However, note that the second display is not activated by default, but must be enabled.

- Under Windows 2000, the NVIDIA Display Driver is installed in Span mode.

  For instructions on how to install nView Dualview mode, see "Initial Installation of nView Dualview Mode — Windows 2000" on page 44 and "Enabling nView Dualview Mode After Initial Installation — Windows 2000" on page 46.

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.

Note: Follow the steps below and/or refer to the *NVIDIA nView Desktop Manager User's Guide* for details. 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
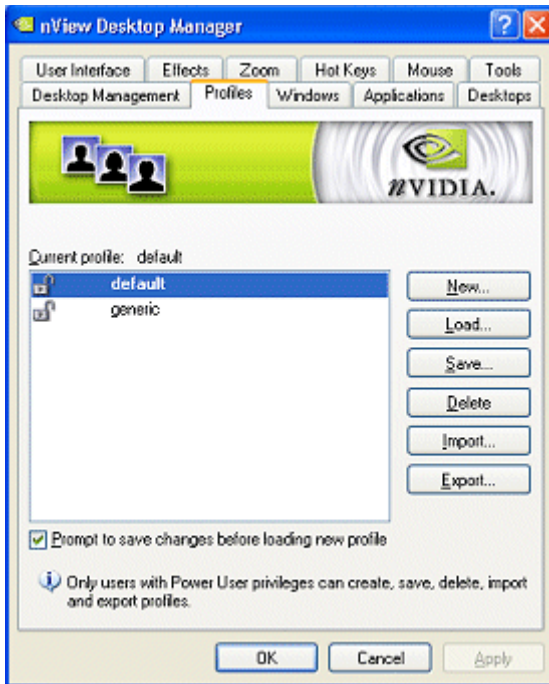
2 To preserve your current settings, you can use either the **Save** or the **New** option from the nView Desktop Manager Profiles page:

- 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**.

3 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

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

5 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.
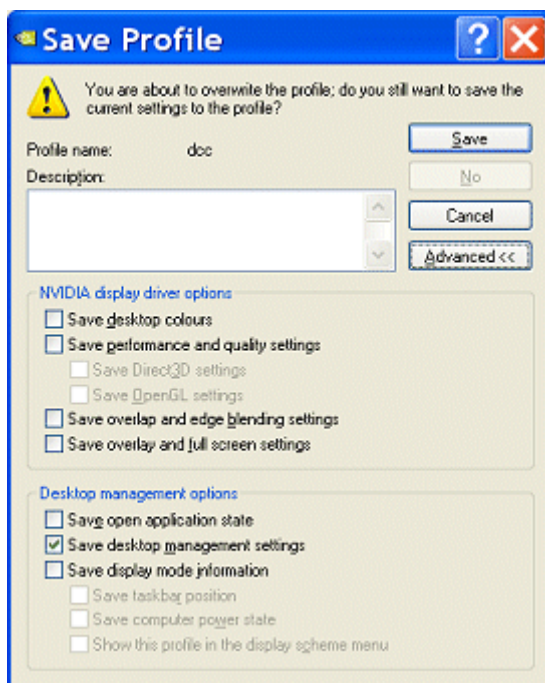
If you overwrote a current profile, the same profile name is retained in the list.

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.

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

7 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.

Uninstalling the NVIDIA Display 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.

Your system now restarts.

Installing the NVIDIA ForceWare Graphics Drivers

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

2 Click the driver download link.

The license agreement dialog box appears.

3 Click **Accept** if you accept the terms of the agreement, then either open the file or save the file to your PC and open it later.

Opening the EXE file launches the NVIDIA InstallShield Wizard.

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

Notes on Feature and Configuration Support

Feature Support

- To access features on the nView Display Settings page (see "nView Display Modes" on page 31), 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 8, *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 31.

- 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.

3

NVIDIA 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 199.

Figure 3.1 Manually Starting the NVIDIA Display Wizards

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.
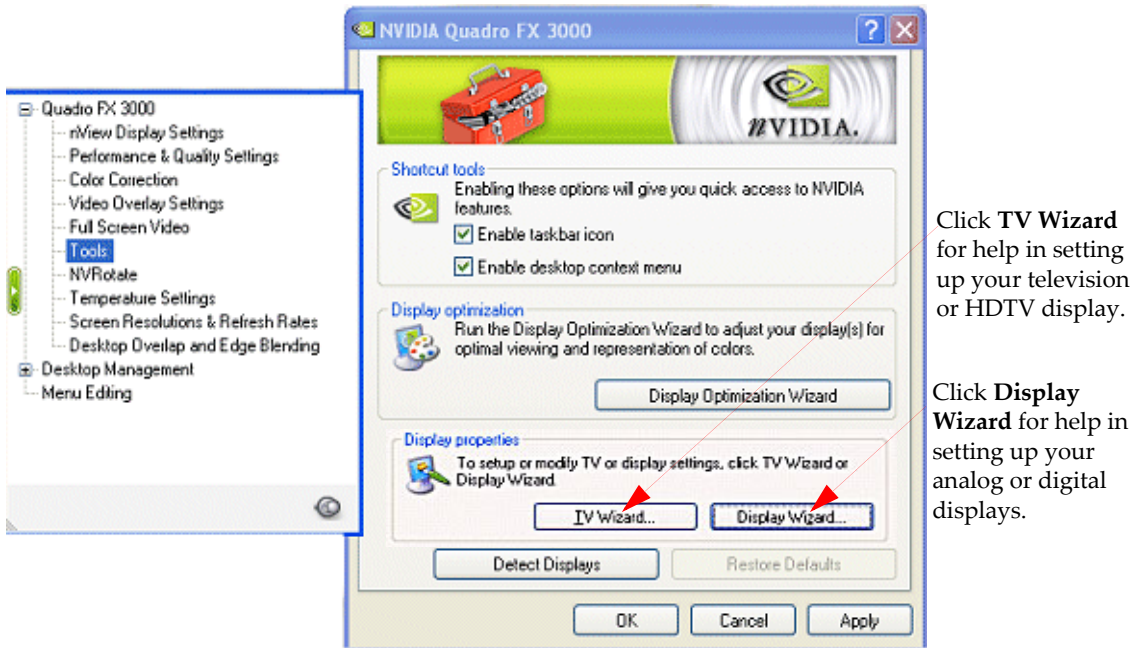
1 Click **Change/Remove**.

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 19 or the "NVIDIA Settings Menu — Windows Taskbar Access" on page 21 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 Figure 3.7, "NVIDIA Display Menu Showing the GPU Page— Multiple Displays Connected" on page 24.

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 129 and then continue to the next step.

3 Click **NVIDIA Display** to see one or more of the descriptive EDID display names as shown in the (Figure 3.2). The display names that appear are based on the

Figure 3.2 NVIDIA Display Options on the Windows Desktop Menu

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 Display Numbering" on page 36 and "About Renaming Displays" on page 36.

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 (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.

Note If you have two displays connected, both displays appear and are accessible on the desktop menu *only* if nView Dualview mode is enabled. Only your primary display appears if any other nView display mode is enabled.
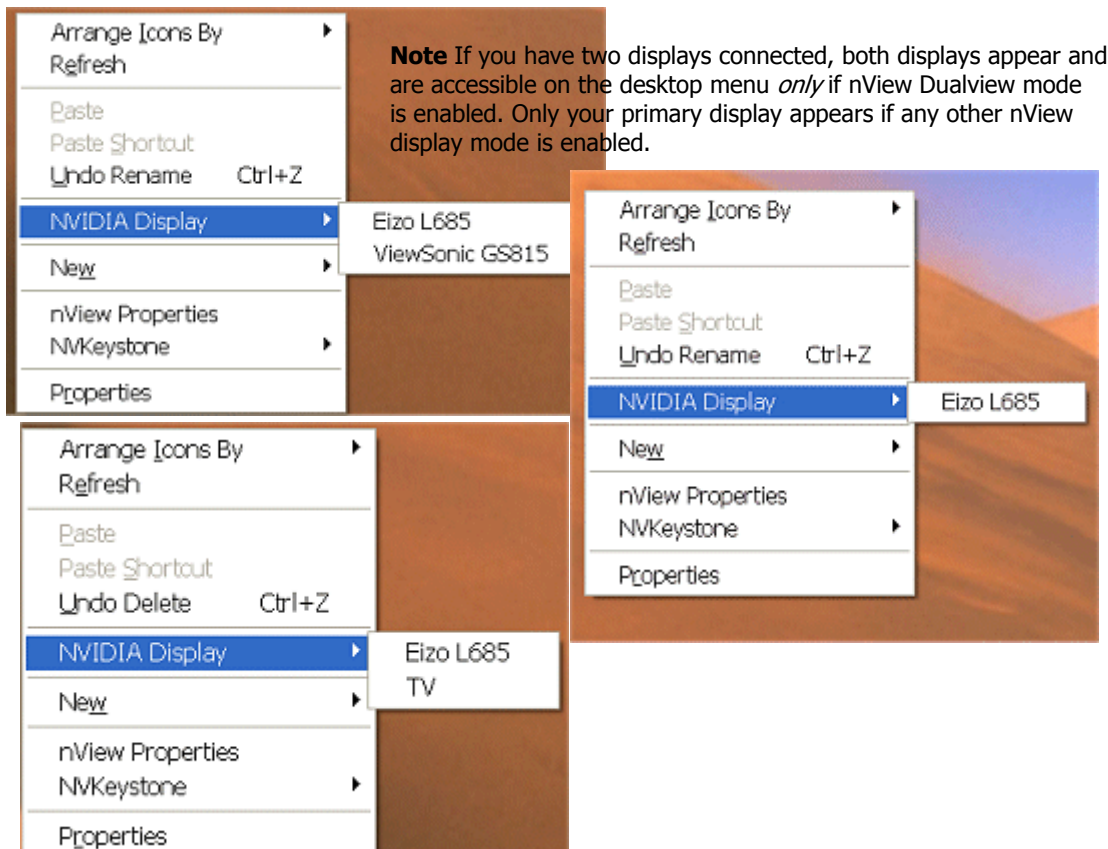
2 Select the NVIDIA option **Play On My** and then choose the display on which you want to play the video.

3 To configure full screen video display, see "Using Full Screen Video Settings" on page 120.

Figure 3.3 NVIDIA Display Options from a Video File Context Menu T
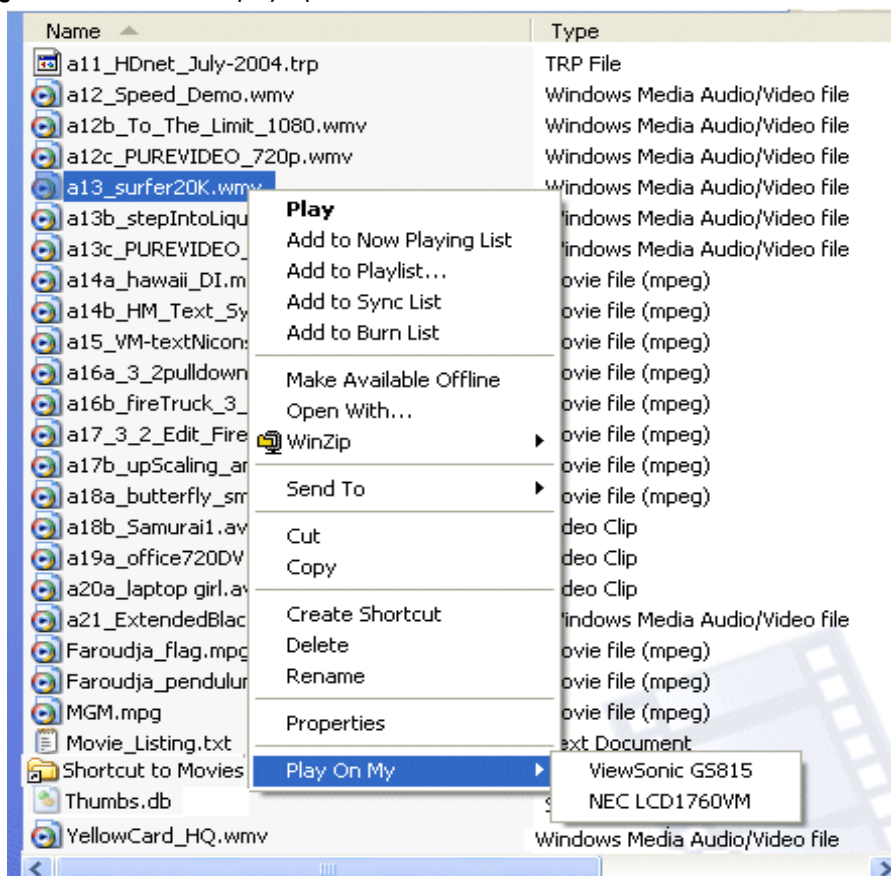
NVIDIA Settings Menu — Windows Taskbar Access

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 126.

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

3 Click **NVIDIA Display** (Figure 3.6) and then select the type of display.

Figure 3.5 NVIDIA Settings Sample Menu
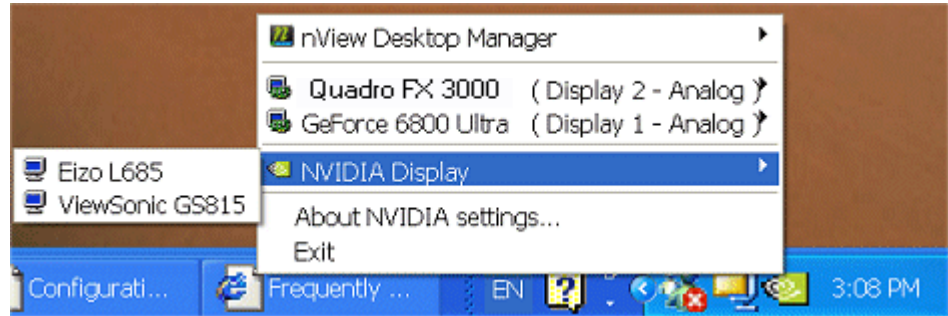
The NVIDIA display control panel appears (Figure 3.7).

Figure 3.8 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 3.9.

Figure 3.6 NVIDIA Settings Sample Menus with Four Connected Graphics Cards
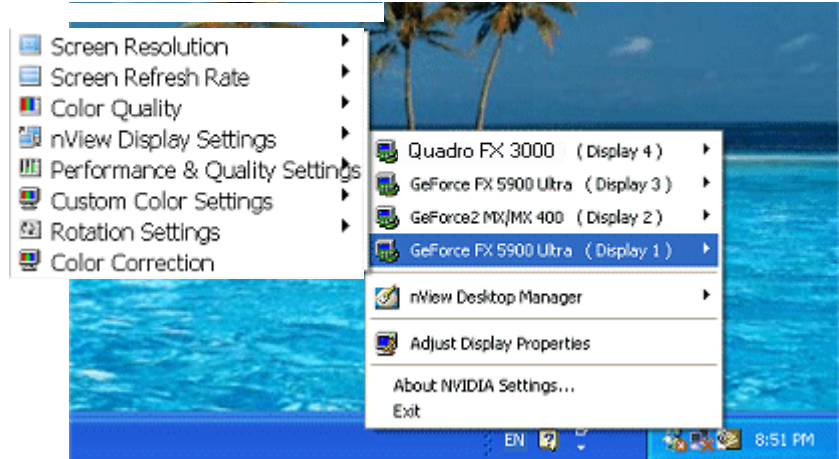
Windows Display Properties Setting Access

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 a variety of 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.

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

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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.

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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
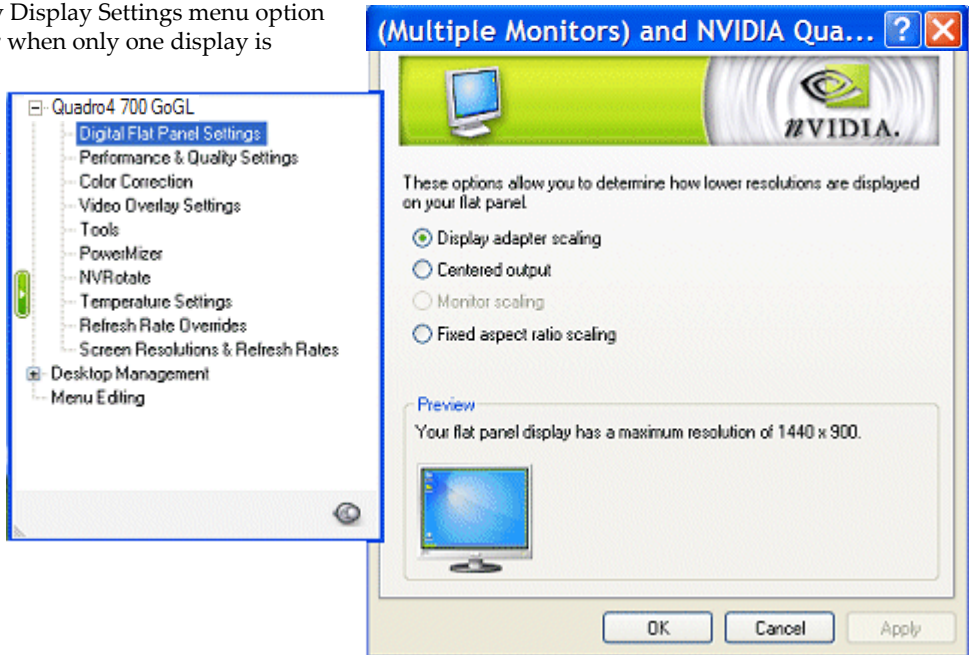
The NVIDIA GPU Page

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
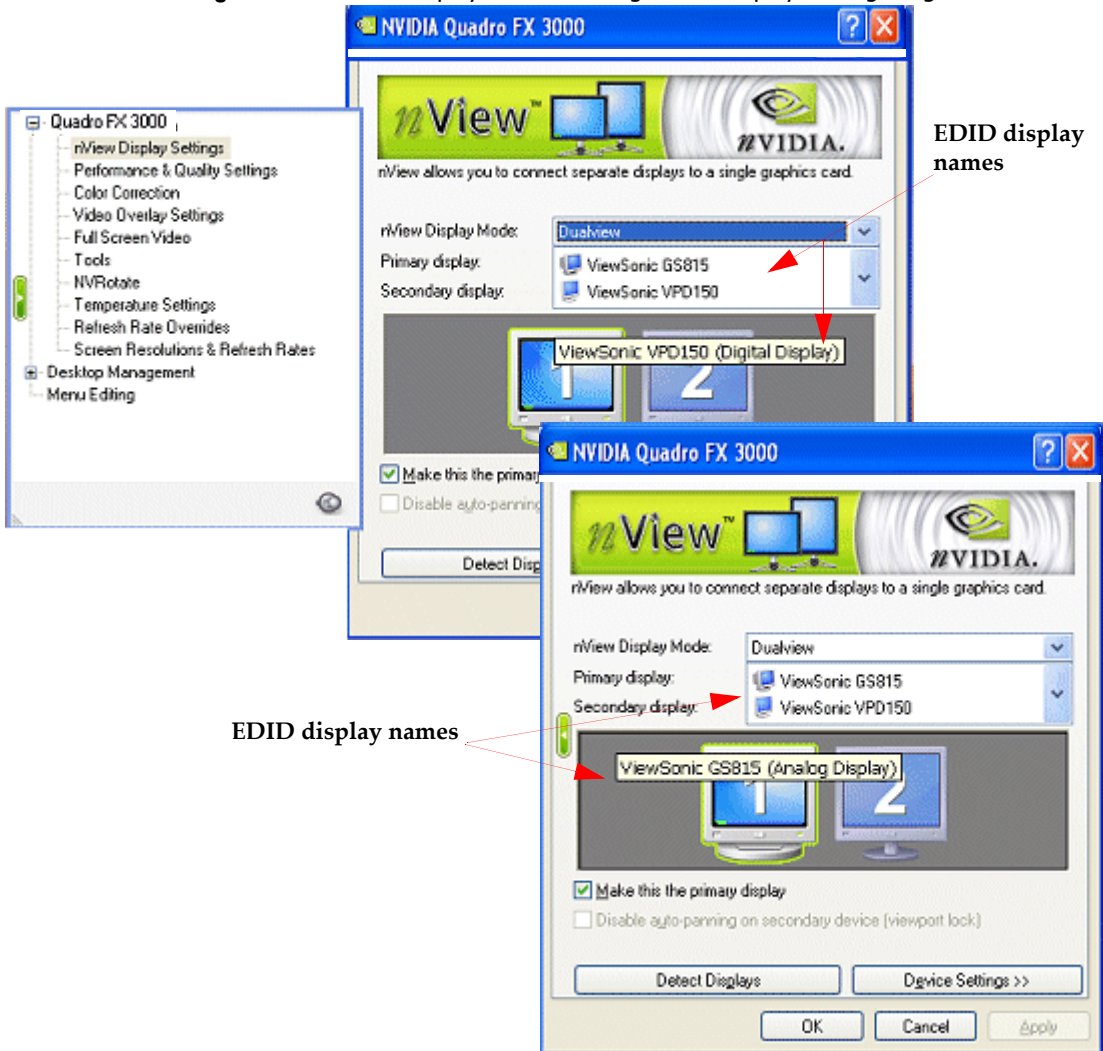
Note: This menu item only appears if you have more than one display connected. For complete details on using the nView Display Settings features, see the next chapter "Using nView Multi-Display Settings" on page 31.

- **Performance and Quality Settings —** see "Adjusting Performance and Quality Settings" on page 97.

- **Video Overlay Settings —** see "Using Video Overlay Settings" on page 118

- **Full Screen Video —** see "Using Full Screen Video Settings" on page 120.

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 125.

- **NVRotate™ —** see "Using NVRotate Settings" on page 131.

- **Temperature Settings** menu option is available on newer GPUs, such as GeForce FX, and on certain older GPUs. "Adjusting Temperature Settings" on page 134.

- **Screen Resolutions & Refresh Rates** "Changing Screen Resolutions and Refresh Rates" on page 136.

- **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 144.

- **PowerMizer™ —** *for mobile computers only*; see "Adjusting PowerMizer Settings — Only for Notebook Computers" on page 146.

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
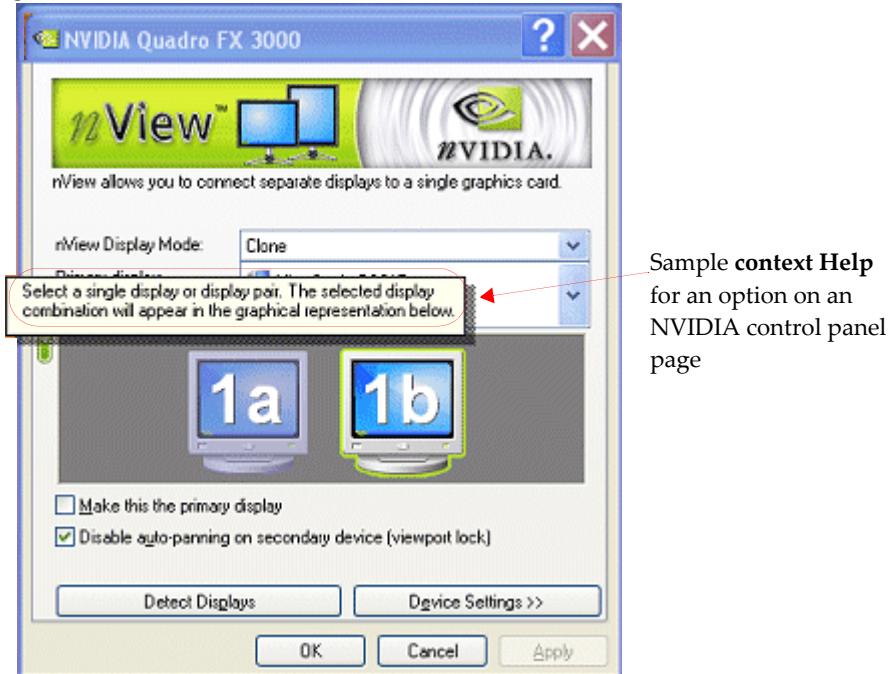
Tool Tips

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
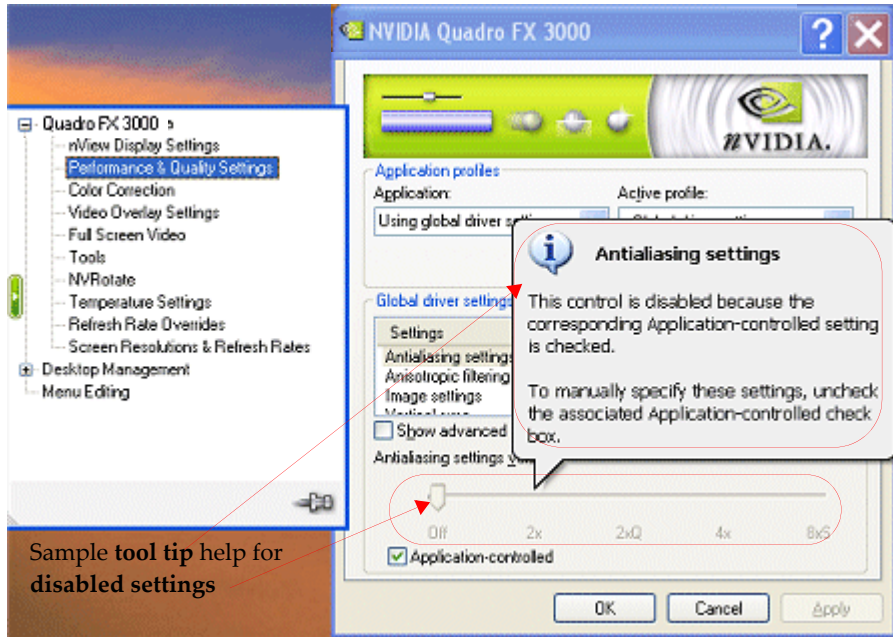
Uninstalling the NVIDIA Display Driver

Note: It is strongly recommended that you follow the steps in this section to completely uninstall the existing NVIDIA driver installed on your computer before you install a new version of the driver.

To uninstall the NVIDIA ForceWare graphics display driver, 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.

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

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 file are saved in the **Windows\nView** directory on your hard disk.

Your system now restarts.

4

USING NVIEW MULTI-DISPLAY SETTINGS

This chapter discusses the following major topics:

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
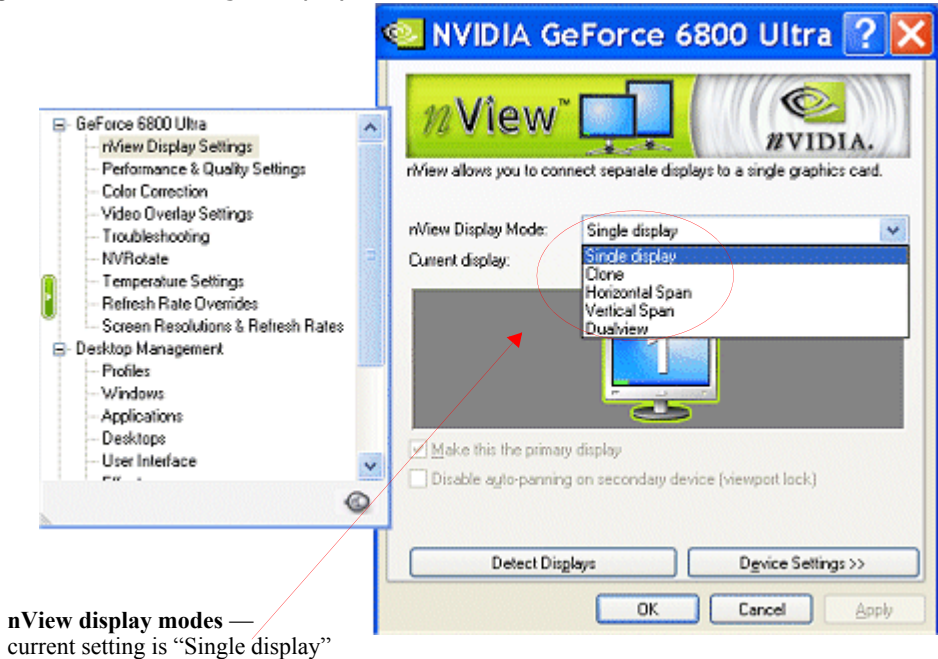
nView display modes — current setting is "Single display"

- **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"
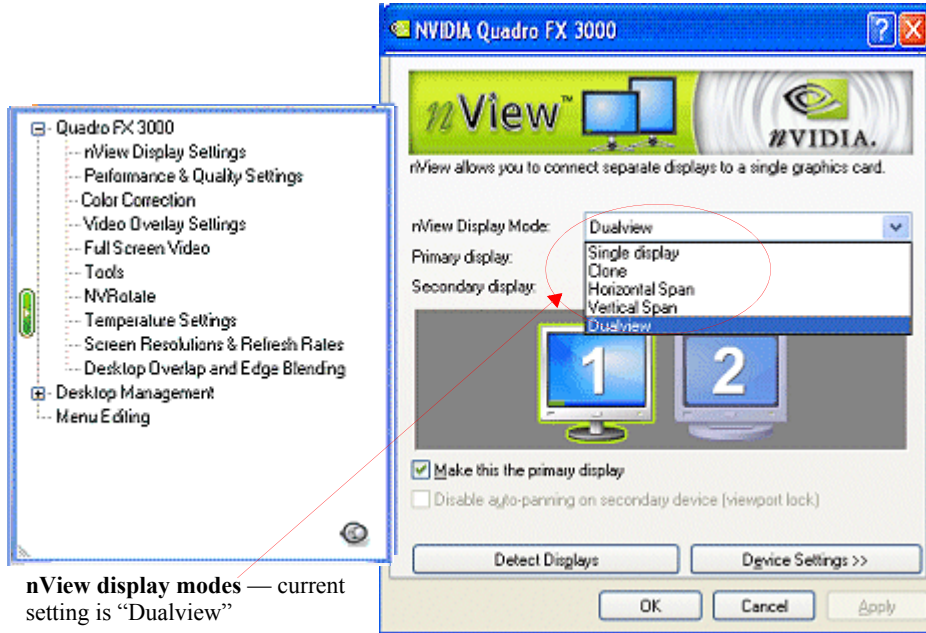
- **Dualview** mode (Figure 4.2, Figure 4.3, and Figure 4.4) indicates that both displays in the display pair function as one virtual desktop. Unlike Horizontal Span or Vertical Span mode, Dualview treats each display as a separate device. This means that the Windows taskbar will not be stretched across 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 51), 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 53), 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 120.

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 120.

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

Display icon 1 representing digital display

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

Display icon 2 representing TV display

Sample **context menu** for a **TV display**
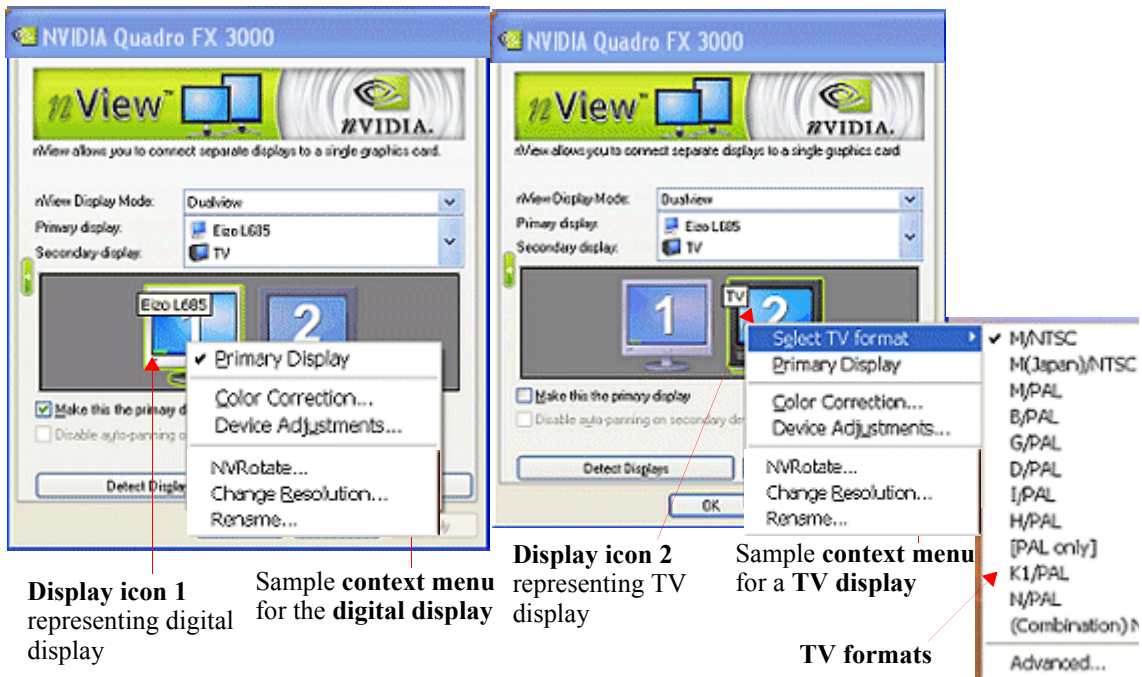
TV formats

Available settings include:

- **Color Correction**. See "Adjusting Desktop Colors" on page 92.
- **Device Adjustments**. See "Configuring Displays" on page 61.
- **Select TV format**. See "Adjusting Television (TV) Settings" on page 66.
- **NVRotate**. See "Using NVRotate Settings" on page 131.
- **Change Resolution**. See "Enabling Virtual Desktop — Clone Mode" on page 53 and "Changing Screen Resolutions and Refresh Rates" on page 136.

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 3.2 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 4.4:

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.

Figure 4.4   nView Display Settings — Renaming a Display

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 4.4.

Figure 4.5   nView Display Settings — Renamed 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).
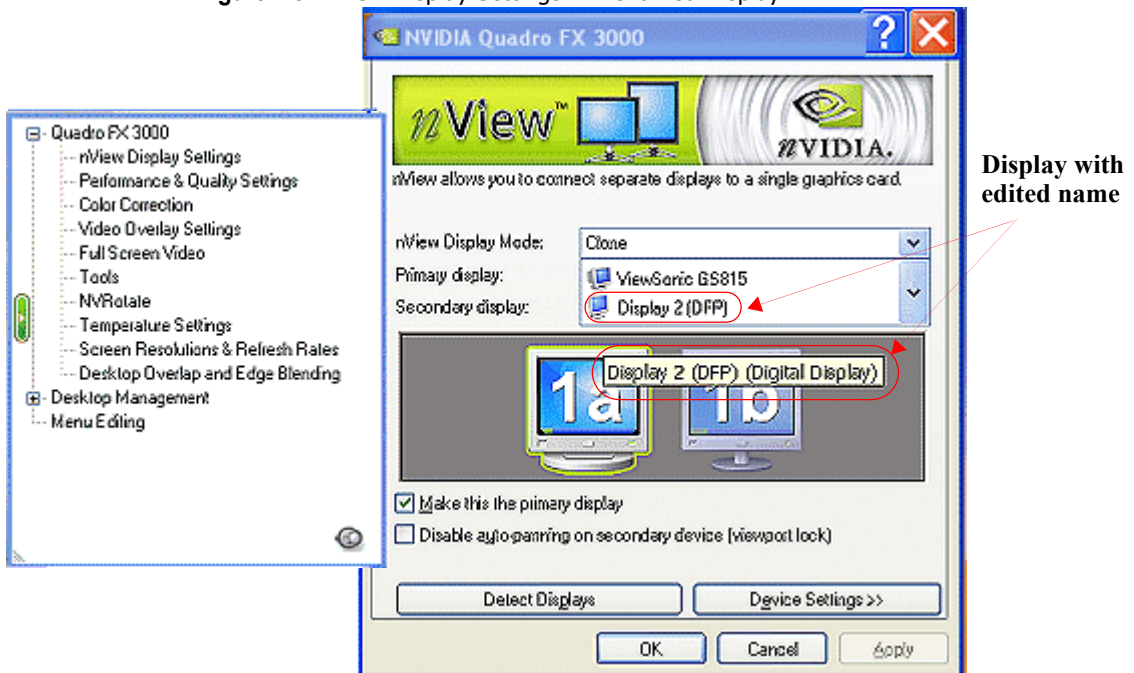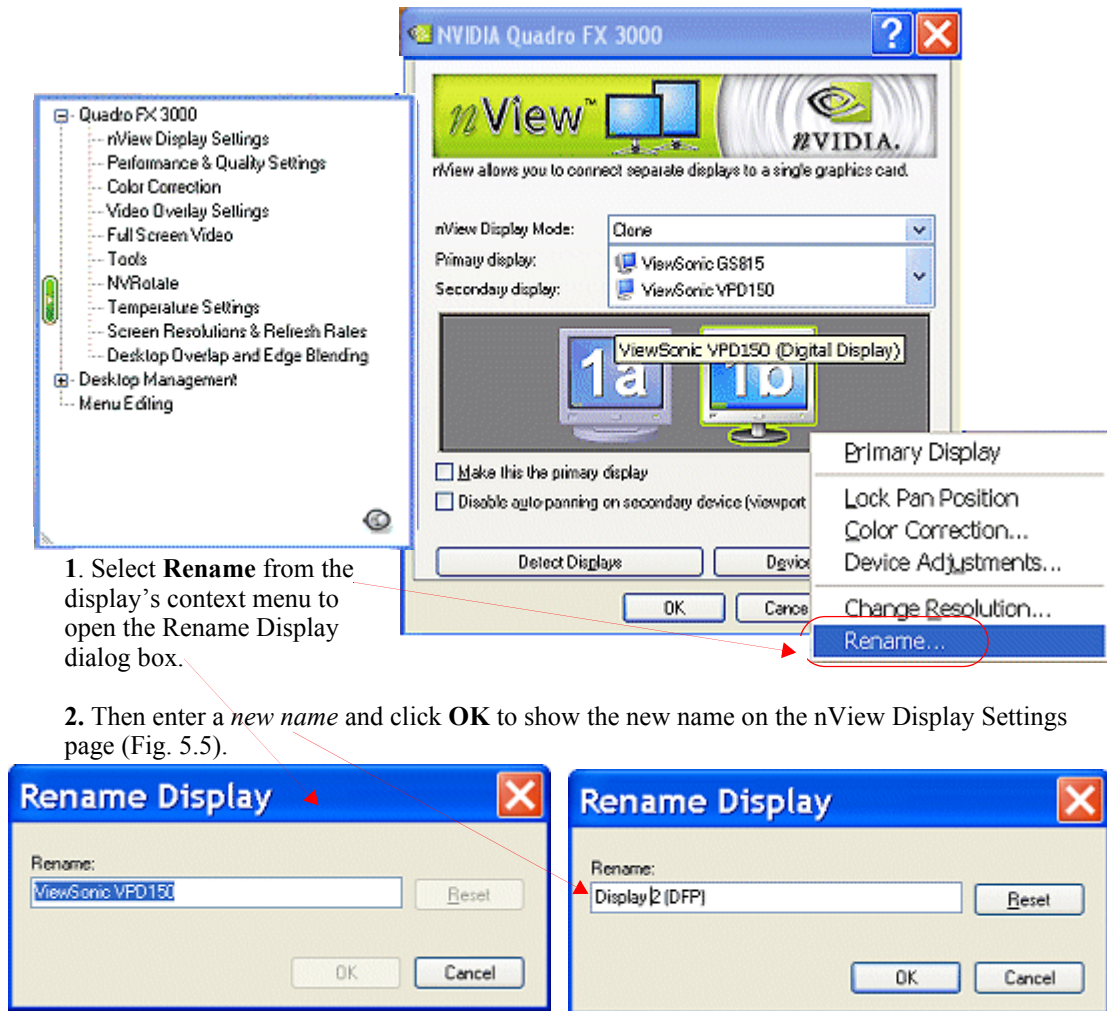
NVIDIA Multi-Display Support

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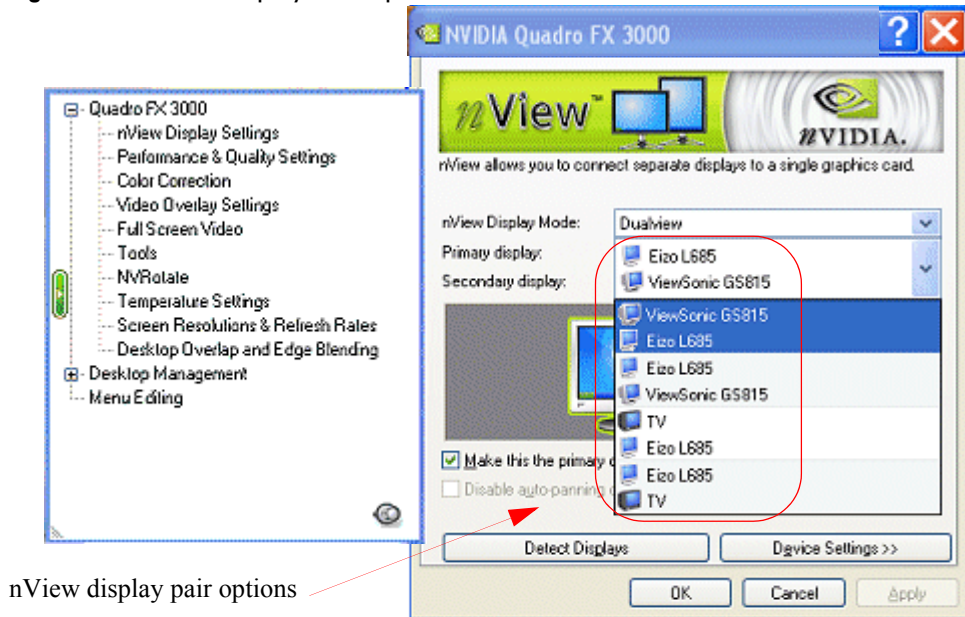
- **Analog display + digital display**
- **Digital display + analog display**
- **TV + digital display**
- **Digital display + TV**
- **Analog display + TV**
- **TV + Analog display**

Primary and Secondary Displays

nView Display Mode

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 later sections.

Sample nView Display Settings 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 120 and "Using Video Overlay Settings" on page 118.)

    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.

- 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.

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
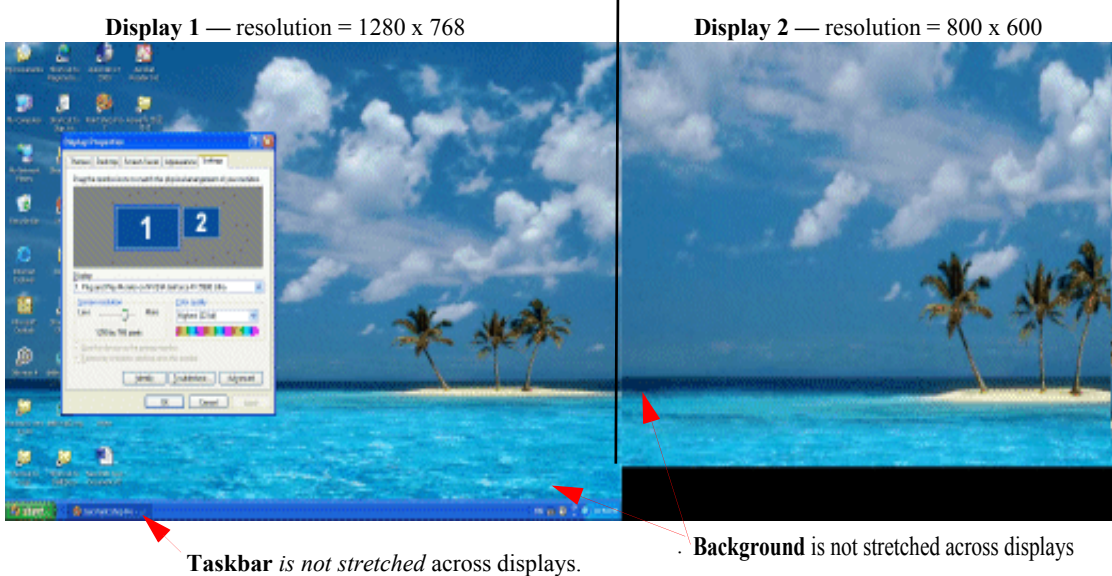
Figure 4.8 Multiple Displays in nView Dualview Mode (2)

- 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 37.

   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.

Display 1 — resolution is 1280 x 768   **Display 2** — resolution is 1024 x 768
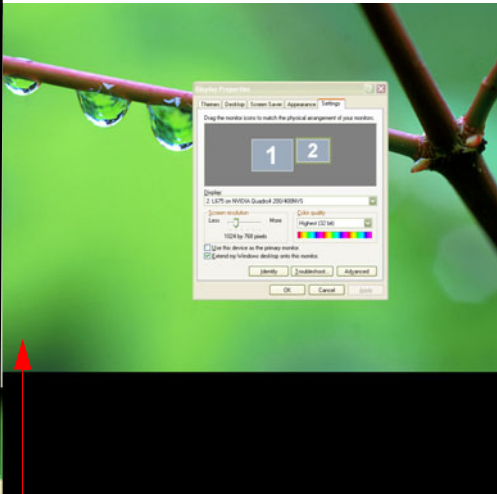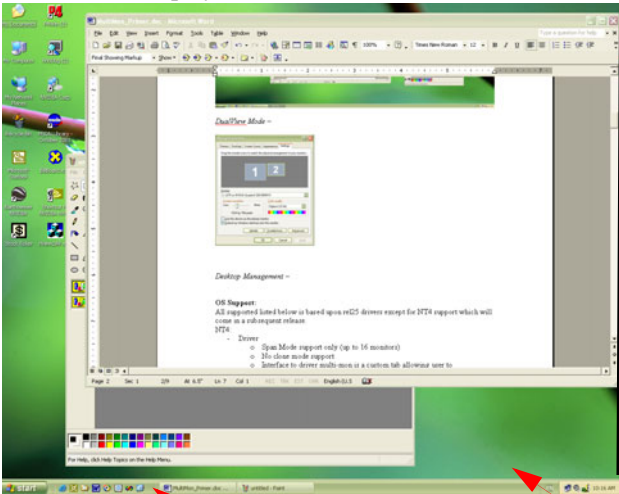
Taskbar is *not* stretched across displays.   **Background** is not stretched across displays.

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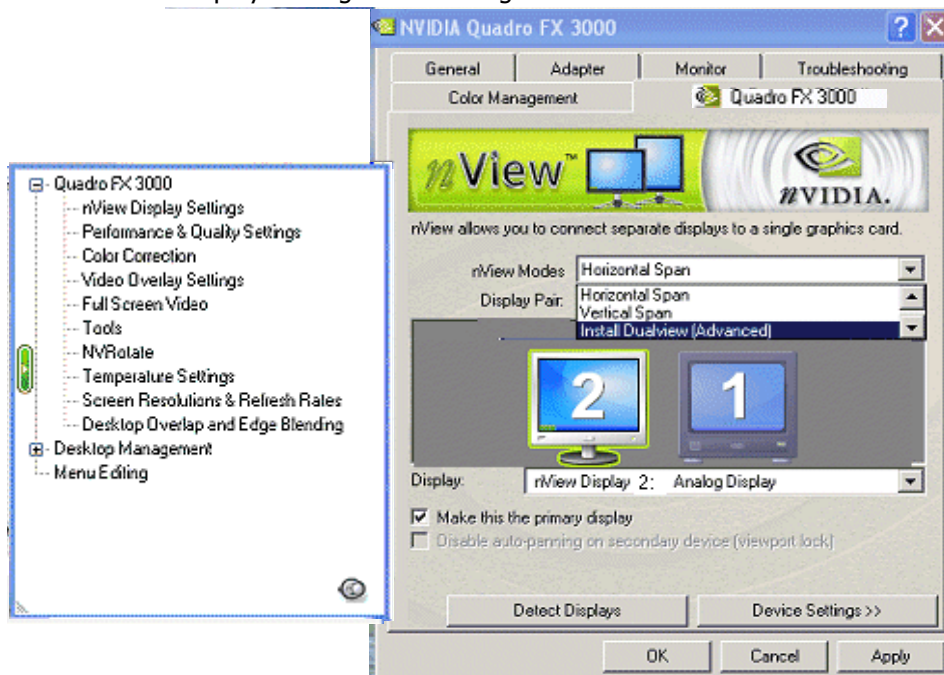
4 When the prompt appears, click **Restart Now**.

> **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)
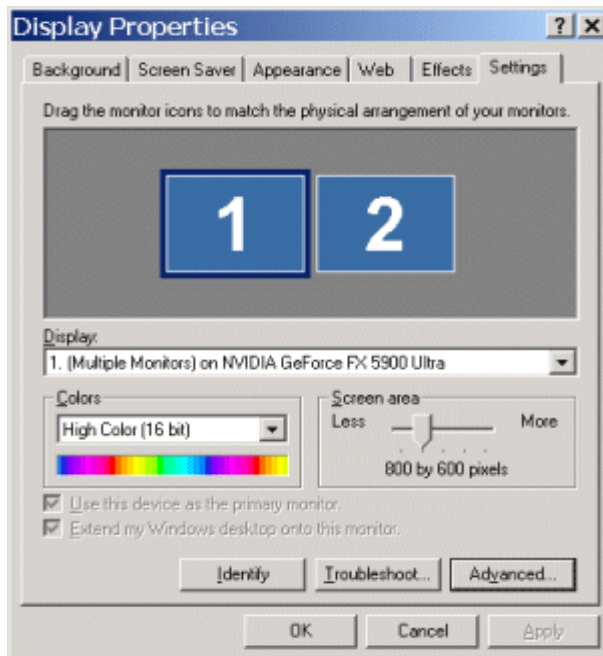
7 Click **Advanced,** the NVIDIA GPU tab, and the **nView Display Settings** menu option.

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 Settings** 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 Settings** 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 Settings 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 48.

- **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 120.

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.

Figure 4.11 Multiple Displays in nView Horizontal Span Mode

Display 1   **Display 2**

Taskbar is stretched across displays.

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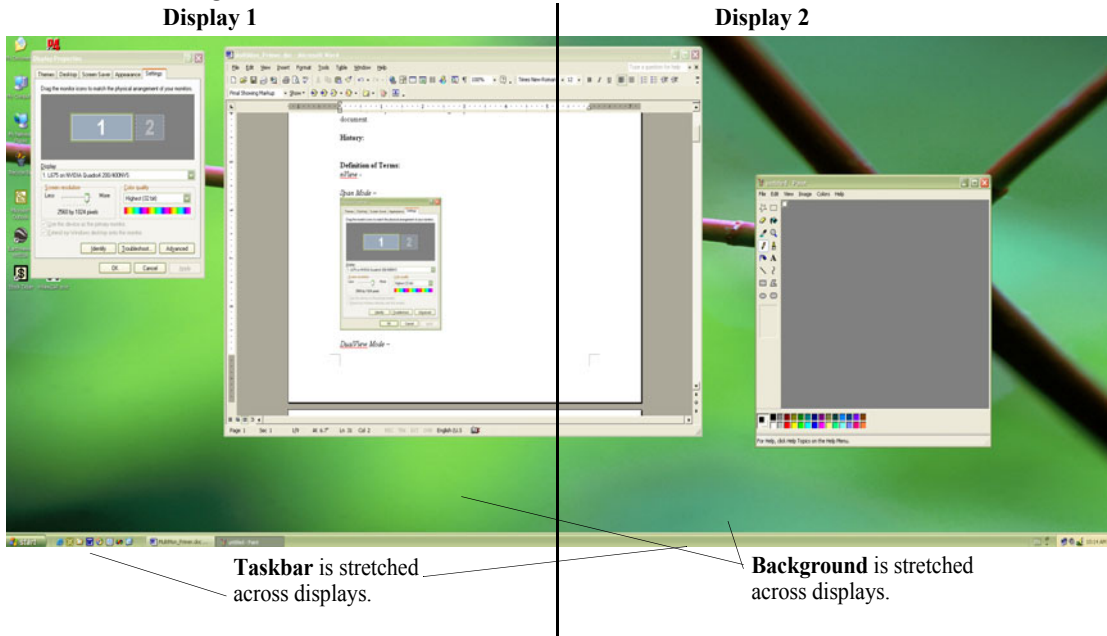
- Under nView Span modes, Windows "stretches" the background wallpaper out to cover your large "logical" display and it stretches the taskbar out to fill your large "logical" display, as shown in Figure 4.11. If you maximize an application, the application will be maximized to fill the large "logical"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

- 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
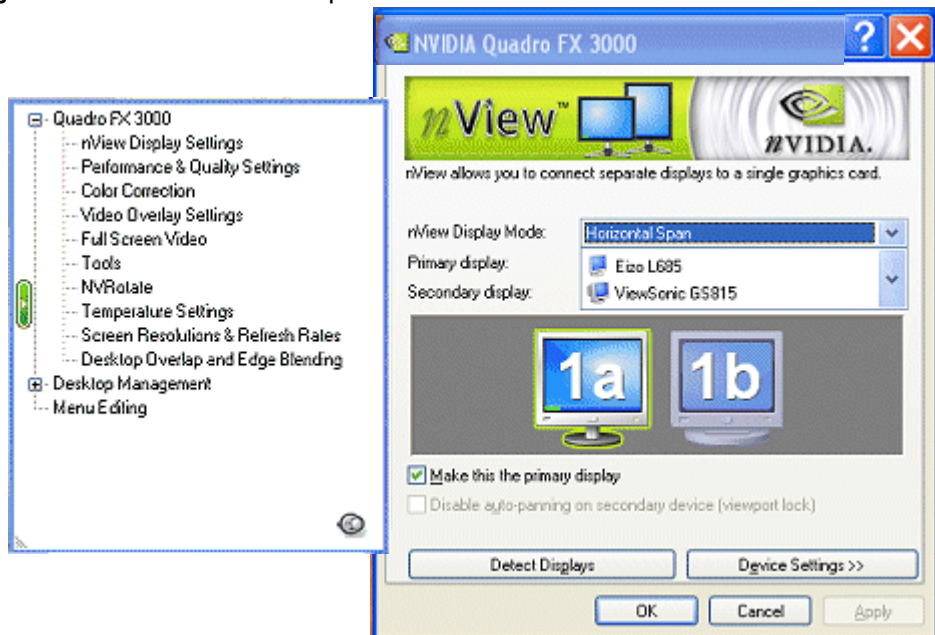
To access the nView Span modes, follow these steps:

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.

---

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

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.

1 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 configration) — 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 47.) 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
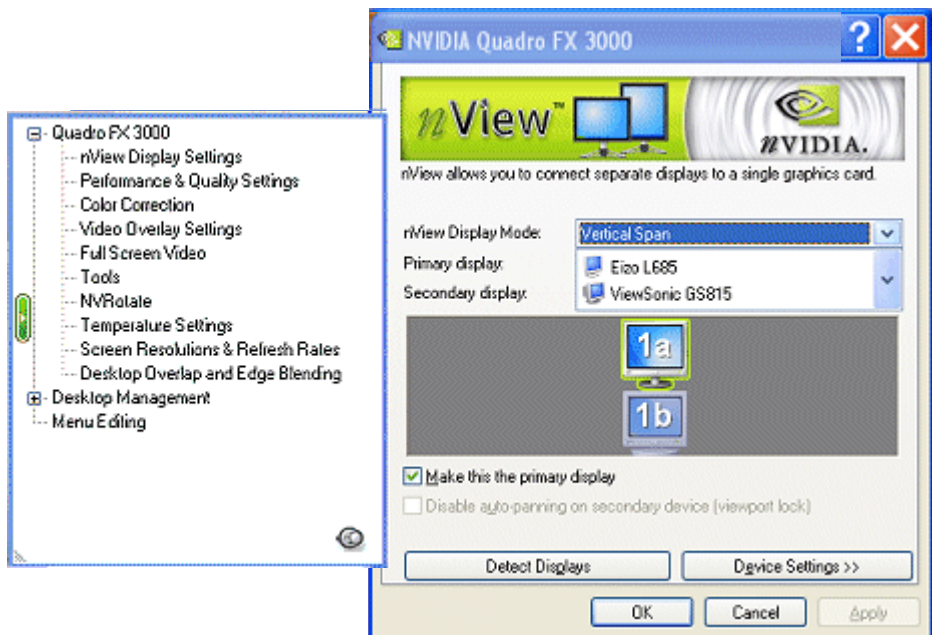
Using nView Clone Mode

> **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 Virtual Desktop — Clone Mode" on page 53.

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 120.

Enabling nView Clone Mode

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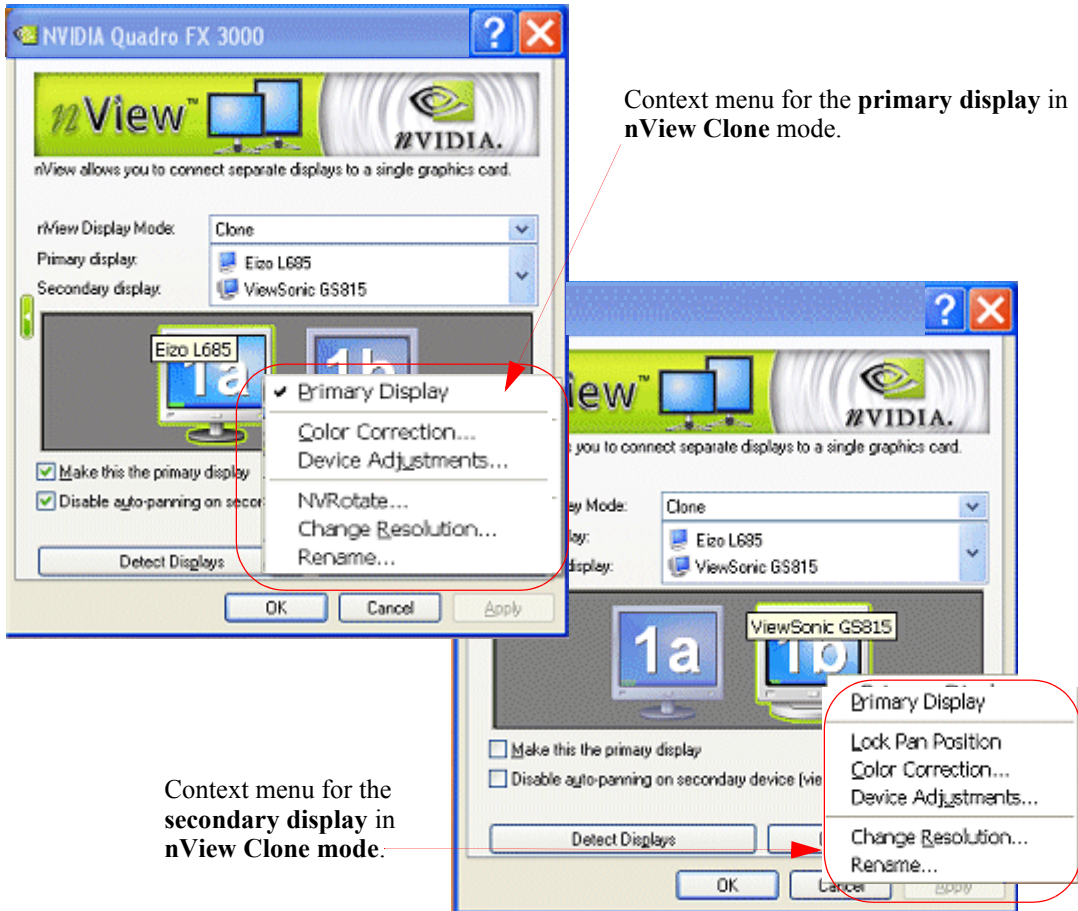
From the Windows Display Properties Settings page, if you click **Identify** when you are in nView Clone mode, you will see the same number on both your displays.

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
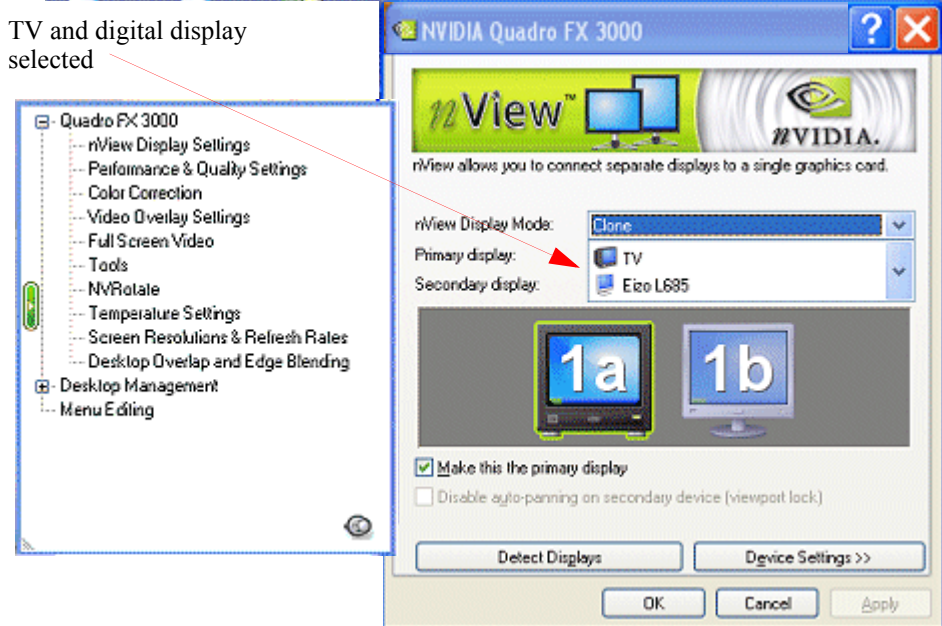
Enabling Virtual Desktop — Clone Mode

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 Settings 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 136") 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 Settings** 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 Settings page and select **Clone** from the nView Modes list and click **Apply**.

From the nView Display Settings page, right click display image (i.e., **1a** or **1b**) to display the pop-up menu and click **Change Resolution** (Figure 4.16). The Screen Resolution & Refresh Rates page appears, as shown in Figure 4.17.

Figure 4.16 nView Clone Mode with Virtual Desktop Enabled — Disabling Panning
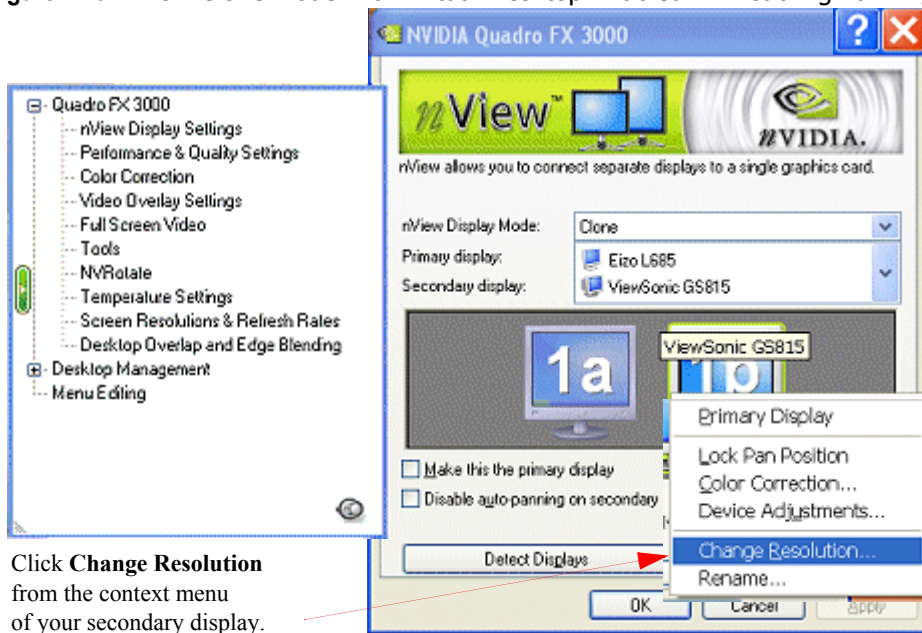
Click **Change Resolution** from the context menu of your secondary display.

Figure 4.17 Configuring Screen Resolution for Virtual Desktop — From nView Display Settings Page
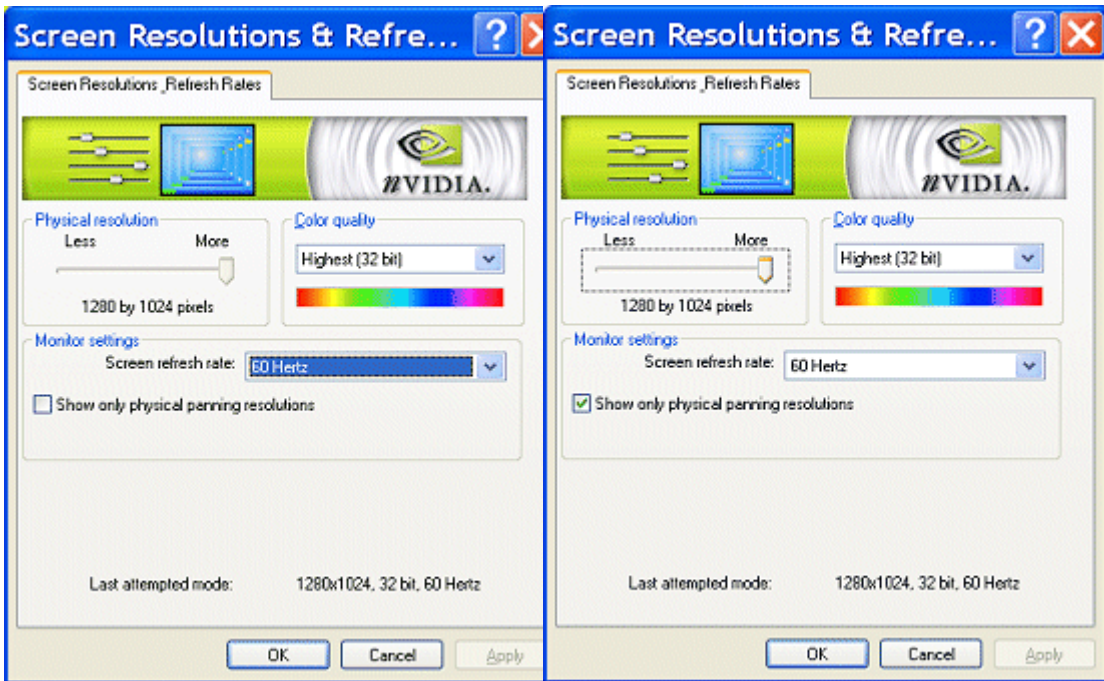
4 Use the **Screen resolution** slider to set the resolution so that the primary display's resolution is greater than the secondary display's resolution.

   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.

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

7 Click **Apply** and **OK** close the Screen Resolution & Refresh Rates page and return to the nView Display Settings 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,

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

Disabling desktop panning of the secondary display = **Lock Pan Position**
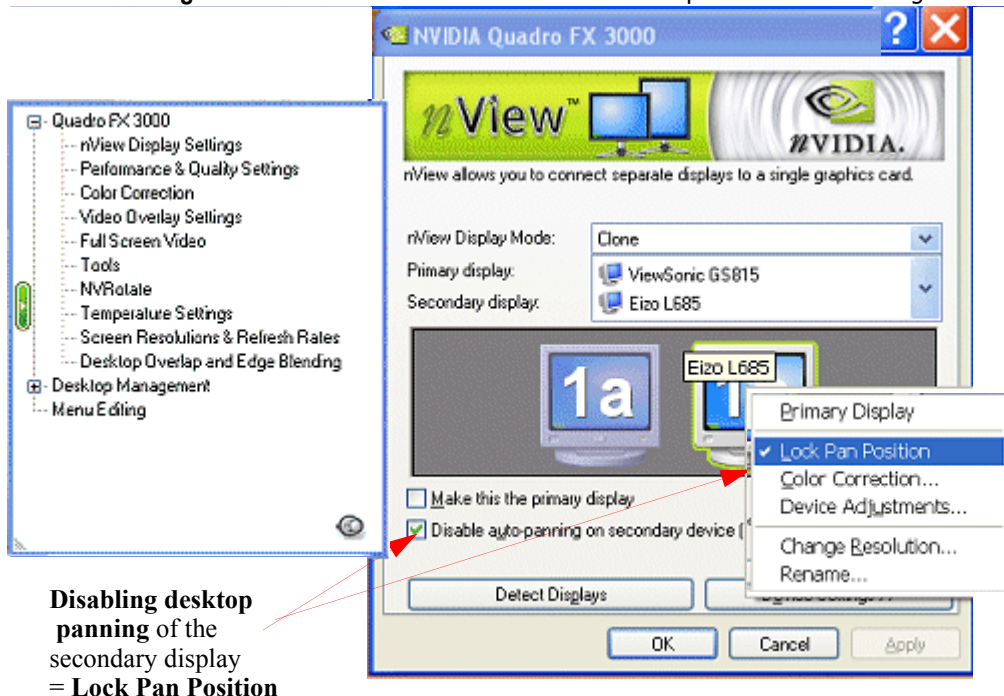
which also enables the equivalent **Disable auto-panning on the secondary device (viewport lock)** check box.

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.

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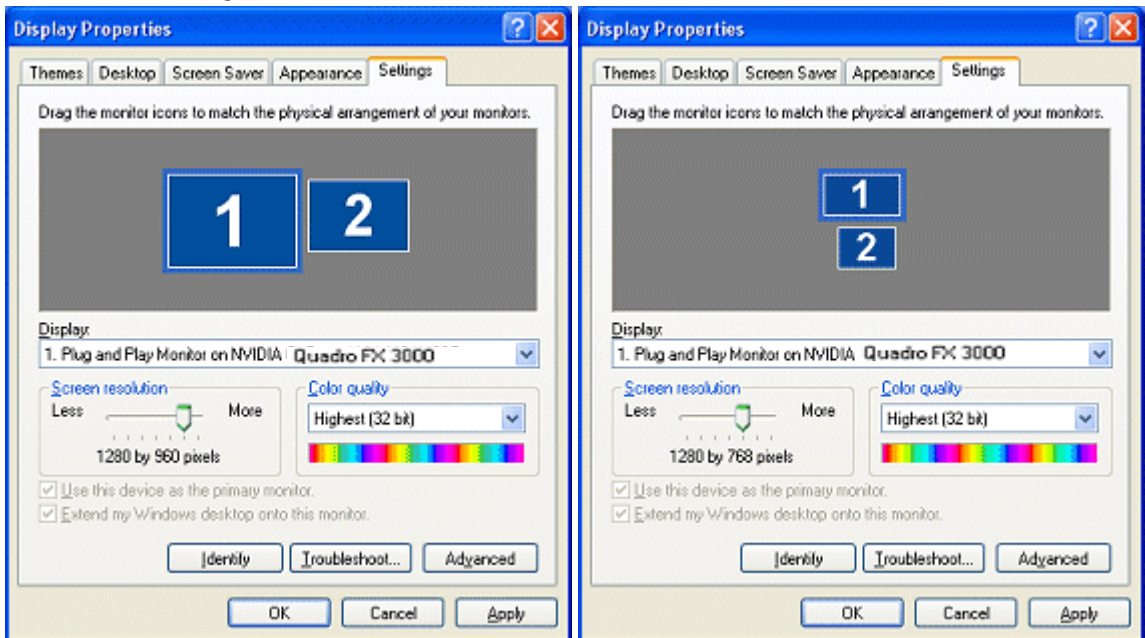
When using multiple displays, the desktop can be extended horizontally and vertically, as well as at other angles by page. You can drag the images to the positions that represent how you want to move items between your displays.

- 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
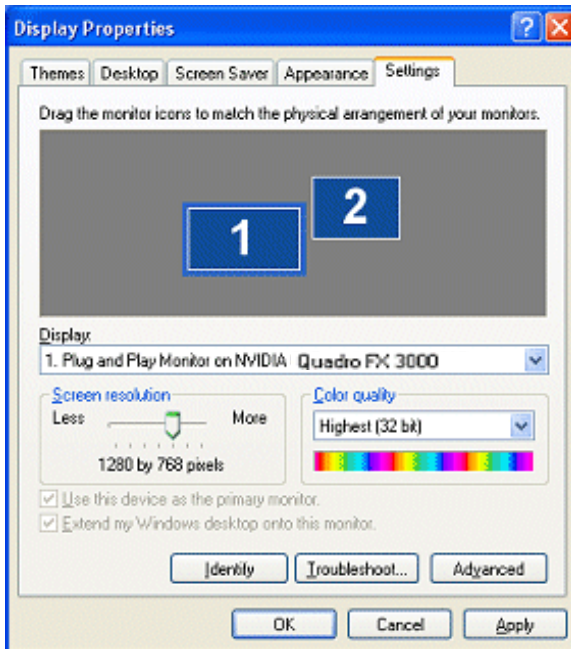
C H A P T E R

5

CONFIGURING DISPLAYS

This chapter discusses the following major topics:

- "Adjusting Analog Display Settings" on page 61
- "Adjusting Digital Display Settings" on page 64
- "Adjusting Television (TV) Settings" on page 66

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 "Screen Adjustment" on page 62.

2   Click **Display Timing** to open the Display Timing page. See "Display Timing Settings" on page 63.

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
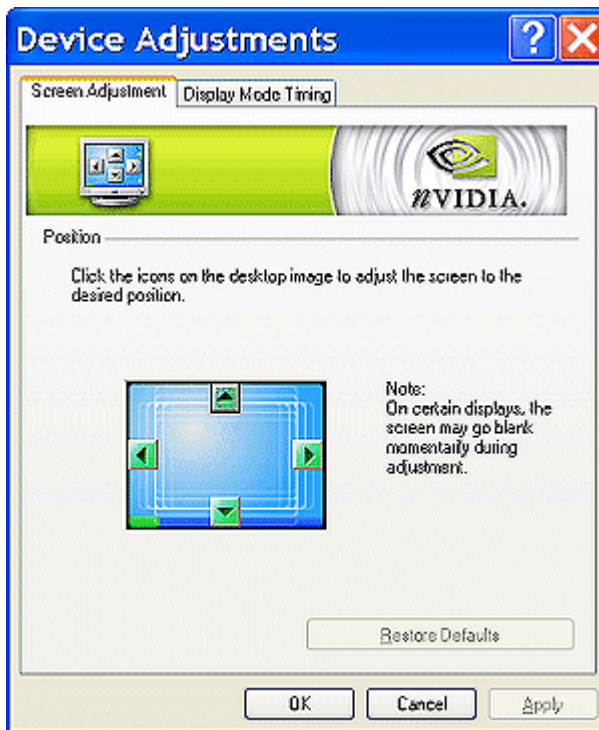
Display Timing Settings

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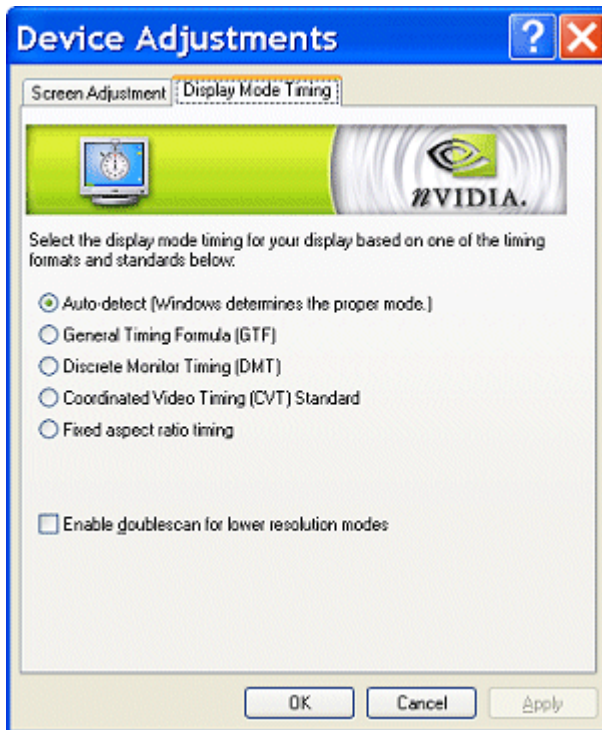
- **General Timing Formula (GTF)** is an older but widely used timing standard. However, newer display are switching to the CVT standard.

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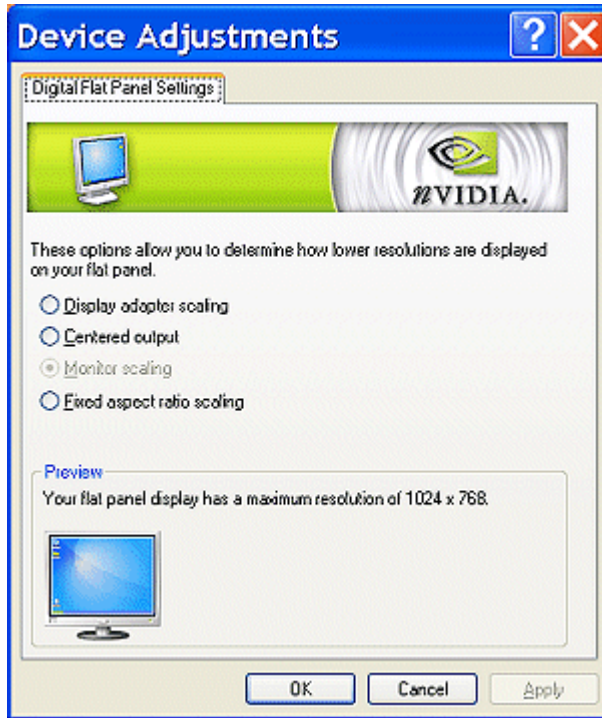
- **Monitor Scaling** is only available for digital flat panels that support multiple native resolutions.

- **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 (TV) 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 68.

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 7.15 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 68.

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 68.

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.
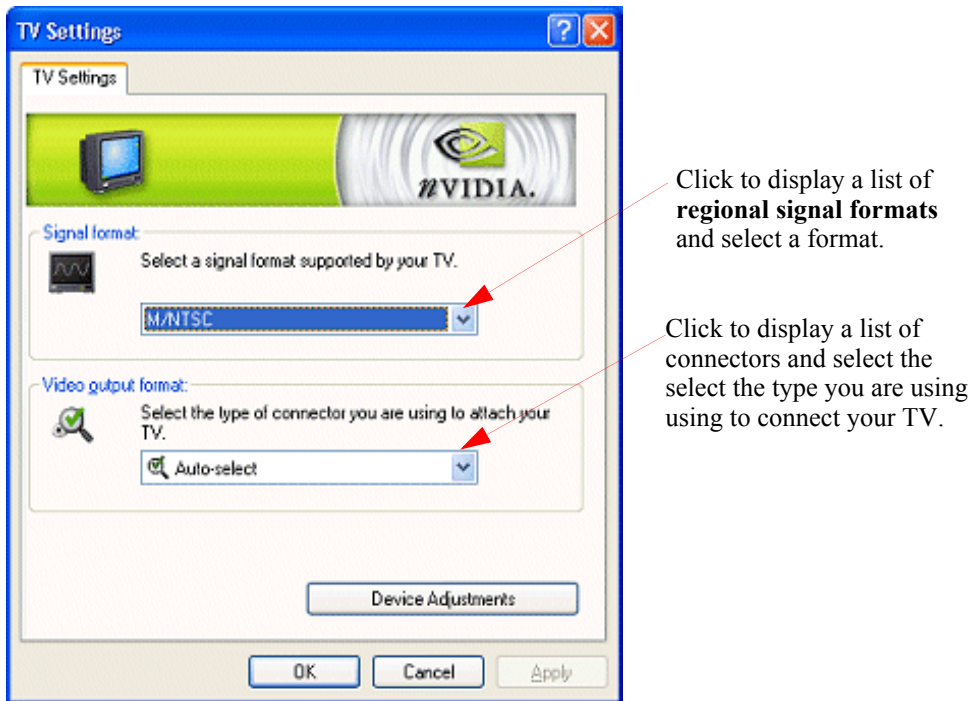
Signal Format

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 Chapter 6 — "Configuring HDTV" on page 73.

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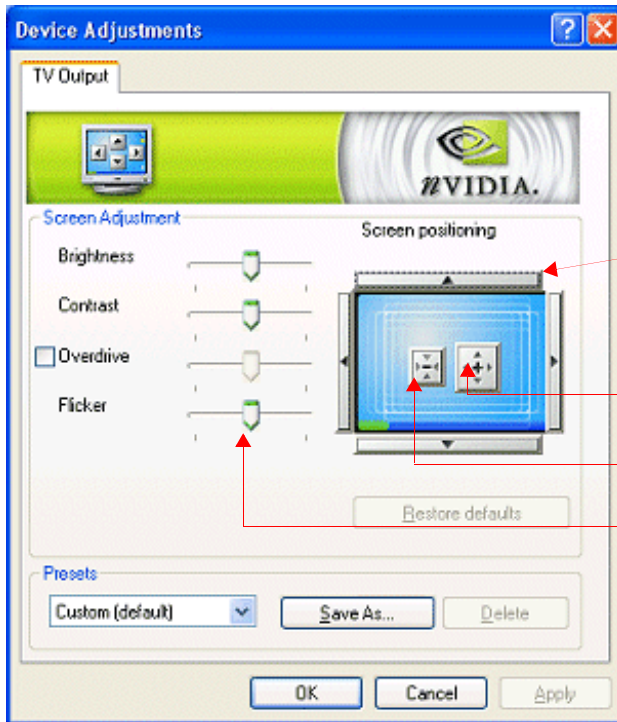
NOTE: The settings that are visible on your TV output page depends on the "internal" TV encoder of your NVIDIA GPU *or* "external" encoder on your NVIDIA GPU-based graphics card. Therefore, the settings on this sample TV Output page may not match those on your TV Output page.

To **reposition your TV screen**, click any of these long arrow buttons *outside* the top, bottom, 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, such 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 Quadro FX-based NVIDIA GPU family. Your Quadro FX-based graphics card may not have TV support.

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.

C H A P T E R

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 74
- "Optimizing HDTV Viewing" on page 76
- "Notes on Startup Functionality with HDTV Connected" on page 78
- "Using HDTV in nView Display Modes" on page 79
- "Using HDTV Formats" on page 81
- "Troubleshooting HDTV Configuration" on page 89

Note: If you are using the Quadro 3400 — 4400, 1400, and later series of NVIDIA GPU-based graphics cards with your HDTV, for helpful hardware information, see Appendix B — "Using HDTV with NVIDIA GPU-Based Graphics Cards" on page 193.

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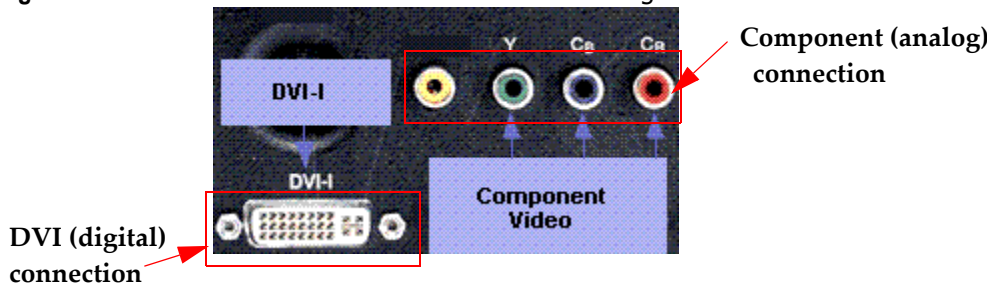
NVIDIA graphics cards support the following television and HDTV formats, depending on the GPU or graphics card encoder and EDID of the TV/HDTV display:

- **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 139.					

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 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 81.

 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 68.

Optimizing HDTV Viewing

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

Table 6.3 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 6.7) 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, "Underscan Screen Resolution Adjustment Sliders" on page 89.

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 88 explains how to use the Underscan setting.

Overscan Shift

The **Overscan shift** setting 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.

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 74) in use, all the associated HDTV formats ("Supported Television/HDTV Formats for Analog and Digital Outputs" on page 74) 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 75) 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 74) 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 68.

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 68.

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 75.

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 74) in use, all the associated HDTV formats ("Supported Television/HDTV Formats for Analog and Digital Outputs" on page 74) 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 connected, 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 **6**.

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**.

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) *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 78.

Figure 6.2 Quick Access to HDTV Formats — HDTV Component Connection
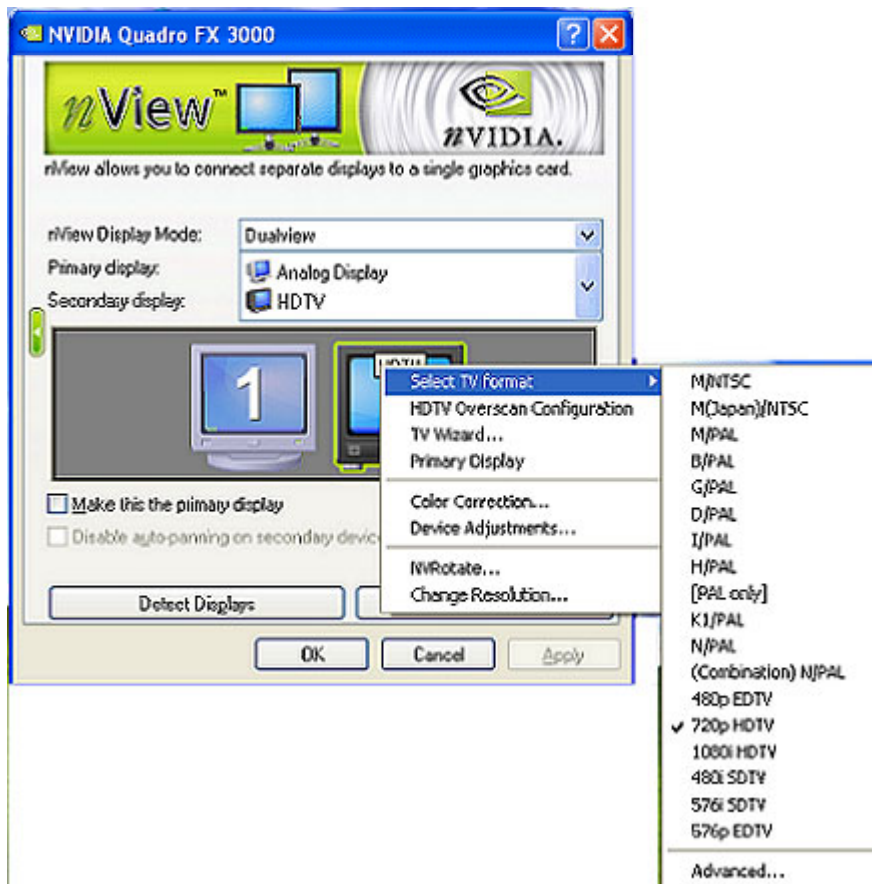
Figure 6.3   Quick Access to HDTV Formats — HDTV over DVI Connection.

Select **Treat Digital Display as HDTV** and click **Apply** to enable the HDTV formats.
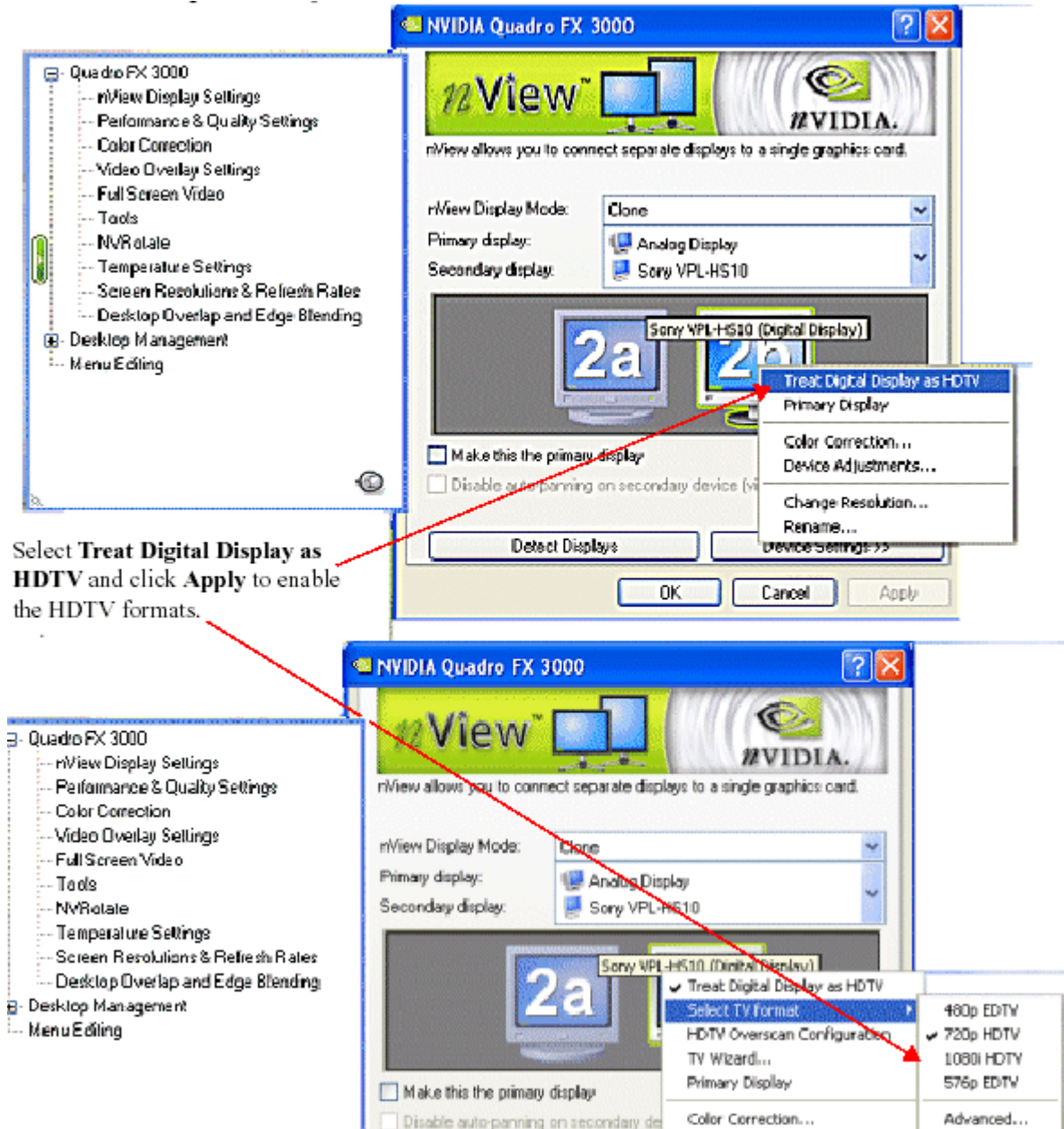
Figure 6.4   TV Settings — HDTV Component Connection
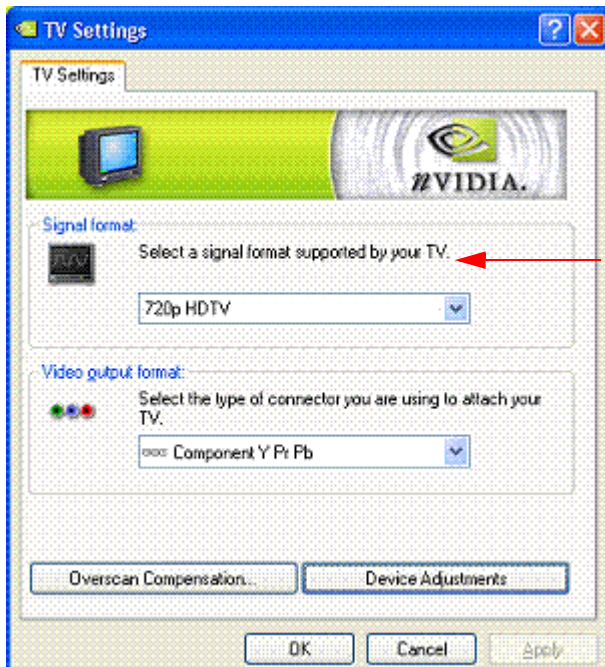
Click this list to select an HDTV (EDTV/SDTV) format.

.

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
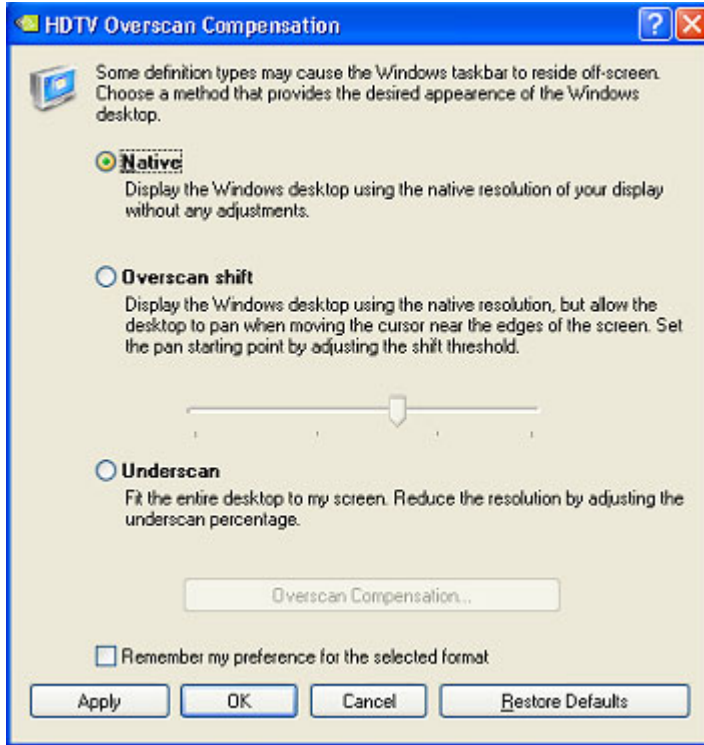
Using Overscan Shift

As explained in "Overscan Shift" on page 78, 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
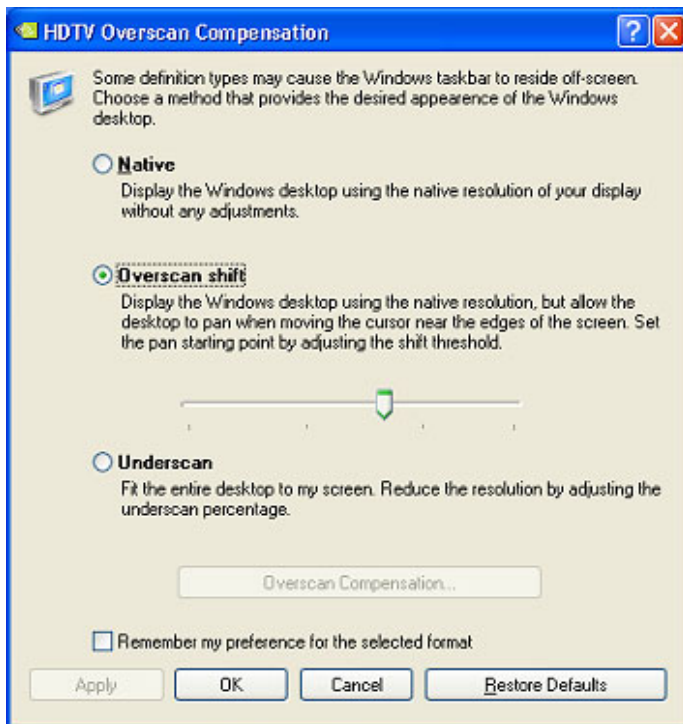
Figure 6.8   Confirm Display Settings Prompts
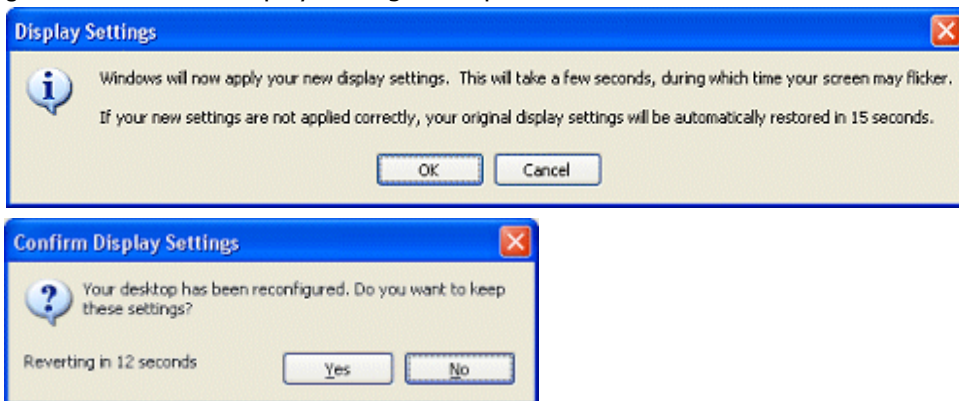
Using Underscan

As explained in "Underscan" on page 77, 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
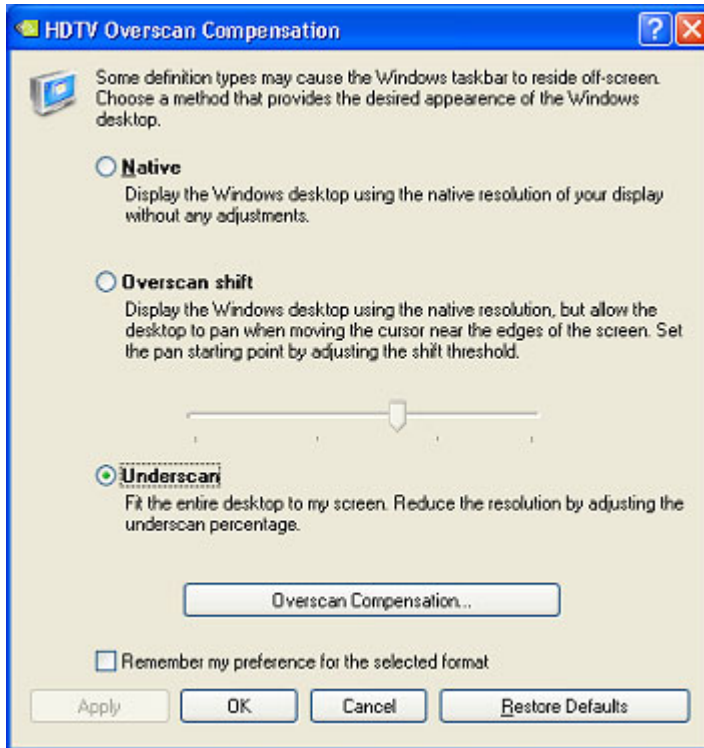
2 Click the **Overscan Compensation** button to display a screen resolution adjustment control panel (Figure 6.10).

Figure 6.10 Underscan Screen Resolution Adjustment Sliders

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 76 for a description of this feature.

See "Using Overscan Shift" on page 86 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 76 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 76 for a description of this feature.

See "Using Overscan Shift" on page 86 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 the newer series of NVIDIA Quadro GPUs.
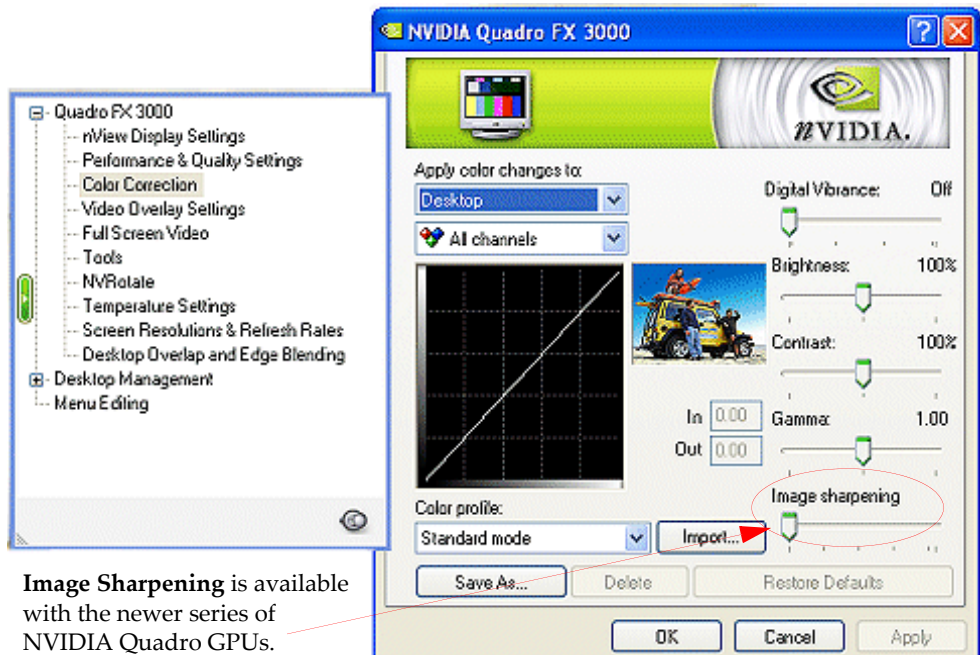
Color Correction Settings

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 96 and "Color Curve Graph" on page 97.

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...), 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 97.

   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:

- "Changing Global Driver Settings" on page 101
- "Modifying an Existing Application Profile" on page 103
- "Adding a New Application Profile" on page 106
- "Deleting Application Profiles" on page 107
- "Basic Driver Settings" on page 108
- "Advanced Driver Settings" on page 111

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

When the **View** list is set to **Basic settings**, a standard short list of driver settings appear in the Global driver settings window.
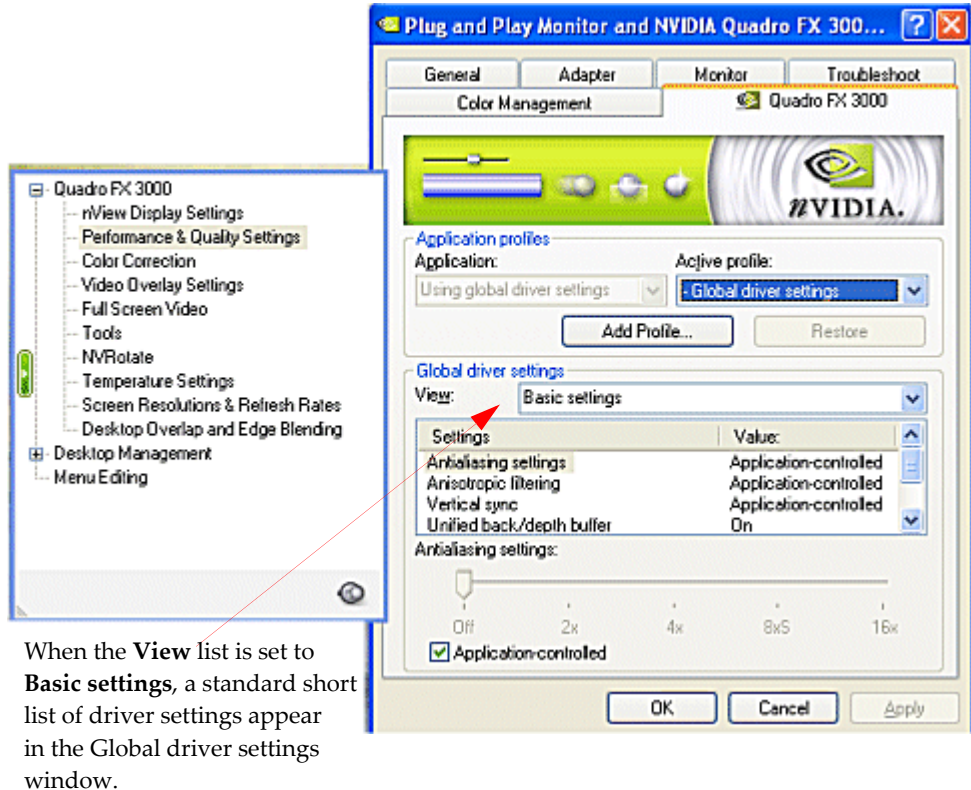
Note: You can use the "Application profiles" and "Global driver settings" modules independently. For example, you can use the Global driver settings to modify your active desktop application without having to use any of the Application profiles features or settings.

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

- When **Basic settings** is selected in the **View** window (Figure 7.2), a standard shorter list of settings appear in the Global driver settings list. For details about these basic driver settings, see "Basic Driver Settings" on page 108.

- When you select **Advanced settings** from the **View** window, additional advanced settings, intended for advanced users, appear in the Global driver settings list. For details about these advanced driver settings, see "Advanced Driver Settings" on page 111

You can change driver settings for any applications that you are currently running. See "Changing Global Driver Settings" on page 101.

You can also change driver settings for existing workstation application profiles and new application profiles you are adding and then save these settings. See "Modifying an Existing Application Profile" on page 103.

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.

   Note: If you have chosen a setting that is application-controlled, click the **Application-controlled** check box to clear the check mark, then use the slider to change the setting,

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 101
- "Modifying an Existing Application Profile" on page 103

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
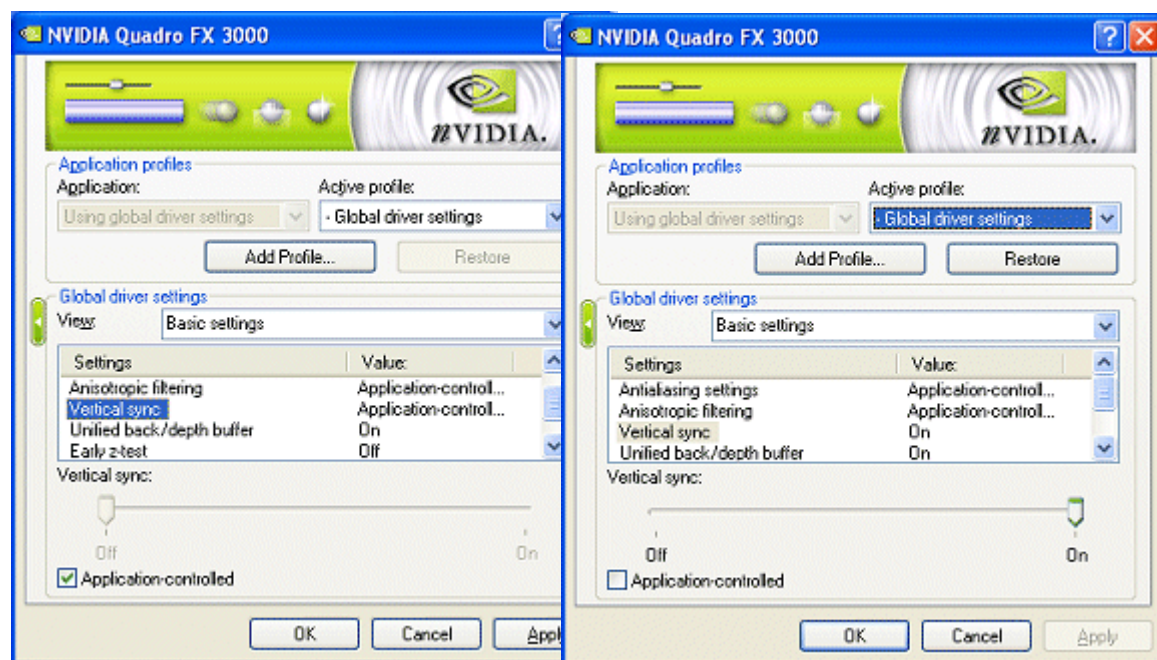
Modifying an Existing Application Profile

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 Click the **Active profile** list and select an application profile from the list.

The driver settings of the profile you selected appear in the Global driver settings list. Figure 7.4 shows an example for the 3D Studio Max selected profile.

Figure 7.4 Changing An Existing Application Profile

A driver setting with a check mark before it indicates that the setting is part of the selected profile chosen in the **Active profile** list.
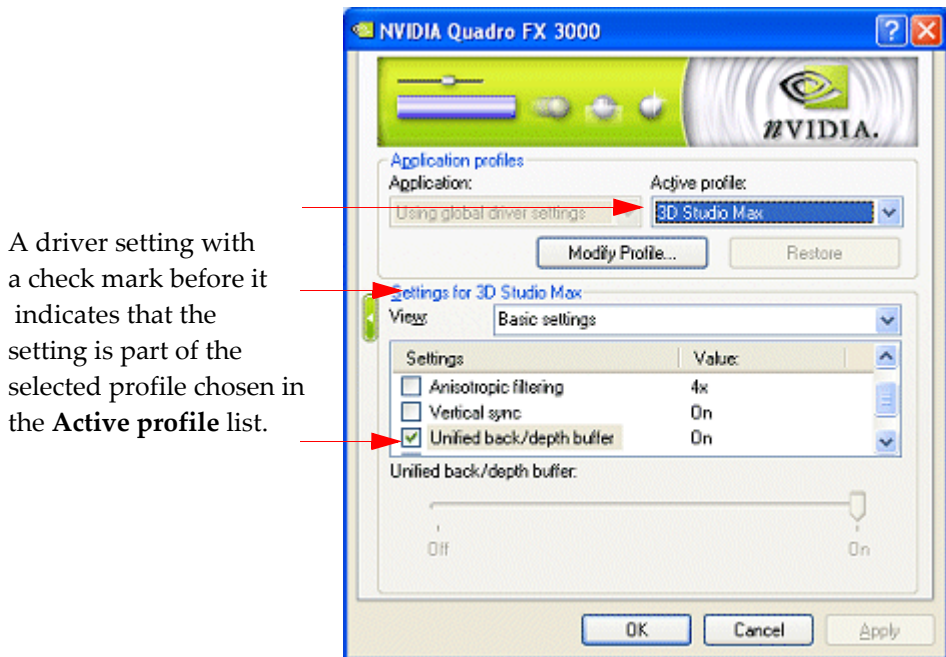
3 Scroll down in the **Global driver setting** list to view any driver setting with a check mark preceding it.

These checked settings are part of the selected profile. Notice that for these checked settings, the "Global driver settings" label changes to the name of the selected profile — in the Figure 7.4 example, the label reads "Settings for 3D Studio Max" — indicating that these are the profile settings.

Note: You cannot change profile driver settings; i.e., those that contain a check mark. However, you can modify other non-checked driver settings, then

check the associated check box, and save the profile with a new name. Or if you don't save the profile with a new name, you can always use the **Restore** button to restore the profile to its original state.

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

5   Select the check box (inserts a check mark) for that setting and click **Apply**. Notice that its slider appears at the bottom of the page.

6   If the **Application-controlled** check box is checked, click the check box to clear the check mark and click **Apply**.

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

8   Repeat steps **4** through **7** for each driver setting you want to change.

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

Note: If you do not want to save these settings with a new name, these settings automatically become part of the existing profile. But you can always click the **Restore** button to restore the settings to their original state.

10 To save the changed profile settings with a new name, click the **Modify Profile** button, then click **Save As** to display the Save Settings dialog box (Figure 7.5).

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

If you retain the existing name, thus overwriting the profile with the new settings, you can always click the **Restore** button to restore the original settings when you select this profile from the Application profile list.

If you renamed the profile (Figure 7.6), then it is considered a "new" profile and the **Remove** button appears when you retrieve the profile from the Application profile list. You can always remove these types of profiles from the list.

Figure 7.5 Saving a Modified Profile (1)
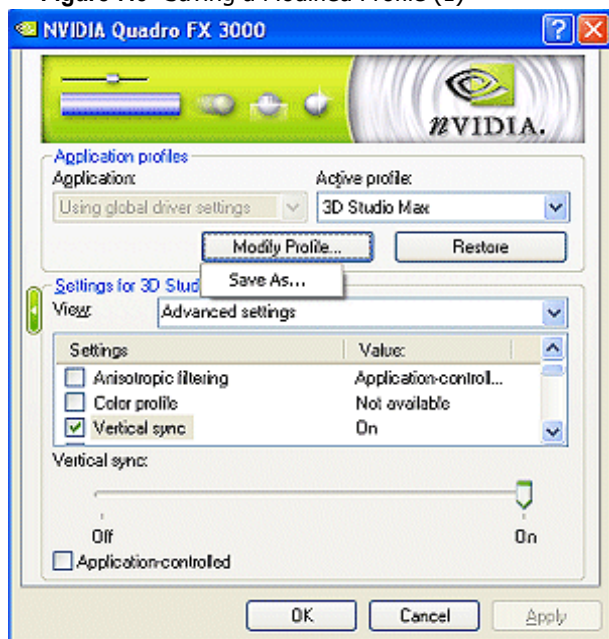
Figure 7.6 Saving a Modified Profile (2)
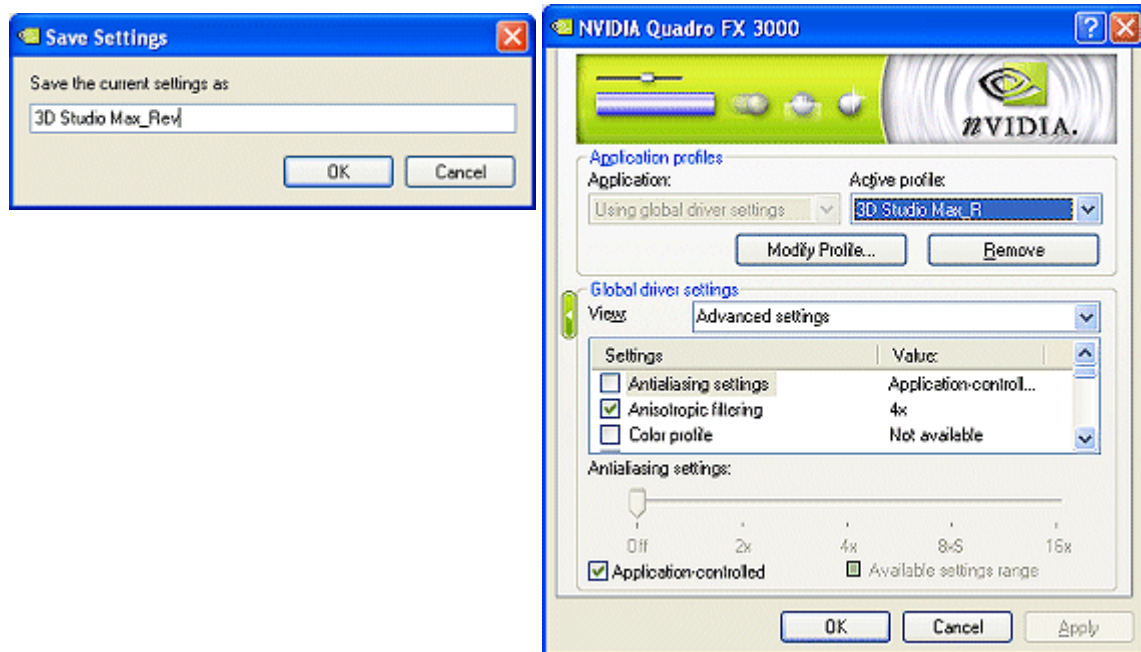
Adding a New Application Profile

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.

> **Note:** If you don't intend to associate specific applications with this profile, make sure that the Global driver settings check box is checked.

4 If you want to associate one or more applications with the profile you are adding, select the check boxes for those applications. You can click the **Browse** button to locate applications that may not appear in the list.

5 Enter a name for the profile you are adding in the **Profile** text entry box, as shown in the left image in Figure 7.7.

Figure 7.7 Adding a Profile
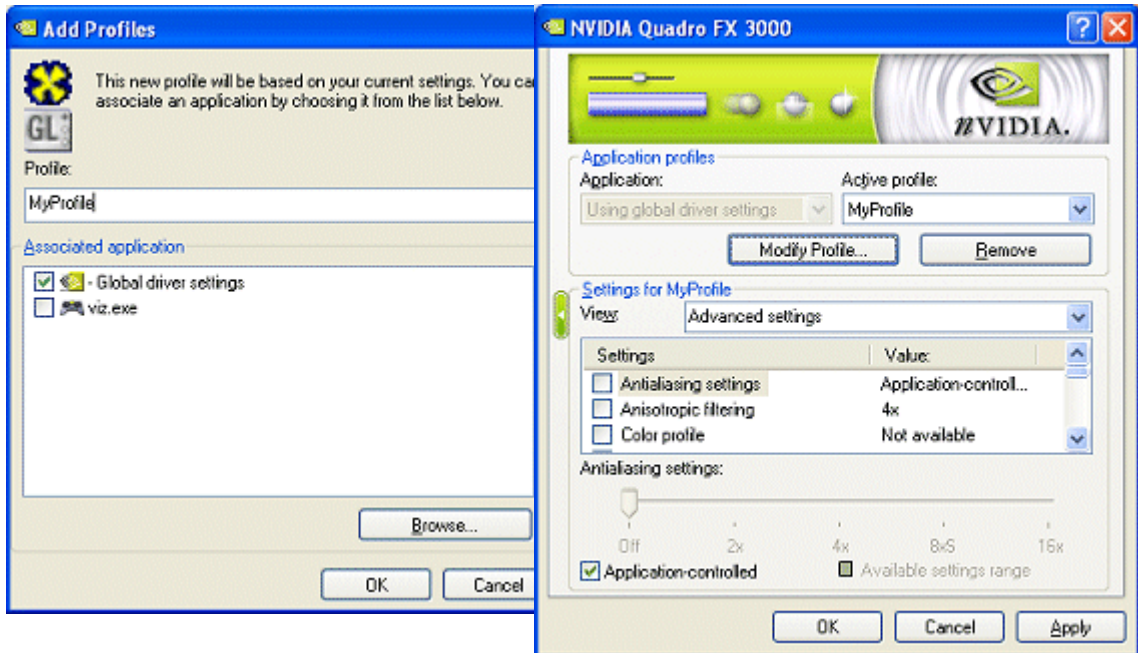
6 Click **OK** to return to the previous page. The Application profiles list displays the new profile name, as shown in the image on the right in Figure 7.7.

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 If needed, 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 on specific driver settings, see "Basic Driver Settings" on page 108 or "Advanced Driver Settings" on page 111**.**

    e 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 117 and "About Using Other SLI-based Advanced Settings" on page 117.
- "Using NVIDIA Scalable Link Interface (SLI)" on page 165

Deleting Application Profiles

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

- From the **Active profile** list, you have selected a profile you have added.
- From the **Active profile** list, you have selected an existing pre-defined profile that you have modified and then 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. d

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

Basic 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.

Figure 7.8 NVIDIA Driver Settings (Standard)
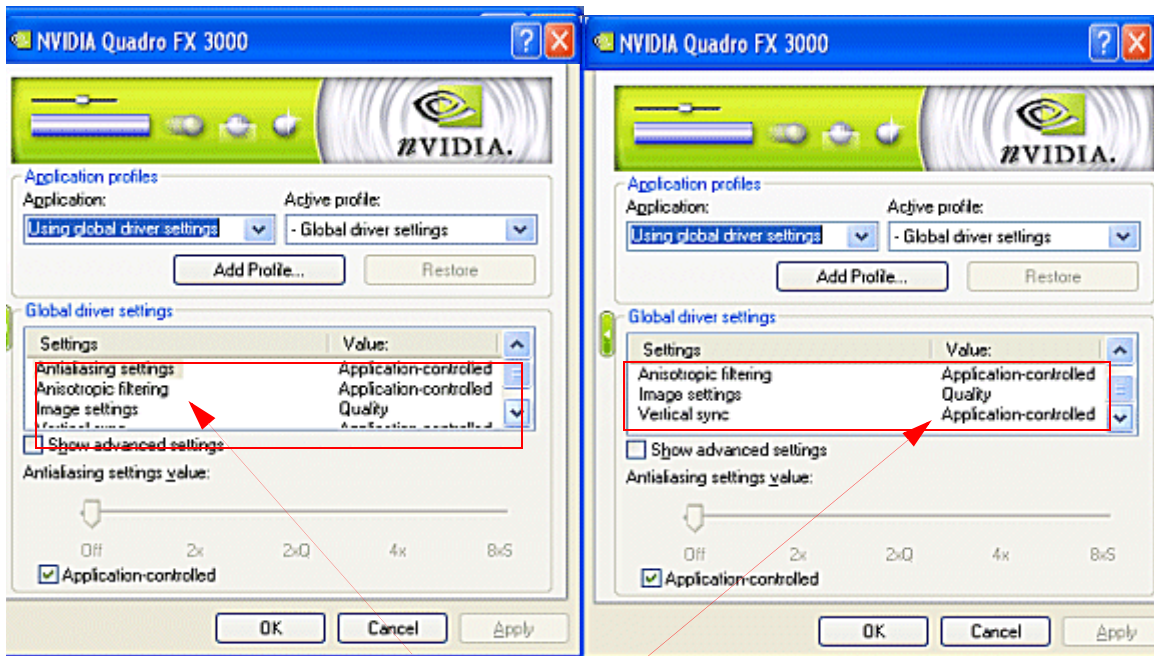
Basic driver settings

- **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**.

- **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.

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.

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.

Vertical Sync Click the list to specify how vertical sync is handled in OpenGL.

- **Always off** always disables vertical sync in OpenGL applications.

- **Off by default** keeps vertical sync disabled unless an application specifically requests that it be enabled.

On by default keeps vertical sync enabled unless an application specifically requests that it be disabled.

Unified back/depth buffer

Note that this setting is *on* by default allowing the OpenGL driver to allocate one back buffer and one depth buffer at the same resolution of the display. When this setting is enabled, OpenGL applications that create multiple windows use video memory more efficiently and show improved performance.

*When this setting is **off**,* the OpenGL driver allocates a back buffer and depth buffer for every window created by an OpenGL application.

Early z test

Enabling this option causes a z-test to be performed earlier in the graphics pipeline, which can improve the performance especially of shaded rendering when items are often behind other items that were already drawn.

Note: This settings is "disabled" by default for most application because enabling this setting generally hurts application performance for wireframe rendering.

Advanced Driver 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 7.9 through Figure 7.9 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.

Figure 7.9 NVIDIA Driver Settings (Advanced)
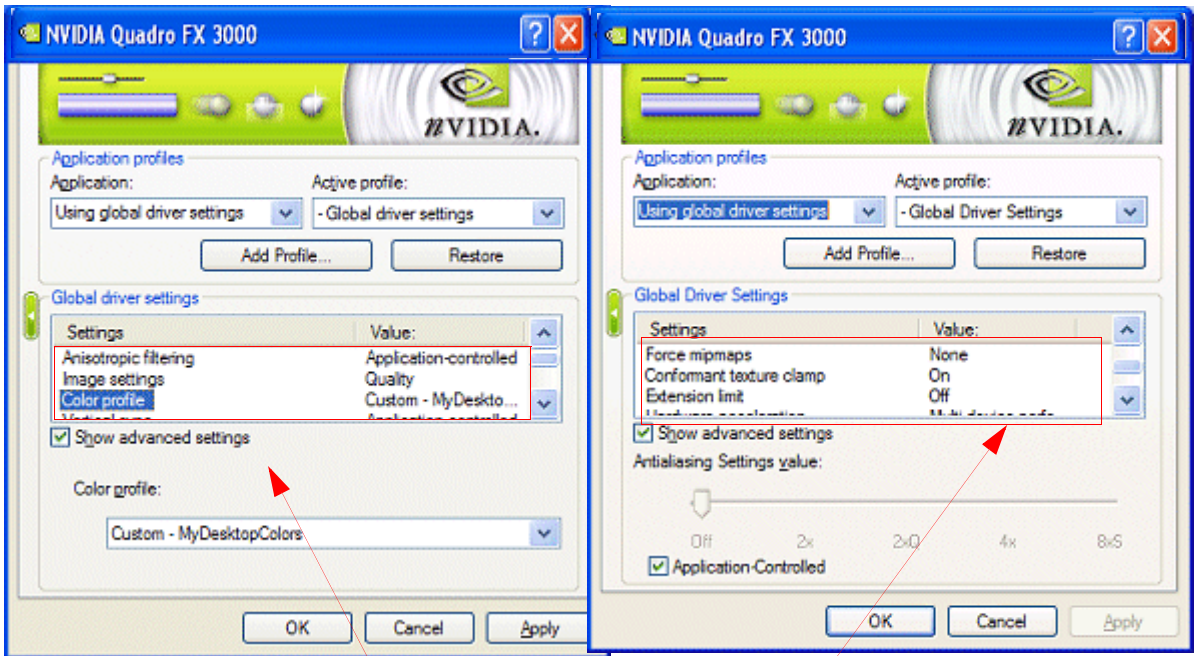
NVIDIA Advanced Driver Settings

Color Profile

Use the **Color profile** setting to associate a color profile with the selected application profile.

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 98 and "Other Settings" on page 98.

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 7.9).

4 If you completed step 1, you will see the **Color profile** list box at the bottom of the page (Figure 7.9).

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

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 7.10 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 7.10 Hardware Acceleration Driver Setting
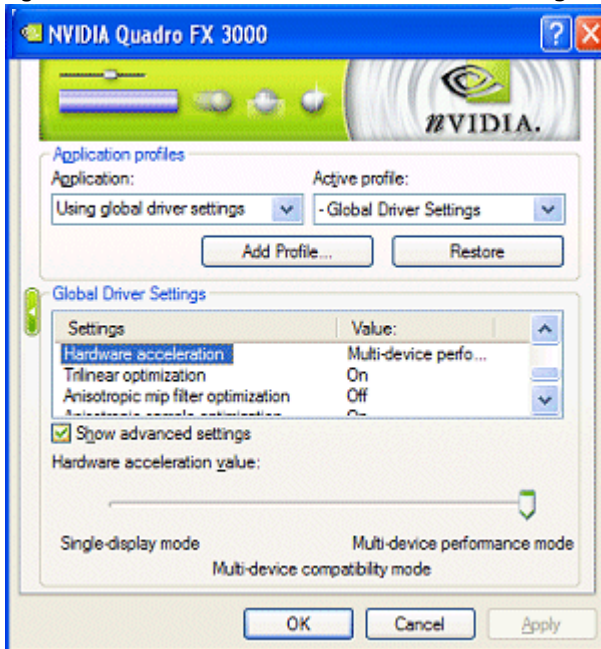
- **Multi-display compatibility mode** is available if you have two or more active displays when running in nView Dualview display mode or if you are using different classes of NVIDIA GPU-based cards.

  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.

Multi-Display Hardware Acceleration settings determine advanced rendering options when using multiple displays and/or graphics cards based on different classes of NVIDIA GPUs. The settings are shown in Figure 7.4.

> **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.

- **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 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.

> **Note: 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.

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.

Disable Enhanced CPU Instruction Set

On — Disables driver support for enhanced instructions used by certain **central processing units (CPUs)**. Some CPUs support additional 3D instructions that

complement your NVIDIA GPU and improve performance in 3D applications. Enabling this setting lets you disable support for these additional 3D instructions in the drivers, which can be useful when comparing performance or when troubleshooting.

Off — Support for enhanced instructions used by certain CPUs is not disabled.

Maximize texture memory

Enabling this option sets aside as much memory as possible for use by texture maps. This can increase performance for highly texture-intensive applications but at the expense of a minor amount of performance for non-textured applications.

Buffer-Flipping Mode

Click the list to display the buffer-flipping modes for full-screen OpenGL applications. You can select one of the following methods:

- **Use Block Transfer** is the block transfer method.
- **Auto-select** allows the driver to determine the best method based on your hardware configuration.

Antialiasing Line Gamma

Note: This setting is available on newer NVIDIA GPUs, such as the Quadro FX series.

Enabling this option allows gamma-corrected antialiased lines to consider variances in the color-display capabilities of your displays when rendering smooth lines.

Antialiasing Full Screen Gamma

Note: This setting is available on newer NVIDIA GPUs.

Activating this setting enables gamma correction for full screen antialiasing. Gamma-corrected antialiasing consider variances in the color display capabilities of your displays when rendering smooth edges. As a result, slightly inclined edges look smoother.

Note: Enabling this setting can slow down application performance speed.

Texture Color Depth

This setting determines whether textures of a specific color depth should be used by default in OpenGL applications.

- **Use desktop color depth** always uses textures of the color depth at which your Windows desktop is currently running.

- The **Always use 16 bpp** and **Always use 32 bpp** settings force the use of textures of the specified color depth, regardless of your desktop settings.

Triple Buffering

- **On** enables the driver to maintain higher frame rates when the frame rate is less than the VSYNC (vertical synchronization) value.

  Note: In order for the **On** setting to work, the Unified back/depth buffer setting must be turned *off*.

- **Off** disables triple buffering.

Gamma Correct Antialiasing

Note: This option is available on newer NVIDIA GPUs, such as the Quadro FX 4500 and later series of GPUs.

- **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 option has no effect on applications that are exclusively OpenGL-based.

Note: This option is available on newer NVIDIA GPUs, such as the Quadro FX 4500 and later series of GPUs.

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 and you have selected "global driver settings" from the Active profile list.

- Select **SLI multi-GPU rendering** to use SLI frame rendering for application profiles that use SLI.

- 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.

- Select **SLI antialiasing** to use quality modes beyond 16x antialiasing for application profiles that use SLI.

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`

Enable Stereo

Applies to graphics cards based on newer NVIDIA GPUs, such as the Quadro FX series.

> **Tip:** If the stereo or overlay features do not work properly, you may want to try setting different screen resolutions and refresh rates until you arrive at a setting or combination of settings for better results.

Select the **Enable stereo in OpenGL** check box to enable stereo functionality in OpenGL applications. To run stereo applications with shutter glasses or other hardware, the NVIDIA driver exports OpenGL stereo pixel formats and organizes

memory to allow stereoscopic and monoscopic applications to be used simultaneously.

Tips: • Enable this option only if it is necessary. Some applications automatically choose a stereo format while other applications may not function properly in a stereo pixel format.

• Stereo viewing requires additional onboard graphics memory and may not be available under all resolutions. You may want to reduce the resolution or color depth if you have problems viewing in stereo.

Stereo Display Mode

Applies to graphics cards based on newer NVIDIA GPUs, such as the Quadro FX series.

Tip: If the stereo or overlay features do not work properly, you may want to try setting different screen resolutions and refresh rates until you arrive at a setting or combination of settings for better results.

The NVIDIA driver supports a variety of stereo hardware. If you use stereo hardware other than the default, select a display mode from the list box.

• **Use shutter glasses —** Select this option only if you use an ELSA 3D Revelator or compatible adapter. These adapters will translate the monitor signal to the standardized 3-pin-DIN used by most of available stereo hardware.

You don't need to use the adapter if your graphics card has a built-in 3-pin-DIN connector!

Tips: If you are encountering problems with stereo viewing with shutter glasses, you may want to experiment with different refresh rate settings for your monitor. For example, your shutter glasses will not work on a flat panel set to a very low refresh rate.

• **Use vertical interlace monitor —** Select this option if you have connected an auto-stereo flat panel to your graphics card.

Note: Non-stereo flat panels are not recommended for stereo viewing.

• **Use nView Clone mode —** Select this option if you have passive stereo hardware. This option is *only* available on NVIDIA GPU-based multi-display graphics cards. To use this option, you need to have connected the projectors to the multi-display graphics card and enabled nView Clone mode from the nView tab. One head will show the left eye of the image and the second head will show the right eye.

- **Use onboard DIN connector —** If your graphics card has a built-in 3-pin DIN connector, select this option to enable the feature. In this case, you do not need extra adapters such as those shipped with the ELSA 3D Revelator or StereoGraphics glasses. You can connect any stereo hardware using the 3-pin-DIN connector directly to the graphics card.

- **Use blue-line-code for StereoGraphics products —** Select this option if you use an adapter shipped with StereoGraphics StereoEyes or compatible products. These adapters translate the monitor signal to the standardized 3-pin DIN connector used by most of available stereo hardware.

  You don't need to use the adapter if your graphics card has a built-in 3-pin DIN connector.

Swap eyes (L becomes R, R becomes L)

Applies to graphics cards based on newer NVIDIA GPUs, such as the Quadro FX series.

Tip: If the stereo or overlay features do not work properly, you may want to try setting different screen resolutions and refresh rates until you arrive at a setting or combination of settings for better results.

In case you cannot view a stereo effect, select this option to exchange the left and right images. In general, you may need to enable this option only on vertical interlace monitors and in passive mode.

Enable Overlay

Applies to graphics cards based on newer NVIDIA GPUs, such as the Quadro FX series.

Tip: If the stereo or overlay features do not work properly, you may want to try setting different screen resolutions and refresh rates until you arrive at a setting or combination of settings for better results.

On enables the NVIDIA driver to export overlay pixel formats so that OpenGL applications can use overlays.

Some applications (for example, Softimage3D) require overlay planes, which are used as a paletted surface in addition to the normal color (RGB) buffer. Overlays are especially useful for overlapping drawing areas that are independent of the 3D image itself, such as menus and cursors.

Overlays are supported in 16-bit and 32-bit color modes.

Tip: Overlays need additional onboard graphics memory and may not be available under all resolutions. You may want to reduce the resolution or color depth if you have problems accessing overlay functionality.

Exported Pixel Types

Applies to graphics cards based on newer NVIDIA GPUs, such as the Quadro FX series.

Tip: If the stereo or overlay features do not work properly, you may want to try setting different screen resolutions and refresh rates until you arrive at a setting or combination of settings for better results.

Option available only on newer NVIDIA GPUs) lets you specify pixel formats to use for overlays in OpenGL.

- **Color indexed overlays (8bpp)** allows the application to use 8-bit paletted overlays.
- **RGB overlays (RGB555 format)** allows the application to use 16-bit (RGB555) overlays.
- **Color indexed (8 bpp) and RGB555 format** allows the application to use either 8-bit paletted or 16-bit (RGB555) overlays.

Overlays need additional onboard graphics memory and may not be available under all resolutions. You may want to reduce the resolution or color depth if you have problems accessing overlay functionality.

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 Video Overlay Settings page (Figure 7.11).

If you need help in accessing the NVIDIA display menu, see "Accessing the NVIDIA Display Control Panel Pages" on page 18.

Figure 7.11 Video Overlay Settings — Windows XP/2000
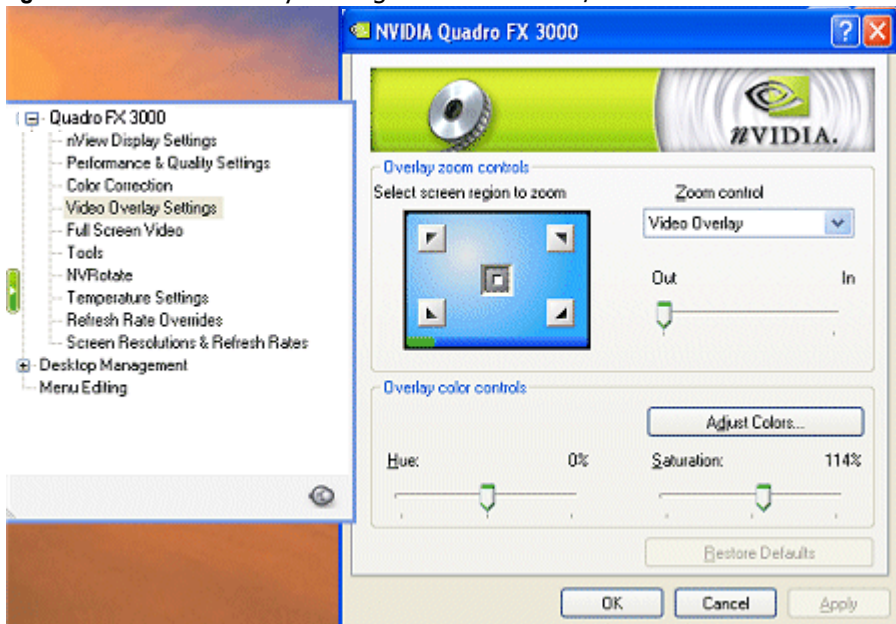
Overlay Zoom Controls

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 122).

  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 94.

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 19.

Use the Full Screen Video settings page (Figure 7.12) 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.

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.

Figure 7.12 Full Screen Video Settings — Disabled
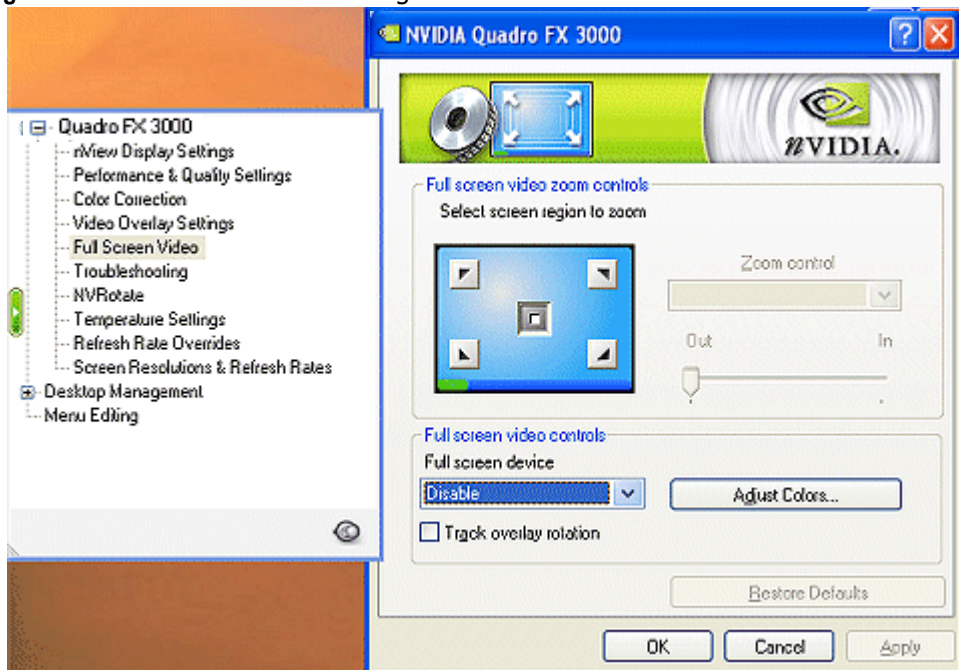
About the Full Screen Video Mirror Feature

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 18.

Figure 7.12 and Figure 7.13 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 7.12) disables Video Mirror (including the Full screen video zoom controls).

• **Primary display/Secondary display** settings (Figure 7.13) 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 7.14) 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 7.13 Full Screen Video — Settings for nView Dualview/Span and Clone Modes
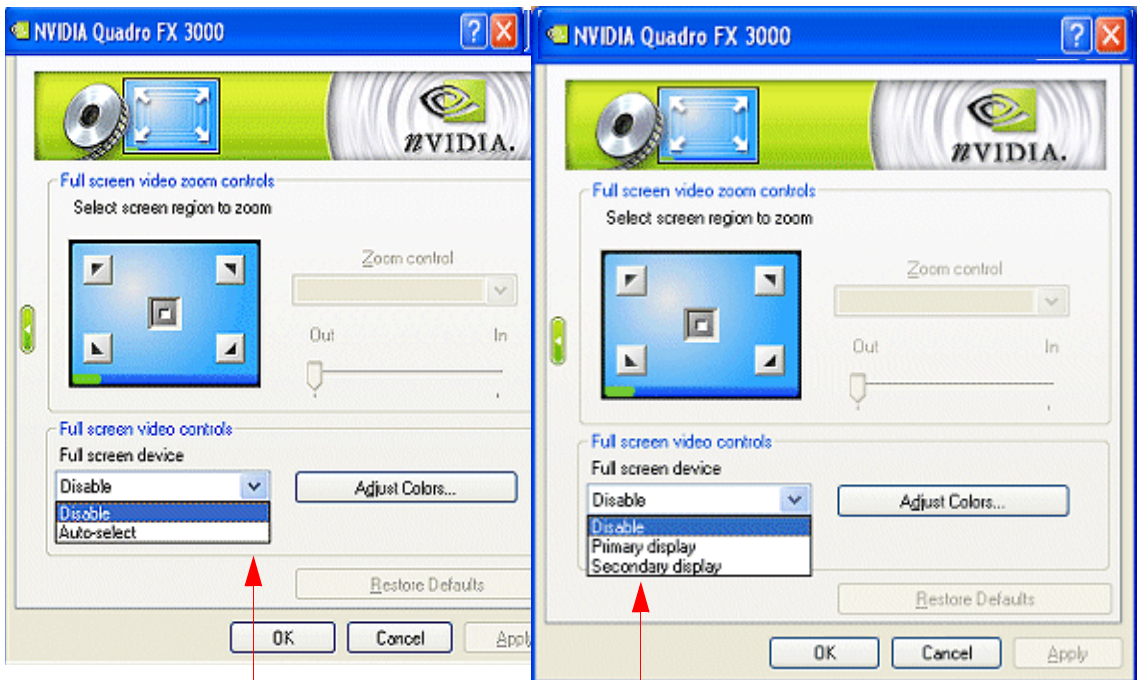
Auto-select option is available in **nView Dualview** and **Span** modes.

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

Track Overlay Rotation

Select the **Track overlay rotation** check box (Figure 7.14) to link the degree of rotation you specify on the NVRotate page (*see* "Using NVRotate Settings" on page 133*)* for a video overlay between the primary and secondary displays.

Adjust Colors

See "Adjusting Desktop Colors" on page 94.

Figure 7.14   Full Screen Video — Zoom Control Video Mirror Settings
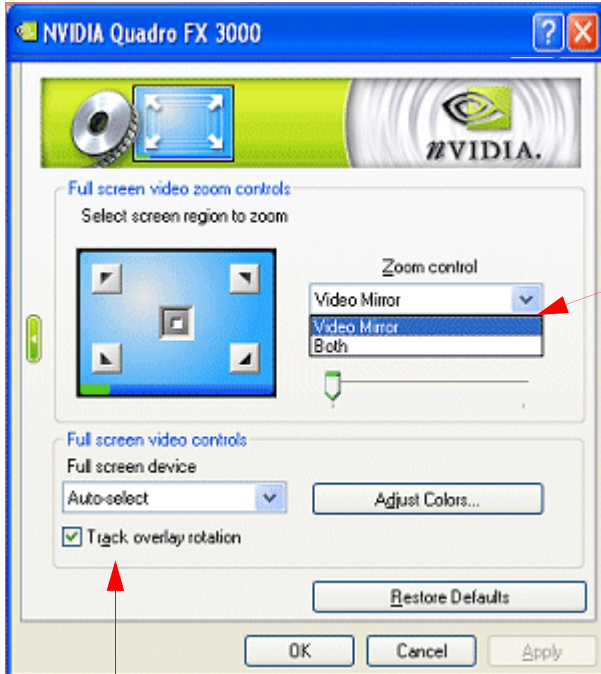
Zoom controls apply to the display being used for the "**video mirror**" feature.

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.

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 7.14) 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 120.)

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

Accessing 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 18.

Figure 7.15 shows the Tools page.

Figure 7.15 Tools Settings

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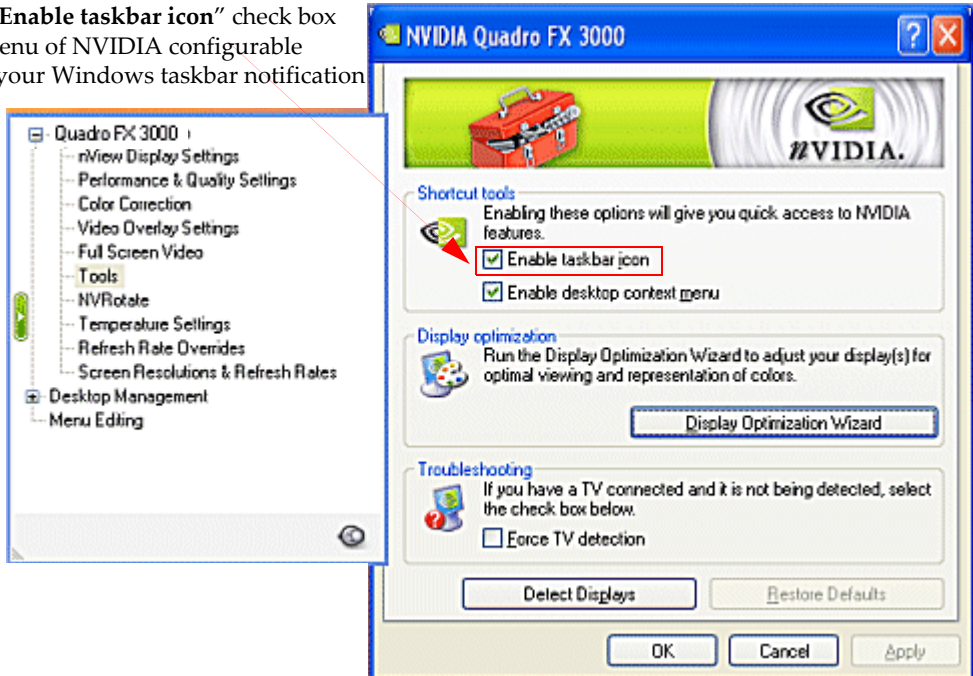
Adding the NVIDIA Settings Menu to the Windows Taskbar

The **Enable taskbar icon** check box is selected, by default, on the Tools page (Figure 7.15). When this option is selected, the NVIDIA Settings menu icon is added to the Windows taskbar notification areas, as shown in Figure 7.16.

Figure 7.16 NVIDIA Settings Menu Icon Displayed in the Windows Taskbar Notification Area

NVIDIA Settings menu icon

Windows taskbar notification area
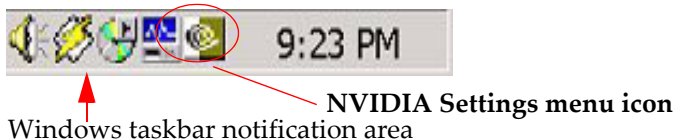
You can click this icon to display and use the NVIDIA Settings menu to apply any of the NVIDIA graphics driver settings (which are normally configurable from the NVIDIA display menu) *on the fly*. This menu also contains options for restoring default settings and accessing the Windows Display Properties 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 7.17 and Figure 7.18 show sample NVIDIA Settings menus.

Figure 7.17 NVIDIA Settings Sample Menus with Four Connected Graphics Cards
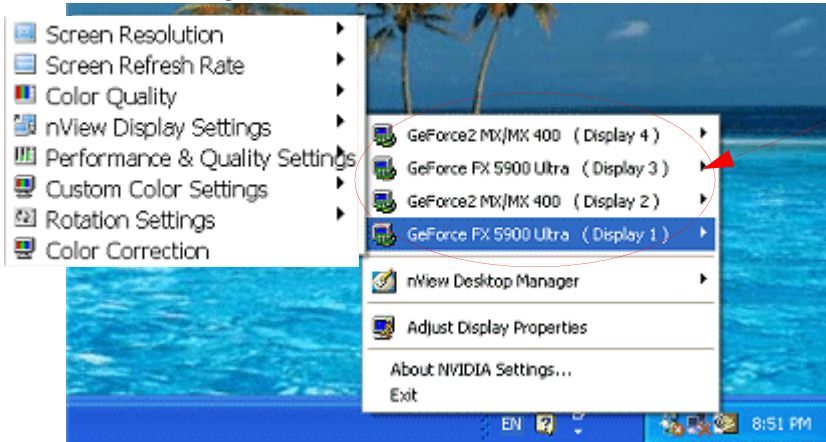
NVIDIA Settings menu showing four graphics cares are connected. You can select each to access and configure its display settings.

Figure 7.18 NVIDIA Settings Menus — Another Example
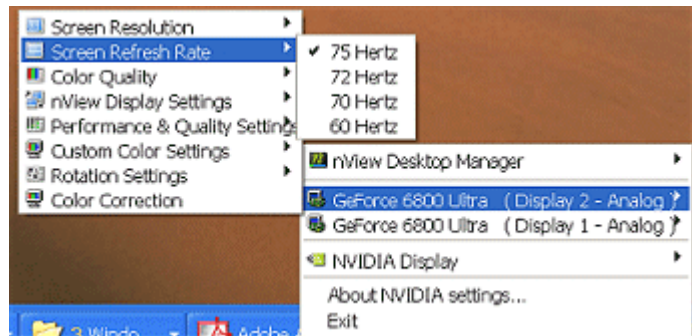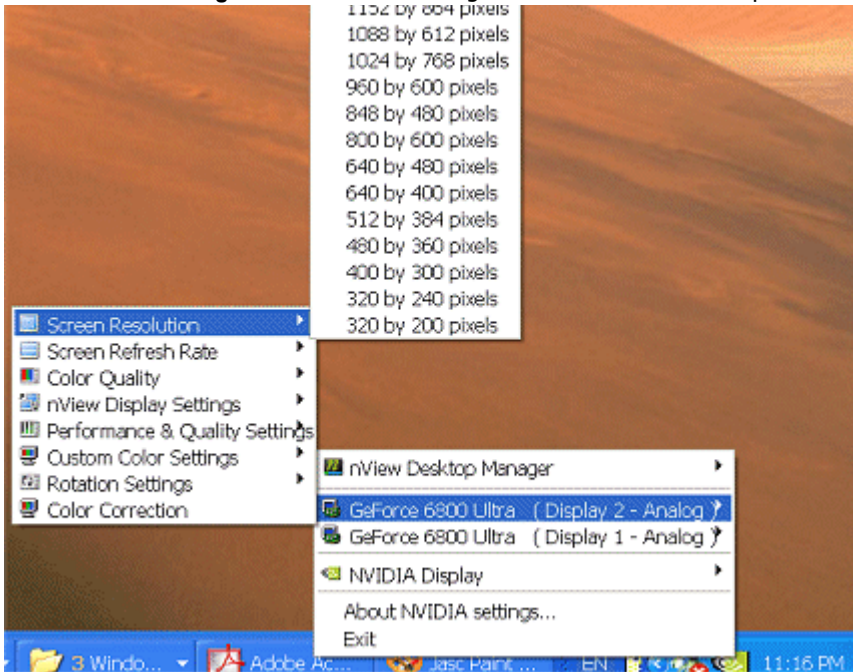
Display Optimization Wizard

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.

Adding NVIDIA Menu Options to the Windows Desktop Menu

When the **Enable desktop context menu** check box is selected (the *default* condition) (Figure 7.19), 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 7.19).

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 7.19).

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 (TV) Settings" on page 66.

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 7.19 Tools Settings
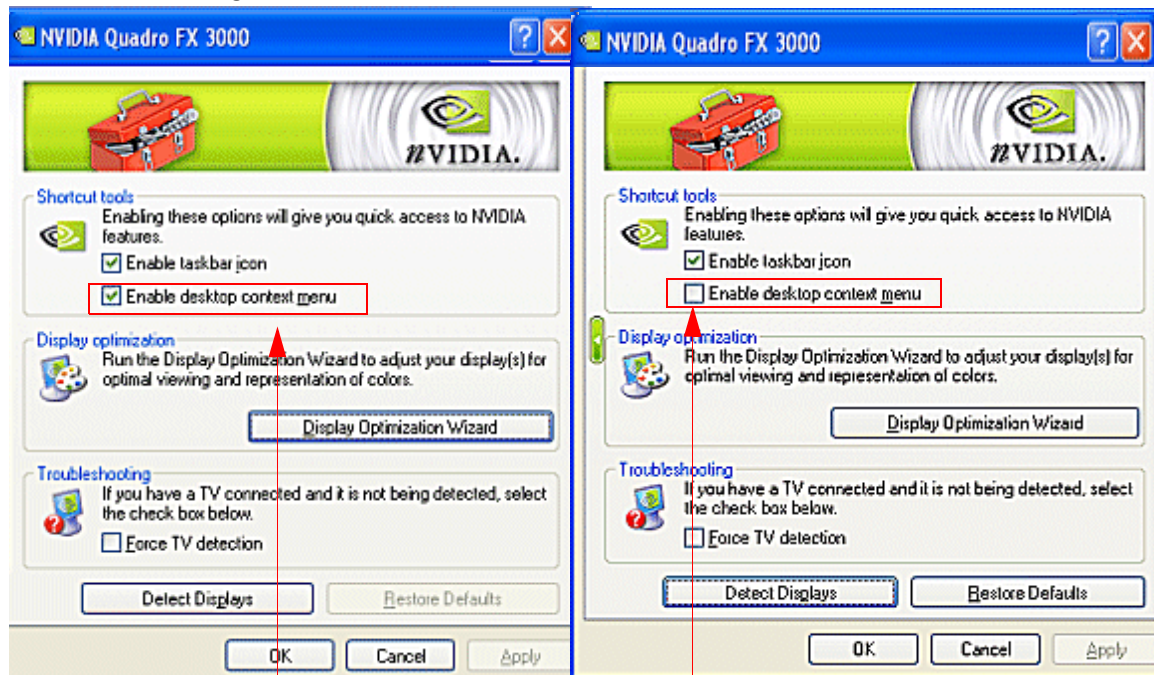
Selecting the **Enable desktop context menu** check box adds the **NVIDIA display menu** item to your desktop context menu.
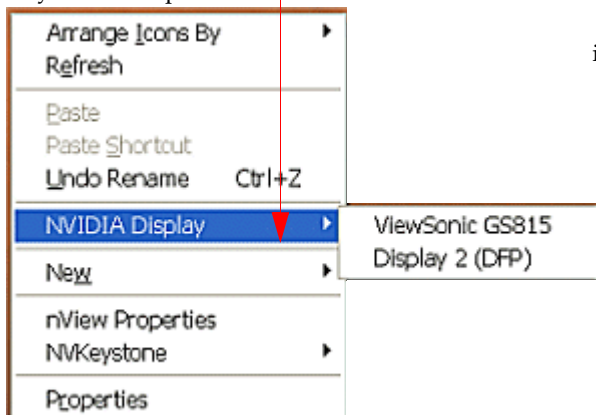
Clearing the **Enable desktop context menu** check box *removes the* **NVIDIA display** menu option, but retains the nView Desktop Manager menu items if you chose to display them using options on the nView Desktop Manager control panel, as shown in the desktop menu below.
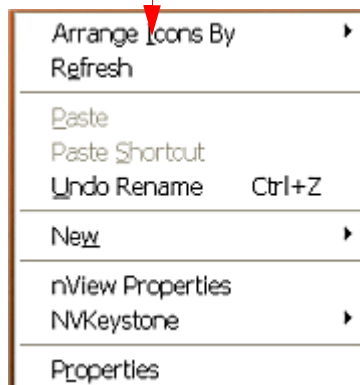
Using NVRotate Settings

The NVRotate settings (Figure 7.20) 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 122.

Accessing the NVRotate Page

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

Figure 7.20 through Figure 7.22 show the NVRotate settings.

Figure 7.20 NVRotate Settings — Landscape Mode
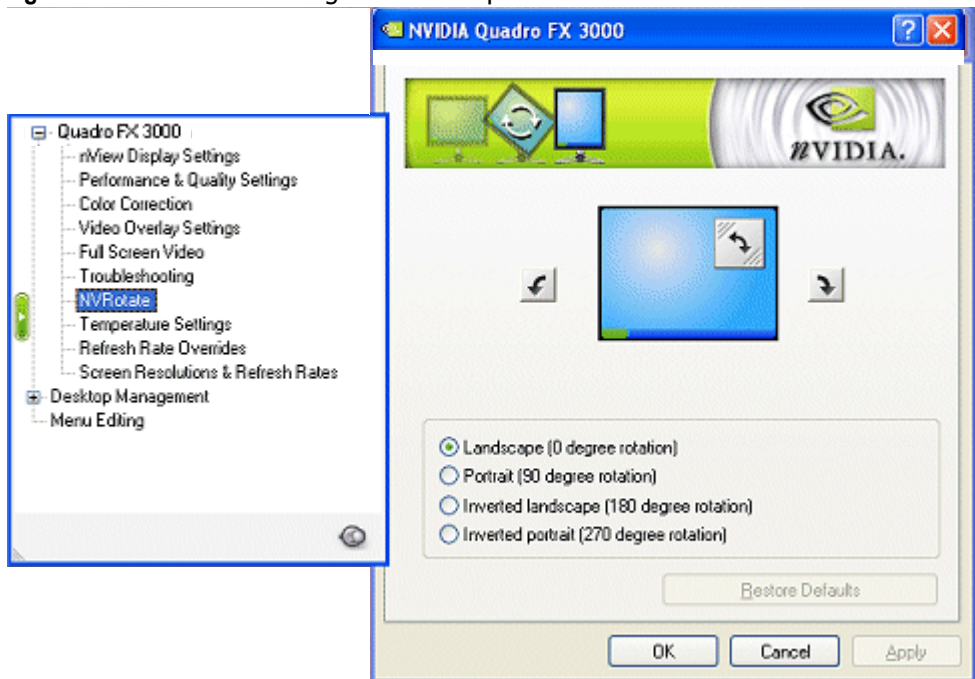
Before You Use NVRotate Settings

- 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 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 7.20).
- **Inverted Landscape** results in a 270 degree rotation (Figure 7.21).
- **Portrait** results in a 90 degree rotation (Figure 7.22).
- **Inverted Portrait** results in a 180 degree rotation (Figure 7.22).
- **Restore Default** results in the default "Landscape" mode (Figure 7.20).

1 As shown in Figure 7.21, 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 7.21 NVRotate Settings — Inverted Landscape Mode
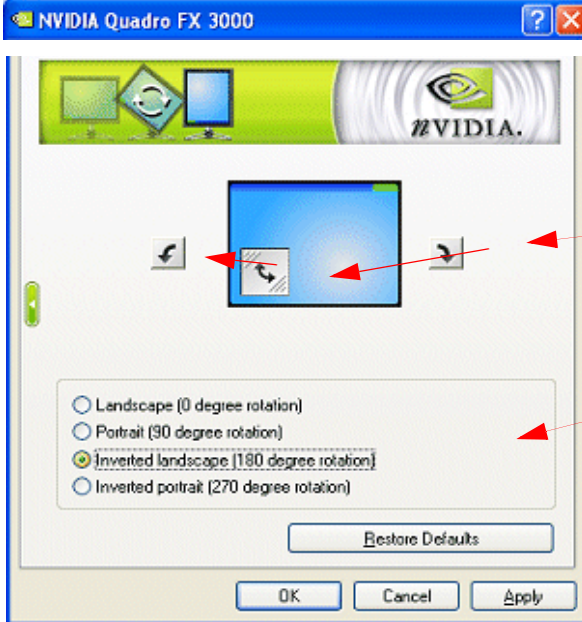
To rotate your desktop, click one of these **arrow buttons**.

or

Select one of these **options**.

Figure 7.22 NVRotate Settings — Portrait & Inverted Portrait Mode
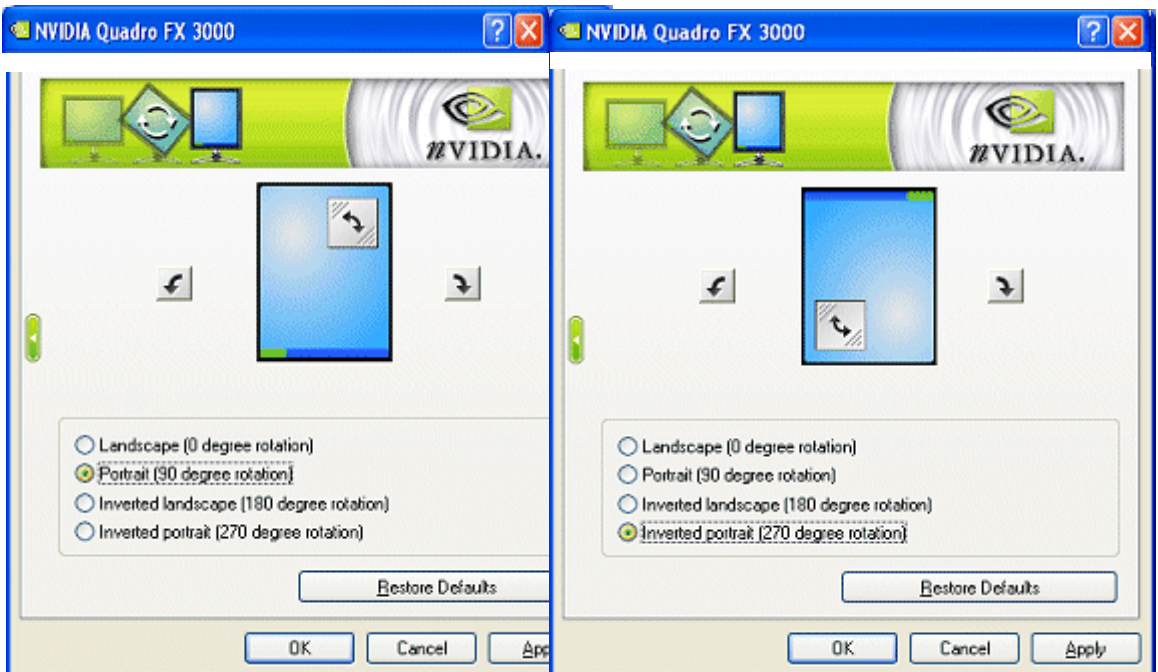
Adjusting Temperature Settings

> **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 7.23 Temperature Settings
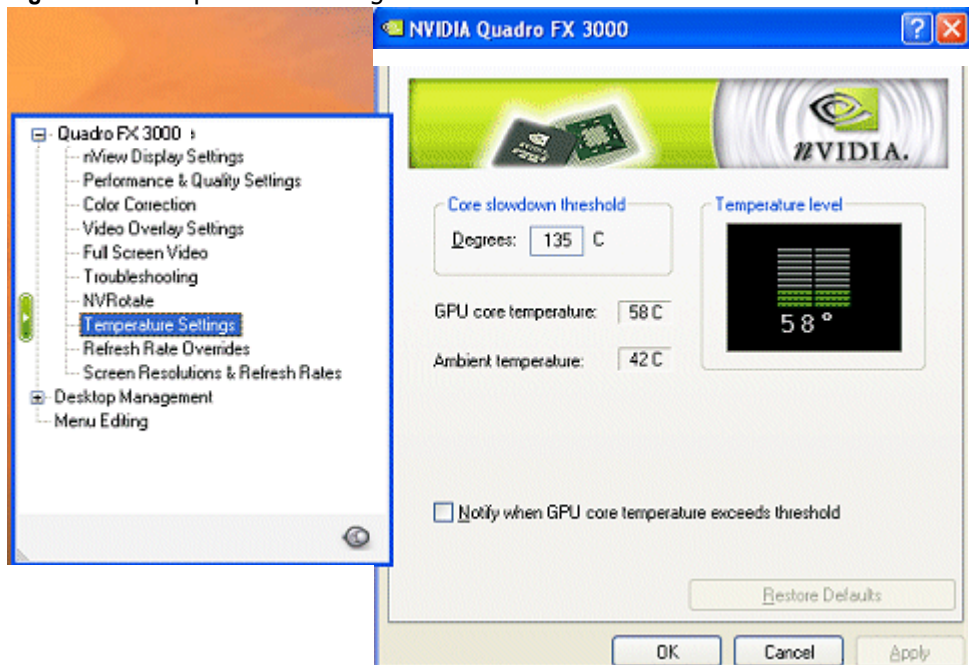
Temperature Settings

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 7.24) 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 18.

Figure 7.24 Screen Resolution & Refresh Rates Page
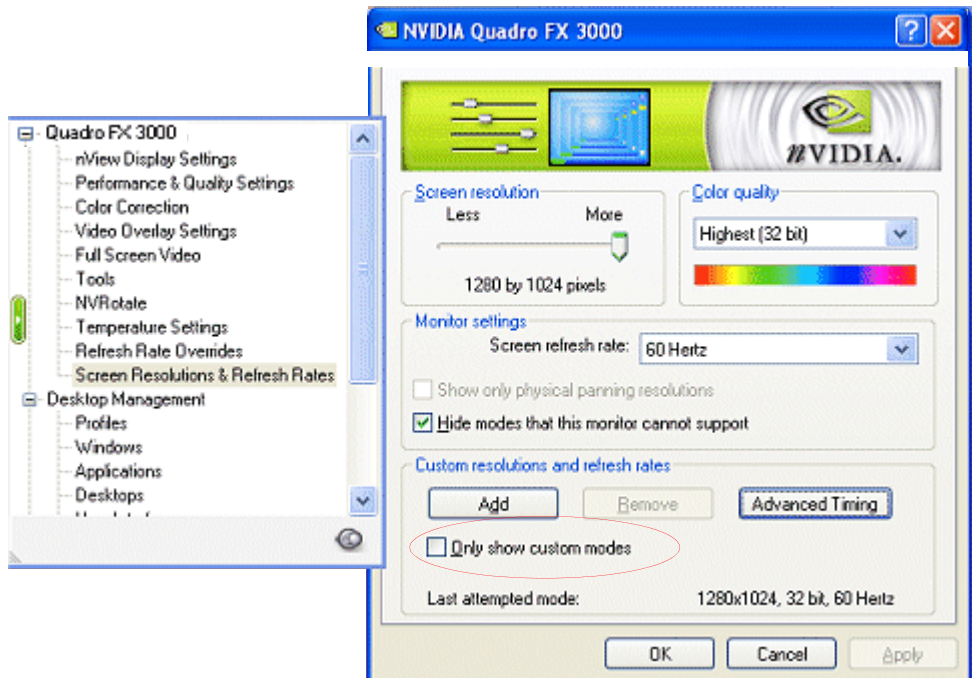
Screen Resolution and Color Quality

- **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 7.25.

Figure 7.25 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 140.

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.

If an Agreement page appears, scroll down and then click the **I Agree button** to accept the agreement and open the Advanced Timing page.

The **Advanced Timing** configuration page (Figure 7.26) where you can select display timing standards and custom parameters.

Figure 7.26 Advanced Timing — Custom Modes/Timings & Timing Standards
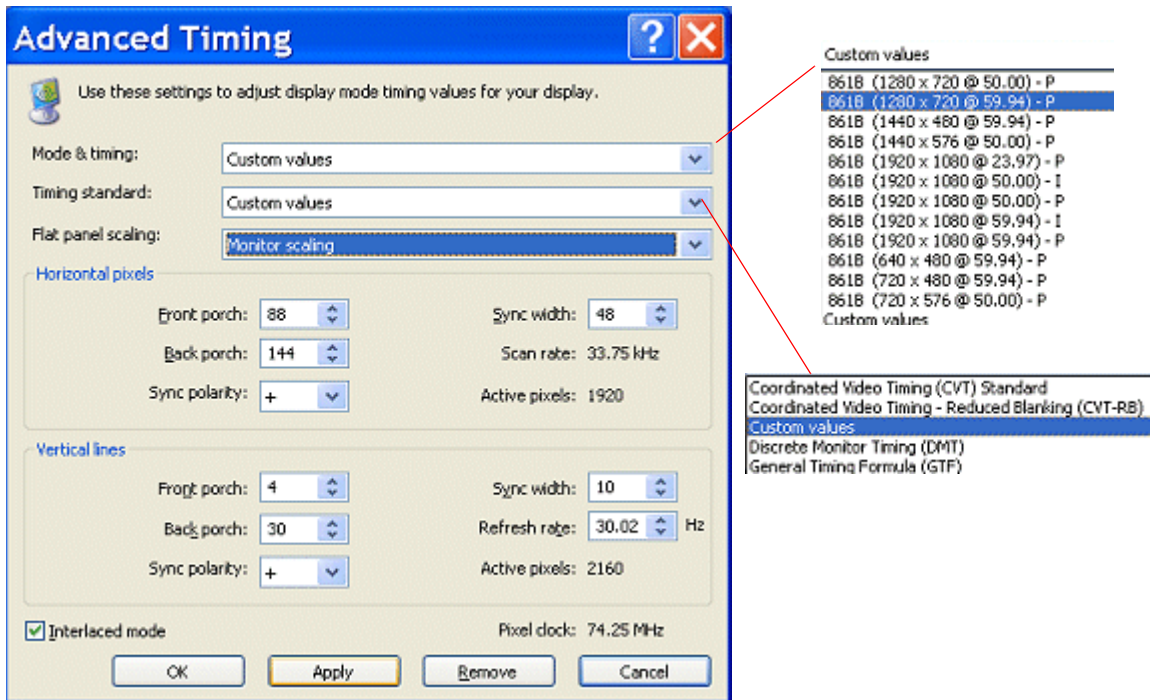
Display Mode & Timing Parameters

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 145 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**.

Table 7.1   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.
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.

Table 7.1   Advanced Timing Parameters (continued)

Advanced Timing Parameter	Description
Refresh rate	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), or more generally, the frequency at which the entire screen is refreshed. Specify the frequency at which your entire screen is refreshed, or retraced, to prevent the image from flickering. **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.
Active pixels	Indicates the number of all visible pixels in one vertical line.
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. **Note:** Also see the explanation for **-I** (interlaced scanning) on page 144. 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. 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 142, follow these steps:

1 Click the **Timing standard** list and select one of the display timing standards described in Table 7.2.

2 Click **Apply**.

Table 7.2 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 7.27).

If you need help in accessing the NVIDIA display menu, see "Accessing the NVIDIA Display Control Panel Pages" on page 18.

Figure 7.27 Menu Editing Page — Default Settings
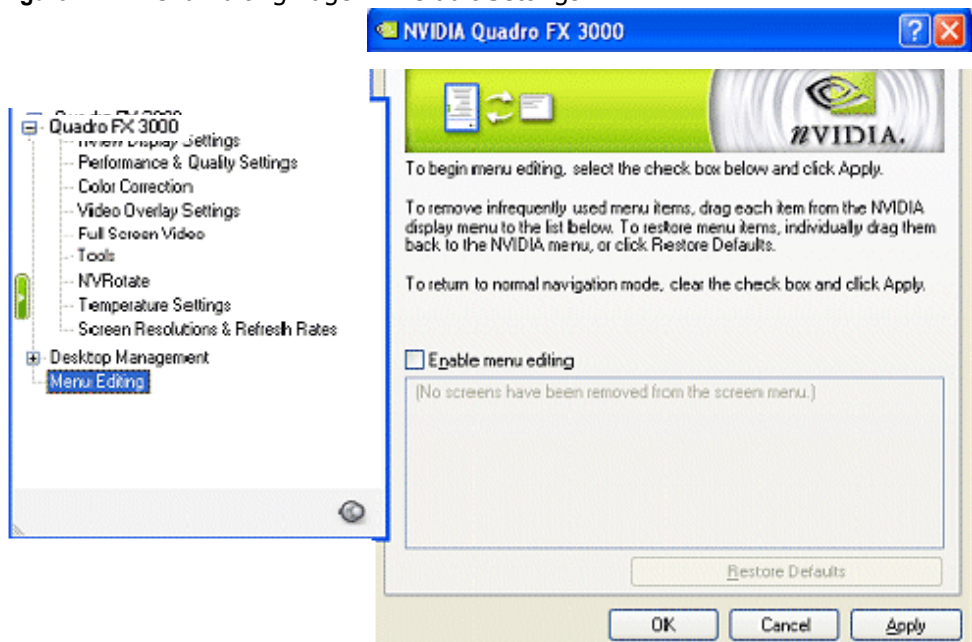
Using Menu Editing

1 Select the **Enable menu editing** check box (Figure 7.28).

Figure 7.28 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.
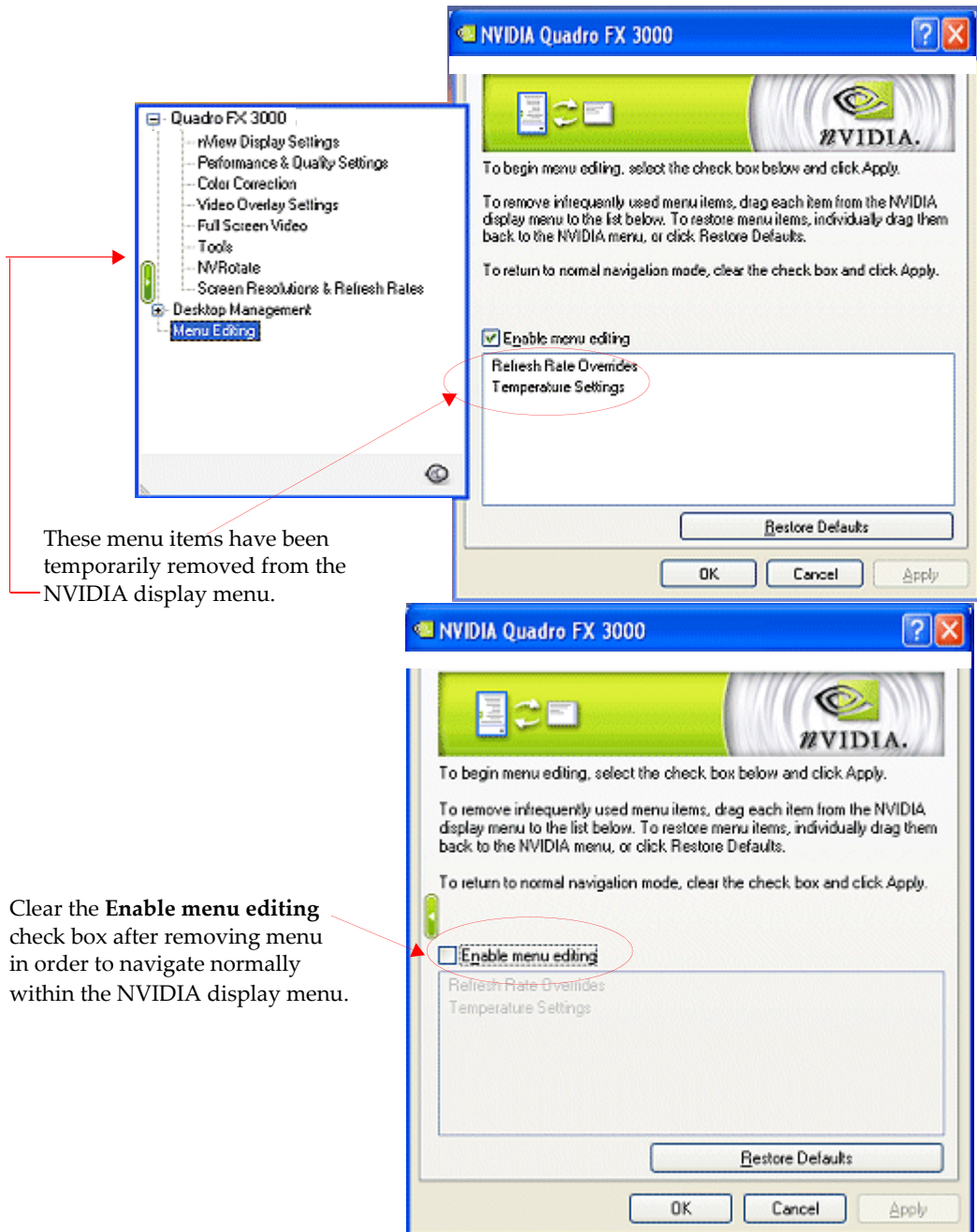
2 Remove infrequently used screens by dragging them from the NVIDIA display menu to the list box shown below the check box.

Figure 7.28 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 7.28).

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.

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 18.

Figure 7.29 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 7.29) it is AC Outlet.

Figure 7.29 PowerMizer Settings — Applies *only* to Notebook Computers
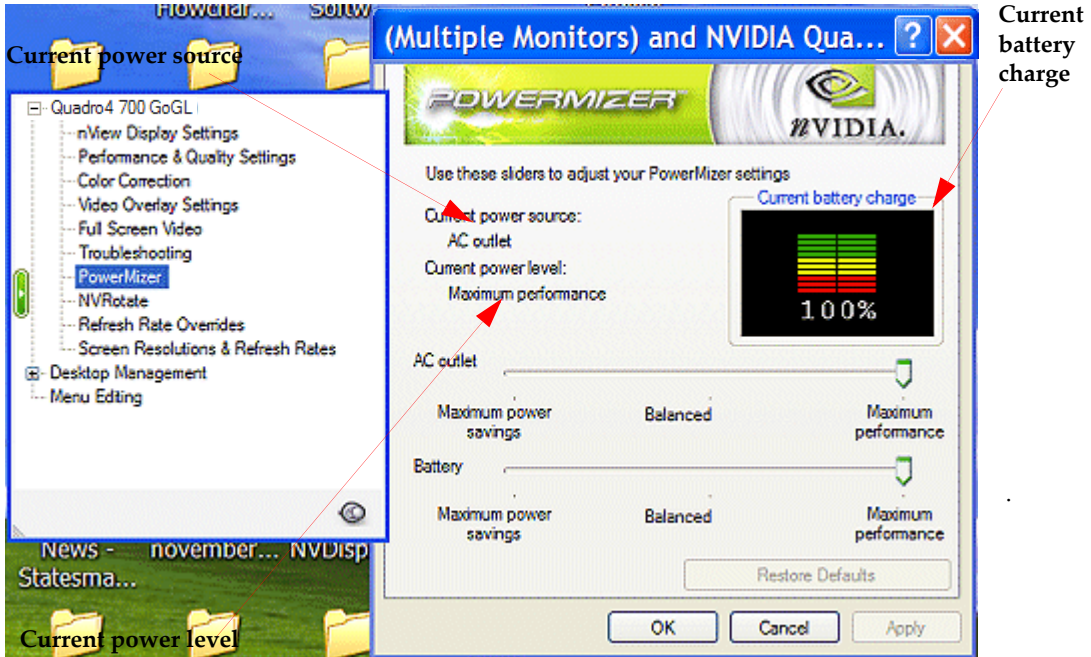
Current Power Level

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 the HiRes Desktop Scaling Feature

High resolution (HiRes) desktops are used with many workstation applications, which often results in desktops that are difficult to navigate. For example, Figure 7.30 illustrates the effect of high resolution on icon size.

Figure 7.30 3840 x 2400 versus 1920 x 1200
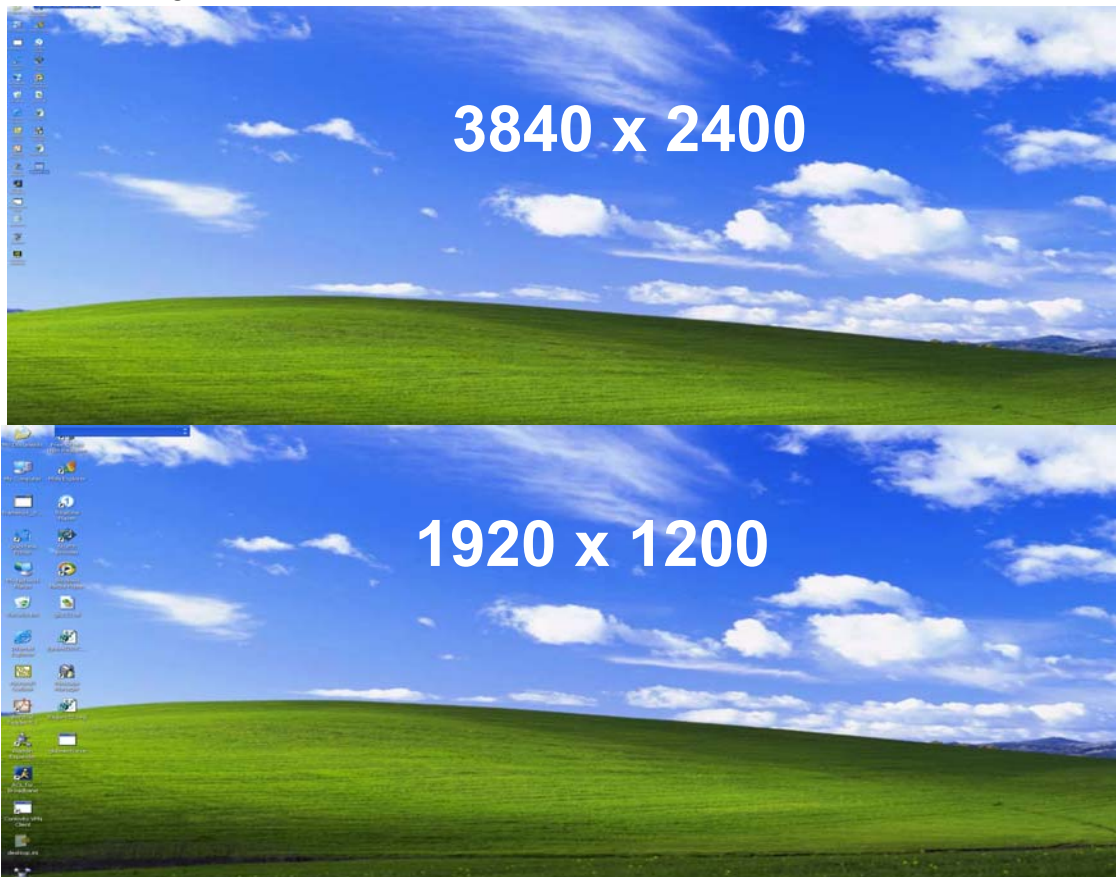
HiRes desktop scaling allows you to comfortably view desktops set to 3840x2400 by scaling it down to 1920 x 1200, without affecting the OpenGL window resolution.

Figure 7.31 illustrates the difference in OpenGL applications when viewed on a desktop set to 1920 x 1200 versus a desktop set to 3480 x 2400 with hires scaling enabled.

Figure 7.31 Effect of Hires Scaling on OpenGL Drawing
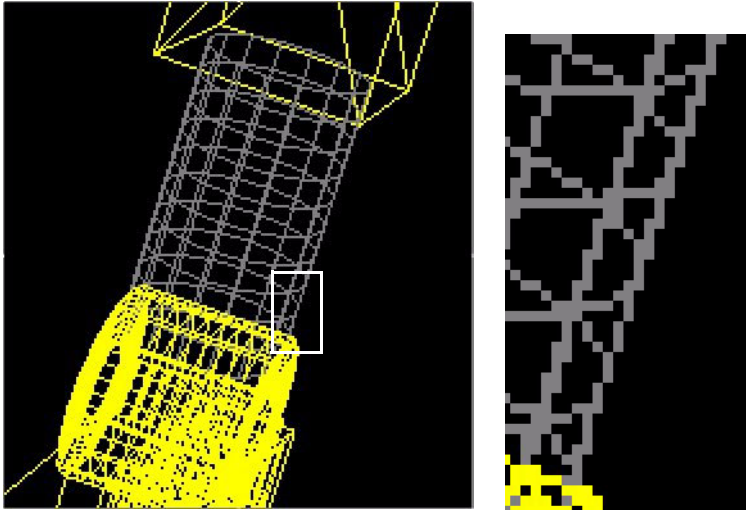
OpenGL wireframe with desktop at 1920 x 1200.
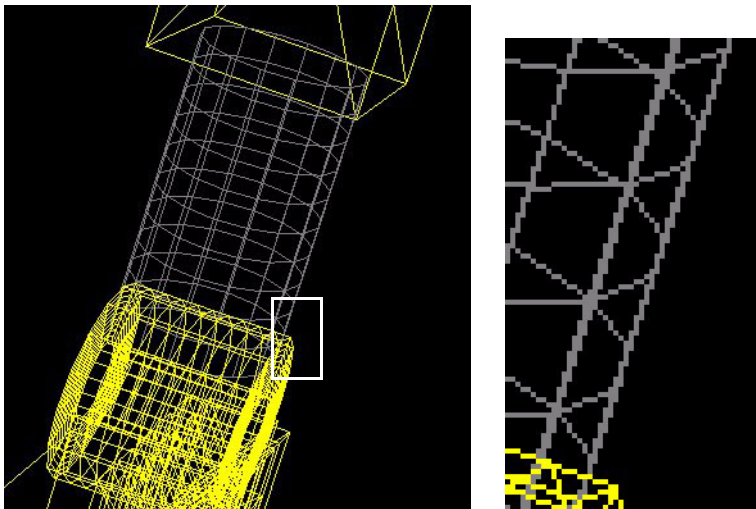
OpenGL wireframe with desktop hires scaled to 1920 x 1200 from 3840 x 2400.

Activating HiRes Desktop Scaling

To enable HiRes desktop scaling on flat panel displays capable of 3840 x 2400, follow these steps:

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

2 Click **Properties** > **Settings** to display the Windows Display Properties Settings page Figure 7.32.

3 If Dualview is enabled, click the display icon corresponding to your high resolution display.

Figure 7.32 Windows Display Properties Settings Page
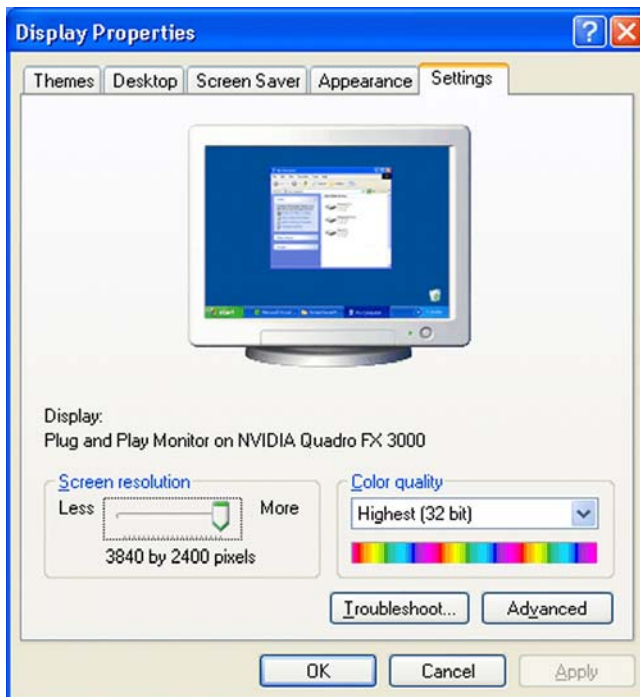
4 Change the resolution using any *one* of the following methods:

Using the Settings page

a Under Screen Resolution, move the slider to 3840 x 2400 pixels (Figure 7.32), then click **Apply**.

b Click **Advanced** and then click the NVIDIA Quadro GPU tab.

Using the NVIDIA Change Resolution page

a Click **Advanced** and then click the NVIDIA Quadro product tab.

b From the NVIDIA display menu, click **Change Resolution**.

c Move the slider to 3840 x 2400 and click **Apply**.

5 From the NVIDIA display menu, select the **nView Display Settings** option to display the nView Display Settings page (Figure 7.33).

6 Select the **HiRes desktop scaling from 3840 x 2400 to 1920 x 1200** check box and (Figure 7.33) and click **Apply**.

Note: Your desktop is now scaled to 1920 x 1200, yet OpenGL application windows will continue to appear at 3840 x 2400 resolution.

Figure 7.33 HiRes Desktop Scaling Option on nView Display Settings Page

HiRes desktop scaling check box

C H A P T E R

8

USING NVIDIA DIRECT ACCESS

This chapter explains how to use NVIDIA Direct Access:

- "About NVIDIA Direct Access" on page 155
- "Configuring Display Settings" on page 158
- "Adjusting Color Settings" on page 160
- "Adjusting Display Size and Position" on page 162

About NVIDIA Direct Access

NVIDIA Direct Access allows you to directly configure monitor settings without using the physical buttons on the monitor. On monitors that use the Display Data Channel/Command Interface (DDC/CI) protocol (see Direct Access Compatible Monitors), you can configure the following display settings (if available on the monitor) using the keyboard and mouse:

- Language Settings
- Color Settings - Brightness, contrast, and color temperature
- Horizontal/Vertical size and position

Direct Access Compatible Monitors

The following monitors are DDC/CI-compliant and supported by NVIDIA Direct Access:

NEC FE750+	NEC FE770	NEC FE771SB	NEC FE791SB
NEC FE950+	NEC FE990	NEC FE991SB	NEC FE1250+
NEC FE2111SB	NEC FP912SB	NEC FP955	NEC FP1355
NEC FP1375X	NEC FP2141SB	NEC LCD51V	NEC LCD51VM
NEC LCD52V	NEC LCD52VM	NEC LCD1501	NEC LCD1504M
NEC LCD1535VI	NEC LCD1550X	NEC LCD1555V	NEC LCD1560V
NEC LCD1560V+	NEC LCD1560NX	NEC LCD1560VM	NEC LCD1560M
NEC LCD1570NX	NEC LCD71V	NEC LCD71VM	NEC LCD72V
NEC LCD72VM	NEC LCD72XM	NEC LCD1701	NEC LCD1704M
NEC LCD1760VM	NEC LCD1760NX	NEC LCD1760V	NEC LCD1770GX
NEC LCD1770V	NEC LCD1770NX	NEC LCD1770NXM	NEC LCD1850E
NEC LCD1880SX	NEC LCD1860NX	NEC LCD92V	NEC LCD92VM
NEC LCD1904M	NEC LCD1960NX	NEC LCD1960NXi	NEC LCD1970GX
NEC LCD1970NX	NEC LCD1970V	NEC LCD1980FXi	NEC LCD1980SX
NEC LCD1980SX+	NEC LCD1980SXi	NEC LCD200VX	NEC LCD2070NX
NEC LCD2080UX	NEC LCD2080UX+	NEC LCD2180UX	NEC LCD2060NX
NEC LCD3000	NEC LCD4000	NEC LCD4000e	NEC LCD4010
NEC LCD4610			

Mitsubishi V51LCD	Mitsubishi V71LCD	Mitsubishi V91LCD
Mitsubishi Diamond Plus 74SB	Mitsubishi Diamond Point SB70	Mitsubishi Diamond Pro 730
Mitsubishi Diamond Pro 740SB	Mitsubishi Diamond Pro 750SB	Mitsubishi Diamond Plus 92
Mitsubishi Diamond Plus 93SB	Mitsubishi Diamond Pro 930SB	Mitsubishi Diamond Plus 220
Mitsubishi Diamond Plus 230SB	Mitsubishi Diamond Pro 2060u	Mitsubishi Diamond Pro 2070SB

Mitsubishi DiamondPoint VM72LCD	Mitsubishi DiamondPoint NX76LCD
Mitsubishi DiamondPoint NX77LCD	Mitsubishi DiamondPoint NX86LCD
Mitsubishi DiamondPoint NX96LCD	Mitsubishi DiamondPoint SX98LCD
Mitsubishi DiamondPoint UX21LCD	Mitsubishi RDF225WG

Using the Direct Access Main Page

1 To access NVIDIA Direct Access, click the **NVIDIA Direct Access** option from the NVIDIA display menu.
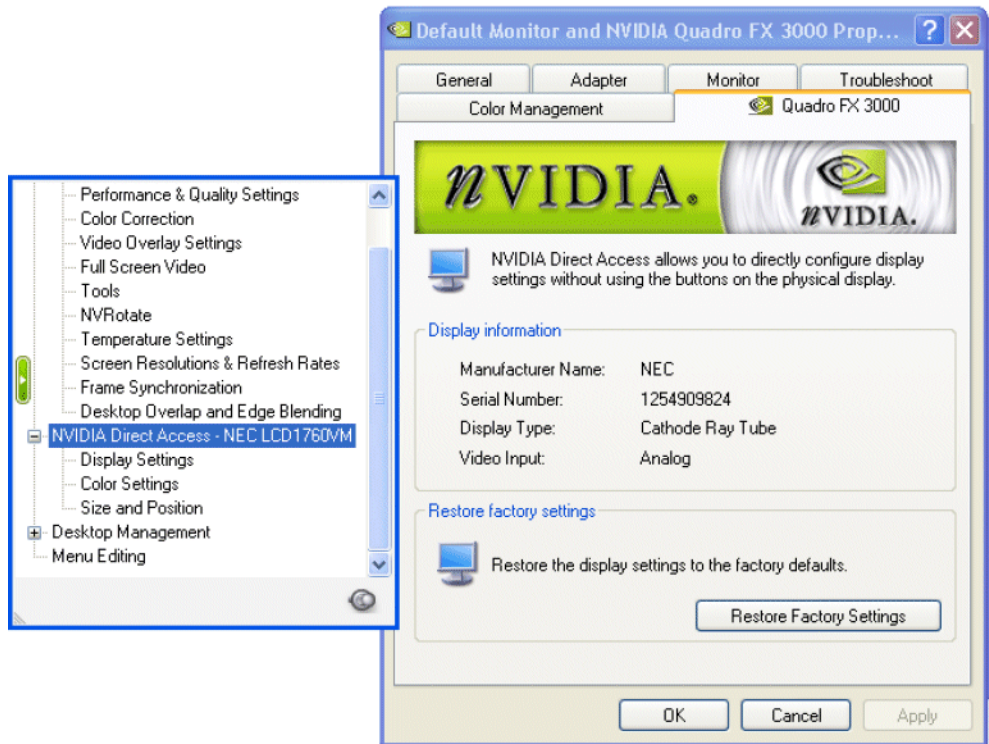
Figure 8.1   NVIDIA Direct Access Page

The NVIDIA Direct Access page displays information about your monitor.

Note: If you do not have a compatible monitor connected, the NVIDIA Direct Access page is not available.

2 To restore your monitor to your manufacturer's default settings, click **Restore Factory Settings,** then click **OK** or **Apply.**

You may want to use this setting if you changed certain display settings that did not give you desirable results.

3 To prevent display settings from being manually changed, or to select language preferences, click the sub-menu item **Display Settings** to open and use the Direct Access Display Settings page. See "Configuring Display Settings" on page 158.

4 To adjust the monitor brightness, contrast, and color temperature, click the sub-menu item **Color Settings** to open and use the Color Settings page. See "Adjusting Color Settings" on page 160.

5 To adjust the size and position of the viewable area of your monitor, click the sub-menu item **Size and Position** to open and use the Size and Position page. See "Adjusting Display Size and Position" on page 162.

Configuring Display Settings

Click the sub-menu item **Display Settings** to open the Direct Access Display Settings page.
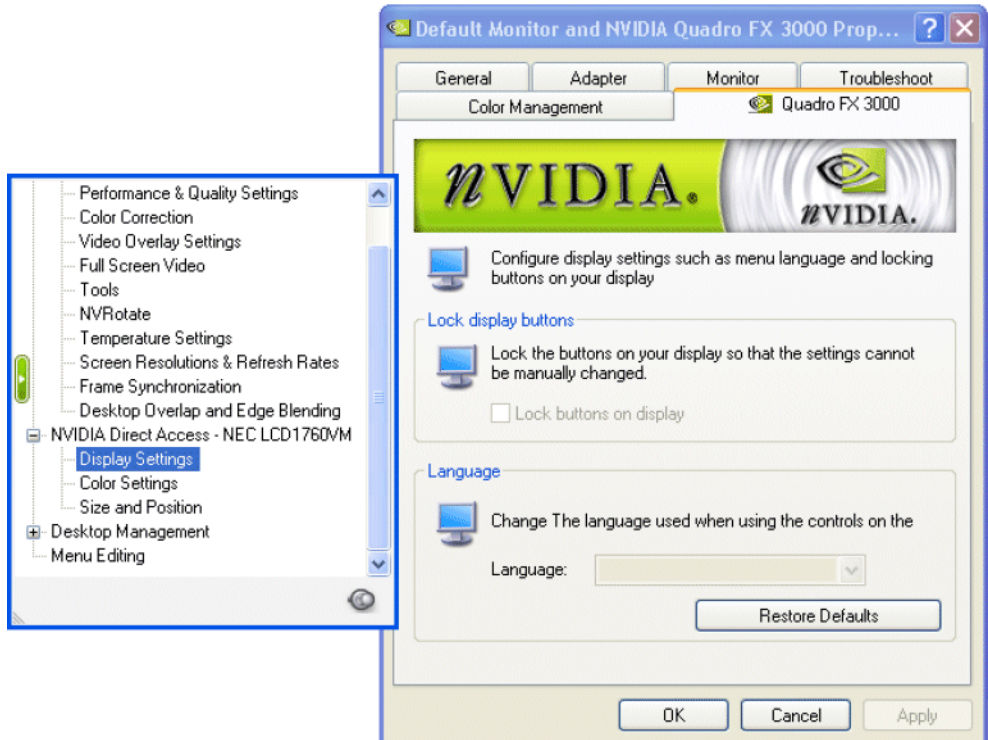
Figure 8.2 NVIDIA Direct Access—Display Settings Page

The controls available on this page depend on which controls are available using the physical buttons on the connected monitor.

Locking Display Buttons

You can lock the physical controls on your display so that these controls cannot be used to manually change any settings. Use this setting if you would rather use the NVIDIA Direct Access online controls to change your display settings and would like to protect these settings.

To lock the physical controls on your display, check **Lock buttons on display**.

Changing Languages

You can select the language that you want displayed when using the physical controls on the monitor.

To select a language, click the **Language** list row and then click the language to display.

Adjusting Color Settings

Click the sub-menu item **Color Settings** to open the Direct Access Color Settings page.
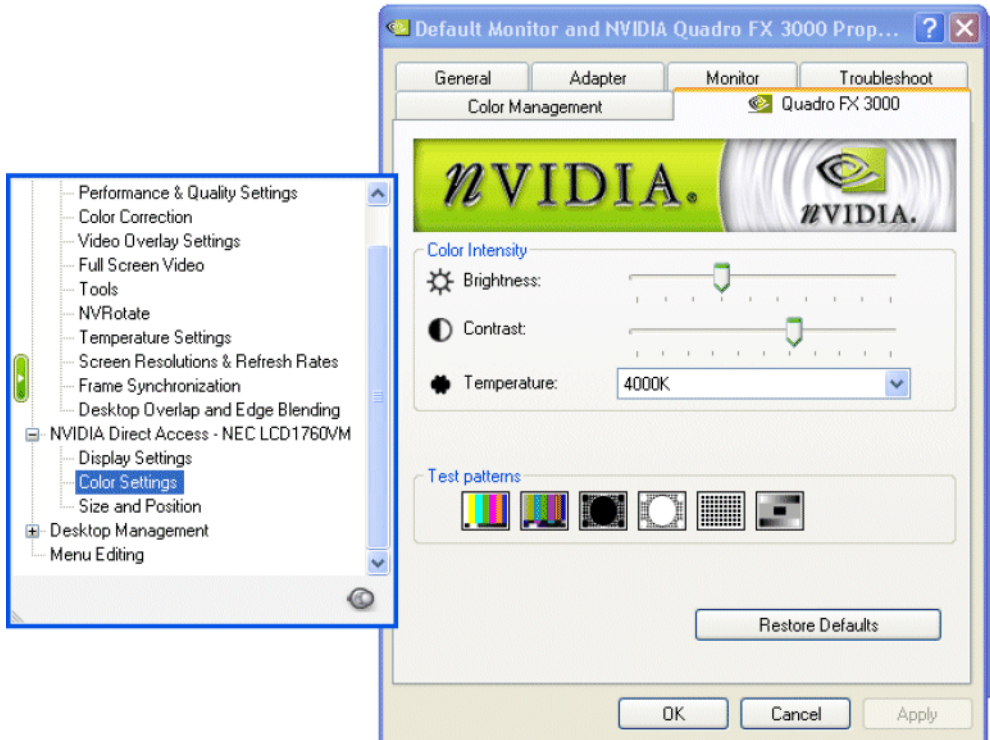
Figure 8.3 NVIDIA Direct Access—Color Settings Page

The controls available on this page depend on which controls are available using the physical buttons on the connected monitor.

- **Brightness** slider adjusts the display's brightness, which is the lightness or darkness of your display.

  Move the slide to the left to make your desktop appear darker, or move it to the right to make your desktop appear lighter.

- **Contrast** slider adjusts the display's contrast, which is the difference between the lightest and darkest parts of the desktop. Use this slider when the desktop appears gray or washed out.

Move the slider to the left to decrease contrast, or to the right to increase the contrast.

- **Temperature** refers to the display's color temperature, which is a measure of the whiteness of the light source.

  Lighting with a lower temperature appears more yellow or red, while lighting with a higher temperature contains more blue. Change this setting when the white areas on the desktop appear dull with more yellow tint or the white areas of the desktop appear blue.

  To change the color temperature, click the **Temperature** list arrow and then click one of the temperature values.

- **Test patterns** gives you the option of using a test pattern as a reference when fine tuning your display settings.

  To select a test pattern, click one of the **Test pattern** icons.

Adjusting Display Size and Position

Click the sub-menu item **Size and Position** to open the Direct Access Size and Position page.
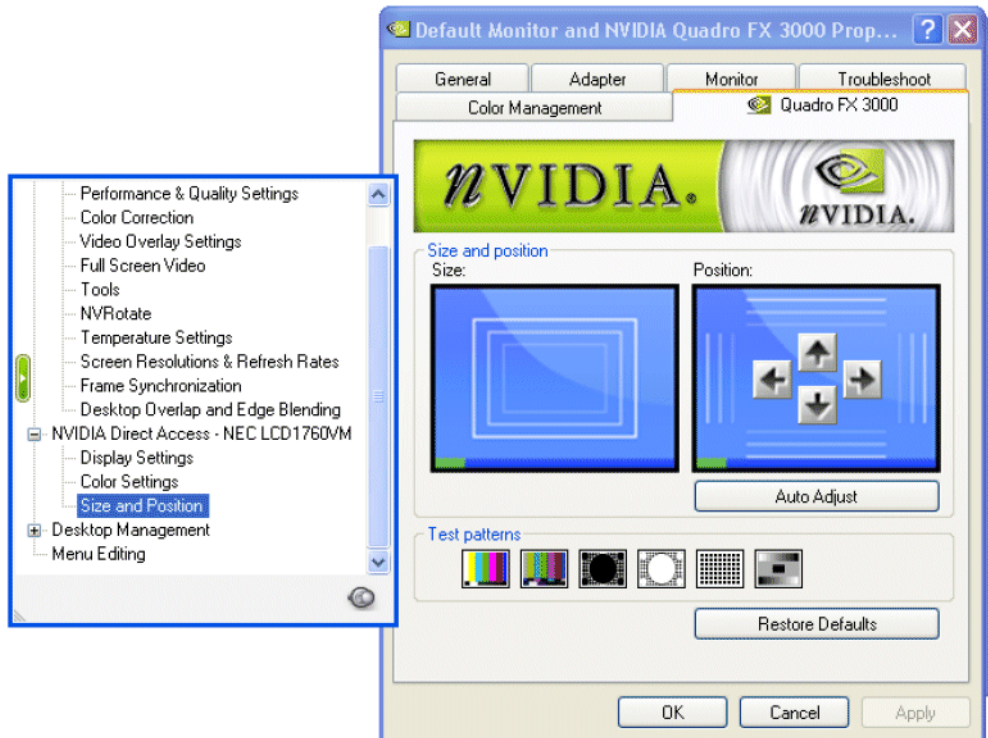
Figure 8.4   NVIDIA Direct Access—Size and Position Page

The controls available on this page depend on which controls are available using the physical buttons on the connected monitor.

- **Size**

  Click the controls to increase or decrease the size of the viewable area of your display.

  - Click the Decrease button if the sides of your desktop extend beyond the viewable area of your display.

  - Click the Increase button if there are black borders surrounding the desktop and you would like to stretch the desktop to fill this area.

- **Position**

Click the arrows corresponding to the direction that you want to move the display area:

- Click the **left arrow** if the left side of your desktop has a black border, the desktop needs to be more horizontally centered on the display, or if the right side of the desktop extends beyond the viewable area of your display.

- Click the **right arrow** if the right side of your desktop has a black border, the desktop needs to be more horizontally centered on the display, or if the left side of the desktop extends beyond the viewable area of your display.

- Click the **up arrow** if the top of your desktop has a black border, the desktop needs to be more vertically centered on the display, or if the bottom of the desktop extends beyond the viewable area of your display.

- Click the **down arrow** if the bottom of your desktop has a black border, the desktop needs to be more vertically centered on the display, or if the top of the desktop extends beyond the viewable area of your display.

- **Test patterns** gives you the option of using a test pattern as a reference when fine tuning your display settings.

To select a test pattern, click one of the **Test pattern** icons.

C H A P T E R

9

USING NVIDIA SCALABLE LINK INTERFACE (SLI)

NVIDIA SLI (Scalable Link Interface) technology lets you install and benefit from two PCI Express (PCIe) graphics boards in a single PC. Just as dual processors or dual core CPUs improve computer performance, SLI allows dual GPUs (Graphics Processing Units) to significantly accelerate graphics performance.

This chapter explains how to install, configure, and use NVIDIA SLI graphics cards as supported in ForceWare driver version 81.76 and later.

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-

Overview of SLI for NVIDIA Quadro Cards

Professional users benefit by using SLI technology on dual NVIDIA Quadro GPUs to span an OpenGL window across multiple displays, or to run a single application on each GPU. The SLI connector offers dual GPU performance on a single display by leveraging the capabilities of two NVIDIA Quadro GPUs.

SLI Modes for NVIDIA Quadro GPUs

There are three SLI functions available for NVIDIA Quadro GPUs:

SLI Frame Rendering Mode

SLI frame rendering combines two PCI Express graphics boards with an SLI connector to transparently scale application performance on a single display by presenting them as a single graphics card to the operating system.

SLI Multi-View Mode

SLI multi-view combines the power of two NVIDIA Quadro PCI Express graphics boards to span a single hardware-accelerated OpenGL application window across multiple displays, run a single application per GPU with multiple display outputs, or enable other uses of two PCI Express graphics boards.

SLI Antialiasing Mode

SLI antialiasing combines the power of two PCI Express graphics boards to offer higher quality antialiasing.

Hardware Requirements

To support SLI, the motherboard and system must include the following:

Motherboard

Your PC 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
- x8 + x8

Graphics Cards

NVIDIA SLI requires two SLI graphics cards.

- **For SLI Frame Rendering**
    - Two identical NVIDIA Quadro FX 4500, 4400, 3450, or 3400 graphics cards
    - An SLI bridge connector (provided with your graphics board) must also be installed to utilize the full capabilities of SLI Frame Rendering.
- **For SLI Multi-View**
    - Two matching NVIDIA Quadro FX 4400, 3400, 1400, and 540

Power supply

- Some SLI capable graphics boards, such as the NVIDIA Quadro 3450, 3400, 4500, or 4400, require an external power cable.
- Since SLI supports up to two high-end graphics boards, the load on the system's power supply can increase significantly. A minimum of a 450W Power Supply Unit (PSU) is recommended.

    An inadequate power supply will result in erratic and unpredictable system behavior.

Installation and Operating Instructions

Before removing current graphics boards and installing two NVIDIA Quadro FX boards, please 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 Power off the system and remove the power cord from the power supply.

2 Gently remove or open the system enclosure.

Refer to owners manual that came with your computer.

3 Remove any non-SLI capable graphics boards that may occupy the x16 expansion slot and replace it with your SLI-capable graphics board.

4 Install the second SLI-capable graphics board 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 boards with the SLI bridge connector.
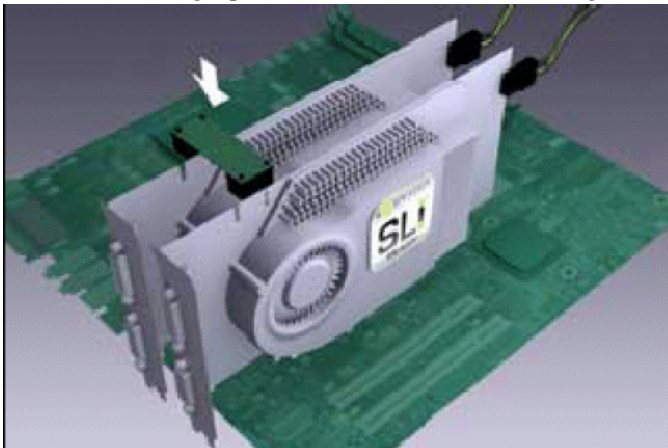
The SLI connector is required only for SLI Frame Rendering.

6 If your graphics boards 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 board 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 Power on the system and log into Windows.

2 Cancel the Windows "Found New Hardware Wizard".

   This message should apear twice – one for each graphics board).

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 reboot the system.

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.
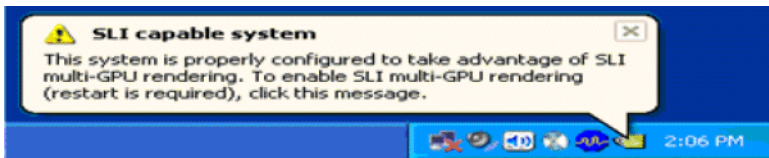
2 Click anywhere on the message.

   If the message disappears, continue with the following steps.

3 Right click the desktop and click **Properties**->**Settings**->**Advanced**, then click the Quadro FX product tab.

4 Click the **SLI multi-GPU** tree item to open the SLI multi-GPU page.

5 Check **Enable SLI multi-GPU**.

6 Click the **Select display** list arrow, then click the display that you want to use as the SLI display.

7 Click **OK**.

You can now configure your system to use SLI, as explained in the next section.

Using NVIDIA SLI

This section explains how to use the following SLI features:

- SLI Frame Rendering
- SLI Antialiasing Mode
- Viewing Load Balancing

SLI Mode Overview

The following SLI modes are available:

- **SLI Frame Rendering (Multi-GPU)**

  SLI frame rendering accelerates OpenGL operation in two different ways: split-frame rendering (SFR) and alternate-frame rendering (AFR). In SFR, the display is split into distinct sections, and each section is sent to a different GPU. The resulting rendering is recomposed and displayed as a single contiguous frame. The position of the split is adjusted dynamically as the workload moves between the GPUs. In AFR, each GPU renders alternate frames of data from the application.

- **SLI AA**

  You can use SLI to provide higher-quality antialiasing beyond 16xFSAA. In this mode, neither AFR nor SFR are available.

- **SLI Single GPU**

  Also known as SLI compatibility mode, this mode provides for improved performance at a level that assures compatibility with most applications.

Two basic steps are required to select an SLI mode,

1 Select the SLI mode to use when SLI is enabled in a profile.

  - SLI Multi-GPU rendering
  - SLI Single-GPU rendering
  - SLI AA

2 Select the 3D application profile to use.

  - 3D App-Modeling AFR
  - 3D App-Visual Simulation
  - 3D App-Default Global Settings

The resulting SLI modes are listed in Table 9.1.

Table 9.1   SLI Mode Configuration

	SLI Mode		
Profile	**SLI Multi-GPU**	**SLI AA**	**SLI Single-GPU**
3D App-Modeling AFR	AFR	SLI AA	Single GPU
3D App-Visual Simulation	SFR	SLI AA	Single GPU
3D App-Default Global Settings	Single GPU	SLI AA	Single GPU

See the next sections for detailed steps on using these modes.

SLI Frame Rendering

To use SLI frame rendering, perform the following steps:

1 Enable SLI multi-GPU rendering

   a Open the **Performance & Quality Settings** page.

   b From the **Active profile** list, select **Global driver settings.**

   c From the **Global driver settings** View list, select **Advanced settings**.

   d From the **Global driver settings** list box, select **SLI rendering** and then choose **SLI multi-GPU rendering**.

   e Click **Apply**.

2 Choose the frame rendering mode.

SFR typically benefits pixel-shader or texture-intensive operations, whereas AFR benefits geometry-intensive operations.

- To select AFR, select **3D App-Modeling AFR** from the **Active profile** list, then click **Apply**.

- To select SFR, select **3D App-Visual Simulation** from the **Active profile** list, then click **Apply**.

  This profile is also useful for non-SLI configurations, since it optimizes the driver for texture- and shader-intensive operations.

SLI Antialiasing Mode

To use SLI antialiasing, perform the following steps.

1 Enable SLI antialiasing.

   a Open the **Performance & Quality Settings** page.

   b From the **Active profile** list, select **Global driver settings**.

   c From the **Global driver settings** View list, select **Advanced settings**.

   d From the **Global driver settings** list box, select **SLI rendering** and then choose **SLI antialiasing**.

   e Click **Apply**.

2 Select an SLI antialiasing setting.

   a From the **Global driver settings** list box, select **Antialiasing settings.**

   b Adjust the SLI antialiasing settings slider to the desired antialiasing level., then click **Apply**.

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.

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 9.1.

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.

Figure 9.1 Load Balancing Indicators

A P P E N D I X

A

USING TWO NVIDIA GPU-BASED GRAPHICS CARDS

This appendix contains the following major topics:

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 graphics 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 graphics 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 display devices to each card, making sure that the cable connectors are *securely* attached to the graphics cards.

5 Turn on your display devices.

Examples and Setup

The examples in this appendix show the following NVIDIA-based graphics cards and configurations.

- The **Quadro FX 3000 GPU-based graphics card** is an AGP card supporting multi-display nView functionality.

- The **GeForce4 MX GPU-based graphics card** is a PCI 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.

Quadro FX 3000 — Installing the NVIDIA ForceWare Graphics Display Driver

1 Start up your computer.

Your desktop will appear on one of the display devices 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.

Quadro FX 3000 — 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 device numbered **1** appears active, connected, and attached to the Quadro FX 3000 graphics card. Display **2** (connected to the GeForce4 MX) and display **3** (connected to the Quadro FX 3000 graphics card) are not active (appear as grayed screen images) because they have not yet been attached.

2 Click **Identify** to identify the display device.

3 Notice that the display's number, as represented on the Settings page, appears briefly on that display device's desktop (Figure A.2).

Figure A.1 Display Properties Settings — **3** Display Devices with **1** Attached
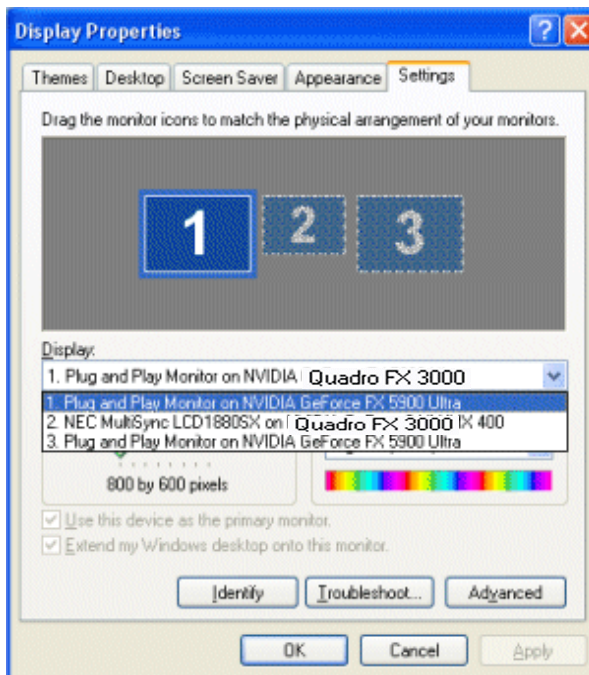
Figure A.2 One Display Device With Identifying Number
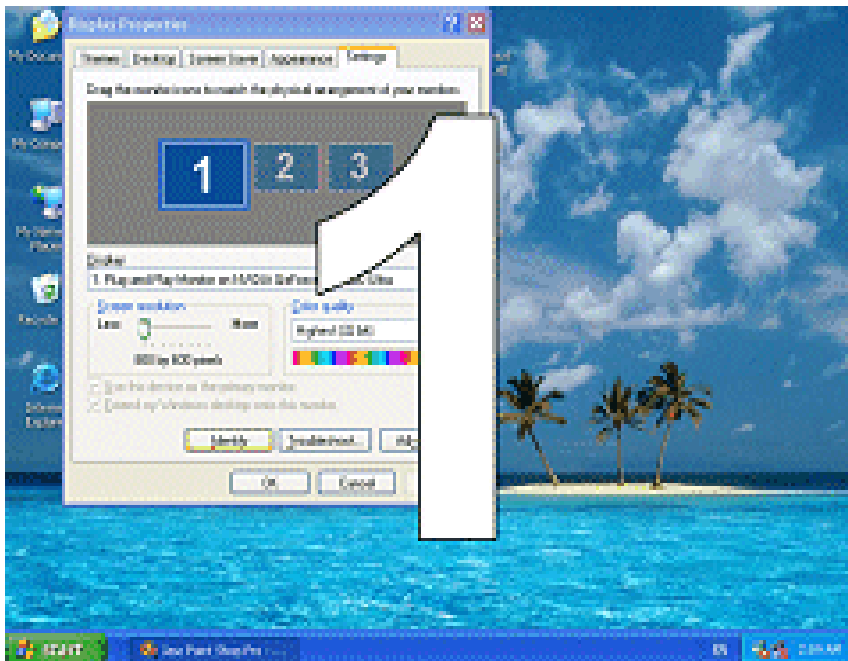
4 From the Settings page, right click the inactive screen image numbered display **3** (connected to the GFX 5900 Ultra card), click **Attached**, and click **Apply**.

   Figure A.3 show that display **3** is now enabled and attached.

5 Click **Identify** to identify the attached display devices (**1** and **3**) on their desktops.

   Notice that the attached display devices' numbers, as represented on the Settings page, appear briefly on those display devices' desktops (Figure A.4).

Figure A.3   Display Properties Settings — **3** Display Devices with **2** Attached
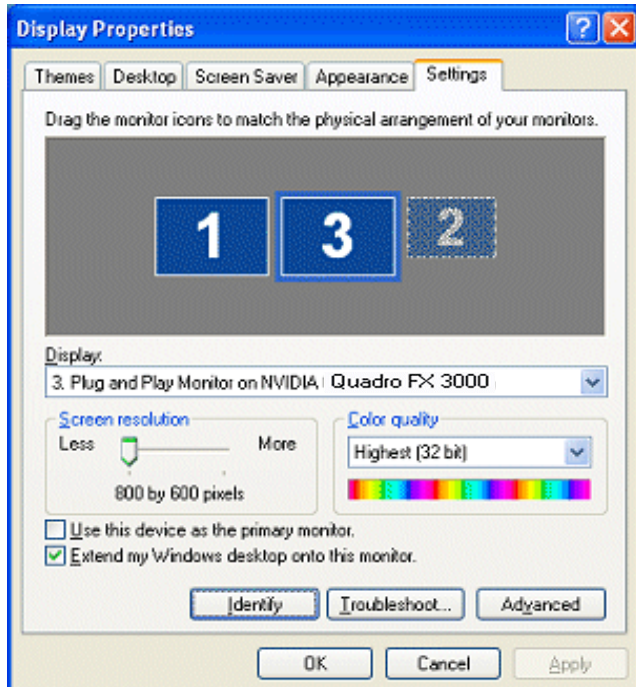
Figure A.4   Two Display Devices With Identifying Numbers
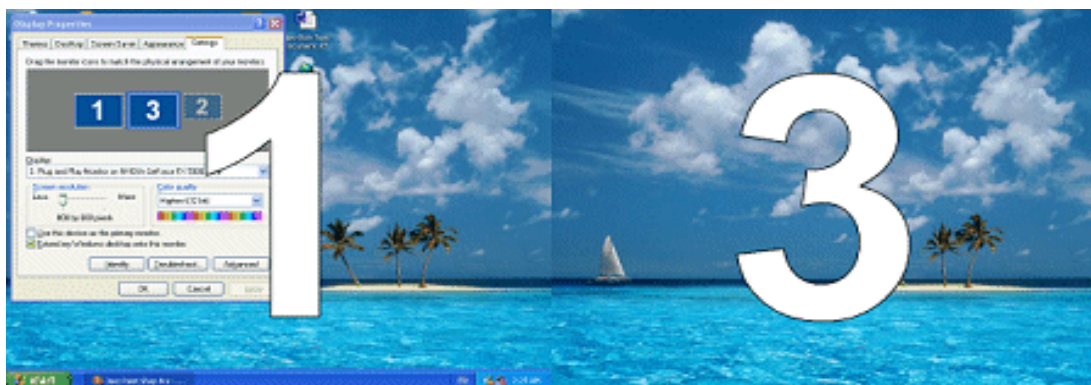
GeForce4 MX — Installing the NVIDIA ForceWare Graphics Display Driver

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 display devices are now represented by numbered display images, as shown in Figure A.5.

Remember that we already attached display devices 1 and 3 for the Quadro FX 3000-based graphics card. Now we will enable display devices 2 and 4 for the GeForce4 MX-based graphics card.

2 Right click display image **2**, click **Attached** and click **Apply**. The associated display device becomes enabled and displays a desktop.

3 Right click on display image **4**, click **Attached** and click **Apply**. The associated display device 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 display devices.

Figure A.5 Display Properties Settings — 4 Attached Display Devices
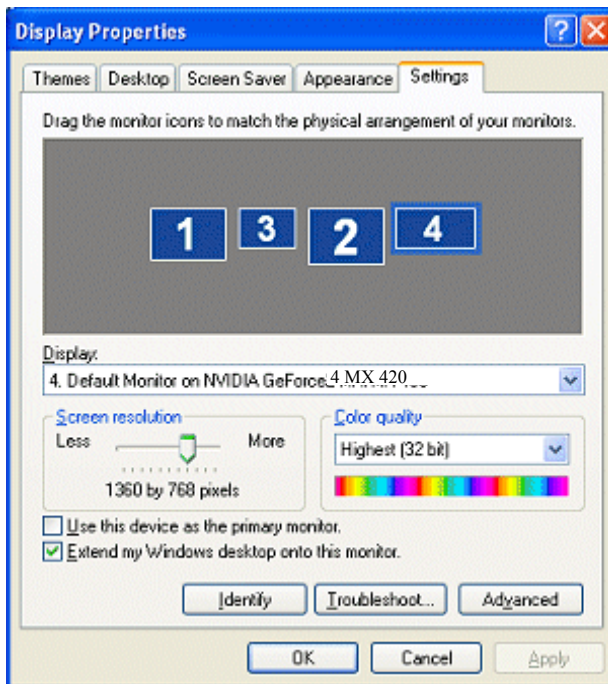
Figure A.6 Four Display Devices With Identifying Numbers

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 Device

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 device as separate display devices.

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 display devices 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** Display Devices with **2** Attached
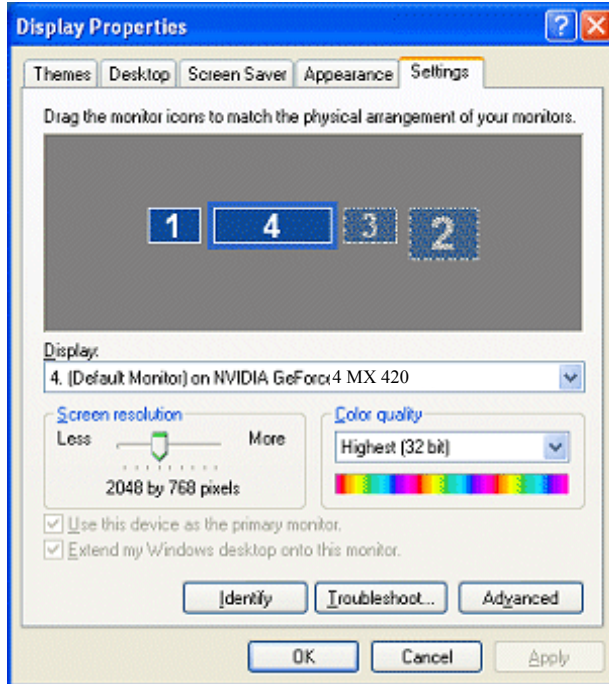
Figure A.8   Two Display Devices With Identifying Numbers

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 device as a separate display device.

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. See Chapter 8, "Configuring Key ForceWare Graphics Driver Features" on page 91.

Figure A.9   NVIDIA Display Menu — Quadro FX 3000 and GeForce4 MX 420 Options
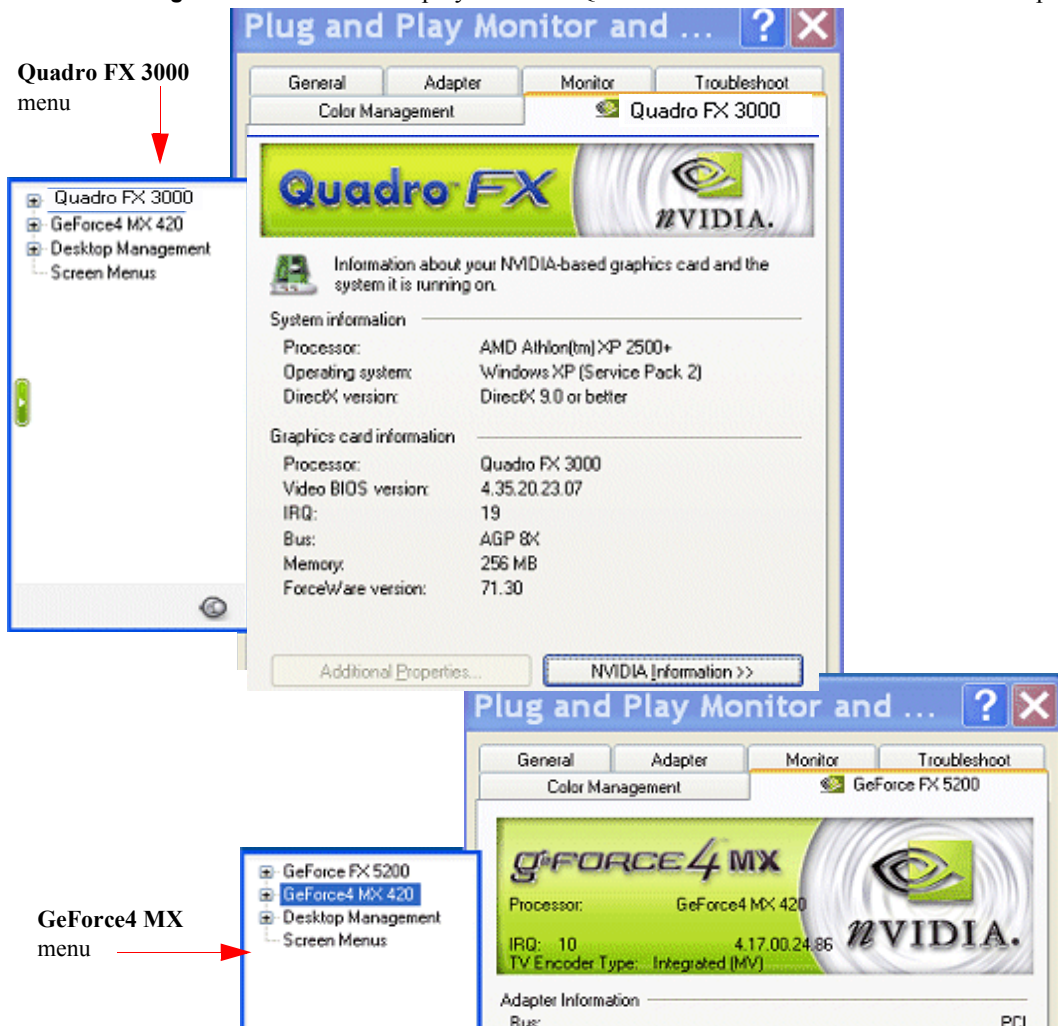
Figure A.10 NVIDIA Display Menu Showing Both Quadro FX 3000 and GeForce4 MX
Graphics Cards

Quadro FX 3000
menu

GeForce4 MX
menu
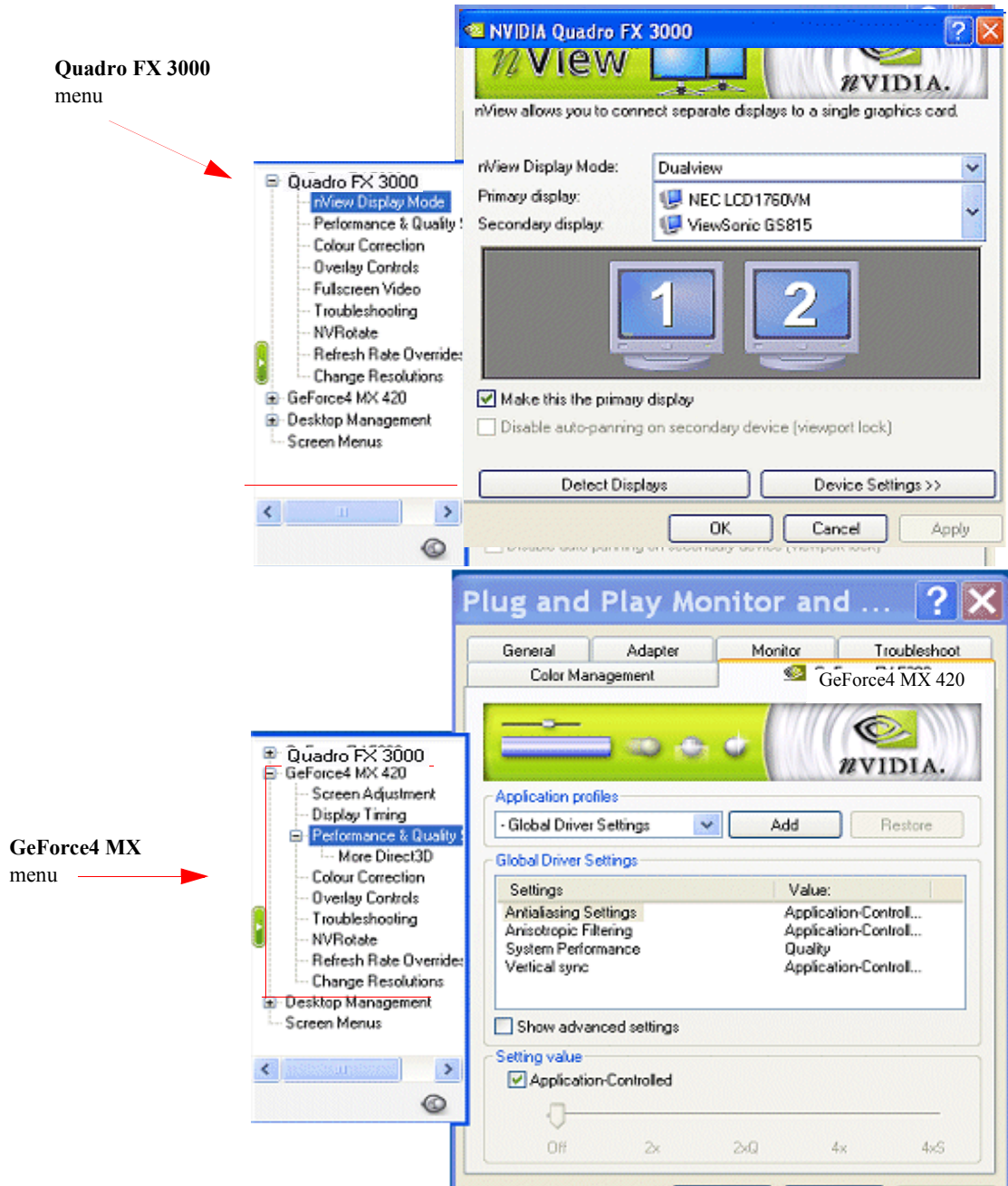
Viewing Multiple Card Configurations Using the NVIDIA Settings Menu

You can view the multi-GPU configurations through the NVIDIA Settings icon on the Windows taskbar. If you don't have the NVIDIA Settings icon enabled, see "Adding the NVIDIA Settings Menu to the Windows Taskbar" on page 126.

1 Right click the NVIDIA Settings icon from your Windows taskbar notification area. A menu of configuration options appears, as shown in Figure A.11.

Notice that both Quadro FX 3000 and GeForce4 MX 420 GPU-based graphics cards are shown in the menu.

Figure A.11 NVIDIA Settings Menu Displaying NVIDIA Quadro FX 3000-based and GeForce4 MX-based Graphics Cards
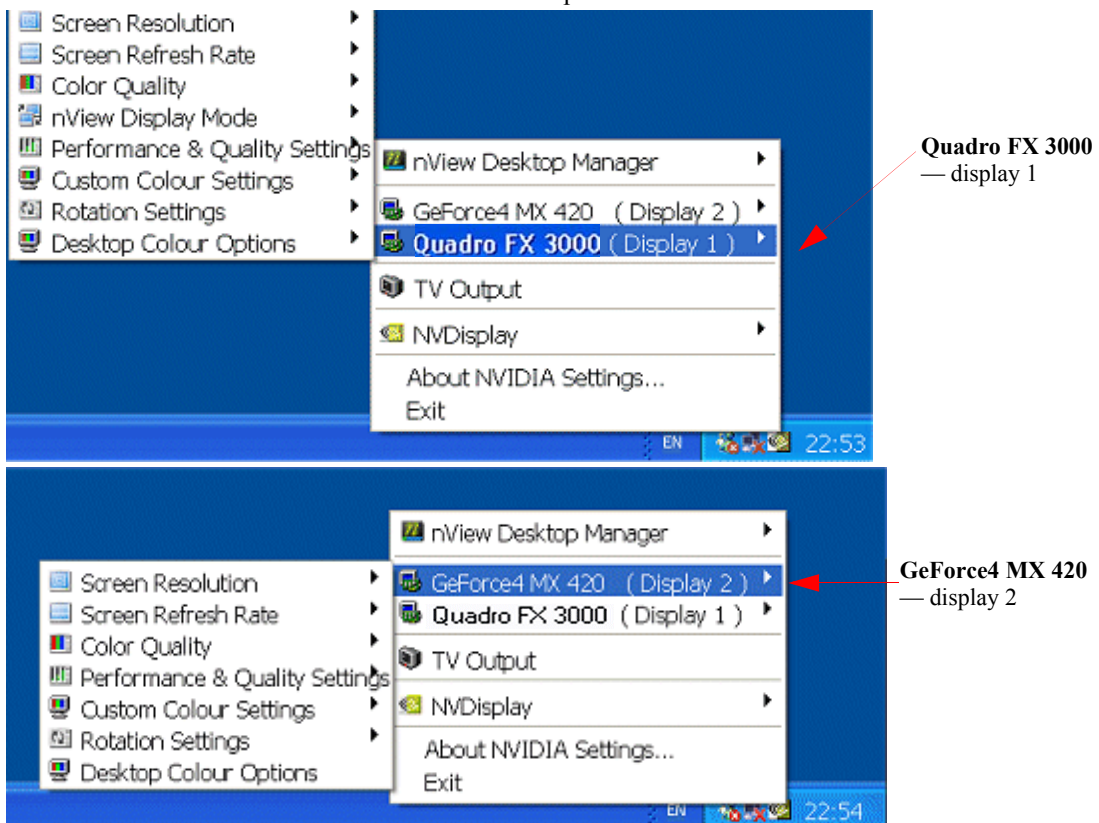
2 To see the configuration options for each GPU-based graphics card, point to the GPU names on the menu (Figure A.11) and then move the cursor to any of the options that appear on the next menu level.

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. Also see Supported HDTV Connectors in the next section.

Any NVIDIA graphics card solution for HDTV ships with an appropriate video cable — examples are shown in the "Sample Video Cables..." sections.

- "Supported HDTV Connectors" on page B-194
- "Sample Cables Shipped with NVIDIA HDTV-Encoded Graphics Cards" on page B-196
- "Sample Cables Shipped with NVIDIA HDTV-Encoded Graphics Cards" on page B-196

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.
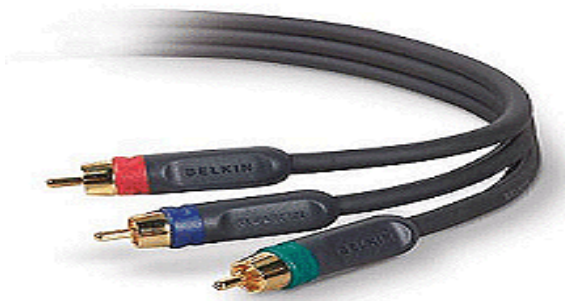
Your NVIDIA HDTV-encoded graphics card is supplied with the "breakout pod" to which you connect the Component Y-Pb-Pr Video Cable for DVD/HDTV that came with your HDTV set.

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 81) 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.

Sample Cables Shipped with NVIDIA HDTV-Encoded Graphics Cards

Figure B.3   Sample Video Cables
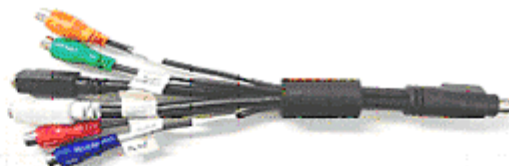
Note: Only cables with a "component" connection can be used with an HDTV.

Figure B.4 Sample NVIDIA Personal Cinema™ A/V Cables

C
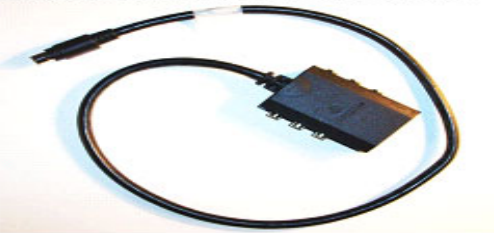
NVIDIA SETUP WIZARD PAGES

The following sections contain the NVIDIA Setup Wizard pages in sequence for a few different display configurations.

NVIDIA Display Wizard — Typical Setup

Figure C.1   NVIDIA Display Wizard — Typical Setup
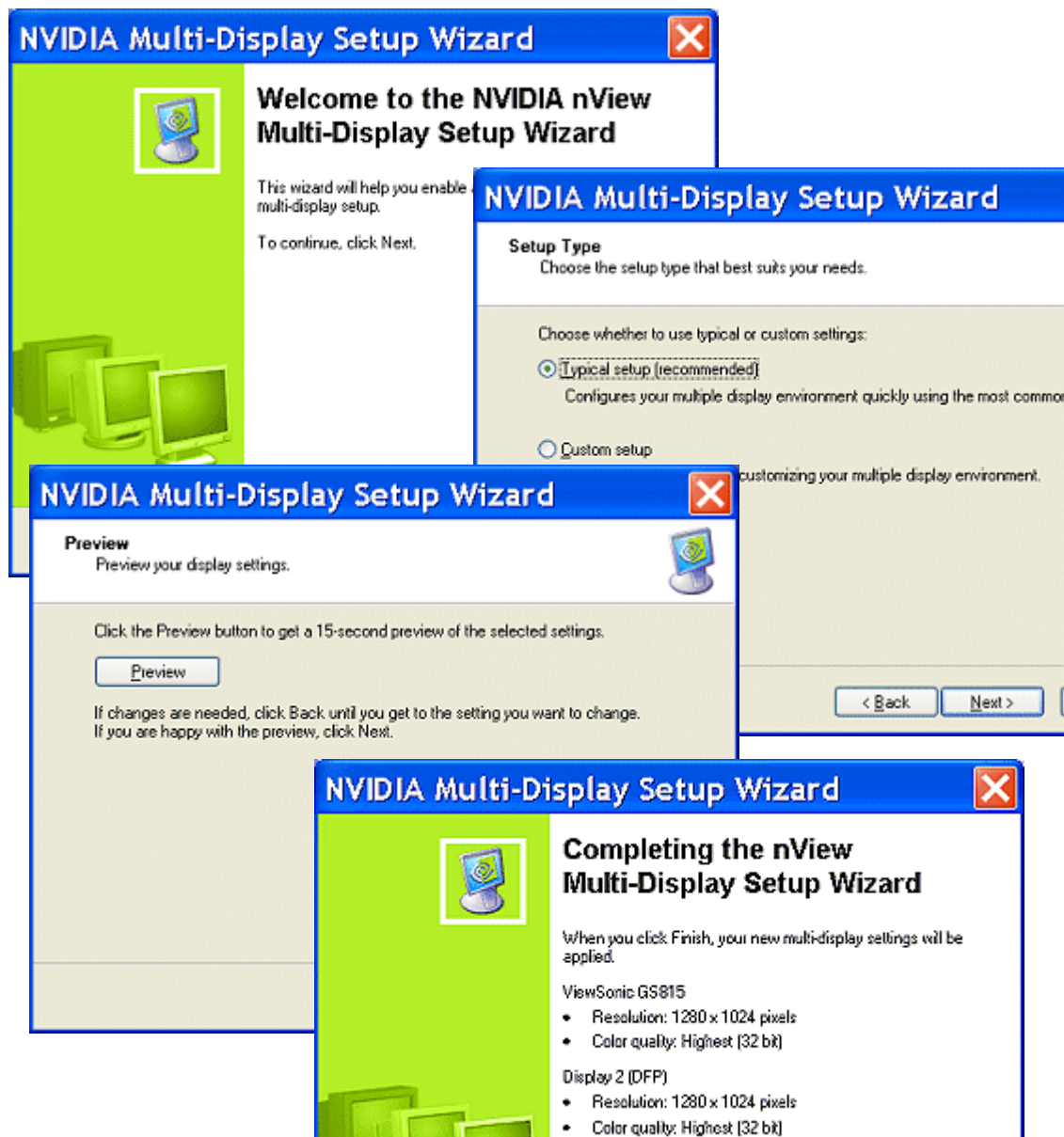
NVIDA Display Setup Wizard — Custom Setup

Figure C.2 NVIDIA Display Setup Wizard — Custom Setup Pages (1)

Figure C.3   NVIDIA Display Setup Wizard — Custom Setup Pages (2)
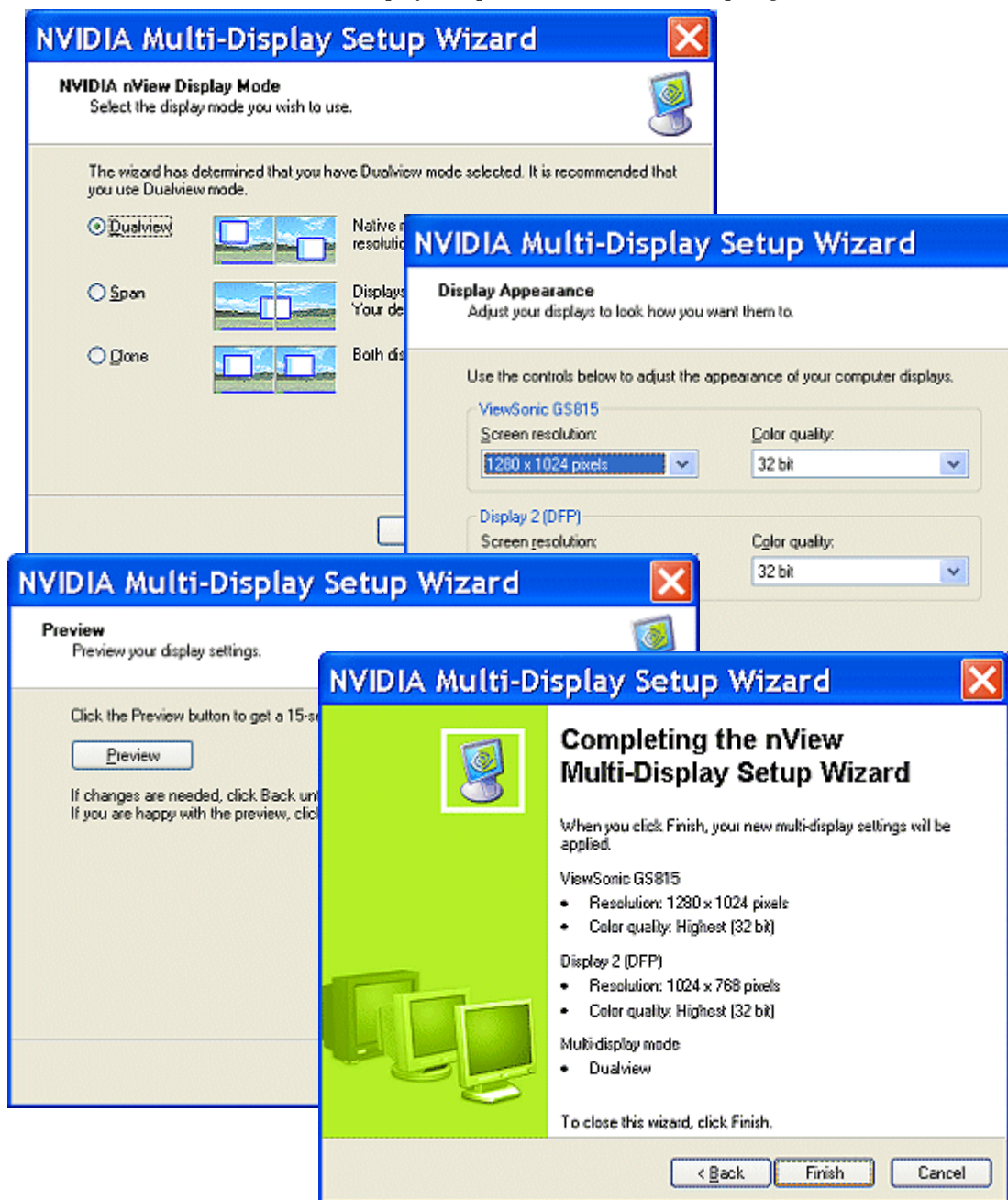
NVIDIA Display Wizard — HDTV Component Connection

Figure C.4 NVIDIA TV Display Wizard — HDTV Component Connection Page (1)
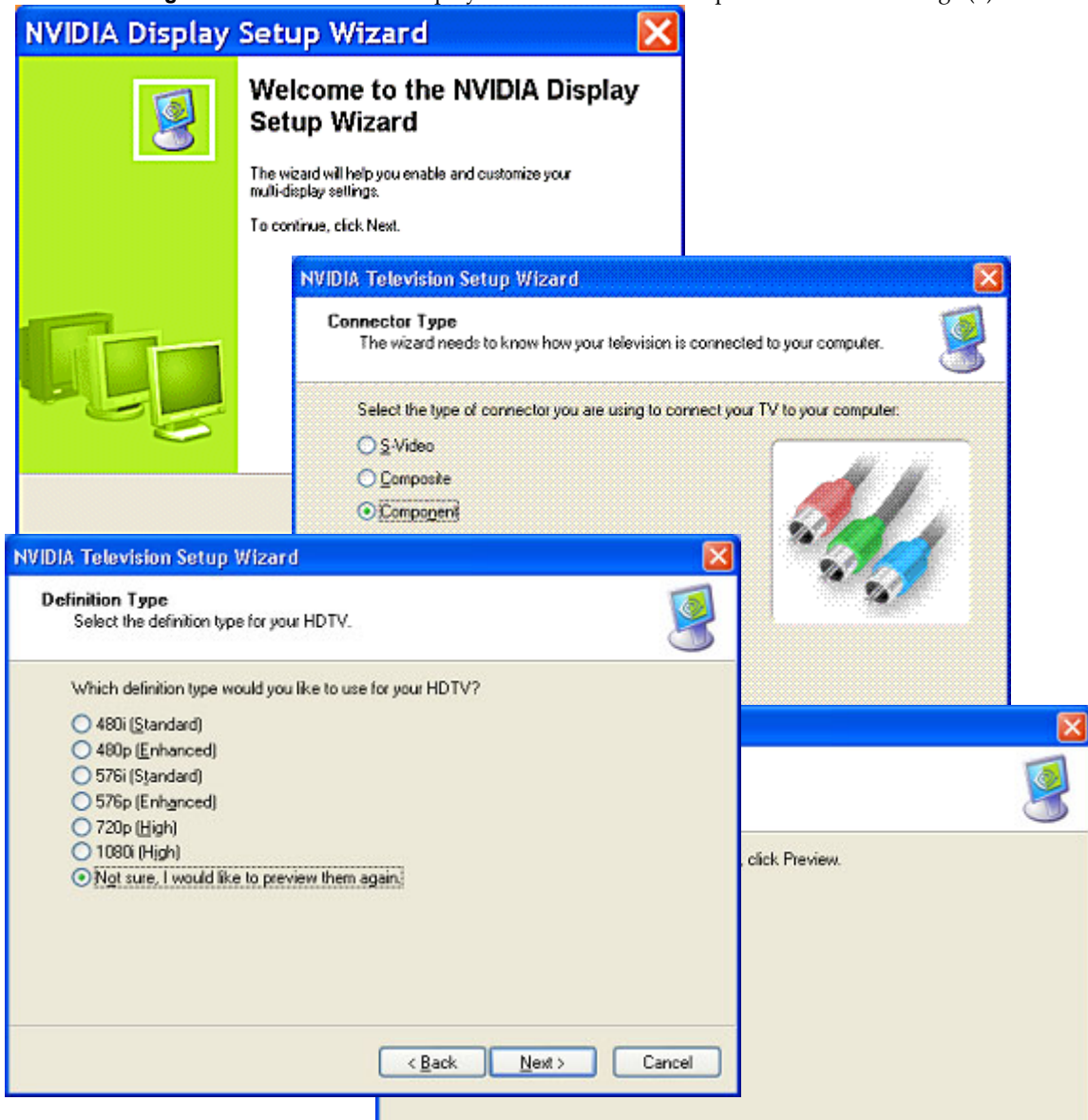
Figure C.5   NVIDIA TV Display Wizard — HDTV Component Connection Page (2)
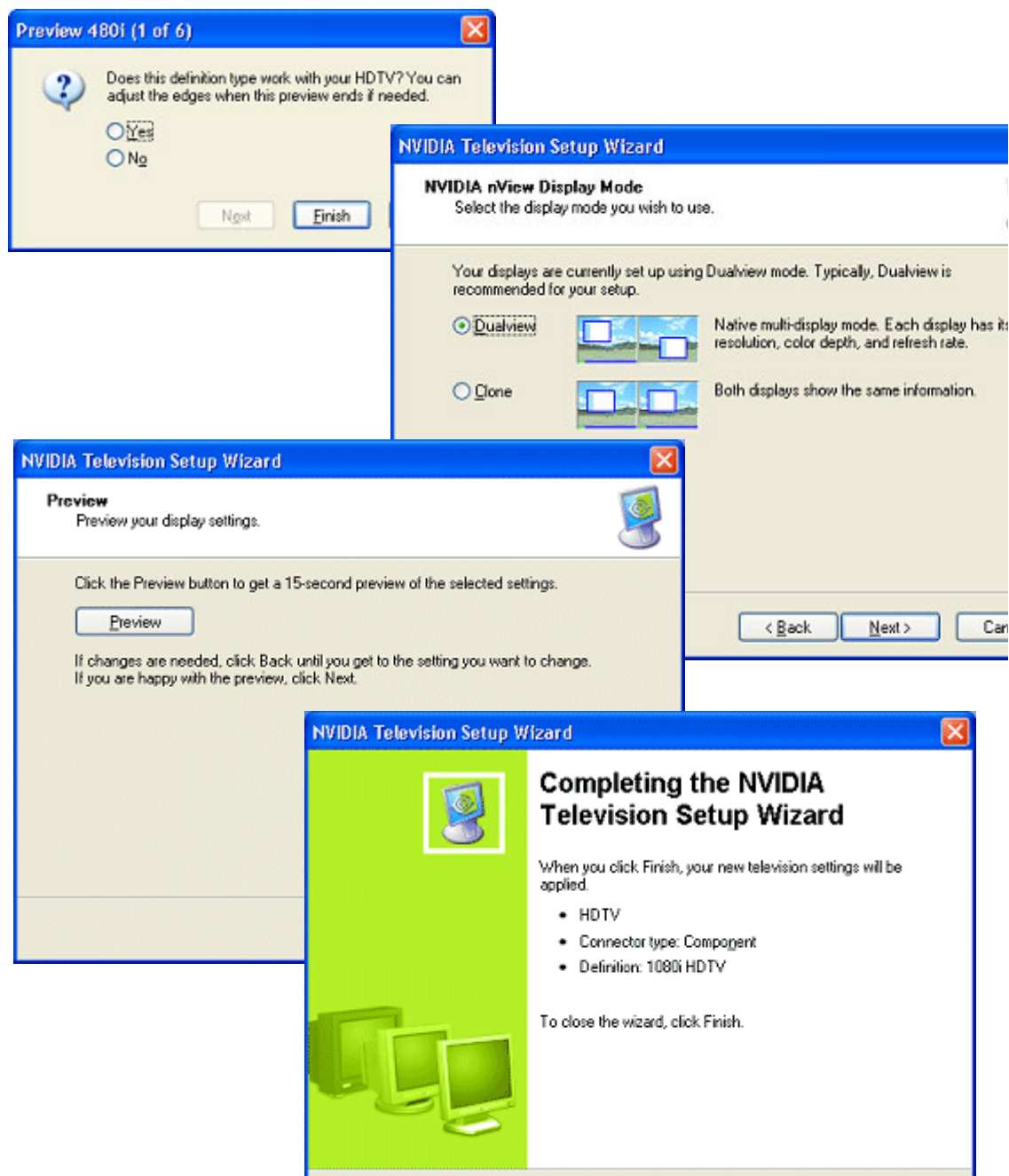
NVIDA Display Wizard — Analog Display with HDTV/DVI

Figure C.6   NVIDIA Display Wizard—Analog Display with HDTV/DVI Pages (1)
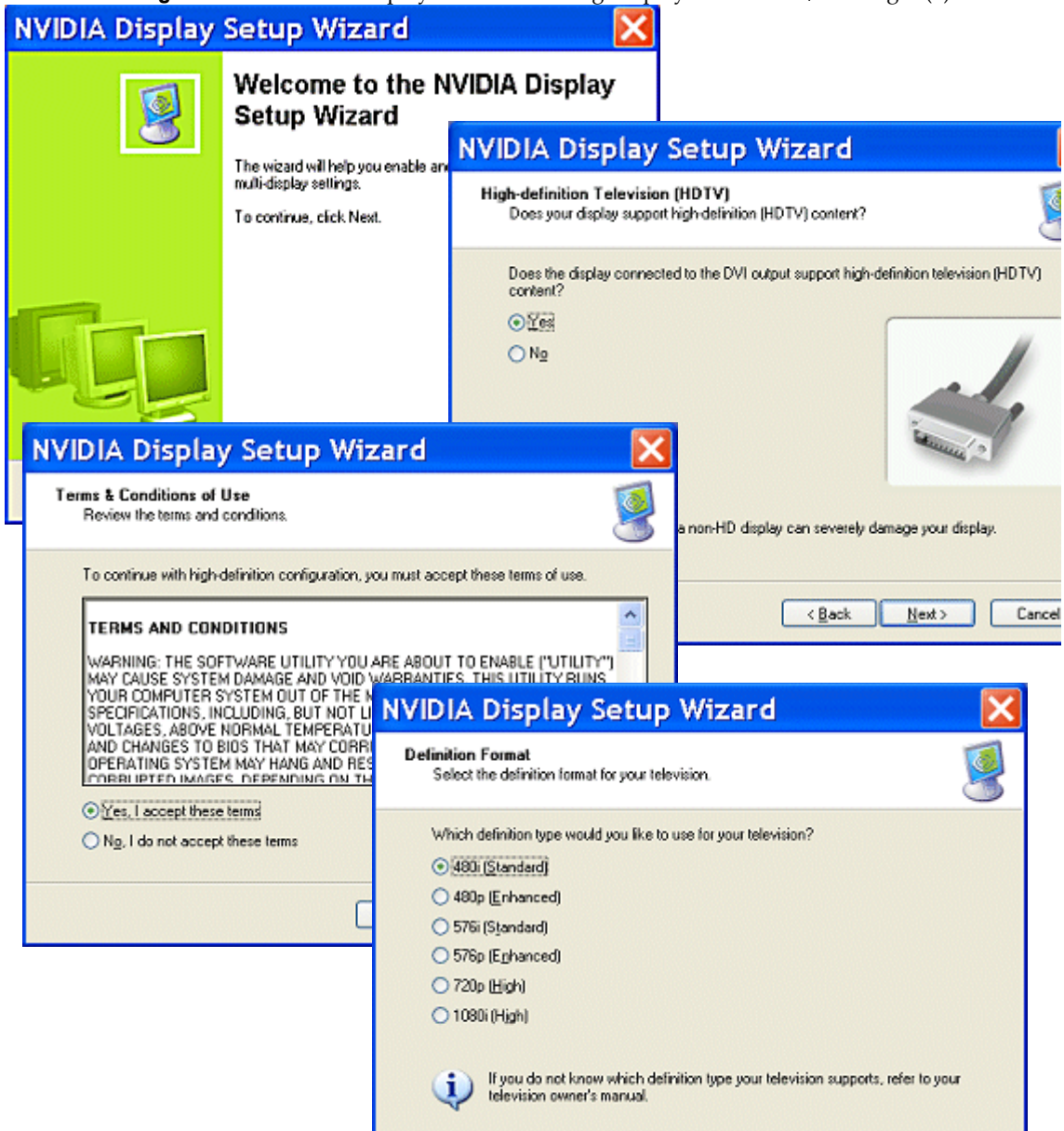
Figure C.7   NVIDIA Display Wizard—Analog Display with HDTV/DVI Pages (2)
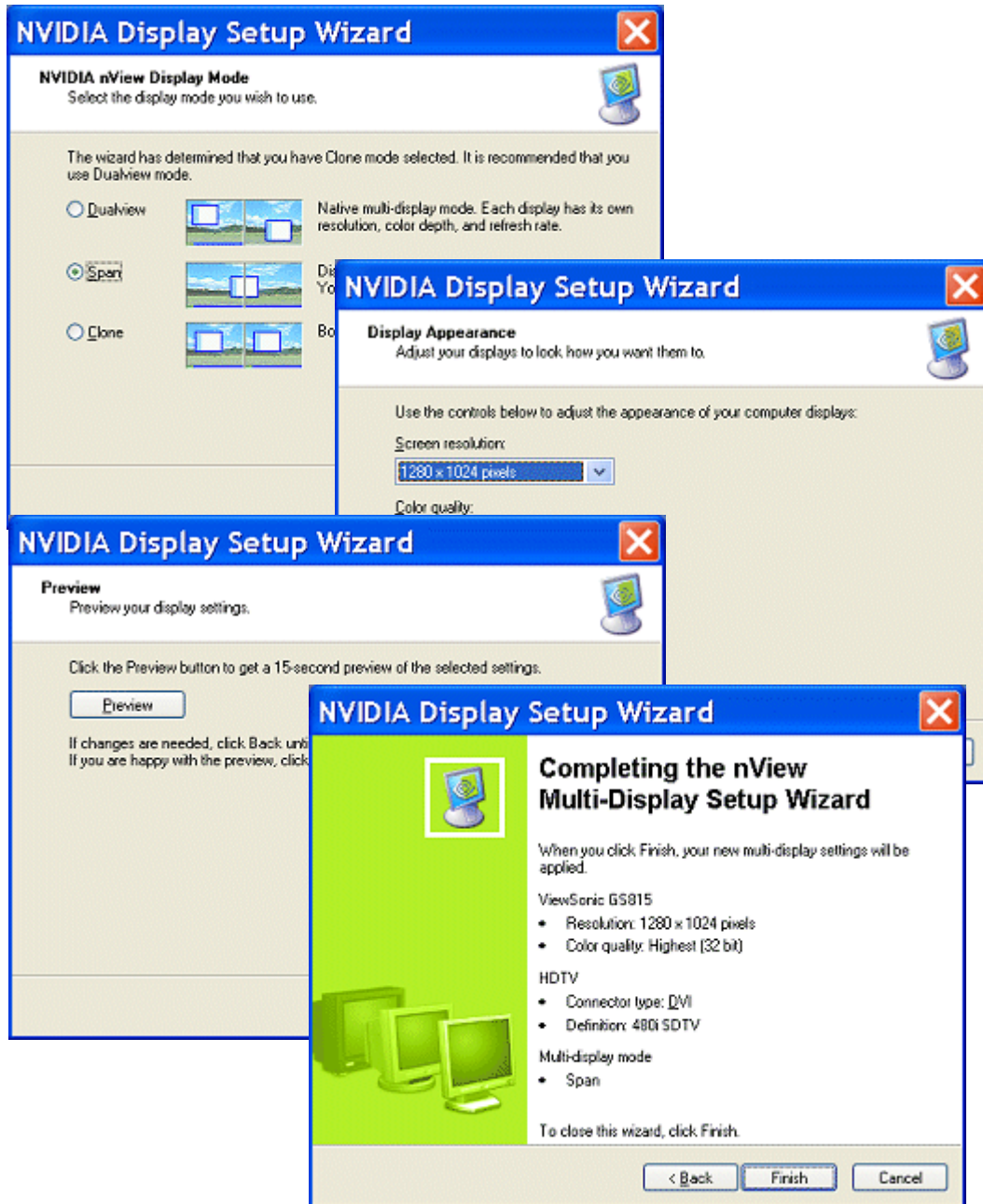
NVIDA Display Wizard — Digital Display and Television

Figure C.8   NVIDIA Display Wizard — Digital Display with TV Pages (1)
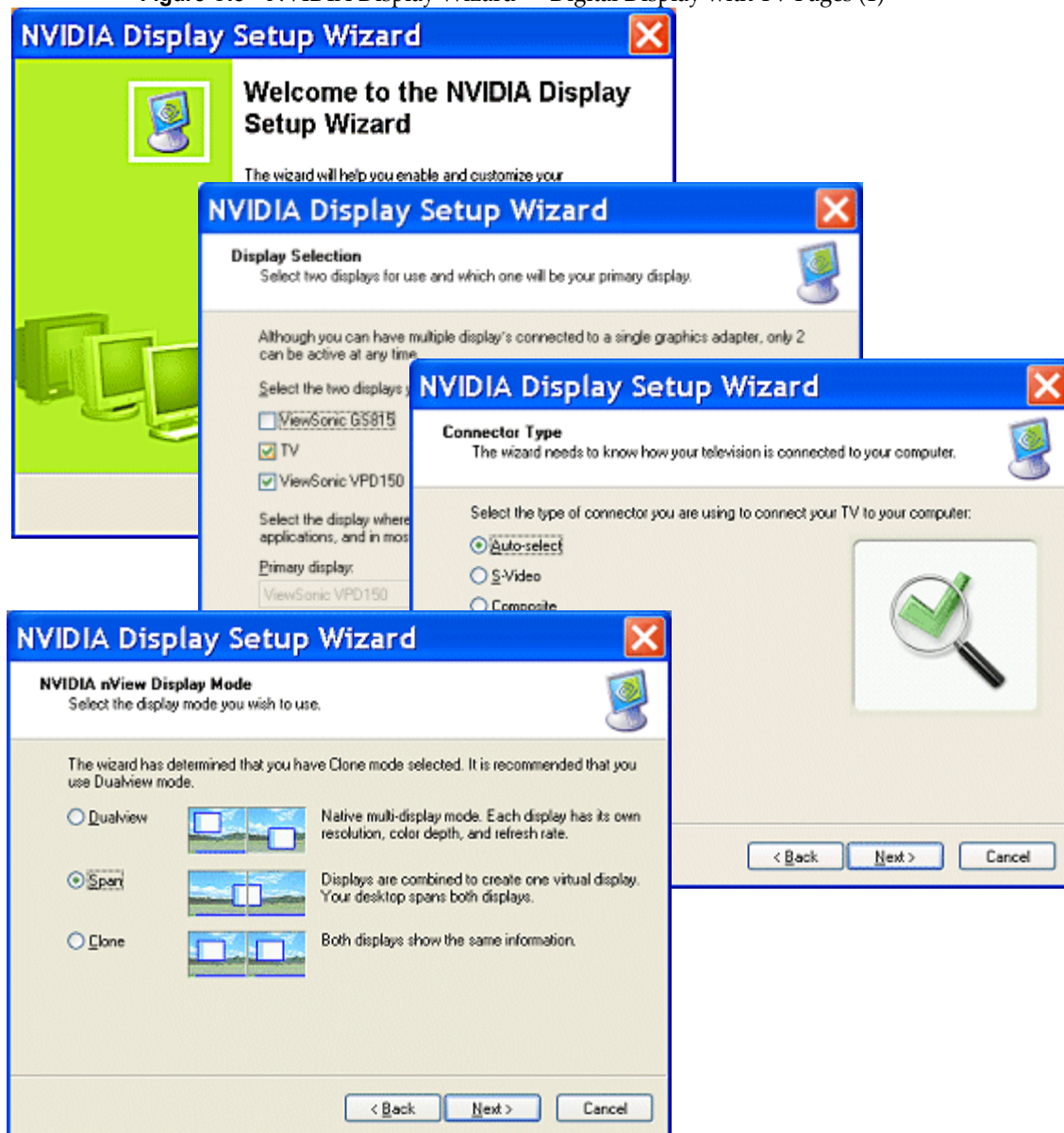
Figure C.9   NVIDIA Display Wizard — Various Types of TV Connectors
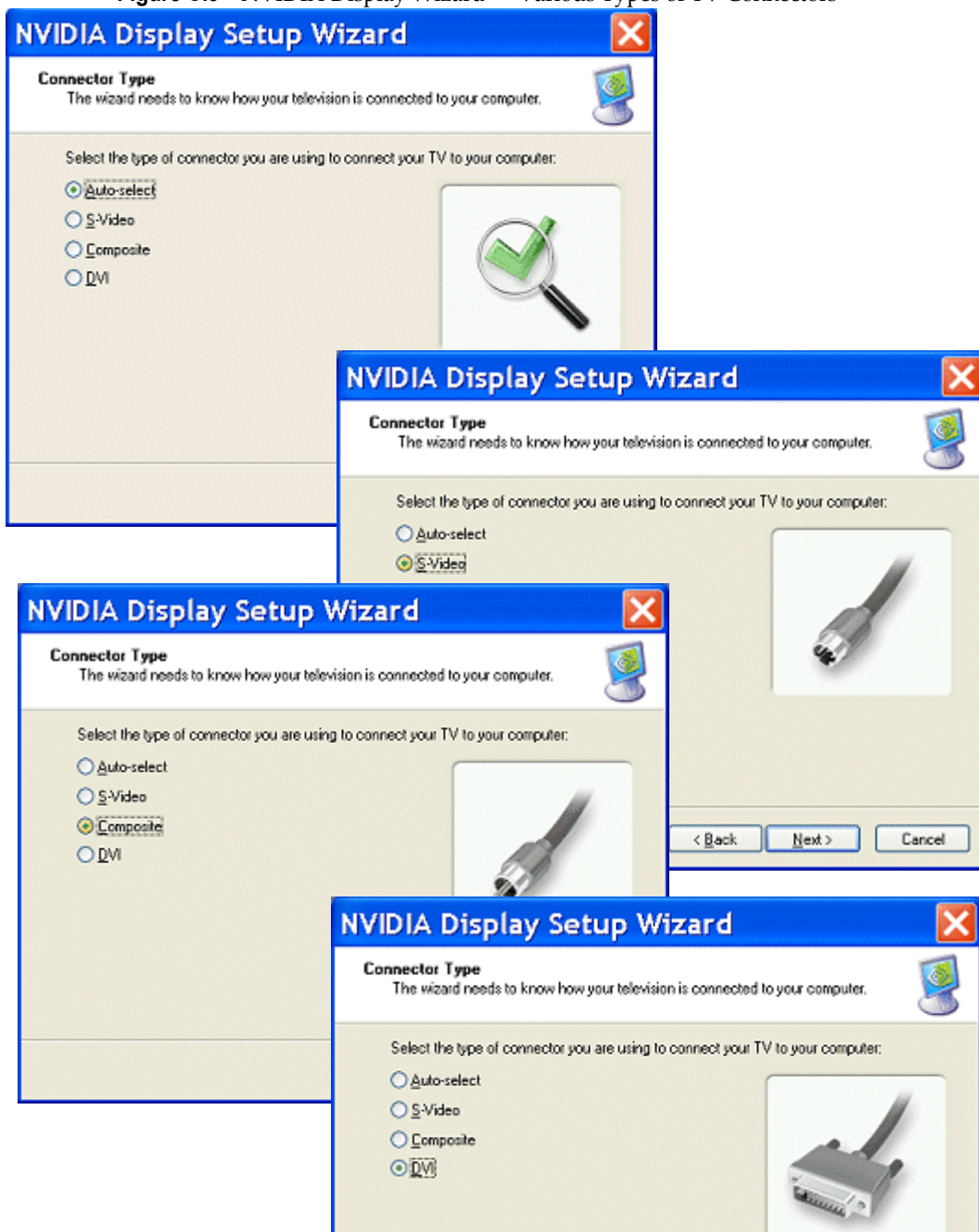
Figure C.10 NVIDIA Display Wizard — Digital Display with TV Pages (2)

D
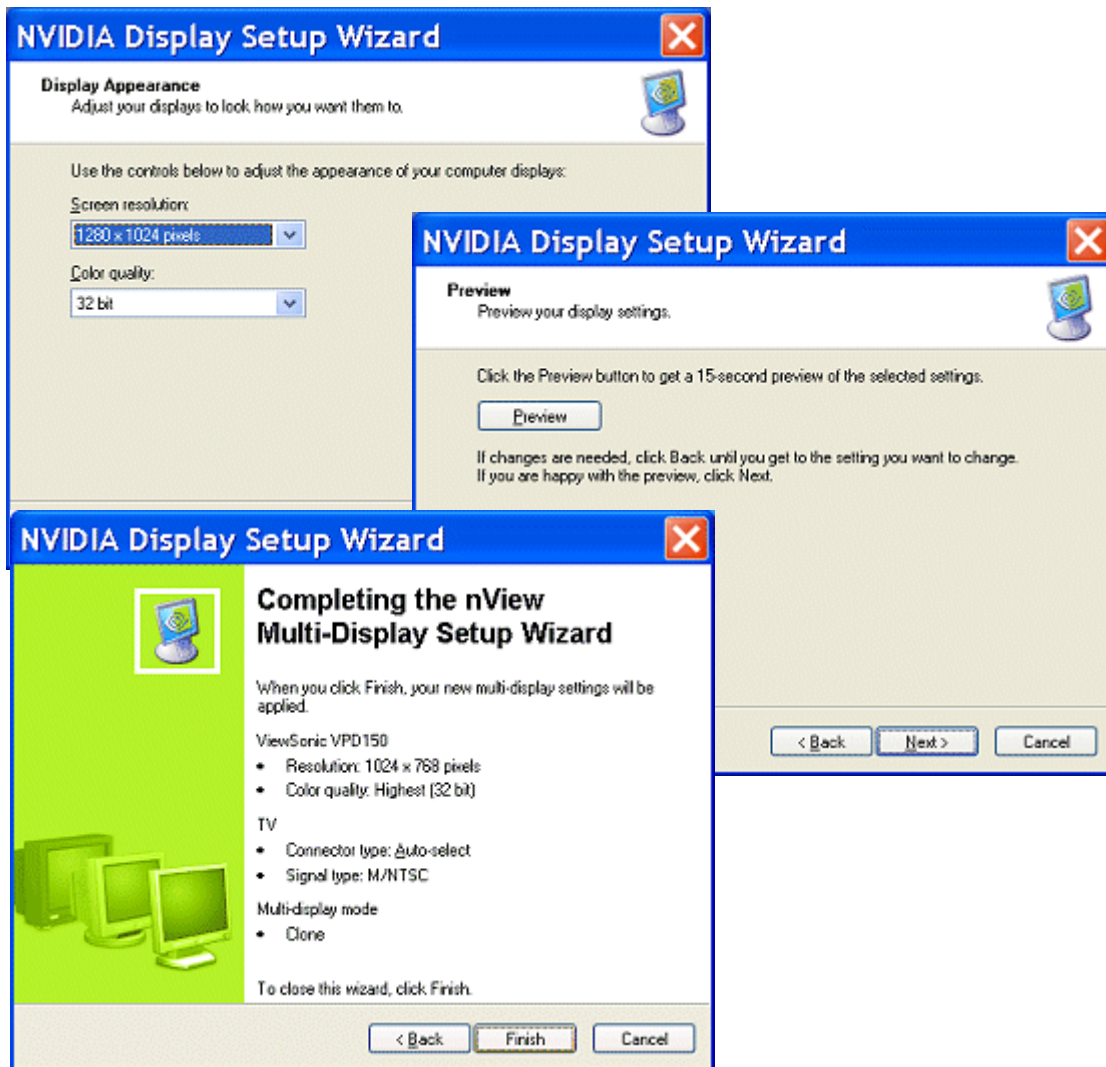
NVIDIA FORCEWARE GRAPHICS DISPLAY DRIVER — FEATURE HISTORY

This appendix 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 D.1 includes a summary of previous driver releases and the versions associated with them.

Table D.1   NVIDIA Drivers for Windows

Driver	Name	Versions	Comments
Release 80	ForceWare	81.84, 81.85, 81.87	
Release 75	ForceWare	77.56, 77.72, 77.76, 77.77, 78.01, 78.05	
Release 70	ForceWare	71.84, 71.89	
Release 65	ForceWare	66.77, 66.93, 67.02, 67.03, 67.66	

Table D.1   NVIDIA Drivers for Windows (continued)

Driver	Name	Versions	Comments
Release 60	ForceWare	61.76, 61.77	
Release 55	ForceWare	56.64, 56.72, 57.30	
Release 50	ForceWare	52.16, 53.04	
Release 40	Detonator FX	44.03–45.xx	
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 80 Enhancements

Release 75 Enhancements

OpenGL 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

- SLI support for OpenGL workstation applications with Quadro-based PCI-Express graphics cards.

- Additional SLI support — Release 75 adds support for the following combinations of PCI Express graphics cards and NVIDIA products, as listed below:

NVIDIA Product	PCI-Express Graphics Cards
NVIDIA nForce4 SLI	
NVIDIA nForce Professional 2200	GeForce 7800 GTX + GeForce 7800 GTX
NVIDIA nForce Professional 2200 + NVIDIA nForce Professional 2050	
All NVIDIA GPUs	GeForce 6600 + GeForce 6600

- Improved SLI performance for DirectX and OpenGL applications

- Improved end-user control of SLI profiles and rendering modes – see descriptions of SLI-based options in "Adjusting Performance and Quality Settings" on page 97.

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.

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 97) include:
  - Combined DirectX and OpenGL application profiles on one page
  - All application profiles, including workstation applications, are combined into the same application profiles page.
  - Added a **triple-buffering** option for improved frame rates. (Does not apply to applications that are fully OpenGL-based.)
  - Added a **transparency antialiasing** option, which applies to graphics cards based on the Quadro FX 4500 and newer series of GPUs. 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 the Quadro FX 4500 and newer series of GPUs. 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-display 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

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. See chapters 3 and 4 — "NVIDIA Control Panel Access" on page 17 and "Using nView Multi-Display Settings" on page 31.

- **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. See "Desktop Access" on page 19 and "Other NVIDIA Display Menu Items" on page 25.

- **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. See "Shortcut to Playing Video Files on Any Display" on page 19.

- **Tools** page — provides options for shortcuts, display optimizations, and troubleshooting. For details, see "Using the Tools Page" on page 125.

  Note: 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**

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

Display Driver, DirectX, and OpenGL

Table D.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.

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

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.

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1. Cards must be of the same vendor and model number.

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

- 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

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2. PAE is an extension that enables Intel compatible computers to address more than 4 GB of physical memory.

3D Graphics API Enhancements

Direct3D

- Improved antialiasing performance
- Improved shaders

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 monitor 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**
  - 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.

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3. Rotation is not supported on graphics cards based on the TNT, TNT2 or Vanta product families.

- **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
  - Immediate mode optimizations for Solid Edge, and display list tuning for UGv17.

- **Multi-monitor 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

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4. Keystone is not supported on graphics cards based on the TNT, TNT2 or Vanta product families.

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 board (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 9x 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 9x 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 board), is also supported by any two NVIDIA graphics boards 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 board).

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 $9x$.

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 the table below were added or changed in Release 5.

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.

D

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 3 and throughout this guide) refers to the entire NVIDIA-based window with the fly-out NVIDIA display menu containing menu 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 (GPU)**. Supported NVIDIA GPUs are listed in Chapter 2. 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 additional details, see the Application Note titled "*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.